CINDERELLA 248, LLC

KINGS COUNTY

BROOKLYN, NEW YORK

SITE MANAGEMENT PLAN

NYSDEC BCP Site Number: C224160

Prepared for:

CINDERELLA 248, LLC

248 FLATBUSH AVENUE

BROOKLYN, NEW YORK

Prepared by:

FPM group™

909 MARCONI AVENUE
RONKONKOMA, NY 11779

Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date

SEPTEMBER 2017

CERTIFICATION STATEMENT

I KEVIN LOYST certify that I am currently a NYS Professional Engineer as defined in 6 NYCRR Part 375] and that this Site Management Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).



_____, PE

9-18-17 DATE

CINDERELLA 248, LLC SITE

KINGS COUNTY

BROOKLYN, NEW YORK

SITE MANAGEMENT PLAN

TABLE OF CONTENTS

Section	Description	Page
	LIST OF ACRONYMS	v
ES	**EXECUTIVE SUMMARY**	vii
1.0	**INTRODUCTION**	1-1
	1.1 General	1-1
	1.2 Revisions	1-2
	1.3 Notifications	1-3
2.0	**SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS**	2-1
	2.1 Site Location and Description	2-1
	2.2 Physical Setting	2-1
	2.2.1 Land Use	2-1
	2.2.2 Geology	2-2
	2.2.3 Hydrogeology	2-2
	2.3 Investigation and Remedial History	2-3
	2.4 Remedial Action Objectives	2-7
	2.5 Remaining Contamination	2-7
	2.5.1 Groundwater	2-8
	2.5.2 Soil Vapor	2-8
3.0	**INSTITUTIONAL AND ENGINEERING CONTROL PLAN**	3-1
	3.1 General	3-1
	3.2 Institutional Controls	3-1
	3.3 Engineering Controls	3-2

TABLE OF CONTENTS (Continued)

Section	Description	Page
	3.3.1 Sub-slab Depressurization System	3-3
	3.3.2 Criteria for Completion of Remediation/Termination of Remedial System	3-5
	3.3.2.1 Sub-slab Depressurization System (SSDS)	3-5
4.0	**MONITORING AND SAMPLING PLAN**	4-1
	4.1 General	4-1
	4.2 Site-wide Inspection	4-2
	4.3 Mitigation System Monitoring and Sampling	4-3
	4.3.1 SSDS Monitoring	4-3
	4.3.2 SSDS Emissions Sampling	4-4
	4.3.3 SVI Sampling	4-5
	4.4 Post-Remediation Media Monitoring and Sampling	4-6
	4.4.1 Soil Vapor Intrusion Sampling	4-6
	4.4.2 SVI Monitoring and Sampling Protocol	4-7
5.0	**OPERATION AND MAINTENANCE PLAN**	5-1
	5.1 General	5-1
	5.2 SSDS Performance Criteria	5-1
	5.3 Operation and Maintenance of SSDS	5-1
	5.3.1 SSDS Start-up and Testing	5-2
	5.3.2 Routine SSDS Operation and Maintenance	5-2
	5.3.3 Non-Routine Operation and Maintenance	5-3
	5.3.4 SSDS Monitoring Devices and Alarms	5-3
6.0	**PERIODIC ASSESSMENTS/EVALUATIONS**	6-1
	6.1 Climate Change Vulnerability Assessment	6-1
	6.2 Green Remediation Evaluation	6-1
	6.2.1 Timing of Green Remediation Evaluations	6-2
	6.2.2 SSDS Operations	6-2
	6.2.3 SSDS Equipment Enclosure Operations	6-3
	6.2.4 Frequency of SSDS Checks, Sampling and Other Periodic Activities	6-3
	6.2.5 Metrics and Reporting	6-4
	6.3 Remedial System Optimization	6-4

TABLE OF CONTENTS (Continued)

Section	Description	Page
7.0	**REPORTING REQUIREMENTS**	7-1
7.1	Site Management Reports	7-1
7.2	Periodic Review Report	7-3
7.2.1	Certification of Institutional and Engineering Controls	7-4
7.3	Corrective Measures Work Plan	7-6
7.4	Remedial Site Optimization Report	7-6
8.0	**REFERENCES**	8-1

LIST OF TABLES

Table No.	Description
1.3.1	Notifications
2.2.3.1	Groundwater Elevation Measurements
2.3.1	Soil Chemical Analytical Results
2.5.1.1	Groundwater Chemical Analytical Results
2.5.2.1	Soil Vapor and Indoor Air Chemical Analytical Results
4.3.1.1	Mitigation System Monitoring Requirements and Schedule
4.3.2.1	SSDS Emissions Sampling Requirements and Schedule
4.3.3.1	SVI Sampling Requirements and Schedule
4.4.1.1	Post-Remediation SVI Sampling Requirements and Schedule
5.3.2.1	SSDS Routine Maintenance
7.1.1	Schedule of Monitoring/Inspection Reports

LIST OF FIGURES

Figure No.	Description
1.1.1	Site Location
1.1.2	Site Boundary Map
2.1.1	Site and Vicinity Plan
2.2.2.1	Southwest – Southeast Cross Section From Front to Back of Site
2.2.3.1	Groundwater Flow Direction and PCE Data
2.5.1	Groundwater Data
2.5.2	Soil Vapor and Air Data
3.3.1.1	SSDS Layout
3.3.1.2	Schematic of SSDS Process Flow
4.3.3.1	SVI Sampling Locations

LIST OF APPENDICES

Appendix	Description
A	Environmental Easement and ALTA/ASCM Land Title Survey
B	List of Site Contacts
C	Field Sampling Plan
D	Quality Assurance Project Plan
E	Health and Safety Plan
F	Site Management Forms
G	Operation and Maintenance Manual for SSDS
H	Remedial System Optimization Table of Contents
I	Soil Boring Logs

LIST OF ACRONYMS

AS	Air Sparging
ASP	Analytical Services Protocol
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CAMP	Community Air Monitoring Plan
C/D	Construction and Demolition
CFR	Code of Federal Regulation
CLP	Contract Laboratory Program
COC	Certificate of Completion
CO2	Carbon Dioxide
CP	Commissioner Policy
DER	Division of Environmental Remediation
EC	Engineering Control
ECL	Environmental Conservation Law
ELAP	Environmental Laboratory Approval Program
ERP	Environmental Restoration Program
EWP	Excavation Work Plan
GHG	Green House Gas
GWE&T	Groundwater Extraction and Treatment
HASP	Health and Safety Plan
IC	Institutional Control
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYCRR	New York Codes, Rules and Regulations
O&M	Operation and Maintenance
OM&M	Operation, Maintenance and Monitoring
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PID	Photoionization Detector
PRP	Potentially Responsible Party
PRR	Periodic Review Report
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RP	Remedial Party
RSO	Remedial System Optimization

LIST OF ACRONYMS (Continued)

SAC	State Assistance Contract
SCG	Standards, Criteria and Guidelines
SCO	Soil Cleanup Objective
SMP	Site Management Plan
SOP	Standard Operating Procedures
SOW	Statement of Work
SPDES	State Pollutant Discharge Elimination System
SSD	Sub-slab Depressurization
SVE	Soil Vapor Extraction
SVI	Soil Vapor Intrusion
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leachate Procedure
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VCA	Voluntary Cleanup Agreement
VCP	Voluntary Cleanup Program

ES EXECUTIVE SUMMARY

The following provides a brief summary of the controls implemented for the Site, as well as the inspections, monitoring, maintenance and reporting activities required by this Site Management Plan:

Site Identification:	BCP Site No. C224160 Cinderella 248, LLC 248 Flatbush Ave. Brooklyn, NY
Institutional Controls:	1. Requires the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3); 2. Allows the use and development of the controlled property for residential use, which allows for restricted-residential use, commercial use and industrial use, as defined by Part 375-1.8(g), although land use is subject to local zoning laws; 3. Restricts the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or County DOH; and 4. Requires compliance with the Department approved Site Management Plan.
Engineering Controls:	1. SSDS

Inspections:	Frequency
1. Site-wide (EC/IC Inspections)	Annually, and as needed
Monitoring:	
1. SSDS Operation	Quarterly
2. SVI Sampling for Effectiveness (via collection of sub-slab soil vapor, indoor air and outdoor ambient air samples)	Initial and Annually (during heating season)
3. Post-remediation SVI Sampling for Compliance (via collection of sub-slab soil vapor, indoor air and outdoor ambient air samples)	Once (during heating season)

Maintenance:	
1. SSDS maintenance	As needed
Reporting:	
1. Periodic Review Report	Annually

Further descriptions of the above requirements are provided in detail in the latter sections of this Site Management Plan.

1.0 INTRODUCTION

1.1 General

This Site Management Plan (SMP) is a required element of the remedial program for Cinderella 248, LLC located in Brooklyn, New York (hereinafter referred to as the "Site"). See Figure 1.1.1 for the Site location. The Site is currently in the New York State (NYS) Brownfield Cleanup Program (BCP), which is administered by New York State Department of Environmental Conservation (NYSDEC), as Site No. C224160.

Cinderella 248, LLC entered into a Brownfield Cleanup Agreement (BCA) on April 10, 2013 with the NYSDEC to remediate the site. A figure showing the site location and boundaries of this site is provided in Figure 1.1.2. The boundaries of the site are more fully described in the metes and bounds site description that is part of the Environmental Easement provided in Appendix A.

After completion of the remedial work, some contamination may have been left at this site, which is hereafter referred to as "potential remaining contamination". Institutional and Engineering Controls (ICs and ECs) have been incorporated into the site remedy to control exposure to remaining contamination to ensure protection of public health and the environment. An Environmental Easement granted to the NYSDEC, and recorded with the Kings County Clerk, requires compliance with this SMP and all ECs and ICs placed on the site.

This SMP was prepared to manage remaining contamination at the site until the Environmental Easement is extinguished in accordance with ECL Article 71, Title 36. This plan has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

It is important to note that:

- This SMP details the site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the Environmental Easement, which is grounds for revocation of the Certificate of Completion (COC); and

- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6NYCRR Part 375 and the BCA Index #C224160-09-12; Site #C224160 for the site, and thereby subject to applicable penalties.

All reports associated with the site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State. A list of contacts for persons involved with the site is provided in Appendix B of this SMP.

This SMP was prepared by FPM Group (FPM) on behalf of Cinderella 248, LLC in accordance with the requirements of the NYSDEC's DER-10 ("Technical Guidance for Site Investigation and Remediation"), dated May 2010, and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the ICs and/or ECs that are required by the Environmental Easement for the site.

1.2 Revisions

Revisions to this plan will be proposed in writing to the NYSDEC's project manager. Revisions will be necessary upon, but not limited to, the following occurring: a change in media monitoring requirements, upgrades to or shut-down of a remedial system, post-remedial removal of contaminated sediment or soil, or other significant change to the site conditions. In accordance with the Environmental Easement for the site, the NYSDEC will provide a notice of any approved changes to the SMP, and append these notices to the SMP that is retained in its files.

1.3 Notifications

Notifications will be submitted by the property owner to the NYSDEC, as needed, in accordance with NYSDEC's DER – 10 for the following reasons:

- 60-day advance notice of any proposed changes in site use that are required under the terms of the BCA, 6NYCRR Part 375 and/or Environmental Conservation Law.
- 7-day advance notice of any field activity associated with the remedial program.
- Notice within 48-hours of any damage or defect to the foundation, structures or EC that reduces or has the potential to reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect.
- Verbal notice by noon of the following day of any emergency, such as a fire; flood; or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.
- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the NYSDEC within 45 days describing and documenting actions taken to restore the effectiveness of the ECs.

Any change in the ownership of the site or the responsibility for implementing this SMP will include the following notifications:

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party has been provided with a copy of the Brownfield Cleanup Agreement (BCA) and all approved work plans and reports, including this SMP.
- Within 15 days after the transfer of all or part of the site, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC.

Table 1.3.1 below includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix B.

Table 1.3.1: Notifications*

Name	Contact Information
NYSDEC DER Project Manager: Alicia Barraza	(518) 402-9690 alicia.barraza@dec.ny.gov
NYSDEC Region 2 HW Engineer: Jane O'Connell	(718)-482-4599 jane.oconnnell@dec.ny.gov
NYSDEC Site Control: Kelly Lewandowski, Chief, Site Control Section	(518) 402-9553 kelly.lewandowski@dec.ny.gov

* Note: Notifications are subject to change and will be updated as necessary.

2.0 SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

2.1 Site Location and Description

The site is located in Brooklyn, Kings County, New York and is identified as Block 936 and Lot 12 on the Kings County Tax Map (see Figure 1.1.2). The site is an approximately 0.057-acre area and is bounded by 244 Flatbush Avenue to the north, 250 Flatbush Avenue to the south, Flatbush Avenue to the east, and 77 Prospect Place to the west (see Figure 2.1.1 – Site and Vicinity Plan). The boundaries of the site are more fully described in Appendix A –Environmental Easement. The owner of the site parcel at the time of issuance of this SMP is Cinderella 248, LLC.

2.2 Physical Setting

2.2.1 Land Use

The Site consists of the following: a 1-story building with a basement. The Site is zoned commercial and is currently being redeveloped for commercial uses. Site occupants will include a fitness center.

The properties adjoining the Site and in the neighborhood surrounding the Site primarily include commercial and residential properties. The properties immediately to the southeast of the Site include offices, the properties immediately northwest and east of the Site (across Flatbush Avenue) include mixed used buildings utilized for commercial/retail and residential apartments. Residential properties adjoin the property to southwest. See Figure 2.1.1.

2.2.2 Geology

The Site is generally underlain by fill material from immediately below the building slab to a depth of approximately five feet below the basement slab. The fill generally consists of silty sand with minor amounts of brick, wood, glass, and/or angular gravel. No visual indications suggestive of potential contamination were noted during the RI. Minor amounts of brick and concrete fragments were noted in a few borings, but no debris, ash, or other indications suggestive of contaminated historic fill were observed.

Native soil was observed from below the base of the fill to a depth of 10 feet below the basement slab as noted in the soil borings.. These soils generally consisted of silty sand with varying amounts of gravel.

A geologic cross section is shown in Figure 2.2.2.1. Site specific boring logs are provided in Appendix I.

2.2.3 Hydrogeology

The depth to groundwater beneath the Site is approximately 52 feet below the basement level (the basement level is at approximately 10 feet below ground surface relative to Flatbush Avenue)he site-specific groundwater flow is to the north-northwest, which is generally consistent with previous investigation data. A groundwater contour map including groundwater elevation data is shown in Figure 2.2.3.1. A table summarizing the groundwater elevation and well construction information is included as Table 2.2.3.1.

The closest surface water body is the Gowanus Canal, which is located approximately 0.67 miles west-northwest of the Site. The Gowanus Canal is a federal National Priorities List (NPL, or Superfund) site and has been impacted by discharges from the surrounding industrial activities, as well as the New York City sewer system.

2.3 Investigation and Remedial History

The following narrative provides a remedial history timeline and a brief summary of the available project records to document key investigative and remedial milestones for the Site. Full titles for each of the reports referenced below are provided in Section 8.0 - References.

2005 Investigation

The Site was initially investigated in 2005 by Advanced Cleanup Technologies, Inc. (ACT). This investigation included an environmental site assessment (ESA), a limited subsurface investigation, and remedial activities. The ESA identified an abandoned 1,000-gallon fuel oil aboveground storage tank (AST) and a historic dry cleaning machine coolant leak as issues of environmental concern.

The dry cleaning machine coolant leak was investigated in April 2005 and soils impacted by tetrachloroethylene (PCE) were reported to be present beneath the former boiler room to a depth of approximately nine feet below the basement level; the data from this sampling event are not available. Groundwater sampling was also performed in July 2005 below the former boiler and PCE was detected at a concentration of 285 micrograms per liter (ug/l), which was above the NYSDEC Class GA Ambient Water Quality Standard (Standard) for PCE.

In September 2005 the impacted soils were excavated to a depth of five feet below the basement floor under the direction of ACT. The basement floor is approximately 10 feet below ground surface relative to Flatbush Avenue.. The excavation location is shown on Figure 2.2.3.1. Following excavation, end-point sampling was conducted on the four sidewalls and floor of the excavation. PCE was not detected in any of the end-point samples. Further soil sampling below the five foot excavation depth was conducted in 2013 and 2014, as discussed below. The 1,000-gallon fuel oil AST was emptied, cleaned, and properly abandoned in October 2005 by Action Remediation, Inc.

2007 Soil Vapor Data

Soil vapor investigations were performed at the Site by ACT and Leggett, Brashears and Graham, Inc. (LBG); the results of these investigations were documented by ACT in a March 2007 and indicated that PCE was present in soil vapor beneath the basement slab in close proximity to supports situated beneath the former location of the dry-cleaning machine, which was formerly located on the first floor.

2011 Environmental Activities

In 2011 Arcadis US, Inc. (Arcadis) conducted an environmental investigation that included an ESA, a limited subsurface soil and groundwater investigation, and a vapor intrusion investigation. The ESA identified the historic use of dry cleaning solvents onsite and an offsite dry cleaner as issues of environmental concern.

Soil sampling was conducted at ten locations beneath the basement and included an area of stained floor in proximity to the supports beneath the former location of the dry-cleaning machine, the former boiler room, a storage area, and much of the basement. Soil screening was performed and photoionization (PID) responses of up to 5,000 parts per million (ppm) were noted. PCE was detected in soil from five of the borings. None of the detections exceeded the 6 NYCRR Part 375-6 Soil Cleanup Objectives (Objectives) for unrestricted use. No other volatile organic compounds (VOCs) were detected in any of the soil samples.

Groundwater sampling was performed at three locations beneath the basement floor. PCE was detected at all three sampling locations, but was noted to exceed its NYSDEC Standard only at an upgradient location and beneath the former dry cleaning equipment. The upgradient PCE detection was 69 micrograms per liter (ug/l) and the PCE level beneath the former dry cleaning equipment location was 25 ug/l. The PCE concentration closest location to the former boiler room, was 3.9 ug/l, which is below the NYSDEC Standard.

A vapor intrusion investigation was conducted in August 2011 at the Site and on adjoining properties situated at 80 St. Marks Avenue and 250 and 252 Flatbush Avenue and included sub-slab soil vapor and indoor/outdoor air sampling. PCE was detected in sub-slab soil vapor at concentrations ranging from 4,010 to 20,800 micrograms per cubic meter (ug/m^3) at the Site, 454 to 1,480 ug/m^3 at 250 Flatbush Avenue, 3,810 to 20,400 ug/m^3 at 80 St. Mark's Avenue, and 185 to 450 ug/m^3 at 252 Flatbush Avenue. PCE was noted in indoor air at 12.1 ug/m^3 at 250 Flatbush Avenue, 2.67 ug/m^3 at 252 Flatbush Avenue, and 30.3 ug/m^3 at 80 St. Mark's Avenue. Based upon Decision Matrix 2 of the NYSDOH Soil Vapor Intrusion Guidance Document, a "Mitigation" response was noted for the Site and the two directly adjoining properties situated at 250 Flatbush Avenue and 80 St. Mark's Avenue. A "Monitoring" response was noted for 252 Flatbush Avenue.

2013 - 2014 Remedial Investigation/Alternatives Analysis

In late 2013 and early 2014 FPM conducted a Remedial Investigation and prepared an Alternatives Analysis in accordance with NYSDEC approved May 2013 Remedial Investigation/Alternatives Analysis (RIAA) Work Plan. Activities included a soil, groundwater and vapor intrusion investigation, and performance of a sub-slab depressurization system (SSDS) pilot test. The RI and AA results were documented in an October 2014 RI/AA Report.

Soil sampling was conducted at 8 locations at depths of 5 to 10 feet below the basement floor (or at approximately 13 to 18 feet below ground surface relative to Flatbush Avenue). Sampling included an area beneath the former location of the dry cleaning machine, the former boiler room, and much of the basement. Select shallow samples were also collected to evaluate the presence of fill at the site Soil screening was performed and photoionization (PID) responses of up to 37 ppm were noted. PCE was detected in soil from each of the borings, ranging from low estimated concentration of 0.89 ug/kg to a maximum of 380 ug/l. None of the detections of PCE exceeded the 6 NYCRR Part 375-6 Soil Cleanup Objectives for unrestricted use. Several analytes, including acetone (a VOC) and metals, including copper, silver and nickel, were noted to be above their respective

NYSDEC Objectives for unrestricted use, but were well below their respective NYSDEC restricted residential SCOs. No semivolatile organic compounds (SVOCs), PCBs or pesticides were detected. Table 2.3.1 summarizes the results of the RI soil samples.

Groundwater sampling was performed at three locations beneath the basement floor in March 2014 as shown on Figure 2.2.3.1. Groundwater monitoring and well construction information is included in Table 2.2.3.1 PCE was detected at all three sampling locations at concentrations exceeding the NYSDEC Standard. The upgradient PCE detection was 6.6 ug/l and the PCE level beneath the former dry cleaning equipment location was 25 ug/l. The PCE concentration at the closest location to the former boiler room, was 6.4 ug/l. Several petroleum-related VOCs were also detected at concentrations slightly exceeding the NYSDEC Standard; these detections appear to be from an off-site source. PCBs, pesticides, and SVOCs were noted to be either not detected or below the NYSDEC Standards. Several metals were detected, but only iron and sodium were noted to be above their respective NYSDEC Standards. These metals are commonly found at elevated concentrations in Long Island groundwater and are not suggestive of site-related contamination.

A vapor intrusion investigation was conducted to provide additional information at the Site and adjoining properties situated at 76 St. Marks Avenue and 254 Flatbush Avenue and included sub-slab soil vapor and indoor/outdoor air sampling. PCE was detected in sub-slab soil vapor at concentrations ranging from not detected to 4.4 micrograms per cubic meter (ug/m^3) at 76 St. Marks Avenue, 3.2 to 440 ug/m^3 at 254 Flatbush Avenue, and 13 ug/m^3 in soil vapor adjacent to 248 Flatbush Avenue. PCE was noted in indoor air at 3.6 to 5.7 ug/m^3 at 254 Flatbush Avenue and 1.7 ug/m^3 at 76 St. Mark's Avenue. Based upon Decision Matrix 2 of the NYSDOH Soil Vapor Intrusion Guidance Document, a "Mitigation" response was noted for the front portion of 254 Flatbush Avenue. The results of this investigation are further discussed in section

2015-2016 SSDS Startup

A pilot test to determine design parameters for an SSDS was conducted at the Site utilizing a regenerative blower connected to a temporary depressurization well and vapor monitoring points. The testing included the measuring of vacuums at varying distances from the depressurization well and indicated that a radius of influence of between 16 and 20 feet was achievable with a vacuum of between 10 and 20 inches of water column. Effluent emissions were also analyzed for compliance with NYSDEC Air Guide 1criteria; based upon the emissions test results, no treatment of the effluent was anticipated to be necessary. Additional analysis of the effluent was performed during startup of the SSDS system in August 2016, no exceedances of Air Guide 1 criteria were noted. Based up the pilot testing and startup effluent analysis data, effluent treatment is not necessary.

2.4 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for the Site, as listed in the NYSDEC's Decision Document dated March 27, 2015, are as follows:

Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of volatiles, from contaminated groundwater.

Soil Vapor

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion (SVI) into buildings at the site.

2.5 Remaining Contamination

Past dry-cleaning operations identified during site investigation activities (discussed above) have resulted in contamination remaining on the site. Figure 2.5.1 and shows the groundwater where regulatory criteria are exceeded include groundwater at

MW-1 through MW-3. Indoor air and soil vapor data are shown on Figure 2.5.2 and indicate that a "Mitigation" for the Site (248 Flatbush Avenue), and the two directly adjoining properties situated at 250 Flatbush Avenue and 244 Flatbush Ave./80 St. Mark's Avenue. A "Monitor/Mitigate" response was noted in portion of 252 and 254 Flatbush Avenue. Specifically, the following known contamination remains:

2.5.1 Groundwater

Groundwater containing low levels of dissolved VOCs remains present onsite, as discussed above. The data obtained during the RI documents that onsite groundwater conditions do not warrant additional monitoring or remediation based upon, the remediation of impacted soils from the boiler drain, the absence of soils in excess of the SCO for groundwater protection (PCE 1,300 ug/kg), the low levels (max 25 ug/L) of PCE observed in onsite groundwater, the depth to groundwater (approximately 50 feet below grade) and the availability of public water in the vicinity of the Site. Similarly, the potential offsite migration of groundwater does not pose a concern due to the low levels of PCE in onsite groundwater, the depth to groundwater (approximately 50 feet below grade) and the availability of public water in the vicinity of Site. Table 2.5.1.1 and Figure 2.5.1 summarize the results of the groundwater samples collected during the RI. As per the NYSDEC-approved Remedial Design Work Plan (FPM, July 2015), the groundwater monitoring wells were removed in 2016.

2.5.2 Soil Vapor

Soil vapor containing VOCs is present onsite and extends offsite as discussed above. The recent data obtained during the RI are summarized in Table 2.5.2.1. The previous investigation and current soil vapor and air data are summarized in Figure 2.5.2 An SSDS has been installed to prevent potential SVI. These measures provide mitigation for SVI to the impacted areas.

3.0 INSTITUTIONAL AND ENGINEERING CONTROL PLAN

3.1 General

Since remaining contamination exists at the site, Institutional Controls (ICs) and Engineering Controls (ECs) are required to protect human health and the environment. This IC/EC Plan describes the procedures for the implementation and management of all IC/ECs at the site. The IC/EC Plan is one component of the SMP and is subject to revision by the NYSDEC.

This plan provides:

- A description of all IC/ECs on the site;
- The basic implementation and intended role of each IC/EC;
- A description of the key components of the ICs set forth in the Environmental Easement;
- A description of the controls to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of IC/ECs for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the site; and
- Any other provisions necessary to identify or establish methods for implementing the IC/ECs required by the site remedy, as determined by the NYSDEC.

3.2 Institutional Controls

A series of ICs is required by the Decision Document to: (1) implement, maintain and monitor Engineering Control systems; (2) prevent future exposure to remaining contamination; and, (3) limit the use and development of the site to restricted-residential, commercial and industrial uses only. Adherence to these ICs on the site is required by the Environmental Easement and will be implemented under this SMP. ICs identified in the

Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement. The IC boundaries are shown on the ALTA/ASCM Land Title Survey included in Appendix A. These ICs are:

- Requires the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375- 1.8 (h)(3);
- Allows the use and development of the controlled property for residential use, which also allows for restricted-residential use, commercial use and industrial use, as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
- Restricts the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or County DOH; and
- Requires compliance with the Department approved Site Management Plan.

3.3 Engineering Controls

3.3.1 Sub-slab Depressurization System

A sub-slab depressurization system (SSDS) has been installed at the Site and extended offsite to prevent potential SVI at the Site and adjoining properties situated at 244, 248, 250, 252 and 254 Flatbush Avenue and 82 St. Marks Avenue. The SSDS includes lateral piping beneath the concrete slab of the Site building and offsite at 254 Flatbush Avenue, remedial equipment operating components located onsite, and an associated vapor barrier. The SSDS was placed into operation on August 1, 2016. A layout of the SSDS and process flow diagram are included as Figure 3.3.1.1 and Figure3.3.1.2, respectively.

In general, the SSDS lateral piping is constructed of perforated Schedule 40 PVC pipe with solid slip-on end caps. T-connections were placed near the center of each lateral for connection to solid piping that extends to the remedial equipment area. Backfill around

the lateral piping consists of uniform gradation gravel-size base material for the concrete slab that was constructed above the laterals. Following lateral piping placement, the backfill was field-compacted so as to reduce the potential for settlement while not damaging the installed lateral piping.

A vapor barrier was installed above the sub-slab SSDS components prior to restoring the building slab. The vapor barrier is constructed of a VOC-resistant barrier material (20-mil VaporBloc) meeting or exceeding the ASTM E-1745 Class A Standard for vapor barriers used in contact with soil under concrete slabs. Sealing tape was used to seal joins between sheets of vapor barrier and pipe penetrations were sealed with vapor barrier material in accordance with the manufacturer's instructions. A 4-inch thick concrete slab was then poured atop the vapor barrier. During site development, penetration of the vapor barrier was required to accommodate sub-slab plumbing. Upon completion of the sub-slab work, penetrations were sealed using a sprayed-on sealant (Liquid Boot).

The SSDS operating components, including a 4.62-horsepower regenerative blower, moisture knockout vessel, debris filter, piping manifold, control panel, and ancillary equipment (alarms, pressure/vacuum gauges, flow meters, valves), have been installed in the remedial equipment area located onsite. A remote monitoring system (RMS) has also been installed to monitor certain alarm conditions, including high moisture knockout vessel level, low vacuum, and blower motor start failure. The RMS system will notify the site operator and system maintenance personnel of the above listed alarm conditions pending final connections to a communication line. The discharge from the blower is directed above the roof via a Schedule 40 PVC stack.

Procedures for operating and maintaining the SSDS are documented in the Operation and Maintenance Plan (Section 5.0 of this SMP). As-built drawings, signed and sealed by a professional engineer, are included in Appendix G.

3.3.2 Criteria for Completion of Remediation/Termination of Remedial System

Generally, remedial processes are considered completed when monitoring indicates that the remedy has achieved the remedial action objectives identified by the decision document. The framework for determining when remedial processes are complete is provided in Section 6.4 of NYSDEC DER-10.

The active SSDS will not be discontinued unless prior written approval is granted by the NYSDEC and the NYSDOH. In the event that monitoring data indicates that the SSD system may no longer be required, a proposal to discontinue the SSD system will be submitted by the remedial party to the NYSDEC and NYSDOH.

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4.0 MONITORING AND SAMPLING PLAN

4.1 General

This Monitoring and Sampling Plan describes the measures for evaluating the overall performance and effectiveness of the remedy. This Monitoring and Sampling Plan may only be revised with the approval of the NYSDEC. Details regarding the sampling procedures, data quality usability objectives, analytical methods, etc. for all samples collected as part of site management for the site are included in the Quality Assurance Project Plan provided in Appendix D. A Health and Safety Plan (HASP) to be implemented during onsite monitoring and sampling activities is included in Appendix E.

This Monitoring and Sampling Plan describes the methods to be used for:

- Sampling and analysis of all appropriate media (indoor air, soil vapor, ambient air, SSDS effluent);
- Assessing compliance with applicable NYSDEC standards, criteria and guidance (SCGs); and
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment;

To adequately address these issues, this Monitoring and Sampling Plan provides information on:

- Sampling locations, protocol and frequency;
- Information on all designed monitoring systems;
- Analytical sampling program requirements;
- Inspection and maintenance requirements for vapor monitoring points; and
- Annual inspection and periodic certification.

Reporting requirements are provided in Section 7.0 of this SMP.

4.2 Site-wide Inspection

Site-wide inspections will be performed at a minimum of once per year. Modification to the frequency or duration of the inspections will require approval from the NYSDEC. Site-wide inspections will also be performed after all severe weather conditions that may affect the EC or monitoring devices. During these inspections, an inspection form will be completed as provided in Appendix F – Site Management Forms. The form will compile sufficient information to assess the following:

- Compliance with all ICs, including site usage;
- An evaluation of the condition and continued effectiveness of the EC;
- General site conditions at the time of the inspection;
- The site management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection; and
- Confirm that site records are up to date.

Inspections of all remedial components installed at the site will be conducted. A comprehensive site-wide inspection will be conducted and documented according to the SMP schedule, regardless of the frequency of the Periodic Review Report. The inspections will determine and document the following:

- Whether the EC continues to perform as designed;
- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Environmental Easement;
- Achievement of remedial performance criteria; and

- If site records are complete and up to date.

Reporting requirements are outlined in Section 7.0 of this plan.

Inspections will also be performed in the event of an emergency. If an emergency, such as a natural disaster or an unforeseen failure of the EC occurs that reduces or has the potential to reduce the effectiveness of the EC in place at the site, verbal notice to the NYSDEC must be given by noon of the following day. In addition, an inspection of the site will be conducted within 5 days of the event to verify the effectiveness of the ICs/ECs implemented at the site by a qualified environmental professional, as determined by the NYSDEC. Written confirmation must be provided to the NYSDEC within 7 days of the event that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

4.3 Mitigation System Monitoring and Sampling

4.3.1 SSDS Monitoring

Effluent samples were collected to evaluate SSDS emissions compliance following system startup, as documented in the FER. The analytical results were compared to NYSDEC's DAR-1 guidance to determine if emissions treatment is required. Based on the resulting data, SSDS effluent treatment is not necessary. SSDS effluent will be monitored as noted in Table 4.3.1.1 (below) to confirm that emissions do not increase and to assess changes in emissions over time. In the event that the SSDS is modified, or if Site conditions change, or if the monitoring results suggest that effluent treatment might be required, then effluent sampling and testing will be performed to evaluate compliance with NYSDEC's DAR-1 guidance. In the event that emissions treatment (carbon canisters or other) is required, then sampling and testing will be performed downstream of the effluent treatment to monitor emissions compliance.

Periodic sub-slab pressure monitoring will be continued to confirm that a downward pressure gradient remains established while the SSDS is running. The schedule for pressure monitoring is shown in Table 4.3.1.1 below.

SSDS monitoring will be performed on a routine basis, as identified in Table 4.3.1.1 - Mitigation System Monitoring Requirements and Schedule (see below). Modification to the frequency or sampling requirements will require approval from the NYSDEC. A visual inspection of the complete SSDS will be conducted during each monitoring event. Unscheduled inspections and/or sampling may take place when a suspected failure of the SSDS has been reported or an emergency occurs that is deemed likely to affect the operation of the system. SSDS components to be monitored include, but are not limited to, the components included in Table 4.3.1.1 below.

Table 4.3.1.1 – Mitigation System Monitoring Requirements and Schedule

Mitigation System Component	Monitoring Parameter	Operating Range	Monitoring Schedule
• Blower	• Vacuum	• 24 to 30 “H2O	• Quarterly
• SSDS Lateral	• Flow Rate & Vacuum	• 40 to 60 SCFM 20 to 30 “H20	• Quarterly
• Emissions	• VOCs via PID	• 0 to 150 ppm	• Quarterly
• Monitoring points	• Vacuum	• 0.01 0.16 “H20	• Quarterly

A complete list of components to be inspected is provided in the Operation and Maintenance Data Sheet in Appendix F – Site Management Forms. If any equipment readings are not within their specified operation range, any equipment is observed to be malfunctioning or the system is not performing within specifications, maintenance and repair, as per the Operation and Maintenance Plan, is required immediately.

4.3.2 SSDS Emissions Sampling

The SSDS emissions will be monitored on a quarterly basis using a photoionization detector (PID) calibrated in accordance with the manufacturer’s directions. In the event that the SSDS is modified, or if Site conditions change, or if the monitoring results suggest

that effluent treatment might be required, then emissions sampling and testing will be performed to evaluate compliance with NYSDEC's DAR-1 guidance. Detailed sample collection and analytical procedures and protocols are provided in Appendix C – Field Sampling Plan and Appendix D – Quality Assurance Project Plan. Emissions sampling may be discontinued if the results demonstrate that emissions are consistently below NYSDEC Air Guide 1 criteria. Sampling criteria are provided in Table 4.3.2.1 - SSDS Sampling Requirements and Schedule below. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

Table 4.3.2.1 – SSDS Emissions Sampling Requirements and Schedule

Sampling Location	Analytical Methods	Schedule
SSDS Effluent Stack	Calibrated PID	Quarterly
SSDS Effluent Stack	VOCs (Method TO-15)	Periodic, as needed

4.3.3 SVI Sampling

SVI sampling will be performed initially following SSDS startup and completion of construction in the Site building to confirm that SVI is not occurring. SVI sampling will include collection of sub-slab soil vapor, indoor air, and ambient (outdoor) air samples. In the event that SSDS emissions monitoring suggests that the criteria for termination of SSDS operation may have been achieved, then SVI sampling will be also conducted to evaluate whether the criteria for termination of SSDS operation have actually been achieved. Sampling criteria are provided in Table 4.3.3.1 -A site plan showing the locations of indoor air, sub-slab soil vapor and ambient air sampling locations are shown on Figure 4.3.3.1. SVI Sampling Requirements and Schedule below. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

Table 4.3.3.1 – SVI Sampling Requirements and Schedule

Sampling Location	Analytical Parameters	Schedule
SVI Locations (sub-slab, indoor air and ambient air) See Figure 4.3.3.1	VOCs (EPA Method TO-15)	Initial, Annually thereafter during the heating season.

Detailed sample collection and analytical procedures and protocols are provided in Appendix C – Field Sampling Plan and Appendix D – Quality Assurance Project Plan.

4.4 Post-Remediation Media Monitoring and Sampling

Post-remediation monitoring at this Site includes SVI sampling, which shall be conducted in accordance with NYSDOH guidance. SVI sampling locations, required analytical parameters and schedule are provided in Table 4.4.1.1 – Post-Remediation SVI Sampling Requirements and Schedule below. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

Detailed sample collection and analytical procedures and protocols are provided in Appendix C – Field Sampling Plan and Appendix D – Quality Assurance Project Plan.

4.4.1 Soil Vapor Intrusion Sampling

Post-remediation SVI sampling information is presented on Table 4.4.4.1 and sampling locations are shown on Figure 4.3.3.1. Post-Remediation SVI Sampling Requirements and Schedule. SVI sampling will be performed following termination of the SSDS operation to confirm the post-remedial condition and that SVI no longer presents a concern.

The network of SVI sample locations has been designed based on the proposed building design and the following criteria:

- Locations relative to the SSDS laterals so as to confirm ROIs; and
- Locations distributed throughout the Site building and affected neighboring properties.

Table 4.4.1.1 – Post-Remediation SVI Sampling Requirements and Schedule

Sampling Location	Analytical Parameters		Schedule
	VOCs (Method TO-15 low level)	VOCs (Method TO-15)	
Sub-slab monitoring points		X	Once post-remediation, during heating season
Co-located indoor air monitoring locations	X		
Outdoor (ambient) location	X		

The sampling frequency may only be modified with the approval of the NYSDEC. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC.

Deliverables for the SVI sampling program are specified in Section 7.0 – Reporting Requirements.

4.4.2 SVI Monitoring and Sampling Protocol

All SVI monitoring activities will be recorded in a field book and associated sampling log as provided in Appendix F - Site Management Forms. Other observations (e.g., sub-slab monitoring point integrity, etc.) will be noted on the sampling log. The sampling log will serve as the inspection form for the monitoring network. Additional detail regarding monitoring and sampling protocols are provided in the site-specific Field Sampling Plan provided as Appendix C of this document.

5.0 OPERATION AND MAINTENANCE PLAN

5.1 General

This Operation and Maintenance Plan provides a brief description of the measures necessary to operate, monitor and maintain the mechanical components of the remedy selected for the site. This Operation and Maintenance Plan:

- Includes the procedures necessary to allow individuals unfamiliar with the site to operate and maintain the SSDS and associated vapor barrier;
- Will be updated periodically to reflect changes in site conditions or the manner in which the SSDS is operated and maintained.

Further detail regarding the Operation and Maintenance of the SSDS and associated vapor barrier is provided in Appendix G - Operation and Maintenance Manual. A copy of this Operation and Maintenance Manual, along with the complete SMP, is to be maintained at the site. This Operation and Maintenance Plan is not to be used as a stand-alone document, but as a component document of this SMP.

5.2 SSDS Performance Criteria

The operating requirements for the components of the SSDS, including flow rates for extraction wells, system operating vacuums, and other parameters are provided in Table 4.3.1.1 in Section 4.3 of this SMP. The system has been documented to meet NYSDEC Air Guide 1 criteria without effluent treatment.

5.3 Operation and Maintenance of SSDS

The following section provides a description of the operations and maintenance of the SSDS. The SSDS is designed for easy routine operation and maintenance, which includes quarterly operational checks following system startup as described in the following sections. The associated vapor barrier, which is installed below the new portions of the Site building slab, is designed to be maintenance-free. Cut-sheets and as-built drawings for

SSDS and associated vapor barrier are provided in the Final Engineering Report and the Operation and Maintenance Manual (Appendix G).

5.3.1 SSDS Start-Up and Testing

Prior to start-up of the SSDS all equipment and components will be installed in accordance with the manufacturers' recommendations, as appropriate. Baseline measurements will be collected prior to startup and will include measurement of the background vacuum in the sub-slab monitoring points. Upon startup of the SSDS the following items will be checked:

- For leaks;
- System balancing;
- Testing of warning devices;
- Monitoring of effluent emissions with a calibrated PID; and
- Collection of effluent samples for laboratory analysis starting after the first week of operation and continuing for four consecutive weeks.

The SSDS testing described above will be conducted if, in the course of the SSDS lifetime, the SSDS is out of service for any significant period of time or significant changes are made to the system and the system must be restarted.

5.3.2 Routine SSDS Operation and Maintenance

Regular operation and maintenance of the SSDS is limited to confirming that the depressurization equipment is operational, the air filter is operating within criteria, the moisture separator is draining properly, and that a vacuum is present at the blower and the wellheads. The concrete slab of the onsite building will also be inspected to confirm that it remains intact such that the underlying vapor barrier is undisturbed. A log will be maintained to document the quarterly inspections. The SSDS is to be operated on a continuous basis and no regular maintenance or repairs are expected.

A copy of an Operations and Maintenance Manual specific to the SSDS is provided in the Final Engineering Report and in Appendix G, and provides further details on the SSDS operation and maintenance. Table 5.3.2.1- SSDS Routine Maintenance provides a summary and schedule of routine maintenance.

Table 5.3.2.1 SSDS Routine Maintenance

Maintenance Item	Inspection Frequency	Corrective Measures
Air Filter	Quarterly	Replace/clean when pressure differential is greater than 10" water column
Moisture Separator	Quarterly	Check separator and service drain as needed
System Alarms	Quarterly	Evaluate/repair, as necessary.

5.3.3 Non-Routine Operation and Maintenance

In the event the SSDS is found to be no longer operating properly, the affected equipment will be repaired or replaced with components that meet or exceed the requirements of the initial design.

5.3.4 SSDS Monitoring Devices and Alarms

The SSDS control panel is equipped with several monitoring devices to identify alarm conditions, including:

- Monitoring device and alarm notification for SSDS vacuum blower failure;
- System monitoring device for water level in moisture separator;
- An alarm notification for high-high moisture separator level; and
- Pressure/vacuum gauges to monitor system performance.

In the event that a warning device is activated, applicable maintenance and repairs will be conducted, as specified in the Operation and Maintenance Plan, and the SSDS will be restarted. Operational problems will be noted in the Periodic Review Report to be prepared for that reporting period.

6.0 PERIODIC ASSESSMENTS/EVALUATIONS

6.1 Climate Change Vulnerability Assessment

Increases in both the severity and frequency of storms/weather events, an increase in sea level elevations along with accompanying flooding impacts, shifting precipitation patterns and wide temperature fluctuation, resulting from global climactic change and instability, have the potential to significantly impact the performance, effectiveness and protectiveness of a given site and associated remedial systems. Vulnerability assessments provide information so that the site and associated remedial systems are prepared for the impacts of the increasing frequency and intensity of severe storms/weather events and associated flooding.

A vulnerability assessment has not been prepared for the site because the site is not located in a flood plain or low-lying area. Storm water onsite is discharged to the municipal combined sewer system. The site surface is relatively level and all permeable surfaces are covered by the building or the adjoining concrete sidewalk. If high winds occur it is unlikely that damage may result as there are no large trees in proximity to the building and the SSDS is protected within the building.

Electricity to the site and surrounding community is provided via an underground electrical distribution system and is not generally susceptible to disruptions from storms. There is not anticipated to be a reasonable possibility of a spill or other contaminant release that could affect the remedial measures as the site is served by natural gas and no petroleum storage is occurring or planned.

6.2 Green Remediation Evaluation

NYSDEC's DER-31 Green Remediation requires that green remediation concepts and techniques be considered during all stages of the remedial program, including site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. This section of the SMP provides a summary of any green remediation evaluations to be completed for the site during site management, and as reported in the Periodic Review Report (PRR).

This assessment includes, but not be limited to, a discussion of items listed below in relation to the implementation and operation and maintenance of the SSDS. As appropriate, quantification of these items will be provided:

- Waste Generation (No liquid or solid wastes are anticipated to be generated, if wastes are generated, they will be characterized and properly disposed in accordance with all applicable rules and regulations)
- Energy usage (electrical usage for operation of the SSDS); and
- Emissions (vapor-phase SSDS emissions, fuel usage for transportation to and from the site for inspections and/or sampling, operation of powered equipment, etc.).

Any methods proposed or implemented to reduce energy consumption, resource usage, waste generation, water usage, etc. will be included in the PRR.

6.2.1 Timing of Green Remediation Evaluations

For the remedial system at this site (SSDS), green remediation evaluations and corresponding modifications will be undertaken as part of a formal Remedial System Optimization (RSO), or at any time that the Project Manager feels appropriate, e.g. during significant maintenance events, if the SSDS is reconfigured, or in conjunction with storm recovery activities.

Modifications resulting from green remediation evaluations will be routinely implemented and scheduled to occur during planned/routine operation and maintenance activities. Reporting of these modifications will be presented in the appropriate PRR.

6.2.2 SSDS Operations

The SSDS will be operated properly considering the site conditions to conserve materials and resources to the greatest extent possible. Consideration will be given to operating rates and use of consumables. Spent materials will be sent for recycling, as appropriate. The parameters to be evaluated for the SSDS include, but are not limited to:

- Size of the SSDS operating equipment (operating parameters); and

- Effluent treatment system, if any (spent carbon replacement and disposal or regeneration).

6.2.3 SSDS Equipment Enclosure Operations

The enclosure containing the SSDS equipment will be operated and maintained to provide for the most efficient operation of the remedy, while minimizing energy, waste generation and water consumption. Components to be evaluated should include, but are not limited to:

- Heating/cooling systems and temperature set-points;
- Building insulation and building use and occupancy;
- Ventilation;
- Lighting and plug loads; and
- Property management.

6.2.4 Frequency of SSDS Checks, Sampling and Other Periodic Activities

Transportation to and from the Site, use of consumables in relation to visiting the Site in order to conduct system checks and or collect samples, and shipping samples to a laboratory for analyses have direct and/or inherent energy costs. The schedule and/or means of these periodic activities have been prepared so that these tasks can be accomplished in a manner that does not impact remedy protectiveness but reduces expenditure of energy or resources. Consideration shall be given to:

- Reduced sampling frequencies;
- Reduced site visits and system checks;
- Installation of remote sensing/operations and telemetry;
- Coordination/consolidation of activities to maximize labor time; and
- Use of mass transit for site visits, if feasible.

6.2.5 Metrics and Reporting

Information on energy usage, solid waste generation, and transportation and shipping will be recorded to facilitate and document consistent implementation of green remediation during site management and to identify corresponding benefits. This information will be documented on the Green Remediation Metrics form included in Appendix F and reported in the PRRs.

6.3 Remedial System Optimization

A RSO study will be conducted any time that the NYSDEC or the remedial party requests in writing that an in-depth evaluation of the remedy is needed. An RSO may be appropriate if any of the following occur:

- The remedial actions have not met or are not expected to meet RAOs in the time frame estimated in the Decision Document;
- The management and operation of the remedial system is exceeding the estimated costs;
- The remedial system is not performing as expected or as designed;
- Previously unidentified source material may be suspected;
- Site conditions change due to development, change of use, change in groundwater use, etc.;
- There is an anticipated transfer of the site management to another remedial party or agency; and
- A new and applicable remedial technology becomes available.

An RSO will provide a critique of a site's conceptual model, give a summary of past performance, document current cleanup practices, summarize progress made toward the site's cleanup goals, gather additional performance or media-specific data and information and provide recommendations for improvements to enhance the ability of the present system to reach RAOs or to provide a basis for changing the remedial strategy.

The RSO study will focus on the overall site cleanup strategy, process optimization, and management with the intent of identifying impediments to cleanup and improvements to site operations to increase efficiency, cost-effectiveness and remedial timeframes. Green remediation technology and principles are to be considered when performing the RSO. An example Table of Contents for an RSO Report is included in Appendix H.

7.0. REPORTING REQUIREMENTS

7.1 Site Management Reports

All site management inspection, maintenance and monitoring events will be recorded on the appropriate site management forms provided in Appendix F. These forms are subject to NYSDEC revision.

All applicable inspection forms and other records, including media sampling data and system maintenance reports, generated for the site during the reporting period will be provided in electronic format to the NYSDEC in accordance with the requirements of Table 7.1.1 and summarized in the Periodic Review Report.

Table 7.1.1: Schedule of Monitoring/Inspection Reports

Task/Report	Reporting Frequency*
Inspection	Recorded quarterly, reported annually in the PRR
Periodic Review Report	Annually, or as otherwise determined by the NYSDEC

* The frequency of events will be conducted as specified until otherwise approved by the NYSDEC.

All interim monitoring/inspection reports will include, at a minimum:

- Date of event or reporting period;
- Name, company, and position of person(s) conducting monitoring/inspection activities;
- Description of the activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet);

- Type of samples collected (e.g., sub-slab vapor, indoor air, outdoor air, etc.);
- Copies of all field forms completed (e.g., sampling logs, chain-of-custody documentation, etc.);
- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample types and sampling locations;
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format);
- Any observations, conclusions, or recommendations; and
- A determination as to whether contaminant conditions have changed since the last reporting event.

Routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting maintenance activities;
- Description of maintenance activities performed;
- Any modifications to the system;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet); and,
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc., (attached to the checklist/form).

Non-routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities;
- Description of non-routine activities performed;

- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet); and

- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

Data will be reported in digital format as determined by the NYSDEC. Currently, data is to be supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link: http://www.dec.ny.gov/chemical/62440.html

7.2 Periodic Review Report

A Periodic Review Report (PRR) will be submitted to the Department beginning sixteen (16) months after the Certificate of Completion is issued. After submittal of the initial PRR, the next PRR shall be submitted annually or at another frequency as may be required by the Department. In the event that the site is subdivided into separate parcels with different ownership, a single PRR will be prepared that addresses the site described in Appendix A - Environmental Easement. The report will be prepared in accordance with NYSDEC's DER-10 and submitted within the NYSDEC-required time following the end of each certification period. Media sampling results will also be incorporated into the PRR, as appropriate. The report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the site.

- Results of the required annual site inspections and severe condition inspections, if applicable.

- All applicable site management forms and other records generated for the site during the reporting period in the NYSDEC-approved electronic format.

- A summary of any discharge monitoring data and/or information generated during the reporting period, with comments and conclusions.

- Data summary tables and graphical representations of contaminants of concern by media (soil vapor, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These will include a presentation of past data as part of an evaluation of contaminant concentration trends.

- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by the NYSDEC.

- A site evaluation, which includes the following:

  – The compliance of the remedy with the requirements of the site-specific Decision Document;

  – The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications;

  – Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored;

  – Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan; and

  – Trends in contaminant levels in the affected media will be evaluated to determine if the remedy continues to be effective in achieving remedial goals as specified by the Decision Document.

  – The overall performance and effectiveness of the remedy.

- A performance summary for the SSDS at the site during the calendar year, including information such as:

  – A description of breakdowns and/or repairs along with an explanation for any significant downtime;

  – A description of the resolution of performance problems;

  – Alarm conditions;

  – Any trends in equipment failure;

- A summary of the performance, effluent and/or effectiveness monitoring; and
- Comments, conclusions, and recommendations based on data evaluation.

7.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, a Professional Engineer licensed to practice in New York State will prepare, and include in the PRR, the following certification as per the requirements of NYSDEC DER-10:

"*For each institutional or engineering control identified for the site, I certify that all of the following statements are true:*

- *The institutional control and/or engineering control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*
- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;*
- *Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *Use of the site is compliant with the environmental easement;*
- *The engineering control systems are performing as designed and are effective;*
- *To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program and generally accepted engineering practices; and*
- *The information presented in this report is accurate and complete.*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as [Remedial Party's

Designated Site Representative] and I have been authorized and designated by all site owners/remedial parties to sign this certification] for the site."

Every five years the following certification will be added:

- *The assumptions made in the qualitative exposure assessment remain valid.*

The signed certification will be included in the PRR. The PRR will be submitted, in electronic format, to the NYSDEC Central Office, the NYSDEC Regional Office in which the site is located, and the NYSDOH Bureau of Environmental Exposure Investigation. The PRR may need to be submitted in hard-copy format, as requested by the NYSDEC project manager.

7.3 Corrective Measures Work Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an institutional or engineering control, a Corrective Measures Work Plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Work Plan until it has been approved by the NYSDEC.

7.4 Remedial Site Optimization Report

In the event that an RSO is to be performed (see Section 6.3), upon completion of an RSO, an RSO report must be submitted to the Department for approval. A general outline for the RSO report is provided in Appendix H. The RSO report will document the research/ investigation and data gathering that was conducted, evaluate the results and facts obtained, present a revised conceptual site model and present recommendations. RSO recommendations are to be implemented upon approval from the NYSDEC. Additional work plans, design documents, HASPs, etc., may still be required to implement the

recommendations, based upon the actions that need to be taken. A final engineering report and update to the SMP may also be required.

The RSO report will be submitted, in electronic format, to the NYSDEC Central Office, the NYSDEC Regional Office in which the site is located, NYSDEC Site Control, and the NYSDOH Bureau of Environmental Exposure Investigation.

8.0 REFERENCES

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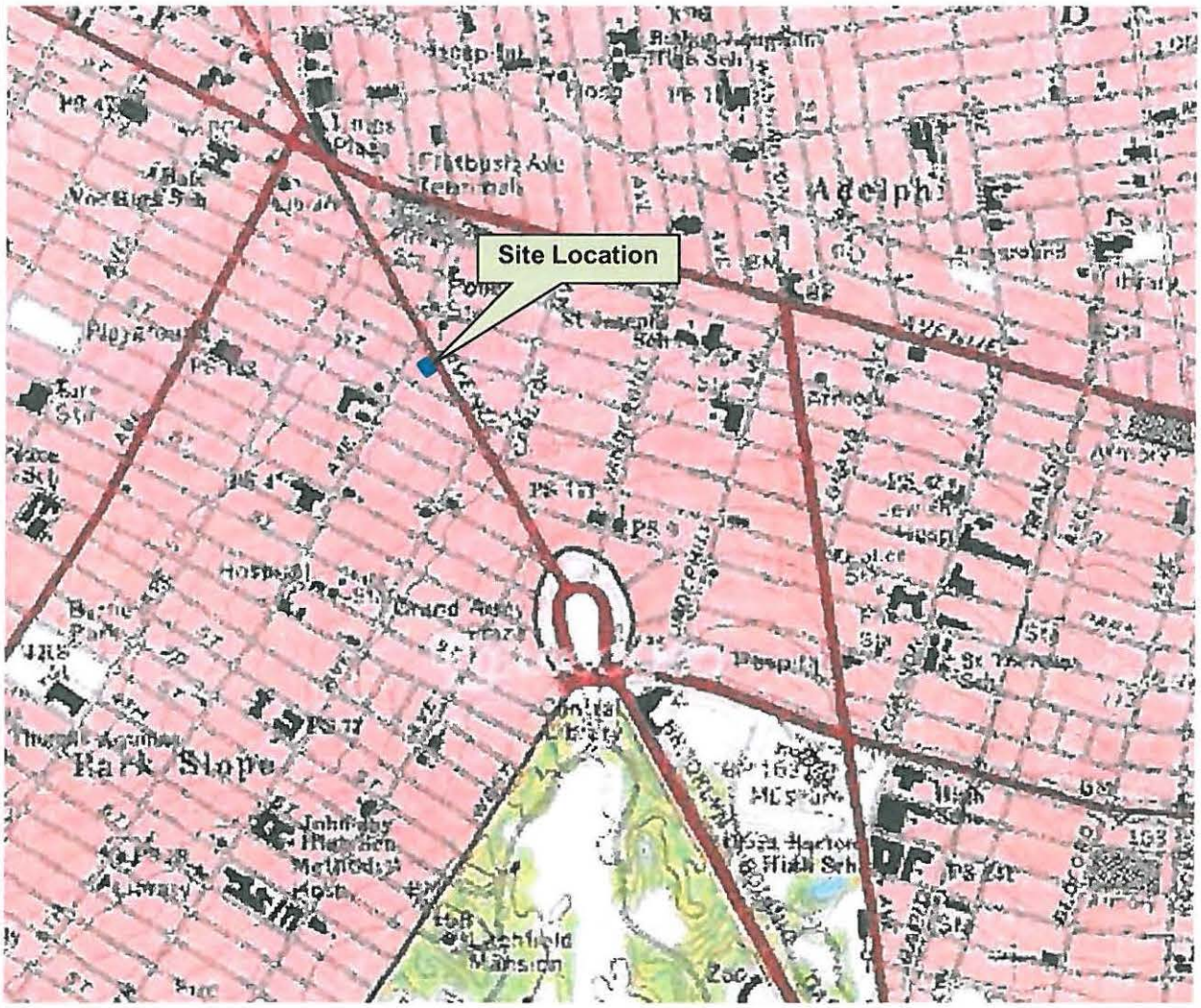
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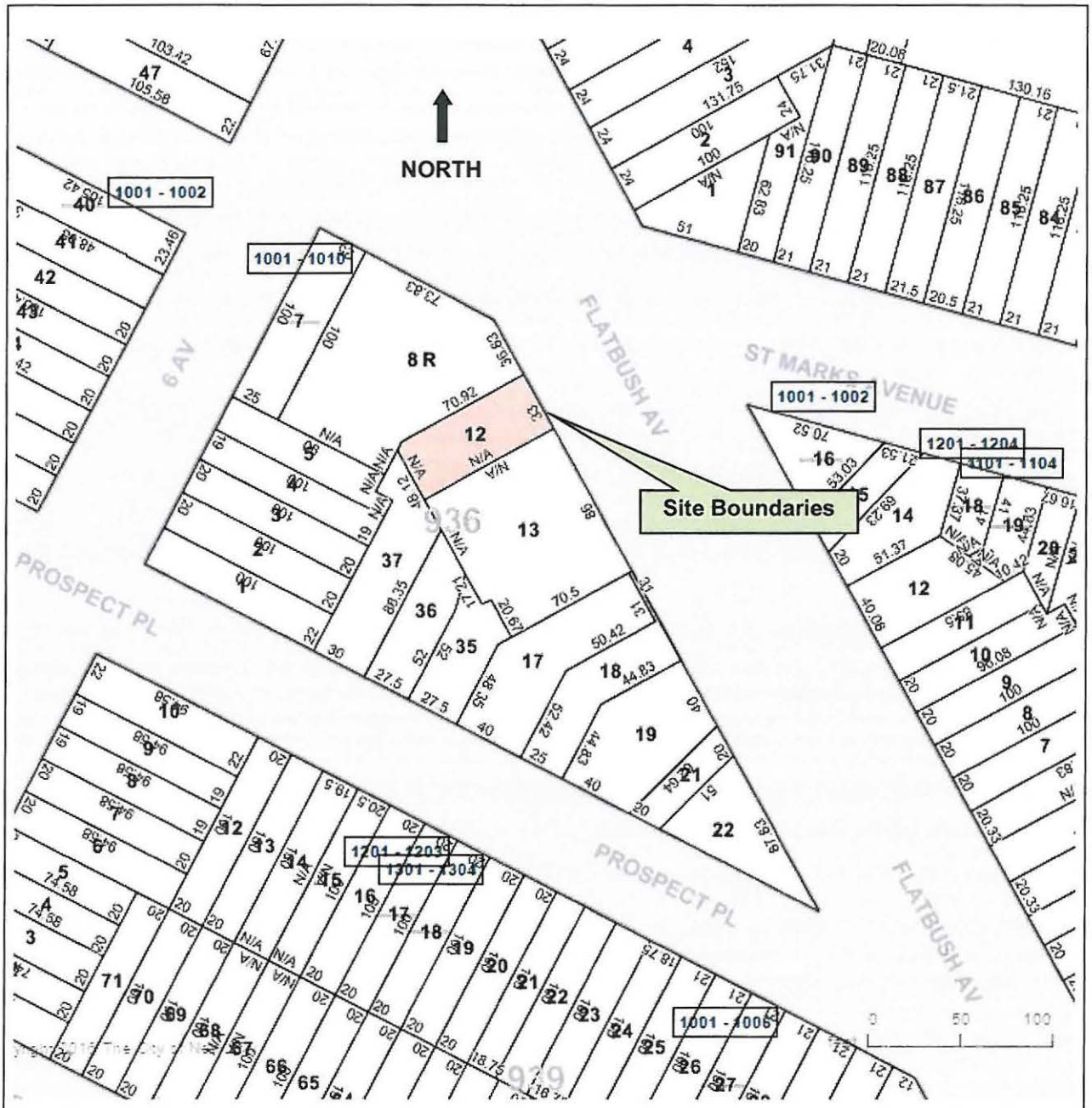
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FIGURES



Source: US Geological Survey 7.5-Minute
Brooklyn Quadrangle

FPM GROUP		
FIGURE 1.1.1 **SITE LOCATION** CINDERELLA 248, LLC SITE 248 FLATBUSH AVENUE, BROOKLYN, NEW YORK		
Drawn by: BC	Checked By: SOD	Date: 10/12/16



Source: NYC Department of Finance

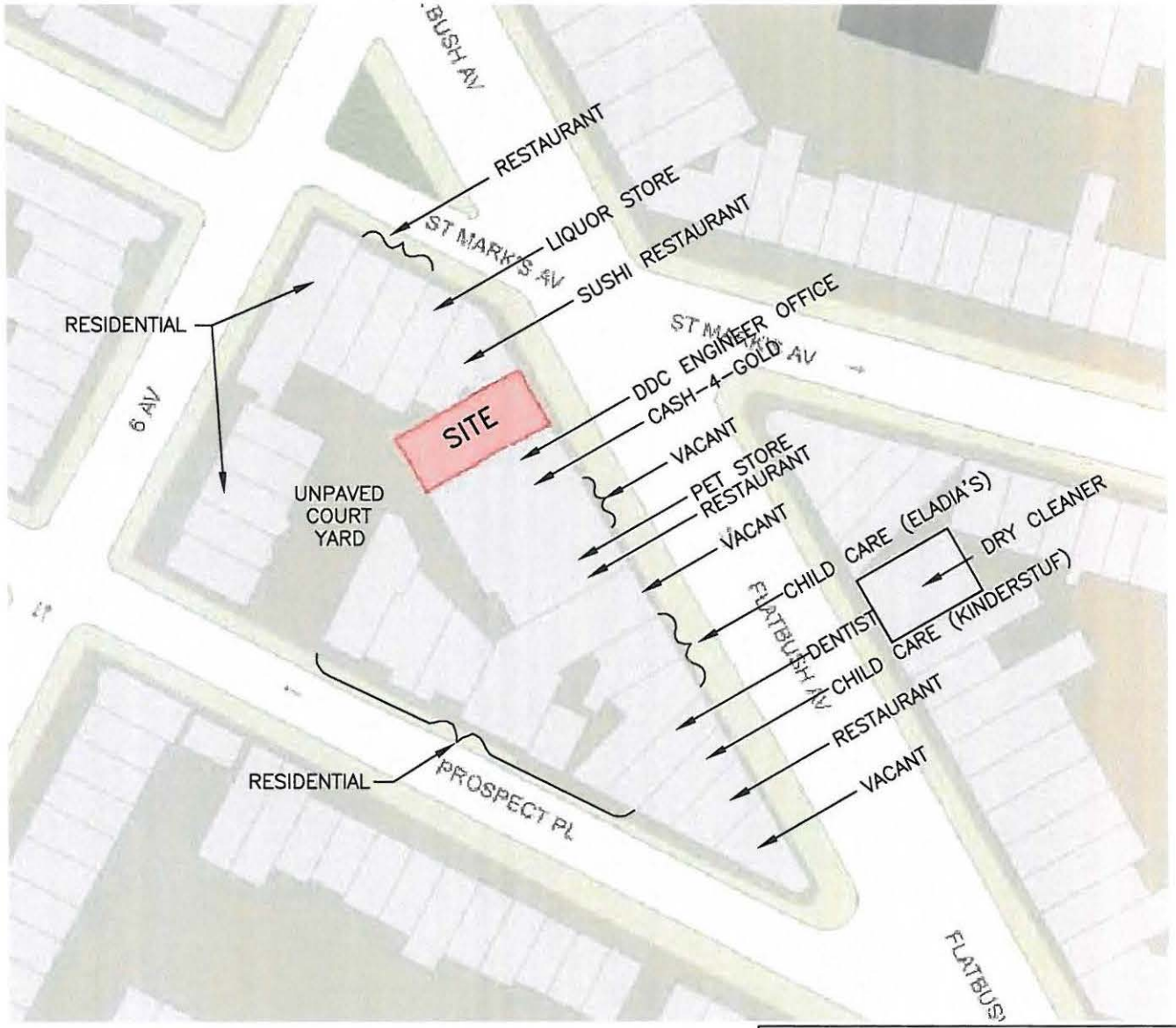
FPM GROUP

FIGURE 1.1.2

SITE BOUNDARY MAP

CINDERELLA 248, LLC SITE
248 FLATBUSH AVENUE, BROOKLYN, NEW YORK

Drawn by: BC	Checked By: SOD	Date: 10/12/16

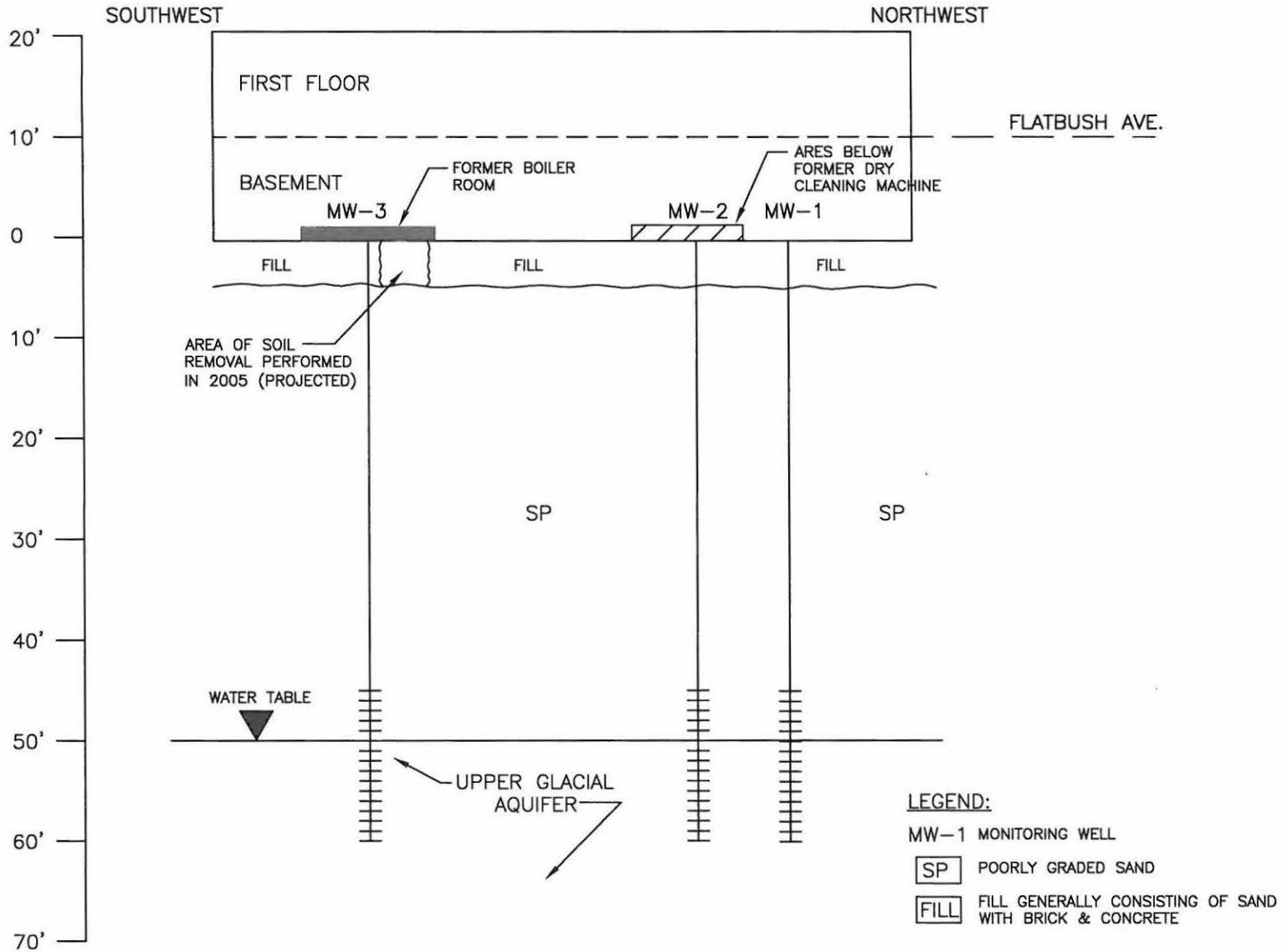


FPM GROUP

FIGURE 2.1.1
SITE AND VICINITY PLAN
CINDERELLA 248, LLC SITE
248 FLATBUSH AVENUE, BROOKLYN, NY

Drawn By: H.C.	Checked By: B.C.	Date: 10/25/16

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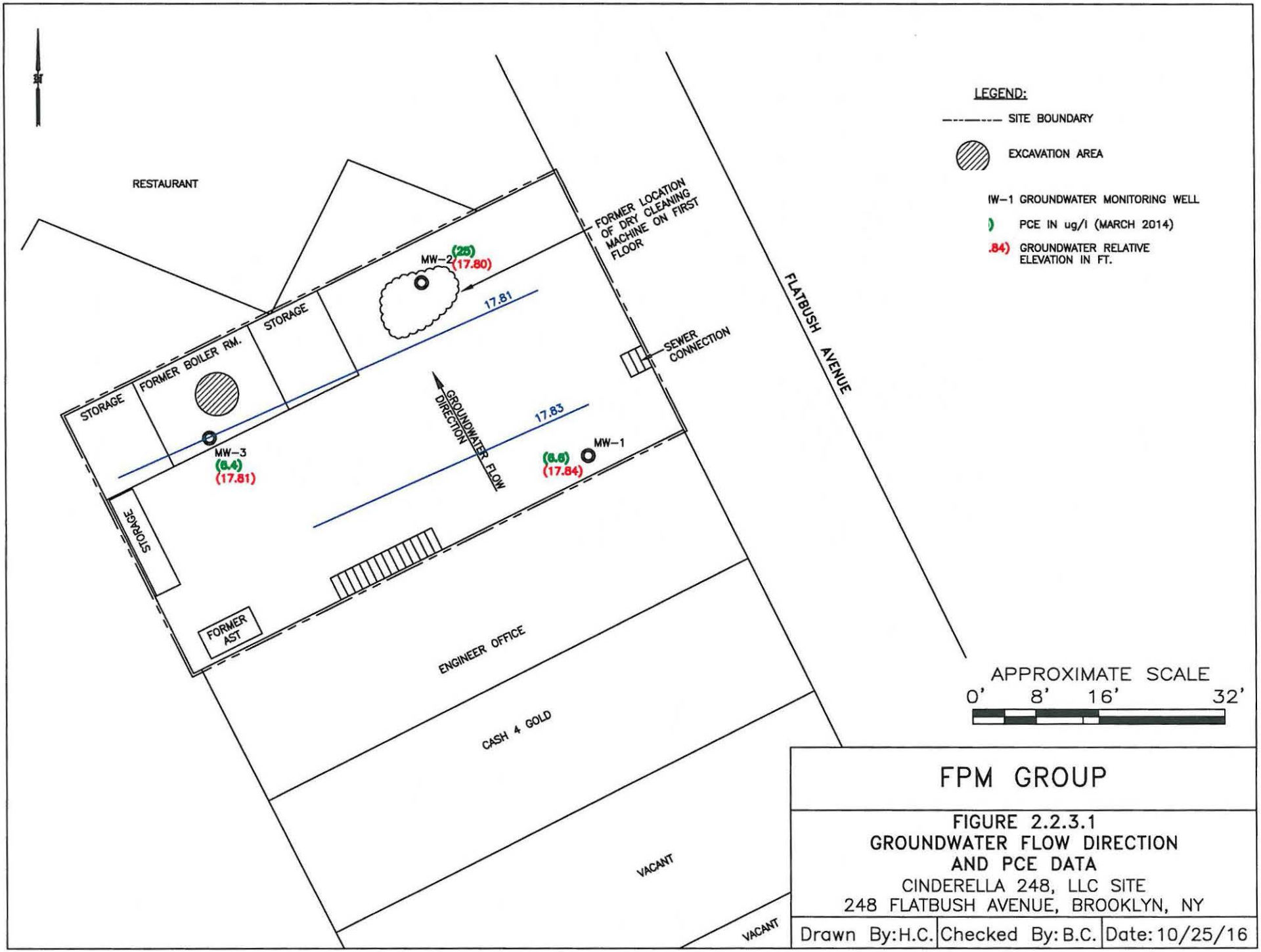


FPM GROUP

FIGURE 2.2.2.1
SW-SE CROSS-SECTION FROM FRONT TO BACK OF PROPERTIES
248 FLATBUSH AVENUE
BROOKLYN, NY

Drawn By: H.C.	Checked By: B.C.	Date: 4/10/17

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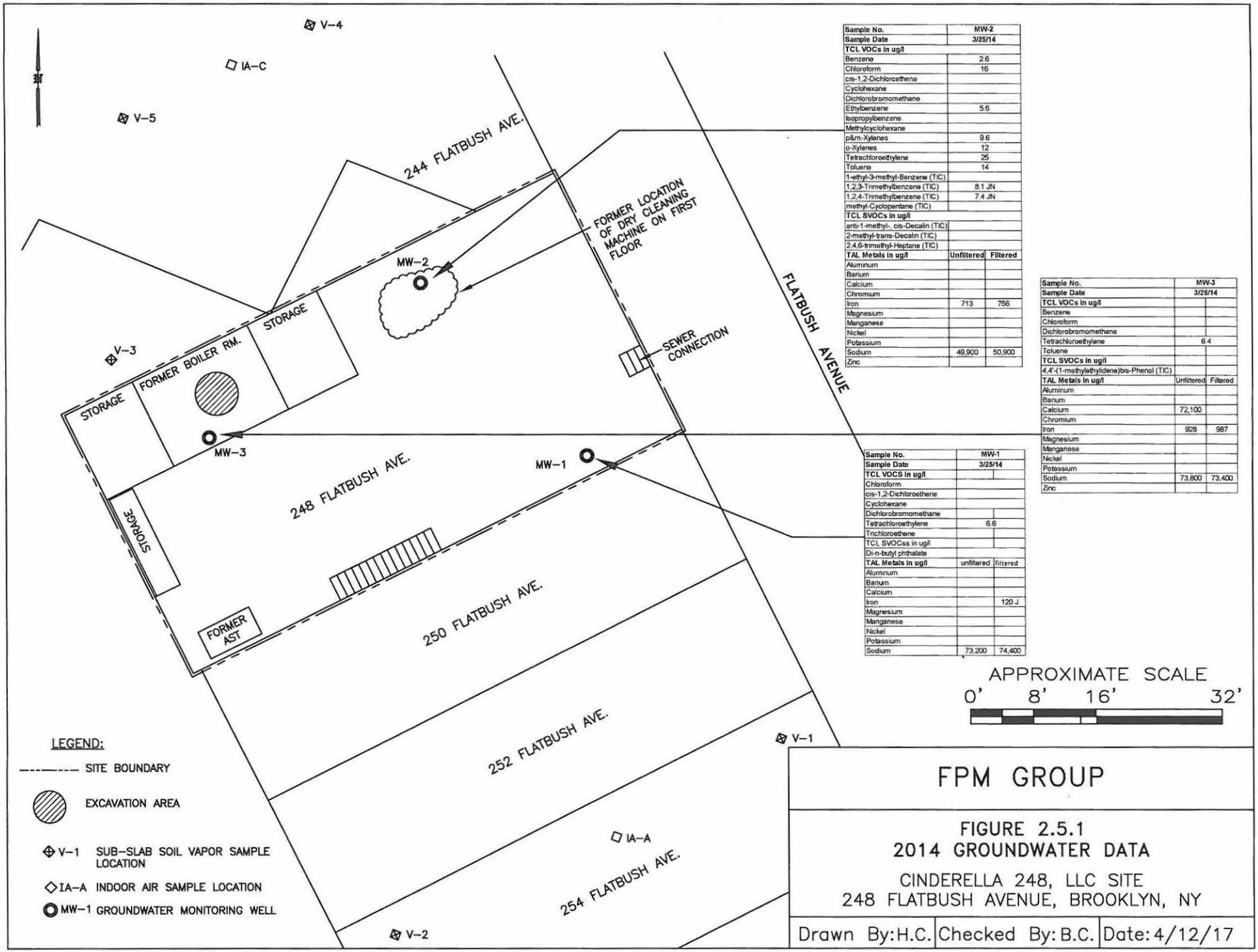


FPM GROUP

FIGURE 2.2.3.1
GROUNDWATER FLOW DIRECTION AND PCE DATA
CINDERELLA 248, LLC SITE
248 FLATBUSH AVENUE, BROOKLYN, NY

Drawn By: H.C.	Checked By: B.C.	Date: 10/25/16

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Sample No.	MW-2	
Sample Date	3/25/14	
TCL VOCs in ug/l		
Benzene	2.6	
Chloroform	16	
cis-1,2-Dichloroethene		
Cyclohexane		
Dichlorobromomethane		
Ethylbenzene	5.6	
Isopropylbenzene		
Methylcyclohexane		
p&m-Xylenes	9.6	
o-Xylenes	12	
Tetrachloroethylene	25	
Toluene	14	
1-ethyl-3-methyl-Benzene (TIC)		
1,2,3-Trimethylbenzene (TIC)	8.1 JN	
1,2,4-Trimethylbenzene (TIC)	7.4 JN	
methyl-Cyclopentane (TIC)		
TCL SVOCs in ug/l		
anti-1-methyl-, cis-Decalin (TIC)		
2-methyl-trans-Decalin (TIC)		
2,4,6-trimethyl-Heptane (TIC)		
TAL Metals in ug/l	Unfiltered	Filtered
Aluminum		
Barium		
Calcium		
Chromium		
Iron	713	756
Magnesium		
Manganese		
Nickel		
Potassium		
Sodium	49,900	50,900
Zinc		

Sample No.	MW-3	
Sample Date	3/25/14	
TCL VOCs in ug/l		
Benzene		
Chloroform		
Dichlorobromomethane		
Tetrachloroethylene	6.4	
Toluene		
TCL SVOCs in ug/l		
4,4'-(1-methylethylidene)bis-Phenol (TIC)		
TAL Metals in ug/l	Unfiltered	Filtered
Aluminum		
Barium		
Calcium	72,100	
Chromium		
Iron	928	987
Magnesium		
Manganese		
Nickel		
Potassium		
Sodium	73,800	73,400
Zinc		

Sample No.	MW-1	
Sample Date	3/25/14	
TCL VOCS in ug/l		
Chloroform		
cis-1,2-Dichloroethene		
Cyclohexane		
Dichlorobromomethane		
Tetrachloroethylene	6.6	
Trichloroethene		
TCL SVOCss in ug/l		
Di-n-butyl phthalate		
TAL Metals in ug/l	unfiltered	filtered
Aluminum		
Banum		
Calcium		
Iron		120 J
Magnesium		
Manganese		
Nickel		
Potassium		
Sodium	73,200	74,400

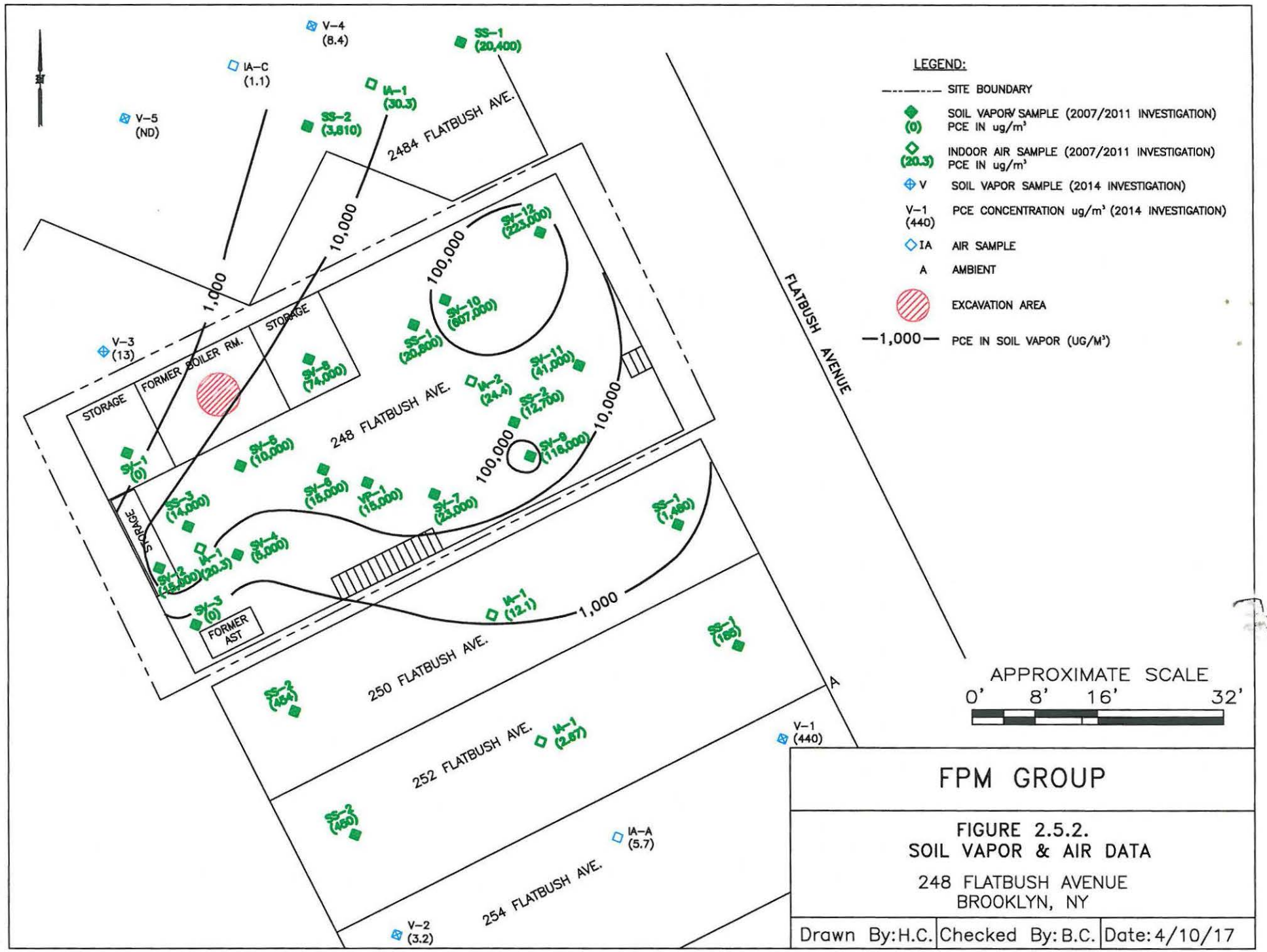
FPM GROUP

FIGURE 2.5.1
2014 GROUNDWATER DATA

CINDERELLA 248, LLC SITE
248 FLATBUSH AVENUE, BROOKLYN, NY

Drawn By: H.C. | Checked By: B.C. | Date: 4/12/17

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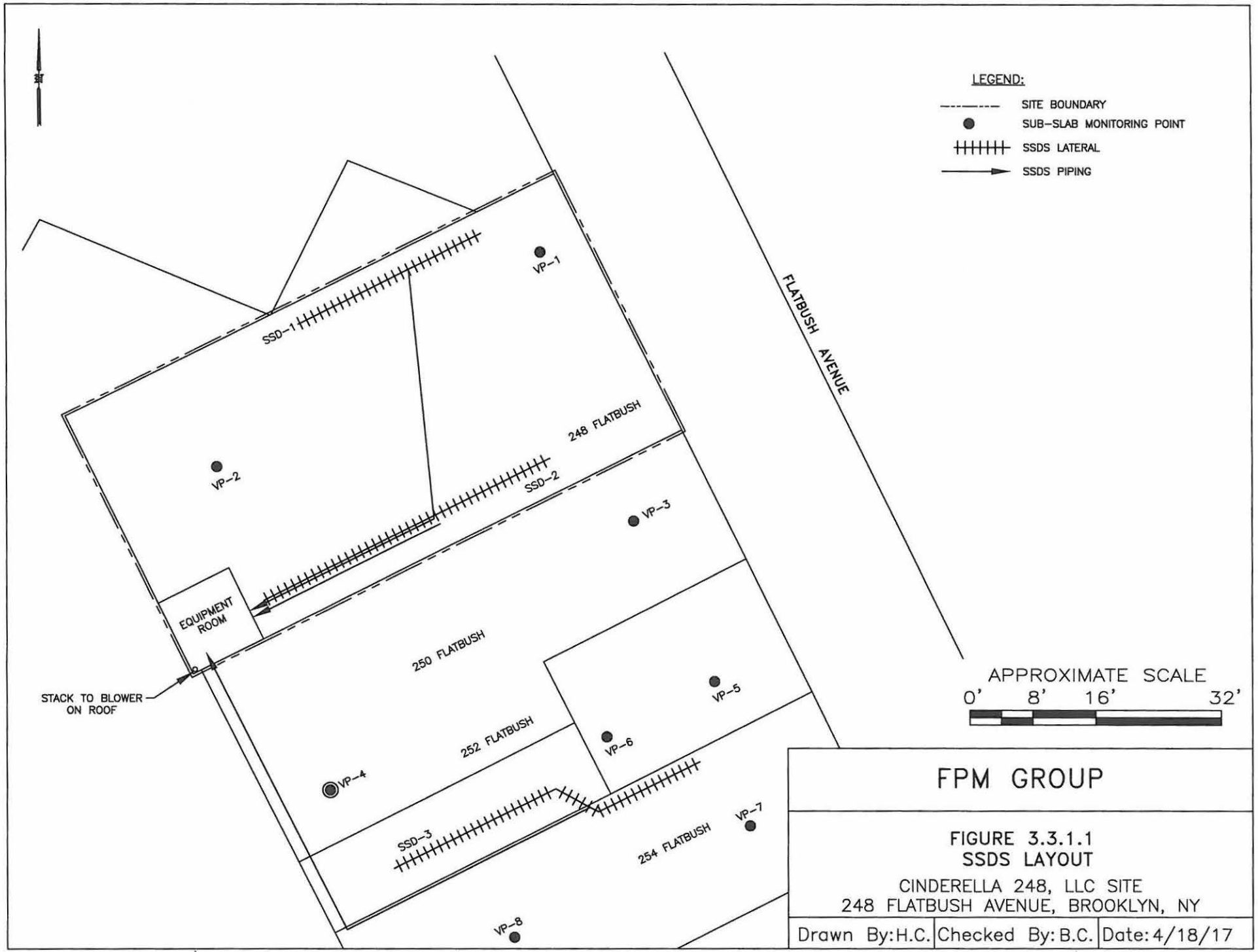
Z:\CINDERELLA 248\SMP\SOIL VAPOR _AIR DATA.dwg, 4/18/2017 10:01:16 AM

FPM GROUP

FIGURE 2.5.2.
SOIL VAPOR & AIR DATA

248 FLATBUSH AVENUE
BROOKLYN, NY

Drawn By: H.C.	Checked By: B.C.	Date: 4/10/17



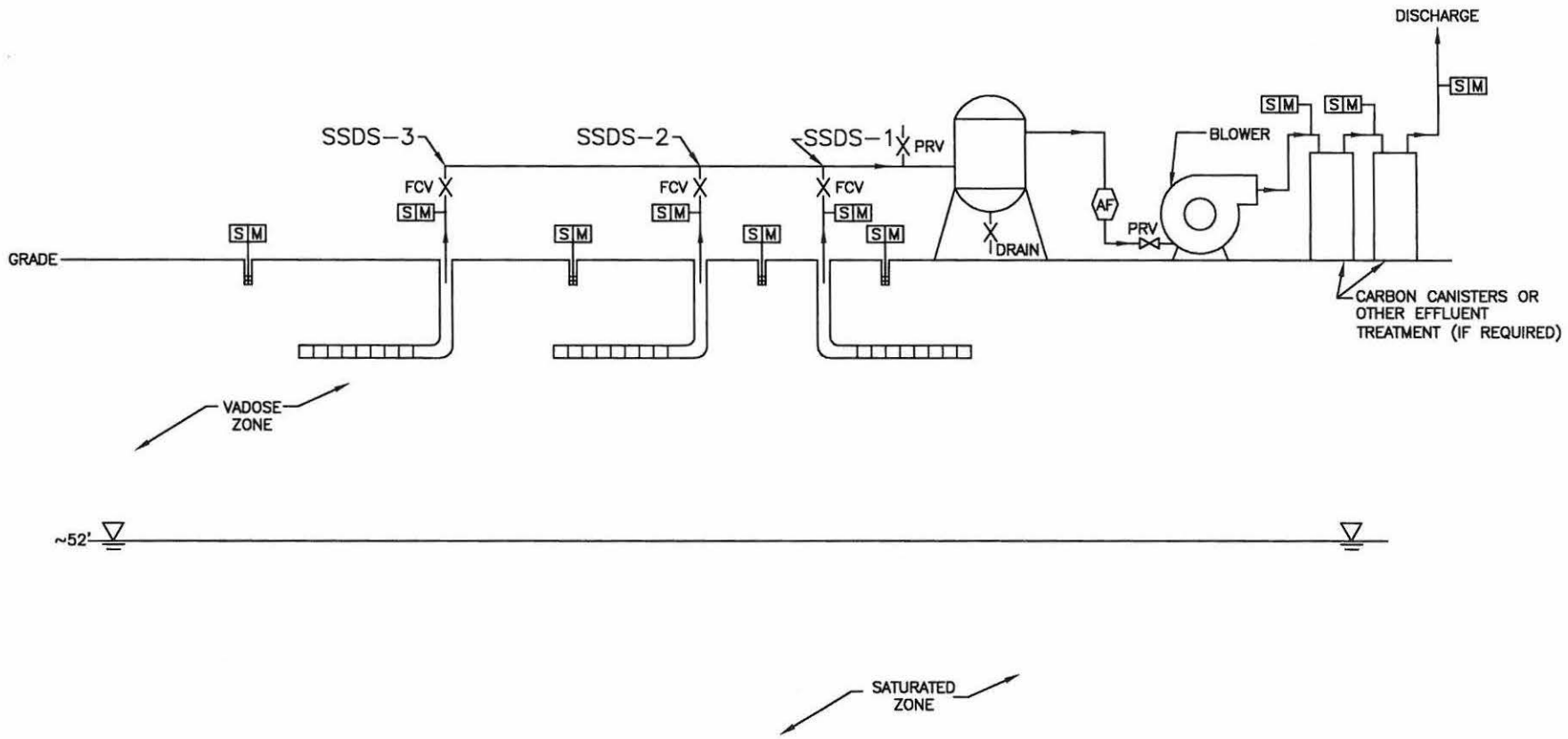
FPM GROUP

FIGURE 3.3.1.1
SSDS LAYOUT

CINDERELLA 248, LLC SITE
248 FLATBUSH AVENUE, BROOKLYN, NY

Drawn By: H.C.	Checked By: B.C.	Date: 4/18/17

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LEGEND:

- PROCESS LINE
- GROUNDWATER SURFACE
- AF — INLINE AIR FILTER
- PRV — PRESSURE RELIEF VALVE
- FRV — FLOW CONTROL VALVE
- S M — SAMPLE/MONITOR POINT

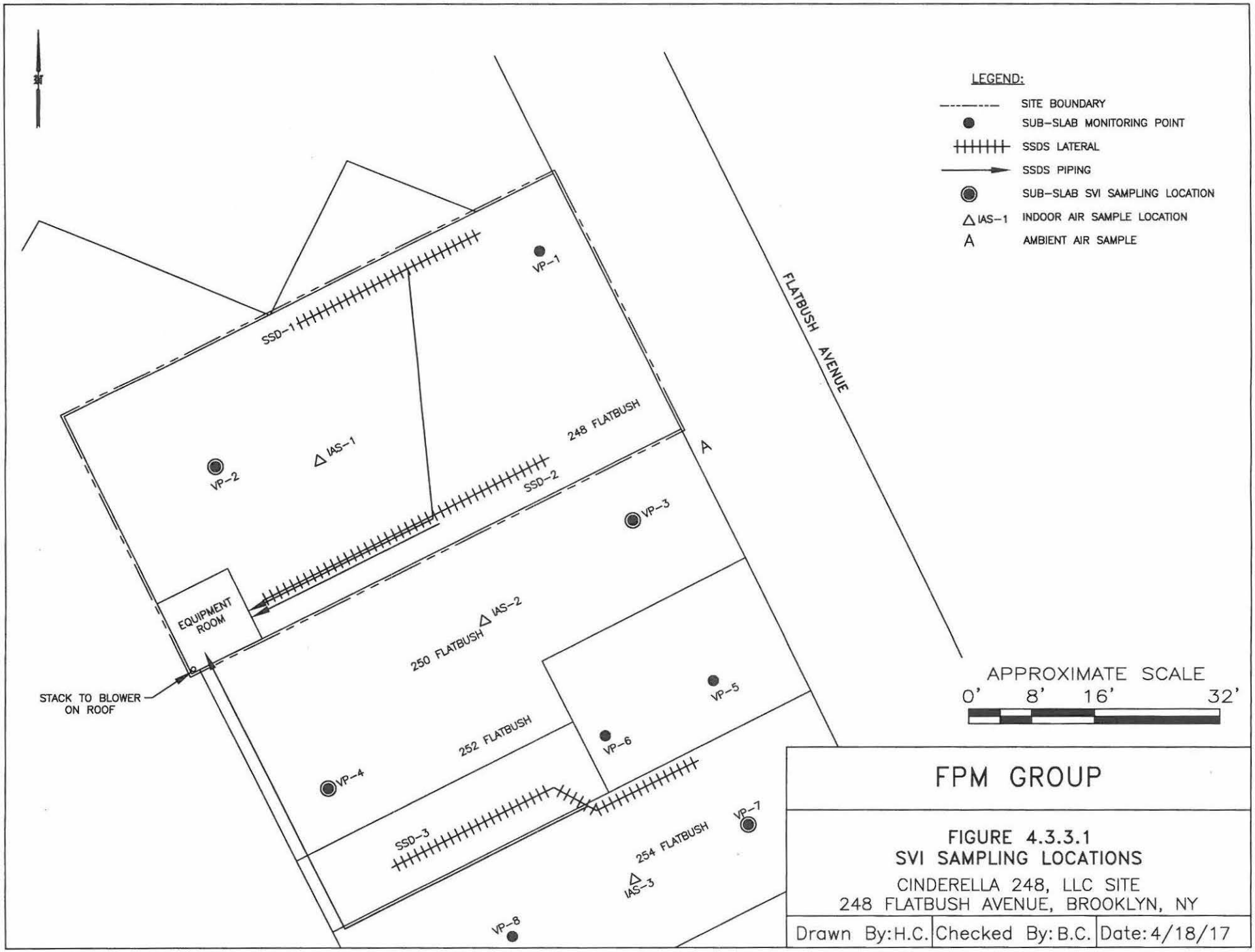
FPM GROUP

FIGURE 3.3.1.2
SCHEMATIC OF SSDS PROCESS FLOW

248 FLATBUSH AVENUE
BROOKLYN, NY

Drawn By: H.C.	Checked By: B.C.	Date: 4/12/17

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FPM GROUP

FIGURE 4.3.3.1
SVI SAMPLING LOCATIONS
CINDERELLA 248, LLC SITE
248 FLATBUSH AVENUE, BROOKLYN, NY

Drawn By: H.C.	Checked By: B.C.	Date: 4/18/17

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TABLES

TABLE 2.2.3.1
GROUNDWATER ELEVATION MEASUREMENTS
248 FLATBUSH AVENEUE, BROOKLYN, NY

Well	Depth (ft bgs)	Well Casing Diameter (inches)	Screen Length (feet)	Screened Interval (ft bgs)	Relative Groundwater Elevation (feet)*	Depth to Water (ft bgs)*
MW-1	60	1	15	45-60	17.84	52.25
MW-2	60	1	15	45-60	17.80	52.26
MW-3	59	1	15	44-59	17.81	51.24

ft bgs = feet below ground surface
* Water elevation data obtained in March 2014.
Wells were abandoned in February 2016 in accordance with the RAWP.

TABLE 2.3.1
SOIL CHEMICAL ANALYTICAL RESULTS
CINDERELLA 248, LLC SITE
248 FLATBUSH AVENUE, BROOKLYN, NEW YORK

Sample No.	B-1		B-2		B-3		B-4		B-5		B-6		B-7	B-8			B-9(sedi)	6 NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives	6 NYCRR Part 375 Restricted Residential Use Soil Cleanup Objectives	6 NYCRR Part 375 Commercial Use Soil Cleanup Objectives
Sample Depth (feet)	0-2	4-5	0-2	4-5	2-4	8-9	0-2	8-9	0-2	3-4	0-2	4-5	0-2	0-2	0-2 (duplicate B-8D)	9-10	Surface			
Sample Date	12/18/13																			
TCL Volatile Organic Compounds in ug/kg																				
Acetone	12	6.9	12	19	15	25	8.3	21	31	9.4	7.8	10	9.4	**61**	16	7.0	ND	50	100,000	500,000
Carbon disulfide	ND	ND	ND	ND	ND	ND	ND	ND	0.19 J	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-
Ethylbenzene	ND	ND	0.71 J	0.56 J	ND	ND	ND	ND	0.92 J	ND	ND	ND	0.17 J	ND	ND	ND	ND	1,000	41,000	390,000
Methyl acetate	ND	ND	ND	0.96	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-
Methyl ethyl ketone	ND	ND	ND	ND	ND	8.3 *J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	120	100,000	500,000
Methylene Chloride	0.82 J	0.48 UJ	1.2	1.5	0.54 UJ	1.6	1.0	3.0	0.71 UJ	0.89 J	1.0	1.1 J	0.28 UJ	0.47 UJ	0.23 UJ	0.83 J	ND	50	51,000	500,000
m-&p-Xylene	ND	ND	2.3	1.7 J	ND	ND	ND	ND	3.7	ND	ND	ND	0.57 J	ND	ND	ND	ND	260	100,000	500,000
o-Xylene	ND	ND	0.77 J	0.52 J	ND	ND	ND	ND	1.3	ND	ND	ND	0.20 J	ND	ND	ND	ND	260	100,000	500,000
Tetrachloroethene	1.2	1.3	2.8	1.1	2.2	11	13	43	350	380	83	76	16	0.89 J	1.0	3.2	0.90 J	1,300	19,000	150,000
Cyclopentane (TIC)	ND	ND	ND	ND	ND	56 JN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-
TCL Semivolatile Organic Compounds in ug/kg	ND	NA	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND	ND	NA	NA	-	-	-
TAL Metals in mg/kg																				
Aluminum	4850 [4]	NA	NA	NA	6100 [4]	NA	NA	NA	6920 [4]	NA	NA	NA	NA	6190 [4]	5240 [4]	NA	NA	-	-	-
Arsenic	2.5 J	NA	NA	NA	2.2 J	NA	NA	NA	2.8 J	NA	NA	NA	NA	4.2	2.7	NA	NA	13	16	16
Barium	32.1 J	NA	NA	NA	37.8	NA	NA	NA	44.4	NA	NA	NA	NA	95.4	38.4	NA	NA	350	400	400
Beryllium	0.35 J	NA	NA	NA	0.46	NA	NA	NA	0.42	NA	NA	NA	NA	0.57	0.38	NA	NA	7.2	72	590
Calcium	1660 [4]	NA	NA	NA	3040 [4]	NA	NA	NA	14800 [4]	NA	NA	NA	NA	6390 [4]	6080 [4]	NA	NA	-	-	-
Chromium	12.3	NA	NA	NA	15.1	NA	NA	NA	16.2	NA	NA	NA	NA	10.9	15.8	NA	NA	30	180	1,500
Cobalt	5.7 J	NA	NA	NA	6.1 J	NA	NA	NA	6.9 J	NA	NA	NA	NA	9.8	7.3 J	NA	NA	-	-	-
Copper	12.8	NA	NA	NA	12.7	NA	NA	NA	21.2	NA	NA	NA	NA	**88.6**	18.9	NA	NA	50	270	270
Iron	10400 [4]	NA	NA	NA	11900 [4]	NA	NA	NA	12400 [4]	NA	NA	NA	NA	24000 [4]	12400 [4]	NA	NA	-	-	-
Lead	8.1	NA	NA	NA	8.2	NA	NA	NA	16.3	NA	NA	NA	NA	12.2	13.1	NA	NA	63	400	1,000
Magnesium	2,810	NA	NA	NA	3,050	NA	NA	NA	6,360	NA	NA	NA	NA	4,240	4,630	NA	NA	-	-	-
Manganese	347 [4]	NA	NA	NA	309 [4]	NA	NA	NA	314 [4]	NA	NA	NA	NA	655 [4]	419 [4]	NA	NA	1,600	2,000	10,000
Mercury	ND	NA	NA	NA	ND	NA	NA	NA	0.13	NA	NA	NA	NA	0.022	0.028	NA	NA	0.18	0.81	2.8
Nickel	**41.7**	NA	NA	NA	**46.5**	NA	NA	NA	**66.3**	NA	NA	NA	NA	**86.7**	**76.0**	NA	NA	30	310	310
Potassium	1,150	NA	NA	NA	1,980	NA	NA	NA	1,800	NA	NA	NA	NA	1,490	1,180	NA	NA	-	-	-
Silver	ND	NA	NA	NA	ND	NA	NA	NA	**3.1**	NA	NA	NA	NA	ND	ND	NA	NA	2	180	1,500
Sodium	78.3 J	NA	NA	NA	140 J	NA	NA	NA	289 J	NA	NA	NA	NA	382 J	277 J	NA	NA	-	-	-
Vanadium	17.0	NA	NA	NA	19.1	NA	NA	NA	21.0	NA	NA	NA	NA	19.8	17.8	NA	NA	-	-	-
Zinc	31.8	NA	NA	NA	30.1	NA	NA	NA	49.5	NA	NA	NA	NA	57.1	41.2	NA	NA	109	10,000	10,000
Pesticides in ug/kg	ND	NA	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND	ND	NA	NA	-	-	-
Polychlorinated Biphenyls in ug/kg	ND	NA	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND	ND	NA	NA	100	1,000	1,000

Notes:

Only analytes detected in one or more samples are included herein.
J = Estimated concentration below the Reporting Limit but exceeding the Method Detection Limit.
N = Indicates the presumptive evidence of a compound.
- = Not established
mg/kg = milligrams per kilogram
UJ = Estimated non-detection

Bold shaded values exceed NYSDEC Unrestricted Use Soil Cleanup Objectives
ND = Not detected at or above the method detection limit.
TIC= Tentatively identified compound
ug/kg = micrograms per kilogram
*J = Estimated due to recovery outside of CCV limit
[4] = The analyte present in the original sample is four times the MS concentration; therefore, control limits are not applicable.

TABLE 2.5.1.1

GROUNDWATER CHEMICAL ANALYTICAL RESULTS

CINDERELLA 248, LLC SITE, 248 FLATBUSH AVENUE, BROOKLYN, NEW YORK

Sample No.	MW-1	MW-2	MW-22 (Duplicate of MW-2	MW-3	NYSDEC Class GA Ambient Water Quality Standards
Sample Date	3/25/14				
Volatile Organic Compounds in ug/l					
Benzene	ND	**2.6**	**2.7**	0.11 J	1
Chloroform	5.7	**16**	**16**	4.5	7
cis-1,2-Dichloroethene	0.53 J	0.50 J	0.56 J	ND	5
Cyclohexane	ND	8.4	8.6	ND	-
Dichlorobromomethane	0.40 J	0.81 J	0.76 J	0.15 J	-
Ethylbenzene	ND	**5.6**	**5.9**	ND	5
Isopropylbenzene	ND	0.93 J	0.94 J	ND	5
Methylcyclohexane	ND	5.9	6.1	ND	-
p&m-Xylenes	ND	**9.6**	**9.9**	ND	5
o-Xylenes	ND	**12**	**13**	ND	5
Tetrachloroethylene	**6.6**	**25**	**26**	**6.4**	5
Toluene	ND	**14**	**15**	0.30 J	5
Trichloroethene	0.13 J	ND	ND	ND	5
1-ethyl-2-methyl-Benzene (TIC)	ND	ND	5.6 JN	ND	-
1-ethyl-3-methyl-Benzene (TIC)	ND	5.5 JN	5.8 JN	ND	-
1,2,3-Trimethylbenzene (TIC)	ND	**8.1 JN**	**8.5 JN**	ND	5
1,2,4-Trimethylbenzene (TIC)	ND	**7.4 JN**	**7.9 JN**	ND	5
1,3,5-Trimethylbenzene (TIC)	ND	ND	**5.4 JN**	ND	5
methyl-Cyclopentane (TIC)	ND	7.3 JN	7.8 JN	ND	-
Semivolatile Organic Compounds in ug/l					
Di-n-butyl phthalate	1.1 J	ND	ND	ND	50
anti-1-methyl-, cis-Decalin (TIC)	ND	7.9 JN	ND	ND	-
2-methyl-trans-Decalin (TIC)	ND	7.3 JN	ND	ND	-
2,4,6-trimethyl-Heptane (TIC)	ND	7.2 JN	ND	ND	-
4,4'-(1-methylethylidene)bis-Phenol (TIC)	ND	ND	ND	8.5 JN	-
Tetradecane (TIC)	ND	ND	17 JN	ND	-
Tridecane (TIC)	ND	ND	23 JN	ND	-
Total Metals in ug/l					
Aluminum	293	863	973	890	-
Barium	117 J	64.7 J	66.0 J	113 J	1,000
Calcium	71,800	45,800	48,500	72,100	-
Iron	61.2 J	**713**	**777**	**928**	300
Magnesium	29,700	16,600	17,500	37,900	-
Manganese	21.3	27.9	28.6	78.3	300
Nickel	ND	ND	ND	8.6 J	100
Potassium	3,830 J	4,000 J	4,160 J	5,310	-
Sodium	**73,200**	**49,900**	**51,500**	**73,800**	20,000
Zinc	ND	10.7 J	10.7 J	8.4 J	-
Dissolved Metals in ug/l					
Aluminum	365	924	964	956	-
Barium	118 J	65.1 J	65.7 J	110 J	1,000
Calcium	70,500	44,300	46,000	68,400	-
Chromium	ND	ND	ND	4.7 J	50
Iron	**120 J**	**756**	**756**	**987**	300
Magnesium	29,400	16,200	16,900	36,400	-
Manganese	22.4	25.2	25.7	75.4	300
Nickel	ND	ND		9.1 J	100
Potassium	3,880 J	3,940 J	4,010 J	5,200	-
Sodium	**74,400**	**50,900**	**51,200**	**73,400**	20,000
Zinc	ND	14.3 J	15.0 J	12.7 J	-
Pesticides in ug/l	ND	ND	ND	ND	-
Polychlorinated Biphenyls in ug/l	ND	ND	ND	ND	-

Notes:

Only compounds detected in one or more samples are reported herein. See lab report for complete data.

Bold shaded values exceed NYSDEC Class GA Ambient Water Quality Standards.

J = Estimated concentration above the method detection limit and below the reporting limit.

ND = Not detected

ug/l = micrograms per liter

- = Not established

TIC = Tentatively identified compound

N = Indicates the presumptive evidence of a compound.

TABLE 2.5.2.1
SOIL VAPOR AND INDOOR AIR CHEMICAL ANALYTICAL RESULTS
CINDERELLA 248, LLC SITE, 248 FLATBUSH AVENUE, BROOKLYN, NEW YORK

Sample No.	V-1	V-2	IA-A	IA-B (Duplicate of IA-A)	V-3	V-4	V-5	IA-C	AMBIENT	Indoor Air Background Levels Commercial*
Sample Location	254 Flatbush Ave				Behind 248 Flatbush Ave	76 St Marks Ave			Front of 254 Flatbush Ave	
Sample Type	Sub-slab soil vapor		Indoor air		Soil vapor	Sub-slab soil vapor		Indoor air	Ambient air	
Sample Date	3/12/14									
Volatile Organic Compounds in ug/m^3										
1,4-Dichlorobenzene	29	ND	ND	ND	29	28	ND	ND	ND	<0.8 - 12.5
1,3-Butadiene	ND	ND	0.31	0.23	0.62	ND	ND	ND	0.31	<2.3 - <7.5
1,2,4-Trimethylbenzene	ND	ND	ND	ND	1.3	0.97	ND	ND	ND	1.7 - 13.7
1,3,5-Trimethylbenzene	ND	ND	0.45	ND	ND	ND	ND	ND	ND	<1.3 - 4.6
2,2,4-Trimethylpentane	ND	ND	1.1	0.67	1.3	ND	ND	0.39	0.88	-
4-Ethyltoluene	ND	ND	0.43	0.20	ND	ND	ND	0.26	0.21	<1.5 - 5.9
Acetone	ND	24	ND	ND	34	ND	17	ND	ND	32.4 - 120.2
Benzene	ND	ND	1.6	1.1	2.1	ND	1.2	1.1	1.3	2.1 - 12.5
Bromodichloromethane	ND	ND	ND	ND	ND	5.0	ND	ND	ND	-
Carbon tetrachloride	ND	ND	0.40	0.39	ND	ND	ND	0.41	0.43	<0.8 - 0.7
Chloroform	18	2.0	0.66	0.38	ND	94	1.1	0.97	ND	<0.4 - 1.4
cis-1,2-Dichloroethylene	ND	ND	ND	ND	ND	1.2	ND	ND	ND	<0.8 - <2.0
Cyclohexane	ND	ND	0.34	0.25	ND	ND	ND	0.18	0.64	-
Dichlorodifluoromethane	ND	ND	2.3	2.3	ND	ND	ND	2.3	2.4	4.8 - 32.9
Ethylbenzene	ND	ND	1.7	0.83	2.2	1.4	ND	0.43	3.4	<1.4 - 4.3
Freon 22	27	ND	ND	ND	1.9	7.5	ND	ND	ND	-
Methyl ethyl ketone	4.6	6.5	ND	ND	ND	1.5	ND	ND	ND	<1.6 - 7.6
Methylene chloride	ND	ND	1.8	3.6	6.0	4.6	ND	ND	ND	<1.7 - 16
n-Butane	ND	1.5	ND	ND	6.5	17	3.4	ND	ND	-
n-Heptane	ND	ND	1.8	1.0	1.4	ND	ND	0.61	0.78	-
n-Hexane	ND	ND	1.3	0.96	1.7	ND	0.97	0.74	1.1	1.6 - 15.2
Tetrachloroethylene (PCE)	440	3.2	5.7	3.6	13	8.4	ND	1.1	3.9	<1.9 - 25.4
Toluene	ND	ND	4.9	2.5	5.7	2.8	1.7	1.7	3.9	10.7 - 70.8
Trichlorofluoromethane	ND	1.3	1.9	1.6	1.9	1.6	ND	1.2	1.3	<2.8 - 5.6
o-Xylene	ND	ND	1.4	0.56	1.4	ND	ND	0.55	1.3	<1.4 - 6.0
m & p-Xylenes	ND	ND	3.7	1.6	4.5	2.4	ND	1.4	4.4	4.1 - 28.5

Notes:

All samples analyzed using Method TO-15.

Shaded compounds are those for which the NYSDOH has provided guidance.

Only compounds detected in one or more samples are reported herein. See lab report for complete data.

ug/m^3 = micrograms per cubic meter

ND = Not detected

* = US EPA BASE Study 2001

FPM

APPENDIX A

ENVIRONMENTAL EASEMENT AND ALTA/ASCM LAND TITLE SURVEY

This Appendix includes copies of the Environmental Easement and the ALTA/ASCM Land Title Survey for the Cinderella 248, LLC Site.

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NOTICE TO MUNICIPALITY

Cinderella 248 LLC
254 Flatbush Avenue
Brooklyn, New York 11217

July 27, 2017

Brooklyn Municipal Building
210 Joralemon Street, Room 205
Brooklyn, New York 11201

Re: Notice of Environmental Easement Recording

Dear Sir or Madam:

Attached please find a copy of an environmental easement granted to the New York State Department of Environmental Conservation ("Department") on June 19, 2017 by Cinderella 248 LLC for property at 248 Flatbush Ave, Brooklyn, New York 11217.

Tax Map No.: Borough: Kings Block: 936 Lot: 12
DEC Site No.: C224160

This Environmental Easement restricts future use of the above-referenced property to restricted residential, commercial and industrial uses as described in 6 NYCRR Part 375-1.8. Any on-site activity must be done in accordance with the Environmental Easement and the Site Management Plan which is incorporated into the Environmental Easement. Department approval is also required prior to any groundwater use.

Article 71, Section 71-3607 of the New York State Environmental Conservation Law requires that:

1. Whenever the Department is granted an environmental easement, it shall provide each affected local government with a copy of such easement and shall also provide a copy of any documents modifying or terminating such environmental easement.

2. Whenever an affected local government receives an application for a building permit or any other application affecting land use or development of land that is subject to an environmental easement and that may relate to or impact such easement, the affected local government shall notify the Department and refer such application to the Department. The Department shall evaluate whether the application is consistent with the environmental easement and shall notify the affected local government of its determination in a timely fashion, considering the time frame for the local government's review of the application. The affected local

government shall not approve the application until it receives approval from the Department.

An electronic version of every environmental easement that has been accepted by the Department is available to the public at: http://www.dec.ny.gov/chemical/36045.html. Please forward this notice to your building and/or planning departments, as applicable, to ensure your compliance with these provisions of New York State Environmental Conservation Law. If you have any questions or comments regarding this matter, please do not hesitate to contact me.

Very truly yours,

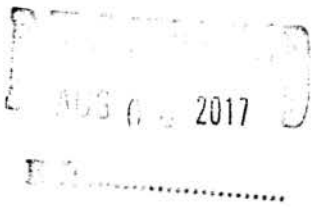
Michael Pintchik
Cinderella 248 LLC

RIGANO LLC
Attorneys at Law

538 Broad Hollow Road, Suite 217
Melville, New York 11747
tel: 631.756.5900 | fax: 631.756.0008
www.riganollc.com

August 7, 2017

New York State Department of Environmental Conservation
625 Broadway, 14th Floor
Albany, New York 12233-1500



Re: Environmental Easement Package
Site Name: Cinderella 248 LLC
Site No.: C224160

Dear Mr. Guglielmi:

As per your June 26, 2017 letter, I have enclosed a copy of the environmental easement with the recording and endorsement cover page containing all recording details. I have also enclosed a copy of the Notice to Municipality that was mailed via Certified Mail, Return Receipt Requested on July 27, 2017, along with a photocopy of the Return Receipt which was returned to my office on August 7, 2017. Please let me know if there is anything further I can provide on these documents or relating to this matter. I can be reached at adellefave@riganollc.com or 631-756-5900. Thank you.

Very truly yours,

Alyse Delle Fave
Rigano LLC

NYC DEPARTMENT OF FINANCE
OFFICE OF THE CITY REGISTER

This page is part of the instrument. The City Register will rely on the information provided by you on this page for purposes of indexing this instrument. The information on this page will control for indexing purposes in the event of any conflict with the rest of the document.

2017071401089001001EFF4F

RECORDING AND ENDORSEMENT COVER PAGE **PAGE 1 OF 19**

Document ID: 2017071401089001 Document Date: 06-19-2017 Preparation Date: 07-14-2017
Document Type: EASEMENT
Document Page Count: 18

PRESENTER:
ADVANTAGE TITLE AGENCY
201 OLD COUNTRY ROAD, SUITE 200
MELVILLE, NY 11747

RETURN TO:
ADVANTAGE TITLE AGENCY
201 OLD COUNTRY ROAD, SUITE 200
MELVILLE, NY 11747

PROPERTY DATA

Borough	Block	Lot	Unit	Address
BROOKLYN	936	12	Entire Lot	248 FLATBUSH AVENUE

Property Type: COMMERCIAL REAL ESTATE

CROSS REFERENCE DATA

CRFN_____ *or* DocumentID_____ *or* _____ Year____ Reel____ Page____ *or* File Number_____

PARTIES

GRANTOR/SELLER:
CINDERELLA 248 LLC
254 FLATBUSH AVENUE
BROOKLYN, NY 11217

GRANTEE/BUYER:
THE PEOPLE OF THE STATE OF NEW YORK
625 BROADWAY
ALBANY, NY 12233

FEES AND TAXES

Mortgage :		
Mortgage Amount:	$	0.00
Taxable Mortgage Amount:	$	0.00
Exemption:		
TAXES: County (Basic):	$	0.00
City (Additional):	$	0.00
Spec (Additional):	$	0.00
TASF:	$	0.00
MTA:	$	0.00
NYCTA:	$	0.00
Additional MRT:	$	0.00
TOTAL:	$	0.00
Recording Fee:	$	127.00
Affidavit Fee:	$	0.00

Filing Fee: $ 0.00
NYC Real Property Transfer Tax: $ 0.00
NYS Real Estate Transfer Tax: $ 0.00

RECORDED OR FILED IN THE OFFICE OF THE CITY REGISTER OF THE CITY OF NEW YORK
Recorded/Filed 07-18-2017 09:56
City Register File No.(CRFN): **2017000262435**

City Register Official Signature

ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36 OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW

THIS INDENTURE made this 19th day of June, 2017, between Owner(s) Cinderella 248 LLC, having an office at 254 Flatbush Avenue, Brooklyn, New York 11217, County of Kings, State of New York (the "Grantor"), and The People of the State of New York (the "Grantee."), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to encourage the remediation of abandoned and likely contaminated properties ("sites") that threaten the health and vitality of the communities they burden while at the same time ensuring the protection of public health and the environment; and

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to establish within the Department a statutory environmental remediation program that includes the use of Environmental Easements as an enforceable means of ensuring the performance of operation, maintenance, and/or monitoring requirements and the restriction of future uses of the land, when an environmental remediation project leaves residual contamination at levels that have been determined to be safe for a specific use, but not all uses, or which includes engineered structures that must be maintained or protected against damage to perform properly and be effective, or which requires groundwater use or soil management restrictions; and

WHEREAS, the Legislature of the State of New York has declared that Environmental Easement shall mean an interest in real property, created under and subject to the provisions of Article 71, Title 36 of the New York State Environmental Conservation Law ("ECL") which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls which are intended to ensure the long term effectiveness of a site remedial program or eliminate potential exposure pathways to hazardous waste or petroleum; and

WHEREAS, Grantor, is the owner of real property located at the address of 248 Flatbush Avenue in the City of New York, County of Kings and State of New York, known and designated on the tax map of the New York City Department of Finance as tax map parcel number: Block 936 Lot 12, being the same as that property conveyed to Grantor by deed dated June 9, 2015 and recorded in the City Register of the City of New York as CRFN # 2015000219141. The property subject to this Environmental Easement (the "Controlled Property") comprises approximately 0.05 +/- acres, and is hereinafter more fully described in the Land Title Survey dated February 2, 2016 prepared by Vincent J. Dicce, L.L.S. of Boro Land Surveying, P.C., which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule A; and

WHEREAS, the Department accepts this Environmental Easement in order to ensure the protection of public health and the environment and to achieve the requirements for remediation established for the Controlled Property until such time as this Environmental Easement is

extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the mutual covenants contained herein and the terms and conditions of Brownfield Cleanup Agreement Index Number: C224160-09-12, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement")

1. Purposes. Grantor and Grantee acknowledge that the Purposes of this Environmental Easement are: to convey to Grantee real property rights and interests that will run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and redevelopment of this Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of operation, maintenance, and/or monitoring requirements; and to ensure the restriction of future uses of the land that are inconsistent with the above-stated purpose.

2. Institutional and Engineering Controls. The controls and requirements listed in the Department approved Site Management Plan ("SMP") including any and all Department approved amendments to the SMP are incorporated into and made part of this Environmental Easement. These controls and requirements apply to the use of the Controlled Property, run with the land, are binding on the Grantor and the Grantor's successors and assigns, and are enforceable in law or equity against any owner of the Controlled Property, any lessees and any person using the Controlled Property.

A. (1) The Controlled Property may be used for:

Restricted Residential as described in 6 NYCRR Part 375-1.8(g)(2)(ii), Commercial as described in 6 NYCRR Part 375-1.8(g)(2)(iii) and Industrial as described in 6 NYCRR Part 375-1.8(g)(2)(iv)

(2) All Engineering Controls must be operated and maintained as specified in the Site Management Plan (SMP);

(3) All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP;

(4) The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health and Mental Hygiene to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;

(5) Groundwater and other environmental or public health monitoring must be performed as defined in the SMP;

(6) Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in the SMP;

(7) All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with the SMP;

(8) Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP;

(9) Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP;

(10) Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by this Environmental Easement.

B. The Controlled Property shall not be used for Residential purposes as defined in 6NYCRR 375-1.8(g)(2)(i), and the above-stated engineering controls may not be discontinued without an amendment or extinguishment of this Environmental Easement.

C. The SMP describes obligations that the Grantor assumes on behalf of Grantor, its successors and assigns. The Grantor's assumption of the obligations contained in the SMP which may include sampling, monitoring, and/or operating a treatment system, and providing certified reports to the NYSDEC, is and remains a fundamental element of the Department's determination that the Controlled Property is safe for a specific use, but not all uses. The SMP may be modified in accordance with the Department's statutory and regulatory authority. The Grantor and all successors and assigns, assume the burden of complying with the SMP and obtaining an up-to-date version of the SMP from:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, New York 12233
Phone: (518) 402-9553

D. Grantor must provide all persons who acquire any interest in the Controlled Property a true and complete copy of the SMP that the Department approves for the Controlled Property and all Department-approved amendments to that SMP.

E. Grantor covenants and agrees that until such time as the Environmental Easement is extinguished in accordance with the requirements of ECL Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Controlled Property shall state in at least fifteen-point bold-faced type:

This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation

pursuant to Title 36 of Article 71 of the Environmental Conservation Law.

F. Grantor covenants and agrees that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Controlled Property.

G. Grantor covenants and agrees that it shall, at such time as NYSDEC may require, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury, in such form and manner as the Department may require, that:

(1) the inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under the direction of the individual set forth at 6 NYCRR Part 375-1.8(h)(3).

(2) the institutional controls and/or engineering controls employed at such site:

(i) are in-place;

(ii) are unchanged from the previous certification, or that any identified changes to the controls employed were approved b the NYSDEC and that all controls are in the Department-approved format; and

(iii) that nothing has occurred that would impair the ability of such control to protect the public health and environment;

(3) the owner will continue to allow access to such real property to evaluate the continued maintenance of such controls;

(4) nothing has occurred that would constitute a violation or failure to comply with any site management plan for such controls;

(5) the report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

(6) to the best of his/her knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and

(7) the information presented is accurate and complete.

3. Right to Enter and Inspect. Grantee, its agents, employees, or other representatives of the State may enter and inspect the Controlled Property in a reasonable manner and at reasonable times to assure compliance with the above-stated restrictions.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives, and successors in interest with respect to the Property, all rights as fee owner of the Property, including:

A. Use of the Controlled Property for all purposes not inconsistent with, or limited by the terms of this Environmental Easement;

B. The right to give, sell, assign, or otherwise transfer part or all of the underlying fee interest to the Controlled Property, subject and subordinate to this Environmental Easement;

5. Enforcement

A. This Environmental Easement is enforceable in law or equity in perpetuity by Grantor, Grantee, or any affected local government, as defined in ECL Section 71-3603, against the owner of the Property, any lessees, and any person using the land. Enforcement shall not be defeated because of any subsequent adverse possession, laches, estoppel, or waiver. It is not a defense in any action to enforce this Environmental Easement that: it is not appurtenant to an interest in real property; it is not of a character that has been recognized traditionally at common law; it imposes a negative burden; it imposes affirmative obligations upon the owner of any interest in the burdened property; the benefit does not touch or concern real property; there is no privity of estate or of contract; or it imposes an unreasonable restraint on alienation.

B. If any person violates this Environmental Easement, the Grantee may revoke the Certificate of Completion with respect to the Controlled Property.

C. Grantee shall notify Grantor of a breach or suspected breach of any of the terms of this Environmental Easement. Such notice shall set forth how Grantor can cure such breach or suspected breach and give Grantor a reasonable amount of time from the date of receipt of notice in which to cure. At the expiration of such period of time to cure, or any extensions granted by Grantee, the Grantee shall notify Grantor of any failure to adequately cure the breach or suspected breach, and Grantee may take any other appropriate action reasonably necessary to remedy any breach of this Environmental Easement, including the commencement of any proceedings in accordance with applicable law.

D. The failure of Grantee to enforce any of the terms contained herein shall not be deemed a waiver of any such term nor bar any enforcement rights.

6. Notice. Whenever notice to the Grantee (other than the annual certification) or approval from the Grantee is required, the Party providing such notice or seeking such approval shall identify the Controlled Property by referencing the following information:

County, NYSDEC Site Number, NYSDEC Brownfield Cleanup Agreement, State Assistance Contract or Order Number, and the County tax map number or the Liber and Page or computerized system identification number.

Parties shall address correspondence to:

Site Number: C224160
Office of General Counsel
NYSDEC
625 Broadway
Albany New York 12233-5500

With a copy to:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, NY 12233

All notices and correspondence shall be delivered by hand, by registered mail or by Certified mail

and return receipt requested. The Parties may provide for other means of receiving and communicating notices and responses to requests for approval.

7. Recordation. Grantor shall record this instrument, within thirty (30) days of execution of this instrument by the Commissioner or her/his authorized representative in the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

8. Amendment. Any amendment to this Environmental Easement may only be executed by the Commissioner of the New York State Department of Environmental Conservation or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

9. Extinguishment. This Environmental Easement may be extinguished only by a release by the Commissioner of the New York State Department of Environmental Conservation, or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

10. Joint Obligation. If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

Remainder of Page Intentionally Left Blank

IN WITNESS WHEREOF, Grantor has caused this instrument to be signed in its name.

Cinderella 248 LLC:

By: _____

Print Name: Michael Pintchik

Title: Member Date: 6/8/2017

Grantor's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF Kings)

On the 8th day of June, in the year 2017, before me, the undersigned, personally appeared Michael Pintchik personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Faith Goldberg
Notary Public - State of New York

FAITH GOLDBERG
Notary Public, State of New York
No. 01GO4735640
Qualified in Kings County
Commission Expires November 30, 2017

THIS ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE PEOPLE OF THE STATE OF NEW YORK, Acting By and Through the Department of Environmental Conservation as Designee of the Commissioner.

By: _____
Robert W. Schick, Director
Division of Environmental Remediation

Grantee's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF ALBANY)

On the 19 day of June, in the year 2017 before me, the undersigned, personally appeared Robert W. Schick, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/ executed the same in his/her/ capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his/her/ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

_____
Notary Public - State of New York

David J. Chiusano
Notary Public, State of New York
No. 01CH5032146
Qualified in Schenectady County
Commission Expires August 22, 2018

SCHEDULE "A" PROPERTY DESCRIPTION

ALL that certain plot, piece or parcel of land, with the buildings and improvements thereon erected, situate, lying and being in the Borough, the County of Kings, City and State of New York, being more particularly described as follows:

BEGINNING at a point on the westerly side of Flatbush Avenue distant 289 feet 10 inches northerly from the corner formed by the intersection of the westerly side of Flatbush Avenue with the northeasterly side of Prospect Place;

RUNNING THENCE at right angles to Flatbush Avenue and part of the distance through a party wall 75 feet 6 inches;

THENCE northerly parallel with Flatbush Avenue 30 feet ¼ inch;

THENCE northeasterly parallel with 6th Avenue 5 feet 4 ¼ inches;

THENCE easterly at right angles to Flatbush Avenue and part of the distance through a party wall 71 feet 5/8 inches to the westerly side of Flatbush Avenue;

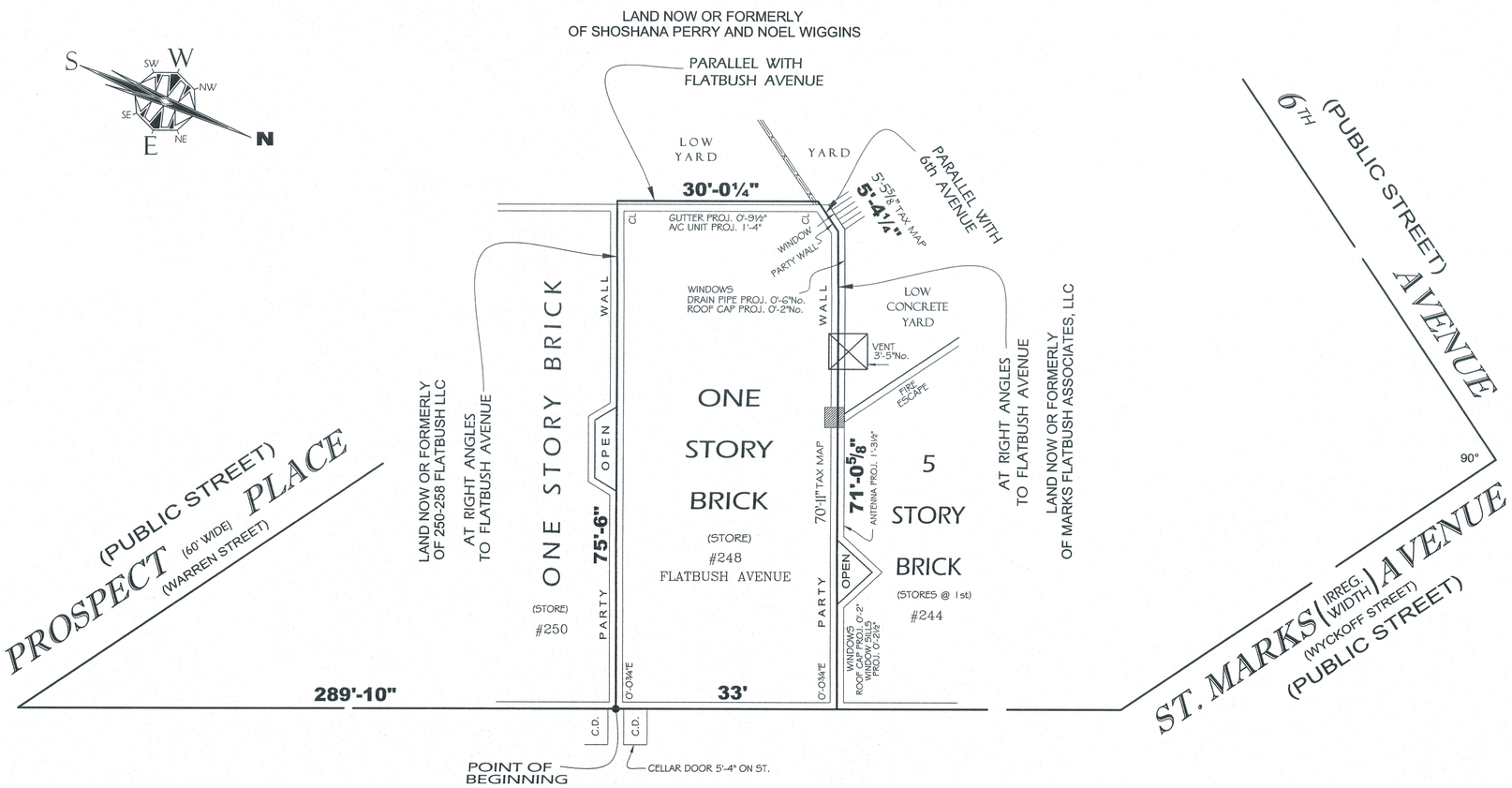
THENCE southerly along the westerly side of Flatbush Avenue 33 feet to the point or place of BEGINNING.

Being approximately 2,485 square feet or 0.05 acres more or less.

BORO LAND SURVEYING, P.C.

15040235ALT

LOT AREA = 2485± SQ. FT.
= 0.05± ACRES



PROJECTIONS BEYOND BUILDING

UPPER METAL STORE FRONT 1'-0"
LIGHTS 1'-8½"
METAL STORE FRONT 0'-2½"
ALARM BOX 0'-5"
SWING SIGN BRACKET 5'-0"

FLATBUSH (100' WIDE) (PUBLIC STREET) AVENUE

NOTE:

THIS PROPERTY IS SUBJECT TO AN ENVIRONMENTAL EASEMENT HELD BY THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION PURSUANT TO TITLE 36 OF ARTICLE 71 OF THE NEW YORK ENVIRONMENTAL CONSERVATION LAW. THE ENGINEERING AND INSTITUTIONAL CONTROLS FOR THIS EASEMENT ARE SET FORTH IN MORE DETAIL IN THE SITE MANAGEMENT PLAN (SMP). A COPY OF THE SMP MUST BE OBTAINED BY ANY PARTY WITH AN INTEREST IN THE PROPERTY. THE SMP CAN BE OBTAINED FROM NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION, DIVISION OF ENVIRONMENTAL REMEDIATION, SITE CONTROL SECTION, 625 BROADWAY, ALBANY, NY 12233 OR AT DERWEB@DEC.NY.GOV.

NOTE:
TO PROVIDE CLARITY, CERTAIN DIMENSIONS, FEATURES AND/OR LOCATIONS ARE NOT DRAWN TO SCALE.

LEGAL DESCRIPTION

Block 936 Lot 12

ALL THAT CERTAIN PLOT, PIECE OR PARCEL OF LAND, WITH THE BUILDINGS AND IMPROVEMENTS THEREON ERECTED, SITUATE, LYING AND BEING IN THE BOROUGH OF BROOKLYN, THE COUNTY OF KINGS, CITY AND STATE OF NEW YORK, BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT ON THE WESTERLY SIDE OF FLATBUSH AVENUE, DISTANT 289 FEET 10 INCHES NORTHERLY FROM THE CORNER FORMED BY THE INTERSECTION OF THE WESTERLY SIDE OF FLATBUSH AVENUE WITH THE NORTHEASTERLY SIDE OF PROSPECT PLACE;

RUNNING THENCE WESTERLY AT RIGHT ANGLES TO FLATBUSH AVENUE, AND PART OF THE DISTANCE THROUGH A PARTY WALL, 75 FEET 6 INCHES;

THENCE NORTHERLY PARALLEL WITH FLATBUSH AVENUE, 30 FEET ¼ INCHES;

THENCE NORTHEASTERLY PARALLEL WITH 6th AVENUE, 5 FEET 4 ¼ INCHES;

THENCE EASTERLY AT RIGHT ANGLES TO FLATBUSH AVENUE AND PART OF THE DISTANCE THROUGH A PARTY WALL, 71 FEET ⅝ INCHES TO THE WESTERLY SIDE OF FLATBUSH AVENUE;

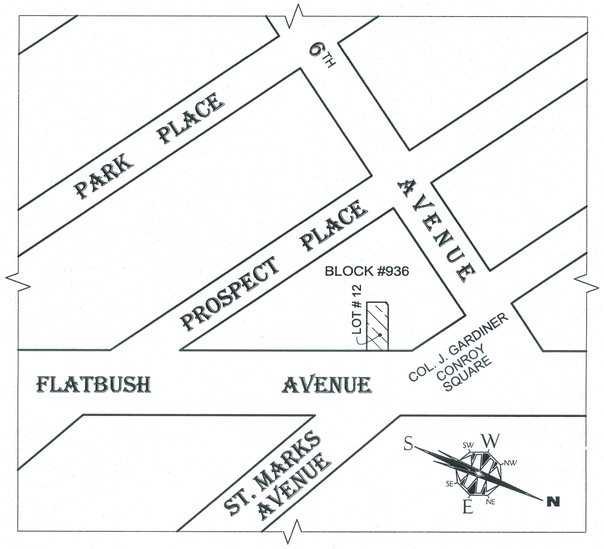
THENCE SOUTHERLY ALONG THE WESTERLY SIDE OF FLATBUSH AVENUE, 33 FEET TO THE POINT OR PLACE OF BEGINNING.

LEGEND

CHAIN LINK FENCE	CALC.	CALCULATED	ST.	STREET
IRON/OR METAL FENCE	C.D.	CELLAR DOOR	STY.	STORY
WOOD FENCE	CL	CLEAR	N./No.	NORTH
WOOD & CHAIN LINK FENCE	CONC.	CONCRETE	S./So.	SOUTH
WIRE FENCE	ENT. UND.	ENTRANCE UNDER	E.	EAST
CHIMNEY	HEDGE		W.	WEST
DRAIN	IND'T	INDEPENDENT	NE.	NORTHEAST
OVERHEAD WIRE	L.A.	LOW AREA	SE.	SOUTHEAST
UTILITY POLE	N.T.S.	NOT TO SCALE	NW.	NORTHWEST
AREAWAY	ORN.	ORNAMENTAL	SW.	SOUTHWEST
ALUM. ALUMINUM	PROJ.	PROJECTS	W.W./W.	WINDOW WELL
AWN. AWNING	RET.	RETAINING	O.F.	OIL FILL
BSM'T BASEMENT	RT	RIGHT		CATCH BASIN
P.S.B. PEDESTRIAN SIGNAL BOX	T.S.P	TRAFFIC SIGN POLE	W E S RT	MANHOLE COVERS
FH FIRE HYDRANT	G.V.	GAS VALVE	U.V.	VALVE
METAL GRATING	P	PARKING		

VICINITY MAP

N. T. S.



NOTE:

*FLOOD ZONE X AREA OF MINIMAL FLOODING.

*COMMUNITY PANEL #3604970211F
EFFECTIVE DATE 9-5-07

*PREMISES IS ADEQUATELY SERVED BY THE FOLLOWING PUBLIC UTILITIES LOCATED IN STREET:
WATER, ELECTRIC, GAS, TELEPHONE, STORM SEWER AND SANITARY SEWER.

*THERE ARE NO SETBACK OR RESTRICTION LINES AFFECTING PROPERTY. (EXCEPT AS SHOWN ON THE SURVEY)

*THERE ARE NO PARKING SPACES WITHIN THE PREMISES.

UNAUTHORIZED ALTERATIONS OR ADDITIONS TO THIS SURVEY IS A VIOLATION OF SECTION 7209 OF THE NEW YORK STATE EDUCATION LAW. COPIES OF THIS SURVEY MAP NOT BEARING THE LAND SURVEYOR'S INKED SEAL OR EMBOSSED SEAL SHALL NOT BE CONSIDERED TO BE A VALID TRUE COPY. GUARANTEES OR CERTIFICATIONS INDICATED HEREON SHALL RUN ONLY TO THE PERSON FOR WHOM THE SURVEY IS PREPARED, AND ON HIS BEHALF TO THE TITLE COMPANY, GOVERNMENTAL AGENCY AND LENDING INSTITUTION LISTED HEREON, AND TO THE ASSIGNEES OF THE LENDING INSTITUTION. GUARANTEES OR CERTIFICATION ARE NOT TRANSFERABLE TO ADDITIONAL INSTITUTIONS OR SUBSEQUENT OWNERS.

BLOCK: 936
LOT: 12
SECTION: 4
COUNTY: KINGS
DWG BY: I. PRAT.
CHK'D BY:

SURVEYED
FEBRUARY 2, 2016

STATE OF NEW YORK
VINCENT J. DICCE
No. 049333
LICENSED LAND SURVEYOR

VINCENT J. DICCE L.S.,Pres.

GRAPHIC SCALE
FEET & METERS

0' 1.524M 3.048M 7.62M 15.24'
0' 5' 10' 25' 50'

SCALE: 1" = 15'

BORO LAND SURVEYING, P.C.
353 COURT STREET
BROOKLYN, N.Y. 11231
TEL. (718) 624-BORO (2676)
E-MAIL: BOROSURVEY@GMAIL.COM

APPENDIX B

LIST OF SITE CONTACTS

Name	Phone/Email Address
Michael Pintchik, Site Owner	(718) 857-1300, mbpintchik@aol.com
Ben T. Cancemi, QEP FPM Group	(631)-737-6200 b.cancemi@fpm-group.com
Alicia Barraza, NYSDEC DER Project Manager	(518)-402-9690, alicia.barraza@dec.ny.gov
Jane O'Connell, NYSDEC Regional HW Engineer	(718) 482-4599, jane.oconnell@dec.ny.gov
Kelly Lewendowski, NYSDEC Chief, Site Control Section	(518) 402-9553 kelly.lewandowski@dec.ny.gov
James Rigano, Esq., Remedial Party Attorney	(631)-756-5900 jrigano@riganollc.com

APPENDIX C
FIELD SAMPLING PLAN

This Field Sampling Plan is applicable to activities involving sampling of SSDS emissions, soil vapor, indoor air and ambient air at the Site.

C.1 SSDS Emissions Sampling

SSDS emissions will be monitored on a quarterly basis using a photoionization detector (PID) calibrated in accordance with the manufacturer's directions. In the event that the SSDS is modified, or if Site conditions change, or if the monitoring results suggest that effluent treatment might be required, then emissions sampling and testing will be performed to evaluate compliance with NYSDEC's DAR-1 guidance. Emissions samples, if obtained, will be collected from the effluent sampling port utilizing either a laboratory-supplied Tedlar sampling bag or a Summa Canister. Upon completion of sampling, the emissions samples will be labeled, managed, transported, and tracked as described in Section C-3 below.

C.2 Soil Vapor and Indoor/Outdoor Air Sampling

Following completion of construction at the Site, a soil vapor intrusion (SVI) assessment will be performed. An SVI assessment will also be performed in the event that emissions monitoring suggests that the conditions for SSDS shutdown may have been achieved. An SVI assessment will also be performed following SSDS shutdown to confirm that SVI no longer presents a concern.

During each SVI assessment co-located sub-slab soil vapor and indoor air samples will be collected at each vapor monitoring point. Prior to soil vapor sample collection three to five volumes of air will be purged through the monitoring point using an air pump to ensure that a representative soil vapor sample is obtained. To confirm the integrity of the monitoring point seal, a helium tracer gas will be confined over the seal and the potential presence of helium in the polyethylene tubing will be checked with a helium meter. Following purging and the seal integrity check, the sub-slab soil vapor sample will be collected into a laboratory-supplied Summa canister equipped with a calibrated flow controller. Co-located indoor air samples and an ambient (outdoor) air sample will also be collected concurrently with the sub-slab vapor samples. This sampling will be performed over an approximate 24-hour time period. The flow controller for

each canister will be set so as not to exceed 0.2 liters per minute. The environmental professional will observe the flow controllers and seal the canisters while some vacuum remains. Upon completion of sampling, each canister will be sealed, labeled, managed, transported, and tracked as described in Section C-3 below. The soil vapor, indoor air, and outdoor air sample locations will be identified using a GPS.

During the sampling event, a building inventory will be completed using the most current NYSDOH inventory form. The information obtained will be used to assess factors that may affect the indoor air sample results.

C.3 Sample Management and Analyses

Each filled and labeled Summa canister or Tedlar bag, as appropriate, shall be secured in shipping containers. A chain of custody form will be completed and kept with each of the shipping containers to document the sequence of sample possession. At the end of each day, the filled shipping containers will be transported by overnight courier to the analytical laboratory.

The analytical laboratories for all samples will be NYSDOH ELAP-certified for the proposed analyses. The soil vapor and emissions samples will be analyzed for VOCs using Method TO-15. Low-level TO-15 analyses will be performed for the indoor air samples. The analytical methods used will be as per NYS Analytical Services Protocol (ASP) with Category B deliverables. Electronic data deliverables (EDDs) will be prepared and uploaded into the NYSDEC's environmental information management system.

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APPENDIX D
QUALITY ASSURANCE PROJECT PLAN

This Quality Assurance Project Plan (QAPP) is applicable to all site management activities at New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) Site #C224160, identified as Cinderella 248, LLC located at 248 Flatbush Avenue, Kings County (Brooklyn), New York (Site). Following the completion of remedial construction activities and during remedial operations, soil vapor and indoor/outdoor (ambient) air sampling will be performed periodically to evaluate the potential for soil vapor intrusion (SVI) at the Site and nearby buildings. Monitoring of the sub-slab depressurization system (SSDS) effluent will also be performed as needed. The schedules for SVI sampling and SSDS monitoring are included in the Monitoring and Sampling Plan and Operation and Maintenance Plan sections of the Site Management Plan.

SSDS operation will be overseen by FPM Engineering Group, PC (FPM) on behalf of the Volunteer, Cinderella 248, LLC. The FPM Project Engineer is Kevin Loyst, PE, the Project Coordinator is Stephanie O. Davis, CPG, and the Project Manager is Ben Cancemi, CPG. Ms. Davis and Mr. Cancemi are qualified environmental professionals (QEPs). Resumes for project personnel are included in Attachment 1 at the end of this QAPP.

Table D.1 presents a summary of the analytical methods that will be used during SSDS monitoring and SVI sampling, and the quality assurance/quality control (QA/QC) sample program. QA/QC samples are further discussed below.

D.1 Data Quality Objectives

The Data Quality Objectives (DQOs) will be applicable to all data-gathering activities at the Site. DQOs will be incorporated into sampling, analysis, and quality assurance tasks associated with remedial activities.

The data users for this project are FPM, the NYSDEC, and the New York State Department of Health (NYSDOH). The Site owner will also be provided with the data. No other data users are anticipated. The data collected are intended to evaluate volatile organic compounds (VOCs) in SSDS emissions, indoor air, outdoor air and soil vapor.

D.2 Standards, Criteria, and Guidance

The following standards, criteria, and guidance (SCGs) have previously been identified for the Site:

- NYSDEC's *DER-10 Technical Guidance for Site Investigation and Remediation*;
- The NYSDEC's Class GA Ambient Water Quality Standards, which are used to evaluate the groundwater chemical analytical results;

TABLE D.1

SSDS MONITORING AND SVI SAMPLING MATRIX

CINDERELLA 248, LLC SITE, NYSDEC SITE C224160

248 FLATBUSH AVENUE, BROOKLYN, NEW YORK

Sample Type	Matrix	Sample Location	Number/ Frequency	Preparation and Analysis	Sample Containers/Duration	Holding Time
Sub-Slab Soil Vapor (for SVI)	Vapor	Six Inches Below Slab	As needed	VOCs (Method TO-15)	One Summa Canister/8 hours	30 days
Indoor/Outdoor Air (for SVI)	Air	3 to 5 feet above grade	As needed	VOCs (Method TO-15, low-level)	One Summa Canister/8 hours	30 days
SSDS Emissions	Effluent	SSDS emissions stack	As needed	VOCs (Method TO-15)	One Tedlar Bag/grab	72 Hours
					One Summa Canister/grab	30 days
Trip blanks	Lab Air	-	One per shipment of SVI samples	VOCs (Method TO-15)	One Summa Canister/-	30 days
Blind duplicates	Soil Vapor/Air	Same as associated primary SVI samples	One per 20 primary SVI samples	VOCs (Method TO-15)	One Summa Canister/8 hours	30 days

Notes:

SSDS = sub-slab depressurization system VOCs = Volatile organic compounds SVI = soil vapor intrusion

- The 6 NYCRR Subpart 375-6 Remedial Program Soil Cleanup Objectives, which are used to evaluate soil sample results;

- The 6 NYCRR Parts 370, 371, and 372 regulations for hazardous waste management, which are used to guide hazardous waste characterization and disposal;

- The NYSDOH *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (October 2006); *and*

- The NYSDEC Division of Air Resources (DAR-1) *Guidelines for the Control of Toxic Ambient Air Contaminants* (November 1997, October 2010).

The SCGs pertaining to air will be applicable for post-remedial SSDS and SVI monitoring. Previous testing conducted during the Remedial Investigation (RI) at the Site has not identified any soil that exceeds SCGs for tetrachloroethene (PCE). Hazardous waste is also not anticipated to be encountered. However, in the event that impacted soil and/or hazardous waste is identified during remedial activities, then the SCGs pertaining to soil and/or hazardous waste will be applicable. Groundwater sampling is no longer required and the groundwater monitoring wells have been properly abandoned as part of remedial activities. Therefore, the SCGs pertaining to groundwater are not anticipated to be needed during the remedial program.

D.3 Quality Assurance/Quality Control Procedures

QA/QC procedures will be utilized during the performance of the remedial operations to ensure that the resulting chemical analytical data accurately represent the condition of the sampled matrix. The following sections include descriptions of the QA/QC procedures to be utilized.

➢ Equipment Decontamination Procedures

Although not anticipated, in the event that any non-disposable subsurface equipment is used during intrusive sampling activities, the equipment will be decontaminated by washing in a potable water and Alconox solution and rinsing in potable water prior to use at each location to reduce the potential for cross contamination. All sampling equipment will be either dedicated disposable equipment or will be decontaminated prior to use at each location. The decontamination procedures utilized for all non-disposable sampling equipment will be as follows:

1. The equipment will be scrubbed in a bath of potable water and low-phosphate detergent followed by a potable water rinse;

2. The equipment will be rinsed with distilled water; and

3. The equipment will be allowed to air dry, if feasible, and wrapped in aluminum foil (shiny side out) for storage and transportation.

➢ QA/QC Samples

When in-situ matrix (soil vapor, indoor air, ambient air) sampling is performed, then QA/QC samples will be collected during the sampling activities to evaluate the potential for field

or laboratory contamination and to evaluate the laboratory's analytical precision and accuracy. A sampling chart showing the number and types of primary environmental samples, analytical methods, and QA/QC samples is shown on Table D.1. The specific types of QA/QC samples to be collected are described below.

Trip blank samples will be utilized to evaluate the potential for VOC cross-contamination between samples in the same cooler or shipping container. Trip blank samples for air consist of laboratory-provided containers filled with laboratory air that are sealed in sample containers at the laboratory and that are transported to and in the field with the other sample containers. A trip blank will be shipped with each group of in-situ matrix samples and will be managed in the field and analyzed in the laboratory in the same manner as the primary environmental samples.

Blind duplicate samples will be obtained at a frequency of at least one per every 20 matrix samples and will be used to attest to the precision of the laboratory. A blind duplicate consists of a separate aliquot of sample collected at the same time, in the same manner, and analyzed for the same parameters as the primary environmental sample. The blind duplicate samples are labeled in a manner such that they cannot be identified by the laboratory. The sample results are compared to those of the primary environmental sample to evaluate laboratory analytical precision.

- Chain-of-Custody Procedures

For each day of sampling, chain-of-custody (COC) sheets will be completed and submitted to the laboratory with the samples collected that day. A copy of each COC sheet will be retained by the FPM QEP for sample tracking purposes. Each COC sheet will include the project name, the sampler's signature, the sampling locations and intervals, and the analytical parameters requested.

- Data Usability Summary Reports

All chemical analytical results will be evaluated by the QEP using the sample data packages, sample data summary packages, and case narratives provided by the analytical laboratory. The data evaluation will be performed to verify that the analytical results are of sufficient quality to be relied upon to assess the potential presence of contaminants in the soil vapor, indoor air, and/or outdoor air samples. A data usability summary report (DUSR) will be prepared for each data package containing in-situ matrix samples following the "Guidance for the Development of Data Usability Summary Reports" provided by the NYSDEC (Appendix 2B of DER-10). The resume of the anticipated DUSR preparer, Richard Baldwin, CPG, who is independent from this project is included in Attachment 2.

D.4 Sample Analysis

All samples will be submitted to NYSDOH ELAP-certified laboratories. The anticipated laboratory for SSDS emissions samples is York Analytical Laboratories, Inc. of Stratford, Connecticut. The anticipated analytical laboratory for in-situ matrix soil vapor, indoor air, and outdoor air samples is Centek Laboratories of Syracuse, New York. Analytical data will be provided by the laboratories in electronic format, in accordance with DER-10, Section 1.15.

SSDS emissions samples will be analyzed for VOCs using Method TO-15. The preparation and analytical methods used will be as per the NYS ASP with Category A-equivalent (report-only) deliverables. Sub-slab soil vapor and indoor/outdoor air samples will be analyzed for VOCs using Method TO-15. Low-level analyses will be performed for the indoor air samples. The analytical methods used will be as per the NYS ASP with Category B-equivalent deliverables. EDDs will be prepared and uploaded into the NYSDEC's environmental information management system.

D.5 Data Evaluation

The data collected will be assembled, reviewed, and evaluated following each sampling event. The SSDS emissions samples will be used to assess compliance with NYSDEC's Division of Air Resources (DAR-1) *Guidelines for the Control of Toxic Ambient Air Contaminants.* The soil vapor, indoor air, and outdoor air samples will be used to assess the potential for SVI. Although none are anticipated, in the event that any soil and/or groundwater samples are collected, the results will be used to assess the potential presence of VOCs.

D.6 Project Organization

The Project Manager and field supervisor for this project will be Ben Cancemi, CPG. Mr. Cancemi will also serve as the health and safety officer. The Project Coordinator and QA/QC officer will be Stephanie Davis, CPG, Senior Hydrogeologist. Resumes for project personnel are included in Attachment 1. Subcontracted services will include laboratory services (York Analytical Laboratories, Inc. and Centek Laboratories).

ATTACHMENT 1

RESUMES OF PROJECT PERSONNEL

Stephanie O. Davis, PG, CPG

FPM group — Engineering and Environmental Science



Ms. Davis has diversified experience in geology and hydrogeology. Her professional technical experience includes groundwater, soil, and soil vapor investigations, design and management of soil and groundwater remediation projects, design and installation of groundwater containment systems, design and evaluation of soil vapor mitigation systems, groundwater flow modeling, aquifer testing and interpretation, evaluation of site compliance with environmental regulations, and personnel training. Ms. Davis presently manages several large-scale investigation and remedial programs, including program scopes, budgets, staffing, and schedules.

Functional Role	Title	Years of Experience
Senior Project Manager	**Corporate Vice President**	**30+**

Personal Data

Education

M.S./1984/Geology/University of Southern California
B.S./1981/Geology/Bucknell University

Registration and Certifications

Certified Professional Geologist #9487, (AIPG) 1995
California Registered Geologist #5192, 1991
Pennsylvania Registered Geologist #PG-000529-G, 1994
OSHA – Approved 40 hour Health and Safety Training Course (1990)
OSHA - Approved 8 hour Health and Safety Training Refresher Courses (1991-Present)
OSHA-Approved 8-hour Site Safety Supervisor Training Course (2008)
National Ground Water Association
Long Island Association of Professional Geologists
USEPA Triad Training for Practitioners
NYC OER Gold Certified Professional

Employment History

1993-Present	FPM Group
1992-1993	Chevron Research and Technology Co.
1990-1992	Chevron Manufacturing Co.
1984-1990	Chevron Exploration, Land, and Production Company

Continuing Education

- Treatment of Contaminated Soil and Rock
- Groundwater Pollution and Hydrology
- Environmental Law and Regulation
- Remedial Engineering
- Soil and Foundation Engineering
- Environmental Geochemistry
- Project Management Professional (PMP) training

Detailed Experience

Site Investigations

- **Program Manager** for ongoing investigation and remedial projects at several New York State Inactive Hazardous Waste Disposal sites, Voluntary Cleanup Program (VCP) sites, and Brownfield Cleanup Program (BCP) sites, and NYC OER e-designated sites. Investigations have included site characterization, Remedial Investigations/ Feasibility Studies (RI/FS), and Resource Conservation and Recovery Act (RCRA) facility investigations and closures. Remedial services have included contaminated soil removal; in-situ chemical treatment; design, installation, and operation of air sparge/soil vapor extraction (AS/SVE) systems and sub-slab depressurization systems (SSDS), capping, and other remedial services.
- **Program Manager, NYS Inactive Hazardous Waste Disposal Site, Greenpoint, NY.** Responsible for project scoping, cost estimation, subcontracting, field services, report preparation, and agency negotiations for a former manufacturing facility. Services have included an RI, an FS, implementation of an Interim Remedial Measure (IRM), and an Underground Utility Survey. A Remedial Action Work Plan (RAWP) was also prepared for an associated petroleum spill and investigation services will be provided for an associated e-designated site.
- **Program Manager, NYS BCP Site, Far Rockaway, NY.** Managed all aspects of pre-application investigation, BCP application, RI Work Plan development and implementation, and Citizen Participation Plan (CPP) for a chlorinated solvent site. Responsible for scope development, NYSDEC and NYSDOH coordination, budget, schedule, staffing, and report management.
- **Program Manager, Site Characterization (SC) for NYS Inactive Hazardous Waste Disposal Site, Flushing, NY.** Responsible for SC scope development, budget, schedule, SC Work Plan and report review, staffing, and agency negotiations for a chlorinated solvent site undergoing residential redevelopment.
- **Program Manager, Environmental Services for Senior Living Developer, Long Island, NY.** Performs environmental analyses and directs investigation and remedial activities for property acquisition and redevelopment for senior residential facilities. Services included Phase I ESAs, investigation and remediation cost estimation,

Phase II investigations, Site Management Plans, and transaction and regulatory agency negotiations.

- **Program Manager** for all Phase I ESA, Phase II investigations, and remediation projects for a major commercial real estate developer on Long Island, New York. Projects have included environmental services associated with purchase and redevelopment of office buildings, aerospace facilities, former research and development facilities, and large manufacturing plants. Remedial services have included RCRA closures, UIC closures, tank removals, and large excavations.
- **Program Manager, Remedial Investigation/ Feasibility Study (RI/FS), Levittown, NY.** Managed all aspects of RI/FS for a Class 2 Inactive Hazardous Waste Disposal (Superfund) site involving chlorinated solvents. Responsibilities included RI/FS scope, budget and schedule development, RI/FS work plan, HASP, CAMP, and QAPP, coordination with client, tenants, and regulatory agencies, report review, remedial approach development, conceptual design, and cost estimation.
- **Project Manager, RCRA Facilities Investigation (RFI), Barksdale AFB, LA**. Responsible for all aspects of field program planning, solicitation and selection of subcontractors, mobilization and establishment of a field office, supervising multiple field crews, installation and sampling of monitoring wells, collection and soil samples, data tracking and management and preparation of an RFI report. The scope of work included characterization of the nature and extent of groundwater and soil contamination at thirteen Solid Waste Management Units (SWMUs), performing a Base-wide evaluation of background contaminant concentrations, and developing a long-term monitoring (LTM) program for the Base.
- **Field Services Manager, UST Investigation, Plattsburgh AFB, NY, AFCEE**. Responsible for field crew training, coordination of sampling crews at multiple sites, sample labeling, handling, tracking, and shipping, field data management and remote field office management. The scope of work included collection of over 450 groundwater samples to characterize groundwater conditions in the vicinity of 150 USTs using a Geoprobe sampling rig, well points, and rapid turnaround-time analysis.
- **Project Manager Environmental Investigation and Property Transaction Support, Long Island, NY**. Conducted site investigations, including soil vapor sampling, soil sampling and analysis, groundwater sampling and analysis, and geotechnical evaluation for numerous sites in Suffolk County, New York. The resulting data were utilized by a major supermarket company in the negotiations for the purchase of the properties and in the property remediation prior to development.
- **Project Manager, Site Investigation, Bronx, NY, NYCT.** Managed field sampling and data analysis activities, including soil vapor analysis, soil sample analysis, and groundwater sampling and analysis at an active commercial bus terminal. Made recommendations for site remediation, including UST removal, soil excavation and disposal, and free-phase product extraction.
- **Project Manager, RCRA Facilities Investigation, City of Richmond, CA**. Prepared RFI work plan, incorporating existing geologic, chemical, and historical data, evaluating newly-acquired site data, and developing recommendations for further investigation and remedial action at a former municipal landfill.
- **Project Manager, Site Investigation, Bay Shore, NY**, **Manufacturing facility.** Managed onsite and offsite soil and groundwater sampling program. Compiled and evaluated data and prepared a comprehensive report of the investigation results for the Suffolk County Department of Health Services (SCDHS) and NYS Department of Environmental Conservation (NYSDEC). Proposed remediation technologies for onsite soil contamination and onsite and offsite groundwater contamination.
- **Project Manager, Site Investigation, Newark Airport, NJ, FAA.** Managed and conducted a soil and groundwater sampling program adjacent to Runway 29. Analyzed chemical analytical data and developed recommendations.
- **Project Manager, Remedial Investigation, Richmond Refinery, CA.** Supervised and conducted drilling, soil sampling, cone penetrometer testing, and well installation at a refinery process water effluent treatment system and former municipal landfill.
- **Senior Hydrogeologist, multiple sites, NY metro area**. Supervised drilling, installation, development, and sampling of monitoring wells at numerous sites in the greater New York metro area. Utilized resulting stratigraphic, hydrologic, and chemical analytical data to evaluate site conditions.
- **Program Manager, multiple sites, major New York Metro area automobile dealer.** Managed all investigation and remedial activities for a major automobile retailer with multiple facilities. Sites included tanks, petroleum spills, underground injection control (UIC) systems, soil vapor intrusion issues, and hazardous waste management.

Responsible for work scope and budget preparation, staffing and oversight, client and regulatory agency interactions, addressing insurance issues, reporting and certification, and project closeouts.

- **Program Manager, SWTP groundwater monitoring program, Town of East Hampton.** Managed groundwater monitoring and reporting for the Scavenger Waste Treatment Plant (SWTP). Responsibilities included oversight of well installation, purging and sampling the SWTP groundwater monitoring wells, and providing data to the Town for reporting purposes.
- **Program Manager, Site Assessments for Transportation Hub development, Suffolk County, NY.** Manages Phase I ESAs, Phase II investigations, and remediation for acquisition of multiple parcels for redevelopment. Coordinates and oversees each project, interfaces with counsel and regulatory agency representatives, and develops comprehensive cost estimates.
- **Expert Environmental Review Services, Nationwide Sites for Real Estate Developers.** Reviews environmental investigation and remediation reports for several major real estate developers, advises clients regarding environmental concerns for property acquisition and redevelopment, develops comprehensive cost estimates, coordinates with construction contractors, architects, regulators and attorneys regarding environmental concerns.
- **Expert Environmental Consulting Services, Multiple Sites, Town of Brookhaven, NY.** Performed site inspections, investigations, and remedial cost estimation in response to Town Attorney requests. Assisted with Town Code revision and litigation. Coordinated with Town personnel, outside counsel, regulatory agency representatives, and law enforcement officers regarding environmental concerns.

Remediation

- **Program Manager, NYSDEC BCP site, NY City, major real estate developer.** In responsible charge of all investigation and remedial activities at a NYSDEC BCP site in New York City. Prepared the Remedial Investigation and Remedial Work Plan; coordinated with the owner, other contractors, and the NYSDEC; prepared for and conducted citizen participation activities; supervised all waste characterization, profile preparation, and waste management; developed the Final Engineering Report (FER) and Site Management Plan (SMP) for NYSDEC approval; and ensured that all remedial requirements were met such that the Certificate of Completion (COC) was issued. Continuing activities include coordination of the ongoing site management, communications with the NYSDEC and NYSDOH, and preparation of the annual Certification Report.
- **Program Manager, Major Oil Storage Facility (MOSF) closure, Glen Harbor, NY.** Responsibilities included coordination of the work scope with the NYSDEC and NCDOH, development of work plans for tanks, UIC, and petroleum spill closure, budget and schedule development, staffing and oversight, reporting and certification, and closeout of all environmental issues such that residential redevelopment could proceed.
- **Program Manager, Delineation and Remedial Services, NYS Spill Site, St. James, NY.** Responsible for client and agency coordination, budget, schedule, staffing, remedial design and reporting for a petroleum release at a Service Station property with offsite impacts.
- **Program Manager, RCRA Closure Site, Freeport, NY.** Successfully managed all aspects of RCRA Closure of a former printing facility, including scope, budget and schedule development, Closure Plan, NYSDEC interactions, QAPP, specifications for contractor services, remediation, and Closure Report.
- **Program Manager, Sub-slab depressurization system (SSDS), Brooklyn, NY.** Managed all aspects of SSDS implementation, including delineation sampling, remedial design, budget and schedule, construction services testing, reporting, and O&M manual development for a former dry cleaner site in an active shopping center.
- **Program Manager, SSDS, Bronx, NY.** Responsible for all aspects of SSDS implementation for a former dry cleaner site in a mixed-use building, including delineation sampling, SSDS design, construction contractor services, testing, reporting, and O&M manual development.
- **Program Manager, Investigation and Remediation for Nassau County, NY Subdivision Approval.** Coordinated investigation and remediation of a former school facility for redevelopment with multi-family housing. Services included Phase I ESA, Phase II investigation, NCDOH Remedial Work Plan development and implementation, and Remedial Action Reports. Issues addressed included soil, USTs, UICs, transformer areas, and water supply well closure.
- **Project Manager, Soil Remediation of metal plating facility, Hauppauge, NY.** Planned remedial project and managed contractor support

for soil remediation. Project was completed and approved by SCDHS.

- **Remedial Design, AS/SVE projects**. Developed pilot test plans, evaluated pilot test results, and prepared conceptual designs for several air sparge/soil vapor extraction (AS/SVE) systems to treat petroleum and/or chlorinated solvent VOCs. These systems were subsequently installed and Ms. Davis provides ongoing review of system operations and remedial monitoring results.
- **Program Manager, Waste soil management, Brooklyn, NY.** In responsible charge of several task orders for waste characterization of a 90,000-cy construction soil stockpile at a municipal sewer facility. Responsibilities included development and implementation of Sampling and Analysis Plan (SAP), coordination of staffing, review of lab data, preparation of Field Sampling Summary Reports, coordination with disposal facilities, and preparation of waste profiles.
- **Program Manager, NYS Inactive Hazardous Waste Disposal (Superfund) site, Hicksville, NY.** Responsibilities included developing and implementing pre-demolition investigations, developing and implementing remedial actions (source removal) in conjunction with retail redevelopment, conceptual design and installation of sub-slab depressurization systems (SSDSs), maintaining ongoing OM&M programs.
- **Project Manager, Remedial projects, Patchogue, NY**. Designed and performed indoor underground storage tank abandonment program, leaching pool remediation plan, and managed contractor support for closure activities at a metal tape manufacturing facility. SCDHS provided oversight and approval.
- **Senior Hydrogeologist, Remedial design for a landfill, Richmond, CA**. Contributed to the design of a groundwater containment and remediation system for a former municipal landfill, including subsurface groundwater barrier walls and extraction wells.
- **Project Manager, Soil remediation, Carle Place, NY**. Designed remedial plan and supervised soil remediation activities at an active construction site involving excavation and disposal of 5,000 tons of PCB-, metal-, and petroleum-contaminated soil. NYSDEC oversaw and approved the completed remediation.
- **Project Manager, Groundwater containment system, Richmond, CA**. Coordinated technical aspects of groundwater barrier wall construction, including routing, permitting, design, material selection, and field activities.
- **Project Manager, Multiple UIC investigations and closures, Suffolk and Nassau Counties, NY** Responsible for investigation and remediation of contaminated cesspool and stormwater drain pool in systems. Fully conversant with SCDHS SOP 9-95 and USEPA UIC regulations for investigation and cleanup of leaching pool systems, including Action Levels and Cleanup Standards, groundwater monitoring criteria, and remedial requirements.
- **Project Coordinator, UIC Closure, Hempstead, NY.** Coordinated and supervised all aspects of waste management for a UIC closure, including disposal facility review, waste sampling and classification, manifesting, project closeout, and taxation issues.

Hydrogeologic Evaluations

- **Project Manager, well permitting, East Hampton, NY. Private client**. Prepared Engineer's Report for Long Island Well Permit for a 230-gpm irrigation supply well. Responsible for evaluation of well interference, salt water upconing, impacts from contaminants, and other factors affecting the proposed well. Performed well design (gravel pack size, screen size, etc.) for numerous groundwater wells on Long Island. Familiar with sieve analyses, well construction and development methods.
- **Senior Hydrogeologist, groundwater modeling, East Hampton,** NY. Utilized Visual Modflow to evaluate the impact of a contaminant plume on a proposed SCWA wellfield. Model development included evaluation of recharge, aquifer properties, subsurface stratigraphy, boundary conditions, plume source and concentration, and various wellfield locations and pumping rates.
- **Hydrogeologist, aquifer testing, Manhattan, NY. NYCT.** Participated in a multi-day, multi-well aquifer pumping test for NYCT subway extension. Responsible for operating and maintaining data logging equipment, coordinating manual water level measurements, and analyzing resulting drawdown data.
- **Hydrogeologist, aquifer evaluation, Brooklyn, NY. NYCT.** Evaluated subsurface geologic conditions for subway site utilizing existing boring logs, topographic, and historic map data.
- **Hydrogeologist, aquifer testing, Queens, NY. NYCT**. Performed slug tests on monitoring wells at an East Side Access site, and evaluated hydrologic properties using the HYDROLOGIC ISOAQX computer program.

- **Hydrogeologist, remedial wells, Deer Park, NY. USEPA.** Supervised drilling, installation and development of groundwater extraction, injection, and monitoring wells at a Superfund site. Interpreted aquifer and well performance from development data and recommended modification of drilling and development procedures.
- **Hydrogeologist, aquifer testing, NYC, NYCT**. Performed aquifer pumping and slug tests and evaluated hydrologic properties using the computer program AQTESOLV. Results were used to address dewatering and construction concerns for subway tunnels.
- **Hydrogeologist, aquifer evaluation, Mattituck Airport, Mattituck, NY**. Performed water level and water quality monitoring at a NYSDEC Superfund site. Constructed groundwater elevation contour maps and utilized chemical analytical data to predict contaminant plume migration.
- **Senior Hydrogeologist, DEIS services, Lazy Point, NY. Town of East Hampton**. Prepared a detailed evaluation of groundwater conditions and potential impacts for a water extension to Lazy Point for a draft Environmental Impact Statement (DEIS). Evaluated current and historic groundwater data and analytical models to determine potential impacts for both Lazy Point and the drinking water source area and prepared associated portions of the DEIS.

Landfills

- **Program Manager, Greenhouse gas monitoring program, Town of Islip, NY**. Responsibilities include scope and budget management, staffing, client and USEPA coordination, reporting review, and troubleshooting.
- **Project Manager, Landfill Closure Investigations, Town of East Hampton, NY**. Prepared Closure Investigation work plans, including Hydrogeologic investigations, methane investigations, surface leachate investigations, and vector investigations. Prepared final Closure Investigation Reports, approved by the NYSDEC.
- **Project Manager, Landfill monitoring networks, Town of East Hampton, NY.** Supervised installation of groundwater and methane monitoring wells at the landfills, including hollow-stem auger and mud-rotary well installations, split-spoon soil sampling and boring log preparation, oversight and interpretation of wireline electric logging, and completion of initial baseline monitoring events.
- **Hydrogeologist, Landfill groundwater monitoring, NJ.** Performed groundwater sampling at a radio tower facility constructed on a landfill. Analyzed results and made recommendations.
- **Hydrogeologist, Landfill groundwater and gas monitoring, Town of East Hampton, NY**. Conducted groundwater and methane monitoring at two landfills over a multi-year period.
- **Program Manager, Landfill monitoring programs, Town of East Hampton, NY.** Supervises ongoing groundwater and methane monitoring programs, including field team coordination, communications with the Town, report scheduling, data review, and report review prior to distribution to the client and NYSDEC. Negotiated successfully with NYSDEC for reduced monitoring frequencies based on historic monitoring results.
- **Senior Hydrogeologist, Landfill plume modeling, Town of East Hampton, NY.** Conducted groundwater flow modeling to evaluate the nature and extent of a landfill plume and its fate. Findings were presented at public meetings and were used to determine the configuration of the landfill's groundwater monitoring network.
- **Hydrogeologist, Septage lagoon Superfund site, Town of East Hampton, NY.** Conducted sampling of former septage lagoons at a landfill. Evaluated the resulting data and prepared a delisting petition for this NYSDEC Superfund site.
- **Hydrogeologist, containment system modeling, Richmond, CA.** Used the FLOW PATH modeling program to predict groundwater flow directions and evaluate extraction well locations and pumping rates for a groundwater containment and remediation system at a former municipal landfill.
- **Program Manager, Landfill gas monitoring program, Town of Islip, NY**. Manages monthly methane monitoring for all landfills, including onsite and offsite monitoring wells, methane collection systems, and flare systems. Data is recorded electronically and downloaded to computer for formatting prior to expedited delivery to Town.
- **Program Manager, Landfill monitoring reporting program, Town of Smithtown, NY**. Supervised and reviewed production of quarterly and annual monitoring reports for all monitoring programs at the landfills for Town compliance with NYSDEC requirements, including tabulation and reporting of groundwater and methane monitoring data, solid waste and recycling collection data, yard waste composting operations, and landfill leachate collection and disposal data.
- **Program Manager, Landfill remediation, Town of Huntington, NY.** An historic landfill was removed from parkland under the NYSDEC's ERP.

Responsibilities included work scope development, schedule and budget management, staffing, client and regulatory agency coordination and reporting, and report review and certification.

- **Program Manager, Landfill Financial Assurance Reporting, Town of Smithtown, NY.** Prepares annual Financial Assurance Reports pertaining to Town landfill closure requirements. Services include summarizing landfill closure and monitoring costs, calculating total costs over a 30-year period, evaluating available Town funds using Comptroller's financial reports, assessing available funds using NYSDEC-required procedures, and preparing annual reports.

Environmental Data Analysis

Ms. Davis has participated in multiple sessions of environmental geochemistry training provided by environmental geochemists, including physical chemistry, thermodynamics, ionic interactions, complexation, biologic effects, and other basic principles. Training also included field sampling procedures and effects on chemical data, chemical analytical methods and equipment, and QA/QC procedures and interpretation. Attended periodic environmental chemistry training sessions hosted by environmental laboratories and participated in hands-on training in data and QA/QC evaluation.

- **Data Evaluation, multiple projects**. Reviewed and evaluated numerous soil, groundwater, product, indoor/ambient air, and soil vapor chemical analytical datasets, including evaluation of batch and site-specific QA/QC samples, laboratory narratives, comparison to regulatory agency criteria, historic data, and background data.
- **QAPPs, multiple projects**. Developed and implemented numerous QAPPs, including QAPP design, sample delivery group (SDG) evaluations, sampling procedures and sequences, and QA/QC sample preparation/collection.
- **DUSR Preparation, multiple projects**. Prepared Data Usability Summary Reports (DUSRs) for numerous chemical analytical datasets for projects overseen by USEPA, NYSDEC and other regulatory agencies, including soil, groundwater, soil vapor, indoor air, and ambient air datasets.
- **DUSR Preparation for Major RCRA Closure, Great Neck, NY.** Prepared DUSRs for over 90 sites during RCRA closure of a major manufacturing facility. Coordinated with sampling personnel, laboratories and regulatory agency chemists to resolve QA/QC issues. Completed work under tight schedules to meet client deadlines.
- **Electronic Data Deliverables, multiple projects**. Implemented protocols and procedures for all FPM sites for which NYSDEC Electronic Data Deliverables (EDDs) are required. Responsibilities included staff training, data package QA/QC, client interactions, budget and schedule impact assessments, and dissemination of EDD training information.
- **Data Evaluation, multiple sites**. Performed forensic assessments of historic environmental chemical analytical data to resolve apparent discrepancies with modern data and other inconsistencies.
- **Leachate test assessments**. Assessed leachate test protocols and results to determine the most applicable methods to evaluate and develop soil cleanup objectives for non-regulated compounds.
- **Organic parameter breakdown assessments.** Interpreted numerous organic parameter datasets to evaluate breakdown sequences, likely original parameters, and rates of degradation.
- **Insitu remediation assessments, multiple sites**. Formulated numerous chemical treatment plans for insitu remediation, including assessment of contaminant concentrations and distribution, chemical processes and indicators, natural attenuation indicators, additional stociometric demands, and hydrogeologic factors.

Community Impacts

- **Community Monitoring Plans, multiple hazardous waste sites**. Developed Community Air Monitoring Plans (CAMP) for investigation and remediation projects, including monitoring procedures, action levels, and mitigation measures for odors, traffic, noise, dust, and/or vapors with the potential to affect surrounding communities. Each CAMP was reviewed and approved by the NYSDEC and NYSDOH and was implemented under agency oversight. Presented CAMP findings at numerous community meetings. Addressed community and agency questions and issues
- **Vector Assessments, multiple landfill sites, Long Island, NY**. Evaluated and implemented abatement for vectors (rodents, flies, and seagulls) in association with landfill closures, including inspection and reporting of vector populations, development of vector abatement plans, and assisting Town personnel with vector abatement.
- **Odor Abatement, NYSDEC BCP site, NYC, NY. Major real estate developer**. Developed and implemented an odor abatement plan for highly-odorous soil discovered during a remedial project.

The site was surrounded by three public schools; complaints following discovery of odorous soil resulted in a job shutdown until the nuisance was abated. The odor abatement plan was prepared and implemented within 24 hours and involved immediate covering of the odorous soil followed by spot excavation and removal during non-school hours (night work) and the use of odor-controlling foam. The removal was completed within one week without further incident. The NYSDEC and NYSDOH approved the completed work, allowing the job to recommence.

- **Vector Assessment, transfer station, Town of East Hampton, NY**. Conducted inspections of intense fly infestations at a Town transfer station building to identify the locations and migration pathways of flies inside the building and to develop an abatement plan. This plan was successfully implemented and abated the nuisance flies.
- **Soil Vapor Intrusion Assessments, multiple sites**. Developed and implemented air and soil vapor investigations of residential and commercial properties, as approved by the NYSDEC/NYSDOH, to evaluate potential air quality impacts and determine if mitigation or monitoring was necessary. Monitoring/mitigation designs were developed for NYSDEC/NYSDOH approval.
- **CAMP Monitoring, multiple sites**. Conducted odor, dust, noise, and organic vapor monitoring in communities surrounding environmental sites. Data were collected and interpreted in accordance with NYSDEC and/or NYSDOH guidance and the results were submitted to these agencies together with recommendations for mitigation, if appropriate.
- **Project Manager, Environmental data assessment, Windmill Village, Town of East Hampton, NY.** Evaluated environmental data obtained during due diligence testing for a proposed housing development. Recommended additional sampling and confirmed the absence of impacts.

Expert Witness/Technical Services

- **Expert Witness/Technical Services, residential project, Glen Harbor, NY. Private client**. Provided expert witness and technical services regarding environmental conditions and remedial procedures for residential redevelopment of a former oil terminal, including preparing and obtaining NYSDEC and NCDOH approval of remedial work plans, preparing remedial cost estimates and schedules, and providing testimony at a public hearing before the Town Board from which a change of zone was requested. The proposed change of zone, although subject to considerable public opposition, was approved, allowing redevelopment and associated remediation of the property to move forward.
- **Expert Witness/Technical Services, petroleum spill site, Westbury, NY. Private client.** Provided expert witness and technical services to a petroleum company defending NYSDEC cost recovery claims for a petroleum spill. The spill site involved two very large petroleum releases at gasoline stations adjoining the defendant's property. Services provided included evaluating tank tests, groundwater, soil and soil vapor chemical analytical data, petroleum fingerprint data, remediation activities and costs. Prepared numerous detailed timelines of activities, large displays of site information and subsurface conditions, and cost allocation calculations. Conducted a detailed subsurface investigation to evaluate stratigraphic conditions.
- **Expert Technical Services, chlorinated solvent site, Far Rockaway, NY.** Provided expert witness services for federal court litigation, including Expert Reports, Affidavits, depositions, and counsel support. Oversaw supporting technical services, including conducting an RI and additional investigations and developing remedial approaches and cost estimates.
- **Expert Technical Services, development site, Village of Larchmont, NY**. Assisted the Village in successfully opposing the construction of a very large superstore in the adjoining community, including evaluating previous environmental investigations, developing cost estimates and scopes of work for a full environmental site assessment, preparing scoping cost estimates for likely remediation scenarios, preparing technical documents in support of the Village's position, and making a presentation at a public hearing. The proposed project was subsequently withdrawn.
- **Expert Hydrogeologist Services, development site, Town of Carmel, NY**. Provided technical evaluation of a proposed water district. The proposed water district would impact existing residents due to limited available water supplies and likely impact on existing wells. The work included evaluation of aquifer pumping tests, determining impacts on nearby wells, assessment of likely increased water demand, preparation of supporting documents, and presentations at project hearings. The proposed project was subsequently conditionally approved by the NYSDEC with significant modifications to protect the water rights of existing residents.

- **Expert Technical Services, solvent plume site, Nassau County, NY. Private client**. Provided technical support to a property owner subject to a USEPA investigation as the potential source of a large chlorinated solvent plume, including evaluation of a plume-wide RI/FS, detailed review of property historic information, multiple meetings with the USEPA, client and counsel, and identification of additional potential source areas.
- **Expert Witness Affidavits, multiple projects**. Prepared affidavits regarding environmental conditions at client properties in support of pending legal actions, including landfill issues, wetlands and navigatable waterway issues, and petroleum spills.
- **Expert Technical Services, road construction projects, Westchester County, NY. Croton Watershed Clean Water Coalition**. Provided technical services to the CWCWC to assess impacts from proposed road construction projects on the Kensico Reservoir and other New York City water supply system facilities. This work included evaluating stormwater pollutant loading calculations, assessing impacts to wetlands, promoting application of more accurate stormwater runoff calculation methods, assessing proposed stormwater management techniques, presenting at public meetings, preparing technical statements for submittal to regulatory agencies, and participating in the NYSDOT SWPPP Guidance committee

Health and Safety

- **Health and safety monitoring, multiple sites**. Implemented HASP monitoring at investigation and remediation sites during intrusive activities, including calibration and operation of photoionization detector (PID) and flame ionization detector (FID) for organic vapors and combustible gas indicator (CGI) for methane. Compared results to applicable action levels and implemented protective measures as necessary.
- **CAMP monitoring, multiple sites**. Performed community monitoring, including monitoring for noise, particulates (dust), and organic vapors. Recorded observations and compared to applicable action levels. Calibrated and operated noise meters, particulate monitors, and PID/FID.
- **Radiation screening, multiple sites**. Performed screening for radiation at select sites, including operating Geiger counter in different radiation modes and obtaining background readings.

Miscellaneous Projects

- **Phase I ESAs**. Performed numerous Phase I Site Assessments for residential and industrial sites in the metropolitan New York area.
- **Environmental Trainer.** Conducted aquifer pumping and soil vapor extraction test training. Instructed classes for site investigation methods, aquifer pumping test analysis, and risk assessment.
- **Project Management**. Performs a wide range of project management functions, including development and management of project budgets and schedules, coordination of field and office staffing, document preparation, review, editing, and interaction with clients, regulatory, legal, real estate, consultant, and compliance personnel.
- **Field Mapping Studies**. Organized, supervised, and conducted field mapping studies in Alaska.
- **Downhole Logging**. Directed petroleum well site geophysical logging operations and interpreted geophysical well logs.
- **Geophysical Data Interpretation**. Processed and interpreted seismic reflection data and constructed seismic velocity models.
- **Regulatory Evaluations**. Assisted and reviewed regulator's revision of proposed risk assessment-based UST cleanup guidelines. Reviewed proposed USEPA NPDES permits for remediation system effluent.
- **Geologic Mapping**. Constructed and interpreted structural and stratigraphic cross sections, and structure contour, fault surface, isochore, and isopach maps.

Regulatory Compliance

- **RCRA compliance audits.** Conducted inspections and reporting regarding underground and aboveground storage tanks (USTs and ASTs), hazardous waste storage facilities, waste management and reporting requirements, and hazardous waste storage area closures in compliance with RCRA.
- **CERCLA Compliance**. Oversees and coordinates environmental site assessments (ESAs) for compliance with CERCLA requirements for a wide variety of facilities, including operating and historic industrial sites, manufacturing plants, abandoned facilities, and multi-property Brownfield sites.
- **Superfund Sites**. Managed multiple investigation and remedial projects at state and federal Superfund sites. Is very familiar with all phases of CERCLA projects, including PA/SI, RI, FS, RD and RA. Has overseen activities at many Superfund sites from investigation through closure.
- **CWA Projects.** Conducted investigation and remediation of Class V underground injection control (UIC) systems, investigation and acquisition

of UIC discharge permits, and discharges into surface water bodies.

- **CAA Compliance Projects**. Conducted facility investigations for emissions sources, including paint booths, fume hoods, process discharges and other point sources. Sampled and evaluated remediation system discharges for CAA compliance, and recommended emissions treatment when required.

Representative DOD Projects

- **Barksdale RFI, Barksdale AFB, LA, $520K-**Lead Geologist for RFI for multiple Base-wide sites at Barksdale AFB, including landfills, petroleum spills, fire training areas, sewage treatment plans, and chemical spills. Managed field crews and sampling of soil, groundwater, and waste, performed sample and waste management, and coordinated with Base representatives. Prepared RFI Report, including analytical data reports, CS, and recommendations.
- **Barksdale LTM Program, Barksdale AFB, LA, $1.7M-**Lead Geologist for LTM Program for Base-wide Barksdale groundwater, including landfills, petroleum spills, fire training areas, sewage treatment plants, and chemical spills. Supervised field crews, managed samples and waste, prepared LTM Reports and made recommendations for LTM optimization.
- **Site Characterization, Plattsburgh AFB, NY, $720K-**Field Team Leader for SC investigation of fuel oil USTs and petroleum spills at Base housing, officers' quarters, and support building prior to transition of these areas to other uses. Working for AFCEE, developed and conducted an SC for over 200 USTs, including soil and groundwater sampling to identify petroleum contamination. Supervised several field crews in an accelerated sampling program to complete the SC prior to winter conditions. Prepared SC Report submitted to and approved by the NYSDEC.

MGP Site Experience

- **Field Sampling Services. Soil Investigation, Brooklyn Union Greenpoint MGP site**. Conducted soil sampling and screening activities during tank removal activities at this former MGP facility. Tasks included visual observations, screening with a calibrated PID, soil sampling, interfacing with the client, subcontractors and NYSDEC personnel, and report preparation.
- **Program Manager. Soil Vapor Intrusion Investigation and Mitigation, Brooklyn MGP site**. Developed and implemented a soil vapor intrusion (SVI) investigation following the discovery of chlorinated solvents in soil vapor beneath a shopping center constructed on an MGP site. Managed all scheduling, budget and contract issues. Reviewed results and developed an SVI mitigation plan to address the chlorinated solvent vapors. Oversaw design and installation of a sub-slab depressurization system (SSDS) to address SVI. This work was completed on time and within budget.
- **Field Team Supervisor. Soil Remediation, Brooklyn Union Coney Island MGP site**. Responsible for coordinating all field activities associated with segregation and removal of lead-paint impacted soil from MGP waste at this NYSDEC-listed MGP site. Conducted pre-excavation waste characterization, implemented HASP, oversaw subcontractor and FPM staff, coordinated with client and NYSDEC, managed waste manifesting, conducted community air monitoring, and prepared remediation report.

Ben T. Cancemi, CPG

FPM group — Engineering and Environmental Science



Mr. Cancemi has diversified experience in geology and hydrogeology. His professional experience includes groundwater and soil investigations, design and management of soil remediation projects, installation and maintenance of groundwater containment and remediation systems, aquifer testing and interpretation, geotechnical studies, evaluation of site compliance with environmental regulations and environmental permitting.

Functional Role	Title	Years of Experience
Senior Hydrogeologist	Department Manager - Hydrogeology	20

Personal Data

Education

M.S./2001/Hydrogeology/SUNY Stony Brook
B.S./1995/Geology/SUNY Stony Brook

Registration and Certifications

Certified Professional Geologist – American Institute of Professional Geologists
NYC Office of Environmental Remediation – Gold Certified Professional
OSHA 40-hour HAZWOPER and Current 8-hour Health and Safety Training and Current Annual Physical
OSHA 8-hour HAZWOPER Supervisor
OSHA 10-hour Construction Safety and Health
OSHA Permit-Required Confined Space Training
Long Island Geologists
National Groundwater Association
MTA NYC Transit Track Safety Certification

Employment History

2001-Present	FPM Group
1998-2001	Burns & McDonnell Engineering Company
1997-1998	Groundwater and Environmental Services
1996-1997	Advanced Cleanup Technologies

Detailed Experience

Hydrogeologic Evaluations

- **Project Manager, Lower Manhattan, NY. NYCT.** Coordinated and performed constant head hydraulic conductivity (packer) testing in boreholes located in fractured bedrock in lower Manhattan, NY to evaluate fracture connectivity with the nearby Hudson and East Rivers and determine hydraulic conductivity and related parameters such that water management procedures could be implemented for redevelopment of the New South Ferry Subway Station.
- **Project Manager, Manhattan, NY. NYCT** Coordinated and performed a hydrogeologic investigation, including utility clearing, soil borings, rock coring, packer testing, aquifer pumping testing, data collection, and interpretation, to evaluate subsurface conditions and determine geologic parameters for a proposed subway extension of the NYC Transit No.7 Subway Line.
- **Project Manager, Various Sites Long Island, NYC, and Westchester County, NY** Performed aquifer pumping and slug tests and evaluated hydrologic properties using the computer program AQTESOLV.

Site Investigations

- **Program Manager** for ongoing investigation and remedial projects at several New York State Inactive Hazardous Waste Disposal sites, Voluntary Cleanup Program (VCP) sites, and NYC OER e-designated sites. Investigations have included site characterization, Remedial Investigations/Feasibility Studies (RI/FS), and Resource Conservation and Recovery Act (RCRA) facility investigations and closures. Remedial services have included contaminated soil removal; design, installation, and operation of air sparge/soil vapor extraction (AS/SVE) systems and sub-slab depressurization systems (SSDS), capping, and other remedial services.
- **Project Manager Remedial Investigation NYSDEC BCP Site, Queens, NY** Coordinated and performed an investigation at a vacant commercial property Far Rockaway, NY, including soil, groundwater and soil vapor sampling to assess onsite chlorinated solvent impacts from an adjoining offsite source. Prepared Remedial Work Plan and Report and provided monthly updates.
- **Project Manager, Site Investigation, Former Aerospace Facilities, Long Island, NY** Coordinated and performed soil and groundwater sampling and soil vapor studies at several aerospace manufacturing facilities on Long Island, NY. Assessments included an evaluation of past manufacturing and facility operations, storage and use of solvents, petroleum and

manufacturing-derived wastes, and impacts to soils, soil vapor, and groundwater. Areas of concern were identified for further evaluation and/or corrective action.

- **Project Manager, Municipal Landfill Monitoring, Town of East Hampton, NY** Coordinated and performed long term groundwater monitoring at two closed Town of East Hampton, NY municipal landfills, including the sampling a multi-depth monitoring well network, analysis and interpretation of analytical and hydrogeologic data, and regulatory reporting in accordance with NYSDEC Part 360 requirements.
- **Project Manager, Site Investigation, Former agricultural facilities, Long Island, NY** Coordinated and performed soil and groundwater investigations at various agricultural and horticultural properties to evaluate impacts of past herbicide and pesticide usage on the underlying soil and groundwater.
- **Project Manager, Municipal Landfill Gas Monitoring, Town of East Hampton, NY** Managed and performed routine methane monitoring at two Town of East Hampton landfills for compliance with NYSDEC requirements and to evaluate potential offsite migration to the surrounding community. Monitored indoor air with a flame ionization detector (FID) to evaluate impacts to buildings.
- **Hydrogeologist, Groundwater Modeling, Town of East Hampton, NY** Assisted with groundwater flow modeling for the Springs-Fireplace Road Landfill to evaluate the nature and extent of the landfill plume, its likely downgradient extent, and its fate.
- **Project Manager, Petroleum Release Sites, Various NYC, Long Island and Westchester County** Coordinated and performed onsite and offsite monitoring at petroleum release sites on Long Island, the New York metropolitan area, and in Westchester County in accordance with NYSDEC Spill program requirements. The monitoring programs generally included sampling multi-depth monitoring well networks utilizing low-flow sampling techniques, analysis/interpretation of analytical and hydrogeologic data, and regulatory reporting.
- **Project Manager, Site Investigation, Logan International Airport, Boston, MA.** Coordinated a soil and groundwater sampling program to evaluate environmental conditions at Terminal A, Logan International Airport, East Boston, Massachusetts. The program included an assessment of the current fuel hydrant system and other locations of potential environmental concern using non-destructive air vacuum extraction-clearing techniques combined with direct-push sampling.
- **Project Manager, Site Investigation, Pyrotechnics Facility, Suffolk County, NY.** Managed and performed a soil and groundwater investigation, a remedial soil excavation, and groundwater monitoring at a pyrotechnics manufacturing facility in Suffolk County, NY. The work was performed under the direction of the Suffolk County Department of Health Services (SCDHS) to investigate and remediate contamination from historic use of perchlorate-containing materials at the facility.
- **Project Manager, Site Investigation, Automobile Franchise, Westchester County, NY.** Coordinated and performed soil, groundwater and soil vapor investigations at several automobile dealerships in Westchester County, NY to evaluate potential impacts from petroleum and chemical solvent storage and usage and onsite waste water disposal systems.

Phase I Environmental Site Assessments

- **Project Manager, Various Northeastern and Mid-Atlantic States.** Performed numerous Phase I Environmental Site Assessments (ESAs) for commercial and industrial properties throughout the Northeastern and Mid-Atlantic States for various clients including trucking companies, major airlines, telecommunication companies, chemical/ petroleum storage facilities, aerospace manufacturing facilities, machine shops, retail shopping centers, auto dealerships and service stations.

Remediation

- **Project Manager, Remediation, Former Landfill, Suffolk County, NY.** Managed remedial activities at a NY State Environmental Restoration Program (ERP) Site situated at a former hospital landfill in Northport, NY. Responsibilities contractor management and oversight, soil disposal management, confirmatory testing, data review, and preparation of remedial work plan and final engineering report for remedial activities.

- **Project Manager, Remediation - AS/SVE, Various Sites, NYC and Long Island.** Performed pilot testing, design, installation and procurement of numerous multi-depth soil vapor extraction (SVE) and air sparge (AS) remediation systems on Long Island and in the NYC metropolitan area to remediate chlorinated solvents and petroleum. Conducted remediation system operation and maintenance, and evaluations of system performance.
- **Project Manager, Remediation – UIC Structures, Nassau and Suffolk County, NY.** Performed numerous storm water and sanitary leaching structure (UIC) cleanouts utilizing excavation and/or vacuum assisted equipment to remove contaminated sediments and liquids. Conducted waste characterization and profiling, pipe camera surveys, and structure locating utilizing water-soluble dyes and electronic locating equipment.
- **Project Manager, Remediation Sub-Slab Depressurization Systems, Bronx, NY** Designed and oversaw the installation of a sub-slab depressurization system (SSDS) at several commercial properties in the NYC to mitigate chlorinated solvent impacts. SSDS monitoring was conducted to ensure proper operation and emissions compliance of with NYSDEC air discharge guidelines.
- **Project Manager, Remediation System O & M, NYC and Long Island.** Operated and maintained remediation systems, including SVE, groundwater pump and treat, AS, dual-phase extraction, SSDS and free-phase petroleum recovery systems.
- **Project Manager, Remediation. White Plains, NY.** Managed and coordinated a petroleum spill investigation to evaluate the nature and extent of a fuel oil release at an office building in White Plains, NY. The investigation included excavation and removal of a 5,000-gallon UST situated over 20 feet below grade, tightness testing of the UST and associated piping, a soil and groundwater investigation, free product recovery utilizing vacuum-enhanced fluid recovery techniques, and coordination and reporting to the NYSDEC and Westchester County Department of Health.

Health and Safety

- **HASP and CAMP Plan Preparation, Various Sites.** Prepared community air monitoring and health and safety plans for several NYSDEC inactive hazardous waste, brownfield cleanup program, volunteer cleanup program, petroleum spill, and NYC e-designation program sites
- **HASP Monitoring, Various Sites.** Performed health and safety monitoring at investigation and remediation sites during intrusive activities. Calibrated and operated photoionization detectors (PID) and flame-ionization detectors (FID) for organic vapors and combustible gas indicators (CGI) for methane. Compared results to applicable action levels and took preventative/protective measures as necessary.
- **CAMP Monitoring, Various Sites.** Performed community monitoring, including monitoring for noise, particulates (dust), and organic vapors. Recorded observations and compared to applicable action levels. Calibrated and operated noise meters, particulate monitors, and PID/FID.
- **Radiation Screening, Various Sites.** Performed screening for radiation at select sites. Operated Geiger counter in different radiation modes and obtained and evaluated background readings.

Expert Witness/Technical Services

- **Expert Witness Services, Glen Cove Waterfront Redevelopment.** Provided expert witness services regarding environmental conditions and remedial procedures for redevelopment of a former industrial and commercial area in Glen Cove, NY.
- **Technical Services, multiple sites, Town of Brookhaven.** Provided technical services regarding environmental conditions at various commercial and residential sites within the municipality. Services included sampling of various media, a methane survey and technical oversight of investigation activities.

MGP Site Experience

- **Field Team Leader, Property Transfer of MGP sites**. Conducted soil and groundwater sampling at several Nicor MGP sites in Illinois prior to property transfer to Con Edison. Coordinated sampling crews, oversaw sampling and sample management, and implemented HASP monitoring.
- **Project Manager, Geophysical Investigation at Brooklyn Union Greenpoint MGP site.** Developed and implemented a geophysical

investigation at an MGP site that was subject to differential settlement. Coordinated with client and subcontractors, oversaw survey activities, implemented HASP, interpreted results, and prepared a report to document the completed work.

Other

- **Project Manager, RCRA Closure, Nassau County, NY** Coordinated RCRA closure activities and performed confirmatory sampling at a former package manufacturing and printing facility in Nassau County, NY. Project duties included preparation of a closure work plan, contractor procurement, a subsurface site investigation, rinseate sampling, and regulatory agency reporting and coordination, and preparation of a closure report.
- **Project Manager, Former Landfill, Suffolk County, NY.** Prepared a remedial design (RD) work plan for a former hospital landfill on Long Island. The RD work plan included a summary of past investigations, a materials management plan for the excavation and disposal of contaminated soils and debris, a post-excavation sampling plan, a site restoration plan, community air monitoring plan (CAMP), health and safety plan (HASP) and a quality assurance and quality control (QA/QC) plan.
- **Project Manager, Air Monitoring, Nassau County, NY.** Managed and performed monthly soil gas sampling and quarterly indoor air quality sampling at an elementary school in southwestern Nassau County, NY. The monitoring and associated NYSDEC reporting were performed to ensure that a gasoline groundwater plume migrating through the school property was not impacting the school occupants.
- **Project Manager, Environmental Compliance, Multiple Sites.** Performed compliance inspections to assess issues of potential environmental concern at manufacturing, aviation, trucking, retail and not-for-profit facilities.

Christopher J. Linkletter

FPM group — Engineering and Environmental Science



Mr. Linkletter has a diversified experience in geology and hydrogeology. His professional experience includes groundwater and soil investigations, routine landfill gas monitoring, Phase I Environmental Site Assessments, soil remediation projects, soil vapor intrusion evaluation, maintenance of groundwater, soil and soil vapor remediation systems, and evaluation of site compliance with environmental regulations.

Functional Role	Title	Years of Experience
Hydrogeologist	Hydrogeologist	1

Personal Data

Education

B.S./2015/Geology/SUNY Oneonta, NY

Registration and Certifications

OSHA 40-hour HAZWOPER Health & Safety Training (2015)
Geological Society of America

Employment History

2015-Present FPM Group

Detailed Experience

Site Investigation and Monitoring

- Performs soil, soil vapor, indoor air and groundwater monitoring and sampling at commercial, industrial, and municipal sites throughout Long Island. Monitoring and sampling activities are conducted in accordance with NYSDEC-approved work plans, Phase II work plans, and regulatory agency requirements.
- Assists in Phase I and II Environmental Site Assessments (ESAs) for various residential, commercial, industrial and vacant sites in New York State in accordance with the ASTM Standard. Phase I ESA tasks included site inspections, interviews, evaluation of state and federal databases, record reviews at local and state government agencies, and reports.
- Skilled in use and calibration of field equipment including photoionization detectors (PID), Landtec Infrared Gas Analyzer, combustible gas indicator (CGI), water-level meters, interface probes, groundwater quality instrumentation, and survey equipment.
- Performs data tabulation and evaluation relative to established regulatory agency criteria including USEPA, NYSDEC, NCDOH, and SCDHS.

Remediation

- Assists in remedial activities at a vacant industrial facility complex in Brooklyn, NY. Responsibilities included collection of waste, monitoring product thickness and recovery, and documentation.
- Operates and maintains remediation systems, including soil vapor extraction, air sparge systems, groundwater pump and treat, and sub-slab depressurization systems.

Landfills

- Conducts ongoing landfill gas monitoring projects at three Town of Islip landfills. Monitoring program includes monthly collection of landfill gas data from onsite and offsite methane wells, methane collection systems (extraction wells), and flare systems, volatile organic compound (VOC) monitoring, greenhouse gas monitoring, and report preparation.
- Manages ongoing field and reporting activities for the U.S. Environmental Protection Agency (EPA) Greenhouse Gas (GHG) Reporting Program at the Blydenburgh Landfill in the Town of Islip. Program includes weekly GHG data collection, usage and maintenance of a dedicated data logging system, data management, and report preparation in accordance with EPA specifications.
- Conducts ongoing groundwater and methane monitoring programs for two Town of East Hampton landfills. Responsibilities include collection of routine and baseline groundwater samples, methane monitoring and operating, tabulation of analytical data, and report preparation

Miscellaneous Projects

- **Undergraduate Senior Thesis, Adirondack Highlands of New York**- Performed geochemistry analysis of anorthositic samples using XRF and ICP-MS analytical methods to evaluate petrographic analysis of anorthosite emplacement in the Adirondack mountain range.

ATTACHMENT 2

RESUME OF DUSR PREPARER

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Richard J. Baldwin, C.P.G., P.G.
Apex Companies, LLC, Project Director

Mr. Baldwin is a hydrogeologist with more than twenty five years of experience in the fields of environmental consulting, hydrogeology and geology with particular experience in conducting and supervising environmental investigations and remedial actions at industrial, private, Federal and publicly-owned facilities and sites. Additionally, Mr. Baldwin has experience in evaluating potential environmental impacts of projects including golf courses, housing developments, senior housing, schools and retail shopping centers. For the last several years, Mr. Baldwin's work has focused primarily on sites and facilities located in the Long Island, New York City and Upstate New York areas. He has extensive knowledge and experience pertaining to Long Island's federally-designated sole-source drinking water aquifer system. Mr. Baldwin has extensive experience in evaluating complex laboratory data packages to ensure that they are precise, accurate, repeatable and comparable.

Education

- *Graduate Course Work, San Jose State University, 1985-1988*
- *BA Geology, San Francisco State University, 1982*

Professional Registrations

- *Professional Geologist, PG-000552-G, Commonwealth of Pennsylvania*
- *Certified Professional Geologist, CPG #9158, Amer.Inst. of Prof. Geologists*
- *OSHA Certification, 40-hour Health and Safety Training at Hazardous Waste Sites*
- *OSHA Certification, 8-hou Refresher Health and Safety Training at Hazardous Waste Sites*
- *OSHA Certification, 8-hour Management Training*
- *OSHA Certification, 8-hour Radiation Safety Training*

Continuing Education

- *Princeton Groundwater Hydrogeology and Pollution course*
- *Environmental Law and Regulations Course, U.C. Berkeley Extension*
- *NGWA MODFLOW and MODPATH Modeling Course*
- *NGWA Visual MODFLOW Modeling Course*

Typical Project Experience

Mr. Baldwin has extensive experience in the selection, design, installation and maintenance of a wide range of soil and groundwater remediation systems. Remedial systems have included both active and passive free-product recovery, traditional groundwater pump and treat, soil-vapor extraction, air sparging, bioventing, bioremediation, excavation impacted-soil management and natural attenuation.

Mr. Baldwin has been the principal-in-charge and directly responsible for hundreds of projects related to the wireless telecommunications field. He has overseen the conduct of hundreds of Phase I Environmental Site Assessments (ESAs) and limited Phase II ESAs. He has developed and implemented Soil and Groundwater Management Work Plan to address environmental impairment issues. He has been instrumental in developing appropriate mitigation measures with various project team members including site acquisition, legal counsel and headquarters level staff.

Mr. Baldwin has evaluated the potential environmental impacts of proposed projects including golf courses, housing developments, senior housing, schools, automobile repair facilities and retail shopping centers. The potential impacts included those to groundwater quality from herbicide/pesticide application, disposal of sanitary waste and school laboratory waste and the impacts to soil quality from handling and disposal of hazardous materials, leaking underground storage tanks, historic disposal of hazardous waste and pesticide/herbicide application. These impacts were evaluated through a variety of means including the collection and analysis of soil and groundwater samples, geo- and organic-chemistry modeling, groundwater fate and transport modeling and basic research of materials, their uses and their potential migration pathways. Mr. Baldwin has provided expert witness services for various venues ranging from NYSDEC spill and hazardous waste sites to potential noise impacts.

Mr. Baldwin has been involved in hundreds of subsurface soil and groundwater investigations ranging from Phase I & II Environmental Site Assessments (ESAs) to Remedial Investigations. Investigation and delineation techniques have included soil borings, groundwater monitoring well networks, hydropunch/GeoProbe sampling, surface and bore-hole geophysical methods, soil-gas surveys, aquifer testing, surface water and sediment sampling, waste characterization (soils piles, drums, USTs, ASTs, landfills, etc), test pits, and computer fate and transport modeling. Materials investigated have included petroleum products (heating/fuel oil and gasoline), PCB oils, coal tar, heavy metals, chlorinated solvents, explosives, pesticides, herbicides and buried medical waste.

Mr. Baldwin has been in the forefront of both evaluating and addressing shallow soils on Long Island which have been impacted by pesticides (particularly arsenic) and herbicides. This important issue is particularly of concern due to the re-development of agricultural lands for residential and educational end uses. Mr. Baldwin has work closely with the SCDHS and Town of Brookhaven to develop effective and easily implementable Soil Management Plans.

Mr. Baldwin works closely with the U.S. Environmental Protection Agency (EPA), New York State Department of Environmental Conservation (NYSDEC) Region 1, Region 2, Region 3 and Central Office, New York State Department of Health (NYSDOH), Suffolk County

APEX

Department of Health Services (SCDHS) and Nassau County Department of Health (NCDOH). Mr. Baldwin also works with local planning and review boards including the Town of East Hampton, Town of Southampton, Town of Babylon, Town of Brookhaven, Village of Patchogue, Village of Great Neck and New York City on issues ranging from groundwater quality to historic resources to noise impacts.

Mr. Baldwin's projects include supervising and performing Remedial Investigations/Feasibility Studies (RI/FSs), Interim Remedial Actions (IRMs), and implementation of selected remedies at NYSDEC Class 2 and 2a Inactive Hazardous Waste Disposal sites. Other work, conducted with the NYSDEC, includes evaluating and implementing large-scale groundwater and soil treatment systems to remediate MTBE.

Environmental Data Analyses

Mr. Baldwin has received multiple sessions of environmental geochemistry training provided by environmental geochemists, including physical chemistry, thermodynamics, ionic interactions, complexation, biologic effects, and other basic principles. Training also included field sampling procedures and effects on chemical data chemical analytical methods and equipment, and QA / QC procedures and interpretation.

Mr. Baldwin has reviewed and evaluated numerous soil, groundwater, product, indoor / ambient air and soil vapor chemical analytical datasets, including evaluation of batch and site-specific QA / QC samples, laboratory narratives, comparison to regulatory agency criteria, historic data, and background data.

Mr. Baldwin has been responsible for the development and implementation of numerous Quality Assurance Project Plans (QAPP), including QAPP design, sample delivery group (SDG) evaluations, sampling procedures and sequences, and QA / QC sample preparation/collection.

Mr. Baldwin has attended periodic environmental chemistry training sessions hosted by environmental laboratories and participated in hands-on training in data and QA / QC evaluation.

Mr. Baldwin has prepared Data Usability Summary Reports (DUSRs) for numerous chemical analytical datasets for projects overseen by the USEPA, NYSDEC and other regulatory agencies. Datasets evaluated have included soil, groundwater, soil vapor, indoor air and ambient air.

Mr. Baldwin has performed forensic assessments of historic environmental chemical analytical data to resolve apparent discrepancies with modern data and other dataset inconsistencies.
Mr. Baldwin has interpreted numerous organic parameter datasets to evaluate breakdown sequences, likely original parameters and rates of degradation.

Mr. Baldwin has formulated numerous chemical treatment plans for insitu remediation of environment contaminants, including assessment of contaminant concentrations and distribution, chemical processes and indicators, natural attenuation indicators, additional stociometric demands and hydrogeologic factors.

Selected Project Experience

Project Director for Major NY Metro Airport Project

Mr. Baldwin is part of a large project team which has been tasked by a coalition of major airlines to evaluate the efficacy of re-instituting the delivery of jet fuel via a water-borne barge delivery system. As part of the project, Mr. Baldwin evaluated the requirements for permits from various agencies including the NYSDEC, USACE, NYSDOS and New York City. Mr. Baldwin has also been providing ongoing evaluations of potential project design scenarios which required the evaluation of existing data sets (e.g., bathymetric surveys, former permits, etc.), conducting cost-benefit analyses assuming various dredge spoil disposal options, etc. This is a major, on-going project with long-term ramifications at all of the major New York Metropolitan airport facilities.

Project Director for Ferry Terminal Project, Glen Cove, NY

The City of Glen Cove Industrial Development Agency (IDA) has acquired Federal Stimulus Funding to develop a ferry terminal along their waterfront area in order to provide passenger ferry service from the North Shore of Long Island to the New York Metropolitan Area, and potentially to selected Connecticut locations. The selected site is part of the former Li Tungsten and Captains Cove Federal and New York State Department of Environmental Conservation (NYSDEC) Superfund Sites. Both sites were subject to remedial actions and were "closed" by both the United States Environmental Protection Agency (USEPA) and NYSDEC circa 2000. A wide range of contaminant types were potentially associated with both sites including solvents, petroleum, oils, heavy metals and radiation. The

NYSDEC and IDA required the preparation of a Soil Management Plan (SMP) as potentially-impacted soils and bottom sediments were potentially going to be encountered as part of the project. Mr. Baldwin successfully prepared and executed a Dredging / Excavation (D / E) Work Plan which detailed the requirements to field screen all excavated soils and dredge spoils with a radiation detector, photo-ionization detector (PID) and by visual / olfactory inspection. Based upon the results of the field screening, excavated soils and dredge spoils were to be addressed by one of the following: 1) cleared for use as on-site backfill materials; 2) disposed of as non-hazardous, regulated materials; or, 3) as hazardous waste. Mr. Baldwin was also responsible for designing and implementing a sediment sampling and analyses program to: 1) evaluate ambient creek bottom conditions with respect to a wide-range of contaminant types; and, 2) confirm the chemical conditions of the "new sea floor" prior of dredging and excavation activities. Mr. Baldwin also successfully applied for a received a NYSDEC Case-specific Beneficial Use Determination (BUD) finding as part of a cost-effective materials disposal option, as well as successfully applying for a NYSEC Long Island Well permit required as part of continuing project support activities.

Project Director for Marina Property, Glen Cove, NY

Mr. Baldwin was responsible for conducting turn-key environmental and engineering services for this active marina facility. The services included: 1) conducting a high-resolution bathymetric survey of the marina's basin in order to evaluate effective depths / vessel mooring and access restrictions; 2) successful acquisition of a United States Army Corps of Engineers (USACE) / NYSDEC Joint Application permit to repair a failed bulk head; 3) preparation of a full engineered design package to rebuild a failing dock-side water supply system; 4) conduct of a land-ward and marine geotechnical evaluation to determine the suitability of sub-surface materials for future construction projects; 5) collection and analyses of multiple bottom sediment samples to evaluate same for dredging issues; and, 6) participation in the marina design team. As part of this, Apex participated in multiple site meetings to discuss dock geometry, future infrastructure repair requirements, future regulatory permitting requirements, travel lift slip issues, potential future dredging protocols, etc.

Project Director for Marina Property, Patchogue, NY

Mr. Baldwin was responsible for providing turn-key environmental and engineering services for this active marina facility. These services included: 1) conduct of a high-resolution bathymetric survey of the marina's basin in order to evaluate effective depths / vessel mooring and access restrictions; 2) Preparation and submission of a USACE / NYSDEC Joint Application permit for maintenance dredging /marina infrastructure improvement; 3) preparation of a full engineered design package to rebuild a failing travel lift rail system; 4) contractor oversight; and, 5) Participation in the marina design team. As part of this, Apex has participated in multiple site meetings to discuss dock geometry, future infrastructure repair requirements, future regulatory permitting requirements, travel lift slip issues, potential future dredging protocols, etc.

Project Director for 10-Year Dredging and Beach Nourishment Program, Yarmouth, MA

Mr. Baldwin has been responsible for providing permit application preparation services for the Town of Yarmouth on Cape Cod. There are currently 37 Town-wide sites which are subject to multiple local, State and Federal permits for maintenance dredging and beach nourishment activities. The Town of Yarmouth's wetlands and waterways represent a highly-valuable, yet fragile ecosystem/resource. Current and historic dredging and beach nourishment practices on a site-by-site basis over the past decades have resulted in a confusing and difficult-to-manage situation with respect to this highly-complex system. Apex recommended that a 10-Year Town-wide Dredging and Beach Nourishment Program be approved and implemented wherein all 37 Yarmouth and Dennis dredge and beach nourishment sites are included/managed under one comprehensive management program. This will allow for effective use of Town resources, as well as ensuring that the dredge/nourishment sites are appropriately managed within appropriate regulatory guidelines. Again, the overall goal of this program is to allow the Town of Yarmouth to manage more effectively its waterways and beaches.

New York State Department of Environmental Conservation, Groundwater Evaluation and Treatment, Taconic Developmental Disabilities Services Office, Wassaic, NY

Worked on a public water supply site in New York conducting a full-scale groundwater investigation in the vicinity of the facility's supply wells which have been impacted by MTBE. Multiple well clusters were installed surrounding the high-capacity wells to evaluate subsurface conditions. One impacted well was converted to a remediation well to provide hydraulic capture of the MTBE plume prior to its impacting the remaining downgradient wells. A large-scale granulated-activated carbon (GAC) system was installed to treat the water extracted from the well. A 40,000-pound GAC unit was also installed in standby mode to address the facility's drinking water should the concentrations of MTBE ever warrant treatment. Several rounds of groundwater investigation were also conducted to confirm the MTBE source area as a nearby gasoline service station. Pilot testing was conducted and an on-site groundwater treatment system was being designed to provide source area remediation.

New York State Department of Environmental Conservation, Potable Water Treatment System, Village of Brewster, NY

Designed and constructed a supplemental water treatment system at a public water supply plant to address MTBE contamination in the system prior to its distribution. The treatment system consisted of a large air stripping tower, installed in line with an existing air stripper to remove the MTBE to non-detectable concentrations. Additionally, a source area investigation was being conducted to determine the potential source(s) of the MTBE contamination.

New York State Department of Environmental Conservation, Potable Water Treatment System, Sullivan Correctional Facility, Fallsburg, NY

Worked with the NYSDEC to evaluate, design and install a supplemental water treatment system to address MTBE present in a New York State Correctional Facility's drinking water. All four of the facility's wells were impacted. Several remedial options including utilizing GAC or air strippers were evaluated. The selected alternative was a 20,000-pound GAC system which was installed inline and in standby mode.

New York State Department of Environmental Conservation, Large Scale Investigation / Remediation Project, Lake Success, New York

Managed large-scale site activities at a major Long Island aerospace facility. Activities included operations of on-going IRMs (soil vapor extraction and groundwater extraction and treatment systems); citizen participation activities; design and implementation of on-site remedies (drywell removal and soil excavation, installation of fencing and an 1,800 gallon per minute groundwater extraction and treatment system); on- and off-site RIs; regulatory compliance activities; client interactions; multi-task, multi-contractor scheduling and management; and general project management. As part of the RI, prepared a large three-dimensional groundwater flow and particle model utilizing Visual MODFLOW and MODPATH. The model was then utilized to design an optimum groundwater treatment system.

Prepared a scoping plan and RI report for an Inactive Hazardous Waste Disposal site in New York under the NYSDEC Superfund program. The work involved evaluating the nature and extent of halogenated solvents in soil and groundwater both on and off of the site. Was responsible for overseeing all phases of the report preparation, including communications with the NYSDEC and for implementing the citizen participation program. Also involved in the preparation of the FS report and selection of the final remedy which included the use of an innovative groundwater treatment technology, in-well air stripping.

Project Director for Marina Property Assessment, Hampton Bays, NY

The owner of this active marina facility was served with a Notice of Violation (NOV) by the NYSDEC for various environmental issues, mostly related to on-site petroleum storage / delivery systems, as well as impacts potentially associated with marine-activity uses such as vessel bottom paint removal and application, use of preserved woods, vessel maintenance activities, housing-keeping issues, etc. Apex was responsible, with input from the NYSDEC, for developing and implementing a Site Investigation Program to investigate potential soil and groundwater impacts associated with the aforementioned on-site practices. Based upon the results of the investigation, Apex was able to conclude that the fuel distribution system was not leaking and that groundwater was not deleteriously impacted. Minor areas of impacted soil, likely from vessel bottom cleaning activities, were identified. Apex prepared and implemented a NYSDEC-approved Remedial Action Plan which included the following: 1) targeted removal of metals-impacted soils; 2) conversion of the existing gasoline / diesel underground storage tank (UST) / sub-grade distribution system to non-regulated biofuel use; 3) confirmation of facility use of aboveground storage tanks (ASTs) equipped with double-walled containment, 4) permitting a vessel-washing rinsate containment/treatment system; and, 5) use of asphaltic/concrete paving as engineering controls to minimize future potential user contact with remaining impacted soils.

Project Manager for Dredge Spoils Quality Investigation, New London, CT.

Mr. Baldwin was retained by a not-for-profit group concerned that the planned disposition of dredge spoils from the Thames River associated with the US Navy nuclear submarine base would negatively impact the lobster fishery of off Fishers Island in the Long Island Sound. Mr. Baldwin directed the field team which collected gravity cores from along the portion of the Thames River slated for dredging. Mr. Baldwin utilized the services of a nationally-recognized laboratory to analyze the bottom sediment samples for a wide-range of contaminants. Other than potentially elevated concentrations of dioxins, the bottom sediments proved to be relatively free of anthropogenic contaminants.

Project Director for Marina Property Assessment, Center Moriches, NY.
Mr. Baldwin was responsible for conducting an evaluation of environmental conditions at this active marina which was under consideration for re-development with residential housing. Issues evaluated included soil and groundwater conditions associated with on-site vessel repair, bottom paint application/removal, USTs and dredge spoils. Based upon the results of the investigation, impacted soils were excavated, transported to and disposed of at an appropriately-licensed facility. The dredge spoils were not impacted above regulatory criteria and required not special actions. Based upon the results of the investigation and remediation activities, the Suffolk County Department of Health Services approved the site for residential re-development.

Senior Project Manager for Former La Salle Military Academy, Oakdale, NY.
Mr. Baldwin was part of project team that conducted a feasibility study for the redevelopment of a portion of this former educational facility. A major component of the Feasibility Study was the evaluation of an on-site boat basin and associated building infrastructure (e.g., a team house) with respect to potential dredging requirements, permitting issues, bottom sediment conditions and marina design.

Former Hess Terminal, Patchogue River, Patchogue, NY.
Mr. Baldwin conducted a site investigation program at this former major fuel oil terminal site to evaluate the efficacy of same for residential re-development, which would have included a residence-use only marina. The site had been the subject of previous site remediation activities, and the NYSDEC had closed its spill file assuming that the site would only be utilized for commercial or industrial purposes. Soil, groundwater, soil vapor and outdoor ambient air samples were collected and analyzed as part of this evaluation. The results of the investigation indicated that additional soil remediation would have been required to make the property suitable for residential re-development. Additionally, the NYSDEC would have likely required the installation and operation of sub-slab depressurization systems for all on-site residential buildings prior to their approving the plans for the site.

Former Lumber Yard Facility, Arverne, NY.
Mr. Baldwin provided environmental consulting services associated with planned redevelopment of a six-acre parcel of land located on the Barbados Basin. The client proposed to construct and operate a boat marina with associated catering hall/shopping complex on this former lumber yard. An exhaustive site investigation including a geophysical survey, soil and groundwater testing and wetlands/permit evaluation was conducted in accordance with the New York City Environmental Quality Review (CEQR) regulations. Also conducted an exhaustive feasibility study regarding stormwater runoff /sanitary waste disposal options. The results of the investigation indicated that historic fill materials on the subject property contained actionable concentrations of lead. Prepared a site specific Soil Management Plan for submission to the New York City Department of Environmental Protection (NYCDEP). The NYCDEP agreed with the remedial option of capping the lead-impacted fill materials under two feet of clean fill to prevent future site users from coming into contact with same.

Dielectric Fluid Release, Village of Port Washington, NY.
During excavation activities being conducted for installing a team building at a Town-owned marina facility, Town of North Hempstead personnel encountered and broke a major, unmarked buried electric line. This rupture caused the immediate and catastrophic release of an estimated 30,000 gallons of dielectric fluid. Mr. Baldwin was retained by the Town of North Hempstead to oversee the cleanup of surface materials, as well as the evaluation of dielectric fluid floating on top of the water table. Adsorbent booms were placed and maintained along the associated wetlands and all identified areas of impacted soils were remediated. A series of monitoring wells were installed and evaluated to ensure the absence of dielectric fluid floating on the water table which would eventually discharge to the adjacent water way. Based upon the work conducted, the released dielectric fluid did not contain polychlorinated biphenyls (PCBs), and the NYSDEC was satisfied that the released had been adequately remediated.

Brownfield Re-development, Greenport, NY.
Mr. Baldwin managed one of the few active NYSDEC Brownfield sites on Long Island utilizing New York State Environmental Bond Act funding. The work included evaluating a large Village-owned undeveloped water-front property for the presence of undocumented USTs utilizing surface geophysical techniques, removing the USTs and associated impacted soils and preparing Site Investigation and Remedial Action reports. Responsible for all regulatory interactions, subcontractor management and Citizen Participation Plan implementation. The work was conducted concurrently with the redevelopment of the site for use as a public park including a water-front walk way, amphitheater and historic carousal.

Preliminary Site Assessment, Concord Naval Weapons Station, Concord, NY.
Mr. Baldwin was the Project Manager responsible for conducting an environmental investigation in the portion of the Concord Naval Weapons Station known as the Tidal Area. The investigation included collecting and analyzing soil, sediment and groundwater samples from adjacent to and within on-site wetlands. Mr. Baldwin also utilized an aerial

magnetic survey to identify anomalies on a nearby off-shore island which could potentially represent buried railcars full of munitions which were reportedly buried after a major WW II explosion which killed hundreds of people. Mr. Baldwin conducted the field investigation which evaluated the nine magnetic anomalies which turned out to be ship wrecks, a crane, gas well heads, miscellaneous debris, etc. No anomalies representative of buried rail cars were observed. Mr. Baldwin was responsible for conducting a geotechnical evaluation of the materials making up the island, known as Bay Muds, which due to their very poor shear strength, could not have been excavated sufficiently to allow for burial of the rail cars. Therefore, it was Mr. Baldwin's belief that the reported burial of the rail cars full of munitions was incorrect.

Site Investigation Activities, Saint George Ferry Terminal, Staten Island NY

Mr. Baldwin was responsible for implementing a groundwater evaluation of the major ferry terminal site to evaluate the most efficacious means of removing two, large out-of-service No. 6 fuel oil USTs. The work including setting up and conducting a tidal influence study, major aquifer pumping test and conducting three-dimensional groundwater modeling. Evaluated and recommended the use of sheet piling surrounding the two USTs to isolate same from the surrounding aquifer materials and protect the adjacent buildings. The recommended remedial approach was implemented and the USTs were successfully removed with minimal de-watering required and the adjacent buildings were successfully protected.

Bottom Sediment Evaluation, Lake Success, NY

As part of a major environmental investigation of a nearby New York State Superfund site, Mr. Baldwin was responsible for the collection and analysis of bottom sediment samples from Lake Success and two on-site stormwater recharge basins. The results of the investigation indicated that the bottom sediment conditions in the on-site recharge basins and Lake Success were very similar leading to the conclusion that the observed impacts to the basins were likely non-site related and typical of stormwater runoff. Further, a bathymetric survey and at-depth water quality investigation was conducted for Lake Success.

Stormwater Retention Basin Bottom Sediment Evaluation, Lake Success, NY

As part of a major environmental investigation of a New York State Superfund site, Mr. Baldwin was responsible for evaluating the thickness of potentially impacted bottom sediments in two on-site stormwater recharge basins. The basins had reportedly been subject to discharge on impacted non-contact cooling waters and other site process waters. As a cost-saving measure, and in order to collected as much data as quickly as possible, Apex utilized an innovative investigation approach of transecting the surfaces of both frozen basins with a ground-penetrating radar (GPR) units. The GPR data was then cross-correlated with direct field measurements collected utilizing more standard techniques (e.g., gravity coring, penetration tests, etc.) to confirm the accuracy of the geophysical technique. The final data set was utilized to evaluate potential remedial techniques and costs.

Terrestrial/Martian Analogue Evaluation, Dry Valley Lakes, Antarctica

While at the United States Geological Survey (USGS), Mr. Baldwin participated on a project team which evaluated the physical and biota conditions of ice-covered lakes in the Dry Valley Region of Antarctica. Such conditions (e.g., ice-covered lakes in an otherwise frozen, low-precipitation region) were believed to be a strong terrestrial analogue for potential lakes which may have formed in the distant past in the Valles Marineris Canyon System on Mars. The biota of the Dry Valley ice-covered lakes was dominated by primitive stromatolites mounds, with much of the sedimentary section dominated by sand and gravel which had migrated through the ice cover. The overall purpose of the work was to assist NASA in evaluating future Mars landing sites with the highest potential for providing fossilized evidence for life on Mars.

Riverine Sediment Evaluation, Thames River, New London, CT

Mr. Baldwin was retained by a not-for-profit group concerned that the planned disposition of dredge spoils from the Thames River associated with the US Navy nuclear submarine base would negatively impact the lobster fishery of off Fishers Island in the Long Island Sound. Mr. Baldwin directed the field team which collected gravity cores from along the portion of the Thames River slated for dredging. Mr. Baldwin utilized the services of a nationally-recognized laboratory to analyze the bottom sediment samples for a wide-range of contaminants. Other than potentially elevated concentrations of dioxins.

Additional information upon request

APPENDIX E
HEALTH AND SAFETY PLAN AND COMMUNITY AIR MONITORING PLAN

This worker Health and Safety Plan (HASP) has been prepared by FPM Engineering Group PC (FPM) for New York State Department of Environmental Conservation (NYSDEC) Brownfield Program Site #C224160, identified as the 248 Cinderella, LLC Site located at 248 Flatbush Avenue, Brooklyn, New York (Site). This HASP is part of the Site Management Plan (SMP) and includes measures for the protection of worker health and safety during site management activities.

Although intrusive activities are not anticipated during site management, a Community Air Monitoring Plan (CAMP) is included in this Appendix in the event that intrusive activities are conducted. The CAMP includes measures to address potential issues that may affect the Site community during intrusive activities at the Site.

E.1 Worker Health and Safety Plan

E.1.1 Introduction

This HASP has been written for compliance with "OSHA Hazardous Waste Operations Standards (29 CFR 1910.120)", the guidance documents, "Standard Operating Safety Guidelines (Office of Solid Waste and Emergency Response, 1992)" and the "Occupational Safety and Health Guidance Manual for Hazardous Waste Activities" (U.S. Department of Health and Human Services, 1985).

E.1.2 Scope and Applicability of the HASP

This HASP is designed to be applicable to locations where remedial system operation and sampling are performed during site management by all parties that either perform or witness the activities. This HASP may also be modified or amended to meet specific needs of the work.

This HASP will detail the Site safety procedures, Site background, and safety monitoring. Although no contractors are anticipated to implement site management activities, any contractors will be required to adopt this HASP in full or to follow an FPM-approved HASP. The Health and Safety Officer (HSO) will be present at the Site to inspect the implementation of the HASP; however, it is the sole responsibility of the contractor(s) to comply with the HASP.

The HASP has been formulated as a guide to complement professional judgment and experience. The appropriateness of the information presented should always be evaluated with respect to unforeseen Site conditions that may arise.

E.1.3 Site Work Zone and Visitors

The Site work zone (a.k.a. exclusion zone) during the sampling activities anticipated during site management will be a 30-foot radius about the work location. This work zone may be extended if, in the judgment of the HSO, Site conditions warrant a larger work zone.

No visitors will be permitted within the work zone without the consent of the HSO. All visitors will be required to be familiar with, and comply with, the HASP. The HSO will deny access to those whose presence within the work zone is unnecessary or those who are deemed by the HSO to be in non-compliance with the HASP.

All Site workers conducting site management activities with the potential for contacting hazardous materials, including contractors, will be required to have 40-hour hazardous material training (eight-hour refresher courses annually), respirator fit test certification, and current medical surveillance as stated in 29 CFR 1910.120.

The HSO will also give an on-Site health and safety discussion to all Site personnel, including the contractors, prior to initiating work involving hazardous materials. Workers not in attendance during the health and safety talk will be required to have the discussion with the HSO prior to entering the work zone.

Emergency telephone numbers and directions to the nearest hospital are shown in Table E.1.3.1 and will be kept at the Site in the possession of the HSO and will be available to all Site workers and visitors.

E.1.4 Key Personnel/Alternates

The Quality Assurance Officer (QAO) for this project is Stephanie Davis, CPG and the project engineer is Kevin Loyst, PE. The project manager will be Ben Cancemi, who will also act as the HSO. An assistant project manager and assistant health and safety officer may be designated for the field activities.

E.1.5 Site Background

Based on the Site history and previous analyses of samples, the known chemicals present at the Site include the volatile organic compound tetrachloroethylene (PCE). This chemical is currently present in soil vapor at the Site. PCE has not been found in excess of regulatory criteria in soil that remains present onsite. Groundwater is present only at depth and no contact with groundwater is anticipated. SSDS monitoring and SVI sampling activities will include the potential for contact with soil vapor.

E.1.6 Task/Operation Health and Safety Analysis

This section presents health and safety analyses for the anticipated site management tasks. In general, FPM will employ one to two persons at the Site. No intrusive operations are anticipated or will be conducted by contractors without the presence of an FPM representative onsite. In the event that the HSO is not present on the Site, the Assistant HSO will implement the HASP. Levels of personal protection mentioned in this section are defined in Section E.1.9.

SSDS Operation and Sampling Safety Analysis

SSDS operation and monitoring will be performed by FPM personnel and will include measurement of vacuums, pressures, flowrates and other system information. Sampling will include obtaining emission samples (soil vapor removed from beneath the basement floor) and SVI samples (sub-slab soil vapor, indoor air, and outdoor air).

TABLE E.1.3.1
EMERGENCY TELEPHONE NUMBERS AND
DIRECTIONS TO BROOKLYN HOSPITAL CENTER

Police 911
Ambulance 911
Poison Control Center 212-689-9014
The Brooklyn Hospital Center (Emergency Room) 718-250-8075

FPM Contact Personnel (631-737-6200)

Dr. Kevin J. Phillips, P.E. ..... Cell # 631-374-6066
Kevin Loyst, PE ..... Cell #631-626-5479
Stephanie Davis, QAO ..... Cell # 516-381-3400
Ben Cancemi, Project Manager ..... Cell # 516-383-7106

Directions to the Brooklyn Hospital Center

121 DeKalb Avenue
Brooklyn, NY 11201
Tel: 718-869-7000

Exit the Site and turn left on to Flatbush Avenue. Travel north on Flatbush Avenue for approximately 10 blocks to Myrtle Avenue. Make a right onto Myrtle Avenue and continue four blocks to Ashland Place. Turn right onto Ashland Place and continue to DeKalb Avenue. Hospital is on northwest corner of DeKalb Avenue and Ashland Place; follow the signs to the Emergency Room.



Organic vapors have not presented a concern during previous sampling activities at this Site. Nevertheless, organic vapor concentrations will be monitored in the work zone during sampling activities involving soil vapor (and intrusive activities, if conducted) by utilizing a Photovac MicroTIP PID or equivalent. The PID will be "zeroed" by exposing the PID to ambient (outdoor) air prior to sampling activities and the upper range of calibration will be established by calibrating at 98 to 100 parts per million (ppm) of isobutylene. Background organic vapor concentrations will then be established in the work zone prior to sampling activities and recorded in the HSO field book. Upon commencement of sampling activities, PID readings will be obtained in the workers' breathing zone. At the discretion of the HSO, PID readings may be obtained more frequently. All readings and observations will be recorded in the HSO field book. PID air monitoring will be conducted by FPM personnel. Steady-state PID readings greater than five ppm in the worker's breathing zone will require upgrading to Level C personal protective equipment. Steady-state readings, for this purpose, will be defined as readings exceeding five ppm above background for a minimum of ten seconds at points approximately one foot above and then around the sampling port. These points will define the worker's breathing zone. Level C personal protection will be implemented including full-face air-purifying respirators with dust and organic vapor cartridges (personal protective equipment will be described in greater detail in Section C.1.9). All FPM personnel and contractors must be properly trained and fit tested prior to donning respirators.

If PID readings exceed steady-state levels greater than 50 ppm above background or any conditions exist for which the HSO determines require Level B personal protective equipment, all work at the Site will cease immediately and all personnel will evacuate the work zone. Evacuation will occur in the upwind direction if discernible. Specific evacuation routes will be discussed prior to commencement of work at each location based on work location and wind direction and an evacuation meeting place will be determined. Level B conditions are not anticipated to be encountered; however, if level B conditions arise, no Site work will be performed by FPM or contractors, a complete evaluation of the operation will be performed, and this HASP will be modified.

Intrusive activities are not anticipated during site management. However, in the event that intrusive activities are conducted, to minimize the potential for dust inhalation the HSO will assess wind and soil moisture conditions and, if it is deemed necessary by the HSO, the affected area will be wetted with potable water. If soil wetting is determined to be ineffective, the HSO may decide to upgrade personal protection to Level C respiratory protection to include respirators with dust cartridges. If extremely dusty conditions exist that cannot be successfully controlled by dust suppression with potable water, then the HSO may choose to postpone intrusive activities until such time as conditions improve.

All personnel will be required to wear chemical-resistant nitrile gloves when the potential for dermal contact with sub-slab materials is possible. This might include handling materials retrieved from the sub-slab monitoring ports. In general, dermal contact subsurface materials and equipment that has been in contact with subsurface materials will be avoided.

Other Safety Considerations

Noise

During operations that may generate potentially harmful levels of noise, the HSO will monitor noise levels with a Realistic^{tm} hand-held sound level meter. Noise levels will be monitored in decibels (dBs) in the A-weighted, slow-response mode. Noise level readings which exceed the 29 CFR 1910.95 permissible noise exposure limits will require hearing protection (see Table E.1.6.1 for Permissible Noise Exposures).

TABLE E.1.6.1
PERMISSIBLE NOISE EXPOSURES*

Duration Per Day Hours	Sound Level dBA Slow Response
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
½	110

Notes:

When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions: $C_1/T_1+C_2/T_2+.....C_n/T_n$ exceeds unity, then, the mixed exposure should be considered to exceed the limit value. C_n indicates the total time of exposure at a specified noise level, and T_n indicates the total time of exposure permitted at that level.

Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.

*Standards derived from 29 CFR 1910.95

Hearing protection will be available to all Site workers during activities that might generate excessive noise and will be required for exceedances of noise exposure limits. The hearing protection will consist of foam, expansion-fit earplugs (or other approved hearing protection) with a noise reduction rating of at least 29 dB. Hearing protection must alleviate worker exposure to noise to an eight-hour time-weighted average of 85 dB or below. In the event that the hearing protection is inadequate, work will cease until a higher level of hearing protection can be incorporated.

Slip/Trip/Fall Preventative Measures

To reduce the potential for slipping, tripping, or falling, the work zone will be kept clear of unnecessary equipment. In addition, all workers conducting site management activities will be required to wear work boots with adequate tread to reduce the potential for slipping (work boots must be leather or chemical-resistant and contain steel toes and steel shanks).

Insects

Potential insect problems include, but are not limited to stinging insects such as bees, wasps, and hornets, and ticks. Although the potential for insect problems is minimal due to the absence of suitable habitat, prior to commencement of work the work area will be surveyed for nests and hives to reduce the possibility of disturbing stinging insects. In addition, each Site worker will be asked to disclose any allergies related to insect stings or bites. The worker will be requested to keep his or her anti-allergy medicine on Site.

Tick species native to Long Island consist of the pinhead-sized deer tick and the much-larger dog tick. Ticks are unlikely to exist at the Site due to a paucity of suitable habitat.

Potential Electrical and Other Utility Hazards

Potential electric hazards consist mainly of overhead and underground power lines. Other utilities that may present hazards include telephone lines, gas lines, sewer lines, water lines, and other overhead or underground utilities. In the event that intrusive work is necessary, prior to commencement of intrusive work all locations will be inspected with respect to overhead lines. As any intrusive work is likely to take place primarily within the Site building, overhead lines are not anticipated to present a significant concern. Intrusive work involving heavy equipment will not be performed when the horizontal distance between the equipment and overhead wires is less than 30 feet. Underground potential utility hazards will be minimized by contacting the One-Call service to provide markouts of the utilities beneath adjoining public streets.

Heat/Cold Stress

Heat stress may become a concern especially if protective clothing is donned that will decrease natural ventilation. To assist in reducing heat stress, an adequate supply of water or other liquids will be staged on the Site and personnel will be encouraged to rehydrate at least every two hours even if not thirsty. In addition, a cool rest area will be designated during sunny or warm days and Site workers will break for at least 10 minutes every two hours in the rest area, and, in very hot weather, workers wearing protective clothing may be rotated.

Indications of heat stress range from mild (fatigue, irritability, anxiety, decreased concentration, dexterity or movement) to fatal. Medical help will be obtained for serious conditions.

Heat-related problems are:

Heat rash: caused by continuous exposure to heat and humid air and aggravated by chafing clothes. Decreases ability to tolerate heat.

Heat cramps: caused by profuse perspiration with inadequate fluid intake and chemical replacement (especially salts). Signs: muscle spasm and pain in the extremities and abdomen.

Heat exhaustion: caused by increased stress on various organs to meet increased demands to cool the body. Signs: shallow breathing; pale, cool, moist skin; profuse sweating; dizziness and lassitude.

Heat stroke: the most severe form of heat stress. Can be fatal. Medical help must be obtained immediately. Body must be cooled immediately to prevent severe injury and/or death. Signs: red, hot, dry skin; no perspiration; nausea; dizziness and confusion; strong, rapid pulse; coma.

Cold exposure is a concern if work is conducted during cold weather, marginally cold weather during precipitation periods, or moderate to high wind periods. To assist in reducing cold exposure the following measures will be taken when cold exposure concerns are present:

All personnel will be required to wear adequate and appropriate clothing. This will include head gear to prevent the high percentage loss of heat that occurs in this area (thermal liners for hard hats if hard hats are required).

A readily-available warm shelter will be identified near the work zone.

Work and rest periods will be scheduled to account for the current temperature and wind velocity conditions.

Work patterns and the physical condition of workers will be monitored and personnel will be rotated, as necessary.

Indications of cold exposure include shivering, dizziness, numbness, confusion, weakness, impaired judgment, impaired vision, and drowsiness. Medical help will be obtained for serious conditions if they occur.

Cold exposure-related problems are:

Frost bite: Ice crystal formation in body tissues. The restricted blood flow to the injured part results in local tissue destruction.

Hypothermia: Severe exposure to cold temperature resulting in the body losing heat at a rate faster than the body can generate heat. The stages of hypothermia are shivering, apathy, loss of consciousness, decreasing pulse and breathing rate, and death.

The Buddy System

All activities in contaminated or potentially contaminated areas will be conducted by pairing off the Site workers in groups of two (or three if necessary). Each person (buddy) will be able to provide his or her partner with assistance, observe his or her partner for signs of chemical, cold, or heat exposure, periodically check the integrity of his or her partner's protective clothing, and notify the HSO or others if emergency help is needed. The buddy system will be instituted at the beginning of each work day in contaminated or potentially contaminated areas. If new workers arrive on Site, a buddy will be chosen prior to the new worker entering the work zone that includes contaminated or potentially contaminated areas.

Site Communications

Two sets of communication systems will be established at the Site: internal communication among personnel onsite, and external communication between onsite and offsite personnel. Internal communication will be used to alert team members to emergencies, pass along safety information such as heat stress check, protective clothing check, etc., communicate changes in the work to be accomplished, and maintain Site control. Due to ambient noise, verbal communications may be difficult at times. The HSO will carry a whistle (and compressed air horn if respirators are donned) to signal Site workers. A single whistle blast will be the signal to immediately evacuate the work zone through the access control point. This signal will be discussed with all Site workers prior to commencement of any intrusive work.

An external communication system between onsite and offsite personnel will be established to coordinate emergency response, report to the Project Manager, and maintain contact with essential offsite personnel. A field telephone will be available at all times in the HSO's vehicle. In addition, a backup telephone will be identified prior to the commencement of Site operations and this location will be relayed to all Site workers.

General Safe Work Practices

Standing orders applicable during site management operations are as follows:

No smoking, eating, drinking, or application of cosmetics in the work zone.

No matches or lighters in the work zone.

All Site workers will enter/exit work zone through the Site access point.

Any signs of contamination, uncontrolled safety hazards, or unusual conditions will require evacuating the Site immediately and reporting the information to the HSO.

Loose-fitting clothing and loose long hair will be prohibited in the work zone during heavy equipment operations.

A signal person will direct the backing of work vehicles.

Equipment operators will be instructed to check equipment for abnormalities such as oozing liquids, frayed cables, unusual odors, etc.

E.1.7 Personnel Training Requirements

All FPM personnel and contractor personnel will receive adequate training prior to entering the Site. FPM and any contractor personnel with the potential to contact hazardous materials will, at a minimum, have completed OSHA-approved, 40-hour hazardous materials Site safety training and OSHA-approved, eight-hour safety refresher course within one year prior to commencing field work. In addition, each worker must have a minimum of three days field experience under the direct supervision of a trained, experienced supervisor.

Prior to Site field work, the HSO will conduct an in-house review of the project with respect to health and safety with all FPM personnel who will be involved with field work at the Site. The review will include discussions of signs and symptoms of chemical exposure and heat/cold stress that indicate potential medical emergencies. In addition, review of PPE will be conducted to include the proper use of air-purifying respirators.

E.1.8 Medical Surveillance Program

All workers participating in intrusive activities at the Site must participate in a medical surveillance program in accordance with 29 CFR 1910.120. A medical examination and consultation must have been performed within the last twelve months to be eligible for field work.

The content of the examination and consultation will include a medical and work history with special emphasis on symptoms related to the handling of hazardous substances, health hazards, and fitness for duty including the ability to wear required personal protective equipment under conditions (i.e., temperature extremes) that may be expected at the work Site.

All medical examinations and procedures will be performed by, or under the supervision of, a licensed physician. The physician shall furnish a written opinion containing:

The results of the medical examination and tests;

The physician’s opinion as to whether the employee has any detected medical conditions which would place the worker at increased risk of material impairment of the employee's health from work in hazardous waste operations;

The physician's recommended limitations upon the worker assigned to the work; and

A statement that the worker has been informed by the physician of the results of the medical examination and any further examination or treatment.

An accurate record of the medical surveillance will be retained. The record will consist of at least the following information:

The name and social security number of the employee;

The physician's written opinions, recommended limitations, and results of examinations and tests; and

Any worker medical complaints related to exposure to hazardous substances.

E.1.9 Personal Protective Equipment

General Considerations

The two basic objectives of the personal protective equipment (PPE) are to protect the wearer from safety and health hazards, and to prevent the wearer from incorrect use and/or malfunction of the PPE.

Potential Site hazards have been discussed previously in Section E.1.6. The duration of Site activities is estimated to be periods of several days. All work is expected to be performed during daylight hours and workdays, in general, are expected to be eight to ten hours in duration. Any work performed beyond daylight hours will require the permission of the HSO. This decision will be based on the adequacy of artificial illumination and the type and necessity of the task being performed.

Personal protection levels for the Site activities, based on past investigations at the Site, are anticipated to be Level D with the possibility of upgrading to Level C. The equipment included for each level of protection is provided below.

Level C Protection

Level C personnel protective equipment includes:

- Air-purifying respirator, full-face
- Chemical-resistant clothing includes: Tyvek^{tm} (spunbonded olefin fibers) for particulate and limited splash protection or Saranex^{tm} (plastic film-laminated Tyvek) for permeation resistance to solvents.
- Coveralls*, or
- Long cotton underwear*
- Gloves (outer), chemical-resistant
- Gloves (inner), chemical-resistant
- Boots (outer), leather or chemical-resistant, steel toe and shank
- Boot covers (outer), chemical-resistant (disposable)*
- Hard hat (face shield)*

- Escape mask*
- 2-way radio communications (inherently safe)*

(*) optional

Meeting all of these criteria permits use of Level C protection:

- Oxygen concentrations are not less than 19.5% by volume.
- Measured air concentrations of identified substances will be reduced by the respirator below the substance's threshold limit value (TLV).
- Atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect any body area left unprotected by chemical-resistant clothing.
- Job functions do not require self-contained breathing apparatus.
- Direct readings are below 50 ppm on the PID.

Level D Protection

Personnel protective equipment:

- Coveralls
- Gloves*
- Boots/shoes, leather or chemical-resistant, steel toe and shank
- Safety glasses or chemical splash goggles*
- Hard hat (face shield*)
- Escape mask*

(*) optional

Meeting any of these criteria allows use of Level D protection:

- No contaminant levels above 5 ppm organic vapors or dusty conditions are present.
- Work functions preclude splashes, immersion, or the reasonable potential for unexpected inhalation of any chemicals above the TLV.

Additional Considerations for Selecting Levels of Protection

Another factor that will be considered in selecting the appropriate level of protection is heat and physical stress. The use of protective clothing and respirators increases physical stress, in particular, heat stress on the wearer. Chemical protective clothing greatly reduces natural ventilation and diminishes the body's ability to regulate its temperature. Even in moderate ambient temperatures, the diminished capacity of the body to dissipate heat can result in one or more heat-related problems.

All chemical protective garments can be a contributing factor to heat stress. Greater susceptibility to heat stress occurs when protective clothing requires the use of a tightly-fitted hood against the respirator face piece, or when gloves or boots are taped to the suit. As more body area is covered, less cooling takes place, increasing the probability of heat stress.

Wearing protective equipment also increases the risk of accidents. It is heavy, cumbersome, decreases dexterity, agility, interferes with vision, and is fatiguing to wear. These factors all increase physical stress and the potential for accidents. In particular, the necessity of selecting a level of protection will be balanced against the increased probability of heat stress and accidents.

Donning and Doffing Ensembles

Donning an Ensemble

A routine will be established and practiced periodically for donning a Level C ensemble. Assistance may be provided for donning and doffing since these operations are difficult to perform alone. Table E.1.9.1 lists sample procedures for donning a Level C ensemble. These procedures should be modified depending on the particular type of suit and/or when extra gloves and/or boots are used.

Doffing an Ensemble

Exact procedures for removing Level C ensembles must be established and followed to prevent contaminant migration from the work area and transfer of contaminants to the wearer's body, the doffing assistant, and others. Doffing procedures are provided in Table E.1.9.2. These procedures should be performed only after decontamination of the suited worker. They require a suitably attired assistant. Throughout the procedures, both worker and assistant should avoid any direct contact with the outside surface of the suit.

TABLE E.1.9.1
SAMPLE LEVEL C DONNING PROCEDURES

1. Inspect the clothing and respiratory equipment before donning (see Inspection in subsection E.1.7).

2. Adjust hard hat or headpiece if worn, to fit user's head.

3. Standing or sitting, step into the legs of the suit; ensure proper placement of the feet within the suit; then gather the suit around the waist.

4. Put on chemical-resistant safety boots over the feet of the suit. Tape the leg cuff over the tops of the boots.

5. Don the respirator and adjust it to be secure, but comfortable.

6. Perform negative and positive respirator facepiece seal test procedures.

   – To conduct a negative pressure test, close the inlet part with the palm of the hand or squeeze the breathing tube so it does not pass air, and gently inhale for about 10 seconds. Any inward rushing of air indicates a poor fit. Note that a leaking facepiece may be drawn tightly to the face to form a good seal, giving a false indication of adequate fit.

   – To conduct a positive pressure test, gently exhale while covering the exhalation valve to ensure that a positive pressure can be built up. Failure to build a positive pressure indicates a poor fit.

7. Depending on type of suit:

   – Put on inner gloves (surgical gloves).

   – Additional overgloves, worn over attached suit gloves, may be donned later.

8. Put on hard hat

9. Have assistant observe the wearer for a period of time to ensure that the wearer is comfortable, psychologically stable, and that the equipment is functioning properly.

TABLE E.1.9.2
DOFFING PROCEDURES

1. Remove any extraneous or disposable clothing, boot covers, outer gloves, and tape.

2. Remove respirator by loosening straps and pulling straps over the top of the head and move mask away from head. Do not pull mask over the top of the head.

3. Remove arms, one at a time, from suit, avoiding any contact between the outside surface of the suit and wearer's body and lay the suit out flat behind the wearer. Leave internal gloves on, if any.

4. Sitting, if possible, remove both legs from the suit.

5. After suit is removed, remove internal gloves by rolling them off the hand, inside out.

Respirator Fit Testing

The fit or integrity of the facepiece-to-face seal of a respirator affects its performance. Most facepieces fit only a certain percentage of the population; thus each facepiece must be tested on the potential wearer in order to ensure a tight seal. Facial features such as scars, hollow temples, very prominent cheekbones, deep skin creases, dentures or missing teeth, and the chewing of gum and tobacco may interfere with the respirator-to-face seal. A respirator shall not be worn when such conditions prevent a good seal. The worker's diligence in observing these factors shall be evaluated by periodic checks. Fit testing will comply with 29 CFR 1910.1025 regulations.

Inspection

The PPE inspection program will entail five different inspections:

Inspection and operational testing of equipment received from the factory or distributor;

Inspection of equipment as it is issued to workers;

Inspection after use;

Periodic inspection of stored equipment; and

Periodic inspection when a question arises concerning the appropriateness of the selected equipment, or when problems with similar equipment arise.

The inspection checklist is provided in Table E.1.9.3. Records will be kept of all inspection procedures. Individual identification numbers will be assigned to all reusable pieces of equipment and records should be maintained by that number. At a minimum, each inspection should record the ID number, date, inspector, and any unusual conditions or findings. Periodic review of these records may indicate an item or type of item with excessive maintenance costs or a particularly high level of down-time.

TABLE E.1.9.3
PPE INSPECTION CHECKLIST

CLOTHING

Before use:

Determine that the clothing material is correct for the specified task at hand.

Visually inspect for imperfect seams, non-uniform coatings, tears, and/or malfunctioning closures.

- Hold up to light and check for pinholes.

Flex product and observe for cracks or other signs of deterioration.

- If the product has been used previously, inspect inside and out for signs of chemical attack, including discoloration, swelling, and/or stiffness.

During the work task, periodically inspect for:

- Evidence of chemical attack such as discoloration, swelling, stiffening, and softening. Keep in mind, however, that chemical permeation can occur without any visible effects.

- Indication of physical damage, including closure failure, tears, punctures, and/or seam discontinuities.

GLOVES

Before use:

- Pressurize glove to check for pinholes. Either blow into glove, then roll gauntlet toward fingers, or inflate glove and hold under water. In either case, no air should escape.

AIR-PURIFYING RESPIRATORS

- Inspect air-purifying respirators before each use to be sure they have been adequately cleaned.

- Check material conditions for signs of pliability, deterioration, and/or distortion.

- Examine cartridges to ensure that they are the proper type for the intended use, the expiration date has not been passed, and they have not been opened or used previously.

- Check faceshields and lenses for cracks, crazing, and/or fogginess.

- Air-purifying respirators will be stored individually in resealable plastic bags.

Storage

Clothing and respirators will be stored properly to prevent damage or malfunction due to exposure to dust, moisture, sunlight, damaging chemicals, extreme temperatures, and impact. Storage procedures are as follows:

Clothing: Potentially-contaminated clothing will be stored in a well-ventilated area separate from street clothing, with good air flow around each item, if possible. Different types and materials of clothing and gloves will be stored separately to prevent issuing the wrong materials by mistake, and protective clothing will be folded or hung in accordance with manufacturer's recommendations.

Respirators: After each use air-purifying respirators will be dismantled, washed, and placed in sealed plastic bags.

PPE Maintenance

Specialized PPE maintenance will be performed only by the factory or an authorized repair person. Routine maintenance, such as cleaning, will be performed by the personnel to whom the equipment is assigned. Respirators will be cleaned at the end of each day with alcohol pads or, preferably, by washing with warm soapy water.

Decontamination Methods

In the event that intrusive activities are conducted, all personnel, clothing, equipment, and samples leaving the work zone area of the Site must be decontaminated as needed to remove any harmful chemicals that may have adhered to them. Decontamination methods either (1) physically remove contaminants (2) inactivate contaminants by chemical detoxification or disinfection/sterilization, or (3) remove contaminants by a combination of both physical and chemical means. In many cases, gross contamination can be removed by physical means involving dislodging/displacement, rinsing, wiping off, and evaporation. Contaminants that can be removed by physical means include dust, vapors, and volatile liquids. All reusable equipment will be decontaminated by rinsing in a bath of detergent and water (respirators, gloves to be reused). Monitoring equipment will be decontaminated by wiping with paper towels and water. All used PPE to be discarded will be disposed offsite as solid waste.

The effectiveness of the decontamination will be evaluated near the beginning of intrusive Site activities and will be modified if determined to be ineffective. Visual observation will be used for this purpose. The HSO will inspect decontaminated materials for discoloration, stains, corrosive effects, visible dirt, or other signs of possible residual contamination.

E.2 Community Air Monitoring Plan

This Community Air Monitoring Plan (CAMP) will be implemented at the Site by FPM during any intrusive site management activities. Due to the nature of the contaminant at the Site, there is a potential for organic vapor emissions as these activities occur. In addition, there is the potential for dust to be associated with intrusive activities. To address these concerns, organic vapor monitoring and dust monitoring will be performed during intrusive activities.

Any CAMP monitoring results that exceed the action levels described below will be reported (or notice provided by another arrangement acceptable to the NYSDEC) when identified if a NYSDEC representative is present at the Site or within two hours by phone call or email to the NYSDEC Project manager when no

NYSDEC representative is onsite. Exceedances of the CAMP action levels will also be summarized in the monthly progress reports, including the duration of the exceedance(s) and any response actions taken.

E.2.1 Organic Vapor Monitoring

Under the CAMP, organic vapor concentrations will be monitored at the boundaries of the work zone during intrusive activities. It will be the responsibility of the HSO to implement the plan and to ensure that proper action is taken in the event that any of the established action levels are exceeded.

To monitor organic vapors, a PID capable of calculating 15-minute running average concentrations will be used and maintained in good operating condition. Calibration of the PID will be performed according to manufacturer's instructions. Background levels of organic vapors will be measured at the work zone boundary prior to beginning work and upwind of the work area periodically using a PID. Monitoring may be performed more frequently at the discretion of the HSO. Organic vapors will be monitored continuously at the downwind perimeter of the work area during ground intrusive activities.

PID readings will be recorded in the field logbook for both background and work area perimeter. Logbook recordings will include the time, location, and PID readings observed. Downwind perimeter levels will be recorded in the log whenever the level reaches 5 ppm above the background along with the action(s) taken to mitigate the level. If the level of organic vapors exceeds 5 ppm above the background at the downwind perimeter of the work area, work activities will be halted and monitoring continued. The vapor emission response plan will then be implemented.

E.2.1.1 Vapor Emission Response Plan

The vapor emission response plan includes the following trigger levels and responses:

Greater than 5 ppm at perimeter:

> In the event the level of organic vapors exceeds 5 ppm above the background at the downwind perimeter of the work area, activities will be halted and monitoring continued. If the organic vapor level then decreases to below 5 ppm above background, work activities can resume but organic vapor readings will be obtained more frequently as directed by the HSO.

5 ppm to 25 ppm at perimeter and less than 5 ppm at the work zone boundary:

> If the level of organic vapors is greater than 5 ppm but less than 25 ppm over background at the downwind perimeter of the work area, activities will be halted, the source of the vapors will be identified and corrective actions will be taken. Monitoring will be continued and activities will resume if the organic vapor concentration at half the distance to the nearest residential or commercial structure, whichever is less, is below 5 ppm over background. More frequent intervals of monitoring will be performed as directed by the HSO.

Above 25 ppm at perimeter:

> If the level of organic vapors is above 25 ppm at the perimeter of the work area, activities will be shut down. Should such a shutdown be necessary, downwind air monitoring will continue as directed by the HSO to confirm that organic vapor concentrations decrease. Actions will be taken to abate the source of vapor emissions and activities will not resume until the source is controlled.

E.2.1.2 Major Vapor Emission Response Plan

The Major Vapor Emission Response Plan shall automatically be placed into effect if:

Efforts to abate the emission source are unsuccessful and levels above 5 ppm persist for more than 30 minutes in the 20-foot zone; or

The vapor levels are greater than 10 ppm above background in the 20-foot zone.

Upon activation of the Major Vapor Emission Response Plan, the following activities will be undertaken:

All emergency response contacts as listed in the HASP will be notified;

Air monitoring will be conducted at 30-minute intervals within the 20-foot zone. If two successive readings below action levels are measured, air monitoring will be halted or modified as directed by the HSO; or

If air monitoring readings remain above action levels, work will be halted and further measures taken to reduce organic vapors.

If a Major Vapor Emission Response Plan is implemented, the NYSDEC and NYSODH will be contacted within 24 hours.

E.2.2 Dust Monitoring

Dust (particulate) monitoring will be performed during intrusive activities with the potential to create dust. Monitoring will be performed using a Miniram personal monitor calibrated according to the manufacturer's instructions. The Miniram will be capable of calculating 15-minute running average concentrations and operated continuously at the downwind perimeter of the work zone during ground intrusive activities. To ensure the validity of the fugitive dust measurements, appropriate QA/QC measures will be employed, including periodic instrument calibration, operator training, daily instrument performance (span) checks, and record-keeping on daily log sheets. If measurable dust levels are noted, then readings will also be obtained upwind of the work zone. If the downwind particulate level exceeds the upwind level by more than 100 micrograms per cubic meter (ug/m^3), then dust suppression techniques will be employed or work will be halted or controlled such that dust levels are reduced at the downwind perimeter to within 150 ug/m^3 of the upwind level.

If dust is generated during intrusive activities, then dust suppression will be performed, as discussed in Section E.1.6 of this HASP. Corrective measures may include increasing the level of PPE for onsite personnel and implementing additional dust suppression techniques. Should the action level of 150 $\mu g/m^3$ continue to be exceeded, work will stop and the NYSDEC will be notified as described in Section E.2 above. The notification will include a description of the control measures implemented to prevent further exceedances.

Reasonable fugitive dust suppression techniques will be employed during all intrusive activities that may generate fugitive dust. Particulate (fugitive dust) monitoring will be employed onsite intrusive activities that may generate fugitive dust.

Fugitive dust that migrates offsite has the potential for transporting contaminants offsite. Although there may be situations when the monitoring equipment does not measure dust at or above the action level, visual observation may indicate that dust is leaving the Site. If dust is observed leaving the working area, additional dust suppression techniques will be employed.

The following techniques have been shown to be effective for controlling generation and migration of dust during intrusive activities and will be used as needed during intrusive activities at the Site:

Wetting equipment and exposed soil;

Restricting vehicle speeds to 10 mph;

Covering areas of exposed soil after investigation activity ceases; and

Reducing the size and/or number of areas of exposed soil.

When techniques involving water application are used, care will be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will be considered to prevent overly wet conditions, conserve water, and provide an effective means of suppressing fugitive dust.

Evaluation of weather conditions is also necessary for proper fugitive dust control. When extreme wind conditions may make dust control ineffective, intrusive activities may be suspended until wind speeds are reduced.

E.2.3 Noise Monitoring

When using heavy equipment, there is a potential for noise to impact the surrounding community. Although no heavy equipment use is anticipated during site management, in the event that heavy equipment is used during site management, then noise monitoring may be needed. In general, site management work will be performed only during normal working hours when ambient noise levels are elevated due to ongoing activities in the surrounding community, which is primarily urban and commercial. In addition, much of the site management work will be performed indoors in a vacant building. Therefore, the potential for noise impacts on the surrounding community is low.

However, if pedestrians are present in the Site vicinity, it is possible for noise impacts to occur during equipment operations. To address these concerns and other safety concerns, pedestrians will be barred from entering the work zone. In addition, during heavy equipment operations the HSO will periodically monitor noise levels at the work zone boundary and the closest property boundary with a Realistic^{tm} hand-held sound level meter. Noise levels will be monitored in dBs in the A-weighted, slow-response mode. If noise level readings exceed an eight-hour time-weighted average of 85 dB at the work zone boundary or at the closest property boundary, the HSO will take appropriate measures to reduce noise exposure beyond these boundaries. These measures may include extension of the work zone boundary, issuing appropriate hearing protection devices as discussed in Section E.1.6 of this plan, or other measures, as appropriate. In the event that the noise exposure measures are inadequate, work will cease until noise levels can be reduced to below 85 dB at the work zone boundary and/or at the closest property boundary.

APPENDIX F
SITE MANAGEMENT FORMS

This Appendix includes initial versions of site management forms, including an example site inspection form, sub-slab depressurization system data sheet, canister sampling form, and summary of green remediation metrics for site management. Additional forms will be developed as needed and incorporated into this SMP. The forms will be completed during site maintenance activities and provided to the NYSDEC in electronic format in accordance with the reporting requirements specified in Section 7.0 of the SMP. All forms are subject to approval of the NYSDEC and include the minimum reporting requirements as described in Section 7.0.

Site-Wide Inspection Form
Cinderella 248, LLC
248 Flatbush Avenue, Brooklyn, New York

Date of Inspection: _____

Site-wide inspections will be performed annually, at a minimum. A site-wide inspection shall also be performed after severe events that may affect the Engineering Controls (ECs) or monitoring points.

The following inspection form will be completed during each site-wide inspection. Supporting documentation will be attached, as necessary. The completed site-wide inspection form and supporting documentation will be included in the associated Periodic Review Report.

Compliance with Institutional Controls

Institutional Controls (ICs) are required to: (1) implement, maintain and monitor EC systems; (2) prevent future exposure to residual contamination by controlling disturbances of residual materials; and, (3) restrict the use of the Site to industrial, commercial and/or restricted residential uses only. Adherence to these ICs on the Site (Controlled Property) is required under the Environmental Easement. These ICs are described in Section 2.3 of the Site Management Plan (SMP). Please complete the following checklist to confirm compliance with the Site ICs:

- The Controlled Property may be used for industrial, commercial, or restricted residential use. Confirm the use of the Site:
- All Engineering Controls (sub-slab depressurization system) must be operated and maintained as specified in the SMP for the Controlled Property. Confirm operation and maintenance of ECs:
- Annual inspections and certifications must be conducted in accordance with the SMP. Confirm compliance with annual inspections and certifications:
- Environmental or public health monitoring, and reporting of information thus obtained, must be performed in a manner specified in the SMP. Confirm that the required monitoring and reporting are in accordance with the SMP:
- Onsite environmental monitoring devices, including but not limited to vapor monitoring

points, will be protected and replaced as necessary to ensure continued functioning in the manner specified in the SMP. Confirm that monitoring devices have been protected and/or replaced:

- Vegetable gardens are prohibited. Confirm the absence of vegetable gardens:
- Use of the groundwater underlying the Controlled Property is prohibited without treatment rendering it safe for the intended purpose. Confirm that groundwater use has not occurred:
- As per the Environmental Easement, the Controlled Property may not be used for a higher level of use, such as restricted-residential use, and the above-stated engineering controls may not be discontinued without proper notification of the NYSDEC of the change and approval of that use by the NYSDEC, and an amendment of the Site Management Plan approved by the NYSDEC. Confirm continued compliance with the Environmental Easement:
- Grantor covenants and agrees that until such time as the Environmental Easement is extinguished in accordance with the requirements of Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Controlled Property shall state in at least fifteen-point bold-faced type:

This property is subject to an environmental easement held by the New York State Department of Environmental Conservation pursuant to Title 36 to Article 71 of the Environmental Conservation Law.

- Confirm that property deed and all subsequent instruments of conveyance are in compliance:
- Grantor covenants and agrees that the Environmental Easement shall be incorporated in full or by reference in any leases, license, or other instruments granting a right to use the Controlled Property. Confirm that leases, licenses or other right-to-use documents incorporate or reference the Environmental Easement:

- Grantor covenants and agrees that it shall annually, or such time as NYSDEC may allow, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury that the controls employed at the Controlled Property are unchanged from the previous certification or that any changes to the controls employed at the Controlled Property were approved by the NYSDEC, and that nothing has occurred that would impair the ability of such control to protect the public health and environment or constitute a violation or failure to comply with any Site Management Plan for such controls and giving access to such Controlled Property to evaluate continued maintenance of such controls. Confirm the submittal of the Annual Certification Statement:

Compliance with Engineering Controls

Provide a written evaluation of the condition and continued effectiveness of the ECs:

- The sub-slab depressurization system (SSDS) EC:

General Site Conditions

Provide a written description of the Site conditions at the time of the site-wide inspection. Attach digital photographs or other supporting information as needed:

Site Management Activities

Provide a discussion and assessment of ongoing site management activities including, but not limited to, SSDS operation and monitoring, SVI testing, community air monitoring (if any), nuisance control, health and safety monitoring, and other applicable and pertinent activities. Attach supporting documentation as necessary:

Compliance with Permits and Schedules

The Operation and Maintenance Plan included in Section 4 of the Site Management Plan does not include any permit requirements but does include a schedule for SSDS maintenance. Discuss compliance with the SSDS maintenance schedule:

Site Records

The Site records include, but are not limited to, EC inspections, site-wide inspection checklists, SSDS operation and maintenance checklist, community air monitoring documents, regulatory agency correspondence, reports, and the PRR. Confirm that each type of Site record is up to date and provide comments:

Inspector Information

Name and Affiliation of Inspector(s):

Date of Inspection:

Reason for Inspection:

List additional inspections or activities conducted in association with this inspection:

Attachments:

Correspondence

SSDS Inspection Checklist and supporting documents

Photolog

Operation & Maintenance Data Sheet

Sub Slab Depressurization System
248 Flatbush Avenue
Brooklyn, NY

Date: **Arrival Time:**

Weather / Temp: **Departure Time:**

Technician / Operator:

System Status

	Arrival	Departure
SSD Blower (ON/OFF)		

Sub-Slab Derpressurization System		SSD Manifold Legs	
Fresh Air Valve Open (%)		SSD-1 Vacuum ("H2	
Air Filter Influent Vacuum ("H2O)		SSD-1 Flow Rate (cf	
Blower Influent Vacuum ("H2O)		SSD-2 Vacuum ("H2	
Blower Effluent Pressure ("H2O)		SSD-2 Flow Rate (cf	
Blower Effluent PID (ppm)		SSD-3 Vacuum ("H2	
Moisture Separator Level (gal)		SSD-3 Flow Rate (cf	
Hour Meter Total Runtime (hrs)			

Vacuum Influence Monitoring

VMP-1 Vacuum ("H2		VMP-5 Vacuum ("H2	
VMP-2 Vacuum ("H2		VMP-6 Vacuum ("H2	
VMP-3 Vacuum ("H2		VMP-7 Vacuum ("H2	
VMP-4 Vacuum ("H2		VMP-8 Vacuum ("H2	

Notes, Comments & Observations:

Summary of Green Remediation Metrics for Site Management

Site Name: _____ Site Code: _____
Address: _____ City: _____
State: _____ Zip Code: _____ County: _____

Initial Report Period (Start Date of period covered by the Initial Report submittal)
Start Date: _____

Current Reporting Period
Reporting Period From: _____ To: _____

Contact Information
Preparer's Name: _____ Phone No.: _____
Preparer's Affiliation: _____

I. Energy Usage: Quantify the amount of energy used directly on-site and the portion of that derived from renewable energy sources.

	Current Reporting Period	**Total to Date**
Fuel Type 1 (e.g. natural gas (cf))		
Fuel Type 2 (e.g. fuel oil, propane (gals))		
Electricity (kWh)		
Of that Electric usage, provide quantity:		
Derived from renewable sources (e.g. solar, wind)		
Other energy sources (e.g. geothermal, solar thermal (Btu))		

Provide a description of all energy usage reduction programs for the site in the space provided on Page 3.

II. Solid Waste Generation: Quantify the management of solid waste generated on-site.

	Current Reporting Period (tons)	**Total to Date (tons)**
Total waste generated on-site		
OM&M generated waste		
Of that total amount, provide quantity:		
Transported off-site to landfills		
Transported off-site to other disposal facilities		
Transported off-site for recycling/reuse		
Reused on-site		

Provide a description of any implemented waste reduction programs for the site in the space provided on Page 3.

III. Transportation/Shipping: Quantify the distances travelled for delivery of supplies, shipping of laboratory samples, and the removal of waste.

	Current Reporting Period (miles)	**Total to Date (miles)**
Standby Engineer/Contractor		
Laboratory Courier/Delivery Service		
Waste Removal/Hauling		

Provide a description of all mileage reduction programs for the site in the space provided on Page 3. Include specifically any local vendor/services utilized that are within 50 miles of the site.

IV. Water Usage: Quantify the volume of water used on-site from various sources.

	Current Reporting Period (gallons)	**Total to Date (gallons)**
Total quantity of water used on-site		
Of that total amount, provide quantity:		
Public potable water supply usage		
Surface water usage		
On-site groundwater usage		
Collected or diverted storm water usage		

Provide a description of any implemented water consumption reduction programs for the site in the space provided on Page 3.

V. Land Use and Ecosystems: Quantify the amount of land and/or ecosystems disturbed and the area of land and/or ecosystems restored to a pre-development condition (i.e. Green Infrastructure).

	Current Reporting Period (acres)	**Total to Date (acres)**
Land disturbed		
Land restored		

Provide a description of any implemented land restoration/green infrastructure programs for the site in the space provided on Page 3.

Description of green remediation programs reported above (Attach additional sheets if needed)
Energy Usage:

Waste Generation:
Transportation/Shipping:
Water usage:
Land Use and Ecosystems:
Other:

CERTIFICATION BY CONTRACTOR
I, _____ (**Name**) do hereby certify that I am _____ (**Title**) of the Company/Corporation herein referenced and contractor for the work described in the foregoing application for payment. According to my knowledge and belief, all items and amounts shown on the face of this application for payment are correct, all work has been performed and/or materials supplied, the foregoing is a true and correct statement of the contract account up to and including that last day of the period covered by this application. _____ **Date** **Contractor**

APPENDIX G

OPERATION AND MAINTENANCE MANUAL FOR SSDS

This Operations and Maintenance (O&M) Manual provides protocols for the operation and maintenance of the sub-slab depressurization system (SSDS) at the Cinderella 248, LLC Site. The procedures detailed in this O&M Manual supplement the procedures described in the equipment manufacturers' documents for the remedial components, which are included at the end of this Manual.

This O&M Manual includes as-built drawings and catalog cuts of the equipment necessary to operate and maintain the remedial system. The catalog cuts include maintenance procedures, spare parts lists, and any special tool requirements, as appropriate. Vendor, service contact, and local dealer information, including address and telephone numbers, is included where available.

G.1 Remedial System Purpose

The SSDS was implemented to address soil vapor intrusion at the Site and adjoining properties. The system was constructed in 2016 and started up on August 1, 2016.

G.2 Remedial System Layout and Equipment

A site plan showing the layout of the SSDS is presented in Figure 3.3.3.1 in the Site Management Plan (SMP) and is included at the end of this Manual. This system includes three depressurization laterals (SSD-1 through SSD-3), of which two are located onsite and one is located offsite at 254 Flatbush Avenue.

The depressurization wells, are constructed of four-inch diameter schedule 40 PVC casing and 0.02-inch slotted screen. Each lateral was installed with between 30 and 40 feet of screen to a depth of approximately 2 feet below the basement slab. A cap was also place on the end of each screened section of lateral piping. The screened intervals are placed on top of and backfilled with an approximate six-inch layer of coarse well gravel. A geotextile fabric was then placed atop the gravel and the lateral trenches were backfilled utilizing existing trenched material. The surface above each lateral was restored with concrete.

Monitoring points, VP-1 through VP-8, were installed to provide additional locations to evaluate the radius of influence of the system as shown in Figure 3.3.3.1. Each monitoring point consists of an approximate 6-inch long quarter-inch diameter stainless steel implant installed below the slab and extended to a protective steel access cover. The top of each implant is capped and equipped with a valve for monitoring purposes. Each monitoring point annulus was gravel-packed to approximately six inches below grade and a bentonite seal was installed above the gravel pack. The base of the protective cover is filled with bentonite to reduce the potential for short-circuiting to the monitoring point screens.

Subsurface system connector piping was installed in trenches extending from the center of each lateral to the remediation system. Subsurface connector piping and aboveground piping is schedule 40 PVC and a piping diameter is four inches. Galvanized steel piping is utilized between the water knockout vessel and blower and just after the blower discharge. Following piping placement, each trench was backfilled in a

manner to reduce the potential for settlement while not damaging the installed piping. The surface above each trench was restored with concrete.

The SSDS operating equipment is enclosed in a room insulated to reduce noise. The enclosure is located in the rear corner of the basement level of the Site building, as shown on Figure 3.3.3.1. A schematic plan showing the process flow and the operating equipment installed in the enclosure is presented in Figure 3.3.1.2, which is included at the end of this Manual.

The SSDS operating equipment includes above-grade manifolded lateral piping connected to a water knockout vessel located within the enclosure. The water knockout vessel is equipped with an adjustable vacuum relief valve and a manual drain valve. A level float valve switch is installed in the water knockout vessel and connected to the blower controls such that the blower will be shut off temporarily until the high-level condition is no longer present. An air filter is installed in the piping following the water knockout vessel for removing particles from the air stream. Remote telemetry (pending final communication connections) has also been installed to allow notification of low vacuum, high knockout level, and motor failure.

The lateral piping is connected to a AirTech regenerative blower (model #3BA1630-7AT26) capable of delivering a flow of 200 cfm at a vacuum of 52" water column vacuum. An adjustable vacuum relief valve is installed between the blower and manifold piping.

As built drawings, signed and sealed by a professional engineer, are at the end of this Manual. A system checklist is included in Appendix F to the SMP (Site Management Forms).

G.3 SSDS Effluent and Vacuum Monitoring

Effluent VOC concentrations from the SSDS system are monitored from a sampling port located on the pressure side of the blower. VOC concentrations are evaluated using a calibrated PID and by obtaining and analyzing air samples(periodically), as described in the Section 4.3 of the SMP. These data are used to evaluate the vapor concentrations for compliance with NYSDEC Division of Air Resources DAR-1 criteria to determine if emissions treatment is required.

SSDS vacuum measurement monitoring is conducted while the system is operating. If the system has been off for any reason, the system should be restored to operation and allowed to operate for at least one full day prior to obtaining vacuum measurements. Vacuum measurements are to be made at each of the monitoring points (VP-1 through VP-8) on a quarterly basis. Vacuum measurements are made by connecting a magnehelic gauge directly to the tubing for each monitoring point and recording the observed vacuum. These readings are to be recorded on the system checklist included in Appendix F the SMP (Site Management Forms).

G.4 SSDS System Operations

Routine Operations

A visual inspection of the system will be conducted during each quarterly monitoring event. System components to be monitored include, but are not limited to, the following:

- Blower vacuum and temperature;
- Effluent (PID quarterly, collect sample for analytical testing periodically);
- Individual lateral well head vacuums and flow rates; and
- System Alarms.

A complete list of components to be checked is provided in the SSDS inspection checklist, presented in Appendix F to the SMP. If any equipment readings are not within their typical range, any equipment is observed to be malfunctioning, or the system is not performing within specifications, maintenance and repair are required immediately such that the system is returned to normal operation.

Non-Routine Operations

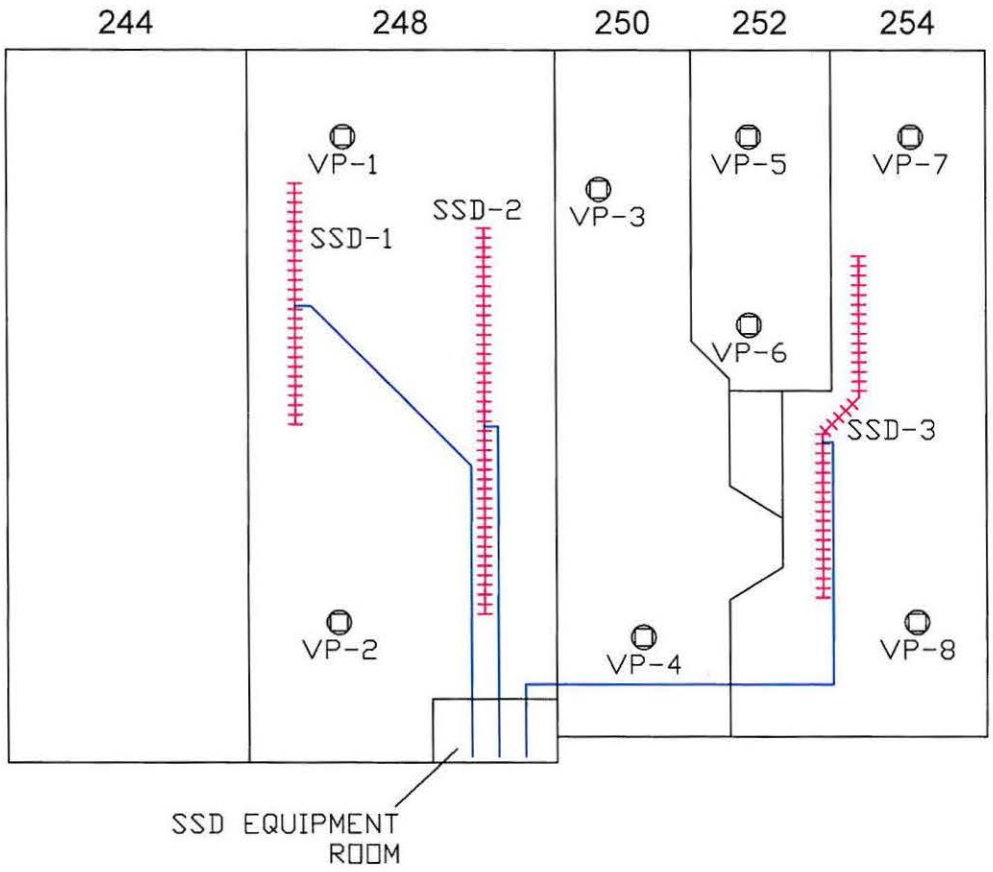
The SSDS operating equipment includes a moisture separator equipped water safety switch. In the event that the water level in the knock-out drum exceeds the established high water level, the safety switch will shut down the system. In this case, emptying of the water knock-out drum is usually sufficient to remedy the condition and allow for the re-start of the system. In the event that this does not allow for system re-start, then the manufacturer's procedures included in the equipment specifications at the end of this Manual should be followed to restore proper operation of the high level shutoff switch.

The SSDS blower may experience failure that cannot be remedied by routine parts replacement. In this event, and assuming that SSDS operation continues to be necessary, the failed blower should be replaced by an identical or comparable blower. Blower replacement should be performed only by qualified personnel.

REMEDIAL EQUIPMENT INFORMATION:

- **Figures showing Remedial System**
- **Remedial Equipment Operating Manuals and Cut Sheets**

FLATBUSH AVE.





LEGEND:

SSD EXTRACTION LATERAL

SSD EXTRACTION PIPING

VACUUM INFLUENCE POINT

0 FT 20

APPROX. SCALE

DRAWN/REVISED BY: JW

REVISION DATE: MARCH 10, 2017

FIGURE: 1

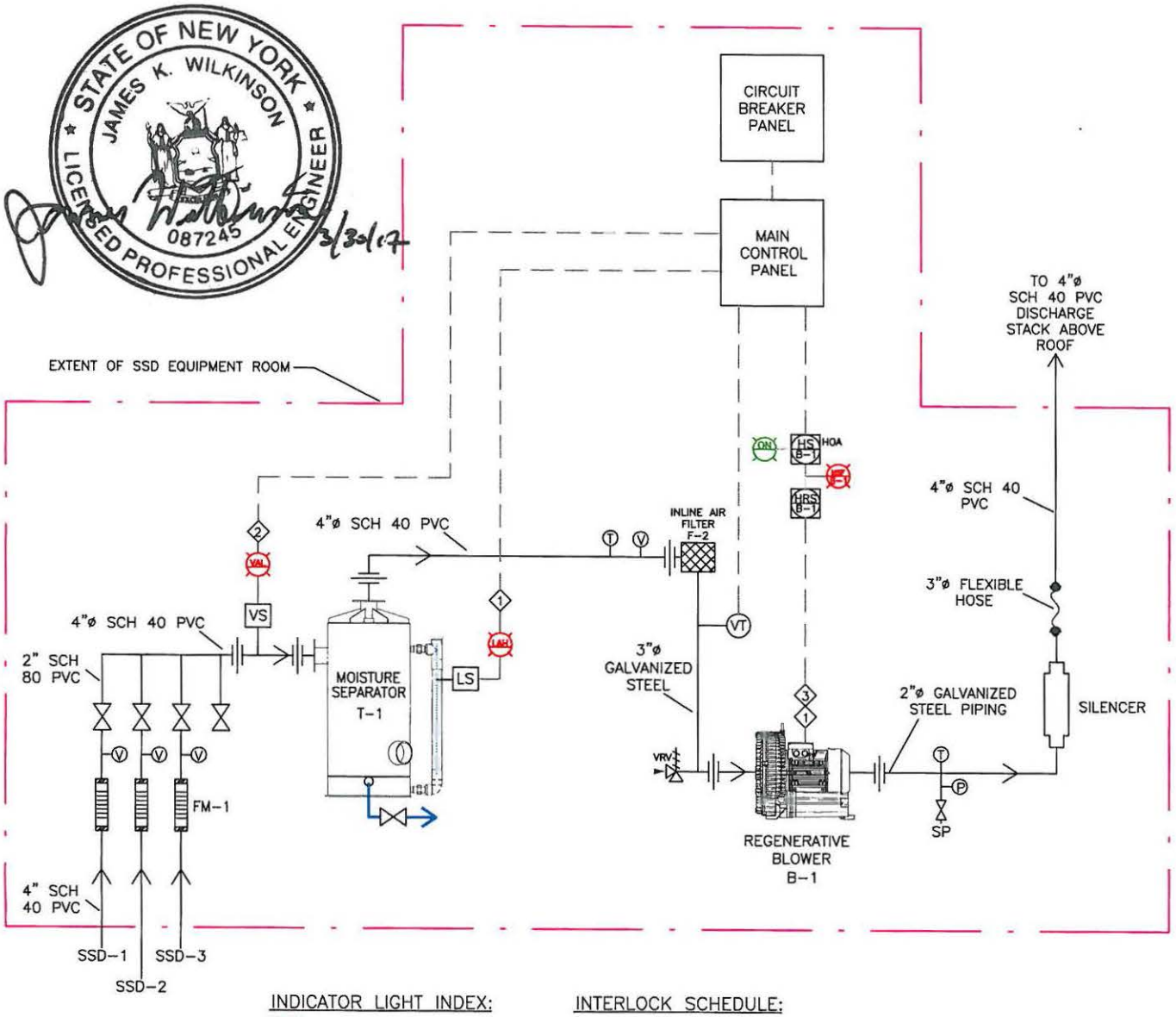
DRAWING TITLE

AS-BUILT SITE PLAN WITH SSD SYSTEM LAYOUT

PREPARED FOR

CINDERELLA 248 LLC
248 FLATBUSH AVENUE
BROOKLYN, NEW YORK

EnviroTrac
ENVIRONMENTAL SERVICES
5 OLD DOCK ROAD, YAPHANK, NEW YORK 11980
PHONE: (631)924-3001 FAX: (631)924-5001



INDICATOR LIGHT INDEX:

- LAH — LEVEL ALARM HIGH
- VAL — VACUUM ALARM LOW
- MSF — MOTOR STARTER FAILURE
- ON — MOTOR RUN INDICATOR

INTERLOCK SCHEDULE:

1. HIGH LEVEL IN T-1 – SHUT DOWN B-1, ACTIVATE SENSAPHONE ALARM ZONE 1.
2. LOW VACUUM – ACTIVATE SENSAPHONE ALARM ZONE 2.
3. MOTOR STARTER FAULT – SHUT DOWN B-1, ACTIVATE SENSAPHONE ALARM ZONE 3.

NOTES:

BLOWER: AIRTECH MODEL NO: 3BA1630-7AT26 (4.6 HP, 3 PH, TEFC)
MOISTURE SEPARATOR T-1: ESD/W2W MODEL NO: AWS80-4

SYSTEM LEGEND:

- V — VACUUM GAUGE
- P — PRESSURE GAUGE
- T — TEMPERATURE GAUGE
- ROTAMETER FLOWMETER
- LS — LEVEL SWITCH
- VS — VACUUM SWITCH
- VT — INDICATING VACUUM TRANSMITTER
- BALL VALVE
- SP — SAMPLE PORT
- VRV — VACUUM RELIEF VALVE
- UNION
- HS — HAND SWITCH PANEL MOUNTED
- HRS — RUN TIME METER
- CONTROL PANEL INDICATOR LIGHT
- CONTROL PANEL INTERLOCK
- ELECTRIC LINE
- AIR FLOW DIRECTION
- CONDENSATE WATER FLOW DIRECTION
- ENCLOSURE LIMITS

DRAWN/REVISED BY: JW
REVISION DATE: MARCH 29, 2017

FIGURE: 2

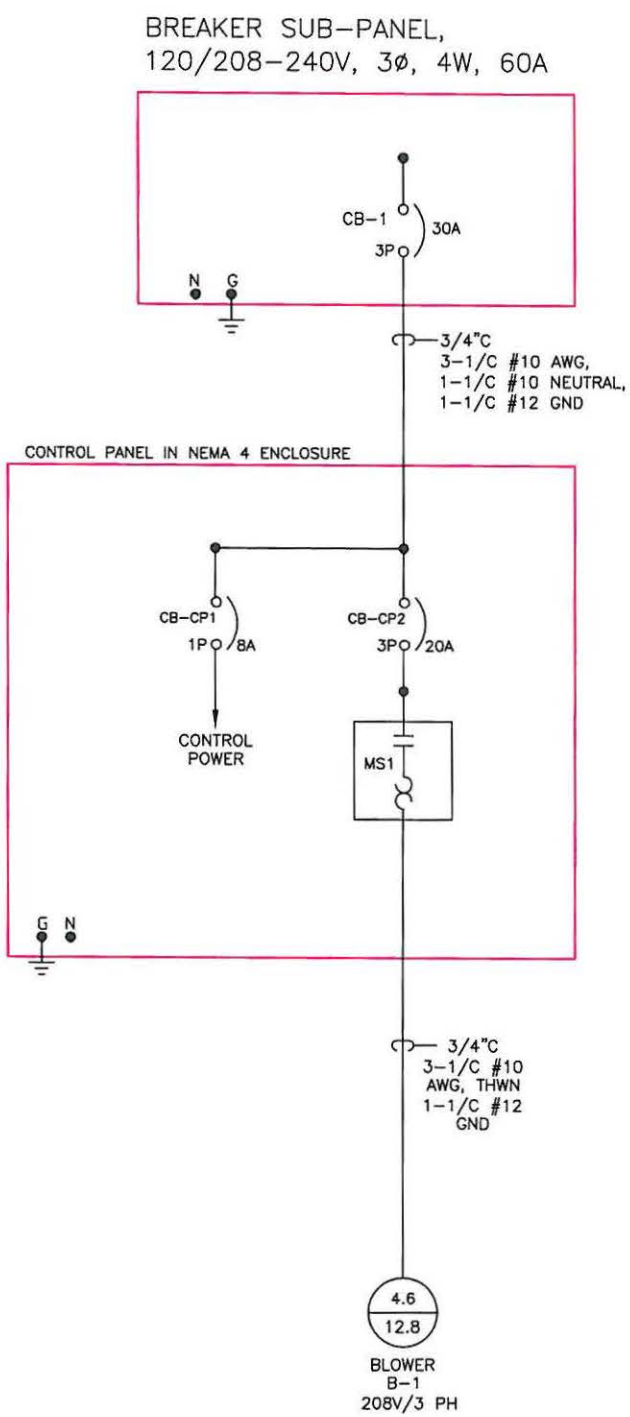
DRAWING TITLE

AS-BUILT SUB-SLAB DEPRESSURIZATION SYSTEM PROCESS AND INSTRUMENTATION DIAGRAM

PREPARED FOR

CINDERELLA 248 LLC
248 FLATBUSH AVENUE
BROOKLYN, NEW YORK

EnviroTrac
ENVIRONMENTAL SERVICES
5 OLD DOCK ROAD, YAPHANK, NEW YORK 11980
PHONE: (631)924-3001 FAX: (631)924-5001



LEGEND:

- MS1 — FULL VOLTAGE NON-REVERSING MOTOR STARTER WITH OVERLOAD RELAY
- MOTOR STARTER AUXILIARY CONTACT
- HP / FLA — MOTOR HORSEPOWER FULL LOAD AMPS
- CB-X, 1P, 20A — CURCUIT BREAKER (RATINGS AS SHOWN)
- THERMOSTAT
- SINGLE POLE SWITCH

SAMPLE BREAKER:

LABEL, CB-X, 1P, 20A, # OF POLES, AMPERAGE



DRAWN/REVISED BY: JW
REVISION DATE: MARCH 29, 2017

FIGURE: E1

DRAWING TITLE

AS-BUILT
ELECTRICAL SINGLE LINE DIAGRAM

PREPARED FOR

CINDERELLA 248 LLC
248 FLATBUSH AVENUE
BROOKLYN, NEW YORK

EnviroTrac
ENVIRONMENTAL SERVICES
5 OLD DOCK ROAD, YAPHANK, NEW YORK 11980
PHONE: (631)924-3001 FAX: (631)924-5001

SUB-SLAB DEPRESSURIZATION SYSTEM

OPERATION AND MAINTENANCE MANUAL

Project:

248 Flatbush Avenue
Brooklyn, NY

Prepared By:

EnviroTracLtd.
5 Old Dock Road
Yaphank, NY 11980

March 2017

Table of Contents

Section 1 – Sub-Slab Depressurization Equipment

- Airtech **#3BA1630-7AT26** Regenerative Blower Specifications, Operating and Maintenance Instructions
- Waste2Water Air/Water Separator **#AWS80-4** Specifications
- Waste2Water #**IPF-300** In-Line Air Filter Specifications
- Solberg **#SLCR300** Discharge Silencer Specifications

Section 2 – Sub-Slab Depressurization Instrumentation/Switches

- Noshok Vacuum & Pressure Gauge Specifications - Installation & Maintenance Guide
- Dwyer Instruments **1950-20-2F XP** Differential Pressure Switch Specifications – Installation and Operating Instructions
- Dwyer Instruments Series **605** Magnehelic Differential Pressure Indicating Transmitter Specifications – Installation and Operating Instructions
- Key Instruments **FR5A75PL** Rotameter Air Flow Meter Specifications
- Winters **TBM20025-B8** Bimetal Thermometer Specifications

Section 3 – Control Panel Materials

- Sensaphone **Sentinel** Technical Specifications, Installation and Setup Guide
- IDEC Smart Relay **#FL1E-H12RCE** Specifications and Manual
- NOARK Contactor **#Ex9C1811G7** Specifications
- NOARK Overload Relay **#Ex9R38B18A** Specifications
- Eaton Moeller 3-Pole Breaker **#FAZ-D20/3** Specifications
- ABB 1-Pole Breaker **#S2018K** Specifications
- Omron 12VDC Power Supply **#S8VK-G01512** Specifications
- Finder Relay **#34.51.7.024.0010** Specifications
- Finder Relay Socket **#93.01.0.024** Specifications
- IDEC Pilot Lights and Switches **TW Series 22mm** Specifications
- Curtis Hour Meter **#700QN001048150D100230A** Specifications
- Weidmuller 6mm Terminal Blocks **#WDU4** Specifications
- Hammond Enclosure **#1418N4ALE6** Specifications

Section 7 – System Drawings

- Site Plan With SSD System Layout
- Process and Instrumentation Diagram
- Electrical Single Line Diagram

1. Sub-Slab Depressurization Equipment

AIRTECH® VACUUM

SSD Blower #3BA1630-7AT26

3BA1630

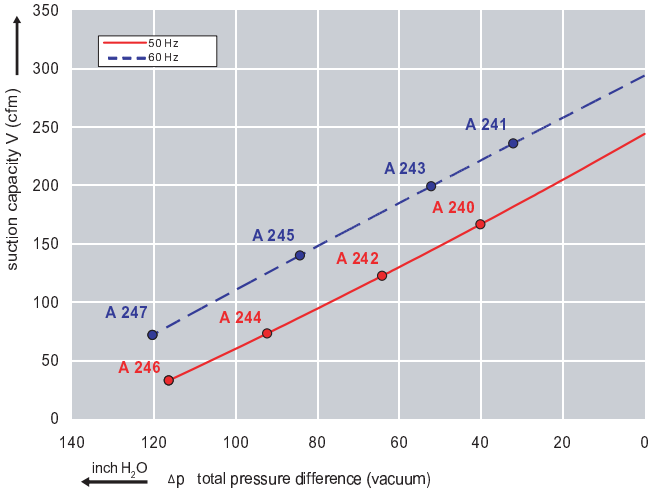
Vacuum/Pressure Regenerative Blower



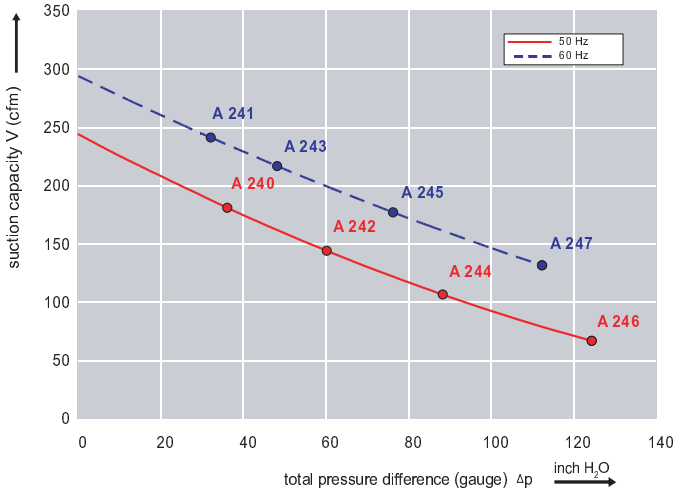
Features:

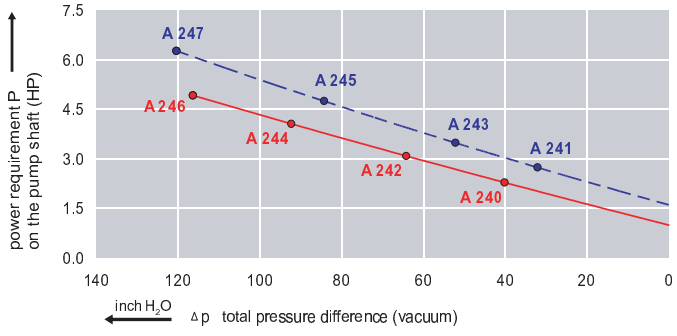
- Cooler running, outboard bearing provides maintenance-free operation
- Environmentally friendly oil-free technology
- Extremely quiet operation
- All motors are standard TEFC with Class F insulation, UL recognized, CE Compliant
  Explosion-Proof motors available
- Custom construction blowers are available
- Rugged die cast aluminum construction

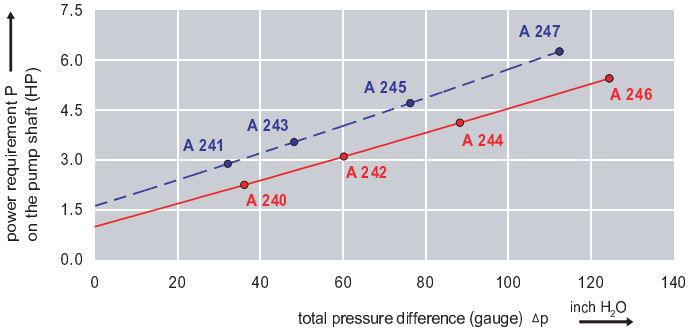
Performance curve for Vacuum pump

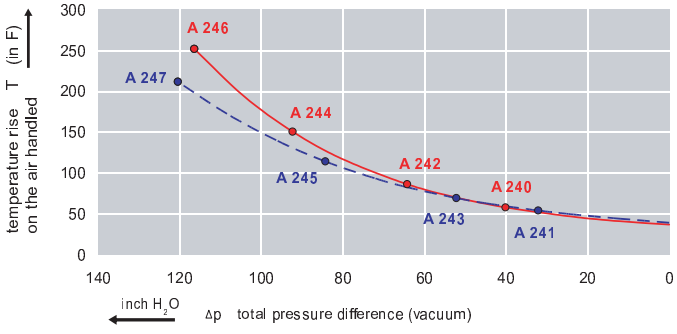


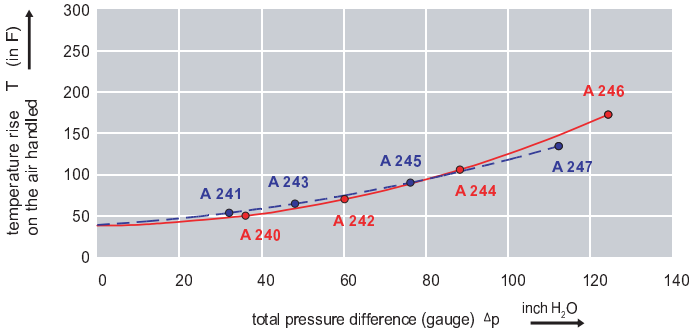
Performance curve for Compressor







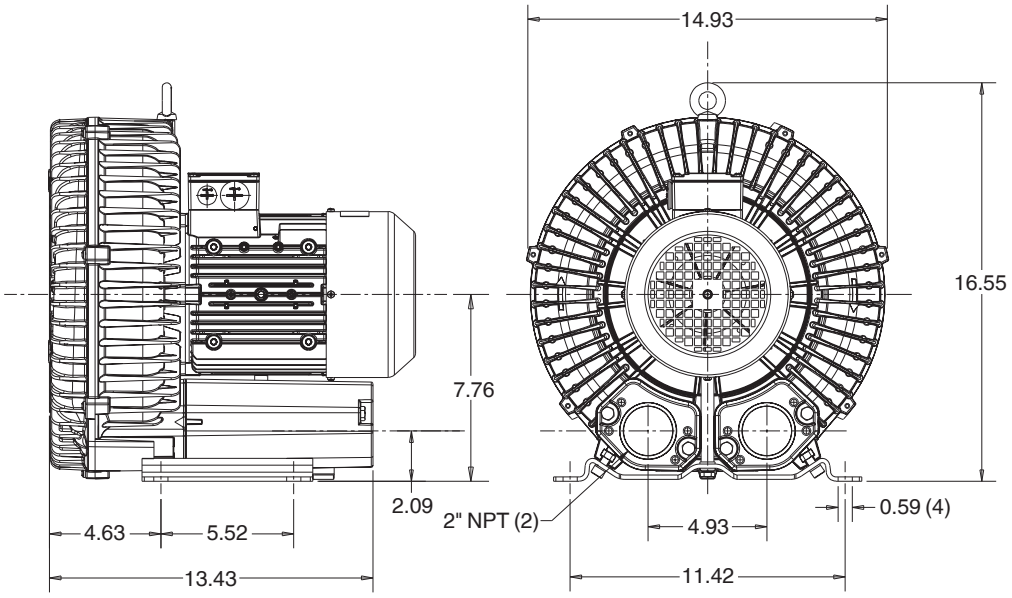




3BA1630

Vacuum/Pressure Regenerative Blower

Dimensions: (inches)



Recommended Accessories:

Relief valve:

VC61Z (Vacuum)

PC61Z (Pressure)

Filter:

ATF-200-15124/1 (Vacuum)

AFS-30-200-10 (Pressure)

Specifications subject to change without notice. Please contact factory for specification updates.

Selection & Ordering Data - Type 3BA1630

Curve No.	Order No.	Frequency Hz	Rated power HP	Input voltage V		Input current A		Permissible total differential pressure Vacuum inch H2O	Compressor inch H2O	Sound pressure level dB(A)	Weight lbs
3~ 50/60 Hz IP55 insulation material class F											
A 240	3BA1630-7AT06	50	2.14	200D ... 240D	345Y ... 415Y	8.5D	4.9Y	-40	36	70	59
A 241	3BA1630-7AT06	60	2.75	220D ... 250D	415Y ... 460Y	7.5D	4.4Y	-32	32	73	59
A 242	3BA1630-7AT16	50	2.95	200D ... 240D	345Y ... 415Y	9.7D	5.6Y	-64	60	70	66
A 243	3BA1630-7AT16	60	3.42	220D ... 250D	415Y ... 460Y	9.0D	5.3Y	-52	48	73	66
A 244	3BA1630-7AT26	50	4.02	200D ... 240D	345Y ... 415Y	12.5D	7.2Y	-92	88	70	77
A 245	3BA1630-7AT26	60	4.62	220D ... 250D	415Y ... 460Y	12.6D	7.3Y	-84	76	73	77
A 245	3BA1630-7AT25	60	4.60		575		5.8Y	-84	76	73	77
A 246	3BA1630-7AT36	50	5.36	200D ... 240D	345Y ... 415Y	15.6D	9.0Y	-116	124	70	95
A 247	3BA1630-7AT36	60	6.17	220D ... 250D	415Y ... 460Y	16.5D	9.8Y	-120	112	73	95

Suitable for 208 Volt Operation

All curves are rated at 14.7 psia and 68° F ambient conditions and are reported in SCFM referenced to 68° F and 14.696 psia sea level conditions. Curve values are nominal, actual performance may vary by up to 10% of the values indicated. For inlet temperatures above approximately 80 °F or for handling gases other than air, please contact your Airtech sales representative for assistance.

AIRTECH®
VACUUM

Operating and Maintenance Instructions

3BA Regenerative Blowers



INSTALLATION & OPERATING MANUAL
3BA REGENERATIVE BLOWERS

Table of Contents

Section:	Page Number:
1. Pump Ranges	3
Table 1: 3 Phase, Single Stage, 50 Hertz	5
Table 2: 3 Phase, Single Stage, 60 Hertz	6
Table 3: 3 Phase, Two/Three Stage, 50 Hertz	7
Table 4: 3 Phase, Two/Three Stage, 60 Hertz	8
Single Stage – Approx. Temperature Rise	10
Two/Three Stage – Approx. Temperature Rise	11
Tightening Torque Specifications	12
2. Installation	14
Installation Procedure	15
3. Start-up	17
4. Maintenance and Servicing	18
Troubleshooting Chart	19
Lifting	21
Storage	22
Disposal	22
5. Exploded-View Drawings	23
3BA1 Single-Stage	23
3BA1 Two-Stage	24
3BA7 Single-Stage	25
3BA7 Two-Stage	26
Warranty Statement	27

1. Pump Ranges

These operating instructions cover the Airtech 3BA side channel vacuum pumps and compressors supplied with standard TEFC motors. Other configurations are available including V-belt driven units, units with explosion proof motors, mechanical seals, magnetic drives, coatings and modifications for high pressure service. Airtech can provide any combination of modifications to meet your application requirements. Such blowers, however, are outside the scope of this manual.

Description

All regenerative blowers are dynamic compression devices and utilize a non-contacting impeller to accelerate the gas and a specially designed housing to compress the gas. Cooling is accomplished by using the motor fan to blow air over the housing. In larger models, the housing is specially designed with cooling fins to allow a wider range of operation. Both the inlet and outlet ports have built-in silencers and mesh screens. Both the inlet and outlet have an inside connection thread corresponding to DIN ISO 228. On larger units, multiple suction and discharge connection configurations may be available.

The wetted parts are constructed of Aluminum on all models. The blower shares a bearing with the motor. The seal between the bearing and the motor is not gas tight in most models, therefore these blowers are not recommended for handling of toxic or explosive gases. (Contact Airtech Vacuum, Inc. for additional options if explosive or toxic gases will be handled.)

A full range of accessory items are available, including vacuum or pressure relief valves, check valves, suction filters, motor starters, vacuum/pressure cross-over valves, and in-line filters.

Application/Installation Environment

CAUTION! These blowers are designed for use in general industry. Suitable personnel protection according to OSHA requirements is provided, but the equipment should not be operated in residential settings.

Airtech blowers can be operated as either vacuum pumps or compressors. They are suitable for use with air having a relative humidity up to 90 percent, but not generally suitable for handling corrosive or erosive gases. Special versions for toxic or aggressive gases may be available. Use of the standard blower in aggressive environments may cause damage to the blower or exposure to gases being handled in the local environment.

CAUTION! Dangerous (flammable or explosive) or aggressive (corrosive) gases should not be handled by the standard blower.

Handling of flammable or aggressive gases and vapors may be possible by using a specially configured or modified blower. Contact factory for additional information. The standard blower is not suitable for operation in explosive environments as defined by NFPA 70. Contact factory for assistance.

CAUTION! The ambient and suction temperatures should be between 40 and 105 F. For temperatures outside this region, please contact the factory.

The maximum permissible pressure difference for vacuum or pressure is dependant on the motor rating (See Tables 1 to 4 for detailed information by model number.) and power supply frequency. The figures in Tables 1 to 4 are computed assuming an ambient temperature of 77 F (25 C) and a local barometric pressure of 1013 mbar (sea level). Operation at an ambient temperature of 104 F (40C) is the maximum permissible, and will result in a reduction of 10 percent on maximum vacuum or pressure attainable by the unit. For temperatures between 77 F and 104 F, reduce the maximum pressure reduction is a linear function of temperature.

Table 1. Three-phase, Single Stage, 50 Hertz

Model	Rated Power HP/kW	Voltage	Motor Current (Amps)	Open Flow Capacity CFM/m3/hr	Maximum Pressure (mbar)	Sound Pressure Level (dBA)
3BA1300-7AT06	.33/.25	200-240/345-415	2.1/1.2	48/82	-100/100	53
2BA1300-7AT16	.54/.4	200-240/345-415	2.6/1.5	48/82	-120/130	53
3BA1400-7AT06	.94/.7	200-240/345-415	3.8/2.2	84/142	-120/120	63
2BA1400-7AT16	1.15/.85	200-240/345-415	4.2/2.4	84/142		63
3BA1400-7AT26	1.75/1.3	200-240/345-415	5.7/3.3	84/142	-170/200	63
3BA1500-7AT06	1.15/.85	200-240/345-415	4.2/2.4	120/204	-100/100	64
3BA1500-7AT16	1.75/1.3	200-240/345-415	5.7/3.3	120/204	-170/170	64
3BA1500-7AT26	2.15/1.6	200-240/345-415	7.5/4.3	120/204	-200/190	64
3BA1500-7AT36	2.96/2.2	200-240/345-415	9.7/5.6	120/204	-220/270	64
3BA1600-7AT06	2.15/1.6	200-240/345-415	8.5/4.9	188/320	-160/150	69
3BA1600-7AT16	2.96/2.2	200-240/345-415	9.7/5.6	188/320	-190/190	69
3BA1600-7AT26	4.04/3.0	200-240/345-415	12.5/7.2	188/320	-260/270	69
3BA1600-7AT36	5.4/4.0	200-240/345-415	13.0/7.5	188/320	-290/360	69
3BA1630-7AT06	2.15/1.6	200-240/345-415	8.5/4.9	240/408	-160/150	69
3BA1630-7AT16	2.96/2.2	200-240/345-415	9.7/5.6	240/408	-190/190	69
3BA1630-7AT26	4.04/3.0	200-240/345-415	12.5/7.2	240/408	-260/270	69
3BA1630-7AT36	5.4/4.0	200-240/345-415	15.6/9.0	240/408	-260/290	69
3BA1800-7AT06	5.4/4.0	200-240/345-415	15.6/9.0	280/476	-200/200	70
3BA1800-7AT16	7.4/5.5	200-240/345-415	23/13.3	280/476	-300/300	70
3BA1800-7AT26	10/7.5	200-240/345-415	29/16.7	280/476	-320/430	70
3BA1830-7AT06	5.4/4	200-240/345-415	15.6/9	400/680	-200/200	76
3BA1830-7AT16	7.4/5.5	200-240/345-415	23/13.3	400/680	-320/430	76
3BA1830-7AT26	10/7.5	200-240/345-415	29/16.7	400/680	-320/430	76
3BA1900-7AT06	10.8/8	200-240/345-415		568/965		74
3BA1900-7AT16	16.8/12.5	200-240/345-415	48.5/28	568/965	-290/280	74
3BA1900-7AT36	25/18.5	200-240/345-415	64.5/37	568/965		74
3BA1930-7AT16	16.8/12.5	200-240/345-415	48.5/28	744/1264	-290/280	71
3BA1930-7AT36	25/18.5	200-240/345-415	64.5/37	744/1264	-310/310	71
3BA7210-0AT167	.75/.55	200-240/345-415	2.8/1.6	28/48	-230/290	57
3BA7310-0AT167	.75/.55	200-240/345-415	2.8/1.6	40/68	-250/250	57
3BA7410-0AT167	1.5/1.1	200-240/345-415	5.4/3.1	50/84	-300/380	58
3BA7510-0AT168	2/1.5	200-240/345-415	7.5/4.3	70/120	-370/650	64
3BA7510-0AT268	3/2.2	200-240/345-415	9.7/5.6	70/120	-310/430	64
3BA7610-0AT168	3/2.2	200-240/345-415	9.7/5.6	96/163	-310/430	65
3BA7610-0AT368	4.4/3.3	200-240/345-415	13/7.5	96/163	-500/750	65

Table 2. Three-phase, Single-stage, 60 Hz

Model	Rated Power HP/kW	Voltage	Motor Current (Amps)	Open Flow Capacity CFM/m3/hr	Maximum Pressure (mbar)	Sound Pressure Level (dBA)
3BA1300-7AT06	.39/.29	220-250/415-460	1.74/1.0	60/102	-100/100	56
2BA1300-7AT16	.67/.5	220-250/415-460	2.6/1.5	60/102	-150/160	56
3BA1400-7AT06	1.12/.83	220-250/415-460	3.75/2.15	105/179	-130/130	64
3BA1400-7AT16	1.28/.95	220-250/415-460	4.35/2.5	105/179		64
3BA1400-7AT26	2/1.5	220-250/415-460	5.5/3.2	105/179	-210/200	64
3BA1500-7AT06	1.28/.95	220-250/415-460	4.35/2.5	150/255	-80/70	70
3BA1500-7AT16	2/1.5	220-250/415-460	5.5/3.2	150/255	-150/140	70
3BA1500-7AT26	2.7/2.05	220-250/415-460	7.5/4.4	150/255	-220/210	70
3BA1500-7AT36	3.4/2.55	220-250/415-460	9.0/5.3	150/255	-260/290	70
3BA1600-7AT06	2.7/2.05	220-250/415-460	7.5/4.4	235/400	-160/150	72
3BA1600-7AT16	3.4/2.55	220-250/415-460	9.0/5.3	235/400	-190/190	72
3BA1600-7AT26	4.6/3.45	220-250/415-460	12.0/6.5	235/400	-240/230	72
3BA1600-7AT36	6.1/4.6	220-250/415-460	15.2/8.5	235/400	-320/310	72
3BA1630-7AT06	2.7/2.05	220-250/415-460	7.5/4.4	300/510	-160/150	72
3BA1630-7AT16	3.4/2.55	220-250/415-460	9.0/5.3	300/510	-190/190	72
3BA1630-7AT26	4.6/3.45	220-250/415-460	12.0/6.5	300/510	-240/230	72
3BA1630-7AT36	6.1/4.6	220-250/415-460	15.2/8.5	300/510	-260/260	72
3BA1800-7AT06	6.1/4.6	220-250/415-460	15.2/8.5	350/595	-160/160	74
3BA1800-7AT16	8.4/6.3	220-250/415-460	20/11.2	350/595	-300/280	74
3BA1800-7AT26	11.5/8.6	220-250/415-460	27.5/15	350/595	-350/400	74
3BA1830-7AT06	6.4/4.6	220-250/415-460	15.2/8.5	500/850	-160/160	79
3BA1830-7AT16	8.4/6.3	220-250/415-460	20/11.2	500/850	-300/280	79
3BA1830-7AT26	11.5/8.6	220-250/415-460	27.5/15	500/850	-350/400	79
3BA1900-7AT06	12.1/9	220-250/415-460		710/1207		79
3BA1900-7AT16	19.5/14.5	220-250/415-460	50/29	710/1207	-270/260	79
3BA1900-7AT36	28.7/21.3	220-250/415-460	68/39	710/1207		79
3BA1930-7AT16	19.5/14.5	220-250/415-460	50/29	930/1581	-270/260	75
3BA1930-7AT36	28.7/21.3	220-250/415-460	68/39	930/1581	-300/280	75
3BA7210-0AT167	1.1/.83	220-250/415-460	3.75/2.15	35/60	-270/320	62
3BA7310-0AT167	1.1/.83	220-250/415-460	3.75/2.15	48/82	-260/250	62
3BA7410-0AT167	2/1.5	220-250/415-460	5.5/3.2	60/102	-340/370	62

When operating at altitudes above 3280 feet (1000 m) above mean sea level, contact Airtech Inc.

CAUTION! Operation of the unit outside the recommended range of pressures and ambient conditions will result in shorted operating life.

Table 3. 3 Phase, Two/Three Stage, 50 Hertz

Model	Rated Power HP/kW	Voltage	Motor Current (Amps)	Open Flow Capacity CFM/m3/hr	Maximum Pressure (mbar)	Sound Pressure Level (dBA)
3BA1310-7AT26	.94/.7	200-240/345-415	3.8/2.2	48/81.6	-120/120	55
3BA1410-7AT36	2.15/1.6	200-240/345-415	7.5/4.3	84/142.8	-200/190	66
3BA1410-7AT46	2.96/2.2	200-240/345-415	9.7/5.6	84/142.8	-320/420	66
3BA1510-7AT46	4.04/3.0	200-240/345-415	12.5/7.2	121.6/206.7	-340/410	72
3BA1510-7AT56	5.39/4.0	200-240/345-415	17.4/10	121.6/206.7	-390/440	72
3BA1610-7AT36	2.9/2.2	200-240/345-415	9.7/5.6	188/319.6	-190/190	73
3BA1610-7AT26	4.04/3.0	200-240/345-415	12.5/7.2	188/319.6	-260/270	73
3BA1610-7AT36	5.39/4.0	200-240/345-415	13.0/7.5	188/319.6	-290/360	73
3BA1610-7AT46	7.41/5.5	200-240/345-415	23/13.3	188/319.6	-420/500	73
3BA1610-7AT56	10.1/7.5	200-240/345-415	29/16.7	188/319.6	-420/610	73
3BA1640-7AT36	5.39/4.0	200-240/345-415	13.0/7.5	280/476	-290/360	74
3BA1640-7AT46	7.41/5.5	200-240/345-415	23/13.3	280/476	-420/500	74
3BA1640-7AT56	10.1/7.5	200-240/345-415	29/16.7	280/476	-420/610	74
3BA1810-7AT16	7.4/5.5	200-240/345-415	23/13.3	280/476	-420/500	74
3BA1810-7AT26	10.1/7.5	200-240/345-415	29/16.7	280/476	-320/430	74
3BA1810-7AT36	14.8/11	200-240/345-415	29/16.7	280/476	-430/600	74
3BA1810-7AT46	20.2/15	200-240/345-415	56.5/32.5	280/476	-460/670	74
3BA1840-7AT26	10.1/7.5	200-240/345-415	29.0/16.7	280/476	-320/430	74
3BA1840-7AT36	14.8/11.0	200-240/345-415	48.5/28.0	280/476	-430/600	74
3BA1910-7AT16	16.8/12.5	200-240/345-415	48.5/28	624/1061	-290/280	74
3BA1910-7AT36	26.95/20.	200-240/345-415	-	624/1061	-	74
3BA7220-0AT567	2/1.5	200-240/345-415	7.5/4.3	28/48	-370/650	58
3BA7320-0AT467	1.5/1.1	200-240/345-415	5.4/3.1	40/68	-300/380	58
3BA7320-0AT567	2/1.5	200-240/345-415	7.5/4.3	40/68	-480/450	59
3BA7420-0AT267	2/1.5	200-240/345-415	7.5/4.3	50/84	-480/450	61
3BA7420-0AT567	4.4/3.3	200-240/345-415	13/7.5	50/84	-500/750	61
3BA7520-0AT268	3/2.2	200-240/345-415	9.7/5.6	70/120	-470/460	64
3BA7620-0AT368	4.4/3.3	200-240/345-415	13/7.5	96/163	-500/750	68
3BA7620-0AT468	5.4/4	200-240/345-415	14/8.1	96/163	-370/650	67
3BA7620-0AT568	7.5/5.5	200-240/345-415	19.9/11.5	96/163	-520/750	68
3BA7630-0AT668	10.1/7.5	200-240/345-415	29/16.7	96/163	-420/610	77

Table 4. 3 Phase, Two/Three Stage, 60 Hertz

Model	Rated Power HP/kW	Voltage	Motor Current (Amps)	Open Flow Capacity CFM/m3/hr	Maximum Pressure (mbar)	Sound Pressure Level (dBA)
3BA1310-7AT26	1.11/.83	220-250/415-460	3.75/2.15	60/102	-130/130	61
3BA1410-7AT36	2.7/2.05	220-250/415-460	7.5/4.4	105/179	-220/210	69
3BA1410-7AT46	3.4/2.55	220-250/415-460	9.0/5.3	105/179	-350/440	69
3BA1510-7AT46	4.6/3.45	220-250/415-460	12.0/6.5	152/258	-380/360	74
3BA1510-7AT56	6.1/4.6	220-250/415-460	15.2/8.5	152/258	-410/480	74
3BA1610-7AT36	3.4/2.55	220-250/415-460	9.0/5.3	235/400	-190/190	76
3BA1610-7AT26	4.6/3.45	220-250/415-460	12.0/6.5	235/400	-240/230	76
3BA1610-7AT36	6.4/4.8	220-250/415-460	16.5/9.8	235/400	-320/310	76
3BA1610-7AT46	8.4/6.3	220-250/415-460	20/11.2	235/400	-440/440	76
3BA1610-7AT56	11.5/8.6	220-250/415-460	27.5/15.0	235/400	-440/670	76
3BA1640-7AT36	6.1/4.6	220-250/415-460	15.2/8.5	350/595	-320/310	78
3BA1640-7AT46	8.4/6.3	220-250/415-460	20.0/11.2	350/595	-440/440	78
3BA1640-7AT56	11.5/8.6	220-250/415-460	27.5/15.0	350/595	-440/670	78
3BA1810-7AT16	8.4/6.3	220-250/415-460	20.0/11.2	350/595	-440/440	78
3BA1810-7AT26	11.5/8.6	220-250/415-460	27.5/15.0	350/595	-350/400	78
3BA1810-7AT36	17/12.6	220-250/415-460	50.2/29.0	350/595	-460/600	78
3BA1810-7AT46	23.3/17.3	220-250/415-460	60.0/34.5	350/595	-490/750	78
3BA1840-7AT26	11.5/8.6	220-250/415-460	27.5/15.0	350/595	-350/400	78
3BA1840-7AT36	17/12.6	220-250/415-460	50.2/29.0	350/595	-460/600	78
3BA1910-7AT16	19.5/14.5	220-250/415-460	50.0/29.0	780/1326	-270/260	84
3BA1910-7AT36	31/23	220-250/415-460	--- / ---	780/1326	--- / ---	84
3BA7220-0AT567	2.7/2.05	220-250/415-460	7.5/4.4	35/60	-500/740	62
3BA7320-0AT467	2/1.5	220-250/415-460	5.5/3.2	48/82	-340/370	63
3BA7320-0AT567	2.7/2.05	220-250/415-460	7.5/4.4	48/82	-430/410	63
3BA7420-0AT267	2.7/2.05	220-250/415-460	7.5/4.4	60/102	-430/410	66
3BA7420-0AT567	5.1/3.8	220-250/415-460	13.5/7.8	60/102	-510/850	66
3BA7520-0AT268	3.4/2.55	220-250/415-460	9/5.3	84/143	-500/450	70
3BA7620-0AT368	5.1/3.8	220-250/415-460	13.5/7.8	115/196	-510/850	71
3BA7620-0AT468	6.1/4.6	220-250/415-460	15.2/8.5	115/196	-480/500	71
3BA7620-0AT568	8.4/6.6	220-250/415-460	22.5/12.6	115/196	-520/820	72
3BA7630-0AT668	11.5/8.6	220-250/415-460	27.5/15	115/196	-440/670	80

Operation of any blower is possible at 87 Hertz without modification. When using a VFD to operate the blower at this frequency, refer to the nameplate for limits on vacuum and pressure, current draw and motor performance.

If your specific model number is not listed above, please consult the nameplate on the unit for electrical data. If the model you are installing is listed above, please confirm the data on the nameplate. Data in Tables 1 through 4 is subject to change and is approximate. Be sure to confirm necessary operating data what that on the nameplate before commissioning the unit.

CAUTION! Do not operate any 3BA blower above 87 Hz without consultation with the factory. Failure of the blower motor is possible when operating out of range. Consult with the factory for assistance.

Expected temperature rise of the handled gas at maximum allowable pressure differential and when operating at sea level is indicated below:

Single Stage – Approximate Temperature Rise

Blower Model	Maximum Rise at 50 Hz speed		Maximum Rise at 60 Hz speed	
	Degrees F	Degrees K	Degrees F	Degrees K
3BA1100-7..0.	115	46	136	58
3BA1200-7..0.	65	18	101	38
3BA1300-7..0.	90	32	77	25
3BA1300-7..1.	90	32	140	60
3BA1300-7..2.	90	32	158	70
3BA1400-7..0.	99	37	86	30
3BA1400-7..1.	129	54	122	50
3BA1400-7..2.	149	65	167	75
3BA1500-7..0.	86	30	72	22
3BA1500-7..1.	115	46	97	36
3BA1500-7..2.	138	59	122	50
3BA1500-7..3.	203	95	180	82
3BA1500-7..6.	248	120	248	120
3BA1600-7..0.	81	27	68	20
3BA1600-7..1.	145	63	104	40
3BA1600-7..2.	171	77	176	80
3BA1600-7..3.	225	107	185	85
3BA1600-7..6.	248	120	194	90
3BA1600-7..7.	248	120	248	120
3BA1800-7..0.	104	40	104	40
3BA1800-7..1.	153	67	185	85
3BA1800-7..2.	248	120	221	105
3BA1900-7..0.	97	36	95	35
3BA1900-7..0.	182	83	155	68
3BA1900-7..0.	230	110	212	100
3BA7210-0..1..	126	52	142	61
3BA7310-0..1..	142	61	142	61
3BA7310-0..2..	178	81	187	86
3BA7410-0..1..	194	90	214	101
3BA7510-0..1..	199	93	232	111
3BA7510-0..2..	248	120	234	112
3BA7610-0..1..	244	118	255	124
3BA7610-0..3..	244	118	255	124

Two/Three Stage – Approximate Temperature Rise

Blower Model	Maximum Rise at 50 Hz speed		Maximum Rise at 60 Hz speed	
	Degrees F	Degrees K	Degrees F	Degrees K
3BA1310-7..2.	127	53	165	74
3BA1410-7..3.	154	68	149	65
3BA1410-7..4.	181	83	180	82
3BA1510-7..4.	190	88	176	80
3BA1510-7..5.	194	90	201	94
3BA1610-7..1.	92	33	86	30
3BA1610-7..2.	129	54	118	48
3BA1610-7..3.	176	80	167	75
3BA1610-7..4.	221	105	190	88
3BA1610-7..5.	246	120	266	130
3BA1610-7..7.	176	80	167	75
3BA1610-7..8.	176	80	248	120
3BA1810-7..1.	113	45	-	-
3BA1810-7..2.	185	85	140	60
3BA1810-7..3.	248	120	248	120
3BA1910-7..1.	119	48	115	46
3BA1910-7..2.	203	95	169	76
3BA1910-7..3.	248	12	274	134
3BA7220-0..2..	131	55	171	77
3BA7220-0..5..	165	74	230	110
3BA7320-0..5..	178	81	255	124
3BA7420-0..2..	192	89	176	80
3BA7420-0..5..	250	121	243	117
3BA7520-0..2..	192	89	216	102
3BA7520-0..7..	257	125	230	110
3BA7620-0..3..	255	124	259	126
3BA7620-0..5..	255	124	262	128
3BA7630-0..6..	248	120	248	120

Tightening Torque Specifications

For non-electrical connections

Thread	Ft-lbs maximum torque	Nm maximum torque
M4	2.43	3.3
M5	3.25	4.4
M6	6.49	8.8
M8	19.47	26.4
M10	34.10	46.2
M12	56.76	77

For electrical connections

Thread	Ft-lbs torque	Nm torque
M4	0.6 to 0.9	0.8 to 1.2
M5	1.3 to 1.8	1.3 to 1.8

For metal threaded glands/unions

Thread	Ft-lbs maximum torque	Nm maximum torque
M12x1.5	3 to 4.5	4 to 6
M16x1.5	3.7 to 5.5	5 to 7.5
M20x1.5	4.4 to 6.6	6 to 9
M32x1.5	5.9 to 8.9	8 to 12
M40x1.5	5.9 to 8.9	8 to 12

For plastic threaded glands/unions

Thread	Ft-lbs maximum torque	Nm maximum torque
M12x1.5	1.5 to 2.6	2 to 3.5
M16x1.5	2.2 to 3	3 to 4
M20x1.5	3 to 3.7	4 to 5
M32x1.5	3.7 to 5.2	5 to 7
M40x1.5	3.7 to 5.2	5 to 7

Operating above the indicated maximum pressure or vacuum would overload the motor and/or overheat the unit. In addition to the maximum allowable pressure difference, careful consideration should be given to matching the motor protection devices (provided by others) to the expected current draw. In no case should the blower be operated with inadequate motor overload protection.

Since regenerative blowers are dynamic compression devices, the performance limits shown in Tables 1 to 4 are applicable only for a gas with the same specific gravity, dynamic viscosity and chemical characteristics as air. For gases with different physical properties than air, the limits will be different from those shown in the tables. Please contact Airtech for assistance in determining the proper blower size and configuration if handling gases other than air.

A vacuum relief valve or pressure relief valve should always be installed at the suction or discharge of the regenerative blower. This will prevent operation outside the applicable ranges shown in Tables 1 to 4. If the relief valves were not specified in the ordering process, please contact Airtech for details, price and availability of the needed valves before commissioning the unit. Failure to use the proper relief valve may result in failure of the blower due to operation outside the applicable limits; any such failure is outside the scope of Airtech's standard warranty.

WARNING! Be sure to install the necessary personnel protection devices if unexpected shut-down of the unit presents danger of death or injury.

2. Installation

As illustrated in Figure 1, the Airtech 3BA blower can be installed in any physical configuration.

CAUTION! Regenerative blowers can have surface temperatures in excess of 120 F. To avoid burns or other physical injury, take care to avoid contact with the surfaces of the blower during and immediately after operation.

To ensure adequate cooling of the blower during operation, install the blower with the minimum clearance as indicated in the table below.

Minimum installation clearances, 3BA blowers

Range	Distance from fan guard to closest obstruction. (inches/mm)	Distance from cover (opposite of fan) to closest obstruction. (inches/mm)
3BA11 through 3BA14	1.4/34	0.79/20
3BA15 through 3BA19	2.1/53	1.57/40
3BA72 and 3BA73	1.3/34	1.18/30
3BA74 through 3BA76	2.1/54	1.18/30

Please note that it may be desirable, where possible, to allow for larger clearances to allow access for maintenance or repair personnel. The noted clearances are to ensure adequate air flow for cooling only and are a minimum requirement.

Failure to allow for the noted clearances may result in premature failure of the blower due to lack of cooling, even if all other precautions are taken as recommended. For specific advice about installations requiring closer clearances, please contact Airtech, Inc. for recommendations.

Airtech regenerative blowers can be mounted in any configuration, either horizontally or vertically mounted. It is not usually necessary to bolt the smaller blowers to a rigid surface during operation, though this may be desirable to reduce pipe vibration, movement and noise. Larger models should be bolted in place, especially when installed vertically, to prevent possible rotation, damage or injury due to start-up torque.

CAUTION! For installations at altitudes greater than 3250 Feet above sea level there will be a loss in capacity. Please contact your factory representative for assistance in determining the extent of the loss of capacity likely at your specific location.

WARNING! Be sure to follow all local codes and regulations with respect to installation and operation of the blower. The blower motor should be wired to a branch circuit disconnect and all other safety devices recommended by the relevant sections of NFPA 70, National Electrical Code, and in accordance with all applicable state and local regulations and requirements.

Installation Procedure

Perform the installation exactly in accordance with the following steps:

1. For vacuum operation, connect the suction pipe to connection A, and for pressure operation connect the pressure pipe to connection B (See Figure 1). Install startup screens before startup to protect pump from debris.

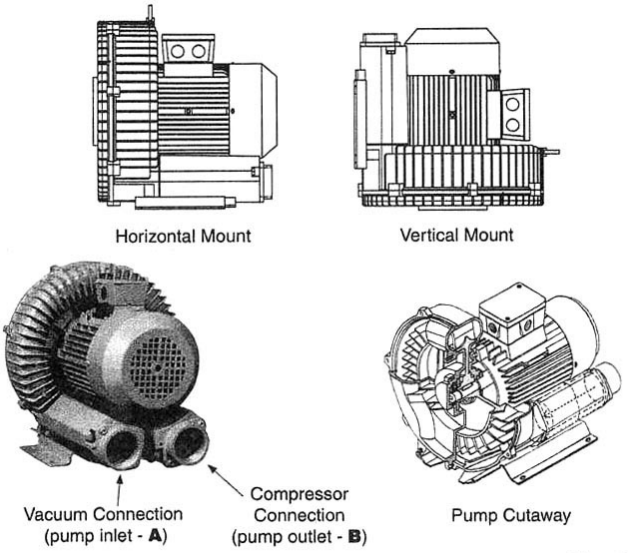


Figure 1

CAUTION! Design your piping system to avoid unnecessary pressure loss, which may significantly affect the operation of any regenerative blower. Contact your Airtech representative for assistance in designing and configuring an appropriate piping system for your application.

For alternation between vacuum and pressure in any application, changeover valves are available. Use of the changeover valve allows the same connection to be used for both vacuum and pressure.

2. The electrical data shown in Tables 1 to 4 should be confirmed by examination of the motor data plate on your 3BA blower. The motors feature Class F insulation as a standard and are UL recognized for applications in both Canada and the United States (CUL). Motors are IEC design IP55, equal to a NEMA TEFC motor design. The connection diagram for the motors can be found in the inside of the terminal box cover. Be sure to confirm that your electrical supply has sufficient capacity to operate the blower according to the nameplate requirements.

3. A magnetic motor starter should always be used to connect the motor to the power supply. It is advisable to use thermal overload motor starters to provide

maximum protection for the motor and wiring. All cabling used on starters should be secured with good quality cable clamps.

We recommend that the motor starters used feature a time delay trip on high amperage to avoid nuisance trips on start-up. When the unit is started cold, over amperage may be experienced for a short time due to the higher resistance of the windings at lower temperatures.

If using a change over or solenoid valve, ensure that the voltage connected to the valve matches that shown on the valve instructions or nameplate. Most valves are rated for 110 Volts 60Hz or 220 Volts 50 Hz. Connection of these valves to higher voltages may result in immediate valve failure.

WARNING! The electrical installation should be made by a qualified electrician and in complete compliance with all NFPA 70 (National Electrical Code) requirements along with all state and local code requirements. The main disconnect and motors starters are assumed to be provided by others.

4. Install the necessary relief valves and confirm their proper operation.

3. Start-up

CAUTION! Do not start the blower motor more than 10 times in one hour. If multiple and frequent start-ups are required by your application, install a minimum run timer in the motor control circuit to avoid decreased motor life and possible fire due to over-starting of the motor.

1. Before operation, confirm the correct direction of rotation by jogging (switching rapidly on and off) the motor and observing the motor fan rotation in the same direction as the arrow. If the direction of rotation is incorrect, lock out the power and switch two leads (three phase) or rewire (single phase) to effect the opposite rotation direction. Recheck the direction of rotation before proceeding.

2. Do not operate the blower at pressure or vacuum ranges that exceed those shown in Tables one through four for the model being installed. This can be achieved by use of the recommended relief valve shown in Table 5.

Note: Relief valves that have been factory pre-set have a label indicating the set pressure and an arrow indicating the direction of flow. The arrow will point into the pipe when installed in vacuum applications and out of the pipe when installed in pressure applications. Do not re-set the relief valve if it has been pre-set from the factory.

In the event the relief valve setting needs to be reset, adjust the set screw to increase or decrease the tension on the spring. Place the blower in operation and note the current draw of the motor. When the current draw of the motor is near the maximum noted on the motor nameplate, tighten the locking nut on the valve and proceed.

3. When checking the current draw of the motor with an ammeter, be sure to confirm the voltage at the motor junction box. Low voltage conditions may result in difficulty starting or in unexpected motor failure or motor starter trips.

Potential Risks for Operators

Noise emission: Free field noise limits are indicated in Tables one through four. Hearing protection is not normally required at the expected noise generation levels in the table; however, local conditions may result in higher ambient noise. If this is the case and local noise exceeds OSHA recommended levels for expected exposure time (typically 85 dBA for eight hours), hearing protection should be used.

4. Maintenance and Servicing

WARNING! Be sure the power supply is disconnected and locked out before attempting to do any maintenance on the unit. It is critical that the unit be locked out from starting during maintenance as severe injury or death could result from exposure to high voltage or rotating parts.

CAUTION! Allow the blower to cool to a surface temperature of lees than 100 F before attempting maintenance. Prolonged exposure to temperatures above 120F can cause severe burns.

Clean the blower surfaces periodically to avoid build up of dust or other debris. Build up of debris can cause overheating and premature failure of the blower.

If an inlet filter is being use, ensure that it remains clean during operation by examining the filter cartridge for debris build up. Replace dirty or clogged filter cartridges.

On pressure units, periodically clean the inlet mesh screen to avoid loss of capacity. If an external inlet filter is used, the filter element should be cleaned monthly or as frequently as required by local conditions. Excessive pressure drop will develop from use of clogged or dirty filters. This pressure drop will degrade blower performance and increase operating temperatures, leading possibly to premature pump failure.

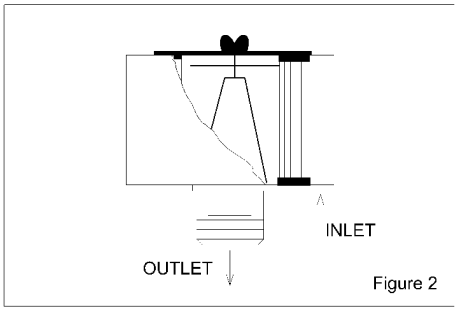


Figure 2

To replace the filter, remove the wing nut and cover. Remove the element and either clean with compressed air or replace. Reassemble in reverse order.

For vacuum applications, the optional in-line vacuum filter must be cleaned regularly, depending on local conditions. Cleaning can be achieved by blowing out with compressed air. If cleaning is not possible, replace the cartridge. Access the cartridge by unhooking the relevant clips and removing the cover.

CAUTION! Do not attempt to check the filter cartridge during operation of the blower. Only check the cartridge after disconnecting the power from the blower and locking out the power to prevent an unexpected start.

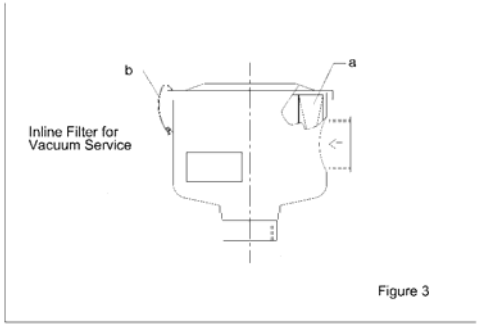


Figure 3

Bearings require regreasing with Exxon/Esso UNIREX N3 or equal grease after approximately 20,000 operating hours (normal conditions) or between 2 and 3 years after installation and commissioning. Do not mix grease types.

Troubleshooting Chart

Fault	Cause	Remedy	Responsible Party
Motor does not start, no noise.	Two or more power legs interrupted	Check fuses, terminals, etc.. for source of interruption and correct.	Electrician
Motor does not start, humming noise.	One power supply lead interrupted	Check fuses, terminals, etc.. for source of interruption and correct.	Electrician
	Impeller is jammed.	Open blower cover, remove debris, clean.	Service Technician
		Check impeller clearance and reset if necessary.	
	Defective Impeller	Replace impeller.	Service Technician
	Defective Bearing	Replace defective bearing.	Service Technician
Trip of motor starter at start-up	Incorrect starter setting	Ensure starter setting is correct (check current on nameplate)	Electrician
	Winding short-circuit	Megger motor	Electrician
	Motor overloaded due to operation of pump at excessive differential pressures.	Inspect filters, mufflers and connection pipes and clean as required. Check relief valve operation. Reset or replace as necessary.	Operator
	Impeller Jammed	See above fault Motor does not start, humming noise, cause jammed impeller.	Operator
Excessive Power Consumption	Lime or other deposits	Decalcify or clean unit as required (see Maintenance Chart)	Operator
No Vacuum or Pressure.	Severe leak in system	Close off pump and run deadheaded to confirm pump is operating properly. If so, find and fix leak in the system.	Operator
	Wrong direction of rotation	Check air flow direction and change direction of rotation if necessary.	Operator Electrician

Insufficient Vacuum	System too small	Use larger system	Operator
	Inlet piping too long or too small.	Increase pipe diameter to reduce pressure loss in inlet piping. Contact Airtech for assistance in determining correct pipe size.	Operator
	Leak at connection to vacuum system.	Check for leaks and repair if necessary.	Operator
	Density of gas handles different from air.	Consider increased limits on operation due to density differences. Consult Airtech, Inc. for assistance.	Airtech Engineering
	Change in impeller geometry due to erosion	Clean impeller and examine for wear. Replace if necessary.	Service Technician
	Inlet filter clogged.	Change filter element; remove clog.	Operator
	Vacuum relief valve incorrectly set.	Reset or replace vacuum relief valve. Contact Airtech for assistance.	Operator
	Seal defective.	Replace seal.	Service Technician
Abnormal flow noises.	Flow speed too high.	Clean pipes or use larger pipes to connect unit to process.	Operator
	Muffler soiled.	Clean muffler inserts, replace if necessary.	Operator
Abnormal running noise	Ball bearing defective or insufficient lubrication on bearing.	Re-grease or replace bearing as required.	Service Technician
Compressor leaky	Seals on muffler defective.	Tighten muffler connection. Replace gasket if necessary.	Operator
	Seals in motor area defective	Replace as necessary.	Service Technician

Repair on-site

WARNING! Before attempting an on-site repair, ensure that a qualified electrician has disconnected the motor from the power supply so that accidental starting of the motor is impossible.

After a repair and before re-installation be sure to follow the instructions noted in this manual under “Installation and Operation.”

Lifting

For smaller units (less than 65 lbs/ 30 kgs), it may be possible to lift the units manually. When doing so, be sure to understand the weight of the unit being lifted and to follow good lifting safety procedures.

Model	Weight Lbs/kgs	Model	Weight Lbs/kgs
3BA1300-7AT06	20/9	3BA1310-7AT26	33/15
2BA1300-7AT16	22/10	3BA1410-7AT36	55/25
3BA1400-7AT06	29/13	3BA1410-7AT46	59.5/29
3BA1400-7AT26	37.5/17	3BA1510-7AT46	86/39
3BA1500-7AT06	40/18	3BA1510-7AT56	97/44
3BA1500-7AT16	46.5/21	3BA1610-7AT26	104/47
3BA1500-7AT26	51/23	3BA1610-7AT36	119/54
3BA1500-7AT36	55/25	3BA1610-7AT46	163/74
3BA1600-7AT06	57.5/26	3BA1610-7AT56	172/78
3BA1600-7AT16	64/29	3BA1640-7AT36	128/58
3BA1600-7AT26	75/34	3BA1640-7AT46	172/78
3BA1600-7AT36	90.5/41	3BA1640-7AT56	181/82
3BA1800-7AT06	128/58	3BA1810-7AT16	250/113
3BA1800-7AT16	143/65	3BA1810-7AT26	260/118
3BA1800-7AT26	150/68	3BA1810-7AT36	316/143
3BA1900-7AT06	265/120	3BA1810-7AT46	341/155
3BA1900-7AT16	314/142	3BA1840-7AT26	260/118
		3BA1840-7AT36	316/143
		3BA1910-7AT16	409/186
		3BA1910-7AT36	455/206
3BA7210-0AT167	35.3/16	3BA7220-0AT567	61.7/28
3BA7310-0AT167	35.3/16	3BA7320-0AT567	66.1/30
3BA7410-0AT167	50.7/23	3BA7420-0AT267	72.7/33
3BA7510-0AT168	57.3/26	3BA7420-0AT567	86/39
3BA7510-0AT268	63.9/29	3BA7520-0AT268	88.2/40
3BA7610-0AT168	70.5/32	3BA7620-0AT368	106/48
3BA7610-0AT368	77.2/35	3BA7620-0AT568	143/65
		3BA7630-0AT668	207/94

When lifting 3BA15 through 3BA19 (but not 3BA1943 units) or the 3BA75 through the 3BA76, use the eye bolt provided (eye bolts are not included on smaller units). One attachment point should be sufficient. Ensure that the crane is rated for the weight being lifted.

For the 3BA1943, use the eye bolt and the holes in the feet of the blower to lift and maintain a balanced load.

Storage

The 3BA units should be stored in a clean, dry environment. If stored in an area with a humidity of greater than 80 percent, store in a closed container with desiccant drying agents to avoid damage.

Disposal

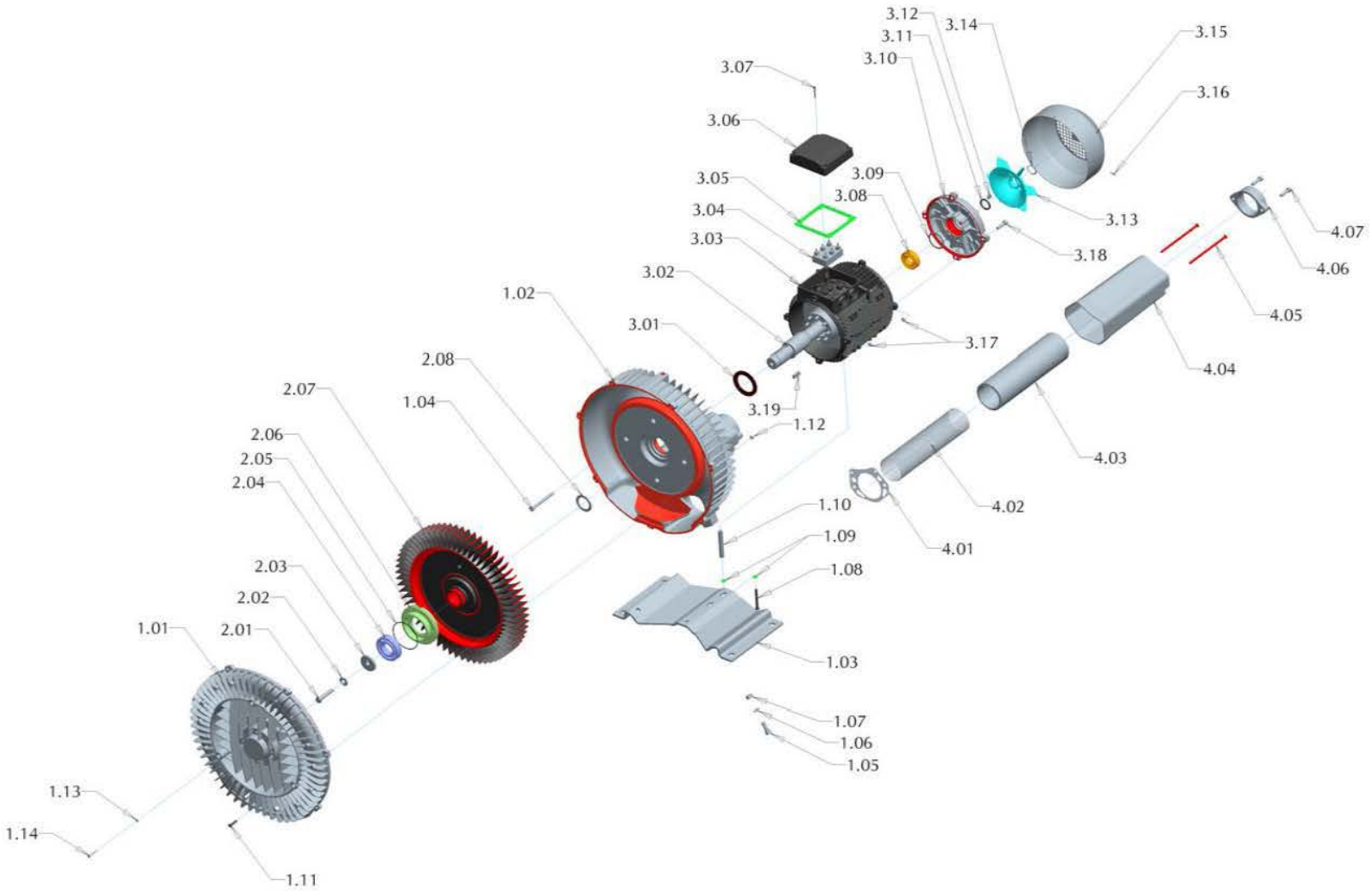
Dispose in accordance with all local health and safety regulations.

Spare parts list are available from your local Airtech service center. Please contact your local Airtech representative for assistance.

For additional assistance, please contact:

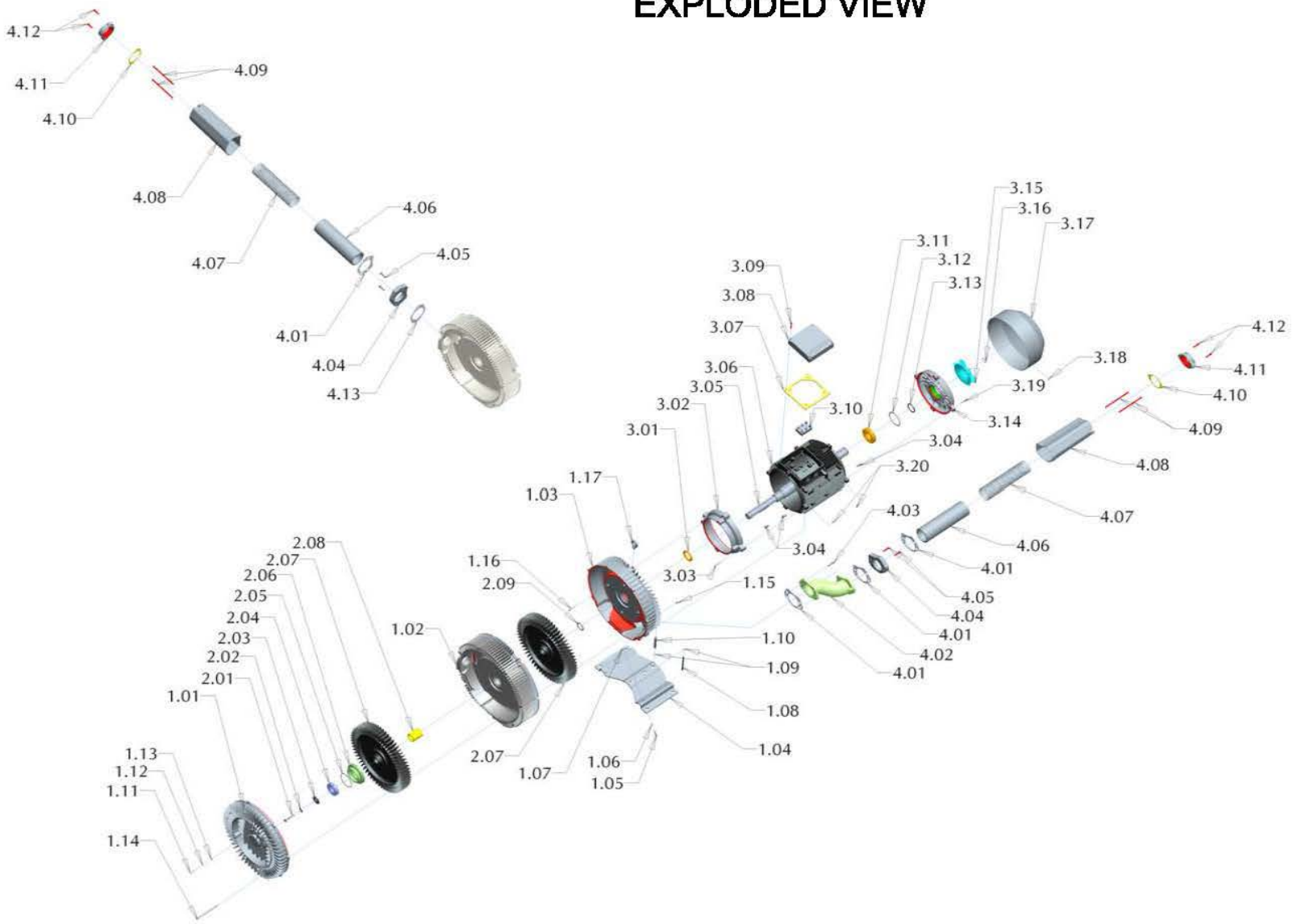
Airtech, Inc.,
150 South Van Brunt Street
Englewood, NJ, 07631
Phone: 1-201-569-1173
Fax: 201-569-1696.

3BA1 SINGLE STAGE
EXPLODED VIEW



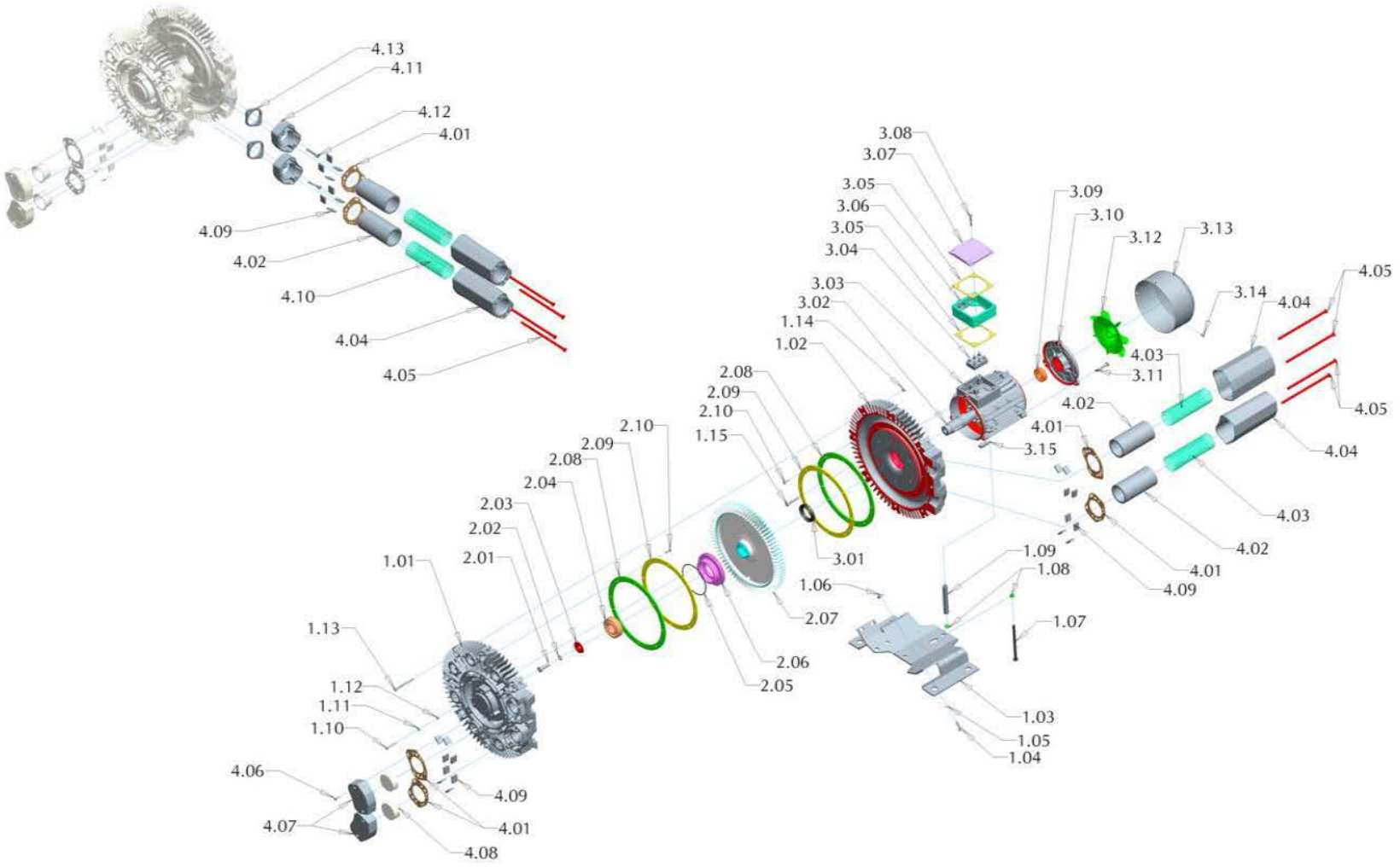
No.	Qty.	Description
1.01	1	Cover
1.02	1	Housing
1.03	1	Mounting Plate
1.04	4	Motor Mounting Screw
1.05	2	Mounting Plate Screw
1.06	2	Mounting Plate Washer
1.07	2	Mounting Plate Nut
1.08	1	Stator Support Screw
1.09	2	Stator Support Washer
1.10	1	Stator Support Sleeve
1.11	8	Cover Mounting Screw
1.12	8	Cover Mounting Nut
1.13	4	Bearing Cover Washer
1.14	4	Bearing Cover Screw
2.01	1	Shaft Screw
2.02	1	Shaft Lock Washer
2.03	1	Disc
2.04	1	Bearing
2.05	1	Bearing Cover O-Ring
2.06	1	Bearing Cover
2.07	1	Impeller
2.08	1	Disc
3.01	1	Seal
3.02	1	Motor Rotor
3.03	1	Stator
3.04	1	Terminal Block
3.05	1	Motor Terminal Box Gasket
3.06	1	Cover For Terminal Box
3.07	4	Terminal Box Cover Screw
3.08	1	Rear Bearing
3.09	1	Bearing Preloading Ring
3.10	1	End Shield
3.11	1	Tolerance Ring
3.12	1	Shaft Key
3.13	1	External Fan
3.14	1	Retaining Ring
3.15	1	Fan Cowl
3.16	4	Fan Cowl Screw
3.17	8	Stator Nut
3.18	4	End Shield Screw
3.19	1	Parallel Key
4.01	2	Silencer Gasket
4.02	2	Silencer Insert
4.03	2	Silencer Insert Filler
4.04	2	Silencer Casing
4.05	4	Silencer Screw
4.06	2	Flange
4.07	4	Flange Screw

3BA1 TWO STAGE
EXPLODED VIEW



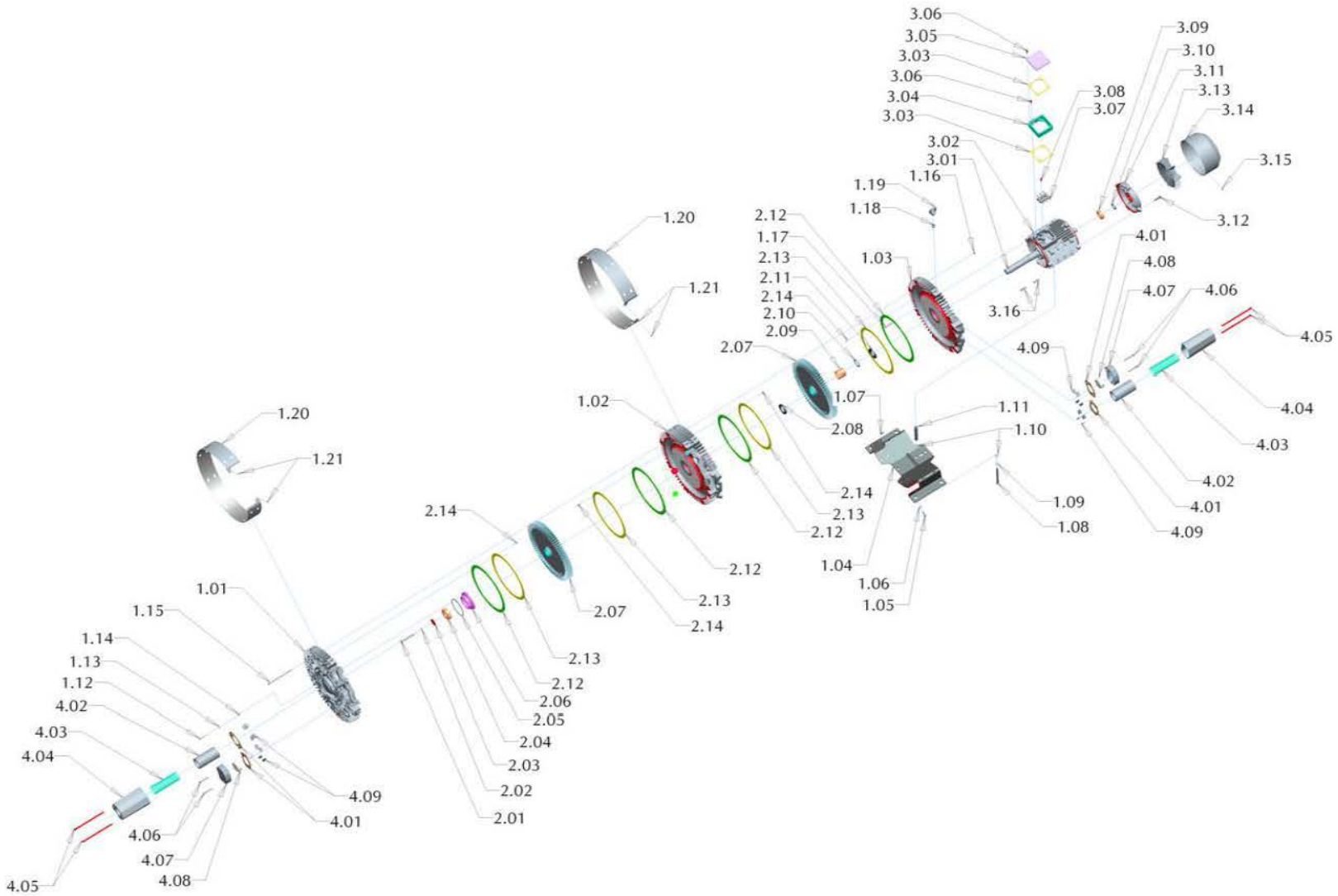
No.	Qty.	Description
1.01	1	Cover
1.02	1	Center Section
1.03	1	Blower Housing
1.04	1	Mounting Plate
1.05	2	Plate Mounting Screw
1.06	2	Mounting Plate Washer
1.07	2	Mounting Plate Nut
1.08	1	Stator Support Screw
1.09	2	Stator Support Washer
1.10	1	Stator Support Sleeve
1.11	4	Bearing Cover Screw
1.12	4	Bearing Screw Washer
1.13	4	Bearing Ring Seal
1.14	8	Cover Mounting Screw
1.15	8	Cover Mounting Nut
1.16	4	Motor Mounting Screw
1.17	1	Lifting Ring
2.01	1	Shaft Screw
2.02	1	Shaft Lock Washer
2.03	1	Disc
2.04	1	Bearing
2.05	1	Bearing Cover O-Ring
2.06	1	Bearing Cover
2.07	2	Impeller
2.08	1	Sleeve
2.09	1	Disk
3.01	1	Shaft Seal Ring
3.02	1	Motor Attachment
3.03	4	Motor Attachment Screw
3.04	3	Parallel Key
3.05	1	Motor Rotor
3.06	1	Stator
3.07	1	Motor Terminal Box Gasket
3.08	1	Cover For Terminal Box
3.09	4	Terminal Box Cover Screw
3.10	1	Terminal Block
3.11	1	Rear Bearing
3.12	1	End Shield Seal
3.13	1	Rotary Shaft Lip Seal
3.14	1	End Shield
3.15	1	External Fan
3.16	1	Retaining Ring
3.17	1	Fan Cowl
3.18	4	Fan Cowl Screw
3.19	4	End Shield Screw
3.20	8	Stator Nut
4.01	4	Silencer Gasket
4.02	1	Silencer Attachment
4.03	2	Silencer Attachment Screw
4.04	2	Silencer Flange
4.05	4	Silencer Flange Screw
4.06	2	Silencer Insert Filler
4.07	2	Silencer Insert
4.08	2	Silencer Casing
4.09	4	Silencer Screw
4.10	2	Flange Gasket
4.11	2	Flange
4.12	4	Flange Screw
4.13	1	Side Silencer Gasket

3BA7 SINGLE STAGE
EXPLODED VIEW



No.	Qty.	Description
1.01	1	Cover
1.02	1	Housing
1.03	1	Mounting Plate
1.04	4	Plate Mounting Screw
1.05	4	Mouting Plate Washer
1.06	4	Mounting Plate Nut
1.07	1	Stator Support Screw
1.08	2	Stator Support Washer
1.09	1	Stator Support Sleeve
1.10	3	Bearing Cover Screw
1.11	3	Bearing Screw Washer
1.12	3	Bearing Ring Seal
1.13	8	Cover Mounting Screw
1.14	8	Cover Mounting Nut
1.15	3	Motor Mounting Screw
2.01	1	Shaft Screw
2.02	1	Shaft Lock Washer
2.03	1	Disc
2.04	1	Bearing
2.05	1	Bearing Cover O-Ring
2.06	1	Bearing Cover
2.07	1	Impeller
2.08	2	Teflon Seal
2.09	2	Retaining Ring
2.10	16	Inner Seal Screw
3.01	1	Shaft Seal Ring
3.02	1	Motor Rotor
3.03	1	Stator
3.04	1	Terminal Block
3.05	2	Motor Terminal Box Gasket
3.06	1	Terminal Box
3.07	1	Cover For Terminal Box
3.08	4	Terminal Box Cover Screw
3.09	1	Rear Bearing
3.10	1	End Shield
3.11	3	End Shield Screw
3.12	1	External Fan
3.13	1	Fan Cowl
3.14	4	Fan Cowl Screw
3.15	1	Parallel Key
4.01	4	Silencer Gasket
4.02	2	Silencer Insert Filler
4.03	2	Silencer Insert
4.04	2	Silencer Casing
4.05	4	Silencer Screw
4.06	4	Flange Screw
4.07	2	Flange Cap
4.08	2	Flange Filler
4.09	16	Filler
4.10	2	Silencer Insert
4.11	2	Flange
4.12	4	Flange Screw
4.13	2	Flange Gasket

3BA7 TWO STAGE
EXPLODED VIEW



No.	Qty.	Description
1.01	1	Cover
1.02	1	Center Section
1.03	1	Housing
1.04	1	Mounting Plate
1.05	4	Plate Mounting Screw
1.06	4	Mounting Plate Washer
1.07	4	Mounting Plate Nut
1.08	1	Stator Support Screw
1.09	1	Stator Support Lock Washer
1.10	2	Stator Support Washer
1.11	1	Stator Support Sleeve
1.12	3	Bearing Cover Screw
1.13	3	Bearing Screw Washer
1.14	3	Bearing Ring Seal
1.15	8	Cover Mounting Screw
1.16	8	Cover Mounting Nut
1.17	4	Motor Mounting Screw
1.18	1	Lifting Ring Nut
1.19	1	Lifting Ring
1.20	2	Blower Cowl
1.21	4	Blower Cowl Screw
2.01	1	Shaft Screw
2.02	1	Shaft Lock Washer
2.03	1	Disc
2.04	1	Bearing
2.05	1	Bearing Cover O-Ring
2.06	1	Bearing Cover
2.07	2	Impeller
2.08	1	Rotary Shaft Seal
2.09	1	Sleeve
2.10	1	Disk
2.11	1	Shaft Seal Ring
2.12	4	Teflon Seal
2.13	4	Retaining Ring
2.14	32	Inner Seal Screw
3.01	1	Motor Rotor
3.02	1	Stator
3.03	2	Motor Terminal Box Gasket
3.04	1	Terminal Box
3.05	1	Cover For Terminal Box
3.06	8	Terminal Box Screw
3.07	1	Terminal Block
3.08	1	Terminal Block Screw
3.09	1	Rear Bearing
3.10	1	End Shield Disk
3.11	1	End Shield
3.12	4	End Shield Screw
3.13	1	External Fan
3.14	1	Fan Cowl
3.15	4	Fan Cowl Screw
3.16	2	Parallel Key
4.01	4	Silencer Gasket
4.02	2	Silencer Insert Filler
4.03	2	Silencer Insert
4.04	2	Silencer Casing
4.05	4	Silencer Screw
4.06	4	Flange Screw
4.07	2	Flange Cap
4.08	2	Flange Filler
4.09	16	Filler

Airtech, Inc. ("Company") Warranty Statement

Company warrants that on the date of shipment to Purchaser the goods will be of the kind and quality described herein, merchantable, and free of all defects in workmanship and materials.

If within one year from the date of initial operation, but not more than eighteen months from date of shipment by the Company, of any item of the goods, Purchaser discovers that such item was not as warranted above and promptly notifies Company in writing thereof, Company shall remedy such defect by, at the Company's option, adjustment, repair or replacement of the item and any affected part of the good. Purchaser shall assume all responsibility and expense for removal, reinstallation and freight in connection with the foregoing remedy. The same obligations and conditions shall extend to replacement items furnished by the Company hereunder. Company shall have the right of disposal of items replaced by it. Purchaser shall grant Company access to the goods at all reasonable times in order for Company to determine any defect in the goods. In the event that adjustment, repair or replacement does not remedy the defect, the Company and Purchaser shall negotiate in good faith an equitable adjustment in the contract price.

The Company's responsibility does not extend to any item of the goods which has not been manufactured and sold by the Company. Such item shall be covered only by the express warranty, if any, by the manufacturer thereof. The Company and its suppliers shall also have no responsibility if the goods have been improperly stored, handled or installed, or if the goods have not been operated or maintained according to their ratings or according to the instructions in Company or supplier furnished manuals, or if unauthorized repairs or modifications have been made to the goods.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES (EXCEPT TITLE) INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS, AND CONSTITUTES THE ONLY WARRANTY OF COMPANY WITH RESPECT TO THE GOODS.

The forgoing states Purchaser's exclusive remedy against Company and its suppliers for any defect in the good or for failure of the goods to be as warranted, whether Purchaser's remedy is based on contract, warranty, failure of such remedy to achieve its essential purpose, tort (including negligence), strict liability, indemnity, or any other legal theory, and whether arising out of warranties, representations, instructions, installations, or defects from any cause.

Neither Company nor its suppliers shall be liable, whether in contract, warranty, failure of a remedy to meet its essential purpose, tort (including negligence), strict liability, indemnity or any other legal theory, for loss of use, revenue or profit or for cost of capital or of substitute use or performance or for indirect, liquidated, incidental or consequential damages or for any other loss or cost of a similar type, or for claims by Purchaser for damages of Purchaser's customers.

For Further Information Please contact:

AIRTECH® VACUUM
150 South Van Brunt St.
Englewood, NJ 07631
Tel: 1-888-222-9940
Fax: 201-569-1696
airtech@airtechusa.com

AIRTECH® VACUUM SOUTH
2211 Newmarket Parkway
Marietta, GA 30067
Tel: 770-690-0700
Fax: 770-690-0709
airtechsouth@airtechusa.com

AIRTECH® VACUUM WEST
42 Digital Drive #9
Novato, CA 94949
Tel: 415-382-9000
Fax: 415-382-9700
airtechwest@airtechusa.com

www.airtechusa.com

Moisture Separator #AWS80-4

ESD Waste2Water, Inc.
Partnership for a Cleaner Tomorrow

Air / Water Separators



ESD Waste2Water, Inc. ESD custom fabricates Air / Water Separators for Soil Vapor Extraction and Dual Phase Extraction applications. Made of structurally sound, light-weight marine grade 5052 aluminum, our separators can withstand full vacuum applications and are completely corrosion resistant. Unlike carbon steel based separators, ESD Separators resist both internal chemical corrosion and the harshest external environmental conditions. The aesthetic qualities of ESD Separators are never compromised by oxidation. ESD Separators never experience corrosive pitting leaks, because our designs render expensive internal/external epoxy mastic coatings entirely unnecessary.

ESD Separators are available in many standard sizes and can be custom designed with a wide variety of options, including pump out systems, level gauging, additional particulate filtration, and baffling for high entrained

UL® Certified to UL-508A Standards

Thank you for allowing ESD to provide a solution to your equipment needs.





ESD Waste2Water, Inc.
495 Oak Road
Ocala, FL 34472
Tel: 800.277.3279 Fax: 352.680.9278
www.waste2water.com



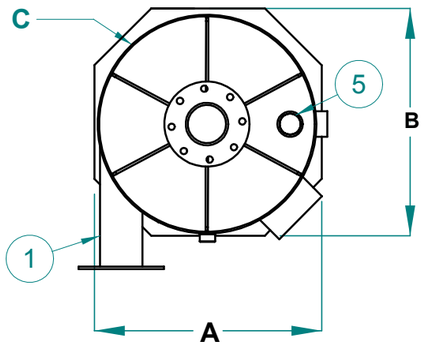
STANDARD AWS SPECIFCATION

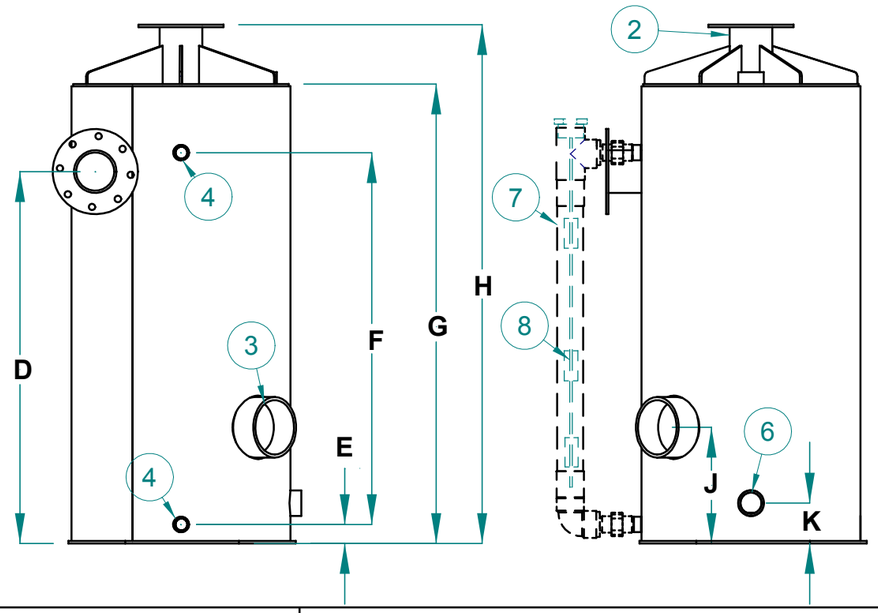
TYPE	WORKING VOLUME @(LSH)	AVAILABLE CONNECTION TYPE																CLEAN OUT PIPE	A	B	C (DIA.)	D	E	F	G	H	J
		FLANGE						MNPT					FNPT														
		2"	3"	4"	6"	8"	10"	2"	3"	4"	6"	8"	2"	3"	4"	6"	8"										
AWS30	12 GAL	X	X	X	-	-	-	X	X	X	-	-	X	X	X	-	-	6"	-	-	16 1/4"	25"	2"	19"	30"	33 1/2"	6"
AWS60	24 GAL	X	X	X	X	-	-	X	X	X	X	-	X	X	X	-	-	6"	24"	24"	23"	25"	2"	23"	30"	36 1/2"	6"
AWS80	47 GAL	X	X	X	X	-	-	X	X	X	X	-	X	X	X	-	-	8"	24"	24"	23"	39"	2"	39"	48"	54 3/4"	12"
AWS120	50 GAL	X	X	X	X	X	-	X	X	X	X	-	X	X	X	-	-	8"	24"	24"	23"	49"	2"	49"	60"	66 3/4"	12"
AWS220	107 GAL	-	X	X	X	X	X	X	X	X	X	-	X	X	X	-	-	8"	34"	34"	33 1/2"	49"	2"	49"	60"	66 3/4"	12"

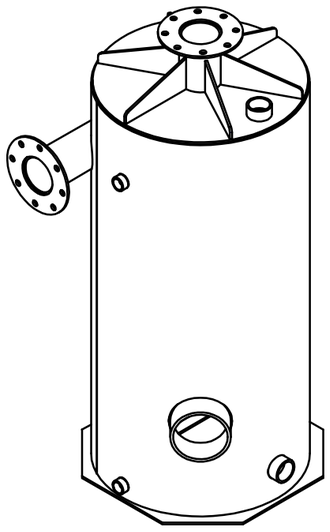
RECOMMENED AIR FLOW (ACFM)						
	2"	3"	4"	6"	8"	10" *
ACFM	120	280	320	500	750	1000

ITEM #	DESCRIPTION
1	INLET PIPE (SEE TABLE FOR AVAILABLE SIZE AND CONNECTION TYPE)
2	OUTLET PIPE (SEE TABLE FOR AVAILABLE SIZE AND CONNECTION TYPE)
3	CLEAN OUT
4	1" FNPT (MULTI LEVEL PROBE)
5	2" FNPT
6	2" FNPT
7	SIGHT TUBE 2" CLEAR PVC
8	MULTI LEVEL PROBE

NOTES:
1.MATERIAL : 1/8" & 3/16" ALUMINUM SHT 5052
2. PROBE (SIGHT TUBE) : 2" CLEAR PVC
3. CUSTOM SIZES AVAILABLE







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ESD Waste2Water, Inc.

495 Oak Road
Ocala, FL 34472
Phone (800) 277-3279
Fax (352) 680-0059

SCALE VERIFCATION

THIS BAR REPRESENTS ONE INCH ON ORIGNAL DRAWING

1"

USE TO VERIFY DRAWING

SIZE: B **SHEET #:** 1 OF 1

SCALE: NTS

UPDATED BY:

DRAWN BY: J.ANDREWS

APPROVED BY: N/A

COMPLETED: 06/15/10

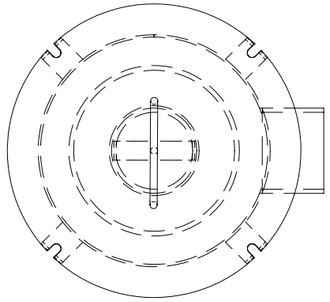
UPDATED:

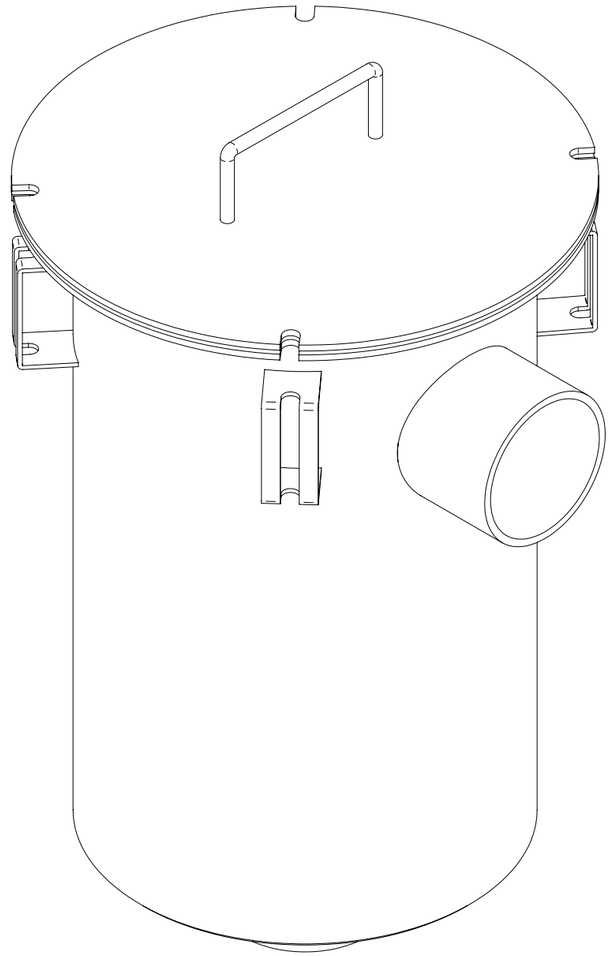
AWS SPECIFICATIONS
GENERAL LAYOUT

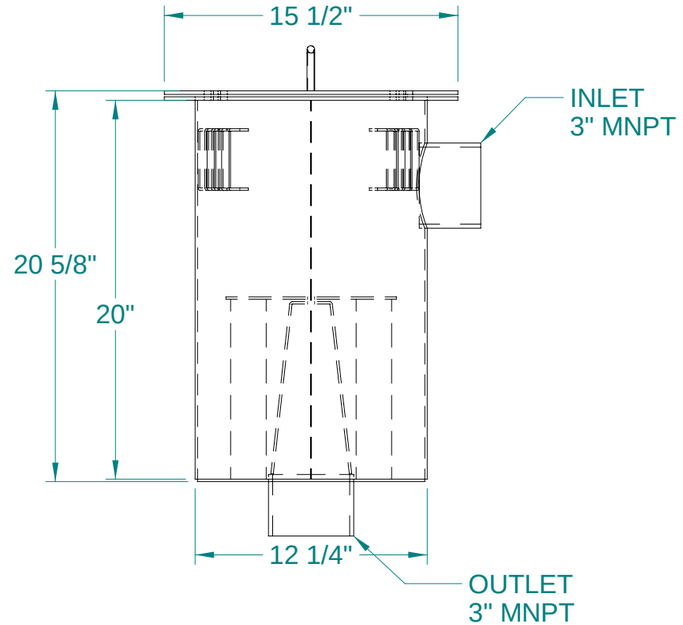
JOB NUMBER:

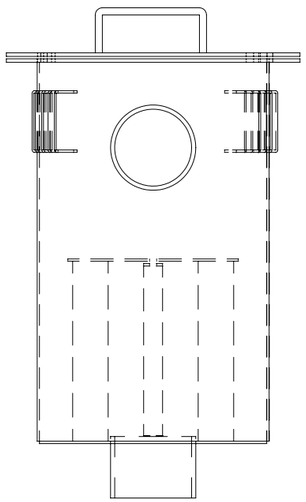
PRODUCT NUMBER: **AWS**

FILE NAME: "AWS SPEC.dft"









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ESD Waste2Water, Inc.

2140 Northeast 36th Avenue, Building 100
Ocala, FL 34470
Phone (800) 277-3279
Fax (352)867-1320

IPF 300 MNPT 2006
w/ p 235 FILTER ELEMENT.

DRAWN BY: J. ANDREWS
APPROVED BY:
DATE: 6/2I/06
UPDATE:

SIZE B **SHEET** 1 OF 1
PART NO.
SCALE:

SCALE VERIFCATION

THIS BAR REPRESENTS ONE INCH ON ORIGNAL DRAWING

1"

USE TO VERIFY DRAWING

Replacement Elements
35 - 6600 SCFM Flow Range



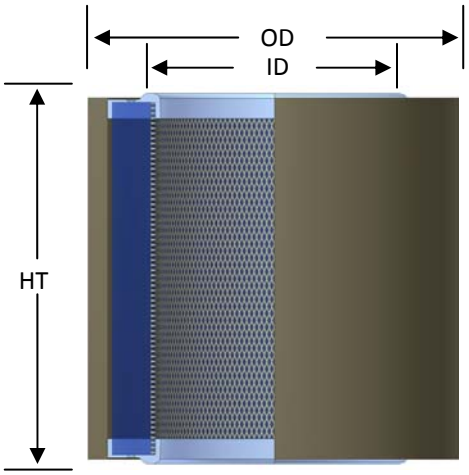
Small Elements
with Molded Endcaps



Compact & Large Elements
with Metal Endcaps

Features

- Pleated media for high dirt holding capacity
- Polyester: Reinforced with epoxy coated steel wire on both sides of cloth
- Paper: Heavy duty industrial strength paper surrounded by heavy gauge galvanized expanded metal
- 40 - 50% increased dust loading capacity with prefilter (part number suffix P)
- Optimal surface area per given size



Technical Specifications

- Polyester: 99%+ removal efficiency to 5 micron
- Paper: 99%+ removal efficiency to 2 micron
- Temp (continuous): min -26°F (-15°C), max 220°F (104°C)
- Filter change out differential: 15-20" H2O over initial Δ P

Polyester Media Benefits

- Washable with lukewarm water & mild detergent
- Less maintenance due to longer durability
- Moisture resistant
- Handles hot air and oil mist from unload cycle of reciprocating/ piston compressor

Paper Media Benefits

- Optimal surface area per given size
- Higher efficiency than many alternative media
- Cost effective

www.solbergmfg.com • sales@solbergmfg.com • Sales: 630.773.1363 • Fax: 630.773.0727

Replacement Elements—up to 300 SCFM flow

Element Part Number		Element SCFM	Surface Area ft²		Dimensions - inches			STD Endcap
Polyester	Paper	Rating	Polyester	Paper	ID	OD	HT	Features
15P	14P	35	0.50	1.12	3	4 3/8	2 5/16	M
19P	18P	100	1.50	3.00	3	4 3/8	4 3/4	M
31P	30P	195	2.30	6.20	3 5/8	5 3/4	4 3/4	M
35P	34P	275	4.00	11.00	4 3/4	7 7/8	4 13/16	M
231P	230P	300	4.50	11.8	3 5/8	5 3/4	9 1/2	M

Note: Also available in wire mesh. Example part number for wire mesh: 230S

Dimension tolerance ± 1/4”

See Element Technical Data section for maintenance guidelines

Replacement Elements—up to 6600 SCFM flow

Element Part Number		Element SCFM	Surface Area ft²		Dimensions - inches			STD Endcap
Polyester	Paper	Rating	Polyester	Paper	ID	OD	HT	Features
235P	234P	570	8.3	22.8	4 3/4	7 7/8	9 5/8	M
335P	334P	800	12	34	4 3/4	7 7/8	14 1/2	M
237	236	550	8.6	22.6	4 2/3	7 3/4	8 1/2	GBN
239P	238P	570	11.5	52	4 7/8	9 1/4	10	GBN
245P	244P	880	14	35.5	6	9 3/4	9 5/8	GN | M
345P	344P	1100	22.1	57	6	9 3/4	14 1/2	GN
275P	274P	1100	19	45.4	8	11 3/4	9 5/8	GN
375P	374P	1500	28	68.1	8	11 3/4	14 1/2	GN
377P	376P	1825	50	125	9	14 5/8	14 1/2	GN
385P	384P	3300	50	140	14	19 5/8	14 1/2	GN
485P	484P	4705	75	200	14	19 5/8	21 1/2	GN
685P	--	6600	100	--	14	19 5/8	28 1/2	GN

Note: Most are available in wire mesh. Example part number for wire mesh: 244S

Dimension tolerance ± 1/4

See Element Technical Data section for maintenance guidelines

Endcap Information

M = Molded plastisol

B = Closed one end with **b**olt hole, open on other end

G = **G**alvanized metal endcaps

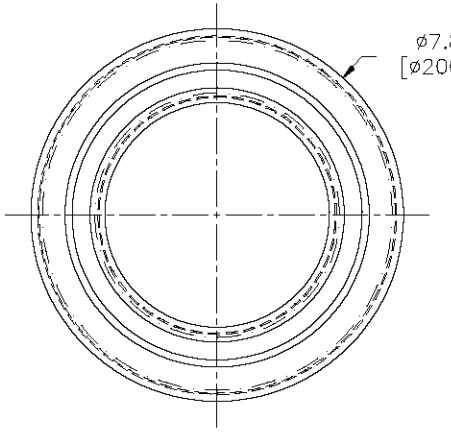
N = Neoprene gaskets on open end(s)

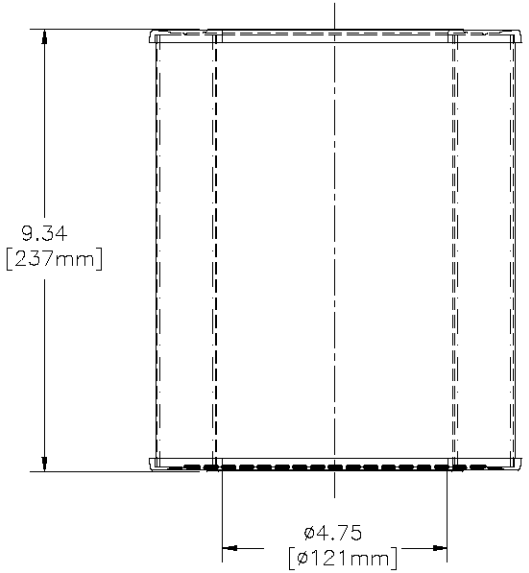
Additional Media Options

- 1, 4, 25, and 100 micron Polyester
- HEPA
- Stainless steel wire mesh
- High temperature Nomex
- Stainless steel Nomex reinforced by stainless steel wire mesh & expanded metal
- Polypropylene
- Activated carbon

Note: Model offerings and design parameters may change without notice. See www.solbergmfg.com for most current offering.

REVISIONS						
ZONE	REV	DESCRIPTION	ECN #	CHG BY	DATE	APP'D





REPLACEMENT ELEMENT# 235P	
MATERIAL	PAPER
CFM FLOW	570
SURFACE AREA	8.3 SQ. FT.
I.D.	SEE DRAWING
O.D.	SEE DRAWING
HEIGHT	SEE DRAWING

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–REF: APPROXIMATE DIMENSIONS, NO TOLERANCES APPLY
–TOLERANCES ARE:
DECIMALS: .XX ±.25, .XXX ±.125
ANGLES ±2°

CUSTOMER APPROVAL:

SOLBERG MANUFACTURING INC.
1151 W. ARDMORE AVE.
ITASCA, IL 60143
630/773-1363

DESCRIPTION:
235P Element

SALES REP.: E. MURO

APPROVALS	DATE
DRAWN: CRW	11/18/03
APPROVED: T.S.	11/18/03

SHEET: 1 of 1 | SHEET SIZE: C | SCALE: 1:2

DRAWING NUMBER: SD11224 | REV: —

Absorptive Silencers

Air Intake and Discharge

"SLCR" Series 1/2" - 4" MPT, FPT

APPLICATIONS & EQUIPMENT

- Small Air Compressors
- Centrifugal Blowers
- Regenerative Blowers
- Vacuum Pumps & Systems
- Vacuum Packaging Equipment
- Vacuum Lifters
- Small Low Pressure Vents
- Blowers - Side Channel

FEATURES & SPECIFICATIONS

- Layered sound absorbent media
- **Minimal** pressure drop because it does not rely on internal baffles, tubes or other restrictive devices
- Reduces high frequency noise up to 30 decibels (Due to the wide range of applications and machines these units are used on, please inquire for your specific application.)
- **Inlet or Discharge** silencing applications with maximum temperature of 212°F (100°C)
- Durable inline carbon steel construction with baked enamel finish
- For inline air service

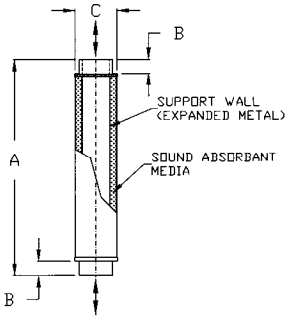
OPTIONS (Inquiries Encouraged)

- Flange Adapters
- Larger sizes available

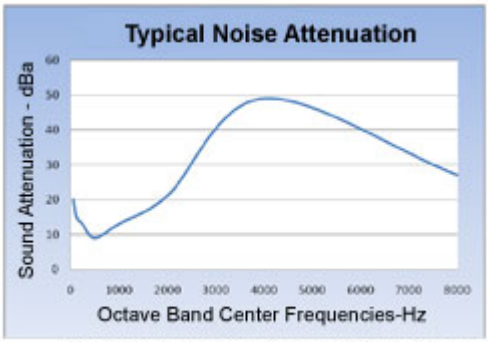
CONFIGURATION



DRAWING



Dimension tolerance ± 1/4"



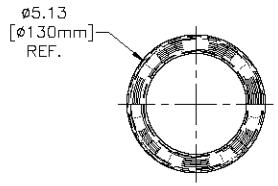
Note: Noise attenuation may vary due to the wide range of applications and equipment.

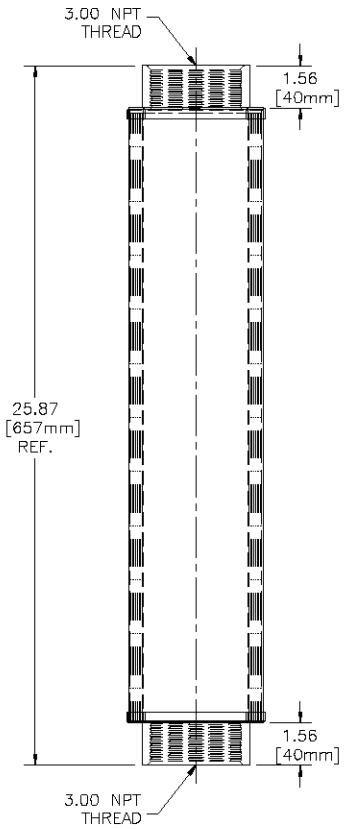
Model No.	Inlet & Outlet	Connection Style	DIMENSIONS - inches A	B	C	Rated Flow SCFM	Approx. Wt. Lbs
SLCR100	1"	FPT	12	11/16	2 1/2	42	2
SLCR125	1 1/4"	FPT	12	11/16	2 1/2	55	2
SLCR150	1 1/2"	FPT	12	11/16	3 1/8	155	3
SLCR200	2"	FPT	15 3/4	11/16	3 5/8	270	4
SLCR250	2 1/2"	FPT	21	1 1/2	4 5/8	385	8
SLCR300	3"	FPT	26	1 9/16	5 1/8	575	10
SLCR400	4"	FPT	23 7/8	1 11/16	10	575	26
SLCRT050	1/2"	MPT	14 1/2	2	2 1/2	25	2
SLCRT075	3/4"	MPT	14 1/2	2	2 1/2	35	2
SLCRT100	1"	MPT	14 1/2	2	2 1/2	42	2
SLCRT125	1 1/4"	MPT	14 1/2	2	2 1/2	55	2
SLCRT150	1 1/2"	MPT	14	1 3/4	3 1/8	155	3
SLCRT200	2"	MPT	18 1/2	2 1/8	3 5/8	270	4
SLCRT250	2 1/2"	MPT	23 11/16	2 5/8	4 5/8	385	8
SLCRT300	3"	MPT	28	2 5/8	5 1/8	575	10
SLCRT400	4"	MPT	29 5/16	4	10	575	26

Note: Model offerings and design parameters may change without notice.

1151 Ardmore Ave. ♦ Itasca, IL 60143 USA
Sales/Service: 630.773.1363 ♦ Fax: 630.773.0727
E-mail: sales@solbergmfg.com ♦ Web Site: www.solbergmfg.com

REVISIONS						
ZONE	REV	DESCRIPTION	ECN #	CHG BY	DATE	APP'D





MODEL#	HOUSING MATERIAL	FINISH
SLCR300	CARBON STEEL	BAKED ENAMEL GREY

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–TOLERANCES ARE:
DECIMALS: .XX ±.25, .XXX ±.125
ANGLES ±2°

CUSTOMER APPROVAL:

SOLBERG MANUFACTURING INC.
1151 W. ARDMORE AVE.
ITASCA, IL 60143
630/773-1363

DESCRIPTION: SLCR300

SALES REP.: C.SOLBERG	
APPROVALS	DATE
DRAWN: CRW	10/06/05
APPROVED: A.A.	10/06/05

SHEET: 1 of 1 | SHEET SIZE: C | SCALE: NTS

DRAWING NUMBER: SD12468 | REV: —

2. Sub-Slab Depressurization Instrumentation/Switches

Vacuum Gauges (0-100” H2O)
Model#25-200-100-In.H2O Vac

Pressure Gauge (0-30” H2O)
Model#25-200-30-In.H2O



GENERAL INFORMATION

NOSHOK 200 Series Diaphragm Gauges are designed for extremely low pressure or vacuum measurement. The ultra sensitive diaphragm capsules are rated for pressure (or vacuum) as low as 0-10 **inches of water** and as high as 0-10 **psi**.

The cases are constructed of black painted steel on the 2 ½" size and 304 Stainless Steel on the 4" size. The lenses are molded plexiglass on the 2½" size and instrument glass on the 4" size for strength and clarity. The diaphragm capsules are phosphor bronze and when coupled to the precision all-brass movements, provide extremely accurate indication over the service life of the gauge.

Available options include a recalibrator on the 2½" size (accessible through the front of the dial) and overpressure protection of up to 200% of the dial range. Mounting options include 304 stainless steel or black steel triangular bezels and U-Clamps in addition to chrome or black steel front flanges.

Applications for **NOSHOK 200 Series Gauges** include medical, biomedical, heating-ventilating and air conditioning, gas distribution, filtration, burner and gas combustion service, waste water treatment and everywhere low pressure and vacuum measurement is required.

Installation

Prior to pressure gauge installation, the following conditions should be considered: temperature, humidity, vibration, pulsation, shock, and other climatic and environmental conditions of the application, as well as the potential need for protective accessories and/or special installation requirements.

Always use a wrench on the gauge socket when installing a NOSHOK pressure gauge into position; never use force on the gauge case to tighten into position. This may result in a loss of accuracy, excessive friction and/or mechanical damage to the measuring element and case of the NOSHOK pressure gauge. When surface or panel mounting a gauge, be sure the surface is flat and the panel cutout and/or the mounting hole configuration is correct (please refer to the NOSHOK Pressure Gauge catalog NK95G for these specifications). If the surface is uneven or the panel cutout is larger than the gauges diameter, use an adapter ring to remove mounting strain and/or adapt the gauge to the larger diameter panel cutout. When connecting a gauge to a rigid pipe service, use flexible tubing where possible as a connector to eliminate plumbing strain. Rapid pressure pulsation and extreme mechanical vibration may be damaging to some NOSHOK pressure gauge movement gearing, bushings, and linkage. In extreme cases, steps should be taken to dampen these forces. In pressure ranges over 600 psi, a NOSHOK orifice is recommended for pulsation dampening, but in extreme pulsation applications a NOSHOK Piston Type Pressure Snubber may be required.

When installing a gauge into a corrosive situation be sure to select a pressure gauge or pressure gauge and diaphragm seal combination suitable for your application. Gauges to be used on high temperature service should have a five foot or longer leg of pipe or tubing connecting the gauge to dissipate heat and protect the gauge measuring element from damage.

A gauge to be used on steam pressure service should be installed with a water filled NOSHOK pigtail steam siphon between the gauge and the steam line.

Maintenance

Apart from occasional calibration, NOSHOK pressure gauges require little or no maintenance. Some applications may be more aggressive than others, resulting in an increased frequency in the need for calibration. The environmental limitations for the specific NOSHOK pressure gauge series should be observed in all cases, and gauges applied in situations outside these requirements may result in premature wear and/or failure of the gauge.

Warranty

All NOSHOK pressure gauges carry a one or three year warranty. NOSHOK warrants for three years our 300, 500, 600, 700 and 900 series liquid filled pressure gauges to be free from defects in materials and workmanship, to remain within the cataloged accuracy and performance specifications, and to maintain the integrity of the hermetically sealed case preventing leakage. NOSHOK warrants for one year our 100, 200, 400, 600, 700, and 800 series non-liquid filled pressure gauge. Certain limitations do apply; for more information please consult page three of the NOSHOK Pressure Gauges catalog (NK95G).

Please do not hesitate to contact us with any additional questions.

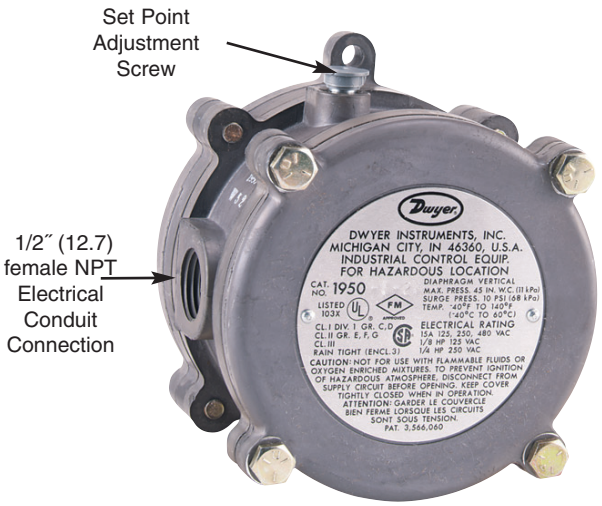
The Instrumentation Company
NOSHOK INCORPORATED

1010 WEST BAGLEY ROAD
BEREA, OHIO 44017
440/243-0888 FAX 440/243-3472
E-MAIL: noshok@noshok.com
WEBSITE: www.noshok.com

Bulletin E-57

Series 1950 Explosion-Proof Differential Pressure Switches

Specifications - Installation and Operating Instructions



Series 1950 Explosion-Proof Differential Pressure Switches combine the best features of the Dwyer Series 1900 Pressure Switch with an integral explosion-proof and weather-proof housing. Each unit is UL & CSA listed; FM approved for use in Class I, Groups C & D; Class II, Groups E, F, & G; and Class III atmospheres (NEMA 7 & 9). They are totally rain-tight for outdoor installations. Twelve models allow set-points from .03 to 20 inches w.c. and from .5 to 50 psi (3.4 to 345 kPa).

Easy access to the SPDT switch for electrical hook-up is provided by removing the top plate of the three-part aluminum housing. Adjustment to the set point of the switch can be made without disassembling the housing. The unit is very compact, about half the weight and bulk of equivalent conventional explosion-proof switches.

CAUTION

For use only with air or compatible gases. Use of the Model 1950 switch with explosive media connected to the Low pressure port (including differential pressure applications in such media) is not recommended. Switch contact arcing can cause an explosion inside the switch housing which, while contained, may render the switch inoperative. If switch is being used to sense a single positive pressure relative to atmosphere, run a line from the low pressure port to a non-hazardous area free of combustible gases. This may increase response time on -0 and -00 models.

NOTE: The last number-letter combination in the model number identifies the switch's electrical rating (number) and diaphragm material (letter). The 2F combination is standard as described in the physical data above. In case of special models, a number 1 rating is the same as 2; a number 3 or 4 rating is 10A 125, 250, 480 VAC; 1/8 H.P. 125 VAC; 1/4 H.P. 250 VAC; a number 5 or 6 rating is 1A 125 VAC. Letter B indicates a Buna-N diaphragm; N = Neoprene; S = Silicone; and V = Viton®.

UL and CSA Listed, FM Approved For
CL. I GR. C, D - CL. II GR. E, F, G - CL. III

Series 1950 Switches
Operating ranges and deadbands

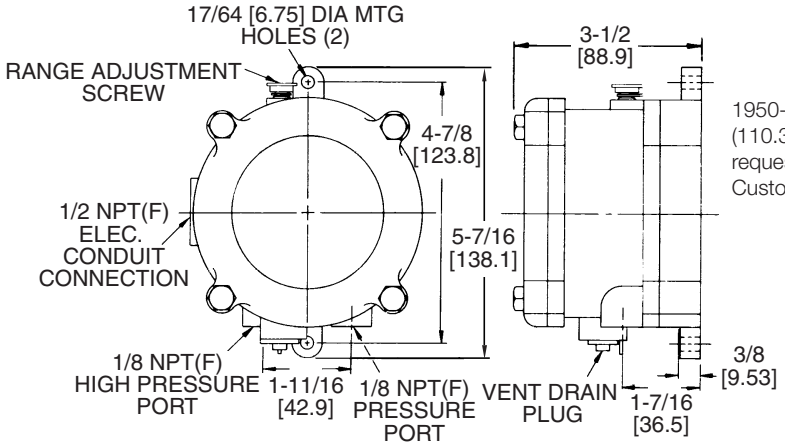
To order specify Model Number	Operating Range: Inches, W.C.	Approximate Dead Band	
		At Min. Set Point	At Max. Set Point
1950-02-2S	0.03 to 0.10	0.025	0.05
1950-00-2F	0.07 to 0.15	0.04	0.05
1950-0-2F	0.15 to 0.5	0.10	0.15
1950-1-2F	0.4 to 1.6	0.15	0.20
1950-5-2F	1.4 to 5.5	0.3	0.4
1950-10-2F	3.0 to 11.0	0.4	0.5
1950-20-2F	4.0 to 20.0	0.4	0.6
Model Number	**Operating Range: PSI**	**Approximate Dead Band**	
		Min. Set Point	Max. Set Point
1950P-2-2F	0.5 to 2.0	0.3 psi	0.3 psi
1950P-8-2F	1.5 to 8.0	1.0 psi	1.0 psi
1950P-15-2F	3.0 to 15.0	0.9 psi	0.9 psi
1950P-25-2F	4.0 to 25.0	0.7 psi	0.7 psi
1950P-50-2F	15.0 to 50	1.0 psi	1.5 psi

SPECIFICATIONS

Service: Air and non-combustible, compatible gases.
Wetted Materials: Consult factory.
Temperature Limits: -40 to 140°F (-40 to 60°C); 0 to 140°F (-17.8 to 60°C) for 1950P-8, 15, 25, and 50. -30 to 130°F (-34.4 to 54.4°C) for 1950-02.
Pressure Limits:
Continuous: 1950's - 45″ w.c. (0.11 bar);
1950P's - 35 psi (2.41 bar); 1950P-50 only - 70 psi (4.83 bar).
Surge: 1950's - 10 psi (0.69 bar), 1950P's - 50 psi (3.45 bar), 1950P-50 only - 90 psi (6.21 bar).
Enclosure Rating: IP64, NEMA 3, 7 and 9.
Switch Type: Single-pole double-throw (SPDT).
Electrical Rating: 15 A @, 125, 250, 480 VAC, 60 Hz. Resistive 1/8 HP @ 125 VAC, 1/4 HP @ 250 VAC, 60 Hz.
Electrical Connections: 3 screw type, common, normally open and normally closed.
Process Connections: 1/8″ female NPT.
Mounting Orientation: Diaphragm in vertical position. Consult factory for other position orientations.
Set Point Adjustment: Screw type on top of housing.
Weight: 3.25 lb (1.5 kg); 1950-02 model, 4.4 lb (2 kg).
Agency Approvals: CE, UL, CSA, FM.

RESPONSE TIME: Because of restrictive effect of flame arrestors, switch response time may be as much as 10-25 seconds where applied pressures are near set point.

DWYER INSTRUMENTS, INC.
P.O. BOX 373 • MICHIGAN CITY, INDIANA 46361, U.S.A.
Phone: 219/879-8000 **www.dwyer-inst.com**
Fax: 219/872-9057 **e-mail: info@dwyer-inst.com**



1950-02: 7-3/4″ (196.9) dia. x 4-11/32″ (110.3) depth. For complete dimensions request drawing 28-700175-00 from our Customer Service Department

1950 Switch Outline Dimensions

INSTALLATION

1. Select a location free from excess vibration and corrosive atmospheres where temperatures will be within the limits noted under Specifications on reverse. Switch may be installed outdoors or in areas where the hazard of explosion exists. See reverse for specific types of hazardous service.

2. Mount standard switches with the diaphragm in a vertical plane and with switch lettering and Dwyer nameplate in an upright position. Some switches are position sensitive and may not reset properly unless they are mounted with the diaphragm vertical.

3. Connect switch to source of pressure, vacuum or differential pressure. Metal tubing with 1/4″ O.D. is recommended, but any tubing which will not restrict the air flow can be used. Connect to the two 1/8″ female NPT pressure ports as noted below:

A. Differential pressures - connect pipes or tubes from source of greater pressure to high pressure port marked HIGH PRESS, and from source of lower pressure to low pressure port marked LOW PRESS.

B. Pressure only (above atmospheric pressure) - connect tube from source of pressure to high pressure port. The low pressure port is left open to atmosphere.

C. Vacuum only (below atmospheric pressure) - connect tube from source of vacuum to low pressure port. The high pressure port is left open to atmosphere.

4. To make electrical connections, remove the three hex head screws from the cover and after loosening the fourth captive screw, swing the cover aside. Electrical connections to the standard single pole, double throw snap switch are provided by means of terminals marked “COM” (common), “NO” (norm open), “NC” (norm closed). The normally open contacts close and the normally closed contacts open when pressure increases beyond the set point. Switch loads for standard models should not exceed the maximum specified current rating of 15 amps resistive. Switch capabilities decrease with an increase in ambient temperature, load inductance, or cycling rate. Whenever an application involves one or more of these factors, the user may find it desirable to limit the switched current to 10 amps or less in the interest of prolonging switch life.

ADJUSTMENT: To Change the Set point

1. Remove the plastic cap and turn the slotted Adjust-ment Screw at the top of the housing clockwise to raise the set point pressure and counter-clockwise to lower the set point. After calibration, replace the plastic cap and re-check the set point.

2. The recommended procedure for calibrating or checking calibration is to use a “T” assembly with three rubber tubing leads, all as short as possible and the entire assembly offering minimum flow restriction. Run one lead to the pressure switch, another to a manometer of known accuracy and appropriate range, and apply pressure through the third tube. Make final approach to the set point very slowly. Note that manometer and pressure switch will have different response times due to different internal volumes, lengths of tubing, fluid drainage, etc. Be certain the switch is checked in the position it will assume in use, i.e. with diaphragm in a vertical plane and switch lettering and Dwyer nameplate in an upright position.

3. For highly critical applications check the set point adjustment and if necessary, reset it as noted in step A.

MAINTENANCE

The moving parts of these switches need no maintenance or lubrication. The only adjustment is that of the set point. Care should be taken to keep the switch reasonably clean. Periodically the vent drain plug should be rotated, then returned to its original position. This will dislodge deposits which could accumulate in applications where there is excessive condensation within the switch. The Series 1950 Explosion-Proof Differential Pressure Switch is not field serviceable and should be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization number before shipping.

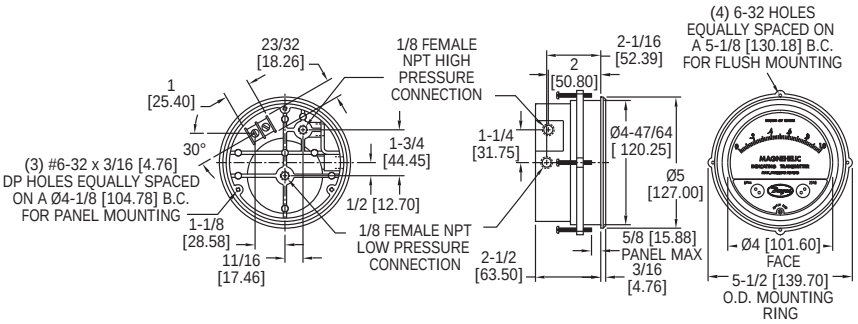
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Phone: 219/879-8000 **www.dwyer-inst.com**
Fax: 219/872-9057 **e-mail: info@dwyer-inst.com**

Series 605 Magnehelic® Differential Pressure Indicating Transmitter

Specifications - Installation and Operating Instructions





The Series 605 Magnehelic® Indicating Transmitter simultaneously provides local indication on a large, easily read analog scale while also converting that pressure into a standard two-wire, 4-20 mA signal for ranges from 0-0.5 to 0-50″ w.c. Positive, negative or differential air and compatible gas pressure can be measured with accuracies as low as ±.5% of full scale. The basic mechanical components of the Series 605 Magnehelic® indicating transmitter are similar to those used in the popular, time-proven Magnehelic® differential pressure gage.

STANDARD ACCESSORIES

Mounting ring
Snap ring
(4) 6-32 x 1-1/4 screws (panel mtg.)
(3) 6-32 x 5/16 screws (surface mtg.)
(2) Tubing to 1/8″ NPT adapters
(2) 1/8″ NPT plugs
Adjustment key

SPECIFICATIONS

GAGE SPECIFICATIONS

Service: Air and non-combustible, compatible gases.
Wetted Materials: Consult factory.
Accuracy: See chart.
Stability: ±1% F.S./yr.
Pressure Limits: See chart.
Temperature Limits: 20 to 120°F (-6.67 to 48.9°C).
Process Connections: 1/8″ female NPT.
Size: 4″ (101.6 mm) dial face, 5″ (127 mm) O.D. x 2-11/16″ (68.3 mm).
Weight: 1 lb, 12.6 oz (811 g).
Agency Approvals: CE.

TRANSMITTER SPECIFICATIONS

Accuracy: See chart (includes linearity, hysteresis, repeatability).
Temperature Limits: 20 to 120°F (-6.67 to 48.9°C).
Compensated Temperature Range: 32 to 120°F (0 to 48.9°C).
Thermal Effect: ±0.025% F.S./°F (0.045% F.S./°C).
Power Requirements: 10-35 VDC (2-wire).
Output Signal: 4 to 20 mA.
Zero and Span Adjustments: Protected potentiometers.
Loop Resistance: DC; 0-1250 ohms maximum.
Current Consumption: DC; 38 mA maximum.
Electrical Connections: Screw terminal block.
Mounting Orientation: Diaphragm in vertical position. Consult factory for other position orientations.

Model	Range in w.c.	Maximum Pressure	Electrical Accuracy +/-%	Mechanical Accuracy +/-%
605-00N	.05-0-.20	25 psi (1.7 bar)	2	4
605-11	.25-0-.25	25 psi (1.7 bar)	2	3
605-0	0-.50	25 psi (1.7 bar)	2	3
605-1	0-1.0	25 psi (1.7 bar)	2	2
605-2	0-2.0	2 psi (13.79 kPa)	0.5	2
605-3	0-3.0	2 psi (13.79 kPa)	0.5	2
605-6	0-6.0	2 psi (13.79 kPa)	0.5	2
605-10	0-10	2 psi (13.79 kPa)	0.5	2

Model	Range in w.c.	Maximum Pressure	Electrical Accuracy +/-%	Mechanical Accuracy +/-%
605-20	0-20.0	11 psi (75.8 kPa)	0.5	2
605-30	0-30	11 psi (75.8 kPa)	0.5	2
605-50	0-50	11 psi (75.8 kPa)	0.5	2
	Range in Pa			
605-60PA	0-60	25 psi (1.7 bar)	2	4
605-125PA	0-125	25 psi (1.7 bar)	2	3
605-250PA	0-250	25 psi (1.7 bar)	2	2
605-500PA	0-500	2 psi (13.79 kPa)	0.5	2

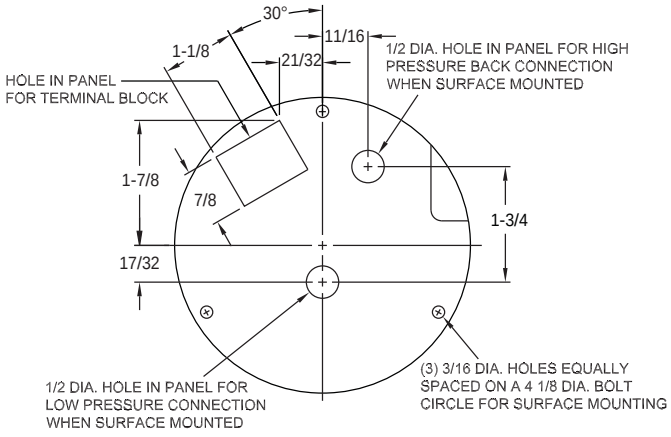
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INSTALLATION

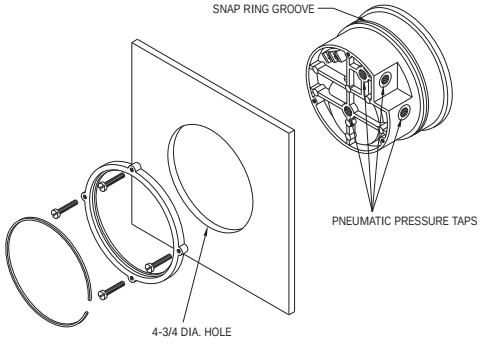
1. **LOCATION**: Select a location where the temperature of the unit will be between 20°F and 120°F. Distance from the receiver is limited only by total loop resistance. See “Electrical Connections”. The tubing feeding pressure to the instrument can be run practically any length required but long lengths will increase response time slightly. Avoid surfaces with excessive vibration.

2. **POSITION:** All standard models are calibrated with the diaphragm vertical and should be used in that position for maximum accuracy. If your application requires mounting in other than a vertical position, be sure to specify this when ordering.

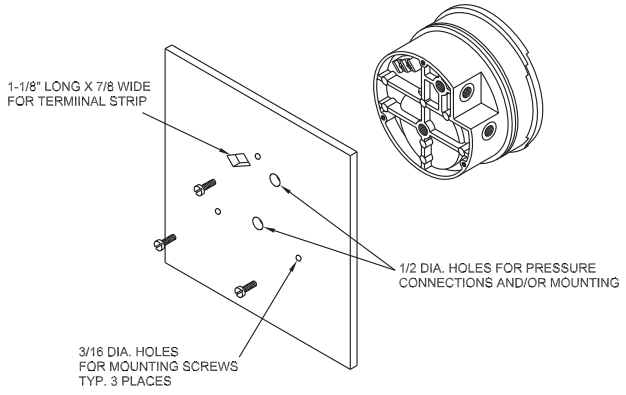
3. **PRESSURE CONNECTIONS:** For convenience, two sets of 1/8″ female NPT ports are available. Plug the unused set with pipe plugs provided. Attach tubing from positive pressure source to port marked “HI” or from negative (Vacuum) source to port marked “LOW”. In either case, opposite port must be vented to atmosphere. In dusty environments, we recommend use of an A-331 Filter Vent Plug to keep interior of instrument clean. For differential pressures the higher source is connected to the “HI” port and lower to the ”LOW” port.



4. **MOUNTING:** The Series 605 Transmitter may be either panel mounted or surface mounted.



A. PANEL MOUNTING: Cut a 4-3/4″ or 120mm dia. hole in panel and insert the complete unit from the front. Slip on the mounting ring and install the split snap ring in the groove on the bezel. Seat the mounting ring against the snap ring and thread the four screws through the tapped holes. Tighten screws against rear of panel.



B. SURFACE MOUNTING: Drill (3) 3/16″ dia. holes for mounting screws and cut (1) 7/8″ x 1-1/8″ hole for access to terminal strip as shown in hole location drawing. Insert screws from rear of panel and thread into tapped holes on back of transmitter case. If rear pressure connections are to be used, make 1/2″ dia. holes located as shown in hole location drawing in left column.

5. **ZEROING:** Once gage/transmitter is mounted in its final position, check to be sure pointer aligns with zero on scale, when no pressure is applied and both low and high pressure ports are vented to atmosphere. To adjust, turn small slotted screw at center-bottom of gage face. **Do not** move the larger black knobs labeled SPAN and ZERO. These are for use only if a calibration check shows the 4-20 mA output signal to need adjustment. See page 3 under heading OUTPUT RANGING.

ELECTRICAL CONNECTIONS

CAUTION: DO NOT EXCEED SPECIFIED SUPPLY VOLTAGE RATINGS. PERMANENT DAMAGE NOT COVERED BY WARRANTY WILL RESULT. THIS UNIT IS NOT DESIGNED FOR AC VOLTAGE OPERATION.

Electrical connections to the Series 605 Transmitter are made to the two-screw terminal strip on the rear of the case. Polarity is indicated by + and – signs stamped on side. The schematic diagram of the Series 605 transmitter is illustrated in Figure B.

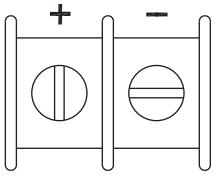


Figure A

An external power supply delivering 10.0 to 35 VDC with a minimum current capability of 40 milliamps must be used to power the control loop in which the Series 605 transmitter is connected. Refer to Fig. B for connection of the power supply, transmitter and receiver. The range of appropriate receiver load resistances (R_L) for the power supply voltage available is given by the formula and graph in Fig. C. Shielded two wire cable is recommended for control loop wiring and the negative side of the loop may be grounded if desired. Note also that the receiver may be connected in either the negative or positive side of the loop, whichever is most convenient. Should polarity of the transmitter or receiver be inadvertently reversed, the loop will not function properly but no damage will be done to the transmitter.

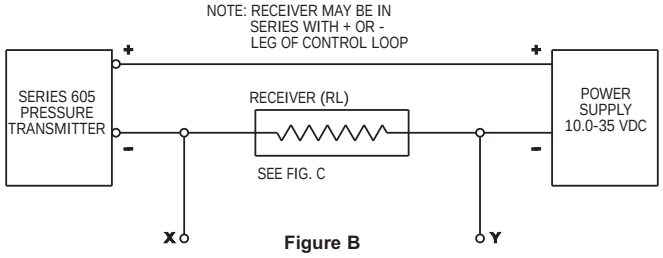


Figure B

The maximum length of connecting wire between the transmitter and the receiver is a function of wire size and receiver resistance. That portion of the total current loop resistance represented by the resistance of the connecting wires themselves should not exceed 10% of the receiver resistance. For extremely long runs (over 1,000 feet), it is desirable to select receivers with higher resistances in order to keep the size and cost of the connecting leads as low as possible. In installations where the connecting run is no more than 100 feet, connecting lead wire as small as No. 22 Ga. can be used.

The Series 605 transmitters can be used with receivers requiring 1-5 volt input rather than 4-20 mA. If the receiver requires a 1-5 volt input, insert a 250 ohm, 1/2 watt resistor in series with the current loop but in parallel with the receiver input. Referring to Figure B, R_L becomes the 250 ohm resistor and point X and Y are connected to the receiver input, point X being positive (+) and point Y negative (–) or ground. The resistor should be connected at the panel end of the transmitter current loop close to the receiver input to take advantage of the immunity of the current loop to electrical noise pickup. Most electronic component distributors stock a 249 r, 1/2 watt, ±1% tolerance metal film resistor which is adequate for this application.

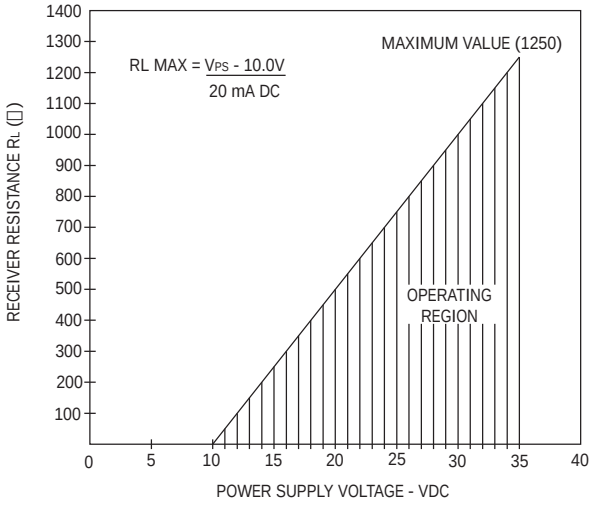


Figure C

OUTPUT RANGING

Each Series 605 Magnehelic® indicating transmitter is factory calibrated to produce 4 mA at zero scale reading and 20 mA at full scale reading. The following procedure should be used if the pressure versus output signal relationship needs to be checked.

1. With unit connected to the companion receiver per preceding instructions, insert an accurate milliammeter with a full scale reading of approximately 30 mA in series with the current loop.

2. Vent both pressure ports to atmosphere and, if necessary, adjust pointer zero screw to align pointer with zero on scale. A controllable pressure source capable of reaching the full scale range should be connected to either high pressure port. Plug the other high pressure port and vent one or both low pressure ports to atmosphere. The instrument must be ranged in the same position in which it will be used. Standard factory calibration and ranging is done with unit vertical.

3. Apply electrical power to the system and check for proper operation by slowly increasing pressure and observing whether the loop current increases above the 4 mA zero pressure reading.

4. A spanner type key is supplied to adjust span and zero. This helps to reduce unauthorized tampering. Apply pressure until pointer aligns with full scale reading and adjust the SPAN knob for a 20 mA reading.

5. Relieve all pressure, allow a few seconds for setting and adjust the ZERO knob for a 4 mA current loop reading.

6. The SPAN and ZERO controls are slightly interactive so steps 4 & 5 should be repeated a few times until readings of 4 and 20 mA are obtained consistently.

7. Remove the milliammeter from the current loop and proceed with final installation of the transmitter and receiver.

MULTIPLE UNITS WITH COMMON POWER SUPPLY

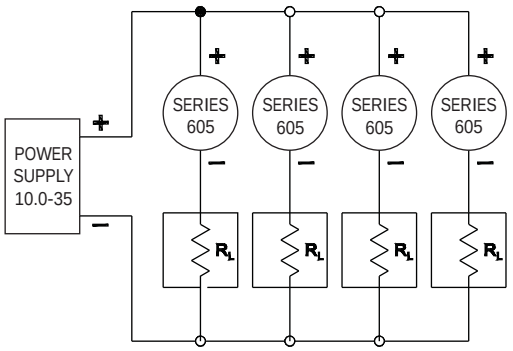


Figure D

Several Series 605 transmitters can be operated with a single power supply as depicted above in Figure D. Be careful to specify a supply with sufficient capacity. The minimum current requirement at a given voltage can be calculated by multiplying the number of units x 20 mA. In the example shown this would be 4 x 20 or 80 mA minimum.

MAINTENANCE

Upon final installation of the Series 605 Transmitter and the companion receiver, including the A-701 Digital Readout, no routine maintenance is required. A periodic check of system calibration is recommended. The Series 605 Differential Pressure Transmitter is not field repairable and should be returned, freight prepaid, to the factory if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization (RGA) number before shipping.

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P.O. BOX 373 • MICHIGAN CITY, IN 46361, U.S.A.

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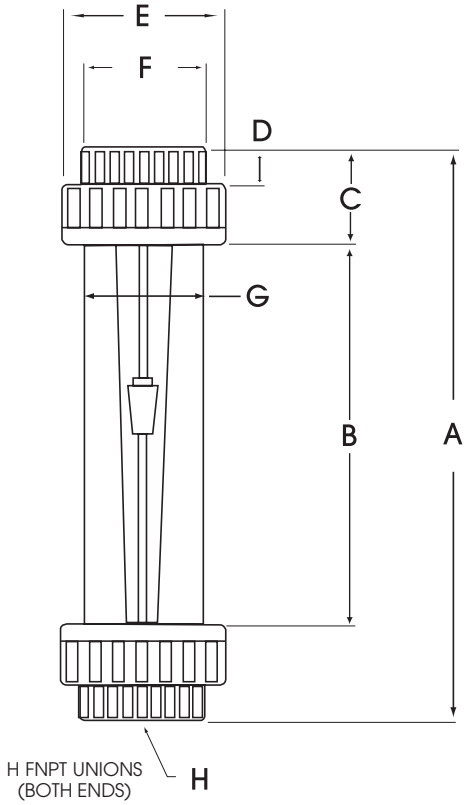
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SERIES FR5500 ACRYLIC FLOWMETERS

SPECIFICATIONS	
ACCURACY	+/-5% OF FULL SCALE
METER BODY	MACHINED ACRYLIC METERING TUBE
FLOAT	STAINLESS STEEL
FITTINGS	1-1/2" OR 2" FNPT UNION FITTINGS MADE OF PVC OR STAINLESS STEEL
O-RINGS	VITON®
PRESSURE	100 PSIG MAXIMUM OPERATING PRESSURE
TEMPERATURE	150°F/65°C MAXIMUM OPERATING TEMPERATURE

FEATURES

- Easy-to-read scales for GPM or LPM H_20 and SCFM or LPM air
- Durable one-piece clear acrylic construction
- Stable, easy-to-read stainless steel floats
- Integrated union fittings for easy installation
- PVC or stainless steel fitting options
- Easy disassembly and assembly for maintenance
- Superior quality



SERIES FR5500 FLOW RATES- 1-1/2" MODELS			
Model	SCFM AIR*	Model	LPM AIR*
5A75	10-110	5A87	300-3000
5A76	15-160	5A88	450-4600
5A77	20-200	5A89	550-5500
Model	GPM H_2O	Model	LPM H_2O
5L78	3-30	5L90	10-120
5L79	4-40	5L91	15-150
5L80	5-50	5L92	20-200

*Air Ranges-Stainless Steel Fittings Only

SERIES FR5500 FLOW RATES- 2" MODELS			
Model	SCFM AIR*	Model	LPM AIR*
5A81	25-250	5A93	700-7000
5A82	30-330	5A94	800-9000
5A83	40-400	5A95	1000-11000
Model	GPM H_2O	Model	LPM H_2O
5L84	6-60	5L96	25-230
5L85	8-80	5L97	30-300
5L86	10-100	5L98	40-400

VITON® IS A REGISTERED TRADEMARK of E.I. DUPONT.

ORDERING EXAMPLE

FR	MODEL CODE	FITTINGS
	5A81	SI

SAMPLE: FR5A81SI
25-250 SCFM AIR with 2" SI UNIONS

FITTINGS:
PI=PVC
SI=Stainless steel

	FR5500 Dimensions Inches						
H	A	B	C	D	E	F	G
1-1/2" PVC	13-1/4	9	2-1/4	7/8	3-1/2	2-1/2	2-1/2
1-1/2" S.S.	13-3/8	9-1/8	2-1/8	7/8	3-1/2	2-1/2	2-1/2
2" PVC	13-7/8	8-15/16	2-1/2	1	4-1/8	3-1/16	3
2" S.S.	13-1/2	9-3/16	2-5/32	15/16	4	3	3

KEY INSTRUMENTS

250 Andrews Road, Trevose, PA 19053

800.356.7483 • 215.357.0893
Fax:215.357.9239

www.keyinstruments.com
e-mail:sales@keyinstruments.com

Sept. 2001

Bi-Metal Thermometer TBM



Description & Features:

- A general purpose, versatile 1" (25mm) to 6" (150mm) dial, 304 stainless steel thermometer
- Bi-metallic sensing element for reliable readings
- Back, bottom or adjustable angle connection
- Welded stem length from 2.5" (63mm) and up
- ±1% accuracy
- Anti-parallax dial that reduces operator reading errors
- Re-zero adjustment screws are standard on the 2" (50mm) to 6" (150mm) dials
- 5 year warranty

Applications:

- Industrial process, heating and air conditioning, ventilation and wastewater

Specifications	
Dial	1” (25mm), 2” (50mm), 3” (75mm), 4” (100mm), 5” (125mm), 6” (150mm) aluminum with black markings, dish-shaped
Case	AISI 304 SS
Stem	AISI 304 SS welded to socket, centre back, bottom or adjustable angle configurations (316 SS optional*) 2” (50mm) dial: centre back connection only
Recalibrator	Standard**
Lens	1” (25mm): Acrylic Others: Glass standard, hermetically sealed
Ring	AISI 304 SS
Connection	1” (25mm): None 2” (50mm): ¼” NPT standard 3” (75mm), 4” (100mm), 5” (125mm), 6” (150mm): ½” NPT standard
Sensing Element	Bi-metallic coil
Pointer	Aluminum, painted black
Maximum Operating Pressure	125 psi (861 kPa)
Operating Temperature	75% of full scale value (recommended maximum)
Ambient Temperature	-58°F to 248°F (-50°C to 120°C)
Accuracy	±1%
Enclosure Rating	IP68

*Contact Winters for 316 SS requirements
**Not available on 1” pocket and 2” laboratory thermometer
Note: The use of a thermowell is recommended to protect the thermometer in corrosive or pressure applications, as well as to maintain a closed system during its removal from the process

Order Codes (products in bold are normally in stock)

To order, specify the code for each dial/stem length and the range: i.e. TBM20025 - B26

Dial Size	Stem Length	Fixed Centre Back	Bottom	Adjustable Angle
1" (25mm) pocket thermometer	5" (125mm)	**TBM10050**	-	-
2" (50mm) lab thermometer	8" (200mm)	TBM20080	-	-
2" (50mm)	2.5" (63mm)	**TBM20025**	-	-
	4" (100mm)	**TBM20040**	-	-
	6" (150mm)	**TBM20060**	-	-
	9" (225mm)	**TBM20090**	-	-
	12" (300mm)	**TBM20120**	-	-
3" (75mm)	2.5" (63mm)	**TBM30025**	**TBM31025**	**TBM32025**
	4" (100mm)	**TBM30040**	**TBM31040**	**TBM32040**
	6" (150mm)	**TBM30060**	**TBM31060**	**TBM32060**
	9" (225mm)	**TBM30090**	**TBM31090**	**TBM32090**
	12" (300mm)	**TBM30120**	**TBM31120**	**TBM32120**
4" (100mm)	2.5" (63mm)	**TBM40025**	**TBM41025**	**TBM42025**
	4" (100mm)	**TBM40040**	**TBM41040**	**TBM42040**
	6" (150mm)	**TBM40060**	**TBM41060**	**TBM42060**
	9" (225mm)	**TBM40090**	TBM41090	**TBM42090**
	12" (300mm)	**TBM40120**	TBM41120	**TBM42120**
5" (125mm)	2.5" (63mm)	**TBM50025**	**TBM51025**	**TBM52025**
	4" (100mm)	**TBM50040**	**TBM51040**	**TBM52040**
	6" (150mm)	**TBM50060**	**TBM51060**	**TBM52060**
	9" (225mm)	**TBM50090**	**TBM51090**	**TBM52090**
	12" (300mm)	**TBM50120**	**TBM51120**	**TBM52120**
6" (150mm)	2.5" (63mm)	TBM60025	TBM61025	**TBM62025**
	4" (100mm)	TBM60040	TBM61040	**TBM62040**
	6" (150mm)	**TBM60060**	TBM61060	**TBM62060**
	9" (225mm)	**TBM60090**	TBM61090	TBM62090
	12" (300mm)	TBM60120	TBM61120	TBM62120

Available Ranges					
°F & °C (Dual)	Code	°F only	Code	°C Only	Code
-100°F to 150°F & -70°C to 70°C	**B1**	-40°F to 120°F	**B14**	-80°C to 50°C	**B26**
-40°F to 120°F & -40°C to 50°C	**B2**	-40°F to 160°F	**B15**	-50°C to 50°C	**B27**
0°F to 140°F & -20°C to 60°C	**B3**	0°F to 140°F	**B16**	0°C to 50°C	**B28**
-40°F to 160°F & -40°C to 70°C	**B4**	0°F to 200°F	**B17**	-50°C to 100°C	**B29**
25°F to 125°F & - 5°C to 50°C	**B5**	20°F to 240°F	**B18**	0°C to 100°C	**B30**
0°F to 200°F & -20°C to 90°C	**B6**	0°F to 250°F	**B19**	-20°C to 120°C	**B31**
20°F to 240°F & - 5°C to 115°C	**B7**	50°F to 300°F	**B20**	0°C to 150°C	**B32**
0°F to 250°F & -20°C to 120°C	**B8**	50°F to 400°F	**B21**	0°C to 200°C	**B33**
50°F to 300°F & 10°C to 150°C	**B9**	50°F to 550°F	**B22**	0°C to 300°C	**B34**
50°F to 400°F & 10°C to 200°C	**B10**	150°F to 750°F	**B23**	0°C to 450°C	**B35**
50°F to 500°F & 10°C to 260°C	**B11**	0°F to 800°F	**B24**	100°C to 550°C	**B36**
150°F to 750°F & 100°C to 400°C	**B12**	200°F to 1,000°F	**B25**	-	-
200°F to 1,000°F & 100°C to 540°C	**B13**	-	-	-	-

Other ranges, stem lengths and connection sizes available upon request. Flat dial on 6" model available. For glycerin fill, maximum temperature limit is 300°F (150°C). Silicone fill available.

Option suffix:

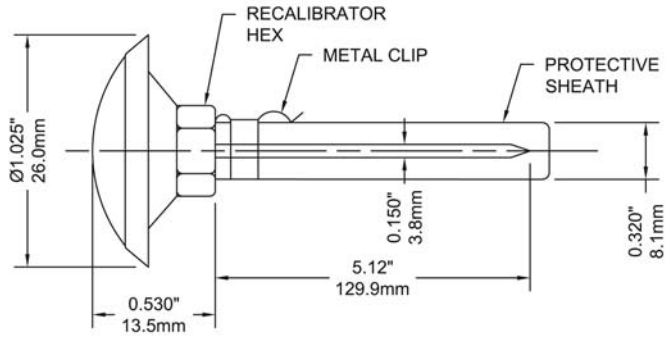
AP3 = 3" acrylic lens
AP4 = 4" acrylic lens
AP5 = 5" acrylic lens
AP6 = 6" acrylic lens

BG3 = 3" glycerin filling
BG4 = 4" glycerin filling
BG5 = 5" glycerin filling
BG6 = 6" glycerin filling

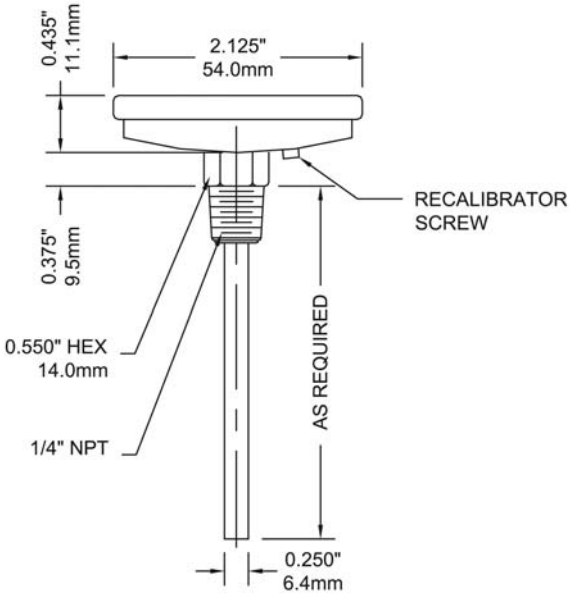
DUCT = Aluminum duct flange
SCK = Socket conversion kit
SPG3 = 3" Shatterproof glass lens
SPG5 = 5" Shatterproof glass lens

Note: The use of a thermowell is recommended to protect the thermometer from corrosive or damaging environments, as well as to maintain a closed system during its removal from the process

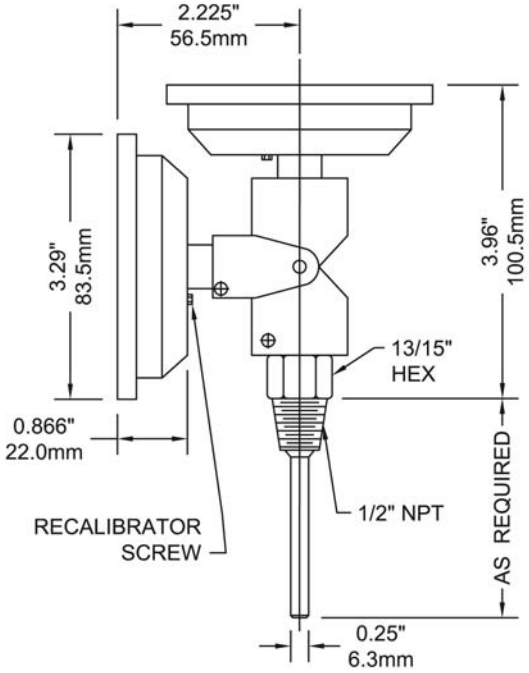
1” Back Connection



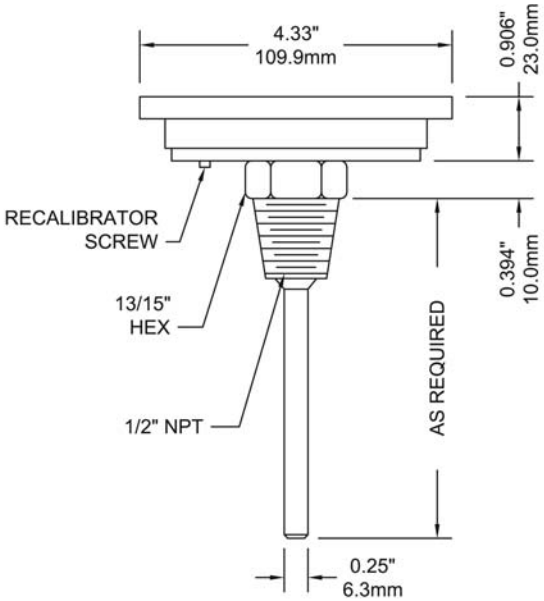
2” Back Connection



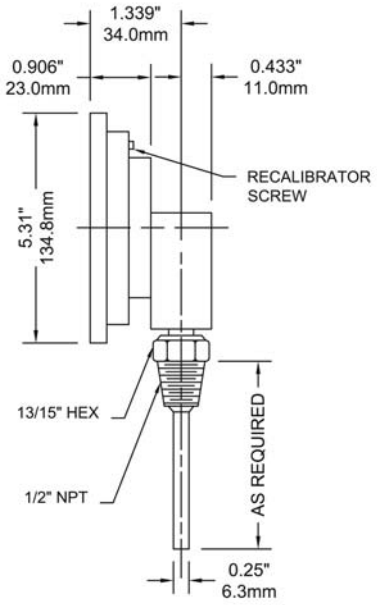
3” Adjustable Angle Connection



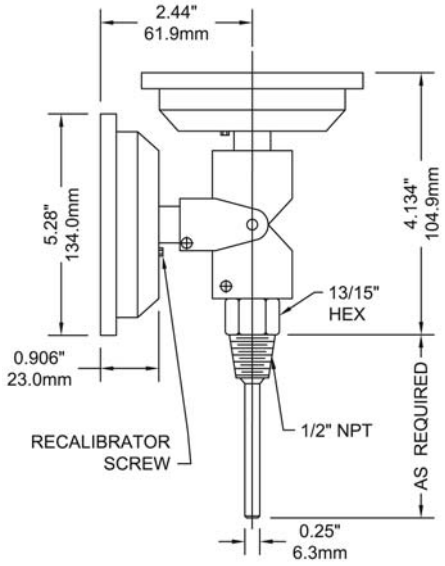
4” Back Connection



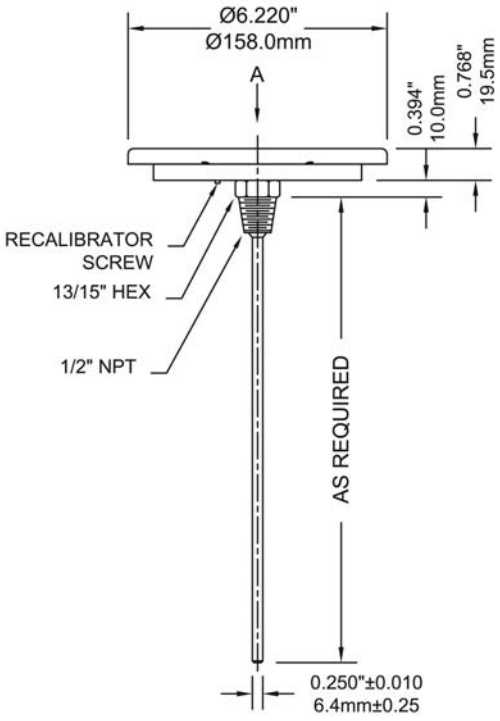
5” Bottom Connection



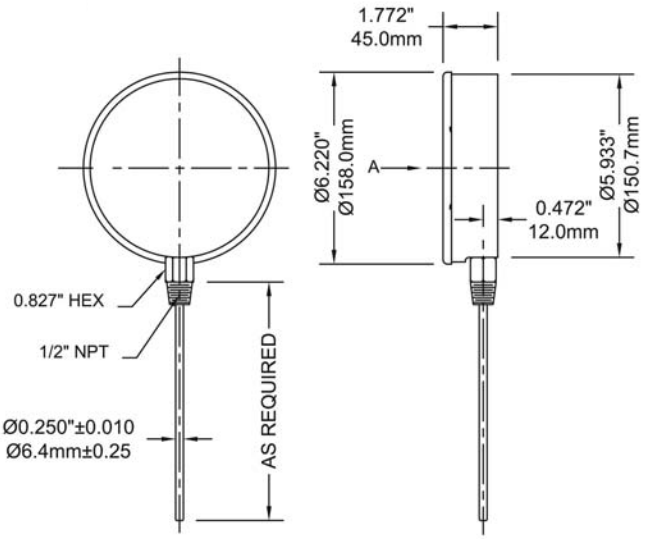
5” Adjustable Angle Connection



6” Back Connection



6” Bottom Connection



3. Control Panel Materials

SENSAPHONE®
REMOTE MONITORING SOLUTIONS



Sentinel
Technical Specifications

ALARM NOTIFICATION METHODS:

E-Mail, Text Messages, Voice Phone Calls

Programmable alarm escalation levels

Comprehensive scheduling per input, profile, and alarm destination

Unlimited number of User Profiles

Multiple contact types per user

INPUTS:

12 Universal Inputs

- Normally Open / Normally Closed Dry Contact
- 2.8K / 10K Thermistor
- 4-20mA Current Loop
- Pulse Count
- 12 Bit Resolution

TEMPERATURE SENSING RANGE:

-109° to 168°F | -85° to 76°C

RELAY OUTPUT:

Programmable. Rated for 1A 30VAC/ 1A 30VDC

DATA LOGGING:

Unlimited samples securely stored on the Sentinel servers

Programmable sampling Interval - 1 min to 24 hrs

User programmable channel selection

COMMUNICATION PORTS:

Ethernet 10/100Base–T

BATTERY BACKUP:

4.8V 2000mAHr NiMh Battery pack (included)

Provides 8 hours of backup

LOCAL INDICATORS:

12 Alarm Status LEDs

- Power LED • Online LED
- Standby LED • Ethernet link and Activity LEDs

POWER REQUIREMENTS:

Comes with 12VDC plug-in power supply.

(International power options available).

ENVIRONMENTAL:

Operating Humidity:
0-90% RH, non–condensing

Operating Temperature:
32° to 122°F | 0° to 50°C

PHYSICAL:

Dimensions:
5.5 x 5.5 x 1.5” | 140 x 140 x 38mm

Weight: 1 lb. | .45kg

STANDARDS:

FCC Part 15 – Class A Compliant

ENCLOSURE:

Durable powder coated metal housing suitable for wall or panel installation.

901 Tryens Road • Aston, PA 19014 • PH: 877-373-2700 • F: 610-558-0222 • www.sensaphone.com



SENTINEL

CLOUD BASED MONITORING

INSTALLATION AND SETUP GUIDE
VERSION 2.1

SENSAPHONE®
REMOTE MONITORING SOLUTIONS

Every effort has been made to ensure that the information in this document is complete, accurate and up-to-date. Sensaphone assumes no responsibility for the results of errors beyond its control. Sensaphone also cannot guarantee that changes in equipment made by other manufacturers, and referred to in this manual, will not affect the applicability of the information in this manual.

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First Edition, version 2.1, April 2015

Written and produced by SENSAPHONE®.

Please address comments on this publication to:

SENSAPHONE®

901 Tryens Road

Aston, PA 19014

Important Safety Instructions

Your Sentinel has been carefully designed to give you years of safe, reliable performance. As with all electrical equipment, however, there are a few basic precautions you should take to avoid hurting yourself or damaging the unit:

- Read the installation and operating instructions in this guide carefully. Be sure to save it for future reference.
- Read and follow all warning and instruction labels on the product itself.
- To protect the Sentinel from overheating, make sure all openings on the unit are not blocked. Do not place on or near a heat source, such as a radiator or heat register.
- Do not use your Sentinel near water, or spill liquid of any kind into it.
- Be certain that your power source matches the rating in the specifications of this manual. If you're not sure of the type of power supply to your facility, consult your dealer or local power company.
- Do not allow anything to rest on the power cord. Do not locate this product where the cord will be abused by persons walking on it.
- Do not overload wall outlets and extension cords, as this can result in the risk of fire or electric shock.
- Never push objects of any kind into this product through ventilation holes as they may touch dangerous voltage points or short out parts that could result in a risk of fire or electric shock.
- To reduce the risk of electric shock, do not disassemble this product, but return it to Sensaphone Customer Service, or another approved repair facility, when any service or repair work is required. Opening or removing covers may expose you to dangerous voltages or other risks. Incorrect reassembly can cause electric shock when the unit is subsequently used.
- If anything happens that indicates that your Sentinel is not working properly or has been damaged, unplug it immediately and follow the procedures in the manual for having it serviced. Return the unit for servicing under the following conditions:

    1. The power cord or plug is frayed or damaged.
    2. Liquid has been spilled into the product or it has been exposed to water.
    3. The unit has been dropped, or the enclosure is damaged.
    4. The unit doesn't function normally when you're following the operating instructions.

- To reduce the risk of fire or injury to persons, read and follow these instructions:

    1. Use only the specified type and size battery.
    2. Do not dispose of the battery in a fire. The cell may explode. Check with local codes for possible special disposal instructions.
    3. Do not open or mutilate batteries. Released electrolyte is corrosive and may cause damage to the eyes or skin. It may be toxic if swallowed.
    4. Exercise care in handling batteries in order not to short the battery with conducting materials such as rings, bracelets, and keys. The battery or conductor may overheat and cause burns.
    5. Remove main power connections before replacing the battery.

FCC Requirements

Part 15: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

2 YEAR LIMITED WARRANTY

PLEASE READ THIS WARRANTY CAREFULLY BEFORE USING THE PRODUCT.

THIS LIMITED WARRANTY CONTAINS SENSAPHONE'S STANDARD TERMS AND CONDITIONS. WHERE PERMITTED BY THE APPLICABLE LAW, BY KEEPING YOUR SENSAPHONE PRODUCT BEYOND THIRTY (30) DAYS AFTER THE DATE OF DELIVERY, YOU FULLY ACCEPT THE TERMS AND CONDITIONS SET FORTH IN THIS LIMITED WARRANTY.

IN ADDITION, WHERE PERMITTED BY THE APPLICABLE LAW, YOUR INSTALLATION AND/OR USE OF THE PRODUCT CONSTITUTES FULL ACCEPTANCE OF THE TERMS AND CONDITIONS OF THIS LIMITED WARRANTY (HEREINAFTER REFERRED TO AS "LIMITED WARRANTY OR WARRANTY"). IF YOU DO NOT AGREE TO THE TERMS AND CONDITIONS THIS WARRANTY, INCLUDING ANY LIMITATIONS OF WARRANTY, INDEMNIFICATION TERMS OR LIMITATION OF LIABILITY, THEN YOU SHOULD NOT USE THE PRODUCT AND SHOULD RETURN IT TO THE SELLER FOR A REFUND OF THE PURCHASE PRICE. THE LAW MAY VARY BY JURISDICTION AS TO THE APPLICABILITY OF YOUR INSTALLATION OR USE ACTUALLY CONSTITUTING ACCEPTANCE OF THE TERMS AND CONDITIONS HEREIN AND AS TO THE APPLICABILITY OF ANY LIMITATION OF WARRANTY, INDEMNIFICATION TERMS OR LIMITATIONS OF LIABILITY.

1. **WARRANTOR**: IN THIS WARRANTY, WARRANTOR SHALL MEAN "DEALER, DISTRIBUTOR, AND/OR MANUFACTURER."

2. **ELEMENTS OF WARRANTY**: THIS PRODUCT IS WARRANTED TO BE FREE FROM DEFECTS IN MATERIALS AND CRAFTSMANSHIP WITH ONLY THE LIMITATIONS AND EXCLUSIONS SET OUT BELOW.

3. **WARRANTY AND REMEDY**: TWO-YEAR WARRANTY — IN THE EVENT THAT THE PRODUCT DOES NOT CONFORM TO THIS WARRANTY AT ANY TIME DURING THE TIME OF TWO YEARS FROM ORIGINAL PURCHASE, WARRANTOR WILL REPAIR THE DEFECT AND RETURN IT TO YOU AT NO CHARGE.

THIS WARRANTY SHALL TERMINATE AND BE OF NO FURTHER EFFECT AT THE TIME THE PRODUCT IS: (1) DAMAGED BY EXTRANEOUS CAUSE SUCH AS FIRE, WATER, LIGHTNING, ETC. OR NOT MAINTAINED AS REASONABLE AND NECESSARY; OR (2) MODIFIED; OR (3) IMPROPERLY INSTALLED; OR (4) MISUSED; OR (5) REPAIRED OR SERVICED BY SOMEONE OTHER THAN WARRANTORS' AUTHORIZED PERSONNEL OR SOMEONE EXPRESSLY AUTHORIZED BY WARRANTOR'S TO MAKE SUCH SERVICE OR REPAIRS; (6) USED IN A MANNER OR PURPOSE FOR WHICH THE PRODUCT WAS NOT INTENDED; OR (7) SOLD BY ORIGINAL PURCHASER.

LIMITED WARRANTY, LIMITATION OF DAMAGES AND DISCLAIMER OF LIABILITY FOR DAMAGES: THE WARRANTOR'S OBLIGATION UNDER THIS WARRANTY IS LIMITED TO REPAIR OR REPLACEMENT OF THE PRODUCT, AT THE WARRANTOR'S OPTION AS TO REPAIR OR REPLACEMENT. IN NO EVENT SHALL WARRANTORS BE LIABLE OR RESPONSIBLE FOR PAYMENT OF ANY INCIDENTAL, CONSEQUENTIAL, SPECIAL AND/OR PUNITIVE DAMAGES OF ANY KIND, INCLUDING BUT NOT LIMITED TO ANY LABOR COSTS, PRODUCT COSTS, LOST REVENUE, BUSINESS INTERRUPTION LOSSES, LOST PROFITS, LOSS OF BUSINESS, LOSS OF DATA OR INFORMATION, OR FINANCIAL LOSS, FOR CLAIMS OF ANY NATURE, INCLUDING BUT NOT LIMITED TO CLAIMS IN CONTRACT, BREACH OF WARRANTY OR TORT, AND WHETHER OR NOT CAUSED BY WARRANTORS' NEGLIGENCE. IN THE EVENT THAT IT IS DETERMINED IN ANY ADJUDICATION THAT THE LIMITED WARRANTIES OF REPAIR OR REPLACEMENT ARE INAPPLICABLE, THEN THE PURCHASER'S SOLE REMEDY SHALL BE PAYMENT TO THE PURCHASER OF THE ORIGINAL COST OF THE PRODUCT, AND IN NO EVENT SHALL WARRANTORS BE LIABLE OR RESPONSIBLE FOR PAYMENT OF ANY INCIDENTAL, CONSEQUENTIAL, SPECIAL AND/OR PUNITIVE DAMAGES OF ANY KIND, INCLUDING BUT NOT LIMITED TO ANY LOST REVENUE, BUSINESS INTERRUPTION LOSSES, LOST PROFITS, LOSS OF BUSINESS, LOSS OF DATA OR INFORMATION, OR FINANCIAL LOSS, FOR CLAIMS OF ANY NATURE, INCLUDING BUT NOT LIMITED TO CLAIMS IN CONTRACT, BREACH OF WARRANTY OR TORT, AND WHETHER OR NOT CAUSED BY

WARRANTORS' NEGLIGENCE.

WITHOUT WAIVING ANY PROVISION IN THIS LIMITED WARRANTY, IF A CIRCUMSTANCE ARISES WHERE WARRANTORS ARE FOUND TO BE LIABLE FOR ANY LOSS OR DAMAGE ARISING OUT OF MISTAKES, NEGLIGENCE, OMISSIONS, INTERRUPTIONS, DELAYS, ERRORS OR DEFECTS IN WARRANTORS' PRODUCTS OR SERVICES, SUCH LIABILITY SHALL NOT EXCEED THE TOTAL AMOUNT PAID BY THE CUSTOMER FOR WARRANTORS' PRODUCT AND SERVICES OR $250.00, WHICHEVER IS GREATER. YOU HEREBY RELEASE WARRANTORS FROM ANY AND ALL OBLIGATIONS, LIABILITIES AND CLAIMS IN EXCESS OF THIS LIMITATION.

INDEMNIFICATION AND COVENANT NOT TO SUE: YOU WILL INDEMNIFY, DEFEND AND HOLD HARMLESS WARRANTORS, THEIR OWNERS, DIRECTORS, OFFICERS, EMPLOYEES, AGENTS, SUPPLIERS OR AFFILIATED COMPANIES, AGAINST ANY AND ALL CLAIMS, DEMANDS OR ACTIONS BASED UPON ANY LOSSES, LIABILITIES, DAMAGES OR COSTS, INCLUDING BUT NOT LIMITED TO DAMAGES THAT ARE DIRECT OR INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL, AND INCLUDING ATTORNEYS FEES AND LEGAL COSTS, THAT MAY RESULT FROM THE INSTALLATION, OPERATION, USE OF, OR INABILITY TO USE WARRANTORS' PRODUCTS AND SERVICES, OR FROM THE FAILURE OF THE WARRANTORS' SYSTEM TO REPORT A GIVEN EVENT OR CONDITION, WHETHER OR NOT CAUSED BY WARRANTORS' NEGLIGENCE.

YOU AGREE TO RELEASE, WAIVE, DISCHARGE AND COVENANT NOT TO SUE WARRANTORS, THEIR OWNERS, DIRECTORS, OFFICERS, EMPLOYEES, AGENTS, SUPPLIERS OR AFFILIATED COMPANIES, FOR ANY AND ALL LIABILITIES POTENTIALLY ARISING FROM ANY CLAIM, DEMAND OR ACTION BASED UPON ANY LOSSES, LIABILITIES, DAMAGES OR COSTS, INCLUDING BUT NOT LIMITED TO DAMAGES THAT ARE DIRECT OR INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL, AND INCLUDING ATTORNEYS FEES AND LEGAL COSTS, THAT MAY RESULT FROM THE INSTALLATION, OPERATION, USE OF, OR INABILITY TO USE WARRANTORS' PRODUCTS AND SERVICES, OR FROM THE FAILURE OF THE WARRANTORS' SYSTEM TO REPORT A GIVEN EVENT OR CONDITION, WHETHER OR NOT CAUSED BY WARRANTORS' NEGLIGENCE, EXCEPT AS NECESSARY TO ENFORCE THE EXPRESS TERMS OF THIS LIMITED WARRANTY.

EXCLUSIVE WARRANTY: THE LIMITED WARRANTY OR WARRANTIES DESCRIBED HEREIN CONSTITUTE THE SOLE WARRANTY OR WARRANTIES TO THE PURCHASER. ALL IMPLIED WARRANTIES ARE EXPRESSLY DISCLAIMED, INCLUDING: THE WARRANTY OF MERCHANTABILITY AND THE WARRANTY OF FITNESS FOR A PARTICULAR USE AND THE WARRANTY OF FITNESS FOR A

PARTICULAR PURPOSE AND THE WARRANTY OF NON-INFRINGEMENT AND/OR ANY WARRANTY ARISING FROM A COURSE OF DEALING, USAGE, OR TRADE PRACTICE.

IT MUST BE CLEAR THAT THE WARRANTORS ARE NOT INSURING YOUR PREMISES OR BUSINESS OR GUARANTEEING THAT THERE WILL NOT BE DAMAGE TO YOUR PERSON OR PROPERTY OR BUSINESS IF YOU USE THIS PRODUCT. YOU SHOULD MAINTAIN INSURANCE COVERAGE SUFFICIENT TO PROVIDE COMPENSATION FOR ANY LOSS, DAMAGE, OR EXPENSE THAT MAY ARISE IN CONNECTION WITH THE USE OF PRODUCTS OR SERVICES, EVEN IF CAUSED BY WARRANTORS' NEGLIGENCE. THE WARRANTORS ASSUME NO LIABILITY FOR INSTALLATION OF THE PRODUCT AND/OR INTERRUPTIONS OF THE SERVICE DUE TO STRIKES, RIOTS, FLOODS, FIRE, AND/OR ANY CAUSE BEYOND SELLER'S CONTROL, FURTHER SUBJECT TO THE LIMITATIONS EXPRESSED IN ANY LICENSE AGREEMENT OR OTHER AGREEMENT PROVIDED BY WARRANTORS TO PURCHASER.

THE AGREEMENT BETWEEN THE WARRANTORS AND THE PURCHASER, INCLUDING BUT NOT LIMITED TO THE TERMS AND CONDITIONS HEREIN SHALL NOT BE GOVERNED BY THE CONVENTION FOR THE INTERNATIONAL SALE OF GOODS. WHERE APPLICABLE, THE UNIFORM COMMERCIAL CODE AS ADOPTED BY THE STATE OF DELAWARE SHALL APPLY.

4. **PROCEDURE FOR OBTAINING PERFORMANCE OF WARRANTY**: IN THE EVENT THAT THE PRODUCT DOES NOT CONFORM TO THIS WARRANTY, THE PRODUCT SHOULD BE SHIPPED OR DELIVERED FREIGHT PREPAID TO A WARRANTOR WITH EVIDENCE OF ORIGINAL PURCHASE.

5. **LEGAL REMEDIES AND DISCLAIMER**: SOME JURISDICTIONS MAY NOT ALLOW, OR MAY PLACE LIMITS UPON, THE EXCLUSION AND/OR LIMITATION OF IMPLIED WARRANTIES, INCIDENTAL DAMAGES AND/OR CONSEQUENTIAL DAMAGES FOR SOME TYPES OF GOODS OR PRODUCTS SOLD TO CONSUMERS AND/OR THE USE OF INDEMNIFICATION TERMS. THUS, THE EXCLUSIONS, INDEMNIFICATION TERMS AND LIMITATIONS SET OUT ABOVE MAY NOT APPLY, OR MAY BE LIMITED IN THEIR APPLICATION, TO YOU. IF THE IMPLIED WARRANTIES CAN NOT BE EXCLUDED, AND THE APPLICABLE LAW PERMITS LIMITING THE DURATION OF IMPLIED WARRANTIES, THEN THE IMPLIED WARRANTIES HEREIN ARE TO BE LIMITED TO THE SAME DURATION AS THE APPLICABLE WRITTEN WARRANTY OR WARRANTIES HEREIN. THE WARRANTY OR WARRANTIES HEREIN MAY GIVE YOU SPECIFIC LEGAL RIGHTS THAT WILL DEPEND UPON THE APPLICABLE LAW. YOU MAY ALSO HAVE OTHER LEGAL RIGHTS DEPENDING UPON THE LAW IN YOUR JURISDICTION.

6. **CHOICE OF FORUM AND CHOICE OF LAW**: IN THE EVENT THAT A DISPUTE ARISES OUT OF OR IN CONNECTION WITH THIS LIMITED WARRANTY, THEN ANY CLAIMS OR SUITS OF ANY KIND CONCERNING SUCH DISPUTES SHALL ONLY AND EXCLUSIVELY BE BROUGHT IN EITHER THE COURT OF COMMON PLEAS OF DELAWARE COUNTY, PENNSYLVANIA OR THE UNITED STATES DISTRICT COURT FOR THE EASTERN DISTRICT OF PENNSYLVANIA.

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Effective date 02/25/2015

PHONETICS, INC. d.b.a. SENSAPHONE

901 Tryens Road

Aston, PA 19014
Phone: 610.558.2700 Fax: 610.558.0222
www.sensaphone.com

TABLE OF CONTENTS

CHAPTER 1: INSTALLATION 9

INTRODUCTION 9

FEATURES 9
TECHNICAL SUPPORT 9

ABOUT THIS MANUAL 9

INSTALLATION AND CONFIGURATION 10

PHYSICAL DESCRIPTION 10
LAYOUT 10
RJ-45 10/100BASE-T ETHERNET PORT 10
SENSOR INPUTS 10
POWER ON LED (GREEN) 10
ALARM LEDS (RED) 10
ONLINE LED (GREEN) 10
STANDBY LED (YELLOW) 10
ACKNOWLEDGE/ STANDBY BUTTON 11

INSTALLATION 11

PARTS REQUIRED 11
OPERATING ENVIRONMENT 11
POWER 11
NETWORK CONFIGURATION 11
WALL MOUNT INSTALLATION 12

CONNECTING SENSORS 12

GENERAL WIRING CONSIDERATIONS 12
NORMALLY OPEN / NORMALLY CLOSED DRY CONTACTS 13
2.8K/10K TEMPERATURE SENSORS 14
4–20MA CURRENT LOOP TRANSDUCERS 14
RELAY OUTPUT WIRING 15
BATTERY BACKUP 15
RESETTING THE SENTINEL TO FACTORY DEFAULT SETTINGS 15

CHAPTER 2: SET UP 16

DESCRIPTION OF WEB PAGES 16

DASHBOARD 16
DEVICE DETAILS 18
CONFIGURE DEVICE 18
ZONE PARAMETER DEFINITIONS 19
MANAGE USERS 21
MANAGE USER GROUPS 22
DEVICE LOGS 24
MANAGE DEVICES 24
DEVICE GROUPS 24
ALARM ACKNOWLEDGEMENT 25

APPENDIX A: WEEKLY TESTING PROCEDURE 26
APPENDIX B: ACCESSORIES. 27
APPENDIX C: SPECIFICATIONS. 28
ALERT ZONES 28
RELAY OUTPUT 28
DATA LOGGING 28
COMMUNICATION TYPE: 28
POWER SUPPLY. 28

CHAPTER 1: INSTALLATION

INTRODUCTION

Congratulations on your purchase of the Sentinel Monitoring System. The system is designed to be an easy, cost–effective, cloud–based monitoring and data logging system to notify you when equipment or conditions go awry. The internet browser–based programming makes the device easy to use from any computer or tablet. Monitored conditions can include temperature, humidity levels, pressure, flow, leak detection, UPS systems, and more. The system allows multiple users to be notified immediately of any detected problems. Notification can occur via voice call, e–mail or SMS (text message), however voice calls and text messages require a premium subscription plan. The internal battery backup system insures the unit will continue to run if main power fails.

FEATURES

The Sentinel includes the following key features:

- Twelve sensor inputs to monitor environmental conditions and/or alarm contacts from other equipment.
- 10/100BASE-T Ethernet port.
- Battery backup for uninterrupted performance.
- Compact design allows wall-mount or weatherproof installation in a suitable enclosure.
- Notification via e–mail, text message (optional) and voice call (optional).
- Relay output capable of automatic or manual control.
- Cloud–based user interface for programming, data storage, and alarm delivery.

TECHNICAL SUPPORT

If any questions arise upon installation or operation of the Sentinel, please contact the Sensaphone Technical Service Department at 610.558.2700 and have the following information available:

- Date of purchase _____
- Serial number _____

Technical support is available from 8:00 AM to 5:00 PM, M-F, eastern time.

ABOUT THIS MANUAL

This manual comprises the instructions necessary to install and setup the Sentinel. You should thoroughly read this manual to establish a basic understanding of the system and keep it as a reference.

INSTALLATION AND CONFIGURATION

PHYSICAL DESCRIPTION

The Sentinel is housed in a 5.5” x 5.5” x 1.5” enclosure, which can be easily wall mounted.

LAYOUT

The Sentinel has connections for twelve sensor inputs, an ethernet port, and 12VDC power. See figure below:

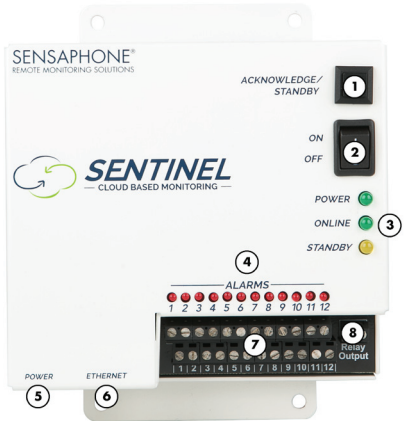


Figure 1: Front Panel Layout of the Sentinel

1) Acknowledge/Standby Button
2) On/Off Switch
3) Power, Online, Standby LEDs
4) Alarm LEDs
5) Power Jack
6) Ethernet Jack
7) Sensor Input Terminal Strip
8) Relay Output Input

RJ-45 10/100BASE-T ETHERNET PORT

This jack is for connecting to your network so that the device can communicate with the Sentinel servers. Two LEDs indicate when the Sentinel has a valid link (green) and transmitted/received data (yellow).

SENSOR INPUTS

The sensor inputs labeled zones 1-12 are designed to interface with normally open/normally closed devices, 2.8K or 10K temperature sensors and 4-20mA transducers.

POWER ON LED (GREEN)

This light indicates that the Sentinel unit is powered and operational.

ALARM LEDS (RED)

The Alarm LEDs indicate if an alarm exists.

ONLINE LED (GREEN)

This light indicates that the Sentinel unit is communicating with the Sentinel servers.

STANDBY LED (YELLOW)

This light indicates that the Sentinel unit is in standby mode.

ACKNOWLEDGE/ STANDBY BUTTON

When an unacknowledged alarm exists (as indicated by a blinking red alarm LED), briefly press the button and the alarm LED will stop blinking, indicating that the alarm is acknowledged. To enter Standby mode, press and hold the button for at least 5 seconds until the Standby LED lights up, then release. To exit from Standby mode, hold the button down for 5 seconds until the Standby LED turns off.

INSTALLATION

This section provides information on:

- Operating environment
- Installation
- Connecting sensors
- Network Configuration

PARTS REQUIRED

- Screwdriver and #8 screws
- Network Hub, Switch, or Router that supports 10 or 100 BASE-T
- Computer w/Internet Connection

OPERATING ENVIRONMENT

Before you install the Sentinel be sure that your operating environment meets the physical requirements of the equipment.

Operating Temperature:	32° – 122° Fahrenheit (0° – 50° C)
Humidity:	5 – 90 %RH, non-condensing
Power:	115VAC 50/60 Hz outlet within 6’

POWER

Connect the included AC power supply to the power jack on the Sentinel. Plug the power adapter into a 115V AC power outlet.

NETWORK CONFIGURATION

Using the included network cable, connect the Sentinel into your network hub, switch or router. If your network supports DHCP the ONLINE green LED should light up within a few minutes indicating that the device has connected to the sensaphone.net servers.

If your network requires the device to have a static IP address, please contact Sensaphone technical support for availability of this feature.

WALL MOUNT INSTALLATION

The Sentinel can be wall mounted using dry wall anchors and (4) #6 screws. Follow the steps below:

1) Install four drywall anchors (if necessary). Attach the Sentinel using four #6 tapping screws. See Figure 2 for dimensions.
2) Attach sensors to the zone terminals.
3) Plug the power adaptor into a 115VAC 50/60Hz outlet.
4) Connect a CAT5 cable to the Ethernet port and connect to a 10/100 network hub, switch or router.

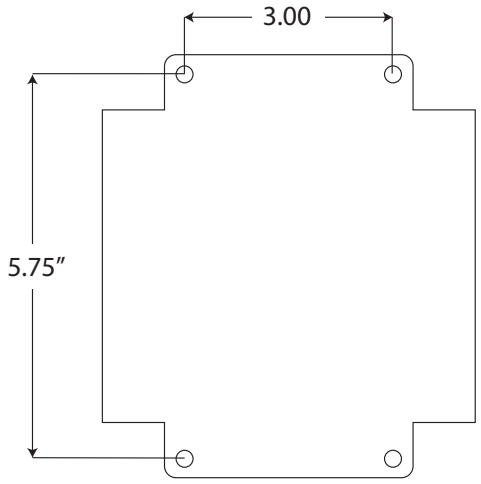


Figure 2: Sentinel mounting dimensions

CONNECTING SENSORS

The Sentinel is compatible with a wide variety of sensors including normally open/normally closed contacts, 2.8K and 10K temperature sensors, and 4–20mA current sources. Compatible sensors and accessories are shown on the Sentinel website. Sensors may be connected while the device is powered on or off. A proper size screwdriver is provided for your convenience. Contact Sensaphone or your Sensaphone reseller for assistance in selecting sensors for your monitoring requirements. A list of sensors and accessories is shown in Appendix **B.** Follow the instructions below to properly wire and configure the inputs for each type of electrical signal.

> **Warning**: The inputs are designed to work with low voltage signals. DO NOT connect voltages greater than 3.3V to the inputs. DO NOT connect 120VAC to the inputs.

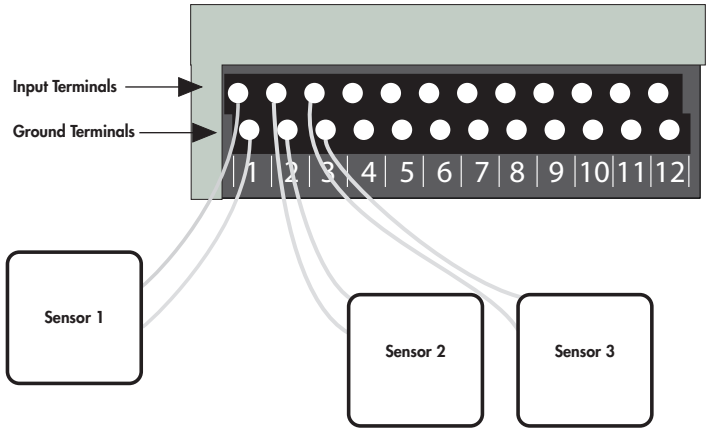
GENERAL WIRING CONSIDERATIONS

Most dry contact sensors can be connected to the Sentinel using inexpensive 2-conductor twisted-pair cable as small as #24 AWG. For temperature and 4–20mA sensors, use the wire chart below as a reference for selecting the appropriate wire gauge. Note that if the sensor is located far from the unit or if you are running cable in an electrically noisy environment, you should seriously consider using shielded cable. This will shield the signal from electrical interference, thereby preventing false readings and/or damage to the unit. For your convenience, Sensaphone has 22 gauge shielded cable available in 50' lengths (part number FGD-0010). To minimize electrical noise coupling between sensor wires and other wiring, follow the guidelines listed below:

- Route the power supply and network cables to the unit by a separate path then the wiring to the sensor inputs. Where paths must cross, their intersection should be perpendicular.
- Do not run sensor wiring and AC power in the same conduit.
- Segregate wiring by signal type. Bundle wiring with similar electrical characteristics together.
- If shielded cable is used, tie the shield to the input ground terminal.

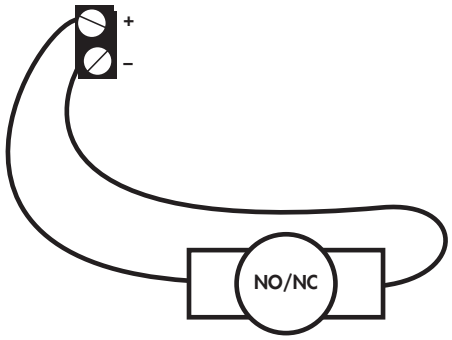
Wiring Distance	Minimum Wire Gauge
700’	#24 AWG
1500’	#22 AWG
2500’	#20 AWG

The zone terminal strip has an upper and lower level for connecting up to 12 sensors. The lower level terminals are all “ground” and are electrically connected together. The upper terminal strip is the positive connection for each sensor. See illustration below.



NORMALLY OPEN / NORMALLY CLOSED DRY CONTACTS

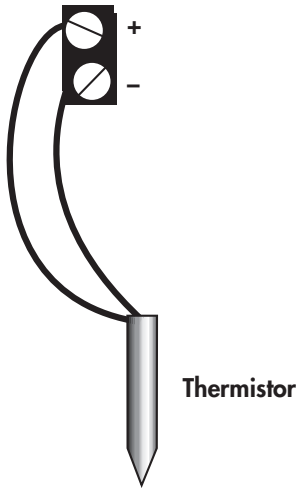
Dry contact sources consist of alarm relays or switches that are isolated and have no external voltage applied. These devices can be connected directly to the zone terminals without regard for polarity. Choose a zone and connect the wires to the corresponding screw terminals for that zone. The following figure shows how to connect a dry contact sensor:



Wiring a Dry Contact Sensor

2.8K/10K TEMPERATURE SENSORS

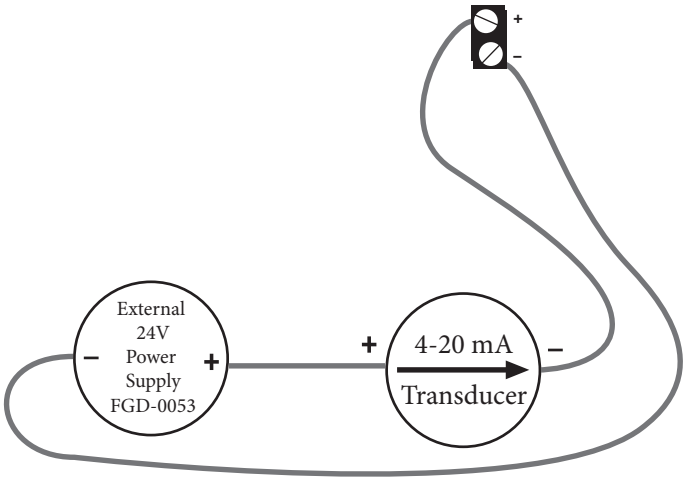
The Sentinel is compatible with 2.8K/10K temperature sensors that match the curve data listed in the tables in Appendix F. The monitoring temperature range of the 2.8K thermistor is -109 to 115ºF (-85º to 57ºC) and the 10K thermistor is -87° to 168°F (-66° to 76°C). Temperature sensors can be connected directly to the zone terminals without regard for polarity. Choose an alarm input and connect the wires to the corresponding screw terminals for that zone. 2.8K and 10K temperature sensors are available from Sensaphone. See Appendix C for part numbers. The figure below shows how to connect a temperature sensor:



Wiring a Temperature Sensor

4–20MA CURRENT LOOP TRANSDUCERS

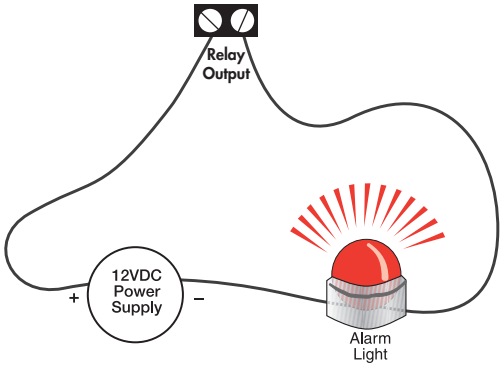
The inputs on the Sentinel are compatible with transducers that produce an analog output current of 4 to 20mA. Such transducers are available to measure tank and well levels, extreme temperatures, air pressure, water pressure, flow, voltage, current, rotational speed, etc. Contact our technical support department for assistance regarding your monitoring requirements (877-373-2700 or support@sensaphone.com). Follow the wiring diagrams below for connecting a 4–20mA device:



Wiring a 4–20mA device using an external 24 VDC supply.

RELAY OUTPUT WIRING

The Sentinel includes an relay output (switch) that can be used to turn on a light, siren, or other device whenever an alarm occurs. The output is a normally–open (i.e. off) dry contact that can be used for low voltage switching. The relay is rated for up to 30VAC/VDC 1 Amp. A sample wiring diagram is shown below:



The relay can be programmed to turn on whenever an input is above or below the programmed alarm limits and the programmed recognition time has been met. It will release as soon as the input returns to a normal condition.

BATTERY BACKUP

The Sentinel has an internal rechargeable battery backup pack (part #FGD-0032) which will provide up to 8 hours of backup time in the event of a power failure. The unit will charge the battery and monitor its charge level. The percent charge can be viewed on the website. The Sentinel contains circuitry to protect the battery from deep discharge damage and will disconnect the battery when all of its available energy has been expended. The battery backup module should last 4 to 5 years.



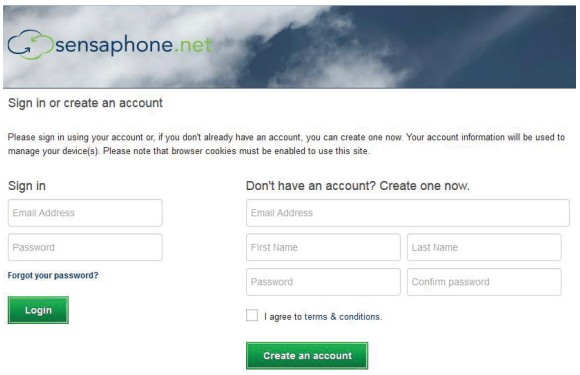
RESETTING THE SENTINEL TO FACTORY DEFAULT SETTINGS

In the event that you can no longer connect to your Sentinel, you can reset the unit to factory defaults. On the bottom of the unit is a small hole. Beneath the hole is a push button. Insert a paper clip or similar item into the hole and push the button for 5 seconds while the device is powered on. The Sentinel will erase all of its programming and then reboot automatically.

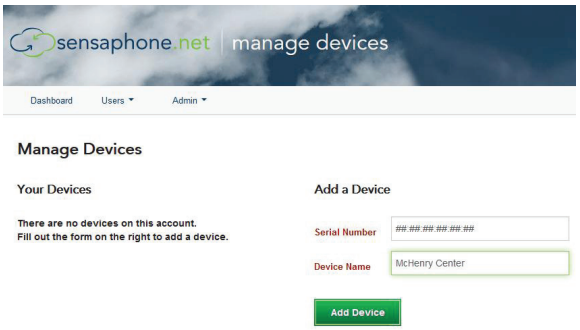
CHAPTER 2: SET UP

When your Sentinel "Online" LED is lit you can continue with the following website section.

1. Open an internet browser and go to www.sensaphone.net.
2. Fill in the form to create a new account.



3. Once you are logged in, click *Admin*, then *Manage Devices*. In the "Add a Device" section, enter the Serial Number of your Sentinel and enter a device name. Click the *Add Device* button when finished.



Your Sentinel is now online with the Sensaphone.net website. Read the section below to learn how to view status and program your device.

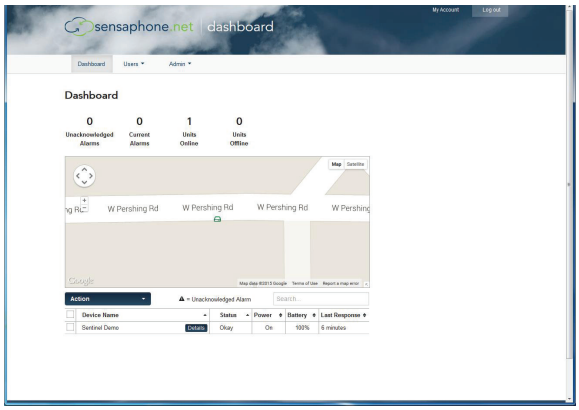
DESCRIPTION OF WEB PAGES

DASHBOARD

The dashboard will list all of the devices on your account. This page is automatically updated with the most current information available.

The numbers at the top will show how many Unacknowledged Alarms, Current Alarms, Units Online, and Units Offline that currently exist for all devices on your account.

The map will show the location of any device on your account that has an address or GPS location listed. You can hover over the icon to see the device name and status. If the icon for the device is green, your device status is OK. If it is red, your device has alarms. You can click on the icon to show the zones for the selected device.



The device table will display all devices on your account. Click on the *Details* button to display and configure the zones for that device. You can also use the search box above the table to search through the table, or click on the table column headers to sort the data.

Device Name – The name of the device

Status – The current status of the device (Okay, Alarms, Offline, or Standby) If the device has any unacknowledged alarms, a symbol will be displayed in this column

Power – Displays if the device is On or Off (--- will display if the device is offline)

Battery – The current percentage of the device battery (--- will display if the device is offline)

Last Response – The time that the device last connected to the server

Alarm Acknowledgment

Alarms can be acknowledged from the dashboard page by selecting a device using the checkboxes next to each device, and then clicking the "Action" drop-down at the top of the screen. You can acknowledge both Device Offline alarms or Zone alarms. Devices with 'Unacknowledged' alarms are identified with an exclamation point within a triangle. Once the alarm is acknowledged this symbol will disappear. You can acknowledge multiple alarms on multiple devices at the same time. Alarms can also be acknowledged during telephone calls by entering 555 when prompted to enter the acknowledgment code, or by simply replying to alarm messages sent via email.

Standby Mode

Standby mode puts the Sentinel in a temporary state such that no alarms will be detected, allowing onsite personnel to perform maintenance or other tasks that may have triggered an alarm otherwise. Standby mode can be entered using the Action drop down on the Dashboard page or via the pushbutton on the front of the unit. Standby mode will persist for the duration of time entered on the Device Configure screen and will automatically exit once the time expires. When using the pushbutton you must depress the button for 5 seconds. The Standby LED will light up to indicate that the device is in Standby mode. You can also exit Standby mode using the same methods.

Standby – Allows you to put the selected devices into Standby mode

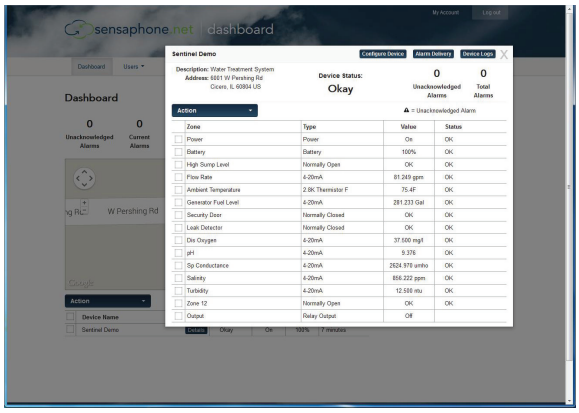
Enter – Put the Sentinel in Standby mode for the length of time that is set on the Device Configure page

Enter (Untimed) – Put the Sentinel in Standby mode until you disable it

Exit – Take the device out of Standby mode

DEVICE DETAILS

The device details page displays the sensor values for your Sentinel. This page is automatically updated with the most current information available. At the top of the page are buttons to access the *Configuration*, *Alarm Delivery* and *Logs*.



At the top of the page, you will see the device name, description, address and alarm status.

You will also see all of the zones for your device in the table.

Zone – The name of the zone

Value – The current value of the zone

Status – The current status of the zone

If the device has any unacknowledged alarms, a symbol will be displayed in this column

Type – The type of sensor that the zone is set to monitor

The Action dropdown menu provides options that allow you to interact with your device.

Acknowledge Alarms – Allows you to acknowledge alarms for the selected zones (you can have multiple zones selected)

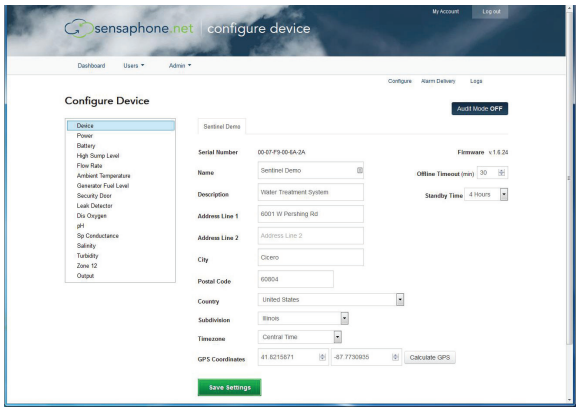
CONFIGURE DEVICE

At the top of the dashboard, click *Configure Device* to go to the device and zone programming screens.

The box on the left will display all of your configureable zones, as well as Device (for general device settings), Power, Battery and Relay Output. As you select an option, the form on the right will change to display the appropriate data. Complete the address so that the Sentinel icon will be displayed at the appropriate location on the dashboard map.

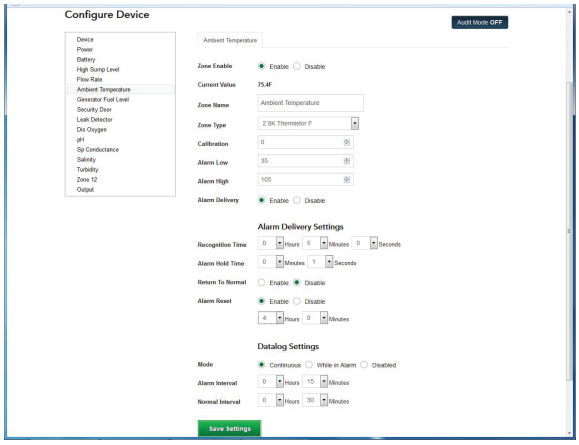
This page also contains settings for the *Device Offline* alarm and for *Standby Mode*. The *Device Offline* alarm will notify you if your devices stops communicating with the sensaphone.net servers for the programmed time duration.

Once you have completed your programming, click on the *Save Settings* button at the bottom of the page.



Zone Programming

Select the zone you would like to configure from the box from the left. A sample screen for a temperature sensor is shown below.



ZONE PARAMETER DEFINITIONS

Enable/Disable: This setting determines if the Zone is being used (Enabled) or not (Disabled). Selecting Disabled will remove the gauge from the Summary screen.

Name: Enter a name for the sensor you are monitoring which describes its purpose and/or location. The name will appear on the Device Details screen as well as on alarm messages.

Type: Choose the type of sensor you are connecting to the Zone input. For temperature sensors choose either degrees F or C.

Units: The Units field is used to describe the units of measure for the value being monitored. When Temperature is selected the Units field will automatically display F (Fahrenheit) or C (Celsius). When a 4-20mA type is selected you can enter the appropriate text for the monitored condition (e.g. %RH, PSI, GPM, RPM,…). When you select Normally Open (NO) or Normally Closed (NC) you can choose from several preset descriptions for the Open and Closed state of the input. The first word always describes the Open state of the contact and the second the Closed state. If you choose Custom you can enter your own text for the Open and Closed states. To do this simply type the words into the lower Units field and separate them with a slash (/). For example, “Slow/Fast”, “Safe/Danger”, “Dry/Wet”.

Calibration: This field can be used to offset the Zone value either positive or negative if there is some error in the reading.

Alarm Low: This is used to determine the low level at which a temperature or 4–20mA Zone has reached the alarm threshold. The value must fall below the Alarm Limit to trip an alarm.

Alarm High: This is used to determine the high level at which a temperature or 4–20mA Zone has reached the alarm threshold. The value must exceed the Alarm Limit to trip an alarm.

Table Low: The Table Low value is used to define the lower range (4mA) of your 4-20mA sensor.

Table High: The Table High value is used to define the upper range (20mA) of your 4-20mA sensor.

Alarm Delivery Enable/Disable: When Enabled, alarm messages will be delivered, if set to Disabled alarm messages will not be delivered.

Recognition Time: This is the length of time that an alarm condition must be present before a valid alarm exists and message delivery is started.

Alarm Hold Time: When an alarm occurs, the *Alarm Hold Time* will latch the alarm condition for the programmed time period, thus preventing redundant alarms from sending additional notification messages. This is useful for alarms that are likely to trip several times within a short time period, such as motion detectors.

Return to Normal Enable/Disable: This feature instructs the Sentinel to send a message when a zone input has changed from an alarm condition back to a normal condition. Anyone who received the original alarm message will also be sent the Return-to-Normal message.

Alarm Reset Enable/Disable: This setting enables or disables the Alarm Reset Feature. The Alarm Reset feature is used to re-send alarm messages in the event that a fault condition is not corrected in a timely fashion. If an alarm continues to exist for the duration of the programmed Reset Time (see below) the alarm will reset (reactivate) and the alarm message delivery process will begin all over again. This is an optional feature.

Alarm Reset Time: This is the time allowed for an alarm's fault condition to be corrected before the Sentinel resets (reactivates) the alarm and begins the message delivery process all over again. It is recommended that this be set to no lower than 30 minutes to prevent numerous messages from being sent.

Datalogging Mode: The Sentinel has two modes of data logging for each zone: Continuous or While In Alarm. In Continuous mode the unit will log the value of the input on a fixed time interval all the time. The Normal Interval sets the logging rate while the value is within the normal range. The Alarm Interval sets the logging rate while the value is an alarm condition. By choosing the While In Alarm mode you can choose to have the unit only log values when it exceeds the alarm limits.

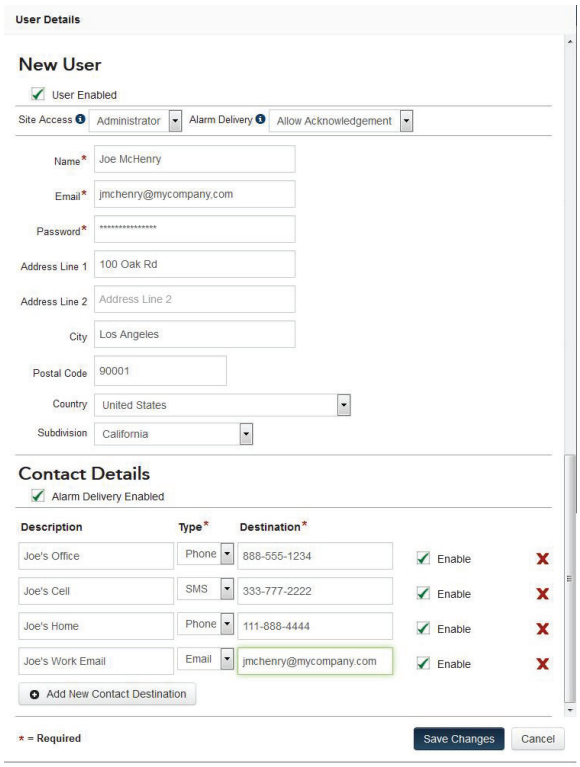
Alarm Datalog Interval: This is the interval that data will be logged while the input is beyond the programmed alarm limits. (Note: this is regardless of the programmed Alarm Recognition Time).

Normal Datalog Interval: This is the interval that data will be logged while the input is within the programmed alarm limits. To maximize the available memory for datalogging, set the Datalog Interval for each zone to multiples of each other. For example, Zone 1 can be set to 30 seconds, Zone 2 to 1 minute, Zone 3 to 5 minutes, etc…

MANAGE USERS

The sensaphone.net website allows you to set up users that will be linked to your account. Each user can be configured to have their own login for website access and/or be contacted for alarms. In addition, you can choose to give alarm acknowledgement capability to each user.

There are several levels of site access that can be assigned to each user. You can also enter contact information for alarm delivery purposes. From the main menu, select *Users*, then *Manage Users*. To add a new user, click on the *Add User* button. The example below shows a user setup as an administrator with four contact destinations.



The following defines the various site access levels:

Administrator – Full site access, all devices on your account

Supervisor – Gives the user access to the Dashboard, device-specific pages (for example, Device Details), Manage Users, and Manage User Groups, but for only the devices you choose for them (chosen under the Device Groups section of the form). Supervisors will have the ability to create new users, but they can only give the users Supervisor access or lower.

User – Gives the user access to the Dashboard, but only shows the devices you choose for them (chosen under the Device Groups section of the form)

None – No access to the website

Alarm Delivery – Choose whether you would like the user to be able to receive alarm notifications or not. There are three options (listed below):

Disabled – No alarm delivery

Inform Only – User is notified about the alarm, but cannot acknowledge it

Allow Acknowledgement – User is notified about the alarm and is able to acknowledge it

Click on *Save Changes* once you are finished editing, or *Cancel* to abandon all changes.

You can search the table for a particular user. Click on a user name to view some quick information about them. Click on the green edit icon to edit the user, or the red X to remove the user from your account.

MANAGE USER GROUPS

Allows you to set up groups of users that can be used on other site pages.

Select the group you wish to edit from the dropdown menu, or select *Create New Group* to make a new group.

Make sure to give each group a unique, descriptive name so they can be easily referenced.

Click on the plus icon to add users to the group. A pop up modal window will show that will list all the alarm users you have added to your account from the Manage Users page (see that page description for more information).

You can select an entire user (all destinations listed under that user at the time of the alarm will be notified) or individual destinations of the user.

Click on the red X icon to remove that user from the group.

Once you are finished adding and removing users, click on the *Save Group* button at the bottom of the page.

ALARM DELIVERY

The Alarm Delivery section is where you program the people that will be contacted when an alarm occurs. You can select from the users and destinations you have already configured, or you can insert individual destinations directly. There are two different scheduling methods to choose from: Custom or Advanced. You can also choose to have no alarms sent out by selecting the "default" option. The sections below explain how to configure each type of schedule. These are the users that will be notified when an alarm occurs. To get to the Alarm Delivery programming section, click the *Details* button from the Dashboard for the device you would like to configure, then click the *Alarm Delivery* button.

Default

No alarm notifications are sent

Custom

Allows you to quickly personalize your alarm delivery schedule

All alarm notifications will be delivered to the users listed on this page immediately after an alarm occurs.

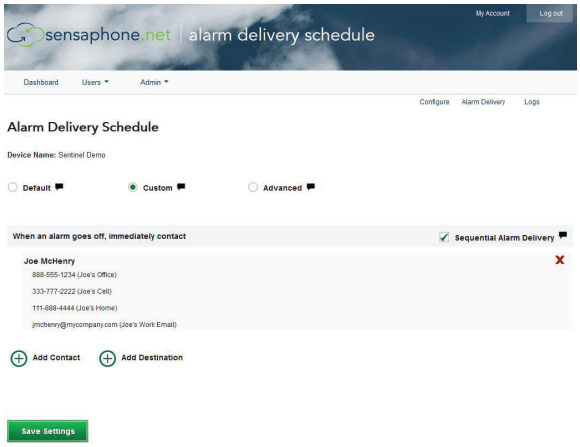
Sequential Alarm Delivery, if checked, allows the notifications to be delivered one at a time (per user) instead of all at once to the users listed.

Click on *Add Contact* to select a user to add to your schedule. These users are the Alarm Users that are set up on the Manage Users page (see page description for more information).

You can select an entire user (all destinations listed under that user at the time of the alarm will be notified) or individual destinations of the user.

Click on *Add Destination* to add a quick destination that will just be used for this schedule.

You can drag and drop the users that are listed to reorder them.



Advanced – Allows advanced settings for your alarm delivery schedule
In addition to everything listed under Custom, this will allow you to set custom time frames for the schedule, and allow you to have multiple tiers of users that can be notified.

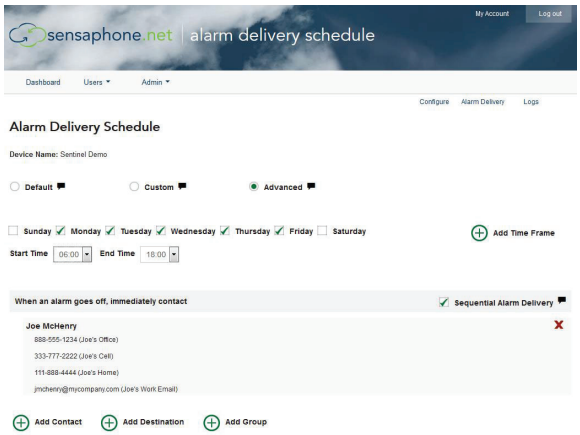
The checkboxes and dropdown menus at the top of the form dictate when exactly the schedule will be active – for example, Monday – Friday 8:00 am to 5:00 pm. You can have multiple time frames.

Click on *Add Group* to add a preset group of users to the schedule (see Manage User Groups for more information).

Click on *Add New Tier* to add another group of users that will be notified after a set time delay – for example, after 30 minutes – if the alarm is not yet acknowledged.

When you are finished setting up your schedule, click on the Save Settings button on the bottom of the form.

When an alarm on your device occurs, this schedule will continue to process in the order you have listed until the alarm is acknowledged.



DEVICE LOGS

The Sentinel includes an Alarm Log and Data Log. The Alarm Log lists all alarm activity for the selected device. You can narrow down the messages by individual zones or you can select multiple zones. The Data Log contains the recorded values for each zone based on the parameters you set up on the Zone Configuration screens. You can display the values on the screen as well as graph them. There is also an option to Save the data to a file. To get to the Device Logs section, click the Details button from the Dashboard for the device you would like to view, then click the Device Logs button.

Alarm Log – Shows the history of all alarm notifications that were sent for the device

Data Log – Show the history of all logged zone values and statuses for the device

You can sort the data, search the data, show/hide more table rows, print the entire table, or save the entire table as a CSV, Excel, or PDF document.

MANAGE DEVICES

Allows you to add, modify, and remove devices from your account.

To add a new device to your account:

Fill out the form on the right, under Add a Device.

You must enter the Device ID, as well as a name and a description of the device. The ID will be located on the bottom of the device in the format 00-11-22-33-44-55.

The name and description can be any text you would like, but it will help you identify the device by a descriptive name. For example, you can use “North Farm” as the name, and “Main Entrance” as the description.

You can also give the address and/or GPS coordinates of the device if you would like to have them shown on the map on the Dashboard page, but these fields are optional.

Once finished with the form, click on *Add Device*.

To modify or remove a device from your account:

Click on the checkbox next to the device(s) you wish to modify from the list on the left, under Your Devices.

Choose the option you would like to do from the dropdown menu.

Click on the *Submit* button at the bottom of the page on the left.

DEVICE GROUPS

Allows you to set up groups of devices that can be used on other site pages.

In the main window, you will see a list of all your devices, and any groups you may have already created.

Devices are shown with a green device icon, and groups are shown with a black users icon.

You can have multiple groups within a groups, empty groups, and devices not listed in any group.

If a device icon is lined up on the left-most side of the window, they are not in a group.

The blue number shown on the groups icon shows how many devices and/or groups are within that group.

To add a new group, click on the *Add Group* button on the bottom of the page.

You can rename a group by right clicking on the group and selecting *Rename*.

To remove a group, right click on the group and select *Delete*.

Any devices and/or groups in that group will be moved up one level.

For example, if a group that had two devices was deleted, the two devices would be shifted to the left and would no longer be in any group. No device will be deleted.

To move a device or a group into a group, click on the device and drag it into the group you would like it.

You can click and drag a device or group to reorder them.

To search through your devices click on *Filters*. You can choose to hide any device or group that does not match your search, and you can choose to only search through your devices and not your groups.

Once you are finished editing your groups, click on the *Save Groups* button at the bottom of the page.

ALARM ACKNOWLEDGEMENT

When receiving voice calls, the alarm can be acknowledged by pressing 555 on a touch-tone telephone when prompted. Alarms can also be acknowledged by simply replying to alarm messages sent via email, or you can login to the website and acknowledge alarms right on the Dashboard.

APPENDIX A: WEEKLY TESTING PROCEDURE

We recommend that you test your Sensaphone weekly to be sure it is functioning properly. This will ensure that when a problem arises the Sensaphone will be ready to alert the appropriate personnel.

There are several tests that can be performed:

1.) Create an alarm on each zone by tripping all connected sensors.

Temperature sensors: Heat or cool the sensor.

Motion sensors: Have someone walk in front of the sensor.

Door/window sensors: open the door/window.

Water sensors: Apply a small amount of water beneath the sensor or use a wet towel and touch it to the sensor probes.

Humidity sensors: Raise the humidity around the sensor by holding a cup of very hot water beneath the sensor.

2.) Allow the unit to contact all programmed users. This will make sure that the Sensaphone is programmed properly. It will also prepare personnel to respond appropriately when they receive a message from the Sensaphone.

3.) Test the battery (if installed) by unplugging the AC adapter and making sure that the Sensaphone continues to function. Keep the AC adapter unplugged so that a Power Failure alarm occurs. Plug in the AC adapter after the unit has finished.

4.) Keep a log of your tests, noting the date and whether the Sentinel passed in each category tested. An example of such a log is shown below. (See "Test Log" at the end of this manual.)

WEB600 Test Log

Date	Inputs		Alarm		Battery		
	Pass	Fail	Pass	Fail	Pass	Fail	
07/19/09	☒	☐	☒	☐	☒	☐	Bob H
08/20/09	☒	☐	☒	☐	☒	☐	Alex G.
09/19/09	☒	☐	☒	☐	☒	☐	Bob H.
	☐	☐	☐	☐	☐	☐	
	☐	☐	☐	☐	☐	☐	

If you require assistance, call Sensaphone Technical Support at 610-558-2700.

APPENDIX B: ACCESSORIES

The sensors listed below are available from Sensaphone, and represent the most commonly used zone devices. Other dry contact sensors, designed for more specialized applications, may also be used. Commercial or industrial electrical supply houses can provide devices to monitor virtually any condition. For further information, contact Sensaphone Customer Service at 610-558-2700.

PART # . . . . . SENSOR / SWITCH

BAT-0032 . . . . .Sentinel Battery

FGD-0006 . . . . .Magnetic Reed Switch

FGD-0007 . . . . .Passive Infra-Red Detector

FGD-0010 . . . . .50’ two-conductor #22AWG shielded Cable

FGD-0013 . . . . .Spot Water Detector

FGD-0022 . . . . .Temp° Alert

FGD-0027 . . . . .Humidistat

FGD-0049 . . . . .Smoke Detector with Built-in Relay

FGD-0052 . . . . .Humidity 4-20mA Transmitter

FGD-0053 . . . . .24VDC Power Supply

FGD-0054 . . . . .Power-Out Alert™

FGD-0056 . . . . .Zone Water Detector w/Water Rope

FGD-0063 . . . . .Additional 10’ Water Rope for FGD-0056

FGD-0065 . . . . .Carbon Monoxide Sensor

FGD-0066 . . . . .Air Quality Sensor

FGD-0067 . . . . .Surge Suppressor

FGD-0100 . . . . .2.8k Remote Temperature Sensor

FGD-0101 . . . . .2.8k Weatherproof Temperature Probe

FGD-0102 . . . . .10k Weatherproof Temperature Probe

FGD-0103 . . . . .10k Indoor Decorator

FGD-0104 . . . . .10k Outdoor Air Weatherproof

FGD-0205 . . . . .Multi-Point Wireless I/O System

APPENDIX C: SPECIFICATIONS

ALERT ZONES

Number of Zones: 12

Zone Connector: terminal block

Zone Types: N.O./N.C. contact, 2.8K Thermistor (-109° to 115°F, -85° to 57°C) And 10K Thermistor (-87° to 168°F; -66° to 76°C), and 4-20mA (-80,000.0 to 80,000.0

Zone Characteristics: 28.7KΩ to 3.3V (temperature/contact) or 250 Ohms to ground (4-20mA)

A/D Converter Resolution: 12 bits ±2 LSB

Zone Protection: 5.5VDC Metal Oxide Varistor with fast acting diode clamps.

RELAY OUTPUT

Rated for 1A 30VAC/ 1A 30VDC Maximum

DATA LOGGING

1 minute to 1 month sampling rate

User programmable channel selection

Zones 1 – 12

Battery

Input Power

LED INDICATORS

Power: On steady when the unit is powered on.

Alarm: Off when no alarm exists.

Ethernet Link and Activity LEDs

Online

Standby

COMMUNICATION TYPE:

10/100 BASE-T Ethernet with SSL encryption

POWER SUPPLY

Power Supply: 120VAC/12VDC 50/60Hz 6W wall plug-in transformer w/6' cord.

Power Consumption: 2 Watts

Power Protection: Metal Oxide Varistor

Battery Backup: Internal 8 hr battery backup module (Part #BAT-0032).

ENVIRONMENTAL

Operating Temperature: 32–122° F (0–50° C)

Operating Humidity: 0–90% RH non-condensing

Storage Temperature: 32°–140° F (0–60° C)

PHYSICAL

Dimensions: 5.5” x 5.5” x 1.5” (14 cm x 14 cm x 3.8 cm)

Weight: 1.5 lbs. (680 grams)

Enclosure: Powder-coated aluminum enclosure with tabs for wall or panel mounting

APPENDIX D: THERMISTORS

2.8K THERMISTOR DATA

Degrees Celsius	Resistance (Ohms)
-50	187,625
-40	94,206
-30	49,549
-20	27,180
-10	15,491
0	9,142
10	5,572
20	3,498
30	2,256
40	1,491
50	1,009
60	697
70	490
80	351

10K THERMISTOR DATA

Degrees Celsius	Resistance (Ohms)
-50	441.3K
-40	239.8K
-30	135.2K
-20	78.91K
-10	47.54K
0	29.49K
10	18.79K
20	12.25K
30	8,194K
40	5,592
50	3,893
60	2,760
70	1,990
80	1,458
90	1,084
100	816.8
120	481.8
130	376.4
140	297.2
150	237.0

APPENDIX E: RETURNING THE UNIT FOR REPAIR

In the event that the Sentinel does not function properly, we suggest that you do the following:

1) Record your observations regarding the Sentinel's malfunction.

2) Call the Technical Service Department at 610-558-2700 prior to sending the unit to Sensaphone for repair.

If the unit must be sent to Sensaphone for Servicing, please do the following:

1) Unplug the AC power supply from the wall outlet and disconnect all sensors from the alert zones.

2) Carefully pack the unit to avoid damage in transit. Use the original container (if available) or a sturdy shipping box.

3) You must include the following information to avoid shipping delays:

a) Your name, address and telephone number.

b) A note explaining the problem.

4) Ship your package to the address below:

SERVICE DEPARTMENT

SENSAPHONE

901 Tryens Road

Aston, PA 19014

5) Ship prepaid and insured via UPS or US Mail to ensure a traceable shipment with recourse for damage or replacement.

APPENDIX F: TEST LOG

Date	Inputs		Alarms		Battery						Tested By
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
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	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
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	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	

Date	Inputs		Alarms		Battery						Tested By
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
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	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
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	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
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	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	
	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	Pass ☐	Fail ☐	

IDEC SmartRelay –The Intelligent Choice



Increase your versatility with a new remote display

Look around. IDEC SmartRelays are in everything from lighting controls to ice-making machines and grocery store misters. Proving reliable time after time, these intelligent logic modules are the ideal controller for simple automation tasks. A new fifth-generation of SmartRelays offer functions to give you even more flexibility and convenience. Advances include extended memory, a brighter display with higher LCD contrast, improved analog and high-speed inputs, an external text display, and upgraded programming software.

With an ever changing market and tough competition, you need an edge to stay on top. SmartRelay has a new HMI text display panel to do just that! This economical interface lets you make quick adjustments, while at the same time making it easy to spot and troubleshoot failures using built-in operator functions and diagnostics. So why wait? Make the smart choice, IDEC SmartRelay!

Industrial Facility Systems



- Conveyor systems
- Elevator controls
- Exhaust and filtering systems
- Automatic food dispensing machines
- Water treatment and irrigation systems
- Motor, pump and valve controls

Unique Solutions



- Solar-electric systems
- Marine systems
- Extreme environmental conditions
- Display panels and traffic light controls
- Energy management

Housing and Building Management



- Lighting controls (outside and inside)
- Door and gate controls
- Heating and cooling systems
- Shutter, sun blind and awning controls
- Water and sprinkler systems
- Ventilation systems

Monitoring Systems



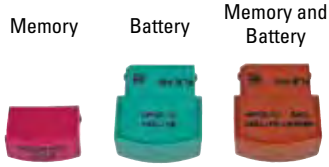
- Access controls
- Alarm systems
- Limit level monitoring
- Parking Lot monitoring
- Baggage control

www.IDEC.com/smartrelay

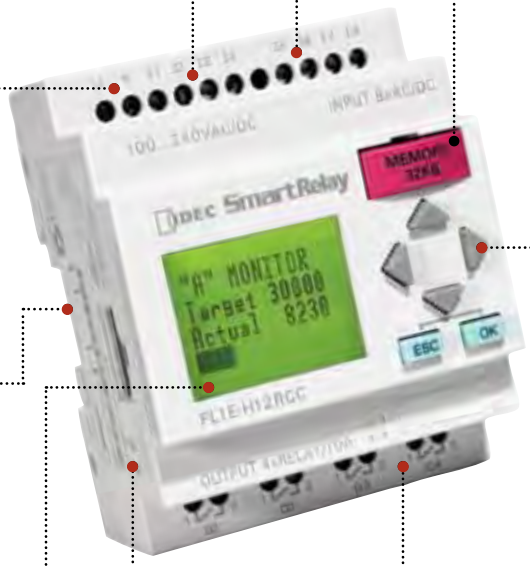
New Built-in Analog Inputs
Each SmartRelay is equipped with 8 digital inputs that can be used for your applications. New in the FL1E 12/24VDC and 24VDC models are four built-in analog inputs. Inputs I1, I2, I7, and I8 can now be configured to accept 0-10V analog signals. Using expansion modules, you can utilize a maximum of 24 digital and 8 analog inputs.

New Faster Inputs
FL1E can support up to four 5KHz high-speed inputs. You have the option of configuring inputs I3, I4, I5 and I6 as fast counter inputs to give you even more flexibility.

New Memory Cartridges
Three memory cartridges are now available for FL1E: Violet, Green and Brown! Violet is a 32K high-capacity, removable program memory card. Green is a battery card that supports a Real Time Clock power supply for up to two years. Brown is a combined memory/battery card.



Universal Voltages
Available in 12/24V DC for solar and vehicle applications, and 24V AC/DC for building automation, as well as 100-240V AC/DC, SmartRelay can be used for a wide variety of applications.



DIN Rail or Surface Mountable

Operational Control Buttons
Program with just the push of a button! SmartRelay control buttons can be used to program, modify and change preset parameters. The four cursor keys can also be configured as inputs as needed.

New Controllable Backlit LCD Display
FL1E SmartRelays have a built-in LCD display with a brighter, higher contrast screen you can adjust to your own preference. System status — input, output, analog values, timers and counters — can be monitored through the 4x12 LCD screen or you can display a predefined message with up to 48 characters (chosen from 103 special character types). Non-LCD versions are also available.

Digital Outputs
IDEC SmartRelays are equipped with four relay outputs rated at 10A/pt. Using digital expansion modules; you can configure a maximum of sixteen outputs.

New 50% More Memory
FL1E SmartRelays offer an expanded program memory of 200 function blocks! This is a 50% increase compared to the existing FL1D series.

EEPROM Memory
With IDEC SmartRelays, your program is stored in a non-volatile EEPROM Memory.

New Extended Retentive Data Memory
Extended memory gives you up to 250 bytes of retentive data memory. More than 4 times that of FL1D!

New Arithmetic Functions
Analog Math function blocks allow basic arithmetic operations such as addition, subtraction, multiplication, and division.

Password Protection
Concerned about your program being copied or altered? IDEC SmartRelays keep you safe with a unique password protection scheme allowing end users to access certain parameters without seeing or modifying the actual program.

Additional text display
For the first time ever, you can connect an external text display to your SmartRelay, making it easy for you to monitor, view and troubleshoot from outside your panel. Turn to page 7 to learn more!

Quality
IDEC has built a reputation based on providing high-quality, dependable products you can trust, and our SmartRelays are no exception. Each model is cULus listed, CE certified, EMC compliant, FM approved for Class 1 Div 2 hazardous locations, C-tick compliant, Lloyds Registered and ABS approved.

Part Numbers

Base Modules – with LCD

Style	Part Number	Voltage	Input Signal	Input	Output	With Clock
	FL1E-H12RCE	12/24V DC	DC I1, I2, I7 and I8 are used for digital/analog	PNP	Relay	Yes
	FL1E-H12SND	24V DC			Transistor Source	
	FL1E-H12RCA	24V AC/DC	AC/DC	PNP/NPN	Relay	Yes
	FL1E-H12RCC	100-240V AC/DC		PNP		

Base Modules – without LCD

Style	Part Number	Voltage	Input Signal	Input	Output	With Clock
	FL1E-B12RCE	12/24V DC	DC I1, I2, I7 and I8 are used for digital/analog	PNP	Relay	Yes
	FL1E-B12RCA	24V AC/DC	AC/DC	PNP/NPN	Relay	Yes
	FL1E-B12RCC	100-240V AC/DC		PNP		

Text Message Display

Style	Part Number	Rated Voltage	Description
	FL1E-RD1	12 VDC, 24 VAC/DC	FL1E Text Display Panel

Digital I/O Expansion Modules

- 8-pt expansion module (4 in/4 out)
- Max. 4 digital expansion modules

Style	Part Number	Total I/O	Input Power	Input	Output
	FL1B-M08B2R2	8 (4 in/ 4 out)	12/24V DC	DC	Relay
	FL1B-M08B1S2		24V DC		Transistor Sink
	FL1B-M08C2R2		100-240V AC/DC	AC/DC	Relay
	FL1B-M08D2R2		24V AC/DC		

Analog I/O Expansion Modules

- 2-pt Analog input module
- 2-pt Analog output module
- 10-bit resolution
- Max. 4 analog input modules and 1 analog output module

Style	Part Number	Total I/O	Input Power	Input	Output
	FL1B-J2B2	2 (2 in/0 Out)	12/24V DC	0-10V, 4-20mA	—
	FL1D-K2BM2	2 (0 in/2 Out)	24V DC	—	0-10V, 4-20mA

AS-Interface Communication Module

- The AS-Interface communication module provides optimum solutions for decentralized controls and savings in installation space and wiring
- Virtual I/O points: 4 inputs, 4 outputs

Style	Part Number	Module	Input Power	Total I/O
	FL1B-CAS2	AS-Interface Communication Module	30V DC	Input: 4 points Output: 4 points

Starter Kits

IDEC SmartRelay Starter Kit is an economical and ideal solution for first time IDEC SmartRelay users

- Package includes a base module, WindLGC programming software, USB programming cable, simulator switch (DC models only) and a user's manual



Starter Kits

Part Number	Description
SMARTSTART-BAC-E	FL1E-B12RCC, WindLGC software and programming cable
SMARTSTART-BDC-E	FL1E-B12RCE, WindLGC software, programming cable, and simulator switch
SMARTSTART-HAC-E	FL1E-H12RCC, WindLGC software and programming cable
SMARTSTART-HDC-E	FL1E-H12RCE, WindLGC software, programming cable, and simulator switch



WindLGC Software
FL9Y-LP1CDW

Accessories

Part Number	Description
FL9Y-LP1CDW	WindLGC 6.0 programming software
FL1E-PC2	SmartRelay USB programming cable
FL1E-PM4	FL1E SmartRelay memory cartridge
FL1E-PB1	FL1E SmartRelay battery cartridge
FL1E-PG1	FL1E SmartRelay memory and battery combination cartridge
FL9Y-B1090-0	FL1E SmartRelay user's manual
FL1B-Y1371-SW8	8-pt simulator switch, used with 12-24VDC, 24VDC base module only

WindLGC

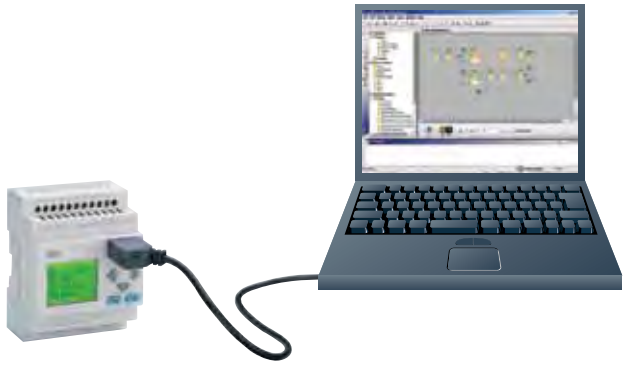
Programming Software

WindLGC is the exclusive programming software for the IDEC SmartRelay using Windows®. Edit, save, and print out your programs.

Key features:

- Ladder programming
- Online Monitor
- Program Comparison
- Time Simulation
- Simplified connection of the functions
- Programs can be saved in PDF or JPG format

Just click the function blocks you need and link function blocks for easy wiring. Devise complicated circuits using the convenient functions of WindLGC.



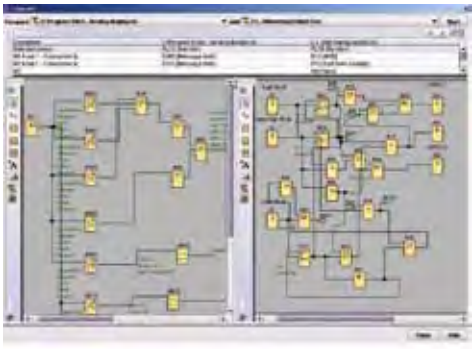
Part Number

Part Number	Description
FL9Y-LP1CDW	WindLGC programming software for IDEC SmartRelay

WindLGC system requirements:

- OS: Windows95/98/ME/NT/2000/XP/Vista and Windows 7
- CPU recommendation: Pentium 266MHz or higher
- Memory: 64MB or more
- RAM recommendation: 128MB
- Hard disk space: 90MB or more for installing WindLGC software.
- Monitor Recommendation: Display more than 800 x 600 dots and 256 colors
- Free download service, if upgrading from WindLGC Version 3.0 to Version 5.0, available at www.idec.com/usa

Program Comparison



Simulation Mode/Online Monitor



Ladder Programming



For more information, see the Automation Software section.

Visit **www.IDEC.com/downloads** for free upgrades or a free demo version.

Specifications

Base Modules

Style			with LCD Display	FL1E-H12SND	FL1E-H12RCE	FL1E-H12RCA	FL1E-H12RCC
			without Display	—	FL1E-B12RCE	FL1E-B12RCA	FL1E-B12RCC
Power Supply	Rated Power Voltage			24V DC	12/24V DC	24V AC/DC	100 to 240V AC/DC
	Allowable Voltage Range			20.4 to 28.8V DC	10.8 to 28.8V DC	20.4 to 26.4V AC, 20.4 to 28.8V DC	85 to 265V AC, 100 to 253V DC
	Rated Frequency			—	—	47 to 63Hz	47 to 63Hz
	Current Draw			40 to 75mA (24V DC)	60 to 175mA (12V DC) 40 to 100mA (24V DC)	76 to 182mA (24V AC) 40 to 100mA (24V DC)	25 to 40mA (100V AC), 20 to 30mA (240V AC) 10 to 25mA (100V DC), 6 to 15mA (240V DC)
	Allowable Momentary Power Interruption			—	2ms (Typ.) (12V DC) 5ms (Typ.) (24V DC)	5ms (Typ.) (24V AC/DC)	10ms (Typ.) (100V AC/DC) 20ms (Typ.) (240V AC/DC)
	Power Consumption			0.7 to 1.3W (24V DC)	0.3 to 1.7W (12V DC) 0.4 to 1.8W (24V DC)	0.9 to 2.7VA (24V AC) 0.4 to 1.8W (24V DC)	1.1 to 4.6VA (100V AC), 2.4 to 6.0VA (240V AC) 0.5 to 2.9W (100V DC), 1.2 to 3.6W (240V DC)
	Reverse Polarity Protection			Yes	Yes	—	—
Clock	Backup Duration			—	80 hours (25°C) [1]	80 hours (25°C) [1]	80 hours (25°C) [1]
	Clock Accuracy			—	±2 sec/day maximum	±2 sec/day maximum	±2 sec/day maximum
Input	Input Signal			DC		AC/DC	AC/DC
	Input Points			8 (I1 to I8)		8 (I1 to I8)	8 (I1 to I8)
	Analog Input Points			4 (I1, I2, I7, I8)		—	—
	High-speed Input [2]			4 (I3, I4, I5, I6), 5Khz maximum		—	—
	Analog	Input Range		0 to 10V DC (max. rated input: 28.8V DC)		—	—
		Input Error		±1.5 (of full scale)		—	—
		Input Resolution		10 bits (0 to 1000)		—	—
		Allowable Voltage Range		0 to 28.8V DC		—	—
	Input Impedance	Digital Input		3.5kΩ		4.8kΩ	840kΩ
		Analog Input		72kΩ		—	—
	Isolation			—	—	—	—
	Operating Range	OFF Voltage		< 5V DC		< 5V AC/DC	< 40V AC, < 30V DC
		ON Voltage		≥ 12V DC		≥ 12V AC/DC	≥ 79V AC, ≥ 79V DC
		OFF Current		< 0.85mA (I1 to I6), < 0.05mA (I1, I2, I7, I8)		< 1.0mA	< 0.03mA
		ON Current		≥ 2mA (I3 to I6) ≥ 0.15mA (I1, I2, I7, I8)	≥ 1.5mA (I3 to I6) ≥ 0.1mA (I1, I2, I7, I8)	≥ 2.5mA	≥ 0.08mA, 100V AC: 50ms (Typ.)
	Turn ON Time			1.5ms (Typ.) ≤ 1.0ms (I3, I6)		1.5ms (Typ.)	100V AC: 50ms (Typ.), 240V AC: 30ms (Typ.) 100V DC: 25ms (Typ.) 240V DC: 15ms (Typ.
	Turn OFF Time			1.5ms (Typ.) ≤ 1.0ms (I3, I6)		15ms (Typ.)	100V AC: 65ms (Typ.), 240V AC: 105ms (Typ.) 100V DC: 95ms (Typ.), 240V DC: 125ms (Typ.)
	Wire Length			100m [3]		100m [3]	100m

1. Two year backup duration (typ.) when bettery cartridge or memory/battery cartridge used.
2. When selecting frequency trigger function and up/down counter function.
3. 10m when connected to analog input (twisted pair cable).

Specifications con't on next page.

Specifications con't

Style		with LCD Display	FL1E-H12SND	FL1E-H12RCE	FL1E-H12RCA	FL1E-H12RCC
		without Display	—	FL1E-B12RCE	FL1E-B12RCA	FL1E-B12RCC
Output	Output		Transistor source	Relay		
	Output Points/ Contact Configuration		4 points (separate)	4NO contacts		
	Isolation		—	Isolated		
	Dielectric Strength (between power/input terminals and output terminals)		—	2500V AC, 1 minute, 500V DC, 1 minute		
	Output Voltage		External power voltage	—		
	Maximum Load Current		0.3A	Resistive load: 10A at 12/24V AC/DC, 10A at 100/120V AC, 10A at 230/240V AC Inductive load: 2A at 12/24V AC/DC, 3A at 100/120V AC, 3A at 230/240V AC		
	Surge Current		—	30A maximum		
	Short-circuit Protection		Built-in current limiting resistor: Approx. 1A	External fuse required: 16A maximum		
	Minimum Switching Load		—	10mA, 2V DC	10mA, 12V DC	
	Initial Contact Resistance		—	100 mΩ maximum (at 1A, 24V DC)		
	Mechanical Life		—	10 million operations (no load, 10Hz)		
	Electrical Life		—	100,000 operations (rated resistive load) 1800 operations/hour		
Switching Rate	Mechanical Load		—	10Hz		
	Electrical Load		10Hz	—		
	Resistive Load/Lamp Load [1]		10Hz	2Hz		
	Inductive Load		0.5Hz	0.5Hz		

1. For fluorescent lamps, if the inrush current exceeds the allowable value, use an appropriate relay.

General

Style		Specification	Standard
Operating Temperature	Horizontal Mounting	0 to 55°C	Cold: IEC60068-2-1 Hot: IEC60068-2-2
	Vertical Mounting	0 to 55°C	
Storage/Transportation Temperature		–40 to +70°C (no freezing)	—
Relative Humidity		10 to 95% RH (no condensation)	IEC60068-2-30
Atmospheric Pressure		795 to 1080 hPa	—
Operating Condition		No corrosive gas	—
Degree of Protection		IP20	—
Vibration Resistance		5 to 8.4Hz, amplitude 3.5mm 8.4 to 150Hz, acceleration 9.8m/s^2	IEC60068-2-6
Shock Resistance		147m/s^2	IEC60068-2-27
Drop Test		0.3m	IEC60068-2-31
Drop Test (packaged)		1m	IEC60068-2-32
Emission		Class B Group 1[1]	EN55011
Electrostatic Discharge		8kV air discharge, 6kV contact discharge [2]	IEC61000-4-2
Radiation Field Immunity		Field Strength: 1V/m and 10V/m	IEC61000-4-3
Burst Pulses		2kV (power line), 1kV (I/O signal line) [3]	IEC61000-4-4
Energy Carriers Single Pulse (Surge)[4] (FL1E-H12RCC, FL1E-B12RCC only)		1kV (power line) normal 2kV (power line) common	IEC61000-4-5
Communication Cable		0.5 to 2.5mm^2 (one wire), 0.5 to 1.5mm^2 (two wires)	—
Terminal Style		Finger-safe type [5]	—

1. Class A for AS-Interface communication module.
2. 8kV (air discharge), 4kV (contact discharge) for AS-Interface communication module.
3. 1kV (criteria A), 2kV (criteria B) for AS-Interface communication module.
4. For protection against surge noise on DC power supply types (FL1E-H12RCE/B12RCE, FL1E-H12SND, FL1E-H12RCA/B12RCA), use surge absorbers, noise cut transformers, or noise filters. Use of surge protection device (DEHN + SOHNE GmbH + Co. VVT AD 24 Part No. 918 402) is recommended.
5. Tightening torque 0.4 to 0.5 N·m.

Text Display

Part Number			FL1E-RD1
Keyboard Display			Membrane keypad with 10 keys, FSTN-Graphic Display with 128 x 64 (columns x rows), LED backlight
Power Supply	Input Voltage		24V AC/DC, 12V DC
	Allowable Voltage Range		20.4 to 26.4V AC, 10.2 to 28.8V DC
	Rated Frequency		47 to 63Hz
	Current Draw		30 to 55mA (24V DC)
	Power Consumption	12V DC	65mA
		24V DC	40mA
		24V AC	90mA
	Data Transmission Rate		19200 baud
LCD Display	Backlight lifetime [1]		20,000 hours
	Display lifetime [2]		50,000 hours
Weight			220g

Connect the text display and the base module using the text display cable (2.5m). The text display cable can be extended up to 10m using an extension cable (D-sub 9-pin).

1. Backlight durability is the number of hours it takes for the light to become 50% of the original brightness.
2. Display durability is calculated under ordinary operating and storage conditions: room temperature, normal humidity below 65% RH, and not subjected to direct sunlight.

Expansion I/O Module

Expansion I/O Module Model Number			FL1B-M08B1S2	FL1B-M08B2R2	FL1B-M08D2R2	FL1B-M08C2R2	FL1B-J2B2	FL1D-K2BM2
Power Supply	Rated Power Voltage		24V DC	12/24V DC	24V AC/DC	100 to 240V AC/DC	12/24V DC	24V DC
	Allowable Voltage Range		20.4 to 28.8V DC	10.8 to 28.8V DC	20.4 to 26.4V AC 20.4 to 28.8V DC	85 to 265V AC 100 to 253V DC	10.8 to 28.8V DC	20.4 to 28.8V DC
	Rated Frequency		—	—	50/60Hz (47 to 63Hz)	50/60Hz (47 to 63Hz)	—	—
	Current Draw		30 to 45mA	30 to 140mA (12V DC) 20 to 75mA (24V DC)	40 to 110mA (24V AC) 20 to 75mA (24V DC)	10 to 30mA (100V AC) 10 to 20mA (240V AC) 5 to 15mA (100V DC) 5 to 10mA (240V DC)	25 to 50mA	25 to 50mA
	Allowable Momentary Power Interruption		—	2ms (Typ.) (12V DC) 5ms (Typ.) (24V DC)	5ms (Typ.) (24V AC/DC)	10ms (Typ.) (100V AC/DC) 20ms (Typ.) (240V AC/DC)	2ms (Typ.) (12V AC/DC) 5ms (Typ.) (24V AC/DC)	5ms (Typ.)
	Power Consumption		0.8 to 1.1W	0.3 to 1.7W (12V DC) 0.4 to 1.8W (24V DC)	0.9 to 2.7VA (24V AC) 0.4 to 1.8W (24V DC)	1.1 to 3.5VA (100V AC) 2.4 to 4.8VA (240V AC) 0.5 to 1.8W (100V DC) 1.2 to 2.4W (240V DC)	0.3 to 0.6W (12V DC) 0.6 to 1.2W (24V DC)	0.6 to 1.2W (24V DC)
	Reverse Polarity Protection		Yes	Yes	—	—	Yes	Yes
Input	Input Signal		DC input	DC input	AC/DC input	AC/DC input	Analog input	—
	Input Points		4	4	4	4	—	—
	Isolation		—	—	—	—	—	—
	Allowable Voltage Range		0 to 28.8V DC	0 to 28.8V DC	0 to 26.4V AC 0 to 28.8V DC	0 to 265V AC 0 to 253V DC	—	—
	Operating Range	OFF Voltage	< 5V DC	< 5V DC	< 5V AC/DC	< 40V AC < 30V DC	—	—
		ON Voltage	≥ 12V DC	≥ 8.5V DC	≥ 12V AC/DC	≥ 79V AC ≥ 79V DC	—	—
		OFF Current	< 0.85mA	< 0.85mA	< 1.0mA	< 0.03mA	—	—
		ON Current	≥ 2mA	≥ 1.5mA	≥ 2.5mA	≥ 0.08mA	—	—
	Turn ON Time		1.5ms (Typ.)	1.5ms (Typ.)	1.5ms (Typ.)	100V AC: 50ms (Typ.) 240V AC: 30ms (Typ.) 100V DC: 25ms (Typ.) 240V DC: 15ms (Typ.)	—	—
	Turn OFF Time		1.5ms (Typ.)	1.5ms (Typ.)	1.5ms (Typ.)	100V AC: 65ms (Typ.) 240V AC: 105ms (Typ.) 100V DC: 95ms (Typ.) 240V DC: 125ms (Typ.)	—	—
	Analog Input Points		—	—	—	—	2	—
	Analog Input Range		—	—	—	—	0 to 10V (max. rated input: 28.8V) 0 to 20mA (max. rated input: 40mA)	—
	Digital Resolution		—	—	—	—	10 bits (0 to 1000)	—
	Input Error		—	—	—	—	±1.5% (of full scale)	—
	Input Impedance		—	—	—	—	76kΩ (0 to 10V) 155 to 250Ω (0 to 20mA)	—
	Sampling Cycle		—	—	—	—	50ms	—

Expansion I/O Module Specifications con't on next page.

Expansion I/O Module, con't

Expansion I/O Module Model Number		FL1B-M08B1S2	FL1B-M08B2R2	FL1B-M08D2R2	FL1B-M08C2R2	FL1B-J2B2	FL1D-K2BM2
Output	Wire Length	100 m	100 m	100 m	100 m	10 m (twisted-pair shielded cable)	—
	Output	Transistor source	Relay	Relay	Relay	—	Analog
	Output Points/ Contact Configuration	4 points (separate)	4NO contacts	4NO contacts	4NO contacts	—	—
	Isolation	—	Isolated	Isolated	Isolated	—	—
	Dielectric Strength (between power/input terminals and output terminals)	—	2500V AC, 1 minute 500V DC, 1 minute	2500V AC, 1 minute 500V DC, 1 minute	2500V AC, 1 minute 500V DC, 1 minute	—	—
	Output Voltage	External power voltage (20.4 to 28.8V DC)	—	—	—	—	—
	Maximum Load Current	0.3A	Resistive load 5A at 12/24V AC/DC 5A at 100/120V AC 5A at 230/240V AC Inductive load 2A at 12/24V AC/DC 3A at 100/120V AC 3A at 230/240V AC	Resistive load 5A at 12/24V AC/DC 5A at 100/120V AC 5A at 230/240V AC Inductive load 2A at 12/24V AC/DC 3A at 100/120V AC 3A at 230/240V AC	Resistive load 5A at 12/24V AC/DC 5A at 100/120V AC 5A at 230/240V AC Inductive load 2A at 12/24V AC/DC 3A at 100/120V AC 3A at 230/240V AC	—	—
	Short-circuit Protection	Built-in current limiting resistor: Approx. 1A	External fuse required: 16A maximum	External fuse required: 16A maximum	External fuse required: 16A maximum	—	Yes
	Minimum Switching Load	—	10mA, 12V DC	10mA, 12V DC	10mA, 12V DC	—	—
	Initial Contact Resistance	—	100 mΩ maximum (at 1A, 24V DC)	100 mΩ maximum (at 1A, 24V DC)	100 mΩ maximum (at 1A, 24V DC)	—	—
	Mechanical Life	—	10 million operations (no load, 10Hz)	10 million operations (no load, 10Hz)	10 million operations (no load, 10Hz)	—	—
	Electrical Life	—	100,000 operations (rated resistive load) 1800 operations/hour	100,000 operations (rated resistive load) 1800 operations/hour	100,000 operations (rated resistive load) 1800 operations/hour	—	—
	Analog Output Points	—	—	—	—	—	2
	Analog Output Range	—	—	—	—	—	0 to 10V, 4-20mA
	Digital Resolution	—	—	—	—	—	10 bits (0 to 1000V)
	Output Error	—	—	—	—	—	±2.5% (of full scale)
	Output Impedance	—	—	—	—	—	5kΩ
	Analog Value Conversion Interval	—	—	—	—	—	50ms
	Wire Length	—	—	—	—	—	10 m (twisted-pair shielded cable)
Switching Rate	Mechanical Load	—	10Hz	10Hz	10Hz	—	—
	Electrical Load	10Hz	—	—	—	—	—
	Resistive Load/Lamp Load	10Hz	2Hz	2Hz	2Hz	—	—
	Inductive Load	0.5Hz	0.5Hz	0.5Hz	0.5Hz	—	—

General

Item		Specification	Standard
Operating Temperature	Horizontal Mounting	0 to 55°C	Cold: IEC60068-2-1 Hot: IEC60068-2-2
	Vertical Mounting	0 to 55°C	
Storage/Transportation Temperature		–40 to +70°C [1]	—
Relative Humidity		10 to 95% RH [2]	IEC60068-2-30
Atmospheric Pressure		795 to 1080 hPa	—
Operating Condition		No corrosive gas	—
Degree of Protection		IP20	—
Vibration Resistance		5 to 9Hz, amplitude 3.5mm 9 to 150Hz, acceleration 9.8m/s^2 (1G)	IEC60068-2-6
Shock Resistance		147m/s^2 (15G)	IEC60068-2-27
Drop Test		50mm	IEC60068-2-31
Drop Test (packaged)		1m	IEC60068-2-32
Emission		Class B Group 1 [3]	EN55011
Electrostatic Discharge		8kV air discharge 6kV contact discharge [4]	IEC61000-4-2
Electromagnetic Fields		10V/m	IEC61000-4-3
Burst Pulses		2kV (power line) 1kV (I/O signal line) [5]	IEC61000-4-4
Energy Carriers Single Pulse (Surge) [6] (FL1B-H12RCC, FL1B-B12RCC only)		1kV (power line) normal 2kV (power line) common	IEC61000-4-5
Communication Cable		0.5 to 2.5mm^2 (one wire) 0.5 to 1.5mm^2 (two wires)	—
Terminal Style		Finger-safe type [7]	—

1. No freezing
2. No condensation
3. Class A for AS-Interface communication module
4. 8kV (air discharge), 4kV (contact discharge) for AS-Interface communication module
5. 1kV (criteria A), 2kV (criteria B) for AS-Interface communication module
6. For protection against surge noise on DC power supply types (FL1D-H12RCE/B12RCE, FL1D-H12SND, FL1D-H12RCA/B12RCA), use surge absorbers, noise cut transformers, or noise filters.
7. Tightening torque 0.4 to 0.5 N·m

AS-Interface Communication Module

Specifications

Module Type	AS-Interface slave module
Slave Type	Standard
Profile	I/O code: 7
	ID code: F
	ID2 code: F
Input/Output	Virtual input: 4
	Virtual output: 4
AS-Interface Voltage	30V DC (26.5 to 31.6V DC)
Current Draw	70 mA maximum (AS-Interface)

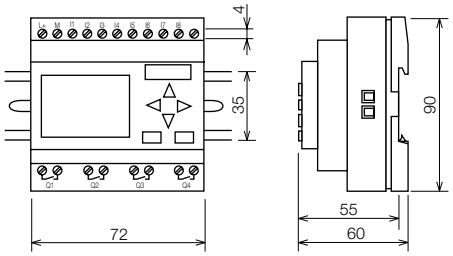
I/O Allocation

Input		Output	
AS-Interface	SmartRelay	SmartRelay	AS-Interface
Output Data Bit D0	Input In	Output Qm	Input Data Bit D0
Output Data Bit D1	Input In+1	Output Qm+1	Input Data Bit D1
Output Data Bit D2	Input In+2	Output Qm+2	Input Data Bit D2
Output Data Bit D3	Input In+3	Output Qm+3	Input Data Bit D3

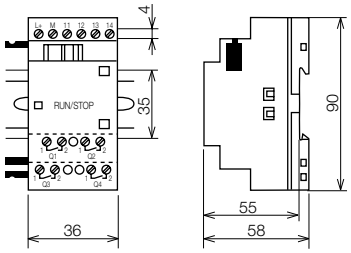
1. I/O point numbers "n" and "m" of the SmartRelay are automatically allocated by the base module according to the mounted position of the AS-Interface communication module.
2. AS-Interface communication module is IP20 terminal type.
3. AS-Interface cable is connected to the terminal block.

Dimensions (mm)

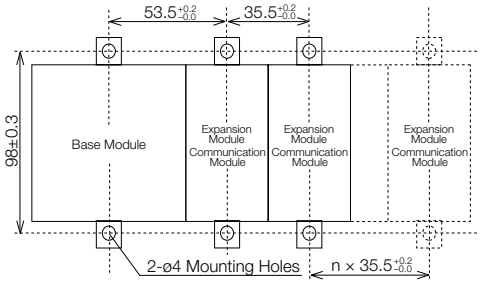
Base Module



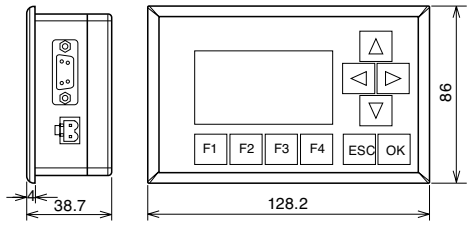
Expansion I/O Module, Communication Module



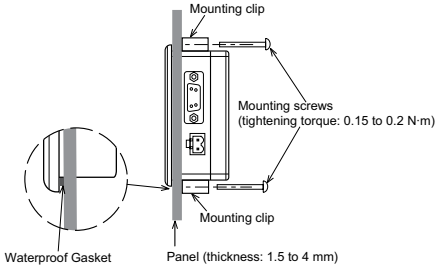
Mounting Hole Layout (Using Mounting Slides)



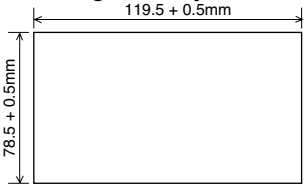
Text Display



Installation



Mounting Hole Layout



IDEC SmartRelay Series

Manual

May 2002

www.idec.com/usa

idec

Table of Contents

Welcome to IDEC SmartRelay v

1 Working with IDEC SmartRelay

1.1 IDEC SmartRelay Structure 1-4
1.2 Models 1-7
1.3 Certification, Recognition and Approval 1-9

2 Installing & Wiring the IDEC SmartRelay

2.1 Configuration of the Modular IDEC SmartRelay 2-2
2.1.1 Maximum Configuration. 2-2
2.1.2 Configuration with Different Voltage Classes 2-3
2.2 Installing/Uninstalling IDEC SmartRelay 2-4
2.2.1 Profile Rail Mounting 2-5
2.2.2 Wall-Mounting 2-9
2.3 Wiring the IDEC SmartRelay 2-11
2.3.1 Connecting the Power Supply 2-11
2.3.2 Connecting IDEC SmartRelay Inputs 2-13
2.3.3 Connecting IDEC SmartRelay Outputs 2-20
2.4 Switching on the IDEC SmartRelay/Power Return 2-23

3 Programming IDEC SmartRelay

3.1 Connectors 3-2
3.2 Blocks and Block Numbers 3-4
3.3 From Circuit Diagram to IDEC SmartRelay 3-7
3.4 Four Rules for Working with IDEC SmartRelay 3-10
3.5 Overview of the IDEC SmartRelay Menus 3-12
3.6 Program Input and Start 3-13
3.6.1 Change to Programming mode 3-13
3.6.2 First Program Example 3-14
3.6.3 Editing a Program 3-16
3.6.4 Assigning a Program Name. 3-21
3.6.5 Password. 3-22
3.6.6 IDEC SmartRelay to RUN Mode 3-26
3.6.7 Second Program Example. 3-28
3.6.8 Deleting a Block. 3-34
3.6.9 Deleting Multiple Interconnected Blocks 3-35
3.6.10 Correcting Typing Errors 3-36
3.6.11 "?" on the Display 3-36

3.6.12 Deleting a Program . . . 3-37
3.6.13 Daylight Savings Time (Summertime/Wintertime Conversion) . . . 3-38
3.7 Memory Space and Circuit Size . . . 3-42

4 IDEC SmartRelay Functions

4.1 Constants and Connectors - Co . . . 4-2
4.2 List of Basic Functions BF . . . 4-5
4.2.1 AND (AND) . . . 4-7
4.2.2 AND with RLO Edge Detection . . . 4-8
4.2.3 NAND (AND not) . . . 4-9
4.2.4 NAND with RLO Edge Detection . . . 4-10
4.2.5 OR (OR) . . . 4-11
4.2.6 NOR (OR not) . . . 4-12
4.2.7 XOR (exclusive OR) . . . 4-13
4.2.8 NOT (Negation, Inverter) . . . 4-14
4.3 Special Functions . . . 4-15
4.3.1 Input Designation . . . 4-16
4.3.2 Time Response . . . 4-18
4.3.3 Buffering the Clock . . . 4-19
4.3.4 Retentivity . . . 4-19
4.3.5 Parameter Protection . . . 4-19
4.3.6 Gain and Offset Calculation With Analog Values . . . 4-20
4.4 List of Special Functions - SF . . . 4-22
4.4.1 On Delay . . . 4-25
4.4.2 Off Delay . . . 4-26
4.4.3 On/Off Delay . . . 4-27
4.4.4 Retentive On Delay . . . 4-29
4.4.5 Latching Relay . . . 4-30
4.4.6 Current Impulse Relay . . . 4-31
4.4.7 Interval Time-Delay Relay / Pulse Output . . . 4-32
4.4.8 Edge-Triggered Interval Time-Delay Relay . . . 4-33
4.4.9 Seven-Day Time Switch . . . 4-34
4.4.10 Twelve-Month Time Switch . . . 4-39
4.4.11 Up/Down Counter . . . 4-41
4.4.12 Operating Hours Counter . . . 4-43
4.4.13 Symmetrical Clock Pulse Generator . . . 4-46
4.4.14 Asynchronous Pulse Generator . . . 4-47
4.4.15 Random Generator . . . 4-48
4.4.16 Frequency Trigger . . . 4-50
4.4.17 Analog Switch . . . 4-52
4.4.18 Analog Comparator . . . 4-55
4.4.19 Stairwell Light Switch . . . 4-59
4.4.20 Dual-Function Switch . . . 4-61
4.4.21 Message Texts . . . 4-63
4.4.22 Softkey . . . 4-66

5 Configuring IDEC SmartRelay

5.1 Switching To Parameter Assignment Mode 5-2
5.1.1 Menu Options in Parameter Assignment Mode 5-3
5.1.2 Parameter 5-4
5.1.3 Selecting the Parameters 5-5
5.1.4 Changing the Parameters 5-6
5.2 Setting the Time-of-Day and the Date (FL1B-*12RC*) 5-9

6 IDEC SmartRelay Program Modules

6.1 Overview of the Modules 6-2
6.2 Removing and Inserting Modules 6-3
6.3 Copying from the IDEC SmartRelay to the Module 6-5
6.4 Copying from the Module to IDEC SmartRelay 6-7

7 IDEC SmartRelay Software

7.1 Connecting the IDEC SmartRelay to a PC 7-3

8 Applications

8.1 Staircase or Corridor Lighting 8-2
8.1.1 Staircase Lighting System Requirements 8-2
8.1.2 Original Solution 8-2
8.1.3 Lighting System with IDEC SmartRelay 8-4
8.1.4 Special Features and Expansion Options 8-6
8.2 Automatic Door 8-7
8.2.1 Automatic Door Requirements 8-7
8.2.2 Original Solution 8-8
8.2.3 Door Control System with IDEC SmartRelay 8-9
8.2.4 Special Features and Expansion Options 8-11
8.2.5 Enhanced Solutions with FL1B-H12RCC 8-11
8.3 Air Conditioning System 8-14
8.3.1 Air Conditioning System Requirements 8-14
8.3.2 Advantages of Using IDEC SmartRelay 8-18
8.4 Industrial Gate 8-20
8.4.1 Gate Control System Requirements 8-20
8.4.2 Original Solution 8-21
8.4.3 Wiring the IDEC SmartRelay Solution 8-23
8.5 Centralized Control and Monitoring of Industrial Gates 8-24
8.5.1 Gate Control System Requirements 8-25
8.6 Luminous Rows 8-28
8.6.1 Lighting System Requirements 8-28
8.6.2 Original Solution 8-29
8.6.3 Luminous Row Control with FL1B-H12RCC 8-30

8.7 Water Pump 8-32
8.7.1 Water Pump Control System Requirements 8-33
8.7.2 Original Solution 8-33
8.7.3 Water Pump with FL1B-H12RCC 8-34
8.7.4 Special Features and Expansion Options 8-35
8.8 Additional Application Options 8-36

Appendix

A. Technical Specifications Appendix-1
A.1 General Technical Specifications Appendix-1
A.2 Technical Specifications:
FL1B-H12RCC, FL1B-B12RCC & FL1B-M08C2R2 . . . . . Appendix-3
A.3 Technical Specifications:
FL1B-H12RCA, FL1B-B12RCA, FL1B-H12SND
& FL1B-M08B1S2 . . . . . Appendix-5
A.5 Technical Specifications: FL1B-J2B2 . . . . . Appendix-7
B. Determining the Cycle Time Appendix-9
C. IDEC SmartRelay Without Display Appendix-11
D. IDEC SmartRelay Menu Structure Appendix-14
E. Models (Part Numbers) Appendix-17
F. Abbreviations Appendix-18

Index

Welcome to IDEC SmartRelay

Dear Customer,

Thank you for your purchase of an IDEC SmartRelay. With the IDEC SmartRelay you have acquired a logic module that meets the stringent quality requirements of ISO 9001.

The IDEC SmartRelay can be used in many applications. Due to its flexibility and ease of operation the IDEC SmartRelay offers you a highly economical product for almost any application.

IDEC SmartRelay Documentation
This IDEC SmartRelay Manual contains information relating to the installation, programming and the use of IDEC SmartRelay FL1B Basic devices.

You can also find information on wiring the IDEC SmartRelay in this manual as well as in the product information included with every device.

WindLGC is the programming software for PCs. It runs under Windows® and helps you to become comfortable with your IDEC SmartRelay in a familiar environment. You can write, test, print out and archive your programs, independent of the IDEC SmartRelay. Find additional information on programming the IDEC SmartRelay with the PC, in the online help for WindLGC at *smart.idec.com*.

We have divided this manual into 8 chapters and an appendix.

1. Working with IDEC SmartRelay
2. Installing and Wiring the IDEC SmartRelay
3. Programming IDEC SmartRelay
4. IDEC SmartRelay Functions
5. Configuring IDEC SmartRelay
6. IDEC SmartRelay Program Modules
7. IDEC SmartRelay Software
8. Applications

Appendix

Safety Guidelines

The notes in this manual are for your own personal safety and for preventing damage to property. You should read them carefully and follow the directions. These instructions are highlighted by a warning triangle and are marked as follows according to the hazard level:



Warning

Warns that death, serious harm to health or damage to property can result if the respective precautionary measures are not taken.

Note

Draws your attention to particularly important information relating to the product and its handling, or to a part of the documentation requiring your special attention.

Major Changes to Previous Basic Device (FL1A)

- The design of IDEC SmartRelay Basic models has improved: all models are now equipped with 8 inputs and 4 outputs.
- IDEC SmartRelay Basic is modular: all models are equipped with an expansion interface.
- IDEC SmartRelay is very versatile: there is a series of expansion modules available to you, including, for example, digital modules and an analog module.

New Features of the Current Basic Device (FL1B)

- Password protection for the user program.
- Program can be named.
- Special "Softkey" function.
- New menu item "S/W Time" for automatic daylight savings time (summertime/wintertime conversion).
- Acknowledgment of the message text in RUN mode.
- Wall mounting is possible.

Additional Support

For additional information, please go to our web site at *www.idec.com*/*usa* or *smart.idec.com*.



Warning

Only skilled personnel should be allowed to start and operate this device. Qualified personnel are persons who are authorized to handle, ground and tag circuits, equipment and systems in accordance with approved safety regulations and standards.

This device must always be used as intended for the applications described in the documentation and in the technical specifications, and only in combination with non-IDEC devices or components approved or recommended by IDEC.

This product must be properly transported, stored, handled and installed as well as meticulously operated and maintained in order to ensure it functions safely and correctly.

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The reproduction, distribution or use of this document or its contents is not permitted without express written authority. Offenders will be liable for damages. All rights reserved, in particular in the event of patents being granted or the registration of a utility model or design.

Disclaimer of Liability
We have examined the contents of this publication for agreement with the hardware and software described. Nevertheless, discrepancies cannot be ruled out. Any liability and warranty for the accuracy of this information is excluded. The data in this manual is reviewed at regular intervals. Any corrections required are included in the subsequent editions. Suggestions for improvement are welcomed.

1 Working with IDEC SmartRelay

What is IDEC SmartRelay?

IDEC SmartRelay represents the universal IDEC logic module. IDEC SmartRelay integrates

- controls
- an operating and display unit
- power supply
- interface for expansion modules
- an interface for program modules and a PC cable
- ready-to-use basic functions that are often required in day-to-day operation, e.g. functions for on/off delays, current impulse relays and Softkey
- time switch
- binary markers
- inputs and outputs according to the device type

What can IDEC SmartRelay do?

IDEC SmartRelay offers solutions for domestic and installation engineering (e.g. for stairway lighting, external lighting, sun blinds, shutters, shop window lighting etc.), switch cabinet engineering and mechanical and apparatus engineering (e.g. for gate control systems, ventilation systems, or rainwater pumps etc.).

IDEC SmartRelay can also be implemented for special control systems in conservatories or greenhouses, for control signal processing and, by connecting a communication module (e.g. ASi) for distributed local controlling of machines and processes.

Special models without operator and display units are available for series production applications in small machine, apparatus, switch control and installation engineering.

New types of Equipment Now Available

IDEC SmartRelay Basic has two voltage classes:

- Class 1 < 24 V (12 V DC, 24 V DC, 24 V AC)
- Class 2 > 24 V (100...240 V AC/DC)

Inputs/Outputs:

- With display: 8 inputs and 4 outputs.
- Without display: 8 inputs and 4 outputs.

Each model is integrated in 4 units and is equipped with an expansion interface and offers you 30 ready-to-use basic and special functions for creating your program.

New Expansion Modules are Now Available?

- The IDEC SmartRelay digital module is available for 12 V DC, 24 V DC and 100 - 240 V AC/DC, with 8 I/Os.
- The IDEC SmartRelay analog module is available for 12 V DC and 24 V DC, with 2 inputs.
- The IDEC SmartRelay Communication module, e.g. the function module ASi (AS Interface bus system). This module is described in separate documentation.

The digital/analog modules are integrated in 2 units. Each one has two expansion interfaces for connecting additional modules.

It's Your Choice

The different basic models and expansion modules offer options and can be adapted by you specific for specific applications.

IDEC SmartRelay provides solutions ranging from the small domestic installation through small automation tasks to complex tasks integrating a bus system (e.g. the AS interface).

Note

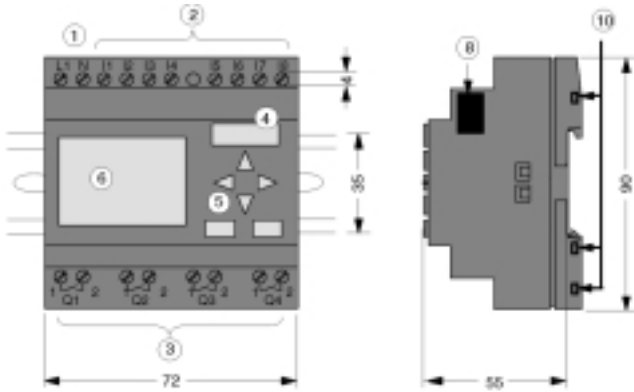
Every basic IDEC SmartRelay unit can be expanded with expansion modules of the same voltage class. Pin configuration prevents interconnection of devices of different voltage classes.

Exception:*The left interface of the analog module or communication module can be connected to devices of a different voltage class. See also "2.1 Configuration of the Modular IDEC SmartRelay" on page 2-2.*

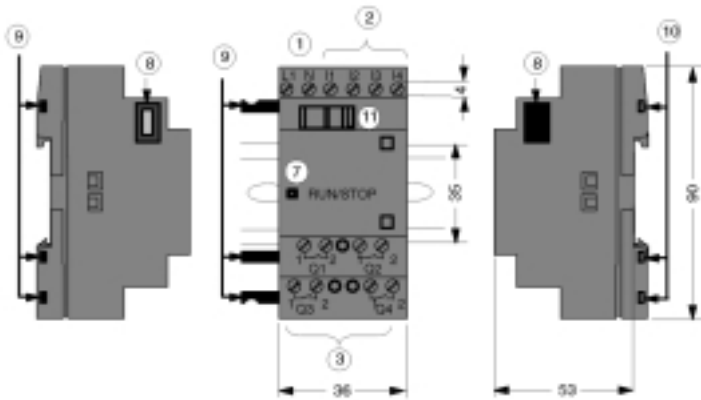
Regardless of the number of modules connected to the IDEC SmartRelay, the following I/O and memory bits are available: I1 to I24, AI1 to AI8, Q1 to Q16 And M1 to M8.

1.1 IDEC SmartRelay Structure

IDEC SmartRelay Basic
(eg. FL1B-H12RCC)

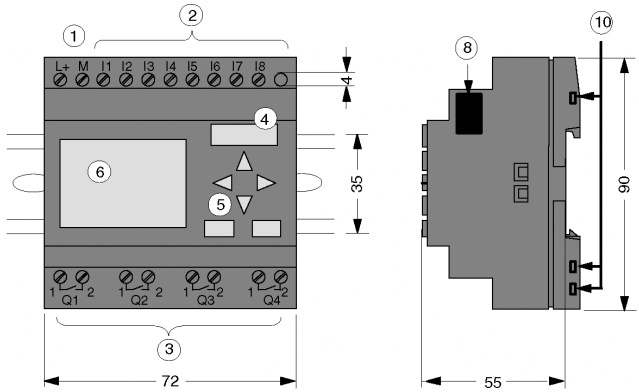


IDEC SmartRelay Expansion Module
(eg. FL1B-M08C2R2)

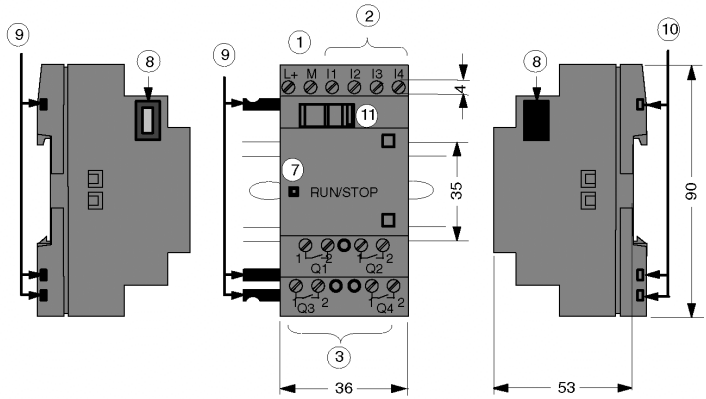


① Power supply
② Inputs
③ Outputs
④ Module slot with cover
⑤ Control panel (not with FL1B-B12***)
⑥ LCD (not with FL1B-B12***)
⑦ Status display RUN/STOP
⑧ Expansion interface
⑨ Mechanical coding – Pins
⑩ Mechanical coding sockets
⑪ Slide

IDEC SmartRelay Basic
(eg. FL1B-H12RCE)



IDEC SmartRelay Expansion Module
(eg. FL1B-M08B2R2)



① Power supply

② Inputs

③ Outputs

④ Module slot with cover

⑤ Control panel (not with FL1B-B12***)

⑥ LCD (not with FL1B-B12***)

⑦ Status display RUN/ STOP

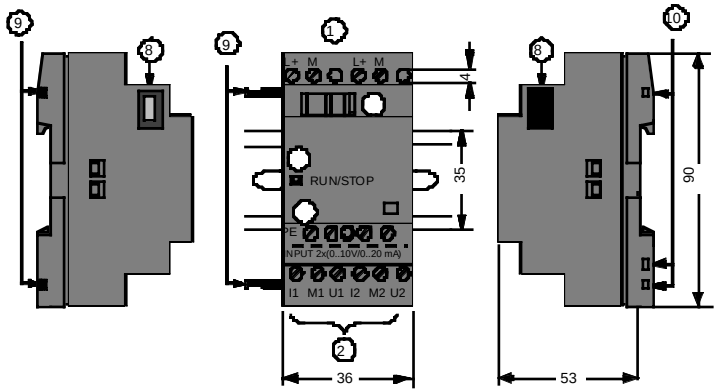
⑧ Expansion interface

⑨ Mechanical coding pins

⑩ Mechanical coding sockets

⑪ Slide

FL1B-J2B2



1 Power supply
2 Inputs
7 Status display RUN/ STOP
8 Expansion interface
9 Mechanical coding pins
10 Mechanical coding sockets
11 Slide
12 Grounding terminal for connecting ground and shielding of the analog measuring line.

IDEC SmartRelay Part Numbers

The IDEC SmartRelay part number indicates the following properties:

- 12: Total I/Os
- 08: Total I/Os
- R: Relay outputs
- S: Transistor output
- C: Integrated seven -day time switch
- H: Model with display
- B: Model without display
- M: Digital module
- J: Analog module

1.2 Models



Models with display are equipped with 8 inputs and 4 outputs



Models without display are equipped with 8 inputs and 4 outputs



The digital module is equipped with 4 digital inputs and 4 digital outputs



The analog module is equipped with 2 analog inputs

Models

IDEC SmartRelay is available in the following models:

Model	Part Number	Supply voltage	Inputs	Outputs	Properties
	FL1B-H12RCE	12/24 V DC	8 Digital*	4 Relays 240 V x 10 A	
	FL1B-H12SND	24 V DC	8 Digital*	4 Transistor 24 V x 0.3 A	no clock
	FL1B-H12RCA	24 V AC	8 Digital	4 Relays 240 Vx10 A	
	FL1B-H12RCC #	100...240 V AC/DC	8 Digital	4 Relays 240 Vx10 A	
	FL1B-B12RCC	12/24 V DC	8 Digital*	4 Relays 240 Vx10 A	no display no keyboard
	FL1B-B12RCA	24 V AC	8 Digital	4 Relays 240 Vx10 A	no display no keyboard
	FL1B-B12RCC #	100...240 V AC/DC	8 Digital	4 Relays 240 Vx10 A	no display no keyboard

*: alternatively, 2 analog inputs (0...10V) and 2 fast inputs can be used.

#: 240 V AC models: Inputs in two groups of 4. Within a group only the same phase, between groups different phases are possible.

Expansion Module

The IDEC SmartRelay can be connected to the following expansion modules:

Symbol	Designation	Supply Voltage	Inputs	Outputs
	FL1B-M08B2R2	12/24 V DC	4 Digital	4 Relays [3]
	FL1B-M08B1S2	24 V DC	4 Digital	4 Transistors
	FL1B-M08C2R2	100...240 V AC/DC	4 Digital [1]	4 Relays[3]
	FL1B-J2B2	12/24 V DC	2 Analog 0-10 V or 0-20 mA[2]	none

1. no different phases allowed within the inputs.
2. 0-10 V, 0-20 mA connection is optional.
3. The maximum sum switching power across all four relays is 20 A.

1.3 Certification, Recognition and Approval

UL, CSA and FM

IDEC SmartRelay is certified according to UL, CSA and FM.

- UL listing mark
  Underwriters Laboratories (UL) to
  UL 508 standard, file no. 116536
- CSA-Certification-Mark
  Canadian Standard Association (CSA) to
  Standard C22.2 No. 142, File No. LR 48323
- FM certification
  Factory Mutual (FM) Approval to
  Standard Class Number 3611,
  - Class I, Division 2, Group A, B, C, D
  - Class I, Zone 2, Group IIC



Warning

Personal injury and property damage may occur.

In potentially explosive areas, personal injury or property damage can result if you disconnect any connectors while the system is in operation. Always switch off the power supply for the IDEC SmartRelay and its components before disconnecting any connectors.

CE, VDE, IEC and EN

IDEC SmartRelay carries CE marking, complies with VDE 0631 and IEC 61131-2 standard and has interference suppression to EN 55011 (limit class B, class A for ASi bus operation).

Shipbuilding Certification

- ABS - American Bureau of Shipping
- BV - Bureau Veritas
- DNV - Det Norske Veritas
- GL - Germanischer Lloyd
- LRS - Lloyds Register of Shipping

- PRS - Polski Rejestr Statków

IDEC SmartRelay can therefore be used both in industrial and domestic applications.

C Tick Mark (Australia)



The products carrying the label shown at the side are compliant with AS/NZL 2064:1997 (Class A) standard.

2 Installing & Wiring the IDEC SmartRelay

General Guidelines

When mounting and wiring your IDEC SmartRelay you should observe the following guidelines:

- When wiring the IDEC SmartRelay ensure you are conforming with current rules and standards. You should also follow any national and regional regulations when installing and operating the devices. Contact the relevant authorities to find out the standards and regulations that apply in your specific case.
- Use wires with the appropriate cross-section for the amount of current involved. IDEC SmartRelay can be wired using cables with a conductor cross-section of 1.5 mm^2 and 2.5 mm^2, refer to “2.3 Wiring the IDEC SmartRelay” on page 2-11.
- Don’t over-tighten the connectors. Maximum torque: 0.5 N/m, refer to “2.3 Wiring the IDEC SmartRelay” on page 2-11.
- Keep wiring distances as short as possible. If longer wires are necessary, a shielded cable should be used. Arrange the wires in pairs: one neutral conductor with one phase conductor or one signal line.
- Keep the following separate:
  -AC circuits
  -High-voltage DC circuits with fast switching cycles
  -Low voltage signal wiring.
- Ensure that the wires have the required strain relief.
- Provide suitable overvoltage protection for wires that could be susceptible to lightning.
- Do not connect an external power supply to an output load parallel to a DC output. This can result in reverse current at the output unless you have a diode or a similar block in your configuration.

Note

IDEC SmartRelay must always be mounted and wired by skilled personnel who are familiar and follow current rules and standards.

2.1 Configuration of the Modular IDEC SmartRelay

2.1.1 Maximum Configuration

Maximum Configuration of IDEC SmartRelay With Analog Inputs

(FL1B-H12RCE/B12RCE and FL1B-H12SND)

IDEC SmartRelay Basic 4 Digital Modules and 3 Analog Modules							
I1.....I6 AI1, AI2	I9...I12	I13...I16	I17...I20	**I21...I24**			
IDEC SmartRelay Basic	FL1B-M08****				FL1B-J2B2		
					AI3 , AI4	AI5 , AI6	AI7 , AI8

Tip

When using inputs I7 / AI1 and I8 / AI2 as analog inputs (AI1 and AI2), you should also avoid using them as digital inputs I7/I8.

Maximum Configuration of IDEC SmartRelay Without Analog Inputs

(FL1B-H12RCA/B12RCA and FL1B-H12RCC/B12RCC)

IDEC SmartRelay Basic 4 digital modules and 4 analog modules								
I1.....I8	I9...I12	I13...I16	I17...I20	I21...I24				
IDEC SmartRelay Basic	FL1B-M08****				FL1B-J2B2			
					AI1 , AI2	AI3 , AI4	AI5 , AI6	AI7 , AI8

Fast/Optimal Communication

In order to achieve optimal communication speed between IDEC SmartRelay Basic and the various modules, we recommend configuring the digital modules first, then the analog modules as in the example above.

2.1.2 Configuration with Different Voltage Classes

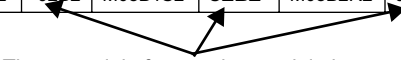
Since the potential of the left analog module interface (FL1B-J2B2, 12/24 V DC) is separated from the right one, you can connect it to all IDEC SmartRelay Basic models.

The potential of expansion modules arranged to the right of the analog module is separated from IDEC SmartRelay Basic.

It is therefore possible to connect an expansion module of a different voltage class as IDEC SmartRelay Basic to the right side of an analog module.

Example:

FL1B-*12RCC	FL1B-M08C2R2	FL1B-J2B2	FL1B-M08B1S2	**FL1B-J2B2**	FL1B-M08B2R2	FL1B-J2B2	FL1B-M08B1S2



The potential of an analog module is separated

2.2 Installing/Uninstalling IDEC SmartRelay

Dimensions

IDEC SmartRelay's installation dimensions are compliant with DIN 43880.

IDEC SmartRelay can be snap-mounted on a 35 mm DIN EN 50022 profile rail or mounted on the wall.

Width of IDEC SmartRelay:

- IDEC SmartRelay Basic has a width of 72 mm, corresponding to 4 unit segments.
- The width of IDEC SmartRelay expansion modules is 36 mm, corresponding to 2 unit segments.

Note

We shall illustrate mounting and removal in a graphic overview for a FL1B-H12RCC and a digital module.The shown methods also apply for all other IDEC SmartRelay basic models and expansion modules.



Warning

Expansion modules must only be "connected" or "disconnected" after power is switched off.

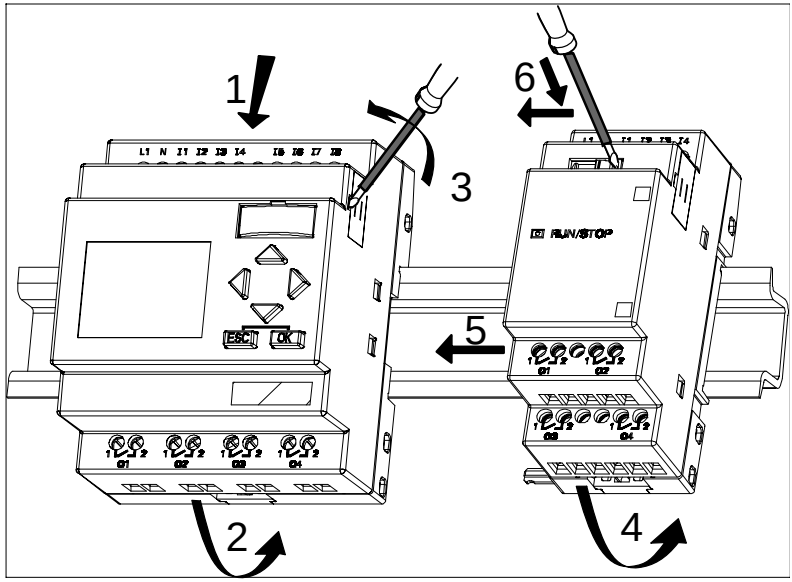
2.2.1 Profile Rail Mounting

Installing

Follow the following guidelines to install the IDEC SmartRelay basic and a digital module on a profile rail:

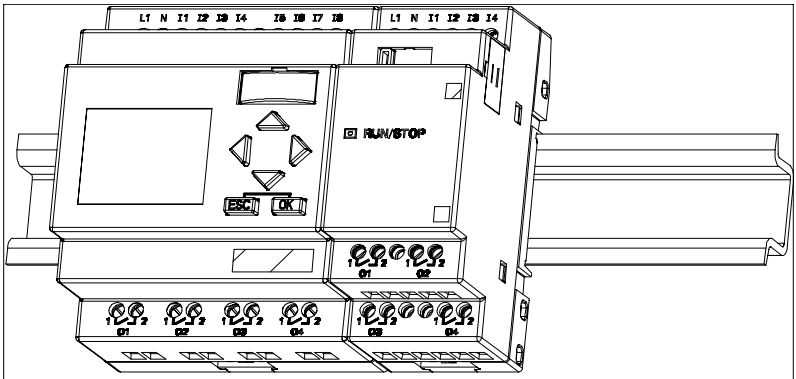
IDEC SmartRelay Basic:

1. Place the IDEC SmartRelay basic on the rail.
2. Then rotate the unit around the rail. (The mounting slide at the rear must be engaged.)



IDEC SmartRelay Digital Module:

3. At the right side of the IDEC SmartRelay Basic/IDEC SmartRelay expansion module, remove the cover of the connector.
4. Place the digital module to the right of the IDEC SmartRelay basic.
5. Slide the digital module towards the left up to the IDEC SmartRelay Basic.



Repeat steps 3 to 6 is you want to install additional expansion modules.

6. Using a screwdriver, slide the integrated to the left. When the slide engages in the IDEC SmartRelay basic it is in the correct position.

Note

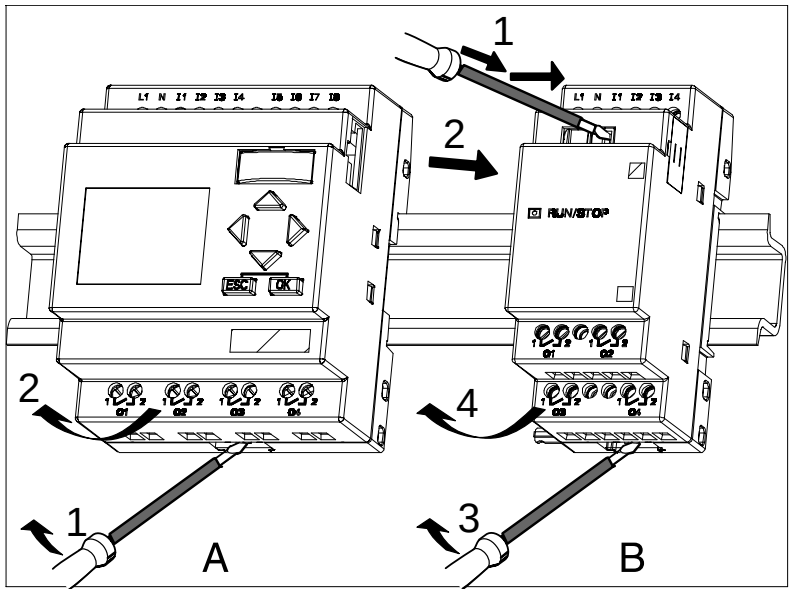
The expansion interface of the last expansion module must be covered.

Uninstalling

To uninstall IDEC SmartRelay, proceed as follows:

A. One IDEC SmartRelay Basic is Installed:

1. Insert a screwdriver into the hole shown at the lower end of the mounting slide and push it downward.
2. Rotate the IDEC SmartRelay basic off the profile rail.



B. One Expansion Module Connected to the IDEC SmartRelay Basic:

1. Using a screwdriver, push down the slide and move it to the right.
2. Slide the expansion module towards the right.
3. Insert a screwdriver into the hole shown at the lower end of the mounting slide and push it downward.
4. Swing the expansion module off the profile rail.

Repeat steps 1 to 4 for all other expansion modules.

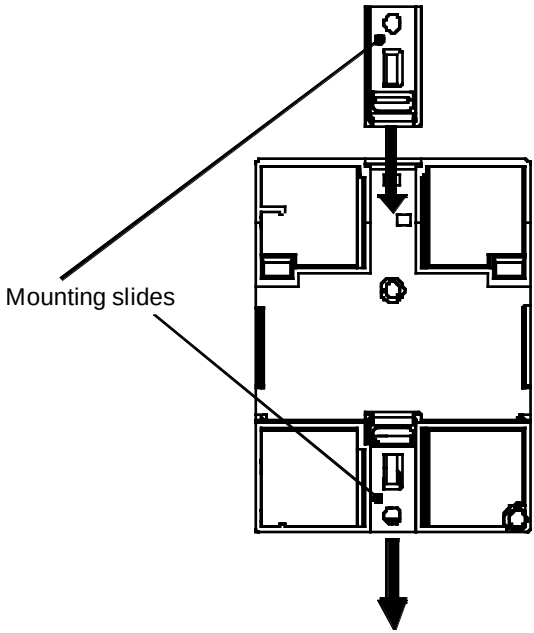
Note

If more than one expansion module is connected, start with the last module on the right.

Make sure that the slide of the module to be installed/removed is not connected to the next module.

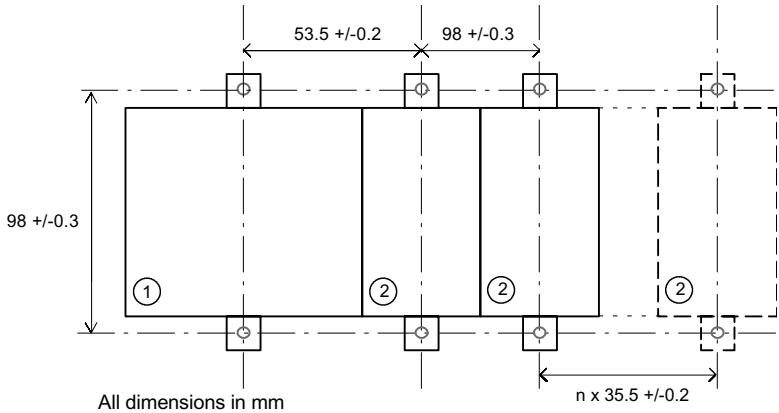
2.2.2 Wall-Mounting

Before you wall-mount the device, the mounting slides at the rear of the device must be pushed towards the outside or the inside. Insert the upper mounting slide (included with the modules) and push the lower one to the outside. You can the fasten the IDEC SmartRelay with two O 4-mm screws (tightening torque 0.8 to 1.2 N/m) to the bracket to mount it on the wall.



Drilling Template for Wall-Mounting

Before you mount the IDEC SmartRelay to the wall you should use the following template for location of the mounting screws.



All dimensions in mm

○ Screw bore 4 mm
Tightening torque 0.8 to 1.2 N/m
① IDEC SmartRelay Basic
② IDEC SmartRelay Expansion module

2.3 Wiring the IDEC SmartRelay

Wire the IDEC SmartRelay using a screwdriver with a 3 mm blade.

You don't need wire ferrules for the connectors. You can use wires up to the following sizes:

- 1 x 2.5 mm^2
- 2 x 1.5 mm^2 for each second connector compartment
- Connecting torque: 0.4 - 0.5 N/m or 3 - 4 LBin

Note

Ensure that the connectors are covered.To protect the IDEC SmartRelay adequately against contact with any voltage carrying parts please conform to any national and regional standards that apply in your area.

2.3.1 Connecting the Power Supply

- IDEC SmartRelay (FL1B-*12RCC, FL1B-M08C2R2) is suitable for nominal line voltages of 100 V AC/DC and 240 V AC/DC.
- IDEC SmartRelay (FL1B-*12RCA) is suitable for a supply voltage of 24 V AC.
- IDEC SmartRelay (FL1B-H12SND, FL1B-M08B1S2) is suitable for a supply voltage of 24 V DC.
- IDEC SmartRelay (FL1B-*12RCE, FL1B-M08B2R2) is suitable for a supply voltage of 12 V AC/DC or 24 V AC/DC.

Please read the information on connecting in the product information documents shipped with your device and the technical specifications in Appendix A relating to permissible voltage tolerances, line frequency and current consumption.

Note

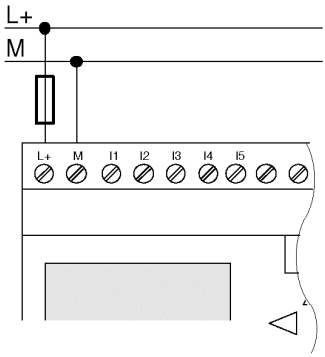
Power failure might result in an additional edge after power restoration with edge-triggered special functions.

Data from the last uninterrupted cycle is stored in IDEC SmartRelay.

Connecting

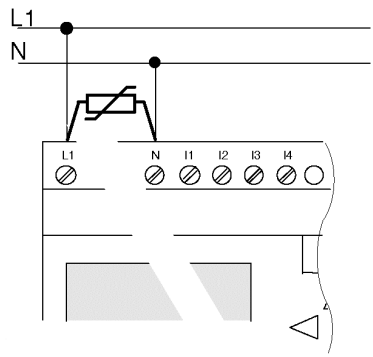
This is how you connect your IDEC SmartRelay to the power supply:

IDEC SmartRelay ....
with DC supply voltage



Protection by fuse
if required (recommended) for:
FL1B-*12RCE: 0.8A
FL1B-H12SND 2.0A

IDEC SmartRelay ....
with AC supply voltage



With voltage peaks, use a varistor (MOV) with at least 20% higher operating voltage than nominal voltage.

Note

IDEC SmartRelay has protective insulation. A ground terminal is not necessary.

Protective Circuit with AC Voltage

You can eliminate line voltage peaks with a metal oxide varistor (MOV). Make sure the operating voltage of the varistor exceeds the rated voltage by at least 20%.

2.3.2 Connecting IDEC SmartRelay Inputs

Prerequisites

Connect sensors to the inputs. Sensors may be: pushbuttons, switches, photoelectric barriers, daylight control switches etc.

Sensor Attributes for IDEC SmartRelay

	FL1B-H12RCE/B12RCE FL1B-M08B2R2		FL1B-H12SND FL1B-M08B1S2	
	I1 ... I6	I7, I8	I1 ... I6	I7, I8
Circuit state 0 Input current	< 5 V DC < 1.0 mA	< 5 V DC < 0.05 mA	< 5 V DC < 1.0 mA	< 5 V DC < 0.05 mA
Circuit state 1 Input current	> 8 V DC > 1.5 mA	> 8 V DC > 0.1 mA	> 8 V DC > 1.5 mA	> 8 V DC > 0.1 mA

	FL1B-H12RCA/ B12RCA (AC)	FL1B-H12RCC/ B12RCC (AC) FL1B-M08C2R2 (AC)	FL1B-H12RCC/ B12RCC (DC) FL1B-M08C2R2 (AC)
Circuit state 0	< 5 V AC	< 40 V AC	< 30 V DC
Input current	< 1.0 mA	< 0.03 mA	< 0.03 mA
Circuit state 1	> 12 V AC	> 79 V AC	> 79 V DC
Input current	> 2.5 mA	> 0.08 mA	> 0.08 mA

Note

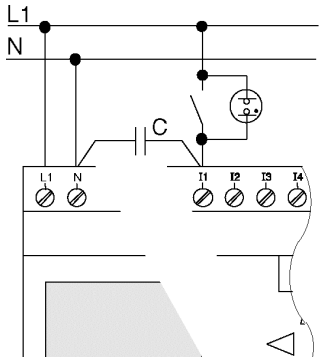
The digital inputs of the FL1B-H12RCC/B12RCC are divided into two groups equipped with 4 inputs each.Within a group all inputs must be operated on the same phase. Different phases are only possible between the groups.

Example: I1 to I4 on phase L1, I5 to I8 on phase L2.

Within the input circuit of the FL1B-M08C2R2 you must not connect different phases.

Sensor Connections

Connecting glow lamps, 2-wire Bero to the FL1B-H12RCC/B12RCC or FL1B-M08C2R2 (AC)



Restrictions

- Circuit status transition 0→1 / 1→0
  When the circuit state changes from 0 to 1, circuit state 1 and, in the case of a change from 1 to 0, circuit state 0 must be in place for at least one program cycle for IDEC SmartRelay to recognize the new circuit status.
  The cycle time of the program processing depends on the size of the program. In “3.7 Memory Space and Circuit Size” on page 3-42 you can find a description of a short test program that will help you to work out the current cycle time.

Special features of FL1B-H12RCE/B12RCE and FL1B-H12SND

- Fast inputs: I5 and I6
  These models are also equipped with inputs for frequency functions. The same restrictions do not apply to these fast inputs.

Note

There are no changes in the standard model compared to previous Basic devices (FL1A): I5 and I6 are still the fast inputs, that is, no changes are necessary to transfer the program written in these models to the new FL1B devices.

- Analog inputs: I7 and I8
  With the FL1B-H12RCE/B12RCE and FL1B-H12SND models the inputs I7 and I8 can be used as normal digital inputs or as analog inputs. How the input is used depends on its purpose in the IDEC SmartRelay control program.
  You can use the digital capability of the input with I7/I8 and its analog capability with the identifiers AI1 and AI2.
  See also Section 4.1.

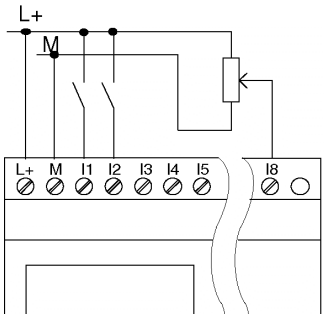
Note

The expansion module FL1B-J2B2 is available for additional inputs.
For the analog signals you must always use twisted and shielded cables as short as possible.

Sensor Connections

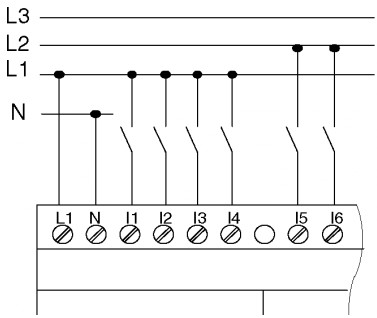
This is how to connect sensors to the IDEC SmartRelay:

FL1B-H12RCE/-B12RCE



The inputs of these devices are non-isolated and therefore require the same reference potential (ground) as the power supply. With the FL1B-H12RCE/-B12RCE and FL1B-H12SND you can tap the analog signal between the supply voltage and ground

FL1B-H12RCC/-B12RCC

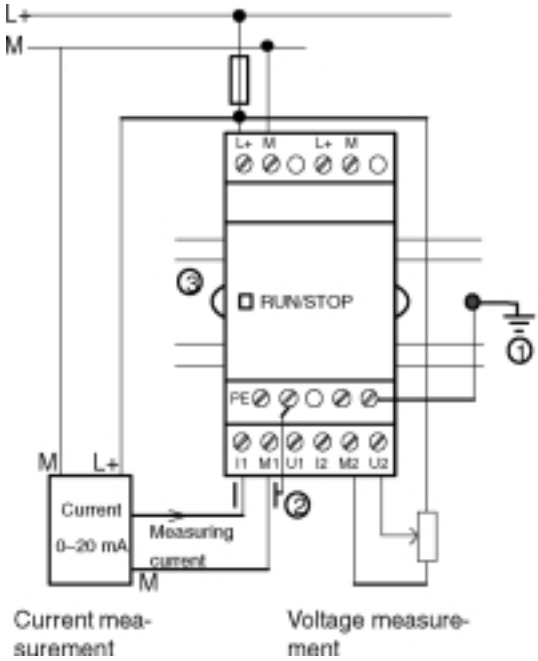


The inputs of these devices are arranged in 2 groups with 4 inputs each. Different phases are only possible between, but not within the blocks.

Warning

Current safety regulations (VDE 0110, ... and IEC 61131-2, ... as well as UL and CSA) do not permit the connection of different phases to one input group (I1-4 or I5-8) of an AC model or on the inputs of one digit al module.

FL1B-J2B2



PE Grounding terminal for connecting ground and shielding of the analog measuring line

① Ground

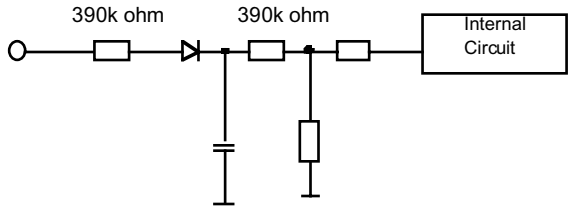
② Cable shielding

③ Profile rail

Input Internal Circuit

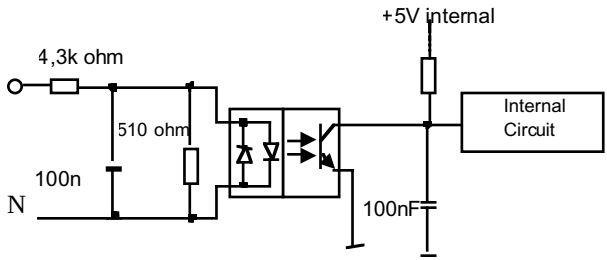
FL1B-H12RCC/FL1B-B12RCC/FL1B-M08C2R2

Digital AC/DC Input



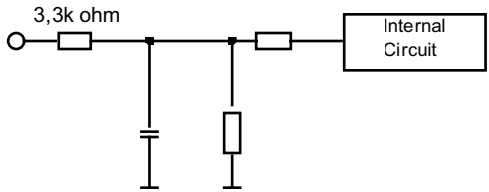
FL1B-H12RCA/FL1B-B12RCA

Digital AC Input



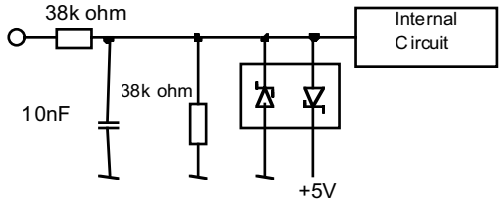
FL1B-H12RCE/FL1B-B12RCE/FL1B-H12SND

Digital DC Input



FL1B-H12RCE/FL1B-B12RCE/FL1B-J2B2

Analog Input



2.3.3 Connecting IDEC SmartRelay Outputs

FL1B-*12R**

The IDEC SmartRelay outputs ...R... are relays. The relay contacts are isolated from the power supply and from the inputs.

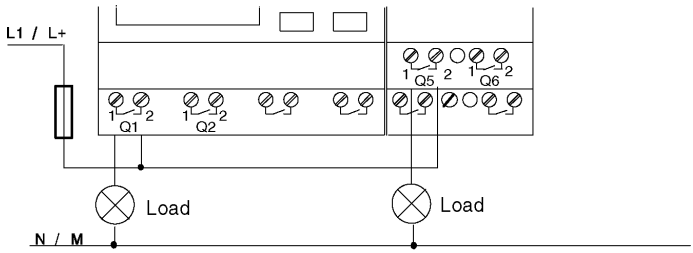
Prerequisites for Relay Outputs

You can connect different loads to the outputs such as lamps, fluorescent tubes, motors, contactors etc. The loads connected to FL1B-*12R** must have the following properties:

- The maximum switched current depends on the type of load and the number of switching cycles (For details refer to Chapter A "Technical Data").
- IDEC SmartRelay FL1B-*12R** in switched on state (Q = 1) and with ohmic load the maximum current is 10 A and for inductive loads the maximum is 3 A (2 A at 12/24 V AC/DC).

Connecting

This is how to connect the load to the FL1B-*12R**:



Protection with automatic circuit breaker (max. 16 A, B16, e.g. power circuit breaker 5SX2 116-6 (if desired)

IDEC SmartRelay with Transistor Outputs

IDEC SmartRelay models with transistor outputs can be identified by the fact that the letter R is missing from their type designation. The outputs are short circuit-proof and overload-proof. An auxiliary load voltage supply is not necessary since IDEC SmartRelay supplies the load voltage.

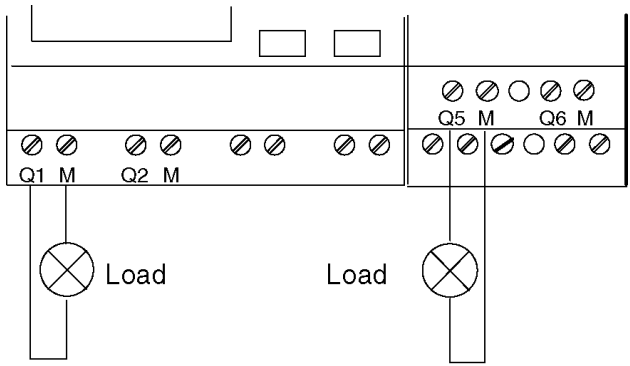
Prerequisites for Transistor Outputs

The load connected to IDEC SmartRelay must have the following properties:

- The maximum switched current is 0.3 amperes per output.

Connecting

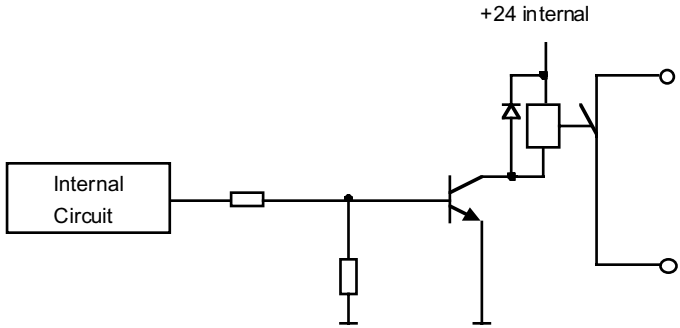
This is how to connect the load to a IDEC SmartRelay with transistor outputs:



Load: 24 V DC, 0.3 A max.

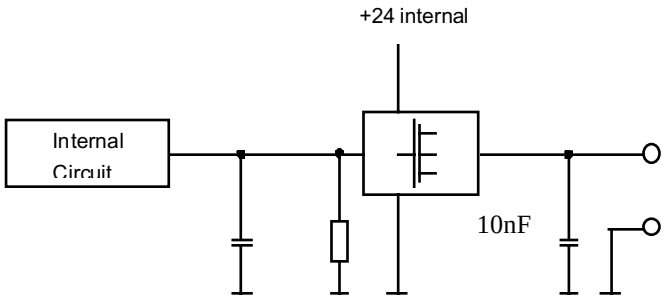
Output Internal Circuit

FL1B-H12RCE/-B12RCE, FL1B-H12RCA/-B12RCA, FL1B-H12RCC/-B12RCC, FL1B-M08B2R2/ -M08C2R2



FL1B-H12SND, FL1B-M08B1S2

Digital AC Input

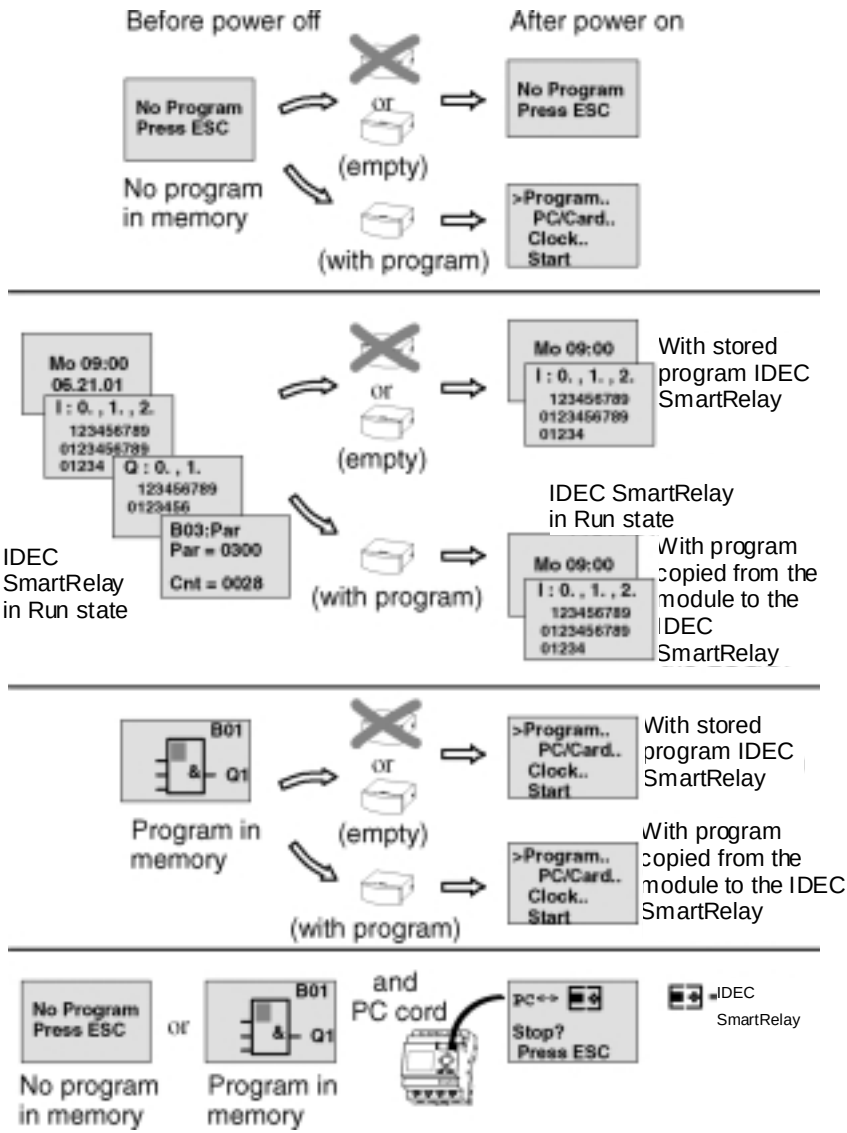


2.4 Switching on the IDEC SmartRelay/Power Return

IDEC SmartRelay does not have a power switch. The IDEC SmartRelay response when switched on depends upon the following:

- If a program is stored in IDEC SmartRelay.
- If a program module is connected.
- If it is a IDEC SmartRelay model without display (FL1B-B12RC*).
- The state IDEC SmartRelay was in prior to POWER-OFF and whether a PC cord was connected.

The IDEC SmartRelay reaction to all possible situations is shown on the following diagram.


Before power off
After power on
No Program
Press ESC
or
No Program
Press ESC
(empty)
No program
in memory
>Program..
PC/Card..
Clock..
Start
(with program)
Mo 09:00
06.21.01
I : 0. , 1. , 2.
123456789
0123456789
01234
Q : 0. , 1.
123456789
0123456
B03:Par
Par = 0300
Cnt = 0028
IDEC
SmartRelay
in Run state
Mo 09:00
I : 0. , 1. , 2.
123456789
0123456789
01234
With stored
program IDEC
SmartRelay
IDEC SmartRelay
in Run state
With program
copied from the
module to the
IDEC
SmartRelay
B01
&
Q1
Program in
memory
With stored
program IDEC
SmartRelay
With program
copied from the
module to the IDEC
SmartRelay
and
PC cord
PC↔
Stop?
Press ESC
IDEC
SmartRelay

Guidelines for Starting IDEC SmartRelay

1. If there is no program in IDEC SmartRelay or in the connected program modules, IDEC SmartRelay (with display) reports: "No Program Press ESC".
2. If there is a program on the program module, it is automatically copied to IDEC SmartRelay. Any program in IDEC SmartRelay is overwritten.
3. If there is a program in IDEC SmartRelay or in the connected program module, IDEC SmartRelay takes over the operating state it had prior to POWER-OFF. The model without display (FL1B-B12RC*) is switched automatically from STOP to RUN mode (LED toggles from red to green).
4. If at least one function is switched retentive or if you have used a function that is permanently retentive the current values are also retentive at POWER-OFF.

   Note
   If a power loss occurs while you are entering a program, the program in IDEC SmartRelay is deleted after power is returned.You should therefore save your original program before modifying it on a program module (card) or on a computer (WindLGC).

IDEC SmartRelay Basic Operating States

IDEC SmartRelay Basic has two operating states: STOP and RUN

STOP	RUN
• Display: "No Program" (not FL1B-B12RC*) • IDEC SmartRelay to programming mode (not FL1B-B12RC*) • The LED lights up red (only FL1B-B12RC*)	• Display: screen form for monitoring I/O and messages (after START in the main menu) (not FL1B-B12RC*) • IDEC SmartRelay to programming mode (not FL1B-B12RC*) • The LED lights up green (FL1B-B12RC*)
Action by IDEC SmartRelay: • The inputs are not read. • The program is not executed. • The relay contacts are always open or the transistor outputs are switched off	Action by IDEC SmartRelay: • IDEC SmartRelay reads the state of the inputs • IDEC SmartRelay calculates the state of the outputs with the program. • IDEC SmartRelay switches the relays/ transistor outputs on or off

IDEC SmartRelay Expansion Modules Operating States

IDEC SmartRelay expansion modules have three operating states. This is shown by the color of the LED indicator; green, red or orange.

IDEC SmartRelay Expansion Modules Operating States		
Green LED (RUN)	**Red LED (STOP)**	**Orange LED**
The expansion module communicates with the left device	The expansion module does not communicate with the left device	Initialization phase of the expansion module

3 Programming IDEC SmartRelay

IDEC SmartRelay Programming Introduction

The term programming refers to the input of a circuit program. An IDEC SmartRelay program is actually no more than a circuit diagram presented in a slightly different form.

In this chapter we are going to show you how to transform your applications into a IDEC SmartRelay program.

> Note
> *The IDEC SmartRelay models FL1B-H12RCE, FL1B-B12RCA and FL1B-B12RCC do not have a keyboard or a display unit.They are mainly intended for production applications in small machine and plant engineering.*
>
> *FL1B-B12RC* models are not programmed locally. Rather, programs in WindLGC or in the memory modules of other IDEC SmartRelay units are transferred to this device.*

In the first section of this chapter we shall use an example to show you how to program the IDEC SmartRelay.

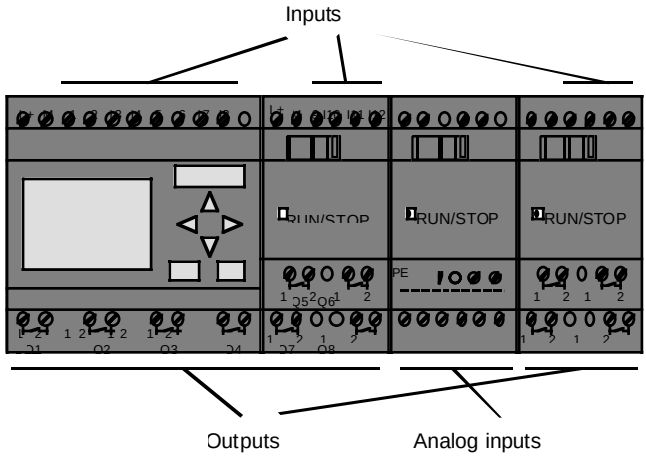
- We shall begin by introducing two basic terms, namely the connector and the block, and show you what they represent.
- Secondly, we shall work out a simple circuit program.
- Finally, you will enter the program directly in IDEC SmartRelay.

By the end of this chapter you will have your first running program stored in the IDEC SmartRelay. With suitable hardware (switches etc.) you will then be able to carry out your first test.

3.1 Connectors

IDEC SmartRelay I/Os

Example of a configuration with several modules:



Each input is identified by the letter I and a number. When you look at the IDEC SmartRelay from the front, you can see the connectors for the inputs at the top. Only the analog module FL1B-J2B2 has its inputs at the bottom.

Each output is identified by the letter Q and a suffix. You can see that the connectors of the outputs are located at the bottom.

Note

IDEC SmartRelay can recognize, read and switch the I/O of all expansion slots, regardless of their type. The I/O is shown in the order of the module arrangement.

*The following I/Os and memory bits are available for programming: I1 to I24, AI1 to AI8, Q1 to Q16 and M1 to M8. For the FL1B-*12RCE and FL1B-H12SND inputs I7 and I8 applies: if Ix is used in the program, the input signal is interpreted as digital signal; with AIx it is an analog signal.*

IDEC SmartRelay's Connectors

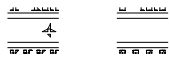
The term connector refers to all connections and states in IDEC SmartRelay.

The I/O status can be "0" or "1". Status "0" means that the input does not carry a voltage. Status "1" means that the input carries voltage.

We have implemented the connectors hi, lo and x in order to facilitate programming for you. The default fixed status of "hi" (high) is "1" and of "lo" (low) is "0".

If you do not want to wire the input of a block, use the "x" connector. The meaning of the term block is explained on the next page.

IDEC SmartRelay knows the following connectors:

Connectors	**FL1B-*12*** 		**FL1B-M08**** 	**FL1B-J2B2** 
Inputs	FL1B-H12RCC/B12RCC FL1B-H12RCA/B12RCA	Two groups: I1... I4 and I5 ... I8	I9 ... I24	AI1(AI3) ... AI8
	FL1B-H12RCE/ B12RCE FL1B-H12SND	I1... I8 along with I7(AI1), I8(AI2)		
Outputs	Q1...Q4		Q5 ... Q16	none
lo	Signal with "0" level (off)			
hi	Signal with "1" level (on)			
x	An existing connection that is not used			

3.2 Blocks and Block Numbers

This section shows you how to use the IDEC SmartRelay elements to create extensive circuits and how the blocks and the I/O are interconnected.

Then go to “3.3 From Circuit Diagram to IDEC SmartRelay” on page 3-7. There you will learn how to convert a simple circuit into a IDEC SmartRelay program.

Blocks

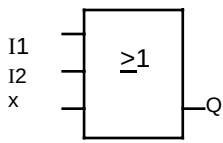
A block in IDEC SmartRelay is a function that is used to convert input information into output information. Previously you had to wire up the individual elements in the control cabinet or terminal box.

When you program IDEC SmartRelay, you connect connectors with blocks. To do this, simply select the connection you require from the Co menu. We have used the abbreviation Co for the term "Connector" to name the menu.

Logic Operations

The most elementary blocks are logical links:

- AND
- OR
- ...



Inputs I1 and I2 are connected to the OR block. The last input of the block is not used and is therefore marked with an x.

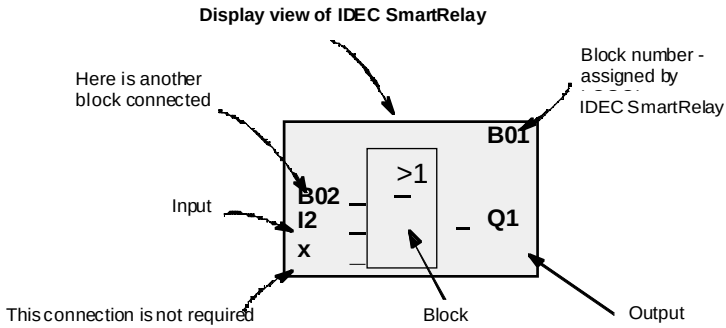
The special functions are far more powerful:

- Pulse relay
- Counter
- On delay
- Softkey
- ....

See Chapter 4 “IDEC SmartRelay Functions” on page 4-1 for a complete list of IDEC SmartRelay’s functions.

Displaying a Block in IDEC SmartRelay

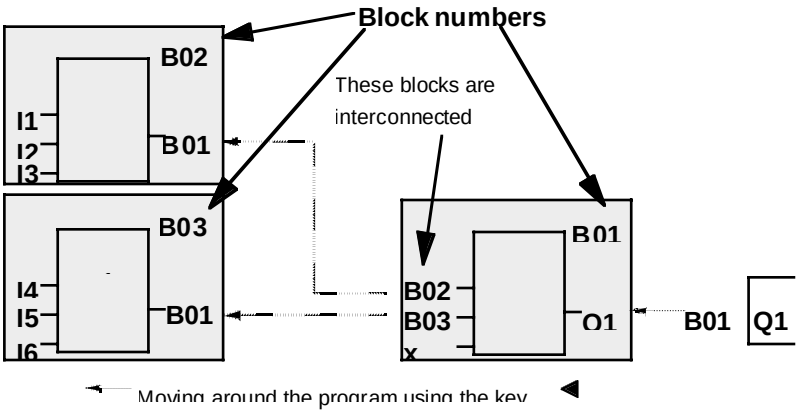
The figure below shows a typical IDEC SmartRelay display. Only one block can be displayed at a time. We have therefore introduced block numbers to help you check the circuit structure.



Assigning a Block Number

When you insert a block in a program, IDEC SmartRelay always assigns it a block number.

IDEC SmartRelay uses the block numbers to show you the block interconnections. Primarily, the block numbers are meant to help you find your way around the program.



The sample diagram shows you three displays of IDEC SmartRelay, which together form the program. You can see how IDEC SmartRelay interconnects the blocks, using the block numbers.

Advantages of Block Numbers

You can append almost any block to an input of the current block using its block number. In this way you can reuse the interim results of logical links or other operations. This saves you input work and memory space, and ensures a clear arrangement of your circuit. In this case, you must know how IDEC SmartRelay has named the blocks.

Note

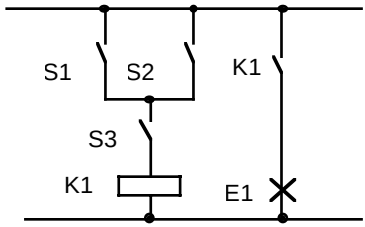
We recommend that you create a block diagram of the program. This will make programming easier, because you can enter the block numbers assigned by IDEC SmartRelay.

If you program the IDEC SmartRelay using WindLGC software, you can directly create a logic diagram of your program.

3.3 From Circuit Diagram to IDEC SmartRelay

How a Circuit is Represented in a Circuit Diagram

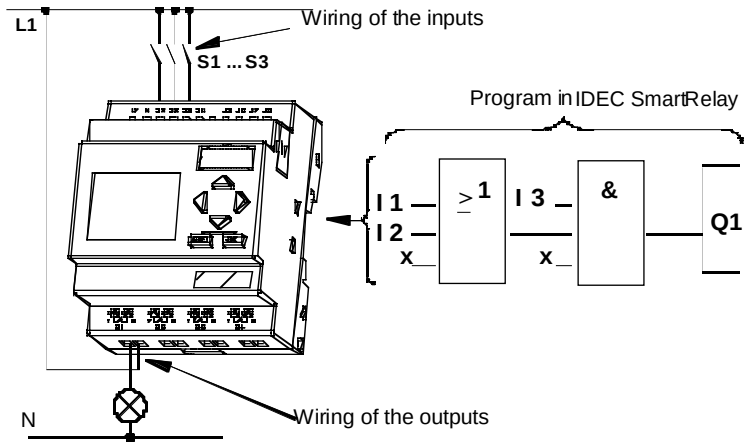
Here is an example of how a circuit is represented in a circuit diagram:



The load E1 is switched on and off by means of the switches (S1 **OR** S2) **AND** S3.
The relay K1 picks up if S1 OR S2 AND S3 are closed.

Configuring this Circuit in IDEC SmartRelay

In IDEC SmartRelay you construct a circuit by interconnecting blocks and connectors:

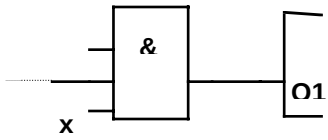


To convert a circuit in IDEC SmartRelay, start at the output of the circuit.

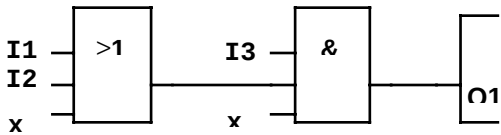
The output is the load or the relay that is to be switched.

Convert the circuit to blocks. To do this, go through the circuit from the output to the input:

1. At output Q1 there is a series connection of the normally open contact S3 with another circuit component. The series connection corresponds to an AND block:



2. S1 and S2 are connected in parallel. The parallel circuit corresponds to an OR block:



You have now completely described the circuit for the IDEC SmartRelay. Now connect the I/Os to the IDEC SmartRelay.

Wiring

Connect the switches S1 to S3 to the screw terminals of the IDEC SmartRelay:

- Connect S1 to connector I1 on the IDEC SmartRelay
- Connect S2 to connector I2 of the IDEC SmartRelay
- Connect S3 to connector I3 of the IDEC SmartRelay

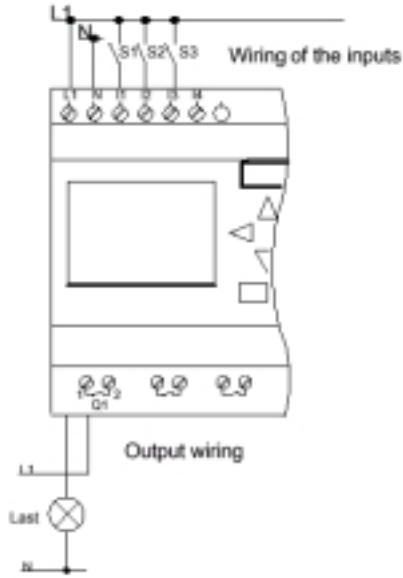
Since only two inputs of the OR blocks are being used, the third input of this block must be marked as "unused". This is indicated by the suffix x.

Likewise, only 2 inputs of the AND block are used. Thus, the third input is also marked as "unused" by the suffix x.

The output of the AND block controls the relay of output Q1. The load E1 is connected to output Q1.

Wiring Example

The following table shows you the wiring based on a 240 V AC model of IDEC SmartRelay.



3.4 Four Rules for Working with IDEC SmartRelay

Rule 1 - Changing Operating Mode

- Edit the circuit in programming mode. After Power On and if "No Program, Press ESC" is displayed, you can open the programming mode by pressing the ESC key.
- You can edit the time and parameter values of an existing program in the parameter assignment mode and in programming mode.
- Start RUN mode by executing "Start" in the main menu.
- In RUN mode you can return to parameter assignment mode via ESC key.
- If you want to return from parameter assignment mode to programming mode, execute the "Stop" command in the parameter assignment menu. When prompted to confirm with "Yes" when "Stop Prg" appears, move the cursor to "Yes" and confirm with OK.

You can find more information on operating modes in the Appendix “D. IDEC SmartRelay Menu Structure” on page Appendix-14.

Rule 2 - Outputs and Inputs

- Always program a circuit working from the output towards the input.
- You can connect an output to several inputs, however, you cannot fan out one input to several outputs.
- You cannot connect an output to a preceding input in the same program path. For such internal recursions you should interconnect memory bits or outputs.

Rule 3 - Cursor and Cursor Movement

When programming a circuit, note:

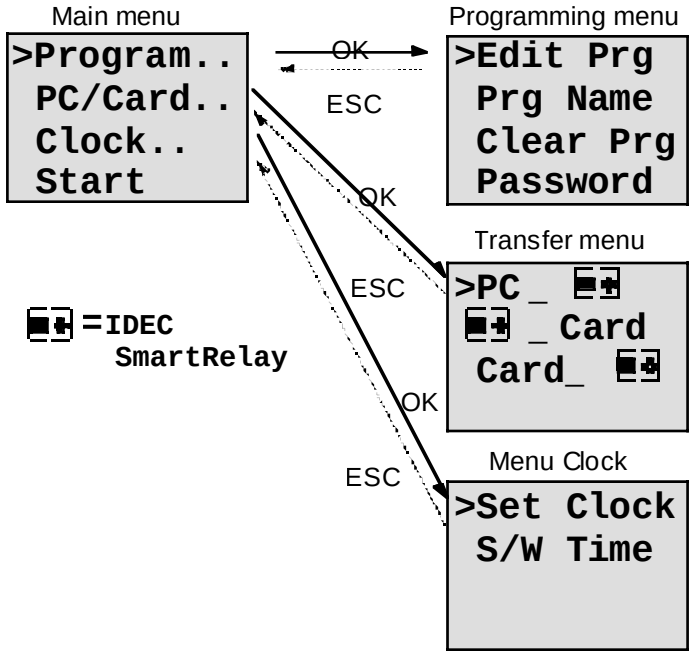
- When the cursor appears with an underscore, the underscore is indicating that the cursor can be moved:
  -Use the ◄ , ► , ▲ or ▼ key to move the cursor in the circuit
  -Press OK to change to "Select terminal/block"
  -Press ESC to exit circuit programming.
- When the cursor appears as a solid square, you should select a connector/block.
  -Use the ▲ or ▼ key to select a connector/block.
  -Confirm your selection with OK.
  -Press ESC to go back one step.

Rule 4 - Planning

- Make a complete plan of your circuit on paper before you input the circuit or program IDEC SmartRelay directly using WindLGC.
- IDEC SmartRelay can only save complete programs. If the circuit program is incomplete IDEC SmartRelay will not exit the programming mode.

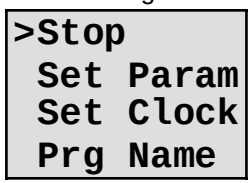
3.5 Overview of the IDEC SmartRelay Menus

Programming mode



Parameter assignment mode

Parameter assignment menu



You can find more information on menus in the Appendix “D. IDEC SmartRelay Menu Structure” on page Appendix-14.

3.6 Program Input and Start

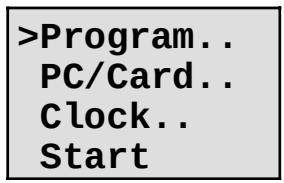
You have designed a circuit and now want to enter it in IDEC SmartRelay. The following example will show how to do this.

3.6.1 Change to Programming mode

You have connected the IDEC SmartRelay to the power supply and voltage is switched on. The display shows you the message:

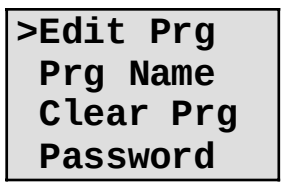


Switch the IDEC SmartRelay to programming mode by pressing the ESC key. This will take you to the main menu of the IDEC SmartRelay:



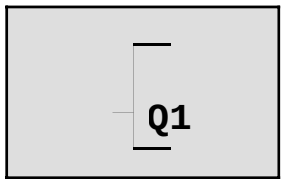
IDEC SmartRelay's main menu

The first character in the first row is the cursor ">". Use the ▲ and ▼ key to move the cursor ">" up and down. Move the cursor ">" to "Program.." and confirm with OK. IDEC SmartRelay opens the programming menu.



IDEC SmartRelay's programming menu

Here too, you can move the cursor ">" by pressing the ▲ or ▼ key. Move the cursor ">" to "Edit Prg" (edit program or input) and confirm with OK. IDEC SmartRelay now shows you the first output:



IDEC SmartRelay's first output

You are now in programming mode. Use the ▲ or ▼ key to select the other outputs. At this point you can begin programming your circuit.

Note

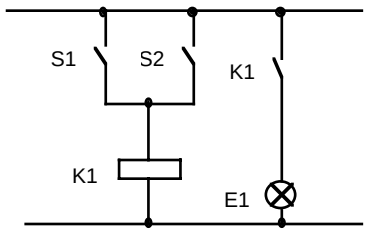
Since our program has not yet been saved with a password in IDEC SmartRelay you can start editing your program right away. If you start a program already saved with password protection, "Edit Prg" and confirmation with OK would be followed by the prompt to enter a password. In this case you cannot start editing unless you enter the correct password (refer to "3.6.5 Password" on page 3-22 for more information).

3.6.2 First Program Example

Let us now take a look at the following parallel circuit consisting of two switches.

Circuit Diagram

How the circuit is represented in a circuit diagram:



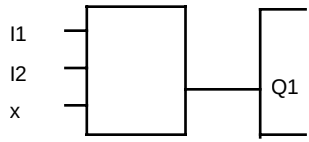
The load is switched on via switch S1 OR S2. IDEC SmartRelay interprets the circuit as 'OR', because either switch S1 **OR** S2 switches the output.

Translated in the IDEC SmartRelay program this means: relay K1 (in IDEC SmartRelay via output Q1) is controlled by an OR block.

Program

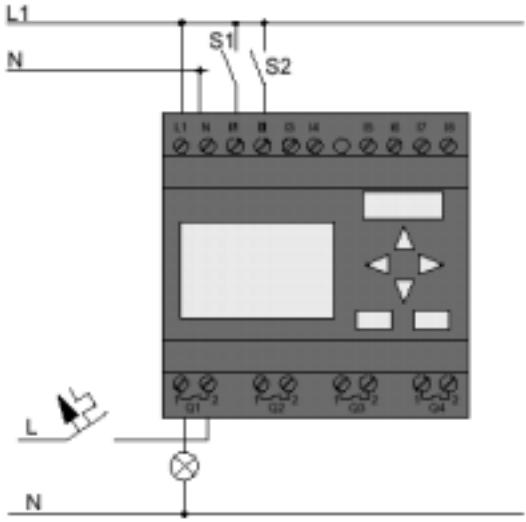
I1 and I2 are connected to the input of the OR block, whereby S1 is connected to I1 and S2 to I2.

This is what the IDEC SmartRelay program then looks like:



Wiring

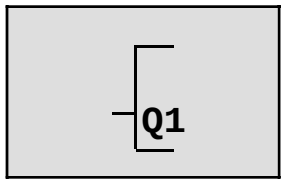
The corresponding wiring:



Switch S1 acts on input I1, switch S2 on input I2. The load is connected to relay Q1.

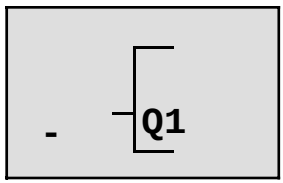
3.6.3 Editing a Program

We will now edit the program (working from the output to the input). Initially, IDEC SmartRelay displays the output:



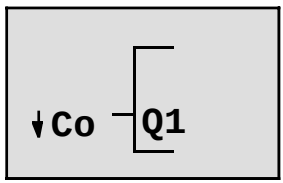
IDEC SmartRelay's first output

The Q of Q1 is underscored. This underscore is called the cursor. The cursor indicates your current position in the program. You can move the cursor by pressing the ▲, ▼, ◀ or ▶ key. Now press the ◀ key. The cursor moves to the left.



The cursor indicates your position in the program.

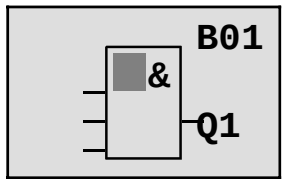
At this point, enter only the first block (the OR block). Press OK to switch to editing mode.



The cursor is displayed as a solid square: You can now select a terminal or a block

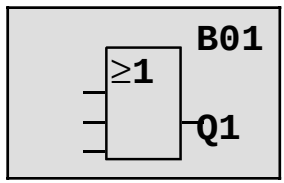
The cursor no longer appears in the form of an underscore; but rather as a flashing solid square. At the same time IDEC SmartRelay gives you various options.

Select the BF (basic functions) by pressing the ▼ key until BF appears. Confirm with OK. IDEC SmartRelay then displays the first block in the list of basic functions:



An AND is the first block in the list of basic functions. The cursor is displayed as solid square, thus prompting you to select a block.

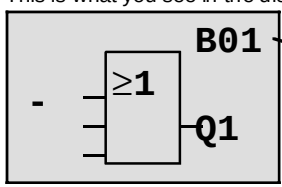
Now press the ▲ OR ▼ key until the OR block is displayed:



The cursor square is still positioned in the block.

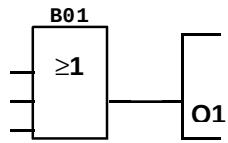
Press OK to confirm your selection.

This is what you see in the display



Block number

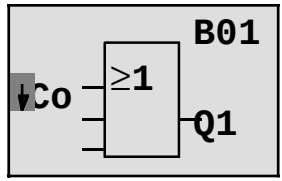
Your entire program looks like this



You have now entered the first block. Each block you enter is assigned a block number. What is now left to do is to wire the inputs of the block. This is how it is done:

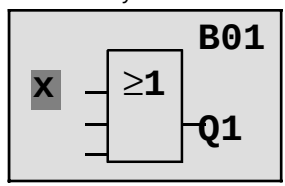
Press OK.

This is what you see in the display



Select the Co list: Confirm with OK

This is what you see in the display

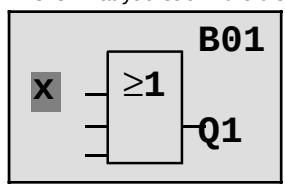


The first element in the Co list is the "Input not used" character, an "x". Use the ▲ or ▼ key to select input I1.

Note

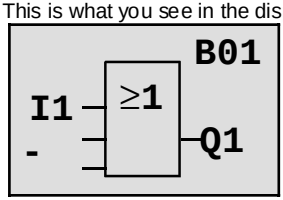
Use the ▼ key to go to the start of the Co list: I1, I2 .... to Io, and again "x". Use the ▲ key to start at the end of the Co list: Io, hi, Q ..... to I1, and once again "x".

This is what you see in the display

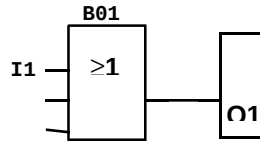


Press OK. I1 is now connected to the input of the OR block. The cursor jumps to the next input of the OR block.

This is what you see in the display



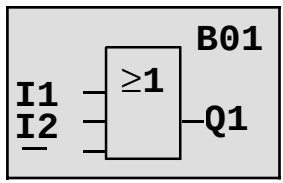
Up to this point, your program in IDEC SmartRelay looks like this

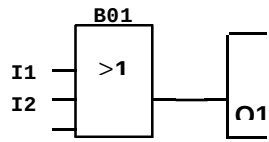


Now connect input I2 to the input of the OR block. You already know how to do this:

1. Switch to editing mode: OK
2. Select the Co list: use ▼ or ▲
3. Accept the Co list: OK
4. Select I2: use ▼ or ▲
5. Accept I2: OK

I2 is now connected to the input of the OR block:

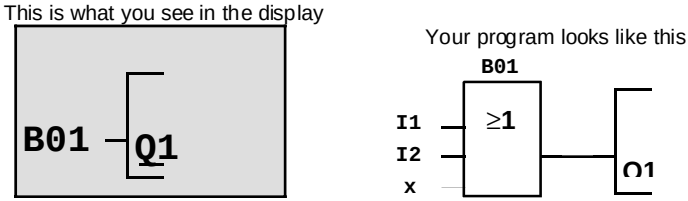




We do not need the last input of the OR block for this program. In a IDEC SmartRelay program the unused inputs are identified with an "x". Now enter the "x":

1. Switch to editing mode: OK
2. Select the Co list: use ▼ or ▲
3. Accept the Co list: OK
4. Select x: use ▼ or ▲
5. Accept x: OK

Now all the inputs of the block are wired. IDEC SmartRelay considers the program as being complete and jumps back to output Q1.



If you want to review your first program, you can use the ◂ or ▸ key to move the cursor through the program.

Exit Program Input

Return to the programming menu: ESC

If this does not return you to the programming menu, you have not wired a block completely. IDEC SmartRelay indicates positions at which you have missed something (For safety reasons, IDEC SmartRelay accepts only complete programs).

Note

IDEC SmartRelay has now saved your program which will be retained on power failure.The program is only stored in the IDEC SmartRelay until you delete it per instruction.

3.6.4 Assigning a Program Name

You can assign a name to your program. This name consists of upper and/or lower case letters, numbers and special characters. The maximum length is 16 characters.

1. move ">" to "Prg Name": use ▼ or ▲
2. Accept "Prg Name": OK

Using the ▲ or ▼ key you can list the alphabet from A(a) to Z(z), numbers and special characters. You can list them forward and backwards. You can select any letter, number or character. Input a blank space by moving the cursor using the ▶ key to the next position. The blank space is the first character of the list.
Examples:

- Press ▼ once: the result is an " A "
- Press ▲ four times: the result is a left bracket " { "

Available Characters															
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
P	Q	R	S	T	U	V	W	X	Y	Z	a	b	c	d	e
f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u
v	w	x	y	z	0	1	2	3	4	5	6	7	8	9	!
	"#	$	%	&	"	(	)	*	+	,	-	.	/	:	;
<	=	>	?	@	[	\	]	^	_	‘	{	|	}	~	

To name your program "ABC":

3. Select " A": Press ▼
4. To the next letter: Press ▶
5. Select " B": Press ▼
6. To the next letter: Press ▶
7. Select "C": Press ▼
8. Confirm the name: OK

Your program is now named "ABC" and you have been returned to the programming menu.

The program name can be changed in the same way as above.

Note

The program name can only be changed in programming mode.You can read the program name in programming mode and in parameter assignment mode.

3.6.5 Password

You can assign a password to protect the program from being edited by unauthorized access.

How to Assign a Password

The maximum password length is 10 characters. It consists of uppercase letters only (A to Z). On the device you can only assign, edit and deactivate the password in the "Password" menu.

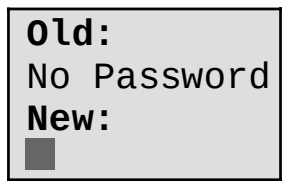
In the programing menu:

1. move ">" to "Password": use ▲ or ▼
2. Accept the "Password": OK

Use the ▼ or ▲ key to move up and down the alphabet to select your letters. Since IDEC SmartRelay allows only uppercase letters for passwords, you can quickly access the letters "at the end" of the alphabet faster by using the key ▲ :

- Press ▲ once gives you a "Z"
- Pressing ▲ twice gives you a "Y" etc.

Let us now assign the password "AA" to our first program. The display shows:



The procedure is the same as for entering the program name. Under "New", enter:

3. Select " A": Press ▼
4. To the next letter: Press ▶
5. Select " A": Press ▼

The display now shows:



6. Confirm the password: OK

Your program is now password protected with "AA" and you have been returned to the programming menu.

Note

If the input of the new password is interrupted with ESC IDEC SmartRelay returns to the programming menu without saving the password.

You can also input your password in WindLGC. You can only upload a password protected program in WindLGC or edit your program on the device after you have entered the correct password.

Changing the Password

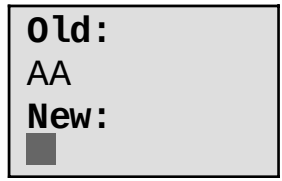
In order to change the password you must know the current one.

In the programming menu:

1. move ">" to "Password": use ▼ or ▲
2. Accept the "Password": OK

Under "Old", enter your old password (in our case "AA") by repeating steps 3 to 6 as described above.

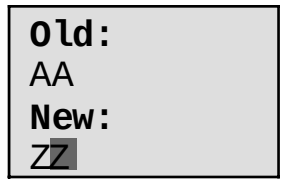
The display now shows:



Now you can enter a new password under "New", e.g. "ZZ":

3. Select "Z": Press ▲
4. To the next letter: Press ▶
5. Select "Z": Press ▲

The display now shows:



6. Confirm your new password: OK

"ZZ" is now your new password and you are back in the programming menu.

Deactivating the Password

Let us assume you want to deactivate the password. For example, you want to grant another user read/write access to your program. Just as when changing it, you must know your current password (in our example "ZZ").

In the programming menu:

1. move ">" to "Password": use ▼ or ▲
2. Accept the "Password": OK

Under "Old" you must now enter your current password as described in steps 3 to 5. Confirm your entry with OK.

The display shows:



Now deactivate the password without making another entry

3. Confirm the "empty" password: OK

The password does not exist anymore. You have been returned to the programming menu.

Note

This deactivation switches off the password prompt. Editing is possible without entering a password.

For the moment, leave the password prompt deactivated in order to speed up our progress with the remaining examples.

Password: Wrong input!

When you enter the wrong password and confirm your entry with OK, IDEC SmartRelay does not open editing mode, but rather returns to the programming menu. This repeats itself until you have entered the correct password.

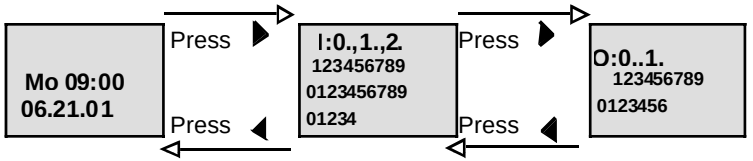
3.6.6 IDEC SmartRelay to RUN Mode

IDEC SmartRelay to RUN mode in the main menu.

1. Return to the main menu: ESC
2. move ">" to "Start": use ▲ or ▼
3. Confirm "Start": OK

IDEC SmartRelay starts the program and displays:

Display field of the IDEC SmartRelay in RUN mode

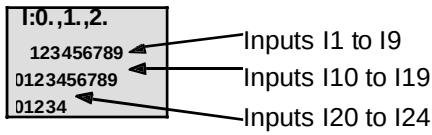


Status of the inputs Status of the outputs

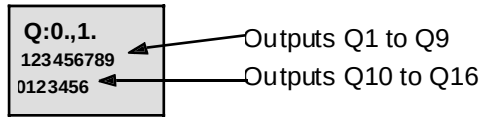
Date and TOD on the Display

This display flashes as long as date and TOD are not set.

Presentation of the Inputs on the Display



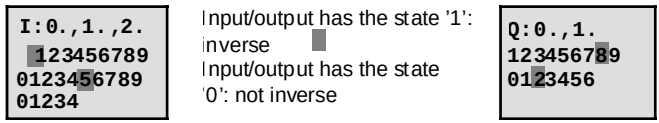
Presentation of the Outputs on the Display



What does "IDEC SmartRelay is in RUN" Mean?

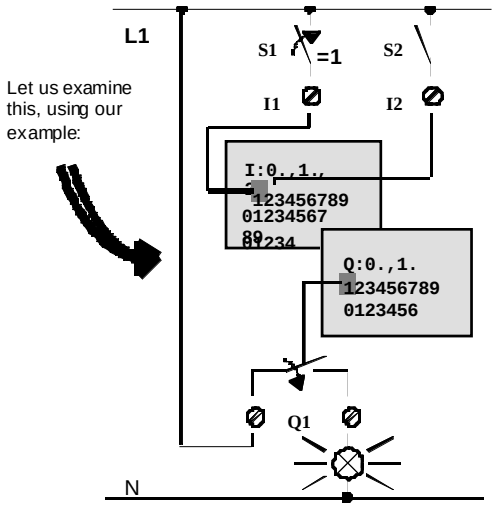
In RUN mode IDEC SmartRelay processes the program. To do this, IDEC SmartRelay initially reads the status of the inputs, determines the status of the outputs using your specified program and switches the outputs on or off.

The IDEC SmartRelay presents the I/O status in this way:



In this example, only the inputs I1, I15, Q8 and Q12 are “high“.

Status Display



When switch S1 is closed, voltage applied to input I1, which has the state '1'.

IDEC SmartRelay uses the program to calculate the output states.

Output Q1 has the state '1' here.

If the status of Q1 is '1' IDEC SmartRelay switches the relay Q1, the load on Q1 is supplied with voltage.

3.6.7 Second Program Example

Now that you have successfully programmed your first circuit, a program name and assigned a password, we shall show in this section how you can modify existing programs and use the special functions.

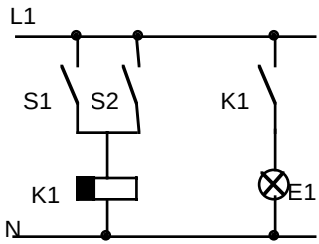
In this second program you will be shown how to:

- Insert a block in an existing program.
- Select a block for a special function.
- Assign parameters.

Modification of Circuits

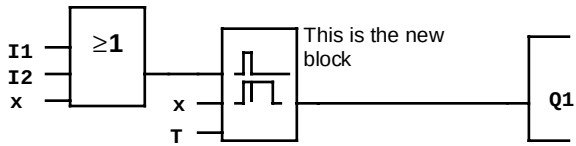
In order to produce the second program, we are now going to modify the first one slightly.

First, let us examine the circuit diagram for the second program:



You already know the first part of the circuit. Switches S1 and S2 operate a relay. This relay switches on the load E1. It should switch off the load again on expiration of a 12-minute off delay.

In IDEC SmartRelay:



You will recognize the OR block and the output relay Q1 from the first program. Only the off delay is new.

How to Edit the Program

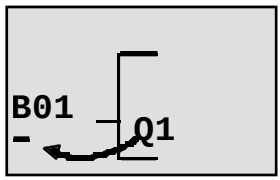
Switch the IDEC SmartRelay to programming mode:

1. In RUN mode: press ESC. This opens the parameter assignment menu
   Select "Stop": confirm with OK, move ">" to "Yes" and confirm once again with OK
2. In the main menu, select "Program.."
3. In the programming menu, select "Edit Prg"
   (If required, enter the password and confirm with OK)

You can now modify the existing program.

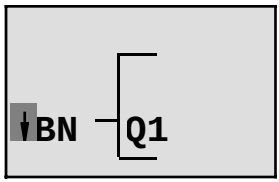
How to Insert a New Block in a Program

Move the cursor underneath the B in B01 (B01 is the block number of the OR):



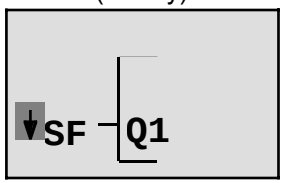
Move the cursor:
press the ◀ key

We now insert the new block at this position. Press OK.



IDEC SmartRelay shows you the BN list.

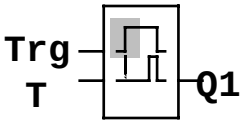
Select the SF list (▼ key):



The SF list contains the blocks for the special functions.

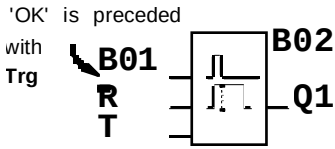
Confirm with OK.

The block of the first special function is displayed:



When you select a special or basic function block, IDEC SmartRelay displays the respective function block. The full square cursor is positioned in the block. Use the keys ▼ or ▲ to select the required block.

Select the block (off delay, see next diagram) and confirm with OK:

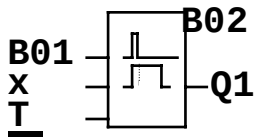


The inserted block is assigned the block number B02. Block B01, up to now connected to Q1, is automatically connected to the upper input of the new block. The cursor is positioned at the upper input of the new block.

The off-delay block has three inputs. The upper input is the trigger input (Trg). Use this input to start the off delay. In our example, the off delay is started via the OR block B01. Reset the time and outputs, using the reset input. In the T parameter, set off delay time.

In our example, we do not use the reset input of the off delay. We wire it with "x". In the first program you have seen how this is done. As a reminder:

1. Position the cursor under the R: use ▲ or ▼
2. change over to editing mode: OK
3. Select the Co list: use ▲ or ▼
4. Accept the Co list: OK
5. Select x: use ▲ or ▼
6. Accept x: OK



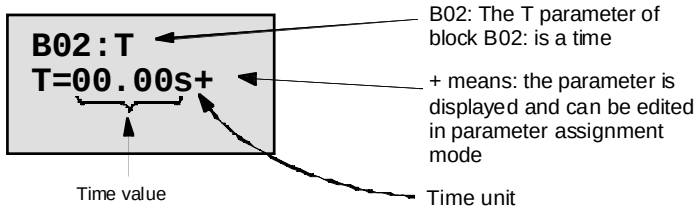
The display should now look like this:

How to Assign Block Parameters

Now, specify the off delay time T:

1. If the cursor is not yet positioned underneath the T, move it there: use ▲ or ◀
2. change over to editing mode: OK

For the parameters IDEC SmartRelay displays the parameter assignment screen form:



The cursor is positioned on the first digit of the time value.

This is how you change the time value:

- Use the ◀ or ▶ key to move the cursor back and forth.
- Use the ▲ or ▼ key to change the value.
- Confirm the time value you have entered with OK.

Setting the Time

Set the time T = 12:00 minutes:

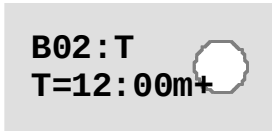
1. Move the cursor to the first digit: use ◀ or ▶
2. Select the digit "1": use ▲ or ▼
3. Shift the cursor to the second digit: use ◀ or ▶
4. Select the digit "2": use ▲ or ▼
5. Move the cursor onto the unit: use ◀ or ▶
6. Select the m unit for minutes: use ▲ or ▼

Displaying/Hiding Parameters -Type of Protection

If you do not want to have the parameter displayed in parameter assignment mode:

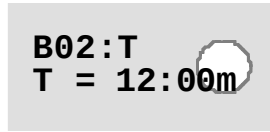
1. Move the cursor onto the type of protection:
   use ◀ or ▶
2. Select the type of protection "-": use ▲ or ▼

On the display you should now see:



Type of protection : +
The time T can be changed in parameter assignment mode

or



Type of protection : -
The time T cannot be changed in parameter assignment mode

3. Close and confirm your entries withOK

Note
You can only change the type of protection and the time unit in programming mode, you cannot do this in parameter assignment mode.

Checking the Program

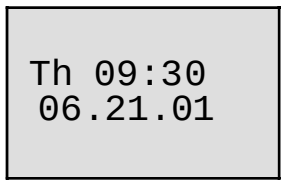
The program path for Q1 is now complete. IDEC SmartRelay shows you the output Q1. You can review the program on the display. Use the keys to browse through the program, e.g. ◄ or ► to move from block to block ▲ or ▼ to move between the inputs on a block.

Exiting Programming Mode

You already know how to exit a program from our first program. As a reminder:

1. Return to the programming menu: ESC
2. Return to the main menu:ESC
3. Move ">" to "Start": use ▲ or ▼
4. Confirm "Start": OK

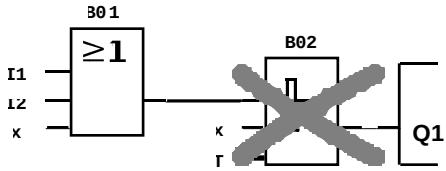
IDEC SmartRelay has now returned to RUN mode



You can use◄ or► for viewing and monitoring the status of I/Os.

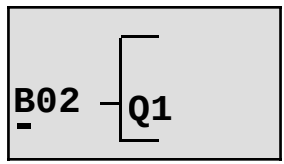
3.6.8 Deleting a Block

Let us assume, in your program you want to delete block B02 and connect B01 directly to Q.



Proceed as follows:

1. Switch the IDEC SmartRelay to programming mode.
2. Select "Edit Prg": use ▲ or ▼
3. Confirm "Edit Prg": OK
   (If required, enter the password and confirm with OK)
4. Position the cursor on the input of Q1, that is, underneath B02. Use the ◀ key:

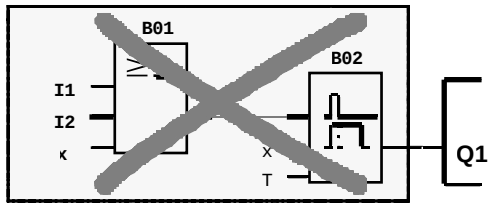


5. Confirm with OK.
6. Now, replace the block B02 with block B01 directly on output Q1. How to do this:
   -Select the BN list: use ▲ or ▼
   -Accept the BN list: OK
   -Select "B01": use ▲ or ▼
   -Accept "B01": OK

Result: Block B02 is deleted because it is not used in the circuit. Block B01 is now connected directly to the output instead of B02.

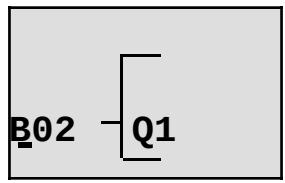
3.6.9 Deleting Multiple Interconnected Blocks

In the following program, (created in “3.6.7 Second Program Example” on page 3-28) delete the blocks B01 and B02.



Proceed as follows:

1. Switch the IDEC SmartRelay to programming mode.
2. Select "Edit Prg": use ▲ or ▼
3. Confirm "Edit Prg": with OK
   (if required, enter the password and confirm with OK)
4. Position the cursor on the input of Q1, underneath B02. Use the ◀ key:



5. Confirm with OK.
6. Now, replace block B02 with the connector x on output Q1. How to do this:
   -Select the Co list: use ▲ or ▼
   -Accept the Co list: OK
   -Select x: use ▲ or ▼
   -Accept x: OK

Result: Block B02 is deleted because it is not used in the circuit. All blocks connected to B02 are deleted (in our example block B01).

3.6.10 Correcting Typing Errors

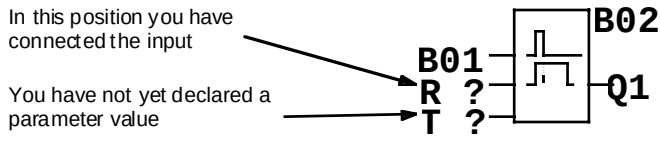
Programming errors can be corrected easily in IDEC SmartRelay:

- Provided you have not exited editing mode, you can go back one step using ESC.
- If you have configured all inputs, just enter the wrong input once again:
  1. Move the cursor to the location of the error.
  2. Change to editing mode. Confirm with OK
  3. Enter the correct input circuit.

You can only replace one block with another if the new block has exactly the same number of inputs as the old one. However, you can delete the old block and insert a new one. You can choose any new block.

3.6.11 "?" on the Display

If you have entered a program and want to exit "Edit Prg" with ESC, IDEC SmartRelay checks whether you have connected the inputs of all blocks. If you have missed an input or parameter IDEC SmartRelay takes you to the incorrect position. It indicates the first incorrect position and marks all inputs which are not connected and the parameters with a question mark.

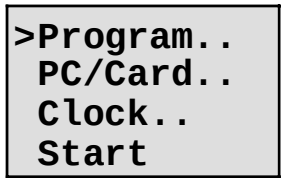


Connect the input and enter a value for the parameter. You can then close the editor using the ESC key.

3.6.12 Deleting a Program

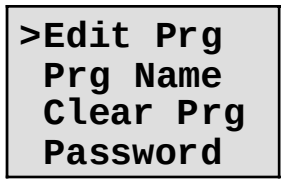
To delete a program:

1. Switch the IDEC SmartRelay to programming mode



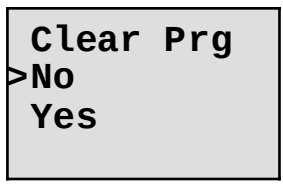
IDEC SmartRelay displays the main menu

2. In the main menu, use ▲ or ▼ to move ">" to "Program.."- Confirm with OK



IDEC SmartRelay opens the programming menu.

3. Move ">" to "Clear Prg": use ▲ or ▼
4. Confirm "Clear Prg": OK



To prevent you from unintentionally deleting your program, we have implemented an additional prompt.

If you do not want to delete the program, leave the ">" on "No" and confirm with OK.

If you are sure that you want to delete the program saved in the IDEC SmartRelay:

5. move the ">" to "Yes": use ▲ or ▼
6. Confirm with OK. IDEC SmartRelay deletes the program.

3.6.13 Daylight Savings Time (Summertime/Wintertime Conversion)

You can enable or disable automatic Daylight Savings Time (Summertime/Wintertime Conversion) in programming mode under the menu item "Clock".

1. Switch the IDEC SmartRelay to programming mode
2. You are now in the main menu and want to select the menu item "Clock": use ▲ or ▼
3. Confirm "Clock": OK
4. Move the ">" to "S/W Time": use ▲ or ▼
5. Confirm "S/W Time": OK

IDEC SmartRelay displays:

```
>On
 Off
S/W Time
 Off
```

The current setting of automatic Daylight Savings Time (Summertime/Wintertime Conversion) is shown in the bottom row. Factory default is Off ("Off" = disabled).

Enabling Daylight Savings Time (Summertime/Wintertime Conversion)

To enable this function and specify its parameter:

1. Move ">" to "On": use ▲ or ▼
2. Confirm "On": OK

The display shows:

```
>EU
 UK
 US
 ..
```

Description of what is displayed:

- "EU" represents the start and end of daylight savings time in Europe.
- "UK" represents the start and end of daylight savings time in the United Kingdom.
- "US" represents the start and end of daylight savings time in the United States.
- . . : here you can specify any month, day and time difference.

The default program for EU, UK and US daylight savings time are found in the table below:

	Start of Daylight Savings Time	End of Daylight Savings Time	Time difference D
EU	Last Sunday in March: 02:00-->03:00	Fourth Sunday in October: 03:00-->02:00	60 Min
UK	Last Sunday in March: 02:00-->03:00	Last Sunday in October: 03:00-->02:00	60 Min
US	First Sunday in April: 02:00-->03:00	Last Sunday in October: 03:00-->02:00	60 Min
. .	Customizing the month and the day: 02:00--> 02:00 + Time difference	Customizing the month and the day: 03:00--> 03:00 + Time difference	Specified by the user (minute accuracy)

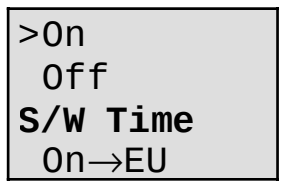
Note

You can specify a time difference D between 0 and 180 minutes.

Let us assume you want to enable European daylight savings time:

3. Move ">" to "EU": use ▲ or ▼
4. Confirm "EU": OK

IDEC SmartRelay displays:



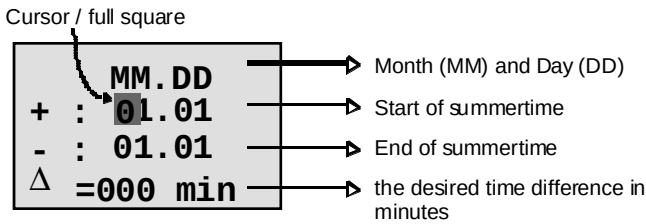
IDEC SmartRelay indicates that European daylight savings time is enabled.

How to Customize Parameters

If all parameters/conversions do not apply to your country, you can customize them in the menu item ". .".

1. Confirm "> On" once again:OK
2. Move ">" to ". .": use ▲ or ▼
3. Confirm menu item ". ." : OK

The display shows:

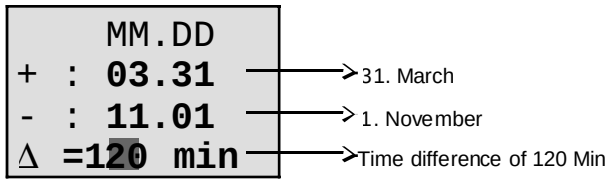


Let us assume you want to configure the following parameters: start of daylight savings time, March 31, end of daylight savings time, November 1, time difference of 120 minutes.

To enter the data:

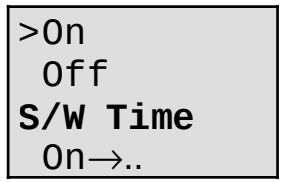
- Use the ◂ or ▸ key to move the cursor/full square to and fro.
- Use the ◂ or ▸ key to change the values at the cursor position.

The display shows:



- Confirm your entries with OK.

You have now customized your daylight savings time. IDEC SmartRelay displays:



IDEC SmartRelay indicates that daylight savings time is enabled and that the parameters were manually entered ("..").

Note

To disable daylight savings time (summertime/wintertime conversion), all you have to do is to confirm "Off" with OK in this menu

3.7 Memory Space and Circuit Size

The size of a program (Circuit program in IDEC SmartRelay, circuit diagram) is limited by the available memory space (memory requirement for the blocks).

Memory Area

In IDEC SmartRelay you can only utilize a specific number of blocks in your program. Some blocks require extra memory for their special functions.

The memory required for special functions can be split into four memory areas.

- Par: The area in which the IDEC SmartRelay stores setpoint values, e.g. the limit values of a counter.
- RAM: The area in which the IDEC SmartRelay stores actual values, e.g. a counter value.
- Timer: The area IDEC SmartRelay utilizes for timer functions, e.g. for on delays.
- REM: The area in which the IDEC SmartRelay stores retentive actual values, e.g. the hours counter value. In blocks with selective use of the retentivity function, this memory area is only used if retentivity is switched on.

Resources Available in IDEC SmartRelay

A program in IDEC SmartRelay can occupy the following maximum resources:

Blocks	Par	RAM	Timer	REM	Bit
56	48	27	16	15	8

IDEC SmartRelay monitors memory utilization. It restricts the functions offered in the function lists to those for which sufficient memory space is physically available.

Memory Utilization

This table gives you an overview of the specific memory requirements of the special functions:

Function block	Par	RAM	Timer	REM
Latching relay*	0	(1)	0	(1)
Current impulse relay	0	(1)	0	(1)
Interval time-delay relay / Pulse output	1	1	1	0
Edge-triggered interval				
time-delay relay	1	1	1	0
On delay	1	1	1	0
Off delay	2	1	1	0
On/off delay	2	1	1	0
Retentive				
on delay	2	1	1	0
Seven-day time switch	6	2	0	0
Twelve-month time switch	2	0	0	0
Up/down counter*	2	(2)	0	(2)
Operating hours counter	2	0	0	4
Symmetrical clock pulse generator	1	1	1	0
Asynchronous pulse generator	3	1	1	0
Random generator	2	1	1	0
Frequency trigger	3	3	1	0
Analog trigger	4	2	0	0
Analog comparator	3	4	0	0
Stairwell light switch	1	1	1	0
Dual-function switch	2	1	1	0
Message texts	1	0	0	0
Softkey	1	(1)	0	(1)

*Depending whether or not the function is configured retentive, it occupies the following memory space:
- Retentivity switched off: RAM area
- Retentivity switched on: REM area

Utilization of Memory Space

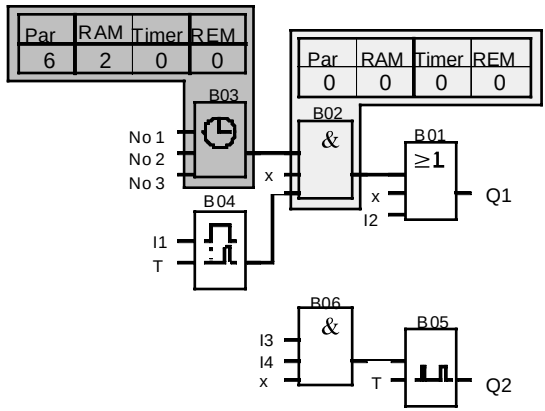
If you are unable to add another block when editing a program, this is a clear indication that no more memory space is available. IDEC SmartRelay offers only the blocks for which it can provide sufficient memory space. If a block from the list cannot be added into the IDEC SmartRelay program you cannot access this list anymore.

If the memory space is fully utilized you must optimize your circuit program or use a second IDEC SmartRelay.

Determining the Amount of Memory Required

When calculating the memory requirements of a circuit, you must always take all memory areas into account.

Example:



The sample program contains:

Block No.	Function	Memory Area				
		Par	RAM	Timer	REM	Blocks
B01	OR	0	0	0	0	1
B02	AND	0	0	0	0	1
B03	Timer switch	6	2	0	0	1
B04	On delay	1	1	1	0	1
B05	Clock generator	1	1	1	0	1
B06	AND	0	0	0	0	1
	Resources occupied by the program	8	4	2	0	6
	IDEC SmartRelay memory limitations	48	27	16	15	56
	still available in IDEC SmartRelay	40	23	14	15	50

The program therefore fits into IDEC SmartRelay.

4 IDEC SmartRelay Functions

IDEC SmartRelay provides various elements for the programming mode. The elements have been separated in to "Lists". These lists are:

- ↓Co: Connector list (Connector) (see “4.1 Constants and Connectors - Co” on page 4-2)
- ↓BF: List of basic functions AND, OR, ... (see “4.2 List of Basic Functions BF” on page 4-5)
- ↓SF: List of special functions (refer to “4.4 List of Special Functions - SF” on page 4-22)
- ↓BN: List of reusable blocks configured in the circuit program

List Contents

All lists show the elements available in IDEC SmartRelay. Normally, this includes all connectors, all basic functions and all special functions the IDEC SmartRelay knows. This includes all blocks you have created in IDEC SmartRelay by the time you access the list ↓BN.

If Not All Choices are Shown

IDEC SmartRelay does not show all elements if:

- No more blocks can be added
  in this case, there is either no more memory space available or the maximum possible number of blocks was reached (56).
- A specific block’s memory space requirement would exceed the space available in IDEC SmartRelay.

4.1 Constants and Connectors - Co

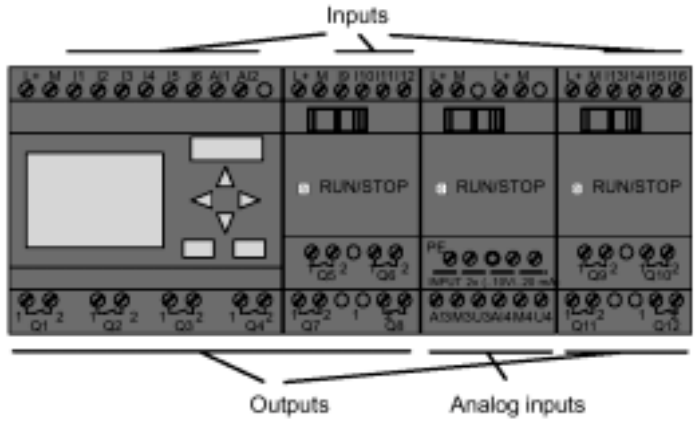
Constants and Connectors (= Co) are inputs, outputs, memory bits and fixed voltage levels (constants).

Inputs

1. Digital Inputs
   Digital inputs are designated with an I. The numbers of the digital inputs (I1, I2, ...) correspond with the numbers of the input connectors of the IDEC SmartRelay Basic and of the connected digital modules in the order they were installed. See the figure on the next page.
2. Analog Inputs
   The IDEC SmartRelay models FL1B-H12SND, FL1B-H12RCE and FL1B-B12RCE are equipped with the inputs I7 and I8 which can also be used as AI1 and AI2, depending on the program. If these inputs are used as I7 and I8 the input signal is interpreted as digital value. When using AI1 and AI2 the signals are interpreted as analog value. When you connect an analog module, the inputs are numbered in the order of the existing analog inputs. When selecting the input signal in programming mode, only the analog inputs AI1 to AI8 are offered for special functions which can be connected to analog inputs. See the figure on the next page.

Outputs

Outputs are designated with a Q. The output numbers (Q1, Q2, ...) correspond to the output connectors of the IDEC SmartRelay Basic and of the connected expansion modules in the order they were installed. See the figure on the following page.



Memory Markers

Memory markers are identified with an M. Memory markers are virtual outputs, with a value at their output analog to that at the input. The IDEC SmartRelay provides 8 memory markers, namely M1 ... M8.

Previous Devices

With previous IDEC SmartRelay models the maximum number of blocks connected in a series can be extended by adding memory markers to the program.

Initialization Memory Marker

Memory marker M8 is set during the first cycle of the user program. You can therefore use it in the program as an initialization memory marker. After the first program cycle it is automatically reset.

In all subsequent cycles you can use memory marker 8 in the same way as memory markers M1 to M7 for setting, deleting and evaluation operations.

> Note
> *The output signal of the memory marker is always that of the previous program cycle.The value does not change within the same program cycle.*

Levels

Voltage levels are designated hi and lo. A constant block status of "1" = hi or "0" = lo is achieved via input of a fixed level or constant hi or lo value.

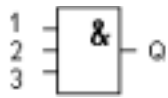
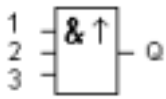
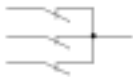
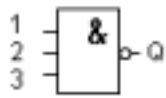
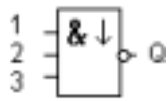
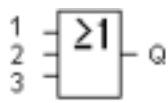
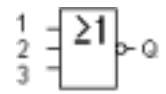
Open Connectors

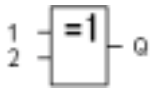
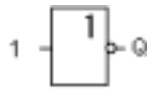
Block pins not connected are identified with an x.

4.2 List of Basic Functions BF

Basic functions represent a simple Boolean algebra logic.

When programming a circuit, you can find the basic function blocks in the BF list. In the last column you can locate the position of every basic function by scrolling through the BF list using the ▼ key from top to bottom. Here are the available basic functions:

View in the Circuit Diagram	View in IDEC SmartRelay	Designation of the Basic Function	Position in the BF
 **Series circuit n.o. contact**		AND	1
		AND with RLO Edge Detection	7
 **Parallel circuit n.c. contact**		NAND (AND not)	4
		AND with RLO Edge Detection	8
 **Parallel circuit n.o. contact**		OR	2
 **Series circuit n.c. Contact**		NOR (OR not)	5

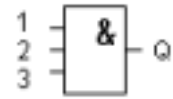
View in the Circuit Diagram	View in IDEC SmartRelay	Designation of the Basic Function	Position in the BF
 **Double change-Over contact**		XOR (exclusive OR)	6
 **n.c. contact**		NOT (negation, inverter	3

4.2.1 AND (AND)

Series connection of multiple make contacts in the circuit diagram



Symbol in IDEC SmartRelay:



The status of the AND output is 1 when all inputs are 1, if they are closed.

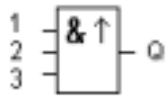
The status of a block input pin which is not connected (x) is: x = 1.

AND Logic Table

1	2	3	Q
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

4.2.2 AND with RLO Edge Detection

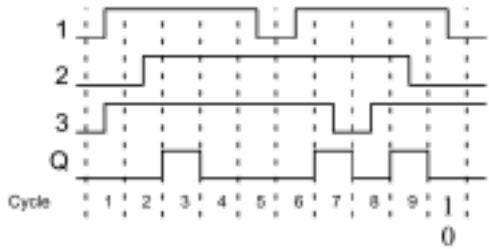
Symbol in IDEC SmartRelay:



The output status of an edge-triggered AND is only 1 if all inputs are 1, and if at least one input was 0 in the previous cycle.

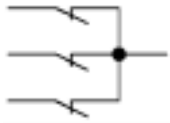
The status of a block input pin which is not connected (x) is: x = 1.

Timing Profile for the AND with RLO Edge Detection

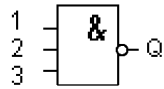


4.2.3 NAND (AND not)

Parallel connection of multiple break contacts in the circuit diagram:



Symbol in IDEC SmartRelay:



The output status of the NAND is only 0 if all inputs are 1, that is, if the contacts are closed.

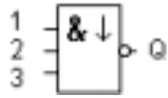
The status of a block input pin which is not connected (x) is: x = 1.

NAND Logic Table

1	2	3	Q
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

4.2.4 NAND with RLO Edge Detection

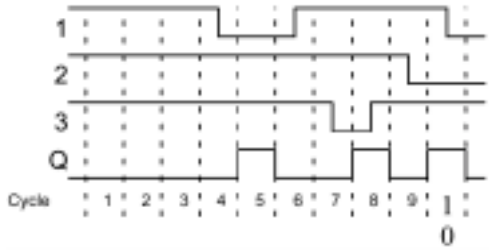
Symbol in IDEC SmartRelay:



The output status of the NAND with edge evaluation is only 1 if at least one input is 0 and if all inputs were 1 in the previous cycle.

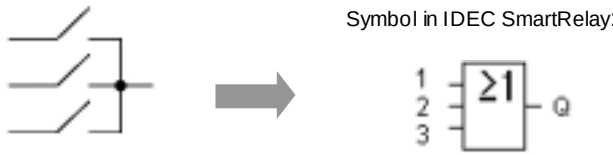
The status of a block input pin which is not connected (x) is: x = 1.

Timing Profile for the NAND with RLO Edge Detection



4.2.5 OR (OR)

The parallel connection of multiple make contacts in a circuit diagram:



The output status of the OR is only 1 if at least one input is 1, that is, if one of the contacts is closed.

The status of a block input pin which is not connected (x) is: x = 0.

OR Logic Table

1	2	3	Q
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

4.2.6 NOR (OR not)

The series connection of multiple break contacts in the circuit diagram:



Symbol in IDEC SmartRelay:



The output status of the NOR is only 1 if all inputs are 0, if switched off. The NOR output is set to 0 at the 0 to 1 transition at one of the inputs.

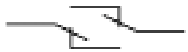
The status of a block input pin which is not connected (x) is: x = 0.

NOR Logic Table

1	2	3	Q
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0

4.2.7 XOR (exclusive OR)

The XOR in the circuit diagram as two changeover contacts connected in series:



Symbol in IDEC SmartRelay:



The output status of the XOR is 1 if the inputs are not equivalent.

The status of a block input pin which is not connected (x) is: x = 0.

XOR Logic Table

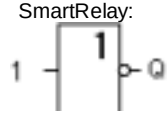
1	2	Q
0	0	0
0	1	1
1	0	1
1	1	0

4.2.8 NOT (Negation, Inverter)

A break contact in the circuit diagram



Symbol in IDEC SmartRelay:



The output status is 1 if the input is 0. The NOT block is an input status inverter.

For the IDEC SmartRelay, the advantage of the NOT is that you do not need break contacts anymore. You simply use a make contact and convert it with the NOT into a break contact.

NOT logic Table

1	Q
0	1
1	0

4.3 Special Functions

Special functions differ from the basic functions because of their different input designation. Special functions include timer functions, retentivity and diverse parameter assignment options for customizing the program.

In this section we should like to give you an overview of the input designations and of special items relating to special functions. The special functions are described in “4.4 List of Special Functions - SF” on page 4-22.

4.3.1 Input Designation

Logical Inputs

Here you find the description of the connections which can be linked to other modules or inputs of the IDEC SmartRelay device.

- S (set):
  Input S can be used to set the output to "1".
- R (reset):
  The reset input R has priority over all other inputs; it switches the outputs to "0".
- Trg (trigger):
  This input is used to trigger the start of a function cycle.
- Cnt (count):
  This input is used to capture count pulses.
- Fre (frequency):
  Frequency signals to be evaluated are input with this designation.
- Dir (direction):
  This input, for example, determines the direction of count.
- En (enable):
  This input enables the block functions. When this input is "0", the block ignores all other signals.
- Inv (invert):
  The output signal of the block is inverted when this input is set.
- Ral (reset all):
  All internal values are reset.

Connection X at the Inputs of the Special Functions

The inputs of the special functions are 0 when connected to the connection "x". That is, the inputs are "lo".

Parameter Inputs

To some of the inputs you do not apply signals, but rather assign specific values to the function block.

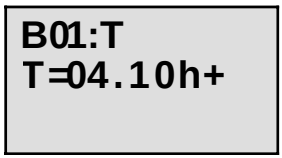
- Par (parameter):
  This input is not wired. Here, you configure the block parameters.
- T (time):
  This input is not wired. Here you configure the times for a block.
- No (cam):
  This input is not wired. Here, you configure the time patterns.
- P (priority):
  This input is not wired. Here, you specify priorities and determine whether or not a message must be acknowledged in RUN mode.

4.3.2 Time Response

Parameter T

With some of the special functions it is possible to configure a time value T. When specifying the time, please note that the values to be entered depend on the set timebase:

Timebase	_ _ : _ _
s (seconds)	seconds : 1/100 seconds
m (minutes)	minutes : seconds
h (hours)	hours : minutes



Setting the time T to 250 minutes:
Unit in hours h:

04.00 hours	240 minutes
00.10 hours	+10 minutes
=	250 minutes

Note
Always specify a time T ≥ 0.10 s. The time T is not de-fined for T = 0.05 s and T= 0.00 s.

Accuracy of T

All electronic components have slightly different parameters. This can cause deviations in the configured time T. With the IDEC SmartRelay the maximum deviation is ± 0.02%. If 0.02% of time T is smaller than 0.1 seconds the maximum deviation is 0.1 seconds.

Example:
The maximum deviation for 1 hour (3600 seconds) is ± 0.02%, that is, ± 0.72 seconds. The maximum deviation for 1 minute (60 seconds) is ± 0.1 seconds.

Timer Switch Accuracy

In order to prevent inaccuracies of clock timing in the C-models as a result of this deviation, the timer switch is continuously compared with a highly accurate timebase and readjusted. This results in a maximum timing deviation of ±5 s/day.

4.3.3 Buffering the Clock

The internal clock of a IDEC SmartRelay continues operation even with a power failure because the clock is buffered. The duration of this buffering is influenced by the ambient temperature. At an ambient temperature of 25°C the buffering time is normally 80 hours.

4.3.4 Retentivity

For special functions there is a possibility to keep circuit states and counter values retentive. This, however, requires that retentivity is enabled for the respective functions. An exception is the principally retentive operating hours meter. See also “6.1 Overview of the Modules” on page 6-2.

4.3.5 Parameter Protection

In the parameter protection configuration you can specify whether the parameters can be displayed and edited in IDEC SmartRelay parameter assignment mode. There are two optional configurations:

+: The parameter configuration can be displayed and edited in parameter assignment mode.

-: The parameter configuration cannot be displayed in parameter assignment mode. Editing is only possible in programming mode.

4.3.6 Gain and Offset Calculation With Analog Values

The gain and offset parameters can be used to adjust the internal image of an analog value to the actual measurement value.

Characteristic Quantity	Minimum	Maximum
Terminal voltage (in V)	0	≥ 10
Internal value	0	1000
Gain (in %)	0	1000
Offset	-999	+999

The terminal voltage (at input AI) of 0 to 10 V is mapped internally to values from 0 to 1000. A terminal voltage higher than 10 V is mapped internally by the value 1000.

With the gain parameter, for example, you can achieve an amplification of 1:10 at a setting of 1000%.

The offset parameter can be used to shift the decimal point of measurement values.

Formula

Displayed value Ax = (Internal value + Offset) • Gain / 100

The gain value displayed is the amplification as percentage.

Hence, the division by 100 in the formula.

Example of Analog Values

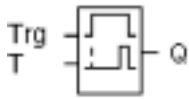
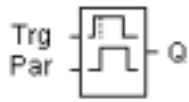
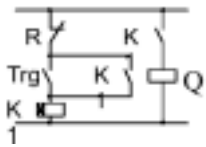
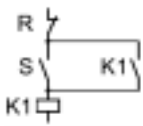
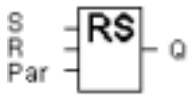
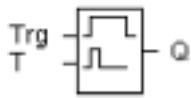
Measurement Value	Voltage (V)	Internal Value	Offset	Gain	Displayed Value (Ax)
	0 5 100	0 500 1000	0 0 0	1 1 1	0 5 10
	0 5 10	0 500 1000	0 0 0	100 100 100	0 500 1000
	0 5 10	0 500 1000	0 0 0	1 1 1	0 5000 10000
	0 5 10	0 500 1000	500 500 500	100 100 100	5 10 15
	0 5 10	0 500 1000	500 500 500	100 100 100	500 1000 1500
	0 5 10	0 500 1000	-200 -200 -200		-200 300 800
	0 10	0 1000	-999 999	1000 1000	-9990 19990
	0.02 0.02 0.02 0.02	2 2 2 2	0 0 0 0	1 10 100 1000	0 0 2 20
-30º C 0º C +70º C	0 3 10	0 300 1000	-300 -300 -300	10 10 10	-30 0 70

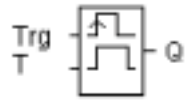
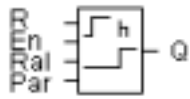
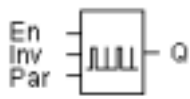
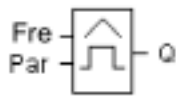
You can find an a sample application in the description of the special function “4.4.18 Analog Comparator” on page 4-55.

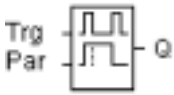
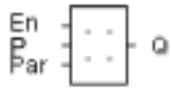
For information on analog inputs also refer to “4.1 Constants and Connectors - Co” on page 4-2.

4.4 List of Special Functions - SF

When programming in IDEC SmartRelay, you can find the blocks for the special functions in the SF list. In the table below you can also find comparable views of circuit diagrams as well as the information whether or not retentivity can be configured for the respective function. In the last column you can locate the position of all special functions by scrolling through the list using the ▼ key.

Display in the Circuit Diagram	Display in IDEC SmartRelay	Designation of the Special Function	Re	Position in SF
		On delay		1
		Off delay		2
		On/off delay		14
		Retentive on delay		7
		Latching relay	Re	5
		Current impulse relay	Re	3
		Interval time-delay relay / Pulse output		9

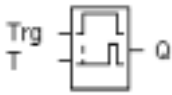
Display in the Circuit Diagram	Display in IDEC SmartRelay	Designation of the Special Function	Re	Position in SF
		Edge triggered interval time-delay relay		18
		Seven-day time switch		4
		Twelve-month time switch		13
		Up/down counter	Re	10
		Operating hours counter		8
		Symmetrical clock pulse generator		6
		Asynchronous pulse generator		12
		Random generator		15
		Frequency trigger		11
		Analog trigger		20

Display in the Circuit Diagram	Display in IDEC SmartRelay	Designation of the Special Function	Re	Position in SF
		Analog comparator		21
		Stairwell light switch		16
		Dual function switch		17
		Message texts		19
		Softkey	Re	22

4.4.1 On Delay

Description

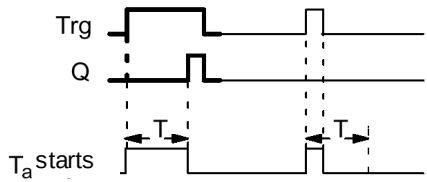
An output with on delay is not switched on until the specified time has elapsed.

Symbol in IDEC SmartRelay	Wiring	Description
	Input Trg	Use input Trg (Trigger) to start the on delay time
	Parameter T	T is the time after which the output is switched (0 to 1 transition of the output signal).
	Output Q	Q is switched on when a specified time T has elapsed, provided Trg is still set.

Parameter T

Please note the specifications for parameter T in “4.3.2 Time Response” on page 4-18.

Timing Diagram



The section of the timing diagram displayed in bold print is found again in the symbol for the on delay.

Function Description

- On 0 to 1 transition of input Trg the time T_a starts (T_a is the current time in IDEC SmartRelay.
- If the status of input Trg is 1, at least for the duration of the configured time T, the output is set to 1 when this time expires (the output follows the input with on delay).
- The time is reset if the status of input Trg changes to 0 before the time T has elapsed.
- The output is set to 0 when the status at input Trg is 0.
- The elapsed time is reset after a power failure.

4.4.2 Off Delay

Description

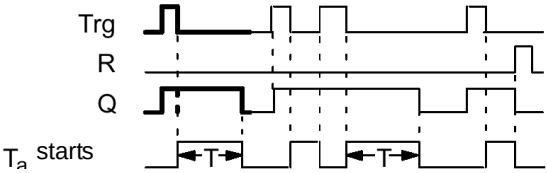
The output is not reset until the set time has elapsed.

Symbol in IDEC SmartRelay	Wiring	Description
	Input Trg	You start the off delay at the negative edge (1 to 0 transition) at input Trg (Trigger)
	Input R	Input R resets the on delay time. It also resets the output to 0.
	Parameter T	T is the time after which the output is switched off (1 to 0 transition of the output signal).
	Output Q	Q is switched on with Trg. It holds this state until T has elapsed.

Parameter T

Please note the value specification for parameter T in “4.3.2 Time Response” on page 4-18.

Timing Diagram



The bold printed section of the timing diagram is found again in the symbol for the off delay.

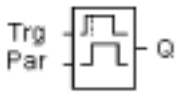
Function Description

- When the status of Trg has changed to 1, the output Q is instantly switched to 1.
- The actual time T_a in IDEC SmartRelay restarts on a 1 to 0 transition at Trg. The output remains set. When T_a reaches the configured value T (T_a = T), output Q is reset to 0 (off delay).
- The time T_a restarts when input Trg is switched on and off again.
- Input R (Reset) is used to reset the time T_a and the output before T_a has elapsed.
- The elapsed time is reset after a power failure.

4.4.3 On/Off Delay

Description

An output with on/off delay is set and reset on expiration of specified times.

Symbol in IDEC SmartRelay	Wiring	Description
	Input Trg	The positive edge (0 to 1 transition) at input Trg (Trigger) starts the time T_H for the on delay. The negative edge (1 to 0 transition) at input Trg (Trigger) starts the time T_L for the off delay.
	Parameter Par	T_H is the time after which the output is switched on (0 to 1 transition of the output signal). T_L is the time after which the output is switched off (1 to 0 transition of the output signal).
	Output Q	On expiration of the configured time T_H, output Q is switched on provided Trg is still set. On expiration of the time T_L it is switched off, provided Trg was not set again.

Parameter T_H and T_L

Note the value specifications for the parameters T_H and T_L in “4.3.2 Time Response” on page 4-18.

Timing Diagram



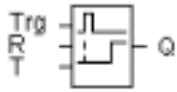
Function Description

- The time T_H starts after a 0 to 1 transition at input Trg.
- If the status at input Trg is 1 at least for the duration of the time T_H, the output is set to 1 on expiration of the time T_H (the output follows the input on delayed).
- The time is reset if input Trg changes to 0 before the time T_H has elapsed.
- Time T_L starts when the status at input Trg returns to 0.
- If the status at input Trg is 0 at least for the duration of T_L, the output is set to 0 on expiration of the time T_L (the output follows the input off delayed).
- The time is reset if the status at input Trg returns to 1 before the time T_L has elapsed.
- The time elapsed is reset after a power failure.

4.4.4 Retentive On Delay

Description

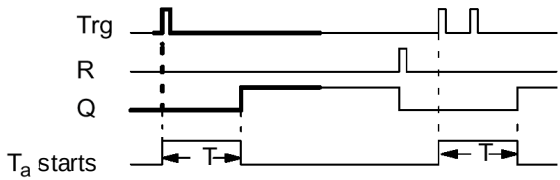
The specified time starts after an input pulse. The output is set on expiration of this time.

Symbol in IDEC SmartRelay	Wiring	Description
	Input Trg	You start the on delay at the negative edge (1 to 0 transition) at input Trg (Trigger).
	Input R	Use the input R to reset the on delay time and the output.
	Parameter T	T is the time after which the output is switched on (output transition 0 to 1).
	Output Q	On expiration of the time T output Q is switched on.

Parameter T

Note the value specifications in “4.3.2 Time Response” on page 4-18.

Timing Diagram



The bold printed section of the timing diagram is found again in the symbol for the retentive on delay.

Function Description

- The current time T_a starts at the 0 to 1 transition at input Trg. Output Q is set to 1 when T_a = T. Further switching actions at input Trg have no influence on T_a.
- The output and the time T_a are only reset to 0 when the status at input R is 1.
- The elapsed time is reset after a power failure.

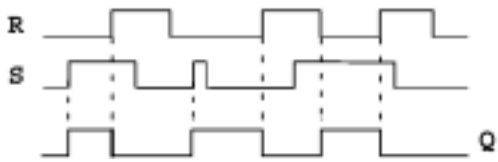
4.4.5 Latching Relay

Description

Input S sets output Q. Input R resets output Q.

Symbol in IDEC SmartRelay	Wiring	Description
	Input S	Use input S to set output Q to 1.
	Input R	Use input R to reset output Q to 0 again. If both S and R are 1, the output is reset.
	Parameter Par	This parameter can be used to switch retentivity on and off. **Ret:** **off = no retentivity** **on = the status is retentive**
	Output Q	Q is switched on with a signal at input S. This state is maintained until input R is set.

Timing Diagram



Switching Behavior

A latching relay is a simple logic memory. The output value depends on the input states and on the previous output status. The following table shows the logic once again:

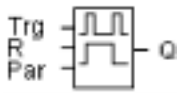
S_n	R_n	Q	Comment
0	0	x	The status is retentive
0	1	0	Reset
1	0	1	Set
1	1	0	Reset (has priority over Set)

With enabled retentivity the status of the output signal does not change when power is returned after power failure.

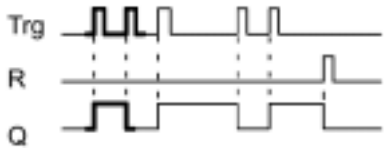
4.4.6 Current Impulse Relay

Description

A short one-shot at the input is used to set and reset the output.

Symbol in IDEC SmartRelay	Wiring	Description
	Input Trg	You use input Trg (Trigger) to switch the output Q on and off.
	Input R	The input R is used to reset the output and the relay.
	Parameter Par	This parameter can be used to switch retentivity on and off. **Ret:** **off = no retentivity** **on = the status is retentive**
	Output Q	Q is switched on with Trg and off again with the next Trg.

Timing Diagram



The bold printed section of the timing diagram is found again in the symbol for the pulse relay.

Function Description

- Output Q status is toggled at every 0 to 1 transition of the status at input Trg, that is, the output is switched on or off.
- Use input R to reset the pulse relay to initial state, that is, the output is set to 0.
- After a power failure the pulse relay is reset and the output Q is set to 0 if you have not enabled retentivity.

4.4.7 Interval Time-Delay Relay / Pulse Output

Description

An input signal generates a signal of specified length at the output.

Symbol in IDEC SmartRelay	Wiring	Description
	Input Trg	You use input Trg (Trigger) to start the time for the wiping relay.
	Parameter T	T is the time after which the output is switched off (1 to 0 transition of the output signal).
	Output Q	Q is switched on with Trg as long as the time T_a expires and the input is set to 1.

Parameter T

For information on the parameter T refer to “4.3.2 Time Response” on page 4-18.

Timing Diagram



The bold printed section of the timing diagram is found again in the symbol for the wiping relay.

Function Description

- The output status is switched to 1 after the input Trg is set to 1. The time T_a is started at the same time and the output remains set.
- When T_a reaches the value specified in T (T_a = T), the status of output Q is reset to 0 (pulse output).
- On input Trg transition from 1 to 0 before the specified time has elapsed, the output follows immediately with a 1 to 0 transition.

4.4.8 Edge-Triggered Interval Time-Delay Relay

Description

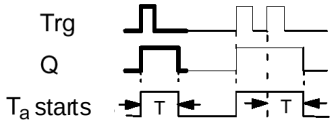
An input signal generates an output signal of specified length (retriggering).

Symbol in IDEC SmartRelay	Wiring	Description
	Input Trg	Use the input Trg (Trigger) to start the time for the edge-triggered wiping relay.
	Parameter T	T is the time after which the output is switched off (1 to 0 transition of the output signal).
	Output Q	Q is switched on with Trg. It holds this state until T has elapsed.

Parameter T

For information on the parameter T refer to “4.3.2 Time Response” on page 4-18.

Timing Diagram



The bold printed section of the timing diagram is found again in the symbol for the edge-triggered wiping relay.

Function Description

- The output status is switched to 1 after the input Trg is set to 1. Time T_a is started at the same time. After T_a has reached the value specified in T (T_a = T) the output Q status is reset to 0 (pulse output).
- The time T_a is reset if input Trg changes again from 0 to 1 (retriggering) before the specified time has elapsed. The output remains switched on.

4.4.9 Seven-Day Time Switch

Description

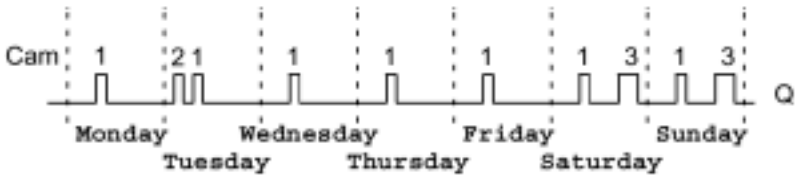
The output is controlled by a specified on-/off-date. The function supports any combination of weekdays. You select the active weekdays by hiding the inactive days.

Note

The FL1B-H12SND model does not have an internal clock.Therefore, the weekly timer switch cannot be used for this model.

Symbol in IDEC SmartRelay	Wiring	Description
	The parameters Cam 1, **Cam 2** **Cam 3**	In the Cam parameter you set the on-/off-time respectively for one Cam of the weekly timer switch. Here you configure the days and the time-of-day.
	Output Q	Q is switched on when the configured cam is switched on.

Timing Diagram (three examples)



Cam1: Daily: 06:30 h to 08:00 h

Cam 2: Tuesday: 03:10 h to 04:15 h

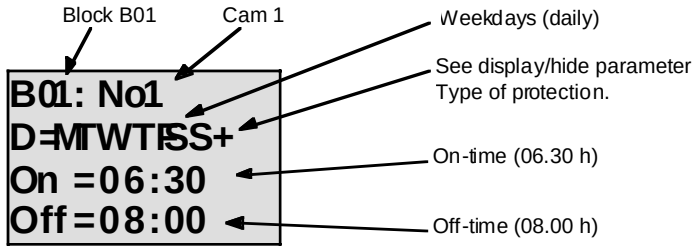
Cam 3: Saturday and Sunday: 16:30 h to 23:10 h

Function Description

- Every Seven-day time switch has three cams. In the cam setting you specify the on-/off-times. At the on-time, the Seven-day time switch switches on the output, if the output is not already switched on.
- At the off-time, the Seven-day time switch switches off the output, if the output is not already switched off. The on- and off-times are in conflict if their specified switching time is the same for the Seven-day time switch, but on different cams. In this case cam 3 has priority over cam 2, whereas cam 2 has priority over cam 1.

Parameter Assignment Screen Form

Parameter assignment screen form for cam no.1:



Weekday

The letters behind the "D=" have the following meaning:

- M : Monday
- T : Tuesday
- W : Wednesday
- T : Thursday
- F : Friday
- S : Saturday
- S : Sunday

An upper case letter means that the weekday is selected. The character "-" means that the weekday is not selected.

Switching Times

Switching times are possible between 00:00 h and 23:59 h.

—:— means there are no on- and off-times.

Setting the Weekly Timer Switch

This is how you specify the switching times:

1. Position the cursor on one of the Cam parameters of the timer switch (e.g. Cam 1).
2. Confirm with OK. IDEC SmartRelay opens the parameter assignment screen form for the cam. The cursor is positioned on the weekday.
3. Use ▲ and ▼ to select one or several weekdays.
4. Use ▶ to move the cursor to the first position of the on-time.
5. Set the on-time.
   Modify the value at the respective position, using the ▲ or ▼ key. Move the cursor around to the various positions, using the ◀ or ▶ key. You can only select the value —:—at the first position (—:— means: no switching operation).
6. Using the ▶ key, move the cursor to the first position of the off-time.
7. Set the off-time (in same way as in step 5).
8. Confirm your entries with OK.

The cursor is positioned on the Cam 2 parameters. You can now configure another cam.

> Note
> *You can find information on timer switch accuracy in the "A.Technical Specifications" on page 9-1 and in "4.3.2 Time Response" on page 4-18.*

Seven-Day Time Switch:

Example:

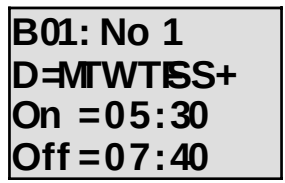
The output of the Seven-day time switch is to be switched on daily from 05:30 h to 07:40 h. The output should also be switched on every Tuesday from 03:10 h to 04:15 h and on the weekends from 16:30 h to 23:10 h.

This requires three cams.

Here are the parameter assignment screen forms of cams 1, 2 and 3, based on the timing diagram above.

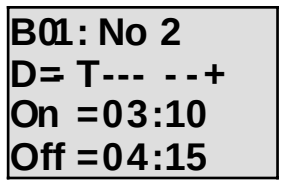
Cam 1

Cam 1 must switch on the output of the weekly timer switch daily from 05:30 h to 07:40 h.



Cam 2

Cam 2 must switch on the output of the weekly timer switch every Tuesday from 03:10 h to 04:15 h.

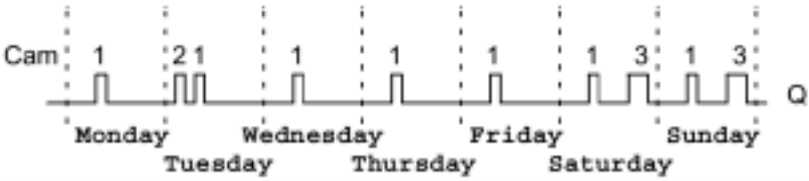


Cam 3

Cam 3 must switch on the output of the weekly timer switch every Saturday and Sunday from 16:30 h to 23:10 h.

```
B01: No 3
D= ----  SS+
On =16:30
Off=23:10
```

Result



4.4.10 Twelve-Month Time Switch

Description

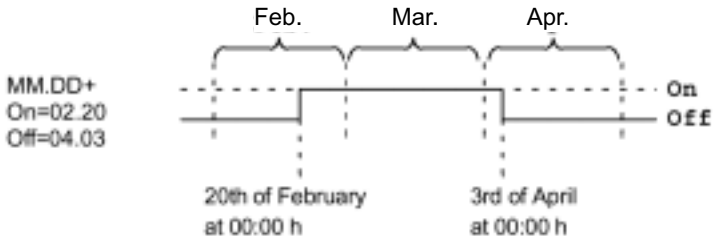
The output is controlled by a specified on-/off-date.

Note

The FL1B-H12SND model does not have a clock.Therefore, the yearly timer switch cannot be used for this model.

Symbol in IDEC SmartRelay	Wiring	Description
	Input Cam	In the Cam parameters, you configure the on-/off-times for the cams of the yearly timer switch.
	Output Q	Q is switched on when the configured cam is switched on.

Timing Diagram



Function Description

At the specified on-time the Twelve-month time switch switches on the output. At the specified off-time the yearly timer switch switches off the output. The off-date specifies the day on which the output is reset to 0 again. The first value identifies the months, the second value the day.

Sample Configuration

On March 1st the output of a IDEC SmartRelay is to be switched on until the April 4th. On July 7th it is switched on once again until the November 19th. This requires two yearly timer switches for which the respective on times must be configured. The outputs are then linked by an OR block.

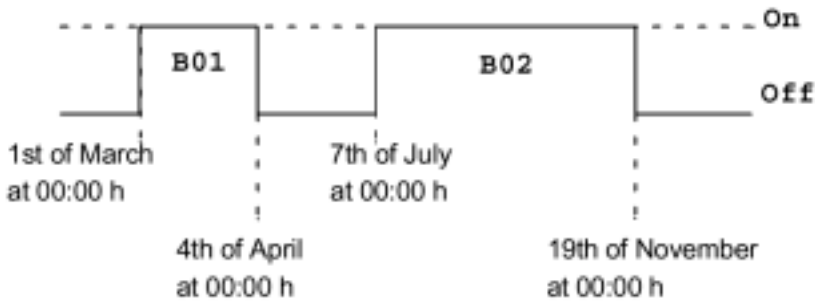
```
B01: No
      MM DD
On  =03.01
Off =04.04
```

on-time 1st of march
off-time 4th of April

```
B02: No
      MM DD
On  =07.07
Off =11.19
```

in addition:
on-time 7th of July
off-time on 19th of November

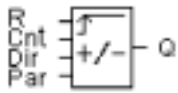
Result



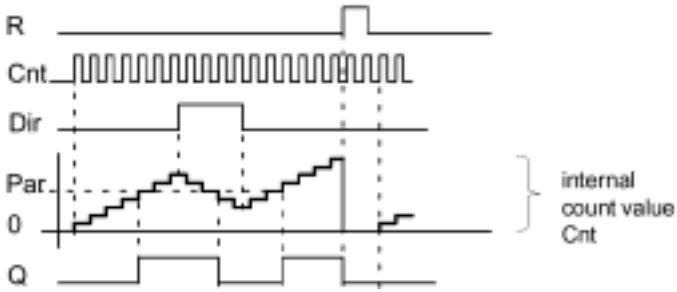
4.4.11 Up/Down Counter

Description

Depending on the configuration, an internal value is counted up or down at every input pulse. The output is set when the configured count value is reached. A special input can be used to change the counting direction.

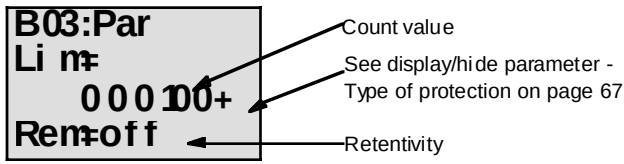
Symbol in IDEC SmartRelay	Wiring	Description
	Input R	Input R resets the internal count value and the output to zero.
	Input Cnt	The counter counts the 0 to 1 transitions at input Cnt. 1 to 0 transitions are not counted. Maximum counting frequency at the input terminals: 5 Hz
	Input Dir	You specify the counting direction using the input Dir: **Dir = 0: Up-count** **Dir = 1: Down-count**
	Parameter Par	Lim: Counter value limit at which the output is reset by the internal count value. **Ret: Enabling retentivity**
	Output Q	Q is switched on when the count value is reached.

Timing Diagram



Function Description

- With every positive edge at input Cnt the internal counter increments (Dir = 0) or decrements (Dir = 1) by one count.
- Output Q is set to 1 when the internal value is greater than or equal to the value specified in Par.
- You can use reset input R to reset the output and the internal count value to "000000". When R=1, the output is 0 and the pulses at input Cnt are not counted.



Configuration of the Par Parameter

The output is set when the internal value is greater than or equal to the value specified in Par. The counter stops on over/underflow.

Lim can lie between 0 and 999999.

Ret: This parameter is used to switch retentivity on and off for the internal count value Cnt.

off = no retentivity

on = the count value Cnt is retentive

When retentivity is switched on, the counter value is maintained in the event of power failure. The count is resumed at the same value after power is restored.

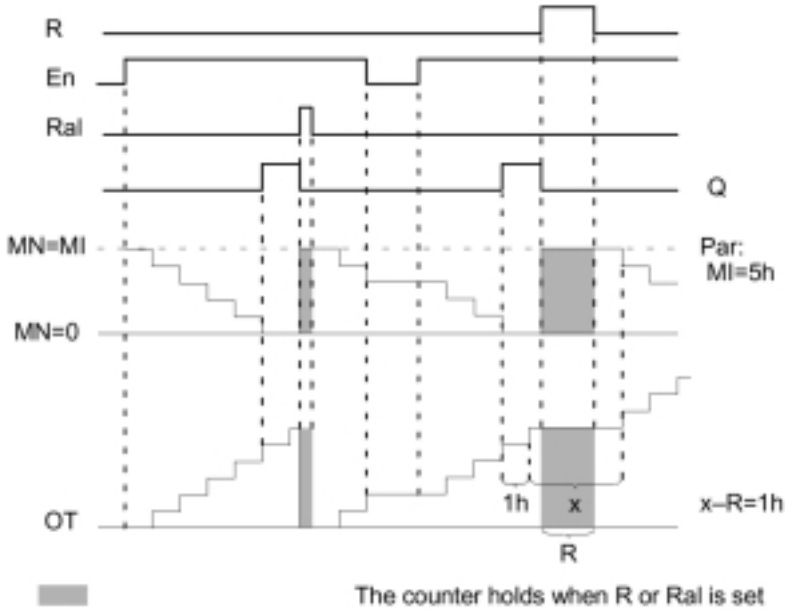
4.4.12 Operating Hours Counter

Description

A specified time starts when the input is set. The output is set on once this time has elapsed of this time.

Symbol in IDEC SmartRelay	Wiring	Description
	Input R	R = 0: Counting is enabled if Ral is not 1 **R = 1: Counter has stopped** **Use input R to reset the output. The time-to-go for the maintenance interval MN is set to the value MN = MI. The time elapsed is maintained.**
	Input En	En is the monitoring input. IDEC SmartRelay measures the time when this input is set.
	Input Ral	Ral = 0:Counting is enabled if Ral is not 1 **Ral = 1: The counter has stopped** **Use input Ral (Reset all) to reset the counter and the output. That is,** • output Q = 0, • measured operating time OT = 0 and • **the time-to-go of the maintenance interval MN = MI.**
	Parameter Par: MI	MI: maintenance interval to be specified, in hour units. MI can lie between 0 and 9999 hours.
	Output Q	The output is set when the time-to-go MN = 0 (see the timing diagram).

Timing Diagram



MI = configured time interval
MN = time–to–go
OT = total time elapsed since the last 1 signal at the Ral–input

Function Description

The hour counter monitors the input En. As long as the status of this input is 1, IDEC SmartRelay determines the time elapsed and the time-to-go MN. The IDEC SmartRelay displays the times in parameter assignment mode. Output Q is set to 1 when the time-to-go MN = 0.

- Use input R to reset output Q and time-to-go counter to the specified value MI. The internal counter OT continues the count.
- Use input Ral to reset output Q and the time-to-go counter to the specified value MI. The internal counter OT is reset to 0.

Viewing MN and OT Values

- IDEC SmartRelay Basic with display: In parameter assignment mode you can view the actual values of MN and OT while the program is running.
- IDEC SmartRelay Basic without display: with WindLGC (refer to “IDEC SmartRelay Software” on page 7-1for additional information) you can read the values as follows:

Note

The PC link must be connected to the IDEC SmartRelay before you switch on the power supply.

1. In the "Extras transfer" menu, select the menu item "Hours counter". A connection is automatically established to the IDEC SmartRelay and the current program is retrieved.
2. An Info box pops up showing the data.

Note

The hours counter can be accessed without entering a password.

If your IDEC SmartRelay without display is equipped with a red module you cannot access the hours counter, because the program of the IDEC SmartRelay will be deleted when you remove the module (to connect the PC cable).

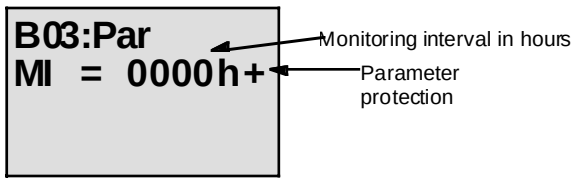
Limit Value for OT

Elapsed operating hours are saved in OT when using the input R signal to reset the hours counter. The limit value for the OT counter is 99999 h.

When the hours counter reaches this value, no more hours are counted.

The OT value ensures retentivity of the hours counter.

Configuration of the Par parameter



MI is the specified time interval. It can be between 0 and 9999.

4.4.13 Symmetrical Clock Pulse Generator

Description

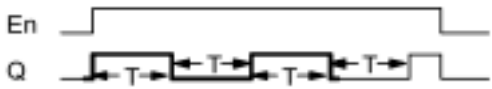
The period of the output clock signal can be configured.

Symbol in IDEC SmartRelay	Wiring	Description
	Input En	Use the input En to switch the clock generator on and off.
	Parameter T	T is the time during which the output is switched on or off.
	Output Q	Q is toggled periodically depending on the clock cycle time T.

Parameter T

Note the value specifications in “4.3.2 Time Response” on page 4-18.

Timing Diagram



The bold printed section of the timing diagram is found again in the symbol for the symmetric clock generator.

Function Description

- In parameter T you specify the length of the on and off times. Using input En (Enable) you can switch on the clock generator, that is, the generator toggles the output between 1 and 0, respectively for the duration of the time T, until the input status is 0 again.

  Note relating to relay outputs:
  The output contacts of a relay wear slightly when switched under load.You can find information on the number of switching cycles an output of a IDEC SmartRelay can safely process in the appendix “A.Technical Specifications” on page Appendix-1.

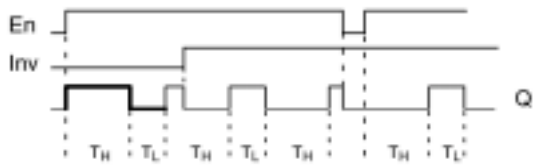
4.4.14 Asynchronous Pulse Generator

Description

The pulse profile of the output can be customized using pulse/pause ratio.

Symbol in IDEC SmartRelay	Wiring	Description
	Input En	You can use input EN to switch the asynchronous pulse generator on and off.
	Input INV	You can use input INV to invert the output signal of the active asynchronous pulse generator.
	Parameter Par	You can customize the period TH and the pulse pause width TL.
	Output Q	Q is toggled periodically, depending on the clock cycles TH and TL.

Timing Diagram



Function Description

- In the parameters T_H (Time High) and T_L (Time Low) you can adjust the period and the pause width.
- With input INV you can also invert the output. The input block INV only negates the output if it is enabled by EN.

4.4.15 Random Generator

Description

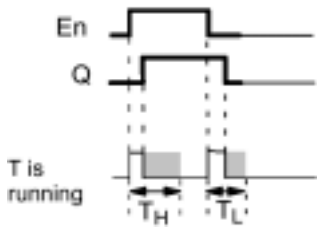
With a random generator the output is switched on and off again within a specified time.

Symbol in IDEC SmartRelay	Wiring	Description
	Input En	You can start the on delay time of the random generator at the positive edge (0 to 1 transition) at the enable input En. **You can start the off delay time of the random generator at the negative edge (1 to 0 transition).**
	Parameter Par	The random on delay time is 0 s to TH. The random on delay time is 0 s to TL.
	Output Q	On expiration of the on delay time output Q is switched on, provided En is still set. On expiration of the off delay time it is switched off, provided En was not set again meanwhile.

Parameter T_H and T_L

Note the value specifications for the parameters T_H and T_L in “4.3.2 Time Response” on page 4-18.

Timing Diagram



The bold printed section of the timing diagram is found again in the symbol for the off delay.

Function Description

- A random time (on delay) between 0 s and T_H is determined and started at the 0 to 1 transition of the status at input EN. The output is set to 1 on expiration of the on delay time, if the status at input En is 1 at least for the duration of the on delay time.
- The time is reset if the status at input En returns to 0 before the on delay time has elapsed.
- When the status at input En returns to 0, a random time (off delay) between 0s and T_L is determined and started.
- The output is reset to 0 on expiration of the off delay time, if the status at input En is 0 at least for the duration of the off delay time.
- The time is reset if the status at input En returns to 1 before the on delay time has elapsed.
- The time elapsed is reset after a power failure.

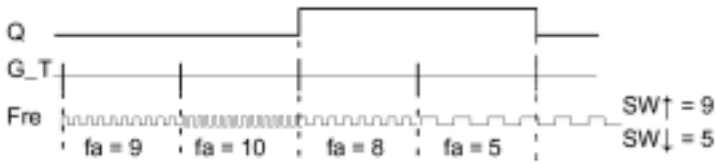
4.4.16 Frequency Trigger

Description

The output is switched on and off, depending on two specified frequencies.

Symbol in IDEC SmartRelay	Wiring	Description
	input Fre	At input Fre you connect the input that supplies the pulses to be counted. Use **• inputs I5/I6 for fast counting operations (only FL1B-H12RCE/ B12RCE and FL1B-H12SND): max. 1 kHz.** • any other input or circuit component for counting low frequencies.
	Parameter Par: **SW↓ , SW ↑** **G_T**	SW↑: on threshold SW↓: off threshold **G_T: Time interval or gate time during which the pulses are measured.**
	Output Q	Q is switched on and off depending on SW↑ and SW↓.

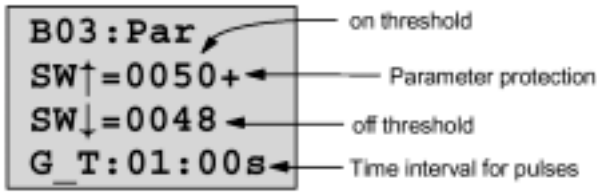
Timing Diagram



Function Description

- The threshold switch measures the signals at input Fre. The pulses are captured across a specified period G_T. Output Q is switched on if the value measured within the time G_T is higher then the on and off threshold.
- Q is switched off again when the measured pulse rate is equal to/lower than the off threshold value.

Configuration of the Par Parameter



SW↑ is the on threshold. The range is 0000 to 9999.

SW↓ is the off threshold. The range is 0000 to 9999.

G_T is the time interval during which the pulses at the Fre input are measured. The range for G_T is 00.05 s to 99.95 s.

Note

When you specify a time G_T of 1 s, the IDEC SmartRelay returns the current frequency in parameter fa in Hz.

f_a is always the sum of the measured pulses per time unit G_T.

4.4.17 Analog Switch

Description

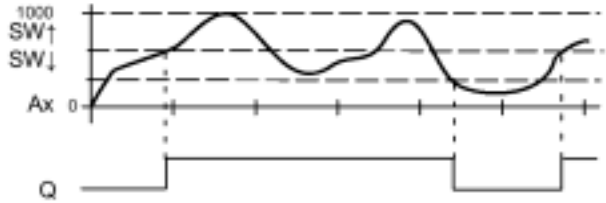
The output is switched on when the analog value exceeds a specified on threshold. The output is switched on when the analog value drops below a specified off threshold.

Symbol in IDEC SmartRelay	Wiring	Description
	Input Ax	At input Ax you apply the analog signal you want to evaluate. Only use terminals I7 (AI1) or I8 (AI2), on FL1B-H12RCE/ B12RCE and FL1B-H12SND or those of an analog module. 0-10 V is equivalent to 0-1000 (internal value).
	Parameter Par: ↕, ↑, **sw↑** , **sw ↓**	↕ : Gain in % range of values 0..1000% ↑ : Offset range of values ±999 SW↑ : on threshold range of values ±19990 SW↓ : off threshold range of values ±19990
	Output Q	Q is set and reset depending on the thresholds.

Gain and Offset Parameters

Note the information relating to the gain and offset parameters in “4.3.6 Gain and Offset Calculation With Analog Values” on page 4-20.

Timing Diagram



Function Description

This function retrieves the analog value of a signal at the analog input (AI1, AI2...AI8).

The offset parameter is then added to the analog value. The result is multiplied by the gain parameter.

Since this is given as a percentage, the value 1000% for instance is equivalent to a multiplication by 10. See “4.3.6 Gain and Offset Calculation With Analog Values” on page 4-20.

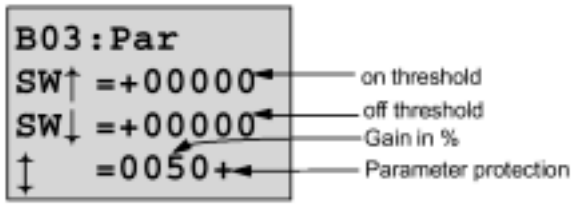
Output Q is set to 1 if this value exceeds the on threshold (SW ↑).

Q is reset to 0 again after the value reaches or drops below the off threshold (SW ↓).

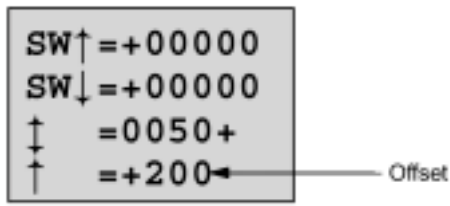
Configuration of the Par Parameter

The gain and offset parameters are used to adapt the used sensors to the respective application.

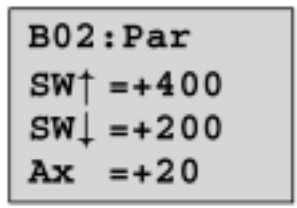
Parameter assignment:



Press the ▸ key



Display in parameter assignment mode (example):



4.4.18 Analog Comparator

Description

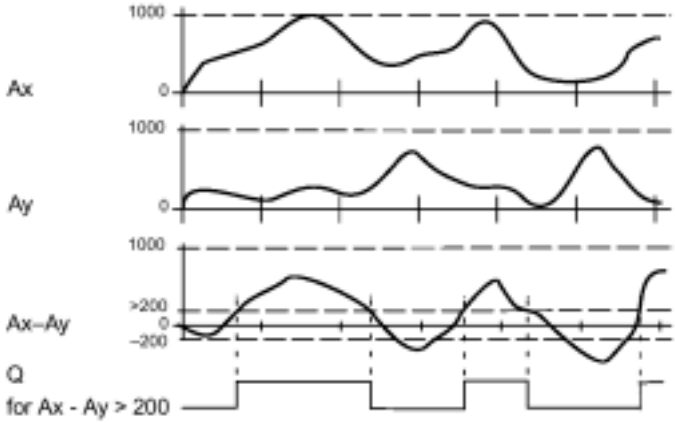
The output is switched on if the difference Ax - Ay exceeds the set threshold.

Symbol in IDEC SmartRelay	Wiring	Description
	Inputs Ax and Ay	At the inputs Ax and Ay, apply the analog signals for which you want to evaluate the difference. **Use the terminals I7 (AI1) and I8 (AI2), only the FL1B-H12RCE/B12RCE and FL1B-H12SND or those of an analog module.**
	Parameter Par: ↕, ↑, △	↕ : Gain in % range of values 0..1000% ↑: Offset **range of values ±999** **△: threshold**
	Output Q	Q is set to 1 if the difference Ax-Ay exceeds the threshold.

Gain and Offset Parameters

Note the information relating to the gain and offset parameters in “4.3.6 Gain and Offset Calculation With Analog Values” on page 4-20.

Timing Diagram



Function Description

The analog comparator function carries out the following calculations:

1. The value configured in the offset parameter is added to Ax and Ay.
2. Ax and Ay are multiplied by the gain parameter. Since this is given as a percentage, the value 1000% for instance is equivalent to a multiplication by 10.
3. The function forms the difference of the analog values Ax-Ay

Output Q to 1 if this differential value exceeds the threshold you have configured under r. Otherwise Q is reset to 0.

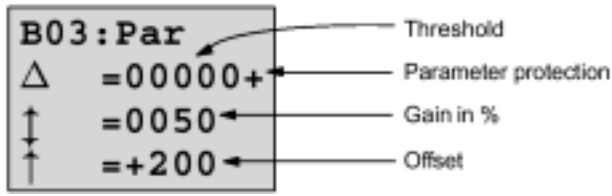
Calculation Guidelines

Q = 1, if:

[(Ax + offset) · gain] - [(Ay + offset) · gain] > threshold

Configuration of the Par Parameter

The gain and offset parameters are used to adapt the used sensors to the respective application.



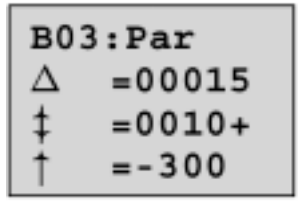
Example

- For the controls of a heater, the supply and return line temperatures T_v (e.g. with a sensor at AI1) and T_r (e.g. with a sensor at AI2) are to be compared.
- A switching operation is to be triggered (e.g. burner on) if the return line temperature deviates by more than 15 °C from the supply line temperature.
- The physical temperature is to be displayed in parameter assignment mode.
- Available are thermal elements with the following technical data: -30 to +70°C, 0 to 10 V DC.

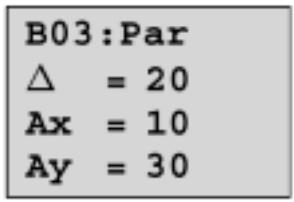
Application	Internal Mapping
-30 to +70º C = 0 to 10V DC	0 to 1000
0º C	300 → Offset = -300
Range of values: -30 to +70∞C = 100	1000 → Gain = 100/1000 = 0,1 = 10%
Switching threshold = 15°C	Threshold = 15

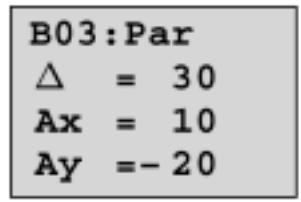
See also “4.3.6 Gain and Offset Calculation With Analog Values” on page 4-20.

Parameter assignment:



Display in parameter assignment mode (example):





4.4.19 Stairwell Light Switch

Description

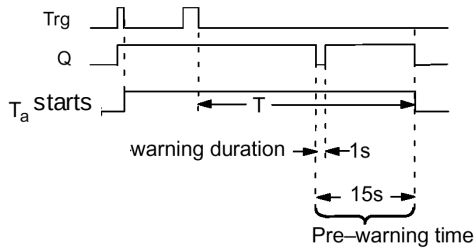
The input pulse (edge control) starts a specified time. The output is reset on expiration of this time. 15 s prior to the expiration of this time an off warning is generated.

Symbol in IDEC SmartRelay	Wiring	Description
	Input Trg	Use the input Trg (Trigger) to start the timer for the stairway lighting switch (off delay).
	Parameter T	T is the time after which the output is switched off (1 to 0 transition of the output status). **Default timebase is the minute.**
	Output Q	On expiration of the time T Q is switched off. 15 s prior to the expiration of this time the output is switched to 0 fro the duration of 1 s.

Parameter T

Note the value specifications in “4.3.2 Time Response” on page 4-18.

Timing Diagram



Function Description

- The output Q is set to 1 on a 0 to 1 transition at input Trg. At the 1 to 0 transition of the status at input Trg the current time T_a starts. The output Q remains set.
- 15 s before T_a reaches the time T the output Q is reset to 0 for a time of 1 s.
- When T_a = T, the output Q is reset to 0.
- When input Trg is switched on and off again while T_a expires, T_a is reset (retriggering option).
- The time elapsed is reset after a power failure.

How to Change the Timebase

You can also set other values for the warning time and warning period.

Timebase T	Pre-warning time	Pre-warning duration
Seconds*	750 ms	50 ms
minutes	15 s	1 s
hours	15 min	1 min

*Only feasible for programs with a cycle time < 25 ms

For more information see the Appendix “B. Determining the Cycle Time” on page Appendix-9.

4.4.20 Dual-Function Switch

Description

Switch with two different functions:

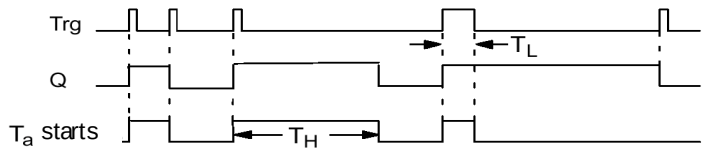
- Pulse switch with off delay
- Switch (continuous lighting)

Symbol in IDEC SmartRelay	Wiring	Description
	Input Trg	Use input Trg (Trigger) to switch on the output Q (off delay or continuous lighting). The active output Q can be reset with Trg.
	Parameter Par	T_H is the time after which the output is switched off (1 to 0 transition of the output status). **T_L is the period during which the input must be set in order to enable the continuous lighting function.**
	Output Q	The output Q is switched on with Trg. Depending on the pulse width at the input Trg, it is switched off again on expiration of a specified time, or reset by setting Trg once again.

Parameter T_H and T_L

Note the value specifications in “4.3.1 Input Designation” on page 4-16 (as a reminder: "Always specify a time T ≥ 0.10 s. The time T is not defined for T = 0.05 s and T= 0.00 s")

Timing Diagram



Function Description

The current time T_a starts and the output Q is set to 1 at the 0 to 1 transition of the status at input Trg.

When T_a reaches the time T_H, the output Q is reset to 0.

The elapsed time is reset after a power failure.

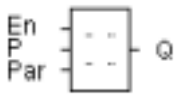
At the 0 to 1 transition of the status at input Trg and if the status "1" is set at least for the duration of the time T_L, the continuous lighting function is enabled and output Q is switched on continuously.

If the input is switched once again, Trg resets T_H nevertheless and the output Q is switched off.

4.4.21 Message Texts

Description

Displaying a specified message text in RUN mode.

Symbol in IDEC SmartRelay	Wiring	Description
	Input En	The 0 to 1 transition of the status at input En (Enable) starts the output of the message text.
	Parameter P	P represents the priority of the message text. **Quit: Acknowledgment of the message text.**
	Parameter Par	Par is the text for the message output.
	Output Q	Q is set as long as the message text is displayed.

Restriction

A maximum of five message text functions are possible.

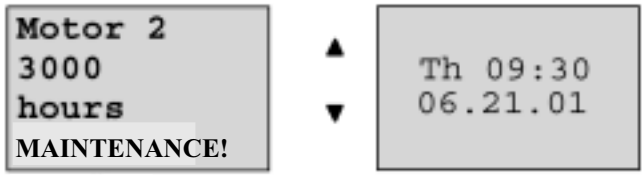
Function Description

- On 0 to 1 transition of the status at input En the display shows in RUN mode your specified message text.
- Acknowledgment disabled (Quit = Off):
- On 1 to 0 transition of the status at input En the message text is hidden.
- Acknowledgment enabled (Quit = On):
- On a 1 to 0 transition of the status at input En, the message text is held until acknowledged with OK. When En is 1, you cannot acknowledge the message text.
- When multiple message text functions are triggered with En=1, the message text with the highest priority is shown (0=lowest, 9=highest).
- You can toggle between the standard display and the message text display using the ▲ or ▼ keys.

Example

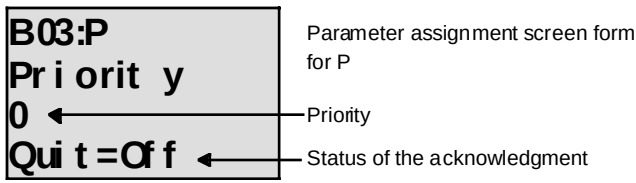
This is how the message text might be displayed:

En=1



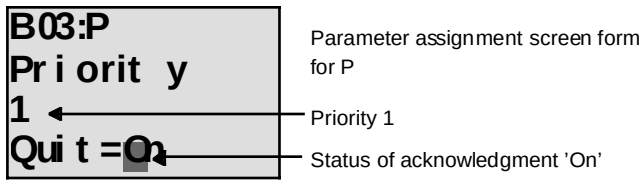
Parameter Assignment Screen Form

This is how to configure the priority and the acknowledgment:



1. Increase priority to 1: Cursor on "0" + ▲
2. Change to "Quit": Press the ▶ key
3. Enable "Quit": use ▲ or ▼

IDEC SmartRelay displays:



4. Confirm messages with OK

This is how to configure the message text



Using the ▸ key, select the row for the message text.

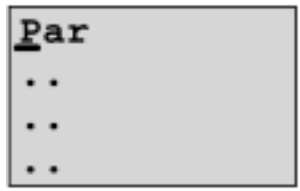
Confirm with OK to open the editing mode for this line.

Use the ▲ or ▼ keys to select the letter to be displayed. Move the cursor from one position to the other, using the ◂ or ▸ keys.

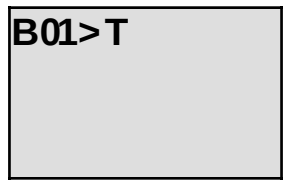
The list of available characters is the same as for the program name. You can find a list of the available characters in “3.6.4 Assigning a Program Name” on page 3-21.

Confirm the changes with OK. Exit the editing mode with ESC.

In order to output a parameter (e.g.: the display of a measurement or function value) as message text in a line, select this line with the ▸ key and then press the ▼ key:



Confirm with OK to open editing mode:



Use the ◂ or ▸ keys to select the blocks to be displayed and their corresponding parameters.

Use the ▲ or ▼ keys to select the block or the parameter you want to view.

Select the parameter with OK.

Exit parameter assignment mode with ESC. Your changes are applied.

4.4.22 Softkey

Description

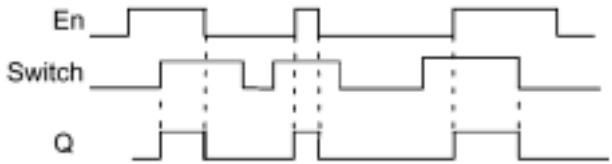
This logical function has the effect of a mechanical momentary switch or of a switch.

Symbol in IDEC SmartRelay	Wiring	Description
	Input En	On a 0 to 1 transition of the status at input En (Enable) the output Q is switched on, provided "Switch=On" was confirmed in parameter assignment mode.
	Parameter Par	Par gives you the option to use the function as momentary pushbutton in one cycle or to use it as switch. Ret: off = no retentivity on = the status can be saved retentive In RUN mode: Switch: switches the pushbutton or switch on or off.
	Output Q	Switches on if En=1 and if Switch=On was confirmed with OK.

Factory Default

The factory default setting of "Par" is "Pushbutton".

Timing Diagram



Function Description

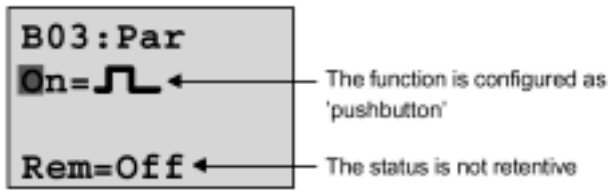
- The output is switched on after input En is set and, in parameter assignment mode, if "On" is selected in the parameter "Switch" "On" and confirmed with OK. The function can be configured as either a pushbutton or a switch.
- The output is reset to "0" at three events:

1. At the 0 to 1 transition of the status at input En.
2. When the function was configured as a pushbutton and one cycle has elapsed since it was switched on.
3. When the position "Off" was selected in the parameter "Switch" and confirmed with OK in parameter assignment mode.

Configuration of the Par Parameter

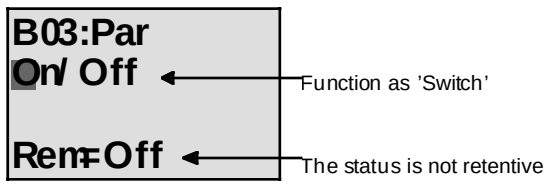
In programming mode:

1. Select the "Softkey" function.
2. Select input En and confirm with OK. The cursor is now positioned below "Par".
3. Change to the input mode of "Par": Confirm with OK
   (the cursor is now positioned to "On")

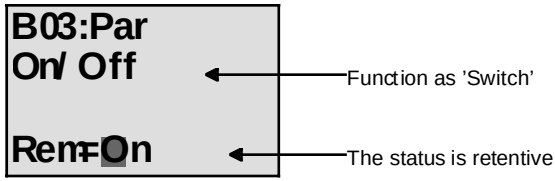


   This is how to change "Par" to "Switch" and activate retentivity (Ret=On):

4. Toggling between the "Pushbutton" and "Switch" function:
   use ▲ or ▼



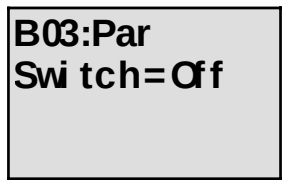
5. Change to retentivity: use ▲ or ▼
6. Enable retentivity: use ▲ or ▼



7. Confirm your entries with OK

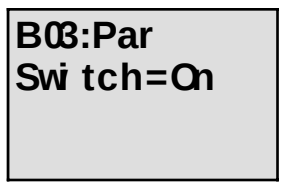
In Parameter Assignment Mode (RUN mode):

Here, you can switch the parameter "Switch" on and off (On/Off). In RUN mode IDEC SmartRelay displays:



Let us assume you want to activate "Switch" (On).

1. Change into editing mode: Confirm with OK
   (the cursor is now positioned to "Off")
2. Change from "Off" to "On": use ▲ or ▼
3. Confirm your entries with OK



5 Configuring IDEC SmartRelay

"Parameter assignment" is the configuration of block parameters. You can set delay times for time functions, switching times for the timer switches, the threshold value of a counter, the monitoring interval of an operating hours counter and the on and off thresholds of the triggers.

You can configure the parameters:

- In programming mode
- In parameter assignment mode

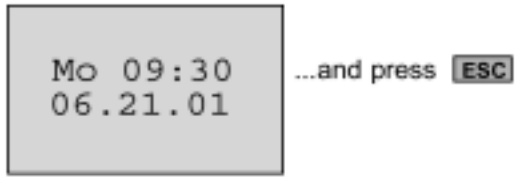
In parameter assignment mode, the programmer configures the parameters.

Parameter assignment mode allows editing of the parameters without having to change the program. As a result, a user can edit parameters without having to switch to programming mode. The advantage: The program (and thus the circuit) is protected but can still be modified to suit requirements.

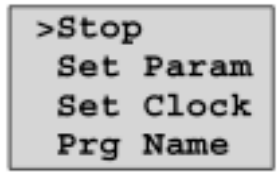
> Note
> *In parameter assignment mode, the IDEC SmartRelay continues processing of the program.*

5.1 Switching To Parameter Assignment Mode

In RUN mode, you can switch to parameter assignment mode by pressing the ESC key:



The IDEC SmartRelay switches to parameter assignment mode and displays Parameter assignment menu:

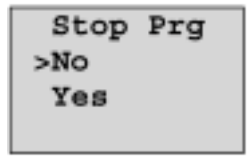


5.1.1 Menu Options in Parameter Assignment Mode

Stop

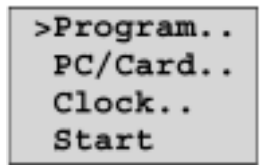
You are going to use this menu item to stop your program and, as a result, open the main menu in programming mode. Proceed as follows:

1. Move the ">" character to "Stop": use ▲ or ▼
2. Confirm the "Stop": OK



3. Move the ">" character to "Yes": use ▲ or ▼
4. Confirm "Yes": OK

IDEC SmartRelay returns to the main menu:



Set Param

The diverse parameters are described in the following Chapters “5.1.1 Menu Options in Parameter Assignment Mode” on page 5-3. to “5.1.3 Selecting the Parameters” on page 5-5.

Set Clock

The menu item "Set Clock" is only executed in a IDEC SmartRelay equipped with a clock (FL1B-*12RC*). In "Set Clock" you can set the internal clock of the IDEC SmartRelay. For more information, see “5.2 Setting the Time-of-Day and the Date (FL1B-*12RC*)” on page 5-9.

Prg Name

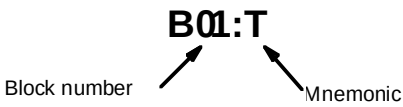
Under this menu item you can only read your program name. In parameter assignment mode it is not possible to change the program name.

5.1.2 Parameter

Parameters are:

- The delay times of a timer relay.
- The switching times (cams) of a timer switch.
- The threshold value of a counter.
- The monitoring time for an operating hours counter.
- The switching thresholds of a threshold switch.

Each one of the parameters is identified by its block number and mnemonics. Examples:

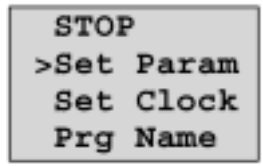


- T: ...is a configurable time.
- No 1: ...is the first cam of a timer switch.
- Par: ...denotes multiple counter parameters that can be monitored.

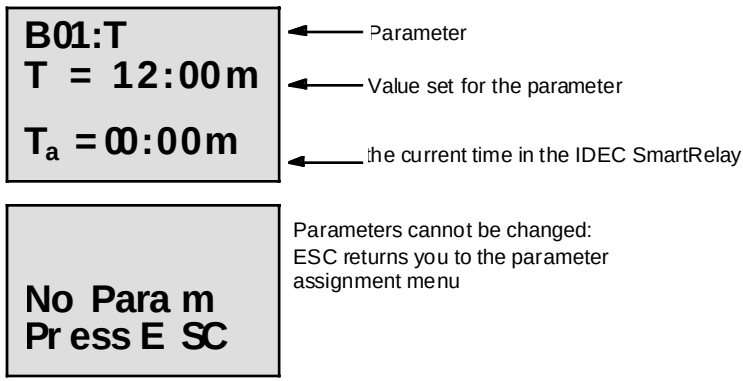
5.1.3 Selecting the Parameters

Select a parameter:

1. In the parameter assignment menu using "Set Param" option
   Use ▲ or ▼ key



2. Press OK
   IDEC SmartRelay displays the first parameter. If the parameters cannot be set, you can use ESC to return to the parameter assignment menu.



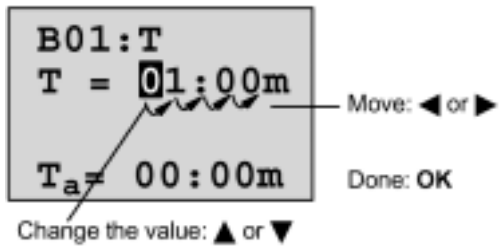
3. Now, Select the desired parameter:
   Use ▲ or ▼ key
   IDEC SmartRelay displays the parameter in separate windows.
4. If you want to edit a parameter, select it and press OK.

5.1.4 Changing the Parameters

To change a parameter, you first have to select it (see “5.1.3 Selecting the Parameters” on page 5-5).

You change the value of the parameter in the same way as you entered it in programming mode:

1. Move the cursor to the point at which you want to make the change: use ▲ or ▼
2. Change the value: use ▲ or ▼
3. Confirm the value: OK

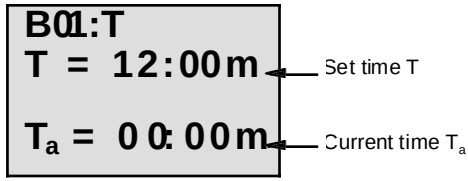


Note

In parameter assignment mode, you cannot change the unit of the delay time or the parameter protection for the parameter T. This is only possible in programming mode.

Current Value of Time T

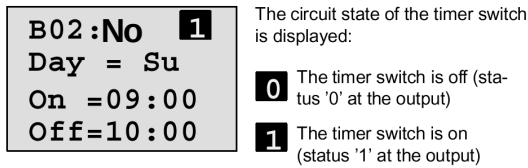
If you view a time T in parameter assignment mode, it will look like this:



You can change the set time T (see “5.1.4 Changing the Parameters” on page 5-6).

Current Value of the Seven-Day Timer Switch

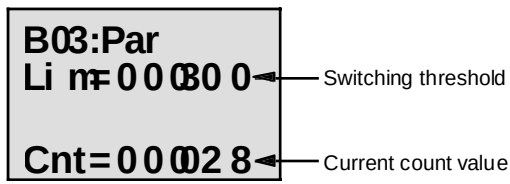
If you view a timer switch cam in parameter assignment mode, it looks like this:



IDEC SmartRelay displays the circuit state of the timer switch rather than the circuit state of a cam. The circuit state of the timer switch depends on all three cams (Cam 1, Cam 2 and Cam 3).

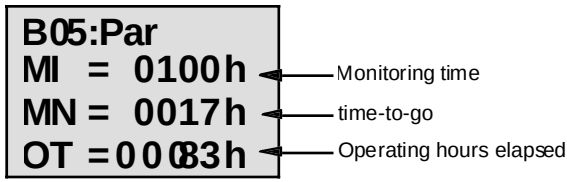
Current Value of a Counter

If you view the parameter of a counter in parameter assignment mode, it looks like this:



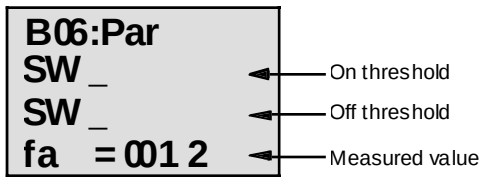
Current value of an Operating Hours Counter

If you view the parameter of an operating hours counter in parameter assignment mode, it looks like this:



Current value of a Analog Trigger

If you view the parameter of a threshold switch in parameter assignment mode, it looks like this:



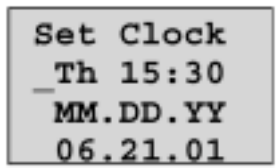
5.2 Setting the Time-of-Day and the Date (FL1B-*12RC*)

You can set the TOD and the date

- In parameter assignment mode
- In programming mode.

Set the TOD and Date in Parameter Assignment Mode

1. Open the parameter assignment mode (refer to Chapter 5.1 “Configuring IDEC SmartRelay” on page 5-1)
2. Select "Set Clock" (▲ or ▼ key) and press OK.



The cursor position precedes the day of the week.

3. Select the day of the week: use ▲ or ▼
4. Move the cursor to the next position:
   use ▲ or ▼
5. Change the value: use ▲ or ▼
6. Set the correct TOD. Repeat steps 4 and 5.
7. Set the correct date. Repeat steps 4 and 5
8. Confirm your entries: OK

Set the TOD and Date in Programming Mode:

1. Switch to programming mode: In RUN, execute the menu item "Stop".
2. Select "Clock.." (▲ or ▼) and press OK.
3. Select "Set Clock" (▲ or ▼) and press OK

Now you can set the day of the week and the time, as described in step 3 above.

6 IDEC SmartRelay Program Modules

In IDEC SmartRelay you can only have one program stored in memory at a time. If you want to modify the program or write another program without deleting the first one, you must archive it. You can use program modules/cards to do this.

You can copy the program stored in the IDEC SmartRelay to a program module/card. You can then insert the program module/card in another IDEC SmartRelay and transfer the program to this IDEC SmartRelay. You can use the program module/card to do the following:

- archive programs
- duplicate programs
- transport programs
- write and test programs out of the office and then transfer it to a IDEC SmartRelay in a switching cabinet

IDEC SmartRelay is supplied with a cover. You can order the program module/card separately.

Note

It is not necessary to have a module to store your IDEC SmartRelay program.

The IDEC SmartRelay program is automatically stored when programming mode is closed.

Below we shall introduce the two modules that you can purchase for your IDEC SmartRelay. Both of them can accommodate the entire program memory of a IDEC SmartRelay.

Module	Type No.
Yellow module: for copying	FL1A-PM1
Red module: with know-how/copy protection	FL1A-PM2

6.1 Overview of the Modules

Yellow Program Module

- Programs can be transferred from the yellow module to the device and vice versa.

Red Program Module

- A program is protected if it is transferred from a red module to the IDEC SmartRelay.
- Such a protected program can only run if the red module remains inserted in IDEC SmartRelay during runtime.
- A protected program cannot be edited.
- A program is not protected anymore when the correct password is entered.
- If you create a program for the red module and want to edit it at a later time you must assign it a password.

Compatibility

- FL1B devices:
  A module written in one of the basic models (FL1B devices) can be read in all other basic models.
- FL1B devices --> FL1A devices:
  A module written in one of the basic models (FL1B devices) can only be read in FL1B devices.

Upward Compatibility

- The new FL1B devices support upward compatibility.
- A module written in one of the standard models (FL1A devices) can be read in all basic models (FL1B devices).

Note

Upward compatibility: An adaptation of the program or an upgrade of the IDEC SmartRelay Basic is required in some cases in order to achieve appropriate results. For more information see "Fast inputs" in "2.3.2 Connecting IDEC SmartRelay Inputs" on page 2-13.

6.2 Removing and Inserting Modules

When removing a red module (know-how/copy protection), note that: The program stored on this module can only run if the module remains inserted during runtime.

If the module is removed the IDEC SmartRelay reports a "No program" error. Removal of the red module during runtime leads to impermissible operate states.

Always heed the following warning:



Warning

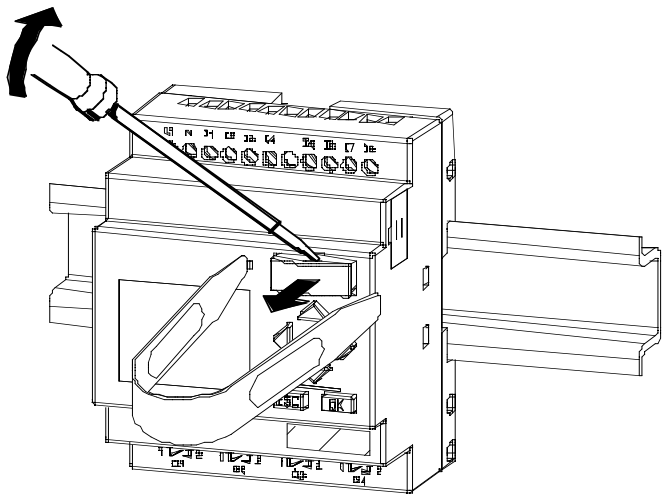
Do not put your finger or objects made of metal or any other conductive material in the open slot of the memory cartridge.

The socket for the memory cartridge may be live if L1 and N have been incorrectly wired.

The memory cartridge must always be replaced by a skilled technician.

Removing the Module

To remove the memory cartridge:



1. Carefully insert a screwdriver into the slot at the upper end of the memory cartridge, and ease it out of the slot a little.
2. Hold the memory cartridge at both sides using the memory cartridge removal tool (MT-101), and pull the memory cartridge straight out.

Note

When removing the memory cartridge, use the memory cartridge removal tool (MT-101), otherwise the connector may be damaged.

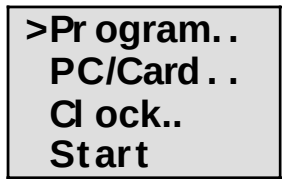
Inserting the Memory Cartridge

The slot for the memory cartridge is chamfered at the lower right edge. The memory cartridge also has a chamfered edge. This prevents you from inserting the memory cartridge the wrong way around. Insert the memory cartridge into the slot until it engages.

6.3 Copying from the IDEC SmartRelay to the Module

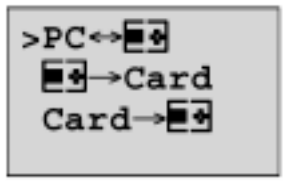
To copy a program to the program module/card:

1. Insert the program module/card into the slot.
2. Switch the IDEC SmartRelay to programming mode. In RUN mode: Press ESC and execute the menu item "Stop".



IDEC SmartRelay main menu

3. Move the ">" to "PC/Card": Press the ▼ key
4. Press OK. The transfer menu opens.

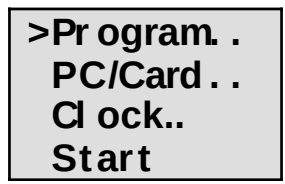


IDEC SmartRelay

5. Move the ">" to " IDEC SmartRelay → Card": Press the ▼ key
6. Press OK.

IDEC SmartRelay copies the program to the program module/card.

When IDEC SmartRelay has finished copying, it automatically returns to the main menu:



The program is now also stored on the program module/ card. You can now remove the program module/card: Do not forget to replace the cover.

If power is lost while IDEC SmartRelay is copying the program you must copy it again when power is restored.

Note

If the program in the IDEC SmartRelay is protected with a password, the copied program in the module/card is also protected with the same password.

6.4 Copying from the Module to IDEC SmartRelay

You have a program module/card containing your program. You can copy the program to IDEC SmartRelay in two ways:

- Automatic copying when IDEC SmartRelay starts up (POWER ON) or
- via the PC/Card menu in IDEC SmartRelay.

Note

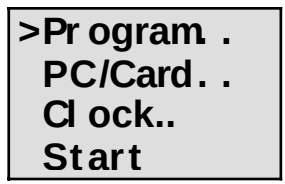
If the program in the module/Card is protected with the password X, the copied program in the IDEC SmartRelay is also protected with the same password.

Before you copy a module written in another device type, refer once again to the information on "Compatibility of IDEC SmartRelay models or devices" in "6.1 Overview of the Modules" on page 6-2.

Automatic Copying when IDEC SmartRelay Starts Up:

1. Switch off the power supply to the IDEC SmartRelay (POWER OFF)
2. Remove the slot cover.
3. Insert the program module/card into the appropriate slot.
4. Switch off the power supply to the IDEC SmartRelay.

IDEC SmartRelay copies the program from the program module/card to IDEC SmartRelay. When IDEC SmartRelay has finished copying, it displays the main menu:



Note

Before you switch the IDEC SmartRelay to RUN, you must ensure that the system you are controlling with IDEC SmartRelay does not represent a possible hazard.

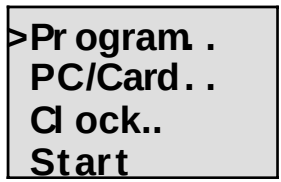
1. Move the ">" character to Start: use ▲ or ▼
2. Press OK.

Using the PC/Card Menu to Copy

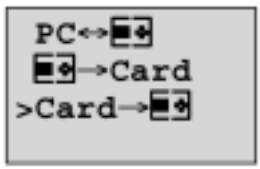
Read the note about changing the program module/card.

This is how you copy a program from the program module/card to IDEC SmartRelay:

1. Insert the program module/card
2. Switch the IDEC SmartRelay to programming mode. In RUN mode: Press ESC execute the menu item "Stop".



3. Move the ">" to "PC/Card": Press the ▼ key
4. Press OK. The transfer menu opens.
5. Move the ">" to "Card → IDEC SmartRelay": ▲ or ▼



= **IDEC SmartRelay**

6. Press OK.

IDEC SmartRelay copies the program from the program module/card to IDEC SmartRelay. When IDEC SmartRelay has finished copying, it automatically returns to the main menu.

7 IDEC SmartRelay Software

The WindLGC software is available as a programming package for the PC. This software includes the following features:

- Offline program generation for your application
- Simulation of your circuit (or program) on the computer
- Generation and printing of a block diagram
- Saving the program to the hard disk or other storage media
- Program transfer
  -from the IDEC SmartRelay to the PC
  -From the PC to IDEC SmartRelay
- Reading the operating hours counter
- Setting the TOD
- Daylight Savings Time (summertime/wintertime conversion)

The IDEC SmartRelay Alternative

WindLGC software offers you an alternative to conventional means of programming:

1. First you develop your applications at your desktop.
2. You simulate the application in your computer and test whether or not it functions properly before the circuit is actually put to use.
3. You print out the entire circuit in one or several block diagrams, sorted according to outputs.
4. You archive your circuits in your PC file system. In this way you can retrieve a circuit directly for future changes.
5. You transfer the program to IDEC SmartRelay at a touch with just a few key operations. Your IDEC SmartRelay is quickly retooled.

WindLGC

In WindLGC you can create your circuit programs easily and efficiently ("wiring per keyboard"). Programs are created on the PC desktop using the “drag & drop” function. Once you have created your program, you can have the system evaluate the program in order to determine the required IDEC SmartRelay model, or you can determine this before you start programming.

One particularly user-friendly feature is the offline program simulation function. This allows the simultaneous status display of multiple special functions and permits extensive documentation of the programs created. This optional programming software also offers a comprehensive Online Help on CD ROM.

WindLGC runs under Windows 95/98, Windows NT 4.0, Windows Me, Windows 2000. It is capable of server operation.

WindLGC V3.0

This is the current version of WindLGC. In Version 3.0 you will find all the function and functionality included in the new devices, exactly the way they are described in this manual.

Upgrades & Info

At *smart.idec.com*, you can download software upgrades and demo versions free of cost.

7.1 Connecting the IDEC SmartRelay to a PC

Connecting a PC Cable

To connect the IDEC SmartRelay to a PC you require the IDEC SmartRelay-to-PC link (order part number FL1A-PC1).

Remove the cover or the program module/Card of your IDEC SmartRelay and connect the cable. Connect the other end of the cable to the serial port of your PC.

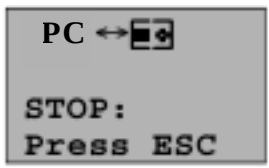
IDEC SmartRelay to PC - PC↔IDEC SmartRelay Mode

There are two ways of communication between the PC and the IDEC SmartRelay. IDEC SmartRelay to transfer mode in RUN state or automatically when the IDEC SmartRelay power supply is switched on, provided the link is plugged in.

To Switch the IDEC SmartRelay to the PC↔ IDEC SmartRelay mode:

1. Switch the IDEC SmartRelay to programming mode: In RUN mode, press ESC and execute the menu item "Stop".
2. Select "PC/Card": use ▲ or ▼
3. Confirm with OK
4. Select "PC↔ IDEC SmartRelay": use ▲ or ▼
5. Confirm with OK

IDEC SmartRelay is now in PC↔ IDEC SmartRelay and displays:



= IDEC SmartRelay

To Automatically Switch IDEC SmartRelay to PC↔ IDEC SmartRelay Mode:

1. Switch off the power supply to IDEC SmartRelay
2. Remove the cover or the program module/card and connect the cable.
3. Switch on power.

IDEC SmartRelay switches automatically to PC↔ IDEC SmartRelay mode.

The PC can now communicate with the IDEC SmartRelay.

Use the ESC key on the IDEC SmartRelay if you want to interrupt the PC communication.

Note

If the program you have created in WindLGC is password protected, the "PC→IDEC SmartRelay" function transfers the program and the password to the IDEC SmartRelay.The password prompt is switched on when the device exits the transfer mode.

The upload of a password protected program created in IDEC SmartRelay is only possible after the correct password is entered in WindLGC.

When disconnecting the PC cable from IDEC SmartRelay, pull the cable straight out so the connector will not be damaged.

8 Applications

We have provided a small collection of applications in this manual to give you an idea of the versatility of the IDEC SmartRelay. For these examples we have shown the circuit diagram of both the original solution and the IDEC SmartRelay solution.

You will find solutions for the following tasks:

- Staircase or corridor lighting system
- Automatic door
- Ventilation system
- Industrial gate
- Central controlling and monitoring of several industrial gates
- Luminous rows
- Rainwater pump
- Other applications

Note

The following IDEC SmartRelay applications are available to all our customers.They are examples only and are not binding in any way.They are included to provide general information on the types of applications that a re possible with an IDEC SmartRelay. Customer specific solutions may be different.

The user must ensure proper operation of the system.We refer to the standards and system related installation regulations of your respective country.

We reserve the right to make changes to these examples.

8.1 Staircase or Corridor Lighting

8.1.1 Staircase Lighting System Requirements

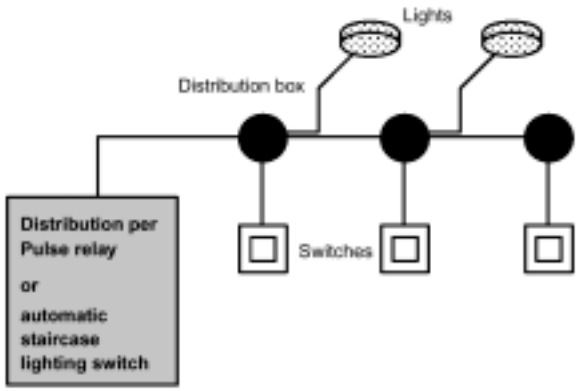
- When someone is using the staircase, the lighting should be on.
- If no one is in the staircase the lights should be off in order to save energy.

8.1.2 Original Solution

The two conventional options for switching on the lights:

- Pulse relay
- Automatic staircase time switch

The wiring for these two lighting systems is identical.



Components Used

- Switches
- Automatic staircase time switch or pulse relay

Lighting system with Current Impulse Relay

Function of a lighting system with current impulse relay:

- Activate any pushbutton: the lighting is switched on
- Activate any of the pushbuttons again: the lighting is switched off.

Disadvantage: Someone can forget to switch off the lights.

Lighting System with Automatic Staircase Time Switch

When an automatic staircase time switch is used, the lighting system behaves as follows:

- Actuate any pushbutton: The lighting is switched on
- On expiration of the preset time the lights switch off automatically.

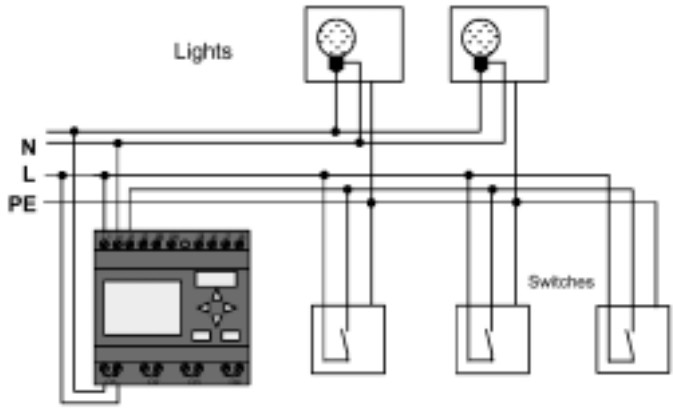
Disadvantage: The light cannot be switched on for a longer period of time (e.g. when cleaning the staircase). The switch for continuous lighting is usually installed on the automatic staircase time switch that may be difficult or impossible to access.

8.1.3 Lighting System with IDEC SmartRelay

With the IDEC SmartRelay you can replace the automatic staircase time switch or the current impulse relay. You can also implement both functions (timed off delay and current impulse relay) in a single unit. In addition, you can incorporate extra functions without making any modifications to the wiring. Here are some examples:

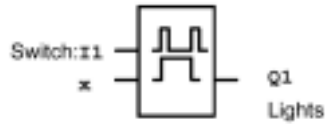
- Current impulse relay with IDEC SmartRelay
- Automatic staircase time switch with IDEC SmartRelay
- Dual-function switch with IDEC SmartRelay
  -Switch light on
  -Switch on continuous lighting
  -Switch light off

Wiring of the Lighting System with FL1B-H12RCC



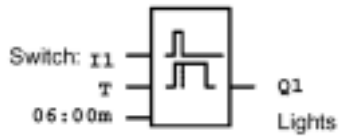
The external wiring of a lighting system with a IDEC SmartRelay is no different than it is for a conventional staircase and corridor lighting system. Only the automatic staircase time switch/ Current impulse relay is replaced. Supplementary functions are entered directly in IDEC SmartRelay.

Current Impulse Relay with IDEC SmartRelay



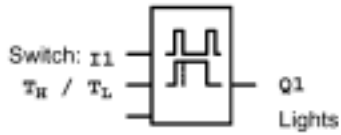
Output Q1 is toggled with a gate pulse at input I1.

Automatic Staircase Time Switch with IDEC SmartRelay



Output Q1 is switched on for the duration of 6 minutes with a gate pulse at input I1.

Dual-Function Switch with IDEC SmartRelay



Output Q1 is switched on for a specified time TH with a gate pulse at input I1.

The continuous lighting function is enabled by holding down the pushbutton for a specified time TL.

8.1.4 Special Features and Expansion Options

Other options for increasing comfort or saving energy are:

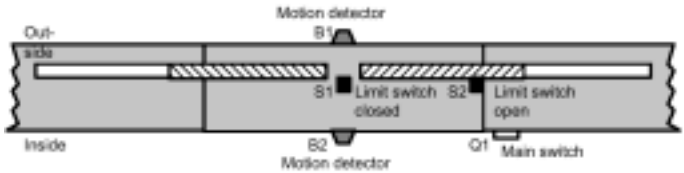
- A flashing function that indicates that the light is about to be switched off automatically.
- You can integrate various central functions:
  -Central off
  -Central on (panic button)
  -Control of all lamps or individual circuits via a daylight control switch
  -Control via integrated timer switch
  (e.g. continuous lighting only until 24.00 h; disabling at specific times)
  -Automatic off for the continuous lighting on expiration of a preset time (e.g. after 3 hours)

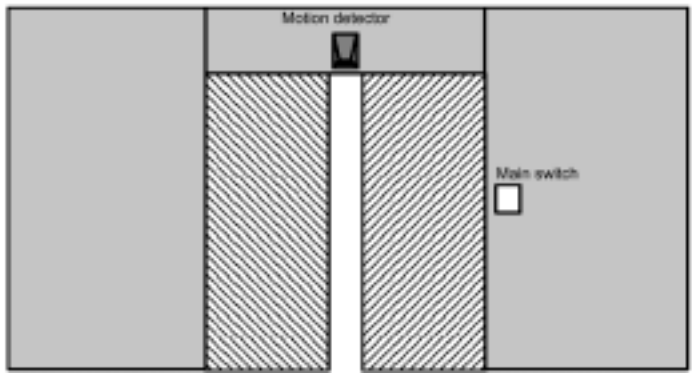
8.2 Automatic Door

You often find automatic door control systems at the entrance to supermarkets, public buildings, banks, hospitals etc.

8.2.1 Automatic Door Requirements

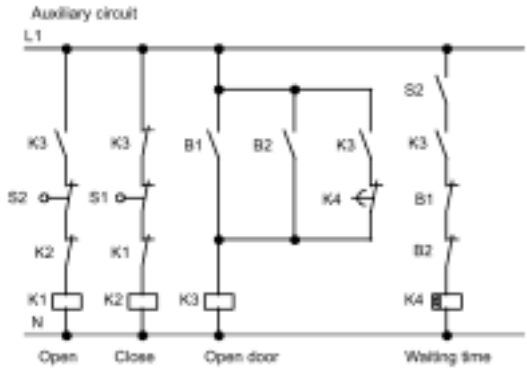
- When somebody approaches the door, it must open automatically.
- The door must remain open until the doorway is clear.
- When the doorway is clear, the door must close automatically within a short time.





The door is usually motor-driven and equipped with a slip coupling. This prevents people from being trapped and injured. The control system is connected to the mains via a master switch.

8.2.2 Original Solution



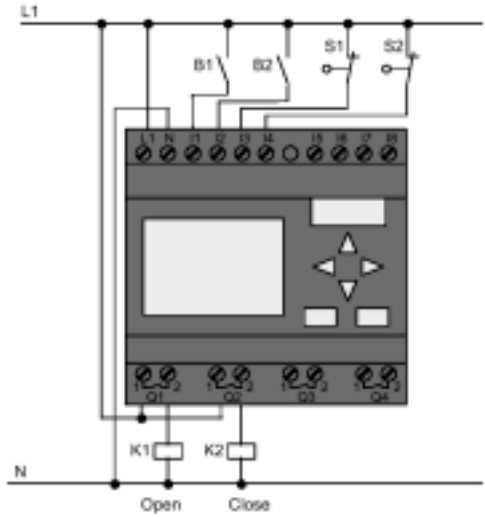
When someone enters the detection range of the motion sensors B1 or B2, the door is opened via K3.

After the detection range of the two motion sensors has been clear for a period, K4 enables the closing motion.

8.2.3 Door Control System with IDEC SmartRelay

With IDEC SmartRelay you can simplify this circuit considerably. Just connect the motion sensors, limit switches and power contactors to the IDEC SmartRelay.

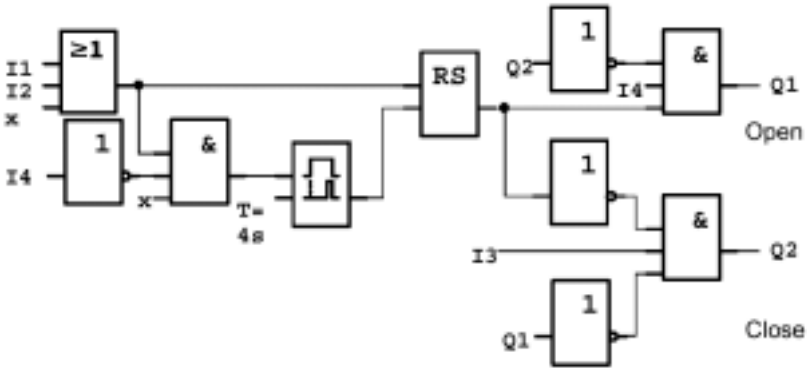
Wiring the door control system with FL1B-H12RCC



Components Used

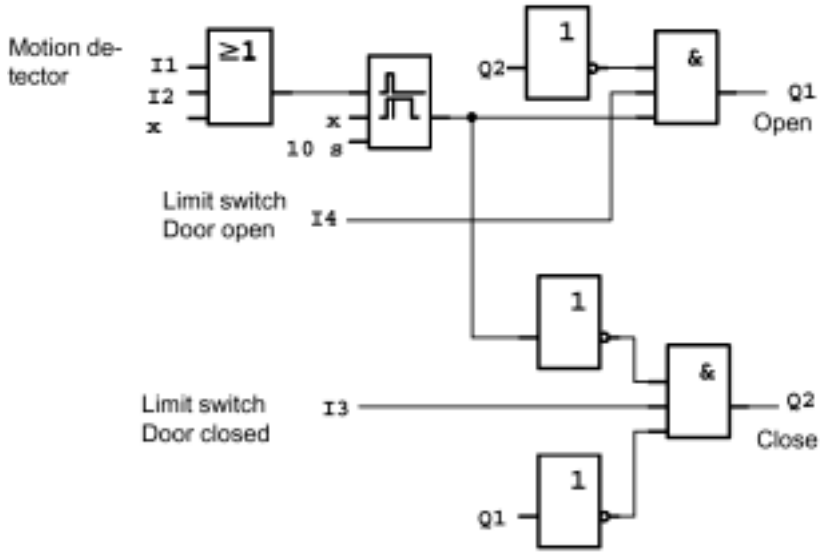
- K1 Main contactor Open
- K2 Main contactor Close
- S1 (n.c. contact) Limit switch Closed
- S2 (n.c. contact) Limit switch Open
- B1 (n.o. contact) Infrared motion detector outdoor
- B2 (n.o. contact) Infrared motion detector indoor

Block Diagram of Door Control System with IDEC SmartRelay



This is what the circuit diagram of the conventional solution looks like.

You can simplify this circuit if you make use of the IDEC SmartRelay functions. You can use the off delay to replace the latching relay and the on delay. The block diagram below illustrates this:



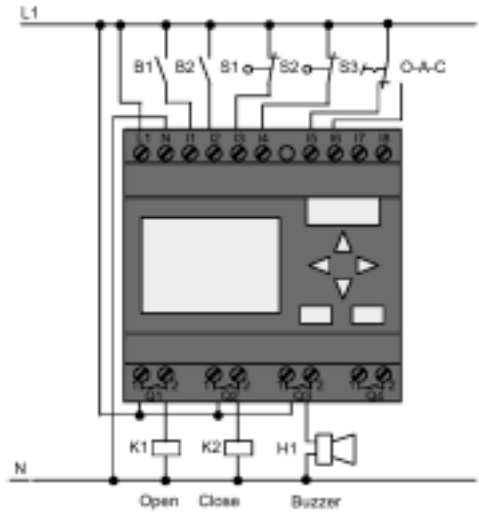
8.2.4 Special Features and Expansion Options

Options for increasing comfort and user friendliness are:

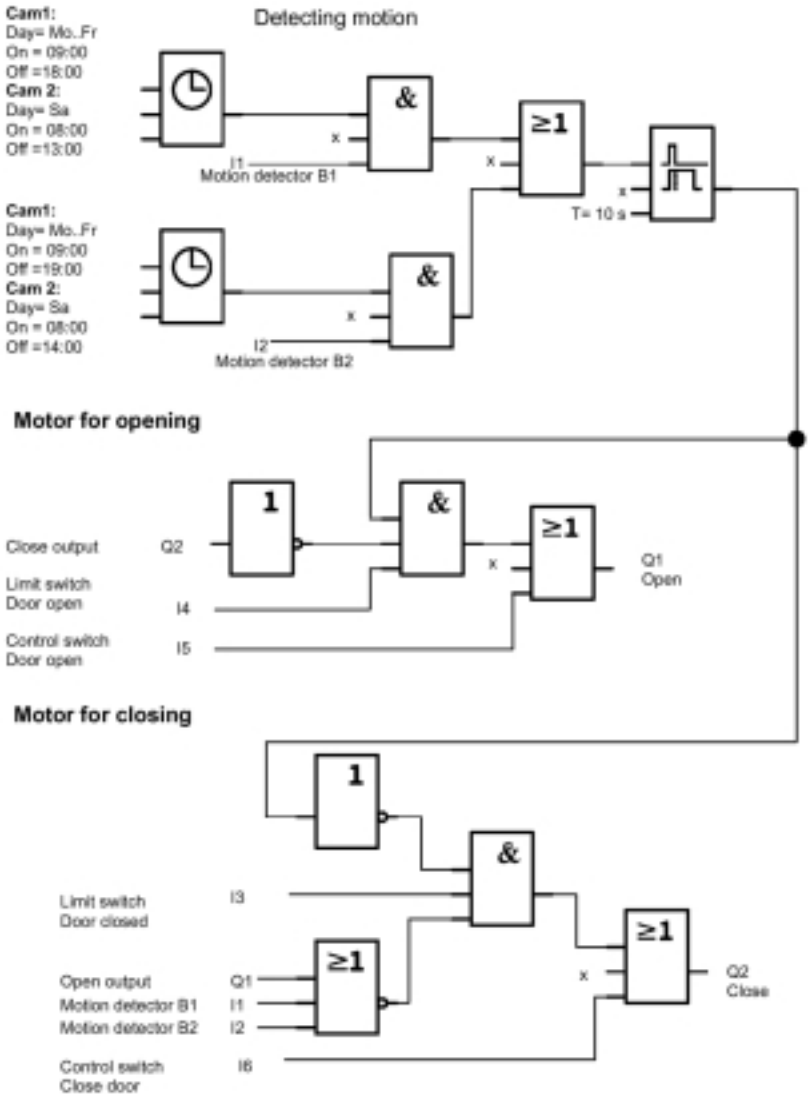
- You can connect an additional control switch with the positions: Open - Automatic - Closed (O-A-C)
- You can connect a buzzer to an output of the IDEC SmartRelay to warn of the door closing.
- You can implement time and direction dependent enable functions for opening of the door (e.g. opening only during business hours; after business hours to be opened only from inside), etc.

8.2.5 Enhanced Solutions with FL1B-H12RCC

Wiring the IDEC SmartRelay Expansion



Block Diagram of the Enhanced IDEC SmartRelay Solution



Detecting Motion

During business hours, the motion detector B1 initiates the opening of the door as soon as somebody wants to enter the shop from outside. Motion detector B2 initiates the opening of the door if somebody wants to leave the shop.

After closing time, the motion detector B2 continues to be used to open the door for 1 hour to allow the customers to leave the shop.

Motor for Opening

Output Q1 is switched on to open the door when the following occurs:

- The control switch at 15 is operated (the door is to be constantly open) or
- The motion detectors indicate that somebody is approaching the door and
- The door is not yet fully open (limit switch at I4).

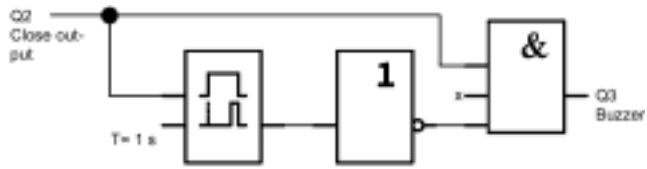
Motor for Closing

Output Q2 is switched on to close the door when the following occurs:

- The control switch at 16 is operated (the door is to be constantly closed) or
- The motion detectors indicate that there is nobody near the door and
- The door is not yet fully closed (limit switch at I3).

Buzzer

Connect the buzzer to output Q3. The buzzer sounds for a short time (in this case 1 second) when the door is closed. Enter the following circuit at Q3 in the block diagram:



8.3 Air Conditioning System

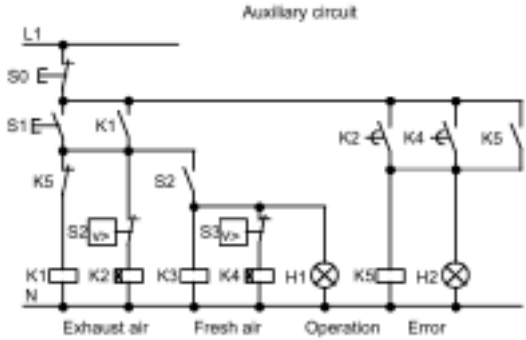
8.3.1 Air Conditioning System Requirements

The air-conditioning system is used to control the supply of fresh air to a room and to exhaust the contaminated air in the room. Let us examine the following example:



- The room is equipped with an exhaust fan and a fresh-air fan.
- Both fans are monitored by a flow sensor.
- The pressure in the room must not be allowed to rise above the atmospheric pressure.
- The fresh-air fan must only be switched on if reliable functioning of the exhaust fan is signaled by the flow sensor.
- A warning lamp indicates if one of the fans fails.

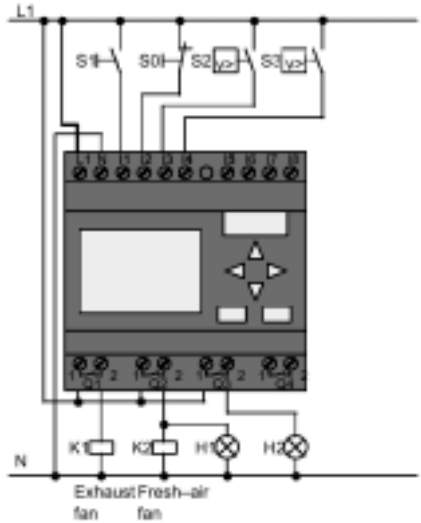
Circuit Diagram for Conventional Solution



The fans are monitored by flow sensors. If, after a short delay, no air flow is detected, the system is switched off and an error is reported. Acknowledge this by pressing the off pushbutton.

Fan monitoring requires an evaluation circuit with several switching devices in addition to the flow sensors. The evaluation circuit can be replaced by a single IDEC SmartRelay unit.

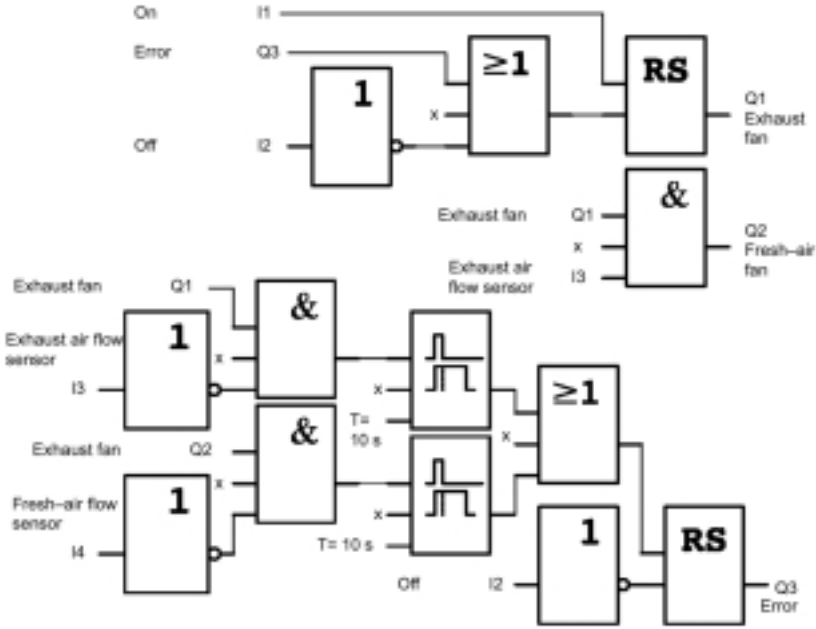
Wiring the Air Conditioning System With FL1B-H12RCC



Components Used

- K1 Main contactor
- K2 Main contactor
- S0 (n.c. contact) STOP pushbutton
- S1 (n.o. contact) Start pushbutton
- S2 (n.o. contact) Flow sensor
- S3 (n.o. contact) Flow sensor
- H1 Indicator lamp
- H2 Indicator lamp

Circuit Diagram of the IDEC SmartRelay Solution



8.3.2 Advantages of Using IDEC SmartRelay

When using the IDEC SmartRelay, you require less switchgear. That saves you installation time and space in the control cabinet. You might even be able to use a smaller control cabinet.

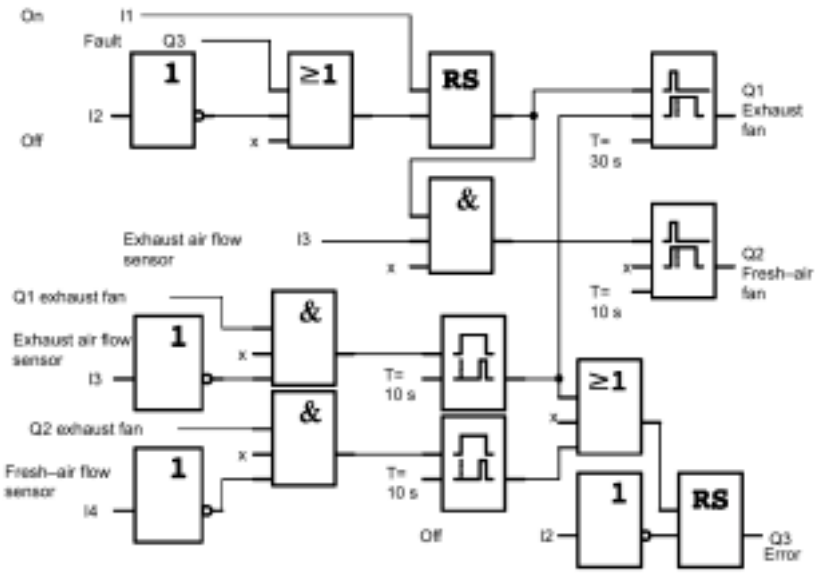
Additional Options When Using IDEC SmartRelay

- The free output (Q4) can be used for signaling a fault or a power failure.
- It is possible to switch off of the fans via a sequential circuit.

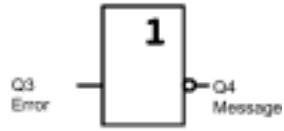
These functions can be incorporated without additional switchgear.

Block Diagram of the Enhanced IDEC SmartRelay Solution

The fans at Q1 and Q2 are switched on and off as shown in the following circuit:

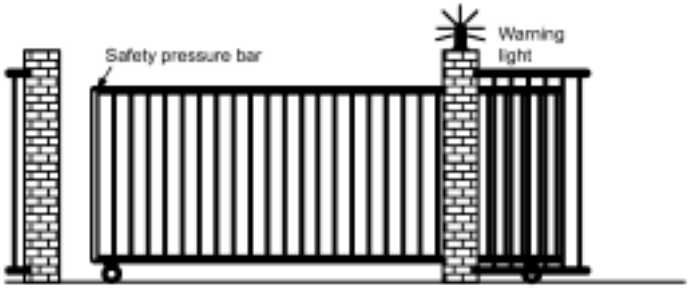


You can also generate a message at output Q4:



The relay contacts of output Q4 are always closed when the system is in operation. Relay Q4 does not drop unless there is a power failure or a fault in the system. This contact can also be used for remote messaging.

8.4 Industrial Gate



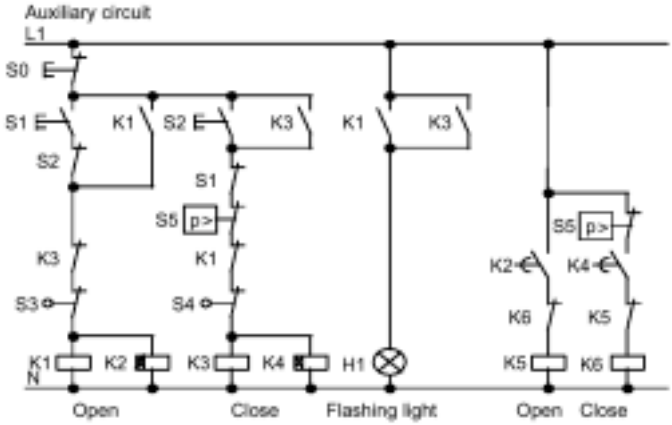
The entrance to a company's premises is often closed with a gate. The gate is only opened to let vehicles in and out. The gate is controlled by a gateman.

8.4.1 Gate Control System Requirements

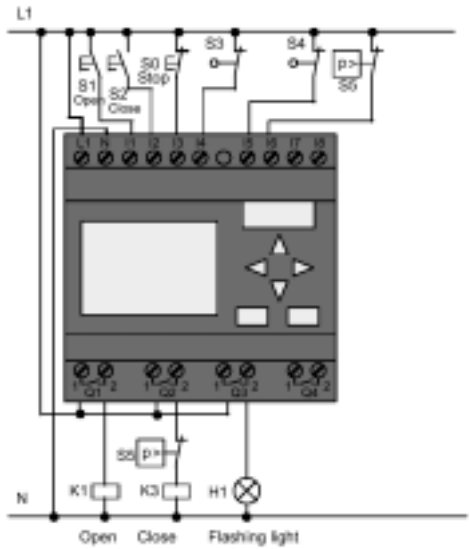
- The gate is opened and closed by operating a pushbutton in the gatehouse. The gateman can monitor the operation of the gate at the same time.
- The gate is normally fully opened or closed. However, the gate motion can be interrupted at any time.
- A flashing light is activated 5 seconds before the gate begins to move and continues for as long as the gate is in motion.
- A safety pressure bar prevents harm to persons and objects from being trapped or injured when the gate closes.

8.4.2 Original Solution

Various kinds of control systems are used to operate automatic gates. The gate control circuit diagram shows one option.



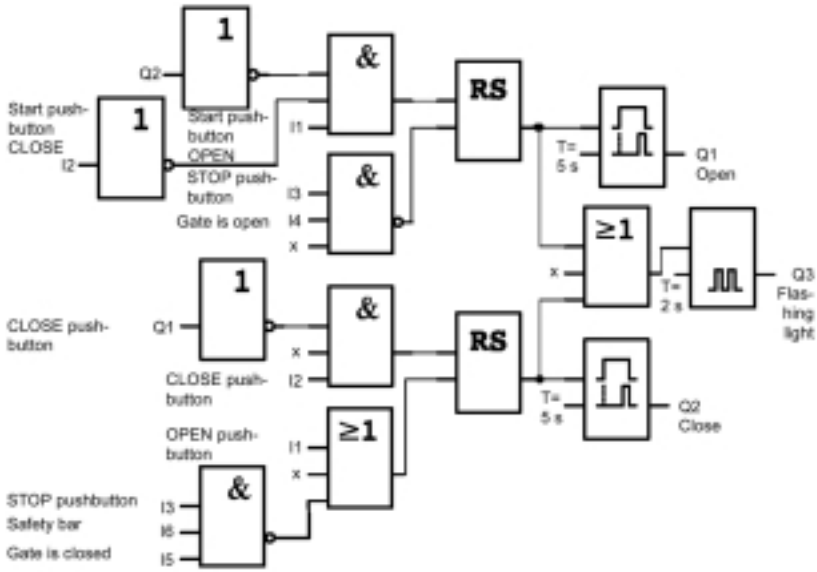
Wiring Gate Controls With FL1B-H12RCC



Components Used

- K1 Main contactor
- K2 Main contactor
- S0 (n.c. contact) STOP pushbutton
- S1 (n.o. contact) Open switch
- S2 (n.o. contact) CLOSE pushbutton
- S3 (n.c. contact) OPEN position switch
- S4 (n.c. contact) CLOSED position switch
- S5 (n.c. contact) Safety pressure bar

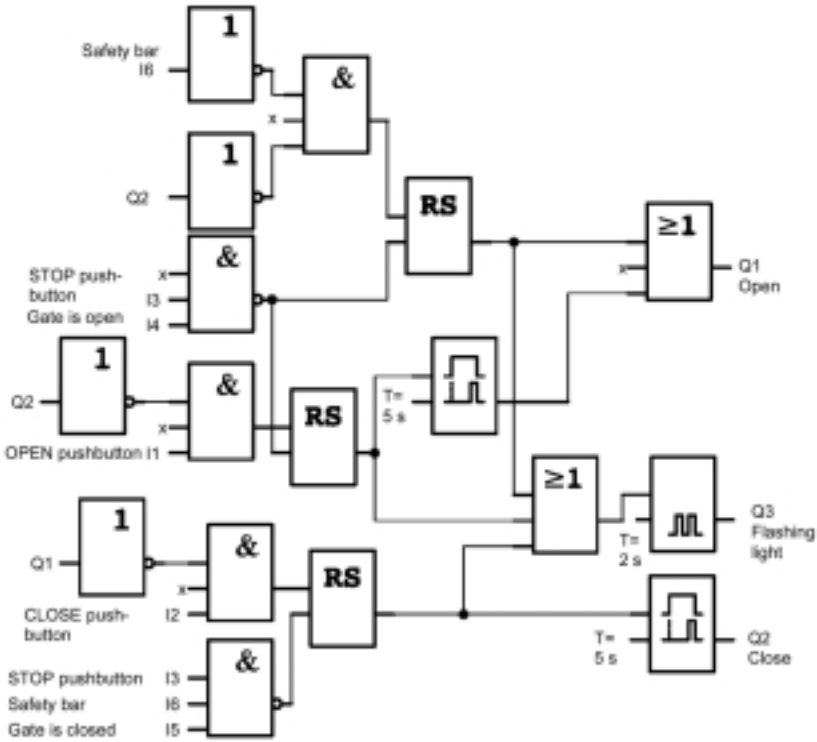
Block Diagram for the IDEC SmartRelay Solution



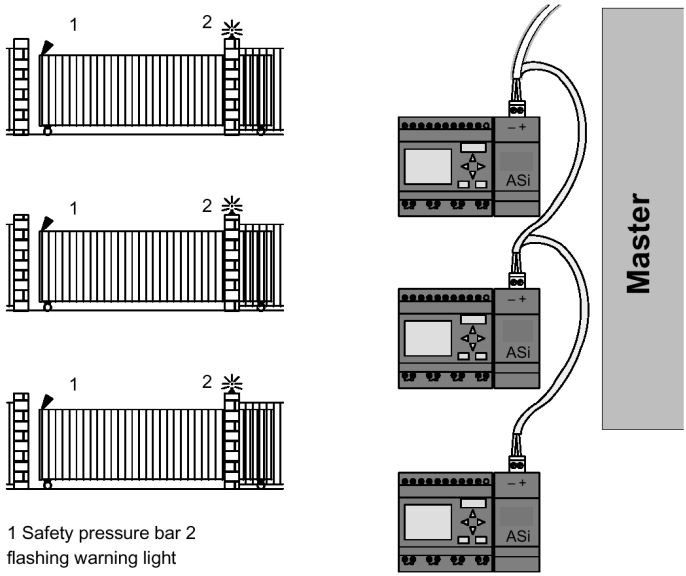
The OPEN or CLOSE start switches initiate the gate's motion in the appropriate direction provided it is not already moving in the other direction. The gate's motion is halted by the STOP pushbutton or the relevant limit switch. Closing of the gate is also interrupted by the safety bar.

8.4.3 Wiring the IDEC SmartRelay Solution

In this solution the gate will automatically open again when the safety bar is operated.



8.5 Centralized Control and Monitoring of Industrial Gates



1 Safety pressure bar 2 flashing warning light

Often, a company's premises can be entered at several locations. Not all of the gates can always be monitored by company personnel. They must therefore be able to be monitored and operated by the gateman who sits in a central gatehouse.

It must also be possible for an employee to open and close the gate locally.

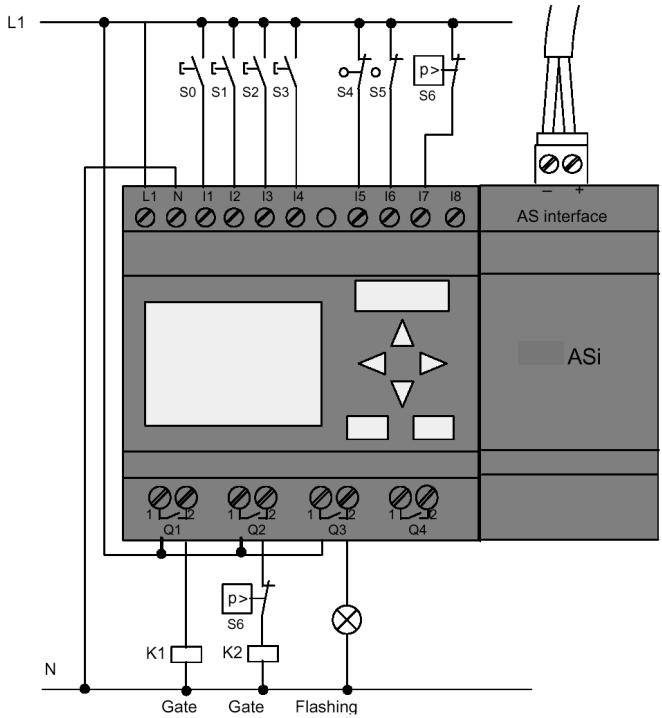
For every gate we implement one FL1B-H12RCC and one AS interface function module. The bus interconnects the modules and the master.

In this section, we will describe a gate control system. The structure of the other gate control systems is identical.

8.5.1 Gate Control System Requirements

- Every gate is opened and closed by means of a cord-operated switch. The gate is fully opened or closed by this switch.
- Every gate can also be opened and closed per local pushbutton.
- The gate can be opened and closed via the bus link to the gate-house. The GATE OPEN or GATE CLOSED status is indicated.
- A flashing light is activated 5 seconds before the gate begins to move and continues for as long as the gate is in motion.
- A safety pressure bar prevents harm to persons and objects from being trapped or injured when the gate closes.

Wiring the Gate Controls With FL1B-H12RCC and FL1B-CASC12



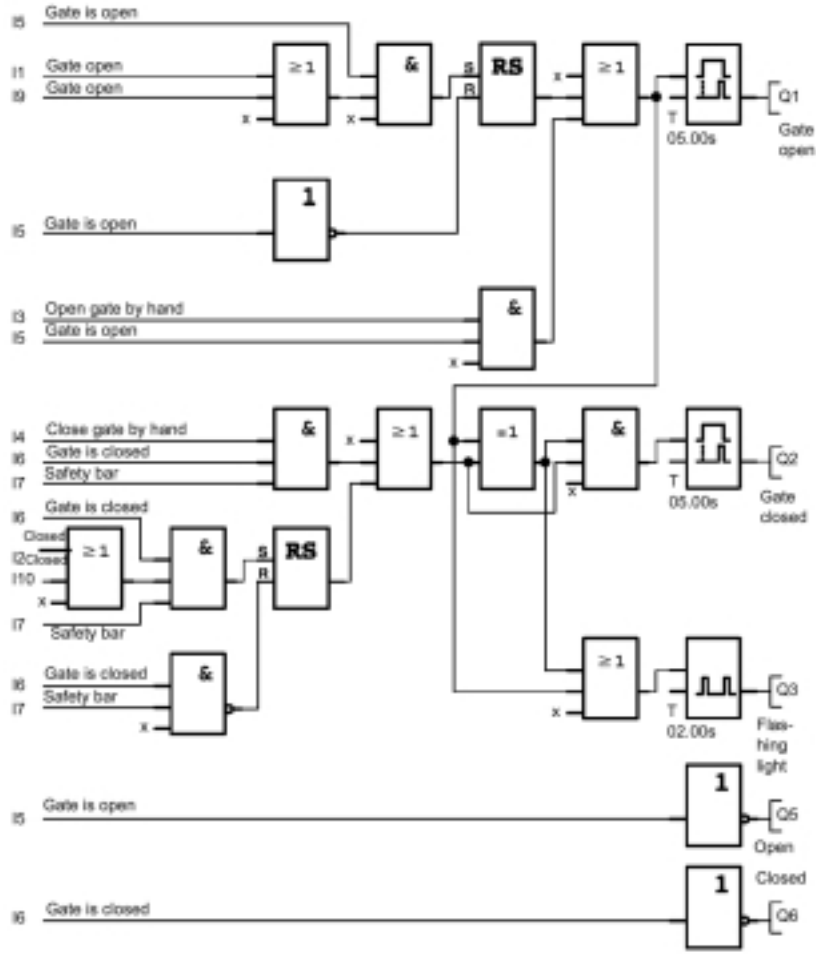
Components Used

- K1 Main contactor for opening
- K2 Main contactor for closing
- S0 (n.o. contact) Cord-operated switch OPEN
- S1 (n.o. contact) Cord-operated switch CLOSE
- S2 (n.o. contact) Open switch
- S3 (n.o. contact) CLOSE pushbutton
- S4 (n.c. contact) OPEN GATE position switch
- S5 (n.c. contact) CLOSE GATE position switch
- S6 (n.c. contact) Safety pressure bar

Higher Level Control System

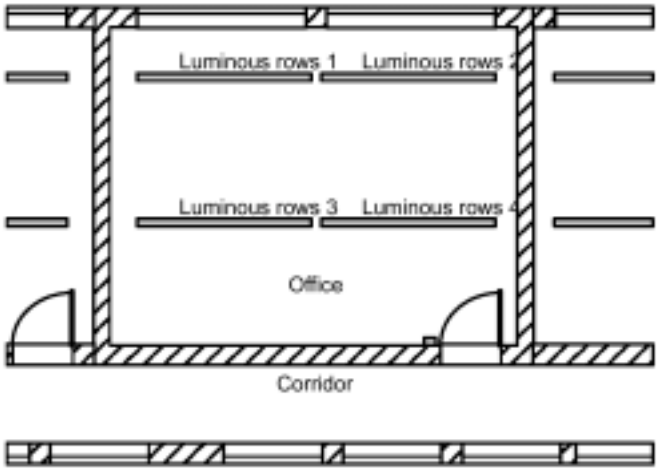
- Q5 OPEN GATE position switch
- Q6 CLOSE GATE position switch
- I9External OPEN GATE pushbutton
- I10External CLOSE GATE pushbutton

Block Diagram of the IDEC SmartRelay Solution



The OPEN GATE and CLOSE GATE start pushbuttons move the gate in the appropriate direction provided it is not already moving in the opposite direction. The gate motion ends at the respective limit switch. Closing of the gate is also interrupted by the safety bar.

8.6 Luminous Rows

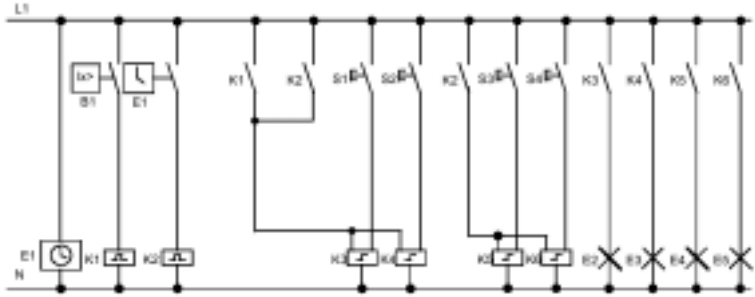


When planning lighting systems for commercial locations, the type and number of lamps used is determined by the lighting requirements. For reasons of cost, fluorescent tubes arranged in luminous rows are often used. They are divided into separate switching circuits, according to the way the room is used.

8.6.1 Lighting System Requirements

- These separate luminous rows are switched on and off locally.
- If there is sufficient daylight, the rows on the window side of the room are automatically switched off by a daylight control switch.
- The lights are switched off automatically at 20.00.
- It must be possible at all times to switch the lights on and off manually.

8.6.2 Original Solution



The lamps are switched on and off with a pulse relay that is controlled by pushbuttons at the door. Regardless of this, they are reset by the time switch or by the daylight control switch via the central off input. The length of the off commands must be reduced per wiping relays in order to make it possible to switch the lights on and off manually after they have been switched off.

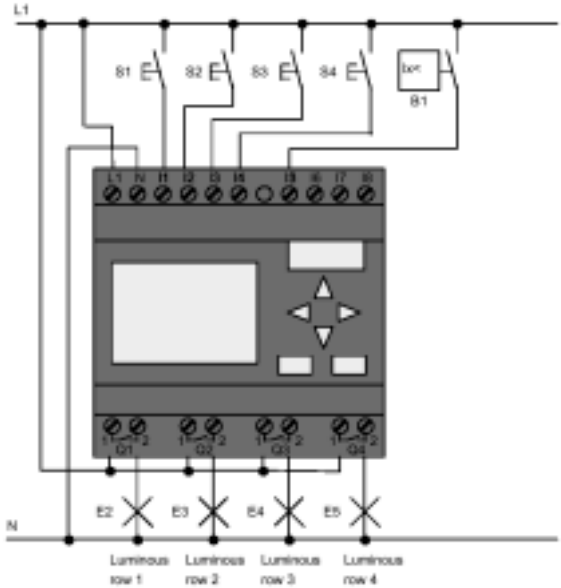
Components Required:

- Switches S1 to S4
- Daylight control switch B1
- Timer switch E1
- Wiping relays K1 and K2
- Pulse switches with central off K3 to K6

Disadvantages of the Original Solution

- A substantial amount of switchgear is required in order to implement these functions.
- Due to the high number of mechanical components, wear and tear, and maintenance expenditures will be high.
- Changing the function requires considerable effort.

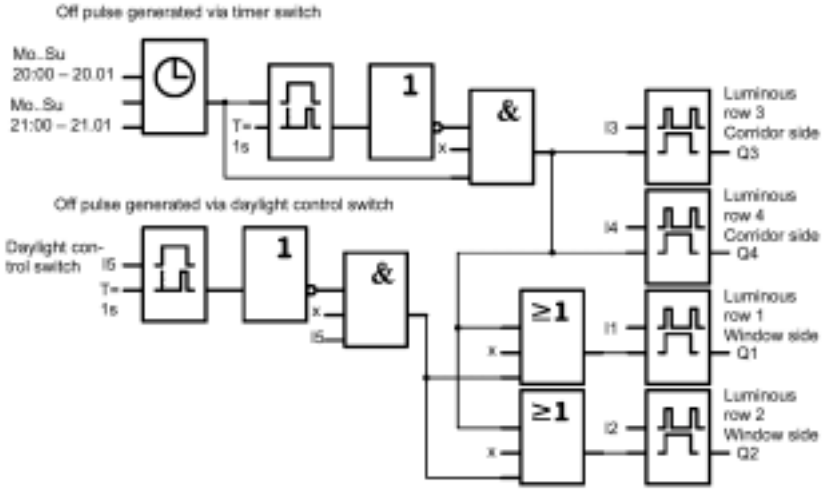
8.6.3 Luminous Row Control with FL1B-H12RCC



Components Used

- S1 to S4 (n.o. contact) Switches
- B1 (n.o. contact) Daylight control switch

Block Diagram of the IDEC SmartRelay Solution



Advantages of the IDEC SmartRelay Solution

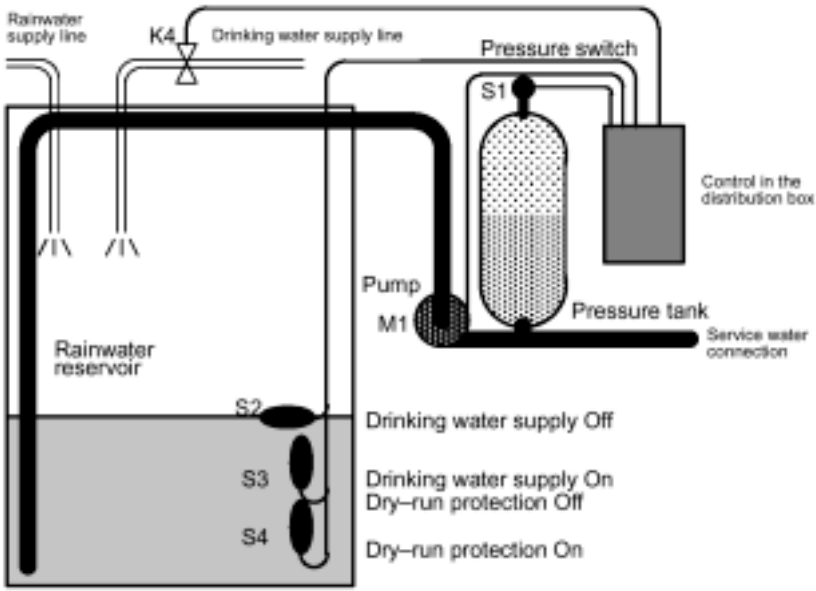
- You can connect the lamps directly to the IDEC SmartRelay, provided the power consumption of the individual outputs does not exceed its switching capacity. If higher loads must be switched you should use a power contactor.
- Connect the daylight control switch directly to an input of the IDEC SmartRelay.
- You do not need an external timer switch, because this function is integrated in the IDEC SmartRelay.
- Due to the reduced amount of switchgear, you can install a smaller and space-saving subsidiary distribution cabinet.
- Fewer devices are required.
- The lighting system can easily be modified.
- Additional switching times can be set as required (sequential circuit for the off pulses at the end of the day).
- The function of the daylight control switch can easily be applied to all lamps or a modified group of lamps.

8.7 Water Pump

The use of rainwater as an addition to the drinking water supply is gaining importance in the domestic housing market. This saves money and helps protect the environment. For example, rainwater can be used for:

- Washing clothes
- Irrigation for gardens
- Watering indoor plants
- Washing cars
- Flushing toilets

The sketch below illustrates how such a rainwater system is operated:

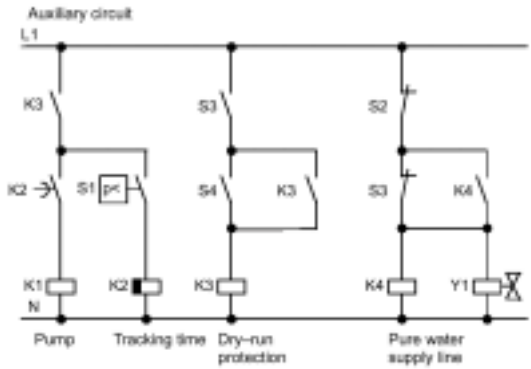


The rainwater is collected in a reservoir. From the reservoir a pumping station supplies a water line system. From there it can be tapped in the same way as normal drinking water. If the reservoir should run dry it can be backed up by the drinking water system.

8.7.1 Water Pump Control System Requirements

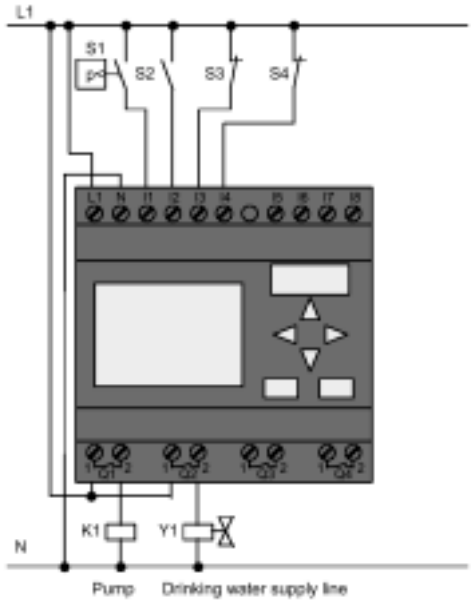
- The system must be capable of supplying water service at all times. In case of an emergency, the control system must automatically switch over to the drinking water supply.
- When switching over to the drinking water supply rainwater must not enter the main water system.
- The water service pump must not be switched on if rainwater is low in the reservoir.

8.7.2 Original Solution



The pump and a solenoid valve are controlled by means of a pressure switch and three float switches installed in the rainwater reservoir. The pump must be switched on when the pressure level in the cylinder drops below a set minimum. Once the operating pressure has been reached, the pump is switched off again after a few seconds. The tracking time prevents oscillation of the water pump if water is drawn over any length of time.

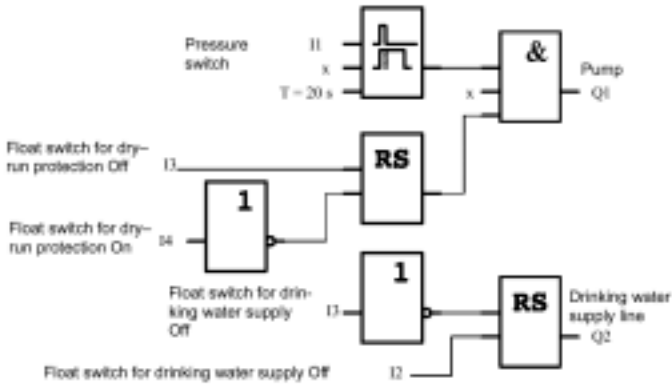
8.7.3 Water Pump with FL1B-H12RCC



Besides the IDEC SmartRelay, all you need is a pressure switch and the float switches to control the pump. If you are using a 3-phase AC motor, you must use a power contactor for switching the pump. For single-phase AC pump systems you must provide a contactor if the current consumption of the AC motor exceeds the capacity of the output relay Q1. The power of a solenoid valve is low enough to allow direct controlling.

- K1 Main contactor
- Y1 Solenoid valve
- S1 (n.o. contact) Pressure switch
- S2 (n.o. contact) Float switch
- S3 (n.c. contact) Float switch
- S4 (n.c. contact) Float switch

Circuit Diagram of the IDEC SmartRelay Solution



8.7.4 Special Features and Expansion Options

The circuit diagram shows how you can wire the pump controls and the solenoid valve. The layout corresponds to that of the circuit diagram. You also have the option to integrate further functions for specific applications that could otherwise only be accomplished with conventional technology and additional purchase of switchgear:

- Starting the pump at specific times
- Indication of possible water shortage
- Reporting of system faults

8.8 Additional Application Options

Possible applications:

- Irrigation system for greenhouse plants
- Controlling of conveyor systems
- Controlling of a bending machine
- Shop window lighting
- Bell system (e.g. in a school)
- Parking lot surveillance
- Outdoor lighting
- Control system for shutters
- Domestic outdoor and indoor lighting
- Control system for a cream mixer
- Sports hall lighting
- Constant load on 3 consumers
- Sequential control system for cable-welding machines for large cross-sections
- Step switch (e.g. for fans)
- Sequential control for a boiler
- Control system for several pump sets with centralized operation
- Cutting device (e.g. for detonating fuses)
- Monitoring periods of utilization, e.g. of a solar energy system
- Intelligent foot switches, e.g. for speed preselection)
- Controlling an elevated platform
- Textile printing; controlling the heating and conveyor belts
- Silo-filling system

On the Web you can also find descriptions and the corresponding circuit diagrams for the applications. You can view these PDF files using Adobe Acrobat Reader. If you have installed the WindLGC programming software on your PC, you can simply download the relevant circuit diagrams, adapt them to your requirements, and transfer them into IDEC SmartRelay using the PC cable.

Advantages of Using IDEC SmartRelay

The use of IDEC SmartRelay is highly beneficial, especially in the following situations:

- replace multiple auxiliary switchgear with integrated functions
- reduce wiring and installation labor and costs
  -IDEC SmartRelay does the wiring "internally"
- reduce component space in the control cabinet/distribution box
  - you might even be able to reduce the size of your control cabinet/ distribution box
- modify functions after installation without having to install additional switchgear or change wiring
- offer customers additional functions for domestic and commercial housing installations. Examples:
  -domestic security systems: use IDEC SmartRelay to switch a lamp on regularly or open and close your shutters while you are on vacation.
  -central heating: use IDEC SmartRelay to run a circulation pump only when you actually require water or heating
  -refrigeration systems: use IDEC SmartRelay to defrost your refrigerator system at regular intervals; reducing energy costs.
  -you can illuminate aquariums (and terrariums) on a time-dependent basis.

In addition, you can:

- Use commonly available switches and pushbuttons, which makes it easy to install a domestic system.
- Wire IDEC SmartRelay directly to your house’s electrical system; the integrated power supply makes it possible.

Appendix

A. Technical Specifications

A.1 General Technical Specifications

Item	Complies with	Specification
IDEC SmartRelay Basic:		
Dimensions (WxHxD)		72 x 90 x 55 mm
Weight		Approx. 190 g
Installation		on a 35 mm profile rail 4 module widths or wall mounting
IDEC SmartRelay Expansion module:		
Dimensions (WxHxD)		36 x 90 x 55 mm
Weight		Approx. 90 g
Installation		on a 35 mm profile rail 4 module widths or wall mounting
Climatic Environmental Conditions		
Ambient temperature		
Horizontal installation	Cold: IEC 60068-2-1 Heat: IEC 60068-2-2*	0 ... 55°C 0 ... 45°C (FL1B-M08B2R2, FL1B-M08C2R2)
Vertical installation		0 ... 55°C 0 ... 45°C (FL1B-M08B2R2, FL1B-M08C2R2)
Storage/transport		-40°C ... +70°C
Relative humidity	IEC 60068-2-30	From 10 to 85% no condensation
Air pressure		795 ... 1080 hPa
Pollutants	IEC 60068-2-42 IEC 60068-2-43	SO2 10 cm3 /m3, 4 days H2S 1 cm3 /m3, 4 days
Mechanical Environmental Conditions		
Type of protection		IP20
Vibrations:	IEC 60068-2-6	5 ... 9 Hz (constant amplitude 3.5 mm) 9 ... 150 Hz (constant acceleration 1 g)
Shock	IEC 60068-2-27	18 shocks (Half-sine wave 15g/11 ms)
Drop	IEC 60068-2-31	Drop height 50 mm
Free fall (packaged)	IEC 60068-2-32	1 m

Item	Complies with	Specification
Electromagnetic compatibility (EMC)		
Electrostatic discharge	IEC 1000-4-2 Severity 3	8 kV air discharge 6 kV contact discharge
Electromagnetic fields	IEC 1000-4-3	Field strength 10 V/m
Interference suppression	EN 55011	Limit class B group 1 Limit class for ASi operation
EMC interference emission	EN 50081-2	
Interference immunity	EN 50082-2	
Burst pulses	IEC 1000-4-4 Severity 3	2 kV (supply and signal lines)
Energy carriers Single pulse (surge) (applies only to FL1B-H12RCC, FL1B-B12RCC)	IEC 1000-4-5 Severity 3	1 kV (power lines) symmetrical 2 kV (power lines) asymmetrical
Information on IEC - / VDE - Safety		
Measurement of clearance and creepage distance	IEC 60664, IEC 61131-2, EN 50178 Draft. 11/ 94 UL 508, CSA C22.2 No. 142 With FL1B-H12RCC, FL1B-B12RCC also VDE 0631	Fulfilled
Insulation strength	IEC 61131-2	Fulfilled

*IEC 60068 includes VDE 0631

A.2 Technical Specifications: FL1B-H12RCC, FL1B-B12RCC & FL1B-M08C2R2

	FL1B-H12RCC FL1B-B12RCC	FL1B-M08C2R2
Power Supply		
Input voltage	100/240 V AC/DC	100/240 V AC/DC
Permissible range	85 ... 253 V AC 100 ... 253 V DC	85 ... 253 V AC 100 ... 253 V DC
Permissible mains frequency	47 ... 63 Hz	47 ... 63 Hz
Power Consumption		
100 V AC	10 ... 30 mA	10 ... 30 mA
240 V AC	10 ... 20 mA	10 ... 20 mA
100 VDC	5 ... 15 mA	5 ... 15 mA
240 V DC	5 ... 10 mA	5 ... 10 mA
Voltage Failure Buffering		
100 V AC/DC	typ. 10 ms	typ. 10 ms
240 V AC/DC	typ. 20 ms	typ. 20 ms
Power Loss at		
100 V AC	1.1 ... 3.5 W	1.1 ... 3.5 W
240 V AC	2.4 ... 4.8 W	2.4 ... 4.8 W
100V DC	0.5 ... 1.8 W	0.5 ... 1.8 W
240 V DC	1.2 ... 2.4 W	1.2 ... 2.4 W
Buffering the clock at 25 °C	typ. 80h	
Accuracy of the real-time clock	max. ±5 s / Tag	
Digital Inputs		
Number	8	4
Electrical isolation	No	No
Input voltage L1		
Signal 0	< 40 V AC	< 40 V AC
Signal 1	> 79 V AC	> 79 V AC
Signal 0	< 30 V DC	< 30 V DC
Signal 1	> 79 V DC	> 79 V DC
Input current at		
Signal 0	< 0.03 mA	< 0.03 mA
Signal 1	> 0.08 mA	> 0.08 mA

	FL1B-H12RCC FL1B-B12RCC	FL1B-M08C2R2
Delay time at		
0 to 1	typ. 50 ms	typ. 50 ms
1 to 0	typ. 50 ms	typ. 50 ms
Line length (unshielded)	100 m	100 m
Digital Outputs		
Number	4	4
Output type	Relay outputs	Relay outputs
Electrical isolation	Yes	Yes
In groups of	1	1
Activation of digital input	Yes	Yes
Continuous current Ith	max. 10 A per relay	max. 5 A per relay
Incandescent lamp load (25,000 switching cycles) at		
230/240 V	1000 W	1000 W
115/120 V	500 W	500 W
Fluorescent tubes with choke (25,000 switching cycles)	10 x 58 W (at 230/240 V AC)	10 x 58 W (at 230/240 V AC)
Fluorescent tubes, conventionally compensated (25,000 switching cycles)	1 x 58 W (at 230/240 V AC)	1 x 58 W (at 230/240 V AC)
Fluorescent tubes, uncompensated (25,000 switching cycles)	10 x 58 W (at 230/240 V AC)	10 x 58 W (at 230/240 V AC)
Short circuit-proof cos 1	Power protection B16 600A	Power protection B16 600A
Short-circuit proof cos 0.5 to 0.7	Power protection B16 900A	Power protection B16 900A
Derating	none; across the total temperature range	none; across the total temperature range
Parallel switching of outputs to increase power	Not permitted	Not permitted
Protection of output relay (if desired)	max. 16 A, characteristic B16	max. 16 A, characteristic B1
Switching Rate		
Mechanical	10 Hz	10 Hz
Ohmic load/lamp load	2 Hz	2 Hz
Inductive load	0.5 Hz	0.5 Hz

A.3 Technical Specifications: FL1B-H12RCA, FL1B-B12RCA, FL1B-H12SND & FL1B-M08B1S2

	FL1B-M08B1S2 FL1B-H12SND	FL1B-H12RCA (AC) FL1B-B12RCA (AC)
Power Supply		
Input voltage	24 V DC	24 V AC
Permissible range	20.4 ... 28.8 V DC	20.4 ... 26.4 V AC
Reverse polarity protection	Yes	
Permissible mains frequency		47 ... 63 Hz
Power consumption from 24 V DC	FL1B-H12SND 10 ... 25 mA	120 ... 20 mA
	FL1B-M08B1S2 30 ... 45 mA	
	0.3 A per output	
Voltage failure buffering		typ. 5 ms
Power loss at 24 V	FL1B-H12SND 0,2 ... 0,6 W	0.5 ... 2.9 W (AC)
	FL1B-M08B1S2 0.8 ... 1.1 W	
Buffering the clock at 25°C		typ. 80h
Accuracy of the real-time clock		max. ±5 s / Tag
Digital Inputs		
Number	FL1B-H12SND: 8 FL1B-M08B1S2: 4	8
Electrical isolation	No	No
Input voltage	L+	L
Signal 0	< 5 V DC	< 5 V DC
Signal 1	> 8 V DC	> 12 V AC
Input current at		
Signal 0	< 1.0 mA (I1...I6) < 0.05 mA (I7, I8)	< 1.0 mA
Signal 1	> 1.5 mA (I1... I6) > 0.1 mA (I7, I8)	> 2.5 mA
Delay time at		
0 to 1	typ. 1.5 ms (I1...I4) <1.0 ms (I5, I6) typ. 300 ms (I7,I8)	typ. 15 ms
1 to 0	typ. 1.5 ms (I1...I4) <1.0 ms (I5, I6) typ. 300 ms (I7,I8)	typ. 1.5 ms
Line length (unshielded)	100 m	100 m

	FL1B-M08B1S2 FL1B-H12SND	FL1B-H12RCA (AC) FL1B-B12RCA (AC)
Analog Inputs		
Number	only FL1B-H12SND: 2 (I7 and I8)	
Range	0 ... 10 V DC	
max. Input voltage	28,8 V DC	
Digital Outputs		
Number	4	4
Output type	Transistor, current-sourcing	Relay outputs
Electrical isolation	No	Yes
In groups of		1
Activation of digital input	Yes	Yes
Output voltage	≙ Supply voltage	
Output current	max. 0.3 A	
Continuous current I_{th}		max. 10 A
Incandescent lamp load (25,000 switching cycles) at		1000 W
Fluorescent tubes with choke (25,000 switching cycles)		10 x 58 W
Fluorescent tubes, conventionally compensated (25,000 switching cycles)		1 x 58 W
Fluorescent tubes, uncompensated (25,000 switching cycles)		10 x 58 W
Short circuit-proof and overload-proof	Yes	
Short-circuit current limitation	Approx. 1 A	
Derating	none; across the total temperature range	none; across the total temperature range
Short circuit-proof cos 1		Power protection B16 600A
Short-circuit proof cos 0.5 to 0.7		Power protection B16 900A
Parallel switching of outputs to increase power	Not permitted	Not permitted
Protection of output relay (if desired)		max. 16 A, characteristic B16
Switching Rate		
Mechanical		10 Hz
Electrical	10 Hz	
Ohmic load/lamp load	10 Hz	2 Hz
Inductive load	0.5 Hz	0.5 Hz

A.5 Technical Specifications: FL1B-J2B2

	FL1B-J2B2
Power Supply	
Input voltage	12/24 V DC
Permissible range	10.8 ... 15.6 V DC 20.4 ... 28.8 V DC
Power consumption	25 ... 50 mA
Voltage failure buffering	typ. 5 ms
Power loss at	
0.3 ... 0.6 W	12 V
0.6 ... 1.2 W	24 V
Electrical isolation	No
Reverse polarity protection	Yes
Ground terminal	for connecting ground and shielding of the analog measuring line.
Analog Inputs	
Number	2
Type	Unipolar
Input range	0-10 V or 0-20 mA
Resolution	10 bit, standardized to 0-1000
Cycle time for analog value generation	50 ms
Electrical isolation	No
Line length (shielded and twisted)	10m
Encoder supply voltage	none
Error limit	+/- 1.5 %
Interference frequency suppression	55 Hz

Switching Capacity and Service Life of the Relay Outputs

Ohmic load

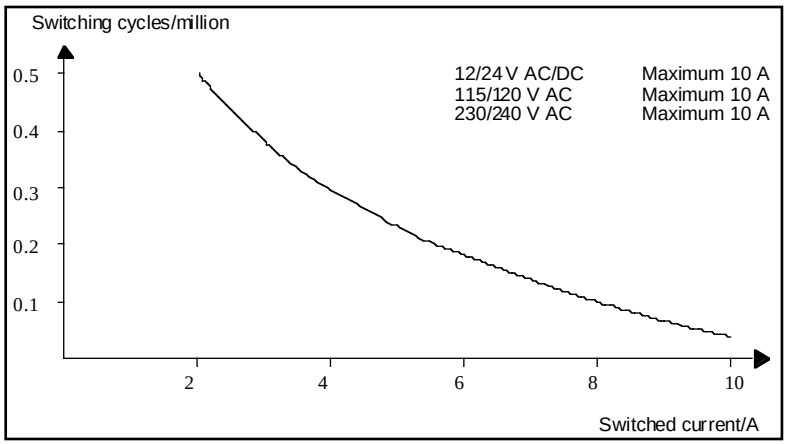


Figure A Switching capacity and service life of the contacts at ohmic load (heating)

Inductive load

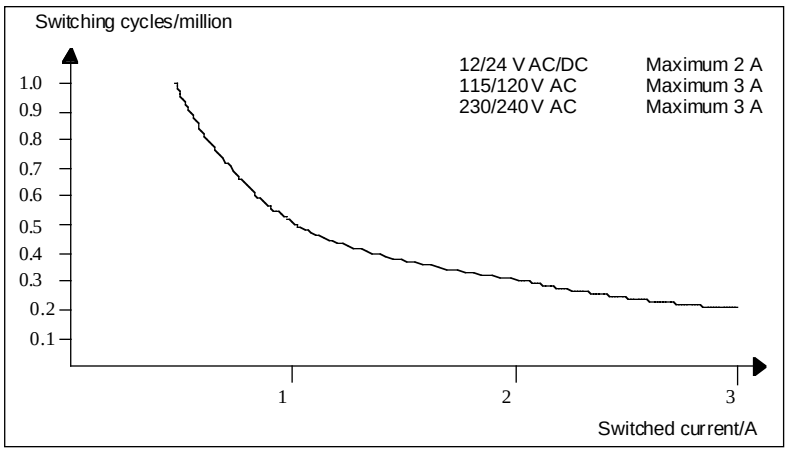


Figure B Switching capacity and service life of the contacts at highly inductive load to IEC 947-5-1 DC 13/AC 15 (contactors, solenoid coils, motors)

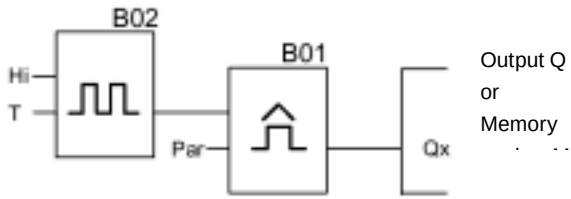
B. Determining the Cycle Time

The program cycle is the complete execution of the program, that is, primarily the reading in of the inputs, the processing of the program and the subsequent reading out of the outputs. The cycle time is the time required to execute a complete program once.

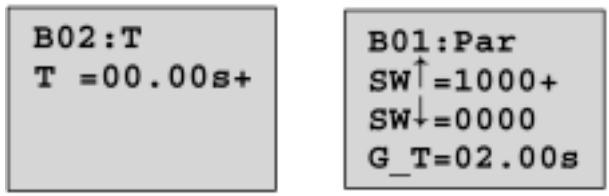
The time required for a program cycle can be determined using a short test program. This test program is generated in IDEC SmartRelay. In parameter assignment mode it outputs a value used to calculate the actual cycle time.

Test Program

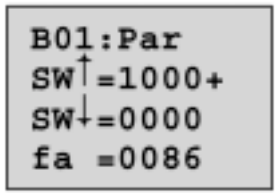
1. Start to create the test program by linking an output or memory bit to a threshold switch. At the input of the switch you can then connect a clock generator that is switched on with a hi signal.



2. Configure the two blocks as shown below. Due to the pulse rate of 0 seconds a pulse is generated in every program cycle. The time interval of the threshold switch is set to 2 seconds.



3. Then start the program and switch the IDEC SmartRelay to parameter assignment mode. You can view the parameters of the threshold switch in this parameter assignment mode.



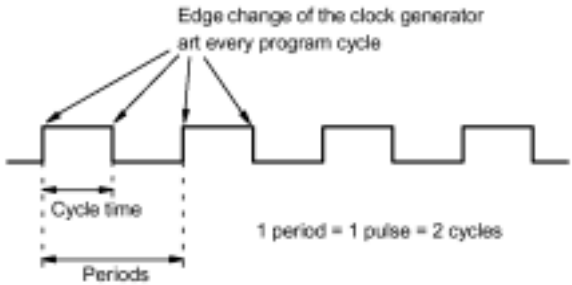
fa= is the sum of the pulses measured per time unit G T

4. The reciprocal value of Fe is equal to the cycle time of the IDEC SmartRelay with the program currently in its memory.
   1/Fe = cycle time in s

Explanation

The output signal of the clock pulse generator (T = 0) is toggled at every program cycle. Thus, one logic level (high or low) width is exactly equivalent to the length of one cycle. Hence, a period lasts 2 cycles.

The threshold switch indicates the ratio of periods per 2 seconds which results in the ratio of cycles per second.



C. IDEC SmartRelay Without Display

The IDEC SmartRelay model without display is intended for use in specific applications not requiring operating elements such as a keyboard or a display FL1B-B12RCE, FL1B-B12RCA and FL1B-B12RCC.

For example, this is what a FL1B-B12RCC looks like:



Less is Definitely More!

Benefits:

- Improved economies without the operating element.
- Requires less switch cabinet space than conventional hardware.
- Substantial benefits with regard to flexibility and costs compared to stand-alone electronic switchgear.
- Of advantage even for applications in which merely two or three conventional switching devices can be replaced.
- Very easy to use.
- Cannot be used by unauthorized persons.
- Compatible with IDEC SmartRelay basic models.
- Offers the option to read data via WindLGC.

Programming Without an Operating Element

You can program the IDEC SmartRelay without display in two ways:

- On the PC, create a program with WindLGC and transfer it to the IDEC SmartRelay.
- Use a IDEC SmartRelay program module/card and transfer the program contained in this device to the IDEC SmartRelay without display.

Operating Characteristics

The IDEC SmartRelay is ready for operation when power is switched on. Switching off a IDEC SmartRelay without display is equivalent to disconnecting the power supply.

FL1B-B12RC* models cannot be prepared for data transfer by the keyboard and the programs cannot be started or stopped by pushbutton. This is why the startup behavior of FL1B-B12RC* models has been slightly modified.

Startup Characteristics

The program in a module/card that is plugged into the IDEC SmartRelay is copied immediately to the IDEC SmartRelay after power is switched on. Any existing program is overwritten.

If a PC cable is connected, the IDEC SmartRelay switches automatically to PC ↔ IDEC SmartRelay mode at startup. The WindLGC software can be used to read the IDEC SmartRelay program or to save a program to the IDEC SmartRelay,

After power is switched on, the IDEC SmartRelay automatically switches from STOP to RUN if a valid program exists in memory.

Operating Status Indicator

Operating states, e.g. Power On, RUN and STOP are indicated by an LED on the front cover.

- Red LED: Power On/STOP
- Green LED: Power On/RUN

The red LED is lit after Power On and in all IDEC SmartRelay states other than RUN. The green LED is lit when IDEC SmartRelay is in RUN mode.

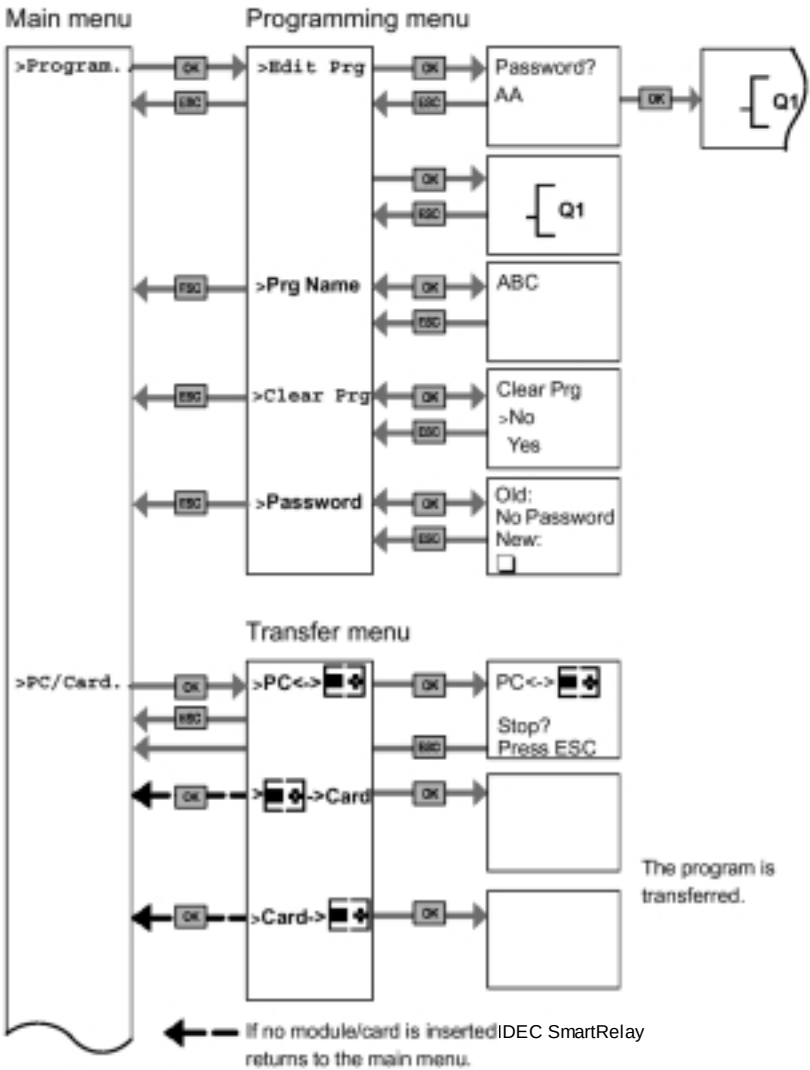
Reading the Operating Hours Counter in STOP Mode

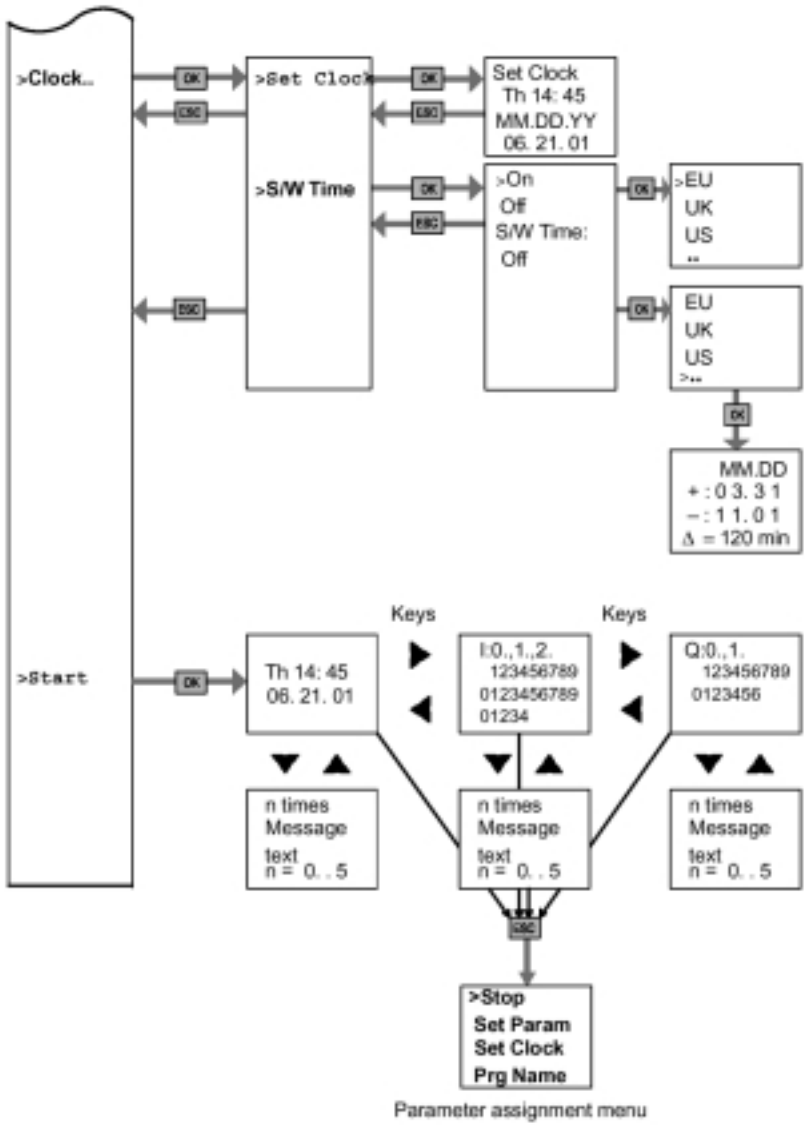
Prerequisites: The PC link must be plugged in prior to Power On.

In WindLGC V 3.0 (refer to Chapter 7 “IDEC SmartRelay Software” on page 7-1) you can read the MN and OT values of the hours counter. The hours counter values can be accessed without having to enter a password.

If your IDEC SmartRelay without display is equipped with a red module you cannot access the values of the hours counter, because when you remove the module (in order to connect the PC link) you delete the program in the IDEC SmartRelay.

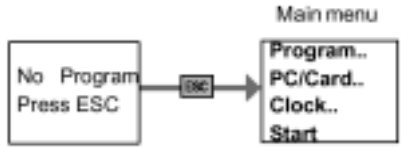
D. IDEC SmartRelay Menu Structure



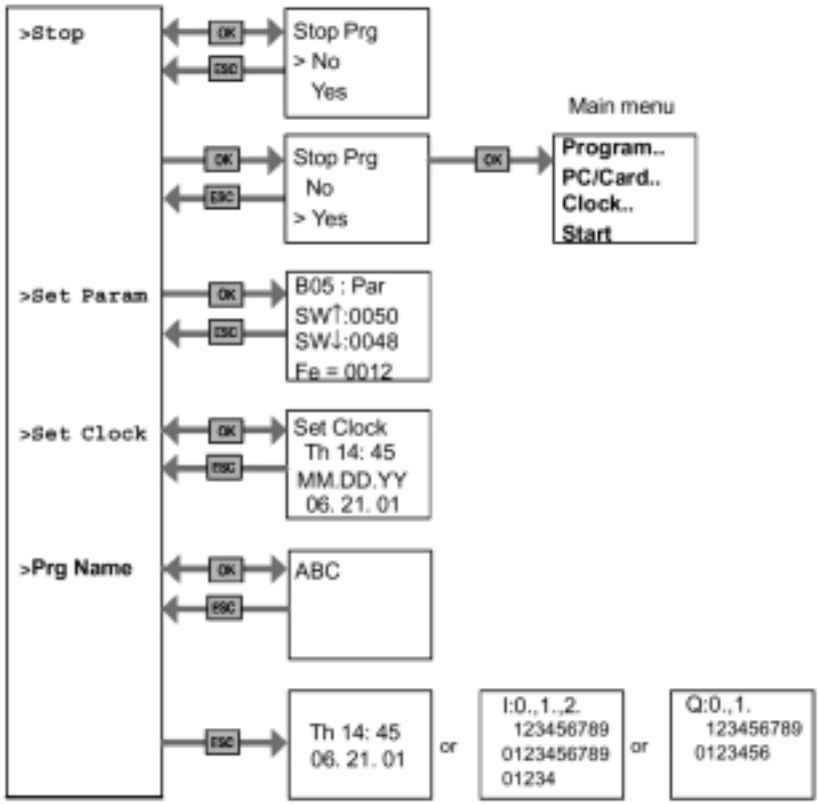


Parameter assignment menu

No program after Power on



Parameter assignment menu



E. Models (Part Numbers)

Table A Model (Part Number) List

Model	Model Number	Rated Power Voltage	Input Type (Digital)	Input Type (Analog)	Output Type (Relay)	Display and Keypad	Real Time Clock
Base Modules	FL1B-H12RCC	100-240V **AC/DC**	8	-	4	Yes	Yes
	FL1B-B12RCC	100-240V **AC/DC**	8	-	4	-	Yes
	FL1B-H12RCA	24V **AC**	8	-	4	Yes	Yes
	FL1B-B12RCA	24V **AC**	8	-	4	-	Yes
	FL1B-H12RCE	12/24V **DC**	8 (I1-I8)	2 (I7, I8)	4	Yes	Yes
	FL1B-B12RCE	12/24V **DC**	8 (I1-I8)	2 (I7, I8)	4	-	Yes
	FL1B-H12SND	24V **DC**	8 (I1-I8)	2 (I7, I8)	4 (Tr)	Yes	
Expansion Modules	FL1B-M08B2R2	12/24V **DC**	4	-	4	-	-
	FL1B-M08B1S2	24V **DC**	4	-	4 (Tr)	-	-
	FL1B-M08C2R2	100-240V **AC/DC**	4	-	4	-	-
	FL1B-J2B2	12/24V **DC**	-	2	-	-	-

Table B Cable and Accessories

Model	Function	Model No.
Memory Cartridge (Yellow)	for copying	FL1A-PM1
Memory Cartridge (Red)	With know-how protection and copy protection	FL1A-PM2
PC Cable	Download/Upload Cable	FL1A-PC1
WindLGC	Exclusive programming software for IDEC SmartRelay	FL9Y-LP1CDW
Removal Tool	The memory cartridge removal tool	MT-101

F. Abbreviations

B01	Block number B01
BN	Block number
Cnt	Count = input for counter
Co	Connector
Dir	Direction (e.g. for counter)
En	Enable (e.g. for switching on the clock pulse generator)
BF	Basic functions
No	Cams (time switch parameters)
Par	Parameter
R	Reset
S	Set (e.g. setting the latching relay)
SF	Special functions
T	Time (parameter)
S	Segment
Trg	Trigger (parameter)

Index

Symbols

"?" 3–36

A

abbreviations 11–18
accessories 11–17
air conditioning system, application 8–14
analog comparator 4–55
analog switch 4–52
AND 4–7
  not 4–9
  with RLO rdge detection 4–8
applications 1–1, 8–1
  additonal options 8–36
  air conditioning system 8–14
  automatic door 8–7
  industrial gate 8–20
  industrial gate control 8–24
  luminous rows 8–28
  staircase or corridor lighting 8–2
  water pump 8–32
asynchronous pulse generator 4–47
automatic door, application 8–7

B

B01 11–18
BF 4–1, 4–5, 11–18
block
  deleting 3–34
  deleting multiple 3–35
  number 3–4
BN 4–1, 11–18
  functions 4–1
buffering the clock 4–19

C

C Tick Mark 1–10
cable 11–17
CE 1–9
certification 1–9
changes i–vi
circuit diagram 3–7
circuit size 3–42
Cnt 11–18
Co 4–1, 11–18
configuration 2–2, 2–3
configuring 5–1
  date 5–9
  parameter 5–4
  parameter assignment mode 5–2
  parameters
    changing 5–6
    selecting 5–5
  time-of-day 5–9
connecting
  inputs 2–13
  outputs 2–20
  power supply 2–11
  to a PC 7–3
connectors 3–2
constants & connectors - Co 4–2
copying
  from modules 6–7
  to modules 6–5
counter
  operating hours 4–43
  up/down 4–41
CSA 1–9
current impulse relay 4–31
cycle time, determining 10–9

D

date 5–9

daylight savings time 3–38
deleting
a block 3–34
a program 3–37
multiple blocks 3–35
different voltage classes 2–3
dimensions 2–4
Dir 11–18
documentation i–v
dual-function switch 4–61

E

edge-triggered interval time-delay relay 4–33
EN 1–9
En 11–18
example
program 3–14, 3–28
expansion module 1–8

F

features i–vi
FM 1–9
frequency trigger 4–50
functions 4–1, 4–59
analog comparator 4–55
analog switch 4–52
AND 4–7
AND with RLO edge detection 4–8
asynchronous pulse generator 4–47
BF 4–1, 4–5
buffering the clock 4–19
Co 4–1
current impulse relay 4–31
dual-function switch 4–61
edge-triggered interval time-delay relay 4–33
frequency trigger 4–50
gain & offset calculation 4–20
input designation 4–16
interval time-delay relay / pulse output 4–32
latching relay 4–30
list 4–5
message texts 4–63
NAND 4–9
NAND with RLO edge detection 4–10
NOR 4–12
NOT 4–14
off delay 4–26
on delay 4–25
on/off delay 4–27
operating hours counter 4–43
OR 4–11
parameter protection 4–19
random generator 4–48
retentive on delay 4–29
retentivity 4–19
seven-day time switch 4–34
SF 4–1, 4–22
softkey 4–66
special 4–15, 4–22
symmetrical clock pulse generator 4–46
time response 4–18
twelve-month time switch 4–39
up/down counter 4–41
XOR 4–13

G

gain & offset calculation 4–20
general guidelines 2–1
generator
asynchronous pulse 4–47
random 4–48
symmetrical clock pulse 4–46

I

IEC 1–9
industrial gate control, application

8–24
industrial gate, application 8–20
input designation 4–16
inputs 3–10, 4–2
connecting 2–13
logical 4–16
parameter 4–17
installing 2–4
profile rail mounting 2–5
wall-mounting 2–9
interval time-delay relay / pulse output 4–32

L

latching relay 4–30
luminous rows, application 8–28

M

maximum 2–2
memory
area 3–42
markers 4–3
required 3–44
space 3–42
utilization 3–43
menu structure 10–14
menus, overview 3–12
message texts 4–63
mode
parameter assignment 5–2
run 3–26
models 1–7, 11–17
Modular IDEC SmartRelay 2–2
modules 6–1
copying from 6–7
copying to 6–5
inserting 6–3
overview 6–2
removing 6–3

N

NAND 4–9
with RLO edge detection 4–10
No 11–18
NOR 4–12
NOT 4–14

O

off delay 4–26
on delay 4–25
on/off delay 4–27
operating hours counter 4–43
operating mode
changing 3–10
OR 4–11
outputs 3–10, 4–3
connecting 2–20

P

Par 11–18
parameter 5–4
assignment mode 5–2
protection 4–19
parameter assignment mode
menu options 5–3
parameters
changing 5–6
selecting 5–5
part numbers 11–17
password 3–22
changing 3–23
deactivating 3–24
Wrong input! 3–25
power return 2–23
power supply 2–11
profile rail mounting 2–5
program
"?" 3–36
assigning name 3–21
circuit size 3–42

correcting typing errors 3–36
daylight savings time 3–38
deleting 3–37
deleting a block 3–34
deleting multiple blocks 3–35
editing 3–16
exit input 3–20
first example 3–14
input & start 3–13
memory space 3–42
modules 6–1
password 3–22
second example 3–28
summer/wintertime conversion 3–38
program modules 6–1
programming 3–1
mode 3–13

R

R 11–18
random generator 4–48
retentive on delay 4–29
retentivity 4–19
RUN 3–26

S

S 11–18
safety guidelines i–vi
sensor attributes 2–13
setting date 5–9
setting time-of-day 5–9
seven-day time switch 4–34
SF 4–1, 4–22, 11–18
shipbuilding 1–9
softkey 4–66
software 7–1
special functions 4–15, 4–22
specifications 9–1
staircase or corridor lighting, application 8–2
stairwell light switch 4–59
starting 2–25
structure 1–4
summer/wintertime conversion 3–38
support i–vi
switch
analog 4–52
dual-function 4–61
seven-day time 4–34
stairwell light 4–59
twelve-month time 4–39
switching on
see also starting 2–23
symmetrical clock pulse generator 4–46

T

T 11–18
technical specifications 9–1
FL1B-B12RCA 9–5
FL1B-B12RCC 9–3
FL1B-H12RCA 9–5
FL1B-H12RCC 9–3
FL1B-H12SND 9–5
FL1B-J2B2 9–7
FL1B-M08B1S2 9–5
FL1B-M08C2R2 9–3
general 9–1
template 2–10
time response 4–18
time-of-day 5–9
Trg 11–18
twelve-month time switch 4–39

U

UL 1–9
uninstalling 2–4
up/down counter 4–41

V

VDE 1–9

W

wall-mounting 2–9, 2–10
warning i–vii
water pump, application 8–32
welcome i–v
WindLGC 7–1
wiring 2–11
without display 10–11
Wrong input! 3–25

X

XOR 4–13

Contactors Ex9C



- **Contactors according to IEC / EN 60947-4-1**
- **Four frame sizes with rated current up to 100 A at 400 V AC-3**
- **3-pole versions**
- **Coil control voltage 24 — 415 V AC**
- **Rated conditional short circuit current I_q 50 kA**
- **Suitable mainly for industrial applications, can be used also for domestic ones**
- **Mounting onto device rail (DIN) 35 mm or 75 mm (frame sizes 38, 65, 100) or onto panel**

Rated operational voltage of main contacts 690 V AC

Rated frequency 50 Hz

Ex9C contactors are intended for various applications including heavy industrial ones. Splitting into four frame sizes brings optimization of electrical parameters and mechanical dimensions. All these frame sizes share accessory auxiliary contacts. Overload relays differ with the frame sizes in order to fit respective contactor of given rated current.

Frame size 18 contains contactors with rated currents AC-3 9, 12 and 18 A at 400 V. Size 38 consists of rated currents 25, 32, 38 A. Version 65 is splitted into currents 40, 50 and 65. Finally frame size 100 is covered with rated currents 80 and 100 A.

Type Key

Ex9	C	18	11	3P	120V
Product family	Product	Rated current AC-3 400 V	Built-in auxiliary contacts	Poles (main contacts)	Coil control voltage
Ex9	C: Contactors	9, 12, 18, 25, 32, 38, 40, 50, 65, 80, 100 A	11 : 1 NO + 1 NC 22 : 2 NO + 2 NC	3	24 — 415 V AC

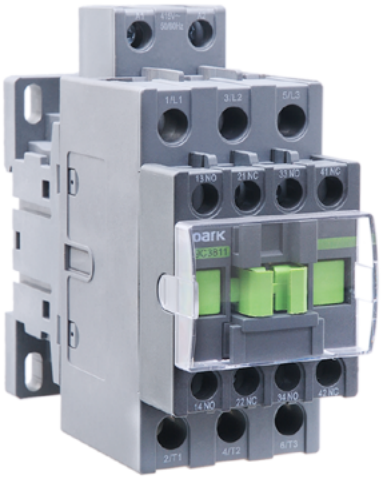
Certification marks

Contactors Ex9C

Frame sizes



Frame size 18
Rated currents 9, 12, 18 A



Frame size 38
Rated currents 25, 32, 38 A



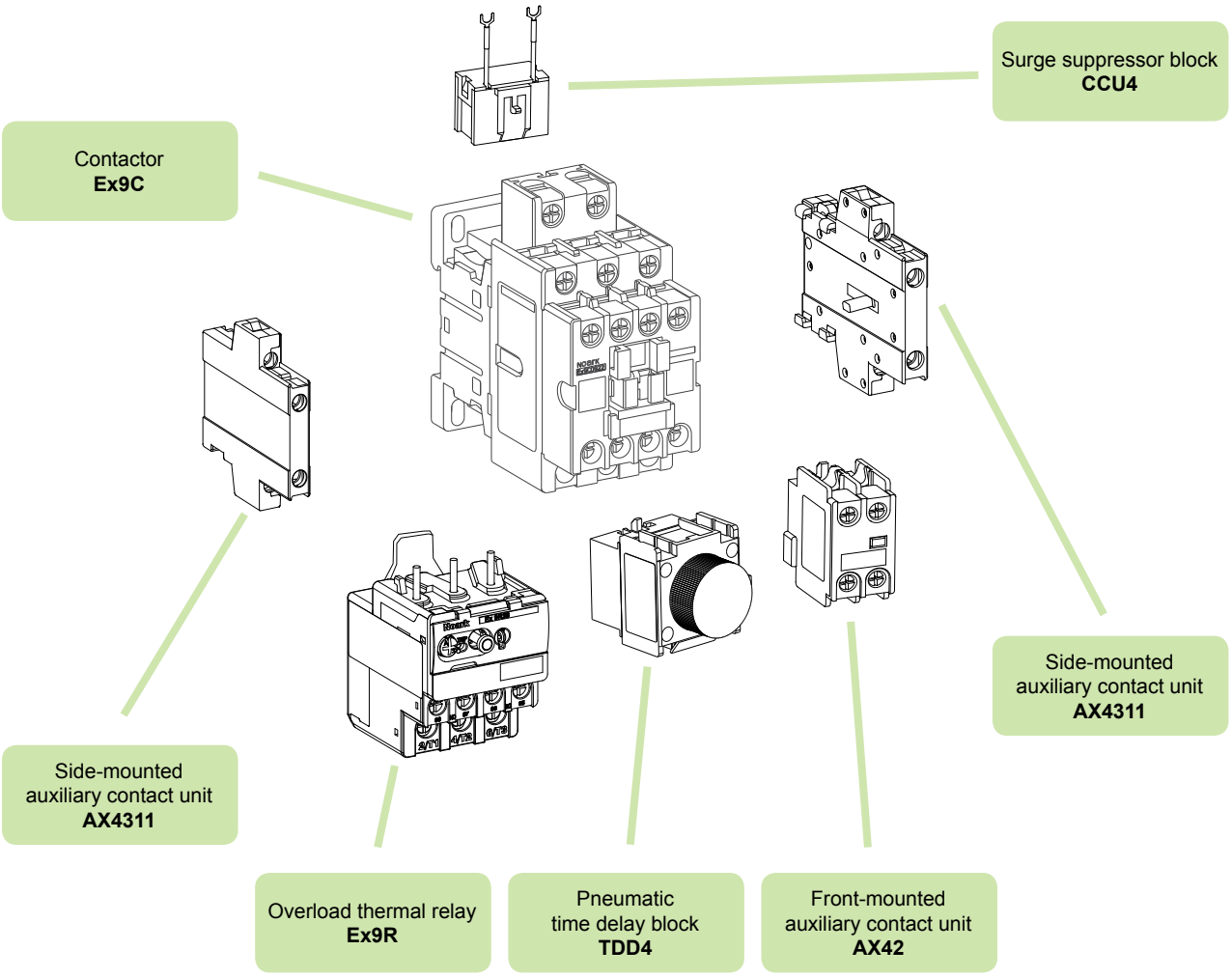
Frame size 65
Rated currents 40, 50, 65 A



Frame size 100
Rated currents 80, 100 A

Contactors Ex9C

Accessories



Auxiliary contacts AX4311

Auxiliary contacts AX42

Overload thermal relays Ex9R

Pneumatic time delay block TDD4

Surge suppressor block CCU4

Contactors Ex9C, frame size 18

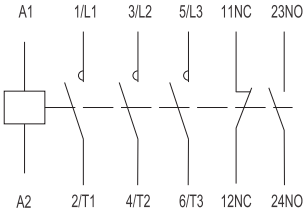
Rated current 18 A, 3-pole

- Standard version of contactor
- Mounting onto device (DIN) rail 35 mm or onto panel
- Front-mounted auxiliary contacts AX42.. as well as side-mounted ones AX43 can be used
- Can be combined with overload relays Ex9R38

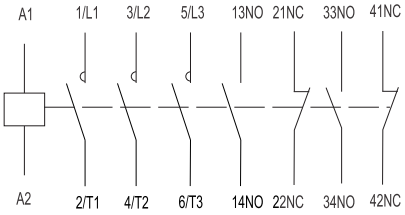


Control Voltage	I_e	Frame size	Poles	Aux. cont.	Article No.	Type	Packing
415 V AC	18 A	18	3	1 NO + 1 NC	101148	Ex9C18 11 3P 415V	1/40
400 V AC	18 A	18	3	1 NO + 1 NC	101149	Ex9C18 11 3P 400V	1/40
380 V AC	18 A	18	3	1 NO + 1 NC	101150	Ex9C18 11 3P 380V	1/40
240 V AC	18 A	18	3	1 NO + 1 NC	101151	Ex9C18 11 3P 240V	1/40
230 V AC	18 A	18	3	1 NO + 1 NC	101152	Ex9C18 11 3P 230V	1/40
220 V AC	18 A	18	3	1 NO + 1 NC	101153	Ex9C18 11 3P 220V	1/40
127 V AC	18 A	18	3	1 NO + 1 NC	101154	Ex9C18 11 3P 127V	1/40
110 V AC	18 A	18	3	1 NO + 1 NC	101155	Ex9C18 11 3P 110V	1/40
48 V AC	18 A	18	3	1 NO + 1 NC	101156	Ex9C18 11 3P 48V	1/40
42 V AC	18 A	18	3	1 NO + 1 NC	101157	Ex9C18 11 3P 42V	1/40
36 V AC	18 A	18	3	1 NO + 1 NC	101158	Ex9C18 11 3P 36V	1/40
24 V AC	18 A	18	3	1 NO + 1 NC	101159	Ex9C18 11 3P 24V	1/40
415 V AC	18 A	18	3	2 NO + 2 NC	101160	Ex9C18 22 3P 415V	1/40
400 V AC	18 A	18	3	2 NO + 2 NC	101161	Ex9C18 22 3P 400V	1/40
380 V AC	18 A	18	3	2 NO + 2 NC	101162	Ex9C18 22 3P 380V	1/40
240 V AC	18 A	18	3	2 NO + 2 NC	101163	Ex9C18 22 3P 240V	1/40
230 V AC	18 A	18	3	2 NO + 2 NC	101164	Ex9C18 22 3P 230V	1/40
220 V AC	18 A	18	3	2 NO + 2 NC	101165	Ex9C18 22 3P 220V	1/40
127 V AC	18 A	18	3	2 NO + 2 NC	101166	Ex9C18 22 3P 127V	1/40
110 V AC	18 A	18	3	2 NO + 2 NC	101167	Ex9C18 22 3P 110V	1/40
48 V AC	18 A	18	3	2 NO + 2 NC	101168	Ex9C18 22 3P 48V	1/40
42 V AC	18 A	18	3	2 NO + 2 NC	101169	Ex9C18 22 3P 42V	1/40
36 V AC	18 A	18	3	2 NO + 2 NC	101170	Ex9C18 22 3P 36V	1/40
24 V AC	18 A	18	3	2 NO + 2 NC	101171	Ex9C18 22 3P 24V	1/40

Wiring diagrams



Ex9C18 11 3P



Ex9C18 22 3P

Technical data p. 13

Technical Data Ex9C, frame size 18

Contactors Ex9C09, Ex9C12, Ex9C18

General parameters

Standard contactors		
Contactors rated at AC-3		
Suitable mainly for industrial applications		
3-pole versions		
Mounting onto device rail (DIN) 35 mm or onto panel		
With built-in auxiliary contacts		
Accessories		
Front-mounted auxiliary contacts	AX42	101284 — 101291
Side-mounted auxiliary contacts	AX4311	101292
Surge suppressor block	CCU42	104498, 104499, 104500

Electrical parameters - main contacts and general

	Ex9C09	Ex9C12	Ex9C18
Tested according to		IEC/EN 60947-4-1	
Rated op. voltage U_e		690 V AC	
Rated insulating voltage U_i		690 V AC	
Rated impulse withstand voltage U_{imp}	6 kV	6 kV	6 kV
Rated frequency		50/60 Hz	
Interlocked opposing contacts according to EN 60947-4-1, Annex L	yes	yes	yes
Conventional free air thermal current I_{th}	25 A	25 A	32 A
Rated operational current I_e			
AC-1	25 A	25 A	32 A
AC-2/AC-3/AC-4, 380/400 V	9 A	12 A	18 A
AC-3, 660/690 V	6.7 A	9 A	10.6 A
AC-2/AC-4, 660/690 V	4.9 A	4.9 A	6.7 A
Rated power of 3-phase motor			
AC-3/AC-4, 380/400 V	4 kW	5.5 kW	7.5 kW
AC-3, 660/690 V	5.5 kW	7.5 kW	9 kW
AC-4, 660/690 V	4 kW	4 kW	5.5 kW
Maximum short circuit protection fuse			
Coordination type 1 at 500 V AC	25 A gG/gL	40 A gG/gL	50 A gG/gL
Coordination type 2 at 500 V AC	20 A gG/gL	25 A gG/gL	36 A gG/gL
Safe isolation (EN 61140)			
Main contact — main contact	400 V AC	400 V AC	400 V AC
Main contact — coil	400 V AC	400 V AC	400 V AC
3-phase power AC-1			
Maximum back-up fuse gG/gL	50 A	50 A	63 A
Power at 230/240 V	10 kW	10 kW	13 kW
Power at 380/400 V	17 kW	17 kW	21 kW
Power at 660/690 V	29 kW	29 kW	37 kW
Rated current $I_e = I_{th}$	25 A	25 A	32 A
1-phase power AC-1, 3 contacts in parallel			
Maximum back-up fuse gG/gL	80 A	80 A	100 A
Power at 230/240 V	23 kW	23 kW	29 kW
Power at 380/400 V	37 kW	37 kW	48 kW
Power at 660/690 V	64 kW	64 kW	82 kW
Rated current $I_e = I_{th}$	56 A	56 A	72 A

Ordering data p. 4

Technical Data Ex9C, frame size 18

Contactors Ex9C09, Ex9C12, Ex9C18

Electrical parameters - main contacts and general

	Ex9C09	Ex9C12	Ex9C18
Making capacity			
230/240 V	144 A	144 A	216 A
380/400 V	144 A	144 A	216 A
660/690 V	144 A	144 A	216 A
Breaking capacity			
230/240 V	90 A	120 A	180 A
380/400 V	90 A	120 A	180 A
660/690 V	67 A	90 A	106 A
Mechanical service life	10 000 000 operation cycles		
Electrical service life 380/400 V			
AC-3	1 200 000 operation cycles		
AC-4	50 000 operation cycles	40 000 operation cycles	40 000 operation cycles
Overvoltage category	III		
EMC environment	A		
Comparative Tracking Index	400 V		
Prospective short circuit current I_q	50 kA		

Electrical parameters - coil

	Ex9C09	Ex9C12	Ex9C18
Control Voltage U_c	24, 36, 42, 48, 110, 127, 220, 230, 240, 380, 400, 415 V AC		
Tolerance of Control Voltage U_c	0.8 — 1.1 U_c	0.8 — 1.1 U_c	0.8 — 1.1 U_c
Frequency	50 Hz	50 Hz	50 Hz
Power consumption			
Pick-up	90 VA / 40 W	90 VA / 40 W	90 VA / 40 W
Hold	9.5 VA / 4 W	9.5 VA / 4 W	9.5 VA / 4 W
Duty	100 %	100 %	100 %
Closing delay	12 — 24 ms	12 — 24 ms	12 — 24 ms
Opening delay	6 — 20 ms	6 — 20 ms	6 — 20 ms
Closing delay with front-mounted AX	8 — 18 ms	8 — 18 ms	8 — 18 ms

Electrical parameters - built-in auxiliary contacts

Rated op. voltage U_e	690 V AC
Rated insulating voltage U_i	690 V AC
Rated impulse withstand voltage U_{imp}	6 kV
Rated frequency	50 Hz
Interlocked opposing contacts according to EN 60947-4-1, Annex L	yes
Conventional free air thermal current I_{th}	10 A
Rated operational current I_e	
AC-15	6 A / 120 V, 3 A / 240 V, 1.9 A / 380 V, 1.5 A / 480 V, 1.2 A / 600 V
DC-13	0.55 A / 125 V, 0.27 A / 250 V
Max. back-up fuse	10 A gG/gL
Conditional short circuit current I_k with max. back-up fuse	1 kA

Ordering data p. 4

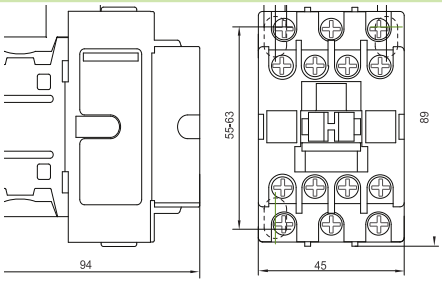
Technical Data Ex9C, frame size 18

Contactors Ex9C09, Ex9C12, Ex9C18

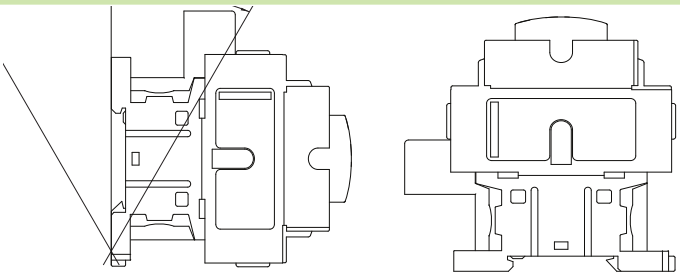
Mechanical parameters

	Ex9C09	Ex9C12	Ex9C18
Device width	45 mm (without side-mounted auxiliary contact)		
Device height	89 mm including rail clip		
Device depth	94 mm (without front-mounted auxiliary contact)		
Mounting	easy fastening onto 35 mm device rail (DIN) or onto panel		
Degree of protection	IP20		
Terminals	lift		
Terminal capacity	(1 — 2) x (1.5 — 6 mm²) wired; 1 x (1 — 6 mm²), 2 x (1 — 4 mm²) solid		
Fastening torque of terminals	1.5 — 1.7 Nm		
Ambient temperature	-20 — +60 °C		
Altitude	≤ 2000 m		
Relative humidity	≤ 95 %		
Resistance to humidity and heat	class 2		
Pollution degree	3		
Installation class	III		
Weight	0.35 kg	0.35 kg	0.35 kg
Power loss at I_e	0.2 W	0.36 W	0.8 W

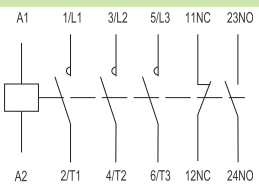
Dimensions



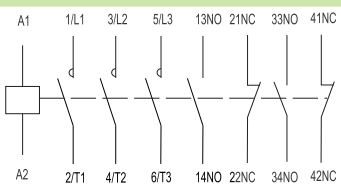
Mounting positions



Wiring diagrams



Ex9C.. 11 3P



Ex9C.. 22 3P

Ordering data p. 4

Overload Relays Ex9R



- **Overload thermal relays according to IEC / EN 60947-4-1**
- **Three frame sizes with rated current up to 100 A at 690 V AC-3**
- **3-pole versions**
- **Tripping class 10A**
- **For direct mounting onto Ex9C(S) contactors series or as a stand-alone device**
- **Suitable mainly for motor protection against overload or phase lost**
- **Mounting onto connected contactor or onto device rail (DIN) 35 mm by means of AD5. adaptor**

Rated operational voltage 690 V AC, rated frequency 50/60 Hz

Ex9R overload thermal relays contactors are designed for protection of motors mainly. These relays can be either combined directly with Contactors of Ex9CS and Ex9C series or used as a stand-alone device with AD5. adaptor. Relays are available in three frame sizes for rated non-reduced currents from 0.16 — 100 A.

Size Ex9R12 is designed to match Miniature Contactors Ex9CS. Version Ex9R38 can be mounted onto Contactors Ex9C18 and with spacer (in the scope of delivery of the relay) also with size Ex9C38. The last size Ex9R100 can be combined with Ex9C65 and Ex9C100 (with spacer).

Ex9R relays are equipped with 1 NO and 1 NC auxiliary contacts.

Type Key

Ex9	R	38	18A
Product family	Product	Frame size	Rated current
Ex9	R: Overload thermal relay	12, 38, 100	0.16 A — 100 A

Certification marks

Overload Relays Ex9R

Design



Ex9R12
Frame size 12



Ex9R38
Frame size 38



Ex9R100
Frame size 100

Mounting



Direct mounting onto Contactor Ex9C..



Adaptor AD5.



Stand-alone device with adaptor AD5.

Overload Relays Ex9R

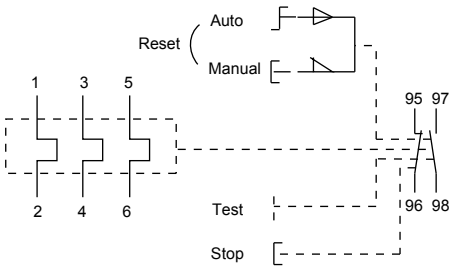
Frame size 38

- Overload thermal relay
- For direct mounting onto Contactors Ex9C18 and Ex9C38 (with included spacer)
- Stand-alone device for mounting onto device (DIN) rail 35 mm by means of combination with adaptor AD52
- Automatic and manual reset function
- Tripping class 10A



Current setting range I_e	For contactor frame size	Poles	Auxiliary contacts	Article No.	Type	Packing
2.5 - 4 A	18 (09, 12, 18), 38 (25, 32, 38)	3	1 NO + 1 NC	101371	Ex9R38 4A	1/80
4 - 6 A	18 (09, 12, 18), 38 (25, 32, 38)	3	1 NO + 1 NC	101372	Ex9R38 6A	1/80
5.5 - 8 A	18 (09, 12, 18), 38 (25, 32, 38)	3	1 NO + 1 NC	101373	Ex9R38 8A	1/80
7 - 10 A	18 (09, 12, 18), 38 (25, 32, 38)	3	1 NO + 1 NC	101374	Ex9R38 10A	1/80
9 - 13 A	18 (09, 12, 18), 38 (25, 32, 38)	3	1 NO + 1 NC	101375	Ex9R38 13A	1/80
12 - 18 A	18 (09, 12, 18), 38 (25, 32, 38)	3	1 NO + 1 NC	101376	Ex9R38 18A	1/80
16 - 24 A	18 (09, 12, 18), 38 (25, 32, 38)	3	1 NO + 1 NC	101377	Ex9R38 24A	1/80
23 - 32 A	18 (09, 12, 18), 38 (25, 32, 38)	3	1 NO + 1 NC	101378	Ex9R38 32A	1/80
30 - 38 A	18 (09, 12, 18), 38 (25, 32, 38)	3	1 NO + 1 NC	101379	Ex9R38 38A	1/80

Wiring diagram



Ex9R38

Technical data p. 9

Technical Data Overload Relays Ex9R

Overload Relays Ex9R12, Ex9R38, Ex9R100

General parameters

Thermal overload relays		
Ex9R12 for direct mounting onto Contactors frame size Ex9CS		
Ex9R38 for direct mounting onto Contactors frame size Ex9C18, Ex9C38 (with spacer)		
Ex9R38 for direct mounting onto Contactors frame size Ex9C65, Ex9C100 (with spacer)		
For stand-alone applications by means of adaptor AD5.		
Suitable mainly for motor protection against overload or phase lost		
With built-in auxiliary contacts 1 NO + 1 NC		
Accessories		
Adaptors for stand-alone use	AD51, AD52, AD53	101436 — 101438

Electrical parameters

	Ex9R12	Ex9R38	Ex9R100
Tested according to		IEC/EN 60947-4-1	
Rated op. voltage U_e		690 V AC	
Rated insulating voltage U_i		690 V AC	
Rated impulse withstand voltage U_{imp}	6 kV	6 kV	6 kV
Rated frequency		50/60 Hz	
Tripping Class	10A	10A	10A
Current setting range (per frame size)	0.1 — 12 A	2.5 — 38 A	23 — 100 A
Tripping treshold		1.14 ± 0.06 x I_n	
Phase failure detection		30 % in a phase	
Maximum short circuit protection fuse	25 A gG/gL	80 A gG/gL	160 A gG/gL
Reset		Manual or Auto	
Min. op. voltage per AX contact U_{min}		17 V AC, 3 V DC	
Rated thermal current I_{th} of AX cont.		5 A	
Rated op. current I_e, AC-15 of AX		1.64 A / 230 V, 0.95 A / 400 V	
Rated op. current I_e, DC-13 of AX		0.13 A / 220 V	
Min. operational current I_{min} of AX		5 mA AC, 5 mA DC	
Max. back-up fuse of AX		6 A gG/gL, 6 A MCB char. B	
Conditional short circuit current I_k with max. back-up fuse of AX		1 kA	

Mechanical parameters

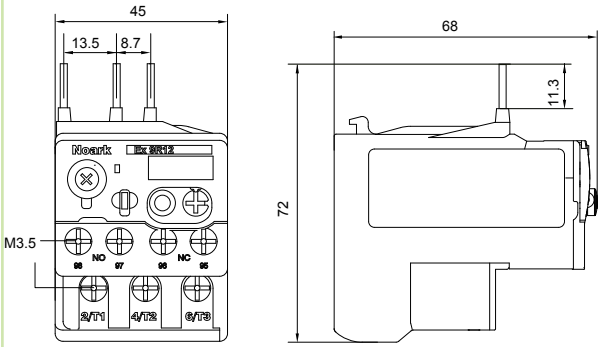
	Ex9R12	Ex9R38	Ex9R100
Tripping indicator	blank-yellow	blank-yellow	blank-yellow
Device width	45 mm	46 mm	72 mm
Device height	72 mm	69 mm	80 mm
Device depth	68 mm	65 mm	117 mm
Mounting onto	Ex9CS, AD51	Ex9C09 — 38, AD52	Ex9C40 — 100, AD53
Degree of protection		IP20	
Terminals		lift	
Terminal capacity	1 — 4 mm²	1 — 10 mm²	4 — 35 mm²
Fastening torque of terminals	1.7 Nm	2.5 Nm	9 Nm
Weight	0.16 kg	0.14 kg	0.51 kg
Vibration resistance IEC 68-2-6		2 g, 5 — 300 Hz	
Shock resistance IEC 68-2-27		15 g, 11 ms	

Ordering data p. 3

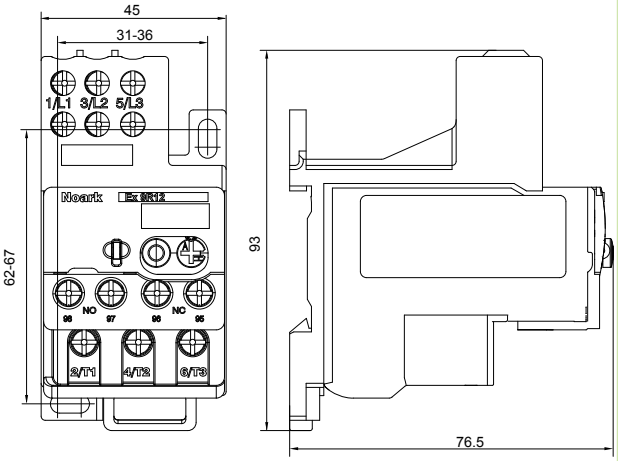
Technical Data Overload Relays Ex9R

Overload Relays Ex9R12, Ex9R38, Ex9R100

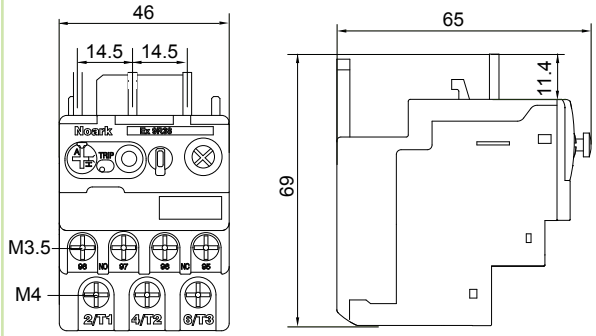
Dimensions



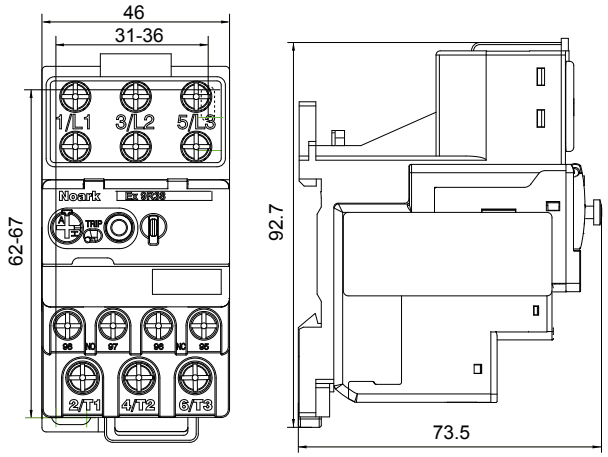
Ex9R12



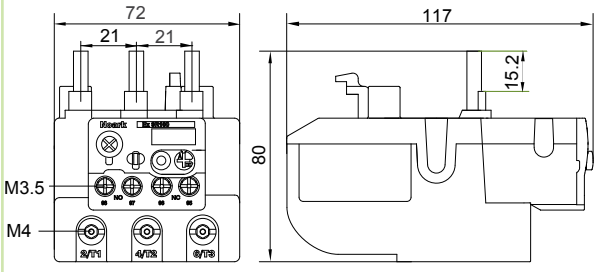
Ex9R12 + AD51



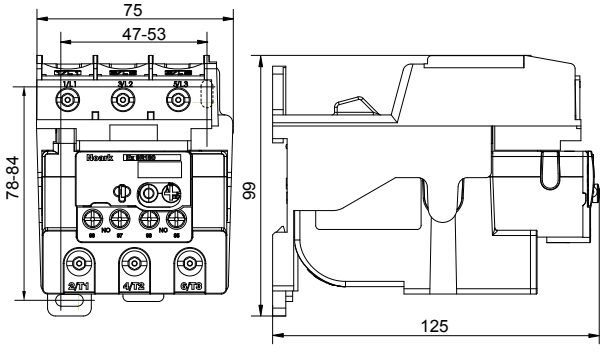
Ex9R38



Ex9R38 + AD52



Ex9R100



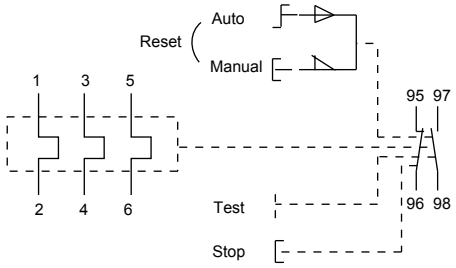
Ex9R100 + AD53

Ordering data p. 3

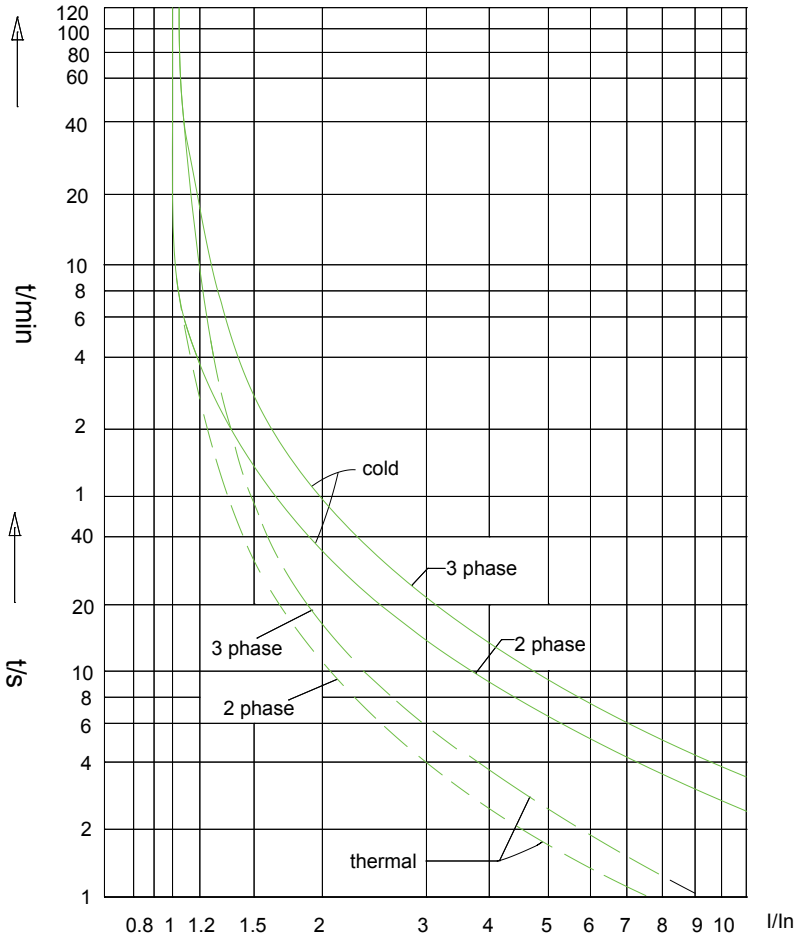
Technical Data Overload Relays Ex9R

Overload Relays Ex9R12, Ex9R38, Ex9R100

Wiring diagrams



Tripping characteristics



Ordering data p. 3

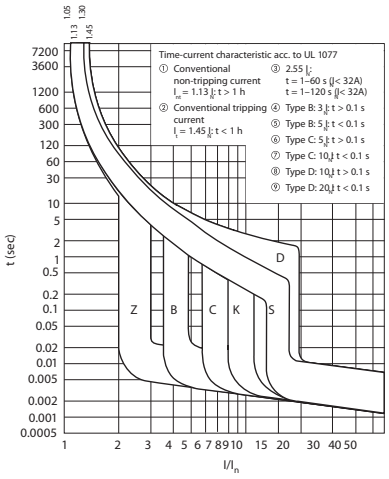
Miniature Circuit Breakers — FAZ Series — UL 1077 — B, C and D Curves

Optimum product quality, tested reliability and safety stand for best protection of personnel, installations and plant. Eaton's FAZ DIN rail mountable circuit breaker is designed for use in control panel applications. The FAZ Series is available with B, C, D and Z characteristics in accordance with UL 1077, CSA C22.2 No.235 and IEC 60947-2. These devices are CE marked.

Broad Range of Tripping Curves
- B Characteristic for Standard Circuit Protection
- C Characteristic for Higher Inrush Currents
- D Characteristic for Inductive and Capacitive Loads
- Z Characteristic for Semi-Conductor Protection — See Page 260
- Also Available in K and S Characteristics — Contact Your Local Allied Representative for More Information

Features
- Rated Currents Up to 63 A
- DIN Rail Mount
- Suitable for Supplementary Protection
- Current Limiting Design
- Fulfill UL 1077, CSA C22.2 No. 235 and IEC 60947-2
- Module Width of Only 17.7 mm Per Pole
- Reliable and Safe Operation
- Captive Screws Cannot Be Lost
- Snap-On Accessories
- Contact Position Indicator
- Finger Proof
- Trip-Free Mechanism

Applications
- Supplementary Protection
- Control Circuits
- Lighting
- Business Equipment
- Appliances




1-Pole


2-Pole


3-Pole

1-Pole, Single Package Breakers

Stock No.	Mfr.'s Type	Current Rating (A)	Trip Char. Curve	EACH
70275810	FAZ-B6/1-SP	6.0	B	20.55
70275811	FAZ-B7/1-SP	7.0	B	20.55
70275812	FAZ-B8/1-SP	8.0	B	20.55
70275813	FAZ-B10/1-SP	10.0	B	20.55
70275814	FAZ-B13/1-SP	13.0	B	20.55
70275815	FAZ-B15/1-SP	15.0	B	20.55
70275816	FAZ-B16/1-SP	16.0	B	20.55
70275817	FAZ-B20/1-SP	20.0	B	20.55
70275818	FAZ-B25/1-SP	25.0	B	20.55
70275819	FAZ-B30/1-SP	30.0	B	20.55
70275820	FAZ-B32/1-SP	32.0	B	20.55
70275821	FAZ-B40/1-SP	40.0	B	24.84
70275822	FAZ-B50/1-SP	50.0	B	30.48
70275823	FAZ-B63/1-SP	63.0	B	30.48
70275824	FAZ-C0.5/1-SP	0.5	C	24.84
70275825	FAZ-C1/1-SP	1.0	C	24.84
70275826	FAZ-C2/1-SP	2.0	C	24.84
70275827	FAZ-C3/1-SP	3.0	C	24.84
70275828	FAZ-C4/1-SP	4.0	C	24.84
70275829	FAZ-C5/1-SP	5.0	C	24.84
70275830	FAZ-C6/1-SP	6.0	C	20.55
70275831	FAZ-C7/1-SP	7.0	C	20.55
70275832	FAZ-C8/1-SP	8.0	C	20.55
70275833	FAZ-C10/1-SP	10.0	C	20.55
70275834	FAZ-C13/1-SP	13.0	C	20.55
70275835	FAZ-C15/1-SP	15.0	C	20.55
70275836	FAZ-C16/1-SP	16.0	C	20.55
70275837	FAZ-C20/1-SP	20.0	C	20.55
70275838	FAZ-C25/1-SP	25.0	C	20.55
70275839	FAZ-C30/1-SP	30.0	C	20.55
70275840	FAZ-C32/1-SP	32.0	C	20.55
70275841	FAZ-C40/1-SP	40.0	C	24.84
70275842	FAZ-C50/1-SP	50.0	C	30.48
70275843	FAZ-C63/1-SP	63.0	C	30.48
70275844	FAZ-D0.5/1-SP	0.5	D	24.84
70275845	FAZ-D1/1-SP	1.0	D	24.84
70275846	FAZ-D2/1-SP	2.0	D	24.84
70275847	FAZ-D3/1-SP	3.0	D	24.84
70275848	FAZ-D4/1-SP	4.0	D	24.45
70275849	FAZ-D5/1-SP	5.0	D	24.84
70275850	FAZ-D6/1-SP	6.0	D	20.55
70275851	FAZ-D7/1-SP	7.0	D	20.55
70275852	FAZ-D8/1-SP	8.0	D	20.55
70275853	FAZ-D10/1-SP	10.0	D	20.55
70275854	FAZ-D13/1-SP	13.0	D	20.55
70275855	FAZ-D15/1-SP	15.0	D	20.55
70275856	FAZ-D16/1-SP	16.0	D	20.55
70275857	FAZ-D20/1-SP	20.0	D	20.55
70275858	FAZ-D25/1-SP	25.0	D	20.55
70275859	FAZ-D30/1-SP	30.0	D	20.55
70275860	FAZ-D32/1-SP	32.0	D	20.55
70275861	FAZ-D40/1-SP	40.0	D	24.84

2-Pole, Standard Package Breakers

Stock No.	Mfr.'s Type	Current Rating (A)	Trip Char. Curve	EACH
70275863	FAZ-B6/2	6.0	B	44.71
70275864	FAZ-B7/2	7.0	B	44.71
70275865	FAZ-B8/2	8.0	B	44.71
70275866	FAZ-B10/2	10.0	B	44.71
70275867	FAZ-B13/2	13.0	B	44.71
70275868	FAZ-B15/2	15.0	B	44.71
70275869	FAZ-B16/2	16.0	B	44.71
70275870	FAZ-B20/2	20.0	B	44.71
70275871	FAZ-B25/2	25.0	B	44.71
70275872	FAZ-B30/2	30.0	B	44.71
70275873	FAZ-B32/2	32.0	B	44.71
70275874	FAZ-B40/2	40.0	B	51.26
70275875	FAZ-B50/2	50.0	B	62.32
70275876	FAZ-B63/2	63.0	B	62.32
70275877	FAZ-C0.5/2	0.5	C	51.26
70275878	FAZ-C1/2	1.0	C	51.26
70275879	FAZ-C2/2	2.0	C	51.26
70275880	FAZ-C3/2	3.0	C	51.26
70275881	FAZ-C4/2	4.0	C	51.26
70275882	FAZ-C5/2	5.0	C	51.26
70275883	FAZ-C6/2	6.0	C	44.71
70275884	FAZ-C7/2	7.0	C	44.71
70275885	FAZ-C8/2	8.0	C	44.71
70275886	FAZ-C10/2	10.0	C	44.71
70275887	FAZ-C13/2	13.0	C	44.71
70275888	FAZ-C15/2	15.0	C	44.71
70275889	FAZ-C16/2	16.0	C	44.71
70275890	FAZ-C20/2	20.0	C	44.71
70275891	FAZ-C25/2	25.0	C	44.71
70275892	FAZ-C30/2	30.0	C	44.71
70275893	FAZ-C32/2	32.0	C	44.71
70275894	FAZ-C40/2	40.0	C	51.26
70275895	FAZ-C50/2	50.0	C	62.32
70275896	FAZ-C63/2	63.0	C	62.32
70275897	FAZ-D0.5/2	0.5	D	51.26
70275898	FAZ-D1/2	1.0	D	51.26
70275899	FAZ-D2/2	2.0	D	51.26
70275900	FAZ-D3/2	3.0	D	51.26
70275901	FAZ-D4/2	4.0	D	51.26
70275902	FAZ-D5/2	5.0	D	51.26
70275903	FAZ-D6/2	6.0	D	44.71
70275904	FAZ-D7/2	7.0	D	44.71
70275905	FAZ-D8/2	8.0	D	44.71
70275906	FAZ-D10/2	10.0	D	44.71
70275907	FAZ-D13/2	13.0	D	44.71
70275908	FAZ-D15/2	15.0	D	44.71
70275909	FAZ-D16/2	16.0	D	44.71
70275910	FAZ-D20/2	20.0	D	44.71
70275911	FAZ-D25/2	25.0	D	44.71
70275912	FAZ-D30/2	30.0	D	44.71
70275913	FAZ-D32/2	32.0	D	44.71
70275914	FAZ-D40/2	40.0	D	51.26

3-Pole, Standard Package Breakers

Stock No.	Mfr.'s Type	Current Rating (A)	Trip Char. Curve	EACH
70275916	FAZ-B6/3	6.0	B	79.94
70275917	FAZ-B7/3	7.0	B	79.94
70275918	FAZ-B8/3	8.0	B	79.94
70275919	FAZ-B10/3	10.0	B	79.94
70275920	FAZ-B13/3	13.0	B	79.94
70275921	FAZ-B15/3	15.0	B	79.94
70275922	FAZ-B16/3	16.0	B	79.94
70275923	FAZ-B20/3	20.0	B	79.94
70275924	FAZ-B25/3	25.0	B	79.94
70275925	FAZ-B30/3	30.0	B	79.94
70275926	FAZ-B32/3	32.0	B	79.94
70275927	FAZ-B40/3	40.0	B	86.48
70275928	FAZ-B50/3	50.0	B	92.58
70275929	FAZ-B63/3	63.0	B	92.58
70275930	FAZ-C0.5/3	0.5	C	73.16
70275931	FAZ-C1/3	1.0	C	73.16
70275932	FAZ-C2/3	2.0	C	73.16
70275933	FAZ-C3/3	3.0	C	73.16
70275934	FAZ-C4/3	4.0	C	73.16
70275935	FAZ-C5/3	5.0	C	73.16
70275936	FAZ-C6/3	6.0	C	68.87
70275937	FAZ-C7/3	7.0	C	68.87
70275938	FAZ-C8/3	8.0	C	68.87
70275939	FAZ-C10/3	10.0	C	68.87
70275940	FAZ-C13/3	13.0	C	68.87
70275941	FAZ-C15/3	15.0	C	68.87
70275942	FAZ-C16/3	16.0	C	68.87
70275943	FAZ-C20/3	20.0	C	68.87
70275944	FAZ-C25/3	25.0	C	68.87
70275945	FAZ-C30/3	30.0	C	68.87
70275946	FAZ-C32/3	32.0	C	68.87
70275947	FAZ-C40/3	40.0	C	73.16
70275948	FAZ-C50/3	50.0	C	79.94
70275949	FAZ-C63/3	63.0	C	79.94
70274490	FAZ-D0.5/3	0.5	D	73.16
70275951	FAZ-D1/3	1.0	D	73.16
70274491	FAZ-D2/3	2.0	D	73.16
70275952	FAZ-D3/3	3.0	D	73.16
70275953	FAZ-D4/3	4.0	D	73.16
70275954	FAZ-D5/3	5.0	D	73.16
70275955	FAZ-D6/3	6.0	D	68.87
70275956	FAZ-D7/3	7.0	D	68.87
70275957	FAZ-D8/3	8.0	D	68.87
70275958	FAZ-D10/3	10.0	D	68.87
70275959	FAZ-D13/3	13.0	D	68.87
70275960	FAZ-D15/3	15.0	D	68.87
70275961	FAZ-D16/3	16.0	D	68.87
70275962	FAZ-D20/3	20.0	D	68.87
70275963	FAZ-D25/3	25.0	D	68.87
70275964	FAZ-D30/3	30.0	D	68.87
70275965	FAZ-D32/3	32.0	D	68.87
70275966	FAZ-D40/3	40.0	D	73.16

Accessories

Stock No.	Mfr.'s Type	Description	EACH
70275968	FAZ-XHIN11	Auxiliary Contact Module, 1NO/1NC, 230 VAC	24.84
70275970	FAZ-XAA-C-110-415VAC	Shunt Trip, 110-415 VAC/110-230 VDC	37.71
70275862	BB-UL-18/1P-1M/57	Busbar, 1-Pole, 57 Terminals, 80 A	37.84
70275915	BB-UL-18/2P-2M/56	Busbar, 2-Pole, 56 Terminals, 80 A	98.90
70275967	BB-UL-18/3P-3M/57	Busbar, 3-Pole, 57 Terminals, 80 A	148.13
70275950	BB-UL-EC/3	Busbar End Cap, Fork Connector, 2- and 3-Pole	.81
70275969	BB-UL-TE/50	Bus Incoming Supply Terminal, 14-1 AWG	17.73

S200P-K, 480Y/277 VAC
Supplemental protectors
UL 1077, CSA 22.2

K



S201P-K



S202P-K



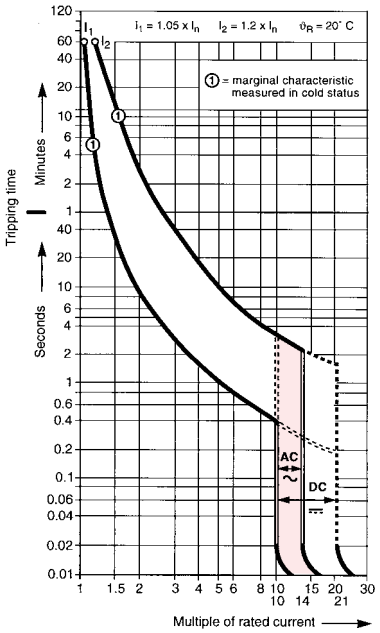
S203P-K

No. of poles	Rated current	Catalog number
1	0.2	**S201P-K0.2**
	0.3	**S201P-K0.3**
	0.5	**S201P-K0.5**
	0.75	**S201P-K0.75**
	1	**S201P-K1**
	1.6	**S201P-K1.6**
	2	**S201P-K2**
	3	**S201P-K3**
	4	**S201P-K4**
	6	**S201P-K6**
	8	**S201P-K8**
	10	**S201P-K10**
	13	**S201P-K13**
	16	**S201P-K16**
	20	**S201P-K20**
	25	**S201P-K25**
	32	**S201P-K32**
	40	**S201P-K40**
	50	**S201P-K50**
	63	**S201P-K63**
2	0.2	**S202P-K0.2**
	0.3	**S202P-K0.3**
	0.5	**S202P-K0.5**
	0.75	**S202P-K0.75**
	1	**S202P-K1**
	1.6	**S202P-K1,6**
	2	**S202P-K2**
	3	**S202P-K3**
	4	**S202P-K4**
	6	**S202P-K6**
	8	**S202P-K8**
	10	**S202P-K10**
	13	**S202P-K13**
	16	**S202P-K16**
	20	**S202P-K20**
	25	**S202P-K25**
	32	**S202P-K32**
	40	**S202P-K40**
	50	**S202P-K50**
	63	**S202P-K63**
3	0.2	**S203P-K0.2**
	0.3	**S203P-K0.3**
	0.5	**S203P-K0.5**
	0.75	**S203P-K0.75**
	1	**S203P-K1**
	1,6	**S203P-K1,6**
	2	**S203P-K2**
	3	**S203P-K3**
	4	**S203P-K4**
	6	**S203P-K6**
	8	**S203P-K8**
	10	**S203P-K10**
	13	**S203P-K13**
	16	**S203P-K16**
	20	**S203P-K20**
	25	**S203P-K25**
	32	**S203P-K32**
	40	**S203P-K40**
	50	**S203P-K50**
	63	**S203P-K63**

Tripping characteristic K
UL 1077
480Y/277 VAC
10 kA

Inductive loads
- K Curve
- Designed for allowing higher in-rush currents during system start up
- Example: motors, transformers

Accessories & technical data
Accessories – See page 15.26
Technical data – See page 15.76 - 15.82



Note: This breaker for AC use only

Ordering information

S8VK-G series

Type	Power ratings	Input voltage	Output voltage	Output current	Boost current	Size (W × H × D) [mm]	Order code
Power supply Single phase	15 W	100 to 240 VAC, 90 to 350 VDC	5 V	3 A	3.6 A	22.5 × 90 × 90	S8VK-G01505
			12 V	1.2 A	1.44 A		S8VK-G01512
			24 V	0.65 A	0.78 A		S8VK-G01524
	30 W		5 V	5 A	6 A	32 × 90 × 90	S8VK-G03005
			12 V	2.5 A	3 A		S8VK-G03012
			24 V	1.3 A	1.56 A		S8VK-G03024
	60 W		12 V	4.5 A	5.4 A	32 × 90 × 110	S8VK-G06012
			24 V	2.5 A	3 A		S8VK-G06024
	120 W		24 V	5 A	6 A	40 × 125 × 112.2	S8VK-G12024
	240 W		24 V	10 A	12 A	60 × 125 × 140	S8VK-G24024
			48 V	5 A	6 A		S8VK-G24048
	480 W		24 V	20 A	24 A	95 × 125 × 140	S8VK-G48024
			48 V	10 A	12 A		S8VK-G48048

S8VK-C series

Type	Power ratings	Input voltage	Output voltage	Output current	Boost current	Size (W × H × D) [mm]	Order code
Power supply Single phase	60 W	100 to 240 VAC, 90 to 350 VDC	24 V	2.5 A	-	32 × 90 × 110	S8VK-C06024
	120 W		24 V	5 A	-	40 × 125 × 112.2	S8VK-C12024
	240 W		24 V	10 A	-	60 × 125 × 140	S8VK-C24024
	480 W		24 V	20 A	-	95 × 125 × 140	S8VK-C48024

S8VK-T series

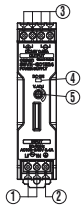
Type	Power ratings	Input voltage	Output voltage	Output current	Boost current	Size (W × H × D) [mm]	Order code
Power supply Three phase	120 W	380 to 480 VAC, 450 to 600 VDC	24 V	5 A	6 A	40 × 125 × 112.2	S8VK-T12024
	240 W		24 V	10 A	12 A	60 × 125 × 140	S8VK-T24024
	480 W		24 V	20 A	24 A	95 × 125 × 140	S8VK-T48024
	960 W	380 to 480 VAC	24 V	40 A	48 A	135 × 125 × 170	S8VK-T96024

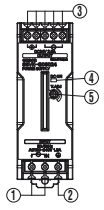
S8VK-R series

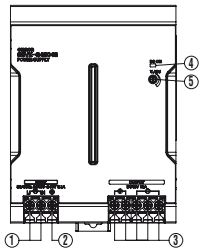
Type	Current ratings	Input voltage	Output current	Size (W × H × D) [mm]	Order code
Redundancy Module	10 A	5 to 30 VDC	10 A	32 × 90 × 110	S8VK-R10
	20 A	10 to 60 VDC	20 A	40 × 125 × 112.2	S8VK-R20

S8VK-G Nomenclature

15-W Models	30-W / 60-W / 120-W / 240-W Models	480-W Models
S8VK-G015□□	S8VK-G030□□/S8VK-G060□□/S8VK-G12024/S8VK-G240□□	S8VK-G480□□







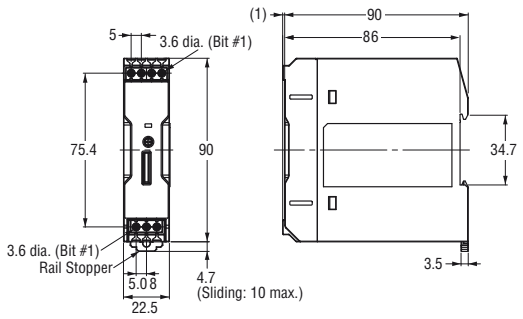
Note: The S8VK-G06024 is shown above.

No.	Name	Function
1	Input terminals (L), (N)	Connect the input lines to these terminals. *1
2	Protective Earth terminal (PE)	Connect the ground line to this terminal. *2
3	DC Output terminals (-V), (+V)	Connect the load lines to these terminals.
4	Output indicator (DC ON: Green)	Lights while a direct current (DC) output is ON.
5	Output voltage adjuster (V.ADJ)	Use to adjust the voltage.

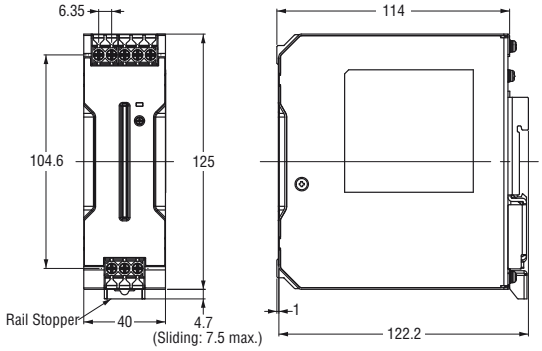
*1. The fuse is located on the (L) side. It is not user-replaceable. For a DC input, connect the positive voltage to the L terminal.
*2. This is the protective earth terminal specified in the safety standards. Always ground this terminal.

S8VK-G Dimensions

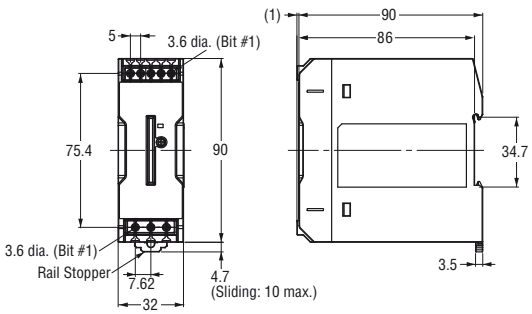
S8VK-G015□□ (15 W)



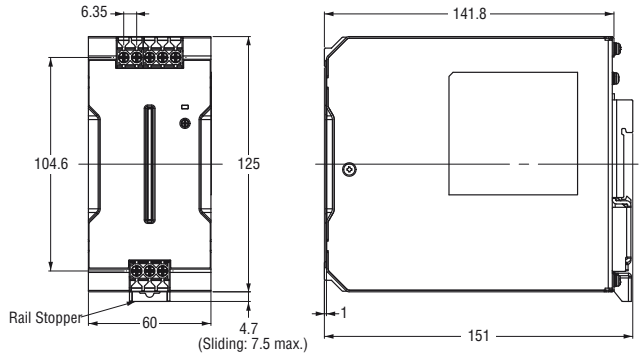
S8VK-G12024 (120 W)



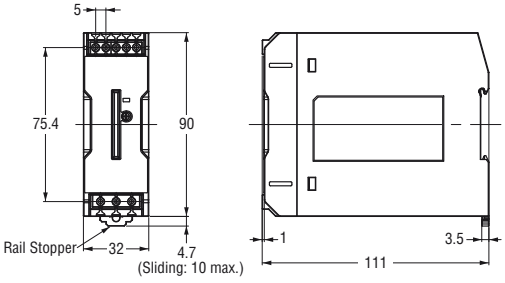
S8VK-G030□□ (30 W)



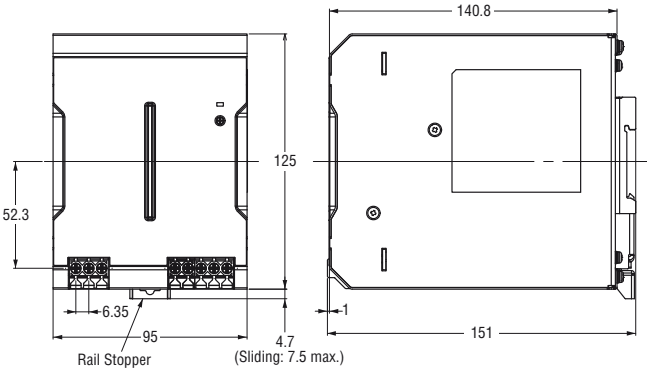
S8VK-G240□□ (240 W)



S8VK-G060□□ (60 W)



S8VK-G480□□ (480 W)



34 Series - Slim electromechanical PCB relays 6 A

Features

Ultra-slim 1 Pole - 6 A relay

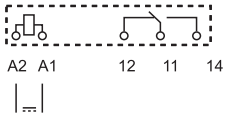
Printed circuit mount
- direct or via PCB socket
35 mm rail mount
- via screw or screwless sockets

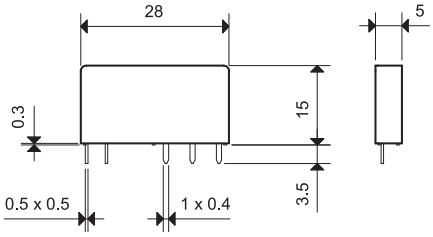
- 1 Pole changeover contacts or 1 Pole normally open contact
- Ultra slim, 5 mm, package
- Sensitive DC coil - 170 mW (Dual AC/DC coil drive possible using 93 series sockets)
- UL Listing (certain relay/socket combinations)
- Cadmium Free contact materials
- 8/8 mm clearance/creepage distance
- 6 kV (1.2/50 µs) insulation, coil-contacts

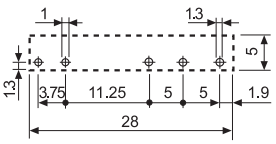
34.51



- 5 mm wide
- Low coil power
- PCB or 93 series sockets







FOR UL RATINGS SEE:
"General technical information" page V

Copper side view

Contact specification		
Contact configuration		1 CO (SPDT)
Rated current/Maximum peak current	A	6/10
Rated voltage/Maximum switching voltage	V AC	250/400
Rated load AC1	VA	1,500
Rated load AC15 (230 V AC)	VA	300
Single phase motor rating (230 V AC)	kW	0.185
Breaking capacity DC1: 30/110/220 V	A	6/0.2/0.12
Minimum switching load	mW (V/mA)	500 (12/10)
Standard contact material		AgNi
Coil specification		
Nominal voltage (U_N)	V AC (50/60 Hz)	—
	V DC	5 - 12 - 24 - 48 - 60
Rated power AC/DC	VA (50 Hz)/W	—/0.17
Operating range	AC	—
	DC	(0.7...1.5)U_N
Holding voltage	AC/DC	—/0.4 U_N
Must drop-out voltage	AC/DC	—/0.05 U_N
Technical data		
Mechanical life AC/DC	cycles	—/10 · 10^6
Electrical life at rated load AC1	cycles	60 · 10^3
Operate/release time	ms	5/3
Insulation between coil and contacts (1.2/50 µs)	kV	6 (8 mm)
Dielectric strength between open contacts	V AC	1,000
Ambient temperature range	°C	–40...+85
Environmental protection		RT II
Approvals (according to type)		

Ordering information

Electromechanical relay (EMR)

Example: 34 series slim electromechanical relay, 1 CO (SPDT) 6 A contacts, 24 V sensitive DC coil.

3 4	.	5	1	.	7	.	0 2 4	.	A 0	B 0	C 1	D 0

Series

Type
5 = Electromechanical type

No. of poles
1 = 1 pole, 6 A

Coil version
7 = Sensitive DC

Coil voltage
See coil specifications

A: Contact material
0 = Standard AgNi
4 = $AgSnO_2$
5 = AgNi + Au (5 µm)

B: Contact circuit
0 = CO (SPDT)
3 = NO (SPST)

C: Options
1 = None

D: Special versions
0 = Flux proof (RT II)
9 = Flat version

Selecting features and options: only combinations in the same row are possible.
Preferred selections for best availability are shown in **bold.**

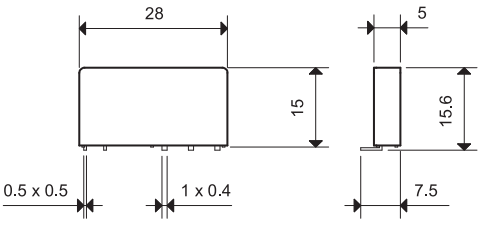
Type	Coil version	A	B	C	D
34.51	sens. DC	**0** - 4 - 5	**0** - 3	**1**	**0**
34.51	sens. DC	0 - 4 - 5	0	1	9

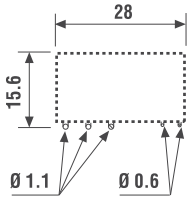
Flat pack version



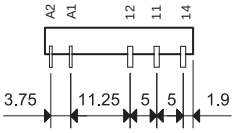
Option = 34.51.7xxx.x019

Environmental protection RT I

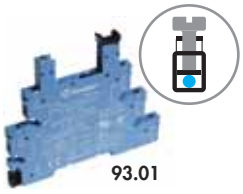




Copper side view



93 Series - Sockets and accessories for 34 series relays



93.01

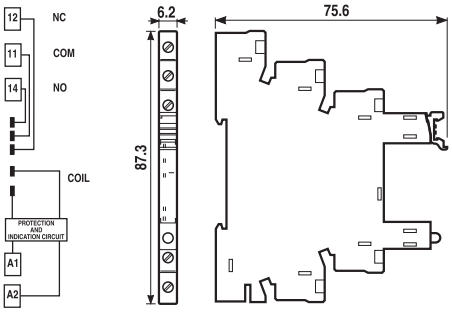
Approvals (according to type):

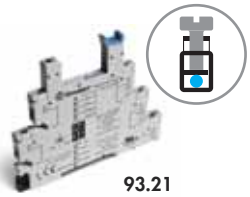
Certain relay/socket combinations

Screw terminal socket 35 mm (EN 60715) mounting

Supply voltage	Relay type	Socket type
12 V AC/DC	34.51.7.012.xx10	93.01.0.024
24 V AC/DC	34.51.7.024.xx10	93.01.0.024
48 V AC/DC	34.51.7.048.xx10	93.01.0.060
60 V AC/DC	34.51.7.060.xx10	93.01.0.060
(110...125)V AC/DC	34.51.7.060.xx10 or 34.81.7.060.xxxx	93.01.0.125
(220...240)V AC/DC	34.51.7.060.xx10 or 34.81.7.060.xxxx	93.01.0.240
(110...125)V AC/DC*	34.51.7.060.xx10 or 34.81.7.060.xxxx	93.01.3.125*
(220...240)V AC*	34.51.7.060.xx10 or 34.81.7.060.xxxx	93.01.3.240*
(220...240)V AC	34.51.7.060.xx10 or 34.81.7.060.xxxx	93.01.8.240
6 V DC	34.51.7.005.xx10 or 34.81.7.005.xxxx	93.01.7.024
12 V DC	34.51.7.012.xx10	93.01.7.024
24 V DC	34.51.7.024.xx10 or 34.81.7.024.xxxx	93.01.7.024
48 V DC	34.51.7.048.xx10	93.01.7.060
60 V DC	34.51.7.060.xx10 or 34.81.7.060.xxxx	93.01.7.060
Accessories		
20-way jumper link	093.20 (see specification next page)	
Plastic separator	093.01 (see specification next page)	
Sheet of marker tags	093.64 (see specification next page)	
Technical data		
Rated values	6A - 250 V	
Dielectric strength	6 kV (1.2/50 µs) between coil and contacts	
Protection category	IP 20	
Ambient temperature	(–40...+70)°C ($U_N \leq$ 60 V), (–40...+55)°C ($U_N >$ 60 V)	
Screw torque Nm	0.5	
Wire strip length mm	10	
Max. wire size for 93.01 socket	solid wire	stranded wire
mm²	1x2.5 / 2x1.5	1x2.5 / 2x1.5
AWG	1x14 / 2x16	1x14 / 2x16

* Leakage current suppression.



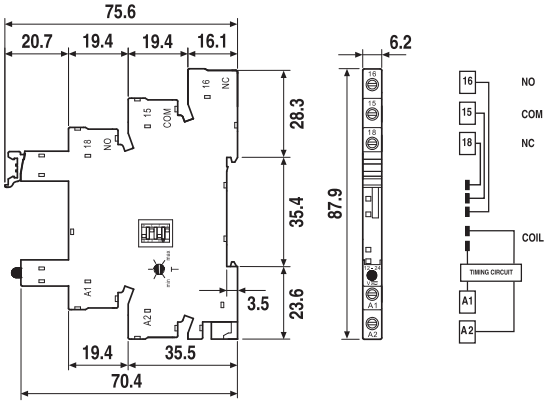


93.21

Approvals (according to type):

Slim timed socket for 34 series (refer to 38 series data sheet for technical data)

Output	Supply voltage	Type of relay	Type of socket
1 pole 6A, electromechanical relay	12 V AC/DC	34.51.7.012.0010	93.21.0.024
1 pole 6A, electromechanical relay	24 V AC/DC	34.51.7.024.0010	93.21.0.024
1 output 2A 24 V DC, solid state relay	24 V AC/DC	34.81.7.024.9024	93.21.0.024
1 output 2A 240 V AC, solid state relay	24 V AC/DC	34.81.7.024.8240	93.21.0.024



TW Series — 22mm NEMA Style Pushbuttons



Key features:

- TW NEMA Style Switches with snap-on contacts
- Corrosion resistant octagonal chrome plated locking bezel
- Snap-on 10A contact blocks
- Incandescent or LED illumination
- Slow make, double break, self cleaning contacts
- Modular construction for maximum flexibility
- NEMA 4X and IP65 watertight/oiltight panel
- Available assembled or as sub-components
- Large M3.5 screw terminals with captive sems plate

IDEC has your 22mm switching needs covered.

Button styles include flush, extended, mushroom, or square and all bodies are crafted from fracture-resistant nylon.

All illuminated units feature two lens styles, one that maximizes light dispersion, the other accommodates direct lens engraving.

Self cleaning contact mechanisms allow for a wide current rating, 5mA to 10A, which reduces the need for various contact materials.

When looking for a 22mm switch that is durable, easy to use, and versatile, then IDEC's TW series is your solution.

UL Listed
File No. E68961

TÜV Rheinland

CSA Approved
File No. LR21451

File No. DK95-01696

Specifications

Conforming to Standards	EN60947-1, EN60947-5-1, VDE0660-200, UL508, CSA C22-2 No.14
Approvals File No. E68961 File No. LR21451 Certificate No. 2030010305027380 TÜV Rheinland Registration No: J9551802 (E-Stops) Registration No: J9551803 (All other switches) Registration No: J9551804 (Pilot Lights)	**CSA:** pushbuttons and selector switches: A600 pilot lights and illuminated pushbuttons, direct supply pilot lights and illuminated pushbuttons with integral transformer (100/110, 115, 120, 200/220, 230, 240, 380, 400/440, 480V) **UL:** pushbuttons and selector switches: A600 pilot lights and illuminated pushbuttons, direct supply pilot lights and illuminated pushbuttons with integral transformer (100/110, 115, 120, 200/220, 230, 240, 380, 400/440, 480V) **TÜV:** pushbuttons and selector switches: A600=P600 (NO, NC)/Q600 (NO-EM, NC-LB) pilot lights and illuminated pushbuttons, direct supply pilot lights and illuminated pushbuttons with integral transformer (100/110, 115, 120, 200/220, 230, 240, 380, 400/440, 480V)
Operating Temperature	Operation: –25 to +50°C (without freezing), Storage: –40 to +80°C (without freezing)
Vibration Resistance	5 to 55Hz, 100m/sec^2 (10g) conforming to IEC6068-2-6
Shock Resistance	1000m/sec^2 (100g) conforming to IEC6068-2-7
Electric Shock Protection	Class 0 conforming to IEC60536
Degree of Protection (conforming to IEC60529) (conforming to NEMA ICS6-110)	IP65 from front of the panel; (IP54 for key switches) IP20 (Type HW-F contact block) Type 1, 2, 3, 3R, 3S, 4, 4X, 5, 12, 13 (Type 1, 2, 3R, 5, 12, 13 for key switches)
Mechanical Life	Momentary pushbuttons: 5,000,000 (900 operations per hour) All other switches: 500,000
Pollution Degree (conforming to IEC60947-1)	3 for switches not using a transformer, 2 for switches using a transformer
Rated Operational Characteristics	AC-15: A600 or Ue = 250V, Ie = 3A (NO, NC, NO-EM, NC-LB) DC-13: P600 or Ue = 125V, Ie = 1.1A (NO, NC) DC-13: Q600 or Ue = 125V, Ie = 0.9A (NO-EM, NC-LB)
Rated Insulation Voltage	600V
Rated Switching Over-Voltage	Less than 4kV, conforming to IEC60947-1
Rated Impulse Withstanding Voltage	4kV for contact circuit, 2.5kV for lamp circuit
Rated Thermal Current	10 Amp
Minimum Switching Capacity	5 mA at 3V AC/DC
Contact Operation	Slow break NC or slow make NO, self-cleaning
Recommended Terminal Torque	0.8 N m (7.1 in lb.)
External Short-Circuit Protection	10A 250V fuse conforming to IEC60269-1
Applicable Wire Size	Minimum 1 x 22 AWG, max. 2 x 14 AWG or 1 x 12 AWG
Contact Resistance	Initial contact resistance of 50mΩ or less
Contact Gap	4mm (NO and NC), 2mm (NO-EM and NC-LB)
Electrical Reliability	MTBF < 1 fault for 10 million operation cycles (3V DC, 5mA)
Lamp Ratings	Incandescent: 1 W LEDs: 6V: 17mA max, 12/24V: 11mA max, 120/240V: 10mA max
Horsepower Rating	1/4 HP @ 120V (single-phase, non-reversing motor); 1 HP @ 240V (3 phase, non-reversing motor)
Maximum Inrush Current	40 A (40 ms)
Contact Material	Silver

Contact Ratings

Pushbuttons
Illuminated Pushbuttons
Selector Switches
Illuminated Selector Switches
Pushbutton Selectors

Contact Block	Type HW-C/HW-F
Rated Insulation Voltage	600V
Rated Continuous Current	10A
Contact Ratings by Utilization Category IEC 60947-5-1	AC-15 (A600) DC-13 (P600)

Characteristics

Contact Ratings by Utilization Category

Operational Voltage			24V	48V	50V	110V	220V	440V
Operational Current	AC50/60Hz	AC-12 Control of resistive loads and solid state loads	10A	—	10A	10A	6A	2A
		AC-15 Control of electromagnetic loads (> 72VA)	10A	—	7A	5A	3A	1A
	DC	DC-12 Control of resistive loads and solid state loads	8A	5A	—	2.2A	1.1A	—
		DC-13 Control of electromagnets	5A	2A	—	1.1A	0.6A	—

Pilot Lights (Assembled)



Alarm pilot lights: AP_W2_99DR24V
Sparge enable pilot light: AP_W2_99DG24V

Assembled Pilot Lights

A P (Q) W 1 (B) (99) (D) – R – (24V)

Function

P: Pilot Light

Bezel Shape

Blank: Octagonal (round lenses)
Q: Square

Series Designation

W: TW Series

Lens Shape

1: Flat
2: Dome

Lens Type

Blank: Standard (ribbed)
B: Engravable (smooth with insert included)

Illumination Circuit

99: Full Voltage (lamp determines voltage)
126: 120V AC Step Down Transformer
246: 240V AC Step Down Transformer
486: 480V AC Step Down Transformer

Lamp Voltage
(Full Voltage Units Only)

6V: 6V AC/DC
12V: 12V AC/DC
24V: 24V AC/DC
120V: 120V AC (LED only)
240V: 240V AC (LED only)

Lens Color Code

A: Amber
G: Green
R: Red
S: Blue
W: White
Y: Yellow

Lamp Type

Blank: Incandescent
D: LED

1. Use only when interpreting part numbers. Do not use for developing part numbers.
2. All transformers step down to 6V.

Non-Illuminated Selector Switches (Assembled)



HOA & Test Lights/Reset switches: ASW33L11N

Assembled Selector Switches

A S W 3 (1) (L) 20 (N) – 304

Function

S: Selector Switch

Series Designation

W: TW Series

Number of Positions

2: 2-Position
3: 3-Position
4: 4-Position
5: 5-Position

Spring Return Action

Blank: Maintained
1: Spring return from Right (2 or 3 position)
2: Spring return from Left (2 or 3 position)
3: 2-Way spring return from Left and Right (3 position only)

Circuit Number

(Standard circuits shown on following pages and 669.)

Contacts Terminal Style

Blank: standard
N: Fingersafe (IP20)

Contact Arrangement Code

10: 1NO	01: 1NC
20: 2NO	02: 2NC
40: 4NO	04: 4NC
11: 1NO-1NC	22: 2NO-2NC

Operator Style Code

Blank: Knob Operator
L: Lever Operator
K: Key Operator

1. Use only when interpreting part numbers. Do not use for developing part numbers.
2. Custom contact configurations available.
3. Custom key removable codes available.
4. Portions of part number inside ( ) are optional.

Hour Meter #700QN001O48150D100230A

SOLID STATE HOUR METERS & COUNTERS

700 SERIES

CURTIS



DESCRIPTION

The Curtis 700 Series are highly reliable solid state hour meters and counters that offer an unprecedented combination of patented technology, performance, reliability and value.

MODEL 700: 2-Wire Hour Meter, displays only when powered. Available in AC/DC.

MODEL 701: 3-Wire Hour Meter, has a provision or continuous display. Available in AC/DC and DC-only.

MODEL 703: Pulse Counter. Available in AC/DC and DC-only.

APPLICATIONS

A wide variety of industrial and commercial applications, including scheduled maintenance, warranty and leasing – for medical equipment, transport and industrial vehicles and other industrial equipment.

FEATURES

- All-8's LCD function test: each digit displays an eight for one second after power-up.
- Attractive 6-digit LCD 5mm or 7mm high digits (7mm with optional backlighting) are much easier to read than electro-mechanical meters, which have only 3mm high digits.
- Silent operation – no moving parts. Eliminates annoying gear and motor noise.
- Exceptional reliability due to nonvolatile memory (EEPROM) which retains data for 25+ years.
- Wide voltage ranges, for example, one unit can be powered from 75 to 270 VAC anywhere between 48 and 440 Hz – ideal for distribution and worldwide markets without having to stock multiple model types.
- Electrical reset (optional).
- Available in ten case styles – all fit in standard hour meter/counter cutouts.
- Multiple mountings available – Metal U-bracket, "U" clamp/stud (D, Q, R and S cases), flange mount with hardware (F, G, J cases), or mounting clip (G, L, Y, Z, cases).
- Backlit units allow external illumination control, i.e., on/off or dimmer (12VDC only).
- Flashing hourglass icon indicates when the hour meter is accumulating time.
- Memory will arm only when power has been applied for five seconds (with no loss of time or counts).
- Low power consumption.
- UL and CE recognized.

CURTIS INSTRUMENTS, INC.
200 KISCO AVENUE
MT. KISCO, NY 10549 USA
TEL (914) 666-2971
FAX (914) 666-2188

CURTIS INSTRUMENTS, (UK) LTD.
5 UPPER PRIORY STREET
NORTHAMPTON NN1 2PT, ENGLAND
TEL 44 (0) 1604-629755
FAX 44 (0) 1604-629876

CURTIS INSTRUMENTS INDIA PRIVATE LTD.
1199, GHOLE ROAD
PUNE 411004, INDIA
TEL 91 (0) 20-5531288
FAX 91 (0) 20-5539192

www.curtisinstruments.com

SPECIFICATIONS

Case Style	Bezel Shape	Lens Material	Case Material	IP Rating Front/Rear	Termination	UL[5]/CE	Suggested Panel Cutout mm
D	Rectangular	Acrylic	ABS	65/50	3/16" Spade	Yes	45.0 x 22.2
F	Hexagonal	Acrylic	ABS	65/65	1/4" Spade	Yes	36.8 x 24.1
G	Hexagonal	Acrylic	ABS	65/651	Packard (2 pin) 2	Yes	36.8 x 24.1
J	Hexagonal	Acrylic	ABS	65/651	Packard (4 pin) 3	Yes	36.8 x 24.1
L	Rectangular	Polycarbonate	Polycarbonate	65/40	Molex 4	Yes	36.8 x 24.1
Q	Round	Glass	Polycarbonate	65/506	1/4" Spade	Yes	ø52 (ø2-1/16)
R (5mm display)	Round	Glass	Polycarbonate	65/506	3/16" Spade	Yes	ø52 (ø2-1/16)
R (7mm display)	Round	Glass	Polycarbonate	65/50	1/4" Spade	Yes	ø52 (ø2-1/16)
S	Square	Glass	ABS	52/50	1/4" Spade	Yes	45.0 x 45.0
Y	Rectangular	Acrylic	ABS	65/651	Packard (4 pin) 3	Yes	36.8 x 24.1
Z	Rectangular	Acrylic	ABS	65/65	1/4" Spade	Yes	36.8 x 24.1

Display	6 digit LCD, 5 or 7mm high
Range & Resolution	Hour meters: 99,999.9 hours Counters: 999,999 counts
Accuracy	Hour meters: 0.1% Counters: ±1 count
Humidity	95%, non-condensing at 38°C
Operating Temperature	-40°C to +85°C
Storage Temperature	-50°C to +85°C
Mechanical Shock	SAE J 1378, 55g
Mechanical Vibration	SAE J 1378, 20g
Operating Frequency (AC powered units)	48 to 440 Hz
Memory	Main power must be applied for 5 seconds to arm memory (with no loss of time/counts). EEPROM, data retained for 25+ years without power.
Current Consumption (Power Terminals)	0.5mA max. @ 5VDC (0512D models) 0.8mA max. @ 12VDC (1248D models) 1.0mA max. @ 120VAC 2.0mA max. @ 230VAC
Input Signal (DC-only)	Counters (703 only): 500 Hz. max., 50% duty cycle (1ms low, min., between consecutive highs)
Input Signal (AC/DC)	Hour meters (701 only): Power must be applied for 0.5s, min., to accumulate time. Counters (703 only): 1 Hz. max., 50% duty cycle (500ms low, min., between consecutive highs)
Reset	5ms min. at operating voltage. Main power must be applied for a minimum of 250ms prior to reset signal.

NOTES:
1. Mating connector must be installed.
2. Equivalent to Delphi-Packard connector P/N 12162000 2-pin.
3. Equivalent to Delphi-Packard connector P/N 15336035 4-pin.
4. Equivalent to Molex connector P/N 43045-0412.
5. UL files AU1841 and E45175.
6. R(5mm) and Q housings also available in a 65/65 version (see model encodement).

MODEL ENCODING

700 MODEL	R Case Style	R Resetability	001 Additional Feature	O Logo*	0512D0612A Operating Voltage
700 = (2-wire hour meter, AC/DC only) 701 = (3-wire hour meter, AC/DC or DC-only 703 = (3-wire counter, AC/DC or DC-only)	D F G[1] J L[2] Q R S Y Z	R = Electrically	001 = 5mm, non-backlit display (Standard) 091 = Epoxy filled unit (moisture resistant, Q, R (5mm), cases only) 601 = 7mm, backlit display (R or S case only) 701 = 7mm, non-backlit display (R or S case only)	O = Curtis Logo N = No Logo	0512D = 5-12VDC nom., 4.75-15VDC abs. 1248D = 12-48VDC nom., 9-60VDC abs. 48150D = 48-150VDC nom., 36-185VDC abs. 0512D0612A = 5-12VDC nom., 4.75-15VDC abs. 6-12VAC nom., 5-15VAC abs. 1248D2060A = 12-48VDC nom., 9-60VDC abs. 20-60VAC nom., 15-75VAC abs. 48150D100230A = 48-150VDC nom., 36-185VDC abs. 100-230VAC nom., 75-270VAC abs.

1. Only model offered: 700GN001N1248D2060A
2. Only models offered: 700LN001N1248D2060A, 700LN001N48150D100230A and 701LN001N1248D

* Custom logos are available
Backlight available on 7mm R or S cases only.

WIRING GUIDE

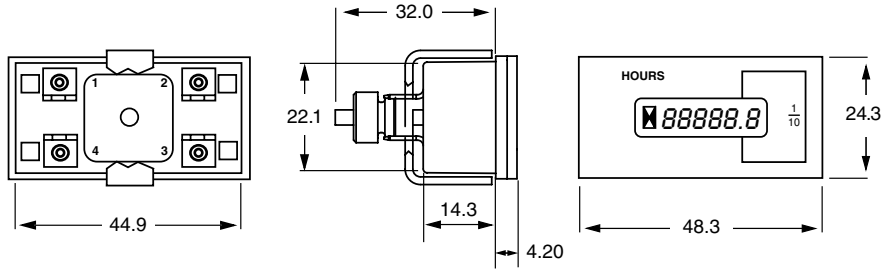
Case Style	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6
D, F, J,Q, R (5mm), Y & Z	V+	V-	I	R	N/A	N/A
G	V+	V-	N/A	N/A	N/A	N/A
L	V+	V-	I	N/A	N/A	N/A
R (7mm), S	V+	V-	R	I	L	N/A

V+ Operating voltage
V- Common (ground)
I Enable (Optional, use operating voltage to power this pin to record elapsed time (701) or increment count (703).)
R Reset (Optional, supply with operating voltage when unit is to be reset to 0.)
L Lighting control (Optional, 9-15VDC absolute only, regardless of operating voltage.)
NC No connection

DIMENSIONS IN MM

Case Style D

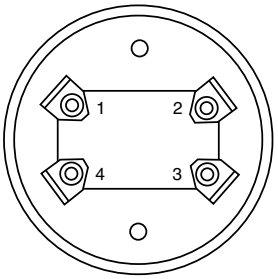


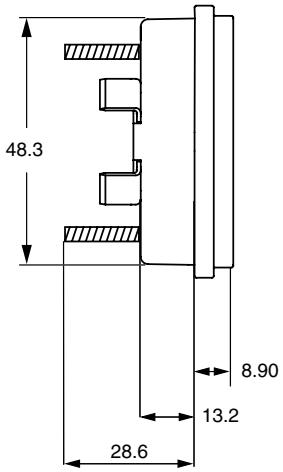


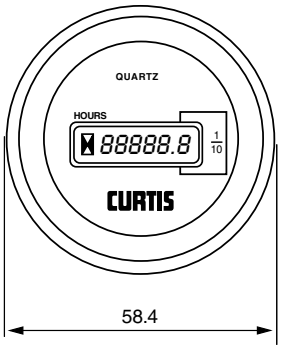
DIMENSIONS IN MM

Case Style Q



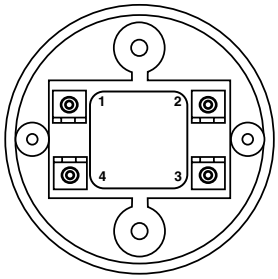


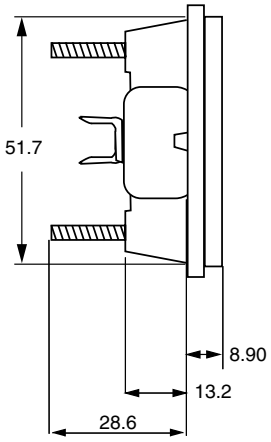


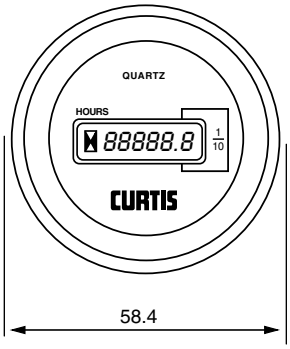


Case Style R (5mm)



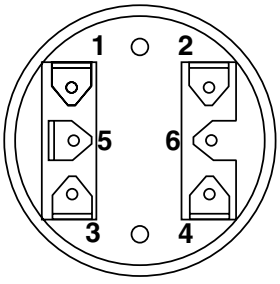


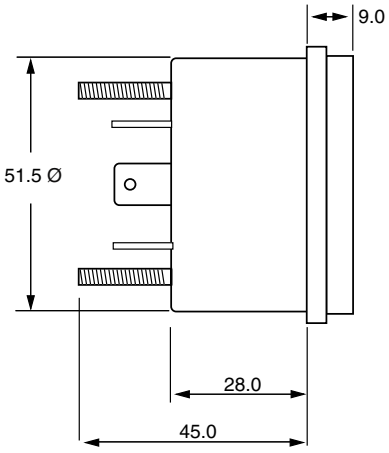


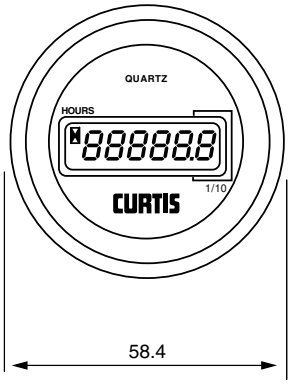


Case Style R (7mm)



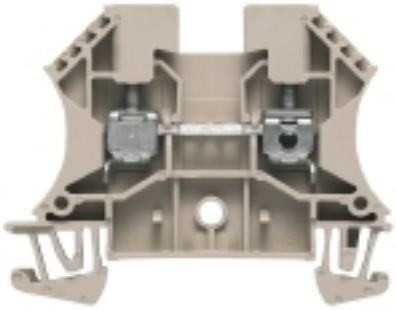






W-Series
WDU 4

Weidmüller Interface GmbH & Co. KG
Klingenbergstraße 16
D-32758 Detmold
Germany
Fon: +49 5231 14-0
Fax: +49 5231 14-292083
www.weidmueller.com



The versatile and extensive range of products - from 0.05 mm² to 300 mm² - means that you have diverse options for your applications at your disposal.
Hardened steel for mechanical strength and high-quality tinned copper for optimum conductivity. All materials comply with RoHS requirements and have been tested to current environment guidelines.

General ordering data

Type	WDU 4
Order No.	1020100000
Version	W-Series, Feed-through terminal, Rated cross-section: 4 mm², Screw connection
GTIN (EAN)	4008190150617
Qty.	100 pc(s).

W-Series
WDU 4

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www.weidmueller.com

Technical data

Dimensions and weights

Width	6.1 mm	Height	60 mm
Height of lowest version	47 mm	Depth	46.5 mm
Weight	9 g	Net weight	9.57 g

Temperatures

Continuous operating temp., min.	-50 °C	Continuous operating temp., max.	120 °C

Rated data IECEx/ATEX

Certificate No. (ATEX)	KEMA98ATEX1683U	ATEX certificate	KEMA98ATEX1683U_d.pdf
ATEX certificate	KEMA98ATEX1683U_e.pdf	IEC Ex certificate	IECEXULD05.0008U_e.pdf
Max. voltage (ATEX)	690 V	Current (ATEX)	28 A
Wire cross section max. (ATEX)	4 mm²	Voltage, cross-connection	CrossConnectionGuide.pdf
Operating temperature range	For operating temperature range see EC Design Test Certificate / IEC Ex-Certificate of Conformity	Marking EN 60079-7	Ex e II
Marking ATEX Directive 94/9/EC	II 2 G D		

2 clampable wires (H05V/H07V) same cross-section (rated connection)

Wire connection cross section, finely stranded, two clampable wires, min.	0.5 mm²	Wire cross-section, finely stranded, two clampable wires, max.	1.5 mm²
Wire connection cross section, finely stranded with wire-end ferrules DIN 46228/1, 2 clampable wires, min.	0.5 mm²	Wire connection cross section, finely stranded with wire-end ferrules DIN 46228/1, 2 clampable wires, max.	1.5 mm²

Additional technical data

Explosion-tested version	Yes	Number of similar terminals	1
Open sides	right	Type of mounting	Snap-on
Version	Screw connection, for plug-in cross-connector, for screwable cross-connection, One end without connector		

CSA ratings data

Certificate No. (CSA)	200039-1057876	Voltage size C (CSA)	600 V
Current size B (CSA)	35 A	Current size C (CSA)	35 A
Wire cross section max. (CSA)	10 AWG	Wire cross section min. (CSA)	26 AWG

Weidmüller

W-Series
WDU 4

Weidmüller Interface GmbH & Co. KG
Klingenbergstraße 16
D-32758 Detmold
Germany
Fon: +49 5231 14-0
Fax: +49 5231 14-292083
www.weidmueller.com

Technical data

Clampable wires (rated connection)

Type of connection	Screw connection	Stripping length	10 mm
Blade size	0.6 x 3.5 mm	Connection direction	on side
Number of connections	2	Clamping range, rated connection, min.	0.13 mm²
Clamping range, rated connection, max.	6 mm²	Clamping screw	M 3
Tightening torque, min.	0.5 Nm	Tightening torque, max.	1 Nm
Torque level with DMS electric screwdriver	2	Gauge to IEC 60947-1	A4
Wire connection cross section, solid core, min. rated connection	0.5 mm²	Wire connection cross section, solid core max. rated connection	6 mm²
Wire connection cross section, stranded, rated connection, min.	1.5 mm²	Wire connection cross section, stranded, rated connection, max.	6 mm²
Wire connection cross section, finely stranded, max.	6 mm²	Wire connection cross-section, finely stranded, min.	0.5 mm²
Wire connection cross section, finely stranded with wire-end ferrules DIN 46228/1, rated connection, min.	0.5 mm²	Wire connection cross section, finely stranded with wire-end ferrules DIN 46228/1, rated connection, max.	4 mm²
Cross-section for connected conductor, finely stranded with wire-end ferrules and plastic collars DIN 46228/4, rated connection, min.	0.5 mm²	Wire connection cross-section, finely stranded with wire-end ferrules and plastic collars DIN 46228/4, rated connection, max.	4 mm²
Twin wire-end ferrules, min.	0.5 mm²	Twin wire-end ferrules, max.	2.5 mm²
Wire connection cross section AWG, min.	AWG 26	Wire connection cross section AWG, max.	AWG 10

Rated data

Rated cross-section	4 mm²	Rated voltage	800 V
Rated impulse withstand voltage	8 kV	Rated current	32 A
Current at maximum wires	41 A	Standards	IEC 60947-7-1
Pollution severity	3		

UL ratings data

Certificate No. (UR)	E60693	Voltage size C (UR)	600 V
Current size C (UR)	35 A	Conductor size Factory wiring max. (UR)	10 AWG
Conductor size Factory wiring min. (UR)	26 AWG	Conductor size Field wiring max. (UR)	10 AWG

Material data

Material	Wemid	Colour	Dark Beige
UL 94 flammability rating	V-0		

System specifications

Product family	W-Series	Type of connection	Screw connection
Connection direction	on side	Number of levels	1
Number of connections	2	No. of clamping points per level	2
Number of potentials per level	1	Levels cross-connected internally	No
Mounting rail	TS 35	End cover plate required	Yes
PE connection	No		

Classifications

ETIM 3.0	EC000897	UNSPSC	30-21-18-11
eClass 5.1	27-14-11-20	eClass 6.2	27-14-11-20
eClass 7.1	27-14-11-20		

HAMMOND MANUFACTURING

Quality Products. Service Excellence.

Type 4X Aluminum Wallmount Enclosure *1418 N4 AL Series*

Continuous Hinge Door with Clamps



Inner Panel Included

Application

- Designed for use as instrument enclosures, electric, hydraulic or pneumatic control housings, electrical junction boxes or terminal wiring enclosures.
- Provides protection where equipment may be hosed down or otherwise be very wet, or in specific applications where corrosion may be a problem.

Standards

- UL 508 Type 4, 4X, 12 and 13
- CSA Type 4, 4X, 12 and 13
- Complies with
  - NEMA Type 4, 4X, 12 and 13
  - JIC EGP-1-1967
  - IEC 60529, IP66

Construction

- Formed from 0.081" (Body) / 0.100" (Door) Type 5052 H-32 aluminum.
- Smooth, continuously welded seams without knockouts, cutouts or holes.
- Door and body stiffeners are provided in the larger enclosures for extra rigidity.
- Welded brackets provide for enclosure mounting.
- Formed lip on door and enclosure excludes flowing liquids and contaminants.
- Aluminum continuous hinge on door may be removed by pulling the aluminum hinge pin.
- Door is secured with easily operated aluminum clamps.
- Provision for padlocking.
- Seamless poured-in place gasket.
- A removable 12 gauge steel inner panel is included.
- Collar studs are provided for mounting inner panels.
- A bonding stud is provided on the door and a grounding stud is provided in the enclosure.
- A literature pocket is provided for the inside of the door.

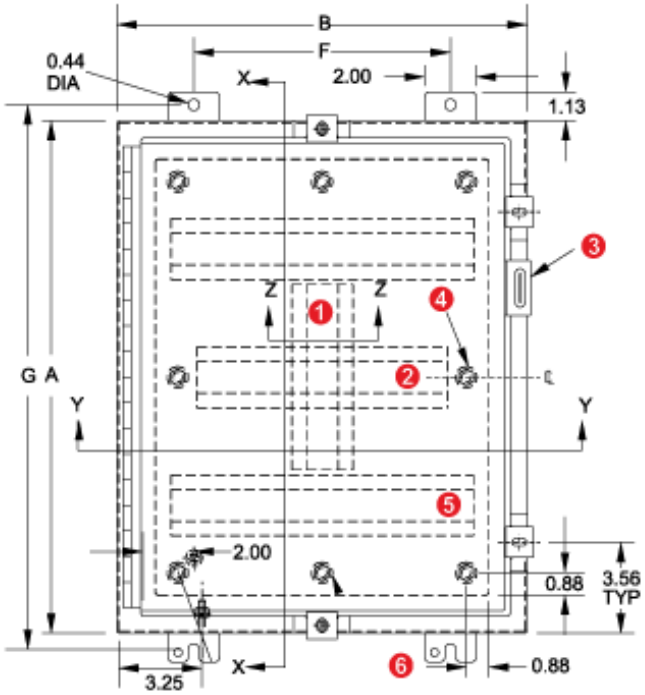
Finish

- Cover and enclosure are natural unfinished aluminum.
- Removable inner panel is finished in white powder coating.

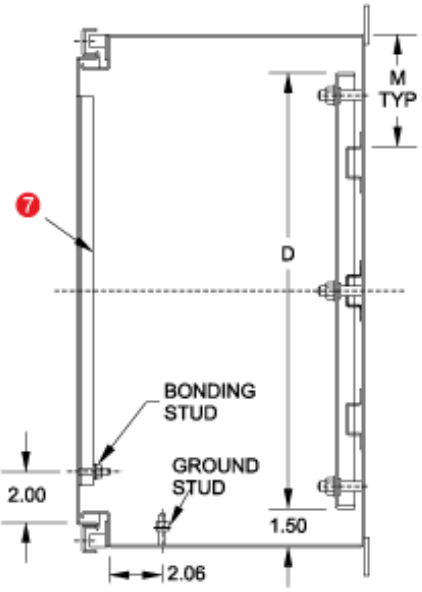
Accessories

- Inner Panels
- Ventilation
- Lock kit
- Door Stop Kit
- Heaters
- Terminal Kits

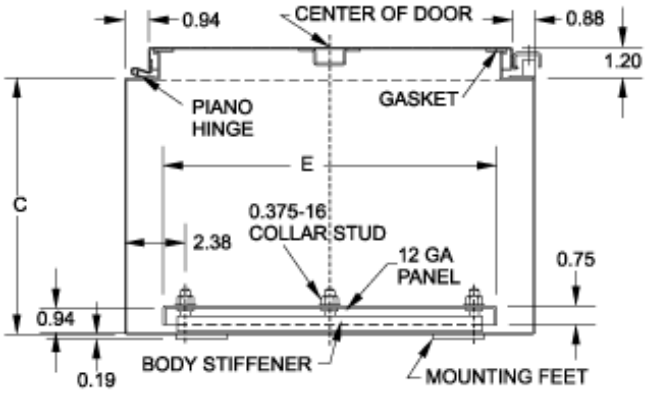
- Temperature Controls
- Ground Wire Kits
- Window Kits



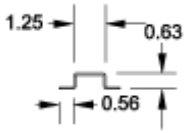
Front View



Side View



Section Y-Y



Section Z-Z

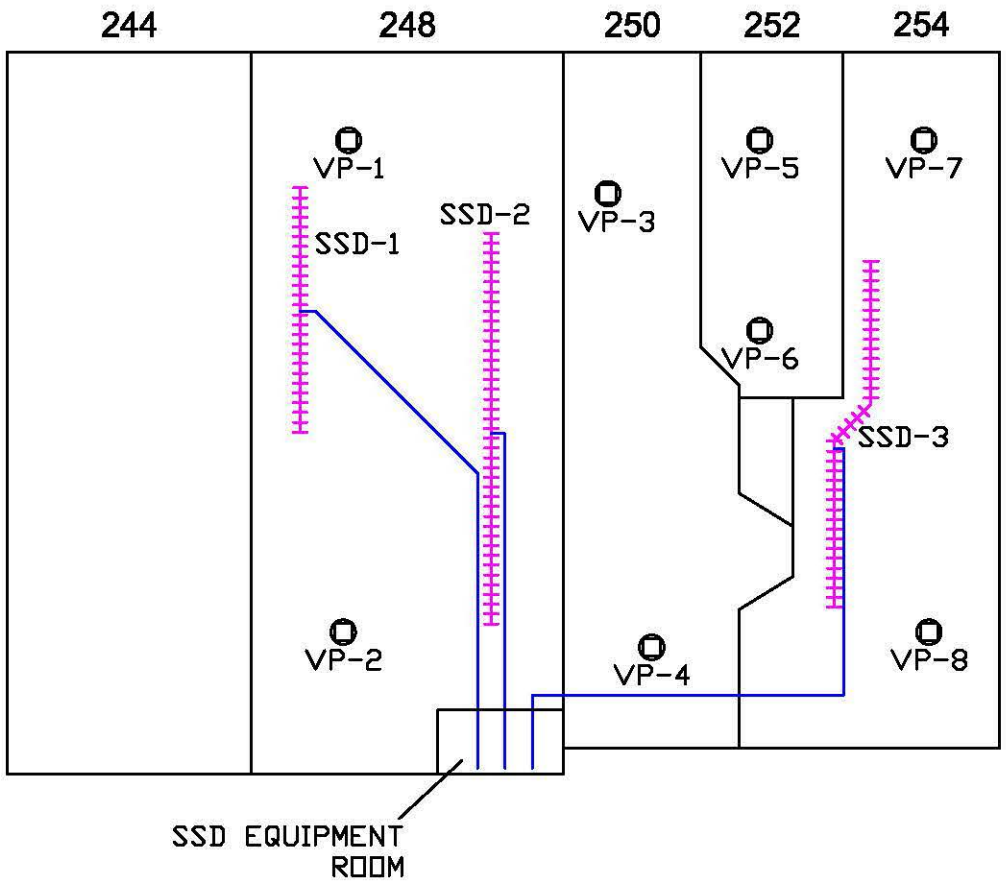
1. Vertical stiffener required on KK and M only.
2. Omit center body stiffener if A is less than 41".
3. Padlocking hasp and staple.
4. Omit 2 middle studs if A is less than 31".
5. Omit body stiffeners if A or B is less than 23".
6. Omit 2 middle studs if B is less than 31".
7. Omit door stiffener if A or B is less than 31".

When A=	M=
30.00	7.00
36.00	9.00
42.00	9.88
48.00	11.38
60.00	14.38

				Panel Size		Mounting Centers		Ship Wt.
Part No.	A	B	C	D	E	F	G	lbs
1418N4ALB6	16.00	12.00	6.00	13.00	9.00	9.50	17.25	14
1418N4ALC6	20.00	16.00	6.00	17.00	13.00	10.00	21.25	16
1418N4ALE6	24.00	20.00	6.00	21.00	17.00	14.00	25.25	21
1418N4ALJ8	24.00	24.00	8.00	21.00	21.00	18.00	25.25	26
1418N4ALK8	30.00	24.00	8.00	27.00	21.00	18.00	31.25	39

4. System Drawings

FLATBUSH AVE.



LEGEND:

= SSD EXTRACTION LATERAL

= SSD EXTRACTION PIPING

= VACUUM INFLUENCE POINT

0 FT 20

APPROX. SCALE

DRAWN/REVISED BY: JW

REVISION DATE: MARCH 10, 2017

FIGURE: 1

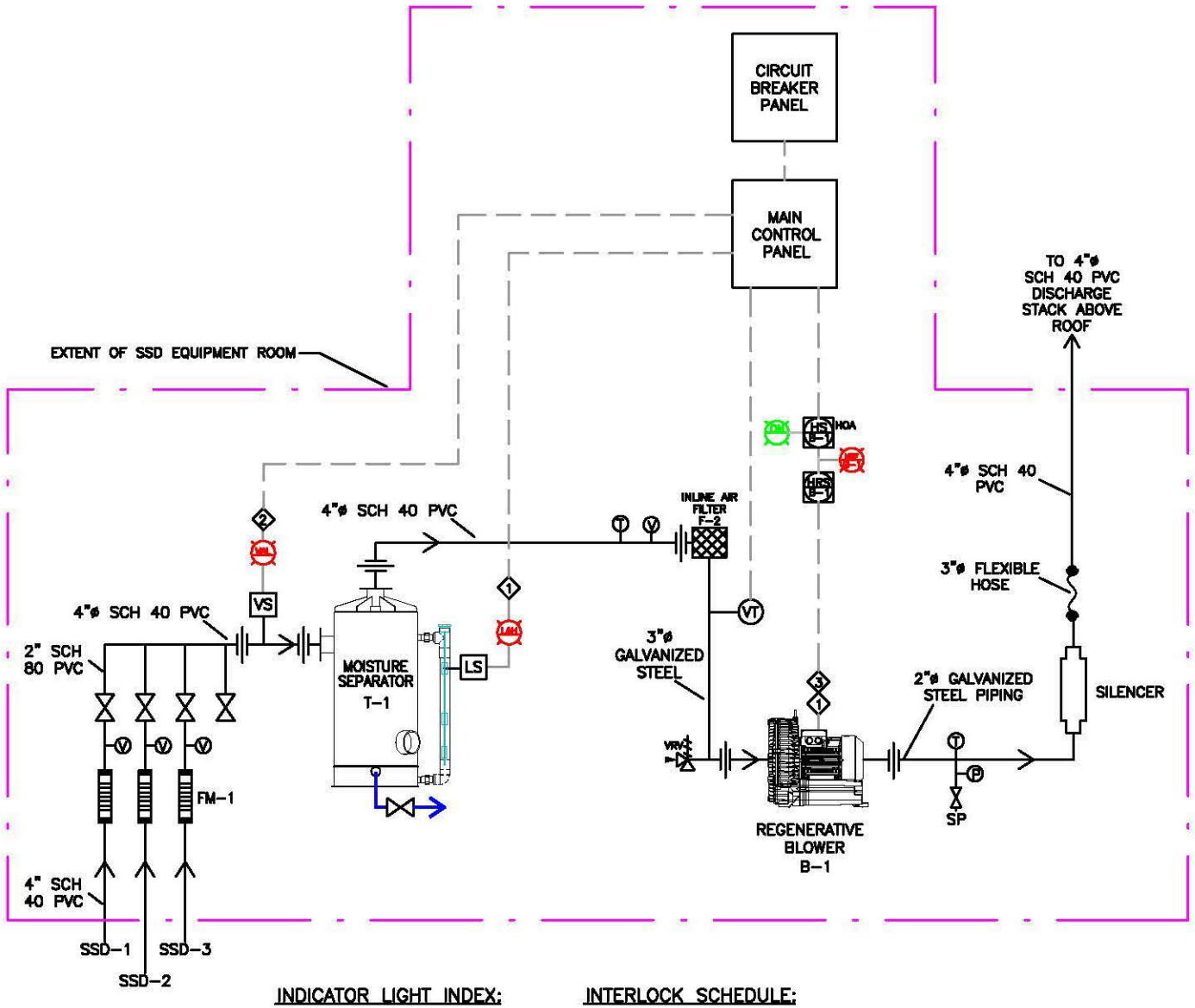
DRAWING TITLE

SITE PLAN WITH
SSD SYSTEM LAYOUT

PREPARED FOR

CINDERELLA 248 LLC
248 FLATBUSH AVENUE
BROOKLYN, NEW YORK

EnviroTrac
ENVIRONMENTAL SERVICES
5 OLD DOCK ROAD, YAPHANK, NEW YORK 11980
PHONE: (631)924-3001 FAX: (631)924-5001



INDICATOR LIGHT INDEX:

- LEVEL ALARM HIGH
- VACUUM ALARM LOW
- MOTOR STARTER FAILURE
- MOTOR RUN INDICATOR

INTERLOCK SCHEDULE:

1. HIGH LEVEL IN T-1 – SHUT DOWN B-1, ACTIVATE SENSAPHONE ALARM ZONE 1.
2. LOW VACUUM – ACTIVATE SENSAPHONE ALARM ZONE 2.
3. MOTOR STARTER FAULT – SHUT DOWN B-1, ACTIVATE SENSAPHONE ALARM ZONE 3.

SYSTEM LEGEND:

- VACUUM GAUGE
- PRESSURE GAUGE
- TEMPERATURE GAUGE
- ROTAMETER FLOWMETER
- LEVEL SWITCH
- VACUUM SWITCH
- INDICATING VACUUM TRANSMITTER
- BALL VALVE
- SAMPLE PORT
- VACUUM RELIEF VALVE
- UNION
- HAND SWITCH PANEL MOUNTED
- RUN TIME METER
- CONTROL PANEL INDICATOR LIGHT
- CONTROL PANEL INTERLOCK
- ELECTRIC LINE
- AIR FLOW DIRECTION
- CONDENSATE WATER FLOW DIRECTION
- ENCLOSURE LIMITS

NOTES:

BLOWER: AIRTECH MODEL NO: 3BA1630-7AT26 (4.6 HP, 3 PH, TEFC)
MOISTURE SEPARATOR T-1: ESD/W2W MODEL NO: AWS80-4

DRAWN/REVISED BY: JW
REVISION DATE: MARCH 29, 2017

FIGURE: 2

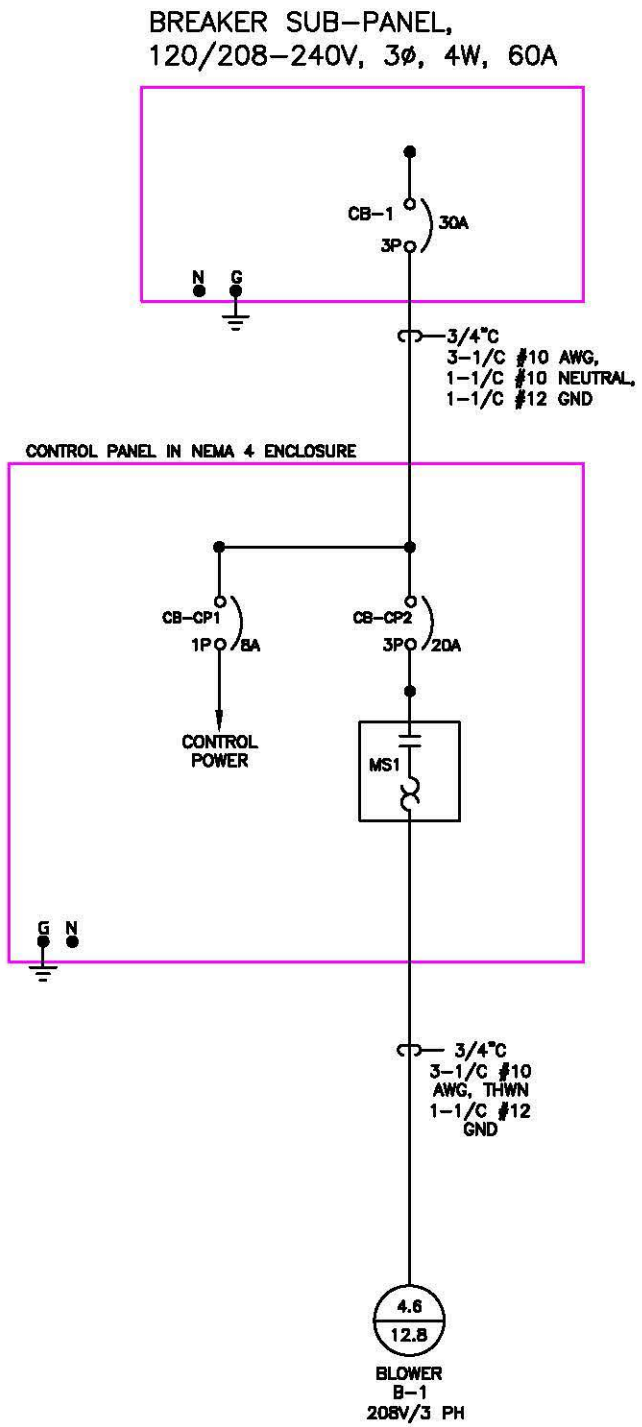
DRAWING TITLE

AS-BUILT SUB-SLAB DEPRESSURIZATION SYSTEM PROCESS AND INSTRUMENTATION DIAGRAM

PREPARED FOR

CINDERELLA 248 LLC
248 FLATBUSH AVENUE
BROOKLYN, NEW YORK

EnviroTrac
ENVIRONMENTAL SERVICES
5 OLD DOCK ROAD, YAPHANK, NEW YORK 11980
PHONE: (631)924-3001 FAX: (631)924-5001



LEGEND:

- MS1 — FULL VOLTAGE NON-REVERSING MOTOR STARTER WITH OVERLOAD RELAY
- MOTOR STARTER AUXILIARY CONTACT
- HP / FLA — MOTOR HORSEPOWER FULL LOAD AMPS
- CB-X, 1P, 20A — CURCUIT BREAKER (RATINGS AS SHOWN)
- THERMOSTAT
- SINGLE POLE SWITCH

SAMPLE BREAKER:

LABEL, CB-X, 1P, 20A, # OF POLES, AMPERAGE

DRAWN/REVISED BY: JW
REVISION DATE: MARCH 29, 2017

FIGURE: E1

DRAWING TITLE

AS-BUILT
ELECTRICAL SINGLE LINE DIAGRAM

PREPARED FOR

CINDERELLA 248 LLC
248 FLATBUSH AVENUE
BROOKLYN, NEW YORK

EnviroTrac
ENVIRONMENTAL SERVICES
5 OLD DOCK ROAD, YAPHANK, NEW YORK 11980
PHONE: (631)924-3001 FAX: (631)924-5001

VAPORBLOCK® PLUS™ VBP20

Under-Slab Vapor / Gas Barrier

RAVEN INDUSTRIES

Product Description

VaporBlock® Plus™ 20 is a seven-layer co-extruded barrier made from state-of-the-art polyethylene and EVOH resins to provide unmatched impact strength as well as superior resistance to gas and moisture transmission. VaporBlock® Plus™ 20 is a highly resilient underslab / vertical wall barrier designed to restrict naturally occurring gases such as radon and/or methane from migrating through the ground and concrete slab. VaporBlock® Plus™ 20 is more than 100 times less permeable than typical high-performance polyethylene vapor retarders against Methane, Radon and other harmful VOCs.

VaporBlock® Plus™ 20 is one of the most effective underslab gas barriers in the building industry today far exceeding ASTM E-1745 (Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs) Class A, B and C requirements. Available in a 20 (Class A) mil thicknesses designed to meet the most stringent requirements. VaporBlock® Plus™ 20 is produced within the strict guidelines of our ISO 9001:2008 Certified Management System.

Product Use

VaporBlock® Plus™ 20 resists gas and moisture migration into the building envelop when properly installed to provide protection from toxic/harmful chemicals. It can be installed as part of a passive or active control system extending across the entire building including floors, walls and crawl spaces. When installed as a passive system it is recommended to also include a ventilated system with sump(s) that could be converted to an active control system with properly designed ventilation fans.

VaporBlock® Plus™ 20 works to protect your flooring and other moisture-sensitive furnishings in the building's interior from moisture and water vapor migration, greatly reducing condensation, mold and degradation.

Size & Packaging

VaporBlock® Plus™ 20 is available in 10' x 150' rolls to maximize coverage. All rolls are folded on heavy-duty cores for ease in handling and installation. Other custom sizes with factory welded seams are available based on minimum volume requirements. Installation instructions and ASTM E-1745 classifications accompany each roll.



Under-Slab Vapor/Gas Retarder

Product	Part #
VaporBlock Plus 20	VBP20

APPLICATIONS

- Radon Barrier
- Methane Barrier
- VOC Barrier
- Under-Slab Vapor Retarder
- Foundation Wall Vapor Retarder

VaporBlock® Plus™
UNDERSLAB VAPOR RETARDER / GAS BARRIER

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VAPORBLOCK® PLUS™ VBP20

Under-Slab Vapor / Gas Barrier

		VAPORBLOCK PLUS 20	
PROPERTIES	**TEST METHOD**	**IMPERIAL**	**METRIC**
Appearance		White/Gold	
Thickness, Nominal		20 mil	0.51 mm
Weight		102 lbs/MSF	498 g/m²
Classification	ASTM E 1745	CLASS A, B & C	
Tensile Strength lbf/in (N/cm) average MD & TD (new material)	ASTM E 154 Section 9 (D-882)	58 lbf	102 N
Impact Resistance	ASTM D 1709	2600 g	
Maximum Use Temperature		180° F	82° C
Minimum Use Temperature		-70° F	-57° C
Permeance (new material)	ASTM E 154 Section 7 ASTM E 96 Procedure B	0.0098 Perms grains/(ft²·hr·in·Hg)	0.0064 Perms g/(24hr·m²·mm Hg)
(after conditioning) Perms (same measurement as above permeance)	ASTM E 154 Section 8, E96 Section 11, E96 Section 12, E96 Section 13, E96	0.0079 0.0079 0.0097 0.0113	0.0052 0.0052 0.0064 0.0074
WVTR	ASTM E 96 Procedure B	0.0040 grains/hr-ft²	0.0028 gm/hr-m²
Radon Diffusion Coeffiecient	K124/02/95	< 1.1 x 10^{-13} m²/s	
Methane Permeance	ASTM D 1434	< 1.7 x 10^{-10} m²/d• atm 0.32 GTR (Gas Transmission Rate) ml/m²•D•ATM	

VaporBlock® Plus™ Placement

All instructions on architectural or structural drawings should be reviewed and followed.
Detailed installation instructions accompany each roll of VaporBlock® Plus™ and can also be located on our website.
ASTM E-1643 also provides general installation information for vapor retarders.

VaporBlock® Plus™
UNDERSLAB VAPOR RETARDER / GAS BARRIER

VaporBlock® Plus™ is a seven-layer co-extruded barrier made using high quality virgin-grade polyethylene and EVOH resins to provide unmatched impact strength as well as superior resistance to gas and moisture transmission.

Note: To the best of our knowledge, unless otherwise stated, these are typical property values and are intended as guides only, not as specification limits. Chemical resistance, odor transmission, longevity as well as other performance criteria is not implied or given and actual testing must be performed for applicability in specific applications and/or conditions. RAVEN INDUSTRIES MAKES NO WARRANTIES AS TO THE FITNESS FOR A SPECIFIC USE OR MERCHANTABILITY OF PRODUCTS REFERRED TO, no guarantee of satisfactory results from reliance upon contained information or recommendations and disclaims all liability for resulting loss or damage. Limited Warranty available at www.RavenEFD.com

RAVEN INDUSTRIES

Engineered Films Division
P.O. Box 5107
Sioux Falls, SD 57117-5107
Ph: (605) 335-0174 • Fx: (605) 331-0333

Toll Free: **800-635-3456**
Email: **efdsales@ravenind.com**
www.ravenefd.com
1/11 EFD 1125

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LIQUID BOOT®

SPRAY-APPLIED GAS VAPOR BARRIER

DESCRIPTION

LIQUID BOOT® is a seamless, spray-applied, water-based membrane containing no VOCs, which provides a barrier against vapor intrusion into structures. LIQUID BOOT® is installed under slab and on below grade vertical walls as a gas vapor barrier to minimize vapor and nuisance water migration into buildings. LIQUID BOOT® spray-application directly to penetrations, footings, grade beams, pile caps and other irregular surfaces, provides for a fully-adhered gas vapor barrier system.

APPLICATIONS

LIQUID BOOT® is used as an underslab and below-grade vertical wall gas vapor barrier, used to minimize vapor and nuisance water (non-hydrostatic conditions) migration into buildings. LIQUID BOOT® is ideal for methane migration control. LIQUID BOOT® is also NSF® certified for use as a potable water liner in concrete water reservoirs and tanks greater than 300,000 gallons to protect the concrete from water seepage.

BENEFITS

- Spray-application provides excellent sealing of penetrations, eliminating the need for mechanical fastening
- Seamless, monolithic membrane eliminates seaming-related membrane failures
- Unique formulation provides superior protection from methane gases and water vapor
- Fully adhered system reduces risk of gas migration
- Protection from methane gas, VOCs, chlorinated solvents and other contaminates

INSTALLATION

Protect all adjacent areas not to receive gas vapor barrier. Ambient temperature shall be within man-ufacturer's specifications. All plumbing, electrical, mechanical and structural items to be under or passing through the gas vapor barrier shall be secured in their proper positions and appropriately protected prior to membrane application. Gas vapor barrier shall be installed before placement of rein-forcing steel. Expansion joints must be filled with a conventional waterproof expansion joint material. Surface preparation shall be per manufacturer's specification. A minimum thickness of 60 dry mils, unless specified otherwise.

LIMITED WARRANTY

CETCO warrants its products to be free of defects. This warranty only applies when the product is applied by Approved Applicators trained by CETCO. As factors which affect the result obtained from this product, including weather, equipment, construction, work-manship and other variables are all beyond CETCO's control, we warrant only that the material herein conforms to our product specifications. Under this warranty we will replace at no charge any product proved to be defective within 12 months of manufacture, provided it has been applied in accordance with our written directions for uses we recommend as suitable for this product. This warranty is in lieu of any and all other warranties expressed or implied (including any implied warranty of merchantability or fitness for a particular use), and the Manufacturer shall have no further liability of any kind including liability for consequential or incidental damages resulting from any defects or any delays caused by replacement or otherwise. This warranty shall become valid only when the product has been paid for in full.



In addition to superior chemical resistance performance, LIQUID BOOT® spray-application effectively seals penetrations, footings, grade beams and other irregular surfaces that are considered critical vapor intrusion pathways.

EQUIPMENT

- COMPRESSOR: Minimum output of 155-185 cubic feet per minute (CFM)
- PUMPS: For "A" drum, an air-powered piston pump of 4:1 ratio (suggested model: Graco, 4:1 Bulldog). For "B" drum, an air-powered diaphragm pump (0 -100 psi)
- HOSES: For "A" drum, ½" wire hose with a solvent resistant core (for diesel cleaning flush), hose rated for 500 psi minimum. For "B" drum, a 3/8" fluid hose rated at only 300 psi may be used.
- SPRAY WAND: Only the spray wand sold by CETCO is approved for the application of LIQUID BOOT®.
- SPRAY TIPS: Replacement tips can be purchased separately from CETCO.

PACKAGING

LIQUID BOOT® is available in the following packaging options:

- 55 Gallon Drum
- 275 Gallon Tote

LIQUID BOOT ®

SPRAY-APPLIED GAS VAPOR BARRIER

TESTING DATA

CHEMICAL & PHYSICAL PROPERTIES		
CHEMICAL PROPERTY	**TEST METHOD**	**RESULT**
Acid Exposure (10% H_2SO_4 for 90 days)	ASTM D543	Less than 1% weight change
Benzene Diffusion Test	Tested at 43,000 ppm	2.90 x 10^{-11} m^2/day
Chemical Resistance: VOCs, BTEXs (tested at 20,000 ppm)	ASTM D543	Less than 1% weight change
Chromate Exposure (10% Chromium6+ salt for 31 days)	ASTM E96	Less than 1% weight change
Diesel (1000 mg/l), Ethylbenzene (1000 mg/l), Naphthalene (5000 mg/l) and Acetone (500 mg/l) Exposure for 7 days	ASTM D543	Less than 1% weight change; Less than 1% tensile strength change
Hydrogen Sulfide Gas Permeability	ASTM D1434	None Detected
Methane Permeability	**ASTM 1434-82**	**Passed***
Microorganism Resistance	**ASTM D4068-88**	**Passed***
Oil Resistance	**ASTM D543-87**	**Passed***
PCE Diffusion Coefficient	Tested at 120 mg/L	1.32 x 10^{-13} m^2/sec
Radon Permeability	Tested by US Dept. of Energy	Zero permeability to Radon (222Rn)
TCE Diffusion Coefficient	Tested at 524 mg/L	9.07 x 10^{-13} m^2/sec

PHYSICAL PROPERTY	**TEST METHOD**	**RESULT**
Accelerated Weathering and Ultraviolet Exposure	ASTM D822	No adverse effect after 500 hours
Air Infiltration	ASTM E283-91	0 cfm/sq. ft.
Bonded Seam Strength Tests	ASTM D6392	Passed*
Coefficient of Friction (with geotextile both sides)	ASTM D5321	0.72
Cold Bend Test	ASTM D146	Passed. Ø cracking at -25°F
Dead Load Seam Strength	City of Los Angeles	Passed*
Electric Volume Resistivity	ASTM D257	1.91 x 1010 ohms-cm
Elongation	ASTM D412	1,332% Ø reinforcement, 90% recovery
Elongation w/8 oz. non-woven geotextile both sides	ASTM D751	100% (same as geotextile tested separately)
Environmental Stress-Cracking	ASTM D1693-78	Passed*
Flame Spread	ASTM E108	Class A with top coat (comparable to UL790)
Freeze-Thaw Resistance (100 Cycles)	ASTM A742	Meets criteria. Ø spalling or disbondment
Heat Aging	ASTM D4068-88	Passed*
Hydrostatic Head Resistance	ASTM D751	Tested to 138 feet or 60 psi
Potable Water Containment	ANSI/NSF 61	NSF Certified for tanks >300,000 gal
Puncture Resistance w/8 oz. non-woven geotextile both sides	ASTM D4833	286 lbs. (travel of probe = 0.756 in)
Sodium Sulfate (2% water solution)	ASTM D543, D412, D1434	Less than 1% weight change
Soil Burial	ASTM E154-88	Passed
Tensile Bond Strength to Concrete	ASTM D413	2,556 lbs/ft^2 uplift force
Tensile Strength	ASTM D412	58 psi without reinforcement
Tensile Strength w/8 oz. non-woven geotextile both sides	ASTM D751	196 psi (same as geotextile tested separately)
Toxicity Test	22 CCR 66696	Passed
Water Penetration Rate	ASTM D2434	<7.75 x 10^{-9} cm/sec
Water Vapor Permeance	ASTM E96	0.069 perms

*Passes all Los Angeles City and County Methane Criteria

North America: 847.851.1800 | 800.527.9948 | www.CETCO.com

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UPDATED: NOVEMBER 2013

TDS_LIQUIDBOOT_AM_EN_201311_v1

CETCO®
OUR STANDARDS. YOUR PEACE OF MIND.
A Minerals Technologies Company

APPENDIX H

REMEDIAL SYSTEM OPTIMIZATION TABLE OF CONTENTS FOR CINDERELLA 248, LLC SITE

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 SITE OVERVIEW

1.2 PROJECT OBJECTIVES AND SCOPE OF WORK

1.3 REPORT OVERVIEW

2.0 REMEDIAL ACTION DESCRIPTION

2.1 SITE LOCATION AND HISTORY

2.2 REGULATORY HISTORY AND REQUIREMENTS

2.3 CLEAN-UP GOALS AND SITE CLOSURE CRITERIA

2.4 PREVIOUS REMEDIAL ACTIONS

2.5 DESCRIPTION OF EXISTING REMEDY

2.5.1 System Goals and Objectives

2.5.2 System Description

2.5.3 Operation and Maintenance Program

3.0 FINDINGS AND OBSERVATIONS

3.1 SUBSURFACE PERFORMANCE

3.2 TREATMENT SYSTEM PERFORMANCE

3.3 REGULATORY COMPLIANCE 3-3

3.4 MAJOR COST COMPONENTS OR PROCESSES

3.5 SAFETY RECORD

4.0 RECOMMENDATIONS

4.1 RECOMMENDATIONS TO ACHIEVE OR ACCELERATE SITE CLOSURE

4.1.1 Source Reduction/Treatment

4.1.2 Sampling

4.1.3 Conceptual Site Model (Risk Assessment)

4.2 RECOMMENDATIONS TO IMPROVE PERFORMANCE

4.2.1 Maintenance Improvements

4.2.2 Monitoring Improvements
4.2.3 Process Modifications
4.3 RECOMMENDATIONS TO REDUCE COSTS
4.3.1 Supply Management
4.3.2 Process Improvements or Changes
4.3.3 Optimize Monitoring Program
4.3.4 Maintenance and Repairs
4.4 RECOMMENDATIONS FOR IMPLEMENTATION

APPENDIX I

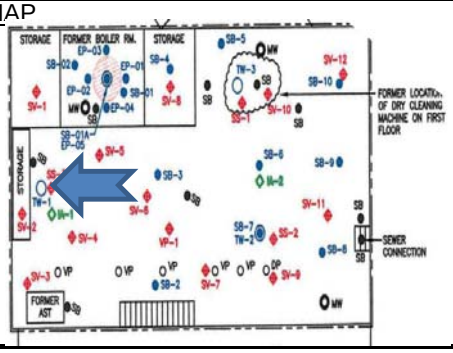
SOIL BORING LOGS

FPM GROUP

Ronkonkoma,NY

PROJECT NAME	Cinderella 248, LLC		FPM JOB #	1104g-13-02	
SITE ADDRESS	248 Flatbush Ave., Brooklyn, NY				
BORING/WELL	B-1	TOTAL DEPTH	5	DIAMETER	2"
TOC ELEVATION	-	WATER LEVEL INITIAL	-	STATIC	-
SCREEN DIA.	-	LENGTH	-	SLOT SIZE	-
CASING DIA.	-	LENGTH	-	TYPE	-
DRILLING CO.	AES	DRILLING METHOD		Direct Push	
DRILLER	JV	LOG BY	BC/GH	DATE DRILLED	11/18/2013

MAP



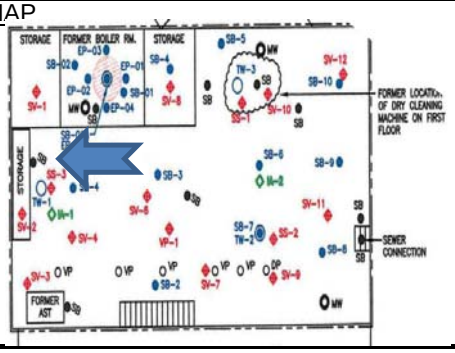
DEPTH (FT)	SAMPLE	OVA/PID (PPM)	WELL CONSTRUCTION	GRAPHIC LOG	DESCRIPTION/SOIL CLASSIFICATION (INTERVAL, RECOVERY, COLOR, MATRIX TYPE, MOISTURE CONTENT, COMMENTS)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	0-2 4-5	1 0		FILL	0-5' 0-3" Concrete 3"-5' Brown SILTY SAND w/ trace brick, gravel. No odor/stain.

FPM GROUP

Ronkonkoma,NY

PROJECT NAME	Cinderella 248, LLC		FPM JOB #	1104g-13-02	
SITE ADDRESS	248 Flatbush Ave., Brooklyn, NY				
BORING/WELL	B-2	TOTAL DEPTH	6	DIAMETER	2"
TOC ELEVATION	-	WATER LEVEL INITIAL	-	STATIC	-
SCREEN DIA.	-	LENGTH	-	SLOT SIZE	-
CASING DIA.	-	LENGTH	-	TYPE	-
DRILLING CO.	AES	DRILLING METHOD		Direct Push	
DRILLER	JV	LOG BY	BC/GH	DATE DRILLED	11/18/2013

MAP



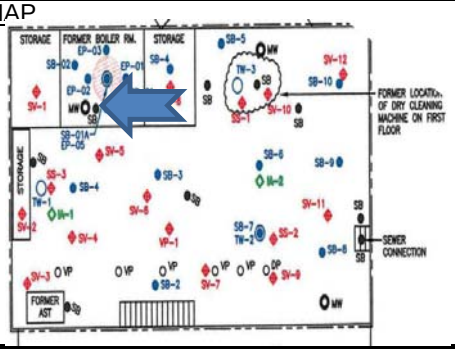
DEPTH (FT)	SAMPLE	OVA/PID (PPM)	WELL CONSTRUCTION	GRAPHIC LOG	DESCRIPTION/SOIL CLASSIFICATION (INTERVAL, RECOVERY, COLOR, MATRIX TYPE, MOISTURE CONTENT, COMMENTS)
1	0-2	0		SM	0-5' 0-3" Concrete 3"-5' Brown SILTY SAND. No odor/stain.
2					
3					
4					
5	4-5	0.4			
6		0			5-6' SAA
7					
8					
9					
10					
11					
12					
13					
14					
15					

FPM GROUP

Ronkonkoma,NY

PROJECT NAME	Cinderella 248, LLC		FPM JOB #	1104g-13-02	
SITE ADDRESS	248 Flatbush Ave., Brooklyn, NY				
BORING/WELL	B-3	TOTAL DEPTH	9	DIAMETER	2"
TOC ELEVATION	-	WATER LEVEL INITIAL	-	STATIC	-
SCREEN DIA.	-	LENGTH	-	SLOT SIZE	-
CASING DIA.	-	LENGTH	-	TYPE	-
DRILLING CO.	AES	DRILLING METHOD		Direct Push	
DRILLER	JV	LOG BY	BC/GH	DATE DRILLED	11/18/2013

MAP



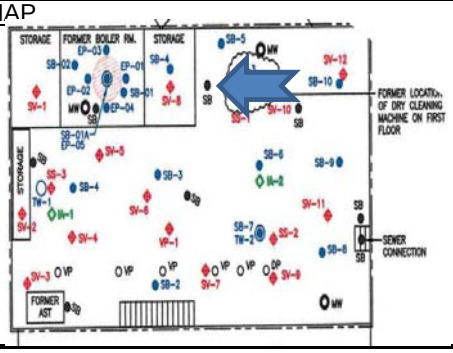
DEPTH (FT)	SAMPLE	OVA/PID (PPM)	WELL CONSTRUCTION	GRAPHIC LOG	DESCRIPTION/SOIL CLASSIFICATION (INTERVAL, RECOVERY, COLOR, MATRIX TYPE, MOISTURE CONTENT, COMMENTS)
1				FILL	0-5'
2					0-3" Concrete
3	2-4				3"-3' Tan medium-coarse SAND. No odor/stain.
4		0			3-5' Brown SILTY SAND. No odor/stain.
5					
6				SM	5-9'
7					SAA
8					
9	8-9	4			
10					
11					
12					
13					
14					
15					

FPM GROUP

Ronkonkoma,NY

PROJECT NAME	Cinderella 248, LLC		FPM JOB #	1104g-13-02	
SITE ADDRESS	248 Flatbush Ave., Brooklyn, NY				
BORING/WELL	B-4	TOTAL DEPTH	9	DIAMETER	2"
TOC ELEVATION	-	WATER LEVEL INITIAL	-	STATIC	-
SCREEN DIA.	-	LENGTH	-	SLOT SIZE	-
CASING DIA.	-	LENGTH	-	TYPE	-
DRILLING CO.	AES	DRILLING METHOD		Direct Push	
DRILLER	JV	LOG BY	BC/GH	DATE DRILLED	11/18/2013

MAP



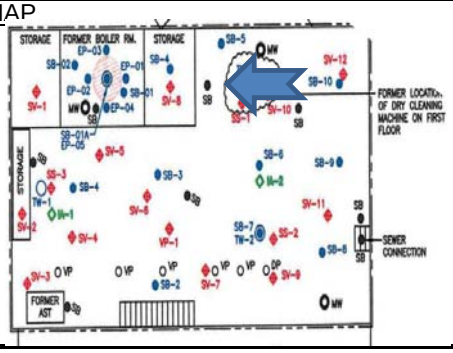
DEPTH (FT)	SAMPLE	OVA/PID (PPM)	WELL CONSTRUCTION	GRAPHIC LOG	DESCRIPTION/SOIL CLASSIFICATION (INTERVAL, RECOVERY, COLOR, MATRIX TYPE, MOISTURE CONTENT, COMMENTS)
1	0-2	0		FILL	0-5'
2					0-3" Concrete
3					3"-5' Brown SILTY SAND, trace brick. No odor/stain.
4					
5					
6		2			5-9'
7		3			SAA
8					
9	8-9				
10					
11					
12					
13					
14					
15					

FPM GROUP

Ronkonkoma,NY

PROJECT NAME	Cinderella 248, LLC		FPM JOB #	1104g-13-02	
SITE ADDRESS	248 Flatbush Ave., Brooklyn, NY				
BORING/WELL	B-5	TOTAL DEPTH	6	DIAMETER	2"
TOC ELEVATION	-	WATER LEVEL INITIAL	-	STATIC	-
SCREEN DIA.	-	LENGTH	-	SLOT SIZE	-
CASING DIA.	-	LENGTH	-	TYPE	-
DRILLING CO.	AES	DRILLING METHOD		Direct Push	
DRILLER	JV	LOG BY	BC/GH	DATE DRILLED	11/18/2013

MAP



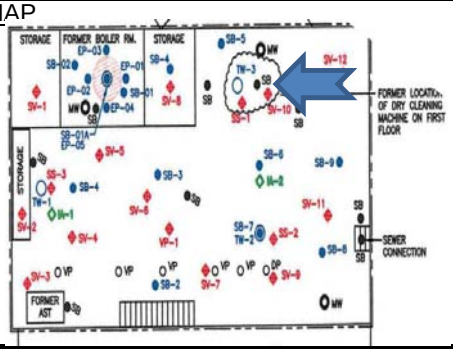
DEPTH (FT)	SAMPLE	OVA/PID (PPM)	WELL CONSTRUCTION	GRAPHIC LOG	DESCRIPTION/SOIL CLASSIFICATION (INTERVAL, RECOVERY, COLOR, MATRIX TYPE, MOISTURE CONTENT, COMMENTS)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	0-2 3-4	0 17 37 15		FILL	0-5' 0-3" Concrete 3"-5' Brown SILTY SAND, trace brick and angular gravel. No odor/stain. 5-6' SAA

FPM GROUP

Ronkonkoma,NY

PROJECT NAME	Cinderella 248, LLC		FPM JOB #	1104g-13-02	
SITE ADDRESS	248 Flatbush Ave., Brooklyn, NY				
BORING/WELL	B-6	TOTAL DEPTH	5	DIAMETER	2"
TOC ELEVATION	-	WATER LEVEL INITIAL	-	STATIC	-
SCREEN DIA.	-	LENGTH	-	SLOT SIZE	-
CASING DIA.	-	LENGTH	-	TYPE	-
DRILLING CO.	AES	DRILLING METHOD		Direct Push	
DRILLER	JV	LOG BY	BC/GH	DATE DRILLED	11/18/2013

MAP



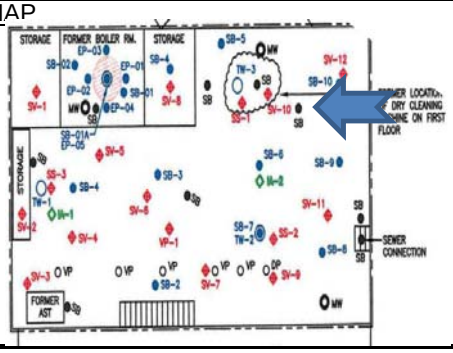
DEPTH (FT)	SAMPLE	OVA/PID (PPM)	WELL CONSTRUCTION	GRAPHIC LOG	DESCRIPTION/SOIL CLASSIFICATION (INTERVAL, RECOVERY, COLOR, MATRIX TYPE, MOISTURE CONTENT, COMMENTS)
1 2	0-2	1		FILL	0-5' 0-3" Concrete 3"-5' Brown SILTY SAND, trace brick and angular gravel. No odor/stain.
3 4		0			
5	4-5	5			
6 7 8 9 10 11 12 13 14 15					

FPM GROUP

Ronkonkoma,NY

PROJECT NAME	Cinderella 248, LLC		FPM JOB #	1104g-13-02	
SITE ADDRESS	248 Flatbush Ave., Brooklyn, NY				
BORING/WELL	B-7	TOTAL DEPTH	6	DIAMETER	2"
TOC ELEVATION	-	WATER LEVEL INITIAL	-	STATIC	-
SCREEN DIA.	-	LENGTH	-	SLOT SIZE	-
CASING DIA.	-	LENGTH	-	TYPE	-
DRILLING CO.	AES	DRILLING METHOD		Direct Push	
DRILLER	JV	LOG BY	BC/GH	DATE DRILLED	11/18/2013

MAP



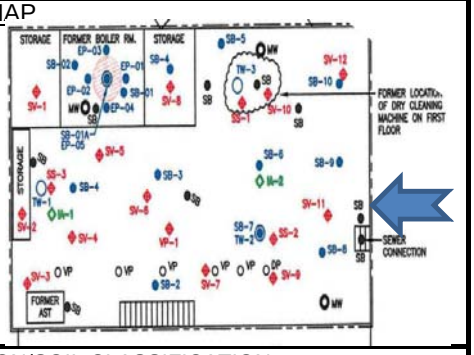
DEPTH (FT)	SAMPLE	OVA/PID (PPM)	WELL CONSTRUCTION	GRAPHIC LOG	DESCRIPTION/SOIL CLASSIFICATION (INTERVAL, RECOVERY, COLOR, MATRIX TYPE, MOISTURE CONTENT, COMMENTS)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	0-2	0		FILL	0-5' 0-3" Concrete 3"-5' Brown SILTY SAND, trace brick and angular gravel. No odor/stain. 5-6' SAA

FPM GROUP

Ronkonkoma,NY

PROJECT NAME	Cinderella 248, LLC		FPM JOB #	1104g-13-02	
SITE ADDRESS	248 Flatbush Ave., Brooklyn, NY				
BORING/WELL	B-8	TOTAL DEPTH	10	DIAMETER	2"
TOC ELEVATION	-	WATER LEVEL INITIAL	-	STATIC	-
SCREEN DIA.	-	LENGTH	-	SLOT SIZE	-
CASING DIA.	-	LENGTH	-	TYPE	-
DRILLING CO.	AES	DRILLING METHOD		Direct Push	
DRILLER	JV	LOG BY	BC/GH	DATE DRILLED	11/18/2013

MAP



DEPTH (FT)	SAMPLE	OVA/PID (PPM)	WELL CONSTRUCTION	GRAPHIC LOG	DESCRIPTION/SOIL CLASSIFICATION (INTERVAL, RECOVERY, COLOR, MATRIX TYPE, MOISTURE CONTENT, COMMENTS)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	0-2 9-10	0		FILL SP	0-5' 0-3" Concrete 3"-4' Brown SILTY SAND, trace brick and angular gravel. No odor/stain. 4-5' Brown medium SAND. No odor/stain. 5-10' 5-8' SAA 8-10' Brown fine SAND w/ some silt. No odor/stain.