Former General Circuits, Inc Property

MONROE COUNTY, NEW YORK

Interim Site Management Plan

NYSDEC Site Number: C8-28-085

Prepared for:
95 Mt. Read Boulevard, LLC
770 Rock Beach Road
Rochester, New York

Prepared by:
Day Environmental, Inc.
1563 Lyell Avenue
Rochester, New York
585-454-0210

Revisions to Interim Approved Site Management Plan:

Revision #	Submitted Date	Summary of Revision	DEC Approval Date
1	January 2012	Added Soil Vapor Intrusion Component	February 2012
2	November 2013	Added Extraction Wells EW-6 and EW-7	

MARCH 2010

New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 8
6274 East Avon-Lima Road, Avon, New York 14414-9519
Phone: (585) 226-5353 • **FAX:** (585) 226-8139
Website: www.dec.ny.gov

Joe Martens
Commissioner

November 21, 2013

Mr. Thomas Maguire
770 Rock Beach Road
Rochester, New York 14617

Dear Mr. Maguire:

Subject: General Circuits Brownfield Cleanup Program Site #C828085
Interim Site Management Plan Revision #2; November 2013
95 Mount Read Boulevard, Rochester, New York

The New York State Department of Environmental Conservation (NYSDEC) has completed its review of the document entitled *Interim Site Management Plan Revision #2* (the ISMP) dated November 2013 and prepared by Day Environmental Inc. In accordance with 6 NYCRR Part 375-1.6, NYSDEC has determined that the ISMP substantially addresses the requirements of the Brownfield Cleanup Agreement. The ISMP is hereby approved.

By **December 31, 2013**, please attach this letter to the final ISMP and distribute as follows:

- Frank Sowers (NYSDEC, Avon) - 1 hard copy;
- John Frazer (Monroe County Health Department) - 1 electronic copy on CD; and
- Arnett Branch Library – 1 hard copy and remove previous versions of the ISMP.

Thank you for your continued cooperation in this matter and please contact me at (585) 226-5357 if you have any questions.

Sincerely,

Frank Sowers

Frank Sowers, P.E.
Environmental Engineer II

ec:
B. Kline
B. Callaghan
J. Mahoney
D. Maguire
B. Putzig
J. Frazer
P. Sylvestri

INTERIM SITE MANAGEMENT PLAN

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

This Interim Site Management Plan (SMP) has been developed by Day Environmental Inc. (DAY) on behalf of 95 Mount Read Blvd., LLC (Owner) as part of the Brownfield Cleanup Program (BCP) being administered by New York State Department of Environmental Conservation (NYSDEC) at the former General Circuits BCP Site located at 95 Mount Read Boulevard in Rochester, New York (Site). A figure showing the Site location is provided as Figure 1.

The Site is being remediated in accordance with Brownfield Cleanup Agreement (BCA) Index # B8-0701-05-08, Site # C8-28-085. The Owner entered into a BCA with the NYSDEC to remediate an approximate 3.5-acre property located in Rochester, New York. This BCA requires the Owner to investigate and remediate contaminated media at the Site, and the property is to be remediated to restricted commercial standards and guidance values.

NYSDEC's March 2005 Record of Decision (ROD) for the Site identifies several planned remedial activities for the Site, including:

- Extraction and on-site treatment of groundwater;
- In situ treatment of groundwater;
- Soil excavation and removal; and
- Soil vapor intrusion mitigation.

This Interim SMP identifies the requirements and protocols to operate, maintain and track the remedial progress and effectiveness of: (i) the extraction and on-site treatment of groundwater; and (ii) the IRM engineering controls for mitigation of potential soil vapor intrusion. Revisions to the SMP will be completed to address additional remedial activities as the other remedial phases are implemented.

This SMP was developed in accordance with the requirements and guidance provided in the following documents:

- Groundwater Extraction and Treatment Remedial Design Plan: Former General Circuits Facility, 95 Mt. Blvd., Rochester, New York; NYSDEC Site Number 8-28-085 dated December 2007, with modifications as approved by NYSDEC.
- Interim Remedial Measures (IRM) Design Plan: Indoor Vapor Intrusion System, Former General Circuits Facility Inactive Hazardous Waste Disposal Site, NYSDEC Site Code #828085, 95 Mt. Read Blvd., Rochester, New York, dated July 2004 (revised September 2004, and as amended by later addenda approved by NYSDEC).
- NYSDEC Site Management Plan Template dated April 2009.

1.1 Background

The General Circuits site is located in an urban area in the City of Rochester, Monroe County at the corner of Buffalo Road and Mt. Read Boulevard (Figure 1). The Site is approximately 3.5-acres in size improved by a 108,000-square-foot building. Properties located north, south, east and west of the Site are zoned industrial or commercial. Some residential properties also exist east of the Site. The Arch Chemicals site (site #8-28-018A) is located approximately 1/4-mile northwest of General Circuits and the New York State Barge Canal is located approximately 1/2-mile west of General Circuits.

The original portion of the building was constructed in the 1920s and the Site was used by Rochester Lithograph Corporation for a printing business until the early 1960s. General Circuits began manufacturing printed circuit boards at the Site in the early 1960s and continued operations until 1990 when it closed as a result of bankruptcy. Several expansions were constructed in the 1960s and 1970s that increased the floor space of the building to the current 108,000 square-feet. In 1991, the property was sold to the current owner who subdivided up the building and leases space to small light-industrial and commercial businesses.

The primary contaminants of concern attributable to former operations at the Site include chlorinated volatile organic compounds (VOCs) and metals, particularly chromium. The suspected cause of the VOC contamination was the historical use of chlorinated solvent degreasers. It is suspected that the contents of these degreasers were periodically disposed of on the ground west of the original building, and currently beneath the expansions referenced above.

The chromium contamination resulted from the use of chromic acid to etch circuit boards. The etching process operated from the early 1960s to the 1970s and was located in an area of the building formerly known as the "Shipping Room" (Figure 2). The chromic acid deteriorated underground cast iron piping that was used to transfer the chromic acid between the etching machines. As a result of the deteriorated pipes, chromic acid was released to the subsurface soil and groundwater at the Site.

1.2 Remedial History

In 1990, as part of the General Circuits bankruptcy process, a Phase 1 environmental site assessment was performed. The assessment indicated the potential release of metals and hazardous constituents to soils and groundwater underlying the Site. A Phase II environmental site assessment (Phase II ESA) was also performed in 1990 to collect and analyze soils and groundwater at the Site. The Phase II ESA included 16 soil borings and 10 groundwater monitoring wells. The results indicated that VOCs in the groundwater and metals in the soil appeared to be the primary Site contaminants. Total VOC concentrations up to 252,000 parts per billion (ppb) were detected in groundwater in well MW-9. Site soils and groundwater were not analyzed for chromium during the Phase II ESA.

In 1992, the NYSDEC listed the Site as a Class 2 site in the Registry of Inactive Hazardous Waste Disposal Sites in New York. A Class 2 site is a site where hazardous waste presents a significant threat to the public health or the environment and action is required. It was also at this time that the current owner installed a groundwater treatment system to pretreat groundwater from the building foundation that collects in the basement sumps prior to discharging to the sanitary sewer.

In 1993, two indoor air samples were collected from the basement. One of the samples detected trichloroethene (TCE) at a concentration of 700 micrograms per cubic meter ($\mu g/m^3$) and cis-1,2-dichloroethene at a concentration of 1,300 $\mu g/m^3$. Site related compounds were not detected in the other sample.

In 1995, 60,100 ppb of chromium was detected in a groundwater sample from under the building at well MW-8. Six new groundwater monitoring wells and 13 soil borings were also installed in 1995, and the former Shipping Room was identified as the likely source of the chromium due to the historic use of chromic acid in this area. Soil samples collected from the shipping room detected total chromium at concentrations up to 310 parts per million (ppm).

In 1996, a removal action was conducted in the chromium source area. The removal action included the excavation and removal of floor drains, soil, and an underground sump in the former shipping room. The specific amount of material removed was not provided, but the excavation was reportedly completed to a depth of approximately 3.7 feet below grade. Six confirmatory soil samples collected from the bottom and sidewalls of the excavation contained chromium at concentrations ranging from 2,390 ppm to 21,400 ppm. A boring completed through the bottom of the excavation indicated that chromium was still present at a concentration of 100 ppm at a depth of 7.7 to 9.7 feet below grade. The excavation was backfilled without removing the remaining chromium contaminated soil, as additional excavation was not deemed feasible at the time.

Over the following years, a Feasibility Study (FS) was completed for the Site under an Order-On-Consent with the NYSDEC. The NYSDEC approved the revised FS dated January 2005, and subsequently issued a ROD dated March 2005. The Owner then entered into a BCA with NYSDEC in June 2005.

The remedial actions identified in the ROD include a groundwater extraction and treatment phase, which is scheduled to operate until: (i) the groundwater concentrations of chromium decrease to adequate levels for subsequent treatment via in-situ chemical reduction; and (ii) the soil removal component of the remedy has been completed. The Groundwater Extraction and Treatment Remedial Design Work Plan, approved by the NYSDEC, describes the design concepts used to achieve the groundwater extraction and treatment objectives for the pump-and-treat system at the Site. The groundwater extraction and treatment system was installed in the basement of the on-site building and began operation in July 2008.

Engineering controls to mitigate potential VOC vapor intrusion at the Site include: (i) an interim remedial measure (IRM) to address indoor air quality concerns within the building associated with soil vapor intrusion; and (ii) installation of a vapor mitigation system in the basement, as required under the ROD. The IRM work includes a sub-slab depressurization system that was installed in January 2005, as well as supplemental controls (carbon air filtration units) and ongoing monitoring. Activities completed under the ROD included installation of a ventilation system for the groundwater extraction and treatment system, including the basement floor trench and sumps.

The start-up and monitoring phase for the groundwater and indoor air systems are complete, and this Interim SMP has been developed to cover the routine operation, maintenance and monitoring of these systems.

1.3 Nature And Extent Of Contaminants Of Concern

1.3.1 Groundwater

Based upon the findings presented in the FS Report for the Site and monitoring associated with the groundwater extraction system sampling, contaminants of concern (COCs) include chlorinated VOCs and chromium, including hexavalent chromium (chromium VI). The chlorinated VOCs at the Site generally consist of perchloroethene (PCE) and trichloroethene (TCE), and their breakdown products 1,2-dichloroethene (DCE) and vinyl chloride (VC).

Prior to the recent sampling events associated with the groundwater extraction system, the highest concentration of total VOCs detected in a groundwater sample was from overburden monitoring well MW-9 (greater than 155,000 ppb total VOCs). VOC results for groundwater samples from overburden monitoring wells MW-8, MW-10 and MW-12, deep bedrock monitoring well MW-17 and the basement sumps were observed to range from 2,140 ppb to 20,340 ppb. VOCs were also detected in monitoring wells located along the perimeter of the Site, but at much lower concentrations (i.e., less than 144 ppb) than the interior monitoring wells and the basement sump system.

During the sampling events completed subsequent to installation of additional monitoring and extraction wells associated with the groundwater extraction system (i.e., background sampling event conducted on June 6, 2008, and post-start up sampling events conducted on August 19, 2008 and August 6-11, 2009), the highest concentration of total VOCs detected in a groundwater sample was from bedrock interface monitoring well MW-30 (34,100 ppb). Overall, VOC results for groundwater samples from interior monitoring wells were observed to

range from 37 ppb to 34,100 ppb, while VOCs results for Site perimeter monitoring wells were observed to range from 0 ppb to 59.9 ppb.

With the exception of data collected at monitoring well MW-33, the nature and extent of VOC results obtained from the groundwater extraction system sampling events are consistent with prior Site groundwater VOC results. Total VOC concentrations observed at monitoring well MW-33 were somewhat higher than anticipated for this portion of the delineated dissolved VOC plume, but the MW-33 results do not impact the extent of the overall plume delineation.

Prior to operation of the groundwater extraction system, chromium was detected at concentrations above the NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 groundwater standard of 50 ppb at monitoring wells MW-8, MW-9, MW-12 and MW-21. With the exception of monitoring well MW-21, these monitoring wells are located beneath the slab-on-grade portion of the on-site building. Monitoring well MW-21 is positioned just east of the building, in the parking lot along Mt. Read Blvd.

During the sampling events completed subsequent to installation of additional monitoring and extraction wells associated with the groundwater extraction system, chromium was detected above the 50 ppb NYSDEC TOGS 1.1.1 standard at monitoring wells MW-8, MW-30/EW-6, MW-31, MW-32/EW-5, and MW-18; and at extraction wells EW-1 and EW-2. Monitoring/extraction wells MW-8, MW-30/EW-6, MW-31, EW-1 and EW-2 are located beneath the slab-on-grade portion of the on-site building. Extraction well MW-32/EW-5 is an exterior extraction well located between the building and the northern property line, and monitoring well MW-18 is an upgradient exterior well located between the building and the western property boundary.

With the exception of chromium levels observed at monitoring well MW-32/EW-5, the nature and extent of chromium results obtained from the groundwater sampling events associated with the groundwater extraction system are consistent with the analytical laboratory results obtained prior to the groundwater extraction system sampling events. Chromium concentrations observed at monitoring well MW-32/EW-5 suggests that the extent of chromium in groundwater extends further to the north than initially anticipated, and site plan extents were adjusted accordingly (see Figure 2, which portrays the revised chromium target capture zone delineated for the groundwater extraction system, as well as the area of influence achieved by the existing groundwater extraction system).

The vertical extent of COCs in groundwater was delineated by evaluating groundwater quality in monitoring wells sealed within the overburden and monitoring wells sealed within the bedrock. VOCs were not detected in

groundwater samples collected approximately 50 feet (ft) below the ground surface (bgs). In addition, with the exception of monitoring well MW-21, chromium was not detected at concentrations that exceed the NYSDEC groundwater standards and guidance values in bedrock groundwater monitoring wells. Monitoring well MW-21 is an "open hole" well starting at 18 ft bgs; therefore, the chromium observed at this location could be representative of shallow bedrock groundwater. Furthermore, the chromium concentration detected in monitoring well MW-21 only slightly exceeded the NYSDEC TOGS 1.1.1 groundwater Standard of 50 ppb.

1.32 Soils *(Future)*

1.33 Indoor Air

The contaminants of concern to indoor air quality are essentially those found in the groundwater and soils beneath the Site. Inorganic and non-volatile components (such as chromium) typically do not impact indoor air quality provided that the groundwater and soil substrates are not openly disturbed (and for which any such Site activities require NYSDEC involvement). Underground volatile components, however, can more readily impact indoor air quality through soil vapor intrusion.

Sampling of sub-slab soil gas and indoor air quality was conducted in 2004 as a part of the FS, at which time chlorinated VOC's were detected in sub-slab vapor samples. The data from previously performed groundwater and soil sampling studies, together with the air sampling results, indicated an apparent pathway for vapor intrusion to indoor air in selected areas of the building. Based upon the various data obtained, Areas of Concern (AOCs) were delineated to include areas of apparent vapor intrusion, as well as adjacent areas identified as possessing higher levels of contaminants in groundwater, soil and/or sub-slab air space that could potentially contribute to vapor intrusion. AOC #1 consists of the ground level indoor spaces beneath which elevated VOCs, indicative of possible vapor intrusion, were detected. AOC #2 consists of the unoccupied basement that is used for storage, and houses the Site's remedial groundwater treatment system. Refer to Figure 7 for delineation of the AOC #1 and AOC #2 areas.

In comparing the sub-slab and indoor air test results, indoor air concentrations of three compounds (PCE, TCE and chloroform) were identified as potentially influenced by soil vapor intrusion due to the presence of these compounds at levels above typical background concentrations in indoor air. Concentrations of these three compounds in sub-slab vapor samples within AOC #1 ranged from 8 to 190,000 $\mu g/m^3$ PCE; non-detect to 360,000 $\mu g/m^3$ TCE; and non-detect to 2,000 $\mu g/m^3$ chloroform. Results of AOC #1 indoor air sampling conducted from 2005 through 2010 indicated VOC concentrations of non-detect to 1,440 $\mu g/m^3$

PCE (the latter impacted by tenant operations); non-detect to 15 $\mu g/m^3$ TCE; and non-detect to 5.1 $\mu g/m^3$ chloroform.

Due to the proximity of groundwater to the basement's slab, sub-slab vapor samples have not been collected from AOC #2. Historical (1993) results for this area referenced in the Site Risk Assessment indicate that low concentrations of VOC's were detected near the open sump, including 0.1 ppm TCE. PCE and chloroform were not reported as being detected at that time. Results of more recent AOC #2 indoor air sampling conducted from 2007 through 2010 indicated VOC concentrations of 24 $\mu g/m^3$ to 1,070 $\mu g/m^3$ PCE, 11 $\mu g/m^3$ to 166 $\mu g/m^3$ TCE, and non-detect to 0.48 $\mu g/m^3$ chloroform, although it should be noted that these results may have been impacted by ongoing operation of the remedial groundwater treatment system located in this area.

1.4 Objectives

This Interim SMP identifies the requirements and protocols to operate, maintain and track the remedial progress and effectiveness of: (i) the extraction and on-site treatment of groundwater; and (ii) mitigation of potential soil vapor intrusion. Revisions to the SMP will be completed to address other remedial activities as the other remedial phases are implemented. All reports associated with the Site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State.

This SMP provides a detailed description of all procedures required to manage the above-mentioned remedial measures, including: (1) implementation and management of associated Engineering Controls and Institutional Controls (EC/ICs); (2) media monitoring; (3) operation and maintenance of treatment, collection, containment, and/or recovery systems; (4) performance of periodic inspections and submittal of Annual Progress Reports; and (5) defining criteria for termination of treatment system operations, as applicable.

To address these needs, this SMP includes three plans: (1) an Engineering and Institutional Control Plan for implementation and management of EC/ICs; (2) a Monitoring Plan for implementation of Site Monitoring; (3) an Operation and Maintenance Plan for implementation of remedial collection, containment, treatment, and recovery systems (including, where appropriate, preparation of an Operation and Maintenance Manual for complex systems).

This plan also includes a description of Annual Progress Reports for the periodic submittal of data, information and recommendations to NYSDEC.

Failure to comply with this SMP is considered a violation of Environmental Conservation Law, 6NYCRR Part 375 and the BCA Index # B8-0701-05-08, Site # C82805, and thereby subject to applicable penalties.

1.5 Revisions

As mentioned, the scope of this Interim SMP is currently limited to the following phases of the remedial effort:

- the extraction and on-site treatment of groundwater; and
- mitigation of sub-slab vapor intrusion.

Revisions to the SMP will be completed to address other remedial activities as the other remedial phases are implemented, and upon completion of the temporary groundwater extraction and treatment activities, at which time changes will be made to the basement ventilation system. Revisions to the SMP will be proposed in writing to the NYSDEC's project manager. This interim SMP may also be periodically updated to address changes in Site management activities.

1.6 Future Use of Site

It is understood that the Site will continue to be used as multi-tenant leased space for light-industrial and commercial business applications. Indoor renovations of this building are common to accommodate tenant needs. Such renovations do not typically involve disturbance of soils or groundwater in the area of concern beneath the building; however, minor renovations (e.g. above-grade modifications to walls, doors, ceiling, etc. that changes overall room dimensions) are a potential concern in areas at which indoor air filtration units are in use as part of the remedy for the Site, as changes can alter airflow patterns and impact the performance of the filtration units.

For these reasons, NYSDEC contact and notification shall be required for any Change of Use that consists of: (i) major renovations that result in disturbance of site soils, or penetration or breakthrough of existing flooring; or (ii) minor renovations impacting the spaces in which indoor air filtration units are utilized as supplemental engineering controls. For these site changes, NYSDEC must first be contacted to evaluate their affect, if any, on the remedy for this Site, including existing engineering and institutional controls. At a minimum, an evaluation of the potential for vapor intrusion will be required for any new Site buildings, building additions or enclosed structures located over a designated area of concern (see Figure 7).

2.0 ENGINEERING AND INSTITUTIONAL CONTROL PLAN

2.1 Introduction

2.1.1 General

Since contaminated soil, groundwater, and soil vapor exists beneath the Site, EC/ICs are required to protect human health and the environment. This Engineering and Institutional Control Plan describes the procedures for the implementation and management of all EC/ICs at the Site. The EC/IC Plan is one component of the SMP and is subject to revision by NYSDEC.

An engineering and institutional control plan will ultimately be employed at the Site to address the residual contamination that remains in soil, fill, or groundwater subsequent to the completion of remedial activities. Upon completion, this plan will cover each of the following planned remedial activities:

- Extraction and on-site treatment of groundwater;
- In situ treatment of groundwater via chemical oxidation;
- Soils excavation and removal; and
- Soil vapor intrusion mitigation.

Engineering and/or institutional controls that have been fully developed to date are limited to:

- the extraction and on-site treatment of groundwater; and
- mitigation of soil vapor intrusion.

Requirements for each of the abovementioned remedial systems are described fully within this Interim SMP. It should be noted that the groundwater extraction and treatment system will likely be discontinued prior to completion of the BCP Site remediation; however, it is anticipated that the ventilation portion of this system will continue to operate, in modified form, after the groundwater extraction and treatment remedial process is discontinued.

2.1.2 Purpose

Post-remedial engineering and institutional controls will be provided as part of the final SMP for this Site, including:

- A description of all EC/ICs on the Site;
- The basic implementation and intended role of each EC/IC;

- A description of the key components of the ICs set forth in the Environmental Easement;

- A description of the features to be evaluated during each required inspection and periodic review;

- A description of plans and procedures to be followed for implementation of EC/ICs, such as the implementation of the Excavation Work Plan 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 EC/ICs required by the Site remedy, as determined by the NYSDEC.

2.2 Engineering Controls

2.2.1 Engineering Control Systems

2.2.1.1 Groundwater

Ongoing remedial actions include operation of the groundwater extraction and treatment system described in section 1.2. Long-term engineering controls will be established as necessary upon completion of the groundwater remedial actions.

Procedures for operating and maintaining the groundwater extraction and treatment system are documented in the Operation and Maintenance Plan (Section 4 of this SMP). Procedures for monitoring the system are included in the Monitoring Plan (Section 3 of this SMP). The Monitoring Plan also addresses severe condition inspections in the event that a severe condition, which may affect controls at the Site, occurs.

2.2.1.2 Soil *(future)*

2.2.1.3 Indoor Air

A sub-slab depressurization system (SSDS) and supplemental controls (carbon air filtration units) were installed at the Site in accordance with the IRM Design Plan. The SSDS is intended to prevent vapors from subsurface VOC-contaminated soil or groundwater from entering the building, while the carbon air filtration units are intended to remove contaminants that could potentially migrate into the building at areas in which the SSDS is not fully effective. Additionally, a dedicated ventilation system

was installed in the basement for the groundwater extraction and treatment system, which is intended to prevent vapors from the extracted groundwater and basement floor trench and sumps from adversely impacting the air in the basement of the Site building.

Procedures for operating and maintaining the SSDS and supplemental controls are documented in the Operation and Maintenance Plan (Section 4 of this SMP). Procedures for monitoring the system are included in the Monitoring Plan (Section 3 of this SMP). The Monitoring Plan also addresses severe condition inspections in the event that a severe condition, which may affect controls at the Site, occurs.

2.2.2 Criteria for Completion of Remediation/Termination of Remedial Systems

Generally, remedial processes are considered completed when effectiveness 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 6.6 of NYSDEC DER-10.

2.2.2.1 Groundwater

The groundwater extraction and treatment system is scheduled to operate until: (i) the groundwater concentrations of chromium decrease to adequate levels for subsequent treatment via in-situ chemical reduction; and (ii) the soil removal component of the remedy has been completed.

2.2.2.2 Soil *(future)*

2.2.2.3 Indoor Air

The active SSD system and associated engineering controls will not be discontinued unless prior written approval is granted by the NYSDEC. In the event that monitoring data indicates that the system is no longer required (e.g., sub-slab air, soil, and groundwater do not contain VOC concentrations with potential to adversely impact indoor air quality), a proposal to discontinue the system will be submitted by the property owner to the NYSDEC and NYSDOH.

2.3 Institutional Controls

A series of Institutional Controls is required by the ROD to: (1) implement, maintain and monitor Engineering Control systems; (2) maintain the site's protective cover, and prevent future exposure to remaining contamination by controlling disturbances of the subsurface contamination; and, (3) limit the use and development of the Site to restricted commercial and restricted industrial uses only.

Upon completion of the remaining remedial elements for this site (i.e. soil removal and in-situ groundwater treatment), a Site Environmental Easement will be developed and implemented to require adherence to the applicable Institutional Controls and site restrictions. A more complete description of the Environmental Easement and Institutional Controls will be included in the SMP at that time.

2.3.1 Excavation Work Plan

A detailed Excavation Work Plan (EWP) will be developed and attached to this SMP for any future intrusive work at the Site that will: (i) penetrate, encounter, or disturb remaining contamination*; or (ii) disturb the existing cover system. The soils removal remedial activities will be completed as part of the remedial action and in accordance with a NYSDEC-approved Remedial Design. Intrusive activities that are not part of the remedial action constitute a Change of Use to which the requirements of section 2.4.2 will apply, and an excavation plan specific for the activity must be submitted for NYSDEC approval.

* *Note: Remaining contamination includes any soils with any compound above the unrestricted use SCOs (not just 'contaminants of concern'), or groundwater above groundwater standards and guidance values.*

The EWP is subject to NYSDEC approval, and any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) prepared for the Site, and in compliance with DER-10, and 29 CFR 1910, 29 CFR 1926, and other applicable Federal, State and local regulations. Based on future changes to State and federal health and safety requirements, and specific methods employed by future contractors, the HASP and CAMP may be updated and re-submitted with the notification provided in the EWP. Any intrusive construction work will be performed in compliance with the EWP, HASP and CAMP, and will be included in the periodic inspection and certification reports submitted under the Site Management Reporting Plan (See Section 5).

The Site owner and associated parties preparing the remedial documents submitted to the State, and parties performing this work, are responsible for the safe performance of intrusive work, the structural integrity of excavations, proper disposal of excavated materials, control of runoff from

open excavations into remaining contamination, and for structures that may be affected by excavations (such as building foundations and bridge footings). The Site owner will ensure that Site development activities will not interfere with, or otherwise impair or compromise, the engineering controls described in this SMP.

2.3.2 Soil Vapor Intrusion Evaluation

Prior to the construction of any new enclosed structures on the site, a soil vapor intrusion (SVI) evaluation will be performed to determine whether actions are needed to address the potential for exposures related to soil vapor intrusion in the proposed structure. Alternatively, a soil vapor intrusion mitigation system may be installed as an element of the building foundation without first conducting an investigation. This soil vapor intrusion mitigation system will likely include a vapor barrier and passive sub-slab depressurization system that is capable of being converted to an active system. Active systems are more effective than passive systems because they actively manipulate the pressure differential between the building's interior and exterior on a continuous basis.

Prior to conducting an SVI investigation or installing a soil vapor intrusion mitigation system, a work plan will be developed and submitted to the NYSDEC and NYSDOH for approval. This work plan will be developed in accordance with the most recent NYSDOH “Guidance for Evaluating Vapor Intrusion in the State of New York”. Measures to be employed to mitigate potential vapor intrusion will be evaluated, selected, designed, installed, and maintained based on the SVI evaluation, the NYSDOH guidance, and construction details of the proposed structure.

Preliminary (unvalidated) SVI sampling data will be forwarded to the NYSDEC and NYSDOH for initial review and interpretation. Upon validation, the final data will be transmitted to the agencies, along with a recommendation for follow-up action, such as mitigation.

SVI sampling results, evaluations, and follow-up actions will also be summarized in the next Annual Progress Report.

2.4 Inspections and Notifications

2.4.1 Inspections

Inspections of all remedial components installed at the Site will be conducted at the frequency specified in the SMP Monitoring Plan schedule. A comprehensive site-wide inspection will be conducted annually. The inspections will determine and document the following:

- Whether Engineering Controls continue 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;
- Sampling and analysis of appropriate media during monitoring events;
- If Site records are complete and up to date;
- Changes, or needed changes, to the remedial or monitoring system; and
- Changes in Site conditions or use.

Inspections will be conducted in accordance with the procedures set forth in the Monitoring Plan of this SMP (Section 3). The reporting requirements are outlined in the Annual Progress Reporting section of this plan (Section 5).

If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs, an inspection of the Site will be conducted within 5 days of the event to verify the effectiveness of the EC/ICs implemented at the Site by a qualified environmental professional as determined by NYSDEC.

2.4.2 Notifications

Notifications will be submitted by the property owner to the NYSDEC as needed for the following reasons:

Change In Use Notice

- 60-day advance notice of any proposed changes in Site use that are required under the terms of the Brownfield Cleanup Agreement (BCA), 6NYCRR Part 375, and/or Environmental Conservation Law. The following activities constitute a change in use: any ground intrusive activity not associated with an approved Remedial Design plan; renovations that would alter air flow patterns at locations currently serviced by indoor air filtration units; conversion of the basement into occupied space before air guideline values are achieved; or construction of a new building or building addition.

Emergency Notice

- 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 Engineering Controls 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 shall be submitted to the NYSDEC within 45 days and shall describe and document actions taken to restore the effectiveness of the ECs.

Change In Ownership Notice

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 has been provided with a copy of the 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.

2.5 Contingency Plan

Emergencies may include injury to personnel, fire or explosion, environmental release, or serious weather conditions. Emergency contact numbers are provided in Table 2-1 below for use in the event of an environmentally related situation or unplanned occurrence requiring assistance. The Owner's representative listed below will be used for response and assessment of non-critical situations. For emergencies, appropriate emergency response personnel should be contacted immediately.

Table 2-1: Emergency Contact Numbers

Owner's Representative	Day Environmental, Inc. (585) 454-0210
Medical, Fire, and Police	911
Pollution/Toxic Chemical/Oil Spills	(800) 424-8802
NYSDEC Spills Hotline	226-2466 or (800) 457-7362
Poison Control Center	275-5151 or (800) 222-1222

The nearest hospital to the Site is:

Strong Memorial Hospital, 601 Elmwood Avenue, Rochester, New York
Phone: 911 (275-2100)
Emergency Dept: 275-4551

FIGURE 3: EMERGENCY ROUTE TO HOSPITAL

Directions to the Hospital:

- From Site, turn north on Mt. Read Boulevard – go 0.3 mi;
- Turn left to take ramp onto I-490W – go 0.8 mi;
- Take left exit 9B onto I-390 South – go 3.0 mi;
- Take exit 17, and turn left onto NY-383/Scottsville Road – go 0.6 mi;
- Bear right onto Elmwood Ave. – go 0.9 mi;
- Hospital is on right (South) side of road

Total Distance: approx. 5.8 mi
Total Estimated Time: approx. 10 minutes

3.0 SITE MONITORING PLAN

3.1 Introduction

3.1.1 General

The SMP describes the measures for evaluating the performance and effectiveness of the remedial measures to reduce or mitigate contamination at the Site. The only ROD-specified remedial activities fully implemented to date for the Site are:

- the extraction and on-site treatment of groundwater; and
- mitigation of soil vapor intrusion.

As such, the scope of this Interim SMP is currently limited to activities as necessary to evaluate the performance of the above-mentioned remedial measures.

Future revisions will be made to this SMP to incorporate monitoring of groundwater and soils to evaluate the performance of future additional planned remedial activities for the Site, including:

- In-situ treatment of groundwater; and
- Soil excavation and removal.

Monitoring of specific Engineering Controls is described in Section 4 of this Interim SMP.

3.1.2 Purpose and Schedule

The objective of the Site Monitoring Plan is to describe the methods to be used for:

- Sampling and analysis of appropriate media (e.g., groundwater, indoor air, soil vapor, soils);
- Assessing compliance with applicable NYSDEC standards, criteria and guidance, particularly ambient groundwater standards and Part 375 SCOs for soil;
- Assessing achievement of the remedial performance criteria.
- Evaluating Site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment; and
- Preparing the necessary reports for the various monitoring activities.

To adequately address these issues, this Interim Site Monitoring Plan provides information on:

- Sampling locations, protocol, and frequency;
- Information on the designed monitoring systems (e.g., well logs);
- Analytical sampling program requirements;
- Reporting requirements;
- Quality Assurance/Quality Control (QA/QC) requirements;
- Inspection and maintenance requirements for monitoring wells;
- Monitoring well decommissioning procedures; and
- Annual inspection.

Routine monitoring of the groundwater extraction and treatment system performance will be conducted over the operational life of the system, currently anticipated to be five to ten years in duration. Routine system monitoring activities are summarized in Table 3-1, and are further detailed in the Sampling Programs summarized in Table 3-2 and 3-3.

Routine monitoring of the soil vapor intrusion mitigation systems will be conducted indefinitely until such time as monitoring data indicates that the system is no longer required (e.g., sub-slab air, soil, and groundwater contain no VOC concentrations with potential to adversely impact indoor air), and approval is received by NYSDEC and NYSDOH to discontinue system operations. Routine system monitoring activities for the soil vapor mitigation systems are summarized in Table 3-4, and include:

- Quarterly checks of each vent system to confirm positive airflow;
- Quarterly checks of carbon filters to confirm that carbon absorbancy is still adequate (i.e. media is not spent – based on initial observations, the two 160-lb Electrocorp I6500A carbon units located in the first-floor occupied spaces were estimated to have a service life of up to 10 years or more, while the 22-lb to 36-lb AllerAir carbon units located in the basement were expected to provide a minimum service life of 3-5 years);
- Annual check of sub-slab depressurization points to confirm that sub-slab vacuum is being maintained;
- Annual site walkover for general integrity review of system equipment, piping, covers, etc.; and
- Periodic indoor air sampling to confirm the effectiveness of the vapor intrusion mitigation engineering controls.

Table 3-1: Groundwater Extraction & Treatment
Routine Monitoring Schedule

Monitoring Program	Frequency	Matrix	Analysis
Treatment System Review	Daily (weekdays)	Water	Pressure drops, flowmeter readings, leak inspection
Extraction Well Pump Operation	Weekly	Water	Manual Pump Check & Review of Total WWTP Flow Rates
Monitoring Well Water Levels	Quarterly (4/yr) for one year, bi-annually (2/yr) thereafter	Water	Static Water Levels (Monday and Friday readings, at start and end of pump cycle)
Extraction Well Yield (EW-1 through EW-7)	Bi-annually (2/yr)	Water	Well yield (gallons per minute)
Water Treatment System Influent	Varies (see Table 3-3)	Water	Total and Hex. Chromium
MetalMaster Media Filter	Quarterly	Water	Soluble Chromium
Activated Carbon Filtration System	Quarterly	Water	Halogenated VOCs
Water Treatment System Effluent	Quarterly	Water	Purgeable Aromatics VOCs Total Chromium
Extraction and Monitoring Well Contaminants	Varies (see Table 3-2)	Water	Total and Hex. Chromium Halogenated VOCs

Table 3-2
Groundwater Monitoring and Extraction Well
Sampling Program

Monitoring Well ID	Sampling Frequency	Target Analysis	Analytical Methods	Sample Container	Preservative	Deliverable Package
Perimeter Wells (MW-1, MW-4, MW-14, MW-15, MW-18, MW-21)	Quarterly (4/yr) for one year, annually (1/yr) thereafter	Total Chromium	EPA 200.7	1 plastic 250 mL	Nitric Acid	Standard
		Hexavalent Chromium	SW 7196 A	1 plastic 100 mL	None	Standard
		Halogenated VOCs	EPA 8260B	2 - 40 mL Vials	HCL	Standard
Interior Wells (MW-8, MW-11, MW-13, MW-31, MW-33, MW-34)	Quarterly (4/yr) for one year, annually (1/yr) thereafter	Total Chromium	EPA 200.7	1 plastic 250 mL	Nitric Acid	Standard
		Hexavalent Chromium	SW 7196 A	1 plastic 100 mL	None	Standard
		Halogenated VOCs	EPA 8260B	2 - 40 mL Vials	HCL	Standard
Extraction Wells (EW-1, EW-2, EW-3, EW-4, EW-5, EW-6, EW-7)	Quarterly (4/yr) for one year, bi-annually (2/yr) thereafter	Total Chromium	EPA 200.7	1 plastic 250 mL	Nitric Acid	Standard
		Hexavalent Chromium	SW 7196 A	1 plastic 100 mL	None	Standard
		Halogenated VOCs	EPA 8260B	2 - 40 mL Vials	HCL	Standard

Table 3-3

Groundwater Treatment System

Sampling Program

Sample Location	Sampling Frequency	Target Analysis	Analytical Methods	Sample Container	Preservative	Deliverable Package
Metal Master Influent	Monthly for six months, quarterly thereafter	Total Chromium	EPA 200.7	1 plastic 250 mL	Nitric Acid	Standard
		Hexavalent Chromium	SW 7196 A	1 plastic 100 mL	None	Standard
Metal Master Primary Filter Effluent (Train 1 and Train 2)	Quarterly	Soluble Chromium	EPA 200.7	1 plastic 250 mL	None	Standard
Activated Carbon Influent	Quarterly	Halogenated VOCs	EPA 8260B	2 - 40 mL Vials	HCL	Standard
Activated Carbon Primary Filter Effluent (Train 1 and Train 2)	Quarterly	Halogenated VOCs	EPA 8260B	2 - 40 mL Vials	HCL	Standard
System Effluent	Quarterly	Purgeable Aromatics	EPA 601/602	2 - 40 mL Vials	HCL	Standard
		VOCs	EPA 8260B			Standard
		Total Chromium	EPA 200.7	1 plastic 250 mL	Nitric Acid	Standard

Table 3-4
Soil Vapor Intrusion Mitigation System
Monitoring Schedule

Monitoring Program	Frequency	Matrix	Analysis
Component Review	Quarterly	Air	Verification of Equipment Operation
Electrocorp I6500A Activated Carbon Filter Testing	Quarterly	Air	PID check of carbon adsorbancy (two units, 1st floor)
AllerAir 5000D Activated Carbon Filter Testing	Quarterly	Air	PID check of carbon adsorbancy (two units, basement)
AllerAir 6000DX Activated Carbon Filter Testing	Quarterly	Air	PID check of carbon adsorbancy (three units, basement)
Sub-Slab Depressurization Points	Annual	Air	Vacuum pressure check
Site Review	Annual	Air	Site review of visible components, piping, etc.
Indoor Air Testing	Annual (select locations only, see Section 3.2.2)	Air	VOC's (EPA TO-15)

3.2 Media Monitoring Program

3.2.1 Groundwater Monitoring Program

Monitoring of the groundwater monitoring and extraction wells will include quarterly sampling over the first year (beginning December 2009) for baseline characterization purposes, following which the extraction wells will be monitored bi-annually (twice each year) to evaluate changes in the chromium and VOC concentrations in the groundwater at these wells. Monitoring of the interior monitoring wells will be performed on an annual frequency following the first year of quarterly sampling, to similarly chart trends at these locations; however, a lesser (annual) frequency is anticipated to be adequate for the interior wells as the extraction well contaminant concentrations are considered more critical for assessing system efficiency and removals. Monitoring of the perimeter monitoring wells will also be performed on an annual frequency following the first year of quarterly sampling, as an annual frequency is anticipated to be adequate for confirmation that the groundwater depression created by the groundwater extraction system is preventing the further migration of contaminants to any significant degree. The frequency of systems monitoring and performance reviews may be re-evaluated at a later date, but no changes to the routine monitoring program will be made without prior approval of the NYSDEC.

3.2.1.1 Well Field Description

Groundwater monitoring will be performed on a periodic basis as described in Table 3-2 to assess the performance of the remedy. A network of monitoring wells has been installed to provide for groundwater extraction, as well as for monitoring Site conditions up-gradient and down-gradient from the area of concern identified in the ROD. This network of on-site wells was designed based on the following criteria:

- The ability to provide background groundwater quality data;
- The ability to provide Site perimeter groundwater quality data;
- The ability to provide source zone migration/reduction indicators and dissolved phase concentrations;
- The ability to provide groundwater extraction system capture zone information;
- The ability to provide groundwater elevation data for development/analysis of groundwater flow direction and;

- The ability to provide hydraulic control and prevent possible off-site migration of Site-related contaminants.

Figure 4 presents the location of the various monitoring and extraction wells included in the monitoring well field established for the Site. In general, with the exception of extraction well EW-4 and monitoring well MW-21, the monitoring/extraction wells presented on Figure 4 are bedrock interface wells with a 10 foot screened interval that extends approximately five feet into bedrock and five feet into the overburden approximately five feet above bedrock. Monitoring well MW-21 and extraction well EW-4 are approximately 40 feet deep with a screened intervals extending between approximately 10-to-40 feet below the ground surface. Monitoring well construction details for select monitoring and extraction wells are provided in the document titled "Construction Completion Report, Groundwater Extraction and Treatment System" (March 2010) prepared by DAY for the Site.

3.2.1.2 Baseline and Post-Extraction System Startup Groundwater Conditions

Prior to groundwater extraction system startup, background measurements (i.e., static water levels and analytical laboratory testing) were collected to establish baseline groundwater conditions. Baseline static water level measurements for monitoring wells MW-1, MW-4, MW-11, MW-13, MW-14 MW-15, MW-21, MW-31, MW-33 and MW-34 and extraction wells EW-1, EW-2, EW-3, EW-4, EW-5 and EW-6 were collected prior to systems startup, and periodically throughout the post-startup extraction systems startup and monitoring period. A summary of the static water level data is provided in Table 3-5.

Potentiometric maps were developed to identify groundwater flow conditions prior to and following startup of the groundwater extraction and treatment system. Figure 5 presents the potentiometric map for July 21, 2008 (detailed static water level data is provided in the Construction Completion Report). As shown in Figure 5, the groundwater flow prior to system startup was radial towards the basement sump system. Figure 6 portrays the potentiometric map showing post-startup groundwater conditions on September 4, 2009. As shown in Figure 6, and as summarized in Table 3-5, the groundwater extraction system has successfully depressed the groundwater table by several feet throughout the area of concern, and is maintaining a steeper radial gradient towards the area of concern. This is expected to facilitate extraction and removal of contaminants, as well as to minimize the potential for contaminant migration.

TABLE 3-5

Pre and Post Groundwater Extraction System Static Water Levels

Well ID	Pre-Groundwater Extraction System SWLs [1]	Post-Groundwater Extraction System SWLs [2]	Difference Between Pre and Post Groundwater Extraction System SWLs
MW-1 [3]	7.11	7.30	0.13
MW-4 [3]	7.33	7.09	-0.31
MW-8	8.93	11.05	2.43
MW-11	7.83	8.47	0.64
MW-13	8.44	8.92	0.51
MW-14 [3]	9.75	9.69	-0.14
MW-15 [3]	10.47	10.59	-0.03
MW-18 [3,4]	NC	9.32	--
MW-21	9.71	13.24	3.43
MW-30	8.90	12.05	3.15
MW-31	9.12	12.38	3.11
MW-32 [6]	7.23	8.04	0.81
MW-33	9.51	10.83	1.31
MW-34	9.19	9.85	0.56
EW-1 [5]	8.48	14.16	5.94
EW-2 [5]	8.55	14.00	5.39
EW-3 [5]	10.38	13.43	3.15
EW-4 [5]	8.82	15.99	6.55
EW-5 [5,7]	7.23	13.94	7.14
EW-6 [5,8]	8.90	15.02	3.15
EW-7 [5,9]	NC	NC	NC

Notes

SWL = Static Water Level (feet below top of riser)

1) The pre-groundwater extraction system SWLs are an average calculated from measurements collected on: 6/3/08, 7/18/08 and 7/21/08.

2) The post-groundwater extraction system SWLs are an average calculated from measurements collected on: 7/22/08, 7/23/08, 7/24/08, 7/25/08, 7/28/08, 8/1/08, 8/4/08, 8/8/08, 8/12/08, 8/27/08, 9/3/08, 9/10/08, 9/25/08, 10/9/08, 10/15/08, 10/22/08,11/6/08, 11/11/08, 11/19/08, 11/25/08, 12/12/08, 12/19/08, 1/8/09, 1/12/09, 1/20/09, 2/6/09, 2/9/09, 2/20/09, 2/27/09, 3/7/09, 3/20/09, 4/1/09, 4/7/09, 5/21/09, 5/28/09, 6/5/09, 6/12/09, 6/19/09 6/25/09, 7/10/09, 7/17/09, 8/17/09, 9/4/09, 10/23/09, 11/24/09, 12/7/09, 1/14/10, 2/18/10, 3/29/10, 6/15/10, 9/20/10, 6/15/11, 12/19/11, 12/23/11, 8/6/12 and 12/19/12.

3) Monitoring wells MW-1, MW-4, MW-14, MW-15 and MW-18 are perimeter (background) wells. As such, it was not anticipated that the groundwater extraction system's radius of influence would extend to these locations.

4) Monitoring well MW-18 was not located until May 2009. As such, pre-groundwater extraction system SWLs are not available. The post-groundwater extraction system SWL is an average calculated from measurements collected between 5/21/09 and 9/4/09.

5) The indicated post-groundwater extraction SWL is the depth in which the static water level probe could not be advanced any further due to obstruction caused by the submersible pump. As such, the actual groundwater depression at this location is greater than the value reported on the table.

6) Monitoring well MW-32 was converted to extraction well EW-5 on 6/17/09. As such, the post-groundwater extraction system SWL in an average calculated from measurements collected between 7/22/09 and 6/12/09.

7) Extraction well EW-5 became operational on 6/17/09. As such, the post-groundwater extraction system SWL is an average calculated after 6/17/09.

8) Monitoring well MW-30 was converted to extraction well EW-6 on 12/14/12. As such, the post-groundwater extraction system SWL in an average calculated from measurements collected after 12/14/12.

9) Extration well EW-7 was installed on 11/14/12 and became operational on 1/22/13. As such, the post-groundwater extraction system SWL (data pending) is an average calcualted from measurements collected after 1/22/13.

Detailed static water level and contaminant concentration data are provided in the Construction Completion Report for the Groundwater Extraction and Treatment System.

3.2.1.3 Routine Groundwater Monitoring

Static groundwater measurements will be collected from monitoring and extraction wells MW-1, MW-4, MW-8, MW-11, MW-13, MW-14, MW-15, MW-18, MW-21, MW-31, MW-33 and MW-34 and extraction wells EW-1, EW-2, EW-3, EW-4, EW-5, EW-6 and EW-7 on a periodic basis (see Table 3-1) using an electronic groundwater level-measuring device. Water levels will be measured twice during each groundwater monitoring event – once at the start of the extraction pump operating cycle (i.e. on Monday prior to pump start-up), and once at the end of the extraction pump operating cycle (i.e. on Friday prior to pump shut-down). Subsequent to the collection of static water levels, groundwater elevations will be calculated, and groundwater potentiometric maps can be developed illustrating the approximate groundwater elevations and groundwater flow directions for specific dates.

Well yields will be monitored at extraction wells EW-1, EW-2, EW-3, EW-4, EW-5, EW-6 and EW-7 on a periodic basis (see Table 3-1). Well yields will be determined by measuring ongoing pump output at each extraction well. For each measurement, the pump discharge will be diverted from its existing discharge hose into a bucket for a minimum period of ten minutes or until a minimum volume of four gallons is collected (whichever takes longer)..Due to the fluctuating static water levels (SWLs) and pump flow rates caused by the intermittent operating schedule, well yield measurements will be monitored during the second 24-hourr operating period of the week (typically a Tuesday), which has been demonstrated to accurately represent the average well yield during the operating period. Variability in the well yield monitoring results will be periodically evaluated to determine if this method provides data of acceptable quality or if alternate methods of measuring well yields are needed.

Additionally, on a periodic basis (see Table 3-2), samples will be collected and analyzed for total and hexavalent chromium and halogenated VOC’s from monitoring wells MW-1, MW-4, MW-8, MW-11, MW-13, MW-14 MW-15, MW-18, MW-21, MW-31, MW-33, and MW-34; and from extraction wells EW-1, EW-2, EW-3, EW-4 EW-5, EW-6 and EW-7.

The sampling frequencies identified herein may be modified with the approval of NYSDEC. The SMP will be modified to reflect changes in sampling plans approved by NYSDEC.

3.2.1.4 Sampling Protocol

Monitoring well sampling activities will be recorded in a field book and/or a groundwater-sampling log. Other observations (e.g., well integrity, etc.) will be noted on the well sampling log. The well sampling log will serve as the inspection form for the groundwater monitoring well network.

Prior to collecting representative groundwater samples for laboratory analysis, the depth to static water within each monitoring well will be measured, and a Heron Oil/Water Interface Meter (or equivalent) will be used to assess the presence of dense non-aqueous phase liquids (DNAPL) within each well to be sampled.

With the exception of MW-21, each well will be purged prior to sampling by removing a minimum of three well casing volumes of water or to dryness. In general, the wells will be allowed to recharge to a minimum of 90% of their static water level prior to sampling; however, regardless of recharge rate, the wells will be sampled within 24 hours of purging. Due to it's sizable well volume and slow recharge capacity, MW-21 will be sampled using low flow techniques to minimize the volume of purge water removed prior to sampling as follows:

- A portable bladder pump connected to new disposable polyethylene tubing will be lowered and positioned at or slightly above the mid-point of the water column within the well screen. Care will be taken to install and lower the bladder pump slowly in order to minimize disturbance of the water column.

- The pump will be connected to a control box that is operated on compressed gas (nitrogen, air, etc.) and is capable of varying pumping rates. An in-line flow-through cell attached to a Horiba U-22 water quality meter (or similar equipment) will be connected to the bladder pump effluent tubing to measure water quality data.

- The pump will be started at a pumping rate of 100 ml/min or less (for pumps that can not achieve a flow rate this low, the pump will be started at the lowest pump rate possible). The water level in the well will be measured and the pump

rate will be adjusted (i.e., increased or decreased) until the drawdown is stabilized. In order to establish the optimum flow-rate for purging and sampling, the water level in the well will be measured on a periodic basis (i.e., every one or two minutes) using an electronic water level meter or an oil/water interface meter. When the water level in the well has stabilized (i.e., use goal of <0.33 ft of constant drawdown), the water level measurements will be collected less frequently.

- While purging the well at the stabilized water level, water quality indicator parameters will be monitored on a three to five minute basis with the Horiba U-22 water quality meter (or similar equipment). Water quality indicator parameters will be considered stabilized when the parameter readings listed below are generally achieved after three consecutive readings:

    - pH ($\pm$ 0.1);
    - specific conductance ($\pm$ 3%);
    - temperature ($\pm$ 10%); and

- Following stabilization of the water quality parameters, the flow-through cell will be disconnected and a groundwater sample will be collected from the bladder pump effluent tubing. The pumping rate during sampling will remain at the established purging rate or it may be adjusted downward to minimize aeration, bubble formation, or turbulent filling of sample containers. A pumping rate below 100 ml/min will be used when collecting VOC samples.

Each well will be sampled using new, dedicated disposable bailers with dedicated cord. In addition to collecting analytical laboratory samples, additional samples will be obtained at each well to evaluate field parameters. Field parameters will include pH, specific conductivity, and temperature. The field parameters will be presented on monitoring well sampling logs.

The analytical laboratory groundwater samples will be placed in pre-cleaned laboratory containers, labeled and preserved with ice. The samples will be transported under chain-of custody control to a NYSDOH Environmental Laboratory Approval Program (ELAP)-certified analytical laboratory, and will be tested for the following parameters:

- Halogenated VOCs, using United States Environmental Protection Agency (USEPA) Method 8260; and
- Total and hexavalent chromium, using ASP Method CLP-M

3.2.1.5 Monitoring Well Repairs, Replacement And Decommissioning

If biofouling or silt accumulation occurs in a monitoring well, the well will be physically agitated/surged and redeveloped using a vacuum purge system. If biofouling becomes a frequent problem, chlorine tablets approved may be used to control in-well biofilms (although not potable, only EPA-registered and approved tablets for potable water supplies will be used). Additionally, monitoring wells will be properly decommissioned and replaced if an event renders the wells unusable. Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance.

The NYSDEC will be notified prior to any repair or decommissioning of monitoring wells for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent periodic report. Well decommissioning without replacement will be done only with the prior approval of NYSDEC. Well abandonment will be performed in accordance with NYSDEC's "Groundwater Monitoring Well Decommissioning Procedures." Monitoring wells that are decommissioned because they have been rendered unusable will be reinstalled in the nearest available location, unless otherwise approved by the NYSDEC.

3.2.2 Indoor Air Monitoring Program

Indoor air monitoring activities completed to date have demonstrated that tenant operations have a significant impact upon indoor air quality at the Site, and it has proven difficult to isolate these operations and prevent them from impacting indoor air test results. Due to the nature of the building (i.e., varied tenant practices, open interior doors and connecting spaces above permeable and inter-connected drop ceilings), VOC's from tenant operations readily migrate from one space to another, and multiple tenants have reported the detection of chemical odors migrating into their workspace from adjacent rooms.

Three compounds (PCE, TCE and chloroform) were identified in the IRM as potentially influenced by soil vapor intrusion due to the presence of

these compounds at levels above typical background concentrations in indoor air. Given the limited effectiveness of the sub-slab depressurization system at the Site due to the characteristics of the underlying soils, a combination of engineering controls are being used to meet the applicable target indoor air criteria.

Continuous operation of the soil vapor intrusion mitigation system engineering controls is expected to maintain AOC #1 indoor air quality within the applicable target criteria (notwithstanding changes in tenant usage of the above-referenced VOC's of concern, which is outside of the scope of vapor intrusion mitigation). Indoor air testing at AOC #2 (basement) is ongoing to determine if the target criteria can be achieved through the continued operation of the five indoor air carbon filtration units and the groundwater treatment ventilation system.

The following routine monitoring activities will be performed to document the effectiveness of the engineering controls:

- Quarterly checks of fans (equipment, suction ports and/or rooftop vent exhausts) to confirm operation, and to confirm no rooftop obstructions or damage;

- Quarterly checks of indoor air filtration unit prefilter (visual observation of filter to be sure it is not dirty and impedes airflow – with occasional vacuum cleaning, prefilters should last for years) and carbon media (to be sure that carbon absorbancy is still adequate and media is not spent – based on initial observations, the two 160-lb Electrocorp I6500A carbon units located in the first-floor occupied spaces were estimated to have a service life of up to 10 years or more, while the 22-lb to 36-lb AllerAir carbon units located in the basement were expected to provide a minimum service life of 3-5 years);

- Annual checks of sub-slab depressurization points to confirm that baseline vacuum pressures are being maintained;

- Annual site walkover for general integrity review of system equipment, piping, covers, etc.; and

- Periodic indoor air testing to confirm that engineering controls are maintaining indoor air concentrations within applicable guidance value threshold levels.

3.2.2.1 Equipment Location

In accordance with the NYSDEC approved Design Plan, mitigation of potential soil vapor intrusion within AOC #1 (i.e.

potentially impacted first-floor inhabited spaces) and AOC #2 (i.e., potentially impacted basement level unoccupied spaces) was accomplished using a combination of sub-slab depressurization and ventilation/air filtration engineering controls as summarized below. Equipment locations are shown in Figure 7.

AOC #1

- six independent SSDS points;
- four sub-slab vacuum monitoring points;
- two Electrocorp I6500A air filtration units, containing approximately 160 pounds (lbs) of activated carbon per unit;

AOC #2

- two AllerAir 5000D air filtration units, containing approximately 22 lbs of activated carbon per unit;
- three AllerAir 6000DX air filtration units, containing approximately 36 lbs of activated carbon per unit; and
- ventilation system to provide positive suction on the covered sumps, trench and appropriate groundwater treatment tanks.

3.2.2.2 Routine Monitoring Procedures

The routine monitoring procedures presented in this section will be used to verify that the IRM engineering controls are maintained in the same operating condition as they were during completion of the initial confirmatory indoor air testing activities. Additional confirmatory indoor air testing will be completed as detailed in Section 3.2.2.3

Routine monitoring will be performed at the frequency indicated in Table 3-4, and documented by filling out the appropriate logs included in Appendix B. A summary of items to be checked during these routine monitoring procedures is provided below.

Quarterly Equipment Check: Check to make sure that each of the fans (6 SSD fans, 7 carbon filter fans, and 1 basement vent fan) are: plugged in; turned on; set at high speed; are moving air (confirm rotation/air movement); carbon unit location has not changed such that ability to circulate and treat room air is significantly impacted; airflow around each carbon unit is not restricted; and that the SSD systems and carbon filtration units are properly labeled. If present, any local combustion devices will also be checked to verify that the SSD system is not causing noticeable backdrafting.

Quarterly Carbon Filter Media Check: A carbon media test procedure has been developed for this project, as detailed in Appendix C. The field testing procedure is as follows:

Check prefilter and clean or replace as needed if it is visually dirty. Also verify that the filter is operating at the high speed setting. Using a PID meter, measure the background (i.e. unspiked) ppm VOC content of the discharged air from the filter. Place one to two ounces of acetone in a 4-ounce soil jar (2.25-inch diameter opening at top), and place the jar immediately adjacent to the air filter intake (floor level next to side intake of the large carbon unit, or directly beneath the bottom intake of the small unit, raising the unit as necessary). Using a PID meter, measure the ppm VOC content of the spiked discharged air from the filter, and compare it to the carbon changeout criteria listed below.

	Increase in VOC Concentrations @ Discharge	
	Large Carbon Filters (Electrocorp, AOC #1)	Small Carbon Filters (AllerAir, AOC #2)
Virgin Carbon	0.0 ppm	0.5 ppm
Full Breakthrough	16.5	85 ppm
Carbon Changeout Threshold	4.0	21 ppm

If the average increase in measured VOC concentration at the discharge of the air filter exceeds the threshold concentration listed above, the carbon will be changed out, and fresh carbon installed.

Annual Sub-Slab Depressurization Point Check: The vacuum pressure at the inlet side of each sub-slab depressurization point fan will be checked using a liquid-filled manometer or electronic vacuum gauge and a static pressure tip. Baseline pressures at systems start-up were relatively uniform, ranging from -2.0 to -2.3 inches of water column at each of the six depressurization points. A small degree of variability can be expected over time, and as such a minimum vacuum reading of 1.8 inches water will be considered the threshold below which analysis and repair or replacement of the fan will be required.

Annual Site Walkthrough Review: Perform a visual check of all mechanical equipment, ductwork, and seals. Fans shall be checked for positive airflow, excessive noise or vibration, etc.; ductwork shall be checked for integrity/damage, tight connections and seals, etc.; basement equipment shall be checked for tight seals on sumps and trench, and negative suction shall be confirmed on all vented tanks and sumps.

3.2.2.3 Indoor Air Testing Program

Confirmatory indoor air testing will be completed as detailed in this section to verify the effectiveness of the soil vapor intrusion mitigative engineering controls and the associated routine monitoring procedures (see Section 3.2.2.2).

Sampling Frequency: For AOC #1 locations (Site building first floor) in which the SSDS has been determined to be not fully effective (i.e., those locations at which carbon filtration is being used to supplement the SSDS system), indoor air samples shall be collected annually to periodically monitor and confirm the ongoing effectiveness of the engineering controls. For AOC #1 locations at which the SSDS has been deemed effective (i.e. locations not utilizing supplemental carbon filtration), indoor air testing will be conducted as needed to provide a single confirmation of the effectiveness of the SSDS (i.e. receipt of one result indicating that the indoor air quality is within applicable guidance values for the parameters of concern), following which monitoring of SSDS operational parameters (suction pressures) will be used in lieu of further indoor air sampling for effectiveness monitoring purposes.

In addition to the routine monitoring described above, collection of additional indoor air samples within the AOC #1 area shall be required if: (i) building modifications are completed that could change air flow patterns and impact the effectiveness of the purification units; or (ii) an unsuccessful result is obtained at any time from an AOC #1 location. Under these events, resampling of the applicable location will be performed as soon as practical following evaluation and corrective action (see Section 5.3), as needed, and until a successful test result is obtained. A successful indoor air testing result is defined as indoor air concentrations at or below the following target guidance values:

Parameter	Concentration (ug/m^3)
Chloroform	1.1
Trichloroethene	5
Tetrachloroethene	30

AOC #2 (basement) will be sampled for monitoring purposes only on a biennial basis (once every two years) until such time as: (i) the groundwater treatment equipment is removed; (ii) there is a change in the occupational classification of that space; and/or (iii) a corrective measures plan is developed for the basement.

Sample Locations: Indoor air sampling locations will be collected from the locations identified as R-1 and R-2 on Figure 7. The biennial basement sample will be collected from the location identified as R-7 on Figure 7. In addition, an ambient outdoor air sample will also be collected at a Site location that is upwind from the building, and at a ht. of approx..3 ft. above the ground surface.

Sampling Procedure: A site visit will be conducted approximately one week prior to sample collection to inform tenants at the sampling locations of the requirements necessary to collect representative indoor air samples. A formal product inventory has previously been completed for each of the sampling locations (copies of which are included in the Construction Completion Report), and during the pre-sampling Site visit, an update of these inventories will be completed, and tenants will be advised not to use any chemicals observed to contain VOC's of interest until after the conclusion of the indoor air sampling event.

Samples will be collected using Summa Canisters over a 2-hour period to enable a sustained period of tenant inactivity prior to sample collection. The air flow-rate will be controlled with pre-calibrated regulators supplied by the laboratory. Vacuum gauges will be connected to the regulators in order to monitor for proper operation (i.e., slow changes in vacuum), and to verify that the sample collection rate does not exceed 0.2 liters per minute. Additionally, a photoionization detector (PID) will be used to screen the air space above the Summa Canisters to establish background conditions during the sampling event, and identify any VOC fluctuations that may occur during the sampling interval.

Indoor air sampling events will be scheduled early during the heating season, defined as November through March, to allow time for corrective action and resampling, if necessary. As possible, indoor air sampling events will also be scheduled following a long weekend or other period of sustained tenant inactivity to minimize the potential impact of tenant operations upon the indoor air quality results. The Summa Canister samples will be delivered under chain-of-custody documentation to an ELAP certified analytical laboratory for testing. Each of the samples will be tested for VOCs using USEPA Method TO-15. Minimum detection levels of 0.25 $\mu g/m^3$ for TCE and vinyl chloride, and 1 $\mu g/m^3$ for PCE and other compounds of concern, will be requested.

3.3 Quality Assurance / Quality Control

Pertinent components of the Quality Assurance / Quality Control (QA/QC) Plan that was included in the Remedial Design Plan shall be implemented as part of this SMP. This includes the following QA/QC protocols:

- Maintenance of equipment: monitoring, process and control instrumentation and equipment will be calibrated, operated and maintained in accordance with the manufacture's recommendations. Equipment to be maintained in this manner includes, but is not limited to, electronic static water level indicator, water quality meter, PID meter, pH probes and controllers, chemical metering pumps, air diaphragm product transfer pumps, extraction well pumps, air compressor, electronic solenoid valves, fans, and filter units.

- Record keeping: DAY will document project activities in a bound field book or log on a regular basis. Information that will be recorded will include:

    - Date and time work is performed;
    - Details on work being performed;
    - Details on field equipment used;
    - Visual and olfactory observations during remedial activities;
    - Personnel and equipment on-site;
    - Weather conditions; and
    - Other pertinent information as warranted.

- Sampling and laboratory analysis: standard procedures and protocols to be used shall include:

    - Sampling personnel will wear disposable latex, nitrile or PVC gloves. Between collection of environmental samples, personnel performing sampling will discard used gloves and don new gloves to prevent sample cross-contamination.
    - Sampling equipment and materials will be disposable one-use materials, or materials that are dedicated to one particular sampling location (e.g., sampling containers, bailers, rope, pump tubing, latex gloves, etc.).
    - New laboratory-grade sample containers will be used to collect groundwater samples from monitoring wells, extraction wells and the groundwater treatment system. Sufficient volume (i.e., as specified by the analytical laboratory) will be collected to ensure

that the laboratory has adequate sample volume to perform the specified analysis.

- Samples will be preserved as specified by the analytical laboratory for the type of parameters and matrices being tested. Sample holding times and preservation protocols will be adhered to during this project. Analytical laboratories will analyze the samples using the lowest practical quantitation limits (PQLs) possible.
- Samples collected for subsequent analytical testing will be handled using standard chain-of-custody control. Chain-of-custody documentation will accompany samples from their inception to their analysis, and copies of this documentation will be included with the analytical laboratory's report. The chain-of-custody will include the date and time the sample was collected, the sample identity, sampling location, and requested analysis.
- Samples will be analyzed by a NYSDOH-certified laboratory, with standard results/data package reporting. ASP-B data packages and Data Usability Summary Reports (DUSRs) will be completed only upon the last round of groundwater monitoring prior to shutting down the extraction and treatment system.

3.4 Health and Safety Plan

The Health and Safety Plan (HASP) for Remedial Site Management is included as Appendix E to this SMP. Remedial Site management activities, including associated operations, maintenance and monitoring activities, shall be conducted in accordance with the procedures outlined in this HASP to minimize the potential for injury, accident, or incident occurrence.

3.5 Reporting Requirements

Forms and any other information generated during regular operation, maintenance and monitoring events and inspections will be kept on file on-site. All forms, and other relevant reporting formats used during these events are subject to review and approval by NYSDEC, and will be submitted to NYSDEC as specified in the Reporting Plan of this SMP, or otherwise upon request of NYSDEC.

All monitoring results will be reported to NYSDEC on a periodic basis in the Annual Progress Report (see Section 5), which shall include the following:

- Date(s) of event(s);
- Personnel conducting sampling;
- Description of the activities performed;
- Type of samples collected;

- Copies of completed field forms (e.g., well sampling logs, chain-of-custody documentation, etc.);
- Copies of laboratory data sheets (submitted electronically in the NYSDEC-identified format);
- Summary of sampling results, with comparison to appropriate standards/criteria and/or previous sampling data;
- A figure illustrating sample type and sampling locations;
- Any observations, conclusions, or recommendations; and
- A determination as to whether groundwater conditions have changed since the last reporting event.

4.0 OPERATION AND MAINTENANCE PLAN

4.1 Introduction

This Operation and Maintenance (O&M) Plan describes the measures necessary to operate, monitor and maintain the mechanical components of the remedy selected for the Site. The scope of this Interim SMP is currently limited to: (i) the extraction and on-site treatment of groundwater; and (ii) the IRM engineering controls for mitigation of potential soil vapor intrusion. As such, this O&M Plan:

- Includes the steps necessary to allow individuals unfamiliar with the Site to operate and maintain the groundwater extraction and treatment system;
- Includes the steps necessary to allow individuals unfamiliar with the Site to operate and maintain the soil vapor intrusion mitigation system;
- Includes an operation and maintenance contingency plan; and,
- Will be updated periodically to include additional remedial phases for this Site, and/or to reflect changes in Site conditions or the manner in which the groundwater extraction and treatment system is operated and maintained.

A copy of this O&M Plan, along with the complete SMP, will be kept at the Site. This O&M Plan is not to be used as a stand-alone document, but as a component document of the SMP.

4.2 Engineering Control System Operation and Maintenance

4.2.1 Groundwater Extraction and Treatment System Operation And Maintenance

The groundwater extraction and treatment system became operational in July 2008, and in accordance with the ROD, is intended to be operated for a limited number of years until: (i) groundwater concentrations of chromium can be reduced sufficiently to allow subsequent remedial measures to be implemented; and (ii) the soil removal component of the remedy has been completed. As such, this system is considered a part of this Interim SMP, but is not expected to be a part of the final SMP developed for this Site.

The record drawings for this system are included as Appendix A to this SMP. The basic processes utilized in this extraction and treatment system are explained in detail in the Remedial Design Plan for this system, and are summarized as follows:

- Groundwater Extraction – air-operated, automated, controllerless well pumps are used to extract water from each of seven

groundwater extraction wells, and transfer this water to the groundwater treatment system.

- Chromium Reduction – if needed, sulfuric acid and sodium bisulfite are automatically added to the chromium reduction reactor tank to reduce hexavalent chromium to its trivalent state. While this equipment remains fully functional, tested and available for use, it should be noted that chemical chromium reduction appears unnecessary, and has not been operated since late 2008.
- pH Neutralization – as needed, a pH probe and controller are used to automatically feed sodium hydroxide inline and neutralize the depressed pH created by the chemical chromium reduction process; however, this is only required when the chemical chromium reduction process is operated, and thus the pH neutralization step has not been utilized since late 2008.
- Chromium Removal – removal of chromium is predominantly provided by flow through a multi-stage proprietary organic media ("MetalMaster"), which provides for both absorbance of soluble chromium as well as filtration of insoluble chromium (precipitated chromium hydroxide).
- Particle Filtration – cartridge filters are used to remove fine insoluble particulates (chromium or otherwise) that escape the MetalMaster chromium removal stage.
- VOC Removal – multi-stage carbon filtration is used for removal of VOC's.
- Discharge – the treatment system effluent is discharged to the sanitary sewer in accordance with the sewer discharge permit for the Site.

4.2.1.1 Inspections

The groundwater extraction and treatment system is designed for fully automated operation, and requires minimal operator attention. During each weekday that the system is operating, it is recommended that treatment system hardware, equipment and controls be visually checked for integrity and leaks, and the applicable following treatment system parameters be logged on the daily operator's log form (see Appendix B):

- Chromium reduction reactor pH (if operated) – pH to be below 3.0.
- MetalMaster inlet pH (if operated) – pH to be above 6.0.
- Pressure at inlet and outlet of first MetalMaster filter on each train (while feed pump is operating) – inlet pressure not to exceed 30 psi.

- Pressure drop across each cartridge filter (while feed pump is operating) – pressure drop across either not to exceed 10 psi.
- Pressure at inlet and outlet of first carbon filter on each train (while feed pump is operating) – inlet pressure not to exceed 30 psi.
- Totalized flow from totalizer at end of treatment system – daily flows should remain relatively consistent.
- Manual check of extraction well pumps – weekly verification of pump cycle/operation.

4.2.1.2 System Start-Up and Testing

System start-up from a routine shutdown condition will typically require only that the airline supply valve to the well pumps be opened (see Appendix A, Figure C-2). It is intended that all remaining systems and processes will be continuously maintained in an operational condition to accept water from the basement sump pumps.

In the event of a non-routine shutdown, such as may be required for emergency maintenance or if significant changes are made to the system, the operator will need to verify that: (i) all process piping connections are tight, process piping valves are open, and all air bleed and sample valves are closed; (ii) the airline valves to all pumps (well pumps and treatment system transfer pumps) are open; (iii) pH controllers, metering pumps and mixer are plugged in and operating (required only if chemical chromium reduction is necessary); (iv) air compressor is powered and running; and (v) check and log the parameters listed in item 4.2.1 above to confirm that system is operating in accordance with the design parameters.

Equipment manufacturer and model number information is listed on the equipment list provided in the record drawings (see Appendix A). Manufacturer's cut sheets and equipment manuals for select system components is provided as Appendix D to this SMP.

4.2.1.3 Routine Operation Procedures

As previously mentioned, the groundwater extraction and treatment system is designed for fully automated operation, and requires minimal operator attention. Beyond the daily system checks (as identified in Section 4.2.1, and a log form for which is included as Appendix B), the only routine operating procedure is

that of extraction well pump shutdown over the weekends. Although the system can be run continuously, results from pilot testing of an intermittent operating schedule indicate that a higher degree of chromium removal may be possible by allowing the groundwater levels to fluctuate. Shutting down the groundwater extraction system for a period of approximately three days was shown to increase chromium removal concentrations, while still maintaining adequate depression of groundwater level to minimize the potential for off-site migration of contaminants.

As such, the long-term operating schedule for the groundwater extraction and treatment system will be to shut down the groundwater extraction well pumps on Friday of each week, and to restart the well pumps on Monday of each week. Well pump shutdown is accomplished by closing the well pump airline supply valve (see Appendix A, Figure C-2). All remaining systems and processes will be continuously maintained in an operational condition to accept water from the basement sump pumps over the weekend. On Monday of each week, the operator will reopen the single well pump airline valve to re-enable the extraction well pumps.

4.2.1.4 Equipment Maintenance

Systems maintenance requirements, and troubleshooting guideline information for same, are as follows:

- Tank High Level – high water level in a tank is an indication that a transfer pump is not functioning as intended. This can be the result of: (i) a stuck float control (free any hanging floats); (ii) a clogged inlet to the pump (y-strainer may need to be removed; (iii) excessive backpressure on the pump (clean or replace the downstream filters – media filters may need to be opened for removal of top solids/scum layer on media); or (iv) pump failure (see pump manual in Appendix D – pump can be tested offline with a bucket of water to determine if a pump mechanical failure has occurred).
- Backup emergency (basement sump) water treatment system flow – flows to the backup water treatment system indicates: (i) a failure in the isolation solenoid valve (remove valve and clean it to allow liquid-tight shutoff); or (ii) a transfer pump is not functioning as intended (see Tank High Level condition above).
- Excessive pressure at media filter inlet (>15 psi) - clean or replace the downstream filters – media filters (MetalMaster

or carbon) may need to be opened for removal of top solids/scum layer on media.

- Excessive pressure drop across cartridge filter (>15 psi) – replace cartridge filter.
- Well pumps not cycling and/or reduction in total daily flows observed using flow totalizer – can be caused by: (i) flow totalizer failure (remove and clean the totalizer, and check operation); (ii) pump is not operating correctly (remove pump and clean pump inlet strainer, or see pump manual in Appendix D for more detailed troubleshooting). If one or more pumps repeatedly become fouled with biological growth, chlorine tablets may be periodically placed in the wells as needed to control growth on the pump inlet strainers; or (iii) reduced flow totalizer flows can also be the result of well pump shutoff due to treatment system high tank levels (see Tank High Level condition above).
- Media filter(s) exhibits signs of contaminant breakthrough – if sampling results indicate significant concentrations of contaminants are present in the effluent from the first MetalMaster or carbon filter in either treatment train (i.e. minimal or no removal, and/or concentrations approaching the effluent permit limits), then the first media filters on BOTH trains of the same media type are to be changed out. During a filter changeout, the second filter in each train will be moved up to serve as the primary (first) filter in the train, and a new virgin media filter will be placed online as the secondary filter in each train. Media service life observed to date has been in excess of one year, so filter changeout frequencies should be minimal.
- Leaking piping and/or equipment – if water is observed on the floor, the source of the leak is to be identified, and appropriate equipment repairs or replacement made.
- Ventilation system malfunction – if negative pressure is not observed within the tanks, sumps and/or floor trench, check for power and proper operation of the ventilation fan, and confirm integrity and placement of vent piping and equipment covers; repair as needed.

- Compressor failure – refer to the compressor manual in Appendix D for compressor maintenance and troubleshooting information. With the exception of maintaining compressor oil level, there is no required routine maintenance for the compressor.
- Treatment system effluent flowmeter not registering as much flow as usual. Reduction in total system daily flows can be caused by: (i) reduction in flow from extraction wells (see well pump counter issues and cause above); or (ii) effluent flow meter failure (remove and flush out/clean, and repair or replace as needed).

Recommended preventive maintenance activities and frequencies are listed in Table 4-1 below. These activities will be documented on a form provided in Appendix B, a copy of which will be maintained on-site for inspection.

Table 4-1:
Recommended Preventive Maintenance
Activities and Frequencies

Recommended Activity	Recommended Frequency
Check vent system	Weekly
Clean pump and valve inlet strainers	Weekly
Top off compressor with oil	Quarterly
Change out micron filters	Bi-monthly

4.2.2 Soil Vapor Intrusion Mitigation System Operation And Maintenance

The soil vapor intrusion mitigation system is intended to be operated indefinitely until such time as monitoring data indicates that the system is no longer required (e.g., VOC concentrations in sub-slab air, soil, and groundwater have been reduced below applicable target levels), and approval is received by NYSDEC and NYSDOH to discontinue system operations.

The record drawings for this system are included as Appendix A to this SMP. The basic processes utilized in this system are explained in detail in the Remedial Design Plan and related addenda for this system, and are summarized as follows:

- Sub-Slab Ventilation System – a series of six sub-slab vent points were installed to induce a negative pressure beneath the floor of the building, thus minimizing the potential for soil vapors to enter the building; however, due to the tightness of the soils and the lack of an adequately permeable subbase beneath the floor, the system was only partially effective at establishing the desired sub-slab vacuum, and supplemental engineering controls were deemed necessary.
- Indoor Air Filtration System – two large-capacity Electrocorp carbon air filter units were installed to supplement the sub-slab ventilation system described above. These units continuously filter indoor air at select locations within the occupied first floor of the building (AOC #1), removing VOC's from the indoor air. Five smaller AllerAir carbon filter units are operating in the basement (AOC #2).
- Basement (AOC #2) Ventilation System– a fan is being used to vent the groundwater treatment tanks located upstream of the VOC removal stage and which are not fully enclosed, thus inducing airflow into the tanks and minimizing the potential for exfiltration of VOC's into the basement air. This ventilation system was also extended into the groundwater sumps and floor trench in the basement, and covers were placed over these features, to minimize the potential for soil vapors to enter the basement through these potential pathways.

4.2.2.1 Inspections

The soil vapor intrusion mitigation system is designed for continuous, unmanned operation, and requires very little operation and maintenance labor. All components of this system are designed for years of uninterrupted service. Nonetheless, quarterly system checks and annual reviews will be performed to confirm that all are operating as intended, and to identify the need for any maintenance. These monitoring activities will be completed as described in, and documented on, the log forms in Appendix B.

4.2.2.2 System Start-Up and Testing

The only mechanical portion of the system is the set of 14 fans (six sub-slab vent fans, one basement vent fan, and seven carbon filtration unit fans). Start-up of any or all of these fans from a shutdown condition requires only that power be restored to the fan. It is expected that all fans will be continuously maintained in an operational condition, and none of these fans require any type of manual restart, so the fans will restart automatically once power is restored to the building or circuit. In the event that a fan is de-

energized for work on the fan or associated ductwork, re-energizing of the fan will similarly re-enable that portion of the soil vapor mitigation system.

Equipment manufacturer and model number information is provided in the record drawings (see Appendix A). Manufacturer's cut sheets and equipment manuals for select system components is provided as Appendix D to this SMP.

4.2.2.3 Routine Operation & Maintenance Procedures

As previously mentioned, the soil vapor intrusion mitigation system is designed for continuous unattended operation, and requires minimal operations oversight. There are no routine operating or maintenance procedures for this system. The fans require no routine or preventative maintenance, and the only consumable items in the system are the prefilters and carbon media of the seven carbon air filtration units. The carbon filter manufacturer reports that it is very difficult to predetermine a specific maintenance schedule as the rate of dust loading and media consumption will vary for each application, and recommends periodic inspection of the filters to help establish an appropriate replacement schedule. These filter units will be routinely monitored for media/pre-filter change out, as well as speed setting (all should remain on high), and location (to keep the area around each unit clear of obstructions that would impede air flow), as specified under the systems monitoring program (see Section 3.2.2.2 and log sheets in Appendix B).

4.3 Performance Monitoring

4.3.1 Groundwater Extraction And Treatment System

Performance monitoring needs for this system are as follows:

- Groundwater Extraction System – overall system performance will be monitored and evaluated based on: (i) groundwater volumes removed from each extraction well; (ii) zone of influence maintained by the groundwater extraction (static water levels periodically measured at Site monitoring wells); and (iii) groundwater contaminant reduction (chromium and VOC concentrations periodically measured at Site monitoring and extraction wells).

- Groundwater Treatment System – overall system performance will be monitored and evaluated based on: (i) total groundwater volume treated; and (ii) final effluent water quality, and compliance with

applicable sewer use discharge limits; and (iii) ability of the treatment system, including the ventilation system, to operate with limited unplanned down-time.

4.3.1.1 Monitoring Schedule

To date, the groundwater extraction and treatment system has been operating for more than one year. As such, baseline monitoring has been completed in accordance with the NYSDEC approved Work Plan. Specifically, following system startup, static water levels have been documented for the monitoring/extraction wells, and well yields (groundwater removal rates) have been documented for the extraction wells. In conjunction with monitoring static water levels and associated groundwater removal rates, all hardware associated with the groundwater extraction wells (i.e., piping, valves, gauges, etc.) was visually inspected for proper operation, stress indicators (i.e., excessive bending, material discoloration, etc.) and leaking.

The average static water levels following extraction system startup are presented in Table 3-2. The hardware associated with the extraction wells and groundwater treatment system did not leak, show signs of undue stress and operated properly. Subsequent to the initial week of system start-up, the groundwater extraction system and treatment system was inspected at least twice a week for two weeks and weekly thereafter.

With the groundwater extraction system successfully operating at steady state for many months now, the long-term monitoring program will be implemented. The objectives of the long-term monitoring program are as follows:

- To evaluate the long-term effectiveness of the groundwater extraction system using the water level and groundwater quality data to be collected during the long-term monitoring program.
- To identify and confirm proper operation and maintenance requirements.
- To identify methods that could be used to optimize system performance

To this end, static water level measurements will be collected on a periodic basis to confirm continued influence for monitoring wells MW-1, MW-4, MW-8, MW-11, MW-13, MW-14, MW-15, MW-18, MW-21, MW-31, MW-33 and MW-34; and extraction wells EW-1, EW-2, EW-3, EW-4, EW-5, EW-6 and EW-7. In addition, groundwater samples will be collected from the aforementioned

monitoring and extraction wells on a periodic basis and submitted to the analytical laboratory for testing of halogenated VOCs, and total and hexavalent chromium. Sample collection and analysis procedures shall be as specified in Section 3.3.3. Static water level measurement and groundwater sampling frequencies are listed in Table 3-1 and Table 3-2, respectively.

The groundwater extraction and treatment system components will be visually inspected on a weekly basis.

Inspection frequency is subject to change with the approval of the NYSDEC. Unscheduled inspections and/or sampling may take place when a suspected failure of the groundwater extraction or treatment system has been reported or an emergency occurs that is deemed likely to affect the operation of the system. Monitoring deliverables for the groundwater extraction and treatment system are specified later in this Plan.

4.3.1.2 General Equipment Monitoring

Inspection and monitoring of the complete system will be conducted as detailed in Section 4.2 of this report. Groundwater extraction and treatment system components to be monitored in this manner include, but are not limited to, the following:

- For the sump, trench drain and treatment ventilation system:
    - Vacuum fan;
    - General system piping; and
    - Sump and trench cover integrity (including seals).
- For the extraction well pump hardware
    - Valves;
    - Well pumps; and
    - General System Piping
- For the treatment system
    - Y-strainers located before air diaphragm pumps P-1 and P-2;
    - Air diaphragm pumps P-1 and P-2;
    - In-line pH probe;
    - In-line pressure gauges;
    - MetalMaster filters including valves and piping;

- Cartridge filters;
- Activated Carbon Column Filters;
- Final effluent flow meter;
- Air compressor; and
- General system piping.

A complete list of components to be checked is provided in the Operators Log Form, presented in Appendix B. Maintenance and repair will be initiated immediately if equipment readings are not within their typical range, equipment is observed to be malfunctioning, and/or the system is not performing within specifications.

4.3.1.3 System Monitoring Devices and Alarms

Applicable system monitoring devices are as listed in the Operators Log Form (see Appendix B), and parameters for which should remain within the ranges listed in Section 4.2.1 of this Interim SMP.

4.3.1.4 Sampling Event Protocol

Sample ports are located after each extraction well pump, before the MetalMaster filters (i.e., MetalMaster influent sample), after the primary filter in each train (e.g., MetalMaster Train 1 filter 1 effluent), prior to the GAC filters (i.e., activated carbon influent sample), after the primary filter in each GAC train (e.g., GAC Train 1 Filter 1 effluent) and at the end of the treatment system (i.e., final effluent sample). The protocol to collect a sample from the sample port will be to flush the line to remove materials that may have accumulated in the piping. Following purging, a sample will be collected in containers supplied by the analytical laboratory. The purge water will be placed in the chromium reaction tank at the head of the treatment system for processing.

The extraction well and treatment system samples will be placed in pre-cleaned laboratory containers, labeled and preserved with ice. The samples will be transported under chain-of custody control to a NYSDOH ELAP-certified analytical laboratory, and will be tested for the following parameters depending on location of sample:

- Halogenated VOCs, using USEPA Method 8260; and
- total and hexavalent chromium using ASP Method CLP-M

Groundwater treatment system samples will be collected in accordance with the schedule and parameters summarized in Table 3-3 and presented below:

- Influent to MetalMaster Filters, analyzed for total and hexavalent chromium – monthly for six months, quarterly thereafter;
- Effluent samples from the primary (first) MetalMaster drum in each MetalMaster treatment train of the groundwater treatment system, analyzed for total and hexavalent chromium – quarterly;
- Influent and effluent samples from the first activated carbon filter in each activated carbon treatment train of the groundwater treatment system, analyzed for halogenated VOC's - quarterly; and
- Final effluent sample collected downstream of the final carbon filter, analyzed for purgeable aromatics, VOC's and total chromium (in accordance with sewer discharge permit) – quarterly.

4.3.2 Soil Vapor Intrusion Mitigation System

Overall system performance of the soil vapor intrusion mitigation system engineering controls will be evaluated based on the ability of the system to maintain operating parameters within expected ranges, and indoor air test results within applicable guidance values. Indoor air testing and monitoring of the engineering controls shall be completed as detailed in Sections 3.2.2 to periodically confirm that the equipment operation and system effectiveness is maintained. It is not intended that the soil vapor intrusion mitigation system achieve any significant contaminant reduction within Site media (soils, soil vapor and/or groundwater), and as such, monitoring of Site media for remedial performance monitoring purposes (i.e. reduction of contaminants) does not apply to this remedial system.

4.4 Reporting Requirements

4.4.1 Groundwater Extraction And Treatment System

Copies of daily operational logs (see Section 4.2.1), maintenance reports and other information generated during regular operations at the Site will be maintained. Reports, forms, and other relevant information generated will be made available upon request to the NYSDEC, and pertinent information will be summarized and submitted to NYSDEC as part of the Annual Progress Report, as specified in Section 5 of this Interim SMP.

4.4.2 Soil Vapor Intrusion Mitigation System

Copies of the quarterly and annual monitoring logs (see Appendix B), maintenance reports and other information generated during regular operations at the Site will be maintained. Reports, forms, indoor air test results and other relevant information generated will be made available upon request to the NYSDEC, and pertinent information will be summarized and submitted to NYSDEC as part of the Annual Progress Report, as specified in Section 5 of this Interim SMP.

5.0 INSPECTIONS, REPORTING AND CERTIFICATIONS

5.1 Site Inspections

Inspections will be conducted at the frequency specified in the schedules provided in Section 3 Monitoring Plan and Section 4 Operation and Maintenance Plan of this SMP. At a minimum, a site-wide inspection will be conducted annually. Inspections of remedial components will also be conducted when a breakdown of any treatment system component has occurred or whenever a severe condition has taken place, such as an erosion or flooding event that may affect the remedial system components. Inspections and monitoring events will be recorded on the appropriate forms (see Appendix B). Relevant inspection form data, media sampling data and system maintenance information, generated for the Site during the reporting period, will be summarized and provided in electronic format in the Annual Progress Report.

5.2 Annual Progress Report

An Annual Progress Report will be submitted to the NYSDEC every year, beginning within eighteen months after the March 2010 approval of the original Interim SMP. The report will be prepared in accordance with NYSDEC DER-10 and submitted within 45 days of the end of each reporting period. As such, the first annual progress report (covering the reporting period ending September 2011) is due to be submitted by November 15, 2011, and subsequent annual submittals are scheduled for submittal no later than November 15 of future reporting years. Media sampling results will be incorporated into the Annual Progress Report, and this report will also include:

- Summary of results from the Site inspections and severe condition inspections, as applicable;
- Summary of discharge monitoring data and/or information generated during the reporting period with comments and conclusions;
- Data summary tables of contaminants of concern by media (groundwater, soil vapor), which include a listing of all compounds detected, 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, and will include:
    - An up to date table presenting the average pre-groundwater extraction system static water levels and the current average post-groundwater extraction system static water levels for each monitoring well evaluated;
    - An up to date groundwater flow map depicting groundwater flow direction, contour intervals and groundwater elevations relative to the established Site datum for the period;

- A Site evaluation, which includes the following:
    - The compliance of the remedy with the requirements of the site-specific ROD;
    - The operation and the effectiveness of treatment units, 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 Plan for the media being monitored;
    - Recommendations regarding any necessary changes to the remedy and/or Monitoring Plan; and
    - Estimation of the overall performance and effectiveness of the remedy.
- A performance summary for the groundwater extraction and treatment system, including information such as:
    - The number of days the system was run for the reporting period;
    - The average, high, and low daily flows;
    - The estimated contaminant mass removed;
    - A description of breakdowns and/or repairs along with an explanation for any significant downtime;
    - A description of the resolution of any performance problems;
    - A summary of the performance, effluent and/or effectiveness monitoring; and
    - Any pertinent comments, conclusions, and/or recommendations based on data evaluation.
- A performance summary for the indoor air vapor intrusion mitigation engineering controls (SSD systems and indoor air carbon filtration units), including information such as:
    - A description of breakdowns and or repairs along with an explanation for any significant downtime;
    - A summary of inspection results including SSD system vacuum measurements and air purifier carbon evaluations;
    - A summary of any air monitoring results completed during the reporting period; and
    - Any pertinent comments, conclusions, and/or recommendations based on the data evaluation.
- Analytical laboratory data reports, to be submitted to NYSDEC as an Electronic Data Deliverable (EDD) within 90 days of receiving the data from the laboratory, and electronic (pdf) copies of the laboratory data packages will be included as an appendix to the Annual Progress Reports.

Unless otherwise requested by NYSDEC, the Annual Progress Report will be submitted, in hard-copy format, to the NYSDEC regional office in which the Site is located, and in electronic format to the NYSDEC regional office in which the Site is located and the NYSDOH Bureau of Environmental Exposure Investigation. The electronic file will be submitted as a single PDF file with searchable text.

5.3 Corrective Measures Plan

If any component of the remedy is found to have failed, a corrective measures plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work designed to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the corrective measures plan until it is approved by the NYSDEC.

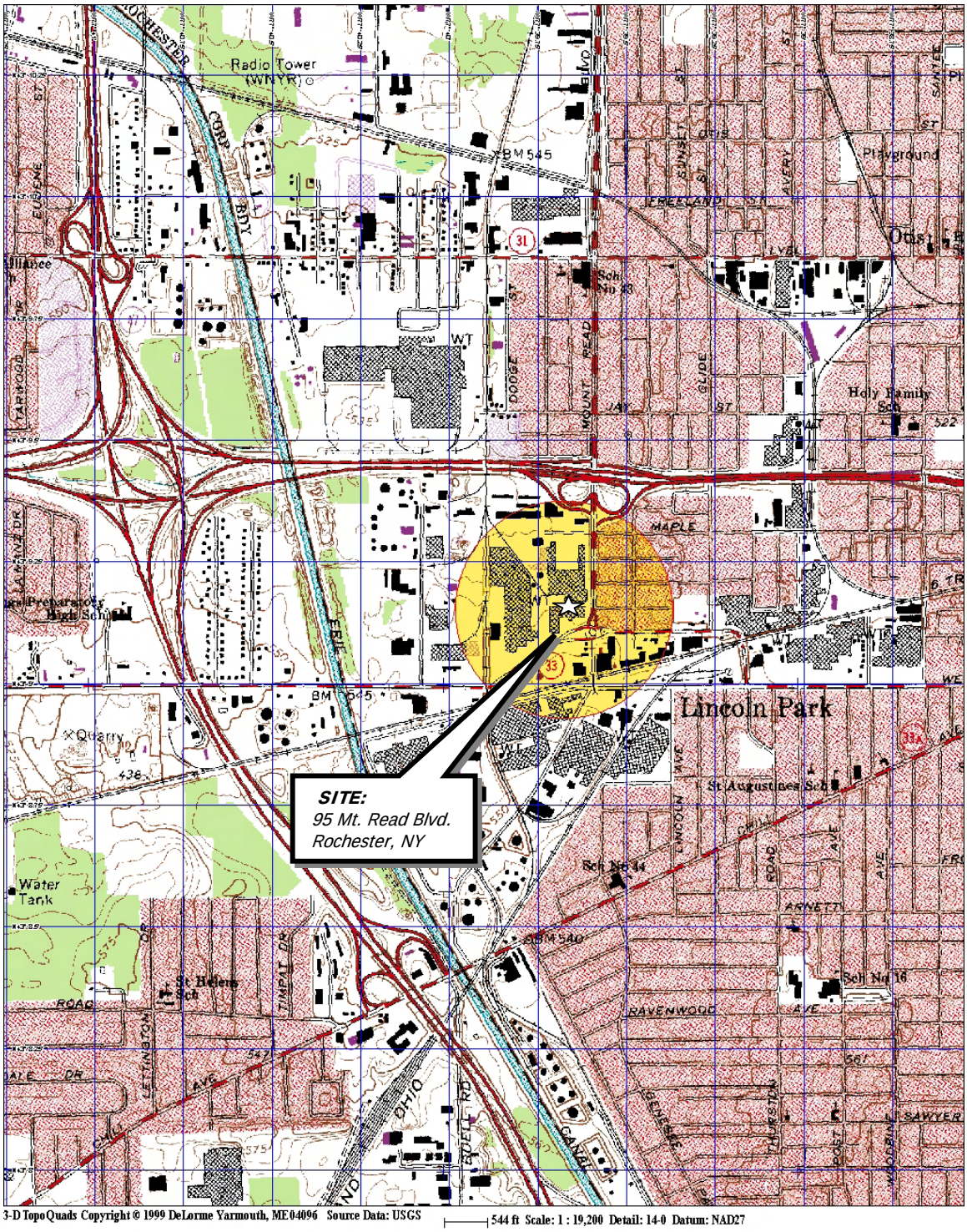
Soil Vapor Intrusion Mitigation System: A corrective measures response will be required in the event that one or more indoor air sampling results at AOC #1 area locations were to exceed the applicable indoor air target concentrations for chloroform, trichloroethene, and/or tetrachloroethene, as identified in the Indoor Air Testing Program (see Section 3.2.2.3). In the event of such an exceedance, the initial corrective measures response shall include, but not necessarily be limited to, the following activities:

- Review of tenant operations and product use in the vicinity of the location at which the exceedance occurred;
- Review of engineering controls to confirm proper operation;
- Temporary removal of any identified tenant products of concern, temporary cessation of any tenant activities of concern, and/or repair of any identified engineering control deficiencies; and
- Collection of a verification indoor air sample at the location of each identified exceedance.

If the verification sample results for parameters of concern meet the applicable indoor air target criteria, additional indoor air sampling at this location will be scheduled in accordance with the indoor air testing program presented in Section 3.2.2.3 of this SMP, However, if the verification sample demonstrates that the above measures failed to correct the problem, then a formal Corrective Measures Plan will be developed, submitted to NYSDEC for review and approval, and implemented prior to the next sampling event.

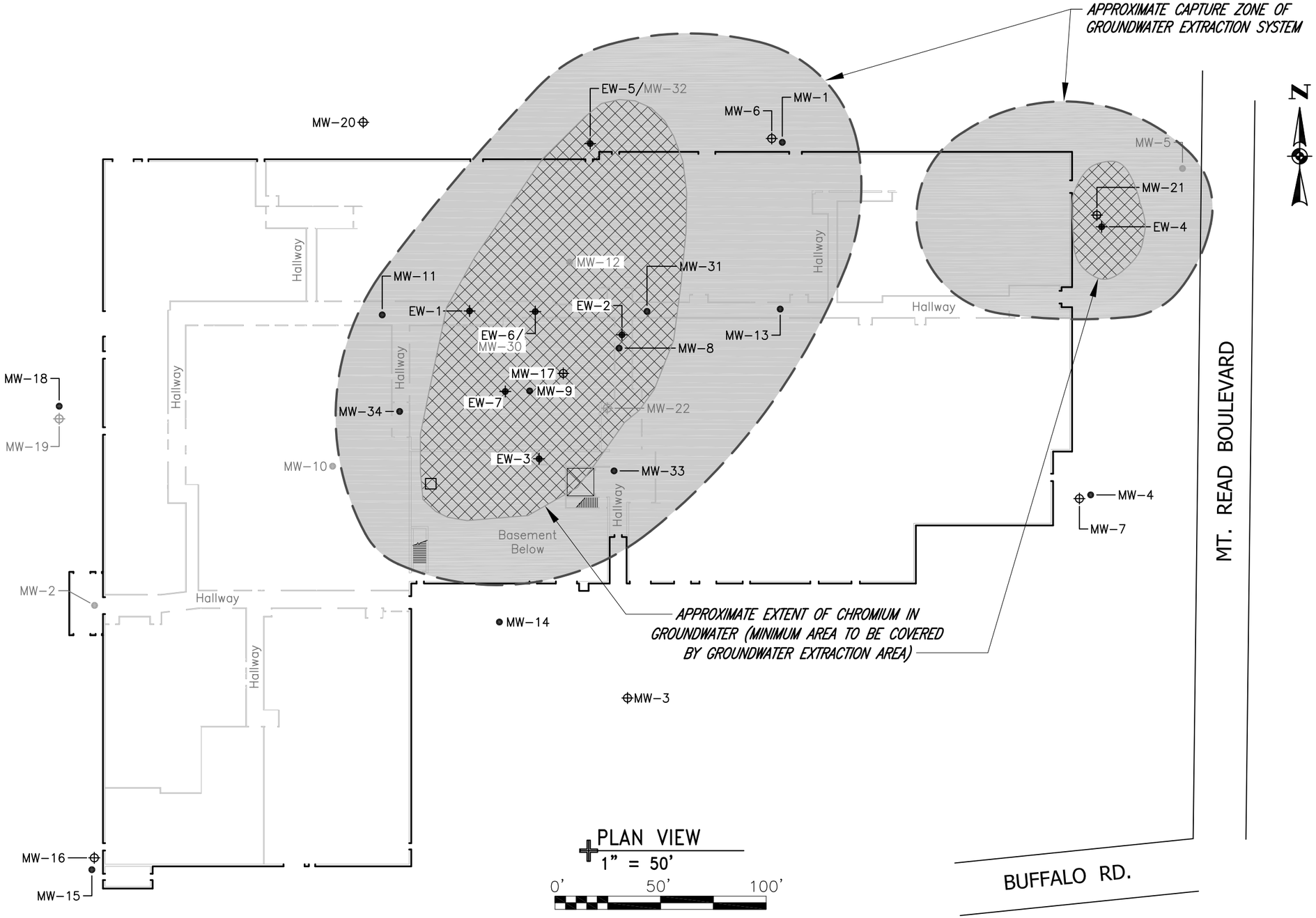
With respect to AOC #2 (basement), a Corrective Measures Plan will be developed in the event that the basement becomes occupied space before air guideline values are achieved, or if it is determined by NYSDEC that basement air quality is not continuing to improve (or is getting worse) and it is anticipated that the air guideline target values will not be achieved in a reasonable period of time.

FIGURES



Drawing Produced From: 3-D TopoQuads, DeLorme Map Co., referencing USGS quad map Rochester West (NY) 1995. Site Lat/Long: N43d-09.15' – W77d-39.67'

DATE **3-1-2010** DRAWN BY **RJM** SCALE **1" = 2000'**	day DAY ENVIRONMENTAL, INC. ENVIRONMENTAL CONSULTANTS ROCHESTER, NEW YORK 14614-1008	PROJECT TITLE **95 MT. READ BOULEVARD** **ROCHESTER, NEW YORK** **SITE MANAGEMENT PLAN** DRAWING TITLE **PROJECT LOCUS MAP**	PROJECT NO. **3681R-05** **FIGURE 1**



NOTES:

1. Drawing produced from a drawing by The ERM Group, entitled "Figure 3–1; PCB, Asbestos & Sediment/Residue Sampling Locations", dated 11/20/1990; A blueline print by Miller–Anderson Architects, entitled "1st Floor Plan Details", date issued 3–3–2000; and from notes of site visits by representatives of Day Environmental, Inc.
2. Monitoring Well MW–32 was converted to Extraction Well EW–5 on June 17, 2009.
3. Monitoring Well MW–30 was converted to Extraction Well EW–6 on December 14, 2012.
4. Extraction Well EW–7 was installed on November 14, 2012, and became operational on January 22, 2013.

LEGEND:

EW–3 ✦	Groundwater Extraction Well Location
MW–11 ●	Overburden and/or Shallow Bedrock Monitoring Well Location (i.e. Bedrock Interface Well)
MW–21 ⊕	Deep Bedrock Monitoring Well Location
MW–5 ●	Decomissioned Monitoring Well

FIELD VERIFIED BY	BFK
DATE	3-2010
DRAWN BY	RJM/Tw
DATE DRAWN	5-2013
SCALE	1" = 50'
DATE ISSUED	5-2013

DAY ENVIRONMENTAL, INC.
ENVIRONMENTAL CONSULTANTS
ROCHESTER, NEW YORK 14614-1008
NEW YORK, NEW YORK 10165-1617

PROJECT TITLE
95 MT. READ BOULEVARD
ROCHESTER, NEW YORK

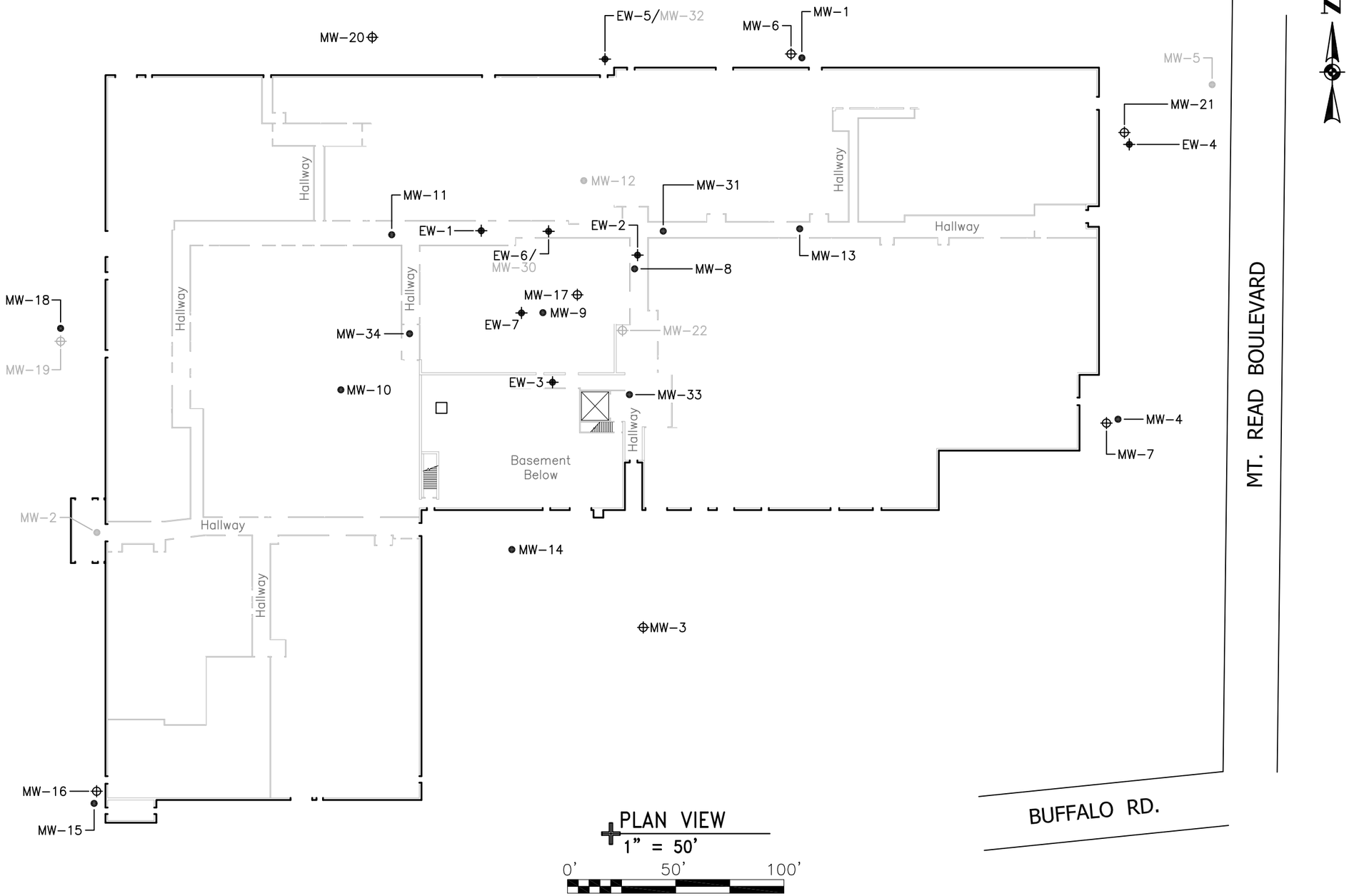
DRAWING TITLE
SITE MANAGEMENT PLAN

Approximate Capture Zone And Extent Of Chromium In Groundwater

PROJECT NO.
3681R-05

FIGURE 2

Ref1:
Ref2:
Ref3:
Xerox432AnsiB–2; 11 x 17
Layout Name: Layout 2
Pen Setting File: Maguie95–1.ctb
Time Plotted: Thursday, May 23, 2013 4:01:05 PM
File Name: U:\McPhee\Drawings\Maguire\3681R\3681R–14.dwg



NOTES:

1. Drawing produced from a drawing by The ERM Group, entitled "Figure 3–1; PCB, Asbestos & Sediment/Residue Sampling Locations", dated 11/20/1990; A blueline print by Miller–Anderson Architects, entitled "1st Floor Plan Details", date issued 3–3–2000; and from notes of site visits by representatives of Day Environmental, Inc.
2. Monitoring Well MW–32 was converted to Extraction Well EW–5 on June 17, 2009.
3. Monitoring Well MW–30 was converted to Extraction Well EW–6 on December 14, 2012.
4. Extraction Well EW–7 was installed on November 14, 2012, and became operational on January 22, 2013.

LEGEND:

EW–3 ✦	Groundwater Extraction Well Location
MW–11 ●	Overburden and/or Shallow Bedrock Monitoring Well Location (i.e. Bedrock Interface Well)
MW–21 ⊕	Deep Bedrock Monitoring Well Location
MW–5 ●	Decomissioned Monitoring Well

FIELD VERIFIED BY	NES
DATE	10-2009
DRAWN BY	RJM/Tw
DATE DRAWN	5-2013
SCALE	1" = 50'
DATE ISSUED	5-2013

DAY ENVIRONMENTAL, INC.
ENVIRONMENTAL CONSULTANTS
ROCHESTER, NEW YORK 14606
NEW YORK, NEW YORK 10016-0710

PROJECT TITLE
95 MT. READ BOULEVARD
ROCHESTER, NEW YORK

SITE MANAGEMENT PLAN

DRAWING TITLE
Groundwater Monitoring Well Location Plan

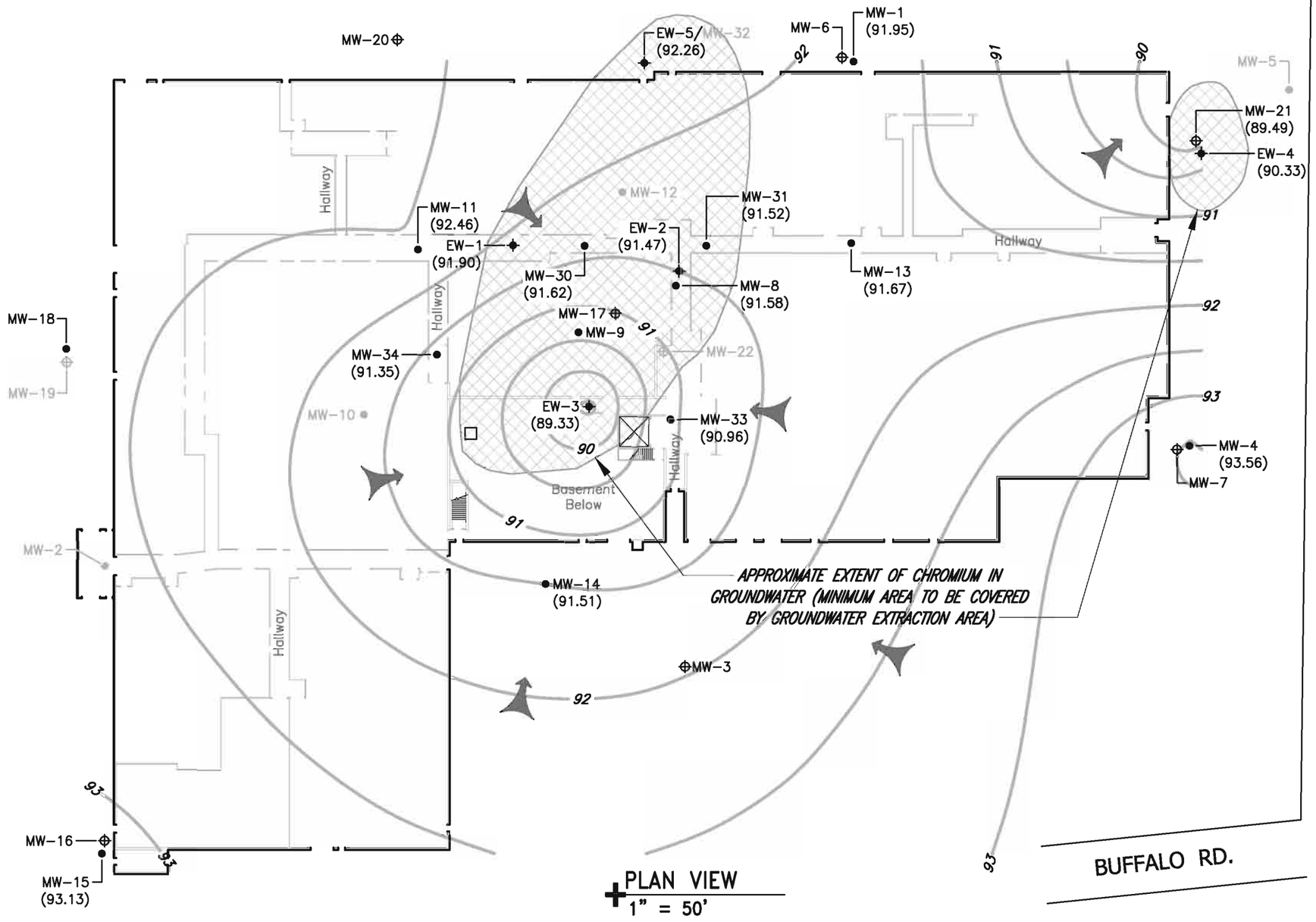
PROJECT NO.
3681R-05

FIGURE 4

Ref1:
Ref2:
Ref3:

Xerox432AnsiB–2; 11 x 17
Layout Name: Layout1
Pen Setting File: Maguire95–1.ctb

Time Plotted: Thursday, May 23, 2013 4:02:09 PM
File Name: U:\McPhee\Drawings\Maguire\3681R\3681R–13.dwg



PLAN VIEW
1" = 50'

NOTES:

1. Drawing produced from a drawing by The ERM Group, entitled "Figure 3-1; PCB, Asbestos & Sediment/Residue Sampling Locations", dated 11/20/1990; A blueline print by Miller-Anderson Architects, entitled "1st Floor Plan Details", date issued 3-3-2000; and from notes of site visits by representatives of Day Environmental, Inc.
2. Monitoring Well MW-32 was converted to Extraction Well EW-5 on June 17, 2009.

LEGEND:

EW-3 (89.33)	Groundwater Extraction Well Location With Groundwater Elevation Obtained On July 21, 2008
MW-11 (92.46)	Overburden and/or Shallow Bedrock Monitoring Well Location (i.e. Bedrock Interface Well) With Groundwater Elevation Obtained On July 21, 2008
MW-21 (89.49)	Deep Bedrock Monitoring Well Location With Groundwater Elevation Obtained On July 21, 2008
92	Potentiometric Contour Line For July 21, 2008 Created By Golden Software Inc. Surfer8 Program
	Apparent Direction Of Groundwater Flow
MW-5	Decommissioned Monitoring Well

0' 50' 100' 150'

FIELD VERIFIED BY	NES
DATE	07-2008
DRAWN BY	RJM
DATE DRAWN	10-29-2009
SCALE	1" = 50'
DATE ISSUED	3-8-2010

DAY ENVIRONMENTAL, INC.
ENVIRONMENTAL CONSULTANTS
ROCHESTER, NEW YORK 14614-1008
NEW YORK, NEW YORK 10165-1617

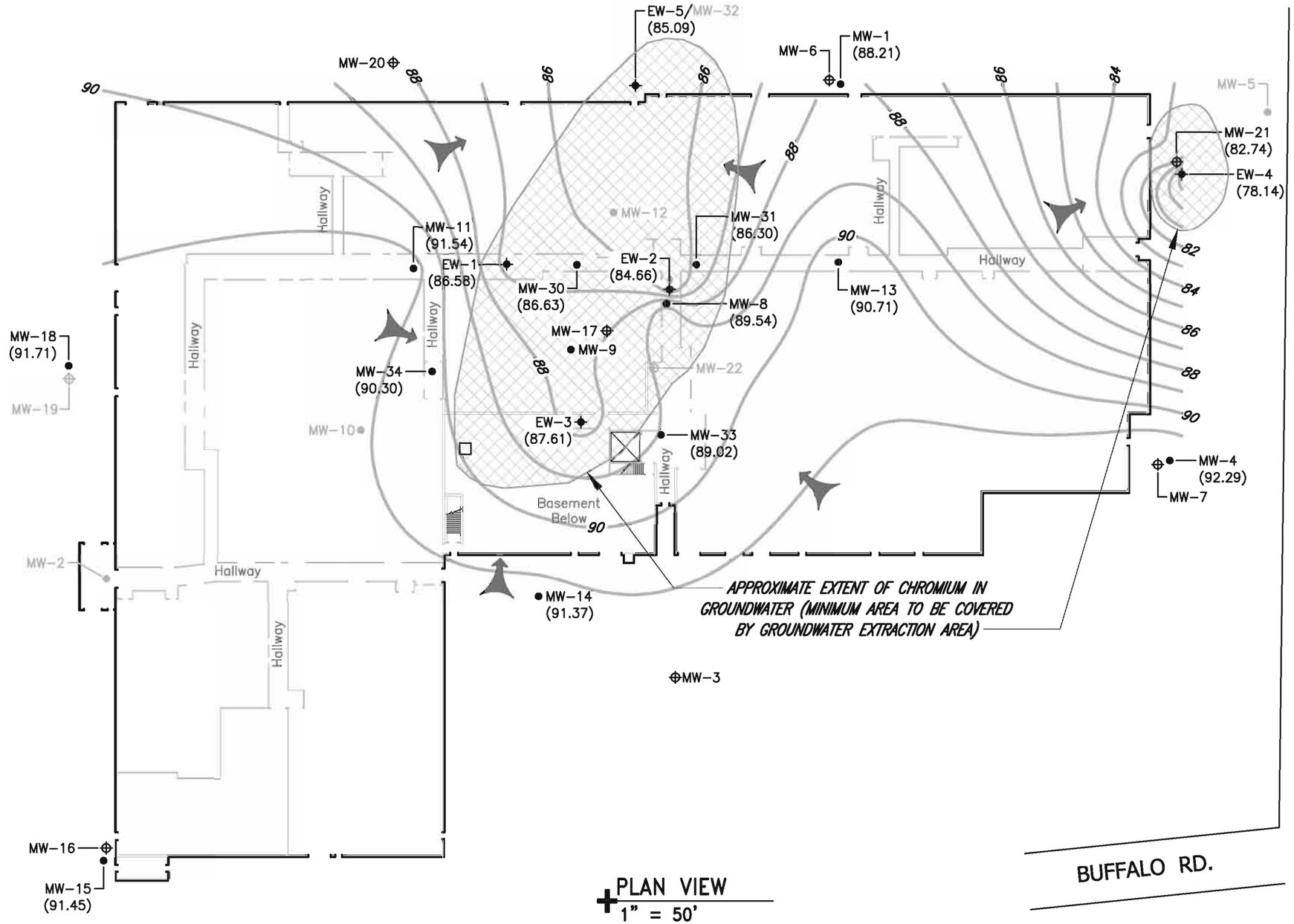
PROJECT TITLE
95 MT. READ BOULEVARD
ROCHESTER, NEW YORK

DRAWING TITLE
SITE MANAGEMENT PLAN

Groundwater Potentiometric Contour Map For July 21, 2008

PROJECT NO.
3681R-05

FIGURE 5



PLAN VIEW
1" = 50'

NOTES:

1. Drawing produced from a drawing by The ERM Group, entitled "Figure 3–1; PCB, Asbestos & Sediment/Residue Sampling Locations", dated 11/20/1990; A blueline print by Miller–Anderson Architects, entitled "1st Floor Plan Details", date issued 3–3–2000; and from notes of site visits by representatives of Day Environmental, Inc.
2. Moniroting Well MW–32 was converted to Extraction Well EW–5 on June 17, 2009.

LEGEND:

EW–3 (87.61)	Groundwater Extraction Well Location With Groundwater Elevation Obtained On September 4, 2009
MW–11 (91.54)	Overburden and/or Shallow Bedrock Monitoring Well Location (i.e. Bedrock Interface Well) With Groundwater Elevation Obtained On September 4, 2009
MW–21 (82.74)	Deep Bedrock Monitoring Well Location With Groundwater Elevation Obtained On September 4, 2009
92	Potentiometric Contour Line For September 4, 2009 Created By Golden Software Inc. Surfer8 Program
	Apparent Direction Of Groundwater Flow
MW–5	Decommissioned Monitoring Well

0' 50' 100' 150'

FIELD VERIFIED BY	NES
DATE	09-2009
DRAWN BY	RJM
DATE DRAWN	10-29-2009
SCALE	1" = 50'
DATE ISSUED	3-8-2010

DAY ENVIRONMENTAL, INC.
ENVIRONMENTAL CONSULTANTS
ROCHESTER, NEW YORK 14614-1008
NEW YORK, NEW YORK 10165-1617

PROJECT TITLE
95 MT. READ BOULEVARD
ROCHESTER, NEW YORK

DRAWING TITLE
SITE MANAGEMENT PLAN

Groundwater Potentiometric Contour Map For September 4, 2009

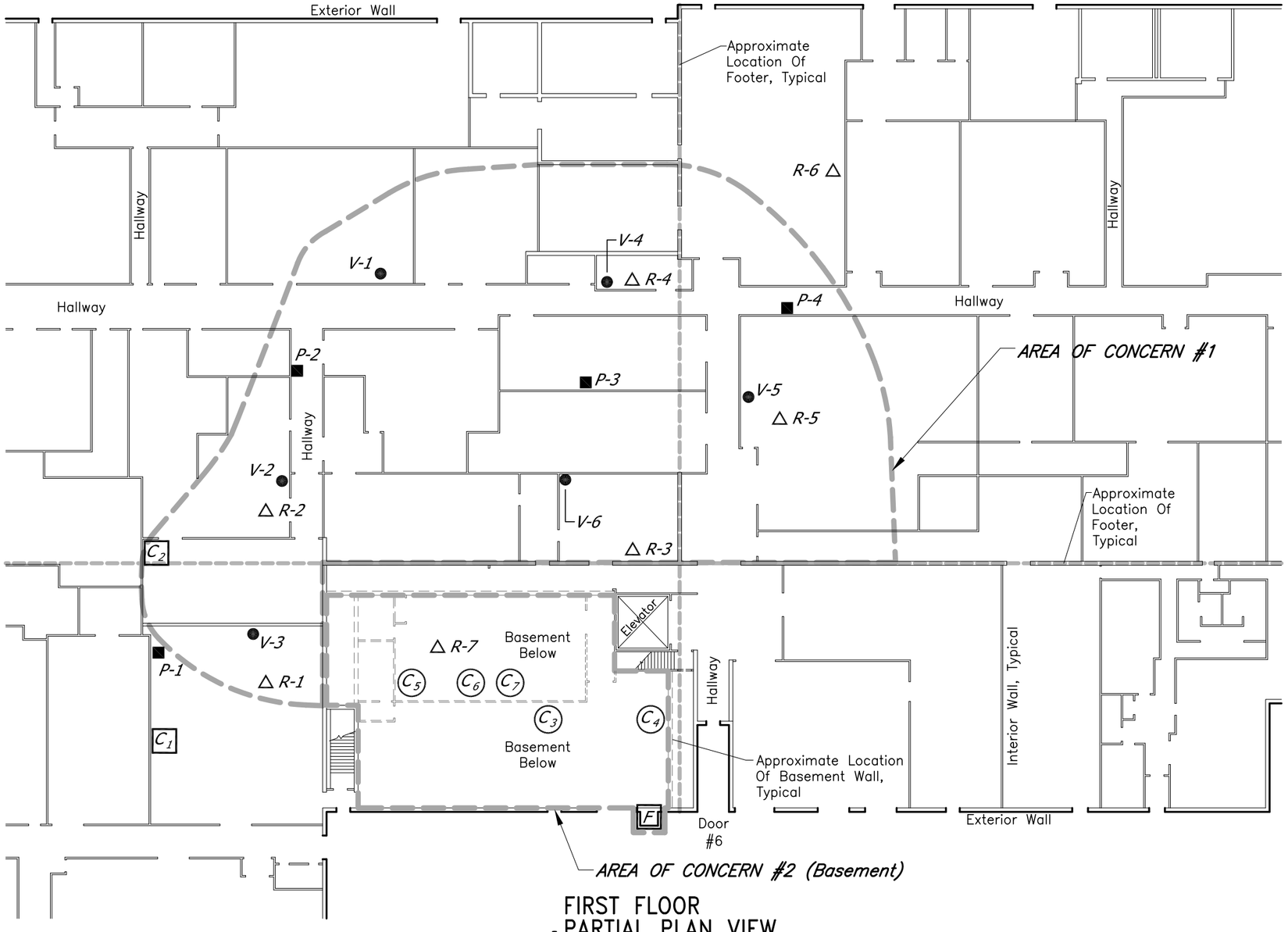
PROJECT NO.
3681R-05

FIGURE 6

Ref1: GW Contours 9-4-09.dwg
Ref2:
Ref3:

Xerox432AnsiB-2; 11 x 17
Layout Name: Layout 2
Pen Setting File: Maguie95-1.ctb

Time Plotted: Monday, March 08, 2010 11:58:28 AM
File Name: P:\Drawings\Maguire\3681R\3681R GW Map 9-4-09.dwg



FIRST FLOOR
PARTIAL PLAN VIEW
1" = 30'

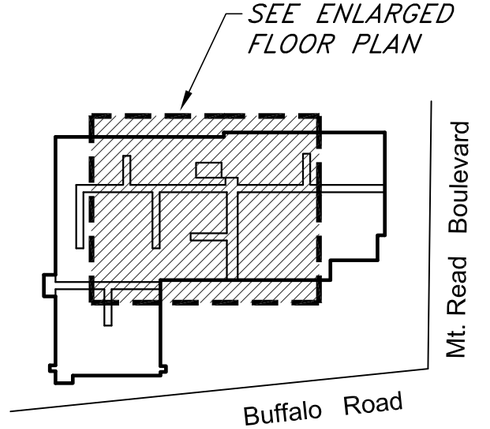
0' 30' 60'

LEGEND:

- *R-1 thru R-7* △ — Routine Indoor Air Sampling Locations
- *V-1 thru V-6* ● — "As-Built" Vertical Vent Stack/Fan Locations
- *P-1 thru P-4* ■ — "As-Built" Sub-Slab Pressure Test Locations
- *C5 thru C7* — AllerAir 6000DX Carbon Air Filters
- *C3 thru C4* — AllerAir 5000D Carbon Air Filters
- *C1 thru C2* — Electrocorp I6500A Carbon Air Filters
- *F* — Fantech FR 160 In-line fan (Basement Fan)

NOTE:

1. Drawing produced from a drawing by The ERM Group, entitled "Figure 3-1; PCB, Asbestos & Sediment/Residue Sampling Locations", dated 11/20/1990; A blueline print by Miller-Anderson Architects, entitled "1st Floor Plan Details", date issued 3-3-2000; and from notes of site visits by representatives of Day Environmental, Inc.



BUILDING
KEY PLAN
Not To Scale

DATE	DATE DRAWN	DATE ISSUED
10-2010	10-27-2010	5-6-2013
FIELD VERIFIED BY: BFK	DRAWN BY: RJM	SCALE: As Noted

DAY ENVIRONMENTAL, INC.
ENVIRONMENTAL CONSULTANTS
ROCHESTER, NEW YORK 14606
NEW YORK, NEW YORK 10170

PROJECT TITLE
95 MT. READ BOULEVARD
ROCHESTER, NEW YORK

DRAWING TITLE
SITE MANAGEMENT PLAN

Indoor Air Engineering Control And Sampling Locations

PROJECT NO.
3681R-05

FIGURE 7

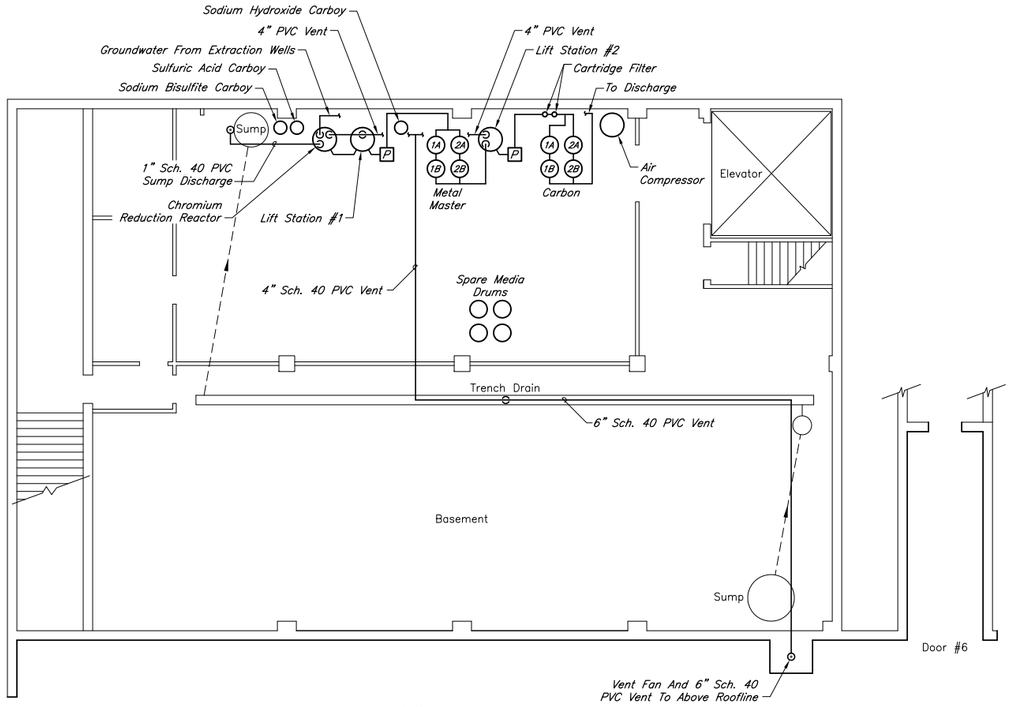
Ref1:
Ref2:
Ref3:

Xerox432AnsiB-2; 11 x 17
Layout Name: Layout1
Pen Setting File: 800psFullcolor.ctb

Time Plotted: Thursday, May 23, 2013 4:03:22 PM
File Name: U:\McPhee\Drawings\Maguire\3681R\3681R-ISMP Control Locations-1.dwg

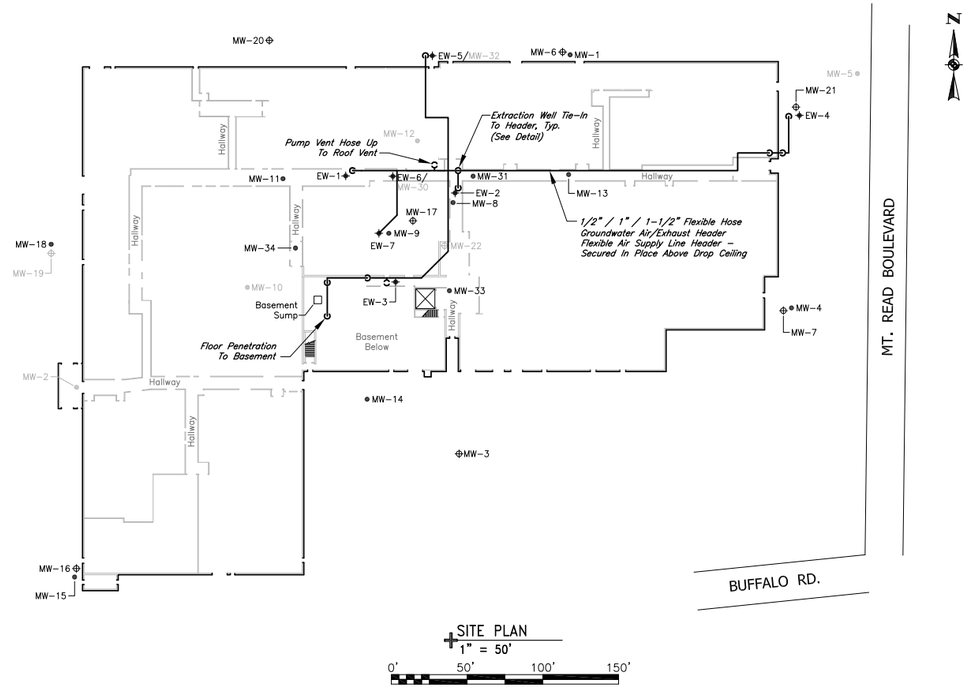
APPENDIX A

REMEDIAL SYSTEMS
RECORD DRAWINGS



Note: All Locations Approximate.

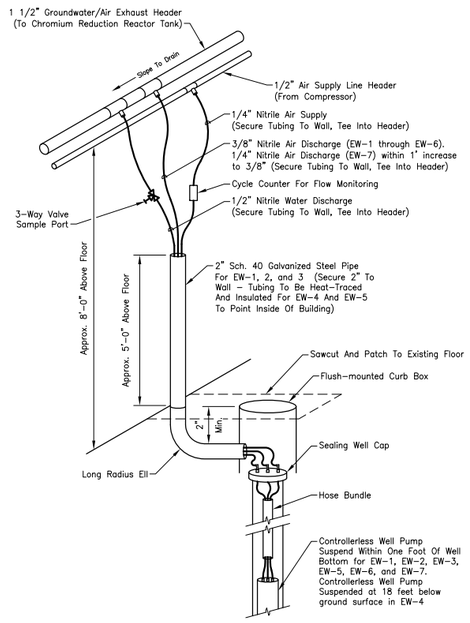
BASEMENT PLAN VIEW
1/8" = 1'-0"
0' 8' 16' 24'



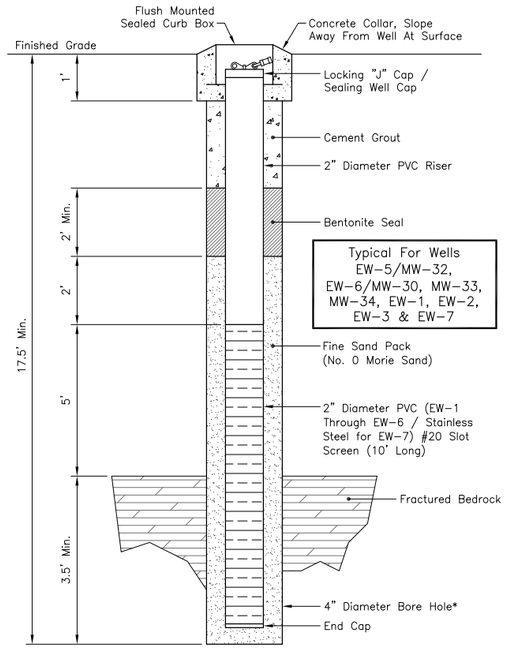
SITE PLAN
1" = 50'
0' 50' 100' 150'

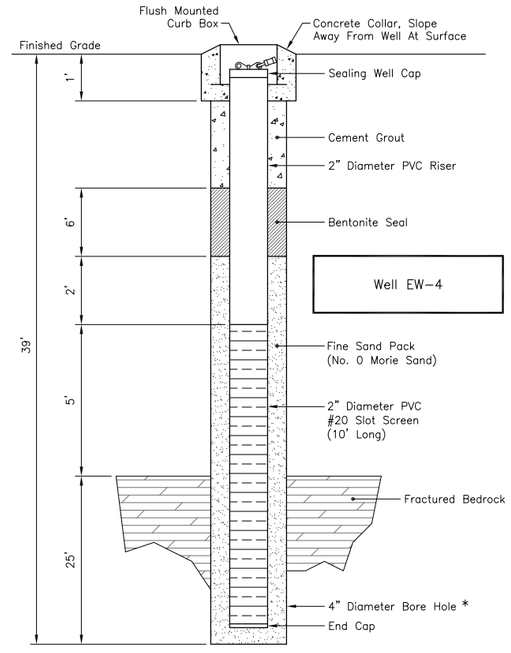
NOTES:

1. Monitoring Well MW-32 was converted to Extraction Well EW-5 on June 17, 2009.
2. Monitoring Well MW-30 was converted to Extraction Well EW-6 on December 14, 2012
3. Extraction Well EW-7 was installed on November 14, 2012, and became operational on January 22, 2013.



DETAIL - WELL PUMP
NOT TO SCALE





TYPICAL MONITORING WELL DIAGRAM
NOT TO SCALE

* Note: 4" Diameter Bore Hole Was Extended Into Bedrock To Point Of Refusal, Following Which 2" Boring (Unscreened) Was Used To Reach Total Indicated Depth.

RECORD DRAWINGS
NOTE:
Day Environmental, Inc. and the Licensed Professional Engineer certify to the best of our knowledge that this drawing is a reasonable true and accurate representation of the records of construction. This record drawing has been prepared based on conditions that existed at the time of preparation and in part on information provided by others. Verification of actual conditions should be confirmed prior to performing additional work that relies on information contained in this drawing.

PROJECT MANAGER	BFK	DATE	09-10-2007
DRAWN BY	RJM	DATE DRAWN	09-10-2007
CHECKED BY	BFK	DATE	09-10-2007
APPROVED BY	BFK	DATE	09-2007
SCALE	As Noted	DATE ISSUED	09-10-2007

DAY ENVIRONMENTAL, INC.
DRAWING ALTERATION
THIS DOCUMENT MAY NOT BE ALTERED BY ANY UNAUTHORIZED PERSON.

	DATE	BY
7		
6		
5	11-1-13	RJM
4	8-28-13	RJM
3	5-13-13	TWW
2	3-5-10	RJM
1	10-29-09	RJM
REVISIONS		
5	REVISED RECORD DRAWING NOTE PER NYSDEC REVIEW COMMENTS	
4	ISSUE FOR SITE MANAGEMENT PLAN	
3	MISC REVISIONS	
2	REVISED PER NYSDEC REVIEW COMMENTS	
1	RECORD DRAWING	

DAY ENVIRONMENTAL, INC.
ENVIRONMENTAL CONSULTANTS
ROCHESTER, NEW YORK 14608
NEW YORK: NEW YORK 10170

PROJECT TITLE
95 MT. READ BOULEVARD
ROCHESTER, NEW YORK

SITE MANAGEMENT PLAN

DRAWING TITLE
Plan Views And Details

PROJECT NO.
3681R-05

FIGURE NO.
C-1

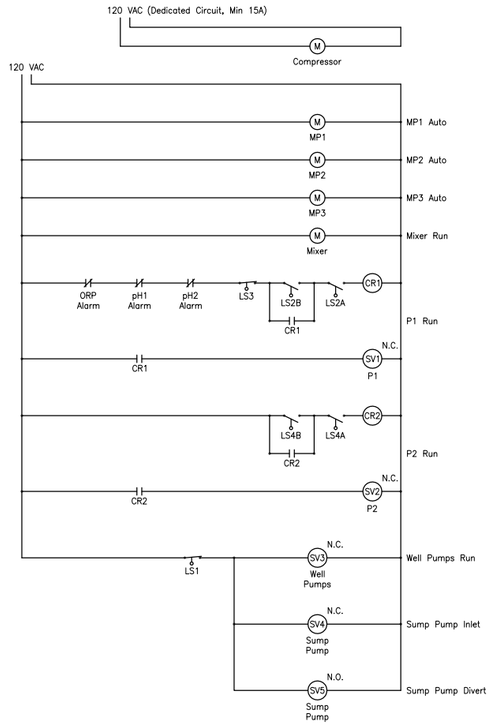
Reference Files Attached:
REF1: 3681R-Basement Plan Oct-09
REF2: 3681R-Plan
REF3: 3681R-Well Pump Oct-09
REF4: Well Detail Oct-09
REF5:
REF6:
REF7:
REF8:
REF9:
REF10:

File Name: P:\Drawing\Maxplot\3681R\C09 Aug 2013\Figure 3.dwg
Layout Name: C-1
Time Plotted: Friday, November 01, 2013 7:51:03 AM
Pen Setting File: 800plusFullcolor.ctb

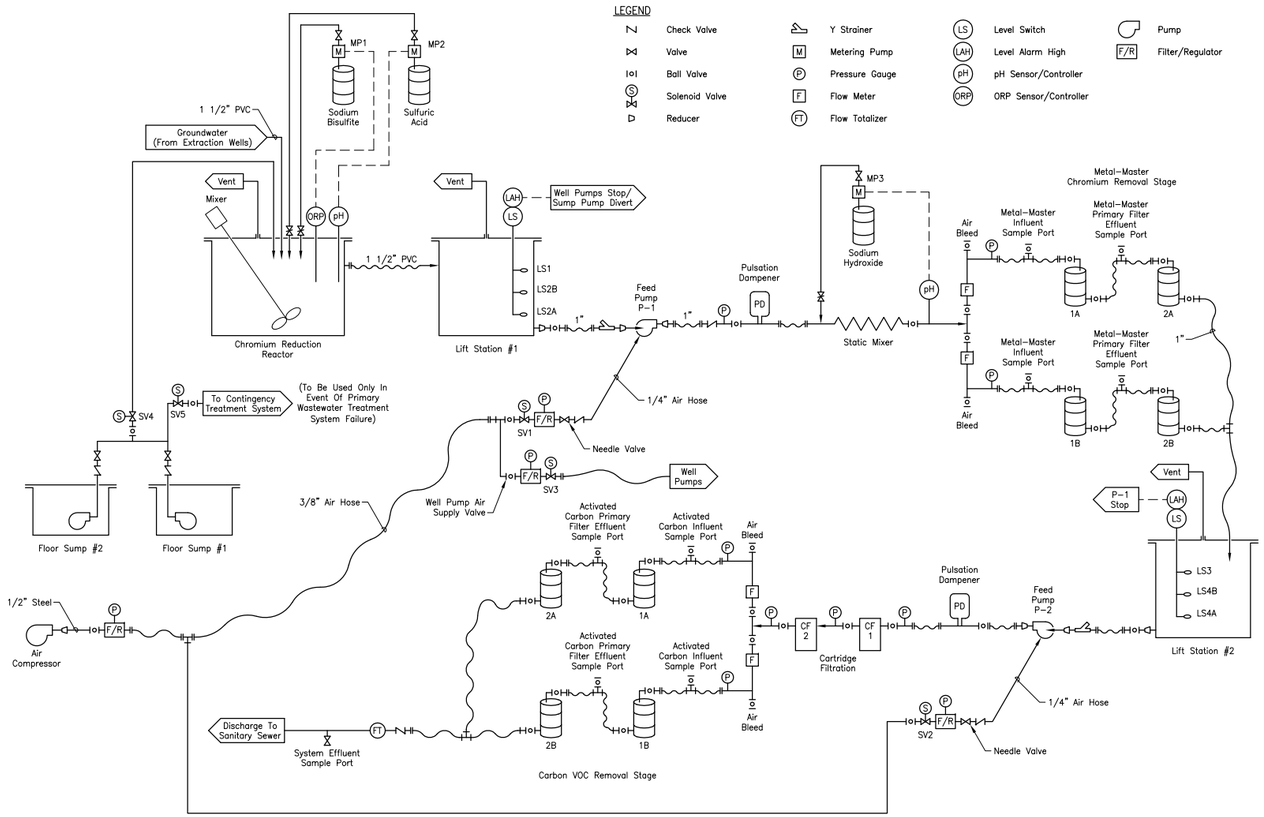
ANSI "D" (22x34)
DayEnv_AnsiD

SYSTEM	ITEM	DESCRIPTION	MFR	MODEL
Chromium Reduction	Tank	150-gal polyethylene tank (31"D x 48"H) with cover	Chem-Tainer	---
	Tank Stand	steel mixer support floor stand	Chem-Tainer	---
	Mixer	1/3 HP; min 32"L, 1/2" dia. shaft; clamp-mount	Neptune	---
	pH Controller	on-off dual pH/ORP controller; min. 2 SPDT relays	Rosemount	1055-01-11-22-32
	pH Probe	pH sensor with 25-ft cable	Rosemount	396P-01-10-55
	pH Cartridge	ORP sensor with 25-ft cable	Rosemount	396P-01-12-55
	Acid Metering Pump	14 GPD; 100:1 turndown; manual control	LMI	AA141-353SP
	Bisulfite Metering Pump	18 GPD; 100:1 turndown; manual control	LMI	AA181-393BI
Lift Station #1	Tank	150-gal polyethylene tank (31"D x 48"H) with cover	Chem-Tainer	---
	Float Switches	3-wire polypropylene float, 10A, 20' cord	Conery	---
	Pump	1/2" PP diaphragm pump; 13 GPM max; viton seals	ARO	666053-333
	Pulsation Dampener	PP dampener; 85% pulsation reduction @ 60 psi, 5 GPM	ARO	SB10P-APS-A
pH Adjustment	Static Mixer	1" PVC static mixer	---	---
	Caustic Metering Pump	24 GPD; 1000:1 turndown; 4-20mA control; remote on-off	LMI	AA951-393BI
	pH Controller	proportional pH controller	LMI	DP5000
	pH Probe	pH probe	Sensorex	S650CD
	pH Cartridge	pH probe cable assembly; 10'L	Sensorex	S653TC-10-BNC
Metal Master Filtration	Flowmeters	1.0 to 10.0 GPM; 1" FNPT ends	Blue White	F-400N
	Chromium Filters	Chromium Removal Media Drums	Terrenew	MetalMaster
Lift Station #2	Tank	100-gal polyethylene tank (28"D x 42"H) with cover	Chem-Tainer	---
	Float Switches	3-wire polypropylene float, 10A, 20' cord	Conery	---
	Pump	1/2" PP diaphragm pump; 13 GPM max; viton seals	ARO	666053-333
	Pulsation Dampener	PP dampener; 85% pulsation reduction @ 60 psi, 5 GPM	ARO	SB10P-APS-A
Cartridge Filtration	Filter Housings	4.5" x 20" filter housing; 1" FNPT ends	---	---
	Cartridge Filters	4.5" x 20" filter; 50-micron	---	---
	Cartridge Filters	4.5" x 20" filter; 5-micron	---	---
Carbon Filtration	Flowmeters	1.0 to 10.0 GPM; 1" FNPT ends	Blue White	F-400N
	Carbon Filter	High-surface area carbon media drums	Terrenew	Carphene
	Flow Totalizer	5/8" x 3/4"; 0.5 to 20 GPM; totalizer in gallons	Neptune	---
Well Pumps	EW-1 thru EW-3, EW-5 & EW-6	2.0 GPM max; bottom inlet; 20" activation level	QED	AP2B (short)
	EW-4	2.3 GPM max; bottom inlet; 35" activation level	QED	AP2B (long)
	EW-7	2.0 GPM max; bottom inlet; 38" activation level	geo tech	---
	Cycle Counters	digital display	QED	---
	Well Cap	vacuum sealing cap with tubing adapters	QED	---
Compressed Air System	Compressor	Oilless; 1.6 HP; 6.0 CFM @ 90 psi	Porter-Cable	C3151
	Filter / Regulator	compact 5-micron filter, 0-125 psi regulator; 1/2" NPT ends	Wilkerson	B18-04-FK00
Alarm	Hi Level Alarm	float w/ 10' cord; panel w/ alarm light, 85 dB horn, test + silence	Conery	LA10H

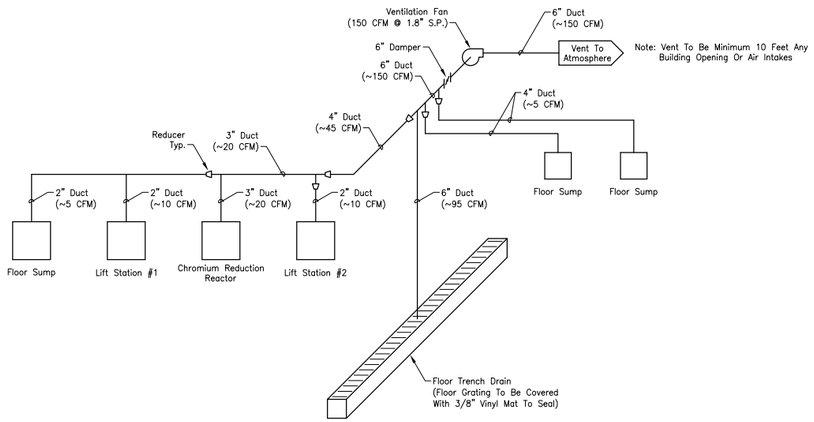
EQUIPMENT LIST
NOT TO SCALE



ELECTRICAL SCHEMATIC
NOT TO SCALE



PROCESS & INSTRUMENTATION SCHEMATIC
NOT TO SCALE



VENTILATION SCHEMATIC
NOT TO SCALE

RECORD DRAWINGS
NOTE:
Day Environmental, Inc. and the Licensed Professional Engineer certify to the best of our knowledge that this drawing is a reasonable true and accurate representation of the records of construction. This record drawing has been prepared based on conditions that existed at the time of preparation and in part on information provided by others. Verification of actual conditions should be confirmed prior to performing additional work that relies on information contained in this drawing.

		DATE	BY
7		11-1-13	RJM
6		8-28-13	RJM
5	REVISED RECORD DRAWING NOTE PER NYSDEC REVIEW COMMENTS	5-13-13	TWW
4	ISSUE FOR SITE MANAGEMENT PLAN	3-5-10	RJM
3	EQUIPMENT LIST ADDITION	10-29-09	RJM
2	REVISED PER NYSDEC REVIEW COMMENTS		
1	RECORD DRAWING		
	REVISIONS	DATE	BY

PROJECT MANAGER: BFK 09-10-2007
DRAWN BY: RJM 09-10-2007
CHECKED BY: BFK 09-10-2007
APPROVED BY: BFK 09-2007
SCALE: As Noted 09-10-2007

DAY ENVIRONMENTAL, INC.
DRAWING ALTERATION
THIS DOCUMENT MAY NOT BE ALTERED BY ANY PERSON OTHER THAN A DAY ENVIRONMENTAL INC.

DAY ENVIRONMENTAL, INC.
ENGINEERING CONSULTANTS
ROCHESTER, NEW YORK 14606
NEW YORK, NEW YORK 10170

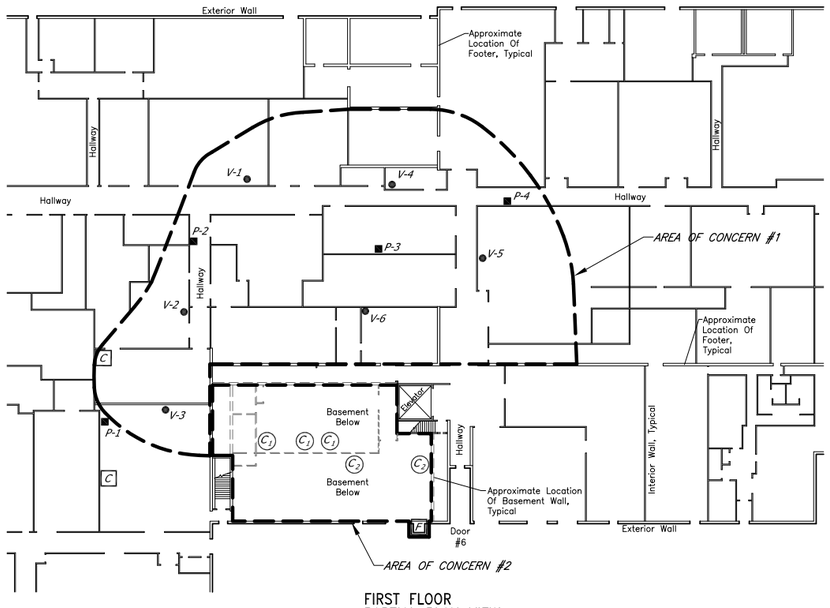
PROJECT TITLE: 95 MT. READ BOULEVARD ROCHESTER, NEW YORK
SITE MANAGEMENT PLAN
DRAWING TITLE: Equipment List And Schematics

PROJECT NO. 3681R-05
FIGURE NO. C-2

Reference Files Attached:
REF1: 3681R-Elec. Schematic-RD
REF2: 3681R-Equipment List
REF3: 3681R-Schematic-RD
REF4: 3681R-Ventilation-RD
REF5:
REF6:
REF7:
REF8:
REF9:
REF10:

File Name: P:\Drawings\Maguire\3681R\C02 Aug 2013\Figure 3.dwg
Layout Name: C-2
Time Plotted: Friday, November 01, 2013 7:53:24 AM
Pen Setting File: 800psffullcolor.ctb

ANSI "D" (22x34)
DayEnv_AnsiD



FIRST FLOOR PARTIAL PLAN VIEW
1" = 30'

LEGEND:

V-5 ● "As-Built" Vertical Vent Stack Location

P-1 ■ "As-Built" Sub-Slab Pressure Test Location

(C1) AllerAir 6000DX Carbon Air Filter

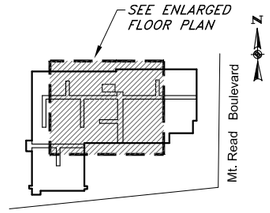
(C2) AllerAir 5000D Carbon Air Filter

[C] Electrocorp I6500A Carbon Air Filter

[F] Fantech FR 160 In-line Fan

NOTE:

1. First Floor Partial Plan View produced from a drawing by The ERM Group, entitled "Figure 3-1; PCB, Asbestos & Sediment/Residue Sampling Locations", dated 11/20/1990; A blueline print by Miller-Anderson Architects, entitled "1st Floor Plan Details", date issued 3-3-2000; and from notes of site visits by representatives of Day Environmental, Inc.



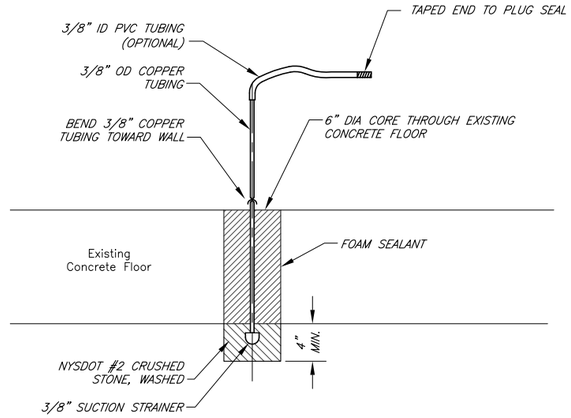
BUILDING KEY PLAN
Not To Scale

NOTE:

1. Located core as close to wall as practical. Centered copper tubing in core, bent toward wall, than ran minimum 1 foot up wall.

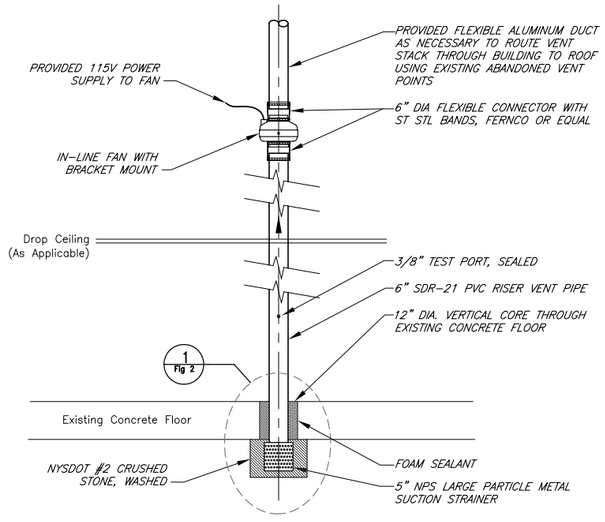
MATERIALS:

Suction Strainer: McMaster-Carr Model #98755K12



TYPICAL SECTION VIEW

SUB-SLAB PRESSURE TEST PIPING DETAIL
1-1/2" = 1'-0"



TYPICAL SECTION SUB-SLAB DEPRESSURIZATION VENT
1/2" = 1'-0"

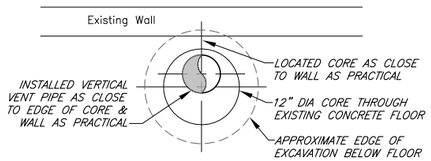
NOTES:

1. Located core and vent pipe as close to wall as practical.
2. Constructed vertical vent with ells if necessary, but keep location and pipe lengths as close to core location as practical to minimize pressure drop through pipe and bends.
3. Provided supports as necessary to secure pipe, fan, and conduit.

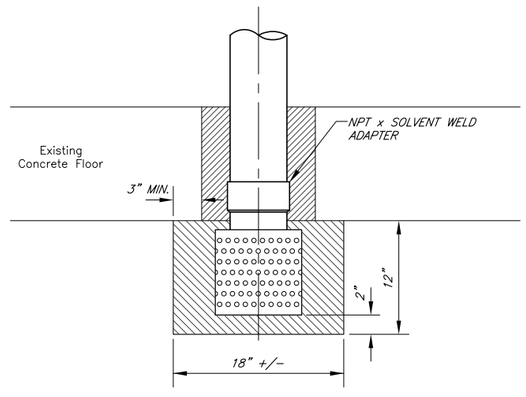
MATERIALS:

In-Line Fan: Fantech Model FR 160

Suction Strainer: McMaster-Carr Model #4413K6



PLAN VIEW AT VERTICAL VENT
1" = 1'-0"



DETAIL 1
1-1/2" = 1'-0"

RECORD DRAWINGS

NOTE:

Day Environmental, Inc. and the Licensed Professional Engineer certify to the best of our knowledge that this drawing is a reasonable true and accurate representation of the records of construction. This record drawing has been prepared based on conditions that existed at the time of preparation and in part on information provided by others. Verification of actual conditions should be confirmed prior to performing additional work that relies on information contained in this drawing.

	PROJECT MANAGER	DRAWN BY	CHECKED BY	APPROVED BY	SCALE
DATE	BFK	RJM	BFK	BFK	As Noted
10-2010	DATE DRAWN: 10-27-2010	DATE 10-27-2010	DATE 10-27-2010	DATE 10-27-2010	DATE REVISED 2-16-2011

DAY ENVIRONMENTAL, INC.
DRAWING ALTERATION
THIS DOCUMENT MAY NOT BE ALTERED WITHOUT WRITTEN CONSENT OF DAY ENVIRONMENTAL, INC.

7	6	5	4	3	2	1	REVISIONS	DATE	BY

DAY ENVIRONMENTAL, INC.
ENVIRONMENTAL CONSULTANTS
ROCHESTER, NEW YORK 14614-1008
NEW YORK, NEW YORK 10016-0710

PROJECT TITLE
95 MT. READ BOULEVARD
ROCHESTER, NEW YORK
CONSTRUCTION COMPLETION REPORT
INDOOR VAPOR INTRUSION MITIGATION SYSTEM

DRAWING TITLE
Engineering Control Details

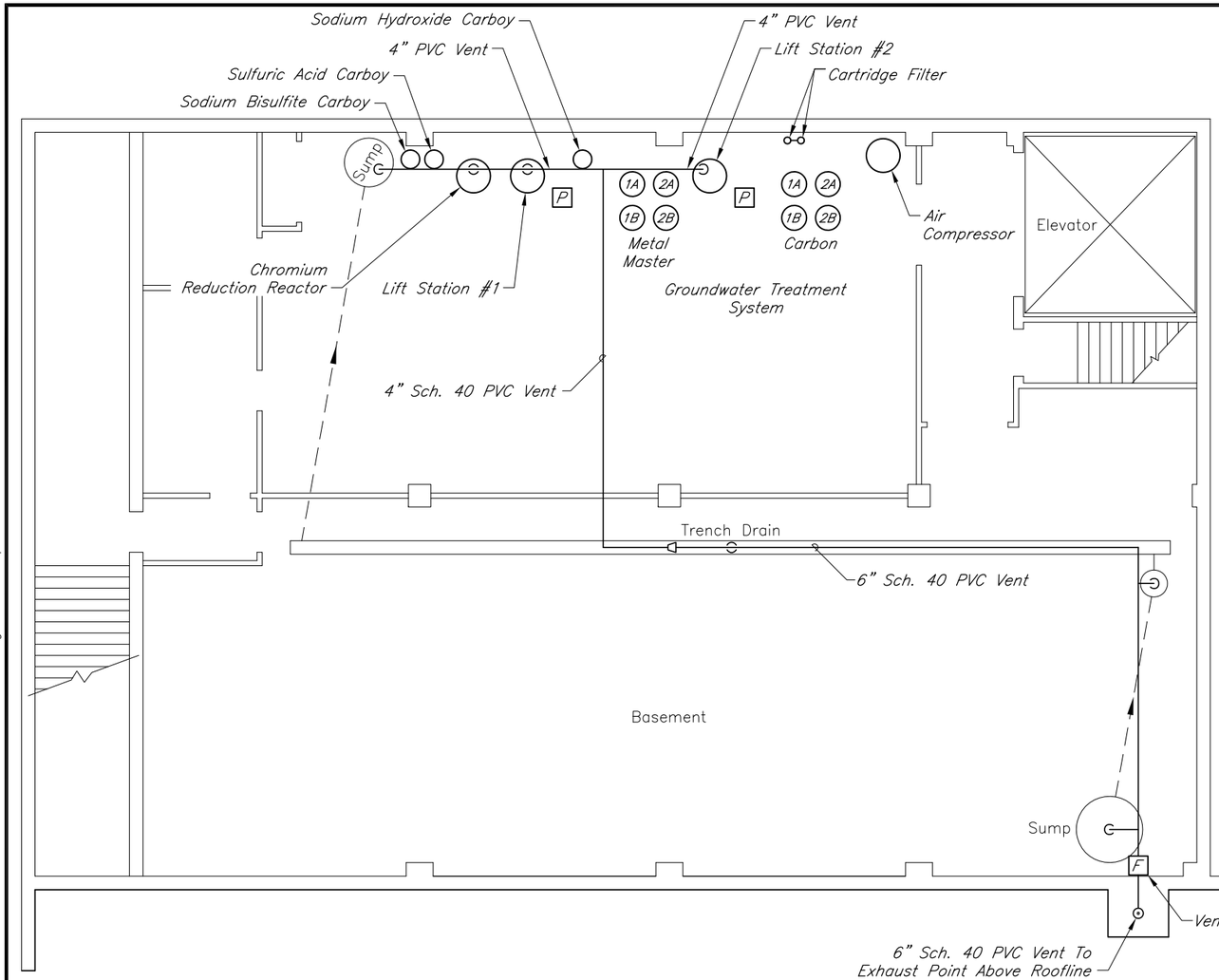
PROJECT NO.
3681R-05

FIGURE NO.
FIGURE 3

Reference Files Attached:
REF1: 3681R-ISMP Control Locations
REF2:
REF3:
REF4:
REF5:
REF6:
REF7:
REF8:
REF9:
REF10:

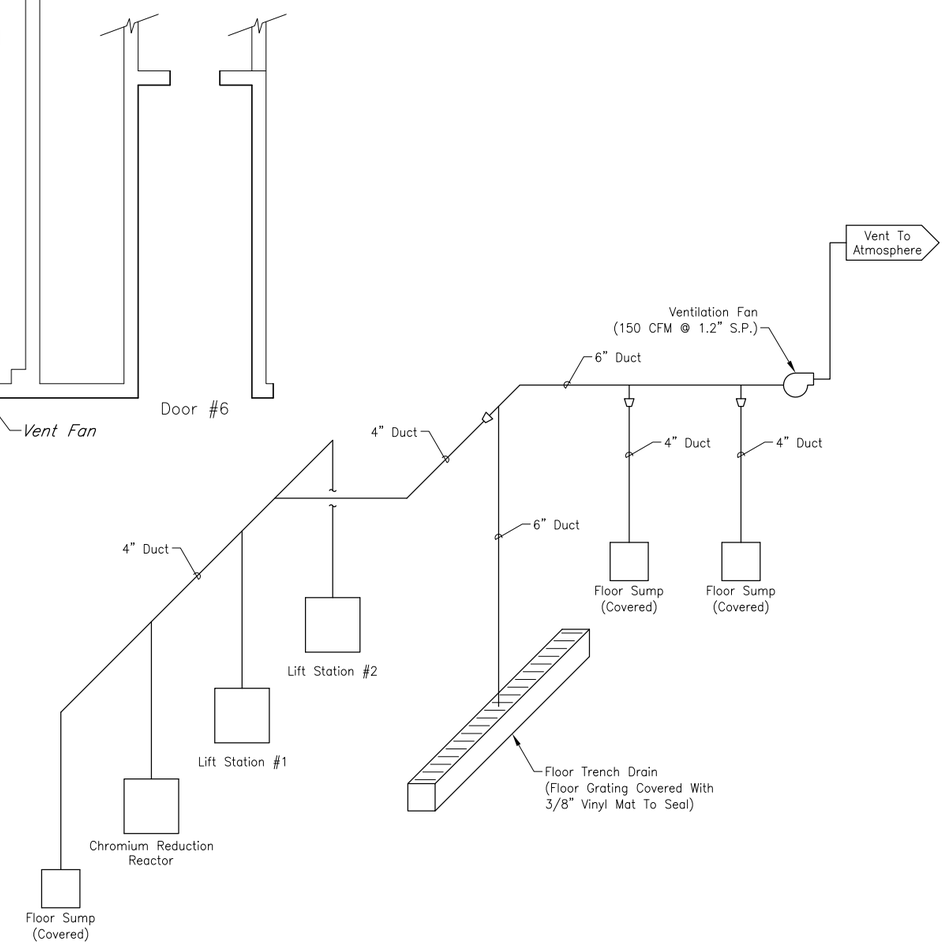
File Name: P:\Drawings\Wayne\3681R\Sub-Slab Details-1.dwg
Layout Name: Layout1
Time Plotted: Friday, February 18, 2011 1:34:12 PM
Pen Setting File: 80ppd.ctb

ANSI "D" (22x34)
DayEnv_AnsiD



Note: All Locations Approximate.

BASEMENT PLAN VIEW
3/32" = 1'-0"



VENTILATION SCHEMATIC
Not To Scale

RECORD DRAWINGS

NOTE:
Day Environmental, Inc. and the Licensed Professional Engineer certify to the best of our knowledge that this drawing is a reasonable true and accurate representation of the records of construction. This record drawing has been prepared based on conditions that existed at the time of preparation and in part on information provided by others. Verification of actual conditions should be confirmed prior to performing additional work that relies on information contained in this drawing.

FIELD VERIFIED BY: BFK	DATE: 2-2011	DRAWN BY: RJM	DATE DRAWN: 2-16-2011
SCALE: As Noted	DATE ISSUED: 2-18-2011		

DAY ENVIRONMENTAL, INC.
ENVIRONMENTAL CONSULTANTS
ROCHESTER, NEW YORK 14614-1008
NEW YORK, NEW YORK 10016-0710

PROJECT TITLE: 95 MT. READ BOULEVARD ROCHESTER, NEW YORK

CONSTRUCTION COMPLETION REPORT

DRAWING TITLE: Basement Ventilation System

PROJECT NO. 3681R-05

FIGURE 4

V-1 & V-4

V-2

V-3

NOTE: No air intakes are known to be located on the roof.

V-5

V-6

BASEMENT VENT

Vent	Height Of Vent Discharge Above Roof	Type Of Rain Protection	In-Line Fan Above Drop Ceiling	Drop Ceiling Present
SSDS V-1	2.5 Feet	Goose-Neck	Yes	Yes
SSDS V-2	2.5 Feet	Rain Cap	No	No
SSDS V-3	5 Feet	Rain Cap	No	No
SSDS V-4	2.5 Feet	Goose-Neck	No	No
SSDS V-5	4 Feet	Rain Cap	No	No
SSDS V-6	1.5 Feet	Rain Cap	No	No
BASEMENT VENT	2.0 Feet	Goose-Neck	No	No

RECORD DRAWINGS

NOTE:
Day Environmental, Inc. and the Licensed Professional Engineer certify to the best of our knowledge that this drawing is a reasonable true and accurate representation of the records of construction. This record drawing has been prepared based on conditions that existed at the time of preparation and in part on information provided by others. Verification of actual conditions should be confirmed prior to performing additional work that relies on information contained in this drawing.

FIELD VERIFIED BY	DATE		
NES	2-2011		
DRAWN BY		DATE DRAWN	
RJM		2-16-2011	
SCALE		DATE ISSUED	
As Noted		2-18-2011	

day

DAY ENVIRONMENTAL, INC.
ENVIRONMENTAL CONSULTANTS
ROCHESTER, NEW YORK 14614-1008
NEW YORK, NEW YORK 10016-0710

PROJECT TITLE
95 MT. READ BOULEVARD
ROCHESTER, NEW YORK

CONSTRUCTION COMPLETION REPORT

DRAWING TITLE
Engineering Control Vent Locations

PROJECT NO.
3681R-05

FIGURE 5

Ref1:
Ref2:
Ref3:

Xerox432AnsiB-2; 11 x 17
Layout Name: Layout1
Pen Setting File: 800psFullcolor.ctb

Time Plotted: Friday, February 18, 2011 1:24:25 PM
File Name: P:\Drawings\Maguire\3681R\3681R-Roof Locations.dwg

APPENDIX B

REMEDIAL SYSTEMS
OPERATOR'S LOG FORMS

Former General Circuits
95 Mount Read LLC
NYSDEC Site Code #828085
Rochester New York

Daily Operator Monitoring Log

Date: _____ Time _____

Personnel _____

Parameter	Measurement	Units
Chromium Reduction Reactor pH: / ORP:	/	S.U. / mV
pH at inlet of Metal Master Filters (pH meter, approximate range):		S.U.
Pressure at Inlet of Metals Master Train #1: / Train #2:	/	PSI
Pressure of Cartridge Filter 50 uM Inlet: / Outlet:	/	PSI
Pressure of Cartridge Filter 5 uM Inlet: / Outlet:	/	PSI
Pressure at Inlet of Carbon Train #1: / Train#2:	/	PSI
pH of Final Effluent: (using Handheld pH meter)		S.U.
Flow Totalizer Reading:		Gallons

S.U. = Standard Units PSI = Pounds Per Square Inch
MV= Millivolts uM = Micron

Notes:

Former General Circuits
95 Mount Read LLC
NYSDEC Site Code #828085
Rochester New York

Weekly Operator Monitoring Log

Date: _____

Personnel _____

Activity	✓
Check for negative pressure in vent system	
Check for integrity of sump, tank and floor trench vent seals/covers	
Check for integrity of vent and water piping and connections	
Check for integrity of tanks and media filter vessels	
Clean pump and valve inlet strainers (as needed)	
Check compressor oil level and top off as needed	
Check Extraction Well Pump Operation: EW-1	
Check Extraction Well Pump Operation: EW-2	
Check Extraction Well Pump Operation: EW-3	
Check Extraction Well Pump Operation: EW-4	
Check Extraction Well Pump Operation: EW-5	

Notes:

Former General Circuits
95 Mt Read Blvd
NYSDEC Site #828085
Rochester, New York

QUARTERLY EQUIPMENT CHECK
MONITORING LOG

Date _____ Time _____

Personnel _____

Subslab Vent Fans & Water Treatment System Vent Fan

	V-1	V-2	V-3	V-4	V-5	V-6	GWE&T Vent
Fan Operation Confirmed							
Exhaust Point Free of Obstruction							
Labeling Intact							

Indoor Air Filtration Units

	C-1 Electrocorp I6500 #1 (Room 2)	C-2 Electrocorp I6500 #2 (Room 3)	C-3 AllerAir 5000D #1 (basement)	C-4 AllerAir 5000D #2 (basement)	C-5 AllerAir 6000DX #1 (basement)	C-6 AllerAir 6000DX #2 (basement)	C-7 AllerAir 6000DX #3 (basement)
Airflow Confirmed							
High Speed Setting Confirmed							
Intake/Exhaust Points Free of Obstruction							
Location Acceptable							
Labeling Intact							

General Notes/Observations: (include check of any local combustion sources for backdraft)

_____

_____

_____

_____

_____

Former General Circuits
95 Mt Read Blvd
NYSDEC Site #828085
Rochester, New York

QUARTERLY CARBON FILTER MEDIA CHECK
MONITORING LOG

Date _____ Time _____

Personnel _____

Indoor Air Filtration Units

	C-1 Electrocorp I6500 #1 (Room 2)	C-2 Electrocorp I6500 #2 (Room 3)	C-3 AllerAir 5000D #1 (basement)	C-4 AllerAir 5000D #2 (basement)	C-5 AllerAir 6000DX #1 (basement)	C-6 AllerAir 6000DX #2 (basement)	C-7 AllerAir 6000DX #3 (basement)
Prefilter Check (Vacuum/Changeout?)							
Acetone Test Effluent Result #1							
Acetone Test Effluent Result #2							
Acetone Test Effluent Result #3							
Acetone Test Effluent Result #4							
Average Acetone Test Effluent Result[1]							
Average Virgin Carbon Test Result	0.0 ppm	0.0 ppm	≤ 1.1 ppm	≤ 1.1 ppm	≤ 1.1 ppm	≤ 1.1 ppm	≤ 1.1 ppm
Average Test Result Carbon Threshold	4.0 ppm	4.0 ppm	20 ppm	20 ppm	20 ppm	20 ppm	20 ppm
Carbon Changed Out (Yes or No)							

Notes:

[1] PID reading of increase in ppm VOC's in discharged air from carbon when operated with open acetone test jar at intake grill. Acetone test jar shall be 4-ounce soil jar (2.25-inch diameter mouth) with 1 to 2 ounces of acetone in the jar. Test result shall be average of minimum 4 readings from center of each of 4 quadrants at discharge.

Former General Circuits
95 Mt Read Blvd
NYSDEC Site #828085
Rochester, New York

ANNUAL MONITORING LOG – VENT FANS

Date _____ Time _____

Personnel _____

Subslab Vent Fans

	V-1	V-2	V-3	V-4	V-5	V-6
Fan Operation Confirmed						
Exhaust Point Free of Obstruction						
Static Pressure ($\geq$1.8" H_2O vacuum req'd)						
Fan Checked for : Vibration/Noise						
Damage						
Secure Mounting						
Electrical Connection Secure						
Piping Checked for: Damage						
Secure Mounting						
Transition Seals Secure						

Basement Water Treatment System Fan

Airflow Confirmed	
Exhaust Point Free of Obstruction	
Fan Checked for : Vibration/Noise	
Damage	
Secure Mounting	
Electrical Connection Secure	
Piping Checked for: Damage	
Secure Mounting	
Transition Seals Secure	

Sump Covers In Place		
Tank Covers In Place		
Negative Suction Check: Sumps		
Trench		
Tanks		

Notes:

_____

_____

_____

APPENDIX C

CARBON TEST PROCEDURE

Carbon Field Test Procedure

There are no known commonly used or manufacturer-recommended test procedures to determine when the carbon media in an indoor air filtration unit is losing its effectiveness.

With aqueous carbon filtration media, a dual-column system is typically used, with the effluent from the first column being monitored on a periodic basis to chart the extent of breakthrough over time and the corresponding loss of removal efficiency. Once the carbon is fully saturated, it is removed from service, a fresh carbon column is placed into service at the end of the line, and the previous end-of-the-line column becomes the first filtration unit in the train. This maximizes the removals and service life of the carbon. Operation in this manner is not practical for indoor air carbon filtration units due to the differences in equipment, operation, and testing; however, the same premise was utilized to develop a field test procedure that could be used with the indoor air filtration units. The concept was to monitor VOC's in the discharged air from a carbon filter in response to a known influent VOC exposure to detect when breakthrough starts occurring. To accomplish this, baseline data was needed to characterize the response of both virgin and spent carbon media filters to a field-induced VOC exposure.

Acetone was selected as the VOC of choice for field testing due to ease of availability, relative low hazard in handling and use, and manufacturer's reported moderate effectiveness at which the VOC is removed by carbon. AllerAir reports that carbon has a high affinity for trichloroethene (TCE) and tetrachlorethene (PCE), and a moderate-to-high affinity for acetone. As such, a carbon filter should see acetone breakthrough at a faster rate than TCE or PCE breakthrough, and thus acetone was chosen as the indicator VOC for field testing.

To provide an influent acetone exposure that is repeatable, an open 4-ounce soil jar (2.25-inch diameter opening at top) filled with one to two ounces of acetone was placed beneath the intake grille at the bottom of an AllerAir 6000DX filter. Measurement of VOC influent concentrations was not possible, and it was necessary to remove the carbon media cartridge to simulate results for spent carbon media. Air flow measurements were also collected for scaling purposes, as removal of the carbon media decreased the pressure drop across the unit, thus increasing the airflow and diluting the influent acetone concentrations. Test measurements of air flow and VOC's were recorded using an air velocity meter and PID meter for (i) the air filter running with carbon; and (ii) the air filter running with carbon removed. Averaged results are as follows:

AllerAir 6000DX	Low Speed Airflow (CFM)	Low Speed VOC's (ppm)	Medium Speed Airflow (CFM)	Medium Speed VOC's (ppm)	High Speed Airflow (CFM)	High Speed VOC's (ppm)
With Carbon	1050	0.0	2150	0.3	3200	0.5
Without Carbon	1300	27	2450	50	4250	85

Background VOC levels measured at the carbon filter exhaust discharge (with no acetone exposure) was 0.0 ppm at each speed setting. The AllerAir 5000D units were not tested. These units are essentially of the same construction as the 6000DX (same diameter, fan and airflow), but are 3 inches less in height with a smaller carbon capacity. As such, both AllerAir units will generate comparable results when the carbon media is spent.

Testing of the Electrocorp I6500A carbon filtration units was slightly different in that the carbon could not be easily removed for testing; however, due to the size and configuration of the units, it was possible to obtain direct measurement of the pre-carbon VOC concentrations from an internal chamber in the filter housing, which directly correlates to the effluent concentrations in the event that the media was spent and no VOC removal was occurring. For testing purposes, an open 4-ounce soil jar (2.25-inch diameter opening at top) was once again filled with one to two ounces of acetone, and was placed beside one of the side-mounted intake grilles at the bottom of an Electrocorp I6500A filter. The internal air chamber was divided into four quadrants of equal size for monitoring purposes. Because the influent concentrations were directly observable, and no carbon removal was required, air flow measurements were not collected during VOC testing of the Electrocorp I6500A unit. It was also observed that results obtained following carbon changeout varied significantly from those obtained on the initial, manufacturer-supplied unit, possibly due to carbon media settling in the unit during shipping. For purposes of developing data applicable to ongoing carbon filter operation, only the post-carbon changeout data is directly applicable, for which test results obtained using a PID meter are as follows:

	Average Influent VOC Concentration (ppm)*				
Electrocorp I6500A	Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4	Filter Average
High Speed	27.0	20.5	6.3	12.4	16.6

* *Denotes average data obtained through three quarterly test events performed on two separate Electrocorp I6500A units in January, April and July of 2013.*

Effluent VOC concentration (i.e. following carbon treatment) both prior to and during the acetone test runs was 0.0 ppm. The influent VOC concentrations for the Electrocorp I6500A observed above were noticeably lower than the comparable AllerAir VOC concentrations, which is believed to be due to the lower air flow rates and greater turbulence generated around the acetone jar at the influent to the AllerAir filter. Nonetheless, both results provide valid standards for use during field evaluations of the carbon units.

For field evaluation purposes, it is necessary to set a filter effluent VOC level which represents breakthrough and is indicative of the need for carbon media replacement. Obviously, the carbon filters will not be used up to the point of media saturation and complete breakthrough, but likewise there will be some natural variability to filter operations and test results, and it is also unnecessary to replace the media at the slightest exceedance of the virgin carbon performance data averages provided herein. The procedure developed as a part of this SMP assumes the need for carbon replacement once a degradation in filter performance for acetone removal of approximately 25% is observed (i.e., effluent VOC concentration of 20 ppm is observed at AllerAir filter, or 4.0 ppm is observed at Electrocorp filter, with filter operating at high speed). As noted previously, acetone breakthrough will occur at a faster rate than TCE and PCE breakthrough, so filter performance for TCE and PCE removals are expected to remain relatively high up until time of changeout.

Field procedure for testing the carbon filters will be as follows:

Confirm filter is running at high speed. Check prefilter and vacuum or replace as needed if it is visually dirty. Using a PID meter, measure the background (i.e. unspiked) ppm VOC content of the discharged air from the filter. Place one to two ounces of acetone in a 4-ounce soil jar (2.25-inch diameter opening at top), and place the jar immediately adjacent to the air filter intake (floor level next to side intake of the large carbon unit, or directly beneath the bottom intake of the small unit, raising the unit as necessary). Using a PID meter, measure the VOC content of the discharged air from the filter, and compare the readings to the carbon changeout criteria listed below.

	Increase in VOC Concentrations @ Discharge	
	Large Carbon Filters (Electrocorp, AOC #1)	Small Carbon Filters (AllerAir, AOC #2)
Virgin Carbon	0.0 ppm	0.5 ppm
Full Breakthrough	16.6 ppm	85 ppm
Carbon Changeout Threshold	4.0 ppm	20 ppm

If the average increase in measured concentration at the discharge of the air filter exceeds the threshold concentration listed above, the carbon will be changed out, and fresh carbon installed.

APPENDIX D

REMEDIAL SYSTEMS COMPONENT MANUALS

OPERATOR'S MANUAL PD05P-X-X-B

INCLUDING: OPERATION, INSTALLATION & MAINTENANCE

RELEASED: 9-13-05
REVISED: 12-14-05
(REV. 02)

1/2" DIAPHRAGM PUMP
1:1 RATIO, NON-METALLIC

READ THIS MANUAL CAREFULLY BEFORE INSTALLING, OPERATING OR SERVICING THIS EQUIPMENT.

It is the responsibility of the employer to place this information in the hands of the operator. Keep for future reference.

SERVICE KITS

Refer to Model Description Chart to match the pump material options.
637427-XX for fluid section repair (see page 4).
637428 for air section repair (see page 6).

PUMP DATA

Models		see Model Description Chart for "-XXX".
Pump Type		Air Operated Double Diaphragm
Material		see Model Description Chart
Weight	PD05P-XDS-XXX-B	6.28 lbs (2.85 kgs)
	PD05P-XES-XXX-B	6.67 lbs (3.03 kgs)
	PD05P-XKS-XXX-B	6.78 lbs (3.08 kgs)
	PD05P-XLS-XXX-B	7.24 lbs (3.28 kgs)
	PD05P-XPS-XXX-B	5.21 lbs (2.36 kgs)
	PD05P-XRS-XXX-B	5.44 lbs (2.47 kgs)
Maximum Air Inlet Pressure		100 p.s.i.g. (6.9 bar)
Maximum Material Inlet Pressure		10 p.s.i.g. (0.69 bar)
Maximum Outlet Pressure		100 p.s.i.g. (6.9 bar)
Air Consumption @ 40 p.s.i.		1 c.f.m. / gallon (approx.)
Maximum Flow Rate (flooded inlet)		14.4 g.p.m. (54.5 l.p.m.)
Displacement / Cycle @ 100 p.s.i.		0.039 gallons (0.15 lit.)
Maximum Particle Size		3/32" dia. (2.4 mm)
Maximum Temperature Limits (diaphragm / ball / seat material)		
Acetal		10° to 180° F (-12 to 82° C)
Hytrel®		-20° to 150° F (-29° to 66° C)
Nitrile		10° to 180° F (-12 to 82° C)
Polypropylene		35° to 150° F (2° to 66° C)
Polyurethane		10° to 150° F (-12° to 66° C)
PVDF (Kynar®)		10° to 200° F (-12 to 93° C)
Santoprene®		-40° to 225° F (-40° to 107° C)
PTFE (Teflon®)		40° to 225° F (4° to 107° C)
Viton®		-40° to 350° F (-40° to 177° C)
Groundable Models		PD05P-XDS-XXX-B
		PD05P-XES-XXX-B
Dimensional Data		see page 8
Noise Level @ 70 p.s.i., 60 c.p.m.		75.0 db(A)①

① The pump sound pressure levels published here have been updated to an Equivalent Continuous Sound Level (L_{eq}) to meet the intent of ANSI S1.13-1971, CAGI PNEUROP S5.1 using four microphone locations.

NOTICE: All possible options are shown in the chart however certain combinations may not be recommended, consult a representative or the factory if you have questions concerning availability.

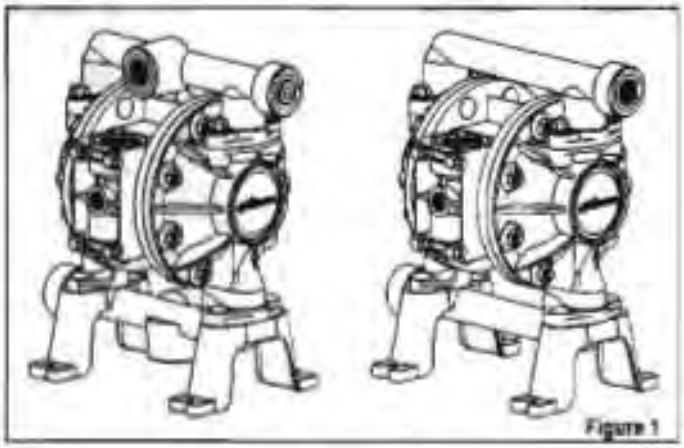


Figure 1

MODEL DESCRIPTION CHART

PD05 P - X X S - X X X - B

CENTER SECTION MATERIAL
P - Polypropylene

FLUID CONNECTION
A - 1/2 - 14 N.P.T.F. - 1
B - Rp 1/2 (1/2 - 14 BSP)

FLUID CAPS / MANIFOLD MATERIAL
D - Groundable Acetal (single port)
E - Groundable Acetal (multiple port)
K - PVDF (Kynar) (single port)
L - PVDF (Kynar) (multiple port)
P - Polypropylene (single port)
R - Polypropylene (multiple port)

HARDWARE MATERIAL
S - Stainless Steel

SEAT MATERIAL
D - Acetal
K - PVDF (Kynar)
P - Polypropylene
S - Stainless Steel

BALL MATERIAL
A - Santoprene
C - Hytrel
G - Nitrile
S - Stainless Steel
T - PTFE (Teflon)
U - Polyurethane
V - Viton

DIAPHRAGM MATERIAL
A - Santoprene
C - Hytrel
G - Nitrile
T - PTFE (Teflon) / Santoprene
U - Polyurethane
V - Viton

FLUID SECTION SERVICE KIT SELECTION PD05P - ARS - S X X - B

EXAMPLE: MODEL # PD05P-ARS-SAA-B 637427 - XX
FLUID SECTION SERVICE KIT # 637427-AA (Ball, Diaphragm)

INGERSOLL RAND COMPANY LTD
P.O. BOX 151 • ONE ARO CENTER • BRYAN, OHIO 43506-0151
(800) 276-4558 • FAX (800) 266-7016

OPERATING AND SAFETY PRECAUTIONS

READ, UNDERSTAND AND FOLLOW THIS INFORMATION TO AVOID INJURY AND PROPERTY DAMAGE.

⚠ WARNING EXCESSIVE AIR PRESSURE. Can cause personal injury, pump damage or property damage.

- Do not exceed the maximum inlet air pressure as stated on the pump model plate.
- Be sure material hoses and other components are able to withstand fluid pressures developed by this pump. Check all hoses for damage or wear. Be certain dispensing device is clean and in proper working condition.

⚠ WARNING STATIC SPARK. Can cause explosion resulting in severe injury or death. Ground pump and pumping system.

- PD05P-XDS-XXX-B and PD05P-XES-XXX-B Groundable Acetal pumps: Use the pump ground lug provided. Connect to a 12 ga. (minimum) wire (kit is included) to a good earth ground source.
- Sparks can ignite flammable material and vapors.
- The pumping system and object being sprayed must be grounded when it is pumping, flushing, recirculating or spraying flammable materials such as paints, solvents, lacquers, etc. or used in a location where surrounding atmosphere is conducive to spontaneous combustion. Ground the dispensing valve or device, containers, hoses and any object to which material is being pumped.
- Secure pump, connections and all contact points to avoid vibration and generation of contact or static spark.
- Consult local building codes and electrical codes for specific grounding requirements.
- After grounding, periodically verify continuity of electrical path to ground. Test with an ohmmeter from each component (e.g., hoses, pump, clamps, container, spray gun, etc.) to ground to insure continuity. Ohmmeter should show 0.1 ohms or less.
- Submerse the outlet hose and, dispensing valve or device in the material being dispensed if possible. (Avoid free streaming of material being dispensed.)
- Use hoses incorporating a static wire.
- Use proper ventilation.
- Keep inflammables away from heat, open flames and sparks.
- Keep containers closed when not in use.

⚠ WARNING Pump exhaust may contain contaminants. Can cause severe injury. Pipe exhaust away from work area and personnel.

- In the event of a diaphragm rupture material can be forced out of the air exhaust muffler.
- Pipe the exhaust to a safe remote location when pumping hazardous or inflammable materials.
- Use a grounded 3/8" minimum I.d. hose between the pump and the muffler.

⚠ WARNING HAZARDOUS PRESSURE. Can result in serious injury or property damage. Do not service or clean pump, hoses or dispensing valve while the system is pressurized.

- Disconnect air supply line and relieve pressure from the system by opening dispensing valve or device and / or carefully and slowly loosening and removing outlet hose or piping from pump.

⚠ WARNING HAZARDOUS MATERIALS. Can cause serious injury or property damage. Do not attempt to return a pump to the factory or service center that contains hazardous material. Safe handling practices must comply with local and national laws and safety code requirements.

- Obtain Material Safety Data Sheets on all materials from the supplier for proper handling instructions.

⚠ WARNING EXPLOSION HAZARD. Models containing aluminum wetted parts cannot be used with fl.-Trichloroethane, Methylene Chloride or other Halogenated Hydrocarbon solvents which may react and explode.

- Check pump motor section, fluid caps, manifolds and all wetted parts to assure compatibility before using with solvents of this type.

⚠ CAUTION Verify the chemical compatibility of the pump wetted parts and the substance being pumped, flushed or recirculated. Chemical compatibility may change with temperature and concentration of the chemical(s) within the substances being pumped, flushed or circulated. For specific fluid compatibility, consult the chemical manufacturer.

⚠ CAUTION Maximum temperatures are based on mechanical stress only. Certain chemicals will significantly reduce maximum safe operating temperature. Consult the chemical manufacturer for chemical compatibility and temperature limits. Refer to Pump Data on page 1 of this manual.

⚠ CAUTION Be certain all operators of this equipment have been trained for safe working practices, understand it's limitations, and wear safety goggles / equipment when required.

⚠ CAUTION Do not use the pump for the structural support of the piping system. Be certain the system components are properly supported to prevent stress on the pump parts.

- Suction and discharge connections should be flexible connections (such as hose), not rigid piped, and should be compatible with the substance being pumped.

⚠ CAUTION Prevent unnecessary damage to the pump. Do not allow pump to operate when out of material for long periods of time.

- Disconnect air line from pump when system sits idle for long periods of time.

⚠ CAUTION Use only genuine ARO replacement parts to assure compatible pressure rating and longest service life.

NOTICE Install the pump in the vertical position. The pump may not prime properly if the balls do not check by gravity upon start-up.

NOTICE Re-torque all fasteners before operation. Creep of housing and gasket materials may cause fasteners to loosen. Re-torque all fasteners to insure against fluid or air leakage.

NOTICE Replacement warning labels are available upon request: "Static Spark" PN\93616-1, "Diaphragm Rupture" PN \93122.

⚠WARNING	= Hazards or unsafe practices which could result in severe personal injury, death or substantial property damage.
⚠ CAUTION	= Hazards or unsafe practices which could result in minor personal injury, product or property damage.
NOTICE	= Important installation, operation or maintenance information.

GENERAL DESCRIPTION

The ARO diaphragm pump offers high volume delivery even at low air pressure and a broad range of material compatibility options available. Refer to the model and option chart. ARO pumps feature stall resistant design, modular air motor / fluid sections.

Air operated double diaphragm pumps utilize a pressure differential in the air chambers to alternately create suction and positive fluid pressure in the fluid chambers, ball checks insure a positive flow of fluid.

Pump cycling will begin as air pressure is applied and it will continue to pump and keep up with the demand. It will build and maintain line pressure and will stop cycling once maximum line pressure is reached (dispensing device closed) and will resume pumping as needed.

AIR AND LUBE REQUIREMENTS

⚠ WARNING EXCESSIVE AIR PRESSURE. Can cause pump damage, personal injury or property damage.

- A filter capable of filtering out particles larger than 50 microns should be used on the air supply. There is no lubrication required other than the "O" ring lubricant which is applied during assembly or repair.
- If lubricated air is present, make sure that it is compatible with the "O" rings and seals in the air motor section of the pump.

OPERATING INSTRUCTIONS

- Always flush the pump with a solvent compatible with the material being pumped if the material being pumped is subject to "setting up" when not in use for a period of time.
- Disconnect the air supply from the pump if it is to be inactive for a few hours.
- The outlet material volume is governed not only by the air supply but also by the material supply available at the inlet. The material supply tubing should not be too small or restrictive. Be sure not to use hose which might collapse.
- When the diaphragm pump is used in a forced-feed (flooded inlet) situation, it is recommended that a "Check Valve" be installed at the air inlet.
- Secure the diaphragm pump legs to a suitable surface to insure against damage by vibration.

MAINTENANCE

- Certain ARO "Smart Parts" are indicated which should be available for fast repair and reduction of down time.
- Provide a clean work surface to protect sensitive internal moving parts from contamination from dirt and foreign matter during service disassembly and reassembly.
- Keep good records of service activity and include pump in preventive maintenance program.
- Service Kits are available to service two separate Diaphragm Pump functions: 1. AIR SECTION, 2. FLUID SECTION. The Fluid Section is divided further to match typical active MATERIAL OPTIONS.

TYPICAL CROSS SECTION

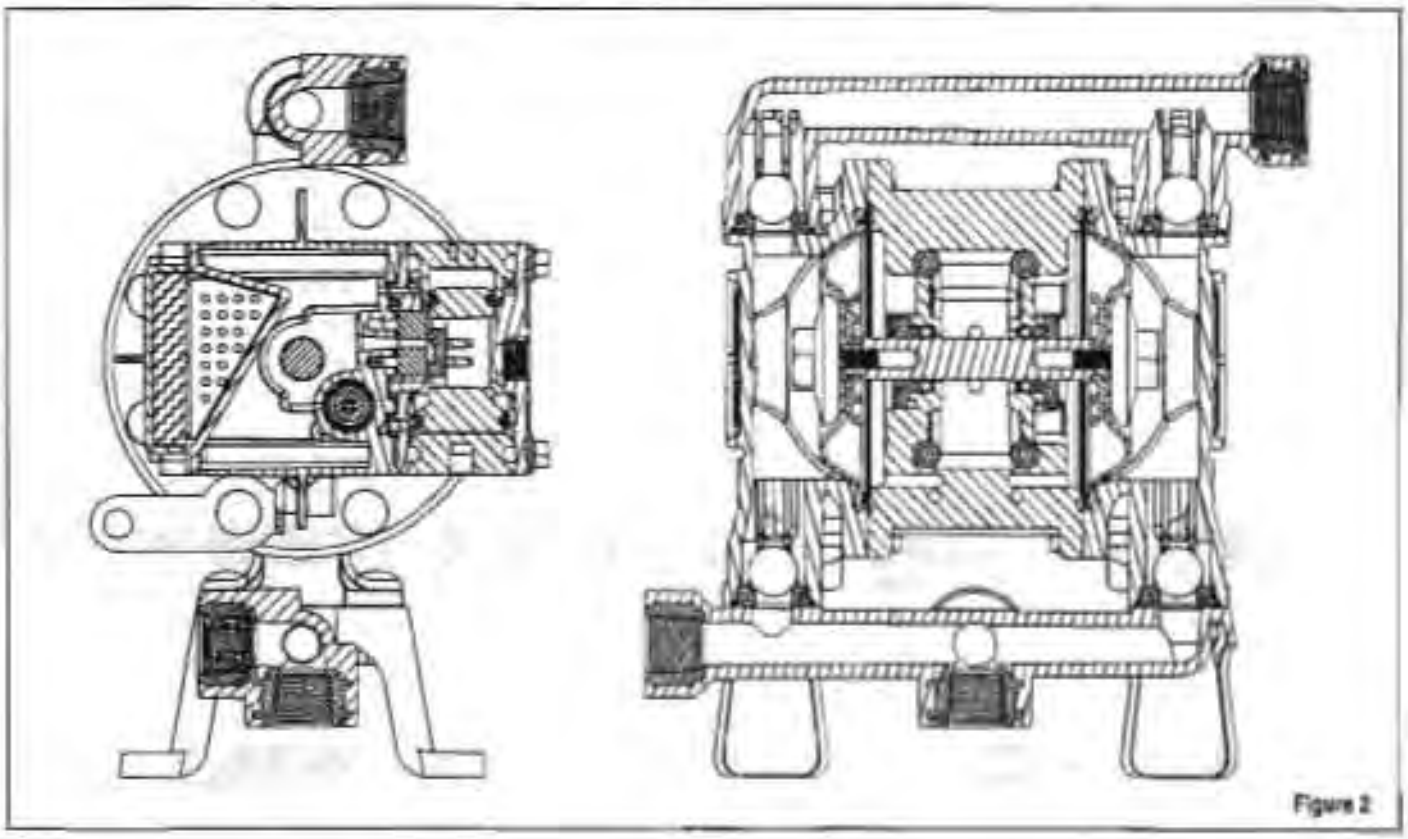


Figure 2

PARTS LIST / PD05P-X-X-B FLUID SECTION

★ 637427-XX FLUID SECTION SERVICE KITS include: Balls (see BALL OPTION, refer to -XX in chart below), Diaphragms (See DIAPHRAGM OPTION, refer to -XX in chart below) and Item 19 (listed below), plus items 144, 174 and 94276 Lubriplate® grease (page 6).

SEAT OPTIONS PD05P-XXS-XXX-B

"21"			
-XXX	Seat	Qty	[Mtl]
-DXX	96572-2	(4)	[D]
-KXX	96572-3	(4)	[K]
-PXX	96572-1	(4)	[P]
-SXX	95917-1	(4)	[SS]

BALL OPTIONS PD05P-XXS-XXX-B

★ "22" (3/4" o.d.)							
-XXX	Ball	Qty	[Mtl]	-XXX	Ball	Qty	[Mtl]
-XAX	93100-E	(4)	[SP]	-XTX	93100-4	(4)	[T]
-XCX	93100-C	(4)	[H]	-XUX	93100-8	(4)	[U]
-XGX	93100-2	(4)	[B]	-XVX	93100-3	(4)	[V]
-XSX	93410-1	(4)	[SS]				

MATERIAL CODE
[A] = Aluminum
[B] = Nitrile
[D] = Acetal
[E] = E.P.R.
[GA] = Groundable Acetal
[GFN] = Glass Filled Nylon
[H] = Hytrel
[K] = PVDF (Kynar)
[P] = Polypropylene
[SP] = Santoprene
[SS] = Stainless Steel
[T] = PTFE (Teflon)
[U] = Polyurethane
[V] = Viton

DIAPHRAGM OPTIONS PD05P-XXS-XXX-B

-XXX	★ SERVICE KIT -XX = (Ball) -XX = (Diaphragm)	★ "7"			★ "8"			★ "19"		
		Diaphragm	Qty	[Mtl]	Diaphragm	Qty	[Mtl]	"O" Ring (3/32" x 1-5/16" o.d.)	Qty	[Mtl]
-XXA	637427-XA	93465	(2)	[SP]	——	—	—	93763	(4)	[E]
-XXC	637427-XC	93465-9	(2)	[H]	——	—	—	Y325-122	(4)	[B]
-XXG	637427-XG	93465-G	(2)	[B]	——	—	—	Y325-122	(4)	[B]
-XXT	637427-XT	93111	(2)	[T]	93465	(2)	[SP]	93265	(4)	[T]
-XXU	637427-XU	93112	(2)	[U]	——	—	—	93119	(4)	[U]
-XXV	637427-XV	93581-3	(2)	[V]	——	—	—	Y327-122	(4)	[V]

MANIFOLD / FLUID CAP OPTIONS PD05P-XXS-XXX-B

			Polypropylene				PVDF (Kynar)				Groundable Acetal			
			PD05P-XPS-		PD05P-XBS-		PD05P-XKS-		PD05P-XLS-		PD05P-XDS-		PD05P-XES-	
Item	Description (size)	Qty	Part No.	[Mtl]	Part No.	[Mtl]	Part No.	[Mtl]	Part No.	[Mtl]	Part No.	[Mtl]	Part No.	[Mtl]
□ 6	Diaphragm Nut (5/16" - 18)	(2)	93103-7	[P]	93103-7	[P]	93103-4	[K]	93103-4	[K]	93103-3	[D]	93103-3	[D]
15	Fluid Cap	(2)	95732-1	[P]	95732-1	[P]	95732-3	[K]	95732-3	[K]	95732-2	[GA]	95732-2	[GA]
43	Ground Strap	(1)	——	—	——	—	——	—	——	—	92956-1	[SS]	92956-1	[SS]
57	Ground Kit Assembly (not shown)	(1)	——	—	——	—	——	—	——	—	66885-1		66885-1	
60	Inlet Manifold (N.P.T.F.)	(1)	95734-7	[P]	95734-1	[P]	95734-9	[K]	95734-3	[K]	95734-8	[GA]	95734-2	[GA]
	(BSP)	(1)	95734-10	[P]	95734-4	[P]	95734-12	[K]	95734-6	[K]	95734-11	[GA]	95734-5	[GA]
61	Outlet Manifold (N.P.T.F.)	(1)	95733-7	[P]	95733-1	[P]	95733-9	[K]	95733-3	[K]	95733-8	[GA]	95733-2	[GA]
	(BSP)	(1)	95733-10	[P]	95733-4	[P]	95733-12	[K]	95733-6	[K]	95733-11	[GA]	95733-5	[GA]
63	Pipe Plug (N.P.T.F.)	(3)	——	—	93897-1	[P]	——	—	93897-3	[K]	——	—	93897-2	[D]
	(BSP)	(3)	——	—	96478-1	[P]	——	—	96478-3	[K]	——	—	96478-2	[D]

COMMON PARTS

Item	Description (size)	Qty	Part No.	[Mtl]
□ 1	Connecting Rod	(1)	96379	[SS]
5	Diaphragm Washer	(2)	94645	[GFN]
26	Flange Bolt (5/16" - 18 x 7/8")	(4)	96176	[SS]

Item	Description (size)	Qty	Part No.	[Mtl]
27	Bolt (5/16" - 18 x 1-1/4")	(20)	93095	[SS]
29	Hex Flange Nut (5/16" - 18)	(20)	93686	[SS]
77	Logo Plate	(2)	93264	[A]

DUAL INLET / DUAL OUTLET KITS 637440-X

			Polypropylene				PVDF (Kynar)				Groundable Acetal			
			637440-1 (N.P.T.)		637440-4 (BSP)		637440-3 (N.P.T.)		637440-6 (BSP)		637440-2 (N.P.T.)		637440-5 (BSP)	
Item	Description (size)	Qty	Part No.	[Mtl]	Part No.	[Mtl]	Part No.	[Mtl]	Part No.	[Mtl]	Part No.	[Mtl]	Part No.	[Mtl]
17	Dual Outlet Manifold	(2)	95914-1	[P]	95914-4	[P]	95914-3	[K]	95914-6	[K]	95914-2	[GA]	95914-5	[GA]
18	Dual Inlet Manifold	(2)	95915-1	[P]	95915-4	[P]	95915-3	[K]	95915-6	[K]	95915-2	[GA]	95915-5	[GA]
19	"O" Ring (3/32" x 1-5/16" o.d.)	(4)	93265	[T]	93265	[T]	93265	[T]	93265	[T]	93265	[T]	93265	[T]

□ "Smart Parts" keep these items on hand in addition to the Service Kits for fast repair and reduction of down time.

PARTS LIST / PD05P-X-X-B FLUID SECTION

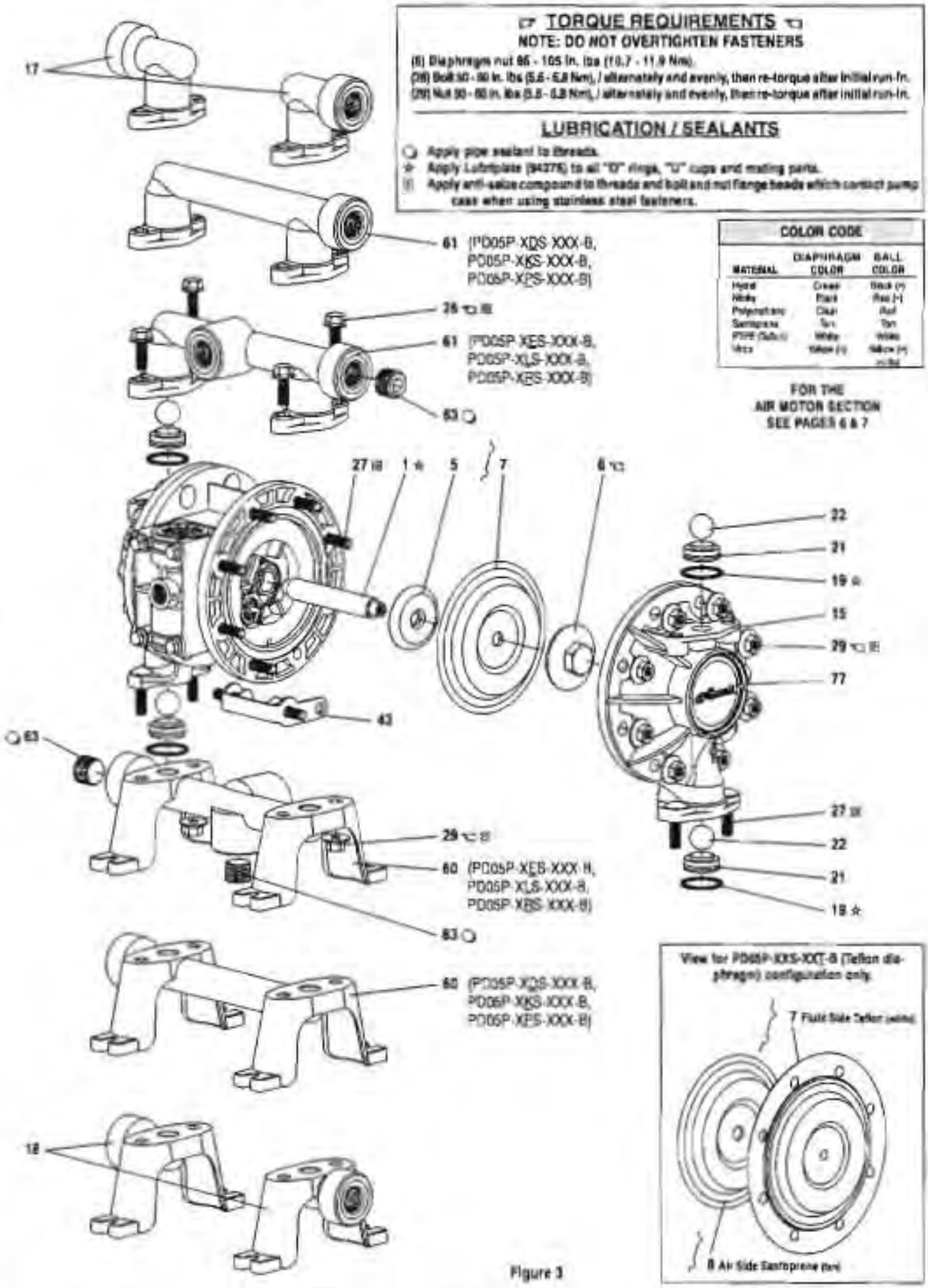


Figure 3

PARTS LIST / PD05P-X-X-B AIR MOTOR SECTION

(✓) Indicates parts included in 637428 Air Section Repair Kit.

Item	Description (size)	Qty	Part No.	[Mtl]
101	Center Body	(1)	96315	[PPG]
103R	Cover (right side)	(1)	96091	[D]
103L	Cover (left side)	(1)	96351	[D]
107	Plug, Small	(1)	96353	[D]
111	Major Valve Spool	(1)	95519	[D]
116	Actuator Pin	(2)	94874-1	[SS]
121	Washer	(2)	96092	[D]
123	Screw (M4 - 20 x 1/2")	(8)	96093	[SS]
129	Muffler Assembly	(1)	67367	[PPG]
⊠ 129	Exhaust Cover (optional)	(1)	67368	[PPG]
⊠ 130	Gasket (optional)	(1)	93107	[SY]
✓ 132	Air Manifold Gasket	(1)	96214-1	[B]
134	Flange Bolt (1/4" - 20 x 3-3/4")	(4)	94571	[SS]
135	Valve Block	(1)	96204	[PPG]
136	Plug, Large	(1)	96352	[D]
✓ 137	"O" Ring (1/16" x 1-5/8" o.d.)	(3)	Y325-29	[B]
✓ 138	"U" Cup Packing (1/8" x 1" o.d.)	(1)	94395	[U]
✓ 139	"U" Cup Packing (1/8" x 1-7/16" o.d.)	(1)	96383	[U]

Item	Description (size)	Qty	Part No.	[Mtl]
140	Valve Insert	(1)	93278	[CK]
141	Valve Plate	(1)	96173	[CK]
✓ 144	"U" Cup Packing (3/16" x 1" o.d.)	(2)	Y187-48	[B]
✓ 166	"O" Ring (1/16" x 1-1/4" o.d.)	(1)	Y325-24	[B]
✓ 167	Pilot Piston (includes 168 and 169)	(1)	67382	[D]
168	"O" Ring (1/16" x 7/16" o.d.)	(2)	96459	[U]
169	"U" Cup Packing (1/8" x 5/8" o.d.)	(1)	96384	[U]
170	Spool Bushing	(1)	96090	[D]
✓ 171	"O" Ring (1/16" x 13/16" o.d.)	(2)	Y325-17	[B]
✓ 173	"O" Ring (.237" x 1/8" o.d.)	(2)	Y325-115	[B]
✓ 174	"O" Ring (.302" x 11/32" o.d.)	(2)	Y325-165	[B]
✓ 200	Porting Gasket	(1)	96364	[B]
201	Muffler (optional)	(1)	93110	[C]
⊠ 233	"O" Ring (1/16" x 3/8" o.d.) (optional)	(4)	Y325-10	[B]
⊠	Ported Exhaust Kit (includes items 129, 130 and 233) (optional)	(1)	637438	—
✓	Lubriplate FML-2 Grease	(1)	94778	
	Lubriplate Grease, 10 Pack		637306	

MATERIAL CODE

[B]	= Nitrile	[PPG]	= Glass Filled Polypropylene
[C]	= Carbon Steel	[SS]	= Stainless Steel
[CK]	= Ceramic	[SY]	= Syn-Seal
[D]	= Acetal	[U]	= Polyurethane

DIAPHRAGM PUMP SERVICE

GENERAL SERVICE NOTES:

- Inspect and replace old parts with new parts as necessary. Look for deep scratches on metallic surfaces, and nicks or cuts in "O" rings.
- Tools needed to complete disassembly and repair:
  - 7/8" socket or wrench, 1/2" socket or wrench, 3/8" socket or wrench, 3/8" Allen wrench, T-10 Torx screwdriver, torque wrench (measuring inch pounds), "O" ring pick.

FLUID SECTION DISASSEMBLY

1. Remove (61) top manifold.
2. Remove (19) "O" rings, (21) seats and (22) balls.
3. Remove (60) bottom manifold.
4. Remove (19) "O" rings, (21) seats and (22) balls.
5. Remove (15) fluid caps.
6. Remove (6) diaphragm nut, (7) or (7 / 8) diaphragms and (5) washer.
7. Remove (1) connecting rod from air motor.
8. Carefully remove remaining (6) diaphragm nut, (7) or (7 / 8) diaphragms and (5) washer from (1) connecting rod. Do not mar surface of connecting rod.

FLUID SECTION REASSEMBLY

- Reassemble in reverse order.
- Lubricate (1) connecting rod with Lubriplate or equivalent "O" ring lubricant.
- Install (5) washers with i.d. chamfer toward diaphragm.
- When replacing Teflon diaphragms, install the 93465 Santoprene diaphragm behind the Teflon diaphragm.

AIR MOTOR SECTION SERVICE

Service is divided into two parts - 1. Pilot Valve, 2. Major Valve.

- Air Motor Section Service is continued from Fluid Section repair.

PILOT VALVE DISASSEMBLY

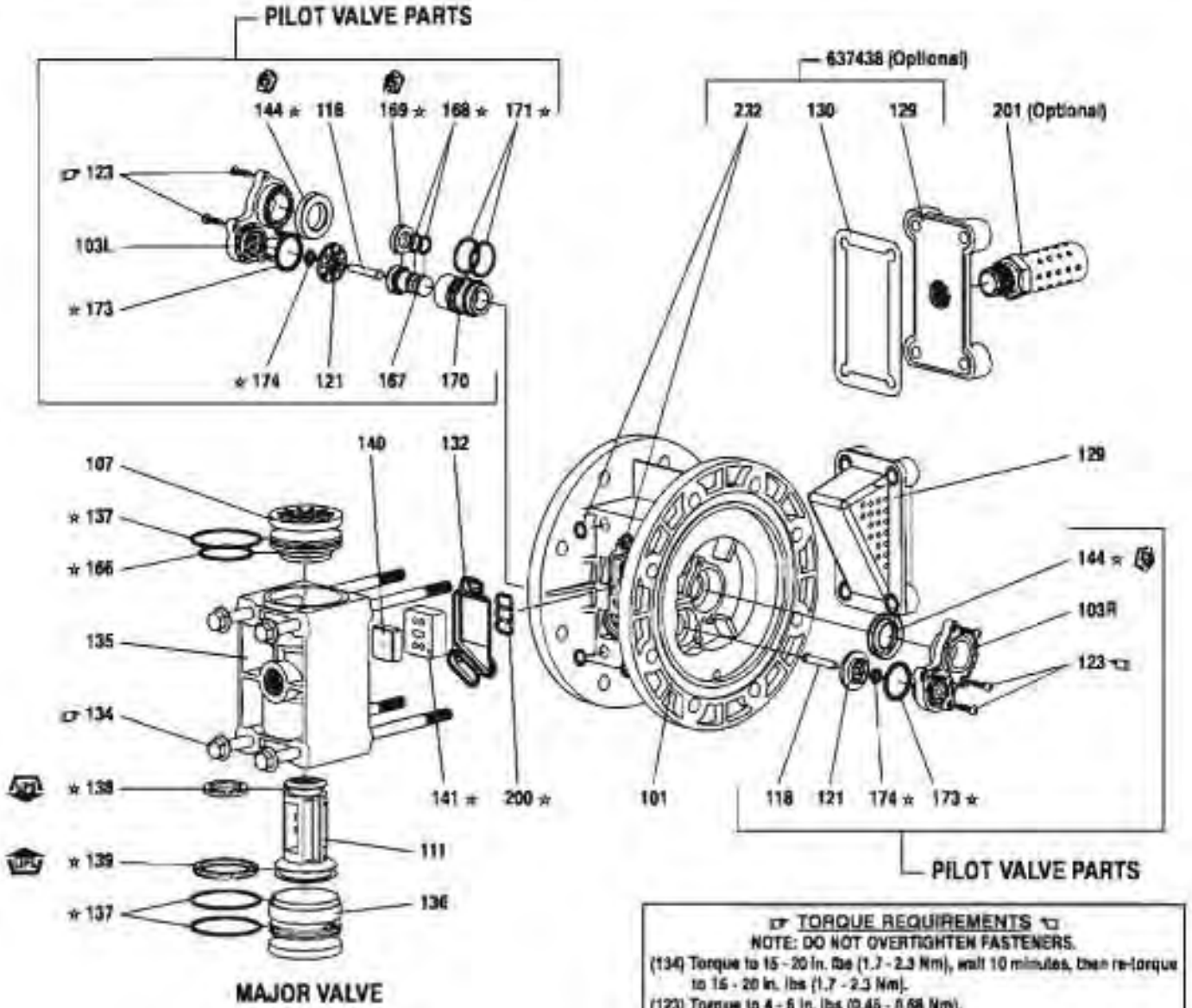
1. Remove (123) screws, releasing (103) covers, (121) washers, (116) actuator pins and (167) pilot piston.
2. Remove (170) spool bushing and inspect inner bore of bushing for damage.

PILOT VALVE REASSEMBLY

1. Clean and lubricate parts not being replaced from service kit.
2. Assemble (171) "O" rings to (170) bushing and assemble bushing into (101) center body.
3. Lubricate and assemble (167) pilot piston assembly into (170) bushing.
4. Assemble (173 and 174) "O" rings and (121) washers to (103) covers, then insert (116) actuator pins through assembly.
5. Assemble (144) "U" cups (note the lip direction) and (103) covers to (101) center body, securing with (123) screws. NOTE: Tighten (123) screws to 4 - 6 in. lbs (0.45 - 0.68 Nm).

MAJOR VALVE DISASSEMBLY

1. Unthread (134) bolts, releasing (129) muffler assembly.
2. Pull (135) valve block and components from (101) center body.
3. Remove (132) gasket, (141) valve plate and (140) valve insert from (135) valve block.
4. Remove (134) bolts, releasing (107 and 136) plugs and (111) spool.



☞ TORQUE REQUIREMENTS ☜

NOTE: DO NOT OVERTIGHTEN FASTENERS.

(134) Torque to 15 - 20 in. lbs (1.7 - 2.3 Nm), wait 10 minutes, then re-torque to 15 - 20 in. lbs (1.7 - 2.3 Nm).

(123) Torque to 4 - 6 in. lbs (0.45 - 0.68 Nm).

LUBRICATION / SEALANTS

☆ Apply Lubriplate (94276) to all "O" rings, "U" cups and mating parts.

Figure 4

MAJOR VALVE REASSEMBLY

1. Assemble new (139 and 138) "U" cups on (111) spool - **LIPS MUST FACE EACH OTHER.**
2. Assemble (137) "O" rings to (136) large plug.
3. Assemble (137 and 166) "O" rings to (107) small plug.
4. Insert (111) spool into (136) large plug, then insert (136) large plug into (135) valve block, being sure the (111) spool is rotated to accept (140) valve insert.
5. Assemble (107) small plug into (135) valve block.
6. Assemble (140) valve insert and (141) valve plate to (135) valve block. Note: Assemble (140) valve insert with "dished" side toward (141) valve plate. Assemble (141) valve plate with identification dot toward (132) gasket.
7. Assemble (132 and 200) gaskets, (135) valve block and (129) muffler assembly to (101) center body, securing with (134) bolts. NOTE: Tighten (134) bolts to 15 - 20 in. lbs (1.7 - 2.3 Nm).

TROUBLE SHOOTING

Product discharged from air exhaust.
- Check for diaphragm rupture.
- Check tightness of (6) diaphragm nut.

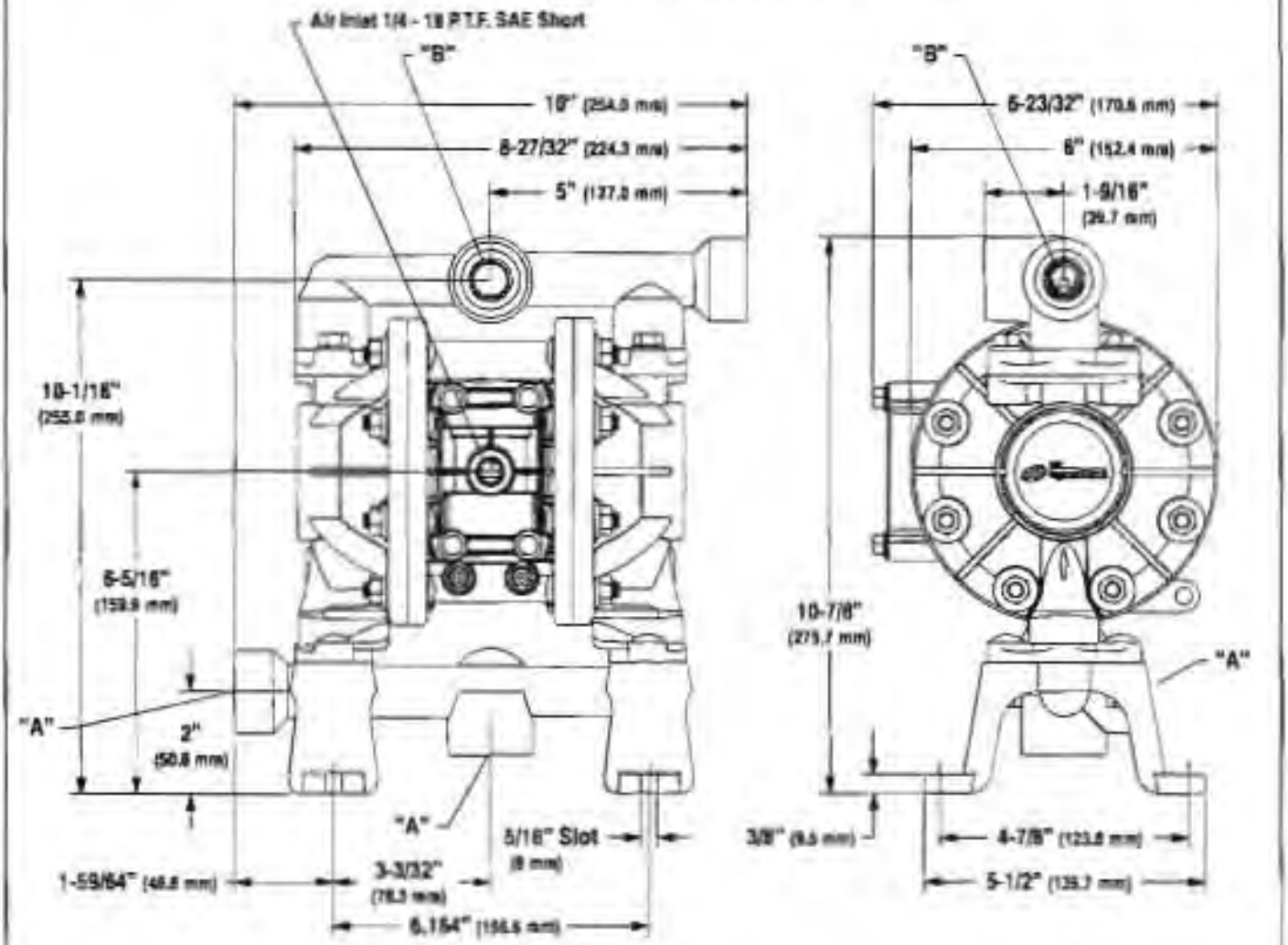
Air Bubbles in product discharge.
- Check connections of suction plumbing.
- Check "O" rings between intake manifold and fluid caps.
- Check tightness of (6) diaphragm nut.

Pump blows air out main exhaust when stalled on either stroke.
- Check "U" cups on (111) spool in major valve.
- Check (141) valve plate and (140) insert for wear.
- Check (169) "U" cup on (167) pilot piston.

Low output volume.
- Check air supply.
- Check for plugged outlet hose.
- For the pump to prime itself, it must be mounted in the vertical position so that the balls will check by gravity.
- Check for pump cavitation - suction pipe should be sized at least as large as the inlet thread diameter of the pump for proper flow if high viscosity fluids are being pumped. Suction hose must be non-collapsible type, capable of pulling a high vacuum.
- Check all joints on intake manifolds and suction connections. These must be airtight.
- Inspect the pump for solid objects lodged in the diaphragm chamber or the seat area.

DIMENSIONAL DATA

Dimensions shown are for reference only, they are shown in inches and millimeters (mm).



Pump Model	"A" Material Inlet	"B" Material Outlet
PD05P-AXS-XXX-B	1/2 - 14 N.P.T.F. - 1	1/2 - 14 N.P.T.F. - 1
PD05P-BXS-XXX-B	Rp 1/2 (1/2 - 14 BSP, parallel)	Rp 1/2 (1/2 - 14 BSP, parallel)

Figure 5

(en)	MODEL:	(pl)	MODEL:	67144, 727312	
(fr)	MODELE:	(cs)	MODEL:	66605( )-( ), 6661H( )-( )-( )	
(es)	MODELO:	(et)	MUDEL:	66610A-( )-C / 666139-( )-C	
(de)	MODELL:	(hu)	MODELL:	6661A3-( )-C / 6661B4-( )-C	
(it)	MODELLO:	(lv)	MODELIS:	66615A-( )-C / 666182-( )-C	66630A-( )-C / 666332-( )-C
(nl)	MODEL:	(lt)	MODELIS:	6661T3-( )-C / 6661U4-( )-C	PD( )-( )-( ), PE( )-( )-( ),
(da)	MODEL:	(sk)	MODEL:	66620A-( )-C / 666232-( )-C	PF( )-( )-( ), PG05A-( )-( ),
(sv)	MODELL:	(sl)	MODEL:	6662A3-( )-C / 6662B4-( )-C	PH10A-X-X, PM( )-( )-( )-( ),
(fi)	MALI:	(ru)	МОДЕЛЬ:	66625A-( )-C / 666282-( )-C	PP( )-( )-( ), PS( )-( )-( ),
(no)	MODELL:	(bg)	МОДЕЛ:	6507XX-X-X, 6700XX	PW10A-( )-( )
(pt)	MODELO:	(ro)	MODEL:		
(el)	MONTEAO:	(zh)	型号:		
(tr)	MODEL:				

S-631

RELEASED: 10-31-94
REVISED: 8-28-07
(REV. W)

GENERAL INFORMATION — English (en)

AIR OPERATED DIAPHRAGM PUMPS

INFORMATION GENERALE — Français (fr)

POMPES PNEUMATIQUES A MEMBRANES

INFORMACION GENERAL — Español (es)

BOMBAS NEUMATICAS DE DIAFRAGMA

ALLGEMEINE INFORMATIONEN — Deutsch (de)

DRUCKLUFTBETRIEBENE MEMBRANPUMPE

INFORMAZIONI DI CARATTERE GENERALE — Italiano (it)

POMPE PNEUMATICHE A MEMBRANA

ALGEMENE INFORMATIE — Nederlands (nl)

PNEUMATISCHE MEMBRAANPOMPEN

GENEREL INFORMATION — Dansk (da)

LUFTDREVNE MEMBRAN PUMPER

ALLMÄN INFORMATION — Svenska (sv)

TRYCKLUFTDRIVNA MEMBRANPUMPAR

YLEISET OHJEET — Suomi (fi)

PAINEILMATOIMINEN KALVOPUMPPU

GENERELL INFORMASJON — Norsk (no)

TRYKKLUFTSDREVET MEMBRANPUMPE

INFORMAÇÃO GERAL — Português (pt)

BOMBAS PNEUMÁTICAS DE DIAFRAGMA

INGERSOLL RAND COMPANY LTD
P.O. BOX 151 • ONE ARO CENTER • BRYAN, OHIO 43506-0151
(800) 276-4658 • FAX (800) 266-7016

CON 96440856

ARO

Ingersoll Rand
Industrial Technologies

(en) • SERVICE CENTERS
(fr) • CENTRES DE SERVICE
(es) • CENTROS DE SERVICIO
(de) • SERVICE-CENTER
(it) • CENTRI ASSISTENZA
(nl) • SERVICECENTRA
(da) • SERVICE CENTRE
(sv) • REPRESENTANTER
(fi) • HUOLTOPISTEEN
(no) • SERVICESENTRE
(pt) • CENTROS DE SERVIÇO
(el) • ΚΕΝΤΡΑ ΣΥΝΤΗΡΗΣΗΣ
(tr) • BAKIM MERKEZLERİ
(pl) • BIURA OBSŁUGI
(cs) • SERVISNÍ STŘEDISKA
(et) • TEENINDUSKESKUSED
(hu) • SZERVIZKÖZPONTOK
(lv) • SERVISA CENTRI
(lt) • SERVISO CENTRAI
(sk) • SERVISNÉ STREDISKÁ
(sl) • SERVISNI CENTRI
(ru) • ЦЕНТРЫ ОБСЛУЖИВАНИЯ
(bg) • СЕРВИЗНИ ЦЕНТРОВЕ
(ro) • CENTRE SERVICE
(zh) • 维修服务中心

- Europe, Africa & Middle East
  Ingersoll Rand
  Zone du Chêne Sorcier
  BP 62
  Les Clayes Sous Bois
  Cedex, France
  Telephone: (33) 01 30 07 69 50
  Fax: (33) 01 30 07 69 69

- Canada
  Production Equipment Group
  Ingersoll-Rand Canada Inc.
  51 Worchester Road
  Rexdale, Ontario M9W 4K2
  Telephone: 1 (416) 213-4500
  Fax: 1 (416) 213-4510

- Latin America
  Ingersoll Rand PEG
  Aro Division
  730 N.W. 107 Avenue, Suite 300
  Miami, FL 33172-3107
  Telephone: (305) 222-0812 / 559-0500
  Fax: (305) 222-0864 / 559-7505

- P.R. China
  Ingersoll Rand (China) Investment Co., Ltd
  No.309 Southern Jiangyang Road,
  Shanghai 200434, P.R.C
  Tel: +86-21-5691 1778
  Fax: +86-21-5691 1779

English (en)

GENERAL INFORMATION

COVERING: SAFETY PRECAUTIONS & PLACING INTO SERVICE

AIR OPERATED DIAPHRAGM PUMPS

READ THIS MANUAL CAREFULLY BEFORE INSTALLING, OPERATING OR SERVICING THIS EQUIPMENT.

It is the responsibility of the employer to place this information into the hands of the operator.

OPERATING AND SAFETY PRECAUTIONS

READ, UNDERSTAND, AND FOLLOW THIS INFORMATION TO AVOID INJURY AND PROPERTY DAMAGE.

The diaphragm pump models listed on page DOC-1 "Declaration of Conformity" may be used in some potentially explosive atmospheres ONLY when the following Special Conditions of Installation and Operation are followed exactly. Non-compliance with any of these special conditions could create an ignition source that may ignite any potentially explosive atmospheres. These models conform to EU Directives 98/37/EC "Machinery Directive" and 94/9/EC "Equipment and Protective Systems intended for use in Potentially Explosive Atmospheres" for equipment category. The models are marked (Ex) Group II 2 GD X. Models listed on page DOC-3 "Declaration of Conformity" conform only to EU Directive 98/37/EC.

You must read and follow the detailed explanation of these hazards and follow the appropriate instructions noted in this manual for safe installation and operation.

WARNING	= Hazards or unsafe practices which could result in severe personal injury, death or substantial property damage.
⚠ CAUTION	= Hazards or unsafe practices which could result in minor personal injury, product or property damage.
NOTICE	= Important installation, operation or maintenance information.

WARNING EXCESSIVE AIR PRESSURE. Can cause personal injury, pump damage or property damage.

- Do not exceed the maximum inlet air pressure as stated on the pump model plate. When the pump is used in a forced-feed (flooded inlet) situation, a "Check Valve" must be installed at the air inlet.
- Be sure material hoses and other components are able to withstand fluid pressures developed by this pump. Damaged hose could leak flammable liquids and create potentially explosive atmospheres. Check all hoses for damage or wear. Be certain dispensing device is clean and in proper working condition.

WARNING MAXIMUM SURFACE TEMPERATURE LIMITS. Maximum surface temperature depends on the operating conditions of heated fluid in the pump. Do not exceed maximum temperature limits as noted on page PTL-1 / PTL-2.

- Ensure proper housekeeping to eliminate dust buildup on the pump. Certain dusts may ignite at pump surface temperature limits, as noted on page PTL-1 / PTL-2.
- Maximum temperatures are based on mechanical stress only. Certain chemicals will significantly reduce maximum safe operating temperature. Consult the chemical manufacturer for chemical compatibility and temperature limits.

WARNING STATIC SPARK. Can cause explosion resulting in severe injury or death. Ground pump and pumping system.

- Sparks can ignite flammable material and vapors.
- The pumping system and object being sprayed must be grounded when it is pumping, flushing, recirculating or spraying flammable materials such as paints, solvents, lacquers, etc. or used in a location where surrounding atmosphere is conducive to spontaneous combustion. Ground the dispensing valve or device, containers, hoses and any object to which material is being pumped.
- Use the pump grounding lug provided on metallic pumps for connection of a ground wire to a good earth ground source. Use Aro Part No. 66885-1 Ground Kit or a suitable ground wire (12 ga. min.).
- Secure pump, connections and all contact points to avoid vibration and generation of contact or static spark.
- Consult local building codes and electrical codes for specific grounding requirements.
- After grounding, periodically verify continuity of electrical path to ground. Test with an ohmmeter from each component (e.g., hoses, pump, clamps, container, spray gun, etc.) to ground to insure continuity. Ohmmeter should show 0.1 ohms or less.
- Submerse the outlet hose end, dispensing valve or device in the material being dispensed if possible. (Avoid free streaming of material being dispensed.)
- Use hoses incorporating a static wire or use groundable piping.
- Use proper ventilation.
- Keep flammables away from heat, open flames and sparks.
- Keep containers closed when not in use.

WARNING Pump exhaust may contain contaminants. Can cause severe injury. Pipe exhaust away from work area and personnel.

- Pipe the exhaust to a safe remote location when pumping hazardous or flammable materials.
- In the event of a diaphragm rupture material can be forced out of the air exhaust muffler.
- Use a grounded hose between the the pump and the muffler. (Refer to minimum size under installation).
- When pumping hazardous or flammable materials, 1/4" diaphragm pumps must be placed in a containment area or vessel. The vessel must be vented to a safe remote location.

WARNING LEAKING FLUIDS. Can cause explosion hazards. Creep of housing and gasket materials can cause fasteners to loosen, resulting in leakage of flammable liquids and create potentially explosive atmospheres.

- Re-torque all fasteners before operation. Re-torque all fasteners and pipe fittings to insure against fluid leakage.
- Pump damage caused by improper mounting or piping stress and external damage can result in fluid leakage.

WARNING EXPLOSION HAZARD. Models containing aluminum wetted parts cannot be used with 1,1,1-trichloroethane, methylene chloride or other halogenated hydrocarbon solvents which may react and explode.

- Check pump motor section, fluid caps, manifolds and all wetted parts to assure compatibility before using with solvents of this type.

WARNING HAZARDOUS PRESSURE. Can result in serious injury or property damage. Do not service or clean pump, hoses or dispensing valve while the system is pressurized.

- Disconnect air supply line and relieve pressure from the system by opening dispensing valve or device and / or carefully and slowly loosening and removing outlet hose or piping from pump.

WARNING EXCESSIVE MATERIAL PRESSURE. Thermal ex-

pansion will occur when fluid in material lines is exposed to elevated temperatures and will cause a system rupture. Install a pressure relief valve in the pumping system.

WARNING INJECTION HAZARD. Any material injected into flesh can cause severe injury or death. If an injection occurs immediately contact a doctor.

- Do not grab front end of dispensing device.
- Do not aim dispensing device at anyone or any part of the body.

WARNING HAZARDOUS MATERIALS. Can cause serious injury or property damage. Do not attempt to return a pump to the factory or service center that contains hazardous material. Safe handling practices must comply with local and national laws and safety code requirements.

- Obtain Material Safety Data Sheets on all materials from the supplier for proper handling instructions.

CAUTION Protect the pump from external damage and do not use the pump for the structural support of the piping system. Be certain the system components are properly supported to prevent stress on the pump parts.

- Secure the diaphragm pump legs to a suitable surface to insure against damage by excess vibration.
- Suction and discharge connections should be flexible connections (such as hose), not rigid piped, and should be compatible with the substance being pumped.

CAUTION Prevent unnecessary damage to the pump. Do not allow pump to operate when out of material for long periods of time.

- Disconnect air line from pump when system sits idle for long periods of time.

CAUTION Verify the chemical compatibility of the pump wetted parts and the substance being pumped, flushed or recirculated. Chemical compatibility may change with temperature and concentration of the chemical(s) within the substances being pumped, flushed or circulated. For specific fluid compatibility, consult the chemical manufacturer.

CAUTION Be certain all operators of this equipment have been trained for safe working practices, understand it's limitations, and wear safety goggles / equipment when required.

PLACING INTO SERVICE

AIR AND LUBE REQUIREMENTS

WARNING EXCESSIVE AIR PRESSURE. Can cause personal injury, pump damage or property damage. Do not exceed maximum inlet air pressure as stated on air motor plate.

- Filtered and oiled air will allow the pump to operate more efficiently and yield a longer life to operating parts and mechanisms.
- A filter capable of filtering out particles larger than 50 microns should be used on the air supply. There is no lubrication required other than the "O" ring lubricant which is applied during assembly or repair.
- If lubricated air is present, make sure that it is compatible with the Nitrile "O" rings in the air motor section of the pump.

TRANSPORT AND STORAGE

- Store in a dry place, do not remove product from box during storage.
- Do not remove protection caps from inlet and outlet prior to installation.
- Do not drop or damage box, handle with care.

INSTALLATION

- Pump cycle rate and operating pressure should be controlled by using an air regulator on the air supply.
- The outlet material volume is governed not only by the air supply but also by the material supply available at the inlet. The material supply tubing should not be too small or restrictive. Be sure not to use hose which might collapse.
- Use flexible connections (such as hose), at the suction and discharge, these connections should not be rigid piped and must be compatible with the material being pumped.
- Pipe exhaust away to a safe location. Size Series (Minimum recommended I.d. size hose): All 1/4" (1/4"), All 3/8" (3/8"), All 1/2" (3/8"), All 3/4" (3/8"), All 1" (3/8"), All 1-1/2" and larger (3/4").
- Install a ground wire where applicable.

OPERATION

NOTICE On non-metallic Diaphragm Pumps re-check the torque settings after pump has been re-started and run a while. Re-torque to specifications after initial running.

START-UP

1. Turn pressure control knob until motor starts to cycle.
2. Allow pump to cycle slowly until it is primed and all air is purged from the fluid hose or dispensing valve.
3. Turn off dispensing valve and allow pump to stall-check all fittings for leakage.
4. Adjust the regulator as required to obtain desired operating pressure and flow.

SHUTDOWN

- It is good practice to periodically flush entire pump system with a solvent that is compatible with the material being pumped, especially if the material being pumped is subject to "setting-out" when not in use for a period of time.
- Disconnect the air supply from the pump if it is to be inactive for a few hours.

SERVICE

- Keep good records of service activity and include pump in preventive maintenance program.
- USE ONLY GENUINE ARO REPLACEMENT PARTS TO ASSURE PERFORMANCE AND PRESSURE RATING.
- Repairs should be made only by authorized trained personnel. Contact your local authorized ARO Service Center for parts and customer service information. Refer to page 3.

(en) • TEMPERATURE LIMITS
(fr) • TEMPERATURES LIMITES
(es) • LÍMITES DE TEMPERATURA
(de) • TEMPERATURGRENZEN
(it) • LIMITI DI TEMPERATURA
(nl) • BOVEN- EN ONDERGRENZEN TEMPERATUUR
(da) • TEMPERATURGRÆNSER
(sv) • TEMPERATURGRÄNSER
(fi) • LÄMPÖTILARAJAT
(no) • TEMPERATURGRENSER
(pt) • LIMITES DE TEMPERATURA
(el) • ΟΡΙΑ ΘΕΡΜΟΚΡΑΣΙΑΣ
(tr) • SICAKLIK LİMİTLERİ
(pl) • LIMITY TEMPERATURY
(cs) • TEPLOTNÍ LIMITY
(et) • TEMPERATUURIPIIRID
(hu) • HŐMÉRSÉKLETI HATÁROK
(lv) • TEMPERATŪRAS ROBEŽAS
(lt) • TEMPERATŪROS RIBOS
(sk) • TEPLOTNÉ LIMITY
(sl) • TEMPERATURNE OMEJITVE
(ru) • ПРЕДЕЛЫ ТЕМПЕРАТУРЫ
(bg) • ОГРАНИЧЕНИЯ НА ТЕМПЕРАТУРАТА
(ro) • LIMITE DE TEMPERATURĂ
(zh) • 温度极限

(en) • Fluid Section / Seat Material
(fr) • Section des Fluides / Matériau du Support
(es) • Sección de fluidos / Material de la superficie de apoyo
(de) • Flüssigkeitsbereich / Dichtungsmaterial
(it) • Sezione liquido / Materiale alloggiamento
(nl) • Materiaal vloeistofkamer / zitting
(da) • Væskeemne / sædemateriale
(sv) • Vätskesektions- / sätesmaterial
(fi) • Nestetosa / Tiivistemateriaali
(no) • Væskedel / Setemateriale
(pt) • Secção do líquido / material da base
(el) • Χύρος υγρού / Υλικό έδρας
(tr) • Sıvı Bölmesi / Yatak Malzemesi
(pl) • Frakcja płynna / Materiał uszczelniający
(cs) • Materiál kapalinová sekce / sedlo
(et) • Vedelikuosa / Pesa materjal
(hu) • Folyadékszakasz / Ülések anyaga
(lv) • Šķidruma nodalījuma / vārsta ligzdas materiāls
(lt) • Skysčių skyrius / lizdo medžiaga
(sk) • Materiál kvapalinovej sekcie / sedla
(sl) • Področja tekočina / Materiali tesnila
(ru) • Секция жидкости / Материал седла
(bg) • Част течности / Основни вещества
(ro) • Secțiunea fluidelor / Material de șprijin
(zh) • 液体段/座垫材料

	°F [°C]
(en) Aluminum • (fr) Aluminium • (es) Aluminio • (de) Aluminium • (it) Alluminio • (nl) Aluminium • (da) Aluminium • (sv) Aluminium • (fi) Alumiini • (no) Aluminium • (pt) Alumínio • (el) Αλουμίνιο • (tr) Alüminyum • (pl) Aluminium • (cs) Hliník • (et) Alumiinium • (hu) Alumínium • (lv) Alumīnijs • (lt) Aliuminis • (sk) Hliník • (sl) Aluminij • (ru) Алюминий • (bg) Алуминий • (ro) Aluminiu • (zh) 铝	O
(en) Carbon Steel • (fr) Acier semi-dur • (es) Acero semiduro • (de) Unlegierter Stahl • (it) Acciaio al carbonio • (nl) Koolstofstaal • (da) Kulstofstål • (sv) Kolstål • (fi) Hiiliteräs • (no) Karbonstål • (pt) Aço-carbono • (el) Ανθρακούχος χάλυβας • (tr) Karbon Çelik • (pl) Stal węglowa • (cs) Uhlíková ocel • (et) Süsinikteras • (hu) Szénacél • (lv) Oglekļa tērauds • (lt) Anglinis plienas • (sk) Uhlíková oceľ • (sl) Ogljikovo jeklo • (ru) Углеродистая сталь • (bg) Въглеродна стомана • (ro) Oțel carbon • (zh) 碳钢	O
(en) Cast Iron • (fr) Fonte • (es) Hierro fundido • (de) Gusseisen • (it) Ghisa • (nl) Gietijzer • (da) Støbejern • (sv) Gjutjärn • (fi) Valurauta • (no) Støpejern • (pt) Ferro fundido • (el) Χυτοσίδηρος • (tr) Dökme Demir • (pl) Żeliwo odlewane • (cs) Litina • (et) Malm • (hu) Öntöttvas • (lv) Čuguns • (lt) Ketus • (sk) Liatina • (sl) Lito železo • (ru) Чугун • (bg) Форматовано желязо • (ro) Fontă • (zh) 铸铁	O
(en) Groundable Acetal • (fr) Acétal mis à la terre • (es) Acetal rectificable • (de) Erdbares Acetal • (it) Acetale Groundable • (nl) Acetal dat kan worden geaard • (da) Acetal til jordforbindelse • (sv) Jordningsbar acetal • (fi) Maadoitettava asetaali • (no) Knusbart acetal • (pt) Acetal passível de ser ligado à terra • (el) Ακετάλη που μπορεί να γειωθεί • (tr) Topraklanabilir Asetal • (pl) Acetal uziemiający • (cs) Groundable Acetal • (et) Maandatav atsetaal • (hu) Alapozható acetál • (lv) Iezemējams acetāls • (lt) Įžeminamas acetalis • (sk) Groundable Acetal • (sl) Ozemljitveni acetal • (ru) Заземляемый ацеталь • (bg) Заземяващ се ацеталь • (ro) Acetal care poate fi legat la pământ • (zh) 可接地乙缩醛	10° - 180° F (-12° - 82° C)
(en) Hastelloy • (fr) Hastelloy • (es) Aleación de níquel-hierro-molibdeno • (de) Hastelloy • (it) Hastelloy • (nl) Hastelloy • (da) Hastelloy • (sv) Hastelloy • (fi) Hastelloy • (no) Hastelloy • (pt) Hastelloy • (el) Hastelloy • (tr) Hastelloy • (pl) Hastelloy • (cs) Hastelloy • (et) Hastelloi • (hu) Hastelloy • (lv) Hastelloy • (lt) Hastelloy • (sk) Hastelloy • (sl) Hastelloy • (ru) Гастелой • (bg) Hastelloy • (ro) Aliaj de nichel fier molibden • (zh) 哈司特镍合金	O
(en) Hytrel • (fr) Hytrel • (es) Hytrel • (de) Hytrel • (it) Hytrel • (nl) Hytrel • (da) Hytrel • (sv) Hytrel • (fi) Hytrel • (no) Hytrel • (pt) Hytrel • (el) Hytrel • (tr) Hytrel • (pl) Hytrel • (cs) Hytrel • (et) Hytrel • (hu) Hytrel • (lv) Hytrel • (lt) Hytrel • (sk) Hytrel • (sl) Hytrel • (ru) Гитрель • (bg) Hytrel • (ro) Hytrel • (zh) Hytrel杜邦聚酯弹性体	-20° - 150° F (-29° - 65° C)
(en) Nitrile • (fr) Nitrile • (es) Nitrilo • (de) Nitril • (it) Nitrile • (nl) Nitril • (da) Nitril • (sv) Nitril • (fi) Nitriili • (no) Nitril • (pt) Nitrilo • (el) Νιτρίλιο • (tr) Nitril • (pl) Nitryl • (cs) Nitrile • (et) Nihtiil • (hu) Nitril • (lv) Nitrils • (lt) Nitrilas • (sk) Nitril • (sl) Nitril • (ru) Нитрил • (bg) Нитрил • (ro) Nitril • (zh) 腈橡胶	10° - 180° F (-12° - 82° C)
(en) Polypropylene • (fr) Polypropylène • (es) Polipropileno • (de) Polypropylen • (it) Polipropilene • (nl) Polypropyleen • (da) Polypropylen • (sv) Polypropylen • (fi) Polypropyleeni • (no) Polypropylen • (pt) Polipropileno • (el) Πολυπροπυλένιο • (tr) Polipropilen • (pl) Polipropylen • (cs) Polypropylen • (et) Polüpropüleen • (hu) Polipropilén • (lv) Polipropilēns • (lt) Polipropilenas • (sk) Polypropylén • (sl) Polipropilen • (ru) Полипропилен • (bg) Полипропилен • (ro) Polipropilenă • (zh) 聚丙烯	35° - 150° F (2° - 66° C)
(en) PVDF (Kynar) • (fr) PVDF (Kynar) • (es) PVDF (Kynar) • (de) PVDF (Kynar) • (it) PVDF (Kynar) • (nl) PVDF (Kynar) • (da) Polyvinylidenfluorid (Kynar) • (sv) PVDF (Kynar) • (fi) PVDF (Kynar) • (no) PVDF (Kynar) • (pt) PVDF (Kynar) • (el) PVDF (Kynar) • (tr) PVDF (Kynar) • (pl) PVDF (Kynar) • (cs) PVDF (Kynar) • (et) Polüvinüülideenfluoriid (Kynar) • (hu) PVDF (Kynar) • (lv) PVDF (Kynar) • (lt) PVDF (Kynar) • (sk) PVDF (Kynar) • (sl) PVDF (Kynar) • (ru) PVDF (Kynar) • (bg) Кинар PVDF (поливинилиден флуорид) • (ro) Kynar PVDF (fluorură de poliviniliden) • (zh) 聚偏氟乙烯 (Kynar)	10° - 200° F (-12° - 93° C)
(en) Santoprene • (fr) Santoprène • (es) Santoprene • (de) Santopren • (it) Santoprene • (nl) Santopreen • (da) Santopren • (sv) Santopren • (fi) Santopreeni • (no) Santopren • (pt) Santoprene • (el) Santoprene • (tr) Santopreno • (pl) Santopren • (cs) Santoprene • (et) Santopreen • (hu) Santoprén • (lv) Santoprēns • (lt) Santoprenas • (sk) Santoprén • (sl) Santopren • (ru) Сантопрен • (bg) Сантопрен • (ro) Santopren • (zh) Santoprene热塑性弹性体	-40° - 225° F (-40° - 107° C)
(en) Stainless Steel • (fr) Acier inoxydable • (es) Acero inoxidable • (de) Edelstahl • (it) Acciaio inossidabile • (nl) Roestvaststaal • (da) Rustfrit stål • (sv) Rostfritt stål • (fi) Ruostumaton teräs • (no) Rustfritt stål • (pt) Aço inoxidável • (el) Ανοξείδωτος χάλυβας • (tr) Paslanmaz Çelik • (pl) Stal nierdzewna • (cs) Nerezová ocel • (et) Roostevaba teras • (hu) Rozsdamentes acél • (lv) Nerūsējošais tērauds • (lt) Nerūdijantis plienas • (sk) Nehrdzavejúca oceľ • (sl) Nerjavečе jeklo • (ru) Нержавеющая сталь • (bg) Неръждаема стомана • (ro) Oțel inoxidabil • (zh) 不锈钢	O

O (en) Refer to Diaphragm / Seal / Ball material
(fr) Référence au diaphragme / dispositif d'étanchéité / matériel à billes
(es) Consulte Material del diafragma / cierre hermético / bola
(de) Schauen Sie unter Membrane / Dichtung / Kugelmaterial
(it) Fare riferimento a Membrana / Guarnizione / Materiale sfera
(nl) Raadpleeg Materiaal membraan / afdichting / kogel
(da) Se membran / forsegling / kugle materiale
(sv) Se Membran- / tätnings- / kulmaterial
(fi) Katso kalvo / tiiviste / kuulamateriaali
(no) Se membran- / forseglings- / kulemateriale
(pt) Vide o material do diafragma / do vedante / da esfera
(el) Ανατρέξτε στο υλικό διαφράγματος / Πώματος Στεγανοποίησης / Σφαιριδίου
(tr) Diyafram / Yatak / Bilye Materyaline Bakınız
(pl) Patrz Materiał Membran / Uszczelek / Zaworów
(cs) Viz materiál membrána / těsnění / koule
(et) Vt Membraani / tihendi / kuuli materjal
(hu) Lásd membrán / tömítés / golyó anyaga
(lv) Sk. Membrānas / blīvējuma / lodes materiāls
(lt) Žr. "Diafragmos / sandarikliо / rutulio medžiagos"
(sk) Viď materiál membrány / tesnenia / guľe
(sl) Glejte material membrane / tesnila / krogle
(ru) См. материал диафрагмы / уплотнителя / шарика
(bg) Отнася се до мембранен / уплътнителен / сферащи вещества
(ro) Consultați secțiunea privind materialele pentru diafragmă / garnituri / bile
(zh) 参看膜片/浸座/球材料

(en) • TEMPERATURE LIMITS
(fr) • TEMPERATURES LIMITES
(es) • LÍMITES DE TEMPERATURA
(de) • TEMPERATURGRENZEN
(it) • LIMITI DI TEMPERATURA
(nl) • BOVEN- EN ONDERGRENZEN TEMPERATUUR
(da) • TEMPERATURGRÆNSER
(sv) • TEMPERATURGRÄNSER
(fi) • LÄMPÖTILARAJAT
(no) • TEMPERATURGRENSER
(pt) • LIMITES DE TEMPERATURA
(el) • ΟΡΙΑ ΘΕΡΜΟΚΡΑΣΙΑΣ
(tr) • SICAKLIK LİMİTLERİ
(pl) • LIMITY TEMPERATURY
(cs) • TEPLOTNÍ LIMITY
(et) • TEMPERATUURIPIIRID
(hu) • HŐMÉRSÉKLETI HATÁROK
(lv) • TEMPERATŪRAS ROBEŽAS
(lt) • TEMPERATŪROS RIBOS
(sk) • TEPLOTNÉ LIMITY
(sl) • TEMPERATURNE OMEJITVE
(ru) • ПРЕДЕЛЫ ТЕМПЕРАТУРЫ
(bg) • ОГРАНИЧЕНИЯ НА ТЕМПЕРАТУРАТА
(ro) • LIMITE DE TEMPERATURĂ
(zh) • 温度极限

(en) • Diaphragm / Seal / Ball Material	(pl) • Materiał Membran / Uszczelek / Zawordw
(fr) • Diaphragme / dispositif d'étanchéité / matériel à billes	(cs) • Materiál membrána / těsnění / koule
(es) • Material del diafragma / cierre hermético / bola	(et) • Membraani / tihendi / kuuli materjal
(de) • Membrane / Dichtung / Kugelmaterial	(hu) • Membrán / tömítés / golyó anyaga
(it) • Membrana / Guarnizione / Materiale sfera	(lv) • Membrānas / blīvējuma / lodes materiāls
(nl) • Materiaal membraan / afdichting / kogel	(lt) • Diafragmos / sandarikliu / rutulio medžiagos
(da) • Membran / forsegling / kugletmateriale	(sk) • Materiál membrány / tesnenia / gule
(sv) • Membran- / tätnings- / kulmaterial	(sl) • Material membrane / tesnila / krogle
(fi) • Kalvo / tiiviste / kuulamateriaali	(ru) • Материал диафрагмы / уплотнителя / шарика
(no) • Membran- / forseglings- / kuglemateriale	(bg) • Мембранен / уплътнителен / сферичен материал
(pt) • Material do diafragma / do vedante / da esfera	(ro) • Materiala pentru diafragmă / garnituri / bile
(el) • Υλικό Διαφράγματος / Παλματος Στεγανοποίησης / Σφαιριδίου	(zh) • 膜片/密封/球材料
(tr) • Diyafram / Yatak / Bilya Materyali	

°F (°C)

(en) E.P.R. / EPDM • (fr) E.P.R. / EPDM • (es) E.P.R. / EPDM • (de) E.P.R. / EPDM • (it) E.P.R. / EPDM • (nl) E.P.R. / EPDM • (da) E.P.R. / EPDM • (sv) E.P.R. / EPDM • (fi) E.P.R. / EPDM • (no) E.P.R. / EPDM • (pt) E.P.R. / EPDM • (el) E.P.R. / EPDM • (tr) E.P.R. / EPDM • (pl) E.P.R. / EPDM • (cs) E.P.R. / EPDM • (et) Etüleen-propüleenkummi / Etüleen-propüleen-dieenkummi • (hu) E.P.R. / EPDM • (lv) Nekonjugēts etilēnpropilēndkaučuks / EPDM • (lt) E.P.R. / EPDM • (sk) E.P.R. / EPDM • (sl) E.P.R. / EPDM • (ru) Этиленпропиленовый сополимер / EPDM • (bg) E.P.R. / EPDM • (ro) E.P.R. / EPDM • (zh) E.P.R.乙丙橡胶 ..... -60° - 280° F (-51° - 138° C)

(en) Hytrel • (fr) Hytrel • (es) Hytrel • (de) Hytrel • (it) Hytrel • (nl) Hytrel • (da) Hytrel • (sv) Hytrel • (fi) Hytrel • (no) Hytrel • (pt) Hytrel • (el) Hytrel • (tr) Hytrel • (pl) Hytrel • (cs) Hytrel • (et) Hytrel • (hu) Hytrel • (lv) Hytrel • (lt) Hytrel • (sk) Hytrel • (sl) Hytrel • (ru) Гытрель • (bg) Hytrel • (ro) Hytrel • (zh) Hytrel杜邦聚酯弹性体 ..... -20° - 150° F (-29° - 66° C)

(en) Neoprene • (fr) Néoprène • (es) Neopreno • (de) Neopren • (it) Neoprene • (nl) Neopreen • (da) Neopren • (sv) Neopren • (fi) Neopreeni • (no) Neopren • (pt) Neopreno • (el) Νεοπρένιο • (tr) Neoprene • (pl) Kauczuk neoprenowy • (cs) Neopren • (et) Neopreen • (hu) Neoprén • (lv) Neoprēns • (lt) Neoprenė • (sk) Neoprén • (sl) Neopren • (ru) Неопрен • (bg) Неопрен • (ro) Neopren • (zh) 氯丁二烯橡胶 ..... 0° - 200° F (-18° - 93° C)

(en) Nitrile • (fr) Nitrile • (es) Nitrilo • (de) Nitril • (it) Nitrile • (nl) Nitril • (da) Nitril • (sv) Nitril • (fi) Nitriili • (no) Nitril • (pt) Nitrilo • (el) Νιτρίλιο • (tr) Nitril • (pl) Nitryl • (cs) Nitrile • (et) Nitriil • (hu) Nitril • (lv) Nitrils • (lt) Nitrilas • (sk) Nitril • (sl) Nitril • (ru) Нитрил • (bg) Нитрил • (ro) Nitril • (zh) 腈橡胶 ..... 10° - 180° F (-12° - 82° C)

(en) Polyurethane • (fr) Polyuréthane • (es) Poliuretano • (de) Polyurethan • (it) Poliuretano • (nl) Polyurethaan • (da) Polyuretan • (sv) Polyuretan • (fi) Polyuretaani • (no) Polyuretan • (pt) Poliuretano • (el) Πολυουρεθάνη • (tr) Poliüretan • (pl) Poliuretan • (cs) Polyuretan • (et) Polüuretaan • (hu) Poliuretán • (lv) Poliuretāns • (lt) Poliuretanas • (sk) Polyuretán • (sl) Poliuretan • (ru) Полиуретан • (bg) Полиуретан • (ro) Poliuretan • (zh) 聚丙烯 ..... 10° - 150° F (-12° - 66° C)

(en) Santoprene • (fr) Santoprène • (es) Santopreno • (de) Santopren • (it) Santoprene • (nl) Santopreen • (da) Santopren • (sv) Santopren • (fi) Santopreeni • (no) Santopren • (pt) Santopreno • (el) Santoprene • (tr) Santopreen • (pl) Santopren • (cs) Santopreen • (et) Santopreen • (hu) Santopréne • (lv) Santoprēns • (lt) Santoprenas • (sk) Santoprén • (sl) Santopren • (ru) Santopren • (bg) Santopren • (ro) Santopren • (zh) Santoprene热塑性橡胶 ..... -40° - 225° F (-40° - 107° C)

(en) T.F.E. (Teflon) • (fr) T.F.E. (Téflon) • (es) T.F.E. (Teflón) • (de) T.F.E. (Teflon) • (it) T.F.E. (Teflon) • (nl) T.F.E. (Teflon) • (da) T.F.E. (Teflon) • (sv) T.F.E. (Teflon) • (fi) T.F.E. (Teflon) • (no) T.F.E. (Teflon) • (pt) T.F.E. (Teflon) • (el) T.F.E. (Τεφλόν) • (tr) T.F.E. (Teflon) • (pl) T.F.E. (Teflon) • (cs) T.F.E. (Teflon) • (et) Tetrafluoroetüleen (Teflon) • (hu) T.F.E. (Teflon) • (lv) T.F.E. (Teflons) • (lt) T.F.E. (Teflonas) • (sk) T.F.E. (Teflón) • (sl) T.F.E. (Teflon) • (ru) T.F.E. (Тефлон) • (bg) Тефлон PTFE (полите трафлуороетилен) • (ro) Teflon PTFE (politetrafluoretilenă) • (zh) T.F.E. (特氟纶) ..... 40° - 225° F (4° - 107° C)

(en) Viton • (fr) Viton • (es) Viton • (de) Viton • (it) Viton • (nl) Viton • (da) Viton • (sv) Viton • (fi) Viton • (no) Viton • (pt) Viton • (el) Viton • (tr) Viton • (pl) Viton • (cs) Viton • (et) Viton • (hu) Viton • (lv) Viton • (lt) Viton • (sk) Viton • (sl) Viton • (ru) Витон • (bg) Витон • (ro) Viton • (zh) Viton氟橡胶 ..... -40° - 350° F (-40° - 177° C)

(en) • To determine the temperature limits of the fluid section - diaphragm / seal / ball material combination, select the highest "low end" temperature limit and the lowest "high end" temperature limit.
(fr) • Pour déterminer les limites de température de la section des fluides - ensemble diaphragme / dispositif d'étanchéité / matériel à billes, sélectionnez la limite de température "inférieure" et la limite de température "supérieure".
(es) • Para averiguar los límites de temperatura de la combinación de la sección de fluidos y del material de diafragma / cierre hermético / bola, seleccione el límite de temperatura superior del "extremo inferior" y el límite de temperatura inferior del "extremo superior".
(de) • Um die höchstens zulässige Temperatur für eine Kombination aus Flüssigkeitsbereich und Membrane / Dichtung / Kugelmaterial zu bestimmen, wählen Sie die höchste "Untere Temperatur" und die niedrigste "Obere Temperatur"-Grenze.
(it) • Per calcolare i limiti di temperatura della combinazione sezione liquido - membrana / guarnizione / materiale sfera, selezionare il limite di temperatura massimo "estremità bassa" e il limite di temperatura minimo "estremità alta".
(nl) • Ga als volgt te werk om de boven- en ondergrenzen voor de temperatuur van de combinatie van vloeistofkamer en membraan / afdichting / kogel te bepalen: selecteer de 'laagste' bovengrens voor de temperatuur en de "hoogste" ondergrens voor de temperatuur.
(da) • Til bestemmelse af temperaturgrænserne for vædskeafsnittet - membran / forsegling / kuglematerialet kombinationen vælges den højeste "nedre" temperaturgrænse og den laveste "øvre" temperaturgrænse.
(sv) • För att avgöra temperaturgränserna för kombinationen vätskesektion - membran- / tätnings- / kulmaterial, väljer du den högsta temperaturgränsen för den "lägre ändan" och den lägsta för den "högre ändan".
(fi) • Voit määrittää nesteosan lämpö / diviste / kuulamateriaali lämpörajat, valitsemalla ylimmän alarajan ja alimman ylärajan.
(no) • For å fastslå temperaturgrensene for væskedelen - membran- / forseglings- / kuglemateriale-kombinasjonen, velg høyeste "lave" temperaturgrense og laveste "høye" temperaturgrense.
(pt) • Para determinar os limites de temperatura da secção do líquido - combinação do material do diafragma, do vedante e da esfera -, seleccione o limite da temperatura "inferior" mais alto e o limite da temperatura "superior" mais baixo.
(el) • Για τον καθορισμό των ορίων θερμοκρασίας του συνδυασμού υλικών χύρου υγρών - διαφράγματος / σφραγίσεως / σφαιριδίου επιλέξτε το ανώτατο χαμηλό όριο θερμοκρασίας και το κατώτατο υψηλό όριο θερμοκρασίας.
(tr) • Sıvı bölmesindeki - diyafram / yatak / bilye materyali kombinasyonu sıcaklık limitlerini belirlemek için, en yüksek "low end" sıcaklık limitini ve en düşük "high end" sıcaklık limitini seçiniz.
(pl) • Aby określić limity temperatury dla różnych kombinacji sekcji płynu - materiał membran / uszczelek / zaworów, należy wybrać najwyższą temperaturę "low end" i najniższą temperaturę "high end".
(cs) • Chcete-li určit teplotní limity podle kapalinové sekce a kombinace materiálu membrána / těsnění / koule, vyberte nejvyšší teplotní limit "dolní konec" a nejnižší teplotní limit horní konec".
(et) • Vedelikusektsioonil ja materjali/kombinatsiooni membraan / tihend / kuul temperatuuripiiride määramiseks valige kõrgeim "alumise otsa" temperatuuripiir ning madalaim "ülemise otsa" temperatuuripiir.
(hu) • A folyadékszakasz - membrán / tömítés / golyó anyaga kombináció hőmérséklet határainak meghatározásához válassza ki a legmagasabb alsó és a legalacsonyabb felső határhőmérsékletet.
(lv) • Lai noteiktu šķidrumu nodaļas temperatūras ierobežojumus attiecībā uz membrānas / blīvējuma / lodes materiālu kombināciju, izvēlieties augstākā temperatūras "zemāko" robežvērtību un zemākā temperatūras "augstāko" robežvērtību.
(lt) • Jei norite nustatyti skysčio dalies diafragmos / sandarinimo / rutulių medžiagos kombinacijai aukščiausias apatines temperatūras, pasirinkite didžiausią temperatūros ir mažiausią aukščiausios temperatūros ribą.
(sk) • Ak chcete určiť teplotné limity kvapalinovej sekcie - kombinácie materiálu membrány / tesnenia / gule, vyberte najvyšší teplotný limit pre "dolný koniec" a najnižší teplotný limit pre "horný koniec".
(sl) • Da bi ugotovili temperaturne omejitve dela za tekočino - kombinacije materiala membrane / tesnila / krogle, izberite najvišjo "spodnjo" temperaturno omejitev in najnižjo "zgornjo" temperaturno omejitev.
(ru) • Чтобы определить предельные значения температур в секции жидкости для сочетания материалов диафрагмы / уплотнителя / шарика, выберите наибольшее значение нижнего предела температур и наименьшее значение верхнего предела.
(bg) • За да определите температурните граници на частта с течности - комбинацията между мембранен / уплътнителен / сферичен материал, изберете най-високата температурна граница в „долна граница" и най-ниската температурна граница в „горна граница".
(ro) • Pentru a determina limitele de temperatură ale secțiunii fluidelor - combinația de materiale pentru diafragmă / garnitură / bilă, selectați limita de temperatură „inferioară" maximă și limita de temperatură „superioară" minimă.
(zh) • 要确定流体段-膜片/密封/球材料组合的温度极限，请选择最高"低端"温度极限和最低"高端"温度极限。

(en) • **TEMPERATURE LIMITS**
(fr) • **TEMPERATURES LIMITES**
(es) • **LÍMITES DE TEMPERATURA**
(de) • **TEMPERATURGRENZEN**
(it) • **LIMITI DI TEMPERATURA**
(nl) • **BOVEN- EN ONDERGRENZEN TEMPERATUUR**
(da) • **TEMPERATURGRÆNSER**
(sv) • **TEMPERATURGRÄNSER**
(fi) • **LÄMPÖTILARAJAT**
(no) • **TEMPERATURGRENSER**
(pt) • **LIMITES DE TEMPERATURA**
(el) • **ΟΡΙΑ ΘΕΡΜΟΚΡΑΣΙΑΣ**
(tr) • **SICAKLIK LİMİTLERİ**
(pl) • **LIMITY TEMPERATURY**
(cs) • **TEPLOTNÍ LIMITY**
(et) • **TEMPERATUURIPIIRID**
(hu) • **HŐMÉRSÉKLETI HATÁROK**
(lv) • **TEMPERATŪRAS ROBEŽAS**
(lt) • **TEMPERATŪROS RIBOS**
(sk) • **TEPLOTNÉ LIMITY**
(sl) • **TEMPERATURNE OMEJITVE**
(ru) • **ПРЕДЕЛЫ ТЕМПЕРАТУРЫ**
(bg) • **ОГРАНИЧЕНИЯ НА ТЕМПЕРАТУРАТА**
(ro) • **LIMITE DE TEMPERATURĂ**
(zh) • **温度极限**

(en) Example: Diaphragm pump with Polypropylene fluid section and Teflon diaphragms.
(fr) Exemple : Pompe à diaphragme avec section des fluides en polypropylène et diaphragmes en téflon.
(es) Ejemplo: bomba de diafragma con sección de fluidos de polipropileno y diafragmas de Teflón.
(de) Beispiel: Membranpumpen mit Polypropylen im Flüssigkeitsbereich und Teflon-Membranen.
(it) Esempio: pompa con sezione liquido in polipropilene e membrane in Teflon.
(nl) Voorbeeld: membraanpomp met vloeistofkamer van polypropyleen en membranen van teflon.
(da) Eksempel: Membranpumpe med polypropylen væskesnit og teflonmembraner.
(sv) Exempel: Membranpump med vätskesektion av polypropylen och teflonmembran.
(fi) Esimerkki: Kalvopumppu, jossa polypropyleenisen nesteosa ja teflonkalvot.
(no) Eksempel: Membranpumpe med væskedel av polypropylen og membraner av teflon.
(pt) Exemplo: Bomba de diafragma com secção do líquido de polipropileno e diafragmas de teflon.
(el) Παράδειγμα: Αντλία διαφράγματος με χύρο υγρών από πολυπροπυλένιο και διαφράγματα από τεφλόν.
(tr) Örnek: Polipropilen sıvı bölmeli ve Teflon diyaframlı diyafram pompası.
(pl) Przykład: Pompa membranowa z polipropylenową frakcją płynu i membranami teflonowymi.
(cs) Příklad: Membránové čerpadlo s kapalinovou sekcí z polypropylenu a membránou z teflonu.
(et) Näide: Membraanpump polüpropüleenist vedelikusektsiooniga ja teflonist membraaniga.
(hu) Példa: Membránszivattyú polipropilén folyadékszekcióval és teflon membránokkal.
(lv) Piemērs: Membrānas sūknis ar polipropilēna nodalījumu un teflona membrānu.
(lt) Pavyzdys: Diafragminis siurblys su polipropilenine skysčio dalimi ir tefloniniais diafragmomis.
(sk) Príklad: Membránové čerpadlo s kvapalinovou sekciou z polypropylénu a membránou z teflónu.
(sl) Zgled: Membranska črpalka z polipropenskim delom za tekočino in teflonsko membrano.
(ru) Пример: Диафрагменный насос с полипропиленовой секцией жидкости и тефлоновыми диафрагмами.
(bg) Например: Мембранна помпа с част за полипропиленов флуид и тефлонови мембрани.
(ro) Exemplu: Pompă cu diafragmă cu secțiunea fluidelor din polipropilenă și diafragme din teflon.
(zh) 示例：带聚丙烯流体段和特氟纶膜片的隔膜泵。

(en) Fluid Section / Seat Material	Polypropylene	Low Limit		High Limit	
(fr) Section des Fluides / Matériau du Support	Polypropylène	Limite Inférieure		Limite supérieure	
(es) Sección de fluidos / Material de la superficie de apoyo	Polipropileno	Límite Inferior		Límite superior	
(de) Flüssigkeitsbereich / Dichtungsmaterial	Polypropylen	Untere Grenze		Obere Grenze	
(it) Sezione liquido / Materiale alloggiamento	Polipropilene	Limite minimo		Limite massimo	
(nl) Materiaal vloeistofkamer / zitting	Polypropyleen	Ondergrens		Bovengrens	
(da) Væskesnit / sædemateriale	Polypropylen	Nedre grænse		Øvre grænse	
(sv) Vätskesektions- / sätesmaterial	Polypropylen	Låg gräns		Hög gräns	
(fi) Nesteosa / Tiivistemateriaali	Polypropyleeni	Alaraja		Yläraja	
(no) Væskedel / Setemateriale	Polypropylen	Lav grense		Høy grense	
(pt) Secção do líquido / material da base	Polipropileno	Limite Inferior	35° F (2° C)	Limite superior	150° F (66° C)
(el) Υλικό χύρου υγρών / μέρους στεγανοποίησης	Πολυπροπυλένιο	Χαμηλό όριο		Υψηλό όριο	
(tr) Sıvı Bölmesi / Yatak Malzemesi	Polipropilen	Alt Limit		Üst Limit	
(pl) Frakcja płynu / Materiał uszczelniający	Polipropylen	Limit dolny		Limit górny	
(cs) Materiál kapalinové sekce / sedlo	Polypropylen	Dolní limit		Horní limit	
(et) Vedelikusektsioon / Pesa materjal	Polüpropüleen	Alumine piir		Ülemine piir	
(hu) Folyadékszekció / Ülszék anyaga	Polipropilén	Alsó határ		Felső határ	
(lv) Šķidruma nodalījuma / vārsta ligzdas materiāls	Polipropilēns	Zemākā robeža		Augstākā robeža	
(lt) Skysčio skyrius / Lizdo medžiaga	Polipropilenas	Apatinė riba		Viršutinė riba	
(sk) Materiál kvapalinovej sekcie / sedla	Polypropylén	Dolný limit		Horný limit	
(sl) Del za tekočino / Material tesnila	Polipropilen	Spodnja meja		Zgornja meja	
(ru) Секция жидкости / Материал седла	Полипропилен	Нижний предел		Верхний предел	
(bg) Част течност / Основни вещества	Полипропилен	Долна граница		Горна граница	
(ro) Secțiunea fluidelor / Material de sprijin	Polipropilenă	Limita inferioară		Limita superioară	
(zh) 液体段/座垫材料	聚丙烯	下限		上限	
(en) Diaphragm / Seal / Ball Material	Teflon	Low Limit		High Limit	
(fr) Diaphragme / dispositif d'étanchéité / matériel à billes	Téflon	Limite Inférieure		Limite supérieure	
(es) Material del diafragma / cierre hermético / bola	Teflón	Límite inferior		Límite superior	
(de) Membrane / Dichtung / Kugelmaterial	Teflon	Untere Grenze		Obere Grenze	
(it) Membrana / Guarnizione / Materiale sfera	Teflon	Limite minimo		Limite massimo	
(nl) Materiaal membraan / afdichting / kogel	Teflon	Ondergrens		Bovengrens	
(da) Membran / forsegling / kuglemateriale	Teflon	Nedre grænse		Øvre grænse	
(sv) Membran- / tätnings- / kulmaterial	Teflon	Låg gräns		Hög gräns	
(fi) Kalvo / tiiviste / kuulamateriaali	Teflon	Alaraja		Yläraja	
(no) Membran- / forseglings- / kulematerialе	Teflon	Lav grense		Høy grense	
(pt) Material do diafragma / do vedante / da esfera	Teflon	Limite Inferior	40° F (4° C)	Limite superior	225° F (107° C)
(el) Υλικό διαφράγματος / πώματος στεγανοποίησης / σφαιρίδιου	Τεφλόν	Χαμηλό όριο		Υψηλό όριο	
(tr) Diyafram / Yatak / Bilye Materyali	Teflon	Alt Limit		Üst Limit	
(pl) Membrana / Uszczelka / Materiał kulowy	Teflon	Limit dolny		Limit górny	
(cs) Materiál membrána / těsnění / koule	Teflon	Dolní limit		Horní limit	
(et) Membraani / tihendi / kuuli materjal	Teflon	Alumine piir		Ülemine piir	
(hu) Membrán / tömítés / golyó anyaga	Teflon	Alsó határ		Felső határ	
(lv) Membrānas / blīvējuma / lodes materiāls	Teflons	Zemākā robeža		Augstākā robeža	
(lt) Diafragmos / sandarinklio / rutulio medžiaga	Teflonas	Apatinė riba		Viršutinė riba	
(sk) Materiál membrány / tesnenia / gule	Teflón	Dolný limit		Horný limit	
(sl) Material membrane / tesnila / krogle	Teflon	Spodnja meja		Zgornja meja	
(ru) Материал диафрагмы / уплотнителя / шарика	Тефлон	Нижний предел		Верхний предел	
(bg) Мембранни / уплътнителни / сферични вещества	Тефлон	Долна граница		Горна граница	
(ro) Materiale pentru diafragmă / garnituri / bile	Teflon	Limita inferioară		Limita superioară	
(zh) 膜片/垫座/球材料	特氟纶	下限		上限	
(en) Temperature Limits (fr) Températures Limites (es) Límites de Temperatura (de) Temperaturgrenzen (it) Limiti di Temperatura (nl) Boven- En Ondergrenzen Temperatuur (da) Temperaturgrænser (sv) Temperaturgränser (fi) Lämpötilarajat (no) Temperaturgrenser (pt) Limites de Temperatura (el) Όρια Θερμοκρασιας (tr) Sıcaklık Limitleri	(pl) Limity Temperatury (cs) Teplotní Limity (et) Temperatuuripiirid (hu) Hőmérséklet Határok (lv) Temperatūras robežas (lt) Temperatūros Ribos (sk) Teplotné Limity (sl) Temperaturne omejitve (ru) Пределы температуры (bg) Ограничения На Температурата (ro) Limite De Temperatură (zh) 温度极限		40° F (4° C)		150° F (66° C)

(en) ▪ **TEMPERATURE LIMITS**
(fr) ▪ **TEMPERATURES LIMITES**
(es) ▪ **LÍMITES DE TEMPERATURA**
(de) ▪ **TEMPERATURGRENZEN**
(it) ▪ **LIMITI DI TEMPERATURA**
(nl) ▪ **BOVEN- EN ONDERGRENZEN TEMPERATUUR**
(da) ▪ **TEMPERATURGRÆNSER**
(sv) ▪ **TEMPERATURGRÄNSER**
(fi) ▪ **LÄMPÖTILARAJAT**
(no) ▪ **TEMPERATURGRENSER**
(pt) ▪ **LIMITES DE TEMPERATURA**
(el) ▪ **ΟΡΙΑ ΘΕΡΜΟΚΡΑΣΙΑΣ**
(tr) ▪ **SICAKLIK LİMİTLERİ**
(pl) ▪ **LIMITY TEMPERATURY**
(cs) ▪ **TEPLOTNÍ LIMITY**
(et) ▪ **TEMPERATUURIPIIRID**
(hu) ▪ **HŐMÉRSÉKLETI HATÁROK**
(lv) ▪ **TEMPERATŪRAS ROBEŽAS**
(lt) ▪ **TEMPERATŪROS RIBOS**
(sk) ▪ **TEPLOTNÉ LIMITY**
(sl) ▪ **TEMPERATURNE OMEJITVE**
(ru) ▪ **ПРЕДЕЛЫ ТЕМПЕРАТУРЫ**
(bg) ▪ **ОГРАНИЧЕНИЯ НА ТЕМПЕРАТУРАТА**
(ro) ▪ **LIMITE DE TEMPERATURĂ**
(zh) ▪ **温度极限**

(en) ▪ Metallic pumps are not to exceed 212° F (100° C). Consult the factory for assistance. Do not exceed rated temperatures of non-metallic pumps and elastomers (diaphragms, balls, seats, "O" rings).

(fr) ▪ Les pompes métalliques ne doivent pas dépasser 212° F (100° C). Pour toute demande d'assistance technique, veuillez appeler l'usine. Ne dépassez pas les températures conseillées de pompes non-métalliques et d'élastomères (diaphragmes, billes, sièges, joints toriques).

(es) ▪ Las bombas metálicas no deben superar los 212° F (100° C). Consulte a la fábrica para obtener ayuda. No supere las temperaturas básicas de las bombas no metálicas y de los elastómeros (diafragmas, bolas, superficies de apoyo y juntas tóricas).

(de) ▪ Metallpumpen dürfen 212° F (100° C) nicht übersteigen. Wenden Sie sich um Unterstützung an den Hersteller. Nicht-metallische Pumpen und Elastomere (Membranen, Kugeln, Auflagen, O-Ringe) dürfen die empfohlenen Temperaturen nicht überschreiten.

(it) ▪ Le pompe metalliche non devono superare i 212° F (100° C). Per assistenza consultare il produttore. Non superare le temperature nominali delle pompe non metalliche e degli elastomeri (diaframmi, sfere, sedi, O-ring).

(nl) ▪ De temperatuur van metalen pompen mag niet 212° F (100° C) overschrijden. Neem contact op met de fabriek voor ondersteuning. De nominale temperatuur van kunststof pompen en elastomeren (membranen, kogels, zittingen, "O"-ringen) mag niet worden overschreden.

(da) ▪ Metalliske pumper må ikke overskride 212° F (100° C). Rådfør med fabrikken for assistance. Overskrid ikke de angivne temperaturer på ikke-metalliske pumper og elastomere (membraner, kugler, sæder, O-ringe).

(sv) ▪ Pumpar av metall får inte bli varmare än 212° F (100 °C). Rådfråga tillverkaren om du behöver hjälp. Överskrid inte angivna temperaturer för pumpar som inte är av metall och elastomerer (membran, kulor, o-ringar).

(fi) ▪ Metalliset pumput eivät saa ylittää 212° F:n (100° C:n) lämpötilaa. Pyydä tehtaalta lisätietoja. Älä ylitä ei-metallisten pumppujen ja elastomeerien nimellisiä lämpötiloja (kalvot, kuulat, istukat, "O"-renkaat).

(no) ▪ Metallpumper skal ikke overskride 212° F (100° C). Kontakt fabrikken for assistanse. Temperaturspesifikasjonene skal ikke overskrides for pumper som ikke er av metall og elastomer (membran, kuler, seter, o-ringer).

(pt) ▪ As bombas metálicas não devem ultrapassar os 212° F (100° C). Contacte a fábrica para obter assistência. Não ultrapasse as temperaturas nominais das bombas não metálicas e dos elastómeros (diafragmas, esferas, vedantes, anéis em "O").

(el) ▪ Οι μεταλλικές αντλίες δεν πρέπει να υπερβαίνουν τους 212° F (100° C). Για βοήθεια, απευθυνθείτε στο εργοστάσιο. Δεν πρέπει να υπερβαίνονται οι ονομαστικές τιμές θερμοκρασίας των μη-μεταλλικών αντλιών και των ελαστομερών (διαφράγματα, σφαίρα, έδρες, δακτύλιοι στεγανότητας).

(tr) ▪ Metal pompalar 212° F (100° C) değerini aşmamalıdır. Yardım almak için fabrikaya başvurunuz. Metal olmayan pompaların ve elastomerlerin (diyaframlar, bilyeler, yataklar, "O" halkalar) oranlanmış sıcaklıklarını aşmayınız.

(pl) ▪ Pompy metalowe nie przekraczają wartości 212° F (100° C). W celu uzyskania pomocy, należy zwrócić się do producenta. Nie wolno przekraczyć nominalnych temperatur dla pomp niemetalowych i elastomerów (membrany, kul, uszczelek, pierścieni "O").

(cs) ▪ Kovová čerpadla by neměla překročit 212° F (100° C). V případě nejasností se obraťte na výrobce. Obejte na to, aby nebyly překročeny jmenovité hodnoty teplot u nekovových čerpadel a elastomerů (membrány, kuule, sedla, O-kroužky).

(et) ▪ Metallpumbad ei tohi ületada 212° F (100° C). Abi saamiseks pöörduge tehase poole. Ärge ületage mitte-metalliliste pumpade ja elastomeeride (membraanid, kuulid, pesad, määrderõngad) nimitemperatuure.

(hu) ▪ A fémszivattyúk nem haladják meg a 212° F (100° C) értéket. Támogatásért forduljon a gyárhoz. Ne lépje túl a nemfém szivattyúk és az elasztomerek (membránok, golyók, ülőlapok és „O"-gyűrűk) névleges hőmérsékletét.

(lv) ▪ Metāla pumpji nedrīkst pārsniegt 212° F (100° C). Pēc palīdzības griezieties uzņēmumā. Nepārsniedziet nemetāliskio sūkņu un elastomēru (membrānu, lodu, vārsta ligzdu, gredzenu) nominālo temperatūru.

(lt) ▪ Metaliniai siurbiai neturėtų viršyti 212° F (100° C). Prireikus pagalbos kreipkitės į gamintoją. Neviršykite nurodytų temperatūrų nemetaliniams siurbiams ir elastomerams (diafragmoms, rutuliams, kizdams, tandartinimo žiedams).

(sk) ▪ Kovové čerpadlá by nemali prekročiť 212° F (100° C). V prípade nejasností sa obráťte na výrobcu. Dbajte na to, aby nebolí prekročené menovité hodnoty teplôt nekovových čerpadiel a elastomérov (membrány, guľe, sedlá, O krúžky).

(sl) ▪ Kovinske črpalke ne smejo preseči temperature 212° F (100° C). Za pomoč se obrnite na proizvajalca. Ne prekoračite nazivnih temperatur za nekovinske črpalke in elastomere (membrane, krogle, tesnila, obroče "O").

(ru) ▪ Температура металлических насосов не должна превышать 212° F (100° C). Консультацию можно получить на заводе-изготовителе. Не допускайте превышения номинальных температур неметаллических насосов и эластомеров (диафрагм, шариков, уплотнителей, уплотнительных колец).

(bg) ▪ Металните помпи не трябва да превишават 212° F (100° C). Ако имате нужда от помощ, свържете се със завода. Не превишавайте измерените температури за неметални помпи и еластомери (мембрани, сачмички, седла, О-пръстени).

(ro) ▪ Pompele metalice nu trebuie să depășească 212° F (100° C). Consultați producătorul pentru asistență. Nu depășiți temperaturile pompelor nemetalice și ale elastomerilor (diafragme, bile, suprafețe de sprijin, garnituri inelare).

(zh) ▪ 金属泵不超过212° F (100° C)。请向工厂咨询获求帮助。不要超过非金属泵和合成橡胶（膜片、球、座垫、"O" 形圈）的额定温度。

DECLARATION OF CONFORMITY

(fr) DECLARATION DE CONFORMITE
(es) DECLARACION DE CONFORMIDAD
(de) ERKLÄRUNG BEZÜGLICH EINHALTUNG DER VORSCHRIFTEN
(it) DICHIARAZIONE DI CONFORMITÀ
(nl) CONFORMITEITSVERKLARING
(da) KONFORMITETS DEKLARATION
(sv) FÖRSÄKRAN OM ÖVERENSSTÄMMELSE
(fi) VAATIMUSTENMUKAISUUSTODISTUS
(no) SAMSVARSERKLÆRING
(pt) DECLARAÇÃO DE CONFORMIDADE
(el) ΔΗΛΩΣΗ ΣΥΜΒΑΤΟΤΗΤΑΣ
(tr) UYGUNLUK BİLDİRİMİ

MANUFACTURED BY:

(fr) FABRIQUE PAR :
(es) FABRICADA POR:
(de) HERGESTELLT VON:
(it) FABBRICATO DA:
(nl) VERVAARDIGD DOOR:
(da) FREMSTILLET AF:
(sv) TILLVERKAT AV:
(fi) VALMISTAJA:
(no) PRODUSERT AV:
(pt) MANUFACTURADO POR:
(el) ΚΑΤΑΣΚΕΥΑΣΤΗΚΕ ΑΠΟ:
(tr) ÜRETİCİ FİRMA:

INGERSOLL RAND COMPANY LTD
ONE ARO CENTER • BRYAN, OHIO, USA 43506-0151

TYPE / SERIES: AIR OPERATED DIAPHRAGM PUMPS

(fr) TYPE / SERIE :
(es) TIPO / SERIE:
(de) TYP / SERIE:
(it) TIPO / SERIE:
(nl) TYPE / SERIE
(da) TYPE / SERIER:
(sv) TYP / SERIE:
(fi) TYYPPI / SARJA:
(no) TYPE / SERIE:
(pt) TIPO / SÉRIE:
(el) ΤΥΠΟΣ / ΣΕΙΡΑ:
(tr) TİP / SERİ:

POMPES PNEUMATIQUES A MEMBRANES
BOMBAS NEUMATICAS DE DIAFRAGMA
DRUCKLUFTBETRIEBENE MEMBRANPUMPE
POMPE PNEUMATICHE A MEMBRANA
PNEUMATISCHE MEMBRAANPOMPEN
LUFTDREVNE MEMBRAN PUMPER
TRYCKLUFTSDRIVNA MEMBRANPUMPAR
PAINEILMATOIMISET KALVOPUMPUT
TRYKKLUFTDREVET MEMBRANPUMPE
BOMBAS PNEUMÁTICAS DE DIAFRAGMA
ΑΕΡΗΤΑΙΕΣ ΔΙΑΦΡΑΓΜΑΤΟΣ
HAVA İLE ÇALIŞAN DİYAFRAM POMPALARI

MODEL:

(fr) MODELE :
(es) MODELO:
(de) MODELL:
(it) MODELLO:
(nl) MODEL:
(da) MODEL:
(sv) MODELL:
(fi) MALI:
(no) MODELL:
(pt) MODELO:
(el) ΜΟΝΤΕΛΟ:
(tr) MODEL:

67144, 650715-( ), 650717-( ), 650718-( ), 650719-( ), 650747, 650750-( ), 650751-( ), 650752, 650758-( ), 650763-1-( ), 650770-3-( ), 650771-3-( ), 650774, 650775, 650777, 650778-( ), 650779-( )-( ), 650780-( ), 650782-( ), 650784-( )-( ), 650785-( ), 650789-( ), 650791, 6660SH-( ), 666058-( ), 666110-( )-C, 66610X-( )-( ), 66611X-( )-( ), 666122X-( )-( ), 666123X-( )-( ), 66614X-( )-( ), 66615X-( )-( ), 66616X-( )-( ), 66617X-( )-( ), 66618X-( )-( ), 666201-( )-( ), 666211-( )-( ), 666221-( )-( ), 666231-( )-( ), 666251-( )-( ), 666271-( )-( ), 666301-( )-( ), 666311-( )-( ), 670000, 670001, 670005, 670015, 670020, 670021, 670024, 670025, 670035, 670036-( ), 670039, 670040-( ), 670041-( ), 670042, 670049-( ), 670050, 670051, 670052, 670053-( )-( ), 670054, 670059-( )-C, PD02P-XDX-( ), PD03P-XDX-( ), PD03P-XEX-( ), PD05A-( )-( ), PD05P-XAX-( ), PD05P-XDX-( ), PD05P-XEX-( ), PD05P-XSX-( ), PD05R-( )-( ), PD07R-( )-( ), PD0AP-XDX-( ), PD10A-( )-( ), PD10E-( )-( ), PD10S-( )-( ), PD15A-( )-( ), PD15E-( )-( ), PD15S-( )-( ), PD20A-( )-( )-( ), PD20C-( )-( )-( ), PD20E-( )-( )-( ), PD20S-( )-( )-( ), PD30A-( )-( )-( ), PD30S-( )-( )-( ), PE03P-XDX-( ), PE01P-XEX-( ), PE05A-( )-( )-( ), PE05P-XDX-( )-( ), PE05P-XEX-( )-( ), PE05R-( )-( )-( ), PE10A-( )-( ), PE10S-( )-( ), PE15A-( )-( ), PE15S-( )-( ), PE20A-( )-( )-B05, PE20S-( )-( )-B05, PE30A-( )-( )-C05, PE30S-( )-( )-C05, PF20A-( )-( ) ( ), PF20C-( )-( ), PF20S-( )-( )-( ), PG05A-( )-( )-B, PM10A-( )-( ), PM05P-( )-( )-A02, PM10A-( )-( )-A02, PM10S-( )-( )-A02, PM15A-( )-( )-A02, PM15S-( )-( ) A02, PM20A-( )-( )-( ), PM20S-( )-( )-( ), PM30A-( )-( )-( ), PM30S-( )-( )-( ), PP20A-( )-( ), PP30A-( )-( ), PS( )-( )-( )-( ), PW10A-( )-( )

SERIAL NO. RANGE: (2007 - 2008) ( )A0XX7-XXX ⇨ ( )L0XX8-XXX

(fr) N° SERIE :
(es) GAMA DE No. DE SERIE:
(de) SERIEN-NR.-BEREICH:
(it) NUMERI DI SERIE:
(nl) SERIENUMMERS:
(da) SERIE NR. RÆKKE:
(sv) SERIE-NR-OMRÅDE:
(fi) SARJA N:O:
(no) SERIENUMMERRÆKKE:
(pt) N.º DE SERIE DA GAMA:
(el) ΕΥΡΟΣ ΣΕΙΡΙΑΚΟΥ ΑΡΙΘΜΟΥ:
(tr) SERİ NO. ARALIĞI

This product complies with the following European Community Directives:

(fr) Ce produit est conforme aux directives de la Communauté Européenne suivantes :
(es) Este producto cumple con las siguientes Directrices de la Comunidad Europea:
(de) Dieses Produkt erfüllt die folgenden Vorschriften der Europäischen Gemeinschaft:
(it) Questo prodotto è conforme alle seguenti direttive CEE:
(nl) Dit produkt voldoet aan de volgende EG-richtlijnen:
(da) Dette produkt imødekommer følgende EU direktiver:
(sv) Denna produkt överensstämmer med EUs nedanstående föreskrifter:
(fi) Tämä tuote täyttää seuraavat EU - direktiivit:
(no) Dette produktet er i samsvar med følgende direktiver fra Det europeiske fellesskap:
(pt) Este produto está conforme as Directivas da Comunidade Económica Europeia:
(el) Το παρόν προϊόν συμμορφούνεται με τις παρακάτω κοινοτικές οδηγίες:
(tr) Bu ürün aşağıda sıralanmış Avrupa Topluluğu Direktiflerİyle uyumludur:

98/37/EC, 94/9/EC (Ex II 2GD X)

The following Standards were used to verify compliance with the Directives:

(fr) Les normes suivantes ont été utilisées pour vérifier la conformité avec les Directives :
(es) Las siguientes Normas se usaron para verificar el cumplimiento de las Directrices:
(de) Folgende Normen wurden angewandt, um Erfüllung der Vorschriften zu bestätigen:
(it) Per verificare la conformità del prodotto alle direttive sono stati usati i seguenti standard:
(nl) De volgende normen zijn gebruikt om naleving van de richtlijnen te bevestigen:
(da) Følgende standardes blev benyttet til at efterkontrollere overenstemmelse med direktiverne:
(sv) Följande normer har använts för bekräfta överensstämmelse med föreskrifterna:
(fi) Seuraavia standardeja on käytetty varmistamaan:
(no) Følgende standard ble benyttet til å fastslå samsvar med direktivene:
(pt) As seguintes normas foram usadas para se verificar o cumprimento das directivas:
(el) Για τη διαπίστωση της συμμόρφωσης με τις οδηγίες χρησιμοποιήθηκαν τα ακόλουθα πρότυπα:
(tr) Direktiflere uyumluluk, aşağıdaki Standartlarca doğrulanmıştır:

EN 292, EN 13463-1

Approved by:

(fr) Approuvé par :
(es) Aprobado por:
(de) Genehmigt von:
(it) Approvato da:
(nl) Goedgekeurd door:
(da) Godkendt af:
(sv) Godkänt av:
(fi) Hyväksytty:
(no) Godkjent av:
(pt) Aprovado por:
(el) Εγκρίθηκε από:
(tr) Onaylayan:

Michael Conti INGERSOLL RAND - Bryan, U.S.A.

(Engineering Product Manager)
(fr) (Gestionnaire des produits de la technologie)
(es) (Gerente de Ingeniería del producto)
(de) (Produktleiter Entwicklung)
(it) (Responsabile Prodotto Ingegneria)
(nl) (Engineering Product Manager)
(da) (Teknisk produktleder)
(sv) (Tekniskt ansvarig chef)
(fi) (Tuotejohtaja)
(no) (Engineering Product Manager)
(pt) (Gestor de Produto de Engenharia)
(el) (Υπεύθυνος Μηχανολογικού Ελέγχου Προϊόντων)
(tr) (Ürün Tasarımı Yöneticisi)

Date: 8-28-07

(fr) Date :
(es) Fecha:
(de) Datum:
(it) Data:
(nl) Datum:
(da) Dato:
(sv) Datum:
(fi) Päivämäärä:
(no) Dato:
(pt) Data:
(el) Ημερομηνία:
(tr) Tarih:

(pl) DEKLARACJA ZGODNOŚCI (lt) ATITIKTIES DEKLARACIJA (ru) ДЕКЛАРАЦИЯ СООТВЕТСТВИЯ
(cz) PROHLÁŠENÍ O SHODĚ (lv) ATBILSTĪBAS DEKLARĀCIJA (bg) ДЕКЛАРАЦИЯ ЗА СЪОТВЕТСТВИЕ
(et) VASTAVUSDEKLARATSIOON (sk) VYHLÁSENIE O ZHODE (ro) DECLARAŢIE DE CONFORMITATE
(hu) MEGFELELŐSÉGI NYILATKOZAT (sl) IZJAVA O SKLADNOSTI

(pl) WYTWÓRCA: (sk) VÝROBCA:
(cz) VÝROBCE: (lt) GAMINTOJAS:
(et) VALMISTAJA: (ro) [illegible]
(hu) GYÁRTÓ: (bg) [illegible]
(lv) RAŽOTĀJS: (sl) [illegible]
(mt) [illegible]

INGERSOLL RAND COMPANY LTD
ONE ARO CENTER - BRYAN, OHIO, USA 43506-0151

(pl) TYP / SERIA: [illegible]
(cz) TYP/SÉRIE: [illegible]
(et) TÜÜP / SEERIA: [illegible]
(hu) TÍPUS / SOROZAT: [illegible]
(lt) TIPS / SĒRIJA: [illegible]
(lv) TIPAS / SERIJA: [illegible]
(sk) TYP / SÉRIA: [illegible]
(sl) TIP / SERIJA: [illegible]
(ru) ТИП / СЕРИЯ: [illegible]
(bg) ВИД / СЕРИЯ: [illegible]
(ro) TIP / SERIE: [illegible]

(pl) MODEL: [illegible]
(cz) MODEL: [illegible]
(et) MUDEL: [illegible]
(hu) MODELL: [illegible]
(lt) MODELIS: [illegible]
(lv) MODELIS: [illegible]
(sk) MODEL: [illegible]
(sl) MODEL: [illegible]
(ru) МОДЕЛЬ: [illegible]
(bg) МОДЕЛ: [illegible]
(ro) MODEL: [illegible]

(pl) [illegible] (2007 - 2008) ( )A0XX7-XXX ⇨ ( )L0XX8-XXX
[illegible]

[illegible]
98/37/EC, 94/9/EC (Ex II 2GD X)

[illegible]
EN 292, EN 13463-1

8-28-07

[illegible]

Michael Cook INGERSOLL RAND - Bryan, U.S.A.

[illegible]

INSTRUCTION SHEET

HOJA DE INSTRUCCION
FEUILLET INSTRUCTION

66073-X
66084-1

Released / Liberado / Decharge: 11-15-89
Revised / Revisado / Revise: 10-27-00
(REV. F)

AIR LINE CONNECTION KITS
JUEGOS DE CONEXIÓN DE TUBERÍA NEUMÁTICA
TROUSSES DE RACCORDEMENT DE CONDUITE D'AIR

INSTALLATION / INSTALACIÓN / INSTALLATION

Apply teflon tape or pipe sealant to threads upon assembly. See page 2 for 66084-1.
Aplique un sellador de rosca o cinta de teflón a todas las roscas de la tubería durante el ensamblaje. Para el modelo 66084-1 ver la página 2.
Apposer du ruban de téflon ou un scellant à tuyaux sur les filets au moment de l'assemblage. Voir la page 2 pour 66084-1.

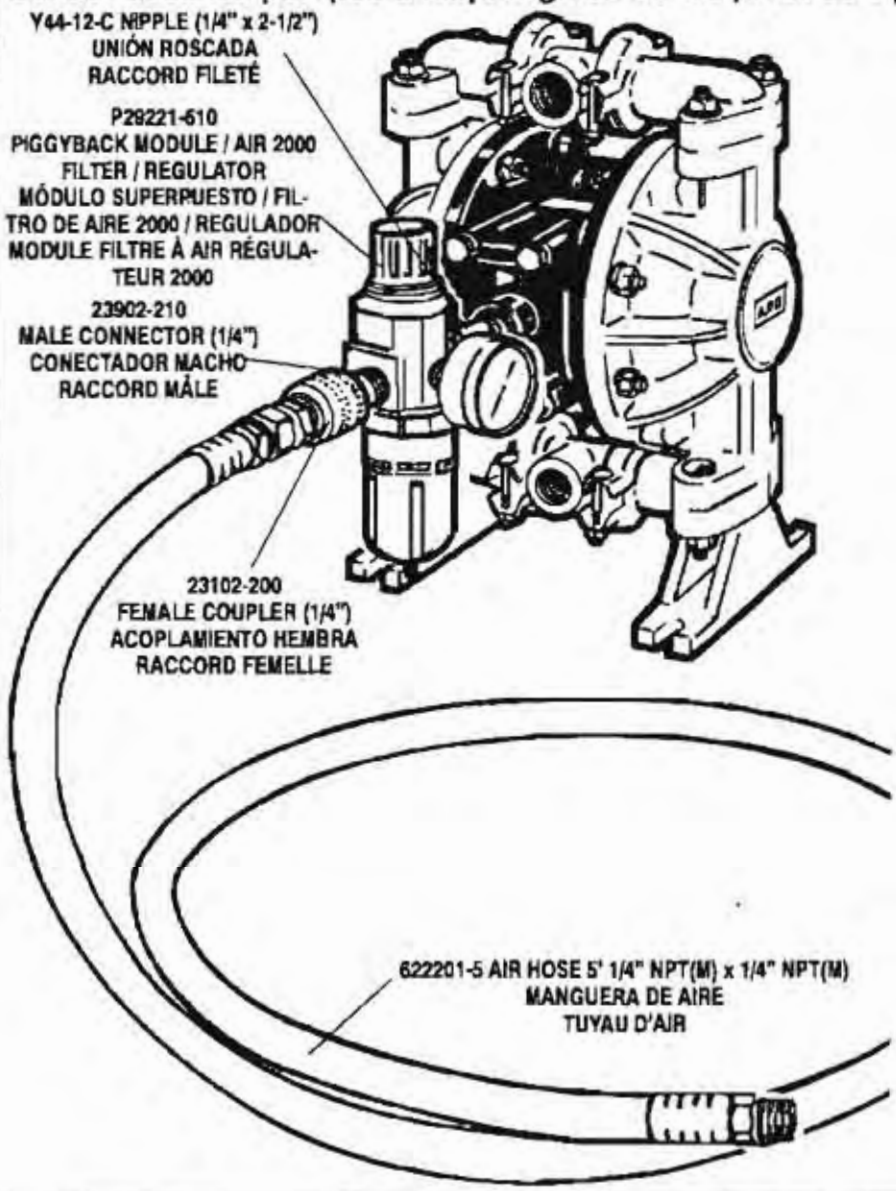
66073-1 For use with 1/4" & 1/2" Diaphragm Pumps
(For applications requiring less than 12 SCFM)

Para utilizarse con bombas de diafragma de 1/4" y 1/2"
(Para aquellas aplicaciones que requieran menos de 12 SCFM)

Utiliser avec les pompes à diaphragmes de 1/4 po et de 1/2 po
(Pour les applications exigeant moins de 12 pi³ / min)

P29122-600
PIGGYBACK MINI FILTER / REGULATOR
MINI FILTRO / REGULADOR SUPERPUESTO
FILTRE-RÉGULATEUR MINIATURE

66073-2
For use with 1/2" & 1" Diaphragm Pumps
Para utilizarse con bombas de diafragma de 1/2" y 1"
Utiliser avec les pompes à diaphragmes de 1/2 po et de 1 po

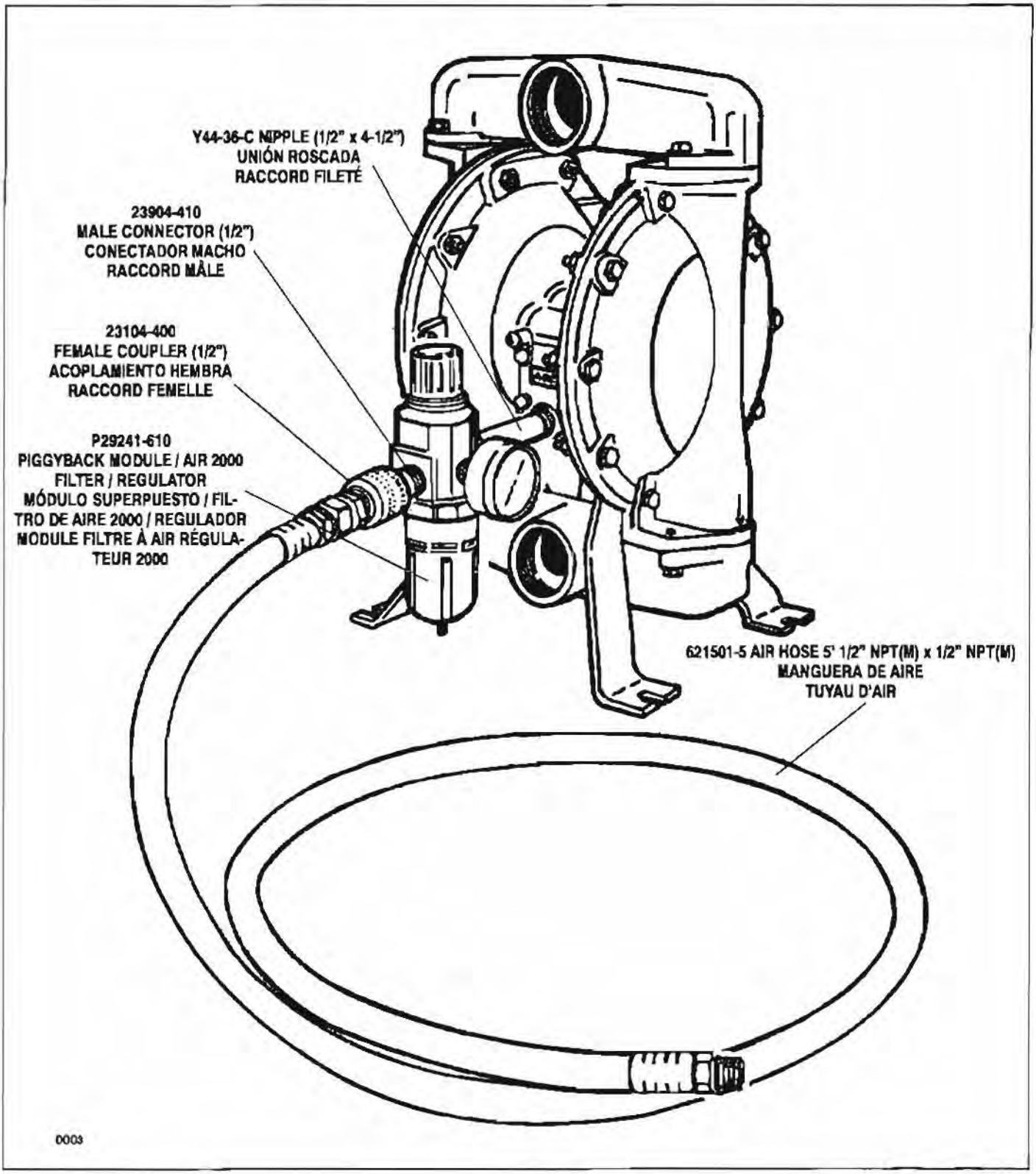


0004

INGERSOLL-RAND COMPANY
P.O. BOX 151 • ONE ARO CENTER • BRYAN, OHIO 43506-0151
✆ (419) 636-4242 • FAX (419) 633-1674

ARO.

66084-1
For use with 1-1/2" & 2" Diaphragm Pumps
Para utilizarse con bombas de diafragma de 1-1/2" y 2"
Utiliser avec les pompes à diaphragmes de 1-1/2 po et de 2 po



Fantech

Installation Instructions for MODEL FR

IMPORTANT: Read These Instructions Completely Before Installing Fan And Save These Instructions For Future Reference.

Items Included: One FR fan, one mounting bracket, mounting hardware

Regular Kits Also Include: Grill with mounting collar/backdraft damper combination, duct mounting clamps

Deluxe Kits Also Include: 2 Grills with mounting collar/backdraft damper combination, "Y" transition, duct mounting clamps, balancing damper

Additional Items Needed: Duct work, duct tape or mounting clamps, duct termination device (roof cap, louvered shutter, etc.)

Tools Required: Electric drill, drill bits, regular screwdriver, phillips screwdriver, razor knife, keyhole saw (optional)

Instructions pour l'installation du MODÈLE FR

IMPORTANT: Lisez ces instructions complètement avant d'installer le ventilateur et sauvegardez ces instructions pour de future référence.

Articles inclus : Un ventilateur FR, un support, matériel de support

Les Kits Réguliers incluent en outre : Grille avec les fixations pour le collier/décharge du régulateur, les pinces de fixation du tuyau.

Les kits de luxe inclus également : 2 Grilles avec les fixations pour le collier/décharge du régulateur, raccordement en "Y", les pinces de fixation du tuyau, du régulateur d'equilibrage.

Les articles supplémentaires nécessaires : Le tuyau, le ruban adhésif ou les pinces de fixation, le dispositif de connexion du tuyau (couvercle du toit, porte-volets, etc.).

Les outils nécessaires : une perceuse électrique, outils de forage, un tournevis normal, un tournevis pour vis de cross, un couteau rasoir, une scie passe partout (optionnel).

Instrucciones de instalacion del MODELO FR

IMPORTANTE: Lea a Fondo Estas Instrucciones Antes de Instalar el Ventilador, y Consérvelas para Referencia Futura.

Renglones Incluidos: Un ventilador FR, un soporte de montaje y tornillería

Los Juegos Regulares También Incluyen: Rejilla con conjunto de collarín de montaje y mariposa de control, y abrazaderas de montaje del conducto

Los Juegos de Lujo También Incluyen: 2 Rejillas con conjunto de collarín de montaje y mariposa de control, adaptador en "Y", abrazaderas de montaje del conducto y mariposa compensadora

Renglones Adicionales Requeridos: Conductos, cinta para conductos o abrazaderas de montaje, dispositivo de terminal del conducto (capucha de terminación en el techo, juego de persianas, etc.)

Herramientas Necesarias: Taladro eléctrico, barrenas, destornillador recto, destornillador Phillips, navaja, sierra calafora (opcional)

Installing Mounting Bracket & Fan

1. When selecting fan mounting location, the following criteria should be considered. *a) mounting to minimize noise generated by fan operation; b) service accessibility*

   a) Mounting the fan as far as possible from the intake point will minimize fan operating noise from being transmitted back through the duct work. If the fan is to be used as a booster for moving the air between two rooms, a central point along the duct may be optimal. Insulated flexible type duct work (recommended for all bathroom exhaust applications) will result in much quieter operation. Fantech recommends minimum 8' of insulated flexible duct between any exhaust grill and fan for low noise level.

   b) Fan location should allow sufficient access for service.


Mount Bracket (NB).


Mount Fan.

2. Using the wood screws provided, attach the mounting bracket (NB or MB) to a support beam at the selected location. Fan mounting can be at any point along the duct and in any angle, however, vertical mounting is recommended to reduce condensation buildup in the fan. If a horizontal installation is necessary and condensation buildup may pose a problem, either wrap insulation around the fan or drill a ¼" hole in the bottom of the housing (along with an NPT insert [by others] and drain tubing) allowing condensation to drain.


Mount Bracket (MB).

3. Attach fan to the mounting bracket with the sheet metal screws provided. Wiring box should be positioned for easy access. Bracket is provided with rubber vibration isolation grommets to prevent the transmission of sound through the structure. Be careful not to overtighten. Also, care should be taken not to strip the plastic housing. Screws are self tapping and do not require pilot holes. However, pilot holes (no larger than 9/32") are recommended.


Mount Fan.

4. Connect duct work to inlet and outlet of fan using CB clamps or duct tape. When using insulated duct, it is recommended that the inner vinyl core be clamped or taped to the inlet and outlet and that the vapor barrier surrounding the insulation be duct taped to the fan housing.

NOTE: Steps 2 & 3 may be reversed.

Installing DG Supply/Exhaust Grill

If a Vent/Light combination kit is purchased, the VLC vent/lights are supplied with a separate installation instruction replacing steps 1 through 4.

1. Select the grill mounting point within the area to be ventilated. To ease installation, locations of framing beams within the walls or joists supporting the ceiling should be considered. Collar/damper is provided with a perforated hanging strap for attachment directly to a beam or joist. Allow sufficient space between the collar/damper and the beam to attach the duct work. If the location of the grill does not allow direct attachment, a cross-member mounted to the framing should be used.


Mount Collar

2. Place the mounting collar/damper in the selected location and trace a circle onto the surface. From the interior side of the room, cut through the surface. Please note: In order to assure a smoother finish when mounting through a sheetrock or tile type ceiling, it is recommended that a razor knife be used to make the cut.


Side view grill and collar.

3. From within the attic or crawl space, place the mounting collar into the hole until the edge of the collar is flush with the interior wall or ceiling surface. Attach collar to the support beam with the 2" wood screws provided. Attach duct work. Secure using CB or FC clamps and/or duct tape. When installing the damper into rigid type ducting, FC clamps or duct tape should be used.

   PLEASE NOTE: *When attaching flex duct to the collar/damper combination and an immediate elbow is necessary, be certain that the elbow is installed with a "soft" bend to allow damper blades to operate properly.*

4. Snap the grill into the mounting collar/damper. Grill should be pushed tightly into place for an airtight fit. If there is a gap between the collar and the ceiling it should be caulked to avoid air leakage. For subsequent cleaning the grill can be pulled out and cleaned.

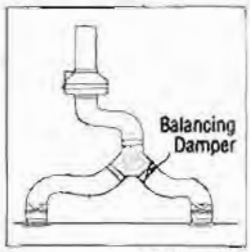
Installing DG Supply/Exhaust Grill

When installing a **DLX kit**, a balancing damper has been included to allow for adjustment of the system. The damper may be used where the grills will be connected using branches of unequal length or where the flow will need to be balanced for any reason.


"Y" with balancing damper.

To Install The Damper:

1. The Damper must be installed on the branch with the least restriction. This is generally the duct that is shortest or has the fewest bends.
2. Drill a 5/16" hole approximately 1½" from the edge on the flat side of the "Y".
3. Place the washer over the threaded shaft on the damper.
4. Insert the damper, shaft first, into the hole just drilled.
5. Attach the handle using the wing nut.
6. Adjust the damper to balance airflow and tighten the wing nut to secure.



FR Series Fan and balancing damper.

Flexible Duct Installation Hints

Flexible insulated duct is strongly recommended where allowed by local code for bathroom exhaust applications, where ducting passes through unconditioned space or where noise is a factor. Failure to use insulation could result in excessive condensation buildup within the duct, and undesirable sound levels within the room. For the quietest possible installations, Fantech recommends a minimum of 8' of insulated flexduct between any exhaust grill and fan. When using flexible type duct work, duct should be stretched as tight and straight as possible. Failure to do so could result in dramatic loss of system performance. Flexible duct should be connected to the fan with CB type clamps or duct tape. All connections should be as airtight as possible to maximize system performance.

Warnings

DO NOT CONNECT POWER SUPPLY until fan is completely installed. Make sure electrical service to the fan is locked in "OFF" position.

1. All units are suitable for use with solid-state speed control.
2. This unit has rotating parts and safety precautions should be exercised during installation, operation and maintenance.
3. **CAUTION:** "For General Ventilation Use Only. Do Not Use To Exhaust Hazardous Or Explosive Materials And Vapors."
4. **WARNING: To reduce the risk of fire, electrical shock, or injury to persons-observe the following:**
   a. Use this unit only in the manner intended by the manufacturer. If you have questions, contact the factory.
   b. Before servicing or cleaning, switch power off at service panel and lock service panel to prevent fan from being switched on accidentally.
   c. Installation work and electrical wiring must be done by qualified person(s) in accordance with all applicable codes and standards, including fire-rated construction.
   d. The combustion airflow needed for safe operation of fuel burning equipment may be affected by this unit's operation. Follow the heating equipment manufacturer's guidelines and safety standards such as those published by the National Fire Protection Association (NFPA), the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) and the local code authorities.
   e. When cutting or drilling into wall or ceiling, do not damage electrical wires or other hidden utilities.
   f. Exhaust fans must always be vented to the outdoors.
   g. Acceptable for use over a bathtub or shower.
   h. NEVER place a switch where it can be reached from a tub or shower.
5. **WARNING!** Check voltage at the fan to see if it corresponds to the motor nameplate.

GUARDS MUST BE INSTALLED WHEN FAN IS WITHIN REACH OF PERSONNEL OR WITHIN SEVEN (7) FEET OF WORKING LEVEL OR WHEN DEEMED ADVISABLE FOR SAFETY.

Electrical Connection

1. Remove the screws securing the terminal box cover plate located on the side of the fan. All fan motor connections are pre-wired to an electrical terminal strip. A ½" romex type cable restraint connector will be needed to secure the wiring through the knockout provided on the side of the terminal box.
2. Bring incoming electrical service through the romex connector and the fan knockout. Be sure to place the connector nut over the wiring coming into the terminal box. There are two open ports on the terminal strip. Using a small regular screwdriver, tighten the neutral (white) wire of the incoming supply under the open terminal strip port labeled "N". Tighten the line (black) wire of the incoming supply under the open terminal strip port labeled "L". Since the fan motor is isolated within a plastic housing, grounding is not necessary.
3. Secure the romex connector. Secure the incoming supply with the romex connector. Replace the fan terminal box cover. All fan motor and capacitor connections have been pre-wired from the factory. No additional fan wiring is necessary.

Liquid tight wiring – Top View (For outside applications)

Romex wiring – Top View

Troubleshooting

If fan fails to operate, please check the following:

1. Consult wiring diagrams (see below) to insure proper connection.
2. Check motor lead wiring, capacitor leads and incoming supply leads to insure definite contact.
3. If possible, use a meter to test for continuity across the fan motor leads. In order to do this, the capacitor must be disconnected (do not test the capacitor - it will not meter continuity). If motor leads show continuity, consult factory for a replacement capacitor.

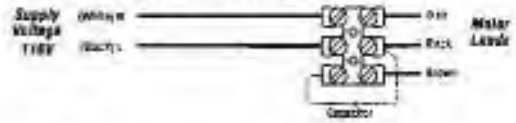
Maintenance Instructions

Since fan bearings are sealed and provided with an internal lubricating material, no additional lubrication is necessary.

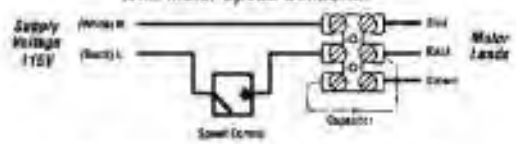
Wiring Diagrams

All Models

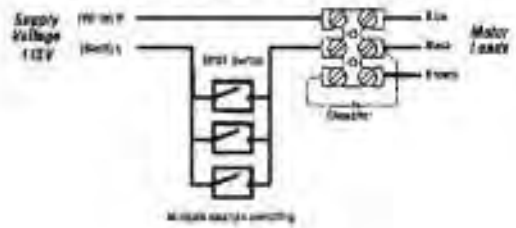
Without Motor Speed Controller



With Motor Speed Controller



Multiple Location Switching Wiring Diagram



Five (5) Year Warranty

DURING ENTIRE WARRANTY PERIOD:
FANTECH will repair or replace any part which has a factory defect in workmanship or material. Product may need to be returned to the Fantech factory, together with a copy of the bill of sale and identified with RMA number.

FOR FACTORY RETURN YOU MUST:
- Have a Return Materials Authorization (RMA) number. This may be obtained by calling FANTECH either in the USA at 1.800.747.1762 or in CANADA at 1.800.565.3548. Please have bill of sale available.
- The RMA number must be clearly written on the outside of the carton, or the carton will be refused.
- All parts and/or product will be repaired/replaced and shipped back to buyer; no credit will be issued.

OR
The Distributor may place an order for the warranty part and/or product and is invoiced. The Distributor will receive a credit equal to the invoice only after product is returned prepaid and verified to be defective.

FANTECH WARRANTY TERMS DO NOT PROVIDE FOR REPLACEMENT WITHOUT CHARGE PRIOR TO INSPECTION FOR A DEFECT.
REPLACEMENTS ISSUED IN ADVANCE OF DEFECT INSPECTION ARE INVOICED, AND CREDIT IS PENDING INSPECTION OF RETURNED
MATERIAL. DEFECTIVE MATERIAL RETURNED BY END USERS SHOULD NOT BE REPLACED BY THE DISTRIBUTOR WITHOUT CHARGE TO THE END USER, AS CREDIT TO DISTRIBUTOR'S ACCOUNT WILL BE PENDING INSPECTION AND VERIFICATION OF ACTUAL DEFECT BY FANTECH.

THE FOLLOWING WARRANTIES DO NOT APPLY:
- Damages from shipping, either concealed or visible. Claim must be filed with freight company.
- Damages resulting from improper wiring or installation.
- Damages or failure caused by acts of God, or resulting from improper consumer procedures, such as:
  1. Improper maintenance
  2. Misuse, abuse, abnormal use, or accident, and
  3. Incorrect electrical voltage or current.
- Removal or any alteration made on the FANTECH label control number or date of manufacture.
- Any other warranty, expressed, implied or written, and to any consequential or incidental damages, loss or property, revenues, or profit, or costs of removal, installation or reinstallation, for any breach of warranty.

WARRANTY VALIDATION
- The user must keep a copy of the bill of sale to verify purchase date.
- These warranties give you specific legal rights, and are subject to an applicable consumer protection legislation. You may have additional rights which vary from state to state.

Garantie de 5 ans

La présente garantie remplace toutes les garanties antérieures.

DURANT TOUTE LA PÉRIODE DE GARANTIE:
FANTECH, INC. s'engage à réparer ou à remplacer toute pièce présentant un défaut d'usine en matière de qualité d'exécution ou de matériau. Il sera peut être nécessaire de retourner le produit à l'usine FANTECH, accompagné d'une copie du contrat de vente et du numéro d'autorisation de retour.
POUR RETOURNER UN PRODUIT À L'USINE, VOUS DEVEZ:
- Obtenir un numéro d'autorisation de retour; pour ce faire, communiquer avec FANTECH, INC. aux États-Unis au numéro 1 800 747-1762, ou au Canada, au numéro 1 800 565-3548. Veuillez avoir votre contrat de vente à portée de la main.
- S'assurer que le numéro d'autorisation de retour est lisible sur l'extérieur de la boîte, sinon la boîte sera refusée.
- Toutes les pièces et/ou le produit seront réparés ou remplacés puis retournés à l'acheteur. Aucun crédit ne sera accordé.

OU
Le Distributeur peut commander une pièce ou un produit couvert par la garantie; la facture lui sera envoyée. Le distributeur ne sera crédité du montant de sa facture qu'après que le produit a été retourné port payé et qu'il a été trouvé défectueux.
LES TERMES DE LA GARANTIE DE FANTECH NE PRÉVOIENT PAS DE REMPLACEMENT SANS FRAIS AVANT QUE LA PIÈCE OU LE PRODUIT DÉFECTUEUX AIT ÉTÉ INSPECTÉ. LES PRODUITS OU PIÈCES REMPLACÉS AVANT L'INSPECTION DE LA DÉFECTUOSITÉ SERONT FACTURÉS ET LE MONTANT DU CRÉDIT EST FONCTION DE L'INSPECTION DE LA PIÈCE OU DU PRODUIT RETOURNÉ. LE DISTRIBUTEUR NE DOIT PAS REMPLACER SANS FRAIS POUR L'UTILISATEUR FINAL L'ÉQUIPEMENT DÉFECTUEUX RETOURNÉ PAR L'UTILISATEUR FINAL, CAR LE COMPTE DU DISTRIBUTEUR NE SERA CRÉDITÉ QU'APRÈS L'INSPECTION ET LA VÉRIFICATION PAR FANTECH DE LA DÉFECTUOSITÉ.
LES GARANTIES NE S'APPLIQUENT PAS DANS LES CAS SUIVANTS:
- Dommages dus au transport (dissimulés ou visibles). Les réclamations doivent être faites à la compagnie de fret.
- Dommages dus au mauvais câblage ou à l'installation inappropriée.
- Dommages ou défectuosité causés par une calamité naturelle ou résultant d'une procédure irrégulière de l'acheteur, notamment :
  1. Entretien irrégulier
  2. Mauvais usage, usage abusif, usage anormal ou accident
  3. Tension ou courant électrique incorrect
- Enlèvement ou toute modification du numéro de contrôle ou de la date de fabrication de l'étiquette FANTECH
- Toute autre garantie expresse, écrite ou implicite, pour les dommages accidentels ou indirects, perte de biens, de recettes, manque à gagner ou coûts relatifs à la dépose, à l'installation ou à la réinstallation, en cas de violation de garantie.

CERTIFICATION DE LA GARANTIE:
- L'utilisateur doit conserver une copie du contrat de vente pour confirmer la date d'achat.
- Les présentes garanties vous donnent des droits spécifiques reconnus par la loi et sont régies par les lois sur la protection du consommateur appropriées. Il est possible que différents états offrent d'autres droits.

Garantia por cinco (5) años

Esta garantía reemplaza toda otra garantía anterior.

DURANTE EL PERÍODO INTEGRO DE LA GARANTÍA:
FANTECH reparará o reemplazará toda parte que presente un defecto en el material o en la mano de obra. Es posible que el producto deba ser devuelto a la fabrica FANTECH, juntamente con una copia de la constancia de compraventa e identificado con el número de RMA.
PARA DEVOLUCIÓN A FÁBRICA USTED DEBE:
- Tener un número de Autorización de Devolución de Material (RMA). Esto se puede obtener llamando a FANTECH ya sea en los Estados Unidos al 1.800.747.1762
- en Canadá al 1.800.565.3548. Tenga a mano la constancia de compraventa.
- El número de RMA deberá estar claramente escrito en la parte exterior de la caja, de lo contrario la caja será rechazada.
- Todas las partes y/o el producto serán reparados/reemplazados y devueltos al comprador; no se otorgará crédito.

O BIEN
El Distribuidor puede colocar una orden por la parte y/o producto en garantía y facturarla/o. El Distribuidor recibirá un crédito igual a la factura sólo después de que se haya devuelto el producto con pago previo y con verificación de defecto.
LAS CONDICIONES DE LA GARANTÍA DE FANTECH NO CONTEMPLAN EL REEMPLAZO SIN CARGO ANTES DE REALIZAR LA INSPECCIÓN PARA DETECTAR DEFECTOS. LOS REEMPLAZOS EMITIDOS ANTES DE INSPECCIONAR POR DEFECTOS SON FACTURADOS, Y EL CRÉDITO ESTÁ A LA ESPERA DE INSPECCIÓN DEL MATERIAL DEVUELTO. EL MATERIAL DEFECTUOSO DEVUELTO POR LOS USUARIOS FINALES NO DEBERÁ SER REEMPLAZADO POR EL DISTRIBUIDOR SIN CARGO PARA EL USUARIO FINAL, YA QUE EL CRÉDITO DE LA CUENTA DEL DISTRIBUIDOR ESTARÁ A LA ESPERA DE INSPECCIÓN Y VERIFICACIÓN DEL DEFECTO REAL POR FANTECH.
LAS SIGUIENTES GARANTÍAS NO SE APLICAN:
- Daños durante el envío, ya sean encubiertos o visibles. Se deberá presentar el reclamo a la compañía transportadora.
- Daños ocasionados por cableado o instalación indebidos.
- Daños o fallas causados por hechos fortuitos, u ocasionados por procedimientos impropios por parte del usuario, tales como:
  1. Mantenimiento indebido
  2. Uso indebido, abuso, uso anormal o accidente y
  3. Tensión o corriente eléctrica incorrecta.
- Remoción o modificación realizada al número de control del rótulo de FANTECH o de la fecha de fabricación.
- Toda otra garantía, expresa, implícita o escrita, daños y perjuicios, pérdida de propiedad, de ingresos, o de beneficios, o costo de remoción, instalación o reinstalación por incumplimiento de la garantía.

VALIDACIÓN DE LA GARANTÍA
- El usuario debe conservar una copia de la constancia de compraventa para verificar la fecha de compra.
- Estas garantías le otorgan derechos legales específicos, y están sujetas a una legislación aplicable para protección del consumidor. Usted puede tener derechos adicionales que varían de estado en estado.

United States
1712 Northgate Blvd.
Sarasota, FL. 34234
Phone: 800.747.1762; 941.309.6000
Fax: 800.487.9915; 941.309.6099
www.fantech.net; info@fantech.net

Canada
50 Kanalflakt Way
Bouctouche, NB E4S 3M5
Phone: 800.565.3548; 506.743.9500
Fax: 877 747.8116; 506.743.9600
www.fantech.ca; info@fantech.ca

Item #: 401444 • Rev Date: 040605

INSTRUCTIONS FOR INSTALLING WALL-MOUNT SPEED CONTROL

⚠ Safety Warning! Please Read Carefully

Unit should be installed by a qualified electrician in accordance with the National Electrical Code and other local codes which may apply. This control must be grounded when installed. Failure to follow these instructions may result in electrical shock or a fire hazard. To reduce the risk of fire or electric shock, this control is to be used only with fans marked as suitable for use with solid state speed controls. This control is suitable for mounting in a metal or polymeric field enclosure. These controls must not be used at ratings exceeding those clearly marked on the device.

We are not responsible for any expense, inconvenience or subsequent damage caused by items of our manufacture or sale.

1 Application

a) Motor Type – Shaded Pole, P.S.C., and Universal.
b) Required Load – Fans, Blowers and speed dependent loads.

2 Wiring

Warning! Power must be turned off before wiring. Connect control in series with motor and line voltage; never connect control across line.

Ground (earth)** - Be sure to ground control using the green wire.

**Some models do not require grounding. Therefore, a ground wire is not provided.*

3 Mounting

a) Use 2" deep standard electrical box.
b) Secure control with outer bracket tabs.

4 Minimum Speed Adjustment

Important: If this option is not supplied, disregard step 4 and continue to step 5.

This control was designed to operate on motors used in diverse applications. A minimum speed adjustment is provided to allow independent control of the minimum speed setting. Minimum speed adjustment ensures motor runs with sufficient torque to prevent stalling.

a) Motor must be in actual operating conditions to achieve proper speed adjustment. Motor will not slow down unless proper load is applied.

b) Turn main control knob to lowest speed position.

c) Locate and adjust minimum speed setting on front plate with screw driver (rotate clockwise to decrease minimum speed; counter-clockwise to increase minimum speed).

Special Note: For 2.5 and 3.0 Amp models, adjustment of minimum speed is reversed. Rotate clockwise to increase minimum speed; counter-clockwise to decrease minimum speed.

On some models minimum speed adjustment hole is located on side of control.

d) Motor will now operate from this preset minimum speed to full speed.

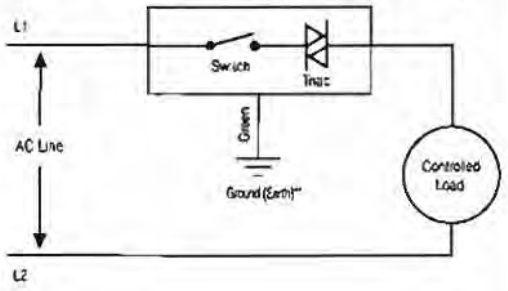
5 Final Mounting

a) Install front dial plate (remove protective plastic on face of dial plate).

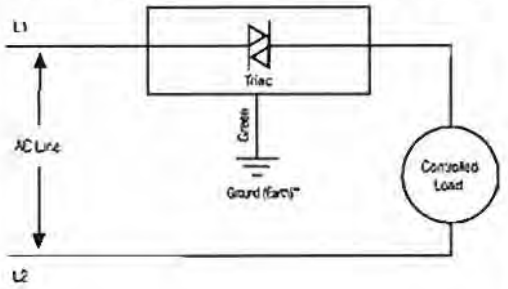
b) Turn main control until switch snaps off. (Switch models only).

c) Push on knob so that pointer is in off position.

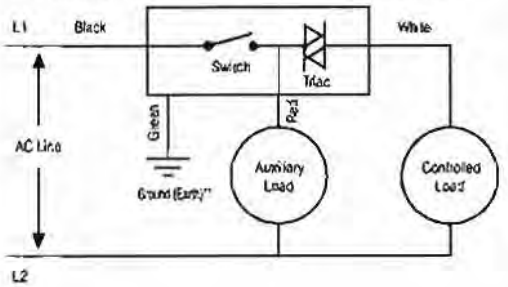
Connection Diagram for 2-Wire* Controls (Switch Models)



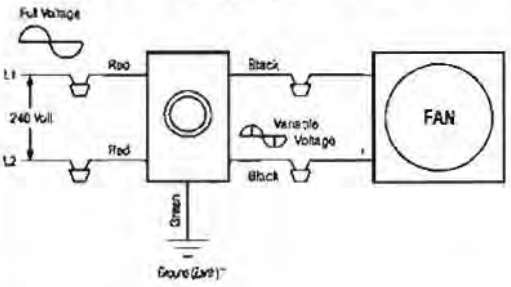
Connection Diagram 2-Wire* Controls for No Switch Model (NS)



Connection Diagram for 3-Wire* Controls (Switch Models)



Connection Diagram for 4-Wire* Controls



*Ground wire is not counted when designating 2,3 or 4 wire controls.

KB Electronics, Inc.
12095 NW 39th Street, Coral Springs, FL 33065 • (954) 346-4900 • Fax (954) 346-3377
Outside Florida Call TOLL FREE (800) 221-6570 • email – info@kbelectronics.com
www.kbelectronics.com

(A40001) - Rev. E - 7/2007

SAFETY WARNINGS — PLEASE READ CAREFULLY

This product should be installed and serviced by a qualified technician, electrican or electrical maintenance personnel familiar with its operation and the hazards involved. Proper installation (see instruction information which accompanies product), which includes wiring, mounting in proper enclosure, fusing or other overcurrent protection and grounding, can reduce the chance of electric shocks, fires or explosion in this product or products used with this product, such as electric motors, switches, coils, solenoids and/or relays. This product is constructed of materials (plastics, metals, carbon, silicon, etc.) which may be a potential hazard. Individual material safety data sheets (MSDS) are available upon request. Proper shielding, grounding and filtering of this product can reduce the emission of radio frequency interference (RFI) which may adversely affect sensitive electronic equipment. If information is required on this product, contact our factory. It is the responsibility of the equipment manufacturer and individual installer to supply this safety warning to the ultimate user of this product. (SW effective 11/86).

TEN YEAR LIMITED WARRANTY

Your AllerAir unit comes with a 10-year limited warranty excluding expendable parts such as pre-filters and filters. This warranty provides for the repair of any defective components and labor for 5 years from the date of delivery. An additional 5-year warranty is provided on parts. This product is not covered against damage resulting from misuse. This warranty is provided to the original purchaser and may not be transferred. A return authorization number is required for warranty repairs. Please contact AllerAir at **1-888-852-8247** for more information.

THE ALLERAIR AIR FILTRATION SYSTEM

ACTIVATED CARBON
Your AllerAir air purifier contains activated carbon that permanently traps dangerous airborne chemicals, gases and odors. This vital filter should be changed approximately every two to three years, depending on the environment in which the unit is operating. You can also upgrade your Exec, Vocarb or D unit at any time to accommodate a larger and deeper carbon filter suitable for removing heavier concentrations of chemicals, gases and odors.

PRE-FILTER
The pre-filter included with your unit removes larger particles and helps prolong the life of your HEPA filter. The pre-filer should be vacuumed or replaced every three months.

LASER TESTED, MEDICAL-GRADE HEPA*
HEPA or high-efficiency particulate air filters were originally developed by the military to remove radio-active dust, and are now the primary particle filtration systems used in hospitals, laboratories, electronic clean rooms and any application where clean air is critical. Today, HEPA filters are widely recommended by allergists, doctors and indoor air quality experts for home and office. They trap an amazing 99.97% of airborne particles at 0.3 microns, including dust, hair, pollen and even some bacteria and viruses.
Depending on the particle level in the environment in which the unit is used, your HEPA filter should be replaced every three to five years.

* Note that chemical and odor models D and DX feature a micro-particle filter which is rated to trap at least 95% airborne particles.

THE ALLERAIR ADVANTAGE

· Our units offer complete air filtration removing airborne chemicals, gases, odors and particles.

· Our deep bed, activated carbon filters last longer than the average thin filter which is generally carbon sprayed onto a synthetic material.
· Our units do not use dangerous ozone technology

· Our units are manufactured to clean your air and therefore are not made with a plastic housing, or other materials which may off-gas chemicals.

· Our units are powered by American-made motors that are energy efficient and cost only pennies a day to operate.

IMPORTANT NOTICE

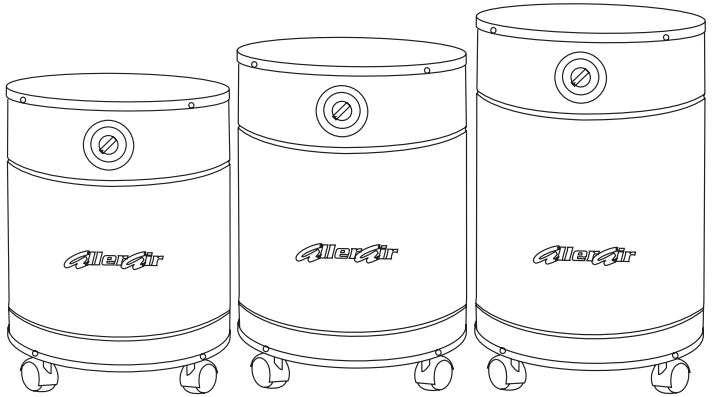
PLANNING ON PAINTING YOUR HOME? READ THIS FIRST:

Particles from paint may clog your HEPA filter, therefore we recommended that users unplug their units and remove the HEPA filter, storing it off-site until the paint job is complete. Due to the serious toxic nature of paint it is also recommended that your carbon filter be replaced or refilled in the weeks after the paint job is complete.

See, Replacing HEPA and/or carbon filters, for instructions on how

AllerAir Industries

Operation and Maintenance Manual



4000 - 5000 - 6000 Series Air Purifiers

Congratulations! You're moments away from fresher, cleaner indoor air. Your new **AllerAir** unit will combat many of the chemicals, gases, odors and particles responsible for poor indoor air quality (IAQ). Poor IAQ may cause or worsen allergies, asthma, multiple chemical sensitivities (MCS) and sick building syndrome. We recommend proper maintenance of your unit to keep it running efficiently for years to come.

Operation:
All units **except** D and DX models are shipped fully assembled and ready for use. (D and DX model owners may refer to their additional instruction sheet for filter installation, or refer to Page 6 of this booklet.)

NOTE: As original packaging is required for warranty returns, new AllerAir owners are advised to keep boxes and shipping materials.

Model # _____

Serial # _____

AllerAir Industries Inc. Toll free: 1-888-852-8247 / Fax: 1-877-688-2193 www.allerair.com

GETTING STARTED

- Keep packaging in case of warranty returns
- Wipe the unit with a soft damp cloth to remove any dust which may have accumulated during shipping
- Check the inlet opening for extra prefilters if ordered. (Bottom of unit)
- Place the unit on its casters and plug it into a 120-volt outlet with ground
- Run the unit on TURBO for a few minutes to re-adjust the airflow patterns in the room
- Depending on your interior conditions, you may choose to run the unit on HIGH during the day and on LOW at night*
- Running the unit on LOW is energy-efficient and increases the amount of air dwell time in the cleansing chambers

* Depending on interior dust conditions. For VOC's, chemicals, smoke or odors we suggest operating continuosly on the low setting to allow for the longest dwell time and adsorbtion.

REPLACING OR CLEANING THE PRE-FILTER

We recommend changing or cleaning pre-filters every one to two months.

STEP A
Turn the unit off, unplug it, and gently lay it on its side.

STEP B
Slowly remove the dirty pre-filter to avoid dispersing its contents.
To clean: Carefully vacuum both sides of the filter.
To discard: Gently insert into a plastic bag and discard.

STEP C
To install:
Gently press the pre-filter flat against the inner walls of the innermost filter. Return the unit to an upright position.

[Warning]

Refrain from poking or sticking any object into the unit's air vent discharge.

Pre-filter Order Reference Numbers*

To order a new pre-filter, call AllerAir toll-free at 1-888-852-8247 during regular business hours (EST), or send an e-mail to info@allerair.com

Models	Prefilters	4000	5000	6000	Notes
Exec, Vocarb	Poly Prefilters	A4FMP006	A5FMP009	A6FMP012	packs of 4 or 8
DS Models	Tacky Prefilters	A4FMPS06	A5FMPS09	A6FMPS12	packs of 10
MCS Models	Cotton Prefilters	A4FCP016	A5FCP019	A6FCP022	packs of 6

*Please use the above part numbers when ordering your replacement parts

REPLACING UV BULB AND BALLAST

NOTE: ALWAYS UNPLUG UNIT FROM POWER SOURCE BEFORE PERFORMING ANY MAINTENANCE.

Step 1
Turn the unit off and **unplug it.** Gently turn it over and lay it upside down.

Step 2
Using a #2 Philips screwdriver, remove the four screws that hold the base onto the unit.

Step 3
Gently grasp the wheels, and remove the lid by pulling gently.

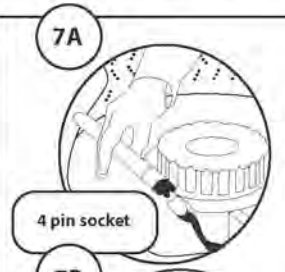
Step 4
Remove the felt pad.

Step 5
Removing Filters
Remove the filter(s) according to the indicated directions.

Carbon Filters

HEPA Filters

Step 6
Remove the three screws in the filter end plate. and remove the end plate.

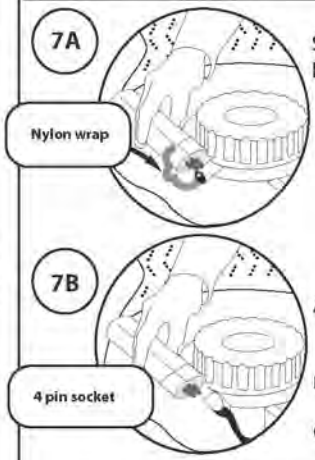


Step 7
For a 10-watt Bulb:

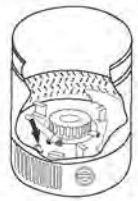
A. Unplug the four-pin socket from the bulb.

B. Loosen the wing nut that holds the bulb in place.

C. Carefully remove the bulb.



Step 7
For a 20-watt Bulb:



A. Carefully cut the band of nylon that holds the UV bulb in place. For shipping purpose only

B. Unplug the four-pin socket.

C. Carefully remove the bulb.

Step 8
Place the new bulb in the holder. Make sure it is horizontal. Make sure it is not touching any of the other components.

Step 9
Replace the four-pin socket.

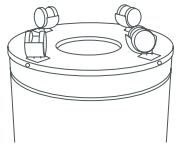
Step 10
Replace the filter end plate. Replace the screws, filter(s) and bottom with the 4 screws.

AllerAir Industries Inc. Toll free: 1-888-852-8247 / Fax: 1-877-688-2193 www.allerair.com

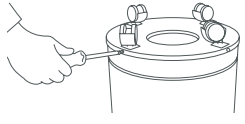
A Message for the Client

FILTER ASSEMBLY D, DS and DX

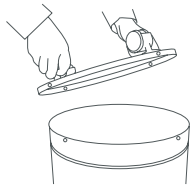
The model you have selected is shipped in 2 separate boxes to protect certain components. The filter comes in one box, and the outer shell of the unit, containing the motor and the fan, comes in another. Filters must be installed before turning the unit on in order for it to work. AllerAir technicians recommend removing the base, installing the filter, and replacing the base according to the following steps:



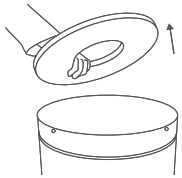
Step 1
Make sure the unit is set to "**Off**," and **unplug it**. Lay the unit upside down, so that the wheels face up.



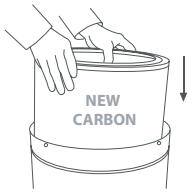
Step 2
Using a #2 Philips screwdriver, remove the four screws that hold the base onto the unit.



Step 3
Grasp the wheels. Remove the base by pulling gently on the wheels.

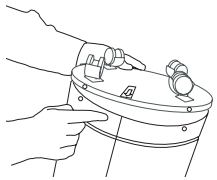


Step 4
Reach inside the unit, and remove only **1** of the **2** felt pads.

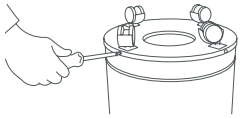


Step 5
Gently insert the carbon filter (either a Model D, DS or DX Carbon) into the unit, either end

Step 6
Put back the felt pad removed in **STEP 4**.



Step 7
Replace the base, making sure the arrow on the gold sticker lines up with unit's rear seam.

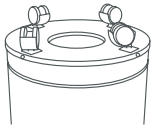


Step 8
Replace the four screws.

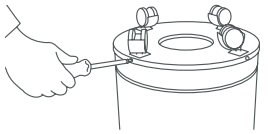
Step 9
Turn the unit back onto its wheels. It is now ready for use.

AllerAir Industries

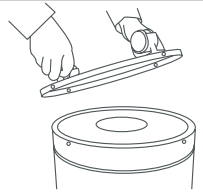
REPLACING HEPA AND/OR CARBON FILTERS



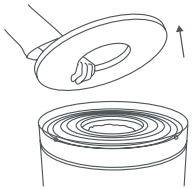
STEP 1
Make sure the unit is set to **"off"** and the unit is **unplugged**. Place the unit upside down, so that the wheels face up.



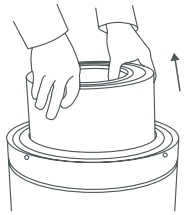
STEP 2
Using a #2 Philips screwdriver, remove the four screws that hold the base onto the unit.



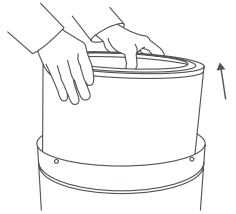
STEP 3
Grasp the wheels. Remove the base by pulling gently on the wheels



STEP 4
Reach inside the unit, and remove felt pad.

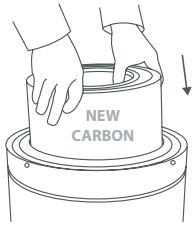


STEP 5
First, **remove** the carbon filter. (pull up gently by placing thumbs on the inner side of the filter)



STEP 6
Then, **remove** the HEPA filter with the same technique.

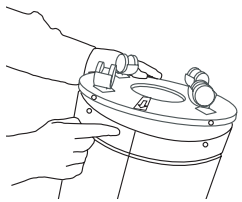
STEP 7
Now, **place** the new HEPA filter into the unit.



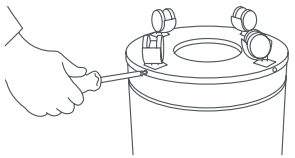
STEP 8
Then, **place** the new carbon filter into the unit.

See page 5 for instructions on replacing carbon filling.

Step 9
Put back the felt pad removed in **STEP 4.**



Step 10
Replace the base, making sure the arrow on the gold sticker lines up with unit's rear seam.



Step 11
Replace the four screws.

Step 12
Turn the unit back onto its wheels. It is now ready for use.

AllerAir Industries Inc. Toll free: 1-888-852-8247 / Fax: 1-877-688-2193 www.allerair.com

HEPA & CARBON FILTERS ORDER GUIDE

These replacement filters will extend the life of your AllerAir unit. Please be sure to follow the instructions for changing the filters in your unit.

We recommend changing pre-filters every two months, HEPA filters every three to five years, and carbon filters every two years.

Order Reference Numbers

Please use the numbers in the chart when placing your order.
Call AllerAir at 1-888-852-8247 during regular business hours (EST)
or send an e-mail to info@allerair.com

HEPA Filter Order Guide

Models	4000	5000	6000
Exec, Vocarb	A4FH0411	A5FH0411	A6FH0411
MCS		A5FH0420	

NOTE: Please use the above part numbers when ordering your replacement parts

Microparticulate Electrostatic Filter Order Guide

Models	4000	5000	6000
D Models	A4FMR002	A5FMR002	A6FMR002
DX Models			
DS Models			
MCS Models			

NOTE: Please use the above part numbers when ordering your replacement parts
This is the filter that wraps around any D, DX, DS or MCS D carbon filter.

Replacement Carbon Filter Order Guide*

Models	4000	5000	6000
Exec Models 2"**	A4FCB320	A5FCB320	A6FCB320
Exec Models 2.5"**	A4FCB325	A5FCB325	A6FCB325
Vocarb Models 2"**	A4FCB220	A5FCB220	A6FCB220
Vocarb Models 2.5"**	A4FCB225	A5FCB225	A6FCB225
D Exec Models 3"	A4FCB330	A5FCB330	A6FCB330
D Vocarb Models 3"	A4FCB230	A5FCB230	A6FCB230
DX Exec Models 3.5"	A4FCB335	A5FCB335	A6FCB335
DX Vocarb Models 3.5"	A4FCB235	A5FCB235	A6FCB235
DS Models 3"	A4FCB620	A5FCB620	A5FCB620
MCS Models 2"	A4FCB120	A5FCB120	A6FCB120

*Please use the above part numbers when ordering your replacement parts.
If you have ordered a special blend of carbon in the past please let us know about it when ordering the replacement
**Please refer to your carbon filter depth when ordering a replacement

AllerAir Industries

REFILLING THE CARBON CANISTER

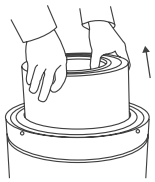
Your AllerAir unit contains a refillable carbon filter. You may choose to refill it* or simply purchase a new filter.

Tools required:
Philips screwdriver, garbage bag large enough to hold all of the old carbon, rubber mallet.

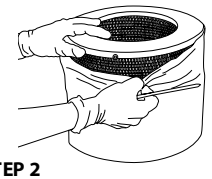
*** Note while cost-effective, refilling the canister will produce dust and black residue.**

AllerAir makes a special funnel to evenly refill carbon filters.

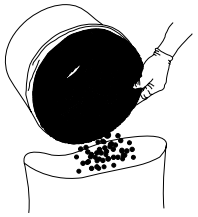
Call 1-888-852-8247 during regular business hours (EST) or e-mail to order.



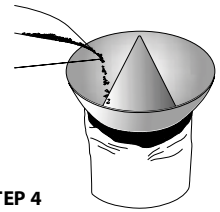
STEP 1
Remove the carbon filter from the unit by pressing thumbs against the inner rim and pulling up.



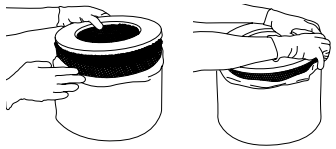
STEP 2
Gently pull back the pre-filter to access the four screws at the top of the filter. Remove the screws with a Philips screwdriver and take off the lid of the filter.



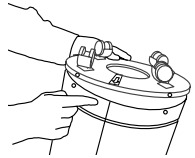
STEP 3
Discard all of the old carbon. Pour it into a garbage bag of adequate size and tie the bag shut.



STEP 4
Pour in the new carbon, using a funnel if desired. As you pour, tap the sides of the filter with the rubber mallet to help settle the carbon granules.



STEP 5
When the filter is full, replace the lid and its screws. Adjust the pre-filter, and gently slide the filter back into the unit.



STEP 6
Replace the felt gasket. Replace the base of the unit. Align the arrow on the gold sticker with the unit's seam, and replace the four screws with a Philips screwdriver.

Order Reference Numbers

Empty Carbon Canisters Order Guide*

Models	4000	5000	6000	Notes
2" Canister**	A4FC0501	A5FC0501	A6FC0501	Exec and Vocarb; MCS models
2.5" Canister**	A4FC1501	A5FC1501	A6FC1501	Exec and Vocarb models
D Models	A4FC0503	A5FC0503	A6FC0503	
DX Models	A4FC1503	A5FC1503	A6FC1503	

*Please use the above part numbers when ordering your replacement parts. Please consult the Bulk Carbon Order Guide
**Please refer to your carbon filter depth when ordering a replacement

Bulk Carbon Order Guide*

Models	4000	5000	6000	Notes
Exec Mix	AM000911	AM000911	AM000911	
Vocarb Mix	AM000912	AM000912	AM000912	
Tobacco Smoke Mi	AM000901	AM000901	AM000901	
MCS Mix	AM000912	AM000912	AM000912	
Special Blend Mix	please call			

*Please use the above part numbers when ordering your replacement parts

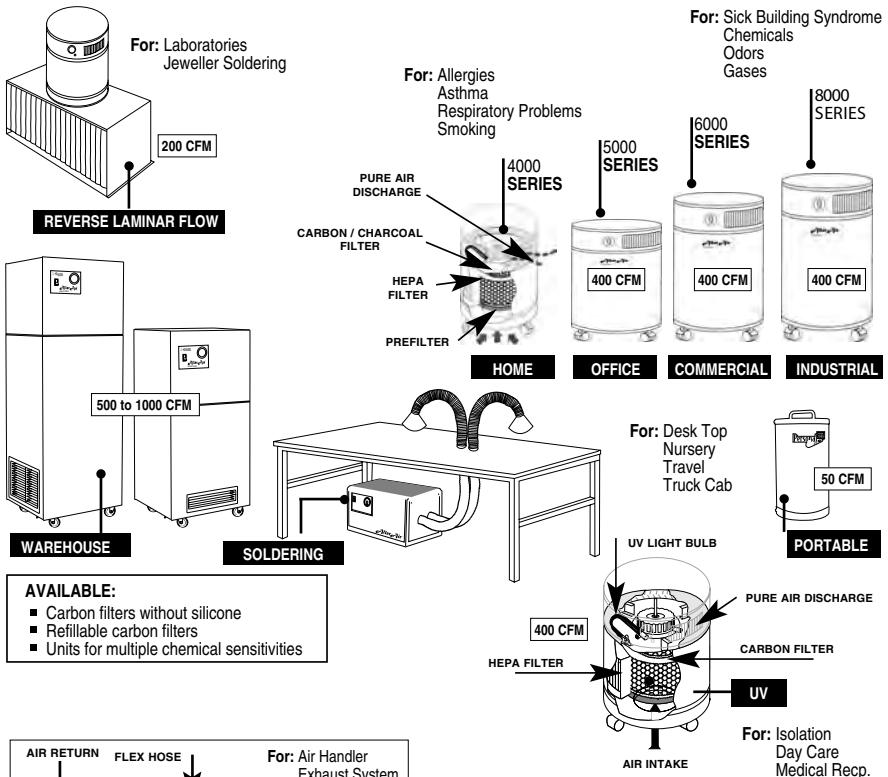
AllerAir Industries Inc. Toll free: 1-888-852-8247 / Fax: 1-877-688-2193 www.allerair.com

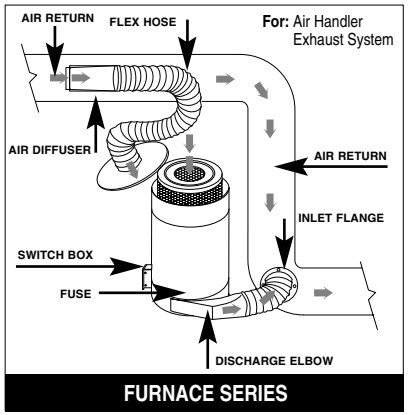
AIR SOLUTIONS
Toll Free : 1-888-852-8247
Fax : (450) 688-3939

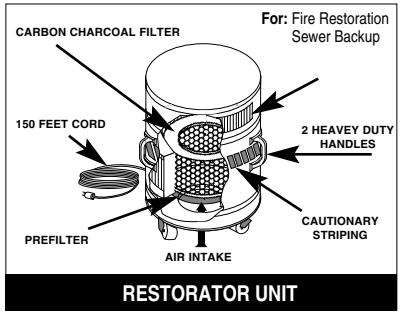
Check out other AllerAir products

Serious Purification Systems (Over 80 Models Available)

* Air flow from 50 to 5000 CFM







I-6500 Series

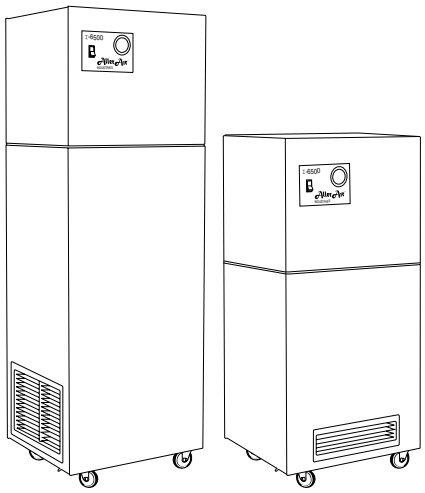
Operations & Maintenance Manual

Manufactured

_____

Serial number

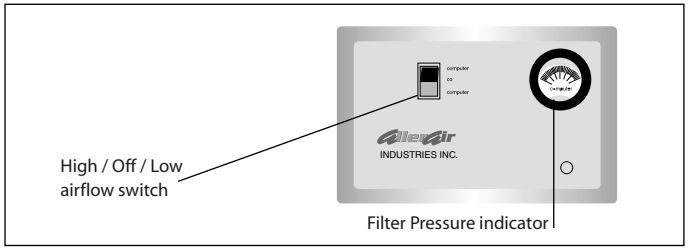
_____



I-6500 A I-6500 B & C

Important Notice: This unit is not designed for use in a flammable applications.

10.2 Control Panel Layout — I-6500 SERIES



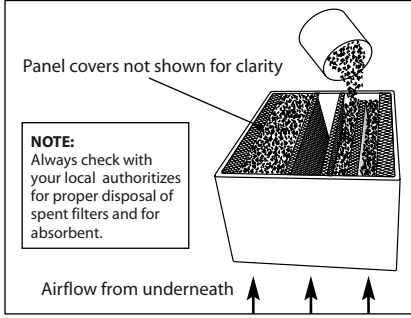
10.3 Terminal Strip Connections

(ON CONTROL PANEL IN **I-6500**)

CONTROL PANEL SIDE

1	• 120v Main Power Supply, black
2	• 120v Main Power Supply, green
3	• 120v Main Power Supply, white
4	• empty
5	• empty
6	• empty
7	• Motor low, red
8	• Motor high, black
9	• Motor neutral, white
10	• Motor ground, green

10.4 Filter Holding Module



The Carbon Assembly is a perforated metal container, engineered to provide maximum air contact with the chemical filters.
An added feature of the carbon filter is the removalbe panel cover running the full depth of the unit for ease of filter loading.

I-6500
AIR SOLUTIONS
AllerAir Industries

4.0 System Components

CABINET

Attractive appliance finish, designed to blend in with any decor.
The **I-6500** system is mounted on recessed casters for ease of portability.

FILTERS

- Ashrae-rated dust filters.
- DOP-rated high efficiency HEPA filters.
- Specially selected particulate and chemical filtration based on local chemical pollutants.

BLOWER ASSEMBLY

The blower is factory balanced and tested to ensure quiet and vibration-free operation.
The blower in the **I-6500** features a motor mounting system designed to reduce vibration.

CONTROL PANEL

Recessed control panel is designed for easy monitoring.
Features include two position on/off switch and visual pressure indicator.

GRILLES

Strategically located intake and discharge grilles will ensure proper air current and air patterns in the selected environment.

PLUG

Eight-foot grounded extension cord for easy placement.

4.1 Unit Specifications

Model	I-6500 A	I-6500 B-C
Air Flow:	1000 CFM (nominal)	1000/700/500 CFM
Dust Filters:	# 65HF0412, (2) only	# 65HF0412
HEPA Filter:	# 65HF0411, (1) only	# 65HF0411
Chemical Filter Assembly:	# 65FCC311, (1) or (2), EXEC	# 65FCC311 (1)
Anti Microbial:	# 65FH0414, (1) only	# 65FH0414 (1)
Dimensions:	Height: 70"	48"
	Width: 21"	21"
	Length: 24 1/2"	24 1/2"
Voltage:	120/1/60	120/1/60
Maximum Power Consumption:	390 watts	390 watts
Maximum Current:	5.4 amps	5.4 amps
Approximate Weight:	250 to 340 lbs.	175 to 250 lbs.

5.0 Unit Receiving Instructions

5.1 Unit Inspection

Upon receipt, inspect unit for either visible or concealed damage.
Damage shoud be immediately reported to the transport company.

The **I-6500 B-C** units are delivered to you in the following combinations:

- **I-6500 B**
  1000 CFM - 80 lb. carbon filter - Anti-microbial pre-filter.
  Optional feature: 2" x 24" x 12" HEPA filter
  or 20" x 24" x 12" HEPA filter, 2" carbon filter.
- **I-6500 C**
  750 CFM - 80 lb. carbon filter - Anti-microbial pre-filter.
  Optional feature: 20" x 24" x 12" HEPA filter, 2" carbon filter.

Optional feature:
specialized absorbents (ask for cost)
UV bulb (ask for cost)

The **I-6500 A** units are delivered to you in one of three ways:

- **Particulate Application:**
  Unit contains four particulate filters mounted within the unit. 1 - Dust filter, 1 - 60% Mini pleat, 1 - HEPA 99.97% down to 0.3, and 1 - Anti-microbial filter.
- **Heavy Duty Odor Application:**
  Unit contains two particulate filters mounted in the unit. The one or two chemical absorbent assemblies are shipped loose in two cardboard boxes on top of the unit.
- **Normal Dust and Odor Applications:**
  Uit contains a HEPA particulate filter and one odor filter in a cardboard box on top of the unit. Two dust pre & post filters.

5.2 Pre Start-up Checklist

Note: Carbon canister is sent in a seperate box and must be installed.

- Open lower door insert the carbon filter canister (1) or (2) with the rubber gasket down.
- Lables and serial numbers are present for future identification.
- Verify that the power supply is compatible with the equipment (120-volt / 15 amps / a phase / 60 hz). Also check that the unit is plugged into a grounded receptacle.
- Ensure that unit-mounted casters are tight and secure before manoeuvring the system.

6.0 Start-Up

- Place unit on a flat surface, ensure all filters are installed (see Equipment Installation and Filter Maintenace Guide on face of unit).
- Ensure that supply and return air grilles are not obstructed in any way (air circulation patterns will be inhibited if airflow is obstructed).
- Insert male end of cord into 15-amp circuit.
  Unit should be connected to an indepentent 15 amp circuit.
- Turn power toggle switch to " HIGH" position and to verify that system is operating properly. Do the same in "LOW" position.
- Pressure gauge should read between 0.5 and 1.1 with filters in place.

WARNING: DO NOT OPERATE THE UNIT UNLESS ALL FILTERS ARE IN PLACE.

9.0 Warranty

AllerAir Industries warrants its equipment to be free from defect in material and workmanship under normal use and service for a period of one year from date of shipment. **AllerAir**'s obligation under this warranty shall be limited to replacing any parts, thereof, which shall be demonstrated to have been defective. This is expressly in lieu of all other warranties, express or implied, including the warranties of merchantability and fitness.
AllerAir claims no warranty as to merchantability or as to the fitness of merchandise for any particular use and shall not be liable for any loss or damage. No person, firm or corporation is authorized to assume for **AllerAir** any other liability in connection with the sale of these good. Equipment, parts and material manufactured by others and incorporated in **AllerAir**'s equipment are warranted by **AllerAir** only to the extent of the original manufacture's liability to **AllerAir Industries Inc.** Expendables are not warranted for any period of time.

Conditions and Limitations:
This warranty does not cover abuse, misuse, maintenance negligence, improper assembly, acts of vandalism, acts of God, fear wear, modifications of the equipment or installation of a part not recommended by **AllerAir Industires Inc.**, as well as operation of the equipment at voltages other than those specified by **AllerAir Industries Inc.**

9.1 Toxic Gas Adsorbent Purifier

AllerAir Model I-6500 room air purifier is designed to scrub the toxic exhaust gas in a 2000 to 3500 cubic foot room. The **AllerAir Model I-6500** room air purifier is provided with installation andoperation instructions.
The **Allerair Model I-6500** room air purifier includes replaceable filter elements with an activated carbon bed fro chemical gas and odor removal; a centrifugal blower is housed in a sandstone gas tight cabinet enclosure.

10 Spare Parts, Drawings and Schematics

10.1 Spare Parts

Qty:	Description:
1	Control Panel Assembly
1	Pressure Gauge
1	Toggle Switch
1	Fuse
1	Blower / Motor Assembly
4	Fan Isolators
2	Dust Filters
1	Mini Pleat
1	HEPA Filter
1/2	CFT Housing
1/2	Intake Grille
1	Discharge Grille
4	Casters

1.0 Introduction

You are now the owner of an **I-6500 SERIES** unit, an advanced effective indoor air purifier. You may now expect a noticeable improvement in your air quailty as your **I-6500 SERIES** begins the process of reducing microscopic airborne particulate as well as harmful chemical gases, smoke, dust and pollen.

2.0 Safety Precautions

- Carefully read all the instructions contained in this manual before operating the unit.
- Keep this manual as it contains information for proper operations and maintenance.
- Keep all fastening hardware tight to ensure that the unit is in safe working condition.
- Familiarize yourself with the way in which filters are removed, installed, and serviced.
- **CAUTION:** All filters must be in place whenever this machine is in operation and doors closed. Operating it with one or more filters missing, the door open, and/or inferior filters in place will cause amperage to increase and the motor to over load. Permanent damage could result.
- Use only on a grounded electrical circuit; do not use a two-wire electrical prong adapter to defeat the three-pronged plug on the end of the cord. Unit must be grounded
- When servicing, be careful when touching the exterior of the motor as soon as it has been turned off; it may be hot enough to be painful or cause injury. With modern motors, this condition is normal when operated at rated load and voltage, as they are built to operate at higher temperatures.
- **Do not substitute any other filters (particulate or chemical) for those supplied as this will alter the design characteristics.**
- **DO NOT SERVICE MOTOR OR CONTROL PANEL UNLESS UNIT IS UNPLUGGED FROM RECEPTACLE (ITS POWER SUPPLY) !**

3.0 Principles of Operation

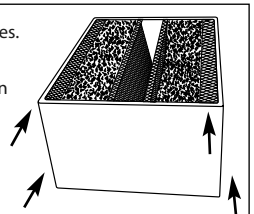
- The **I-6500** features a threefold method of operation:
  - A) Capture general particulate.
  - B) HEPA filter removes microscopic particulate matter.
  - C) Chemically adsorbs, reacts or scrubs toxic or nuisance gases.
- This unit is supplied with an eight-foot extension cord and two 360 degree swivel casters.
- FILTER SEQUENCE HAS BEEN SPECIALLY SELECTED FOR YOUR APPLICATION.

I-6500
AIR SOLUTIONS
AllerAir Industries

10.4 Filter Holding Module

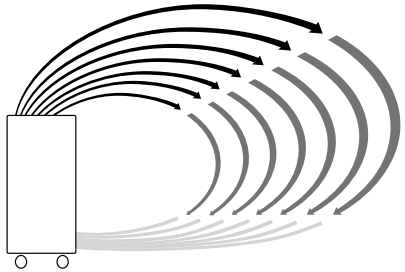
- (1) or (2) Filter Holding Modules.
- Slide into unit as per drawing.
- Please ensure airflow direction arrows on label are pointing up.

NOTE:
Attach panel covers on filter canister before inserting into unit.

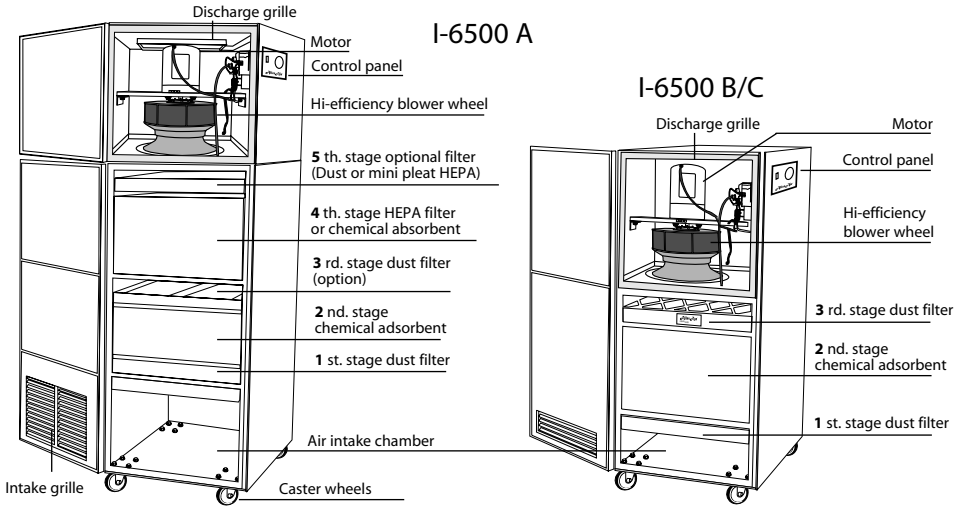


Slide into I-6500 this way.
Airflow from underneath

10.5 Room Airflow Patterns



10.6 General Equipment Layout



10.7 Troubleshooting Guide

Symptoms:	Possible Cause:	Suggested Solution:
Unit will not start	• Faulty Power Supply • Return orsupply grille blocked • HEPA filter improperly installed • Blown fuse • Unite not plugged into receptacle	• Check breaker box • Remove obstruction • See Section 7.2 • Replace fuse • Plug unit in
Excessive noise	• Blower wheel contacting cone • Fan isolators loose or off	• Realign / Replace wheel • Replace isolator
Insufficient airflow	• Obstruction in system • Clogged filters	• Remove obstruction • Replace filters
Excessive airflow	• Filters not in place	• Install filters

7.3 Unit Inspection

Heavy Duty Odor Applications
It is essential that the chemical filters be replaced approximately once every twelve months OR immediately following any detection of odor on the discharge of the system.

After an operating period of twelve months (or when the fitlers are consumed), call your authorized distributor to purchase a new set of chemical filtration assemblies prior to removal of existing filter / or replacement odor absorbent.

To replace CF Filtration Assemblies (Part NO.: 65FC0500):

- Ensure that the unit is unplugged.
- Opendoor with appropriate tool to avoid stripping of screws.
- Slide out existing Carbon Filtration Assemblies from the unit. (See diagram at bottom of last page).
- Remove newly purchased Filtration Assemblies from teh box shipped in.
- Vacuum exterior of new Filtration Assemblies with bristle attachment to remove excess dust and to prolong the life of the dust and HEPA filters.
- Reinsert new Filtration Assembly back into the system (ensure airlow arrows are pointing up, see diagram on last page of this manual).
- Return door to the closed position and verify that an airight seal is maintained.
- Place onsumed Filtration Assembly directly into reusable carboard box.
  NOTE: It is advised to replace dust filters after replacing Carbon filter.

To refill existing Carbon filter cell with new odor absorbent:

- Slide out existing Carbon filters (see diagram on last page of manual).
- Unscrew the two (2) top panel covers and lift off cover.
- Pour out used odor absorbent **(This procedure may be dusty, therefore a dust mask is recommended).**
- Refill Carbon containers with fresh odor absorbent.
- Replace the 2 panel covers and re-insert into unit as per diagram on last page of manual.
  NOTE: It is advised to replace dust filters upon replacing the Carbon filter.

7.4 CF Assembly Maintenance

Light Duty Odor Applications
Filters used in Light Duty Odor Applications are very simple to maintain. When it is time to replace filter, remove used Filters Assembly from the unit and discard.
Replace with new Filters Assembly by sliding filter into proper slot.

7.5 Blower Maintenance

WARNING:
SWITCH UNIT OFF AND UNPLUG POWER CORD FROM WALL BEFORE SERVICING THE BLOWER.
The motor is equipped with electric motor grade double shielded ball bearings and a special lubricant, assuring long life and quiet operation. No extra motor maintenance required.

7.6 Annual General Inspection

- The sealing integrity of the **I-6500** essential. Every 12 months, verify that all gaskets are in proper condition. Should the door gaskets adhere slightly to the unit when opening a door, lubriate its sureface with a transparent grease or petroleum jelly.
- Should the unit be relocated continuously for optimum efficiency, ensure casters are tightly fastened.

8.0 Operation

The air is drawn into the unit through an intake grille located in the side inlets on the B-C series.
The air then passes through the various stages of particulate and odor/gas filtration.
Powered by a 120-volt motor/blower assembly, the clean air is then released throug the top discharge grille into the controlled space.

8.1 Controls

For your convenience, the **I-6500 Series** is equipped with a pressure gauge recessed within the control panel to allow for a visual indication of filter pressure.
IN THE EVENT OF HIGH FILTER PRESSURE (15" TO 1.6 WC), CALL YOUR AUTHORIZED DISTRIBUTOR IMMEDIATELY TO REPLACE YOUR FILTERS.
In case control panel servicing is required, and electrial schematic is located in this manual.

8.2 Positioning of Unit

Portability was taken into consideration when designing the system. Mounted on four casters, the unit can be wheeled virtually anywhere in the room for optimal convenience. The unit is designed in an up-flow configuration allowing the air to create a "sweeping" effect across the room (see **Airflow Patterns Drawing** at the back), moving across the room in a downward motion. the clean air pushes particulate and gaseous matter towards the floor level and draws it into the intake grille located on the lower door. This configuration allows the particulate which have already accumulated on the ground to be pulled towards the return air grille. This results in a very effective means of cleaning the space.

The **I-6500 Series** is more efficient as it is placed closer to its intended source. Conversely, the unit's efficiency is dimished the further it is placed from the source of pollutants. The unit can be conveniently positioned against a wall. The back of the unit must be placed at least 2" away from the wall such that the power cord remains free flowing. It has been designed so that all servicing is accessed through the front of the unit. The **I-6500 Sereis** has been uniquely designed for a throw of up to forty feet.

8.3 I-6500 Filter Combinations

Heavy duty dust and chemical odor solution

I-6500 A

1000 CFM

Standard Equipment
2 Anti-microbial pre-filters
20" x 24" x 12" HEPA filter
80 lb. carbon filter
OR
20" x 24" 2" HEPA filter
160 lbs. of carbon

Specialized absorbents available (ask for cost)

Heavy duty chemical odor or particulate solution

I-6500 B

1000 CFM

Standard Equipment
Anti-microbial pre-filters
80 lb. carbon filter
Optional Feature
20" x 24" 2" HEPA filter
($129.98 extra)
OR
20" x 24" 2" HEPA filter
2" carbon filter

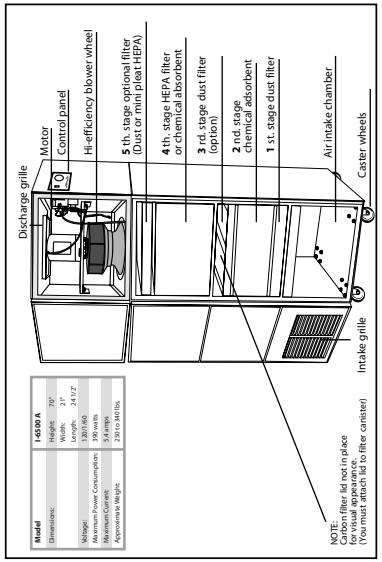
Economical particulate solution

I-6500 C

750 CFM

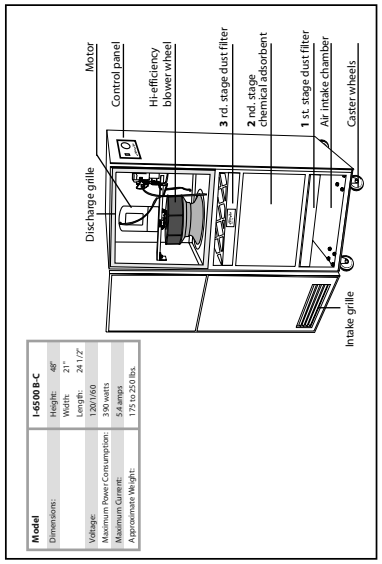
Standard Equipment
Anti-microbial pre-filters
80 lb. carbon filter
Optional Feature
20" x 24" 2" HEPA filter
($129.98 extra)
OR
20" x 24" 2" HEPA filter
2" carbon filter

I-6500 A



Model	I-6500 A
Dimensions:	Height: 30" Width: 21" Length: 24 1/2"
Voltage:	120/1/60
Maximum Power Consumption:	390 watts
Maximum Current:	5.4 amps
Approximate Weight:	230 to 340 lbs.

I-6500 B / I-6500 C



Model	I-6500 B-C
Dimensions:	Height: 48" Width: 21" Length: 24 1/2"
Voltage:	120/1/60
Maximum Power Consumption:	390 watts
Maximum Current:	5.4 amps
Approximate Weight:	175 to 250 lbs.

7.0 Equipment Maintenance Procedures

Proper maintenance is critical to extend the life of the filtration system. The information presented below outlines basic maintenance procedures to ensure the **I-6500** units will provide trouble-free operation for years to come. The **I-6500** is designed to allow quick access to the particulate filters, chemical filters, blower/motor and control panel assemblies.

7.1 General Filter Maintenance

It is very difficult to predetermine a specific maintenance schedule as the rate of dust loading and chemical filter consumption will vary for each application. Periodic inspection of the filters and pressure gauge during the first few months of operation should help establish an appropriate replacement schedule.

AllerAir Industries, through its years of experience has established the following recommendations for a "typical" replacement fitler schedule:

IT IS VERY IMPORTANT TO CHANGE FILTERS ON A REGULAR BASIS.

Filter Type	Part No.:	Qty:	Suggested Replacement
Dust Filters		1	Every two-three months
Chemical Filters		1 or 2	Every six to twelve months
HEPA Filter		1	Every twelve months
Anti-microbial		1	Every two-three months

7.2 Particulate Filter Replacement

- Open with appropriate tool to avoid stripping of screws.
- Carefully slide out filters along their support channels (see diagram in back of manual).
- Slide clean filters gently into place.
- Ensure Dust Fitlers are replaced with mesh screening on the upper side.
- If encountering difficulties, confirm that there are no obstructions in the filter track.
- HEPA filters should be replaced if the filter gauge on the control panel exceeds 1.5 - 1.6".
- Large HEPA filters will be installed with gaskets facing down on the filter track.
- Outmost care must be taken not to damage the exposed portions of the HEPA filter.

Please read and save these instructions. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.

Dayton® Regulators

Refer to Form 555306 for General Safety Information and Warranty

Description

Dayton air pressure regulators are self-relieving, high capacity, heavy-duty units designed for commercial/industrial applications. These regulators provide high flow with minimum pressure drop (deviation between set pressure and actual outlet pressure).

General Safety Information

Air line regulators are utilized in a variety of air system applications. Because the air line regulator and other components (compressor, spray gun, filters, lubricators, hoses, etc.) make up a high pressure pumping system, the following safety precautions should be observed at all times.

1. Read the instruction manuals for each component carefully before attempting to assemble, disassemble, or operate your particular system.
2. Do not exceed the pressure rating of any component in the system.
3. Protect material lines and air lines from damage or puncture.
4. Never point a spray gun at oneself or any other person. Accidental discharge may result in serious injury.
5. Check hoses for weak or worn condition before each use, making certain that all connections are secure.
6. Release all pressures within the system before attempting to service any component.

Materials

Body: Aluminum
Bonnet: Aluminum
Valve: Brass
Elastomers: Nitrile
Bottom plug: Acetal

Installation

1. Shut OFF air pressure. Install regulator in air line with air flow in direction of arrow on body, upstream of lubricators and cycling valves, as close as possible to the device being serviced, at any angle.
2. Connect piping to proper ports using pipe thread sealant on male threads only. Do not allow sealant to enter interior of regulator.
3. Install a pressure gauge or plug the gauge ports. Gauge ports can also be used as additional outlets for regulated air.
4. Install a Dayton air line filter upstream of the regulator.

Operation (See Figure 2)

1. Before applying inlet pressure to regulator, turn adjustment (Ref. Nos. 1 or 18) counterclockwise to remove all force on regulating spring (Ref. No. 6).
2. Apply inlet pressure, then turn adjustment clockwise to increase and counterclockwise to decrease pressure setting.
3. Always approach the desired pressure from a lower pressure. When reducing from a higher to a lower setting, first reduce to some pressure less than that desired, then bring up to the desired pressure.
4. Knob Adjustment: Push knob down to lock pressure setting. Pull knob up to release.
5. T-HANDLE Adjustment: Tighten lock nut (Ref. No. 19) to lock pressure setting.

Disassembly (See Figure 2)

1. Regulator can be disassembled without removal from air line.
2. Shut OFF inlet pressure. Reduce pressure in inlet and outlet lines to zero.
3. Turn adjustment fully counterclockwise.
4. Disassemble in general accordance with the item numbers on Figure 2.

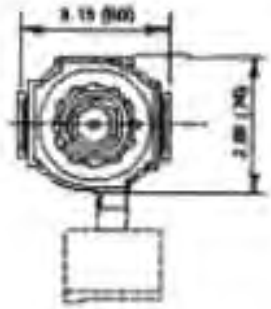
Cleaning (See Figure 2)

1. Clean parts with warm water and soap.
2. Rinse and dry parts. Blow out internal passages in body with clean, dry compressed air.
3. Inspect parts. Replace those found to be damaged.

Assembly (See Figure 2)

1. Lubricate o-rings, bore in bottom plug (Ref. No. 9), valve stem (Ref. No. 14), adjusting screw threads and tip (Ref. Nos. 1 & 18) and the outer circumference and both sides of the thrust washer (Ref. No. 4) with a light coat of good quality o-ring grease.
2. Assemble the unit as shown on Figure 2.

Torque Table Ref. No	Inch Pounds (N·m)
2, 21 (Screw)	25 to 35 (2.8 to 3.9)
9 (Bottom plug)	20 to 30 (2.3 to 3.4)



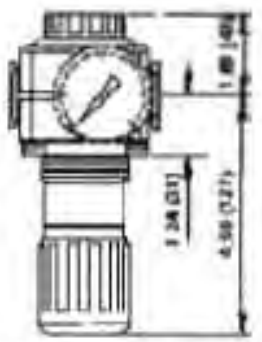


Figure 1. Dimensions in inches (mm)

Specifications

Max Inlet Press	Temp Range*	Max CFM**	Main Ports	Gauge Ports	Pressure Adjustment Range	Wt. (lbs)
300 psi	0 to 175°F	100 cfm	3/8"	1/4"	5 to 150 psi	1.80
300	0 to 175	100	1/2	1/4	5 to 150	1.77
300	0 to 175	100	3/4	1/4	5 to 150	1.73

* Air must be dry enough to avoid ice formation below +35°F.
** At 100 psi inlet pressure, set pressure of 90 psi, and a 15 psi pressure drop.

Printed in U.S.A.
04/10
05B5/145AC/PVP

Dayton®

ENGLISH ESPAÑOL FRANÇAIS

ENGLISH

For Repair Parts,
call 1-800-323-0620
24 hours a day - 365 days a year
Please provide following information:
- Model number
- Serial number (if any)
- Part description and number as shown in parts list

ESPAÑOL

Para obtener repuestos,
en EE.UU. llame al 1-800-323-0620
en México llame al 95-800-527-2331
Servicio permanente, 24 horas al día al año
Por favor proporciónenos la siguiente información:
- Número de Modelo
- Número de Serie (si lo tiene)
- Descripción de la Parte y Número que le Corresponde en la Lista de Partes

FRANÇAIS

Pour des pièces de rechange,
composez le 1-800-323-0620
24 heures sur 24, 365 jours par année
S'il vous plaît fournir les informations suivantes :
- Numéro de modèle
- Numéro de série (s'il y en a un)
- Description de la pièce et son numéro sur la liste

Address parts correspondence to:
Envíe correspondencia relacionada con pedidos de partes a:
Correspondance :

Grainger Parts
P.O. Box 3074
1657 Shermer Road
Northbrook, IL 60065-3074 U.S.A.

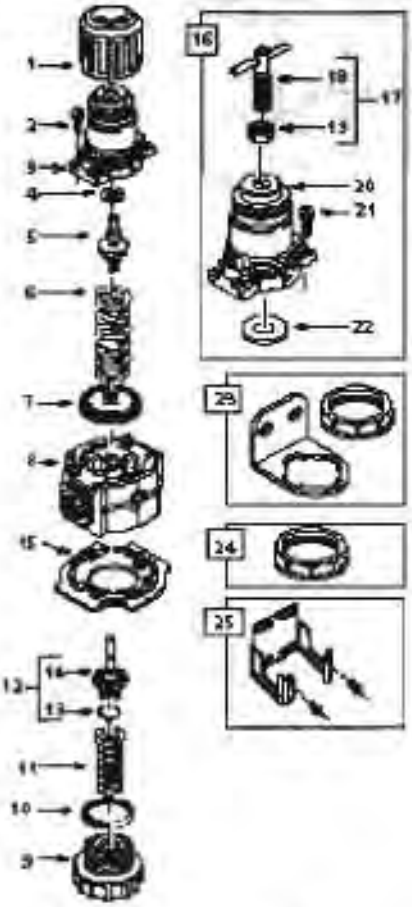


Figure 2 / Figura 2 / Figure 2

Repair Parts List / Lista de partes de repuesto / Liste des pièces de rechange

Reference Number	English Description	Español Descripcion	Français Description	Part Number No. de parte N° de pièce	Qty
1	Knob	Perilla	Poignée	4307-89	1
2	Screw	Tornillo	Vis	9PM5-12	4
3	Bonnet	Sombrerete	Bonnet	4305-89	1
4	Washer	Arandela	Rondelle	5183-05	1
5	Adjusting screw	Tornillo de ajuste	Vis de réglage	5330-50	1
6	Regulating spring	Resorte de regulación	Ressort de régulation	4332-02	1
7	Diaphragm	Diafragma	Diaphragme	4309-50 ▲	1
8	Body	Cuerpo	Corps	■	1
9	Bottom plug	Tapón inferior	Bouchon du dessous	4327-89	1
10	O-ring	Anillo O	Joint torique	2306-23 ▲	1
11	Valve spring	Resorte de válvula	Ressort de clapet	4205-05 ▲	1
12	Valve assy	Unidad de válvula	Montage de clapet	4308-50 ▲	1
13	O-ring	Anillo O	Joint torique	2305-13 ▲	1
14	Valve	Válvula	Clapet	▲	2
15	Bottom cover	Cubierta inferior	Capuchon du dessous	4336-89	1
16	T-handle kit	Juego de empuñadura en T	Trousse pour poignée en T	4ZK33	1
17	T-handle assy	Unidad de empuñadura en T	Montage pour poignée en T	1094-11	1
18	T-handle	Empuñadura en T	Poignée en T	■	1
19	Nut	Tuerca	Écrou	5837-01	1
20	Bonnet	Sombrerete	Bonnet	■	1
21	Screw	Tornillo	Vis	9PM5-12	4
22	Spring rest	Descanso del resorte	Support de ressort	5287-88	1
23	Wall bracket & panel nut	Apoyo empotrado y tuerca de tablero	Support mural et écrou pour panneau	4ZK50	
24	Panel nut	Tuerca de tablero	Écrou pour panneau	4ZK49	
25	Universal wall bracket	Apoyo empotrado universal	Support mural universel	4ZK42	
▲	Service kit	Juego de servicio	Trousse d'entretien	4381-700	

(■) Not Available as a Repair Part. (■) No disponible como una parte reemplazable. (■) Non offert en pièce de rechange.

Torque Chart

Part Name	Torque Value in Inch–Pounds	Torque Value in Newton–Meters
terminal block screws	10 ± 2	1.1 ± 0.2
socket head screw	15 – 20	1.7 – 2.3
center screw	5 ± 1	0.6 ± 0.1

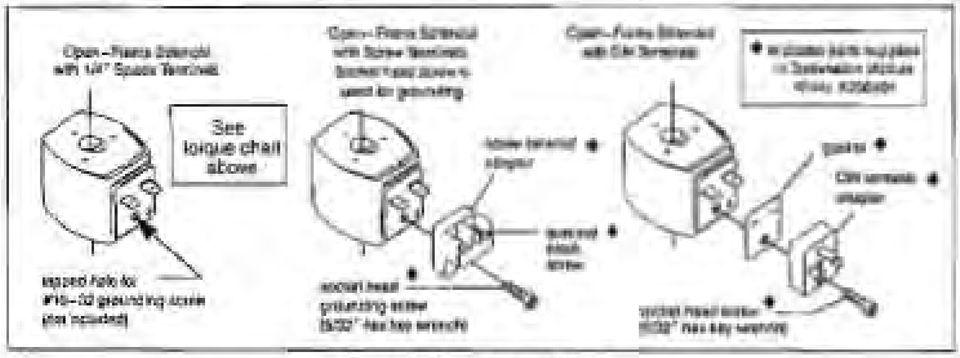


Figure 4. Open–frame solenoids

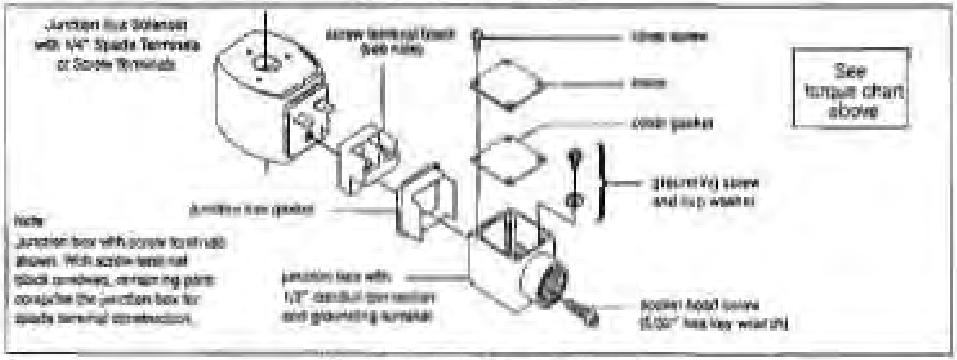


Figure 5. Junction box (optional feature)

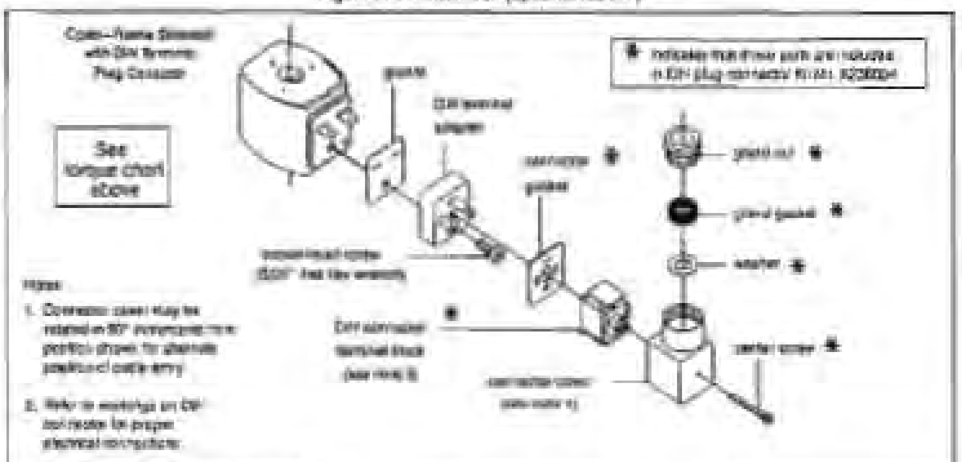


Figure 6. DIN plug connector kit No. K236034 (optional feature)

Installation & Maintenance Instructions

ASCO Red-Hat II®

OPEN–FRAME, GENERAL PURPOSE, WATERTIGHT/EXPLOSIONPROOF SOLENOIDS

SERIES 8003G 8202G

Form No. V6584R8

— SERVICE NOTICE —

[illegible]

See separate instructions for basic valve.

DESCRIPTION

[illegible]

NOTE: [illegible]

[illegible]

Series 8003G and 8202G solenoids are available in:

- Open–Frame Construction: [illegible] 1/4" spade, screw or DIN terminals. (Refer to Figure 4.)
- Panel Mounted Construction: [illegible]

Optional Features For Type 1 – General Purpose Construction Only

- Junction Box: [illegible]
- DIN Plug Connector Kit No. K236034: [illegible]

OPERATION

[illegible]

INSTALLATION

[illegible]

⚠ WARNING: Electrical hazard from the accessibility of live parts. To prevent the possibility of death, serious injury or property damage, install the open – frame solenoid in an enclosure.

FOR BLACK ENCLOSURE TYPES 7 AND 9 ONLY

⚠ CAUTION: [illegible]

NOTE: [illegible]

⚠ CAUTION: [illegible]

Temperature Limitations

[illegible]

Temperature Limitations For Series 8003G or 8202G Solenoids for use on Valves Rated at 10.1, 11.6, 17.1, or 22.6 Watts			
Watt Rating	Catalog Number Coil Prefix	Class of Insulation	Maximum † Ambient Temp.
10.1 & 17.1	None, FB, FT, KF, SC, SD, SF, & SP	F	125°F (51.7°C)
10.1 & 17.1	HB, HT, KB, KH, SS, ST, SU	H	140°F (60°C)
11.6 & 22.6	None, FB, KF, KB, SC, SD, SF, & SP	F	104°F (40°C)
11.6 & 22.6	HF, HT, KB, KH, SS, ST, SU, & SV	H	104°F (40°C)

† Minimum ambient temperature −40° F (−40° C)

Positioning

[illegible]

Wiring

[illegible]

[illegible]

▲ CAUTION: Cryogenic Applications – Solenoid lead wire insulation should not be subjected to cryogenic temperatures. Adequate lead wire protection and routing must be provided.

Additional Wiring Instructions For Optional Features:

- Open–Frame solenoid with 1/4" spade terminals.

[illegible]

- Junction Box

[illegible]

- DIN Plug Connector Kit No. [illegible]

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]

NOTE: [illegible]

5. [illegible]
6. [illegible]

NOTE: Alternating current (AC) and direct current (DC) [illegible] Contact ASCO.

Installation of Solenoid

[illegible]

Installation of Panel Mounted Solenoid (See Figure 1)

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]

Solenoid Temperature

[illegible]

MAINTENANCE

▲ WARNING: To prevent the possibility of death, serious injury or property damage, turn off electrical power, depressurize solenoid operator and/or valve, and vent fluid to a safe area before servicing.

Cleaning

[illegible]

Preventive Maintenance

- [illegible]
- [illegible]
- [illegible]

Causes of Improper Operation

- Faulty Control Circuit: [illegible]
- Burned–Out Solenoid: [illegible]
- Low Voltage: [illegible]

Solenoid Replacement

1. [illegible]

NOTE: [illegible]

2. [illegible]

- Spade or Screw Terminals

[illegible]

NOTE: [illegible]

- Junction Box

[illegible]

- DIN Plug Connector

[illegible]

3. [illegible]
4. [illegible]

NOTE: Series 8202G solenoids have a spacer between the nameplate/retainer and solenoid.

5. [illegible]
6. [illegible]
7. [illegible]

Disassembly and Reassembly of Solenoids

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]
6. [illegible]

ORDERING INFORMATION FOR ASCO SOLENOIDS

[illegible]

Torque Chart

Part Name	Torque Value Inch–Pounds	Torque Value Newton–Meters
solenoid base sub–assembly & adapter	175 ± 25	19,8 ± 2,8
pipe adapter	90 maximum	10,2 maximum

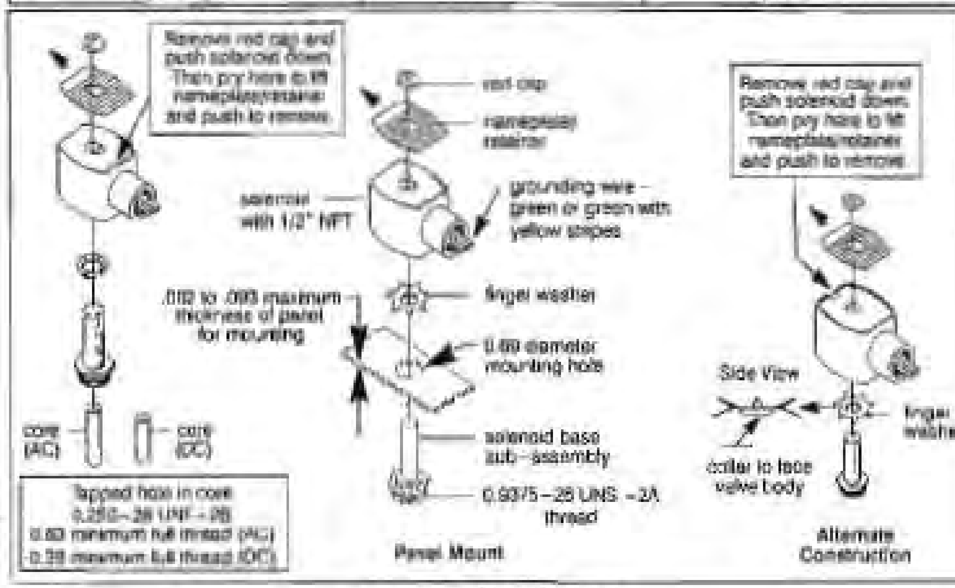


Figure 1. Series 8003G solenoids

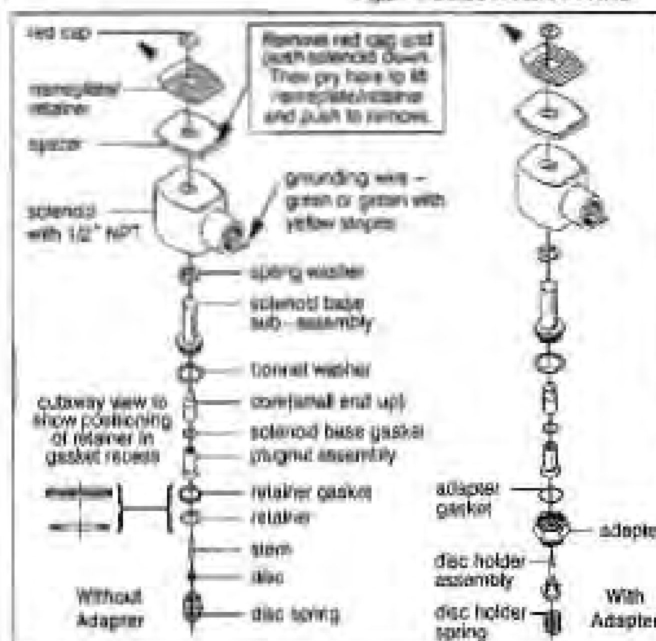


Figure 2. Series 8202G solenoids

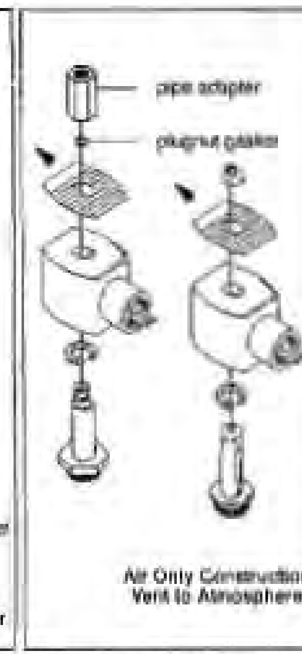
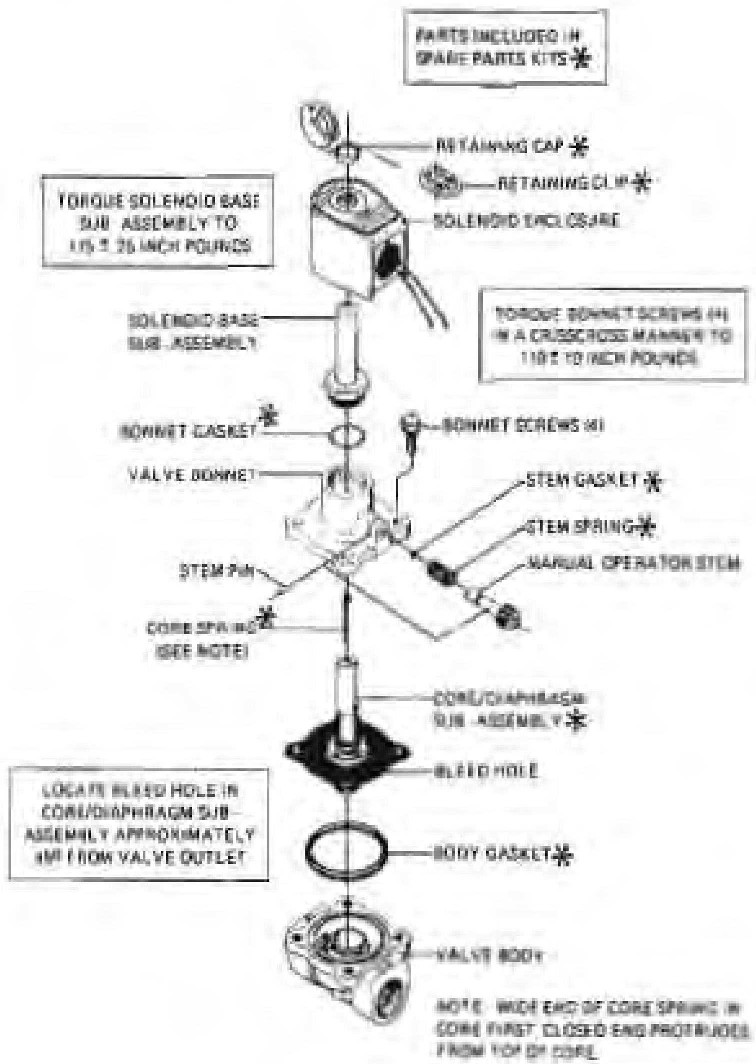


Figure 3. 3–Way Construction



Bulletin 8210 — Manual Operator
General purpose solenoid enclosure shown.
For explosion proof/watertight solenoid enclosure used on Bulletin 8211, see Form No. [illegible]

Figure 1

Installation & Maintenance Instructions

2-WAY INTERNAL PILOT-OPERATED SOLENOID VALVES
HUNG DIAPHRAGM — 3/8, 1/2 AND 3/4 NPT
NORMALLY CLOSED OPERATION

BULLETIN 8210 8211
Form No. V5825R1

DESCRIPTION

[illegible]

OPERATION

[illegible]

MANUAL OPERATOR (Optional)

[illegible]

MANUAL OPERATOR LOCATION (Refer to Figure 3)

[illegible]

INSTALLATION

[illegible]

TEMPERATURE LIMITATIONS

[illegible]

Construction	Coil Class	Catalog Number Prefix	Maximum Ambient Temp. °F	Maximum Fluid Temp. °F
A-C Construction (Alternating Current)	A	None or DA	77	180
	F	DF or FT	122	180
	H	HT	140	180
D-C Construction (Direct Current)	A, F or H	None, FT or HT	77	150
Catalog Numbers Suffixed "HW" A-C Construction (Alternating Current)	A	None or DA	77	180
	F	DF or FT	77	200
	H	HT	122	200

POSITIONING/MOUNTING

[illegible]

PIPING

[illegible]

WIRING

[illegible]

SOLENOID TEMPERATURE

[illegible]

MAINTENANCE

[illegible]

CLEANING

A periodic cleaning of all solenoid valves is desirable. The time between cleanings will vary, depending on service and ambient conditions. In general, if the voltage to the valve and the pressure differential across the valve are correct, sluggish valve operation, excessive valve leakage or noisy valve indicate that cleaning is required.

PREVENTATIVE MAINTENANCE

1. Keep the maximum filtering through the valve as free from dirt and foreign material as possible.
2. While in service, operate valve at least once a month to ensure proper opening and closing.
3. Periodic inspection (depending on media and service conditions) of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. Replace any parts that are worn or damaged.

IMPROPER OPERATION

1. Faulty Control Circuit: Check electrical system by energizing solenoid. A audible click signifies the solenoid is operating. Absence of the click indicates loss of power supply. Check for blown fuse, open circuit, burned or grounded coil, broken lead wires or splice connections.
2. Burned-Out Coil: Check for open circuited coil. Replace coil if necessary.
3. Low Voltage: Check voltage across coil leads. Voltage must be at least 85% of nameplate rating.
4. Incorrect Pressure: Check valve pressure. Pressure to the valve must be within range specified on nameplate.
5. Excessive Leakage: Disassemble valve and clean all parts. Replace worn or damaged parts with a complete Spare Parts Kit for best results.

COIL REPLACEMENT (Refer to Figure 2)

Turn off electrical power supply and disconnect coil leads. Proceed in the following manner:

1. Remove retaining clip or clip, nameplate and cover. CAUTION: When removing clip disengages, it will spring upwards.
2. Remove spring washer, insulating washer and coil. Insulating washers are omitted when a molded coil is used.
3. Reassemble in reverse order of disassembly paying particular attention to exploded view provided for identification and placement of parts.

CAUTION: Solenoid must be fully reassembled so the housing and its internal parts are part of and complete the magnetic circuit. Place insulating washer at each end of coil if required.

VALVE DISASSEMBLY (Refer to Figures 2 and 3)

Depressurize valve and turn off electrical power supply. Proceed in the following manner:

1. Remove retaining clip or clip and clip the cover upward and remove all the solenoid base sub-assembly. CAUTION: When manual retaining clip disengages, it will spring upwards.
2. Unscrew solenoid base sub-assembly and remove bonnet gasket.
3. Remove valve bonnet screws (4) and valve bonnet.
4. Pressure-assisted operation: It is not necessary to disassemble the manual operator bonnet feature unless external leakage is present. To disassemble, loosen hex nut, manual operator screw, screw o-ring and valve gasket.
5. Remove core spring, core/diaphragm sub-assembly and body gasket. CAUTION: Do not damage or distort flanged spring between core/diaphragm sub-assembly.
6. All parts are not available for cleaning or replacement. Replace worn or damaged parts with a complete Spare Parts Kit for best results.

VALVE REASSEMBLY

1. Reassemble valve in reverse of disassembly using careful attention to exploded views provided for identification and placement of parts.
2. Replace body gasket and core/diaphragm sub-assembly. Locate the spring bulb or core/diaphragm sub-assembly approximately 45° from the valve outlet.
3. Replace core spring with wide end in core first closed end protruding from top of core.
4. If removed, replace manual operator screw, o-ring, spring, screw gasket and screw nut.
5. Replace valve bonnet and bonnet screws (4). Torque bonnet screws alternately in a crisscross manner to 110 ± 10 inch pounds.
6. Replace bonnet gasket and solenoid base sub-assembly. Fix solenoid base sub-assembly to 110 ± 20 inch pounds.
7. Replace solenoid enclosure and retaining clip or clip.
8. After reassembly operate the valve a few times to be sure of proper opening and closing.

SPARE PARTS KITS

Spare Parts Kits are available for ASCO valves.
Parts marked with an asterisk (*) are supplied in Spare Parts Kits.

ORDERING INFORMATION FOR SPARE PARTS KITS
When Ordering Spare Parts Kits or Coils Specify Valve Catalog Number Series Number and Voltage.

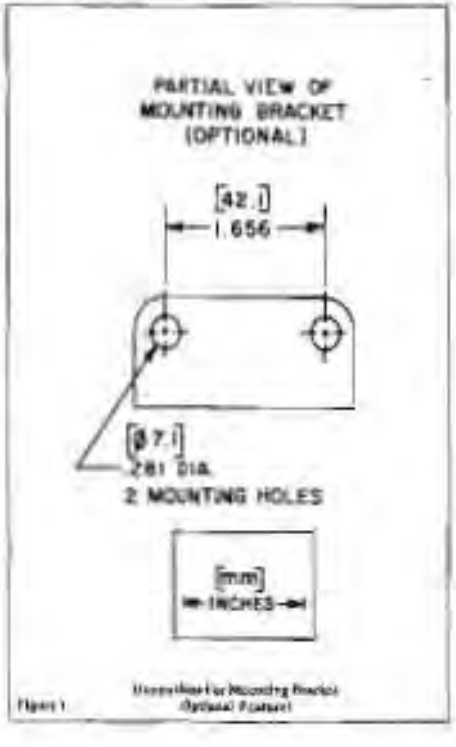


Figure 1. Dimensions for Mounting Bracket (Optional Feature)

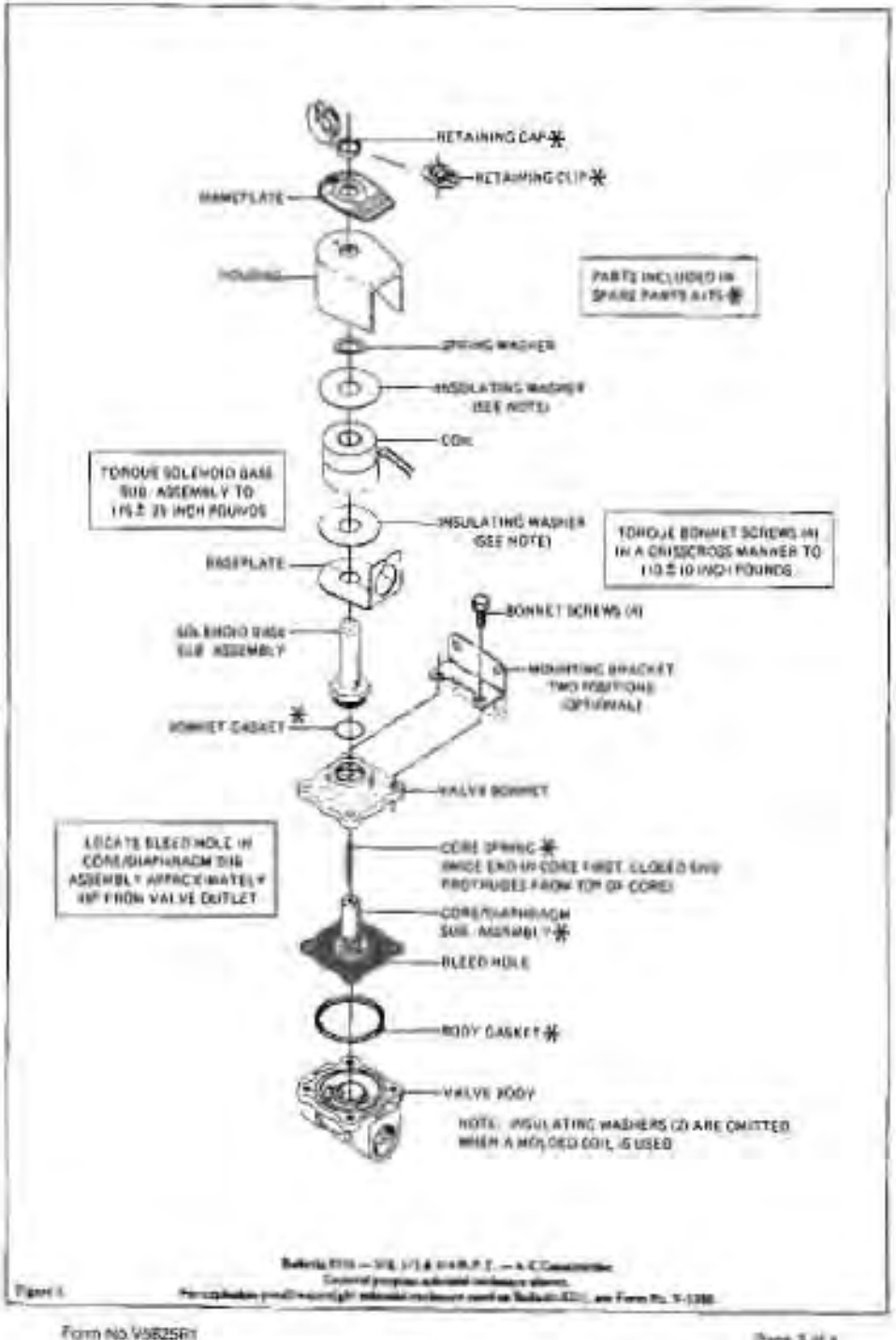
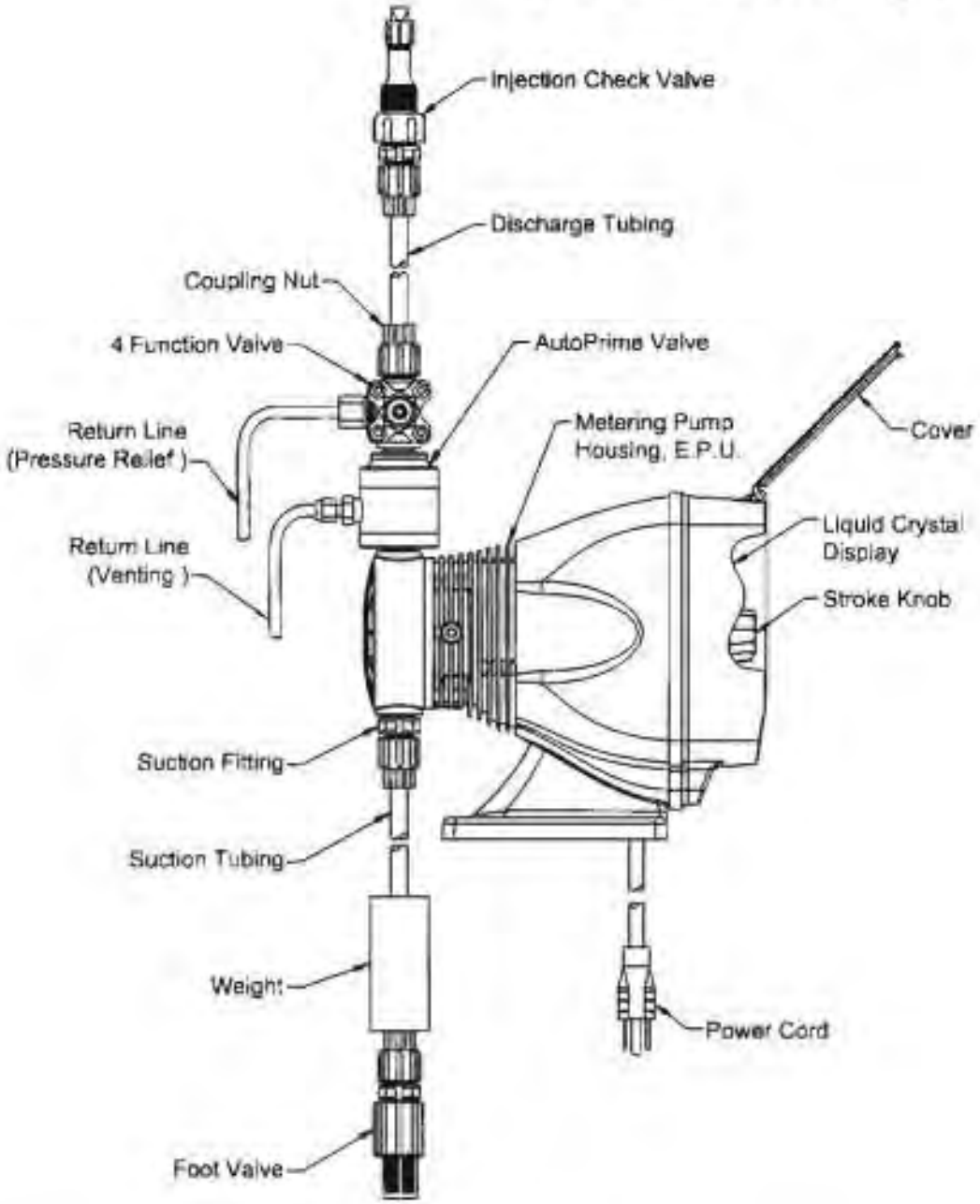


Figure 2. [illegible]

Instruction **Supplement**

Series AA9
Electronic Metering Pump



Metering Pump Component Diagram

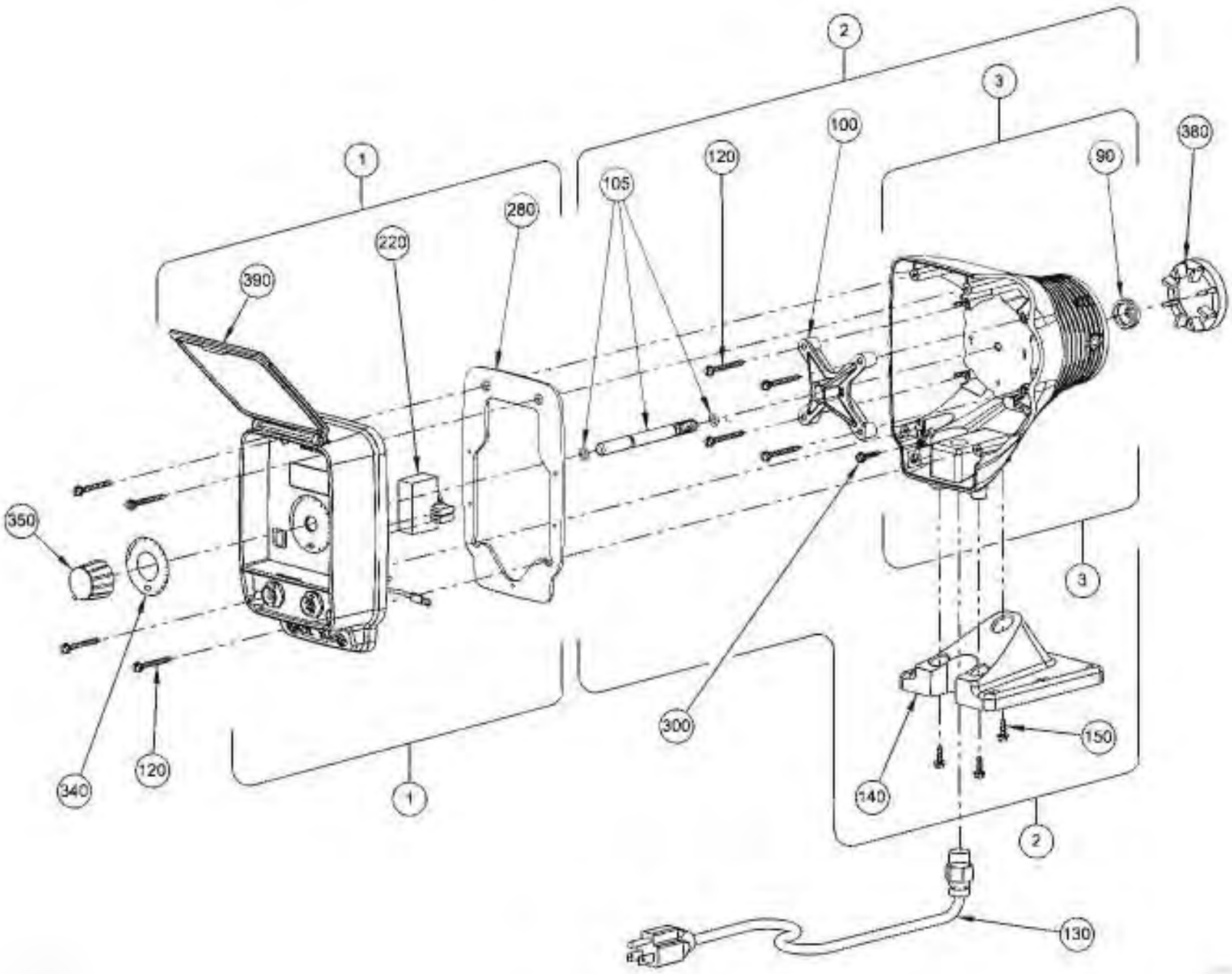
LMI
MILTON ROY

201 Ivyland Road
Ivyland, PA 18974 USA
TEL: (215) 293-0401
FAX: (800) 327-7563
http://www.lmipumps.com

ISO 9001 Certified

1976.A 08/03

Series AA9 Drive Assembly Exploded View Diagram



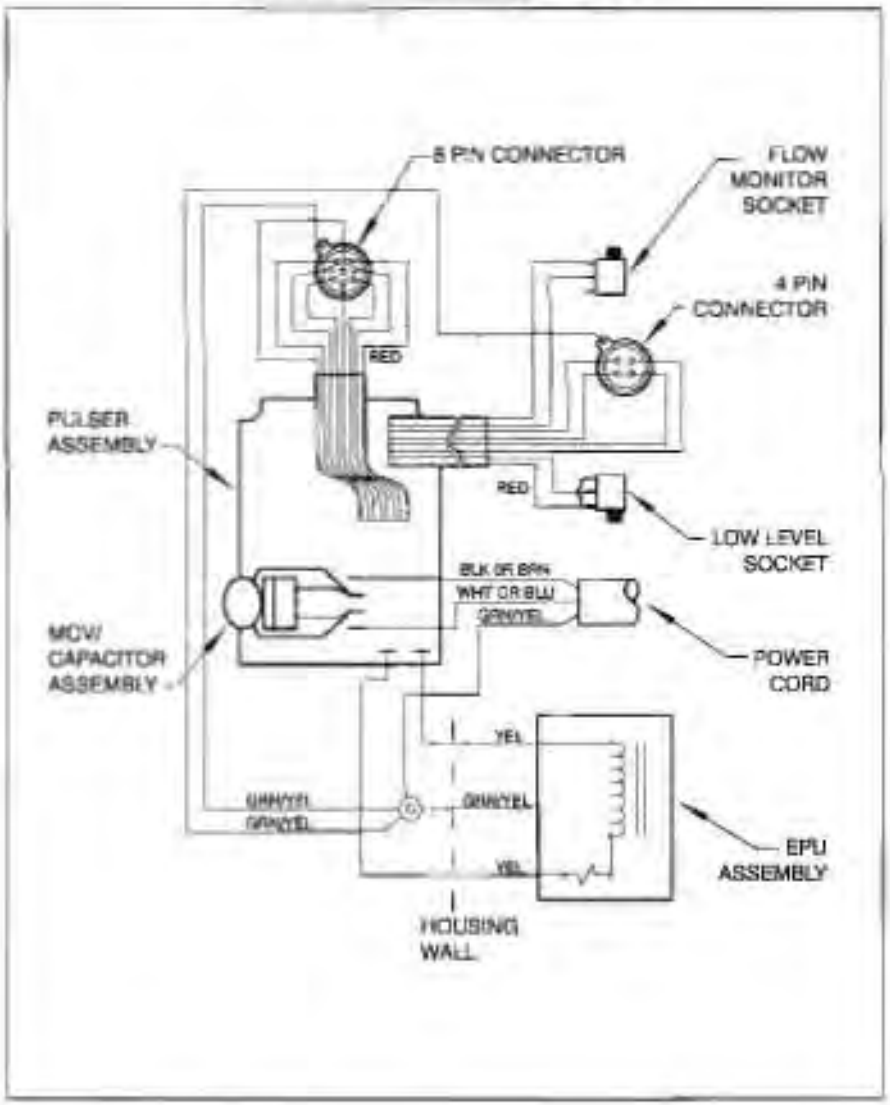
Series AA9 Drive Assembly Parts List

Key No.	Model Series	Part No.	Description	Qty
1	AA941, AA951, AA961, AA971, AA981	45018	Control Panel Assembly, 115V	1
	AA942, AA952, AA962, AA972, AA982 AA943, AA953, AA963, AA973, AA983 AA945, AA955, AA965, AA975, AA985 AA946, AA956, AA966, AA976, AA986 AA947, AA957, AA967, AA977, AA987	45019	Control Panel Assembly, 230-250V	1
2	AA941, AA951	48034	EPU w/ Stroke Adjustment, 115V	1
	AA942, AA943, AA945, AA946, AA947 AA952, AA953, AA955, AA956, AA957	48035	EPU w/ Stroke Adjustment, 230-250V	1
	AA961	48036	EPU w/ Stroke Adjustment, 115V	1
	AA962, AA963, AA965, AA966, AA967	48037	EPU w/ Stroke Adjustment, 230-250V	1
	AA971, AA981	48038	EPU w/ Stroke Adjustment, 115V	1
	AA972, AA973, AA975, AA976, AA977 AA982, AA983, AA985, AA986, AA987	48039	EPU w/ Stroke Adjustment, 230-250V	1
3	AA941, AA951	48025	EPU, 115V	1
	AA942, AA943, AA945, AA946, AA947 AA952, AA953, AA955, AA956, AA957	48026	EPU, 230-250V	1
	AA961	48027	EPU, 115V	1
	AA962, AA963, AA965, AA966, AA967	48028	EPU, 230-250V	1
	AA971, AA981	48029	EPU, 115V	1
	AA972, AA973, AA975, AA976, AA977 AA982, AA983, AA985, AA986, AA987	48030	EPU, 230-250V	1
90	AA9	10973	Seal	1
100	AA9	38886	Stroke Adjustment Bracket	1
105	AA9	48012	Stroke Adjustment Shaft Assembly	1
120	AA9	41227	Screw	8

Key No.	Model Series	Part No.	Description	Qty
130	AA941, AA951, AA961, AA971, AA981	29033CE	Power Cord Assembly, 115V	1
	AA742, AA752, AA762, AA772, AA782	29039CE	Power Cord Assembly, 230V US	1
	AA743, AA753, AA763, AA773, AA783	29042CE	Power Cord Assembly, 230V DIN	1
	AA745, AA755, AA765, AA775, AA785	29044CE	Power Cord Assembly, 240V UK	1
	AA746, AA756, AA766, AA776, AA786	29046CE	Power Cord Assembly, 250V AUST	1
	AA747, AA757, AA767, AA777, AA787	29048CE	Power Cord Assembly, 230V SWISS	1
140	AA9	37879	Foot	1
150	AA9	38199	Screw	3
210	AA9	10422	Retaining Ring	1
220	AA741, AA751, AA761, AA771, AA781	35254	MOV and Capacitor Assy, 115V	1
	AA942, AA952, AA962, AA972, AA982 AA943, AA953, AA963, AA973, AA983 AA945, AA955, AA965, AA975, AA985 AA946, AA956, AA966, AA976, AA986 AA947, AA957, AA967, AA977, AA987	35255	MOV and Capacitor Assy, 230-250V	1
250	AA9	39887	Gasket	1
300	AA9	41244	Screw	1
340	AA76	30374	Stroke Dial	1
	AA77	29269	Stroke Dial	1
	AA78	29268	Stroke Dial	1
350	AA9	31690	Stroke Knob Assembly	1
360	AA74, AA77	29445	Disk, 0.5	1
	AA75, AA78	29437	Disk, 0.9	1
	AA76	29442	Disk, 1.8	1
390	AA9	37974	Cover	1

Series AA9 Control Panel Detail

Series AA9 Wiring Diagram



LMI MILTON ROY

MICROPROCESSOR PUMP – PROGRAMMING QUICK CARD

FUNCTION	PRESS		DISPLAY
ON/OFF	STOP START		INT OFF /MIN or INT 100 /MIN = OFF; INT 100 /MIN = ON
Stroke Frequency	▲ or ▼		From 100 to 0 SPM; ▼ 5 seconds for 59 to 0 SPH
Priming	STOP START	5 Sec	PRI /MIN or 60 /MIN for 1 Min
Power Control	MODE C EXT	and ▲ 3 Sec	P5 /MIN; then ▲ or ▼ from P5 to P0
Safety Lock	MODE C EXT	and ▼ 3 Sec	LOC; All functions except ON/OFF and Prime
Total Lock	MODE C EXT	and ▼ and ▲ 3 Sec	LOC; All Keys
Unlock	MODE C EXT	and ▼ 3 Sec	Cancel both Lock Modes
INT/EXT Mode	MODE C EXT	3 Sec (Pump Off)	EXT ÷ 1 /MIN or INT 100 /MIN
EXT Mode Change	MODE C EXT	and STOP START 5 Sec	EXT ÷ 1 /MIN or EXT X 1 or mA EXT 4.0 P1

EXTERNAL MODE SETTINGS (PUMP OFF)

X or ÷ Mode	▼ or ▲	Changes Divide or Multiply value
mA Mode	▼ or ▲	PRO — Enters the Program Mode
After 3 Seconds		
Point 1 mA	▼ or ▲	mA EXT 4.0 P1 — mA value for Point 1
After 3 Seconds		
Point 1 SPM	▼ or ▲	EXT 0 P1 /MIN — Stroke Frequency value for Point 1
After 3 Seconds		
Point 2 mA	▼ or ▲	mA EXT 20.0 P2 — mA value for Point 2
After 3 Seconds		
Point 2 SPM	▼ or ▲	EXT 100 P2 /MIN — Stroke Frequency value for Point 2

In mA Programming Mode, each line remains on display 5 seconds after the last key pressed.

ISO 9001 Certified — LMI MILTON ROY — ISO 9001 Certified

Replaces same of Rev A 1/96
1757.B 6/96

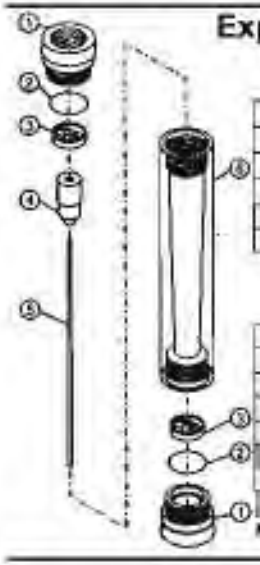
CODE	ALARMS AND ERRORS
E1	Low Level Alarm(With optional 29190 Level Switch)
E2	Flow Alarm (With optional FM-200-9 Series)
E3	Stroke Frequency > 100 SPM (+ Mode Overpulse Protection)
E4	Batch Accumulating Error (x Mode Overpulse Protection)
E5	Excessive mA Signal > 21 mA

ADVANCED PROGRAMMING MENU

Access: ⩓ **to 100 SPM, hold** ⩓ **for 5 seconds**

	DISPLAY		Change with ⩓ or ⩔
	X.X	Software Revision	
	1 0	Batch Accumulate	0 = Disable — 1 = Enable
	2 0	Computer Interface	0 = Disable — 1 = Enable
	3 1	Automatic Voltage Compensation	0 = Disable — 1 = Enable
	4 0	Flow Monitoring	0 = Disable — 1 = Enable
	008	Missing Pulse Level	0 to 255 If Flow Monitoring is Enabled
	6 15	Input Pulse Width	Each Unit = 4 mS 15 = 60 mS
	7 0	Blowdown Solenoid	0 = Disable — 1 = Enable
	0 15	Blowdown ON Time (seconds)	0 to 255 If Blowdown Solenoid is Enabled
	0 10	Pump ON Time (seconds)	0 to 255 If Blowdown Solenoid is Enabled
	Back to Normal Operation		

Exploded View and Parts List



F-400 Parts List 1/4", 3/8" and 1/2" FPT

Item	Catalog	Description	Amount
1	F-4019	1/4" FPT Adapter PP	2
1	76000-709	3/8" FPT Adapter PP	2
1	76000-707	1/2" FPT Adapter PP	2
2	90003-119	O-ring, 127, Viton	2
3	F-4005	Wire holder, 1/4" PSF	2
4		Float	1
5	F-4004	Guide Wire, .125 x 8.5 SS	1
6		Meterbody	1

F-410 Parts List 3/4" and 1" FPT

Item	Catalog	Description	Amount
1	F-4009	3/4" FPT Adapter PP	2
1	F-4011	1" FPT Adapter PP	2
2	F-4010K	O-ring, 127, Viton	2
3	F-4013PP	Wire holder, .75 - 1.0 PP	2
4		Float	1
5	F-4004	Guide Wire, .125 x 8.5 SS	1
6		Meterbody	1

Note: Shaded items (float and meterbody) are not sold separately

Maintenance

The "Exploded View" drawing illustrates assembly of the F-400N series meter. If your flowmeter needs to be cleaned refer to this drawing when reassembling the unit. The tapered tube may be cleaned with a soft bottle brush. Use a MILD soap and water solution for cleaning purposes. Hard water deposits can be removed with a 5% acetic acid solution (vinegar). Note the floats "up" position.

BLUE-WHITE INDUSTRIES LIMITED WARRANTY

FLOWMETERS are warranted to be free of defects in material and workmanship for up to 12 months from the date of factory shipment. Warranty coverage is limited to repair or replacement of the defective flowmeter only. Blue-White Industries does not assume responsibility for any other damage that may occur.

This warranty does not cover damage to the flowmeter that results from misuse or alterations, nor damage that occurs as a result of: meter misalignment, improper installation, over tightening, use of non- recommended chemicals, use of non-reccomended adhesives or pipe dopes, excessive heat or pressure, or allowing the meter to support the weight of related piping. Flowmeters are tested and calibrated with water and air only. Although meters may be suitable for other chemicals, Blue-White cannot guarantee their suitability.

Flowmeters are repaired at the factory only. Call or write the factory to receive a Return Authorization Number, carefully pack the flowmeter to be returned, including a brief description of the problem. Note the RA number on the outside of the carton.

Website: www.Blue-White.com
E-mail: Sales@Blue-White.com | Techsupport@Blue-White.com
Phone: 714-893-8529 | Fax: 714-894-0149

Blue-White Industries, Ltd

5300 Business Drive
Huntington Beach, CA 92649

Installation Instructions
F-400 & F-410

Specifications

Meter Body: Acrylic, clear

Floats: #316 Stainless Steel or Hastelloy C-276

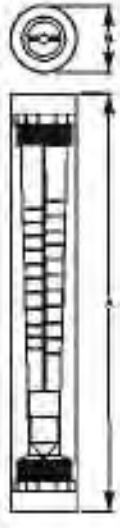
Adapters: Polypropylene with aluminum stress rings

O-Rings: Viton

Scale: Permanent Silkscreen

Max. Pressure: 150 PSIG / 10.3 BAR (see graph)

Max. Temperature: 150°F / 65.6°C (see graph)



Model	A in. (mm)	B in. (mm)
F-40250N	8-3/16" (208.0mm)	1-1/4" (31.75mm)
F-40375N	8-3/16" (208.0mm)	1-1/4" (31.75mm)
F-40376N	8-3/16" (208.0mm)	1-1/4" (31.75mm)
F-40377N	8-3/16" (208.0mm)	1-1/4" (31.75mm)
F-40500N	8-3/16" (208.0mm)	1-1/4" (31.75mm)
F-40750N	11" (279.4mm)	1-3/4" (44.45mm)
F-41017N	11" (279.4mm)	1-3/4" (44.45mm)
F-41000N	11" (279.4mm)	1-3/4" (44.45mm)

Your Blue-White® F-400 / F410 Series In-Line Flowmeter

- Your Blue-White® flowmeter was designed to be easy to install.
- Please read the Instruction Guideline on the next page before installing your flowmeter.
- This flowmeter is an instrument, special care should be taken when handling and installing.

Inspection of the Flowmeter and Compatibility

- Carefully inspect the meter for any damage that may have occurred during shipping.
- Remove the plastic tubing that has been inserted during packaging for shipping reasons.
- Make sure your pressure, temperature, fluid and other requirements are compatible with the meter before installation.
- The maximum temperature capability decreases as the pressure increases. The max PSI decreases as the temperature increases. See the chart on the following page.
- Although the meter may be suitable for other chemicals, Blue-White® meters are tested with water and air only. If you are unsure of the meters compatibility with your chemical, please consult the factory.
- **Blue-White® warranties the flowmeter for use with air and water only.**

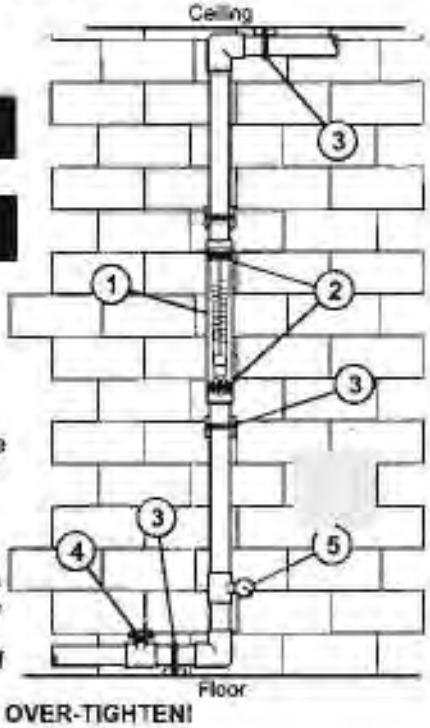
Blue-White Industries, Ltd

Installation Guideline

Please use the following steps to guide you through the installation.

Caution: Follow these steps to avoid failure.

Danger: *Wear eye protection when installing or removing the flowmeter.*



1. The flowmeter must be installed in an exact vertical plane to ensure accuracy.

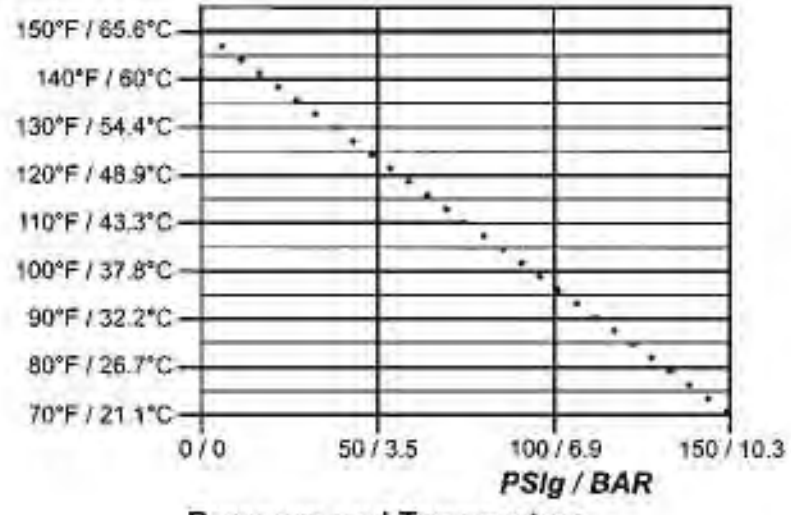
2. Use Teflon® tape (or similar) on all pipe threads. Acrylic and other exotic plastics cannot tolerate PVC Glue and/or pipe dope. Even fumes can cause crazing. If you are installing your flowmeter to a glued pipe installation, install the flowmeter *after* all glued fittings are dried and lines are purged of all fumes. Never hold the meter with pliers or like tools. **DO NOT OVER-TIGHTEN!**

3. Wall, floor and ceiling mounts are to be carefully aligned and sturdy. Wall, floor and ceiling supports are recommended as needed. This is to maintain pipe alignment and to prevent vibration.

4. Valves - **Avoid a system that will impose a sudden burst of flow to the meter.** Such a burst will cause the float to impact the float stop with destructive force which may damage the flowmeter. Solenoid valves, or other quick opening valves cannot be used unless meter is protected against sudden bursts of flow. (If necessary a surge chamber should be installed. This will also be useful in high pressure start-up situations) The flowmeter is not warrantied against this type of damage.

5. Maximum working pressure not to exceed recommended psi at fluid temperature (see Temperature Vs. Pressure chart).

Temperature vs. Pressure



Pressure and Temperature

Pressure and temperature limits are inversely proportional. At the maximum suggested pressure the temperature should approach 70°F / 21.1°C; at the maximum suggested temperature the pressure should approach zero psi. We cannot guarantee our flowmeters will not be damaged either at or below the suggested limits simply because of many factors which influence meter integrity; stress resulting from meter misalignment, damage due to excessive vibration and/or deterioration caused by contact with certain chemicals as well as direct sunlight. These situations and others tend to reduce the strength of the materials from which the meters are manufactured.

Application Note

Flowmeters are tested and calibrated for water or air only.

Although meters may be suitable for other chemicals, Blue-White cannot guarantee their suitability. It is the responsibility of the user to determine the suitability of the flowmeter in their application.

BALL VALVE TYPE21

For the Owner and the Installing Contractor

ASAHI AV

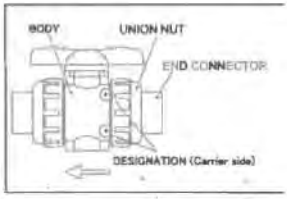
Serial No. UA-001E

User's Guide

General Operating Instructions

Warning -Be sure to conduct a safety check on the machine tools and motor-driven tools to be used, before beginning work.
-Wear protective gloves and safety goggles as fluid remains in the valve. (You may be injured.)

Caution -When installing a pipe support by means of a U-band or something similar, take care not to overtighten it. (Excessive tension may damage it.)
-Take care not to over-tighten the Union Nut. (The valve can be damaged.)
-The installed valve must never be opened or closed when foreign matter such as sand is present in the pipeline.
-When installing pipes and valves, ensure that they are not subjected to tension, compression, bending, impact, or other excessive stress.
-When installing, disassembling, or reassembling the piping, fix the End Connector.
-Fasten the Union Nut while avoiding the parallelism and axial misalignment of the flange surface.
-When connecting an ASAHI AV Valve to metal piping, take care not to let pipe stress to ASAHI AV Valve.
-When installing a piece of equipment at the end of the piping line, be sure to keep the secondary (Downstream) End Connector and Union Nut installed on the valve.
-When installing Ball Valve Type 21, 15 to 50 mm (1/2" to 2") in end of line service, note the direction of flow.
(Find the mark ◂ molded on the Carrier-side body. On the secondary (Downstream) side, the Carrier is integral with the valve body. This is the preferred method of installation when installing the equipment at the end of the line for safety purposes.)
-When loosening the cap nut on the union side, install the body cap (hold it with your hand) and perform installation accordingly. (If the body cap turns, the union will turn together, resulting in the union and ball separating from the body.) If the union is loosened, retighten the union.
-Before a water test, be sure that the Union Nut is tightly fastened.

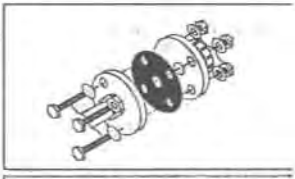


Installation Procedure

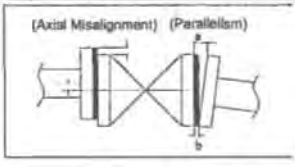
The connection method of the BALL VALVE TYPE21, there are Flanged End, Socket End, Threaded End and Spigot End. Install according to the preferred method of joining for the particular application. As for details, refer to the User's manual separately.

Flanged End

Caution -Take care not to over-tighten the Union Nut. (The valve can be damaged.)
-The parallelism and axial misalignment of the flange surface should be under the values shown in the following table to prevent damage to the valve. (A failure to observe them can cause destruction due to stress application to the pipe)
-Use flat faced flanges for connection to AV Valves.
-Ensure that the mating flanges are of the same standards.
-Be sure to use sealing gaskets (AV Gasket), bolts, nuts, and washers and tighten them to specified torques.



1. Cleaning: Confirm the flange face area is clean and free of dirt or foreign materials.
2. Set the AV gasket between the flanges. Insert washers and bolts from the pipe side, insert washers and nuts from the valve side, then temporarily tighten them by hand. Tighten the bolts and nuts gradually with a torque wrench to the specified torque level in a diagonal manner.



< Axial Misalignment and Parallelism of Flanged face > Unit: mm (inch)

Nom. Size	Axial Misalignment	Parallelism (a-b)
15 - 32 (1/2"-1 1/4")	1.0 (0.04")	0.5 (0.02")
40 - 80 (1 1/2"-3")	1.0 (0.04")	0.8 (0.03")
100 (4")	1.0 (0.04")	1.0 (0.04")

(Fig. 1)

< Recommended Torque Value > Unit: N-m {kgf-cm} [lb-inch]

Nom. Size	15, 20 [1/2"-3/4"]	25-40 (1"-1 1/2")	50, 65 (2", 2 1/2")	80, 100 (3", 4")
Torque Value	17.5 {179} [155]	20.0 {204} [177]	22.5 {230} [200]	30.0 {306} [265]

Socket End Threaded End Spigot End

1. Loosen the union nut and remove the union nut and the end connector.
2. Lead the union nut through the pipe.
3. The end connector is joined according to each joining method.

BALL VALVE TYPE21

For the Owner and the Installing Contractor

ASAHI AV

Serial No. :UA—001E

User's Guide

Read and use the information contained within these documents.

This User's Guide contains information important to the proper installation, maintenance and safe use of the BALL VALVE TYPE21 store in an easily accessable location.

Warning & Caution Signs

⚠ Warning	This remark expresses the user to take caution due to the potential for serious injury or death.
⚠ Caution	This remark expresses the user to take caution due to the potential for damage to the valve if used in such a manner.

Prohibition & Mandatory Action Signs

⊘	Prohibition: When operating the valve, this remark indicates an action that should not be taken.
❗	Mandatory action: When operating the valve, this remark indicates mandatory actions that must be adhered to.

General Information for Transportation, Unpacking and Storage

⚠ Caution ⊘

-The valve is not designed to handle any kind of impact. Avoid throwing or dropping the valve.
-Avoid scratching the valve with any sharp object.
-Do not pile up corrugated cardboard packages one on top of another.
Excessively piled-up packages may collapse.
-Avoid contact with any coal tar creosote, insecticides, vermicides or paint.
(The force of swelling may damage the valve.)

❗

-Keep the piping in the corrugated cardboard boxes, avoid direct sunlight, and store it indoors (at Room Temperature)
Also avoid storing it in a place which may become very hot.
(Corrugated cardboard packages become weaker as they become wet with water or other liquid. Keep Dry during storage and handling.)
-After unpacking the products, check that they are defect-free and meet the specifications.

Inspection Items

⚠ Caution ❗

- ☐ Check for flaw, crack, or deformation on the valve.
- ☐ Check for the smoothness of handle operation.
- ☐ Check for leaks to the outside or inside.
- ☐ Inspect the cap nut and be sure it is not loose.

General Operating Instructions

⚠ Warning ⊘

-Certain liquid such as H_2O_2, NaClO, etc may be prone to vaporization (Off-Gassing) which may cause irregular pressure increases, which may destroy the valve.
-Do not change or replace valve parts under line pressure.

❗

-Operate the valve within the pressure Vs temperature range.
(The valve can be damaged by operating beyond the allowable range.)
-Using a positive-pressure gas with our plastic piping may pose a dangerous condition due to the repellent force particular to compressed fluids, even when the gas is under the same pressure as water. Therefore, be sure to take the necessary safety precautions such as covering the piping with protective material. For inquiries, please contact us. For conducting a leak test on newly installed piping, be sure to check for leaks under water pressure. If absolutely necessary to use gas in testing, please consult your nearest service station beforehand.
-Select a valve material that is compatible with the media, refer to CHEMICAL RESISTANCE ON ASAHI AV VALVE.
(Some chemicals may damage incompatible valve materials.)

⚠ Caution ⊘

-Do not step on the valve or apply excessive weight on valve. (It can be damaged.)
-Keep the valve away from excessive heat or fire. (It can be damaged, or destroyed.)
-Do not use the valve to fluid containing slurry. (The valve will not operate properly.)
-Before opening or closing a lubricant free product, be sure to apply water.
-Do not use the valve on condition that fluid has crystallized. (The valve will not operate properly.)

❗

-Allow sufficient space for maintenance and inspection.
-Keep the valve away from places of direct sunlight, water and dust. Use cover to shield the valve.
(The valve will not operate properly.)
-Perform periodic maintenance.
(Leakage may develop due to temperature changes or changes with time during prolonged storage, rest, or operation. For inspection items, see the operation manual for each product.)

BALL VALVE TYPE21

For the Owner and the Installing Contractor

ASAHI AV

Serial No. :UA−001E

User's Guide

Socket End (Material: PVC, C-PVC)

Warning -When using an adhesive, ventilate the space sufficiently, prohibit the use of fire in the vicinity, and do not inhale adhesive vapors directly.

-If an adhesive gets into contact with your skin, wash it off immediately. If you feel sick or find any anomaly, receive a physician's diagnosis and take appropriate measures promptly.

Caution -Take care in doing work at low temperatures. Solvent vapors are hard to evaporate and are likely to remain. (Solvent cracks may occur, damaging the equipment.) After assembling the piping system, open both ends of the piping and use a fan (of the Low-Voltage Type) or something similar to ventilate the space, thus removing the solvent vapors.
-Do not apply more cement than necessary. Avoid getting cement in the internals of the valve. This can cause damage to the seals and moving parts. Solvent and fumes can chemically attack the valve materials if allowed to enter the internals of the valve. (Cementing with the valve in a vertical position should be avoided)
-Do not under any circumstances try to insert a pipe into another fitting or valve by striking it, which may break the piping.

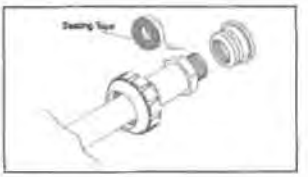
-Use Asahi AV cement Number-32, Number-52, or Number-62 for PVC and Number-88 for C-PVC in case of JIS Pipe & Fittings. The other standard Pipe & Fittings shall be used industrial proper PVC or C-PVC cement.
-Allow 24 hours for solvent cement to dry before performing a water leak test.

4. Entry of the Bench Mark: The bench mark indicates the maximum penetration depth of the pipe into the end connector.
5. Cleaning: Clean the hub part of the end connector by wiping with a waste cloth.
6. Application of adhesive: Apply adhesive evenly to the hub part of the end connector and the pipe spigot.
7. Insertion: After applying adhesive, insert the pipe quickly into the end connector and leave it alone for at least 60 seconds.
8. Insertion completion: Wipe away overflowing adhesive.

Threaded End (Material: PVC, C-PVC, PP, PVDF)

Caution -Make sure that the threaded connections are plastic x plastic. (Metallic thread can cause damage.)
-Wrap the threaded joints on our plastic piping with sealing tape. Using a liquid sealing agent or liquid gasket may cause stress cracks (Environmental Stress Cracking). Our product warranty shall not apply in case of said use, even when said use is unavoidable.
-Avoid excessive tightening. (The valve can be damaged.)

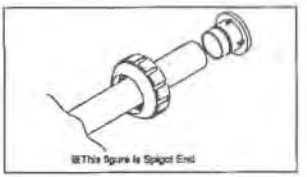
4. Preparation: The seal tape is wound to the Male threaded adapter. (2 to 3 complete wraps around the male threads are sufficient.)
5. Connection: Tighten the external thread of the joint and the end connector hand tight. Using the spanner wrench, screw in the end connector by turning 180°-360°carefully without damaging it.
6. Advance to step #9.



Socket End Spigot End (Material: PP, PVDF)

As for details, refer to the User's manual for automatic welding machine.

4. Preparation: Clean the hub part of the end connector by wiping with a waste cloth. Turn on the welding machine.
[Socket End] The bench mark indicates the maximum penetration depth of the pipe into the end connector.
5. Heating, Welding: The temperature of the heater must be confirmed with a thermometer before welding. Socket and pipe are inserted and heated for a specified time.
6. Heater removal, Connection: After the heater is removed, connect the pipe quickly to the end connector and leave it alone for a specified time.
[Socket End] Insertion to the bench mark.
7. Cooling: Allow appropriate time for cooling.
8. Cleaning: Clean the surface of the heating elements with a clean cloth.


※This figure is Spigot End.

Socket End Threaded End Spigot End

9. Make sure that O-ring(A) is mounted.
10. Tighten union nut by hand.
11. Using a strap wrench tighten union nuts uniformly on each side approx 90° -180°, 1/4 to 1/2 turns.

Signet 3719 pH/ORP Wet-Tap

English

3-3719.090 Rev G 10/06 English

- Do not exceed maximum temperature/pressure specifications.
- Wear safety goggles or face shield during installation/service.
- Do not attempt to disassemble the retraction housing and the electrode piston.
- Do not alter product construction.
- Failure to follow safety instructions may result in severe personal injury.
- Retract electrode before any pipe cleaning operation.

1. Description

The Signet 3719 pH/ORP Wet-Tap allows installation and removal of pH or ORP electrodes without the need for process shutdown during routine electrode maintenance and calibration. Process isolation is achieved with a double O-ring seal on a unique and compact retraction assembly; no separate valve is required. A cam-activated automatic locking mechanism, SafeLoc™, and the short stroke design help to assure operator safety.

2. Specifications

General

- Compatible sensors:
  - 2716-WT Twist-Lock pH Electrode
  - 2717-WT Twist-Lock ORP Electrode
  - 2756-WT DryLoc™ pH Electrode
  - 2756-WT-1 DryLoc™ pH Electrode
  - 2756 -WTP Dryloc plastic pH electrode
  - 2756-WTP-1 DryLoc plastic pH electrode
  - 2757-WT DryLoc ORP Electrode
  - 2757-WTP DryLoc plastic ORP electrode
- Shipping Weight:
  - Wet-tap assembly: 1.2 kg (2.7 lbs.)
  - Electrode: 0.13 kg (0.3 lb)
- Process Connection: 3-3719-11: 1½ in. NPT
  3-3719-21: 2 in. NPT
  3-3719-12: ISO 7/1-R1½
  3-3719-22: ISO 7/1-R2

Performance

- Maximum Flow Velocity: 10 ft/s
- Efficiency: > 97% @ 25°C (77°F)
- Response Time: pH: <5s for 95% of signal change
  ORP: Application dependent
- Drift: < 2 mV per week
- Operating Range: pH: 0 to 14 pH
  ORP: -2000 to +2000 mV
- Accuracy: ± 0.1% over full range
- Reference Junctions: Porous PTFE
- Electrolyte: 3.5M KCl
- Elements: Ag/AgCl
- Temp. Sensor (pH): 3K Balco (3-2716-WT)
  PT-1000 (3-2756-WT, -WTP-X)
- Temp. response time (τ): 438 s
- Sodium Ion Error: < 0.05 pH in 0.1 molar Na+ ion at 12.8 pH
- Impedance (pH): <150 MΩ @ 25°C

Wetted materials

- Retraction Housing: CPVC
- O-rings: FPM
- PE saddle Gasket: FPM
- PE Saddle body: Polypropylene Grade 8 ASTM D2565, 1-8, UV stabilized
- Electrode Body: Glass OR Plastic
- Electrode junctions: Porous PTFE
- Electrode sensing surface: Glass Membrane (pH) Platinum (ORP)
- Electrode O-rings: FPM

WARNING!

If used in conditions that exceed recommended pressure ratings, this product can pose a serious hazard.

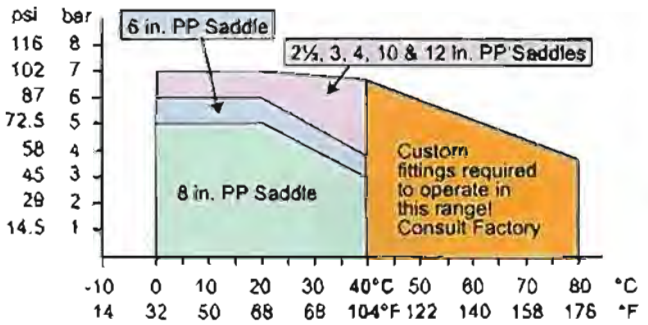
We urge customers to read the specifications carefully before installing and operating this product.

Improper use can cause components and process liquids to be expelled at high speeds and cause serious personal injury.

Process temperature and pressure specifications:

- 3719 Wet-tap and electrode installed with:
  - 8 in. PE saddle: Maximum 5 bar @ 20°C (Maximum 72.5 psi @ 68°F)
  - 6 in. PE saddle: Maximum 6 bar @ 20°C (Maximum 87 psi @ 68°F)
  - All other PE saddles: Maximum 7 bar @ 20°C (Maximum 102 psi @ 68°F)

  The maximum pressure is derated by temperature up to 40°C. See graph below



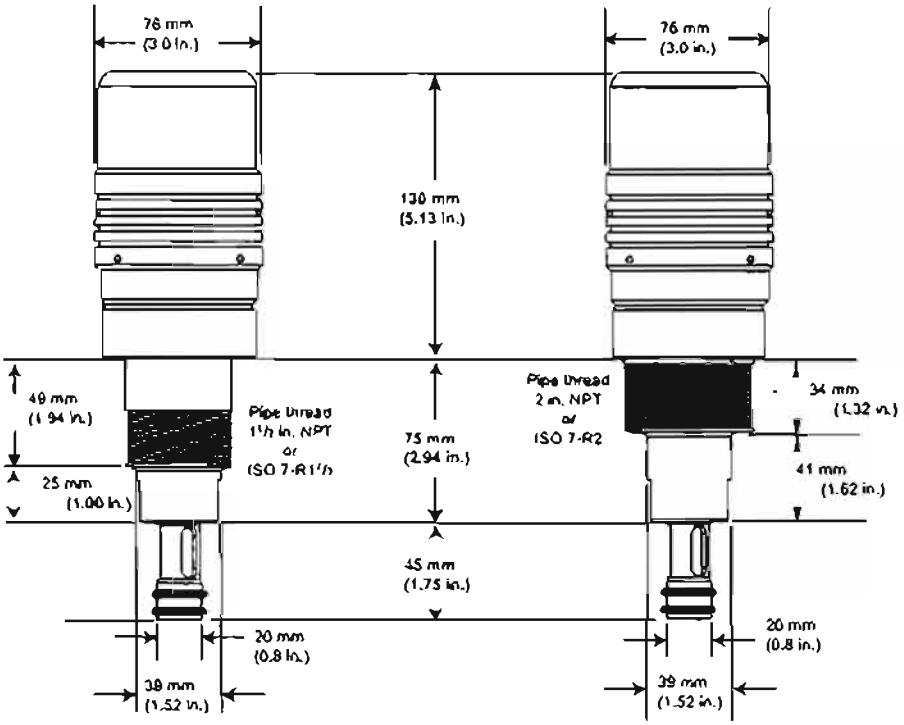
Storage temperature:

- Wet-tap assembly: -15 to 120°C (5 to 248°F)
- Electrode: 0° to 85°C (32° to 185°F)

Other Materials

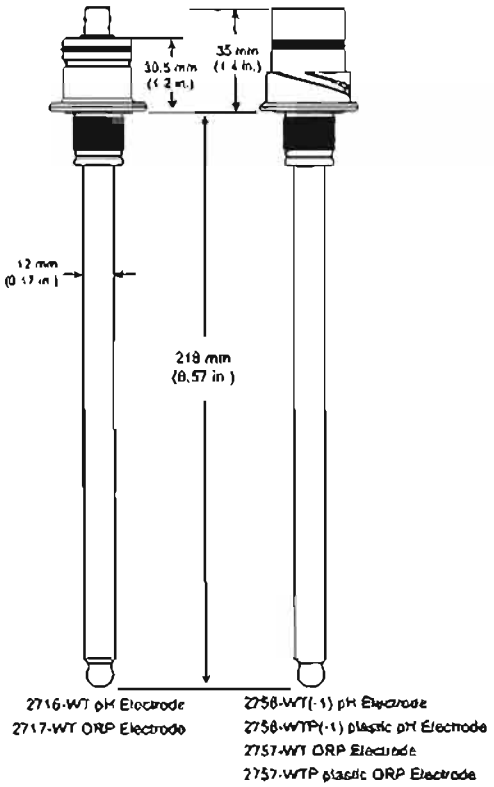
- Locking Shroud: PVC
- Hardware: 316 SS
- PE Saddle Hardware: 316 SS, 430 SS (reinforce. ring)

3. Dimensions

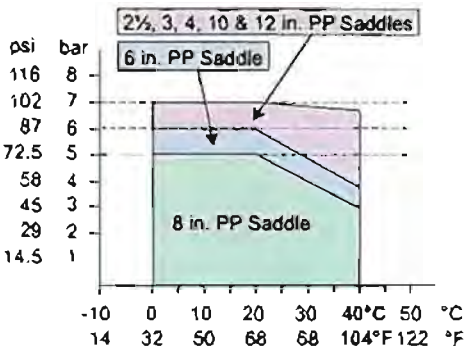


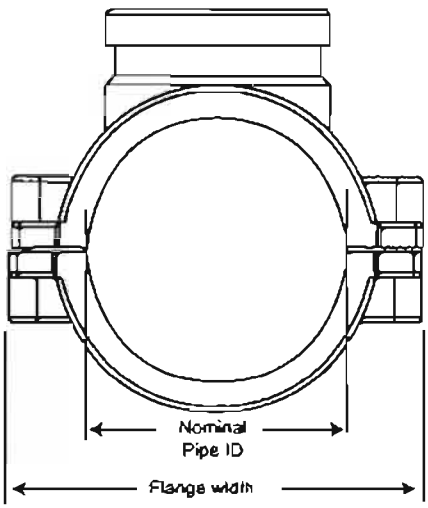
3719-1 Wet-tap
1½ in. outlet
for 2½ to 4 in.
saddles

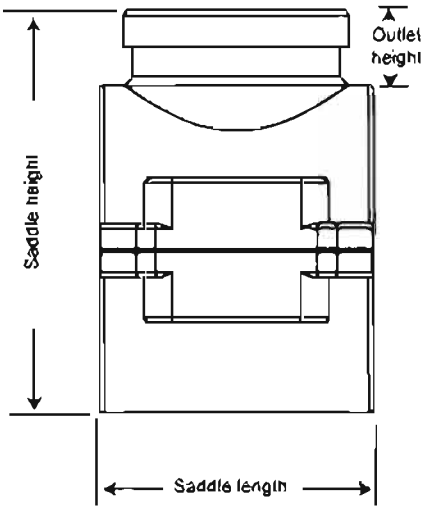
3719-2 Wet-tap
2 in. outlet for
6 to 12 in.
saddles



CAUTION!
When using these clamp-on saddle fittings, the system temperature and pressure is limited by the saddle specifications. The process temperature is limited to 40°C (104°F) maximum when using these saddles.



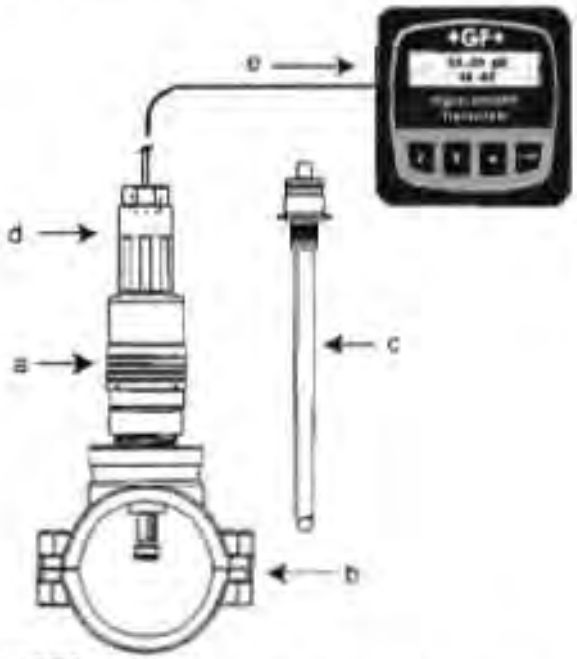




Order No.	Description (ASTM, NPT)	Nominal Pipe OD	Flange Width	Saddle Length	Saddle Height	Outlet Height
2007-0225	Saddle, 2½ in. x 1½ in.	2.875 in.	4.84 in.	3.11 in.	4.29 in.	0.83 in.
2007-0230	Saddle, 3 in. x 1½ in.	3.500 in.	5.43 in.	3.43 in.	4.84 in.	0.83 in.
2007-0240	Saddle, 4 in. x 1½ in.	4.500 in.	5.98 in.	3.90 in.	5.90 in.	0.91 in.
2007-0260	Saddle, 6 in. x 2 in.	6.625 in.	8.90 in.	4.49 in.	8.46 in.	1.50 in.
2007-0280	Saddle, 8 in. x 2 in.	8.625 in.	11.3 in.	5.71 in.	11.3 in.	1.50 in.
2007-0210	Saddle, 10 in. x 2 in.	10.75 in.	12.5 in.	7.04 in.	13.25 in.	1.25 in.
2007-0212	Saddle, 12 in. x 2 in.	12.75 in.	16.0 in.	9.68 in	14.00 in.	1.20 in.

4. 3719 System Overview

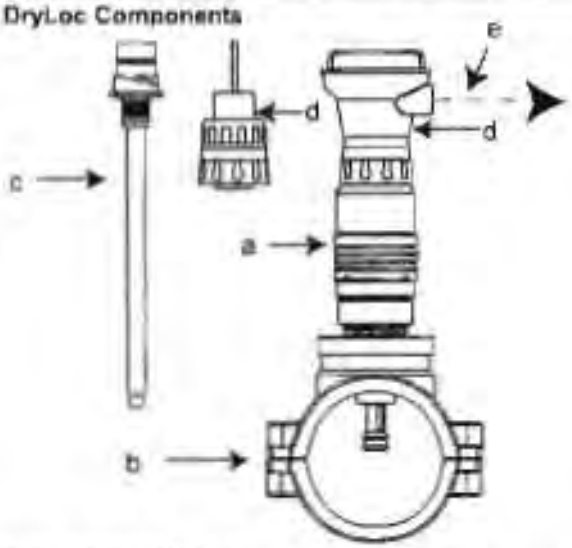
4.1 Twist-Lock Components



a) 3719 pH/ORP Wet-Tap
b) Low Profile PP Clamp-on Saddle Fitting (ASTM sizes 2.5 to 12 in.)
c) 2716-W1 Twist-Lock pH or 2717 Twist-Lock ORP Electrode ("Twist-Lock" refers to the electrode connector style)
d) 2720 Twist Lock Preamplifier
e) Signet pH/ORP Instrument

All of these components are sold separately.

4.2 DryLoc Components



a) 3719 pH/ORP Wet-Tap
b) Low Profile PP Clamp-on Saddle Fitting (ASTM sizes 2½ to 12 in.)
c) DryLoc™ pH or ORP Electrode (6 versions available; see ordering information on page 8.) ("DryLoc" refers to the electrode connector style)
d) 2750 or 2760 DryLoc pH/ORP Preamplifier/Sensor electronics
e) Output signal options:
   - S³L
   - 4 to 20 mA

All of these components (items a to d) are sold separately.

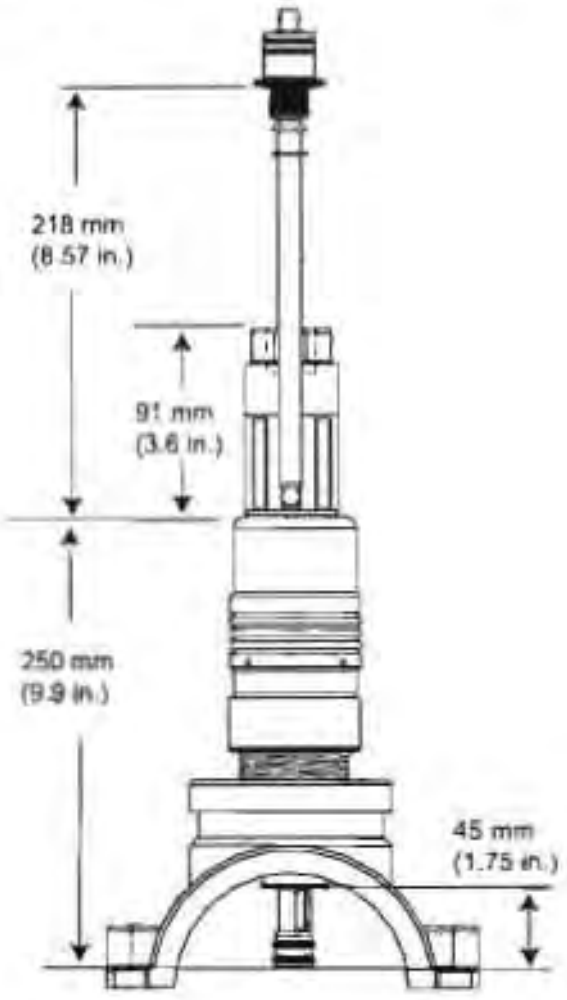
5. Installation

5.1 Notes on Location, Orientation and Required Clearance

- The 3719-1 is designed for use in pipes up to 4 in.
- The 3719-2 is designed for use in pipes from 6 to 12 in.
- Select a location that will provide sufficient clearance to remove and insert the electrode.
- The 3719 can be mounted in any orientation, including horizontal and inverted.
- If inverted, use caution when removing the sensor. Residual fluid may be present in the retraction housing. Keep electrode connector clean and dry at all times.

Any angle OK

- Provide 20 inches (minimum) clearance from the top of the pipe for electrode removal.
- Low profile polypropylene saddles available from 2½ to 12 in. (ASTM).

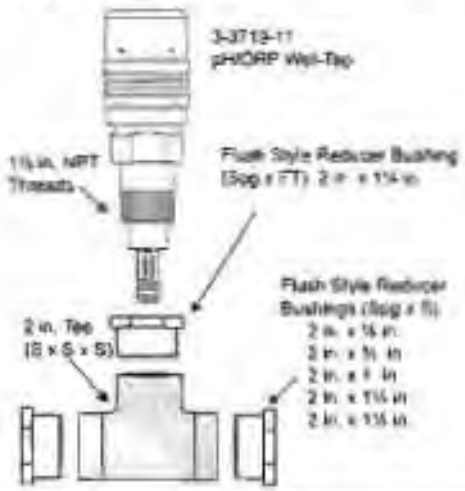


5.2 Installation in Pipe Sizes 2.5 to 12 Inches

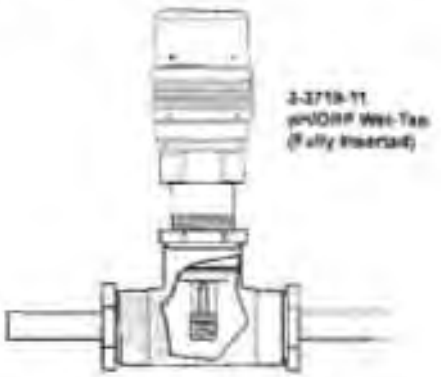
- Cut a 1¼ to 1⅜ inch hole in the pipe.
- For reliable in-line measurements of pH and ORP, it is imperative to position the electrode tip into the process stream.
- Because of its compact "short stroke" design, the 3719 requires low-profile fittings to assure proper positioning in pipe sizes 2.5 to 12 inches.
- **Utilization of the accessory saddle fittings, offered as part of the 3719 system, is strongly recommended.**
- Choose the 3719 version (-11 or -21) appropriate to the size of the branch connection of the required fitting: Use -11 for sizes 2.5 to 4 in, and -21 for sizes 6 to 12 in.

5.3 Installation in Pipe Sizes less than 2.5 Inches

- It is possible to install the 3719 into pipe sizes below 2.5 inches by creating a "flow cell" with standard piping components.
- One simple solution, using a tee fitting and reducer bushings, is shown in the example below.



- Many similar configurations are conceivable in a wide variety of materials, but be very careful to verify dimensional compatibility.
- Select an appropriate installation orientation to avoid the entrapment of air inside the flow cell.
- Contact your local George Fischer Sales and Support office for assistance.

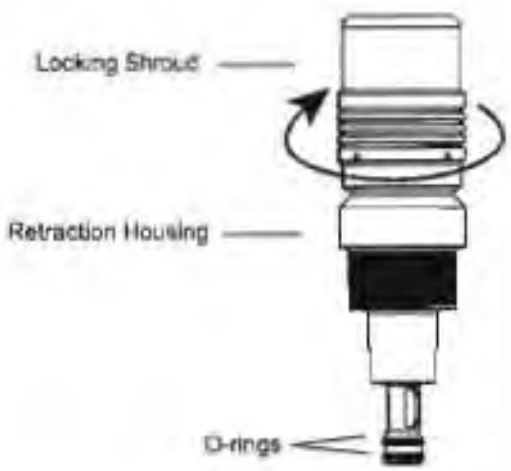


5.4 Installation (Wet-Tap into Fitting)

The 3719 is packaged with no electrode installed, and with the electrode piston in the fully inserted position.

- Examine the female threads at the top of the electrode piston. Do not install electrode if threads are damaged.
- Examine the two O-rings at the lower end of the assembly. Do not install if O-rings are missing or there are any signs of damage.
- The pipe can be pressurized after completion of step 4.
- **DO NOT ATTEMPT TO REMOVE THE RETRACTION HOUSING FROM A PRESSURIZED PIPING SYSTEM!**

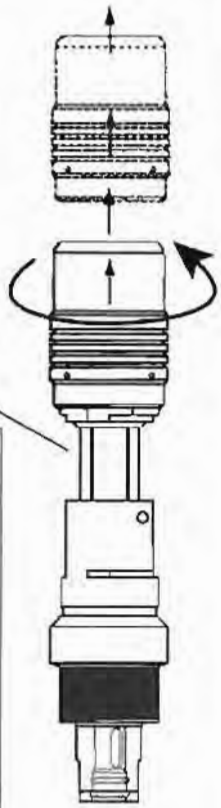
1 Grasp the retraction housing below the locking shroud; turn the locking shroud ¼ turn clockwise.



2 Pull the locking shroud straight up until both O-rings are fully sealed inside the retraction housing.

3

Turn the shroud ¼-turn counterclockwise and lift it completely away from the electrode piston.

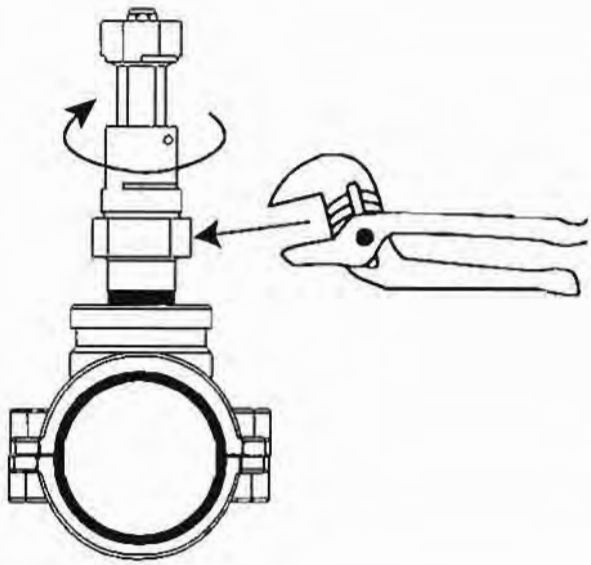


The electrode piston is locked in position by SS locking pins.

DO NOT tamper with the locking pins! If the piston is depressed with no electrode installed, the pipe contents are exposed.

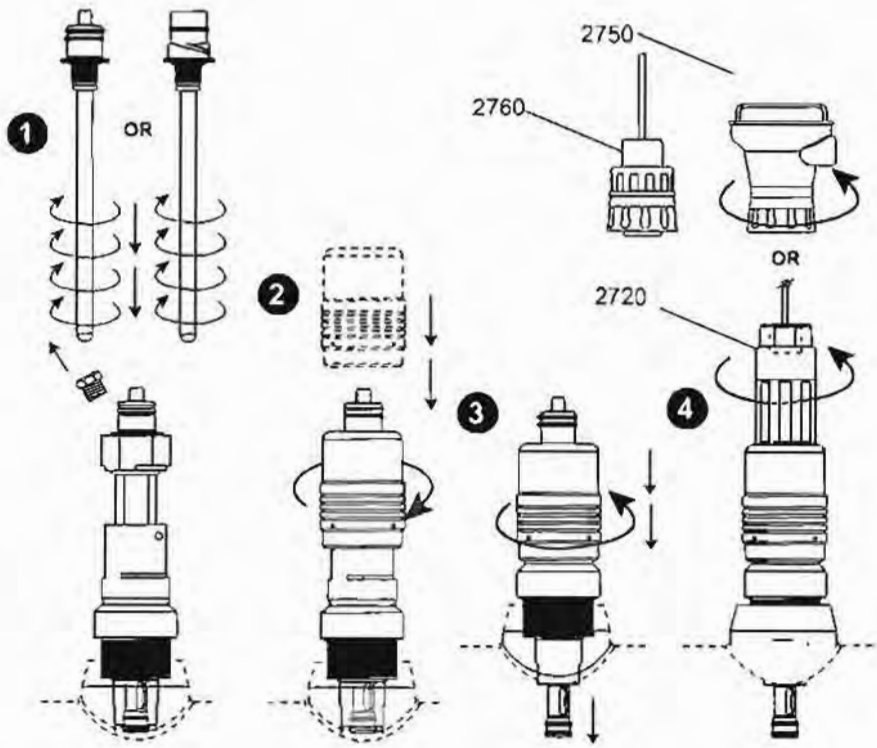
4

- Thread the Wet-Tap into the pipe fitting.
- Smaller pipes may require bracing to support the Wet-Tap weight and the longitudinal forces required for operation.
- Use an appropriate thread sealant to prevent leaks.
- The piping system can now be safely pressurized.
- Inspect the installation for leaks.



5.5 Electrode Installation

1. Remove the safety plug from top of electrode piston. Slide electrode straight down into electrode piston. Thread electrode into place until connector shoulder is flush with top of electrode piston. Hand tighten only.
2. Place the Locking Shroud over electrode; turn ¼-turn clockwise to unlock the piston, then press down firmly on the locking shroud to lower the electrode piston into the pipe.
3. Turn the shroud ¼-turn counterclockwise to lock the piston.
4. Install the matching electronics assembly or preamplifier onto the electrode connector.

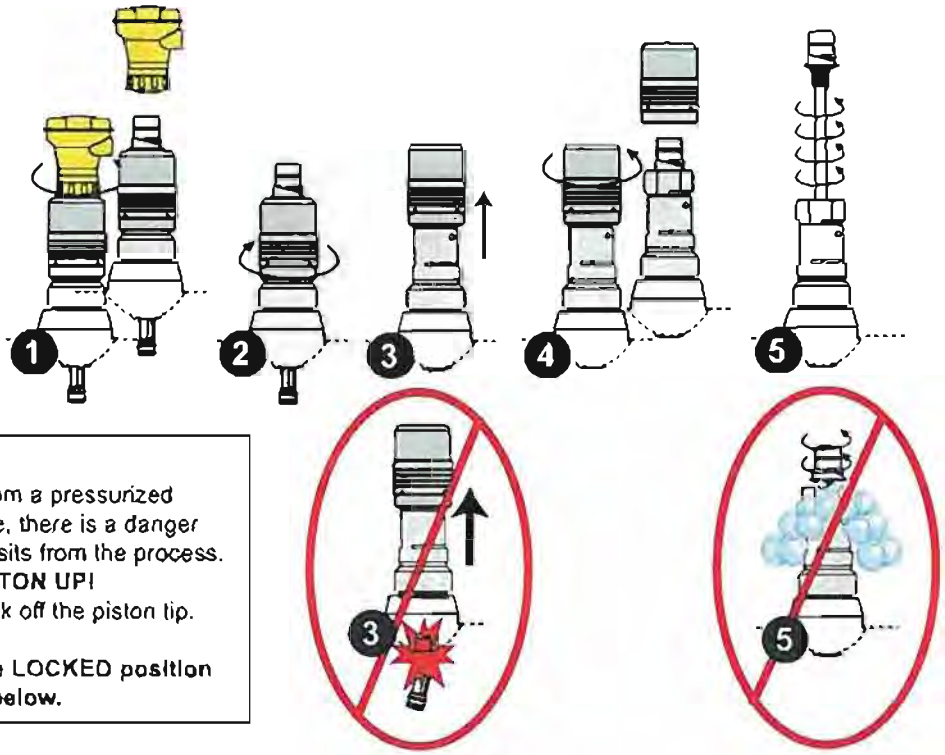


DO NOT ATTEMPT TO REMOVE THE RETRACTION HOUSING FROM A PRESSURIZED PIPING SYSTEM!

5.6 Electrode removal

The electrode in any pH or ORP system requires periodic service, calibration or replacement. When removing the electrode from the wet-tap assembly, it is very important to exercise caution and follow the instructions carefully

1. Remove the preamplifier from the top of the wet-tap assembly.
2. Turn the locking shroud ¼-turn clockwise to unlock the piston.
3. Pull up on the locking shroud to retract the electrode piston into the pipe.



DANGER!
The piston should retract easily from a pressurized pipe. If the piston offers resistance, there is a danger that the piston is coated with deposits from the process.
STOP! DO NOT FORCE THE PISTON UP!
It may damage the O-rings or break off the piston tip.

Return the locking shroud to the LOCKED position and follow the steps in the box below.

4. Turn the locking shroud ¼-turn counterclockwise and lift up to remove it from the wet-tap assembly.
5. Remove the electrode by turning it counterclockwise.
   For safety, keep your body clear of the top of the wet-tap assembly while removing the electrode.

DANGER!
If any fluid is observed leaking from the electrode threads, STOP! DO NOT REMOVE THE ELECTRODE. There is a danger that the piston tip has been damaged.
Tighten the electrode back down to reseal the assembly and follow the steps in the box below.

If the piston does not retract easily, or if any fluid is observed leaking from the electrode threads, the pipe must be drained before the 3719 can be safely removed.

- **Stop the flow and depressurize the pipe.**
- **Remove the entire 3719 assembly from the pipe.**
- **Remove the electrode from the assembly**
- **Clean any scaling and debris found on or in the piston tip and surrounding area.**

6. Electrode Maintenance and Cleaning

Cleaning

Cleaning techniques vary depending on the type of coating present on the glass electrode surface or reference junction.

- Remove soft coatings by vigorous stirring, or with directed spray of a suitable detergent or solvent onto the glass electrode surface.
- Use chlorine bleach or mild detergent to remove soft coatings. Rinse electrode tip in clean water after cleaning.
- Use the least harsh chemical available to remove hard coatings without attacking the materials of construction. (For example, remove calcium carbonate with a 5% HCL (muriatic acid) solution.
- Remove oily or organic coatings with detergents or an appropriate solvent that does not attack the materials of construction.
- ORP electrode surface (platinum) can be gently sanded with 600 grit wet and dry silicone or carbide sandpaper, jewelers rouge, crocus cloth, or very fine steel wool.
- Never scrape or sand the glass electrode surface.
- Treat glass electrode surfaces with appropriate care to avoid breakage.

7. Troubleshooting

Offset in pH Electrodes

Electrode offsets occur due to:

- Clogged reference junction
- Aged or contaminated reference solution/wire
- A constant output near 0 mV in all buffer solutions indicates a shorted electrode that must be replaced

Check offsets in a pH 7 buffer @ 25°C. The theoretical output is 0 mV. Any deviation from 0 mV is the pH electrode offset. The mV offset will track across the entire pH range. The slope is usually not affected by offset changes. (i.e., pH 7= +10 mV, pH 4= +187 mV); slope = 59 mV.

pH Electrode Offset pH 7 buffer @ 25°C

Theoretical:	pH 7.0 (0.0 mV)
New electrode:	pH 7 ± 0.25 pH (±15 mV)
Reliable:	pH 7 ± 0.85 pH (± 50 mV)

Electrode offsets greater than 0.85 pH (50 mV) indicate the electrode requires cleaning or replacement. See Maintenance and Cleaning section.

Theoretical mV Values @ 25°C	
pH	mV
2	+296 mV
3	+237 mV
4	+177 mV
5	+118 mV
6	+59 mV
7	0 mV
8	-59 mV
9	-118 mV
10	-177 mV
11	-237 mV
12	-296 mV

Offset in ORP Electrodes

- ORP electrode offsets are usually caused by clogged reference junctions or by an aged or contaminated reference solution/wire.
- Offsets should be checked in pH 7 buffer saturated with quinhydrone @ 25°C. The theoretical output is +86 mV. Any deviation from +86 mV is the ORP electrode offset (i.e. +90 mV).
- Quinhydrone is the oxidizer measured by the ORP electrode and is required for calibration. To measure ORP electrode offset, saturate 50 mL of pH 4 and pH 7 buffers with ¼ g quinhydrone. A new ORP electrode measures these values ±15 mV. The electrode continues to be functional until the offset from these values exceeds 50 mV. Electrodes with offset greater than 50 mV should be cleaned and replaced if necessary.

	4 pH w/Quinhydrone			7 pH w/Quinhydrone		
Temp:	20°C	25°C	30°C	20°C	25°C	30°C
ORP:	268 mV	263 mV	258 mV	92 mV	86 mV	79 mV

Slope in pH electrodes

Electrode slope is the mV output per pH unit. At 25°C the theoretical slope is 59.16 mV per pH. The graph below illustrates potential pH error when a temperature compensated instrument is not used.

- Coatings on the glass may affect sensor slopes. See Maintenance and Cleaning section.
- Temperature affects electrode slope. Calibrate temperature before calibrating the standard and slope.

°C	pH										
	2	3	4	5	6	7	8	9	10	11	12
15	0.15	0.12	0.09	0.06	0.03	0	0.03	0.06	0.09	0.12	0.15
25	0	0	0	0	0	0	0	0	0	0	0
35	0.15	0.12	0.09	0.06	0.03	0	0.03	0.06	0.09	0.12	0.15
45	0.3	0.24	0.18	0.12	0.06	0	0.06	0.12	0.18	0.24	0.3
55	0.45	0.36	0.27	0.18	0.09	0	0.09	0.18	0.27	0.36	0.45

Slope in ORP electrodes

ORP slope errors are caused by contamination of the platinum electrode surface. Cleaning the electrode surface will usually restore proper values, response time, and stability. Many systems require both pH and ORP calibration. To conserve calibration reference solutions, use pH 7 and 4 buffers for pH calibration first. ORP calibration can be performed with the same buffers after adding quinhydrone.

Response Time/Stability

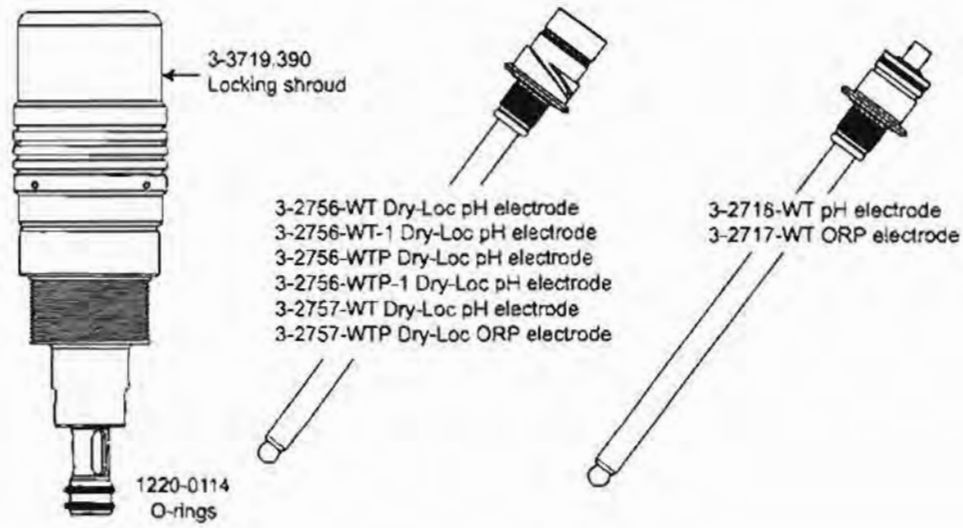
Response time and stability are affected by the condition of the glass surface (ORP electrode - Platinum surface), reference junction, and reference solution. Restoration to acceptable levels can often be accomplished by cleaning the electrode's glass surface (ORP electrode - Platinum surface) and reference junction.

pH and ORP electrodes are similar to batteries; they age with time and usage.
The following information will help maximize electrode life:

- High temperatures or concentrated acids/caustics will accelerate electrode aging.
- Never store the electrode tip in deionized (DI) water.
- Never expose electrode to temperatures below -12°C (10°F) or allow it to dehydrate. These conditions will damage the electrode.

8. Ordering Information

Mfr. Part No.	Code	Description
3-3719-11	159 000 804	pH/ORP Wet-Tap, 1½ in. NPT
3-3719-21	159 000 805	pH/ORP Wet-Tap, 2 in. NPT
3-3719-12	159 000 806	pH/ORP Wet-Tap, ISO 7/1-R 1.5
3-3719-22	159 000 807	Wet-Tap Assembly, ISO 7/1-R 2
Parts and accessories		
3-2716-WT	159 000 809	Electrode, pH, twist-lock, bulb, 3KΩ, wet-tap
3-2717-WT	159 000 811	Electrode, ORP, twist-lock, bulb, 10KΩ ID, wet-tap
3-2720	198 864 602	Twist-Lock Preamplifier, ¼ in. NPT
3-2720-2	198 864 603	Twist-Lock Preamplifier, ISO 7/1-R 3/4
3-2756-WT	159 000 834	Electrode, pH, DryLoc, bulb, PT1000, wet-tap
3-2756-WT-1	159 001 383	Electrode, pH, DryLoc, bulb, 3KΩ, wet-tap
3-2756-WTP	159 001 390	Electrode, pH, DryLoc, plastic bulb, PT1000, wet-tap
3-2756-WTP-1	159 001 384	Electrode, pH, DryLoc, plastic bulb, 3KΩ, wet-tap
3-2757-WT	159 000 835	Electrode, ORP, DryLoc, bulb, 10KΩ ID, wet-tap
3-2757-WTP	159 001 391	Electrode, ORP, DryLoc, plastic bulb, 10KΩ ID, wet-tap
3-2750-1	159 000 744	In-line DryLoc pH/ORP Sensor with J-Box
3-2750-2	159 000 745	In-line DryLoc pH/ORP Sensor with J-Box and EasyCal
3-2760-11	159 001 367	In-line Preamplifier with ¾ in. NPT threads and 4.6 m (15 ft.) cable
3-2760-21	159 001 368	In-line Preamplifier with ¾ in. ISO threads and 4.6 m (15 ft.) cable
3-2760-31	159 001 369	In-line Connector with 4.6 m (15 ft.) cable and ¾ in. NPT threads
3-2760-41	159 001 370	In-line Connector with 4.6 m (15 ft.) cable and ISO 7/1R ¾ threads
2007-0225	159 000 812	PP Clamp-on Saddle, 2.5 in. x 1½ in. (ASTM, NPT)
2007-0230	159 000 813	PP Clamp-on Saddle, 3 in. x 1½ in. (ASTM, NPT
2007-0240	159 000 814	PP Clamp-on Saddle, 4 in. x 1½ in. (ASTM, NPT)
2007-0260	159 000 815	PP Clamp-on Saddle, 6 in. x 2 in. (ASTM, NPT)
2007-0280	159 000 816	PP Clamp-on Saddle, 8 in. x 2 in. (ASTM, NPT)
2007-0210	159 000 817	PP Clamp-on Saddle, 10 in. x 2 in. (ASTM, NPT)
2007-0212	159 000 818	PP Clamp-on Saddle, 12 in. x 2 in. (ASTM, NPT)
3-3719.390	159 000 855	3719 Locking Shroud
1220-0114	159 000 854	3719 O-ring, FPM, Piston Tip



+GF+

George Fischer Signet, Inc. 3401 Aerojet Avenue, El Monte, CA 91731-2882 U.S.A. • Tel. (626) 571-2770 • Fax (626) 573-2057
For Worldwide Sales and Service, visit our website: www.gfsignet.com • Or call (in the U.S.): (800) 854-4090

Signet DryLoc™ pH and ORP Electrodes

For all Signet DryLoc™ Electrodes:
2754-2757 Standard electrodes
2764-2767 Differential Electrodes
2774-2777 Combination Electrodes

English

3-2754.090 Rev. E 3/06 English

WARNING!

SAFETY INSTRUCTIONS

1. Depressurize and vent system prior to installation or removal.
2. Confirm chemical compatibility before use.
3. Do not exceed maximum temperature/pressure specifications.
4. Wear safety goggles or faceshield during installation/service.
5. Do not alter product construction.
6. When using chemicals or solvents care should be taken and appropriate eye, face, hand, body, and/or respiratory protection should be used.

1. Specifications

General

Compatibility: Signet 2750 Electronics
Signet 2760 Preamplifiers

Operating Range:
- pH: 0 to 14 pH
- ORP (Redox): 2765, 2767: ±1500 mV
  2755, 2757: ±2000 mV
  2775, 2777: ±1500 mV

Wetted Materials (2764 and 2774 series):
- Body: PPS (Ryton®)
- Reference junctions: PTFE (Teflon™)
- Sensing surface: Glass membrane (pH)
  Platinum (ORP)
- O-rings: FPM
- Solution ground: carbon graphite (2764 series only)

Wetted Materials (2754-2757 Series):
- Body: CPVC
- Reference junctions: UHMW Polyethylene
- Sensing surface: Glass membrane (pH)
  Platinum (ORP)
- O-rings: FPM

Reference Electrolyte:
- 2754 series electrodes: solidified acrylamide gel, KCl
- 2764 series electrodes: Equitransferant reference buffer acrylamide KNO_3 salt bridge
- 2774 series electrodes: acrylamide gel, KNO_3 / KCl

Reference Element: Ag/AgCl

Temperature Sensor:
- pH: 3KΩ, PT1000 or 300Ω
- ORP: 10 KΩ, PT1000 or 300Ω

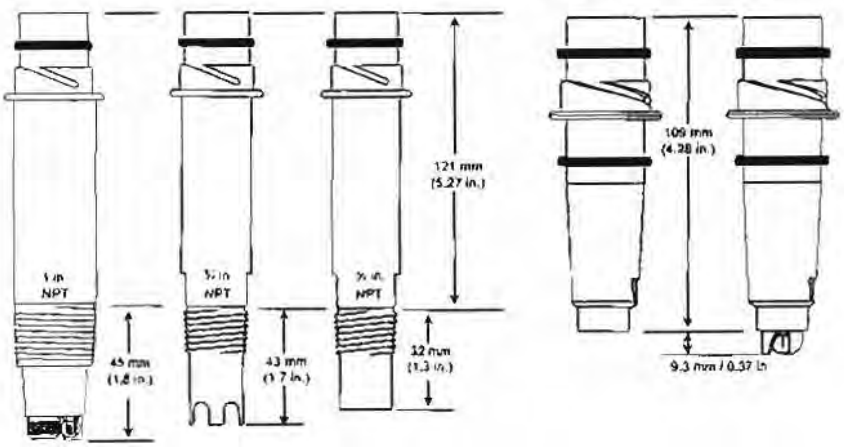
Temperature response time τ:
- 2754 electrodes: 140 s
- 2756 electrodes: 196 s
- 2764, 2774, 2776 series: 20 s

Maximum Temperature/Pressure:
Operating Temperature:
- 2764 series: 0°C to 95°C (32°F to 203°F)
- 2774 series: 0°C to 85°C (32°F to 176°F)
- 2754 series: 0°C to 85°C (32°F to 176°F)

Max. Operating Pressure: 6.89 bar @ 95°C (100 psi @ 203°F)
Storage Temperature: >0°C (32°F)
Shipping Weight: 0.25 kg (0.55 lbs.)

Standards & Approvals
- Manufactured under ISO 9001:2000 for Quality

2764 series Differential electrode | 2774 series Bulb electrode | 2776 series Flat electrode | 2754 & 2755 Flat electrode | 2756 & 2757 Bulb electrode



2. Electrode care and application

pH/ORP electrodes are similar to batteries; they age with time and usage. The following information will help maximize electrode life.

2.1 Conditions to Avoid:

- High temperatures, strong acids or caustics will elevate electrochemical reactions and speed electrode aging.
- Coatings on the glass or junction surfaces (i.e. proteins) cause extended response time and inaccurate measurement.
- Never store the electrode tip in deionized (DI) water. (Use pH 4 buffer solution to keep the glass wet when out of the process.)
- Never expose electrode to temperatures below 0°C (32°F) or allow it to dehydrate. These conditions will damage the electrode.
- Never scrape or sand the glass electrode surface.
- Treat glass electrode surfaces with care to prevent accidental breakage.

2.2 Submersible Installation Tips:

- Choose a location that keeps the electrode glass completely submerged at all times.
- Mount electrodes in a location with ample clearance for removal.
- Place the electrode tip in pH 4 buffer during system maintenance or storage to avoid dehydration.
- Mount the electrode near tank outlets, away from reagent addition areas.

2.3 In-Line Installation Tips:

- pH and ORP electrodes respond best in moving fluids.
- Standard (2754 series) and Differential (2764 series) electrodes must by mounted at a downward angle (>10° from horizontal). 2774 and 2775 electrodes can be mounted at any angle.

3. pH Electrode Calibration

All pH electrodes are designed to provide linear output during their lifespan. The following sections define proper electrode operation.

Theoretical mV Values @ 25°C	
pH	mV
2	+296 mV
3	+237 mV
4	+177 mV
5	+118 mV
6	+59 mV
7	0 mV
8	-59 mV
9	-118 mV
10	-177 mV
11	-237 mV
12	-296 mV

3.1 Offset (STD)

Electrode offsets occur due to:

- Clogged reference junction
- Aged or contaminated reference solution/wire

Check offsets in a pH 7 buffer @ 25°C. The theoretical output is 0 mV. Any deviation from 0 mV is the pH electrode offset.

pH Electrode Offset pH 7 buffer @ 25°C	Theoretical:	7.0 pH (0.0 mV)
	New electrode:	pH 7 ± 0.25 pH (±15 mV)
	Reliable:	pH 7 ± 0.85 pH (± 50 mV)

Electrode offsets greater than 0.85 pH (50 mV) indicate the electrode requires cleaning or replacement. See section 5: Maintenance and cleaning.

3.2 Slope (SLP)

Electrode slope is the number of mV per pH unit. At 25°C the theoretical slope is 59.16 mV per pH. Temperature has an appreciable affect on electrode slope. Reliable instrumentation includes temperature compensation. The graph below illustrates potential pH error when a temperature compensated instrument is not used.

Recommendations:

- Calibrate temperature before calibrating the standard and slope.
- The mV offset will track across the entire pH range. The slope is usually not affected by offset changes.
  (i.e. pH 7= +10 mV, pH 4= +187 mV); slope = 59 mV
- Coatings on the glass may affect sensor slopes. See section 5 maintenance and cleaning.
- A constant output near 0 mV in all buffer solutions indicates a shorted electrode that must be replaced.

°C	pH Error										
	2	3	4	5	6	7	8	9	10	11	12
15	0.15	0.12	0.09	0.06	0.03	0	0.03	0.06	0.09	0.12	0.15
25	0	0	0	0	0	0	0	0	0	0	0
35	0.15	0.12	0.09	0.06	0.03	0	0.03	0.06	0.09	0.12	0.15
45	0.3	0.24	0.18	0.12	0.06	0	0.06	0.12	0.18	0.24	0.3
55	0.45	0.36	0.27	0.18	0.09	0	0.09	0.18	0.27	0.36	0.45

3.3 Response Time/Stability

Response time and stability are affected by the condition of the pH glass measuring surface (ORP electrode - Platinum surface), the reference junction, and and the reference solution. Restoration to acceptable levels can often be accomplished by cleaning the measuring surface and reference junction.

Electrode mV values should remain stable ±3 mV. Conditions that may cause fluctuations are:

- Electrode coating
- Ground fault: If proper operation is observed in the beaker, but readings are unstable in the application, a ground fault may exist.
  - Using instrumentation with isolated inputs and outputs may restore stable operation.
  - Solution grounding may also restore stable operation.

4. ORP Electrode Calibration

ORP electrodes are designed to ensure linearity during their lifespan. The following sections define proper electrode operation.

4.1 Offset (STD)

- Electrode offsets are usually caused by clogged reference junctions or by aged or contaminated reference solution/wire.
- Offsets should be checked in pH 7 buffer saturated with quinhydrone @ 25°C. The theoretical output is +86 mV. Any deviation from +86 mV is the ORP electrode offset (i.e. +90 mV).
- Quinhydrone is the oxidizer measured by the ORP electrode and is required for calibration. To measure ORP electrode offset, saturate 50 mL of pH 4 and pH 7 buffers with ¼ g quinhydrone:

	4 pH w/Quinhydrone			7 pH w/Quinhydrone		
Temp:	20°C	25°C	30°C	20°C	25°C	30°C
ORP:	268 mV	263 mV	258 mV	92 mV	86 mV	79 mV

A new ORP electrode measures these values ±15 mV. The electrode continues to be functional until the offset from these values exceeds 50 mV. Electrodes with offset greater than 50 mV should be cleaned and replaced if necessary.

4.2 Slope (SLP)

ORP slope errors are generally caused by contamination of the platinum electrode surface. Cleaning the electrode surface will usually restore proper values, response time, and stability. See section 5: Maintenance and Cleaning.

Many systems require both pH and ORP calibration. To conserve calibration reference solutions, use pH 7 and 4 buffers for pH calibration first. ORP calibration can be performed with the same buffers by adding quinhydrone.

5. Maintenance and Cleaning

5.1 Maintenance

Variables can affect long term pH or ORP electrode life. For this reason, a maintenance log is recommended for trend analysis. When storing boxed sensors, lay the sensor flat to maximize hydration of the glass surface. Keep the glass surface wet at all times. Soak the sensor tip in pH 4.0 buffer during system maintenance intervals. In-line applications should be plumbed with a depression (trap) so liquid is maintained around the sensor tip. If the sensor dehydrates, soak the sensor tip in pH 4 buffer for 24 to 48 hours, then visually inspect the electrode for surface cracks, swelling, or discoloration. Severely dehydrated electrodes cannot be restored to normal operation.

5.2 Cleaning

Cleaning techniques vary depending on the type of coating present on the glass electrode surface or reference junction.

- Soft coatings can be removed by vigorous stirring, or with directed spray of an applicable detergent or solvent onto the glass surface. Chlorine bleach or mild detergent can be used to remove soft coatings. Always rinse electrode tip in clean water after cleaning.
- Hard coatings can be chemically removed. Use the least harsh chemical which will remove the contaminant within two (2) minutes without attacking the materials of construction. e.g. calcium carbonate may be removed with a 5% HCL (muriatic acid) solution.
- Oily or organic coatings can be removed with detergents or an appropriate solvent that does not attack the materials of construction e.g. isopropyl alcohol may be used but acetone must be avoided to prevent damage to the CPVC sensor body.
- ORP electrode surface (platinum rod) can be gently sanded with 600 grit wet and dry silicone or carbide sandpaper, jewelers rouge, crocus cloth, or very fine steel wool.

5.3 Differential Electrodes

Differential electrodes have a replaceable salt bridge and the electrolyte chamber can be refilled.
The electrolyte chamber should be full. If any fluid is audible when shaken, the chamber should be refilled.
Refill the electrolyte chamber when the electrode offset exceeds 50 mV.
The salt bridge should be replaced when performance becomes sluggish, or if the output is erratic or inaccurate.

Replacing the salt bridge
Parts Required: Salt Bridge (order number 3864-0001) and Differential Reference Solution (order number 3864-0002)
Tools Required: small pliers

1. Remove sensor from mounting.
2. Hold upside down and unscrew salt bridge using a pair of small pliers. Be careful not to damage the glass bulb!
3. Drain the depleted reference solution and dispose of properly.
4. Fill reference chamber with fresh reference solution (approx. 30 ml).
5. Replace salt bridge and screw finger tight.' Solution will drip out while screwing in salt bridge. Use pliers to turn approximately ¼ turn past finger-tight.
6. Perform calibration (standard and slope) before returning the system to service.

NOTE:
The refillable electrolyte chamber in 2764 series Differential electrodes may leak during storage and shipping. Check the fluid and refill before installation if necessary.

WARNING!
Wear appropriate eye, face, hand, body, and respiratory protection when using chemicals or solvents.

Ordering Information

Mfr. Part No.	Code	Description
DryLoc pH Electrodes		
3-2754	159 000 747	Electrode, pH, DryLoc, flat, PT1000
3-2754-1	159 001 380	Electrode, pH, DryLoc, flat, 3KΩ
3-2754-HF	159 000 748	Electrode, pH, DryLoc, flat, PT1000, HF-resist (<2%)
3-2754-HF-1	159 001 381	Electrode, pH, DryLoc, flat, 3KΩ, HF-resist (<2%)
3-2756	159 000 750	Electrode, pH, DryLoc, bulb, PT1000
3-2756-1	159 001 397	Electrode, pH, DryLoc, bulb, 3KΩ
3-2756-DI	159 000 751	Electrode, pH, DryLoc, bulb, PT1000, DI (<100 µS)
3-2756-DI-1	159 001 382	Electrode, pH, DryLoc, bulb, 3KΩ, DI (<100 µS)
3-2764-1	159 000 943	Electrode, pH, DryLoc, flat, 3KΩ, differential, 1 in. NPT process connection
3-2764-2	159 000 944	Electrode, pH, DryLoc, flat, PT1000, differential, 1 in. NPT process connection
3-2764-3	159 000 945	Electrode, pH, DryLoc, flat, 300Ω, differential, 1 in. NPT process connection
3-2766-1	159 000 949	Electrode, pH, DryLoc, bulb, 3KΩ, differential, 1 in. NPT process connection
3-2766-2	159 000 950	Electrode, pH, DryLoc, bulb, PT1000, differential, 1 in. NPT process connection
3-2766-3	159 000 951	Electrode, pH, DryLoc, bulb, 300Ω, differential, 1 in. NPT process connection
3-2774	159 000 955	Electrode, pH, DryLoc, flat, 3KΩ, ¾ in. NPT process connection
3-2774-1	159 000 956	Electrode, pH, DryLoc, flat, PT1000, ¾ in. NPT process connection
3-2776	159 000 959	Electrode, pH, DryLoc, bulb, 3KΩ, ¾ in. NPT process connection
3-2776-1	159 000 960	Electrode, pH, DryLoc, flat, PT1000, ¾ in. NPT process connection
DryLoc ORP (Redox) Electrodes		
3-2755	159 000 749	Electrode, ORP, DryLoc, flat, 10KΩ ID
3-2757	159 000 752	Electrode, ORP, DryLoc, bulb, 10KΩ ID
3-2765-1	159 000 946	Electrode, ORP, DryLoc, flat, 10KΩ ID, differential, 1 in. NPT process connection
3-2765-2	159 000 947	Electrode, ORP, DryLoc, flat, PT1000, differential, 1 in. NPT process connection
3-2765-3	159 000 948	Electrode, ORP, DryLoc, flat, 300Ω, differential, 1 in. NPT process connection
3-2767-1	159 000 952	Electrode, ORP, DryLoc, bulb, 10KΩ ID, differential, 1 in. NPT process connection
3-2767-2	159 000 953	Electrode, ORP, DryLoc, bulb, PT1000, differential, 1 in. NPT process connection
3-2767-3	159 000 954	Electrode, ORP, DryLoc, bulb, 300Ω, differential, 1 in. NPT process connection
3-2775	159 000 957	Electrode, ORP, DryLoc, flat, 10KΩ ID, ¾ in. NPT process connection
3-2775-1	159 000 958	Electrode, ORP, DryLoc, flat, no tc, ¾ in. NPT process connection
3-2777	159 000 961	Electrode, ORP, DryLoc, bulb, 10KΩ ID, ¾ in. NPT process connection
3-2777-1	159 000 962	Electrode, ORP, DryLoc, bulb, no tc, ¾ in. NPT process connection

Accessories and Replacement Parts

Mfr. Part No.	Code	Description
3-2750-1	159 000 744	In-line Sensor Electronics w/Junction Box
3-2750-2	159 000 745	In-line Sensor Electronics w/Junction Box and Easy-Cal
3-2750-3	159 000 746	Submersible Sensor Electronics with 15 ft. cable, ¾ in. NPT threads
3-2750-4	159 000 842	Submersible Sensor Electronics with 15 ft. cable, ISO 7-1/R¾ threads
3-2760-1	159 000 939	Submersible Preamplifier with ¾ in. NPT threads and 4.6 m (15 ft.) cable
3-2760-2	159 000 940	Submersible Preamplifier with ¾ in. ISO threads and 4.6 m (15 ft.) cable
3-2760-3	159 000 941	Submersible Connector with 4.6 m (15 ft.) cable and ¾ in. NPT threads
3-2760-4	159 000 942	Submersible Connector with 4.6 m (15 ft.) cable and ISO 7/1R ¾ in. threads
3-2760-11	159 001 367	In-line Preamplifier with ¾ in. NPT threads and 4.6 m (15 ft.) cable
3-2760-21	159 001 368	In-line Preamplifier with ¾ in. ISO threads and 4.6 m (15 ft.) cable
3-2760-31	159 001 369	In-line Connector with 4.6 m (15 ft.) cable and ¾ in. NPT threads
3-2760-41	159 001 370	In-line Connector with 4.6 m (15 ft.) cable and ISO 7/1R ¾ threads
3-0700.390	198 864 403	pH Buffer Kit (1 each 4, 7, 10 pH buffer in powder form, makes 50 mL)
3864-0001	159 001 007	Replacement Salt Bridge for Differential electrodes
3864-0002	159 001 008	Reference solution refill for Differential electrodes, 500 mL (approx. 12 refills)
5523-0624	159 000 636	Cable, 6 conductor, 24 AWG, shielded
3-2759	159 000 762	pH/ORP System Tester (adapter cable sold separately)
3-2759.391	159 000 764	2759 DryLoc Adapter Cable (for use with 2750 and 2760)

+GF+

George Fischer Signet, Inc., 3401 Aerojet Avenue, El Monte, CA 91731-2882 U.S.A. • Tel. (626) 571-2770 • Fax (626) 573-2057
For Worldwide Sales and Service, visit our website: www.gfsignet.com • Or call (in the U.S.): (800) 854-4090

3-2754.090 Rev. E 3/06 English

Printed in U.S.A. on recycled paper

Signet 2750 DryLoc™ pH/ORP Sensor Electronics

English

3-2750.090 Rev. G 11/05 English

WARNING! SAFETY INSTRUCTIONS

1. Depressurize and vent system prior to installation or removal.
2. Confirm chemical compatibility before use.
3. Do not exceed maximum temperature/pressure specifications.
4. Wear safety goggles or faceshield during installation/service.
5. Do not alter product construction.
6. When using chemicals or solvents care should be taken and appropriate eye, face, hand, body, and/or respiratory protection should be used.

1. Description

Signet 2750 pH/ORP Sensor Electronics provide two-wire 4 to 20mA loop output for pH and ORP measurements, without the expense of local display and other luxuries available in full-featured transmitters. Preamplification is built-in, reducing system costs while ensuring absolute signal integrity up to 304.8m/1,000 feet.

These sophisticated field-mount devices also provide the digital (S³L™: Signet Sensor Serial Link) output, the latest development in leading-edge technology from Signet. The 2750 Sensor Electronics self-configure for pH or ORP operation via automatic recognition of electrode type, and the DryLoc™ electrode connector quickly forms a robust assembly for submersible and in-line installations.

NEMA 4X Junction Boxes are integral parts of the in-line version and are available as accessories for the submersible version. The optional Easy-Cal feature allows simple push-button calibration and includes an LED for visual feedback.

2. Specifications

General

- Compatible Electrodes: Signet DryLoc Electrodes
- Operational Range: 0.00 to 14.00 pH, ±2000 mV ORP
  0°C to 85°C (32°F to 185°F)
- Response Time (includes electrode response):
  pH: <6 s for 95% of change
  ORP: application dependent
  pH Temp τ: 140 s (2754)
  196 s (2756)
  438 s (2756-WT)

Materials:

2750-1, -2 (in-line): PBT (thermal plastic polyester)
2750-3, -4 (submersible): CPVC

Cable for -3, -4 submersible versions:
5 m (15 ft.) 3-conductor shielded, 22 AWG.

- May be extended up to 183 m (600 ft) with current output.
- May be extended up to 305 m (1000 ft) with S³L output.

Weight:
2750-1, -2 (in-line): 0.75 kg (1.75 lb.)
2750-3, -4 (submersible): 0.64 kg (1.4 lb.)

Environmental

- Ambient Temp.: -10°C to 85°C
- Storage Temp.: -20°C to 85°C
- Relative Humidity: 95% max, non-condensing
- Immunity: EN50082-2
- Emissions: EN50081-1
- Enclosure Rating:
  2750-1, -2 (in-line): NEMA 4X/IP65 (with electrode connected)
  2750-3, -4 (submersible): NEMA 6P/IP68 (with electrode and watertight extension pipe connected)

Electrical

- Input Impedance: $>10^{11}\Omega$
- Input response time: 500 ms
- Temperature drift: ±0.002 pH per °C
  ±0.1 mV ORP per °C
- Input resolution: 0.02 pH, 1 mV ORP, 0.3°C

Current output:

- Description: pH: Fixed 4 to 20 mA, isolated, 0 to 14 pH (custom scaling available)
  ORP: Fixed 4 to 20 mA, isolated, -1000 to 2000 mV (custom scaling available, -2000 to 2000 mV)
- Power: Regulated 12-24 VDC ± 10%, 20 mA max.
- Max Loop Resistance: 50Ω max. @ 12V
  325Ω max. @ 18V
  600Ω max. @ 24V
- Accuracy: ±32µA @ 25°C
- Temperature drift: ±1µA per °C
- Output resolution: ± 5 µA
- Error indication: 3.6 mA

Digital (S³L) output:

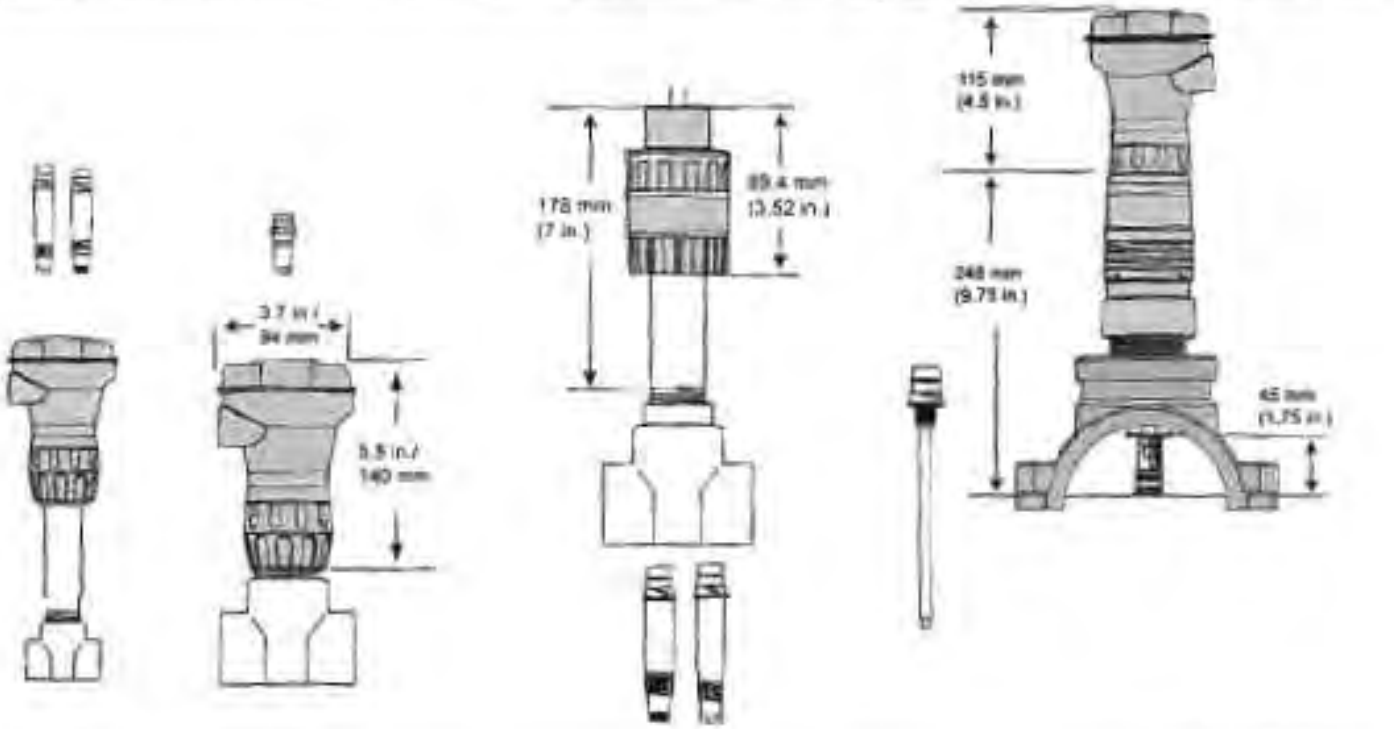
- Description: Serial ASCII, TTL level 9600 bps
- Power: 5VDC ± 10% regulated, 3 mA max
- Accuracy: pH: ± 0.03 pH @ 25°C
  ORP: ± 2 mV @ 25°C
- Resolution: pH: 0.02 pH
  ORP: 1 mV
  Temp. 0.2°C
- Error indication: Temp output "+999.9"

Standards and Approvals

- CE
- Manufactured under ISO 9001 & ISO 14001

3. In-line Dimensions

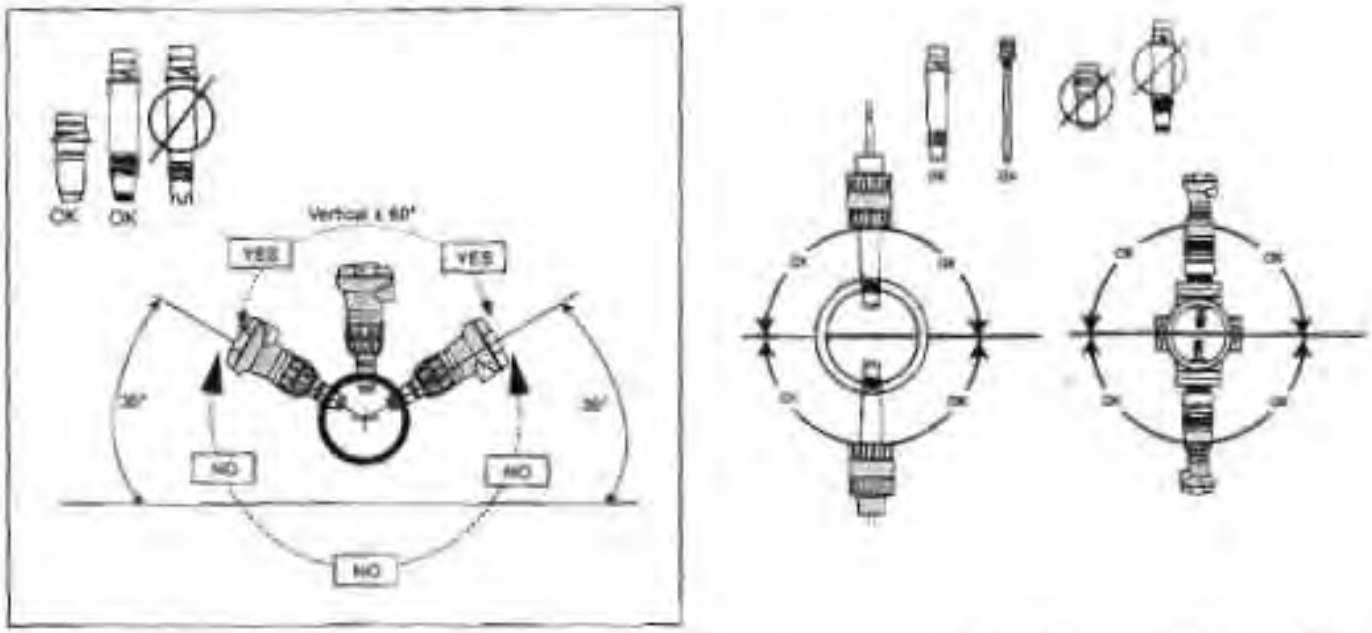
- The 2750-1 in-line sensor (without Easy-Cal) is designed for applications where electrode calibration is facilitated by remote equipment.
- The 2750-2 in-Line sensor includes Easy-Cal.
- A Signet installation fitting (½ in. to 4 in.) or a Signet pipe adapter is required to secure the electrode in the pipe.
- The Signet Measurement and Instrumentation catalog offers a complete selection of fittings.
- The 2750-3 and 2750-4 submersible sensor electronics are recommended for in-line applications using the 2764 series differential electrodes and the 2774 series Threaded DryLoc electrodes.
- 2754 and 2774 series electrodes thread directly into standard 1 in. or 3/4 in. NPT fittings.



Mounting position

2754 and 2764 series electrodes must be mounted upright.

- Vertical (0°) position optimum.
- Do not install within 30° of horizontal (Contact factory for horizontal or inverted installation requirements.)
- Recommended maximum flow rate 10 ft/s.
- Wet-tap electrodes and 2774 series electrodes have pressurized electrolyte chambers, enabling them to be mounted at any angle.



4. 2750 In-line pH Sensor Assembly

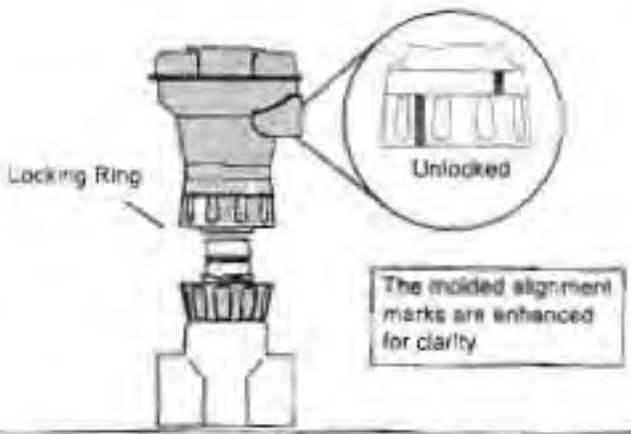
Note: This procedure applies to systems using standard 2754-2751 electrodes. If the 3719 pH/ORP Wet-Tap is used, refer to the 3719 manual for instructions.

1. Insert electrode into Signet installation fitting. Seat the electrode tabs into the alignment notches in the fitting.

2. Thread the in-line retaining cap onto fitting to secure the electrode into place. Hand-tighten the cap. DO NOT use any tools to avoid damaging the threads.

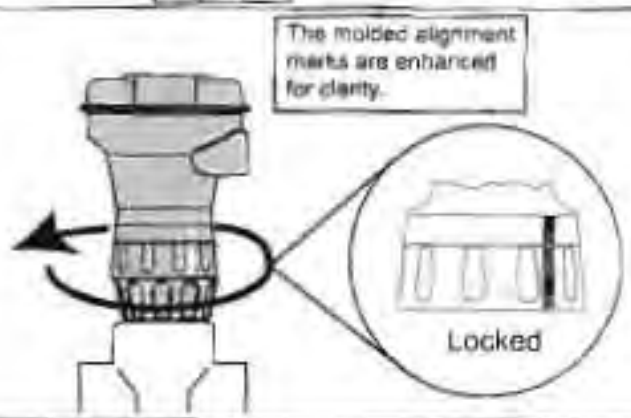
Note:
Keep the electrical interconnection between electrode and sensor electronics dry and clean at all times.

3. Unlock the ring on base of 2750 (The ring is unlocked when the lines on the ring and body of the 2750 are not aligned.)



4. Place 2750 onto top of electrode and turn until the assembly drops into position.

5. Turn locking ring ¼ turn to secure the 2750 assembly. (The ring is locked when the line on the ring and the line on the body of the 2750 are aligned.)



In-Line Sensor and Electrode Removal

- **To remove electronics assembly only:**
  Turn locking ring ¼ turn; lift assembly straight up.
- **To remove electrode from the pipe:**
  Remove electronics assembly, then unthread retaining cap; pull electrode straight up.
- **To remove the complete 2750 system:**
  Hold locking ring in place. Unthread retaining cap and pull electrode straight up.

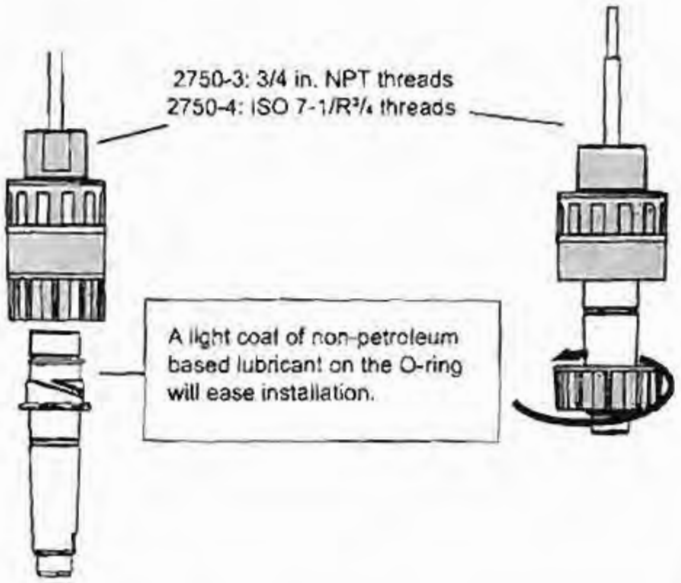
CAUTION!

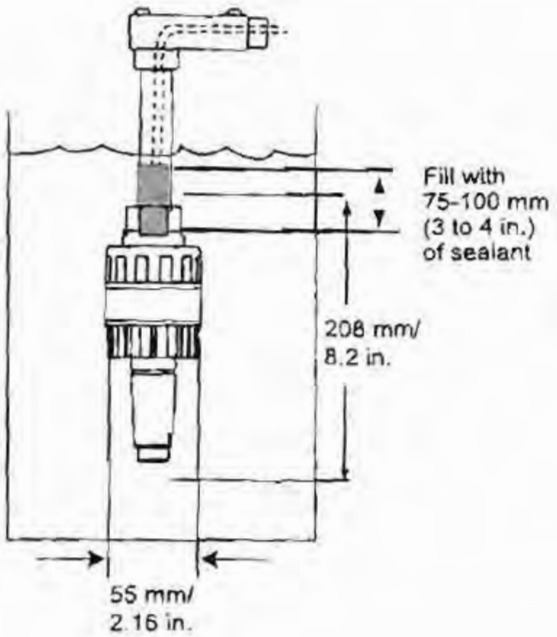
- Do not remove the electrode from a pressurized pipe.
- Wear appropriate protective clothing when working with chemicals in pressurized pipe.

5. 2750-3, -4 Submersible Sensor Assembly and Installation

1. Insert electrode into base of the 2750-3 or 2750-4 and turn until keyed contacts are seated.
2. Thread retaining cap over electrode and hand-tighten onto 2750.
3. Attach ¾ in. watertight pipe to the top of the 2750. Secure the threaded connection to prevent any leakage.

- For additional defense against possible accumulation of condensation at the back seal area of the sensor, fill the lower 3-4 inches (75-100 mm) of conduit or extension pipe with a flexible sealant such as silicone.





Note:
Keep the electrical interconnection between electrode and sensor electronics dry and clean at all times.

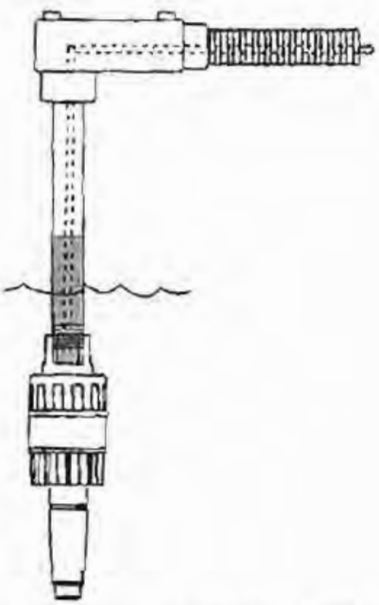
Use standard installation hardware to connect the submersible 2750-3 or -4 directly to external equipment.

OR

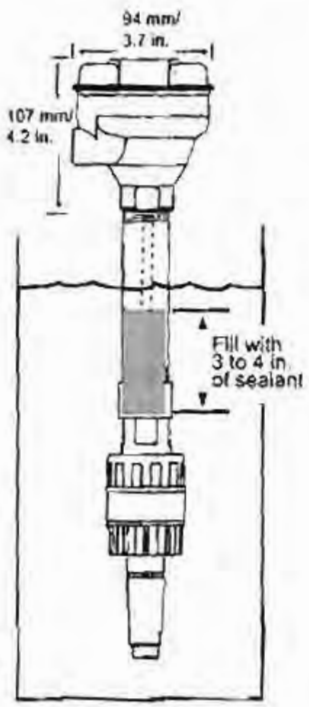
The 8052-1 NPT Mount Junction box (or 8052-2 with Easy-Cal) connects to ¾ in. pipe or conduit and provides convenient wiring termination.

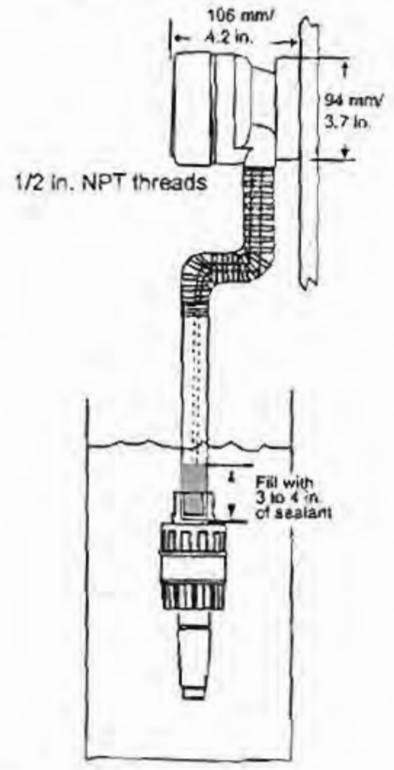
OR

The 8050-1 Universal Mount junction box (or 8050-2 with Easy-Cal) mounts flat onto a wall or can be strapped to a post or pipe.



Cable supplied: 5 m (15 ft.) 3-conductor + shld, 22 AWG.
May be extended up to 183 m (600 ft) with current output.
May be extended up to 305 m (1000 ft) with S³L output.

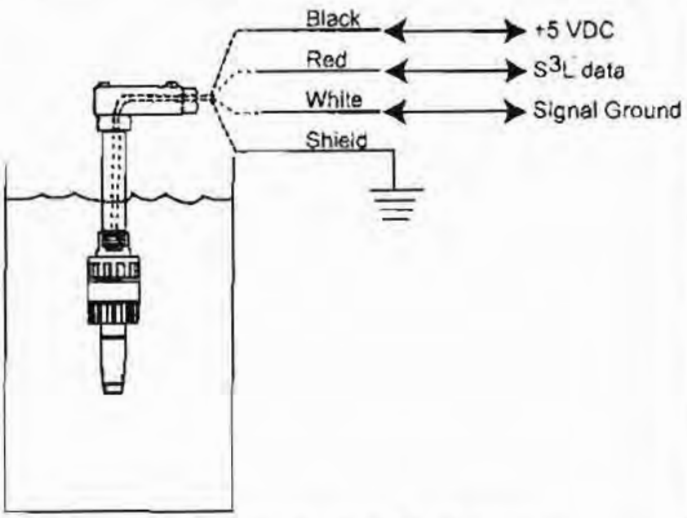




6. Digital (S^3L) wiring

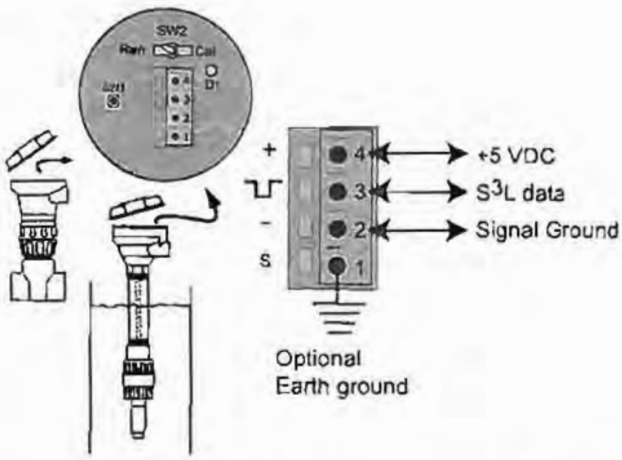
- When the 2750 is powered with 5 VDC, the digital (S^3L) serial data output is automatically selected.
- S^3L data is used exclusively by Signet instruments.
- Remove approximately 10 mm (0.4 in.) of insulation and tin each conductor before inserting into connectors.

S^3L with no junction box



- Connect the 2750 cable directly to S^3L I/O terminals.
- **8900 users:** If this direct wiring is used, set the CALIBRATE menu to "perform calibration at INSTRUMENT"

S^3L with Junction box

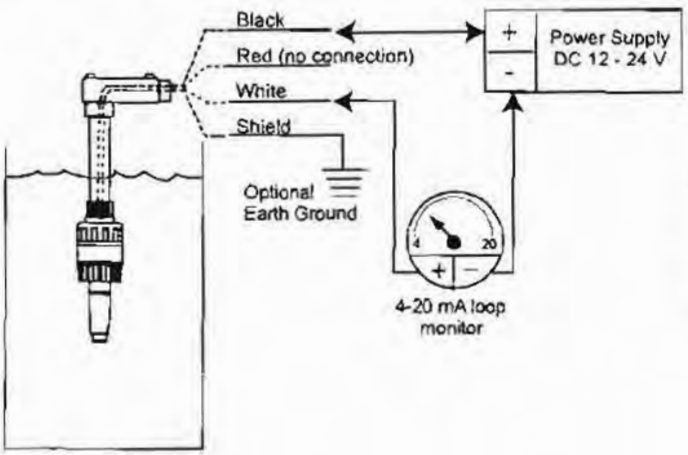


- When the 2750 includes a terminal block, connect the 2750 terminals as shown to any S^3L I/O port.
- **8900 users:** If the 2750 includes the Easy-Cal accessory, set the CALIBRATE menu to "perform Calibration at either SENSOR or INSTRUMENT"
- If SENSOR, use standard pH buffer values (pH 4, 7, or 10) to perform periodic calibration.
- If INSTRUMENT, any pH value can be used.

7. 4-20 mA Loop wiring

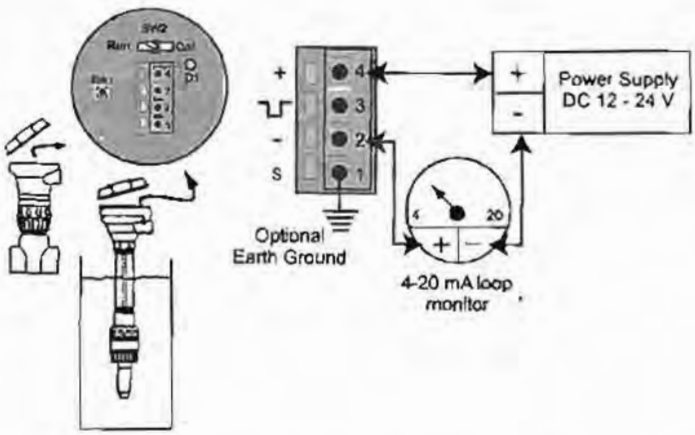
- When the 2750 is powered with 12 to 24 VDC, the 4-20 mA loop output is automatically selected.
- Remove approximately 10 mm (0.4 in.) of insulation and tin each conductor before inserting into connectors.

Current Loop with no junction box



- Connect the 2750 cable directly to a Loop device as shown.
- This configuration does not provide any calibration capability within the 2750 system. Periodic calibration must be performed at the external equipment.

Current loop with Junction box

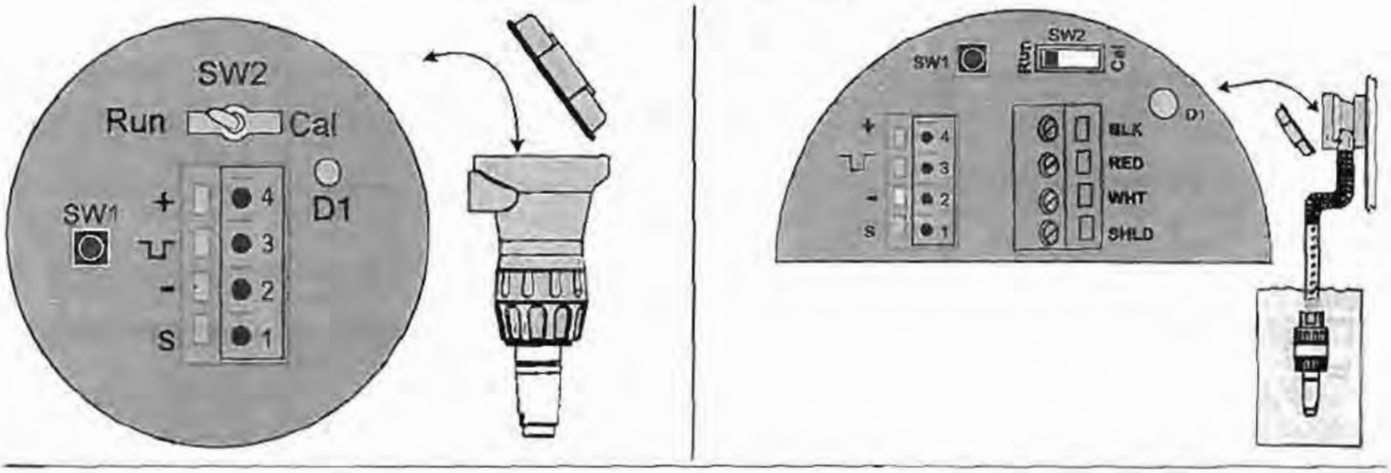


- When the 2750 includes a terminal block, connect the 2750 terminals to the Loop device as shown.
- If the 2750 includes the Easy-Cal accessory, use standard pH buffer values (pH 4, 7, or 10) to perform periodic calibration.

8. Calibration

All 2750 pH/ORP Sensor Electronics are factory-calibrated for maximum out-of-the-box accuracy. Periodic calibration is required to compensate for electrode aging.
The optional Easy-Cal feature allows calibration to be performed local to the sensor.

SW1 Easy-Cal button
SW2 RUN/CALIBRATE switch for S³L system
D1 Easy-Cal Indicator (green LED)



Easy-Cal Procedure:
The first step (Reset) is recommended each time an electrode is replaced, but is NOT necessary upon initial installation or periodic calibration. In fact, for periodic calibration it is best for the electrode/sensor assembly to remain intact to minimize the possibility of moisture or other contamination entering the electrical interconnection area. The electrode/sensor connection must remain dry and clean at all times.

1. Reset the 2750 pH/ORP Sensor to factory calibration: With no electrode connected to the Sensor, press and hold SW1 until the LED (D1) comes on steady then goes off again (approx. 10 seconds). When the LED goes off, release SW1; reset is complete.

2. Connect an electrode to the 2750 pH/ORP Sensor.

3. **If S³L output is being used, place SW2 in the "Cal" position. If 4-20 mA output is being used, SW2 position is of no consequence.**

4. Place the electrode/sensor assembly into a calibration solution as follows: (If the electrode is "healthy", then the 2750 will automatically recognize the solution. The order in which the solutions are used during the calibration procedure is of no consequence.)
   - For pH calibration, use any two of these international standards: pH 4.0, 7.0 or 10.0 buffer solutions. (Signet part number 3-0700.390 contains one capsule of each value)
   - To produce standards for ORP calibration, mix the chemical Quinhydrone into pH 7.0 and 4.0 buffers to saturation (1/8g per 50ml).
   - Regardless of the size of the container used for calibration, one inch of solution is adequate to completely submerge the tip of the electrode.
   - **Allow at least 30 seconds for the electrode response to stabilize before calibration.**

5. Press and hold SW1 for approximately 8 to 10 seconds. During this time, the LED (D1) will come on steady then go back off. Release SW1. (If the LED blinks several times rapidly, the calibration was not successful. See the troubleshooting section.)

6. Remove the electrode/sensor assembly from the first calibration solution, rinse the electrode with clean water, and place it in a second solution.
   - **Allow at least 30 seconds for the electrode response to stabilize before calibration.**

7. Press and hold SW1 for approximately 8 to 10 seconds. During this time, the LED will come on steady then go back off. Release SW1. (If the LED blinks several times rapidly, the calibration was not successful. See the troubleshooting section.)

8. **For S³L systems ONLY: Return SW2 to the RUN position.**

Calibration is complete. Return the system to service.

9. Troubleshooting

LED and Output Condition	Possible Causes	Suggested Solutions
Current Out: **LED off, current output is 3.6 mA** **S³L: Temp out is +999.9**	• No electrode installed • Bad/dirty contacts between electrode and 2750	• Install electrode • Check interconnection between electrode and 2750, clean contacts
During Easy-Cal, the LED blinks rapidly for 4 seconds and the current output is frozen at a random fixed value.	• The buffer solution is outside of the accepted tolerance for the 2750 • The electrode is depleted (> 1.1 pH or 65 mV offset)	• pH system: Use fresh 4 pH, 7 pH, or 10 pH buffer and restart the calibration. • ORP system: Use fresh 4pH and 7 pH buffer solution saturated with quinhydrone. • Replace the electrode.
After completing calibration procedure, the output values are inaccurate.	• Insufficient time allowed for electrode stabilization during calibration.	• Recalibrate, verify that test solutions are at room temperature and wait at least 30 seconds after placing electrode in solution before pressing S1 EasyCal button.

10. Ordering Information

Mfr. Part No.	Code	Description
3-2750-1	159 000 744	In-line Sensor Electronics w/Junction Box
3-2750-2	159 000 745	In-line Sensor Electronics w/Junction Box and Easy-Cal
3-2750-3	159 000 746	Submersible Sensor Electronics with 15 ft. cable, ¾ in. NPT threads
3-2750-4	159 000 842	Submersible Sensor Electronics with 15 ft. cable, ISO 7-1/R¾ threads

Parts and Accessories

Mfr. Part No.	Code	Description
DryLoc pH Electrodes		
3-2754	159 000 747	Electrode, pH, DryLoc, flat, PT1000
3-2754-1	159 001 380	Electrode, pH, DryLoc, flat, 3KΩ
3-2754-HF	159 000 748	Electrode, pH, DryLoc, flat, PT1000, HF-resist (<2%)
3-2754-HF-1	159 001 381	Electrode, pH, DryLoc, flat, 3KΩ, HF-resist (<2%)
3-2756	159 000 750	Electrode, pH, DryLoc, bulb, PT1000
3-2756-DI	159 000 751	Electrode, pH, DryLoc, bulb, PT1000, DI (<100 µS)
3-2756-DI-1	159 001 382	Electrode, pH, DryLoc, bulb, 3KΩ, DI (<100 µS)
3-2756-WT	159 000 834	Electrode, pH, DryLoc, bulb, PT1000, wet-tap
3-2756-WT-1	159 001 383	Electrode, pH, DryLoc, bulb, 3KΩ, wet-tap
3-2756-WTP	159 001 390	Electrode, pH, DryLoc, bulb, PT1000, wet-tap
3-2756-WTP-1	159 001 384	Electrode, pH, DryLoc, plastic bulb, 3KΩ, wet-tap
3-2764-1	159 000 943	Electrode, pH, DryLoc, flat, 3KΩ, differential, 1 in. NPT process connection
3-2764-2	159 000 944	Electrode, pH, DryLoc, flat, PT1000, differential, 1 in. NPT process connection
3-2764-3	159 000 945	Electrode, pH, DryLoc, flat, 300Ω, differential, 1 in. NPT process connection
3-2766-1	159 000 949	Electrode, pH, DryLoc, bulb, 3KΩ, differential, 1 in. NPT process connection
3-2766-2	159 000 950	Electrode, pH, DryLoc, bulb, PT1000, differential, 1 in. NPT process connection
3-2766-3	159 000 951	Electrode, pH, DryLoc, bulb, 300Ω, differential, 1 in. NPT process connection
3-2774	159 000 955	Electrode, pH, DryLoc, flat, 3KΩ, ¾ in. NPT process connection
3-2774-1	159 000 956	Electrode, pH, DryLoc, flat, PT1000, ¾ in. NPT process connection
3-2776	159 000 959	Electrode, pH, DryLoc, bulb, 3KΩ, ¾ in. NPT process connection
3-2776-1	159 000 960	Electrode, pH, DryLoc, flat, PT1000, ¾ in. NPT process connection
DryLoc ORP (Redox) Electrodes		
3-2755	159 000 749	Electrode, ORP, DryLoc, flat, 10KΩ ID
3-2757	159 000 752	Electrode, ORP, DryLoc, bulb, 10KΩ ID
3-2757-WT	159 000 835	Electrode, ORP, DryLoc, bulb, 10KΩ ID, wet-tap
3-2765-1	159 000 946	Electrode, ORP, DryLoc, flat, 10KΩ ID, differential, 1 in. NPT process connection
3-2765-2	159 000 947	Electrode, ORP, DryLoc, flat, PT1000, differential, 1 in. NPT process connection
3-2765-3	159 000 948	Electrode, ORP, DryLoc, flat, 300Ω, differential, 1 in. NPT process connection
3-2767-1	159 000 952	Electrode, ORP, DryLoc, bulb, 10KΩ ID, differential, 1 in. NPT process connection
3-2767-2	159 000 953	Electrode, ORP, DryLoc, bulb, PT1000, differential, 1 in. NPT process connection
3-2767-3	159 000 954	Electrode, ORP, DryLoc, bulb, 300Ω, differential, 1 in. NPT process connection
3-2775	159 000 957	Electrode, ORP, DryLoc, flat, 10KΩ ID, ¾ in. NPT process connection
3-2775-1	159 000 958	Electrode, ORP, DryLoc, flat, no tc, ¾ in. NPT process connection
3-2777	159 000 961	Electrode, ORP, DryLoc, bulb, 10 KΩ ID, ¾ in. NPT process connection
3-2777-1	159 000 962	Electrode, ORP, DryLoc, bulb, no tc, ¾ in. NPT process connection
Miscellaneous Accessories		
3-8050-1	159 000 753	Universal Mount Junction Box
3-8050-2	159 000 754	Universal Mount Jct. Box w/Easy-Cal
3-8052-1	159 000 755	¾ in. NPT Mount Junction Box
3-8052-2	159 000 756	¾ in. NPT Mount Jct. Box w/Easy-Cal
3-2759	159 000 762	pH/ORP Simulator/System tester
3-2759.391	159 000 764	Adapter cable to connect 2759 and 2750
3-0700.390	198 864 403	pH Buffer Kit
P31515-0P200	159 000 630	Universal Pipe Adapter PVC
P31515-0C200	159 000 631	Universal Pipe Adapter CPVC
P31515-0V200	159 000 459	Universal Pipe Adapter PVDF
5523-0322	159 000 761	Cable, 3-conductor + shield (blk/red/wht/shld) 22AWG (per ft)

+GF+
George Fischer Signet Inc. 3401 Aerojet Avenue, El Monte, CA 91731-2882 U.S.A. • Tel. (626) 571-2770 • Fax (626) 573-2057
For Worldwide Sales and Service, visit our website: www.gfsignet.com • Or call (in the U.S.): (800) 854-4090

HAYWARD INDUSTRIAL PRODUCTS
INSTALLATION OPERATION & MAINTENANCE
OF Y-STRAINER

PLEASE READ THE FOLLOWING INFORMATION PRIOR TO INSTALLING AND USING HAYWARD VALVES, STRAINERS, FILTERS, AND OTHER ASSOCIATED PRODUCTS. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN SERIOUS INJURY.

1. Hayward guarantees its products against defective material and workmanship only. Hayward assumes no responsibility for damage or injuries resulting from improper installation, misapplication, or abuse of any product.
2. Hayward assumes no responsibility for damage or injury resulting from chemical incompatibility between its products and the process fluids to which they are subjected. Compatibility charts provided in Hayward literature are based on ambient temperatures of 70°F and are for reference only. Customer should always test to determine application suitability.
3. Consult Hayward literature to determine operating pressure and temperature limitations before installing any Hayward product. Note that the maximum recommended fluid velocity through any Hayward product is eight feet per second. Higher flow rates can result in possible damage due to the water hammer effect. Also note that maximum operating pressure is dependent upon material selection as well as operating temperature.
4. Hayward products are designed primarily for use with non-compressible liquids. They should NEVER be used or tested with compressible fluids such as compressed air or nitrogen.
5. Systems should always be depressurized and drained prior to installing or maintaining Hayward products.
6. Temperature effect on piping systems should always be considered when the systems are initially designed. Piping systems must be designed and supported to prevent excess mechanical loading on Hayward equipment due to system misalignment, weight, shock, vibration, and the effects of thermal expansion and contraction.
7. Because PVC and CPVC plastic products become brittle below 40°F, Hayward recommends caution in their installation and use below this temperature.
8. Published operating torque requirements are based upon testing of new valves using clean water at 70°F. Valve torque is affected by many factors including fluid chemistry, viscosity, flow rate, and temperature. These should be considered when sizing electric or pneumatic actuators.
9. Due to differential thermal expansion rates between metal and plastic, transmittal of pipe vibration, and pipe loading forces DIRECT INSTALLATION OF METAL PIPE INTO PLASTIC CONNECTIONS IS NOT RECOMMENDED. Wherever installation of plastic valves into metal piping systems is necessary, it is recommended that at least 10 pipe diameter in length of plastic pipe be installed upstream and downstream of the plastic valve to compensate for the factors mentioned above.

SOCKET CONNECTION:

Socket end connections are manufactured to ASTM D2467-94. Solvent cementing of socket end connections to pipe should be performed per ASTM specifications D2855-87. Cut pipe square. Chamfer and deburr pipe. Surfaces must be cleaned and free of dirt, moisture, oil and other foreign material. Apply primer to inside socket surface of the strainer. Never allow primer or cement to contact sealing surfaces or the screen, as leaking may result. Use a scrubbing motion. Repeat applications may be necessary to soften the surface of the socket. Next, liberally apply primer to the male end of the pipe to the length of the socket depth. Again apply to the socket, without delay, apply cement to the pipe while the surface is still wet with primer. Next apply cement lightly, but uniformly to the inside of the socket. Apply a second coat of cement to the pipe, and assemble the strainer to the pipe, rotating the strainer 1/4 turn in one direction as it is slipped to full depth on to the pipe. The strainer should be held in position for approx. 30 seconds to allow the connection to "set". After assembly wipe off excess cement. Full set time is a minimum of 30 minutes at 60 to 100 °F. Full cure time should be based on the chart below.

JOINT CURE SCHEDULE:

The cure schedules are suggested as guides. They are based on laboratory test data, and should not be taken to be the recommendations of all cement manufacturers. Individual manufacturer's recommendations for their particular cement should be followed.

	Test Pressures for Pipe Sizes ½" to 1-1/4"		Test Pressures for Pipe Sizes 1-1/2" to 3"		Test Pressures for Pipe Sizes 4" & 5"		Test Pressures for Pipe Sizes 6" to 8"	
Temperature Range During Cure Period(B) °F(°C)	Up to 180 PSI (1240 kPa)	Above 180 to 370 PSI (1240 to 2550 kPa)	Up to 180 PSI (1240 kPa)	Above 180 to 315 PSI (1240 to 2172 kPa)	Up to 180 PSI (1240 kPa)	Above 180 to 315 PSI (1240 to 2172 kPa)	Up to 180 PSI (1240 kPa)	Above 180 to 315 PSI (1240 to 2172 kPa)
60 to 100 (15 to 40)	1 hour	6 hours	2 hours	12 hours	6 hours	18 hours	8 hours	1 day
40 to 60 (5 to 15)	2 hours	12 hours	4 hours	1 day	12 hours	36 hours	16 hours	4 days
20 to 40 (-7 to 5)	6 hours	36 hours	12 hours	3 days	36 hours (A)	4 days (A)	3 days (A)	9 days (A)
10 to 20 (-15 to -7)	8 hours	2 days	16 hours	4 days	3 days (A)	5 days (A)	4 days (A)	12 days (A)
Colder than 10 (-15)	Extreme care should be exercised on all joints made when pipe, fittings or cement is below 10°F.							

A: It is important to note that at temperatures colder than 20°F on sizes that exceed 3 in., test results indicate that many variables exist in the actual cure rate of the joint. The data expressed in these categories represent only estimated averages. In some cases, cure will be achieved in less time, but isolated test results indicate that even longer periods of cure may be required.

B: These cure schedules are based on laboratory test data obtained on Net Fit Joints (NET FIT:=in a dry fit the pipe bottoms snugly in the fitting socket without meeting interference).

THREADED CONNECTION:

Threaded end connections are manufactured to ASTM specifications D2464-88, F437-88 and ANSI B2.1. Wrap threads of pipe with Teflon tape of 3 to 3-1/2 mil thickness. The tape should be wrapped in a clockwise direction starting at the first or second full thread. Overlap each wrap by 1/2 the width of the tape. The wrap should be applied with sufficient tension to allow the threads of a single wrapped area to show through without cutting the tape. The wrap should continue for the full effective length of the thread. Pipe sizes 2" and greater will not benefit with more than a second wrap, due to the greater thread depth. To provide a leak proof joint, the pipe should be threaded into the end connection "hand tight". Using a strap wrench only. (Never use a stillson type wrench) tighten the joint an additional 1/2 to 1-1/2 turns past hand tight. Tightening beyond this point may induce excessive stress that could cause failure.

FLANGED CONNECTION:

Flange bolts should be tight enough to slightly compress the gasket and make a good seal, without distorting or putting excessive stress on the flanges. Suitable washers should be used between the bolt head and flange and the nut and flange. Bolts should be tightened in alternating sequence.

RECOMMENDED FLANGE BOLT TORQUE

FLANGE SIZE	BOLT DIA.	TORQUE FT. LBS.	FLANGE SIZE	BOLT DIA.	TORQUE FT. LBS.
1/2	1/2	10-15	2	5/8	15-25
3/4	1/2	10-15	2-1/2	5/8	20-25
1	1/2	10-15	3	5/8	20-25
1-1/4	1/2	10-15	4	5/8	20-25
1-1/2	1/2	10-15	6	3/4	30-40

NOTE: USE WELL LUBRICATED METAL BOLTS AND NUTS. USE SOFT RUBBER GASKETS.

INSTALLATION:

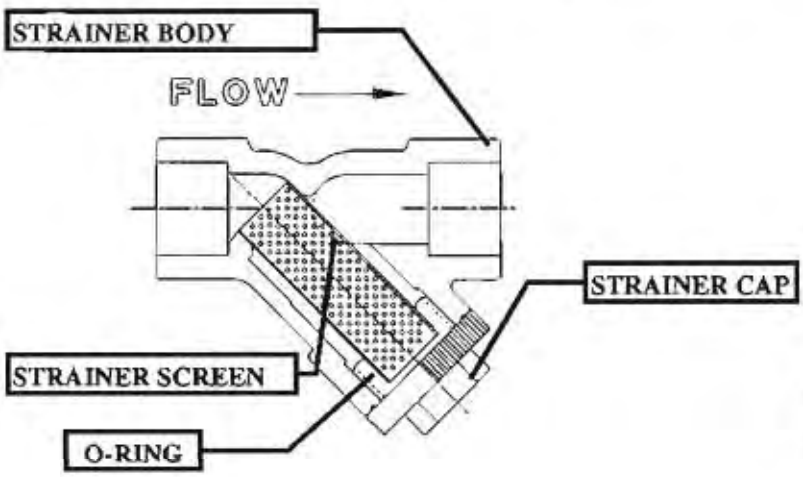
It is recommended that these strainers be installed no closer than 10 pipe diameters from a pump. At least 5 pipe diameters should be between these strainers and an elbow.

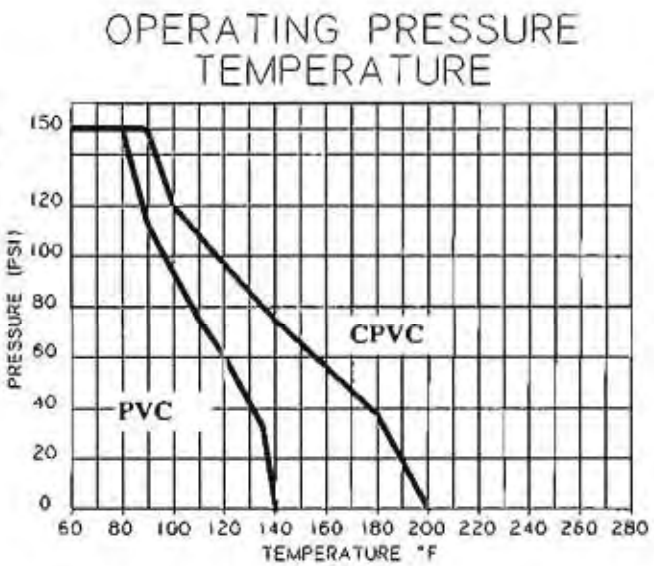
As in all plastic piping the maximum fluid velocity is 8 feet per second. This velocity minimizes the effects of valve closure and pump start up or shut down.

SCREEN CLEANING:

EXTREME CAUTION MUST BE TAKEN WHEN WORKING ON THIS STRAINER.
THE PIPING SYSTEM MUST BE DEPRESSURIZED AND DRAINED. PROPER CARE MUST BE TAKEN. CONSULT M.S.D.S. (MATERIAL SAFETY DATA SHEETS) INFORMATION REGARDING YOUR SPECIFIC APPLICATION.

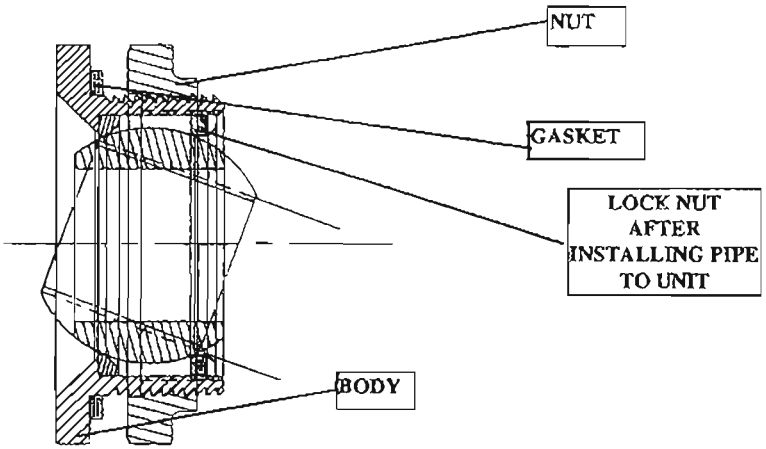
When the pressure drop across the strainer is in excess of 5 PSI the screen requires cleaning. To clean the screen remove the screen cap nut from the strainer by turning counter clockwise. The collected debris should be removed with the screen. Clean the screen. **DO NOT POUND OR DEFORM THE SCREEN.** Insert the screen back into the strainer with the flange, if one is on the screen, into the body first. (Placing the screen in the cap may aid assembly and avoid screen damage.) Install the o-ring in the body groove. Use a non-petroleum base lubricant to lubricate the o-ring and thread, and re-assemble the cap to the strainer.

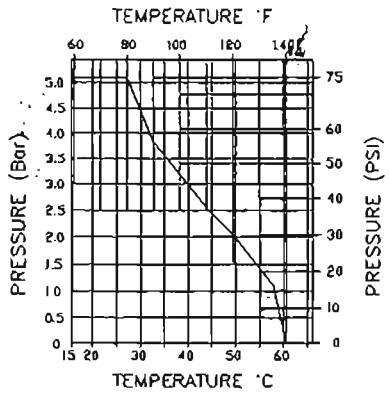




HAYWARD INDUSTRIAL PRODUCTS

INSTALLATION DATA FOR
Self-Aligninging BULKHEAD FITTING





PLEASE READ THE FOLLOWING INFORMATION PRIOR TO INSTALLING AND USING HAYWARD VALVES, STRAINERS, FILTERS, AND OTHER ASSOCIATED PRODUCTS. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN SERIOUS INJURY.

1. Hayward guarantees its products against defective material and workmanship only. Hayward assumes no responsibility for damage or injuries resulting from improper installation, misapplication, or abuse of any product.
2. Hayward assumes no responsibility for damage or injury resulting from chemical incompatibility between its products and the process fluids to which they are subjected. Compatibility charts provided in Hayward literature are based on ambient temperatures of 70F and are for reference only. Customer should always test to determine application suitability.
3. Consult Hayward literature to determine operating pressure and temperature limitations before installing any Hayward product. Note that the maximum recommended fluid velocity through any Hayward product is eight feet per second. Higher flow rates can result in possible damage due to the water hammer effect. Also note that maximum operating pressure is dependent upon material selection as well as operating temperature.
4. Hayward products are designed primarily for use with non-compressible liquids. They should NEVER be used or tested with compressible fluids such as compressed air or nitrogen.
5. Systems should always be depressurized and drained prior to installing or maintaining Hayward products.
6. Temperature effect on piping systems should always be considered when the systems are initially designed. Piping systems must be designed and supported to prevent excess mechanical loading on Hayward equipment due to system misalignment, weight, shock, vibration, and the effects of thermal expansion and contraction.
7. Because PVC and CPVC plastic products become brittle below 40F, Hayward recommends caution in their installation and use below this temperature.
8. Published operating torque requirements are based upon testing of new valves using clean water at 70F. Valve torque is affected by many factors including fluid chemistry, viscosity, flow rate, and temperature. These should be considered when sizing electric or pneumatic actuators.
9. Due to differential thermal expansion rates between metal and plastic, transmittal of pipe vibration, and pipe loading forces DIRECT INSTALLATION OF METAL PIPE INTO PLASTIC CONNECTIONS IS NOT RECOMMENDED. Wherever installation of plastic valves into metal piping systems is necessary, it is recommended that at least 10 pipe diameter in length of plastic pipe be installed upstream and downstream of the plastic valve to compensate for the factors mentioned above.

INSTALLATION INSTRUCTIONS:

PLEASE NOTE: THE SIZE ON THE "NUT" IS NOT THE SIZE OF THE PIPE FOR THE FITTING.

The following table in inches are recommended values.

Bulkhead Pipe size	NUT Size	Mln Rigid Tank ID	Mln Flexible Tank ID	Max Wall	Mln Hole	Max Hole
1"	2"	25.75	19.38	1.50	3.25	3.28
2"	3"	42.50	36.25	1.14	4.50	4.54
3"	4"	90.00	76.81	1.69	5.72	5.78

THE SYSTEM AND TANK SHOULD BE DEPRESSURIZED AND DRAINED BEFORE ATTEMPTING TO INSTALL A BULKHEAD FITTING. VENTING AND PROPER PERSONAL PROTECTION EQUIPMENT SHOULD BE USED WHEN ENTERING TANKS.

THE BULKHEAD FITTING SHOULD BE INSTALLED WITH THE BODY AND THE GASKET ON THE INSIDE OF THE TANK. TIGHTEN THE NUT WHILE HOLDING THE BODY. THE NUT SHOULD BE TIGHTENED FROM THE OUTSIDE OF THE TANK BY HOLDING THE FLATS ON THE BODY INSIDE THE TANK WHILE TURNING THE NUT. PLEASE NOTE THE DIRECTION TO TIGHTEN ON THE NUT. IF THERE IS NO ARROW THE UNIT HAS RIGHT HAND THREADS. IF THERE IS AN ARROW THE UNITS HAVE LEFT HAND THREADS

SFIOM REV A
11/19/1999
ECR 819R

HAYWARD INDUSTRIAL PRODUCTS
INSTALLATION OPERATION & MAINTENANCE
OF TRUE UNION BALL CHECK VALVES

PLEASE READ THE FOLLOWING INFORMATION PRIOR TO INSTALLING AND USING HAYWARD VALVES, STRAINERS, FILTERS, AND OTHER ASSOCIATED PRODUCTS. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN SERIOUS INJURY.

1. Hayward guarantees its products against defective material and workmanship only. Hayward assumes no responsibility for damage or injuries resulting from improper installation, misapplication, or abuse of any product.
2. Hayward assumes no responsibility for damage or injury resulting from chemical incompatibility between its products and the process fluids to which they are subjected. Compatibility charts provided in Hayward literature are based on ambient temperatures of 70F and are for reference only. Customer should always test to determine application suitability.
3. Consult Hayward literature to determine operating pressure and temperature limitations before installing any Hayward product. Note that the maximum recommended fluid velocity through any Hayward product is eight feet per second. Higher flow rates can result in possible damage due to the water hammer effect. Also note that maximum operating pressure is dependent upon material selection as well as operating temperature.
4. Hayward products are designed primarily for use with non-compressible liquids. They should NEVER be used or tested with compressible fluids such as compressed air or nitrogen.
5. Systems should always be depressurized and drained prior to installing or maintaining Hayward products.
6. Temperature effect on piping systems should always be considered when the systems are initially designed. Piping systems must be designed and supported to prevent excess mechanical loading on Hayward equipment due to system misalignment, weight, shock, vibration, and the effects of thermal expansion and contraction.
7. Because PVC and CPVC plastic products become brittle below 40F, Hayward recommends caution in their installation and use below this temperature.
8. Published operating torque requirements are based upon testing of new valves using clean water at 70F. Valve torque is affected by many factors including fluid chemistry, viscosity, flow rate, and temperature. These should be considered when sizing electric or pneumatic actuators.
9. Due to differential thermal expansion rates between metal and plastic, transmittal of pipe vibration, and pipe loading forces DIRECT INSTALLATION OF METAL PIPE INTO PLASTIC CONNECTIONS IS NOT RECOMMENDED. Wherever installation of plastic valves into metal piping systems is necessary, it is recommended that at least 10 pipe diameter in length of plastic pipe be installed upstream and downstream of the plastic valve to compensate for the factors mentioned above.

SOCKET CONNECTION:

Socket end connections are manufactured to ASTM D2467-94. Solvent cementing of socket end connections to pipe should be performed per ASTM specifications D2855-87. Cut pipe square. Chamfer and deburr pipe. Surfaces must be cleaned and free of dirt, moisture, oil and other foreign material. Remove assembly nuts and end connectors from valve body. Slide assembly nuts, with threads facing valve, onto pipe to which the end connector is to be cemented. Apply primer to inside socket surface of end connector. Never allow primer or cement to contact valve ball or end connector o-ring sealing surfaces, as leaking may result. Use a scrubbing motion. Repeat applications may be necessary to soften the surface of the socket. Next, liberally apply primer to the male end of the pipe to the length of the socket depth. Again apply to the socket, without delay apply cement to the pipe while the surface is still wet with primer. Next apply cement lightly, but uniformly to the inside of the socket. Apply a second coat of cement to the pipe, and assemble the end connector to the pipe, rotating the end connector 1/4 turn in one direction as it is slipped to full depth on to the pipe. The end connector should be held in position for approx. 30 seconds to allow the connection to "set". After assembly wipe off excess cement. Full set time is a minimum of 30 minutes at 60 to 100 F. Full cure time should be based on the chart below.

JOINT CURE SCHEDULE:

The cure schedules are suggested as guides. They are based on laboratory test data, and should not be taken to be the recommendations of all cement manufacturers. Individual manufacturer's recommendations for their particular cement should be followed.

Temperature Range During Cure Period(B) °F(°C)	Test Pressures for Pipe Sizes 1/2 to 1-1/4 In. Up to 180 PSI (1240 kPa)	Test Pressures for Pipe Sizes 1/2 to 1-1/4 In. Above 180 to 370 PSI (1240 to 2550 kPa)	Test Pressures for Pipe Sizes 1-1/2 to 3 In. Up to 180 PSI (1240 kPa)	Test Pressures for Pipe Sizes 1-1/2 to 3 In. Above 180 to 315 PSI 1240) to 2170 kPa)	Test Pressures for Pipe Sizes 4 to 5 In. Up to 180 PSI (1240 kPa)	Test Pressures for Pipe Sizes 4 to 5 In. Above 180 to 315 PSI (1240 to 2170 kPa)	Test Pressures for Pipe Sizes 6 to 8 In Up to 180 PSI (1240 kPa)	Test Pressures for Pipe Sizes 6 to 8 In Above 180 to 315 PSI (1240 to 2170 kPa)
60 to 100 (15 to 40)	1 h	6 h	2 h	12 h	6 h	18 h	8 h	24 h
40 to 60 (5 to 15)	2 h	12 h	4 h	24 h	12 h	36 h	16 h	48 h
20 to 40 (-7 to 5)	6 h	36 h	12 h	72 h	36 h A	4 days A	3 days A	9 days A
10 to 20) (-15 to 7)	8 h	48 h	16 h	96 h	72 h A	8 days A	4 days A	12 days A
Colder than 10 (-15)	Extreme care should be exercised on all joints made where pipe, fittings or cement is below 10°F.							

A: It is important to note that at temperatures colder than 20°F on sizes that exceed 3 in., test results indicate that many variables exist in the actual cure rate of the joint. The data expressed in these categories represent only estimated averages. In some cases, cure will be achieved in less time, but isolated test results indicate that even longer periods of cure may be required.

B: These cure schedules are based on laboratory test data obtained on Net Fit Joints (NET FIT=in a dry fit the pipe bottoms snugly in the fitting socket without meeting interference).

THREADED CONNECTION:

Threaded end connections are manufactured to ASTM specifications D2464-88. F437-88 and ANSI B2.1. Wrap threads of pipe with Teflon tape of 3 to 3-1/2 mil thickness. The tape should be wrapped in a clockwise direction starting at the first or second full thread. Overlap each wrap by, 1/2 the width of the tape. The wrap should be applied with sufficient tension to allow the threads of a single wrapped area to show through without cutting the tape. The wrap should continue for the full effective length of the thread. Pipe sizes 2" and greater will not benefit with more than a second wrap, due to the greater thread depth. To provide a leak proof joint, the pipe should be threaded into the end connection "hand tight". Using a strap wrench only. (Never use a stillson type wrench) tighten the joint an additional 1/2 to 1-1/2 turns past hand tight. Tightening beyond this point may induce excessive stress that could cause failure.

FLANGED CONNECTION:

Flange bolts should be tight enough to slightly compress the gasket and make a good seal, without distorting or putting excessive stress on the flanges. Suitable washers should be used between the bolt head and flange and the nut and flange. Bolts should be tightened in alternating sequence.

RECOMMENDED FLANGE BOLT TORQUE

FLANGE SIZE	BOLT DIA.	TORQUE FT. LBS.	FLANGE SIZE	BOLT DIA.	TORQUE FT. LBS.
1/2	1/2	10-15	2	5/8	15-25
3/4	1./2	10-15	2-1/2	5/8	20-25
1	1/2	10-15	3	5/8	20-25
1-1/4	1/2	10-15	4	5/8	20-25
1-1/2	1/2	10-15	6	3/4	30-40

NOTE: USE WELL-LUBRICATED METAL BOLTS AND NUTS. USE SOFT RUBBER GASKETS.

ORIENTATION:

It is recommended that these valves be installed no closer than 10 pipe diameters from a pump. At least 5 pipe diameters should be between these valves and an elbow.

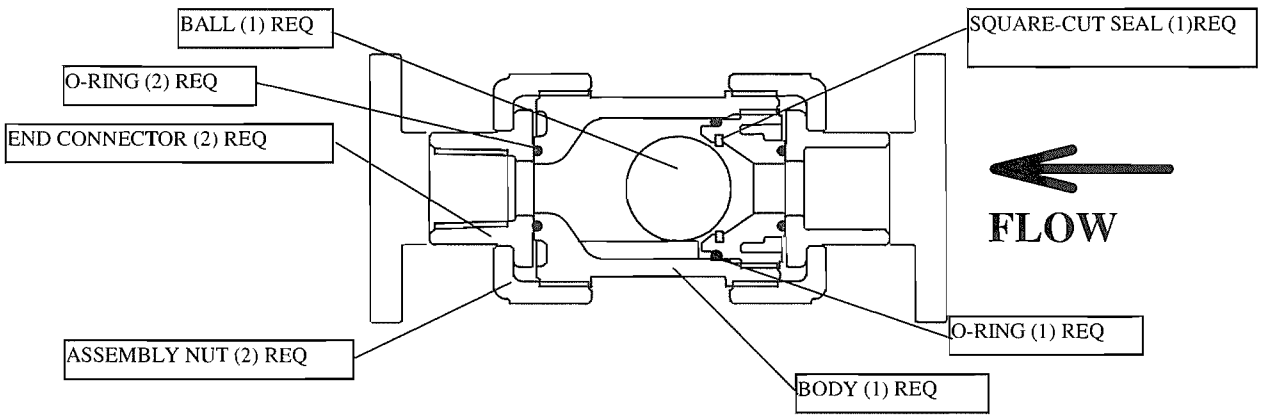
As in all plastic piping the maximum fluid velocity is 8 feet per second. This velocity minimizes the effects of valve closure and pump start up or shut down.

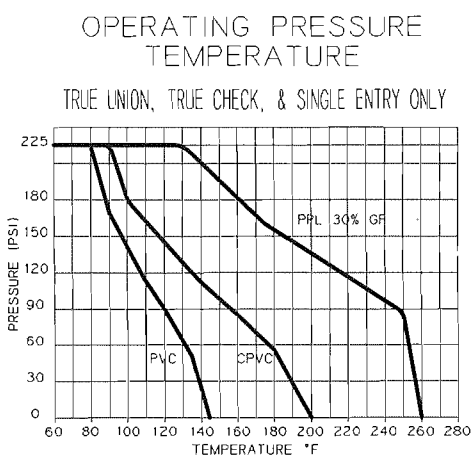
Note flow direction when installing. The ball will not float. This valve can be used in an upfloat line but not in a downfloat line. In horizontal installations standard line drop will generally not allow ball to seat.

REPAIR:

EXTREME CAUTION MUST BE TAKEN WHEN WORKING ON THIS VALVE.
THE PIPING SYSTEM MUST BE DEPRESSURIZED AND DRAINED. PROPER CARE MUST BE TAKEN. CONSULT M.S.D.S. (MATERIAL SAFETY DATA SHEETS) INFORMATION REGARDING YOUR SPECIFIC APPLICATION.

Remove the assembly nut and end connector from the "adjust" end of the body, or the complete valve body from the piping system. The front face of the seal retainer indicates which direction of rotation tightens or loosens the seal retainer, with the word "tighten" and a directional arrow, and the word "loosen" and a directional arrow. Direction of rotation may vary depending on date of manufacture.
Rotate the seal retainer completely in the "loosen" direction and remove it from valve body. The o-rings and seals are now accessible for replacement using a "seal" repair kit. Carefully remove the o-rings from their respective locations taking care not to scratch their sealing surfaces. Use a non-petroleum base lubricant to lubricate the o-rings, and re-assemble the valve.





TCIS REV C
9/7/99
ECR 819R

anchor scientific inc.
Box 378, Long Lake, MN 55356
952-473-7115 · FAX 952-473-6002 · www.anchorscientific.com

mini·float®
Form 2500-D

mini·float®

DESCRIPTION

Mini-floats are pilot duty devices designed for small diameter sumps and places where space is a determining factor in the selection of a level control device. Mini-floats control the function of motor load devices, such as contactors, motor starters, and power relays, to automatically cycle a pump or pumps. They can also be used for alarm signaling devices. Two Mini-Floats are needed for a one-pump operation; three for a two-pump operation.

SPECIFICATIONS

Cable	18-2 SJO W/A
Housing	Polypropylene
Clamp (Only on Type P models)	Adjustable 1"-4"
Temperature Rating	60° C.

MODELS

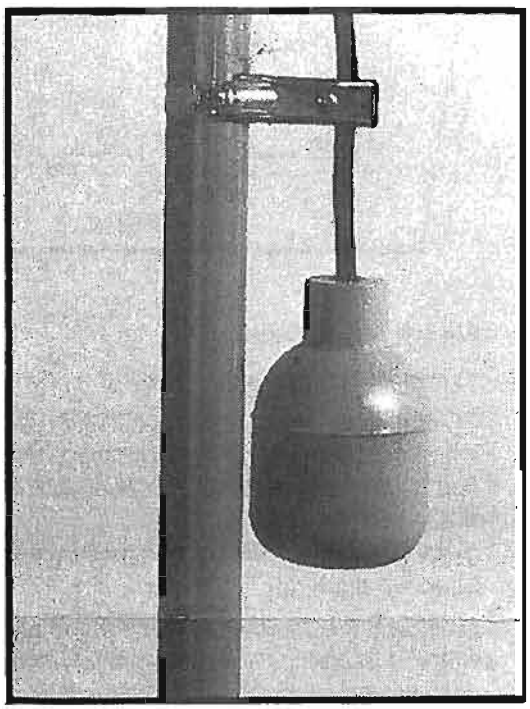
Mini-Floats are available in a combination of mounting styles, cable lengths, and circuit configurations. Mounting styles are shown at right: pipe mounted (Type P), and suspended (Type S). 10, 15, and 25-foot cable lengths are standard, but other lengths can be special ordered. Electrical configurations must be specificied; normally open, (NO), for pump out applications and normally closed, (NC), for pump in applications.

EXAMPLE:

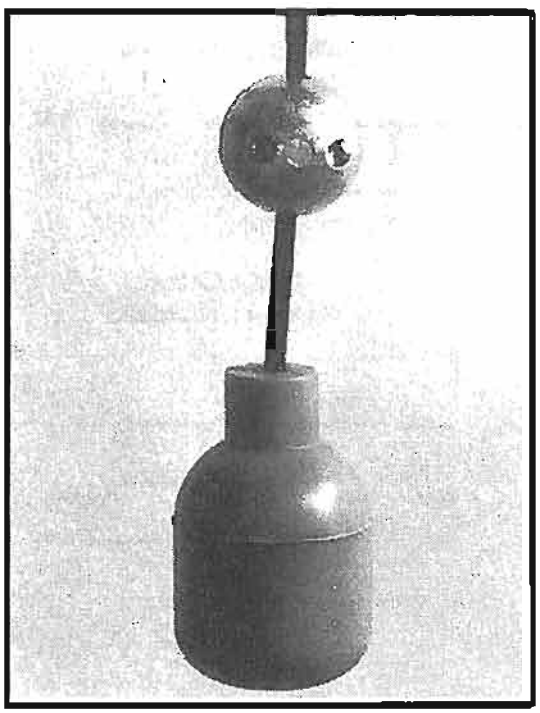
P	M	10	NO
Mounting Style	Mini-Float	Cable Length	Electrical Configuration

ELECTRICAL CONFIGURATION	CABLE LENGTH	SUSPENDED TYPE 'S' MODEL NO.	PIPE MOUNTED TYPE 'P' MODEL NO.
NORMALLY OPEN	10	S M 10 NO	P M 10 NO
	15	S M 15 NO	P M 15 NO
	20	S M 20 NO	P M 20 NO
	25	S M 25 NO	P M 25 NO
	30	S M 30 NO	P M 30 NO
NORMALLY CLOSED	10	S M 10 NC	P M 10 NC
	15	S M 15 NC	P M 15 NC
	20	S M 20 NC	P M 20 NC
	25	S M 25 NC	P M 25 NC
	30	S M 30 NC	P M 30 NC

MOUNTING STYLES

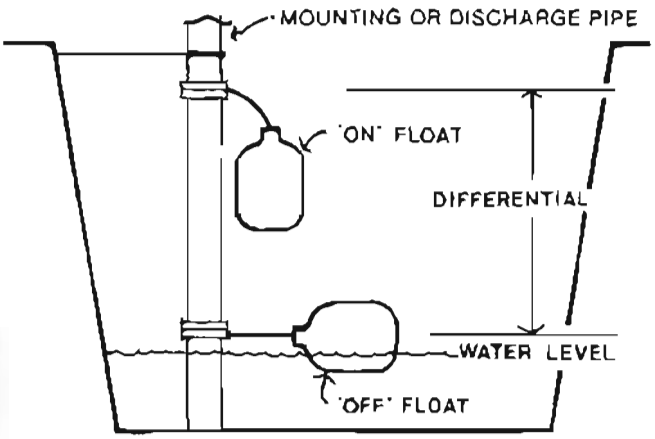


TYPE P - M



TYPE S - M

TYPICAL INSTALLATION



General Comments

1) Never work in the sump with the power on.

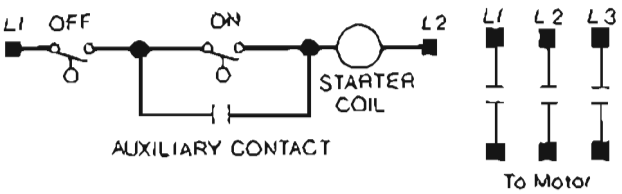
2) Attach the Type P Mini-Floats to the mounting pipe or the pump discharge pipe. The 'off' float should be below the 'on' float in a 'pump out' application.

3) Arrange the Mini-Floats so they do not tangle or hang up.

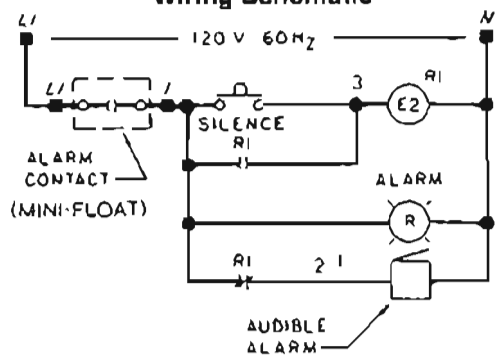
4) Thread the cable strap through the buckle with the ratchet pawl; cinch up tight; thread excess strapping through outer buckle slot.

5) Measuring the difference between mounting points gives the 'pump down' differential.

Typical Simplex Wiring Schematic



Typical Alarm Wiring Schematic



SPECIFICATIONS

Cable - 18-2 SJO W/A 34 x 41 strand. 90°C.
DIAMETER .30

Float - Polypropylene.

Clamp - Stainless Steel.

UL Listed — Ind. Con. Eq. 125 VA @ 115 VAC

Component Switch Rating	4.5A @ 120V., Res. 2.2A @ 230V., Res.
Temperature Rating - 60 C.	To maintain UL Listing, Overcurrent protection Not to exceed 10A.

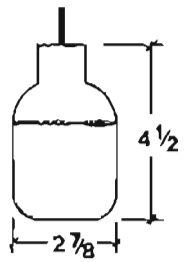
Normally Open - Blue Housing
Normally Closed - Red Housing

ELECTRICAL CONFIGURATION	CABLE LENGTH	SUSPENDED TYPE 'S' MODEL NO.	PIPE MOUNTED TYPE 'P' MODEL NO.
NORMALLY OPEN	10	S M 10 NO	P M 10 NO
	15	S M 15 NO	P M 15 NO
	20	S M 20 NO	P M 20 NO
	25	S M 25 NO	P M 25 NO
	30	S M 30 NO	P M 30 NO
NORMALLY CLOSED	10	S M 10 NC	P M 10 NC
	15	S M 15 NC	P M 15 NC
	20	S M 20 NC	P M 20 NC
	25	S M 25 NC	P M 25 NC
	30	S M 30 NC	P M 30 NC

SUBMITTAL APPROVAL

NAME

DATE



Float Dimensions

* Important Notes - Mini-Floats are pilot duty devices. They cannot be used to directly power pump motors. Also, do not use Mini-Floats in gasoline or other combustibles. These devices can be used with intrinsically safe relays for some hazardous locations. See Sec. 500 of NEC.

This product contains mercury. Dispose of in accordance with Local, State and Federal Regulations so that mercury does not contaminate the environment.
Not for use in potable water.

DWN BY PD	DATE 7-17-80	anchor scientific inc.	
CKD BY JTP	DATE 7 20-80	Industrial Park, Long Lake, MN 55356 952-473-7115	
APPD BY JTP	DATE 7-20	Typical installation and specification data for Mini-Floats	
PROJECT NAME	Mini-Float		
FACTORY ORDER NO.		DWG NO	2510-B

BLACOH FLUID CONTROL

SENTRY INSTALLATION & OPERATION INSTRUCTIONS
AUTOMATIC MODEL

S/N:_____ MODEL #:_____ DATE OF PURCHASE_____

MATERIALS OF CONSTRUCTION: BODY_____ BLADDER_____

PUMP AREA & NUMBER_____

SUPPLIER: COMPANY _____ CONTACT_____

PHONE _____ FAX_____ E-MAIL_____

INSTALLATION NOTES *READ BEFORE INSTALLATION*

- Blacoh recommends installing a pressure relief valve in all pump systems to ensure compliance with pressure limits on system equipment.
- Mount SENTRY as close to pump discharge as possible.
- **If a system pressure test is to be performed, SENTRY must be equipped with a constant source of compressed air prior to test.** This will avoid possible bladder damage.
- Temperature and pressure affect the strength and chemical resistance of plastic and rubber. Please consult factory for additional information.
- Remove all pressure from SENTRY unit AND pumping system before attempting maintenance.
- Do not exceed 150 PSI with Automatic models. **Check pressure rating shown on serial tag.**
- Always wear safety glasses when installing, charging or repairing SENTRY units.
- Do not operate a SENTRY that is leaking, damaged, corroded or unable to hold internal fluid, air or gas pressure.
- Equip SENTRY with a constant air source. Pressure not to exceed 150 PSI. **DO NOT USE OXYGEN**
- **DANGER OF STATIC SPARK!**
  GROUNDING PRECAUTIONS MUST BE CONSIDERED WHEN USED IN FLAMMABLE OR EXPLOSIVE ENVIRONMENTS

INSTALLATION FOR PUMP DISCHARGE PULSATION *READ BEFORE INSTALLATION*

Step 1 – Installation Position:

Install the dampener in-line, as close to the pump discharge as possible to absorb the pulse at its source. Install ahead of any downstream equipment such as risers, valves, elbows, meters, or filters. Dampener installation should be no more than ten pipe diameters from pump discharge. If using a flexible connector from pump to system piping, dampener should be installed at the pump discharge manifold. The flexible connector should be attached to the dampener's tee and system piping (see Figure 1). Since pressure is equal in all directions, SENTRY can be installed in a vertical, horizontal, or upside-down position. Blacoh recommends a vertical installation for better draining of the unit. Limitations for horizontal and upside-down mounting include high specific gravity, high viscosity, settling of solid material, or possible air entrapment, which could result in shortened bladder life and/or reduced dampening performance.

Step 2 – Air Line Connection

A. Units with rubber bladders:

Using a ¼" flexible air hose, run an airline to the top of SENTRY and connect it to the brass one-way check valve on top of the unit. Do not remove one-way check valve. The check valve prevents fluid back flow through the air hose in case of bladder failure. The air supply pressure to SENTRY must be greater than the pump discharge and/or system pressure. If the SENTRY is being used in conjunction with a pneumatically operated pump, a tee can be used to run the airline to SENTRY from the existing pump air supply line (See Figure 1). The tee should be placed before any in-line pump instrumentation such as a filter, regulator, lubricator or other pump control valve. This is imperative for elastomeric bladder fitted Automatic models.

B. Units with PTFE Bellows:

Using a ¼" flexible air hose, run an airline to the top of SENTRY and connect it to the Stainless Steel nipple on top of the pulsation dampener. The air supply pressure to SENTRY must be greater than the pump discharge and/or system pressure. If the SENTRY is being used in conjunction with a pneumatically operated pump, a tee can be used to run the airline to SENTRY from the existing pump air supply line (See Figure 2). The tee should be placed after any in-line pump instrumentation, such as a filter, regulator, lubricator or other pump control valve.

BLACOH FLUID CONTROL, INC.
601 COLUMBIA AVE. BLDG. D, RIVERSIDE, CA 92507 USA
TEL: 800.603.7867 or 951.342.3100 Fax: 951.342.3101
e-mail: sales@blacoh.com web site: www.blacoh.com

Step 3 – Charging and Start Up:

Prior to starting the pump. Automatic models must have the air supply connected and compressed air available to SENTRY prior to pump start up to avoid possible bladder rupture. The Automatic SENTRY's pressure gauge will remain at zero pressure even after the air line is connected because the dampener will only allow air into the air chamber when it is required. Once the air supply line is attached to the air connection and air is available the pump can be started. No further adjustments are necessary.

NOTE: AUTOMATIC SENTRY MODELS ARE NOT RECOMMENDED FOR USE AS INLET STABILIZERS AT PUMP INLET OR AS A SURGE SUPPRESSOR AT A QUICK CLOSING VALVE. USE INLET STABILIZER MODELS ON THE INLET OF YOUR RECIPROCATING PUMP AND METAL SURGE SUPPRESSORS FOR WATER HAMMER OR QUICK CLOSING VALVE APPLICATIONS.
CONSULT FACTORY FOR OPTIONS.

FIGURE 1

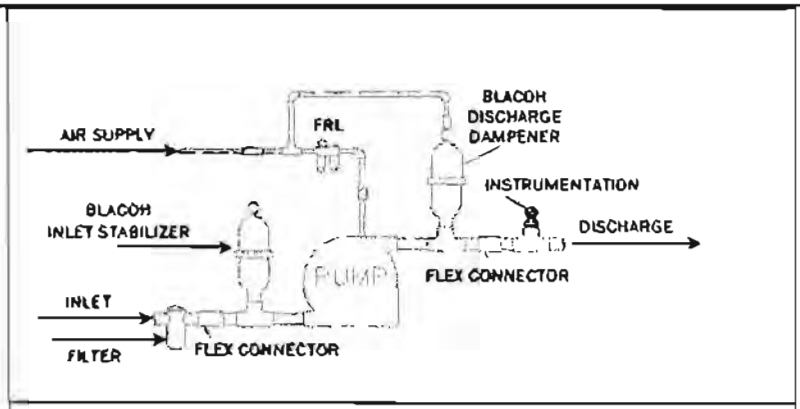
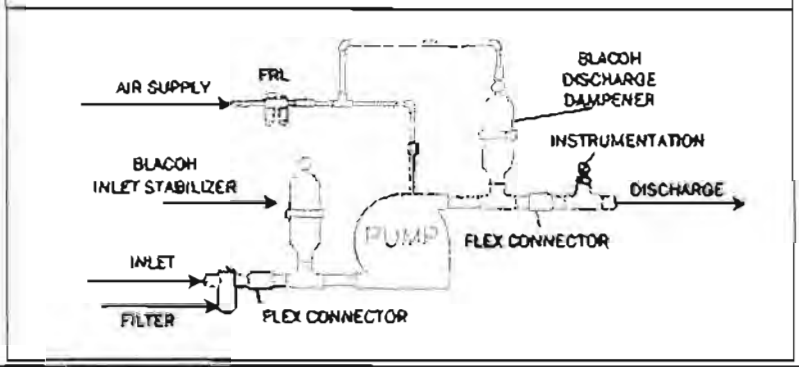


FIGURE 2



MAINTENANCE

SENTRY Pulsation Dampeners require very little maintenance. There is only ONE wear part - the elastomeric bladder or the PTFE bellow. There is no need for lubrication. Elastomeric bladder replacement should be put on a preventive maintenance program. Dampeners used in conjunction with diaphragm pumps should have the bladders replace, at least, every second time the diaphragms in the pump are replaced. As with any pumping system, wear is dependent upon many factors, including material, temperature, chemicals, fluid abrasiveness, system design and so on. This suggested maintenance program might need to be adjusted according to specific applications. Periodic inspection of the dampener and fasteners should be conducted to visually check for signs of over-pressurization, fatigue, stress, or corrosion. Body housings and fasteners must be replaced at first indication of deterioration.

IMPORTANT!

AFTER MAINTENANCE OR RE-ASSEMBLY, TORQUE FASTENERS ACCORDING TO SPECIFICATION ON THE UNIT TAG.

BLACOH FLUID CONTROL, INC.
601 COLUMBIA AVE. BLDG. D, RIVERSIDE, CA 92507 USA
TEL: 800.603.7867 or 951.342.3100 Fax: 951.342.3101
e-mail: sales@blacoh.com web site: www.blacoh.com
L-170 REV: 11/09/04

SENTRY
PULSATION DAMPENERS

SAFETY WARNINGS

This dampener should only be installed and used by experienced and trained professional mechanics. Observe all safety warnings. Read all safety warnings and operation manuals before using or repairing this Pulsation Dampener, Surge Suppressor or Suction Stabilizer (hereafter referred to as "dampener").

GENERAL SAFETY

Observe these symbols in the operating and installation instructions:

The internal dampener pressure will equal the maximum fluid pressure of the system in which it is installed.

Do not exceed maximum pressure as stated on dampener tag. If tag is missing **DO NOT** use this dampener without consulting distributor or factory for maximum pressure rating.

Always make sure safety shut off valves, regulators, pressure relief valves, gauges etc. are working properly before starting system or assembly.

Verify model received against purchase order and shipper

Before starting a system or assembly make certain the discharge point of the piping system is clear and safe, and all persons have been warned to stand clear.

Always wear protective safety glasses etc. when installing, charging or repairing this dampener.

Static spark can cause an explosion resulting in severe injury or death. Ground dampeners and pumping system when pumping flammable fluids.

DO NOT put your face or body near dampener when the system or assembly is operating or dampener is pressurized.

DO NOT operate a dampener that is leaking, damaged, corroded or otherwise unable to contain internal fluid, air or gas pressure.

DO NOT pump incompatible fluids through the dampener. Consult your distributor or the factory if you are not sure of the compatibility of the fluids with the dampener materials.

Dampeners, Suppressors and Stabilizers are designed to operate with compressed air or nitrogen. Other compressed gases have not been tested and may be unsafe to use in dampeners. **DO NOT USE OXYGEN!**

Bleed all pressure from system and dampener before removing equipment from the system.

ALWAYS shut off air supply, bleed internal dampener pressure and shut isolation valve before performing maintenance or repair on dampener.

NOTE: EC standard EN-13463-1 (ATEX) requires grounding (earthing) on dampeners when the potential for static sparking is present. A grounding point is located and marked on these dampeners..

EQUIPMENT MISUSE HAZARD

General Safety
Any misuse of this equipment, such as over-pressurization, modifying parts, incompatible chemicals, using worn or damaged parts or using gases other than air or nitrogen to charge dampener is not recommended. Any of these circumstances could result in serious bodily injury, death, fire, explosion or property damage.

Over-Pressurization
Never exceed the maximum operation pressure recommended for the dampener model being used. Maximum operation pressure is stated on tag. Unit pressure limits are stated at 70°F / 20°C.

Temperature Limits
Do not exceed the recommended operating temperatures for the shell and/or elastomer materials being used. Excessive temperature limits are stated at zero psig / bar. Body shell strength, especially plastic, reduces as temperature rises.

Installation and Start Up Hazards
Install dampener before charging or pressurizing. Do not start system or assembly without first charging or pressurizing dampener. Failure to charge may rein damage to elastomeric bladder.

Temperature & Pressure Hazard
Temperature and pressure reduce the strength and chemical resistance of plastic, metal rubber and PTFE.

Charging / Pressurization
Charge or pressurize dampener with compressed air or nitrogen only. **Do Not Use Oxygen.**

Dampener Bladder Failure
Dampeners utilize an elastomeric membrane (bladder) or PTFE Bellows to separate system fluid from the air supply or gas charge. When this bladder ruptures, system fluid may be expelled from the air valve. Always perform preventive maintenance and replace elastomer before excessive wear occurs. O-rings with PTFE Bellows cannot be re-used.

Maintenance Hazards
Never over-tighten fasteners. This may cause leakage of system fluid and damage to dampener shell. Bolts should not be reused as repeated re-torquing reduces bolt strength.

IMPORTANT!

AFTER MAINTENANCE OR RE-ASSEMBLY, TORQUE FASTENERS ACCORDING TO SPECIFICATION ON THE UNIT TAG.

BLACOH FLUID CONTROL, INC
601 COLUMBIA AVE. BLDG. D, RIVERSIDE, CA 92507 USA
TEL: 800.603.7867 or 951.342.3100 Fax: 951.342.3101
e-mail: sales@blacoh.com website: www.blacoh.com

Neptune
MIXER COMPANY
Lansdale, PA 19446
215-699-8700 • Fax: 215-699-0370
1-888-3NEPTUNE
(888-363-7886)
Toll Free Fax: 1-800-255-4017

SERIES A & B PORTABLE MIXERS
ASSEMBLY INSTRUCTIONS AND PARTS LIST

ATTENTION: TO INSURE SAFE AND EASY USE OF YOUR NEPTUNE MIXER, READ THESE INSTRUCTIONS BEFORE USING.

Description

Series A & B Mixers are designed for economical mixing of small tanks and open head drums. The mixer can be easily mounted and the shaft angle can be easily adjusted for optimum mixing. The mixer can be conveniently moved from one container to another.

Figure 1—Series A & B Mixers

Unpacking

When unpacking the mixer, check carefully for damage that may have occurred during transit. Check for missing parts.

General Safety Information

Warning: These mixers are intended for specific functions. Please follow all instructions to insure safe and proper use.

(1) Be certain that all mounting hardware and the coupling and propeller set screws are properly tightened prior to operation.

(2) Clamp securely to rim. Be certain propeller is not touching side or bottom of tank.

(3) Series A & B Mixers are intended for use on open head drums or small tanks 100 gallons or less. Only the most mild of mixing can be accomplished in larger tanks.

(4) Perform electrical connections and wiring in accordance with the electrical area requirements and local electrical codes.

(5) Do not attempt to adjust mixer when mixer is operating, this could result in personal injury or damage to the tank and mixer.

(6) Always wear required safety equipment including eye protection when observing mixer performance or when adding materials to a tank while the mixer is operating.

Assembly Instructions

Series A & B Mixers

(1) Bolt motor to clamp assembly using enclosed hardware.

(2) Place pivot bolt through clamp body so that head of bolt inserts in recess—attach hex nut.

(3) Insert mounting plate bar through hole in pivot bolt. Tightening hex nut binds motor mounting plate to maintain position.

(4) Attach coupling to motor shaft using setscrews. Note, the end of the coupling with the two setscrews spaced closely together attach to the motor.

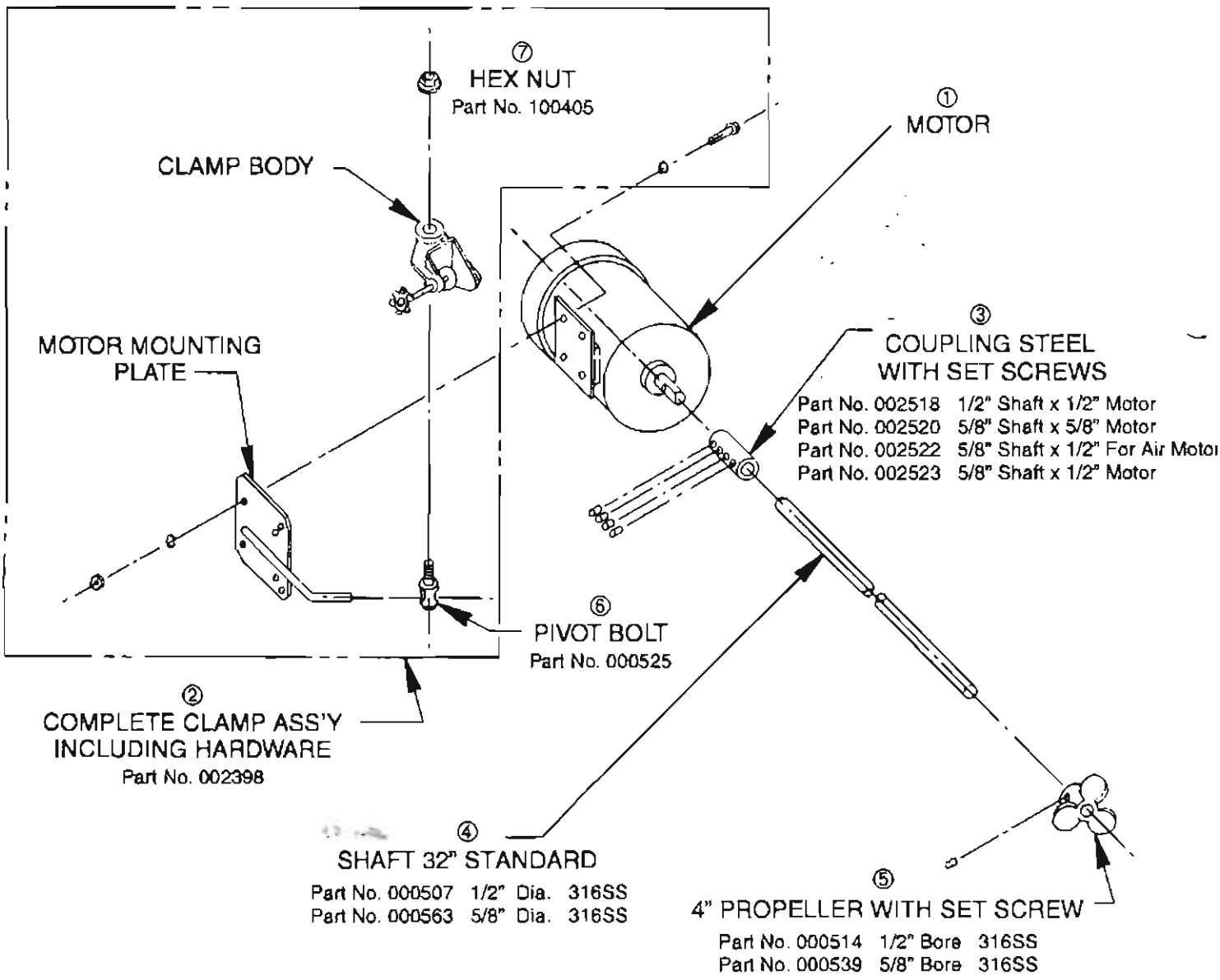
(5) Attach propeller to round end of mixer shaft.

(6) Insert end of shaft with flat into coupling and tighten setscrews.

(7) Recheck all hardware for proper tightening.

(8) Attach to tank using handwheel on clamp.

*** Clamp Assembly Kit (Part No 002398) is not supplied with Series A-1-300 or A-1-301 ECONO MIXERS. Motor Base of a Series A-1-300 or A-1-301 bolts directly to the tank bracket.**



INGERSOLL-RAND
AIR COMPRESSORS

Ingersoll-Rand Company
800-B Beaty Street
P. O. Box 1803
Davidson, NC 28036

Important information! Read and follow these instructions. Retain for reference.

Owner's Manual
Installation, Operation and Maintenance Instructions for Model 2340

CONTENTS

SAFETY

DEFINITIONS

⚠ **DANGER: WILL cause DEATH, SEVERE INJURY or substantial property damage.**

⚠ **WARNING: CAN cause DEATH, SEVERE INJURY or substantial property damage.**

⚠ **CAUTION: WILL or CAN cause MINOR INJURY or property damage.**

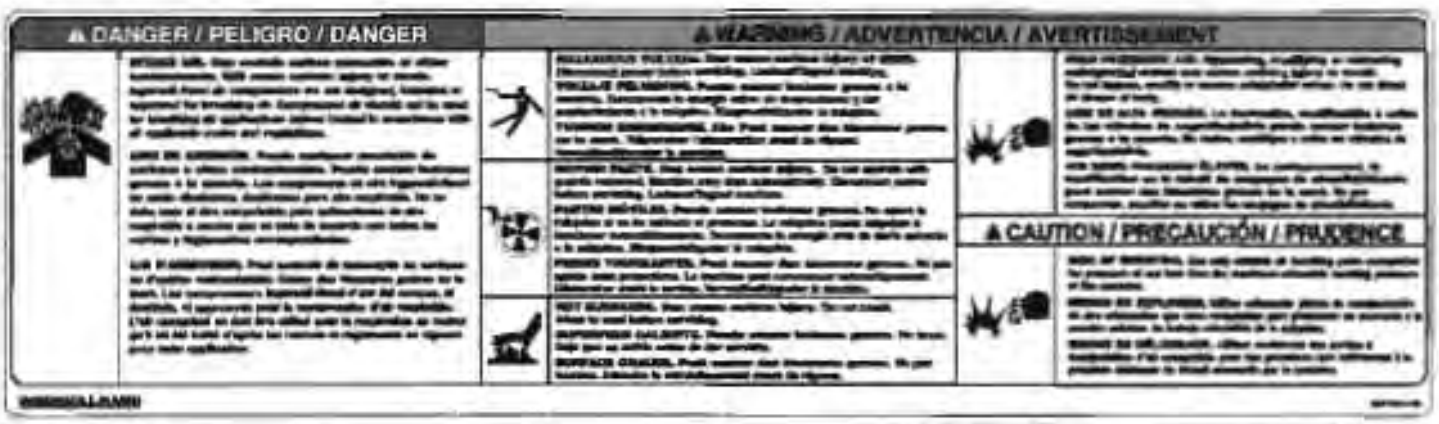
BREATHING AIR PRECAUTION

Ingersoll-Rand air compressors are not designed, intended or approved for breathing air. Compressed air should not be used for breathing air applications unless treated in accordance with all applicable codes and regulations.

GENERAL SAFETY PRECAUTIONS

- Do not directly inhale compressed air.
- Follow precautions on container labels before spraying materials such as paint, insecticide and weed killer.
- Wear a respirator and safety glasses when spraying.
- Do not over-pressurize the receiver tank or similar vessels beyond design limits.
- Do not use a receiver tank or similar vessels that fail to meet the design requirements of the compressor. Contact your dealer for assistance.
- Do not drill into, weld or otherwise alter the receiver tank or similar vessels.
- Do not remove, adjust, bypass, change, modify or make substitutions for safety/relief valves, pressure switches or other pressure control related devices.
- Do not use air tools or attachments without first determining the maximum pressure recommended for that equipment.
- Do not point air nozzles or sprayers toward anyone.
- Do not touch the compressor pump, motor or engine or discharge tubing during or shortly after operation. These parts become hot.
- Wear eye protection when operating or servicing compressor.
- Do not operate where flammable or explosive liquids or vapors such as gasoline, natural gas and solvents are present.
- Do not operate with guards or shields removed, damaged or broken.
- Do not remove, paint over or deface decals. Replace any missing decals.

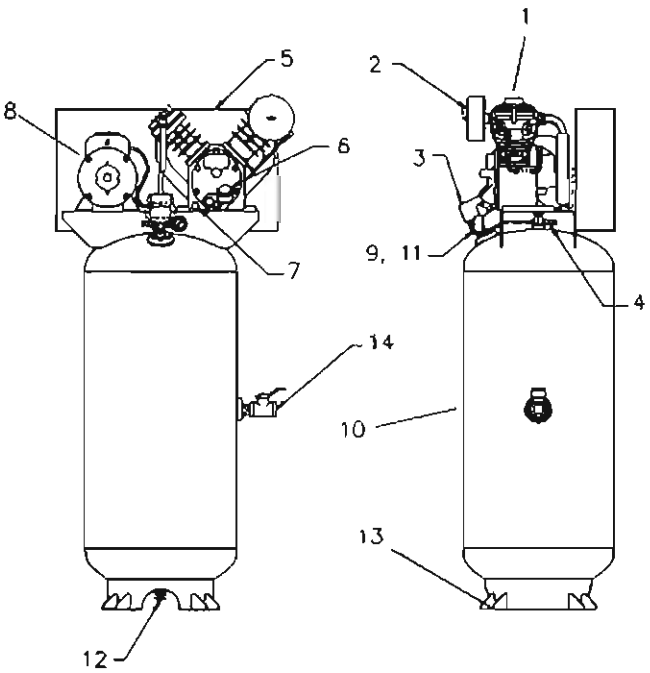
Safety Decal (Located on Receiver Tank)



Printed in U.S.A.

Form SCD-843A
March 2009

GENERAL INFORMATION



1. Bare compressor pump
2. Air inlet filter assembly
3. Pressure switch
4. Discharge safety/relief valve
5. Beltguard
6. Lubricant fill
7. Lubricant drain
8. Electric motor
9. Pressure gauge
10. Air receiver tank
11. Air receiver tank safety/relief valve
12. Manual drain valve
13. Mounting holes
14. Service valve (air outlet)

NOTE: Component locations and appearance may vary. Designs and specifications are subject to change without notice or obligation.

Your air compressor unit is suitable for operating paint spray guns, air tools, caulking guns, grease guns, sandblasters, etc. Depending on your application, the following accessories may be required:

- An air pressure regulator to adjust the air pressure entering the tool or accessory.
- An air line filter for removal of moisture and oil vapor in compressed air when a paint spray gun is used.
- An in-line lubricator to prolong the life of air tools.
- Separate air transformers which combine the functions of air regulation and/or moisture and dirt removal.

Contact your nearest authorized dealer for more information on air tools and accessories for your application.

RECEIPT & INSPECTION

Ensure adequate lifting equipment is available for unloading and moving your unit to the installation site.

NOTE: Lifting equipment must be properly rated for the weight of the unit.

Lift the unit by the shipping skid only. Use straps to prevent tipping.

⚠ **CAUTION! Do not work on or walk under the compressor while it is suspended.**

Before signing the delivery receipt, inspect for damage and missing parts. If damage or missing parts are apparent, make the appropriate notation on the delivery receipt, then sign the receipt. Immediately contact the carrier for an inspection. All material must be held in the receiving location for the carrier's inspection. Delivery receipts that have been signed without a notation of damage or missing parts are considered to be delivered "clear." Subsequent claims are then considered to be concealed damage claims. Settle damage claims directly with the transportation company.

If you discover damage after receiving the compressor (concealed damage), the carrier must be notified within 15 days of receipt and an inspection must be requested by telephone with confirmation in writing. On concealed damage claims, the burden of establishing that the compressor was damaged in transit reverts back to the claimant.

Read the compressor nameplate to verify it is the model ordered, and read the motor nameplate to verify it is compatible with your electrical conditions. Make sure electrical enclosures and components are appropriate.

INSTALLATION

SELECTING A LOCATION

General. Select a well-lighted indoor area with plenty of space for proper cooling air flow and accessibility. Locate the compressor at least 12 inches (30 cm) from walls, and make sure the main power supply is clearly identified and accessible.

Temperature. Ideal operating temperatures are between 32°F and 100°F (0°C and 37.8°C). If temperatures consistently drop below 32°F (0°C), install the compressor inside a heated building. If this is not possible, you must protect safety/relief valves and drain valves from freezing. If temperatures are consistently below 40°F (4.4°C), consider installing a crankcase heater kit, especially if the compressor has difficulty starting.

⚠ **CAUTION! Never operate in temperatures below -15°F (-26.1°C) or above 125°F (51.0°C).**

Humid Areas. In frequently humid areas, moisture may form in the bare pump and produce sludge in the lubricant, causing running parts to wear out prematurely. Excessive moisture is especially likely to occur if the compressor is located in an unheated area that is subject to large temperature changes.

Two signs of excessive humidity are external condensation on the compressor when it cools down and a "milky" appearance in petroleum lubricant.

You may be able to prevent moisture from forming in the pump by increasing ventilation, operating for longer intervals or installing a crankcase heater kit.

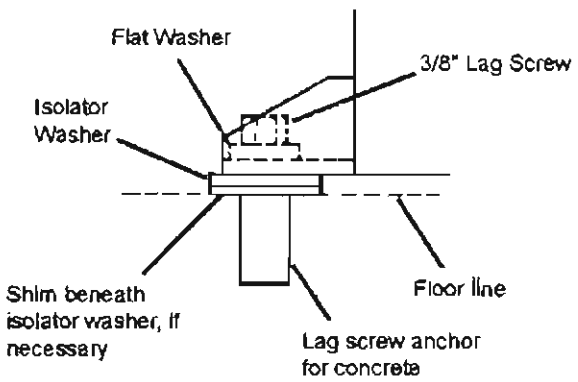
Noise Considerations. Consult local officials for information regarding acceptable noise levels in your area. To reduce excessive noise, use vibration isolator pads or intake silencers, relocate the compressor or construct total enclosures or baffle walls. Contact your dealer for assistance.

MOUNTING

⚠ **WARNING! Remove the unit from the skid before mounting.**

The unit must be permanently mounted. Bolt the unit to a firm, level foundation (such as a concrete floor). Do not bolt uneven feet tightly to the foundation, as this will cause excessive stress on the receiver tank. Use metal shims under the "short" feet if necessary.

Typical Permanent Mounting (Customer-Supplied Hardware)



INSTALLING THE AIR INLET FILTER

⚠ **CAUTION! Do not operate without air inlet filter.**

If the air around the compressor is relatively free of dirt, install the air inlet filter at the inlet connection at the bare pump. If remote air inlet piping or heavy duty filtration is required, contact your dealer for information.

INSTALLING DISCHARGE PIPING

If it is necessary to install air discharge and condensate discharge piping, adhere to the following general guidelines. Contact your dealer for information.

⚠ **WARNING: If an aftercooler, check valve, block valve, or any other restriction is added to the compressor discharge, install a properly-sized ASME approved safety/relief valve between the compressor discharge and the restriction.**

⚠ **CAUTION: If you will be using Ingersoll-Rand Synthetic Lubricant, all downstream piping material and system components must be compatible. Refer to the following material compatibility list. If there are incompatible materials present in your system, or if there are materials not included in the list, contact your dealer.**

Suitable

Viton®, Teflon®, Epoxy (Glass Filled), Oil Resistant Alkyd, Fluorosilicone, Fluorocarbon, Polysulfide, 2-Component Urethane, Nylon, Delrin®, Celcon®, High Nitrile Rubber (Buna N, NBR more than 36% Acrylonitrile), Polyurethane, Polyethylene, Epichlorohydrin, Polyacrylate, Melamine, Polypropylene, Baked Phenolics, Epoxy, Modified Alkyds
(® indicates trademark of DuPont Corporation)

Not Recommended

Neoprene, Natural Rubber, SBR Rubber, Acrylic Paint, Lacquer, Varnish, Polystyrene, PVC, ABS, Polycarbonate, Cellulose Acetate, Low Nitrile Rubber (Buna N, NBR less than 36% Acrylonitrile), EPDM, Ethylene Vinyl Acetate, Latex, EPR, Acrylics, Phenoxy, Polysulfones, Styrene Acrylonitrile (San), Butyl

⚠ **NOTE: All compressed air systems generate condensate which accumulates in any drain point (e.g. tanks, filters, drip legs, aftercoolers, dryers). This condensate contains lubricating oil and/or substances which may be regulated and must be disposed of in accordance with local, state, and federal laws and regulations.**

General Requirements. The piping, fittings, receiver tank, etc. must be certified safe for at least the maximum working pressure of the unit. Use hard-welded or threaded steel or copper pipes and cast iron fittings that are certified safe for the unit's discharge pressure and temperature. DO NOT USE PVC PLASTIC. Use pipe thread sealant on all threads, and make up joints tightly to prevent air leaks.

Condensate Discharge Piping. If installing a condensate discharge line, the piping must be at least one size larger than the connection, as short and direct as possible, secured tightly and routed to a suitable drain point. Condensate must be disposed of in accordance with local, state, and federal laws and regulations.

ELECTRICAL WIRING

⚠ **WARNING! Electrical installation and service should be performed by a qualified electrician who is familiar with all applicable local, state and federal laws and regulations.**

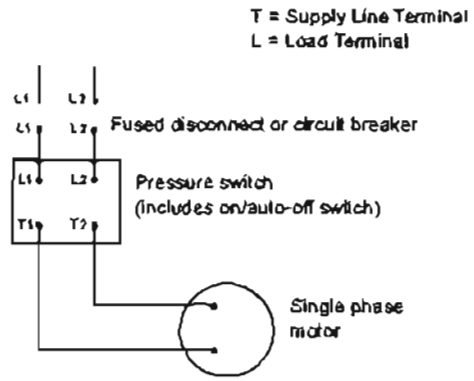
NOTE: This product should be connected to a grounded, metallic, permanent wiring system, or an equipment-grounding terminal or lead on the product.

General. The motor rating, as shown on the motor nameplate, and the power supply must have compatible voltage, phase and hertz characteristics.

Wire Size. The electrical wiring between the power supply and electric motor varies according to motor horsepower. Power leads must be adequately sized to protect against excessive voltage drop during start-up. Information for selecting the proper wire size and securing connections should be provided with the motor. If not, refer to the National Electric Code (NEC) or applicable local, state and federal laws and regulations. If other electrical equipment is connected to the same circuit, the total electrical load must be considered in selecting the proper wire size. DO NOT USE UNDERSIZE WIRE.

Fuses. Refer to the National Electric Code to determine the proper fuse or circuit breaker rating required. When selecting fuses, remember the momentary starting current of an electric motor is greater than its full load current. Time-delay or "slow-blow" fuses are recommended.

Single-Phase Wiring



COMPRESSOR LUBRICATION

⚠ **CAUTION! Do not operate without lubricant or with inadequate lubricant. Ingersoll-Rand is not responsible for compressor failure caused by inadequate lubrication.**

Synthetic Lubricant. We recommend Ingersoll-Rand synthetic lubricant from start-up. See the WARRANTY section for extended warranty information.

Alternate Lubricants. You may use a petroleum-based lubricant that is premium quality, does not contain detergents, contains only anti-rust, anti-oxidation, and anti-foam agents as additives, has a flashpoint of 440°F (227°C) or higher, and has an auto-ignition point of 650°F (343°C) or higher. Remember using a lubricant other than Ingersoll-Rand synthetic lubricant from start-up limits warranty to one year.

See the petroleum lubricant viscosity table below. The table is intended as a general guide only. Heavy duty operating conditions require heavier viscosities. Refer specific operating conditions to your dealer for recommendations.

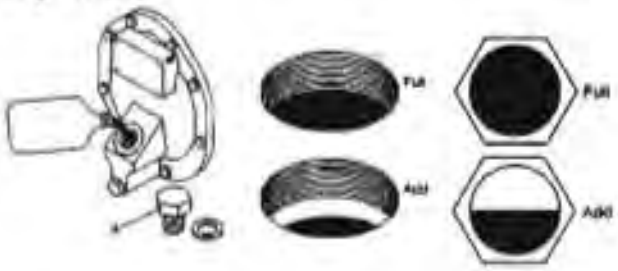
Temperature Around Unit		Viscosity @ 100°F (37.8°C)		Viscosity Grade	
°F	°C	SUS	Centistokes	ISO	SAE
40 & below	4.4 & below	150	32	32	10
40 - 80	4.4 - 26.7	500	110	100	30
80 - 125	26.7 - 51.0	750	165	150	40

If you use a petroleum-based compressor lubricant at start-up and decide to convert to Ingersoll-Rand synthetic lubricant later on, the compressor valves must be decarbonized and the crankcase must be flushed before conversion.

Filling Procedures

1. Unscrew and remove the oil fill plug (A).
2. Slowly fill the crankcase with lubricant until the lubricant reaches the bottom thread of the oil fill opening and the center of the sight glass. Crankcase capacity is 28 oz. (827 mL)
3. Replace the oil fill plug HAND TIGHT ONLY.

Filling Procedures



INITIAL START-UP

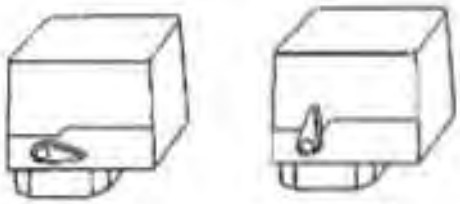
Follow this procedure before putting the unit into service for the first time.

1. Set the pressure switch lever (A) to "OFF".
2. Open the service valve (B) fully to prevent air pressure from building in the tank.
3. Move the pressure switch lever to "ON/AUTO". The unit will start.
4. Run the unit for 30 minutes. Ensure the service valve is fully open and there is no tank pressure build up.

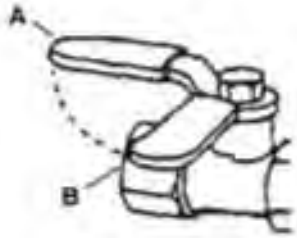
⚠ **CAUTION: Unusual noise or vibration indicates a problem. Do not continue to operate until you identify and correct the source of the problem. IF EMERGENCY CONDITIONS ARE ENCOUNTERED, SHUT OFF THE MAIN POWER IMMEDIATELY.**

5. After 30 minutes, close the service valve fully. The air receiver will fill to cut-out pressure and the motor will stop. The unit is now ready for use.

Pressure Switch Lever



Service Valve



OPERATION

GENERAL

Your air compressor was designed for 100% continuous duty operation with the use of Ingersoll-Rand Synthetic Lubricant and 60% continuous duty operation with the use of petroleum lubricant. In other words, synthetic lubricant allows the compressor to pump continuously without cycling, and petroleum lubricant limits the compressor to a maximum of 36 minutes of pumping time per hour. The compressor should not cycle more than 10 times per hour.

NORMAL START-UP

1. Set the pressure switch lever to "OFF".
2. Close the service valve.
3. Attach hose and accessory.
4. Move the pressure switch lever to "ON/AUTO". The unit will start.
5. Allow tank pressure to build. The motor will stop when tank pressure reaches cut-out pressure.
6. Open the service valve. The unit is now ready for use.

NOTE: When the receiver tank pressure drops below the factory pre-set minimum, the pressure switch resets and restarts the unit.

When you are finished:

1. Set the pressure switch lever to "OFF".
2. Close the service valve fully.
3. Remove the air tool or accessory.
4. Slowly open the service valve to bleed air pressure down to 20 psig.
5. Slowly open the manual drain valve at the bottom of the tank to drain all condensate (water).
6. Close the drain valve and the service valve for the next use.

MAINTENANCE

⚠ **WARNING! Disconnect, lock and tag main power supply and release air pressure from system before performing maintenance.**

NOTE: All compressed air systems contain maintenance parts (e.g. lubricating oil, filters, separators) which are periodically replaced. These used parts may be, or may contain, substances that are regulated and must be disposed of in accordance with local, state, and federal laws and regulations.

NOTE: Take note of the positions and locations of parts during disassembly to make reassembly easier. The assembly sequences and parts illustrated may differ for your particular unit.

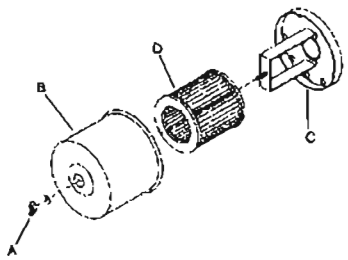
NOTE: Any service operations not included in this section should be performed by an authorized service representative.

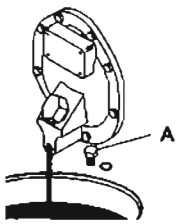
Daily or Before Each Operation	• Check lubricant level. Fill as needed. • Drain receiver tank condensate. Open manual drain valve and collect and dispose of condensate accordingly. • Check for unusual noise and vibration. • Ensure safeguards and covers are securely in place. • Ensure area around compressor is free from rags, tools, debris, and flammable or explosive materials.
Weekly	• Inspect air filter element(s). Clean if necessary.
Monthly	• Inspect for air leaks. Squirt soapy water around joints during compressor operation and watch for bubbles. • Check tightness of screws and bolts. Tighten as needed. • Clean exterior.
3/500 *	• Change petroleum lubricant while crankcase is warm.
12/2000 *	• Change synthetic lubricant while crankcase is warm. • Replace filter element.

* indicates months/operating hours, whichever occurs first

FILTER INSPECTION & CLEANING

1. Unscrew and remove the wing nut (A) securing the filter housing (B) to its base (C).
2. Remove the filter housing and withdraw the old filter element (D). Clean the element with a jet of air or vacuum.
3. Replace the filter element and housing, securing it in place with the wing nut previously removed.





OIL CHANGE

1. Remove the oil drain plug (A) and allow the lubricant to drain into a suitable container.
2. Replace the oil drain plug.
3. Follow the filling procedures in OPERATION section.

TROUBLESHOOTING

This section provides a list of the more frequently encountered malfunctions, their causes and corrective actions. Some corrective actions can be performed by the operator or maintenance personnel, and others may require the assistance of a qualified electrician or your dealer.

PROBLEM	CHECK POINT
Abnormal piston, ring or cylinder wear	4, 8, 9, 18, 23, 29
Air delivery drops off	1, 6, 15, 17, 18, 24
Broken intercooler or aftercooler tubes	30
Compressor does not come up to speed	2, 6, 12, 15, 20
Compressor is slow to come up to speed	27, 28
Compressor runs excessively hot	3, 14, 15
Excessive noise during operation	2, 6, 15, 20, 22, 27
Excessive starting and stopping	5, 11, 16, 27, 31
Knocks or rattles	2, 15, 16, 18, 19, 20
Lights flicker or dim when running	12, 13
Moisture in crankcase or "milky" appearance in petroleum lubricant or rusting in cylinders	9, 10
Motor overload trips or draws excessive current	5, 6, 12, 13, 14, 15, 18, 19, 20, 28
Oil in discharge air (oil pumping)	4, 7, 9, 17, 18, 21, 29
Oil leaking from shaft seal	21
Safety/relief valve "pops"	1, 5, 24, 25
High interstage pressure	25
Low interstage pressure	26
Motor will not start	12

CHECK POINT	POSSIBLE CAUSE	POSSIBLE SOLUTION
1	Clogged or dirty inlet and/or discharge line filter.	Clean or replace.
2	Loose beltwheel or motor pulley, excessive end play in motor shaft or loose drive belts.	Check beltwheel, motor pulley, crankshaft, drive belt tension and alignment. Repair or replace as required.
3	Inadequate ventilation around beltwheel.	Relocate compressor for better air flow.
4	Lubricant viscosity too low.	Drain existing lubricant and refill with proper lubricant.
5	Air leaks in air discharge piping.	Check tubing and connections. Tighten joints or replace as required.
6	Lubricant viscosity too high.	Drain existing lubricant and refill with proper lubricant.
7	Lubricant level too high.	Drain excess lubricant.
8	Lubricant level too low.	Add lubricant to crankcase to proper level.
9	Detergent type lubricant being used.	Drain existing lubricant and refill with proper lubricant.
10	Extremely light duty cycles.	Run compressor for longer duty cycles.
	Compressor located in damp or humid location.	Relocate compressor or install crankcase heater kit.
11	Pressure switch differential too narrow.	Install pressure switch with differential adjustment feature if differential adjustment is desired.
12	Improper line voltage.	Check line voltage and upgrade lines as required. Contact electrician.
	Wiring or electric service panel too small.	Install properly sized wire or service box. Contact electrician.
	Poor contact on motor terminals or starter connections.	Ensure good contact on motor terminals or starter connections.
	Improper starter overload heaters.	Install proper starter overload heaters. Contact electrician.
13	Poor power regulation (unbalanced line).	Contact power company.
14	Drive belts too tight or misaligned.	Adjust belts to proper tension and alignment.
15	Compressor valves leaky, broken, carbonized or loose.	Inspect valves. Clean or replace as required. Install Valve/Gasket Step Saver Kit.
16	Carbon build-up on top of piston(s).	Clean piston(s). Repair or replace as required.
17	Piston rings damaged or worn (broken, rough or scratched). Excessive end gap or side clearance.	Install Ring/Gasket Step Saver Kit.
	Piston rings not seated, are stuck in grooves or end gaps not staggered.	Adjust piston rings.
18	Cylinder(s) or piston(s) scratched, worn or scored.	Repair or replace as required.
19	Connecting rod, piston pin or crankpin bearings worn or scored. Loose bearing spacer on crankshaft.	Inspect all. Repair or replace as required. Install Bearing/Connecting Rod Step Saver Kit.
20	Defective ball bearings on crankshaft or motor shaft.	Inspect bearings and replace if required. Install Bearing/Connecting Rod Step Saver Kit.
21	Crankshaft seal worn or crankshaft scored.	Replace seal. Install shaft sleeve if required. Install Bearing/Connecting Rod Step Saver Kit.
22	Leaking check valve or check valve seat blown out.	Replace check valve.
23	Extremely dusty atmosphere.	Install remote air inlet piping and route to source of cleaner air. Install more effective filtration.
24	Defective safety/relief valve.	Replace.
25	High pressure inlet valve leaking.	Inspect, clean or repair as required.
26	Low pressure discharge valve leaking.	Inspect, clean or repair as required.
27	Automatic start and stop mode is not suitable for air demand.	Constant speed operation required. Contact dealer for recommendations.
28	Ambient temperature too low.	Install crankcase heater kit. Convert to synthetic lubricant. Relocate compressor to warmer environment.
29	Worn cylinder finish.	Deglaze cylinder with 180 grit flex-hone.
30	Beltwheel out of balance, tubes not braced or secured, wrong pulley speed.	Check vibration level, change pulley or beltwheel if required, tighten tube clamps.
31	Excessive condensate in receiver tank.	Drain receiver tank with manual drain valve or install automatic drain valve.

WARRANTY & LIMITATION OF LIABILITY

WARRANTY

Ingersoll-Rand Company warrants that the Equipment manufactured by it and delivered hereunder shall be free of defects in material and workmanship for a period of twelve (12) months from the date of placing the Equipment in operation or eighteen (18) months from the date of shipment, whichever shall occur first. The foregoing warranty period shall apply to all Equipment, except for the following: (A) Compressors that are operated solely on Ingersoll-Rand Synthetic Lubricant will have their bare compressor warranted for the earlier of twenty-four (24) months from the date of initial operation or thirty (30) months from the date of shipment. (B) Replacement parts will be warranted for six (6) months from the date of shipment. Should any failure to conform to this Warranty be reported in writing to the Company within said period, the Company shall, at its option, correct such nonconformity by suitable repair to such Equipment, or furnish a replacement part F.O.B. point of shipment, provided the purchaser has installed, maintained and operated such equipment in accordance with good industry practices and has complied with specific recommendations of the Company. Accessories or equipment furnished by the Company, but manufactured by others, shall carry whatever warranty the manufacturer conveyed to Ingersoll-Rand Company and which can be passed on to the Purchaser. The Company shall not be liable for any repairs, replacements, or adjustments to the Equipment or any costs of labor performed by the Purchaser without the Company's prior written approval.

The Company makes no performance warranty unless specifically stated within its proposal and the effects of corrosion, erosion and normal wear and tear are specifically excluded from the Company's Warranty. In the event performance warranties are expressly included, the Company's obligation shall be to correct in the manner and for the period of time provided above.

THE COMPANY MAKES NO OTHER WARRANTY OF REPRESENTATION OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY DISCLAIMED.

Correction by the Company of nonconformities, whether patent or latent, in the manner and for the period of time provided above, shall constitute fulfillment of all liabilities of the Company and its Distributors for such nonconformities with respect to or arising out of such Equipment.

LIMITATION OF LIABILITY

THE REMEDIES OF THE PURCHASER SET FORTH HEREIN ARE EXCLUSIVE, AND THE TOTAL LIABILITY OF THE COMPANY, ITS DISTRIBUTORS AND SUPPLIERS WITH RESPECT TO CONTRACT OR THE EQUIPMENT AND SERVICES FURNISHED, IN CONNECTION WITH THE PERFORMANCE OR BREACH THEREOF, OR FROM THE MANUFACTURE, SALE, DELIVERY, INSTALLATION, REPAIR OR TECHNICAL DIRECTION COVERED BY OR FURNISHED UNDER CONTRACT, WHETHER BASED ON CONTRACT, WARRANTY, NEGLIGENCE, INDEMNITY, STRICT LIABILITY OR OTHERWISE SHALL NOT EXCEED THE PURCHASE PRICE OF THE UNIT OF EQUIPMENT UPON WHICH SUCH LIABILITY IS BASED.

THE COMPANY, ITS DISTRIBUTORS AND ITS SUPPLIERS SHALL IN NO EVENT BE LIABLE TO THE PURCHASER, ANY SUCCESSORS IN INTEREST OR ANY BENEFICIARY OR ASSIGNEE OF THE CONTRACT FOR ANY CONSEQUENTIAL, INCIDENTAL, INDIRECT, SPECIAL OR PUNITIVE DAMAGES ARISING OUT OF THIS CONTRACT OR ANY BREACH THEREOF, OR ANY DEFECT IN, OR FAILURE OF, OR MALFUNCTION OF THE EQUIPMENT, WHETHER OR NOT BASED UPON LOSS OF USE, LOSS PROFITS OR REVENUE, INTEREST, LOST GOODWILL, WORK STOPPAGE, IMPAIRMENT OF OTHER GOODS, LOSS BY REASON OF SHUTDOWN OR NON-OPERATION, INCREASED EXPENSES OF OPERATION, COST OF PURCHASE OF REPLACEMENT POWER, OR CLAIMS OF PURCHASER OR CUSTOMERS OF PURCHASER FOR SERVICE INTERRUPTION WHETHER OR NOT SUCH LOSS OR DAMAGE IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, INDEMNITY, STRICT LIABILITY OR OTHERWISE.

OPERATIONS MANUAL

QED
Environmental Systems

Leaders in Environmental Compliance Products

AP-2 AutoPump®

AutoPump Controllerless System
(for 2-inch wells or larger)

PO Box 3726
6095 Jackson Road
Ann Arbor, Michigan 48106-3726

(800) 624-2026 — North America Only
(734) 995-2547 — Tele.
(734) 995-1170 — Fax
info@qedenv.com — E-mail
www.qedenv.com

550 Adeline Street
Oakland, California 94607

(800) 537-1767 — North America Only
(510) 891-0880 — Tele.
(510) 444-6789 — Fax

Document No. **600395 07**

The equipment in this manual is protected under U.S. and foreign patents issued and pending:

U.S. Patents:	
Selective Oil Skimmer (SOS)	4,497,370
Specific Gravity Skimmer (SPG)	4,663,037
AutoPump (AP)	5,004,405
Specific Gravity Skimmer (SPG) Product Sensing	5,474,685
Vacuum/Pressure Hydrocarbon Recovery System	4,761,225
SPG PSR technology	5,474,685
AP-2	5,641,272
Genie System	5,704,772
Canada Patent:	
Specific Gravity Skimmer (SPG)	1,239,868

Table of Contents

Chapter 3: Equipment 12

Chapter 4: Assembly & Installation 22

Figures:

Introduction

Welcome to QED Environmental Systems' AutoPump® (AP-2) manual.

To ensure the best operator safety and system performance, it is strongly recommended that the operators read this entire manual before using the system.

This manual reflects our many years of experience and includes comments and suggestions from our sales and service personnel and most importantly from our customers. The chapters, their contents and sequence were designed with you, the user and installer, in mind. We wrote this manual so it can be easily understood by users who may not be familiar with systems of this type or are using a *QED* system for the first time.

Safety

Safety has been a cornerstone of our design which has been proven out in building and shipping systems throughout the world. Our high level of performance is achieved by using quality components, building in redundancies or backup systems, and not compromising our commitment to quality manufacturing. The net result is the highest quality and safest pneumatic pump recovery system on the market. We feel so strongly about safety, based on years of working with the hydrocarbon industry, that it is the first section in all of our manuals.

How to Contact *QED*

If for any reason you are unable to find what you need in this manual please feel free to contact the *QED* Service Department at any time. We encourage you to use following communication methods to reach us at any time:

Service Department
QED Environmental Systems
www.qedenv.com

Oakland Service Center
1133 Seventh Street
Oakland, California 94607

(800) 537-1767 – North America Only
(510) 891-0880 – Tele.
(510) 444-6789 – Fax

Ann Arbor Service Center
PO Box 3726
6095 Jackson Road
Ann Arbor, Michigan 48106-3726

(800) 624-2026 — North America Only
(734) 995-2547 — Tele.
(734) 995-1170 — Fax
info@qedenv.com — E-mail

***QED* can be reached 24 hours a day**

We welcome your comments and encourage your feedback regarding anything in this manual and the equipment you have on-site.

Thank you again for specifying *QED* remediation equipment.

Chapter 1: Safety

Safety has been a prime consideration when designing the AutoPump System. Safety guidelines are provided in this manual, and the AutoPump System safety features are listed below. Please do not attempt to circumvent the safety features of this system.

We have also listed some possible hazards involved when applying this system to site remediation. Nothing will protect you as much as understanding the system, the site at which it is being used, and the careful handling of all the equipment and fluids. If you have any questions, please contact the *QED* Service Department for guidance.

As you read through this manual, you will encounter three kinds of warnings. The following examples indicate how they appear and lists their respective purposes.

Note:	Highlights information of interest.
Caution:	Highlights ways to avoid damaging equipment.
WARNING:	Highlights personal safety issues.

A Partial List of Safety Procedures

WARNING:
The air compressor and any other electrical equipment used with this pneumatic system must be positioned outside of any area considered hazardous because of possible combustible materials.

These safety procedures should be followed at all times when operating QED equipment on or off site, and should be considered as warnings:

- Wear safety goggles when working with the AutoPump System to protect eyes from any splashing or pressure release.

- Wear chemically resistant rubber gloves, boots, and coveralls when handling the AutoPump and fluid discharge hose to avoid skin contact with the fluid being recovered..

- Point all hoses away from personnel and equipment when connecting or disconnecting.
- Always ensure that the fluid discharge hose is connected before the air hose to prevent accidental discharge.

The AutoPump System minimizes the potential for accidents with the following safeguards:

Fire and Explosion Protection

Almost all of QED underground fluid extraction systems are pneumatic. This offers many inherent fire and explosion protection features:

- Compressed air lines eliminates electrical wiring in hazardous areas.
- Aluminum or fiberglass enclosures prevent sparking.
- Standard systems use brass fittings to eliminate sparking hazard.

Personal Protection

On-site, service and maintenance personnel can safely use *QED* equipment. Safety-in-use is the primary design feature in all systems. Following are some samples:

- All standard high pressure air hoses have automatic shut off quick-connects on the supply side which prevents injury due to hose whip or air blown particles. Tubing does not usually have quick-connect fittings, but is pushed over barbs or pushed into compression fittings.
- Metal regulators and filter bowls are rated for an inlet pressure of 200 psi. The metal air filter bowl is made of zinc, providing greater pressure and chemical resistance than plastic bowls and it is less prone to damage if dropped.

Spill Protection

On-site spills cannot always be prevented. *QED* equipment is designed to take into consideration such unpredictable occurrences that may happen despite strict adherence to standardized safety practices.

- The standard air and fluid hoses are rated at over 800 psi burst pressure to prevent accidental hose breakage.
- Down well quick-connects have locking features to prevent accidental disconnections.

Chapter 2: Overview

The AutoPump® fills and empties automatically, and is very easy to install, use, and maintain.

The AutoPump is a pneumatic fluid extraction pump that pumps in pulses. It handles any liquid which flows freely into the pump and is compatible with the component materials and with the connecting hoses.

The AutoPump is very versatile and available in a range of lengths and fluid inlet arrangements to meet particular site specifications.

Equipment will vary by application and site specifications. (See Chapter 3)

General Specifications

Pump Diameter		1.75 inch	44.5 mm
Pressure Range		5-130 psi	0.4-9.2 Kg/cm2
Flow Range	Long BL	0 to 2.3 gallons per minute (GPM)	0 to 8.8 liters per minute (LPM)
	Long TL	0 to 1.9 gallons per minute (GPM)	0 to 7.2 liters per minute (LPM)
	Short BL	0 to 2.0 gallons per minute (GPM)	0 to 7.6 liters per minute (LPM)
	Short TL	0 to 1.6 gallons per minute (GPM)	0 to 6.1 liters per minute (LPM)

This is How it Works

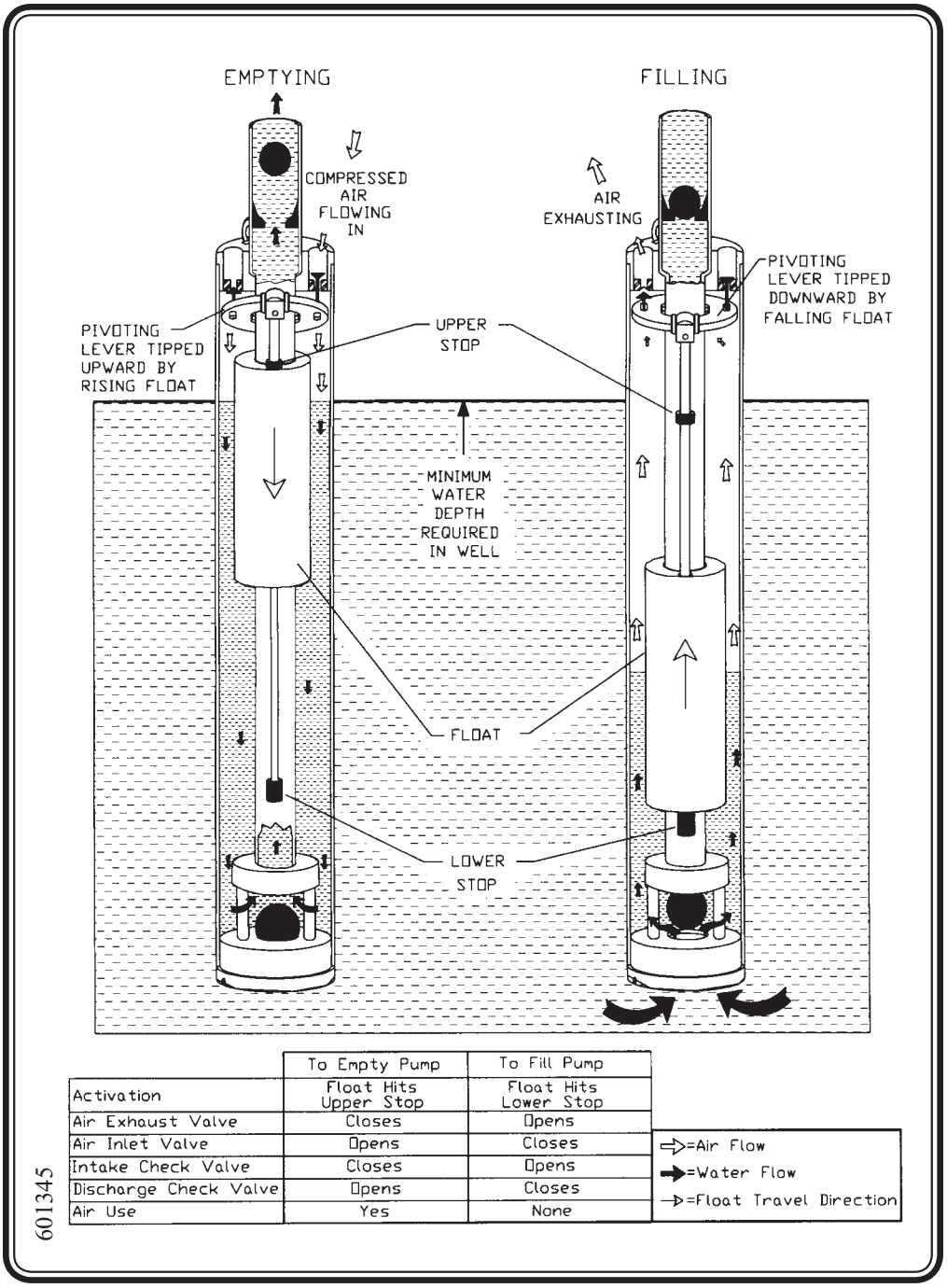
The AutoPump is a submersible compressed air-driven pump which fills and empties automatically. It also controls the fluid level in a well automatically. The pump fills **(see Figure 1)** when fluids enter either the top or bottom check valve. Air in the pump chamber exits through the exhaust valve as the fluid fills the pump. The float inside the pump is carried upwards by the fluid rising inside the casing until it pushes against a stop on the control rod, forcing the valve mechanism to switch to the discharge mode.

The switching of the valve causes the exhaust valve to close and the air inlet valve to open. This causes the pump to empty **(see Figure 1)** by allowing compressed air to enter the pump. This pressure on the fluid closes the inlet check valve and forces the fluid up the discharge tube and out of the pump through the outlet check valve. As the fluid level falls in the pump, the float moves downwards until it pushes against the lower stop on the control rod, forcing the valve mechanism to switch to the fill mode. The outlet check valve closes and prevents discharged fluids from re-entering the pump. The filling and discharging of the pump continues automatically.

Note: The figures shown here are simplified schematics.

Major AutoPump Features

- The AutoPump System is small and lightweight and can be easily moved from site to site, allowing quick response to changing conditions.
- The hoses are color coded and all the fittings are different so only the proper connections can be made.
- Rugged construction ensures long system life, even under harsh conditions.
- The entire system is pneumatically powered with no electrical components, thus avoiding sparks in control power and sensing devices.



Activation	To Empty Pump Float Hits Upper Stop	To Fill Pump Float Hits Lower Stop
Air Exhaust Valve	Closes	Opens
Air Inlet Valve	Opens	Closes
Intake Check Valve	Closes	Opens
Discharge Check Valve	Opens	Closes
Air Use	Yes	None

Figure 1 - How it Works

- The AP-2 only uses air while pumping. Unlike systems that rely on bleeding air sensors or timers which pressurize and depressurize the air hoses for each stroke, the air hose for the AP-2 remains pressurized to the pumps at all times. Air compressor power consumption, compressor filter maintenance, and thus operating costs are substantially reduced.

- The AP-2 can be configured to fill from the top or the bottom.

Figure 2 on the next page illustrates an overview of an AutoPump System.

The AP-2 System provides everything required for pumping fluid from a well. QED can also supply the air compressor, if desired.

The system is designed to perform for years and comes with a one year warranty.

Note:
An automatic drain on the compressor is highly recommended since it dramatically decreases air filter maintenance. *QED* can supply an automatic drain.

Caution:
Alteration of the System: Do not change or modify the equipment without the expressed written approval of *QED*.

Special Operating Conditions

Conditions may require adjustment or adaptations to the equipment. Below is a list of some of these conditions, their possible effects, and solutions.

Since every site is different, please contact your QED representative for detailed assistance if needed.

Cold Weather

Moisture in the pneumatic lines can freeze causing problems with the system. Such freezing could result in regulators not reducing the air pressure, valves sticking, and hoses clogging.

Actions To Take

- Use water traps and automatic compressor tank drains. These are available at industrial distributing companies (e.g., W.W. Graingers®).

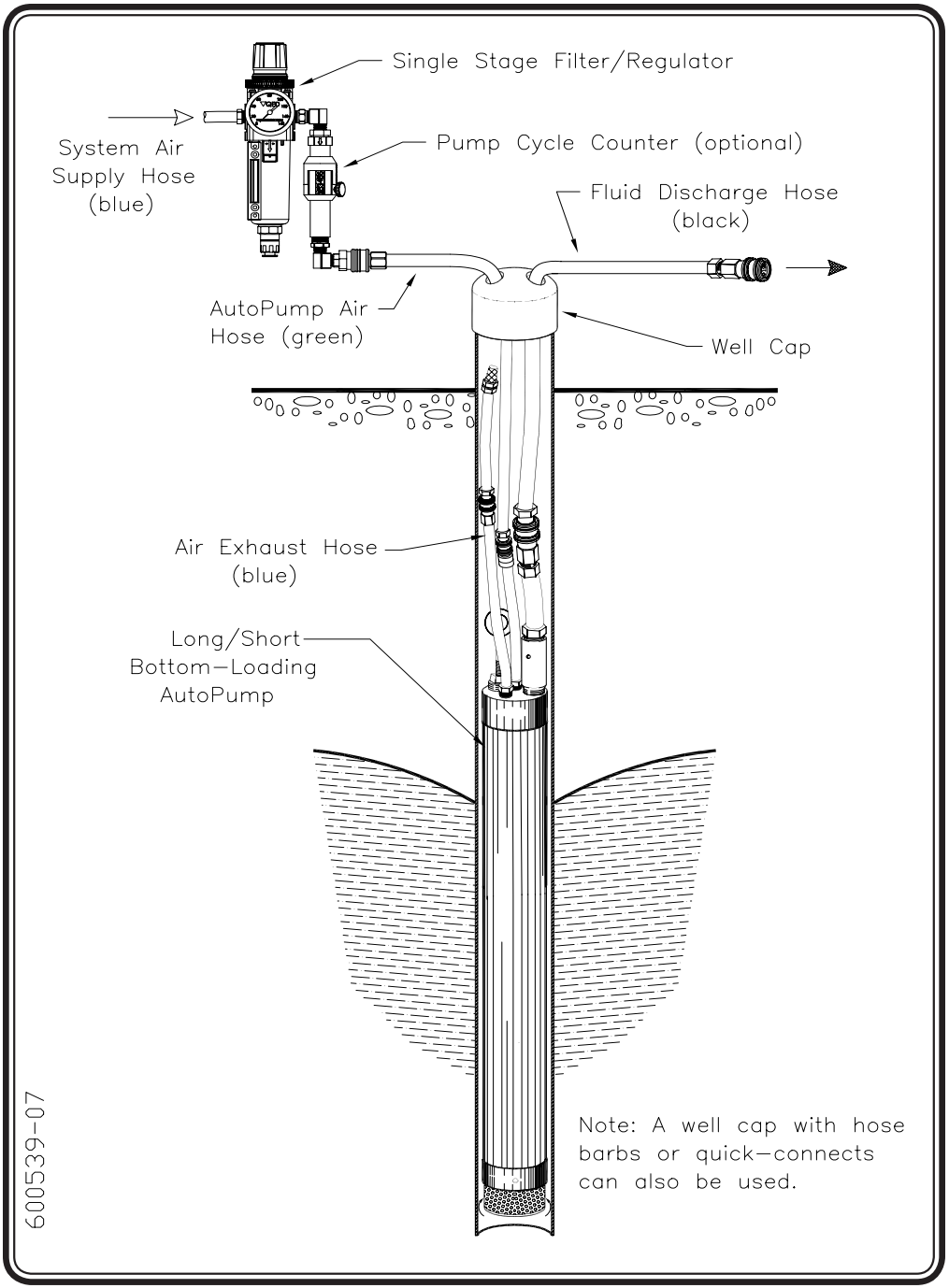


Figure 2 - Overview of the AutoPump System

- Reduce air line freezing by burying air hoses below the frost line, or insulating and heating with heat tape, or running hoses through a PVC pipe with warm air being blown through it.

- Remove all the moisture you can from the air by using drains on the compressor, filter, and low points in the air line. Use an air dryer to lower the dew point of the compressed air below the temperature of exposed lines.

- Protect the air regulator from freezing. During freezing conditions regulators may fail "open", allowing high pressure (e.g. 150 psi from the compressor) to enter components (e.g. gauges, hoses, fluid receptacles) that may be damaged, cause a safety problem, or release contaminating material.

- Locate the air intake to the compressor so the coolest (driest) air is drawn in. Usually it is better to draw air from outside a building than from the inside.

Flow induced freezing

Although it rarely occurs, air flow through an AutoPump may cause freezing internally at water temperatures well above 32˚F, slowing down the system. Cold water, moisture in the compressed air, high air pressure, a high pumping rate, and back pressure on the pump are variables that alone, or in combination with each other, may induce freezing. Should it occur, there are system adaptations which can decrease or eliminate the freezing. Please contact *QED* for advice.

The well is under a vacuum

The pump will work in a well that is under a vacuum, but there several conditions that must be considered.
(See Appendix D)

Abrasive particles in the well

Please contact QED service if you encounter problems with abrasives in the well.

Hard pipe air supply connection to the pump

These can cause debris and scale to travel down to the pump. It can also prevent the pump from cycling smoothly due to a solid connection (non-flexing) to the top of the pump. Blow out all of the hard pipe before connecting the pump. A short (6 feet) length of hose should be used between the hard pipe and the pump to allow the natural movement of the pump to occur without restraint. A small screen filter should be used at the lower end of the metal air pipe to prevent scale from reaching the air valve.

Options and Accessories

The following options and accessories are available from *QED*. Contact your *QED* Representative regarding the following:

- **AP Data Module** – This water-resistant enclosure protects and shields surface instrumentation from weather and/or harsh site conditions while providing easy visual access to key system instrumentation readings. The options available for inclusion inside the NEMA 3R enclosure are a filter/regulator, pump cycle counter, level sensor regulator and gauge with air flow meter. Also included are a fluid level indicator with an On/Off switch, an Air Inlet Supply Gauge, and a Vacuum/Pressure reference with Gauge.

- **Pump Cycle Counter (PCC)** – A PCC counts the number of times a pump cycles. The counter provides information for maintenance, service, and statistical purposes with minimal loss in air pressure or performance. A PCC is easily attached on the air inlet hose to the pump.

- **TFSO** – The Tank-Full Shut-Off (TFSO) System is a unique, self-contained pneumatic system that shuts down other pneumatic systems in the event of a liquid level rise or a pressure increase in a container. The TFSO provides dual safety by using two sensors. The system is expandable—the button sensor of the system can be teed to monitor many containers.

- **Inlet Conversions** – AutoPumps can be converted from Top- to Bottom-Loading and vice versa. See **Appendix C** for more information.

- **Extended Leachate Screens** – **(see figure 5)**

Chapter 3: Equipment

Unpacking

During the unpacking procedure, check for the following:
- All parts on the packing list have been included in the box
- All fitting openings are unobstructed
- The equipment has not been damaged in shipment

Equipment List

The equipment list will vary depending on site specifications, but the following list is a typical configuration:.

1. Top-Loading or Bottom-Loading AP-2 with support eyebolt
2. Single stage filter/regulator with:
- 5 micron filter with manual drain (auto drain option)
- Pressure regulator with gauge

3. Pump Cycle Counter (PCC)

4. Hoses:
- Fluid discharge hose (black)
- System air supply hose (blue)
- AutoPump air hose (green)
- Air exhaust hose (blue)

Note:
Black nylon tubing can be used in place of hose.

5. Pump support system:
- Well cap
- Polypropylene support rope with quick-link assembly or SS wire rope

Tools

The following tools are used to service the AP-2:
- Spanner wrench
- 3/32-inch Hex (Allen) key
- 6-inch Cresent wrench

Parts List

In aggressive sites over millions of cycles, the parts that one may anticipate replacing are:
- Discharge check valve ball

AP-2 AutoPumps

In both the Bottom-Loading and the Top-Loading models, the fluid is pushed out of the pump through a check valve located at the top of the pump. This check valve prevents the fluid from reentering the pump.

Bottom-Loading AP-2/BL

The Bottom-Loading AutoPump fills through a check valve at the bottom of the pump. There are two lengths of AP-2/BL: long and short. The fluid level in the well can be drawn down to 35 inches from the bottom of the long BL, and 20 inches from the bottom of the short BL **(See Figure 3)**

Top-Loading AP-2/TL

The Top-Loading AutoPump fills through a check valve at the top of the pump, therefore the fluid level in the well will never go below the level of this check valve. There are two lengths of AP-2/TL: long and short **(See Figure 4)**

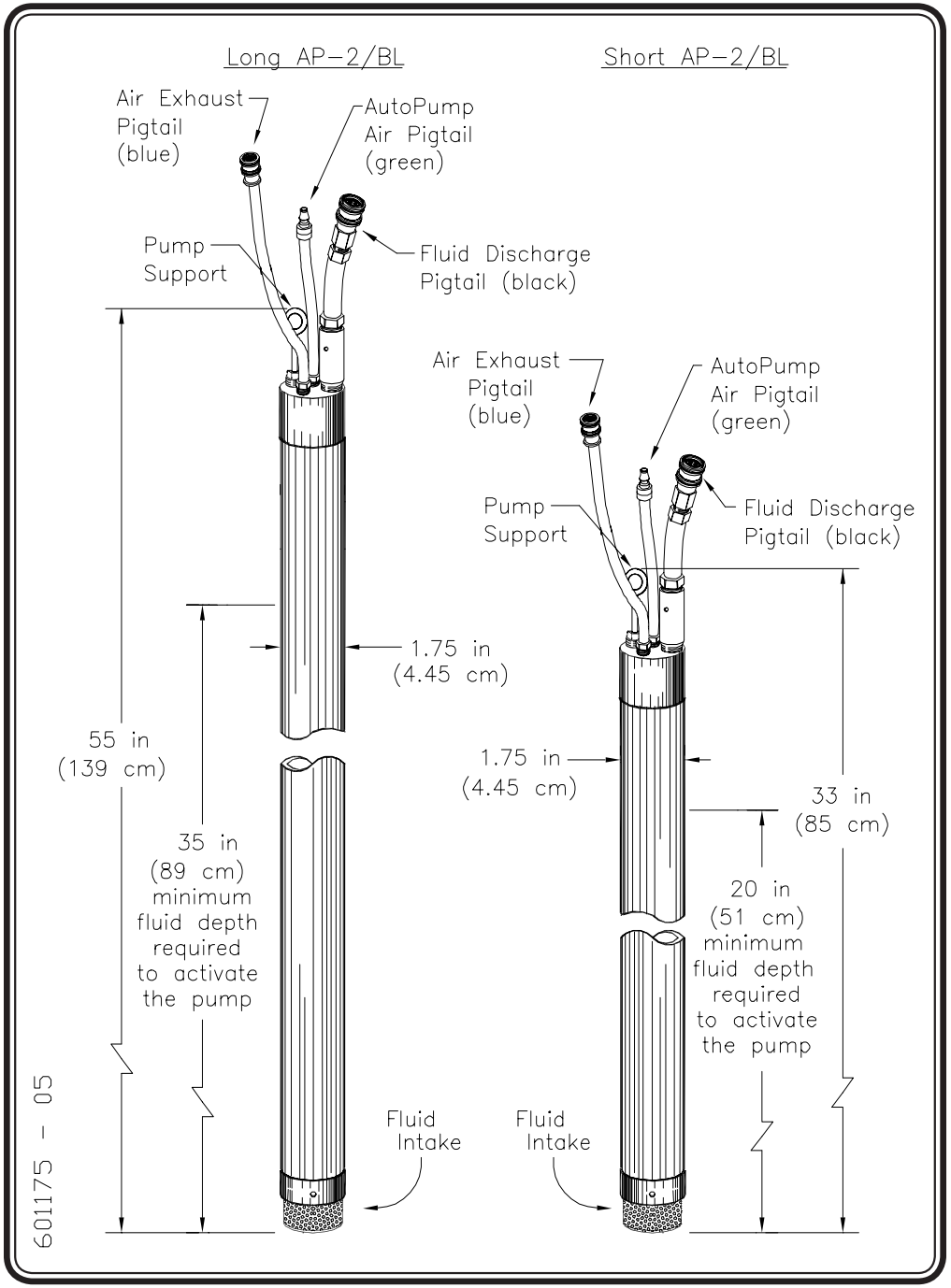


Figure 3 - Long and Short Bottom-Loading (AP-2/BL)

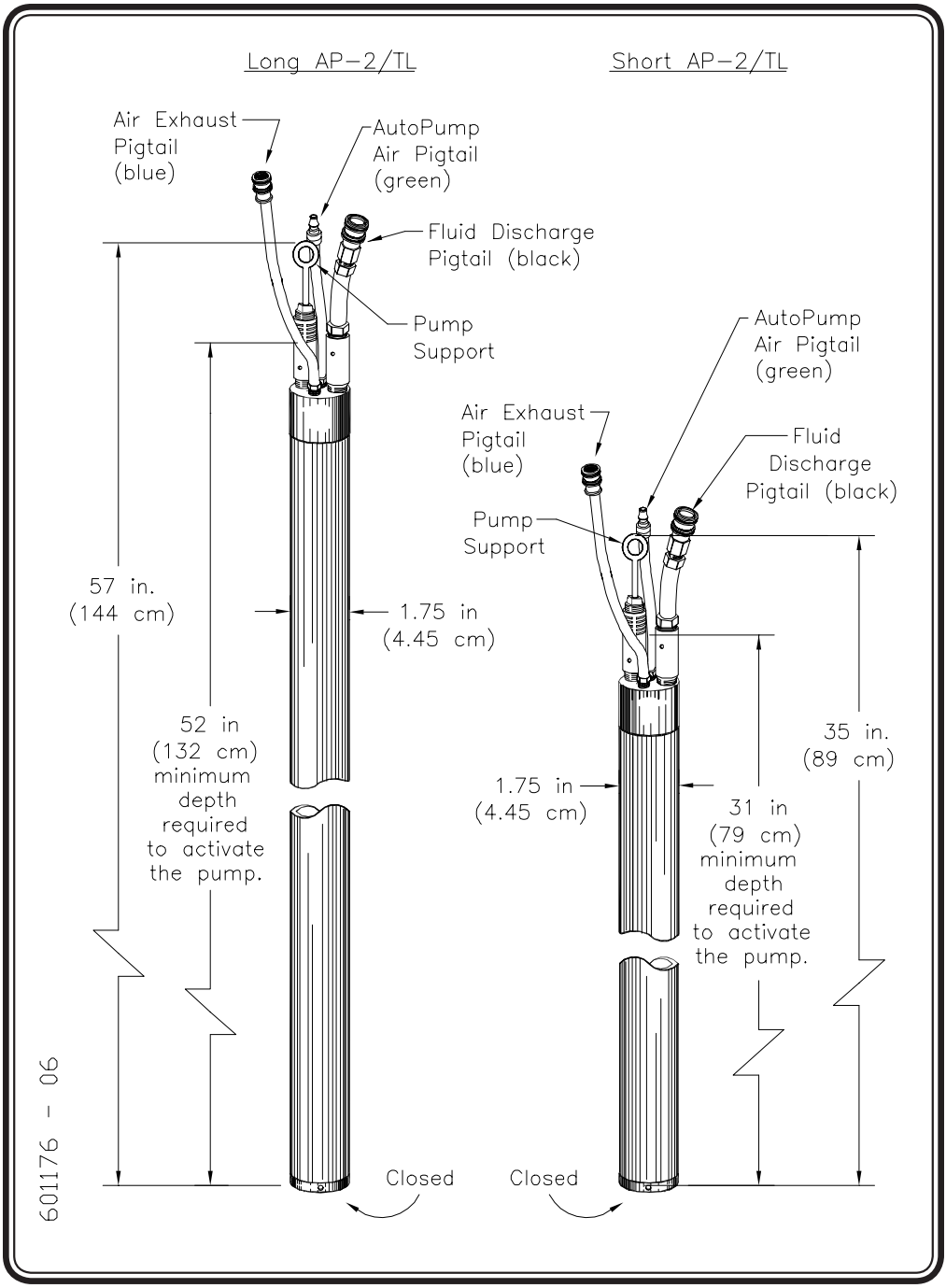


Figure 4 - Long and Short Top-Loading (AP-2/TL)

Specifications

Pump	Length	Vol/Cycle Range	Weight	Outside Diameter
Long AP-2/BL	55-inches 139-cm	0.14 gal - 0.17 gal .53 L - .64 L	7.8 lb 3.6 kg	1.75-in 4.45-cm
Short AP-2/BL	33-inches 85-cm	0.05 gal - 0.08 gal .19 L - .30 L	5.4 lb 2.5 kg	1.75-in 4.45-cm
Long AP-2/TL	57-inches 144-cm	0.14 gal - 0.17 gal .53 L - .64 L	7.8 lb 3.6 kg	1.75-in 4.45-cm
Short AP-2/TL	35-inches 89-cm	0.05 gal - 0.08 gal .19 L - .30 L	5.4 lb 2.5 kg	1.75-in 4.45-cm

Component Materials

Component materials include stainless steel, Viton, nylon, epoxy, PTFE (e.g.-Teflon), polyethylene, titanium, PVDF (e.g.-Kynar). Hose connections can be brass or stainless steel.
Materials may vary depending on site specific needs.

Performance and Air Use Curves

See Appendices A and B.

Landfill Pump Configurations

All lengths (Long and Short) and intake configurations (Bottom-Loading) are available in models for landfill leachate, condensate pumping and dewatering applications. **(See Figure 5)**

Landfill Pump Specifications

Pump	Length	Vol/Cycle Range	Weight	Outside Diameter
Long AP-2/BL	57-inches 144-cm	0.14 gal - 0.17 gal .53 L - .64 L	7.9 lb 3.6 kg	1.75-in 4.45-cm
Short AP-2/BL	35-inches 89-cm	0.05 gal - 0.08 gal .19 L - .30 L	5.5 lb 2.5 kg	1.75-in 4.45-cm

Component Materials

Component materials include stainless steel, Viton, nylon, epoxy, PTFE (e.g.-Teflon), polyethylene, titanium, PVDF (e.g.-Kynar). Hose connections are usually stainless steel.
Materials may vary depending on site specific needs.

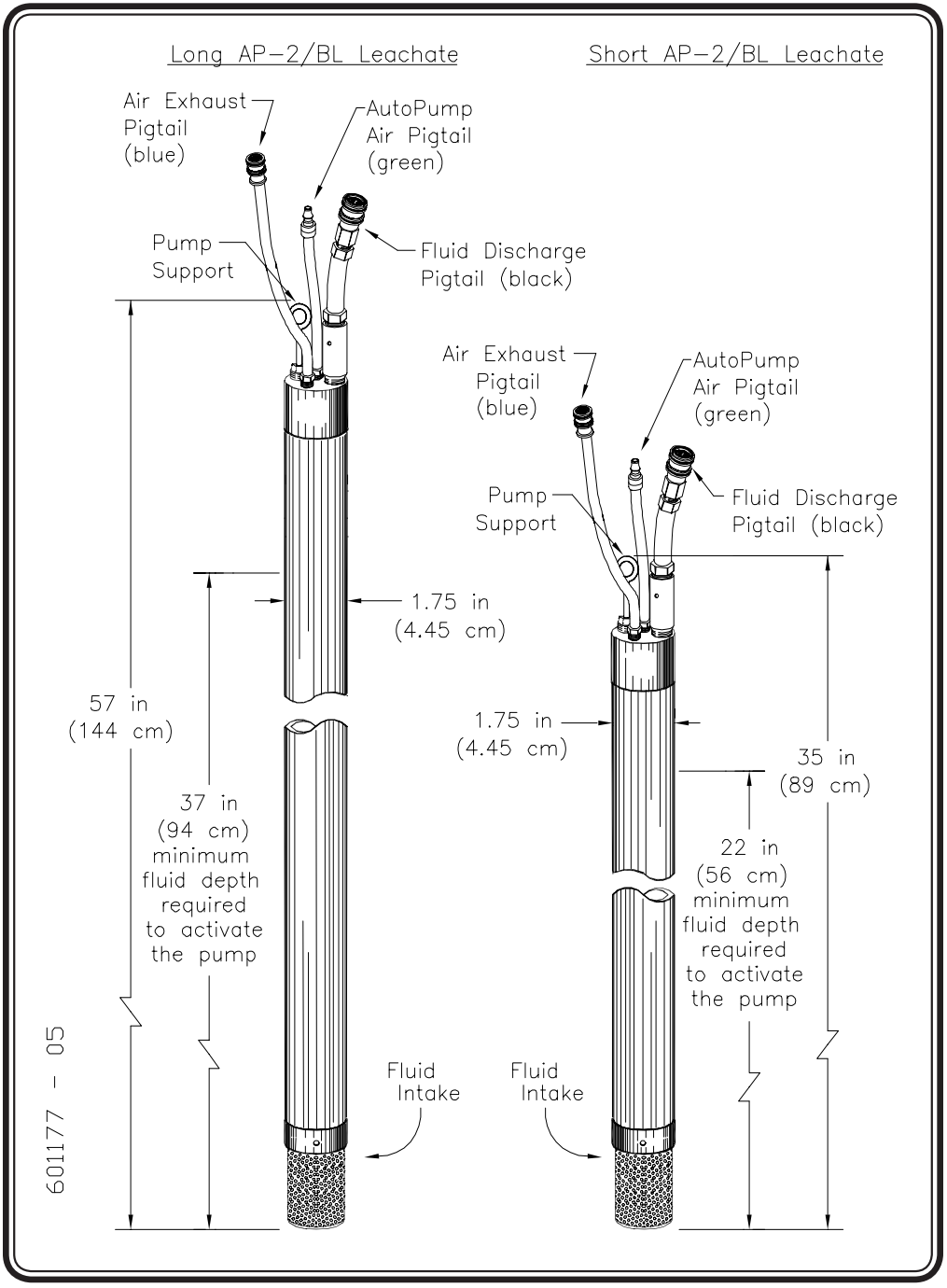


Figure 5 - Long and Short AP-2 Bottom Loading with Leachate Screen

Single Stage Filter/Regulator

A single stage 5 micron particulate air filter/regulator has an a manual or an optional automatic drain and is installed on the system air supply hose. The filter/regulator removes particles and some oil vapor, and water droplets from the air passing to the AP-2. The regulator should produce at least as much pressure as required to move the fluid from the depth at which the pump is installed. **(See Figure 6)**

Note:
Too much air pressure can result in low pump efficiency.

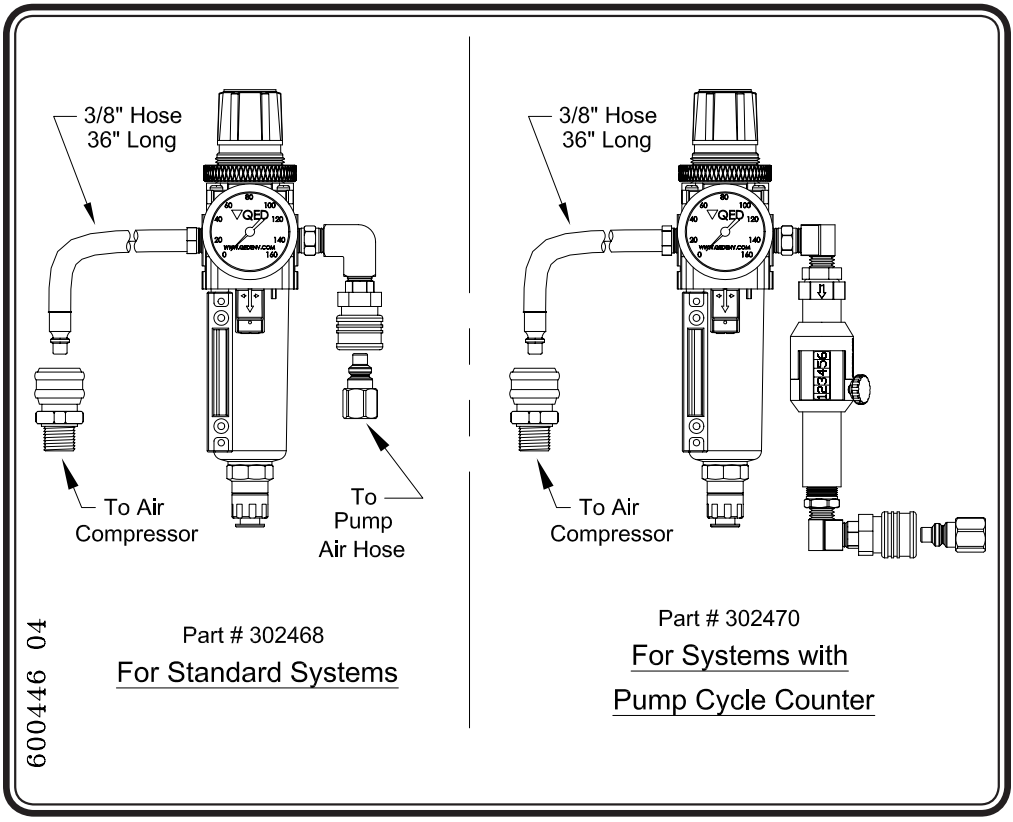


Figure 6 - Single Stage Filter/Regulator with Quick-Connects

Hoses and Fittings

The table below shows the normal hose colors. These may change due to application or need.

Hose and Tubing Color Code Table

	System Air Supply Hose	Fluid Discharge Hose	AutoPump Air Hose	Air Exhaust Hose
Hose Color	Blue	Black	Green	Blue
Hose Material	Nitrile	Nitrile	Nitrile	Nitrile
Hose Size I.D.	1/4-inch to 3/8-inch	1/2-inch to 3/4-inch	1/4-inch to 3/8-inch	3/8-inch to 1/2-inch
Tubing Color	Black	Black	Black	Black
Tubing Material	Nylon or Polyethylene	Nylon or Polyethylene	Nylon or Polyethylene	Nylon or Polyethylene
Tubing Size O.D.	3/8-inch to 1/2-inch	3/4-inch to 1-inch	3/8-inch to 1/2-inch	1/2-inch to 3/4-inch
Function	Transports air from air compressor to filter/regulator	Transports product from AutoPump to discharge point	Transports air from filter/regulator to AutoPump	Exhausts air from AutoPump
Fittings	Hose barb and clamp or one-way quick-connect fitting	Hose barb and clamp or straight through quick-connects	Hose barb and clamp or one-way quick-connect fitting	Hose barb and clamp or straight through quick-connects

* Nylon tubing is available in single tube or jacketed bundles. Contact QED for the sizes and bundle configurations.

If optional quick-connects are used, the flow of air and fluid in the hoses runs *into* the male plug and *out* of the female socket.

The quick-connect fittings on one type of hose will usually not interchange with those of another, so it is very difficult to connect a hose to an incorrect fitting.

Note:
The down well hose fittings normally have locking quick-connects. On sites with water depths over 50 feet, special consideration may be required to support the hoses. Consult with *QED* regarding such applications.

Pump Cycle Counter

Refer to Appendix F – Pump Cycle Counter

Volumes Pumped Per Cycle

- The volume of fluid pumped per cycle from an AutoPump varies depending upon the inlet air pressure, the fluid inlet head and the force against which the pump must move the fluid. This force is a sum of the static head and dynamic losses incurred during fluid movement, usually referred to as Total Head.

- The Total Head depends upon back pressure in the surface lines, hose size, fittings, vertical and horizontal pumping distance, the number of pumps feeding the hose system, air pressure to the pump, and the type of pump.

- The effects of some of these variables may cause the volume pumped per cycle to vary from pump to pump on a single site.

Pump	Volume per Cycle: Range	Volume per Cycle: Average
Long AP-2/BL	0.14 gal - 0.17 gal 53 L - .64 L	0.155 gal .59 L
Short AP-2/BL	0.05 gal - 0.08 gal .19 L - .30 L	0.065 gal .25 L

All figures above are dependent on site specific conditions under which the pump is operating

Pump Support System

To safely support the AP-2, a pump support system is offered. Included in the system are a well cap, support rope, and quick-link assembly.
(See Figure 12 on page 33, and Figure 13 on page 34)

Well caps with various fitting combinations are available.
(See Figure 11 on page 31)

Caution:
Although it may be possible to support the pump using only tubing, it is not always wise to do so. If a pump becomes jammed in a well, a strong rope or wire rope separate from the tubing may be needed to withstand the force required to free it. Thus a separate support line is recommended.

Chapter 4: Assembly & Installation

WARNING:
PVC pipe is generally not recommended for compressed air service.

Cautions

The following suggestions are offered to reduce the complications involved in assembly and installation.

- Cover the hose ends with tape if they are being pulled through trenches. Be sure the ends of the hoses that connect to the air compressor and fluid discharge have the correct fitting leading out of the well. If you are unsure, look at the respective fittings on the pump.

- Blow out all water and particles from compressed air conduits (trunk lines, sensor hoses, air supply hoses etc.) and fluid lines for at least 10 seconds after the water and particles exit before connecting them to the system.

- When running hoses in conduit, include a rope to pull additional hoses in case they are needed at a later date

- If solid metal piping is used for compressed air conduit, it is advised that an air filter or a "Y" strainer with a fine mesh screen (80 mesh or finer) be placed at the downstream end of the piping. Metal flakes, rust, galvanizing material, dirt, etc. can be dislodged from such metal piping and travel to the pump.

Compressed Air Supply

The AP-2 System includes a compressor-to-pump air line quick disconnect fitting for the compressor.

There is a distinct air inlet on the AP-2; an “IN” is stamped next to it on the head of the pump. The air inlet quick connect fitting on the pump has a female counterpart on the air inlet hose. The air inlet must be connected for the AP-2 System to function. Do not lubricate the compressed air coming out of the compressor. The AP-2 does not require lubrication and excess oil may foul the filter/regulator.

WARNING:
The compressor should not provide more pressure than the filter can accept. The metal bowl can accept 200 psi. Maximum output air pressure setting on the standard regulator is 120 psi. A higher pressure regulator and gauge are optional.

Component Assembly

Quick-Connects/Hose Barbs

Follow the instructions on **Figure 7** for properly securing the locking quick-connects. See **Figure 8** for properly securing hose barbs.

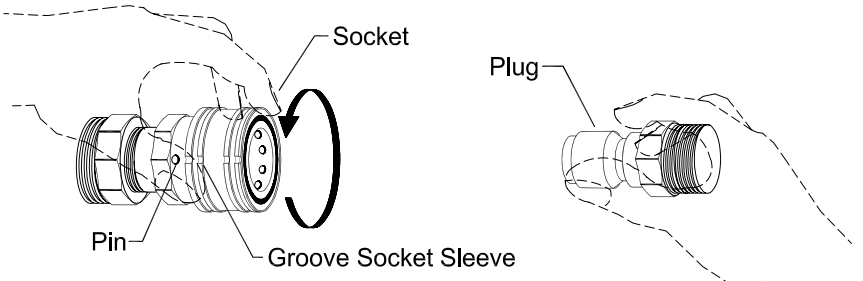
AutoPump Assembly

STEP 1 - Attach Fluid Discharge Hose (black)

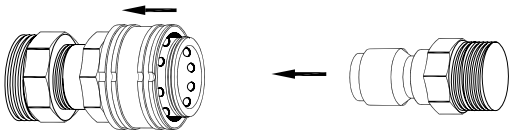
Note:
If a well cap with holes is used, insert the hoses through the cap before attaching hose.

a. Attach the fluid discharge hose or tubing to the AutoPump. **(See Figure 9 and Figure 10)**

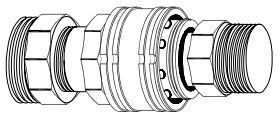
b. Attach the other end of the discharge hose to the fluid discharge point.



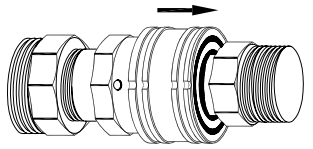
a. Rotate socket sleeve until groove is aligned with the pin close to the hex.



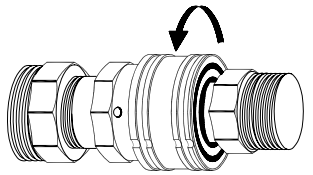
b. Pull socket sleeve against the hex (the pin will be totally covered). Hold in this position for plug insertion.



c. Push plug into socket until the plug is almost covered.



d. Let the socket sleeve go in. It must slide all the way until the pin is visible again.



e. Rotate the socket sleeve so the groove does not align with the pin. To test, gently pull hexes of both fittings in opposite directions. Fittings must remain attached.

600259 02

Figure 7 - Locking Quick-Connects

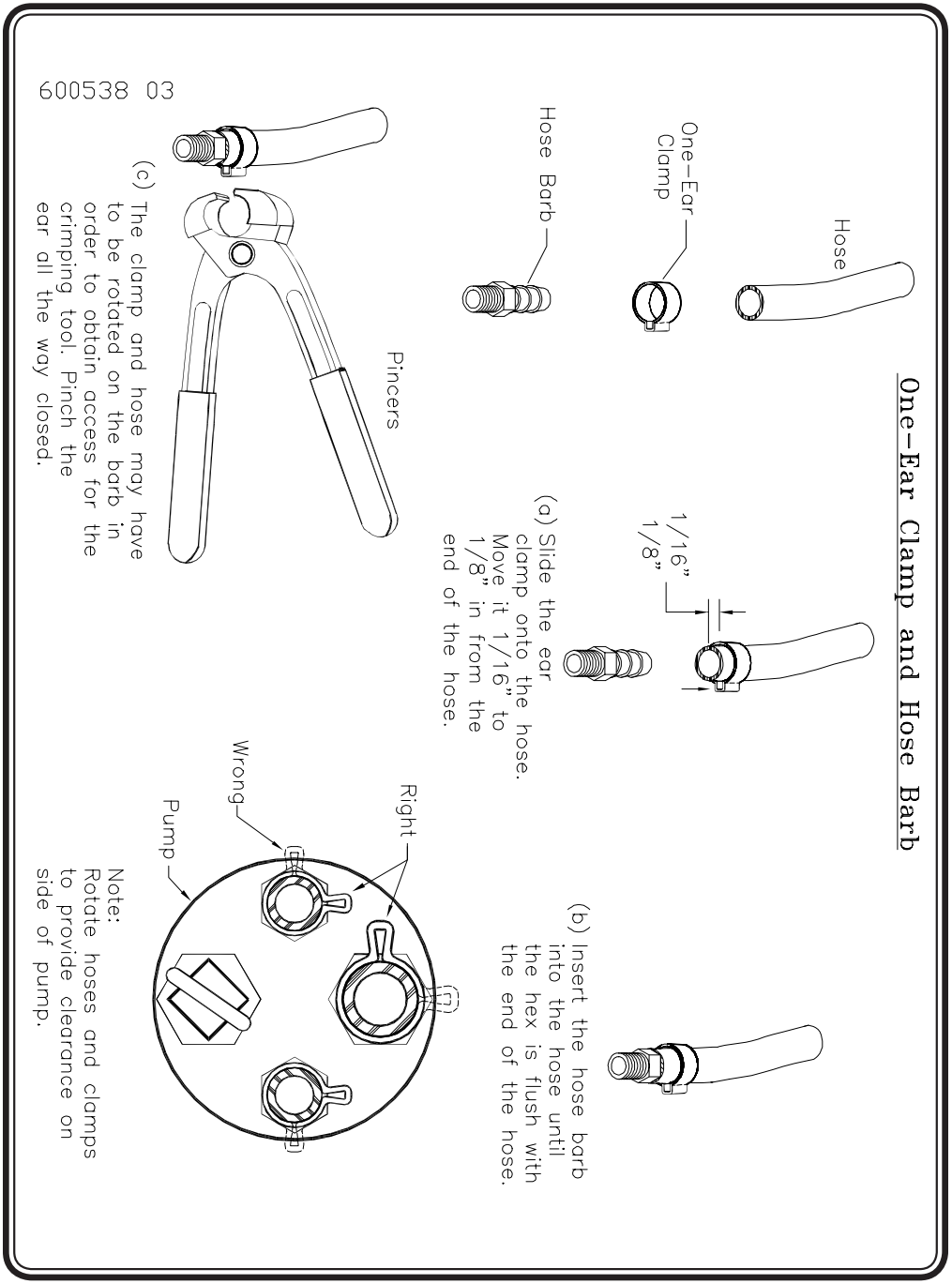


Figure 8 - One-Ear Clamp and Hose Barb Assembly Instructions

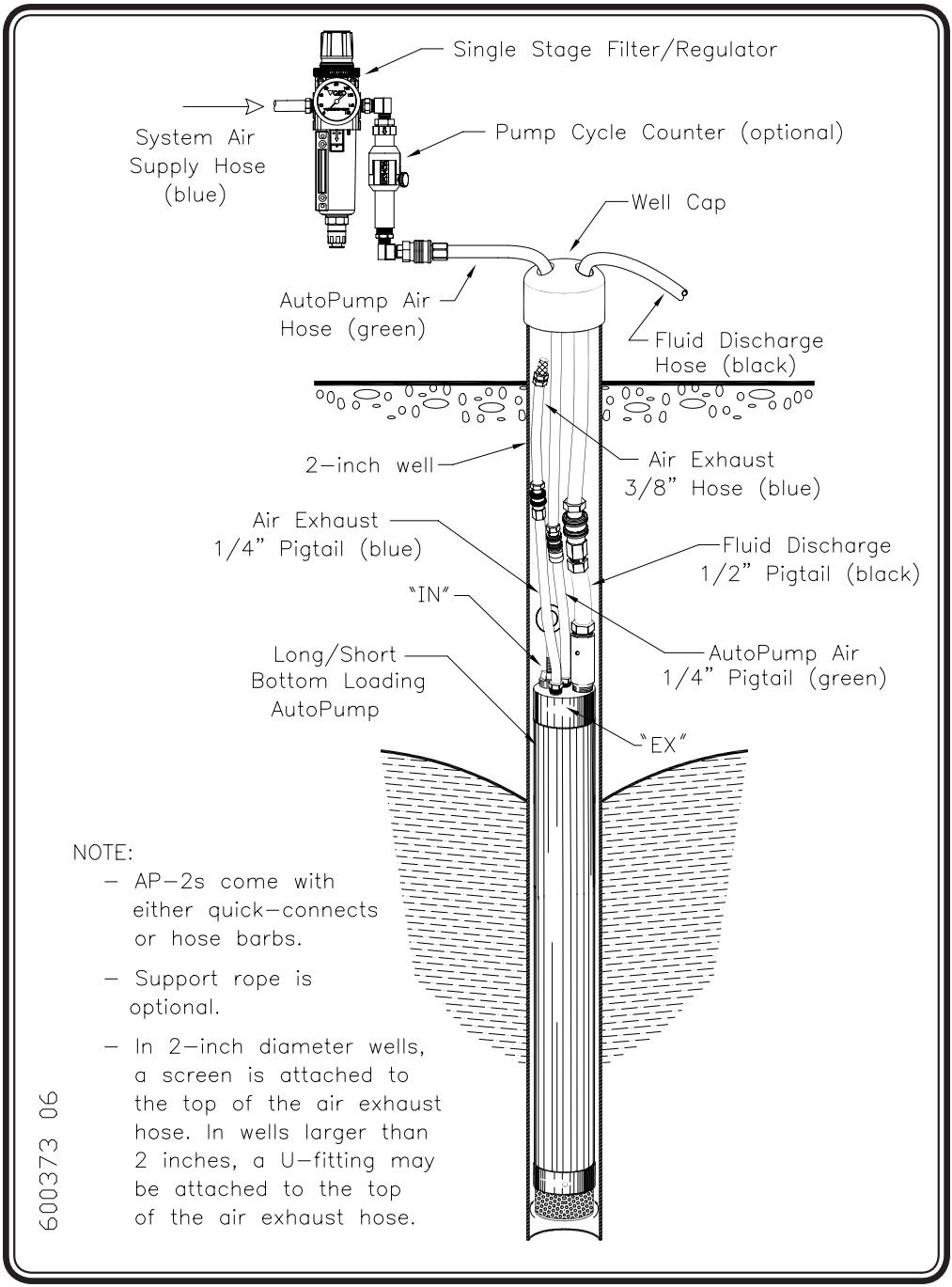


Figure 9 - AP-2 Assembly: Well Cap with Holes

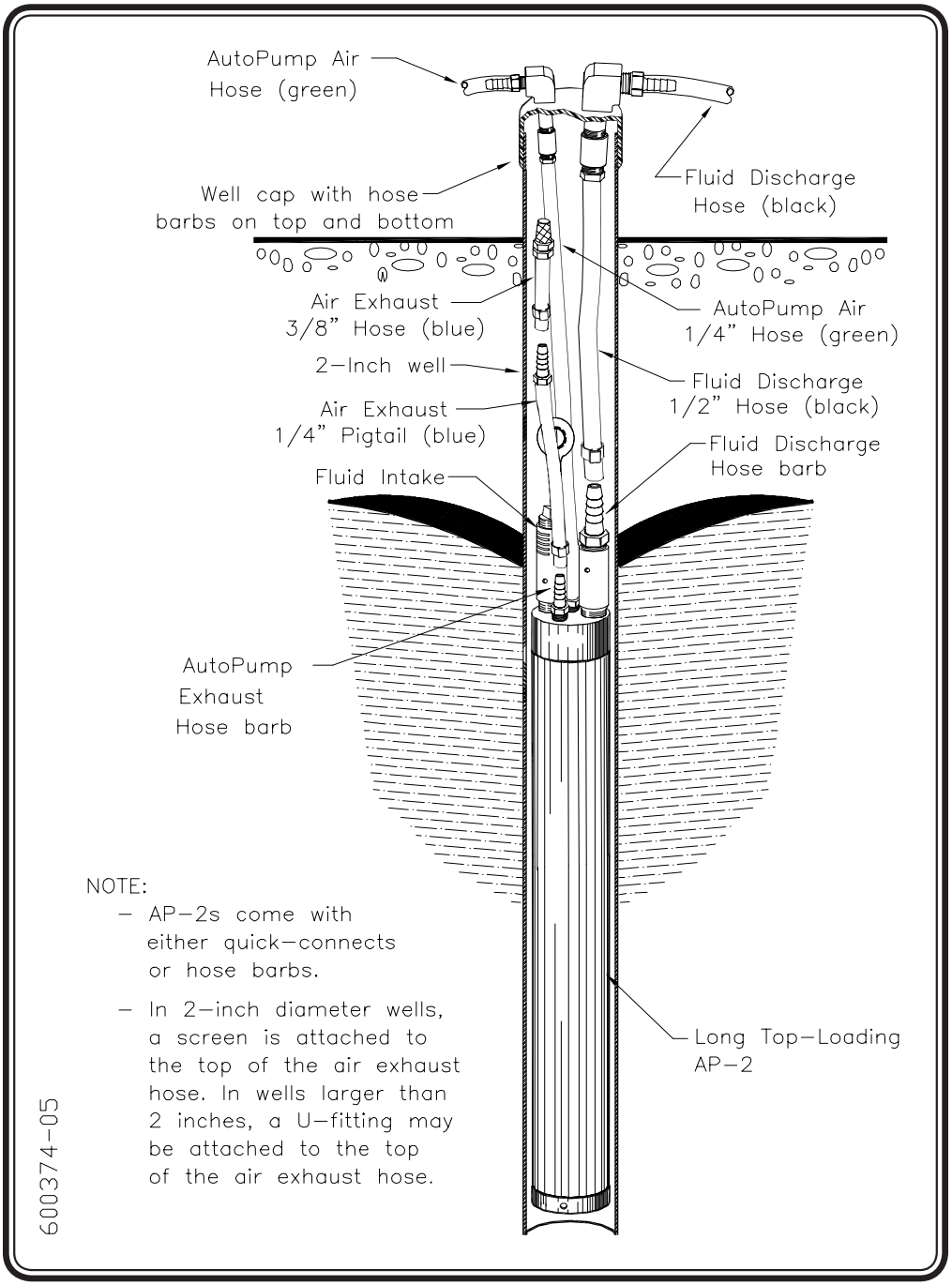


Figure 10 - AP-2 Assembly: Well Cap with Hose Barbs

STEP 2 - Attach AutoPump Air Hose (green)

a. If a Pump Cycle Counter (PCC) is used, install it downstream of the air filter regulator and as close to the pump as is reasonable.

b. Attach the AutoPump air hose to the single stage filter/regulator or optional Pump Cycle Counter **(See Figure 2 on page 9)**

c. Attach the other end of the AutoPump air hose to the AutoPump.

STEP 3 - Attach Air Exhaust Hose (blue)

a. Attach the air exhaust hose to the AutoPump. **(See Figure 9 and Figure 10)**

STEP 4 - Attach System Air Supply Hose (blue)

a. Thread the air hose socket with 1/4-inch MPT to the compressor. Use Teflon tape or sealant on the threads.

b. Attach the air hose plug end of the system air supply hose to the socket now attached to the compressor.

c. Attach the socket on the discharge end of the hose to the single stage filter/regulator. **(See Figure 2 on page 9)**

The pump will work in a well that is under vacuum, but there are several conditions that must be considered. **(See Appendix D)**

Dry Test

Before installing the AutoPump in the recovery well, it is important to test the system for proper operation. Before beginning this test, make sure that all hoses are properly connected as described in the previous section.

To test for float movement and air valve actuation follow these steps:

STEP 1 - Drain all fluid from the pump through the bottom inlet check valve (Bottom-loading) or air inlet fitting (Top-loading).

STEP 2 - Hold the pump horizontally.

STEP 3 - Tip the top of the pump downwards to about 45°. The float should slide to the top of the pump and open the air valve. Air should be heard going into the pump. It will exit the inlet fluid check valve (Bottom-loading) or the outlet check valve (Top-loading).

Caution:
If air is not acceptable in the fluid discharge hose, disconnect the hose before performing this test.

STEP 4 - Tip the head of the pump upwards past horizontal to 45° from the vertical. The float should slide to the bottom of the pump and close the air valve.

STEP 5 - Repeat this process 3 or 4 times to ensure the float moves freely and the air-valve opens and closes. If the pump must be tilted nearly vertical before the float slide or the air valve moves, open the pump and inspect for interference.

Pump Support System and Hose Bundling Assembly

A pump support system can be created to support the pump and hoses. The pump support system uses well caps with various fitting combinations. **(See Figure 11)**

Though it is possible in some instances to support a downwell pump with only the tubing, a separate support line is recommended.

Note:
The walls of some wells deform over time. They may trap a downwell pump. In some of those cases the support line has proven useful when retrieving the pump.

In addition to supporting the down-well equipment with a support rope, it may be important to support down-well hoses (in most cases nylon tubing does not need to be supported by the support line). Since the down-well hoses can weigh more than the pump, particularly in wells over 50 feet deep with fluid inside the discharge hose, hose support can avoid problems such as kinking, jamming, and breaking.

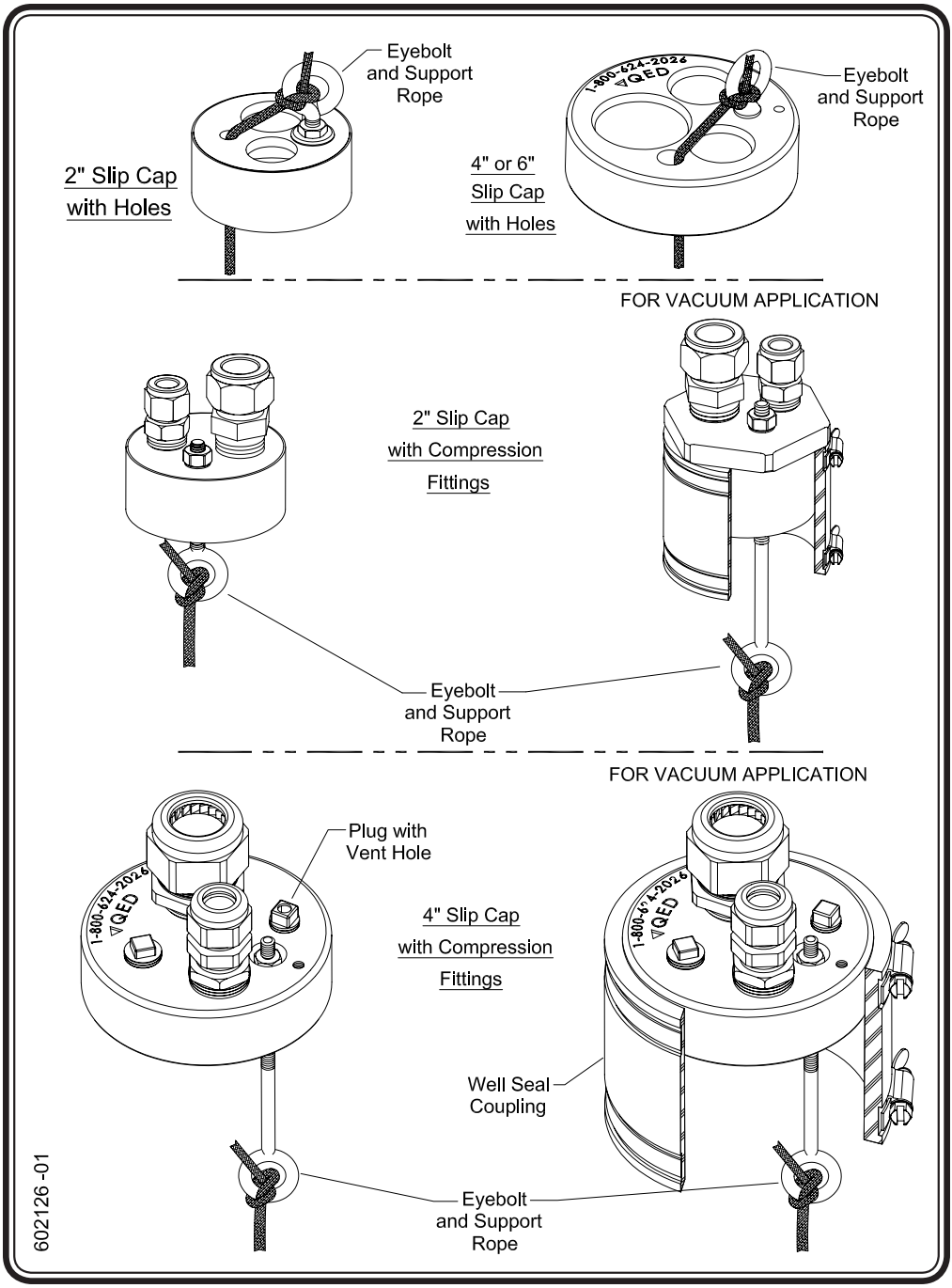


Figure 11 - Examples of Well Caps

Hose bundling or the use of jacketed tubing reduces equipment entanglement at the well surface, and aids the removal of the pump from the well. Bundling also assists in positioning the pump and down-well hose assembly against one side of the well casing. Maximum space is created for other items, such as probes, to be periodically placed inside the well.

Follow these instructions to create a hose bundle.

STEP 1 - Lay the equipment on the ground and make all of the necessary hose connections. **(See Component Assembly on pages 24 through 30)**

STEP 2 - If a well cap is supplied, install it on the hoses. (**See Figure 9** for well cap with holes; **see Figure 10** for well cap with hose barbs)

STEP 3 - Connect the quick-link assembly on the support rope to the eye on the AP-2 and lay the support rope out along with the hoses. Make sure that none of the hoses or support ropes are crossing over each other. **(See Figure 12)**

Note:
To make the next step easier, pull the support rope and the hoses taut.

STEP 4 - Starting at the AutoPump end of the hose, put a tie-wrap through the center of the braided support rope just above the uppermost quick-connect or barb on the AutoPump.
(See Figure 12 and Figure 13)

STEP 5 - Pulling the rope taut, put the tie-wrap around the fluid discharge hose with the rough surface outwards. Cross the ends and complete the figure-8 pattern by securing the ends around the exhaust hose. When you connect the tie-wrap make sure it is straight and is not kinking the hoses. **(See Figure 12 and Figure 13)**

Note:
After completing this step, the fluid discharge hose will be attached to the support rope and the exhaust hose. At this point the air supply hose is still lying free.

STEP 6 - Place the next tie-wrap two feet towards the well cap from the first. Secure the air supply hose rather than the exhaust hose.

Note:
It is important to put the tie-wraps approximately two feet apart to keep a proper discharge hose/support rope bundle. Experience has shown that spreading the tie-wraps further apart than two feet increases the probability for hose kinking.

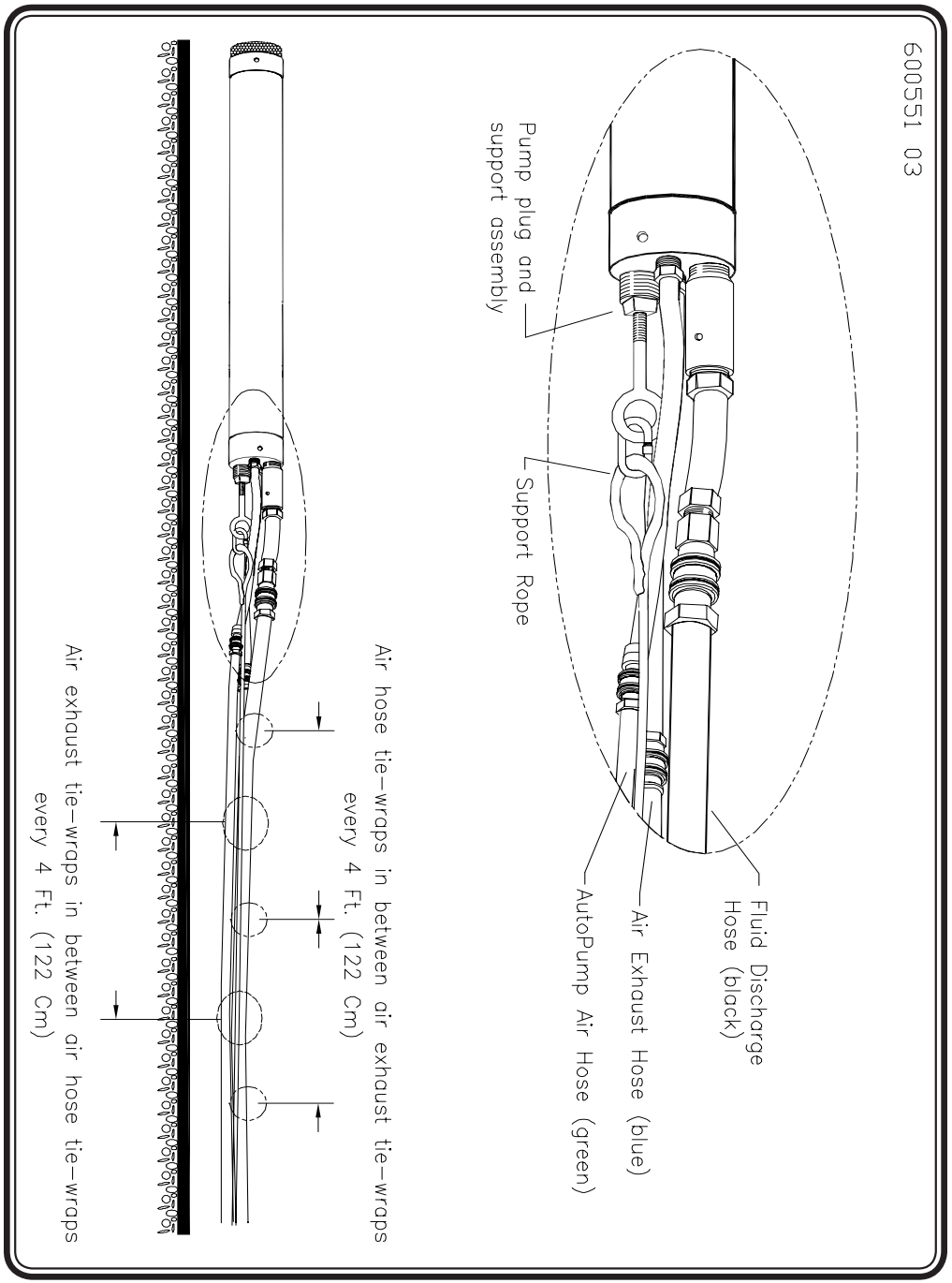


Figure 12 - Hose Bundling: Part 1 of 2

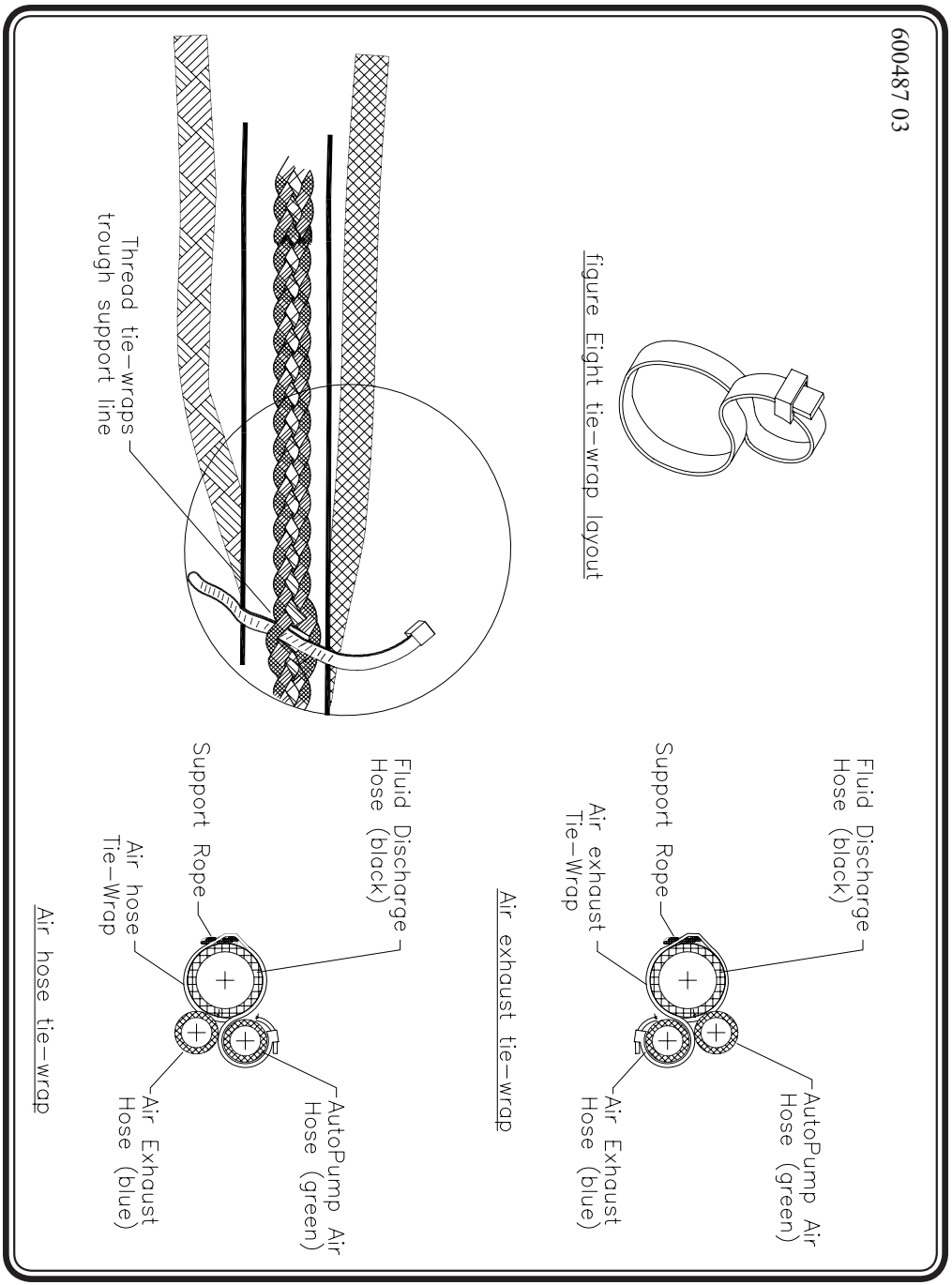


Figure 13 - Hose Bundling: Part 2 of 2

STEP 7- Continue to alternate the air exhaust and the air supply tie-wraps every two feet, stopping about five feet from the wellhead.

STEP 8- Being careful not to leave any sharp edges, cut the excess from the tie-wraps.

You now have a down-well bundled hose assembly that supports both the hoses and the down-well equipment.

AutoPump Installation

Once the installation of the pump support system is completed, you may install the AutoPump in the recovery well.

Note:
Submerging the pump before supplying it with air will result in fluids entering the exhaust hose. Those fluids will be discharged from the exhaust hose during the first few cycles of the pump. If such discharge will not be confined to the well, the operator may wish to install the pump with a low air pressure supplied to the pump. To obtain the value of that low pressure in psi, multiply the number of feet that the pump is to be submerged by one-half (0.5)

WARNING:
Be sure that the fluid discharge has a closed valve during such process because the pump may have enough pressure to begin pumping fluid from the well.

STEP 1 - Lower the pump until it is at the desired level.

STEP 2 - Secure the pump by tying off (securing) the support line or by placing the well cap on the well.

STEP 3 - Increase the air pressure to the pump until the pump is pushing the fluid out at the desired rate. With sufficient air pressure (at least 10 to 15 psi over the vertical static head), the AutoPump will gradually draw down the fluid level in the well to the level of the pump. The time required for this draw down varies with the yield of the well as compared to the flow rate of the pump. The maximum recommended continuous operating pressure is 130 psi.

The pump rate can be increased slightly by increasing the air pressure to the pump. However, under conditions with high inlet pressures and little discharge resistance, some air may exit with the fluid. That would be due to a brief residual pressure in the pump which discharges fluid (and air) even after the exhaust valve is opened.

Under normal operating conditions, no air should exit the pump with the fluid.

If the pump is moving air out the fluid discharge and this is undesirable, a needle valve in the air line can be used. This reduces the air flow rate to the pump and thus the pressure buildup in the pump. Alternately, reduce the pressure going to the pump though the pressure regulator.

Chapter 5: Start Up and Operation

Start Up Checklist

In normal operation, the AutoPump System requires little attention.

Before regulating the air pressure to the desired operating pressure, ensure that the following conditions exist:

1. Personal Protective Equipment (PPE) is being used by all personnel.

2. The pump is submerged below the fluid level.

3. All hoses are connected.

4. The exterior air filter is mounted vertically to allow the filter and its bowl drain to operate properly.

5. All out-of-well air and fluid valves are in their correct positions.

6. A method of rapid disconnect and exhaust (or at least a shut off) of compressed air to the pump is available in case of an unexpected occurrence.

7. When pumping is to begin, either gradually raise the air pressure to the pump or gradually open the air valve to the pump to allow the pump and hoses to slowly pressurize. Check for leaks as you do this.

8. As the air pressure overcomes the static and dynamic resistant forces, the pump will begin to cycle. Listen for the periodic exhaust of air from the pump to determine that the pump is working. The pump should push fluid out and then exhaust sharply to fill before pressurizing and pushing the fluid out again.

   Cycling can also be monitored by placing an air pressure gauge at the well head and by observing a pulse counter, if one is present.

Adjusting the Pump Cycle Counter

Refer to Appendix F – Pump Cycle Counter

Observation of System Operation

Observe the system operation for at least 10 pump cycles to ensure everything is working. If the well influx is low so the pump seldom cycles, pour clean water into the well to check on the pump. If allowed, the pump discharge can be directed into the well so the pump will cycle within an acceptable period to allow for observance of operation. Check your local regulations to determine if these practices are permissible.

Note:
The Pump Cycle Counter may have to be readjusted if it is set when the water is recirculating to the well.

After the entire site is operating, return to each well to ensure that the pump and PCCs are functioning properly. The addition of other pumps and possible system back pressure can necessitate air pressure and counter readjustment.

Downwell Testing of the AutoPump

While the AutoPump is in the well, it can be tested by putting compressed air into the exhaust hose of the pump.

Note:
The air supply hose must be shut off or pressurized when this is done.

The compressed air will enter the pump through the exhaust valve and push any fluids in the pump up the discharge tube. If sufficient compressed air is continually supplied, it will also exit the discharge tube and cause the fluid in the discharge hose to be airlifted to the surface. This method can be used to lighten the pump and hoses before removing the pump from the well. This process can also show whether the fluid inlet check valve is sealing and if the pump is capable of discharging fluid.

AutoPump Shutdown while Submerged

The AutoPump can be submerged for long periods of time at most sites. If the well environment is such that deposition occurs on stainless steel parts, the operator may wish to raise the pump above the water level during a shutdown of the system.

AutoPump Removal Technique (optional)

By pressurizing the exhaust hose as noted above and airlifting the fluids out of the well, the fluid in an AutoPump and discharge hose can be reduced significantly. This can be used to lighten the system before removing it from the well.

Chapter 6: Maintenance

General Maintenance

The AutoPump should be relatively free of maintenance. The frequency of maintenance depends upon the nature of the fluids being pumped. Follow these general maintenance checks.

- Periodically inspect all hoses and connections for damage. Make sure that the hoses are not split or cracked, and listen for leaks in the system.

- Even if significant amounts of water enters the air hose, the AP-2 System should perform reliably for years. Check the air filters and filter bowl drains on the filters/regulator for saturation and operation every few weeks.

- Periodically drain the air filters on the air hose to the pumps of collected particles, water and oil. Draining prevents the filter from clogging up or being otherwise damaged. Check the regulator to ensure the pressure setting has not drifted appreciably.

- An automatic drain on the compressor is highly recommended, since such an addition can dramatically increase air filter life and decrease maintenance. Automatic drains are available from QED.

- The pump can be opened up in the field if the area is clean and dry.

Maintenance Table

A visual check and/or maintenance is recommended at least once every two weeks, but some site environments may demand more frequent service. The following table outlines the recommended minimum schedule for the AP-2 System.

Equipment	Biweekly	Monthly*	As Required
Air Quality Check • Single Stage Filter/Regulator	X		
AutoPump Service			X
Check Pump Cycle Counter	X		
Check Volume Pumped Per Cycle		X	

* Site conditions may require maintenance more often.

The following sections describe each maintenance activity in detail.

Air Quality Check

Single Stage Filter/Regulator Maintenance

Even using air which has some oil and water in it, the AutoPump System should operate trouble-free for years. The air filter is normally a 5 micron filter with a replaceable element.

To replace the element in the air filter on the single stage filter/regulator use the following procedure:

STEP 1 - Disconnect Air Source

- Valve off the air supply and drain the downstream air to the air filter. Or disconnect the blue system air supply hose from the single stage filter/regulator. The air filters will depressurize, allowing them to be safely serviced.

WARNING:
Do not remove a filter bowl that is pressurized.

STEP 2 - Remove Filter Bowl

- Different styles of air filters are available. The following instructions are given for the most typical filter used, one with 1/4" pipe thread.

- Remove the bowl of the air filter by sliding the button downward and twisting the bowl about 1/8 of a turn. The bowl should slide downward from the upper portion of the filter revealing the filter element. Unscrew the element as you would unscrew a light bulb. Hand tighten the element after replacing it.

  Make sure to replace the correct filter element.

  - Blue or black filter bowl:
    QED Filter element Part No. 205071

  - Silver filter bowl:
    QED Filter element Part No. 205800

STEP 3 - Bowl Drain

Optional Float Drain

- Wash out any deposits and oil buildup from the filter bowl with warm water and soap. To make sure the float drain is operating freely, shake it; the drain should rattle. Test the float drain by filling the bowl with water, assembling the bowl to the filter and reconnecting it to the air supply. The water should drain from the bowl. When under pressure, the drain should not leak.

Standard Manual Drain

- With water in the bowl, open the drain and ensure the liquid drains easily. When under pressure and closed, the drain should not leak.

AutoPump Service

AutoPump Shutdown and Removal from Well

To shut down and remove the AutoPump, follow these directions:

STEP 1 - Wait until the pump is in its discharge cycle and then raise it above the water level in the well. This will empty most of the fluid from the pump making it lighter to lift. There will also be less fluid to drain from the pump.

Note:
See Start Up and Operation for optional pump removal technique.

STEP 2 - Pull the pump and hoses to the surface.

STEP 3 - Shut off the air to the pump and disconnect the air hose from the pump.

STEP 4 - Ensure that there is a safe place to drain any fluid from the pump and discharge hose.

STEP 5 - Disconnect the fluid discharge hose from the pump.

STEP 6 - Drain the fluid by turning the pump upside-down and allowing fluid to flow from the air inlet fitting.

Caution:
Wear gloves and catch the draining fluid in a sump or bucket.

Removing Pump Casing

Follow these instructions for removing the pump casing:

Caution:
When assembling or disassembling the pump, do not rotate the casing. If the casing is turned and if any resistance is felt, stop. This action may cause the float and control rod to rotate with the casing. Instead of rotating the casing, spin the bottom check valve (or plug on a Top-Loading pump) and hold the casing stationary.

Caution:
After troubleshooting is completed and before assembling the pump, slowly move the float through its range to ensure that the lever trips, even if the pump fills and empties slowly.

STEP 1 - Insert and hold a spanner wrench on the circumference of the lower head. Rotate a spanner wrench counterclockwise on the lower head assembly. Hold the casing with a handle or a strap wrench. **(See Figure 14)**

Caution:
Do not leverage any tool against the air inlet or air exhaust fittings. This could damage the fittings.

STEP 2 - Once the lower head is unscrewed and removed from the discharge tube, pull the lower head assembly out of the casing.

STEP 3 - If the lower head remains in the casing, turn it and remove it from the pump casing.

Note:
The O-rings at the top and bottom of the pump may have swollen due to solvents in the fluid being pumped and therefore make turning the lower head difficult. Prevent the outer casing from turning while removing the lower head.

Cleaning Pump Interior

The inner workings of the pump should now be exposed for inspection and cleaning. **(See Figure 15, Figure 16, Figure 17, Figure 18, and Figure 19)**

Note:
A Scotch Brite® abrasive pad is useful for cleaning debris from the pump components.

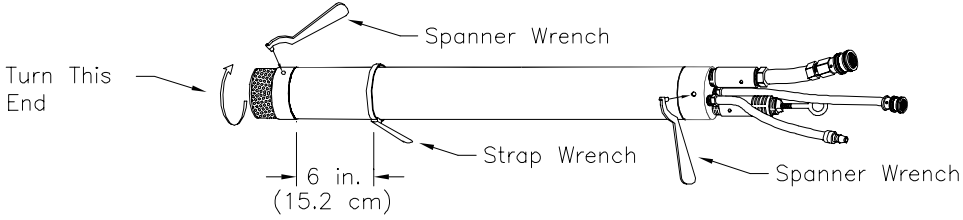
STEP 1 - Gently brush off built-up solids from the float, the discharge tube, the pump casing, and the control rod guide.

STEP 2 - The pump can be steam cleaned without damage.

STEP 3 - Remove thick deposits of hardened scale on the discharge tube by using a handbrush.

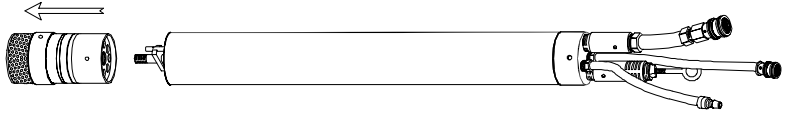
a) Tilt the hose end of the pump down into a container for a few minutes to drain any fluids from the pump. (Remember to wear protective gear: safety glasses, long gloves, aprons, and boots).

b) Insert and hold a spanner wrench on the circumference of the upper head. The upper head could also be gently held in a pipe vise. Secure the casing with a strap wrench 6 in. (15.2 cm) from the bottom of the pump. Hold the casing and pump head still while rotating the bottom head counterclokwise with the second spanner wrench.

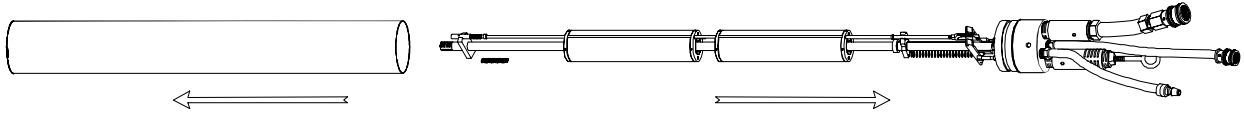


Note: The O–ring at the top and bottom of the pump may have swollen due to solvents in the fluid being pumped and therefore make turning the lower head difficult. Prevent the outer casing from turning while removing the lower head.

c) Once the lower head is unscrewed from the discharge tube, pull the upper head assembly out of the casing.



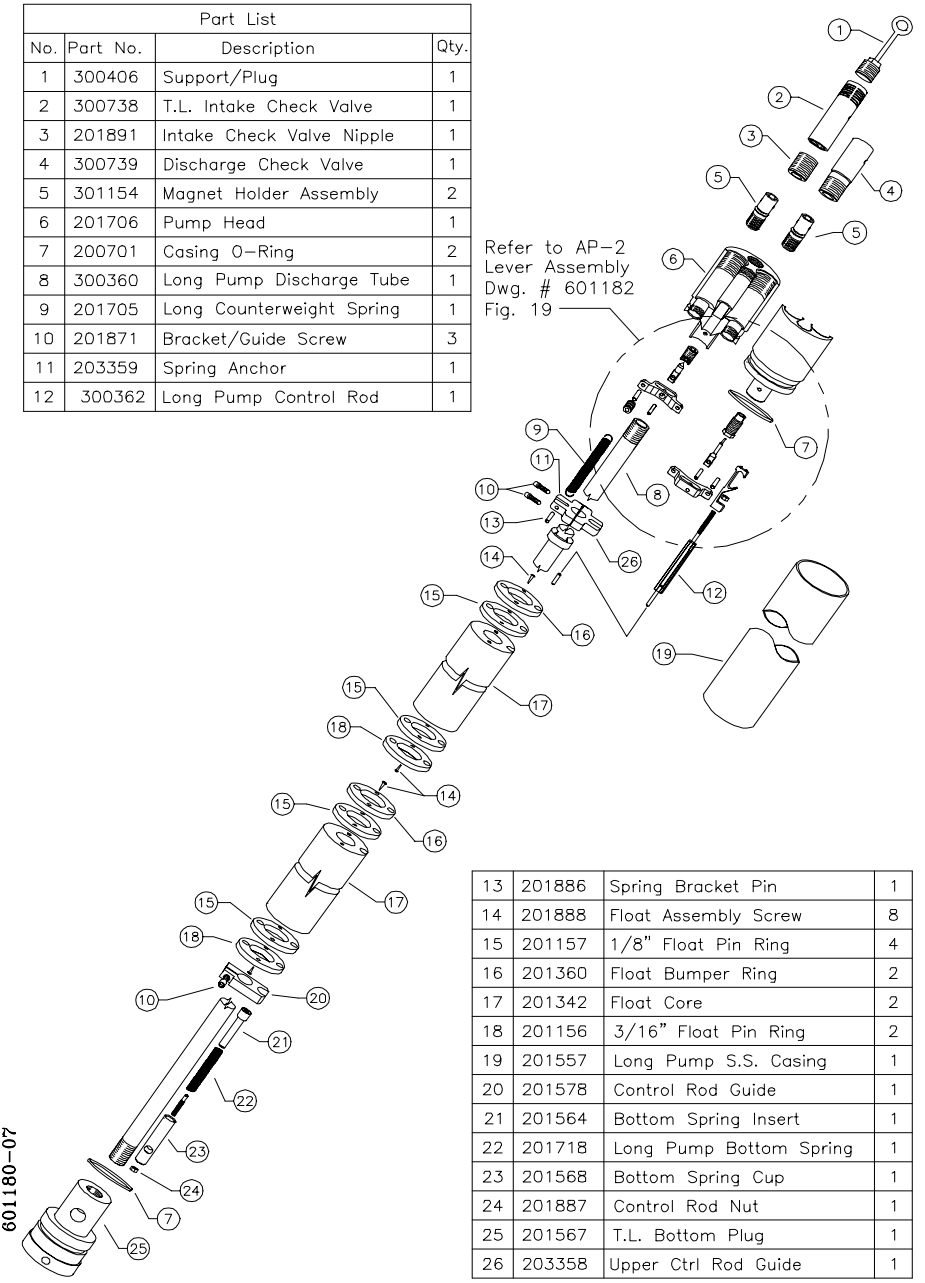
d) Pull the casing from the pump.



600553 05

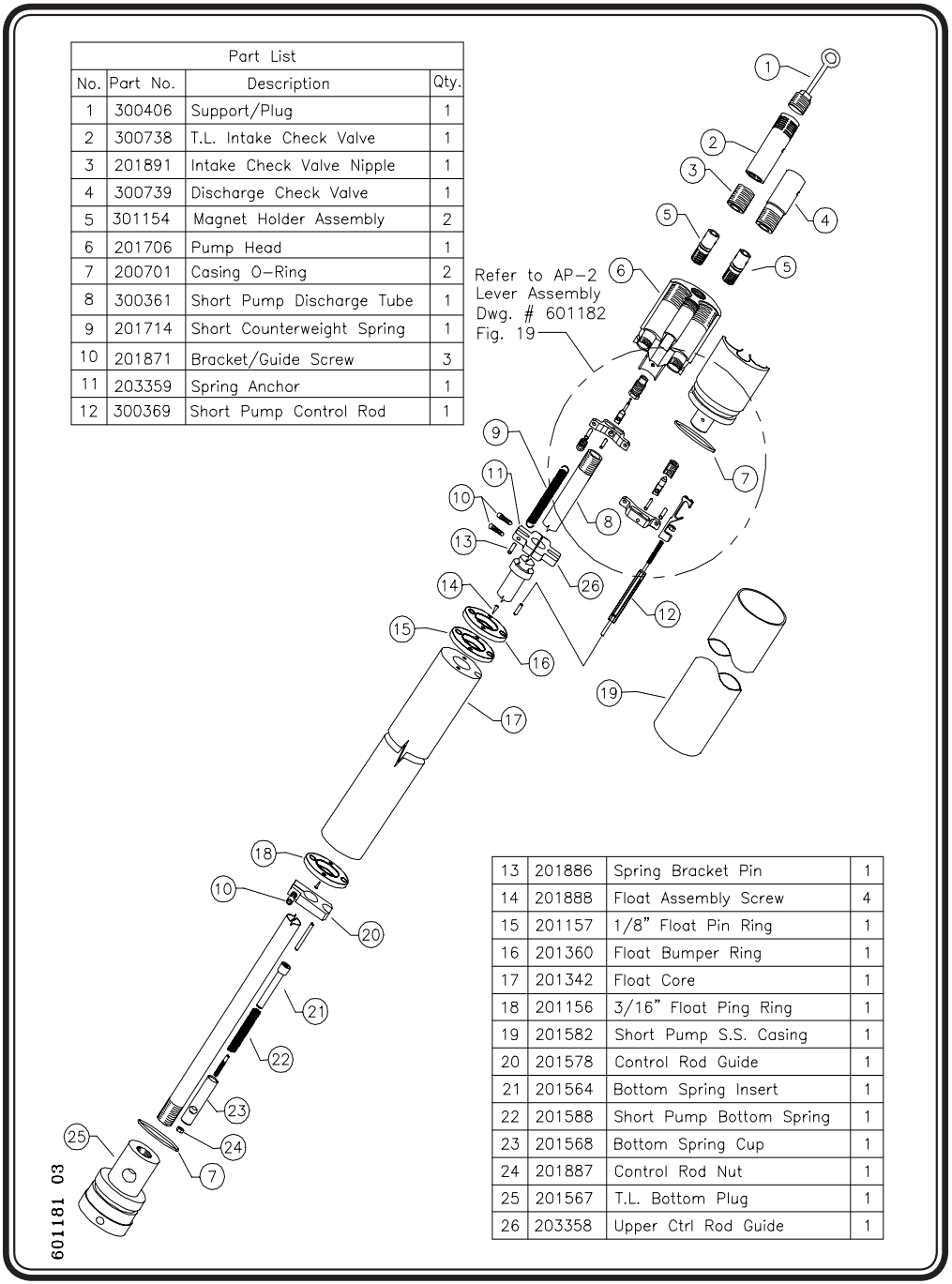
Figure 14 - Removing AP-2 Pump Casing

Part List			
No.	Part No.	Description	Qty.
1	300406	Support/Plug	1
2	300738	T.L. Intake Check Valve	1
3	201891	Intake Check Valve Nipple	1
4	300739	Discharge Check Valve	1
5	301154	Magnet Holder Assembly	2
6	201706	Pump Head	1
7	200701	Casing O-Ring	2
8	300360	Long Pump Discharge Tube	1
9	201705	Long Counterweight Spring	1
10	201871	Bracket/Guide Screw	3
11	203359	Spring Anchor	1
12	300362	Long Pump Control Rod	1



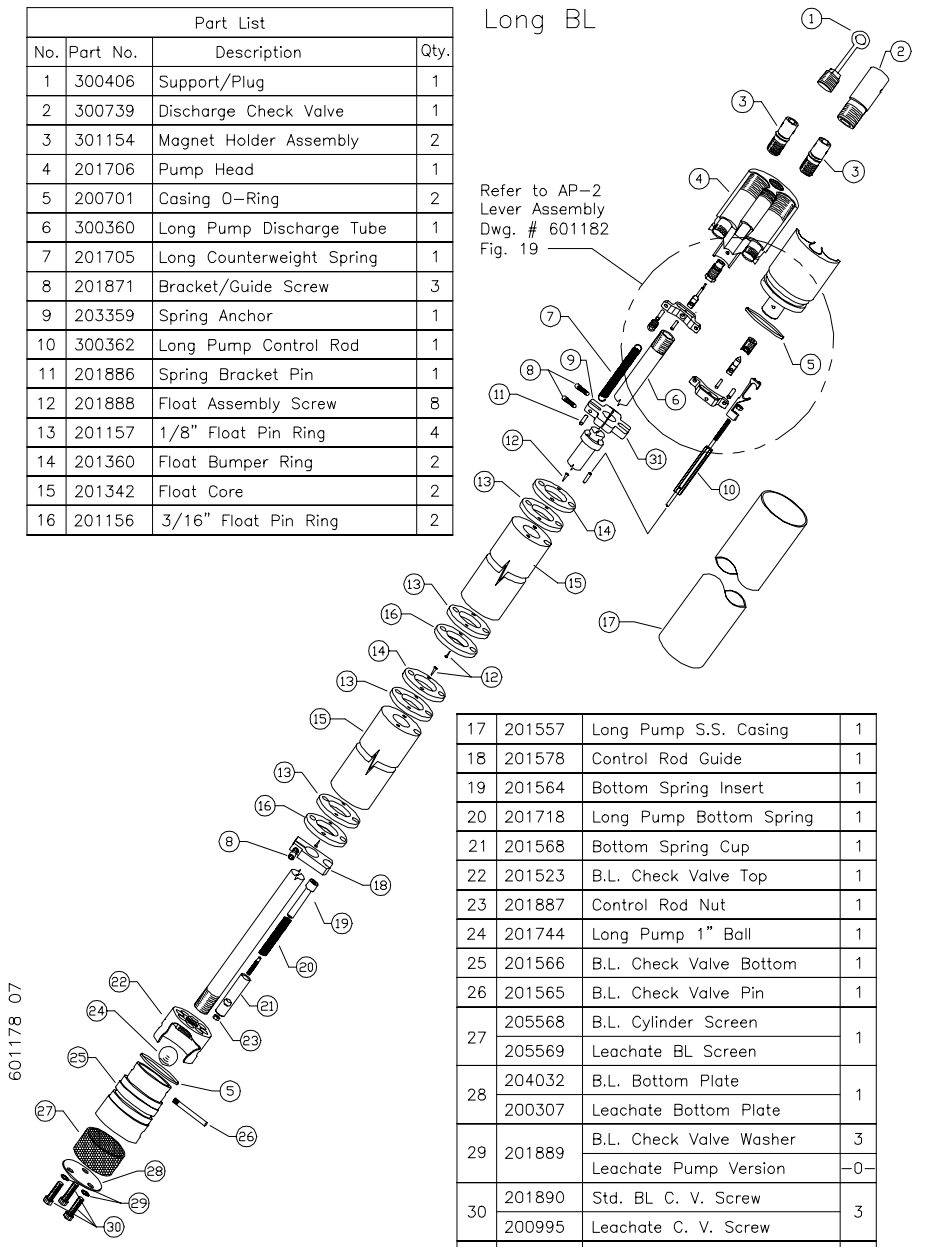
13	201886	Spring Bracket Pin	1
14	201888	Float Assembly Screw	8
15	201157	1/8" Float Pin Ring	4
16	201360	Float Bumper Ring	2
17	201342	Float Core	2
18	201156	3/16" Float Pin Ring	2
19	201557	Long Pump S.S. Casing	1
20	201578	Control Rod Guide	1
21	201564	Bottom Spring Insert	1
22	201718	Long Pump Bottom Spring	1
23	201568	Bottom Spring Cup	1
24	201887	Control Rod Nut	1
25	201567	T.L. Bottom Plug	1
26	203358	Upper Ctrl Rod Guide	1

Figure 15 - Exploded view of a Long Top-Loading AutoPump AP-2



Part List			
No.	Part No.	Description	Qty.
1	300406	Support/Plug	1
2	300738	T.L. Intake Check Valve	1
3	201891	Intake Check Valve Nipple	1
4	300739	Discharge Check Valve	1
5	301154	Magnet Holder Assembly	2
6	201706	Pump Head	1
7	200701	Casing O-Ring	2
8	300361	Short Pump Discharge Tube	1
9	201714	Short Counterweight Spring	1
10	201871	Bracket/Guide Screw	3
11	203359	Spring Anchor	1
12	300369	Short Pump Control Rod	1
13	201886	Spring Bracket Pin	1
14	201888	Float Assembly Screw	4
15	201157	1/8" Float Pin Ring	1
16	201360	Float Bumper Ring	1
17	201342	Float Core	1
18	201156	3/16" Float Ping Ring	1
19	201582	Short Pump S.S. Casing	1
20	201578	Control Rod Guide	1
21	201564	Bottom Spring Insert	1
22	201588	Short Pump Bottom Spring	1
23	201568	Bottom Spring Cup	1
24	201887	Control Rod Nut	1
25	201567	T.L. Bottom Plug	1
26	203358	Upper Ctrl Rod Guide	1

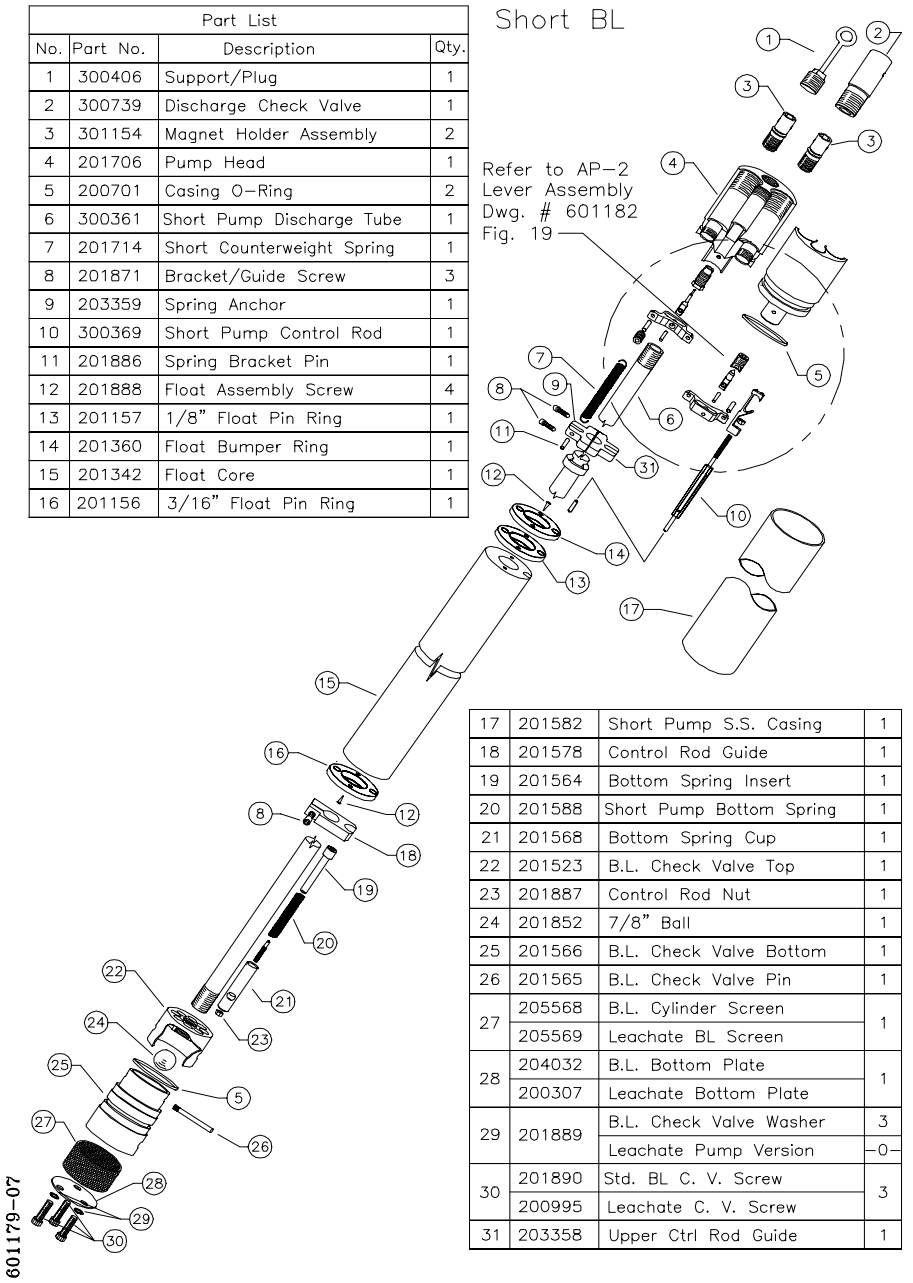
Figure 16 - Exploded View of a Short Top-Loading AutoPump AP-2



Part List			
No.	Part No.	Description	Qty.
1	300406	Support/Plug	1
2	300739	Discharge Check Valve	1
3	301154	Magnet Holder Assembly	2
4	201706	Pump Head	1
5	200701	Casing O-Ring	2
6	300360	Long Pump Discharge Tube	1
7	201705	Long Counterweight Spring	1
8	201871	Bracket/Guide Screw	3
9	203359	Spring Anchor	1
10	300362	Long Pump Control Rod	1
11	201886	Spring Bracket Pin	1
12	201888	Float Assembly Screw	8
13	201157	1/8" Float Pin Ring	4
14	201360	Float Bumper Ring	2
15	201342	Float Core	2
16	201156	3/16" Float Pin Ring	2

17	201557	Long Pump S.S. Casing	1
18	201578	Control Rod Guide	1
19	201564	Bottom Spring Insert	1
20	201718	Long Pump Bottom Spring	1
21	201568	Bottom Spring Cup	1
22	201523	B.L. Check Valve Top	1
23	201887	Control Rod Nut	1
24	201744	Long Pump 1" Ball	1
25	201566	B.L. Check Valve Bottom	1
26	201565	B.L. Check Valve Pin	1
27	205568	B.L. Cylinder Screen	1
	205569	Leachate BL Screen	
28	204032	B.L. Bottom Plate	1
	200307	Leachate Bottom Plate	
29	201889	B.L. Check Valve Washer	3
		Leachate Pump Version	-0-
30	201890	Std. BL C. V. Screw	3
	200995	Leachate C. V. Screw	
31	203358	Upper Ctrl Rod Guide	1

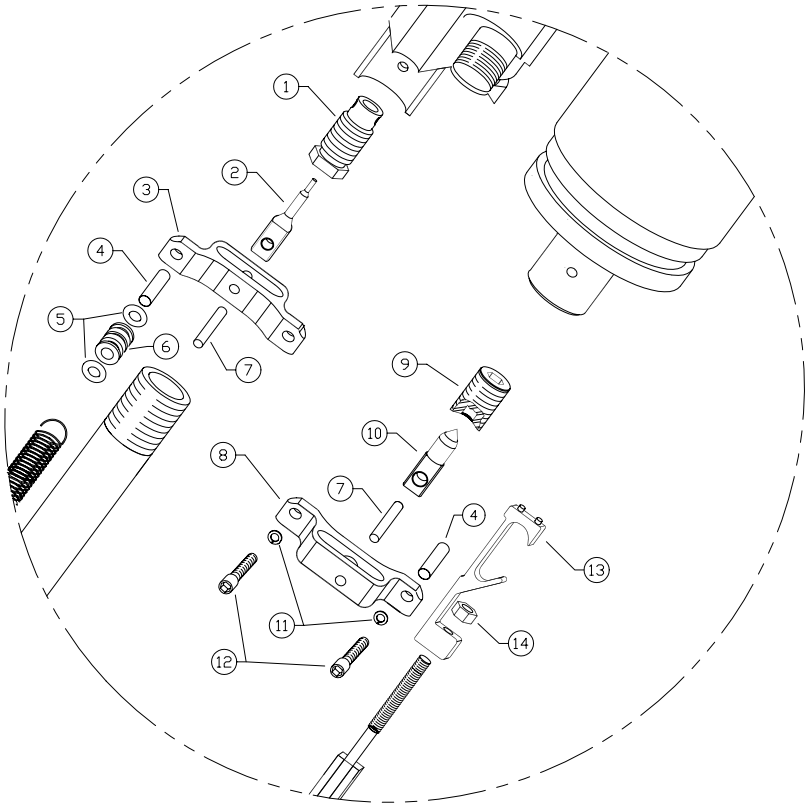
Figure 17 - Exploded View of a Long Bottom-Loading AutoPump AP-2



Part List			
No.	Part No.	Description	Qty.
1	300406	Support/Plug	1
2	300739	Discharge Check Valve	1
3	301154	Magnet Holder Assembly	2
4	201706	Pump Head	1
5	200701	Casing O-Ring	2
6	300361	Short Pump Discharge Tube	1
7	201714	Short Counterweight Spring	1
8	201871	Bracket/Guide Screw	3
9	203359	Spring Anchor	1
10	300369	Short Pump Control Rod	1
11	201886	Spring Bracket Pin	1
12	201888	Float Assembly Screw	4
13	201157	1/8" Float Pin Ring	1
14	201360	Float Bumper Ring	1
15	201342	Float Core	1
16	201156	3/16" Float Pin Ring	1

17	201582	Short Pump S.S. Casing	1
18	201578	Control Rod Guide	1
19	201564	Bottom Spring Insert	1
20	201588	Short Pump Bottom Spring	1
21	201568	Bottom Spring Cup	1
22	201523	B.L. Check Valve Top	1
23	201887	Control Rod Nut	1
24	201852	7/8" Ball	1
25	201566	B.L. Check Valve Bottom	1
26	201565	B.L. Check Valve Pin	1
27	205568	B.L. Cylinder Screen	1
	205569	Leachate BL Screen	
28	204032	B.L. Bottom Plate	1
	200307	Leachate Bottom Plate	
29	201889	B.L. Check Valve Washer	3
		Leachate Pump Version	-0-
30	201890	Std. BL C. V. Screw	3
	200995	Leachate C. V. Screw	
31	203358	Upper Ctrl Rod Guide	1

Figure 18 - Exploded View of a Short Bottom-Loading Autopump AP-2



Parts List							
No.	Part No.	Description	Qty.	No.	Part No.	Description	Qty.
1	300455	Intake Seat Assembly	1	9	201518	Long Pump Exhaust Seat	1
2	201519	Air In Poppet	1		201715	Short Pump Exhaust Seat	
3	201498	Inlet Lever	1	10	201522	Long Pump Exhaust Poppet	1
4	201514	Lever Spacer	2		202252	Short Pump Exhaust Poppet	
5	202100	Roller Bumper	2	11	201632	Lever Screw Washer	2
6	201513	Spring Roller	1	12	201871	Lever Screw	2
7	203740	Pivot Pin	2	13	300456	Tiki Assembly	1
8	201512	Exhaust Lever	1	14	201887	Control Rod Nut	1

601182-05

Figure 19 - Exploded View of AP-2 Lever Assembly

Iron Build-up Cleaning Procedure

After the casing has been removed from the AutoPump please follow the procedure below:

Note:
The procedure described below can be seen in the Maintenance Video Tape. This will aid the technicians understanding and ease of properly disassembling the AutoPump, effectively cleaning components and then re-assembling the AutoPump.

STEP 1 - The bottom intake check valve assembly should be removed from the casing. **(See pages 44 and 45, and Figure 14 on page 46)**

STEP 2 - Visually inspect both stainless steel fluid discharge pipe for iron build-up or debris. Also, do the same with the float that rides up and down on the SS discharge pipe.

STEP 3 - Should there be iron deposits on either or both the discharge pipe or float, then remove the float from the SS fluid discharge pipe as follows:

- Remove the control rod guide. **(See Figures 15 through 18)**
- Remove the small SS nut from the bottom spring cup **(See Figures 15 through 18)** The nut and cup removal will allow you to remove the spring and float from the SS discharge pipe.

STEP 4 - The stainless steel fluid discharge pipe can now be cleaned using either a Scotch Brite pad, a wire brush or finally a wire wheel on either a drill or a grinding machine. After removing the iron debris, it is recommended the pipe be water rinsed.

STEP 5 - Both the internal and external surfaces of the float will generally require cleaning. The material choices include a Scotch Brite pad, and a light grade 150 sandpaper and a razor or Exacto Knife. The internal surface of the float can be cleaned by attaching some Scotch Brite to the end of a long pipe or screw driver to scrape the inside hole of the float.

Note:
This float should not be soaked in any acids.

STEP 6 - The Control rod **(See Figures 15 through 18)** is the next component to be cleaned. Only use a Scotch Brite pad for removing any iron or degris on this metal alloy control rod.

STEP 7 - The final component to be cleaned is the outer AutoPump casing. The fastest and most effective way to clean out the inside surface of the pump casing is to use a three-stone honing tool. The technique is to move the hone in-and-out a half dozen times or so through each end of the casing. The time for the casing cleaning should take no longer than 5 minutes.

The AutoPump is now ready for re-assembly by following the steps above in reverse order.

Installing Pump Casing

STEP 1 - Inspect the O-rings to ensure they are capable of sealing (no discernible cuts or abrasions).

STEP 2 - Lubricate both inside ends of the casing to a depth of 1/2" with a thin layer of food-grade grease. Ensure that the film reaches the edges of the casing.

STEP 3 - Place the bottom check valve (Bottom Loading Pump) or bottom plug (Top Loading Pump) upright on a clean level surface.

STEP 4 - Pull the casing down over the check valve or plug.

Warning:
The pump casing has beveled ends that allow it to slide over the O-rings easily. Keep fingers, hands and other body parts away from these edges as they approach the heads. These edges can pinch when the pump casing is slid over the lower and upper heads.

STEP 5 - Turn the pump upside down and spin the casing assembly on the discharge tube by hand until the edge of the casing contacts the O-ring on the pump head.

Caution:
Be careful to swing the counterweight inside the pump.

STEP 6 - Using a spanner wrench on the bottom fitting, or, a strap wrench on the bottom end of the casing (pump bottom), turn the parts together until the casing just contacts the pump head.

STEP 7 - Turn the bottom check valve or the plug in the reverse direction (counter clockwise) so it is looser by 1/4 turn.

Cleaning the Pump Cycle Counter

Refer to Appendix F – Pump Cycle Counter

Checking Volumes Pumped Per Cycle

See page 21 for information on the AutoPump volumes pumped per cycle. Ensure that volumes correspond with the previous experience on-site, and with the ranges indicated on **page 21**. If it doesn't correspond, then one of the following may exist:

1. The AutoPump is malfunctioning. **(See Chapter 7: Troubleshooting & Repair)**
2. The Pump Cycle Counter may not be counting correctly. See **Appendix F – Pump Cycle Counter** for troubleshooting procedures.
3. Site conditions (e.g. air pressure, discharge head) may have changed substantially.

Chapter 7: Troubleshooting & Repairs

Problems may occur and usually can be easily resolved by following these instructions. If, after careful reading and service, you cannot resolve the problem, please contact the *QED Environmental Systems (QED)* Service Department at (800) 537-1767.

Caution:
Wear goggles, gloves, and coveralls when servicing this system.
After troubleshooting is completed and before assembling the pump, slowly move the float through its range to ensure that the lever will trip even if the pump fills and empties slowly.

Note:
See Chapter 6: Maintenance for disassembly and cleaning instructions.

Possible Causes	Symptoms		
Detailed Instructions Follow this Chart	Pump not cycling	Pump Cycles, but volume is reduced or there is no discharge	Air in fluid discharge
1. Air supply	X		X
2. Fluid level	X		
3. Air exhaust restricted	X		X
4. Fluid Inlet clogged	X		
5. Debris, scale or very viscous fluid	X	X	X
6. Float pins	X		X
7. Debris in air inlet valve	X		
8. Fluid check valve		X	
9. Valve timing	X		

Troubleshooting

1. Air Supply:

- If the air pressure is too low, or if the flow is severely restricted, the pump will not cycle. Check the flow by inserting the pump air fitting part way into the air line socket. A healthy discharge of air should result.

- If the air pressure exceeds the design limitations of the pump, the pump may fail to cycle, or the exhaust valve may have locked up and cause air to enter the fluid discharge.

2. Fluid Level:

- The fluid level must be above the fluid inlet on a Top-Loading pump. On a Bottom-Loading pump, the fluid must be no lower than 10 inches (Short pump) or 17 inches (Long pump) below the head of the pump.

3. Air Exhaust Restricted:

- The exhaust line must not be kinked, plugged, or too small in diameter.

- The air exhaust outlet must be above the fluid level.

- If the air exhausts in the well, the well must be vented to the atmosphere or a functioning vapor recovery line.

- If the air exhausts to the atmosphere (outside the well) and a vacuum is drawn on the well, the pump may fail to fill. In order for the pump to fill under these adverse conditions, the pump must be submerged to make up for the pressure difference between the atmosphere and the partial vacuum in the well.

  The pressure difference, expressed as feet of water column (FT. W. C.), is how far the fluid must be above the pump before it can fill.

- **See Appendix D** if there is a vacuum on the well.

- Ice may be forming on the exhaust valve seat due to the temperature drop that accompanies expansion of compressed air. Restrict the exhaust to lower the expansion rate of the exhaust. Restrict the air inlet hose or lower the pressure to reduce the rate of incoming compressed air. The previous three suggestions may reduce the flow rate from the pump. Submerge the head of the pump, if it is not already submerged. Protect the air lines from low temperatures and freezing by burial or insulation.

4. **Fluid Inlet Clogged**:
   - If the fluid inlet screen is clogged with debris, or if a Bottom-Loading pump is on the bottom of the well, water cannot enter the pump.

5. **Debris, Scale, or very Viscous Fluid**:
   - If debris, scale or a very viscous fluid has accumulated inside the pump, the float may not move freely up and down, or the control rod may not slide easily through the float.

   - Clean the float, control rod, and the casing. See **Chapter 6** for cleaning instructions.

6. **Float Pins**:
   - Determine if any part of the float foam itself can contact the discharge pipe. Move each end of the float back and forth, sideways, to ensure that the pins on the plate of the float prevent float foam contact with the pipe. Call *QED* for repair options.

> **Note:**
> If viscous materials cause continual problems, contact QED for possible solutions.

7. **Debris in Air Inlet Valve**:
   - Open the pump. Connect the air supply. Adjust the air pressure to 40 psi. Pull the control rod down. Listen to determine if significant volume of air leaks through. A leak rate of 4 SCFH or less is within specification (this is a small leak that produces bubbles in a soapy water solution). If so, clean the valve by blowing air or water through it from both ends.

   - If air still leaks through the valve with the control rod down, the air-hose must be removed to access the valve inlet to check for debris in the valve or in the hose pigtail.

   - Push the rod upwards. If little or no air passes through, remove the air-in hose to access the valve inlet. Blow air through the valve from the poppet side to clear debris from the ball and seat.

8. Fluid Check Valves:

- Open the pump. Hold the pump vertically and pour water into the discharge check valve. If water flows through, clean the valve.
- The valve assembly may be soaked in a solvent. Be careful to not damage the teflon ball with the tools used for cleaning.
- Inspect the ball for wear. If it is too small to seal on the seat, or if it is obviously out of round, replace the check valve.
- If the pump is a Bottom-Loading design, inspect the seat of the bottom check valve for debris and wear. Clean or replace if necessary.
- If the pump is a Top-Loading design, remove the fluid inlet check valve, turn it upside down, and pour water into it. If water flows through, clean it.

9. Air Inlet Valve Timing:

- Remove the pump casing. Connect the air supply. Push the control rod end of the lever up to the head. Lower the rod slowly and stop at the point where the sound of air drops dramatically.
- The levers should be nearly ±10 degrees parallel to the lower surface of the head at this point.
- Check if the lever is jamming due to an improper adjustment.

Returning Equipment for Service

If the equipment needs to be returned to *QED* for servicing, please follow these steps:

STEP 1 - Call the *QED* Service Department and obtain a Return Material Authorization **(RMA)** number. Please have available the customers contact person's name, company name and address, phone number, fax number, reason for the return, and the names of the chemicals to which the equipment has been exposed.

STEP 2 - Clean all equipment before shipping. See **Equipment Cleaning Requirements** at the end of this section.

If the equipment must be cleaned after it arrives at *QED*, the customer will be charged for the cleaning and disposal of material, if necessary. (Cost can be $200.00 per piece of equipment cleaned.) Drain and dry all equipment after cleaning.

STEP 3 - Package the equipment so that it will not be damaged in shipment. Use bubble pack rather than styrofoam flakes as packing material.

STEP 4 - Ship the equipment via a carrier and service level (i.e., one-day, two-day shipping) in consideration of probable service time and return shipment time.

STEP 5 - It is recommended that such shipments be insured so if the shipment is badly damaged or lost, the customer can replace the equipment at little or no cost.

STEP 6 - Include the contact's name, company, phone number and RMA number given by *QED* .

STEP 7 - Write the RMA number on the outside of the packaging so it will be directed immediately to the *QED* Service Department.

Equipment Cleaning Requirements

If the equipment is to be shipped to another site or to the factory for service, it needs to be thoroughly cleaned before leaving the site. Cleaning the equipment protects the user (sender), the shipper, and the receiver from dirt and/or contaminants. If the equipment is not cleaned prior to shipping for servicing, it may be severely delayed, refused or the shipper may be charged a cleaning fee. Before packing and shipping, ensure that the equipment is dry inside and out.

The following is a list of equipment and how it should be cleaned prior to shipment.

Hoses and Fittings

STEP 1 - Pump clean water or water with a gentle soap solution (e.g. Dove Dish Soap) through the pump to remove free product and particles.

STEP 2 - Rinse all soap off of the equipment.

STEP 3 - Soak and rinse the outside of the unit with water to remove loose debris and dirt.

STEP 4 - Steam clean inside and out to remove difficult dirt and contaminants.

Caution:
Use low pressure (less than 40 psi) when steam cleaning.

AutoPumps

STEP 1 - Pump clean water or water with a gentle soap (e.g. Dove Dish Soap) solution through the pump to remove free product and particles.

STEP 2 - Rinse all soap off of the equipment.

STEP 3 - Soak and rinse the outside of the unit with water to remove loose debris and dirt.

STEP 4 - Steam clean inside and out to remove difficult dirt and contaminants.

Caution:
Use low pressure (less than 40 psi) when steam cleaning.

Appendix A: Performance Curves

These curves were derived from in-house tests using a pump with average air flow capacity. Flow rates in the field may vary slightly due to temperature, air quality, flow restrictions and minor differences in pump adjustments. Flow rates can be affected due to the natural cooling effect of compressed air expansion. If this cooling effect is lowering the flow rate, decreasing the air pressure to the pump can actually increase the flow rate in some cases. Another way to reduce freezing of water vapor in compressed air is to use an air dryer on the compressed air line.

The following charts show the performance flow rate curves for the Long and Short pumps.

Long Bottom and Top-Loading AP-2 AutoPumps
- **See Figures 20 and 21.**

Short Bottom and Top-Loading AP-2 AutoPumps
- **See Figures 22 and 23.**

The curves are categorized by pump type, hose size, depth of submergence and air supply pressure. To determine the flow rate a pump will produce, the following information must be known:

1. **Pump** – Long, Short or Low Dardown; Top- or Bottom-Loading.
2. **Discharge hose size** – 1/2 inch is standard. A larger inside diameter may yield a higher flow rate. This depends on site conditions.
3. **Fluid Inlet** Submergence – Select the submergence depth of the pump below the fluid under normal operating conditions.
4. **Air pressure**.

With the previous information, obtain the flow rate by using the following steps:
- On the horizontal scale, find the depth in the well at which the pump will be located.
- Trace that depth upwards to the line for the air inlet pressure you selected.
- Travel horizontally over to the vertical scale and read the flow rate.

Example: A long Bottom-Loading AP-2 with a 1/2-inch discharge hose and 70 psi supply pressure positioned 100 feet below ground and submerged 6 inches below the fluid will produce about .77 gallons per minute (GPM).

The same pump submerged 10 feet below the fluid produces 1.0 GPM.

Note:
These flow rates are only applicable for the designated well head conditions. Any additional resistance from out-of-well equipment (e.g. surface hoses, valves, etc.) will affect the values shown on these curves.

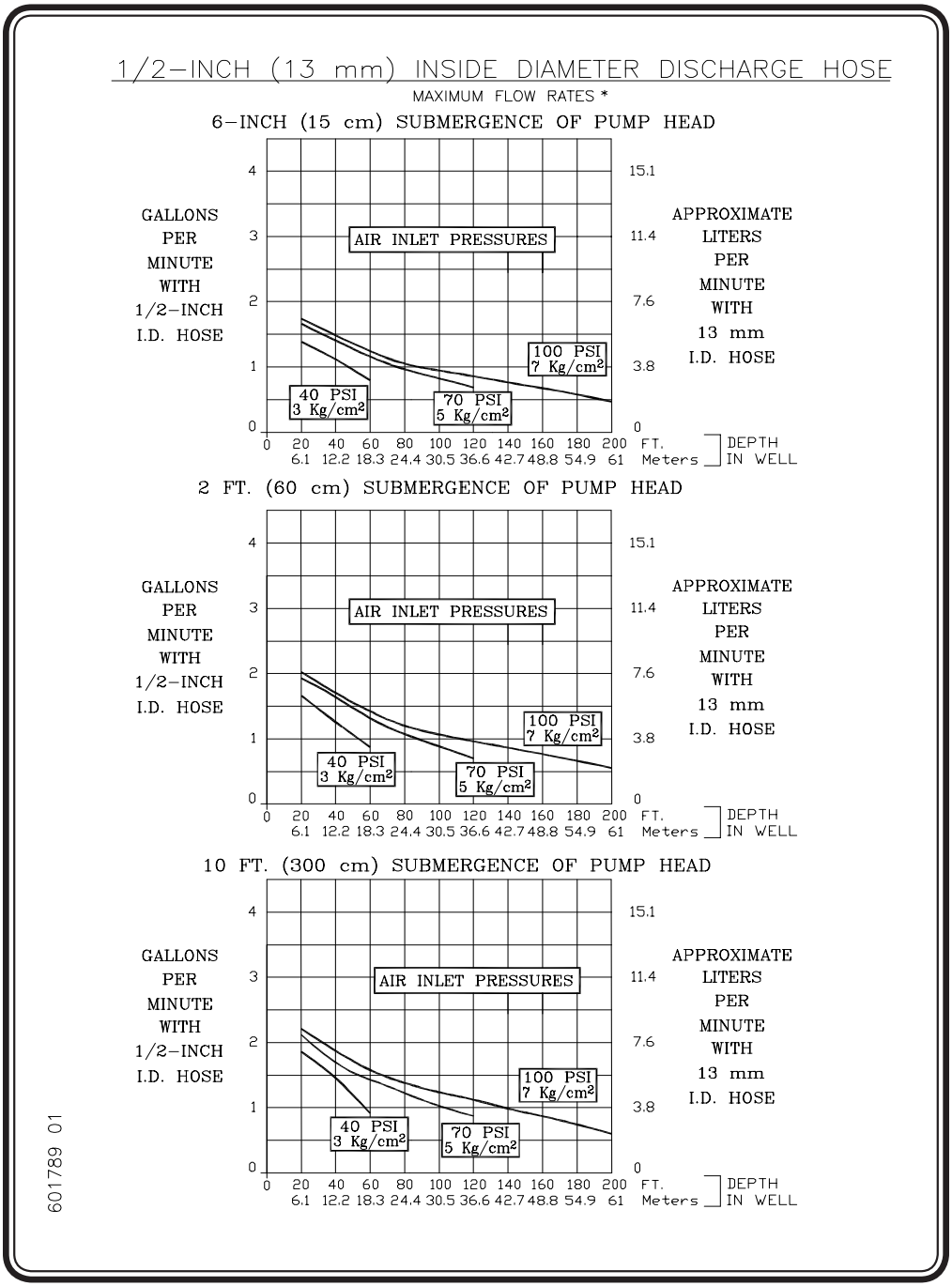


Figure 20 - Long AP-2/BL Performance Curves: 1/2-inch (13 mm) I.D. Discharge US and METRIC UNITS

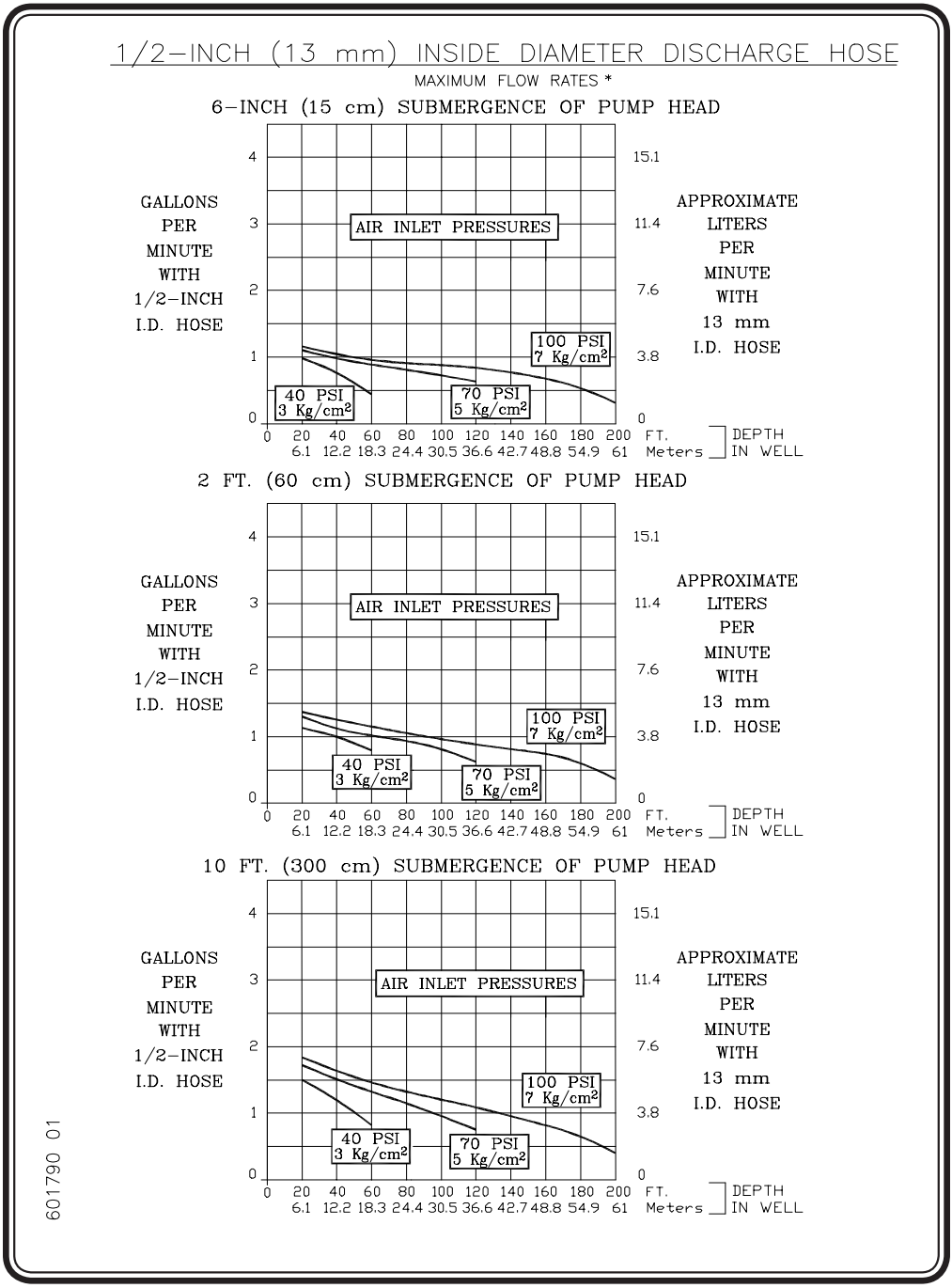


Figure 21 - Long AP-2/TL Performance Curves: 1/2-inch (13 mm) I.D. Discharge US and METRIC UNITS

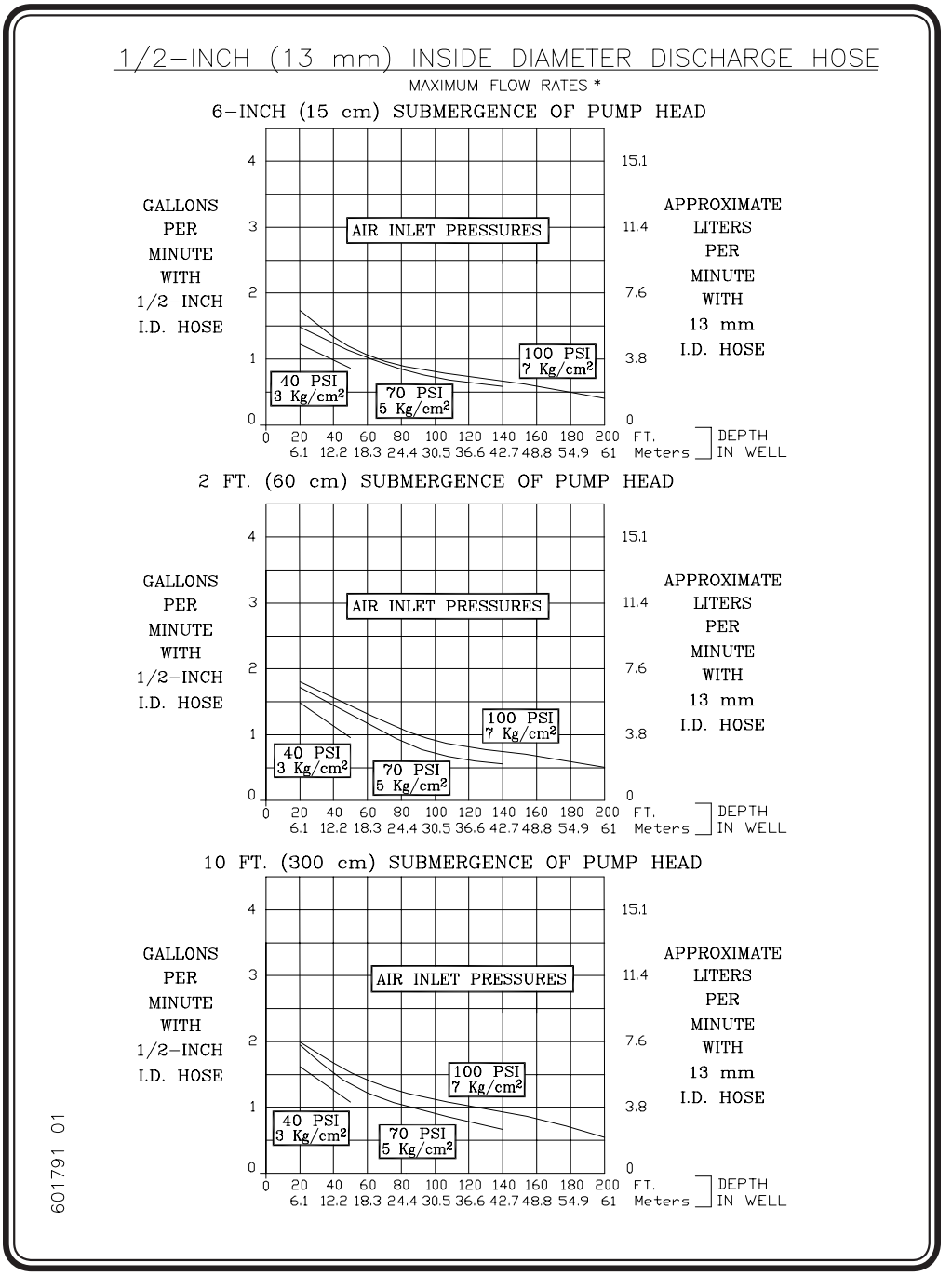


Figure 22 - Short AP-2/BL Performance Curves: 1/2-inch (13 mm) I.D. Discharge US and METRIC UNITS

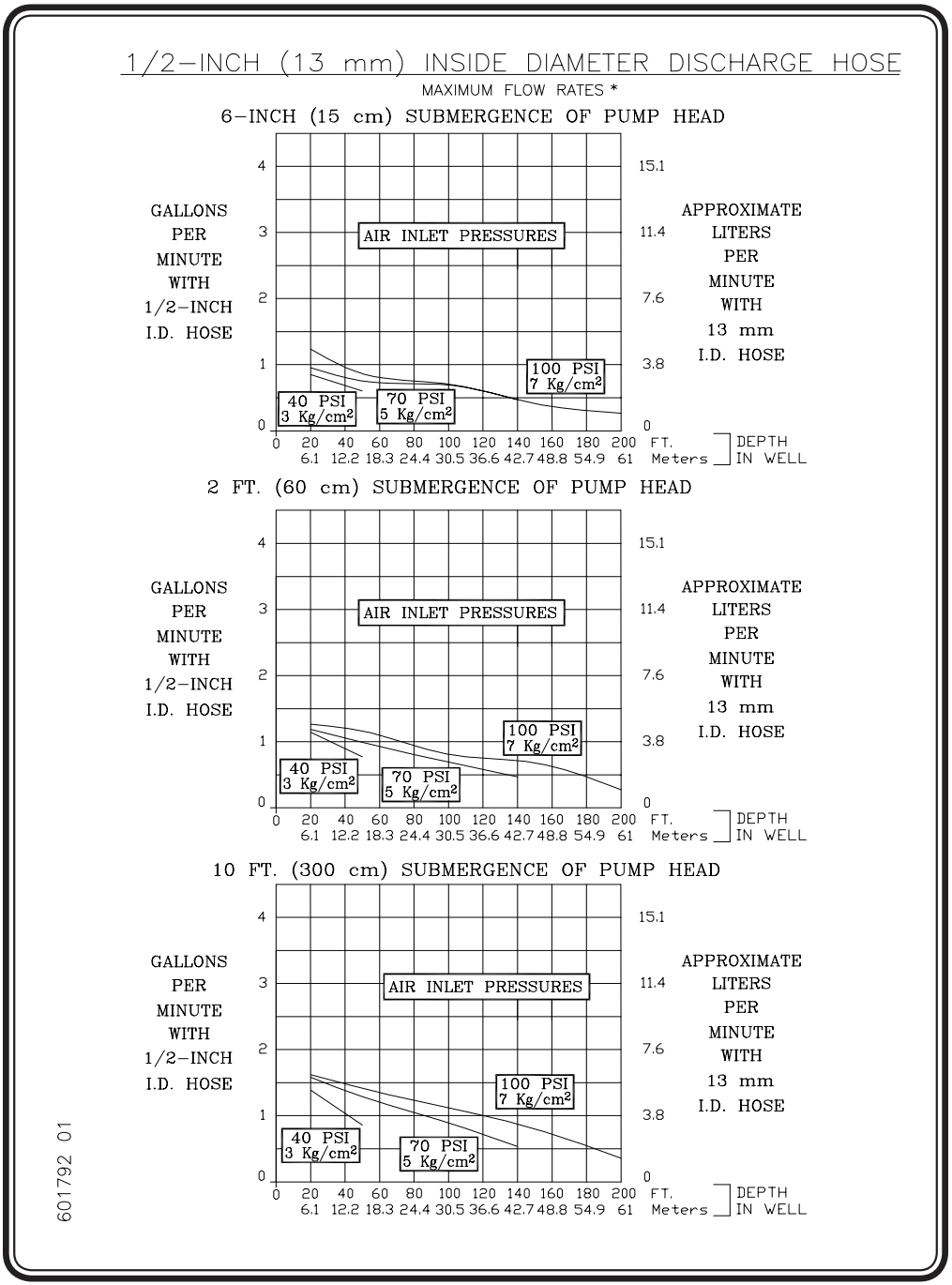


Figure 23 - Short AP-2/TL Performance Curves: 1/2-inch (13 mm) I.D. Discharge US and METRIC UNITS

Appendix B: Air Consumption Curves

The following charts show the air consumption curves for the Long and Short length AP-2 AutoPumps. These curves can be used to estimate air use and compressor sizing. A compressor with reserve capacity is recommended.

The following charts show the air consumption curves for the Long and Short pumps.

Long Bottom and Top-Loading AP-2 AutoPumps
- **See Figures 24 and 25**

Short Bottom and Top-Loading AP-2 AutoPumps
- **See Figures 26 and 27.**

The curves are categorized by pump length, hose size, depth of submergence and air supply pressure. To determine the amount of air used for each gallon of fluid pumped, the following information must be known:

1. **Pump** – Long or Short.
2. **Discharge hose size** – 1/2-inch I.D. A larger diameter may yield significantly lower air use rates, depending upon site conditions.
3. **Air pressure**.

With the above information, obtain the probable flow rate by using the following steps:
- On the horizontal scale, find the depth in the well at which the pump will be located.
- Trace that depth upwards to the line for the air inlet pressure you selected.
- Travel horizontally over to the vertical scale and read the air use factor.

Example: A long Bottom-Loading pump with a 1/2-inch discharge hose and 70 psi supply pressure positioned 50 feet below ground will use about 0.60 SCF of air for each gallon of fluid pumped.

The maximum flow rate for the pump, taken from the flow rate curves, when there is 10 feet of fluid over the pump and it is positioned 50 feet below ground is about 1.5 GPM.

Multiply the 1.50 GPM flow rate times the 0.60 SCF air use factor to generate a .90 SCFM (Standard Cubic Feet per Minute) air use result.

If the yield of the well is less than the maximum pump rate predicted by the appropriate flow rate graph, multiply the actual fluid recovery rate times the air use factor. This air use can be diminished if the regulator pressure is reduced. The maximum pump rate for the lower air pressure can be predicted using the performance curves.

Note:
These air use factors are only applicable for the designated well head conditions. Any additional resistance from out-of-well equipment (e.g. surface hoses, valves, etc.) will affect the factors shown on these curves.

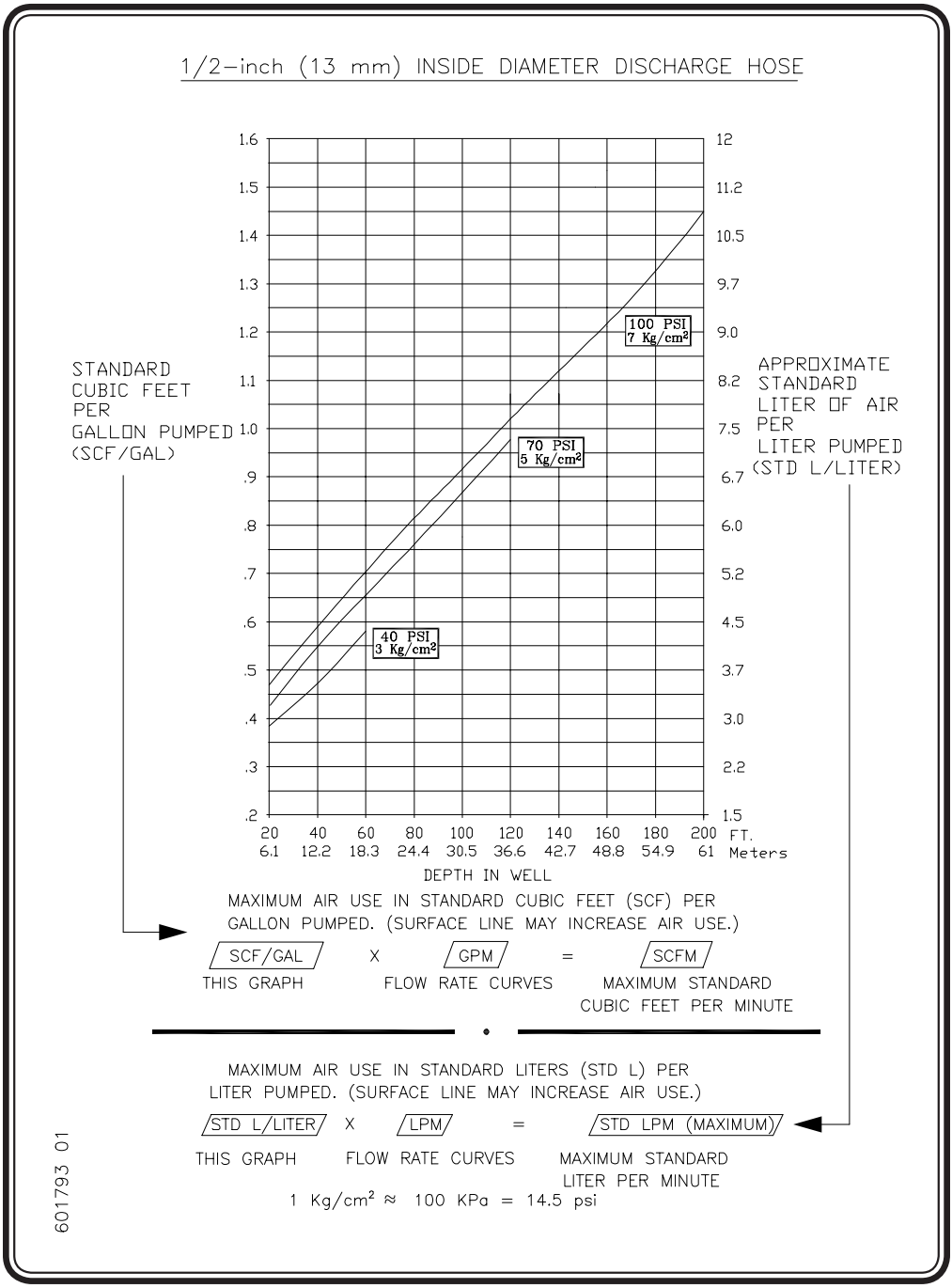


Figure 24 - Long AP-2/BL Air Consumption Curves: 1/2-inch (13 mm) I.D. Discharge US and METRIC UNITS

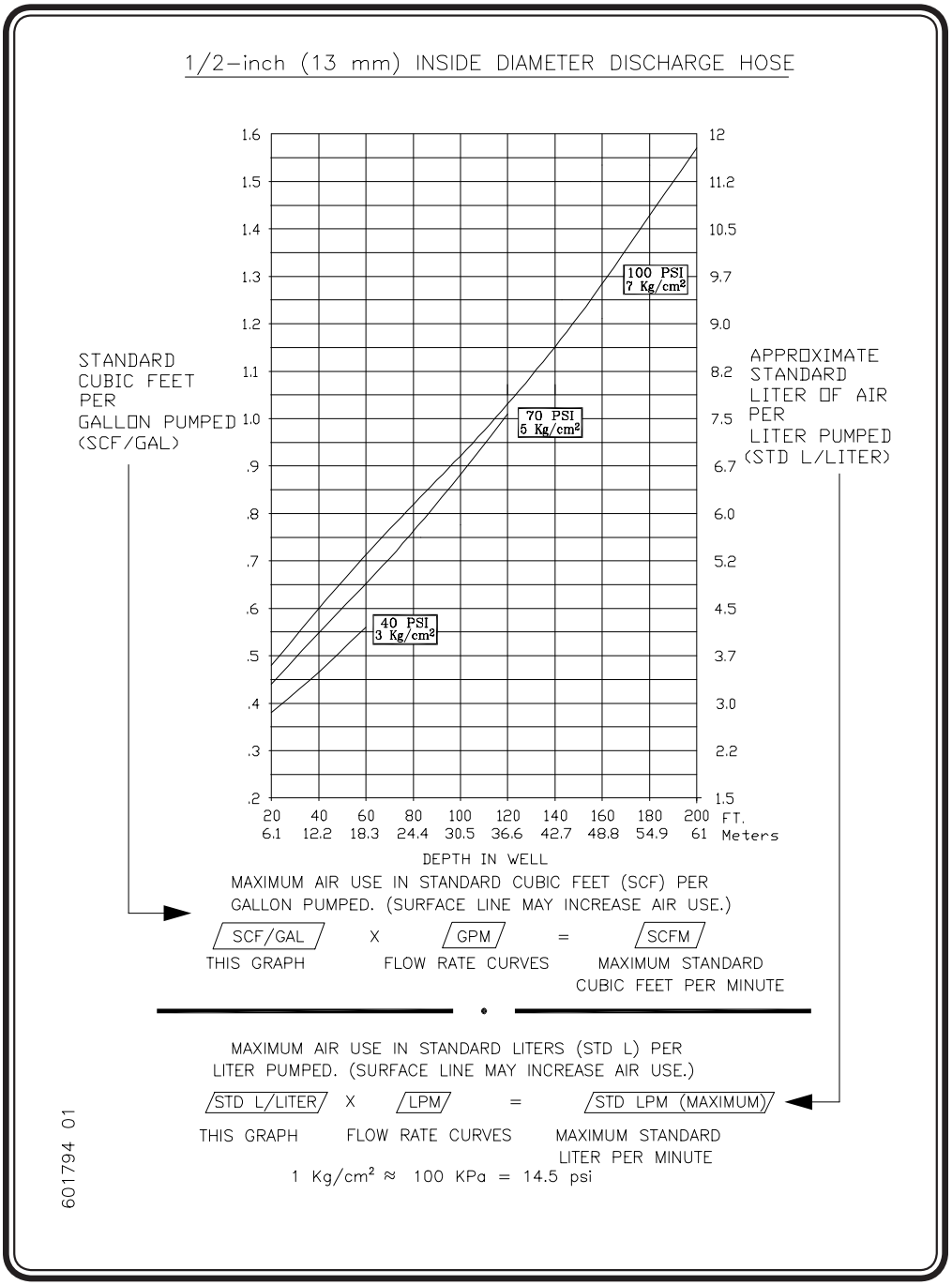


Figure 25 - Long AP-2/TL Air Consumption Curves: 1/2-inch (13 mm) I.D. Discharge US and METRIC UNITS

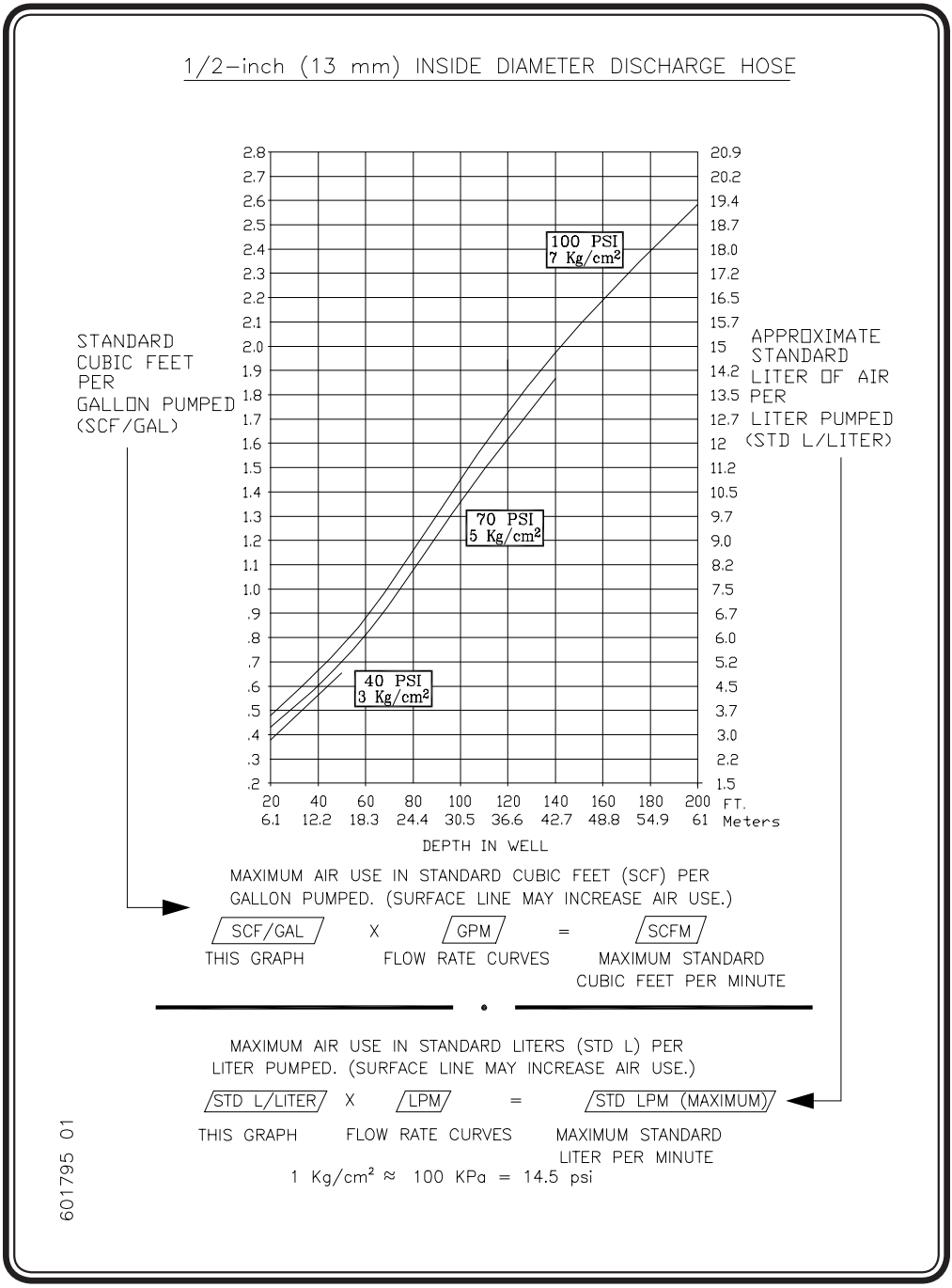


Figure 26 - Short AP-2/BL Air Consumption Curves: 1/2-inch (13 mm) I.D. Discharge US and METRIC UNITS

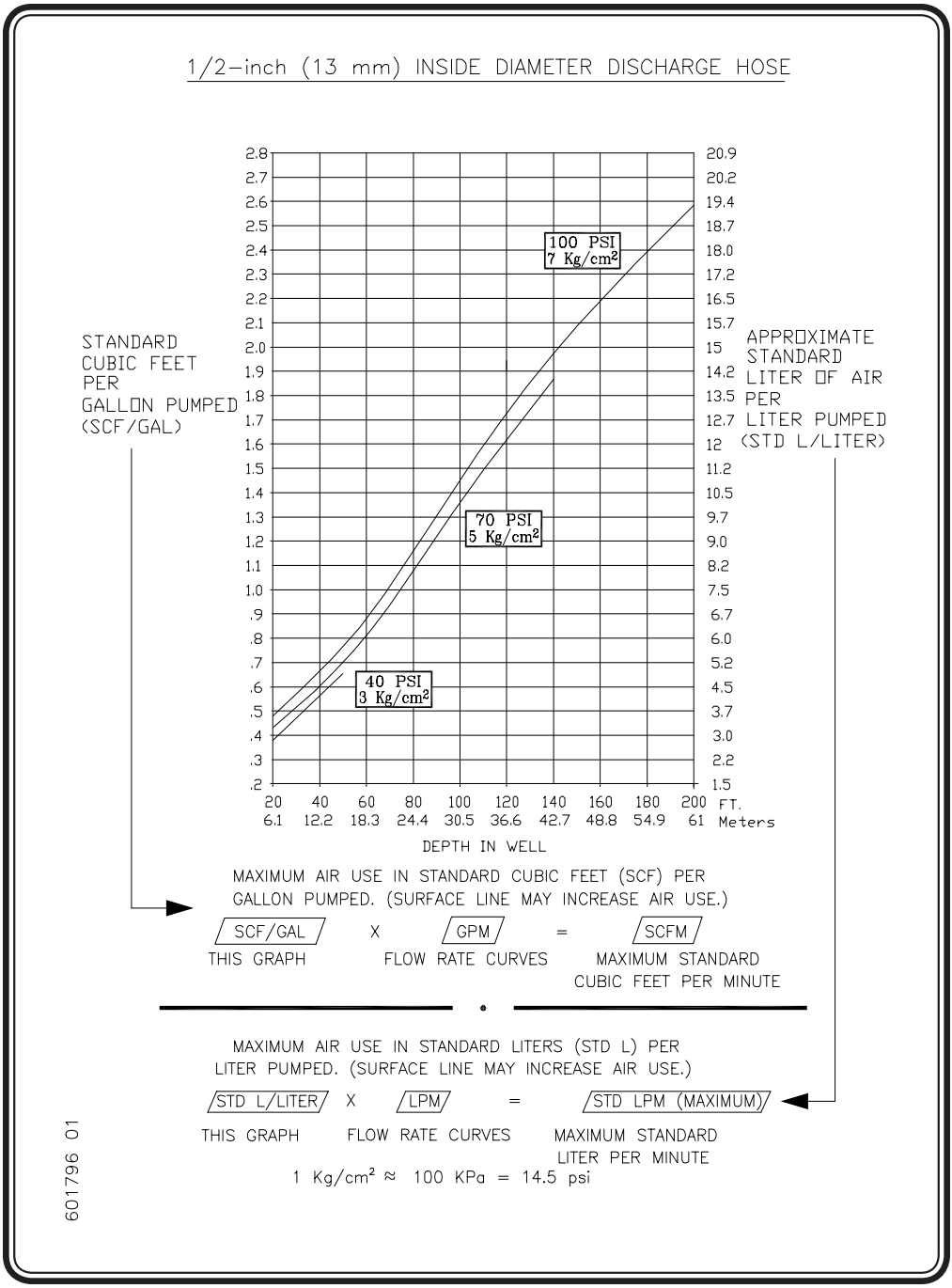


Figure 27 - Short AP-2/TL Air Consumption Curves: 1/2-inch (13 mm) I.D. Discharge US and METRIC UNITS

Appendix C: AP-2 Conversions

The AP-2 can be converted the from Top- to Bottom-Loading or Bottom- to Top-Loading by rearranging the check valves.

For Bottom-Loading to a Top-Loading conversion, **see Figure 28** on the next page.

For Top-Loading to Bottom-Loading conversion, **see Figure 29** on page 74.

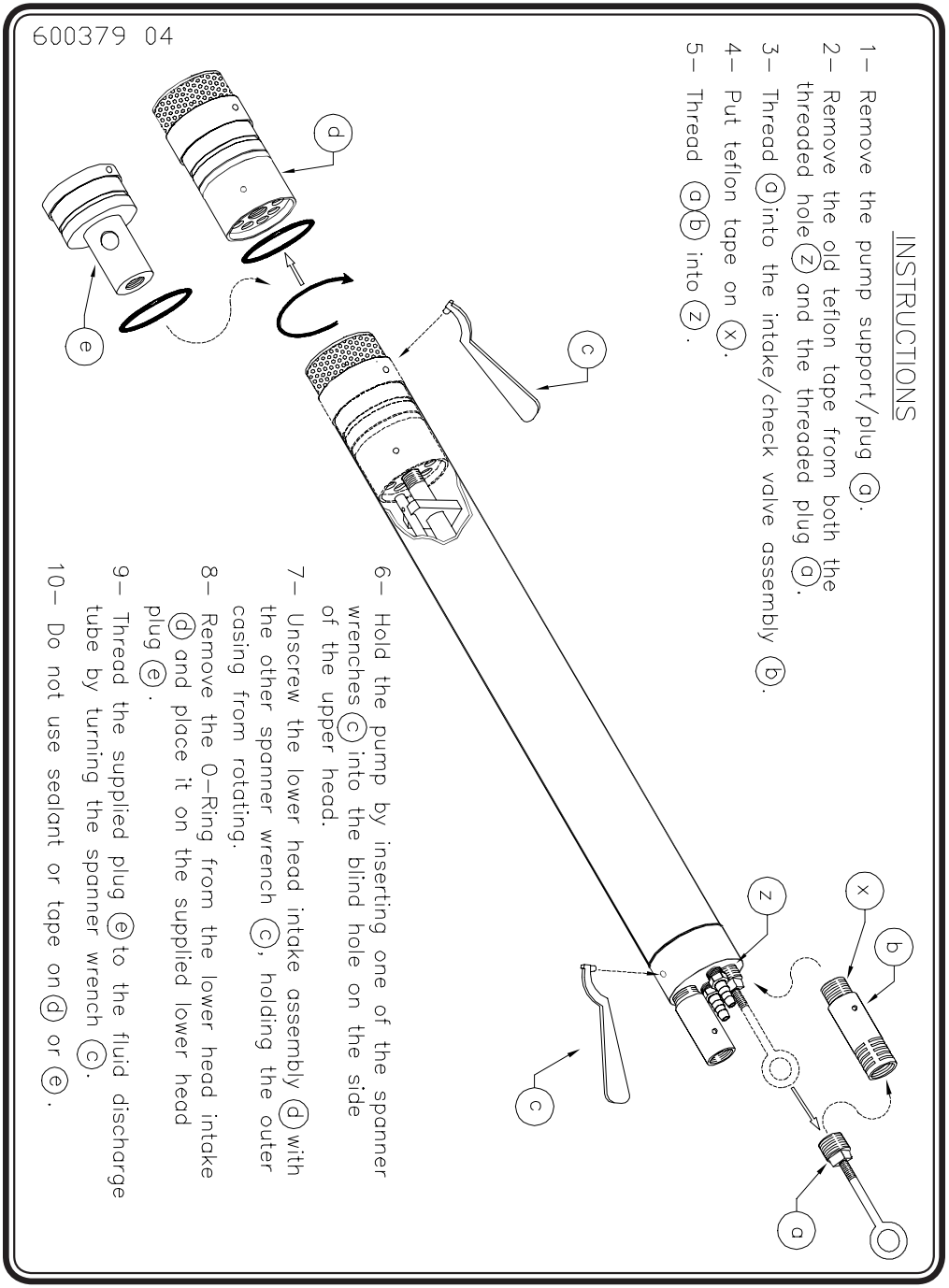


Figure 28 - Conversion From Bottom-Loading to Top-Loading AutoPump

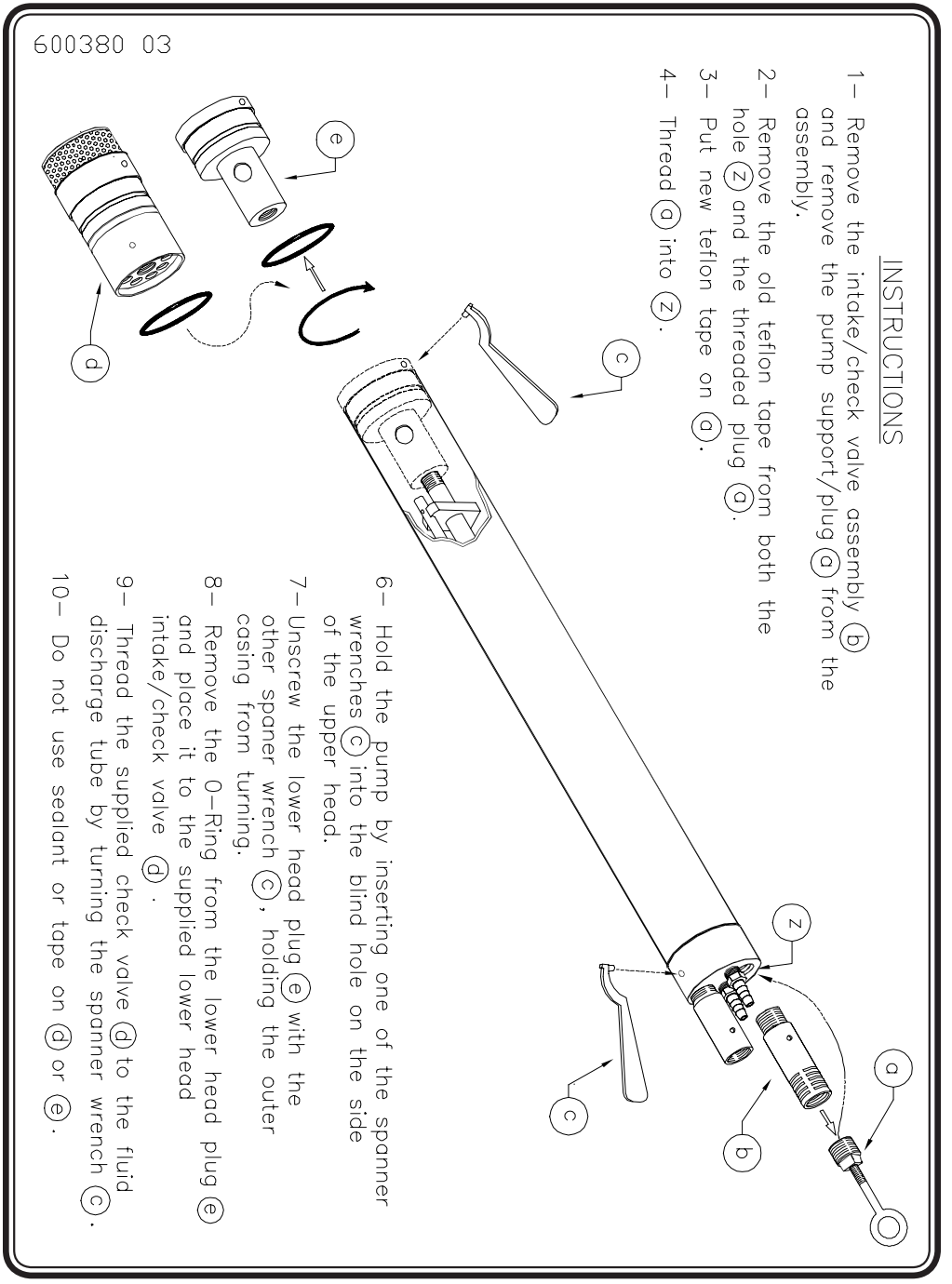
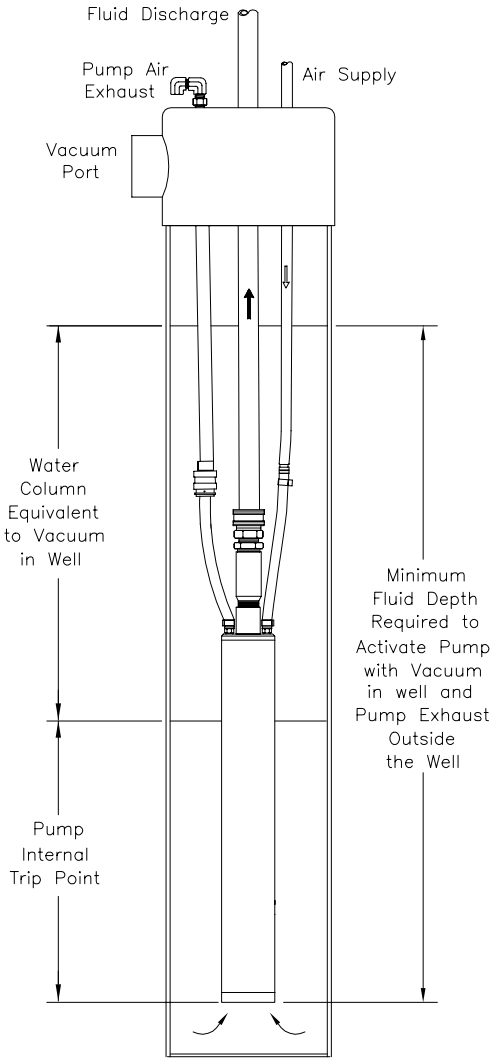


Figure 29 - Conversion From Top-Loading to Bottom-Loading AutoPump

Appendix D: Vacuum on Well

The AP-2 will work in a well that is under vacuum, but there are several conditions that must be considered. These conditions are described in **Figure 30, Figure 31, Figure 32, and Figure 33** on the following pages.



- The water level required to activate the pump is equal to the pump internal trip point plus the vacuum water column.

  Example:

  – A Short AP–3/BL has an internal trip point of 22 in.

  – A well vacuum of 30 in. W.C. (water column)

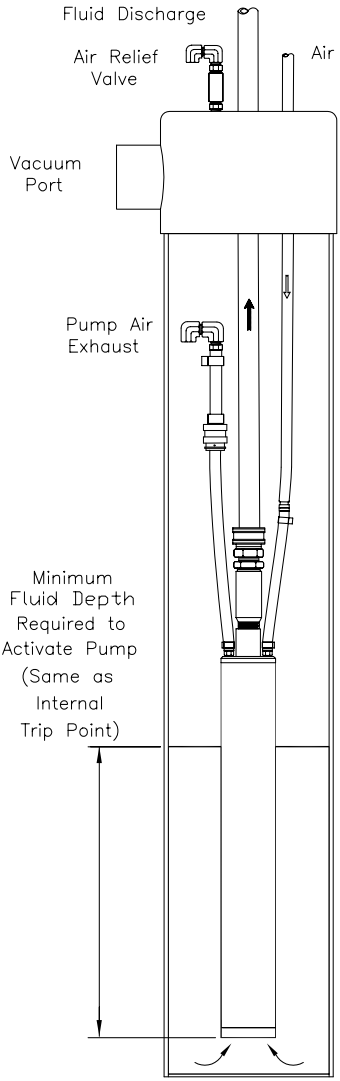
  22+30 = 52 in. Water depth required to activate pump.

- The rated maximum operating pressure of the pump is not affected by this method of installation.

	Pump Internal trip point *						
	Long AP–4/BL	Short AP–4/BL	LDD AP–4/BL	Long AP–3/BL	Short AP–3/BL	Long AP–2/BL	Short AP–2/BL
601238 02	35 in. 89 cm	27 in. 69 cm	11.5 in. 29.2 cm	31 in. 78.8 cm	22 in. 55.5 cm	35 in. 89 cm	20 in. 51 cm

* Special or Extended Intake Screens may Alter Listed Specifications.

Figure 30 - AP-2/BL with Vacuum In the Well and Pump Exhaust Outside the Well



- For this condition the minimum fluid depth required to activate the pump is the same as the pump internal trip point.

- For this method of installation the fluid level required to activate the pump is unaffected by a vacuum or pressure in the well.

  If the well is completely sealed, however, and the well is pressurized (e.g. from the pump exhaust), the water level in the well may be depressed below the depth required to activate the pump. For this reason a QED air relief valve (as shown) is recommended.

- A vacuum on the pump exhaust will affect the maximum operating pressure of the pump. Subtract the vacuum in psi from the rated maximum operating pressure.

  Example:

  – A Long AP–4/BL with 120 psi maximum operating pressure. (200 psi option available).

  – A 90 in. W.C. (water column) vacuum in the well.

  $$\frac{90}{12(2.31)} = 3 \text{ psi}$$

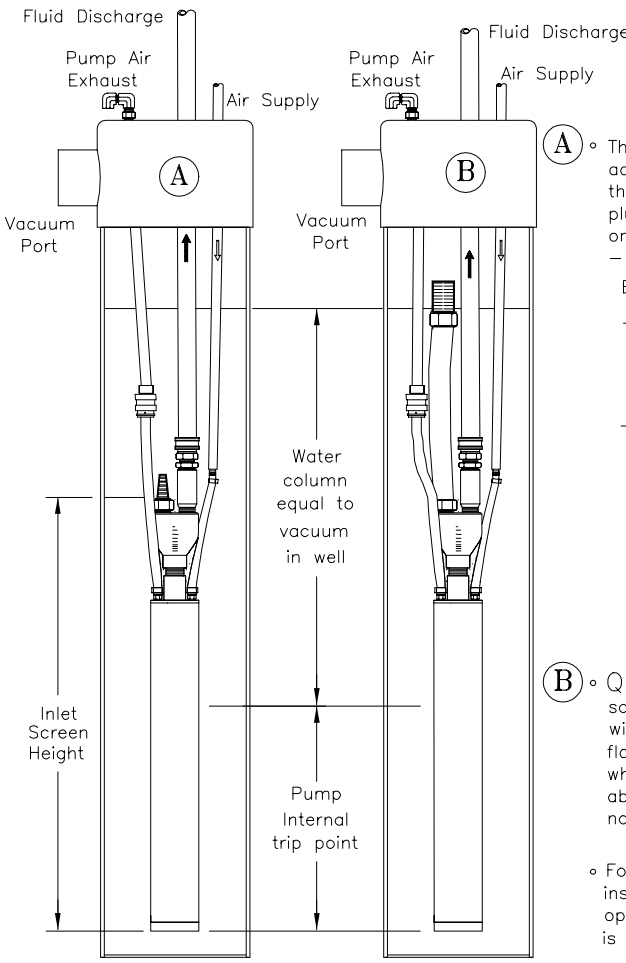
  120–3 = 117 psi maximum operating pressure of the pump.

Pump Internal trip point*						
Long AP–4/BL	Short AP–4/BL	LDD AP–4/BL	Long AP–3/BL	Short AP–3/BL	Long AP–2/BL	Short AP–2/BL
35 in. 89 cm	27 in. 69 cm	11.5 in. 29.2 cm	31 in. 78.8 cm	22 in. 55.5 cm	35 in. 89 cm	20 in. 51 cm

601237 02

* Special or Extended Intake Screens may Alter Listed Specifications.

Figure 31 - AP-2/BL with Vacuum In the Well and Pump Exhaust In the Well



A ◦ The water level required to activate the pump is equal to the pump internal trip point plus the vacuum water column, or, the inlet screen height — whichever is greater.

Example:

— A Long AP–2/TL with an internal trip point of 35 in. and an inlet screen height 52 in.

— A well vacuum of 49 in. W.C. (water column)

35+49 = 84 in. Water depth required to activate pump.

This (84 in) is greater than the inlet screen height (52 in).

B ◦ QED offers custom fluid inlet screen extensions. One of these will enable the recovery of a floating layer of product when the water level (example above) is always above the normal screen position.

◦ For these methods of installation the rated maximum operating pressure of the pump is not affected.

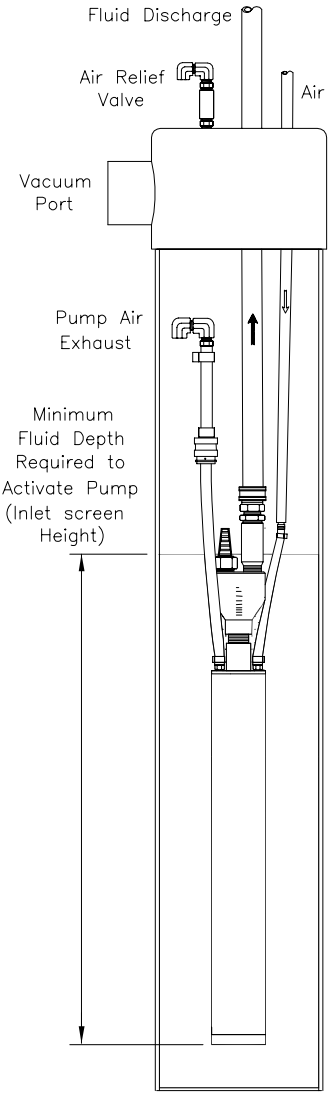
Internal trip point						
Long AP–4/TL	Short AP–4/TL	LDD AP–4/TL	Long AP–3/TL	Short AP–3/TL	Long AP–2/TL	Short AP–2/TL
35 in. 89 cm	27 in. 69 cm	10.6 in. 27 cm	31 in. 78.8 cm	22 in. 55.5 cm	35 in. 89 cm	20 in. 51 cm

Inlet screen height *						
Long AP–4/TL	Short AP–4/TL	LDD AP–4/TL	Long AP–3/TL	Short AP–3/TL	Long AP–2/TL	Short AP–2/TL
52 in. 132 cm	37 in. 94 cm	24 in. 61 cm	53 in. 134.7 cm	42 in. 106.6 cm	52 in. 132 cm	35 in. 89 cm

* Special or Extended Intake Screens may Alter Listed Specifications.

601241 02

Figure 32 - AP-2/TL with Vacuum In the Well and Pump Exhaust Outside the Well



- For this method of installation the fluid level required to activate the pump is unaffected by a vacuum or pressure in the well.

  If the well is completely sealed, however, and the well is pressurized (e.g. from the pump exhaust), the water level in the well may be depressed below the depth required to activate the pump. For this reason a QED air relief valve (as shown) is recommended.

- A vacuum on the pump exhaust will affect the maximum operating pressure of the pump. Subtract the vacuum in psi from the rated maximum operating pressure.

  Example:

  – A Long AP–4/BL with 120 psi maximum operating pressure. (200 psi option available).

  – A 90 in. W.C. (water column) vacuum in the well.

  $$\frac{90}{12(2.31)} = 3 \text{ psi}$$

  120–3 = 117 psi maximum operating pressure of the pump.

	Inlet screen height *						
601240 02	Long AP–4/TL	Short AP–4/TL	LDD AP–4/TL	Long AP–3/TL	Short AP–3/TL	Long AP–2/TL	Short AP–2/TL
	52 in. 132 cm	37 in. 94 cm	24 in. 61 cm	53 in. 134.7 cm	42 in. 106.6 cm	52 in. 132 cm	35 in. 89 cm

* Special or Extended Intake Screens may Alter Listed Specifications.

Figure 33 - AP-2/TL with Vacuum In the Well and Pump Exhaust In the Well

Appendix E: Air Compressor

Installation

The air compressor provides the air necessary to drive the system. The compressed air normally passes through a single stage filter/regulator and then into the AutoPump System.

WARNING:
The air compressor and any other electrical equipment used with this pneumatic system must be positioned outside of any area considered hazardous because of the possibility of the presence of combustible materials.

Compressors start and stop automatically. Do not place hands or objects on or near any part of the compressor.

QED Environmental Systems (QED) does not usually supply the air compressor. It is best to buy the compressor from a local supplier who provides service. Follow the instructions that accompany the compressor. This appendix is only a general guide, not an in-depth manual for the compressor.

WARNING:
When compressing air, parts of a compressor can get very hot. Do not touch the motor, compressor or piping until it has cooled down.

Caution:
The air compressor should be located outside and away from any area which may contain flammable fumes.

Note:
An automatic drain on the compressor receiver tank significantly reduces the load on the air filters, extends the life of the filter elements, and reduces system maintenance. If your air compressor is not equipped with an automatic drain, you can obtain one from QED.

Note:
The information on compressors is for reciprocating piston compressors. A centrifugal compressor produces about twice the air of a piston compressor for the same horsepower.

- As a general rule, a piston-type compressor should not start more than six times per hour. Also, a piston compressor should not operate more than 50% of the time.
- At a minimum, the air compressor should be in the 1 to 1-1/2 HP range with a 20 gallon holding tank.
- At sea level a 1 HP air compressor provides approximately 3.5 cubic feet per minute (SCFM) of free air.
- For compressor sizing, all down well and surface hosing and other resistance must be known.
- The 2 and 3 HP compressors should have 60 to 80 gallon tanks.
- A 5 HP compressor should have at least an 80 gallon tank, and the 7-1/2 HP and 10 HP compressors should have at least a 120 gallon tank.
- Storage tanks and automatic pressure shut-off switches provide a buffer so the compressor motor can cool between each time the tank is pressurized.
- Compressors are generally equipped with a pressure activated start/stop switch. This switch senses the pressure of the air in the holding tank (reservoir) of the compressor. The pressure difference between when the compressor starts and when it stops may need to be adjusted to maintain compressor starts to six times per hour. Refer to the compressor manufacturer for guidance.

Electrical Wiring for the Compressor

- All electrical connections should be made by a licensed electrician and in accordance with the electrical code for particular areas. The wiring should provide full motor nameplate voltage and current at the motor terminals during start-up.
- Wiring hookup must be made so that the compressor flywheel turns in the proper direction. There is usually an arrow on the flywheel to indicate the proper rotation direction.

Motor Overload Protection

- To prevent motor damage, provide all compressor motors with overload protection. Some motors are furnished with built-in thermal overload protection.

- To prevent motor damage due to low voltage or undue load imposed on the motor, use larger motors in conjunction with starters that include thermal overload units.

- To determine the proper thermal protection (thermal element), consider the load to be carried, the starting current, the running current, and the ambient temperature. Recheck electric current characteristics against nameplate characteristics before connecting wiring.

Caution:
Fuses are for circuit protection only and are not to be considered motor protection devices. Consult your local power company regarding proper fuse size.

Air Quality and Pressure

- In compressors requiring lubricating oil, do not use synthetic oil. Synthetic oil can adversely affect some materials. Non-detergent 30 Weight oil is recommended for compressor lubrication.

- Install an automatic drain on the compressor holding tank to periodically drain the water and oil which collects in the tank. This will help to extend air filter cartridge life.

- Do not lubricate the compressed air coming out of the compressor. QED equipment is designed to run without the aid of lubricated air. The air filters are designed to remove oil from the compressed air.

- The compressor should provide between 70 and 250 pounds per square inch (psi) of air pressure to the system. The filter (with metal bowl) and regulator will accept a maximum of 250 psi air pressure. Air filters with plastic bowls will accept a maximum of 150 psi. Maximum output air pressure setting on the regulator is 120 psi.

Maintenance

Although QED usually does not supply the compressor, this section is provided to help the operator. If the system receives clean, oil-free air from the compressor, maintenance will be significantly reduced.

Inspection - Check for possible damage in transit. Almost all compressors are shipped with the flywheel unmounted. Do not force the flywheel on the crankshaft. Use a wedge-in "slot" provided for easy assembly. Checked belt alignment and tension carefully.

Placement - A compressor is a source of sparking. Place it out of what is considered a hazardous area by local and national fire and electric codes.

Mounting - Install in a clean, dry, well-ventilated location away from any source of heat such as a boiler or radiator. If the unit is to be fastened to a foundation, support and shim all four feet firmly to remove all stress from the unit. The compressor flywheel should be mounted towards a wall with a minimum clearance of 18 inches to allow for circulation of air and additional clearance if required for servicing.

Lubrication - Fill the crankcase to the level mark on the oil gauge. Use the type of industrial compressor oil that is recommended by the manufacturer for the ambient temperature. Do not use synthetic oil, as these can damage the pumps.

Pressure and Speed - Never operate the compressor at pressures or speeds in excess of those recommended by the factory. Every compressor assembly must have a safety valve installed and should be set at either the maximum tank working pressure or 25 psi over the actual pressure of the pump, whichever is less.

Daily - Check for unusual noise, failure to compress, overheating, oil leaks, and vibration. Correct before serious damage can develop. Drain all condensate from receiver and traps.

Weekly - Examine intake filter elements and if they are dirty, remove and clean or replace them. Check oil level and add oil if necessary. Do not fill over level mark on sight glass. Keep compressor clean for efficient operation and appearance.

Monthly - Check and tighten all bolts and nuts as required. Check air connections for air leaks and tighten as required. Check belt tension.

Note:
These are standard maintenance procedures which the QED Environmental Systems "warranty" does not cover. QED does not manufacture compressors. Always use the manufacturer's instructions and recommendations when installing, using and servicing the compressor. These notes are included as a general guide only.

Troubleshooting

Although QED usually does not supply the compressor, this section is provided to help the operator. If the system receives clean, oil-free air from the compressor, maintenance will be significantly reduced.

I. Problem: Slow Pumping or Insufficient Pressure

Solutions:

A. Clogged filter element: clean or replace.

B. Leaks in air lines: retighten or replace.

C. Insufficient air capacity: add compressor capacity, consult dealer.

D. Head valves: clean or replace.

E. Slipping belts: adjust or replace.

F. Power cord is too long for the power needed, causing a voltage drop: use a short cord with large wires. Do not coil the power cord.

II. Problem: Excessive Oil Consumption

Solutions:

A. Too much oil: drain out excess to level mark on sight glass.

B. Worn rings: replace rings.

C. Clogged air intake filters: clean or replace.

D. Improper Oil: check the manufacturer's recommendation.

E. Oil leaks: check and tighten all bolts and nuts to manufacturer's specifications. Replace gaskets if necessary.

F. See "Overheating."

III. Problem: Overheating

Solutions:

A. Pump running backwards: reverse rotation.

B. Inadequate ventilation or high ambient temperature: move intakes to outside and install filters to protect against weather and foreign objects. Force air through enclosure if necessary.

C. Restricted air intakes: clean or replace.

D. Loose or restricted valves: retighten, clean, or replace.

E. Incorrect installation: allow 18 inches minimum between wall and flywheel.

F. Insufficient air capacity: consult dealer. Seal all air leaks.

G. Insufficient oil: check level and consult dealer.

IV. Problem: Oil or Water in Air

Solutions:

A. Drain tank more often: use an automatic drain.

B. Reposition intake to take in cooler, drier air.

C. Install water dropouts with automatic drains in the air lines.

D. Install an after cooler prior to the air storage tanks.

Appendix F: Pump Cycle Counter

Introduction

QED Environmental Systems (QED) Pump Cycle Counters (PCC) are air pulse detecting units that are placed in-line between a pump and its air supply. They require no external power source. A digital readout displays the number of times a pump cycles. PCCs consist of a magnet housing, an internally located magnet shuttle, and a digital display.

The position of the digital display is adjustable, allowing the counter to be used on many different kinds of pumps and at various distances from the well. **(See Figure 34)**

The PCC can be used on at least 75 feet (23 m) of 3/8 inch (9.5mm) or
1/4 inch (6.4mm) air hose with air pressure supply 30% higher than the total developed head.

Performance of the PCC is dependent upon the air hose size and the length, the type of pump and the system pressure. Air flow control valves can affect counter performance. Please contact *QED* for application assistance.

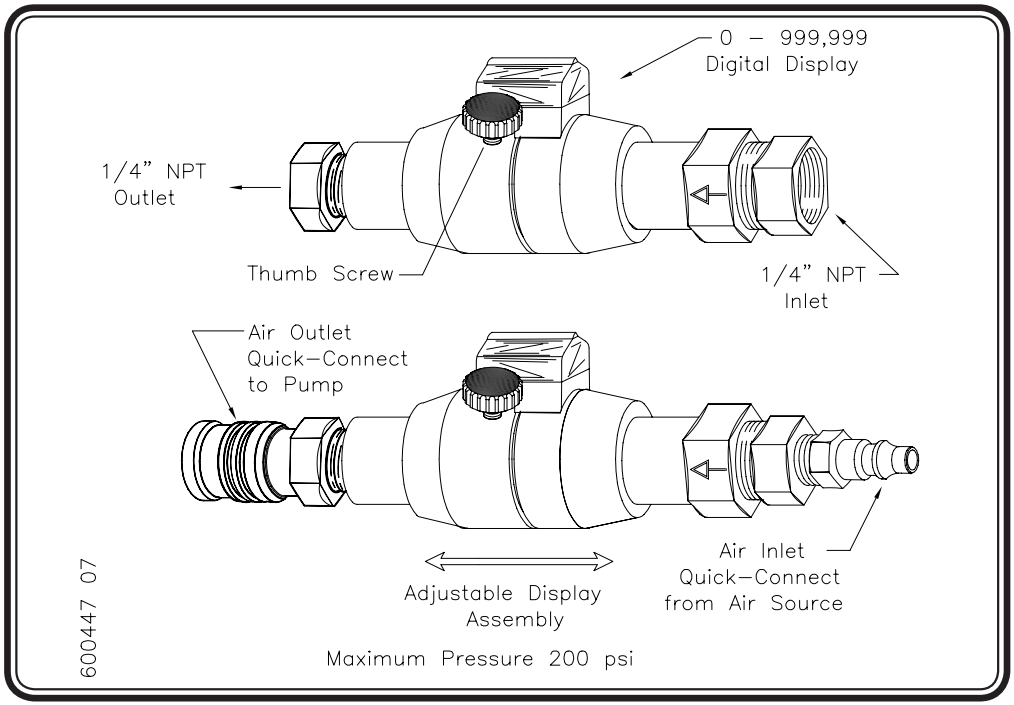


Figure 34 - Pump Cycle Counter

Pump Cycle Counter Operation/Installation

When a pneumatically operated pump such as the *QED* AutoPump® has filled, it triggers itself "On". This allows air to flow to the pump until a certain volume of fluid has discharged. The air stops; the pump fills; then the cycle continues to repeat.

A PCC mounted between a filter/regulator and a pump senses air flow to the pump. In a piston-like action, the internally located magnet shuttle moves forward (in the direction of air flow) during the "On" pulse and returns to a seated position in the "Off" period. **(See Figure 35)**

The digital display senses the completion of this "to-and-from" movement and records the cycle, increasing the number one digit that is shown in the clear plastic display.

This process repeats itself for each pump cycle.

Note:
The PCC will not function properly beyond certain distance limits from the pump, or, above or below optimum air line diameters. Safe limits are as follows:

AP-4: 250 ft. maximum with 1/4 inch or 3/8 inch ID air hose.
AP-3: 150 ft. maximum with 1/4 inch or 3/8 inch ID air hose.
AP-2: 75 ft. maximum with 1/4 inch or 3/8 inch ID air hose.

Contact *QED* for advice.

Digital Display

The digital display has the following features:

- A six digit counter that counts from 0 - 999,999 before resetting itself.
- A clear viewing lens that is water-and-impact resistant.
- **Optional**: Switch for remote electronic readout available upon request. **(See Figure 37)**

Magnet Housing

The magnet housing has the following features:

- A clear mark on the outside that indicates the correct direction of air flow.
- It is made of anodized aluminum.
- It has a 1/4-inch FNPT inlet and a 3/8-inch or 1/4-inch FNPT outlet.
- It handles air pressures from 40 - 200 psi.

Hardware Options

Inlet and outlet openings can be fit with no-mix quick-connects or barb connections depending on site requirements.

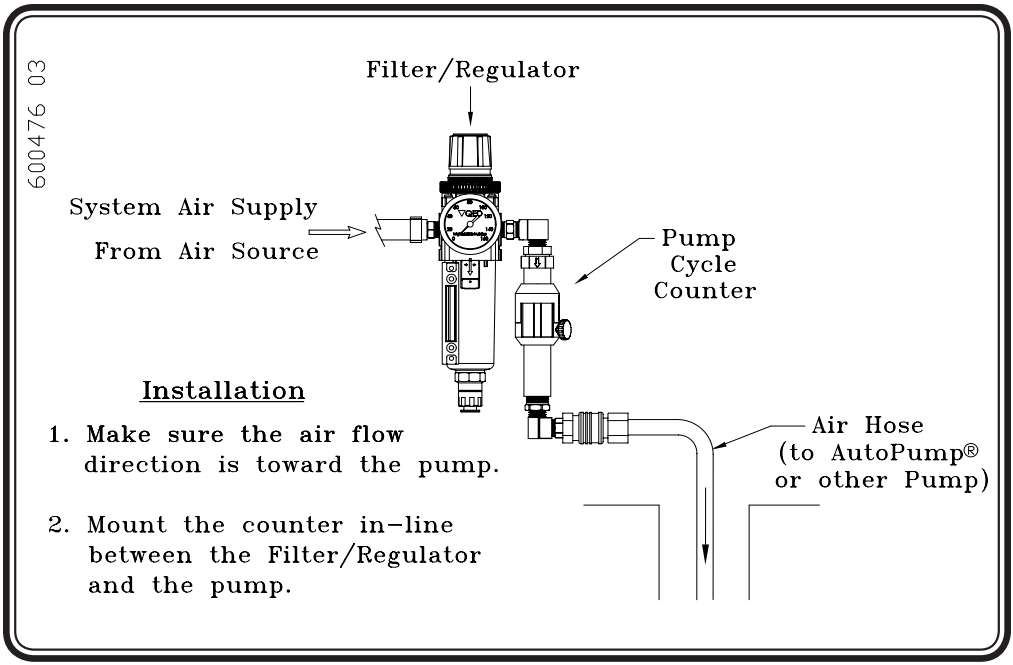


Figure 35 - Pump Cycle Counter Installation

Materials of Construction

QED PCCs are made of the following:

- Anodized Aluminum
- Stainless Steel
- Engineering Plastics
- Brass
- Viton

Pu**mp Cycle Counter Weight - 0.4 lbs** (**0.2 k**g)

Adjusting the Pump Cycle Counter

Note:
To get the most reliable performance, adjust the counter after it is installed and the pump is running. Typically, the Display Assembly that holds the digital readout is set 1/2-inch (13mm) from the upstream hex. Before adjusting the PCC be sure there is no air leak downstream of the counter. A leak could influence the travel of the magnet shuttle when the pump cycles.

STEP 1 - Loosen, but do not remove, the thumb screw **(item #3)** that locks the Display Assembly. **(See Figure 36)**

STEP 2 - Slide the Display Assembly on the magnet housing **(item #6)** (back and forth or up and down as the case may be) while the pump is cycling until the digital display **(item #4)** advances once per pump cycle.

STEP 3 - Slowly slide the Display Assembly upstream towards the air source until the digital display **(item #4)** stops counting. Using a pencil, mark this point on the magnet housing **(item #6)**.

STEP 4 - Slowly slide the Display Assembly in the opposite direction, towards the pump, past where the counting occurs until the digital display **(item #4)** stops counting. Using a pencil, mark this point on the magnet housing **(item #6)**.

STEP 5 - Position the Display Assembly between the two extremes where counting did not occur. Lock the Display Assembly in place with the thumb screw. **(item #3)**

Cleaning the Pump Cycle Counter

Sometimes the PCC does not count due to either the magnet shuttle or the spring hanging up inside the magnet housing. The counter components can be cleaned by *gently* washing the unit in warm water. A soft brush may be used to remove debris. To clean the inside, follow these instructions: **(See Figure 36)**

Note:
As a precaution, mark and/or measure with a pencil, the set distance **(See Figure 36)** so that it can be reset in the same position should movement occur. Do not loosen the thumb screw **(item #3)** since movement of the Display Assembly is unnecessary for cleaning.

STEP 1 - Remove the inlet fitting **(item #11)**, not the thumb screw **(item #3)** as noted above.

STEP 2 - Remove the magnet shuttle assembly **(item #9)** and the spring **(item #8)** from inside the magnet housing **(item #6)**.

STEP 3 - Inspect the magnet shuttle assembly **(item #9)**, the spring **(item #8)**, and the inside of the magnet housing **(item #6)** for burrs which may restrict the magnet shuttle assembly **(item #9)** movement.

STEP 4 - If burrs are present, remove the burrs and smooth the part. Replace the PCC if necessary.

STEP 5 - Use a soft bottle brush and warm water to clean the inside of the magnet housing.

Caution:
Be careful not to scratch the pieces.

STEP 6 - Let the parts dry.

STEP 7 - Reassemble the PCC.

Parts List

No.	Part No.	Description	Qty.
1	200064	Outlet fitting	1
2	200065	Cycle counter sleeve	1
3	205744	Thumb screw	1
4	205048	Digital display	1
5	205031	Display seat	1
6	200069	Magnet housing	1
7	200324	Counter slide stop	1
8	200070	Spring	1
9	300534	Magnet shuttle	1
10	200073	O-Ring	1
11	200074	Inlet fitting	1

Figure 36 - Pump Cycle Counter Exploded View

Assembly of the Digital Display (Figure 36)

Should the digital display be removed and disassembled for any reason, the procedure for assembling is as follows:

STEP 1 - Seat the digital display **(item #4)** on the flat of the display seat **(item #5)**. **(See Figure 36)**

STEP 2 - Slide the cycle counter sleeve **(item #2)** over the display seat **(item #5)** and the bottom lip portion of the digital display **(item #4)**. Both pieces (the display seat **#5** and the digital display **#4**) should be held in place by the cycle counter sleeve **(item #2)**.

STEP 3 - Align the thumb screw holes.

STEP 4 - Screw in the thumb screw **(item #3)** to hold the Display Assembly together.

AP-2 Volumes Pumped Per Cycle

The volume of fluid pumped per cycle from an AutoPump® varies depending upon the inlet air pressure and the total developed head (TDH) (static plus dynamic head). The closer the pressures are to each other, (the TDH is almost the same as the inlet air pressure), the closer the volume pumped per cycle will be to the lower end of the gallon range in the table below. The TDH depends upon back pressure in the surface lines, hose size, fittings, vertical and horizontal pumping distance, the number of pumps feeding the hose system, air pressure to the pump, and the type of pump. The effects of some of these variables may cause the volume pumped per cycle to vary from pump to pump on a single site.

AP2 AutoPump Models		
Pump	**Volume per Cycle: Range**	**Volume per Cycle: Typical**
Long AP2	0.14 - 0.17 gal (0.53 - .64 L)	0.155 gal (0.59 L)
Short AP2	0.05 - 0.08 gal (0.19 - 0.30 L)	0.065 gal (0.25 L)

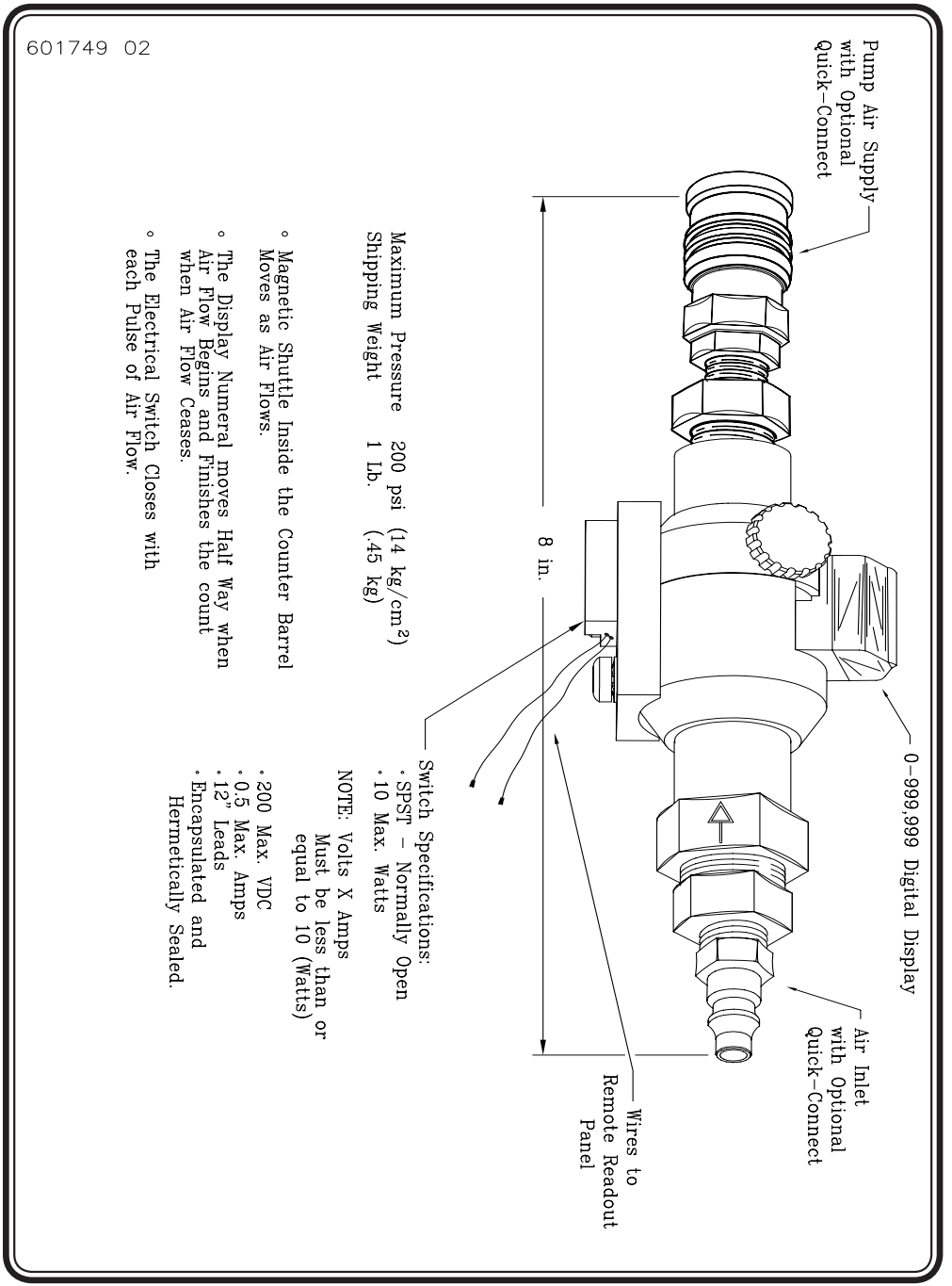


Figure 37 - Pump Cycle Counter with Magnetic Reed Switch

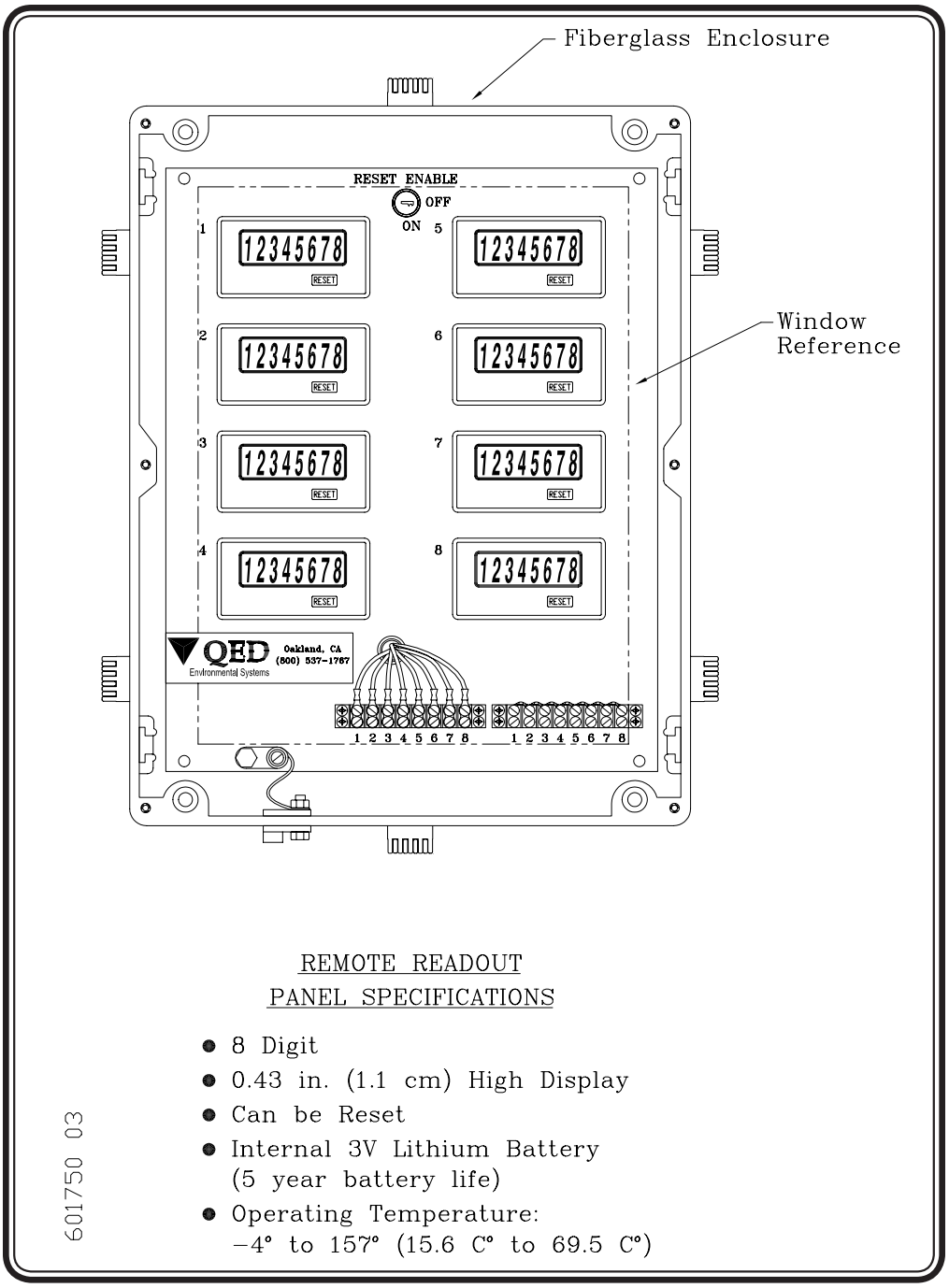


Figure 38 - Pump Cycle Counter Remote Readout Panel

Terms, Conditions, and Warranty

ONE YEAR Warranty
This limited warranty is in lieu of and excludes all other representations made by advertisements, distributors, agents, or manufacturers sales representatives, and all other warranties, both express and implied. There are no implied warranties of merchantability or of fitness for a particular purpose for goods covered hereunder.

QED Environmental Systems warrants to the purchaser of its products that, subject to the limitations and conditions provided within the Terms & Conditions of Sale, products, materials and/or workmanship shall reasonably conform to descriptions of the products and shall be free of defects in material and workmanship.

All warranty durations are calculated from the original date of purchase—determined as beginning the date of shipment from QED facilities and the date QED is notified of a warranty claim. This warranty shall be limited to the duration and conditions set forth below.

1. **AP-2 AutoPumps**—warranted for one (1) year: 100% material and 100% workmanship. This limited warranty coverage only applies to AP-2 AutoPumps. There will be no warranty for application or material compatibility. The materials used in pumps vary depending upon application and the customer is responsible for knowing the environment in which the pump will be operating and working with QED to determine what materials of construction will be best for the application.

The warranty is valid when the following conditions exist: when the site has a pH between 4 and 9, has a salinity of 3500 ppm or less, is between 40 and 120 degrees Fahrenheit, is non-corrosive to the construction materials of the pump; and is not abrasive. Typical commercial fuels are acceptable materials in free or dissolved phase. The pumps and accessories must be operated within the specifications and limits given in the manual for the particular piece of equipment.

2. **Pumps, hose, tubing, fittings, heater, condensers and air filtration housings** — warranted for one (1) year: 100% material and 100% workmanship. This does not include AP-2 AutoPumps. There will be no warranty for application or material compatibility. The materials used vary depending upon application and the customer is responsible for knowing the environment in which the equipment will be operating and working with QED to determine what materials of construction will be best for the application.

3. **Pneumatic Data Modules / Logic Control Panels** — warranted for one (1) year: 100% material and 100% workmanship.

4. **Parts and Repairs** — warranted for ninety (90) days: 100% material and 100% workmanship; when repairs are performed by QED or its appointed agent; from date of repair or for the full term of the original warranty, whichever is longer. Separately sold parts are warranted for ninety (90) days: 100% materials and 100% workmanship.

   This warranty will be void in the event of unauthorized disassembly of component assemblies. Defects in any equipment that result from abuse, operation in any manner outside the recommended procedures, use and applications other than for intended use or exposure to chemical or physical environments beyond the designated limits of materials and construction, will also void the warranty.

   Chemical attack by liquids and/or abrasive substances contacting equipment and accessories shall not be covered by this warranty. A range of materials of construction is available from QED and it is the Buyer's responsibility to select materials of construction to fit the Buyer's application. QED will only warrant that the supplied site liquid contacting materials will conform to published QED specifications and generally accepted standards for that particular material.

   QED Environmental Systems shall be released from all obligations under all warranties if any product covered hereby is repaired or modified by persons other than QED service personnel (unless such repair by others is made with the written consent of QED); resold to other parties; and/or moved to or used on a remediation site other than originally specified.

It is understood and agreed that QED Environmental Systems shall in no event be liable for incidental or consequential damages resulting from its breach of any of the terms of this agreement, nor for special damages, nor for improper selection of any product described or referred to for a particular application. Liability under this warranty is limited to repair or replacement F.O.B. QED's factory, or its appointed agent's shop, of any parts which prove to be defective within the duration and conditions set forth herein, or repayment of the purchase price at the option of QED, provided the products have been returned in accordance with the duration and conditions set forth herein.

Subassemblies and Other Equipment Manufactured by Others
The foregoing warranty does not apply to major subassemblies and other equipment, accessories, and other parts manufactured by others, and such other parts, accessories, and equipment are subject only to the warranties, if any, supplied by their respective manufacturers. QED makes no warranty concerning products or accessories not manufactured by QED. In the event of failure of any such product or accessory, QED will give reasonable assistance to Buyer in obtaining from the respective manufacturer whatever adjustment is reasonable in light of the manufacturer's own warranty.

Illustrations and Drawings
Reasonable Effort has been made to have all illustrations and drawings accurately represent the product(s) as it actually was at the time of doing the illustrations and drawings.

However, products may change to meet user requirements and therefore may not be reflected in the literature. In addition, literature may be updated to reflect the most recent equipment revision(s). Changes to either or both equipment and/or literature can be made without notice.

Buyer's Remedies
The buyer's exclusive and sole remedy on account of or in respect to the furnishing of defective material or workmanship shall be to secure replacement thereof as aforesaid. QED shall not in any event be liable for the cost of any labor expended on any such product or material or for any special, direct, indirect or consequential damages to any one by reason of the fact that it shall have been deemed defective or a breach of said warranty.

Changes without Notice
Prices and Specifications are subject to change without notice.

Shipping Dates
Shipping dates are approximate and are subject to delays beyond our control.

F.O.B. Point and Title
All material is sold F.O.B. factory. Title to all merchandise sold shall pass to Buyer upon delivery by Seller to carrier at factory. All freight insurance is the responsibility of the Buyer and shall be charged to the Buyer on the invoice unless directed in writing. All Freight claims are the Buyer's responsibility.

Terms
Payment terms are net 30 days; 1.5% per month past due.

State and Local Taxes
Any taxes, duties or fees which the seller may be required to pay or collect upon or with respect to the sale, purchase, delivery, use or consumption of any of the material covered hereby shall be for the account of the Buyer and shall be added to the purchase price.

Acceptance
All orders shall be subject to the terms and conditions contained or referred to in the Seller's quotation, acknowledgments, and to those listed here and to no others whatsoever. No waiver, alteration or modification of these terms and conditions shall be binding unless in writing and signed by an executive officer of the Seller. All orders subject to written acceptance by QED Environmental Systems, Ann Arbor, MI, U.S.A.

Warranty Claims Procedure (Responsibility of purchaser)
The original purchaser's sole responsibility in the instance of a warranty claim shall be to notify QED or its appointed agent, of the defect, malfunction, or other manner in which the terms of this warranty are believed to be violated. The purchaser may secure performance of obligations hereunder by contacting the Customer Service Department of QED or its appointed agent, and:

1. Identifying the product involved by model or serial number, or other sufficient description, that will allow QED, or its appointed agent, to determine which product is defective.

2. Specifying where, when, and from whom the product was purchased.

3. Describing the nature of the defect or malfunction covered by this warranty.

4. After obtaining authorization from QED, sending the malfunctioning component via a RMA# (Return Material Authorization number) to the address below or to its appointed agent:

   QED Environmental Systems
   1133 Seventh Street
   Oakland, CA 94607
   USA

   (800) 537-1767 Toll-Free in North America
   (510) 891-0880
   (510) 444-6789 FAX

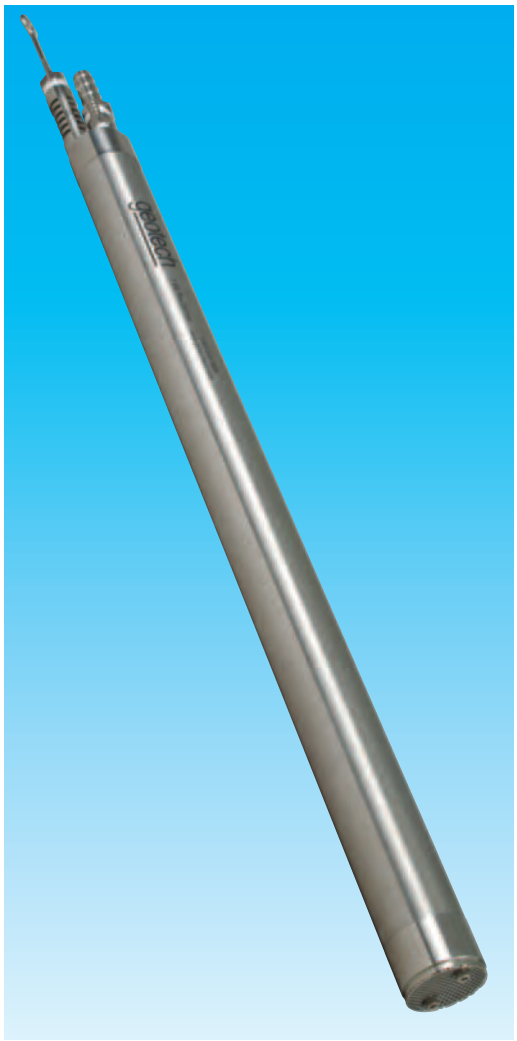
5. Equipment must be cleaned before shipment or it will be cleaned by QED before any work is performed. The customer will be charged for such cleaning.

If any product covered hereby is actually defective within the terms of this warranty, purchaser must contact QED, or its appointed agent, for determination of warranty coverage. If the return of a component is determined to be necessary, QED, or its appointed agent, will authorize the return of the component at Purchasers expense. If the product proves not to be defective within the terms of this warranty, then all costs and expenses in connection with the processing of the Purchaser's claim and all costs for repair, parts, labor, and shipping and handling, as authorized by owner hereunder, shall be borne by the Purchaser. In no event shall such allegedly defective products be returned to QED, or its appointed agent, without its consent, and QED's, or its appointed agent's, obligations of repair, replacement or refund are conditional upon the buyer's return of the defective product to QED, or its appointed agent. All equipment returned to QED will be appropriately cleaned of contamination before shipping.

geotech

Geotech
1.66 Reclaimer

Installation and Operation Manual



Rev 06/10/12 Part# 26600222

TABLE OF CONTENTS

DOCUMENTATION CONVENTIONS

This manual uses the following conventions to present information:

WARNING

An exclamation point icon indicates a **WARNING** of a situation or condition that could lead to personal injury or death. You should not proceed until you read and thoroughly understand the **WARNING** message.

CAUTION

A raised hand icon indicates **CAUTION** information that relates to a situation or condition that could lead to equipment malfunction or damage. You should not proceed until you read and thoroughly understand the **CAUTION** message.

NOTE

A note icon indicates **NOTE** information. Notes provide additional or supplementary information about an activity or concept.

Chapter 1: System Description

Function and Theory

The Geotech Reclaimer can be configured as a Top fill, Bottom fill, or Top and Bottom fill fixed intake, positive air displacement pump. The Geotech Reclaimer is designed for total fluids, hydrocarbon, leachate, and condensate recovery. The Geotech Reclaimer is designed to withstand most aggressive down well environments including highly corrosive fluids without fear of material breakdown or failure.

The Geotech Reclaimer will recover fluids from depths up to 500' (152 m).
Refer to the operation section of this manual.

Flow rates of up to 3 GPM (11.4 LPM) are possible.
Refer to the specifications section of this manual.

The Geotech 1.66" Reclaimer will operate in wells 2" (5cm) inside diameter or larger vertical wells.

Chapter 2: System Installation

Attach product discharge and air supply hoses to the proper barbed fittings on the pump. Refer to Figures 1 and 2 below for fitting configurations.

If pump configuration was not assembled as a complete system, please use the following steps:

Attach air supply hose to Geotech pneumatic controller air supply fitting.

Ensure all hoses are installed properly and securely to the fittings.

Attach the safety cable to the support loop using proper crimps or cable clamps.

The Reclaimer can now be lowered into the recovery well. For optimum efficiency, the Reclaimer must be positioned in the well with the intake adequately submerged.

Figure 1
1.66" Reclaimer Bottom Fill

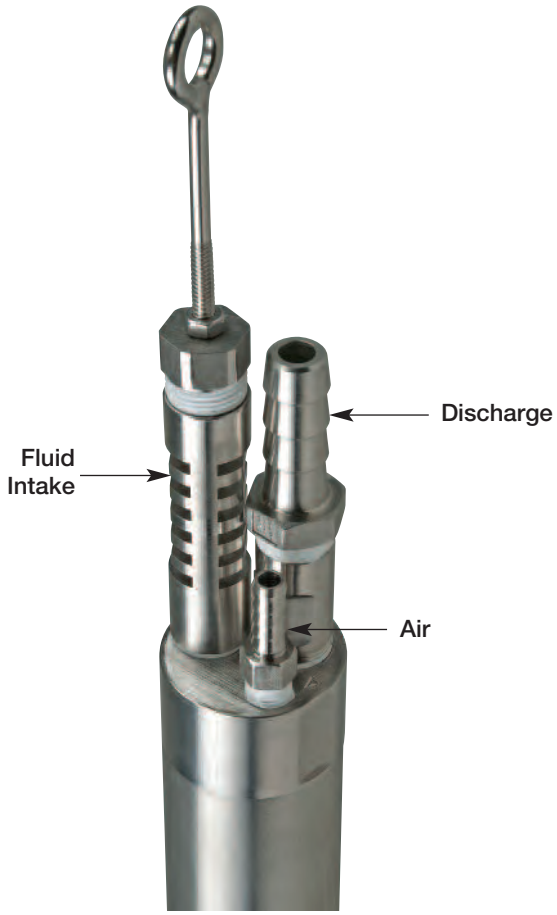


Figure 2
1.66" Reclaimer Top Fill

Chapter 3: System Operation

Compressed air is utilized in this system. For pressure requirements use .5 psi per foot (.03 bar per 30.5 cm) of lift plus ten. Example: 30' (9 m) of head would need a minimum of 25 psi (1.7 bar). Consult the controller manual for air pressure requirements needed.

TOP FILL

The Top Fill Reclaimer is placed in a recovery well with the top inlet submerged below static groundwater. Combined with the Geotech Pneumatic Controller, the Reclaimer cyclically fills and empties.

Well recharge rate and time sequence settings on the Geotech Pneumatic Controller will affect the maintainable fluid level.

BOTTOM FILL

The Bottom Fill Reclaimer is placed in a recovery well with the bottom intake submerged below static groundwater. Combined with Geotech's Pneumatic Controller, the Reclaimer cyclically fills and empties.

Well recharge rate and time sequence settings on the Geotech Pneumatic Controller will affect the maintainable fluid level, see Figure 3.

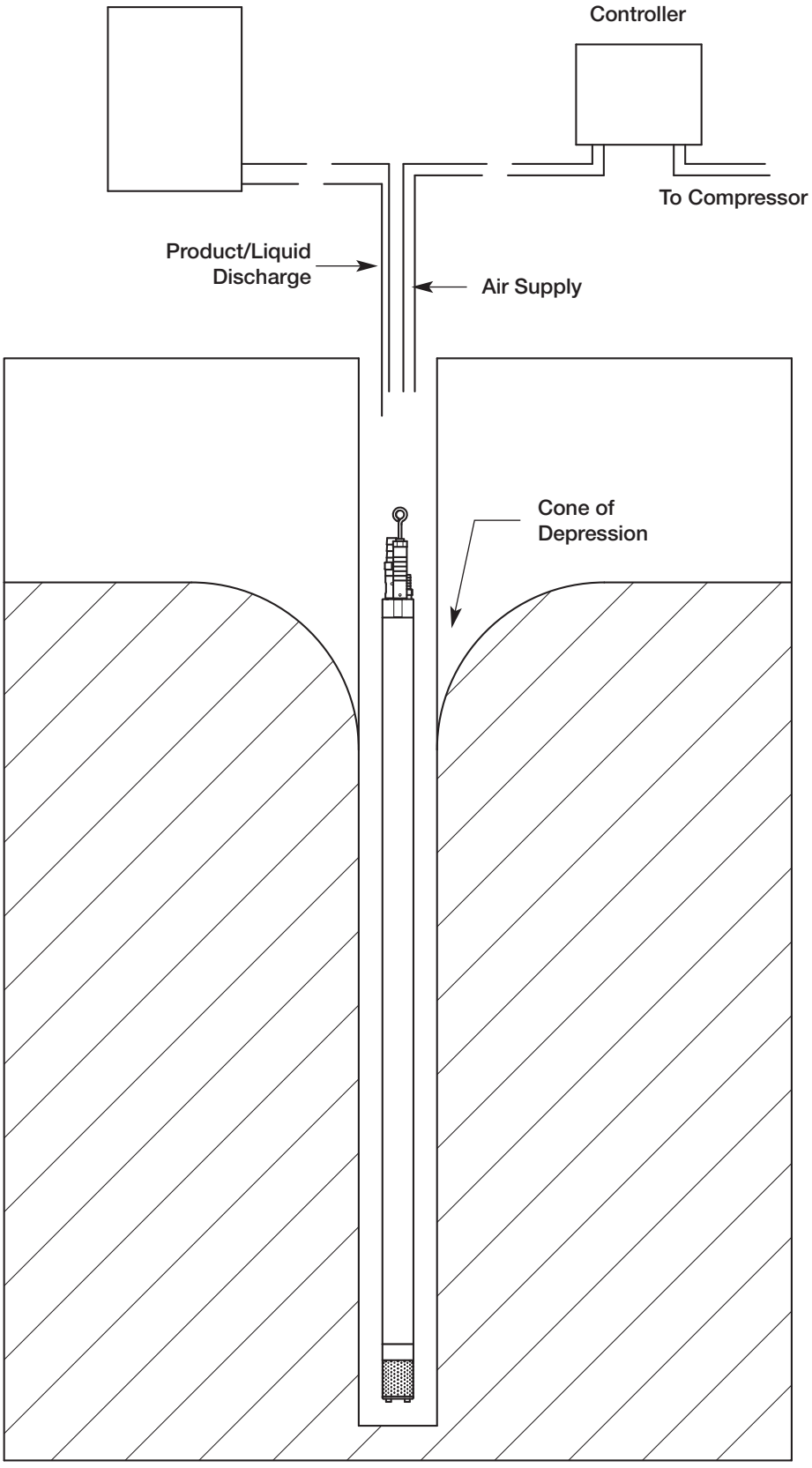


Figure 3
1.66" Reclaimer

Chapter 4: System Maintenance

The Geotech Reclaimer has been designed to be virtually maintenance free. In the event clogging occurs in the pump or trapped particulate in the check ball seats, disassemble the Reclaimer pump and rinse with soapy or clean water to dislodge any matter. The Reclaimer is constructed of 300 series stainless steel and PTFE to provide many years of continued service with minimal maintenance. See Figure 4.

Top Fill **Bottom Fill**

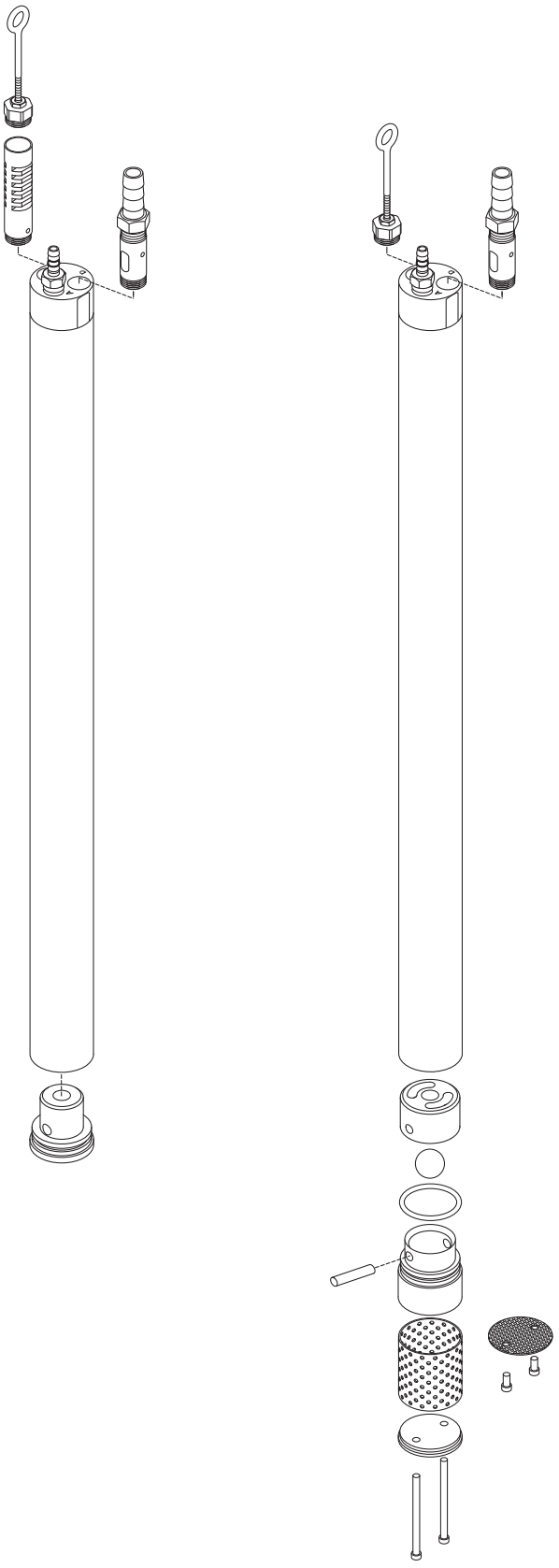


Figure 4

Chapter 5: System Troubleshooting

Problem: Pump does not discharge fluid to the surface.

Solutions:

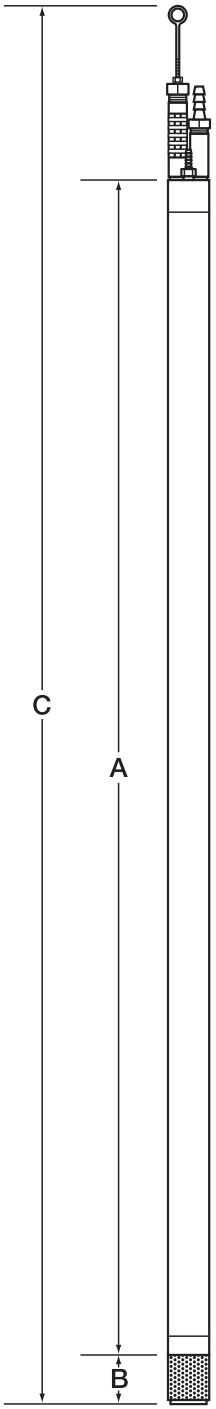
1. Check controller to ensure it is functioning properly. Consult controller manual.
2. Ensure that the air pressure is adequate enough to overcome the total dynamic head pressure the pump is working against. (Consult the controller manual for air pressure requirements needed.)
3. Inlet screen is clogged – Remove pump from well, disassemble, clean screen
4. Inlet pipe plug is clogged – Remove pump from well, disassemble, clear, clean plug
5. Air exhaust vent hose is clogged – Remove pump from well, disassemble, clear vent hose
6. Hoses are kinked or cut – Replace damaged hoses

Chapter 6: System Specifications

1.66" Reclaimer

Outside Diameter . . . . . 1.66" (4.22 cm)
Max. Operating Depth . . . . . 500' (152 m)
Min. Well ID . . . . . 2" (5 cm)
Operating Pressure Range . . . . . 10-300 psi (.7-20.7 bar)
Fittings . . . . . Stainless steel
Fluid Discharge . . . . . ½" - ¾"
Air Supply . . . . . ¼" - ⅜"

1.66 Reclaimer	Dimensions - in. (cm)			Weight lbs. (kg)	Volume/Cycle gallons (L)	Max. Flow Rate GPM (LPM)
	A	B	C			
24" Top Fill	24 (61)	0	30.25 (76.8)	4.0 (1.8)	0.1 (.4)	2 (7.6)
24" Bottom Fill (No Screen)	24 (61)	0	27.25 (69.2)	4.0 (1.8)	0.1 (.4)	2 (7.6)
24" Bottom Fill (Flat Screen)	24 (61)	0.25 (.6)	27.5 (69.8)	4.5 (2)	0.1 (.4)	2 (7.6)
24" Bottom Fill (2" Screen)	24 (61)	2 (5)	29.25 (74.3)	5.0 (2.3)	0.1 (.4)	2 (7.6)
24" Top & Bottom Fill (No Screen)	24 (61)	0	30.25 (76.8)	4.0 (1.8)	0.1 (.4)	2 (7.6)
24" Top & Bottom Fill (Flat Screen)	24 (61)	0.25 (.6)	30.5 (77.5)	4.5 (2)	0.1 (.4)	2 (7.6)
24" Top & Bottom Fill (2" Screen)	24 (61)	2 (5)	32.25 (81.9)	5.0 (2.3)	0.1 (.4)	2 (7.6)
36" Top Fill	36 (91)	0	42.25 (107.3)	5.4 (2.4)	0.2 (.8)	2.4 (9)
36" Bottom Fill (No Screen)	36 (91)	0	39.25 (99.7)	5.4 (2.4)	0.2 (.8)	2.4 (9)
36" Bottom Fill (Flat Screen)	36 (91)	0.25 (.6)	39.5 (100.3)	5.9 (2.7)	0.2 (.8)	2.4 (9)
36" Bottom Fill (2" Screen)	36 (91)	2 (5)	41.25 (104.8)	6.4 (2.9)	0.2 (.8)	2.4 (9)
36" Top & Bottom Fill (No Screen)	36 (91)	0	42.25 (107.3)	5.4 (2.4)	0.2 (.8)	2.4 (9)
36" Top & Bottom Fill (Flat Screen)	36 (91)	0.25 (.6)	42.5 (107.9)	5.9 (2.7)	0.2 (.8)	2.4 (9)
36" Top & Bottom Fill (2" Screen)	36 (91)	2 (5)	44.25 (112.4)	6.4 (2.9)	0.2 (.8)	2.4 (9)
48" Top Fill	48 (122)	0	54.25 (137.8)	7.8 (3.5)	0.4 (1.5)	3 (11.4)
48" Bottom Fill (No Screen)	48 (122)	0	51.25 (130.2)	7.8 (3.5)	0.4 (1.5)	3 (11.4)
48" Bottom Fill (Flat Screen)	48 (122)	0.25 (.6)	51.5 (130.8)	8.3 (3.8)	0.4 (1.5)	3 (11.4)
48" Bottom Fill (2" Screen)	48 (122)	2 (5)	53.25 (135.2)	8.8 (4.0)	0.4 (1.5)	3 (11.4)
48" Top & Bottom Fill (No Screen)	48 (122)	0	54.25 (137.8)	7.8 (3.5)	0.4 (1.5)	3 (11.4)
48" Top & Bottom Fill (Flat Screen)	48 (122)	0.25 (.6)	54.5 (138.4)	8.3 (3.8)	0.4 (1.5)	3 (11.4)
48" Top & Bottom Fill (2" Screen)	48 (122)	2 (5)	56.25 (142.9)	8.8 (4.0)	0.4 (1.5)	3 (11.4)



NOTES

Chapter 7: Replacement Parts List

Item	Qty	Description	Part No.
1	1	BOLT, SS6, 10-24 x 3", EYE W/NUT	16600133
2	1	NUT, SS8, 10-24	11200650
3	1	PLUG, HANGER, SS4, 1.66	26600178
4	1	INTAKE ASSY, UPPER, 1.66	56600056
5	1	ASSY, DISCHARGE, 1.66	56600068
6	1	HOSEBARB, SS6, 1/2 x 3/8 MPT	16600217
7	1	HOSEBARB, SS6, 1/4 x 1/8 MPT	17200072
8	1	HEAD, RECLAIMER, 1.66, CAP, UPPER	26600217
9	1	PIPE, CENTER, SS4, 1/4 x 24, 1.66 RECLAIMER	26600213
	1	PIPE, CENTER, SS4, 1/4 x 36,1.66 RECLAIMER	26600214
	1	PIPE CENTER, SS4, 1/4 x 48" 1.66 AR	26600062
10	1	HOUSING, RECLAIMER, 1.66, SS4, 24"	56600063
	1	HOUSING, RECLAIMER, 1.66, SS4, 36"	56600064
	1	HOUSING, RECLAIMER, 1.66, SS4, 48"	56600065
11	1	CAP, BOTTOM INLET, 1.66	26600070
12	1	BALL, TFE, 3/4"	17500085
13	2	O-RING, VITON, #126	17500104
14	1	BOTTOM INLET, SS, 1.66	26600071
15	1	PIN, DOWEL, SS8, 1/4 x 1.5"	16600124
16	1	SCREEN, INLET, SS, 1.66 x 2	26600083
17	1	CAP, BOTTOM INLET, SCREEN, 1.66	26600072
	1	CAP, SS6, BOT INLET SCREEN, ANODE	26600136
18	2	SCREW, SS8, 8-32 x 2.25", SHCS	16600132
19	1	SCREEN, INLET, SS, 1.66, FLAT	26600134
20	2	SCREW, SS6, 10-32 x .5", SHCS	16600095
21	1	CAP, BOTTOM BLANK, 1.66	26600069
		MANUAL, RECLAIMER, 1.66	26600222

System Components

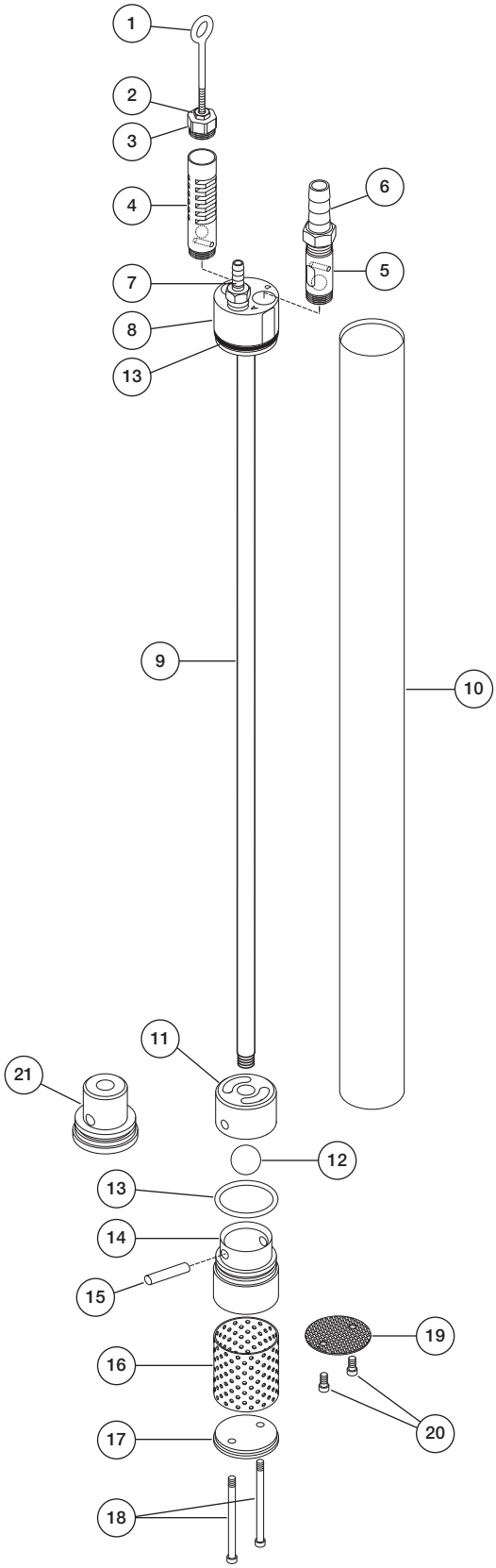


Figure 5

THE WARRANTY

For a period of one (1) year from date of first sale, product is warranted to be free from defects in materials and workmanship. Geotech agrees to repair or replace, at Geotech's option, the portion proving defective, or at our option to refund the purchase price thereof. Geotech will have no warranty obligation if the product is subjected to abnormal operating conditions, accident, abuse, misuse, unauthorized modification, alteration, repair, or replacement of wear parts. User assumes all other risk, if any, including the risk of injury, loss, or damage, direct or consequential, arising out of the use, misuse, or inability to use this product. User agrees to use, maintain and install product in accordance with recommendations and instructions. User is responsible for transportation charges connected to the repair or replacement of product under this warranty.

Equipment Return Policy

A Return Material Authorization number (RMA #) is required prior to return of any equipment to our facilities, please call 800 number for appropriate location. An RMA # will be issued upon receipt of your request to return equipment, which should include reasons for the return. Your return shipment to us must have this RMA # clearly marked on the outside of the package. Proof of date of purchase is required for processing of all warranty requests.

This policy applies to both equipment sales and repair orders.

FOR A RETURN MATERIAL AUTHORIZATION, PLEASE CALL OUR SERVICE DEPARTMENT AT 1-800-833-7958

Model Number: _____

Serial Number: _____

Date of Purchase: _____

Equipment Decontamination

Prior to return, all equipment must be thoroughly cleaned and decontaminated. Please make note on RMA form, the use of equipment, contaminants equipment was exposed to, and decontamination solutions/methods used.

Geotech reserves the right to refuse any equipment not properly decontaminated. Geotech may also choose to decontaminate equipment for a fee, which will be applied to the repair order invoice

Geotech Environmental Equipment, Inc.
2650 East 40th Avenue • Denver, Colorado 80205
(303) 320-4764 • **(800) 833-7958** • FAX (303) 322-7242
email: sales@geotechenv.com website: www.geotechenv.com

APPENDIX E

HEALTH AND SAFETY PLAN
FOR REMEDIAL SITE MANAGEMENT

HEALTH AND SAFETY PLAN
FOR REMEDIAL SITE MANAGEMENT

95 MT. READ BOULEVARD
ROCHESTER, NEW YORK
NYSDEC SITE CODE #828085

Prepared by: Day Environmental, Inc.
40 Commercial Street
Rochester, NY, 14614

Approved by: Nick Harding
Health and Safety Specialist

Project No.: 3681R-05

Date: February 2010

TABLE OF CONTENTS

1.0 INTRODUCTION

This Health and Safety Plan (HASP) has been developed by Day Environmental, Inc. (DAY) as part of the Brownfield Cleanup Program (BCP) remedial activities at the former General Circuits Site (New York State Department of Environmental Conservation (NYSDEC) Site ID #C828085) located at 95 Mount Read Boulevard, Rochester, New York (Site). Figure 1 presents the location of the Site.

The Site is classified as a Class 2 Inactive Hazardous Waste Site by the NYSDEC. This HASP documents the policies and procedures for the protection of the workers and public from potential construction/monitoring hazards posed by the remedial activities at the Site. Project activities will be conducted in a manner that minimizes the probability of injury, accident, or incident occurrence.

The HASP focuses on specific remedial site management activities planned for the Site; however, the HASP is flexible enough to encompass the variable nature of remedial work. Conditions may change and unforeseen situations may arise that require deviations from the original remedial construction/monitoring plan. This flexibility allows modification by DAY personnel, and health and safety officials.

NOTE: The requirements of the HASP shall apply to all employees, subcontractors and agents of DAY performing work on the Site in regards to the installation of the groundwater and extraction treatment system. Additionally, the Site Safety Officer may require compliance with appropriate requirements of this HASP for individuals who may be present or visiting the Site. Individuals who are unable or unwilling to meet the requirements of this HASP may be excluded from the project Site. In the event of a conflict between this HASP and NYSDEC Standards or a HASP developed by subcontractors, the more stringent shall apply.

1.1 Site History and Previous Studies

The Site consists of approximately 3.5 acres of land improved primarily by a single story 120,000 square foot building. The facility is located in a predominantly industrial area of the City of Rochester, and the Site and surrounding properties are serviced by public water. The original portion of the building was constructed in the 1920s and the Site was owned/operated by Rochester Lithograph Corporation until the early 1960s. General Circuits, Inc. owned/operated the Site from the early 1960s until 1990. General Circuits, Inc. closed the facility in 1991 due to bankruptcy. Shortly thereafter, the property was transferred to Maguire Properties, Inc. who owned the site until 2005, at which time it was transferred to 95 Mt. Read Blvd., LLC. The current owner of the Site is 95 Mt. Read Blvd., LLC. The building has been subdivided and leased by several small light-industrial and commercial businesses.

1.2 Nature and Extent of Contamination

Based upon the findings presented in the Feasibility Study (FS) Report dated January 2001 (revised January 2005) for the Site, contaminants of concern (COCs) include chlorinated volatile organic compounds (VOCs) and the metal chromium, including hexavalent chromium (chromium VI). The chlorinated VOCs at the Site generally consist of perchloroethene (PCE) and trichloroethene (TCE), and (to a lesser extent) their breakdown products 1,2-dichloroethene (DCE) and vinyl chloride (VC). The highest concentration of total VOCs was detected in a groundwater sample collected from overburden monitoring well MW-9 (greater than 155,000 ppb total VOCs). Groundwater samples from overburden monitoring wells MW-8, MW-10 and MW-12, deep bedrock monitoring well MW-17 and the basement sump contained concentrations of total VOCs between 2,140 ppb and 20,340 ppb. VOCs were also detected at the monitoring wells positioned around the perimeter of the Site, but at lower concentrations (i.e., less than 144 ppb) than interior monitoring wells MW-8, MW-9, MW-10, MW-17 and the basement sump.

The highest concentration of total and hexavalent chromium was detected in the soil samples collected from inside a former shipping room. The results of one soil sample indicated that at least some of the soils in the unsaturated zone beneath the former shipping room exceed the USEPA TCLP regulatory level for chromium, and that these soils would be considered a characteristic hazardous waste if removed for disposal. Based on the analytical data obtained, the former "Shipping Room" area appeared to be the source of the contamination at the Site. Limited remediation was performed to address the chromium contamination at the site. The work included: removing the glass-lined floor drains within the former shipping room, and any sediments within the drains; removing a limited amount of chromium-impacted soil; and disposing of the removed materials in accordance with applicable regulations.

Chromium concentrations above the NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 groundwater standard of 50 ppb were detected in wells MW-8, MW-9, MW-12 and MW-21. With the exception of monitoring well MW-21, these monitoring wells are located beneath the building at the Site. However, monitoring well MW-21 is an “open hole” well starting at 18 feet (ft) below the ground surface (bgs); therefore, the detected chromium concentration could be indicative of shallow bedrock groundwater.

The vertical extent of COCs in groundwater was delineated by evaluating groundwater quality in monitoring wells sealed within the overburden and monitoring wells sealed within the bedrock. VOCs were not detected in groundwater samples collected approximately 50 ft bgs. In addition, chromium was not detected at concentrations that exceed the NYSDEC groundwater standards and guidance values in bedrock groundwater monitoring wells with the exception of monitoring well MW-21.

1.3 Proposed Scope Of Work

The following field activities may be performed as part of the groundwater extraction and treatment system installation and subsequent systems maintenance and monitoring:

1. Advancement of split spoon sampling equipment at the Site and collection of associated soil samples for visual observation and field screening.

2. Installation of bedrock interface wells at the Site using rotary drilling equipment.

3. Collection of groundwater data and analytical laboratory samples from monitoring wells, and indoor air data and analytical laboratory samples from select indoor air monitoring locations.

4. Installation and maintenance of pumps, tubing and associated controls within the groundwater extraction wells.

5. Decontamination procedures (decon) of site workers and equipment. The decon water and disposable personal protective equipment (PPE) will be containerized in New York State Department of Transportation (NYSDOT) 55-gallon drums.

6. Installation and maintenance of a groundwater treatment system that will include chemical metering and reaction tanks, mechanical pumps and mixing equipment, filtration equipment, piping and controls, etc.

7. Installation and maintenance of engineering controls for mitigation of potential subslab vapor intrusion, including a subslab ventilation system and indoor air filtration equipment.

2.0 KEY PERSONNEL AND MANAGEMENT

The Project Manager (PM), Site Supervisor (SS), Health and Safety Specialist (HSS) and Site Safety Officer (SSO) are responsible for formulating and enforcing health and safety requirements, and implementing the HASP during remedial construction/monitoring activities.

2.1 Designated Heath and Safety Specialist

The designated health and safety specialist is responsible for: (i) the contents of the HASP and (ii) ensuring the HASP complies with federal, state and local health and safety requirements. If necessary, the HSS will modify the HASP to adjust for on-site changes that affect safety. The HSS will coordinate with the SSO on modifications to the HASP and will be available for consultation when required.

2.2 Project Manager

The PM has overall responsibility for the project and assures that the goals of the remedial construction/monitoring activities are attained in a manner consistent with the HASP requirements. The PM coordinates efforts with the SS and the SSO.

2.3 Site Safety Officer

The SSO is responsible for administering the HASP relative to Site activities, and will be present at all times while Site activities are in progress. The SSO's operational responsibilities include monitoring (personal and environmental), ensuring personal protective equipment maintenance, and assigning protection levels. The SSO is the primary contact in an on-site emergency situation. The SSO will direct field activities involved with safety and be responsible for stopping work when unacceptable health or safety risks exist. In addition, the SSO is responsible for ensuring that on-site personnel understand and comply with safety requirements.

2.4 Site Supervisor

The SS is responsible for field implementation of the HASP. The SS will establish and ensure compliance with site control areas and procedures, and coordinate these supervisory responsibilities with the site SSO. [Note: For the purpose of this remedial construction/monitoring program, the aforementioned responsibilities of the SSO and SS may be performed by the same DAY representative.]

2.5 Employee Safety Responsibility

Each employee is responsible for personal safety as well as the safety of others in the area. The employee will use the equipment provided in a safe and responsible manner as directed by the SS.

2.6 OSHA Records

Required records are maintained at DAY's Rochester, New York office.

2.7 Key Safety Personnel

The following individuals share responsibility for health and safety at the site.

Health and Safety Specialist	Nick J. Harding
Project Manager	Barton F. Kline, P.E.
Site Supervisor/Site Safety Officer	Nathan Simon, or Thomas Roszak. Or Kelly Crandall

3.0 JOB HAZARD ANALYSIS

3.1 Chemical Hazards

Preventing exposure to toxic chemicals is a primary concern during remedial construction/monitoring activities. Chemical substances can enter the unprotected body by inhalation, skin absorption, ingestion, or injection (i.e., puncture wound).

Based on results of previous soil and groundwater sampling at the Site, potential contaminants to be encountered are known to include VOCs (e.g., chlorinated solvents), trivalent chromium, and hexavalent chromium. A list of site-specific constituents previously detected in soil and/or groundwater, and/or known to have been used at the Site, are provided below.

3.1.1 List of Potential Chemical Hazards

CONSTITUENT	ESTABLISHED EXPOSURE LIMITS	IDLH	TARGET ORGANS
trichloroethene	100 ppm PEL	1000 ppm	eyes, skin, respiratory system, heart, liver, CNS
chloroform	50 ppm TLV	500 ppm	liver, kidneys, heart, eyes, skin, CNS
1,2-dichloropropane (propylene dichloride)	75 ppm PEL	400 ppm	eyes, skin, respiratory system, kidneys, CNS
tetrachloroethene	100 ppm PEL	150 ppm	eyes, skin, respiratory system, liver, kidneys, CNS
methylene chloride	500 ppm PEL 50 ppm TLV	2300 ppm	eyes, skin, cardiovascular system, CNS, suspect human carcinogen (lung)
acetone	1000 ppm PEL	2500 ppm (LEL)	eyes, skin, respiratory system, CNS
carbon disulfide	20 ppm PEL	500 ppm	CNS, eyes, kidneys, liver skin, reproduction system, peripheral nervous system, cardiovascular system
1,1-dichloroethene (vinyldene chloride)	5 ppm TLV	3000 ppm	eyes, skin, respiratory system, CNS, liver, kidneys
1,1-dichloroethane	100 ppm PEL	3000 ppm	skin liver, kidneys, lungs, CNS
1,2-dichloroethene (total)	200 ppm PEL	1000 ppm	eyes, respiratory system, CNS
2-butanone (MEK)	200 ppm PEL	3000 ppm	eyes, skin, respiratory system, CNS
benzene	1 ppm PEL	500 ppm	leukemia, eyes, skin, respiratory system, blood, CNS, bone marrow
toluene	200 ppm PEL	500 ppm	eyes, skin, respiratory system, CNS, liver, kidneys
ethylbenzene	100 ppm PEL	800 ppm	eyes, skin, respiratory system, CNS
xylene (total)	100 ppm PEL	900 ppm	kidneys, eyes, skin, respiratory system, CNS, GI tract, blood, liver
vinyl chloride	1 ppm PEL	Not determined	liver, CNS, blood, respiratory system, lymphatic system, liver cancer
chromic acid and chromates	0.05 mg/m^3 TLV	15 mg/m^3	blood, respiratory system, liver, kidneys, eyes, skin, lung cancer

Notes:

PEL	=	OSHA Permissible Exposure Limits (TWA for 8-hour day)
TLV	=	ACGIH Threshold Limit Value (8-hour TWA concentration)
IDLH	=	Immediately Dangerous to Life or Health Concentrations
LEL	=	Lower Explosive Limit in air
CNS	=	Central Nervous System

Established Exposure Limits = Published by: American Congress of Governmental Industrial Hygiene (ACGIH), and Occupational Safety and Health Administration (OSHA).

The potential routes of exposure for these chemicals include:

- inhalation,
- ingestion,
- injection,
- skin absorption, and
- skin/eye contact.

The probable routes of exposure for the remedial construction/monitoring activities to be conducted on site include inhalation and skin contact. The activities most likely to result in potential exposure of workers to contaminants would include:

- advancement of split spoon overburden boreholes;
- installation of bedrock wells;
- soil and groundwater sampling; and
- groundwater treatment systems maintenance and monitoring.

The primary contaminants of concern (COCs) are anticipated to be VOCs and chromium in soil and groundwater. The VOCs detected at the highest concentration in groundwater at the site are trichloroethene (TCE) and tetrachloroethene (also known as perchloroethene, or PCE). Many of the other halogenated VOCs detected at the Site are degradation products of these two VOCs. During fieldwork activities resulting in soils disturbance, the worker's breathing zone will be monitored using a Flame Ionization Detector (FID) or photoionization detector (PID) with a 10.6 eV lamp. Site work completed to date indicates that routine monitoring and maintenance activities (i.e. those not requiring soils disturbance) can be safely completed without air monitoring. [Note: TCE and PCE have ionization potentials of 10.6 eV or less; however, some of their degradation products (e.g., 1,1,-dichloroethane) have ionization potentials of 10.6 eV or greater.] The PID and FID readings will determine the level of personal protective equipment (PPE) required (refer to Section 5.0).

Operation of the groundwater treatment system currently does not require any chemical handling or usage; however, the system was designed to potentially include chemical treatment. Should groundwater treatment chemicals or additional contaminants be encountered during the implementation of the proposed activities, this HASP will be modified to include these additional chemicals or contaminants as needed.

3.2 Physical Hazards

The following text outlines physical hazards associated with this project and associated preventative measures:

- Small Quantity Flammable Liquids - Small quantities of flammable liquids will be stored in "safety" cans and labeled according to contents.

- Slip/Trip/Fall Hazards – Some areas have wet surfaces that greatly increase the possibility slips, trips and falls. Exercise caution when using steps and stairs that may be slippery. Good housekeeping practices are essential to minimize trip hazards.

- Electrical Hazards – De-energize electrical devices and equipment prior to working near them. Keep extension cords out of water, protected from crushing, and inspect them regularly to ensure structural integrity. Protect temporary electrical circuits with ground fault circuit interrupters. Only qualified electricians are authorized to work on electrical circuits. Do not operate heavy equipment (e.g., drill rig) within 10 feet of high voltage lines.

- Noise - Work around large equipment often creates excessive noise. If high noise areas (by perception) are encountered, don hearing protection. If employees are subjected to noise exceeding an 8-hour time weighted average sound level of 90 dB(A) (decibels on the A-weighted scale), feasible administrative or engineering controls must be implemented. In addition, whenever employee noise exposures equal to or exceed an 8-hour time weighted average level of 85 dB(A), employers must administer hearing conservation program as described in OSHA Regulation 29 CFR Part 1910.95.

- Heavy Equipment – Prior to shift start-up, heavy equipment will be inspected by the operator to ensure safety equipment and devices are operational and ready for immediate use.

- Subsurface and Overhead Hazards - Prior to drilling, excavation or well installation, efforts will be made to determine underground utility locations (if any) and potential overhead hazards that may be encountered. Underground utility clearance will be obtained prior to subsurface work.

3.3 Environmental Hazards

Environmental factors such as weather, wild animals, insects, and irritant plants pose a hazard when performing outdoor tasks. The SSO and SS will evaluate and address these hazards as they arise.

3.3.1 Heat Stress

The combination of warm ambient temperature and protective clothing increases the potential for heat stress. In particular:

- Heat rash
- Heat cramps
- Heat exhaustion
- Heat stroke

Site workers are encouraged to increase consumption of water and electrolyte-containing beverages (e.g., Gatorade) when the potential for heat stress exists. In addition, workers are encouraged to take frequent breaks.

3.3.2 Exposure to Cold

With outdoor work in the winter months, the potential for hypothermia and frostbite exists. Protective clothing greatly reduces the possibility of hypothermia affecting workers. Personnel should wear warm clothing and stop work to obtain additional clothing if they become cold. Employees should change into dry clothes if their clothing becomes wet.

4.0 SITE CONTROLS

Work areas and personal protective equipment will be clearly specified prior to initiation of activities resulting in soils disturbance. Routine monitoring and maintenance activities (i.e. those not requiring soils disturbance) can be safely completed without designation of work areas, but will still require the necessary personal protective equipment as outlined herein. To the extent possible, and as needed, DAY will designate work areas or zones as suggested by the NIOSH/OSHA/ USCG/EPA's document entitled, "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities". Each work area will be divided into three zones as follows:

- An Exclusion or "hot" Zone (EZ)
- A Contamination-Reduction Zone (CRZ)
- A Support Zone (SZ)

4.1 Exclusion Zone (EZ)

The EZ is the area suspected of contamination and presents the greatest potential for worker exposure. During the remedial construction/monitoring, the EZ will be considered the area where intrusive activities are conducted (i.e., advancement of boreholes and/or wells, soil and groundwater sampling). Personnel entering the area must wear the identified level of protection for the area. Different levels of protection may be required based on the tasks and monitoring performed within the EZ zone.

4.2 Contamination-Reduction Zone (CRZ)

A CRZ will be established between the EZ and SZ. Personnel will begin the sequential decontamination process required to exit the EZ in this area. Personnel will enter and exit the EZ through the CRZ to prevent off-site migration of contamination via tracking and for personnel accountability.

4.3 Support Zone (SZ)

The SZ serves as a clean, control area. Operational support facilities are located within the SZ. Normal work clothing and support equipment are appropriate in this zone. Contaminated equipment, or clothing are not allowed in the SZ. The support facilities should be located upwind of Site activities, if possible. There will be a clearly marked controlled access point from the SZ into the CRZ and EZ that is monitored by the SSO and the SS to ensure proper safety protocols are followed.

4.4 General

The following controls are required to protect the health and safety of workers and will be reviewed with applicable personnel prior to initiating work on the Site.

- Do not eat, drink, chew gum or tobacco, or smoke in the EZ and CRZ.
- Wash hands when leaving the EZ, and/or after completing routine maintenance activities.

- Use a buddy system in the EZ. Establish and use hand signals to maintain communication.
- Each worker should consider himself a safety backup to his partner.
- Maintain visual contact between buddies on site when performing hazardous duties.
- No personnel will be admitted into the EZ without the proper safety equipment, training, and medical surveillance certification.
- Personnel must comply with established safety procedures. Any staff member who does not comply with safety policy, as established by the SSO or the SS, will be immediately dismissed from the site.
- Follow proper decontamination procedures before leaving the Site (see Section 6.0).

5.0 PROTECTIVE EQUIPMENT

This section addresses the various levels of personal protective equipment (PPE) that may be required at the Site. DAY personnel and subcontracted personnel, if warranted, will be certified in the use of the anticipated PPE to be utilized (see Section 9.0).

5.1 Anticipated Protection Levels

TASK	PROTECTION LEVEL	COMMENTS/MODIFICATIONS
Site mobilization	D	
Site prep/construction of engineering controls	D	
Extrusive Investigative Methods (e.g., collecting measurement, etc.)	D	
Intrusive Investigative Methods (e.g., test boring advancement/well installation, static water level measurements, soil and groundwater sampling, etc.)	C, or Modified Level D	Based on air monitoring, and CIH, SSO or SS discretion
Support zone	D	
Site breakdown and demobilization	D, or Modified Level D	
Groundwater treatment systems monitoring and maintenance	D	Nitrile, neoprene, or PVC gloves required when working with groundwater samples and wetted treatment equipment
Engineering controls for vapor intrusion mitigation monitoring and maintenance	D	

5.2 Protection Level Descriptions

This section lists the minimum requirements for each protection level. Modification to these requirements will be noted in the Sites dedicated field book.

5.2.1 Level D

Level D:

- Safety glasses (with side shields)
- Hard hat
- Steel-toed foot wear
- Work clothing as prescribed by weather

5.2.2 Modified Level D

Modified Level D:

- Safety glasses (with side shields)
- Hard hat
- Steel-toed foot wear
- Nitrile, neoprene, or PVC overboots or vinyl booties
- Outer nitrile, neoprene, or PVC gloves over latex gloves
- Face shield (when projectiles or splashes pose a hazard)
- Tyvek coverall [Tyveks (Sarans) and PVC acid gear will be required when workers have a potential to be exposed to contaminated liquids or sludges].

5.2.3 Level C

Level C:

- Air-purifying respirator with appropriate cartridges
- Hooded Tyvek coveralls and/or Tyveks (Sarans) (PVC acid gear will be required when workers have a potential to be exposed to contaminated liquids or sludges)
- Hard hat
- Steel-toed foot wear
- Hooded Chemical Resistant Clothing
- Nitrile, neoprene, or PVC overboots
- Nitrile, neoprene, or PVC gloves over latex sample gloves
- Face shield (when projectiles or splashes pose a hazard)

5.2.4 Level B

Level B protection consists of the items required for Level C protection with the exception that an air-supplied respirator is used in place of the air-purifying respirator. Level B PPE is not anticipated to be required during the remedial construction/monitoring activities.

5.2.5 Level A

Level A protection consists of the items required for Level B protection with the addition of a fully-encapsulating, vapor-proof suit capable of maintaining positive pressure. Level A PPE is not anticipated to be required during the remedial construction/monitoring activities.

5.3 Air-Purifying Respirators

Employees will be fit tested according to OSHA regulations (29 CFR 1910.1025; 29 CFR 1910.134) prior to donning respirator. Any respirators used will meet the requirements of OSHA 29 CPR 1910.134.

Air purifying respirators will not be worn under the following conditions:

- Oxygen deficiency
- IDLH concentrations
- High relative humidity
- If contaminant levels exceed designated use concentrations

5.4 Respirator Cartridges

The crew members working in Level C will wear respirators equipped with compatible air-purifying cartridges. The cartridge will be approved/rated for:

- Organic vapors <1,000 ppm
- Dusts, fumes and mists with a TWA <0.05 mg/m^3
- Asbestos-containing dusts and mists
- Radon
- Radionuclides

5.5 Cartridge Changes

Cartridge change out will occur when personnel begin to experience increased inhalation resistance or the wearer experiences breakthrough of a chemical warning property.

5.6 Inspection and Cleaning

Respirators will be checked periodically by a qualified individual, and inspected before each use by the wearer. Respirators and associated equipment will be properly decontaminated and cleaned after each use.

5.7 Fit Testing

Annual respirator fit tests are required of personnel wearing negative-pressure respirators. The fit test must be for the style and size of the respirator to be used by the individual.

5.8 Facial Hair

Personnel with facial hair that interferes with the respirator's sealing surface will not be permitted to wear a respirator, and will not be permitted to work in areas requiring respirator use.

5.9 Corrective Lenses

Normal eyeglasses will not be worn under full-face respirators because the temple bars interfere with the respirator's sealing surfaces. Workers requiring corrective lenses will don spectacles designed for use with respirators.

5.10 Medical Certification

Respirators will be issued only to personnel who have been certified by a physician as being physically capable of wearing a respirator. Personnel unable to pass a respiratory fit test or without medical clearance for respirator use will not be permitted to enter or work in areas on site that require respirator protection. Employees must receive a written physicians opinion that they are fit for general hazardous waste operations as per 29 CFR 1910.120(f)(7).

5.11 Site Specific Respiratory Protection Program

The primary objective of respiratory protection is to prevent exposure to the workers. When engineering measures to control exposure are not feasible, or while they are being implemented, respiratory protection will be used.

The criteria for determining respirator need are presented in Section 7.0 of this HASP. The respirator cartridges to be used at the Site (if necessary) will protect employees from the hazardous substances specific to the Site. Respirator users are OSHA trained in proper respirator use and will monitor air levels of contaminants to ensure that respiratory protection is sufficient.

6.0 DECONTAMINATION PROCEDURES

This section describes the procedures necessary to ensure that both personnel and equipment are free from contamination when they leave designated work areas at the Site.

6.1 Personnel Decontamination

Decontamination procedures will ensure that material workers may have contacted in the EZ does not result in personal exposure and is not spread to clean areas of the Site. The sequence below describes the general decontamination procedure. The specific stages will vary depending on the Site, the task, the protection level, etc.

1. Go to end of EZ
2. Wash outer boots and gloves in detergent solution
3. Rinse outer boots and gloves in clean water
4. Remove outer boots and let dry
5. Remove outer gloves and let dry
6. Cross into CRZ
7. Remove booties and discard
8. Remove Tyvek suit and discard
9. Remove and wash respirator
10. Rinse respirator and hang to dry
11. Remove sample gloves and discard

NOTE: These decontamination procedures may be modified based on recommendations from the SSO or SS.

6.1.1 Personal Hygiene

Wash hands, arms, neck and face before any eating, smoking, or drinking,.

6.2 Equipment Decontamination

Contaminated equipment must be decontaminated before leaving the Site. Decontamination procedures will vary depending upon the contaminant involved, but may include sweeping, wiping, scraping, hosing, or steam cleaning. Personnel performing this task will wear the proper PPE as prescribed by the SSO.

6.3 Disposal

Liquids and disposable clothing will be treated as contaminated waste and disposed of in accordance with applicable regulations.

7.0 AIR MONITORING

During fieldwork activities resulting in soils disturbance, air monitoring will be conducted to determine airborne contaminant levels. This determination will verify that respiratory protection is adequate to protect personnel against the chemicals being encountered and may indicate whether chemical contaminants are migrating off-site. The following air monitoring efforts will be taken at the Site. Additional air monitoring may be conducted at the discretion of the SSO.

The following chart describes the direct reading instrumentation that will be utilized, the action levels and appropriate actions.

Monitoring Device	Action Level	Action
LEL/0_2 - Gastec 1939OX	>10% LEL <19.5% 0_2	Evacuate area, ventilate, upgrade to Level B if necessary, continue to monitor
PID - Photovac MicroTip HL-2000 with 10.6 eV lamp FID - Century OVA Model 128GC	1-19 ppm unknowns	Workers in Level C and monitor air for vinyl chloride, chromic acid, hydrochloric acid and phosgene gas using Draeger Indicator Tubes. Depending upon monitoring results, continue with Level C or downgrade to Modified Level D.
	1-500 ppm unknowns	Level C
	500-1000 ppm unknowns	Level B
	>1000 ppm unknowns	Level A

7.1 Lower Explosive Limit/Oxygen (LEL/0_2) Meter

The installation of the groundwater treatment system and associated piping may involve welding or other high heat-producing activities. If high heat-producing equipment is used during the extraction/treatment system installation, a potential exists for the decomposition of existing chlorinated solvent vapors. This decomposition can produce potentially toxic levels of hydrochloric acid or phosgene gas. In order to reduce the potential exposure to these decomposition products, solvent vapor monitoring will be conducted prior to any heat-producing activities. If solvent vapor concentrations greater than 1.0 ppm are detected prior to heat-producing activities, monitoring for hydrochloric acid and phosgene gas will be conducted using Draeger Indicator Tubes. In addition, prior to performing high heat-producing operations where flammable or combustible vapors may be present, LEL/0_2 measurements will be taken and recorded.

7.2 On-site Air Monitoring Program

A PID and/or FID will be used to monitor VOCs in the air. The SSO will take measurements in multiple areas to determine background levels of VOCs. Levels of VOCs will be measured in the EZ at least once every hour, and at the support zone once every hour when levels are detected above background in the EZ.

In order to determine a protection level from PID/FID data for known contaminants, the SSO will multiply the TLV of the known compound times the PID/FID reading. If PID/FID readings exceed 25 times the TLV, Level B protection will be required. [Note: PID and FID readings do not always indicate the actual air concentration of a compound. Consult users manual or the HSS for clarification.] Also, Draeger Tubes, if available, will be used to monitor for select chemicals with PELs of 1 ppm or lower.

7.3 Community Air Monitoring Program

The purpose of the Community Air Monitoring Program is to protect the general public from exposure to volatile organic compounds and/or particulates. Where possible, interior site activities resulting in soils disturbance will be completed on the weekends, during off-business hours, or in areas of the buildings where tenants are not working in order to minimize the potential for VOCs to impact building tenants

7.3.1 Vapor Emission Response Plan

VOCs will be monitored at the downwind perimeter of the work area. For interior work, VOCs will be monitored continuously at the EZ and CRZ. For exterior work, VOCs will be monitored in two-hour intervals at the EZ and CRZ.

Work Area	Action Level	Action
Inside	5ppm above background	Stop work, continue monitoring. If levels decrease below 5 ppm below background, resume work.
	5 ppm above background but below 25 ppm above background	Ventilate work area to reduce VOC vapor levels.
	25 ppm above background	Stop work activities, implement engineering controls.
Outside	5ppm above background	Stop work, continue monitoring. If levels decrease below 5 ppm below background, resume work
	5 ppm above background but below 25 ppm above background	Monitor 200 ft downwind of the work area or half the distance to then nearest residential or commercial structure, which ever is less. If level decrease below 5 ppm above background, resume work.
	25 ppm above background	Stop work activities, implement engineering controls.

If work shutdown occurs, implement downwind air monitoring as directed by the SSO to ensure the VOC emissions do not impact the building tenants or the nearest residential or commercial structure at levels exceeding those specified in the Major Vapor Emission (Section 7.3.2) described below.

7.3.2 Major Vapor Emission

If any VOC levels greater than 5 ppm above background are identified 200 feet downwind from the work area, half the distance to the nearest residential or commercial structure, or in areas in the immediate vicinity where tenants may be exposed, work activities will be discontinued. If VOC levels persist above 5 ppm above background following work stoppage, the air quality will be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20 foot zone), or in areas in the immediate vicinity where tenants are working. Efforts will be made to stop emissions. If efforts to abate the emission source are unsuccessful, and if VOC levels of 5 ppm above background or greater persist for more than 30 minutes in the 20 foot zone, then the Major Emission Response Plan described below will be in effect. If VOC vapor levels greater than 10 ppm above background are measured 200 feet downwind from the work area or half the distance to the nearest residential or commercial structure, whichever is less, the Major Emission Response Plan will be in effect.

7.3.3 Major Emission Response Plan

Upon activation, by condition described above, the following activities will be undertaken:

1. All personnel will mobilize to an upwind location.

2. Local police and medical response personnel will be contacted by the SSO and will be advised of the situation.

3. Air monitoring will be conducted at 30 minute intervals within the 20 foot zone. If two successive readings below action levels are measured, the air monitoring may be halted or modified by the SSO.

7.3.4 Particulate Monitoring

Major excavation activities that could result in particulate releases will not be performed as part of the remedial construction/monitoring, so particulate monitoring is not anticipated at this time. However, if major excavation activities become required, or if noticeable particulate/dust generation is observed, real-time air monitoring for particulates will be initiated in accordance with the Community Air Monitoring Program developed for the Site.

7.4 Integrated Air Sampling

Integrated air sampling is not scheduled to be performed during this project, however, it may be performed based on Site conditions as designated by the SSO and SS.

7.5 Air Monitoring Log

Air-monitoring data will be logged in a waterproof, bound fieldbook. Data will include instrument used, wind direction, work process, instrument readings, calibration, etc.

7.6 Calibration Requirements

The PID, FID, LEL/O_2 meter, and any sampling pumps required with fixed-media air sampling will be calibrated daily prior to use. The information detailing the date, time span, gas or other standard, and name of person performing the calibration, will be recorded in the air monitoring log.

7.7 Air Monitoring Results

Air monitoring results may be discussed during morning safety meetings.

8.0 EMERGENCY RESPONSE

The SS and SSO will plan emergency egress routes and discuss them with field personnel prior to field activities.

8.1 Emergency Services

A rapid and clear distress communication system will be developed prior to project startup. Concise, clear directions and accessible transportation to local emergency services will be provided to Site personnel.

The following emergency equipment will be maintained on the Site:

- Fire extinguishers
- First-aid kit
- Eye wash bottles

8.2 Communication

Each member of the site entry team must be able to communicate with at least one other entry team member at all times. The following methods of communication are acceptable:

- Sound (air horn)
- Electronic (radio, bull horn)
- Visual (hand signals)

The following hand signals must be understood by personnel regardless of other means of communication:

- Hand gripping throat--**Out of air, cannot breath**
- Hands on top of head--**Need assistance**
- Thumbs up--**OK, I'm alright, I understand**
- Thumbs down--**No, negative**
- Gripping partner's wrist, or gripping both hands on wrist--**Leave area immediately**

8.3 Emergency Evacuation From Exclusion and Contamination-Reduction Zones

Any personnel requiring emergency medical attention will be evacuated immediately from EZ and CRZ. Personnel will not enter the area to attempt to rescue if their well-being is threatened. The SS and SSO decision whether or not to decontaminate a victim prior to evacuation is based on the type and severity of the injury and the nature of the contaminant.

If decontamination cannot be performed because it may aggravate the injury or delay life-saving treatment, the emergency response personnel will:

- Wrap the victim in blankets or plastic to reduce contamination of other personnel and emergency vehicles.
- Alert emergency and medical personnel of potential contamination; instruct them about specific decontamination procedures.
- Send site personnel familiar with the incident to the hospital with the victim.

8.4 First Aid

Only qualified personnel will administer first aid and stabilize an individual needing assistance. Obtain professional medical assistance will be at the earliest possible opportunity.

To provide first-line assistance to field personnel in the case of illness or injury, the following items will be made immediately available:

- First-aid kit
- Portable emergency eye wash
- Supply of clean water

8.5 Emergency Actions

If actual or suspected serious injury occurs, these steps will be followed:

- Check area before entering.
- Remove the exposed or injured person(s) from immediate danger.
- Render first aid if necessary. Decontaminate affected personnel after critical first aid is given.
- Obtain transport to local hospital.
- Other personnel in the work area will be evacuated to a safe distance until the site supervisor determines that it is safe for work to resume. If there is any doubt regarding the condition of the area, work will not commence until all hazard-control issues are resolved.
- Notify client of incident.

8.6 General Evacuation Plan

In general case of a large fire, explosion, or toxic vapor release will follow these steps:

- Sound the agreed upon alarm and advise client representative.

- Evaluate the immediate situation and downwind direction. Personnel will evacuate in the upwind direction.

8.7 Emergency Telephone Numbers

Fire Department:	911 (428-6739)
Police Department:	911 (428-6501)
Poison Control Center:	275-5151
NYSDEC Spills:	226-2466
NYSDOH:	
Melissa Menetti	(518) 402-7860
MCDOH:	
Joseph Albert	274-6904
After Hours	529-0756
Hospital:	Strong Memorial Hospital 601 Elmwood Ave. Phone 911 or 275-2100
Emergency Dept.	275-4551

Directions to the Hospital:

- Turn north on Mt. Read Boulevard;
- Merge onto I-390 South;
- Left onto NY-383/Scottsville Road;
- Stay straight onto Elmwood Ave.
- Hospital is on right (South) side of road

9.0 TRAINING REQUIREMENTS

As a prerequisite to employment at DAY, field employees are required to complete a 40-hour training class. This training covers personal protective equipment, toxicological effects of various chemicals, handling of unknown tanks and drums, confined-space entry procedures, and electrical safety. This course is in compliance with OSHA requirements in 29 CFR 1910.120. In addition, employees receive annual 8-hour refresher training, and supervisory personnel receive an additional 8-hour training in handling hazardous waste operations.

Site personnel utilized for completion of remedial management activities will be required to review and be knowledgeable of the provisions of this HASP.

10.0 MEDICAL SURVEILLANCE PROGRAM

DAY personnel participate in a medical and health-monitoring program. This program is initiated when the employee starts work with a complete physical and medical history and is continued on a regular basis. A listing of DAY's worker medical profile is shown below. This program was developed in conjunction with a consultant physician. Other medical consultants are retained when additional expertise is required.

The medical surveillance program meets the requirements of the OSHA Standard 29 CFR 1910.120(f).

TABLE 10.1

WORKER MEDICAL PROFILE

ITEM	INITIAL	ANNUAL
Medical History	X	X
Work History	X	X
Visual Acuity	X	*
Pulmonary Function Tests	X	X
Physical Examination	X	X
Audiometry Tests	X	*
Chest X-Ray	X	*
Complete Blood Counts	X	X
Blood Chem. (SSAC-23 or equivalent)	X	X
Urinalysis ("Dip" Only)	X	X
Dermatology Examination (As part of exam; not by a specialist)	X	X
Electrocardiogram/Stress Test	X	*

*Recommended every 3 years unless medically required.

10.1 Examination Schedule

Employees are examined initially upon start of employment, annually thereafter, and may be examined upon termination of employment. Unscheduled medical examinations are conducted:

- At employee request after known or suspected exposure to toxic or hazardous materials.
- At the discretion of the client, the HSS, SSO, or occupational physician after known or suspected exposure to toxic or hazardous materials.
- At the discretion of the occupational physician.

Nonscheduled medical examinations will include, as a minimum, all items specified above for periodic surveillance examination, with the exception of the chest X-ray, which will be conducted at the discretion of the occupational physician performing the examination.