Miller Duva Operation and Maintenance Manual

General Electric Company
Town of Clay, New York

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BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

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1. Introduction

1.1 General

This document presents the Operations and Maintenance (O&M) Manual for the Miller/Duva Inactive Hazardous Waste Site (the site) Groundwater Treatment System (treatment system) located at 4958 West Taft Road in the Town of Clay, New York (Site Plan – Record Drawings). This O&M Manual provides information regarding the treatment system components, operation and maintenance, startup and shutdown procedures, information management procedures, sampling and analysis requirements, laboratory requirements, termination criteria, management of change procedure, training and awareness requirements, health and safety requirements, emergency response procedures, and waste management requirements. The purpose of this O&M Manual is to act as a guide and reference for the proper O&M of the treatment system by site operating personnel.

1.2 Site History and Description

The site is currently listed on the New York State Department of Environmental Conservation's (NYSDEC's) Registry of Inactive Hazardous Waste Disposal Sites (Site No. 07-34-051) as a Class 4 site. A Remedial Investigation/Feasibility Study (RI/FS) program was completed for the site in 1992 and a Record of Decision (ROD), dated March 1993, was prepared and issued by the NYSDEC. The ROD identified the remedial action plan for the site that includes the following:

- Continued operation, maintenance, and monitoring of the existing groundwater treatment system;
- Continued operation, maintenance and monitoring of the indoor containment migration system;
- Implementation of a dual in-situ soil vapor/groundwater extraction system;
- Installation of a permanent impermeable cover over the remedial area;
- Development and implementation of long-term land use restrictions; and
- Monitoring and evaluation of the effectiveness of the installed remedy.

Site work is being conducted pursuant to an Order on Consent (Index # A7-0225-90-03 located in Appendix A) entered into between the NYSDEC and the respondents: General Electric Company (GE) and the Estate of Peter Duva and Donald W. Miller, Inc.

A groundwater collection and treatment system is currently operated at the site. The groundwater collection and treatment system provides on-site hydraulic containment by pumping and treating volatile organic compound (VOC) –impacted groundwater from the following site areas: the downgradient collection trench (including four residential sump pumps), the upgradient collection trench, and a portion of the site known as Area 3.

A dual-phase In-Situ Soil Vapor Extraction (ISVE) system was installed and began operation on site in 1994. The ISVE system generally consisted of a series of 12 combination vent/extraction trenches, a vacuum blower system, a vapor-phase carbon treatment system, and an impermeable cover installed over a portion of the site to

mitigate surface-water infiltration and short-circuiting of the system. During operation, groundwater (condensate) removed by the ISVE system was conveyed to and treated in the groundwater treatment system. In September 1997, operation of the ISVE system was terminated. ISVE system shut down procedures and associated verification soil sampling activities are presented in the 1997 annual report. In September 1999, NYSDEC approved the final shutdown and disassembly of the ISVE System. Finally, in May 2000, the ISVE system blowers, motor starters, variable frequency drives, and heat exchanger were dismantled, cleaned and disposed as scrap off-site. The ISVE system vapor-phase carbon, condensate knock out pot, and condensate transfer pump were left on-site for potential re-use during future site remediation activities.

In April 2000, the Onondaga County Health Department approved GE's request to terminate air handling unit operations at the four adjacent residences. In the fourth quarter of 2000, three of four residential air handling systems were dismantled. The remaining system was dismantled in October 2001.

1.3 O&M Manual Organization

This O&M Manual is organized into the following sections:

- Section 1 - presents the introduction and relevant facility background information;
- Section 2 - presents a description of the treatment system process and components;
- Section 3 - presents information regarding system operation and maintenance;
- Section 4 - presents information regarding treatment system startup/testing and shutdown;
- Section 5 - presents information management procedures;
- Section 6 - presents sampling and analysis activities to be conducted during operation of the treatment system;
- Section 7 - presents laboratory requirements;
- Section 8 – presents site termination criteria;
- Section 9 – presents management of change procedures;
- Section 10 – presents site training requirements;
- Section 11 – presents information regarding health and safety procedures to be followed during operation of the treatment system;
- Section 12 – emergency response procedures to be followed during the operation of the treatment system;
- Section 13 – waste management requirement; and
- Section 14 – presents all references for the O&M Manual.

2. Treatment System Process and Components

2.1 General

Groundwater is pumped from the downgradient collection sump (including the four residential sump pumps), upgradient collection sump, and Area 3 directly to the on site treatment system. The major treatment system components include three influent coagulation/flocculation tanks (equipped with a polymer addition system), a bag filter system, and a granular activated carbon (GAC) system. The treatment system is designed to run automatically with minimal operator attention. This section provides a description of the treatment system equipment, its operation, and control.

2.2 Treatment System Overview

The treatment system is located in a 20'0" x 35'-0" treatment building located at the northern section of the site. Groundwater is collected from the following site areas: the downgradient collection trench, the upgradient collection trench, and a portion of the site known as Area 3. The upgradient collection trench intercepts groundwater migrating onto the site while the downgradient trench intercepts potentially impacted groundwater prior to migrating off site. The upgradient collection trench was designed to reduce groundwater migration into the ISVE area and initially intended to discharge directly to the storm sewer. However, due to the presence of VOCs in the groundwater (which were detected during startup), effluent from the upgradient collection trench is temporarily being directed into the groundwater treatment system. Area 3, located on the eastern portion of the site, includes a groundwater extraction well which collects groundwater and standing surface water within a perforated polyvinyl chloride (PVC) standpipe. In addition, four adjacent residences are currently retrofitted with sump pump systems that are maintained and monitored as necessary. Effluent from each of these sump pumps is directed to the groundwater treatment system via the downgradient collection manhole.

Groundwater entering the treatment system is directed to the influent coagulation/flocculation tanks where an emulsion polymer is added to facilitate coagulation of fine particles and precipitated organics. From the influent settling tanks, groundwater gravity discharges to a subterranean holding sump located just outside the treatment building. Self-priming centrifugal pumps, located in the treatment building, are used to pump water out of the sump and through the remainder of the treatment system. Groundwater from the self-priming pumps first passes through the primary duplex bag filter system for the removal of larger flocculated iron and sediment particles. Following treatment through the primary bag filter system, the groundwater passes through a secondary duplex bag filter system for the removal of smaller sediment and inorganic floc. Following solids removal, the groundwater flows to a manifold where it is split into four parallel lines. Each line delivers flow through a series of three (3) 55-gallon canisters of GAC for the removal of VOCs. Treated water from the carbon canisters discharges into a 4-inch PVC drain line which flows by gravity to a storm sewer which is a tributary to Bloody Brook (East Branch).

A more detailed description of individual treatment system components is presented in sections 2.3 through 2.11 and manufacturers cut sheets are in Appendix B. As-built record drawings of the groundwater collection and treatment system are included in the Record Drawings section of this O&M manual.

2.3 Downgradient Collection Trench

The downgradient collection trench is a 360-foot long groundwater interception drain located at the southern portion of the site. Its purpose is to intercept groundwater flow beneath the site and transport it to the collection trench manhole. The trench consists of a 6-inch high-density polyethylene (HDPE) perforate pipe surrounded by crushed stone, filter fabric and fine gravel. Groundwater collected by the trench flows by gravity to the collection trench manhole. The manhole is a 42-inch-diameter concrete structure fitted with two submersible pumps. In addition to flow from the trench, the manhole receives flow from four home sump pumps (5020, 5022, 5024, 5026 Platinum Drive). The submersible pumps deliver groundwater to the treatment system via a 3-inch-diameter HDPE force main. The downgradient manhole discharge line is equipped with a flow meter capable of reading instantaneous and totalized flows at the treatment building. Flow to the treatment system is regulated via a manual control valve on the force main within the treatment building.

Control of the submersible pumps is through an electric control panel within the treatment building. The pumps can be operated manually by turning one or both pumps to the HAND position or automatically by setting the pumps on AUTO. The pumps are identified as Pump No. 1 and Pump No. 2 on the control panel and alternate lead/lag position after each pumping cycle. The collection manhole is equipped with four level switches that initiate pump operations and signal alarm conditions. The corresponding control/alarm logic for the downgradient manhole pumps is as follows:

Control/Alarm Description		
Alarm	**Loop ID**	**Corresponding Action**
Downgradient Manhole Low Level	LSL	Turn off pumps.
Downgradient Manhole High Level-One	LSH1	Turn on lead pump.
Downgradient Manhole High- Level-Two	LSH2	Turn on lag pump.
Downgradient Manhole High-High Level	LAH	Signal alarm at Control Panel and activate autodialer.

The following is a summary of equipment and instrumentation specifications associated with the downgradient collection trench

Major Equipment Specifications

Submersible Pumps

Quantity:	2
Manufacturer:	Hydromatic
Type:	Submersible
Model:	S3HVX
Flow Rate:	40 gpm @ 65' TDH
Motor	5 hp, 208 volt, three-phase, explosion proof
Material of Construction:	Cast Iron

Manhole Level Switches

Quantity:	4
Manufacturer:	Gems
Type:	Float-type, magnetic switch

Flow Meter

Quantity:	1
Manufacturer:	Kent
Type:	Cold water turbine
Model:	95712569 (3" –4")

2.4 Upgradient Collection Trench

The upgradient collection trench is a 340-foot long trench located along the northern boundary of the site. The upgradient collection trench intercepts groundwater entering the site from the north. The trench consists of a 6-inch HDPE perforate pipe surrounded by crushed stone, filter fabric and fine gravel. Groundwater collected by the trench flows by gravity to the upgradient collection trench manhole. The manhole is a 48-inch-diameter precast concrete structure fitted with one submersible pump. The submersible pump delivers groundwater to the treatment system via a 2-inch-diameter HDPE force main. The upgradient manhole force main is equipped with a flow meter capable of reading instantaneous and totalized flows at the treatment building. Flow to the treatment system is regulated via a manual control valve on the force main within the treatment building.

Control of the submersible pump is through an electric control panel within the treatment building. The pump can be operated manually by turning to the HAND position or automatically by setting the pump on AUTO. The collection manhole is equipped with two level switches that initiate pump operation. The corresponding control/alarm logic for the upgradient manhole pump is as follows:

Control/Alarm Description		
Alarm	**Loop ID**	**Corresponding Action**
Upgradient Manhole Low-Level	LSL	Turn off pump
Upgradient Manhole High-Level	LSH	Turn on pump.

The following is a summary of equipment and instrumentation specifications associated with the upgradient collection trench.

Major Equipment Specifications

Submersible Pumps

Quantity:	1
Manufacturer:	Goulds
Model:	WS1032BF-3885
Type:	Submersible sewage pump
Flow Rate:	76 gpm @ 25' TDH
Motor	1 hp, 208 volt, three-phase, explosion proof
Material of Construction:	Cast Iron

Manhole Level Switches

Quantity:	2
Manufacturer:	Conery
Type:	Float-type, magnetic switch

Flow Meter

Quantity:	1
Manufacturer:	Kent
Type:	Cold water turbine
Model:	95712557 (2")

2.5 Area 3 Well Pump

The Area 3 hydraulic containment system consists of a single 4-inch-diameter, 7'-6" deep well with an electric submersible pump. The submersible pump delivers groundwater to the treatment system via a 1-inch-diameter HDPE carrier pipe within a 4-inch-diameter HDPE containment pipe. The discharge pipe is double contained because it was installed above the impermeable membrane cover. Flow to the treatment system is regulated via a manual control valve on the force main within the treatment building.

The pump is controlled by a Franklin Pumptec pump protector that turns off the pump if the well pump is empty (determined by amp draw).

The following is a summary of equipment and instrumentation specifications associated with the Area 3 well pump.

Major Equipment Specifications

Submersible Well Pump

Quantity:	1
Manufacturer:	Franklin Series
Model:	2445049004
Type:	Two wire submersible pump
Motor	1/2 hp, 3450 rpm, 120 volt, 10 amps
Material of Construction:	Cast Iron

2.6 Influent Coagulation/Flocculation Tanks

Groundwater is pumped from the downgradient collection manhole, upgradient collection manhole, and Area 3 to the treatment building and discharged to the first of three settling tanks in series. These tanks are used for the addition and mixing of an emulsion polymer to facilitate the removal of inorganics and sediment. The emulsion polymer is added to the incoming groundwater via a metering pump. The metering pump operates in sequence with the downgradient manhole, upgradient manhole, and Area 3 submersible pumps via the control panel. The primary tank is equipped with a variable speed mixer to accommodate flash mixing of the polymer at the tank. The addition of polymer facilitates coagulation of fine particles and precipitated organics. The effluent from the primary tank gravity discharges to the secondary tank, which is equipped with a slow mixer. Slow mixing in the secondary tank provides ample agitation for coagulated floc to grow into larger particles. From the secondary tank, the groundwater overflows to the final tank for settling as needed. Finally, the effluent from the final tank overflows to a holding sump located adjacent to the treatment building.

The corresponding control/alarm logic for the influent coagulation/flocculation tanks is as follows:

Control/Alarm Description		
Alarm	**Loop ID**	**Corresponding Action**
Downgradient, Upgradient, Area 3 Submersible Pumps On		Turn on polymer metering pump
Downgradient, Upgradient, Area 3 Submersible Pumps Off		Turn off polymer metering pump

The following is a summary of equipment and instrumentation specifications associated with the coagulation/flocculation tanks.

Major Equipment Specifications

Coagulation/Flocculation Tanks

Quantity:	3
Manufacturer:	Nalgene
Type:	Flat bottom, open top with flat lid
Dimensions:	4'-0" Ø x 4'0" high
Volume:	360 gallons
Material of Construction:	Polyethylene

Mixers

Quantity:	2
Manufacturer:	Lightnin
Type:	Worm Gear
Model:	XJ-33VM
Material of Construction:	304 Stainless Steel (Shaft)

Polymer Feed Pump

Quantity:	1
Manufacturer:	LMI
Type:	Electronic Diaphragm Metering Pump
Model:	2141-151
Capacity:	5 gallons per day (gpd)

2.7 Holding Sump and Self-Priming Pumps

The holding sump, located just outside the treatment building, is a 42-inch-diameter, 6'-9" deep concrete manhole designed to hold flow from the influent coagulation/flocculation tanks prior to filtration. A second 4-inch line from the treatment building floor drain also discharges into this sump. Self-priming centrifugal pumps are used to pump water out of the sump and through the remainder of the treatment process.

Control of the self-priming pumps is through an electric control panel located in the treatment building above the pumps. The pumps can be operated manually by turning one or both pumps to the HAND position or automatically by setting the pumps on AUTO. The pumps are identified as Pump No. 1 and Pump No. 2 on the control panel and alternate lead/lag position after each pumping cycle. The holding sump is equipped with four level switches that initiate pump operations and signal alarm conditions. The corresponding control/alarm logic for the self-priming pumps is as follows:

Control/Alarm Description		
Alarm	**Loop ID**	**Corresponding Action**
Holding Sump Low Level	LSL	Turn off pumps.
Holding Sump High Level-One	LSH1	Turn on lead pump.
Holding Sump High- Level-Two	LSH2	Turn on lag pump
Holding Sump High-High Level	LAH	Signal alarm at Control Panel, turn off downgradient manhole pumps, upgradient manhole pumps, Area 3 submersible pump, and activate autodialer.

The following is a summary of equipment and instrumentation specifications associated with the holding sump and self-priming pumps:

Major Equipment Specifications

Holding Sump

Quantity: 1
Dimensions: 42-inch-diameter x 6'-9" deep
Capacity: 485 gallons
Material of Construction: Precast concrete

Self-Priming Pumps

Quantity: 2
Manufacturer: Burks Pumps
Type: Self-Priming Centrifugal
Model: Burks T330WA6-ME-AI
Flow Rate: 36 gpm @ 120-feet TDH
Electrical: 3 hp, 208 volt, three phase, TEFC
Material of Construction: Cast Iron

Holding Sump Level Switches

Quantity: 4
Manufacturer: GEMS
Type: Mercury Float Switches
Safe Pak Model: 64101

2.8 Solids Removal System

Groundwater from the self-priming pumps first passes through the primary duplex filter housing containing 35 micron bag filters. These filters (1 filter within each of the two canisters) provide removal of larger flocculated iron and sediment particles. Each canister on the housing is fitted with a pressure gauge. These gauges are used to monitor influent pressure to the filters. Following treatment through the primary filters, groundwater passes through the secondary duplex filter housing. This housing (identical to the primary) contains 9 micron filter bags designed to remove smaller sediment and inorganic floc. Each canister on the secondary housing is also fitted with a pressure gauge. These gauges are used to monitor the influent pressure to the secondary filters and provide a means of determining pressure drop through the primary filters. The discharge line of the secondary filter is fitted with an in-line pressure gauge allowing for determination of pressure drop across the secondary filters.

The following is a summary of equipment and instrumentation specifications associated with the solids removal system:

Major Equipment Specifications

Primary Duplex Filter Housing

Quantity:	1
Manufacturer:	Filtration Systems
Model:	S-223
Capacity:	50 gpm
Material of Construction:	Carbon Steel
Filters:	3M Series 529A 35 micron

Secondary Duplex Filter Housing

Quantity:	1
Manufacturer:	Filtration Systems
Model:	S-223
Capacity:	50 gpm
Material of Construction:	Carbon Steel
Filters:	3M Series 527A 9 micron

Pressure Gauges

Quantity:	5
Manufacturer:	Coil Hose Pneumatics
Model:	GB16200

2.9 GAC System

Following solids removal, groundwater flows to a manifold where it is split into four separate lines. Each line delivers flow through a series of three 200 pound carbon canisters to remove VOCs. Flow through each line is measured by a paddle wheel flow meter. Each of the four carbon trains is designed to handle a maximum flow of 10 gallons per minute (gpm). Treated groundwater from the carbon canisters discharge into a 4-inch-diameter PVC drain line and flows by gravity to a storm sewer manhole located south of the site.

The following is a summary of equipment and instrumentation specifications associated with the GAC system.

Major Equipment Specifications

GAC Canisters

Quantity:	12
Type:	55-gallon steel drum
Model:	Calgon Flowsorb F11164
Dimensions:	24" Ø x 2'-10" High
Capacity:	200 pounds of carbon
Material of Construction:	Epoxy-coated carbon steel
Residence Time:	16.5 minutes per train
Surface Loading:	3.17 gpm/ft^2

Flow Meters

Quantity:	4
Manufacturer:	Signet
Type:	Paddle wheel – Instantaneous and Totalized
Model:	NDP-50-BAN

2.10 Secondary Containment System

All bulk/drummed liquids (polymer drums, undrained GAC canisters) and treatment system equipment are located within a 6-inch concrete containment berm inside the treatment building. This berm wall provides 200% containment of the largest tank in the treatment building (360 gallons). Further, any liquids that spill or collect on the treatment building floor drain to a 4-inch-diameter floor drain located at the center of the building. The floor drain discharges to the 485 gallon holding sump. In the event that liquids continue to accumulate on the treatment building floor, a level switch, located 2-inches above the treatment system floor, will be triggered. The control/alarm logic for the level switch is as follows:

Control/Alarm Description		
Alarm	**Loop ID**	**Corresponding Action**
Containment Berm High Level	LAH	Signal alarm at Control Panel, turn off downgradient manhole pumps, upgradient manhole pumps, Area 3 submersible pump, and self-priming pumps, and activate autodialer

The following is a summary of instrumentation specifications associated with containment area.

Major Equipment Specifications

High Level Switch

Quantity: 1
Manufacturer: GEMS
Type: Mercury Float Switches
Safe Pak Model: 64101

2.11 Autodialer and Security System

The treatment building security and alarm system consists of Safewatch Plus Entrepreneur Security System provided by ADT Security Systems (ADT). Upon the event of unauthorized entry into the treatment building or process system failure, the security system autodialer will call predetermined personnel.

The personnel priority list can be found in the Contingency and Emergency Procedures Plan (CEPP) located in Appendix C. ADT will call down the list of personnel until they have made phone contact with that person. Once an alarm has been recognized the proper procedure as outlined in Table 3 shall be followed. The alarm system should be tested a minimum of two times per year.

3. Operation and Maintenance

3.1 General

The treatment system is designed to operate automatically, with minimal on-site operator attention. BBL Environmental Services, Inc. (BBLES) is currently the Operator responsible for operating and maintaining the system. Site personnel are available 24 hours per day (via the system autodialer) to respond to the operational needs and alarm conditions of the treatment system. If assistance is needed beyond that which is provided in this O&M Manual, Table 1 provides the names and phone numbers for project contacts.

The treatment system is designed to operate in compliance with the established discharge limitations referenced Table 2. This section describes detailed activities required for proper O&M of the treatment system.

OPERATION AND MAINTENANCE ACTIVITIES ARE TO BE PERFORMED IN ACCORDANCE WITH THE SITE HEALTH AND SAFETY PLAN (SEE SECTION 11)

3.2 Alarm Response

The site operator is responsible for responding to alarms associated with the treatment system. A summary of potential alarm response actions is located in Table 3. The site operator can check the alarm and current conditions at the at the site local control panel or via the security system company (ADT) through the autodialer.

The system is equipped with interlocks to prevent upset conditions (i.e., high well level, high sump level, etc.) Record Drawing 2 (Record Drawings) provides a list of system interlocks.

3.3 System Monitoring

The operation of the treatment system is monitored to ensure that the systems are operating within design specifications and to obtain data that will be used if modifications to the system are required to make it operate more efficiently. This subsection describes the general treatment system monitoring requirements. Routine sampling and analysis activities to be conducted during operation of the treatment system are discussed in Section 6.0 of this O&M Manual.

3.3.1 Weekly Monitoring

Operating personnel fill out a Weekly Site Inspection Report (Appendix D – Monitoring Logs/Reports) once per week. Weekly site monitoring activities include the following items:

1. General Housekeeping

- Inspect treatment building and surrounding facilities. Verify that grounds are free of clutter/hazards; security fence and gates are in good condition; access road is in good condition and free of snow; surface drainage is adequate; building lights and heater is operational condition; and phone/security system are operational.

- Observe treatment system components during normal operation, and check for leaks, unusual noises, or general indication of poor performance; check centrifugal pumps for seal leaks, cavitation, or other abnormal conditions.

- Record the number of non-hazardous (bag filters, general site waste) and hazardous (carbon canisters) drums on site. Verify that each drum is in good working condition.

2. Downgradient Manhole, Upgradient Manhole, and Area 3

- Check all collection manhole floats. This requires pulling the collection manhole cover and visually verifying that each float is free and not hung up on piping, etc. Attempts should be made to free tangled floats from outside the manhole prior to resorting to entering the manhole. **Please note that all manholes are considered CONFINED SPACE. Entry must comply with Occupational Safety and Health Administration (OSHA) regulations. Refer to the current Health and Safety Plan (HASP) (Section 11). Under no condition is an individual to enter the manhole without confined space entry permit and proper training.**

- Check operation of all submersible pumps by turning each pump to the HAND position at the respective control panel (one at a time). After testing each pump, turn each pump back to the AUTO position to prevent pumps from pumping dry.

- Check water level in upgradient and downgradient manholes. If level is above the trench influent pipe, the operator may be required to open the respective manual control valves in the building necessary to increase respective pumping rates. These valves should not require regular adjustment, however, adjustment may be necessary to accommodate seasonal changes of flow into the respective trenches.

- Record totalized flows at the downgradient flow meter and upgradient flow meter.

3. Calgon POL-E-Z 7736 Polymer Feed System

- Verify operation of polymer feed pump. The polymer feed pump operates in sequence with the downgradient, upgradient, and Area 3 submersible pumps.

- Check polymer supply (Calgon POL-E-Z 7736). Polymer supply should not be allowed to drop below 10 gallons. Determine the quantity of polymer and record it on the Weekly Site Inspection Report. If additional polymer is required, see Section 3.4.3 for instructions on how to prepare polymer solution.

4. Holding Sump and Self-Priming Pumps

- Check operation of self-priming pumps by turning each pump to the HAND position at the control panel (one at a time). After testing each pump, turn each pump back to the AUTO position to prevent pumps from pumping dry.

- Check all holding sump floats. This requires pulling the holding sump manhole cover and visually verifying that each float is free and not hung up on piping, etc. Attempts should be made to free tangled floats from outside the manhole prior to resorting to entering the manhole. **Please note that all manholes are**

considered CONFINED SPACE. Entry must comply with OSHA regulations. Refer to the current HASP (Section 11). Under no condition is an individual to enter the manhole without confined space entry permit and proper training.

5. Solids Removal System (Bag Filters)

Record the pressure readings at the inlet to each primary bag filter, at the inlet to each secondary bag filter, and at the effluent from the secondary bag filter. Refer to Subsection 3.4.5 for guidelines and requirements regarding changing bag filters.

6. GAC System

- Visually inspect carbon canisters for signs of leakage or damage. In the event a canister requires replacement, contact the site operator's project manager (Table 1). Refer to Subsection 3.4.6 for guidelines and requirements for changing out carbon canisters.

- Record the instantaneous flow, totalized flow, and inlet pressure to each carbon canister.

- Record appearance of system effluent.

3.3.2 Quarterly Monitoring

Groundwater elevations at the monitoring wells and piezometers will be monitored quarterly (February, May, August, November) in accordance with the Groundwater Level Monitoring Log (Appendix D – Monitoring Logs/Reports), Monitoring, Sampling, and Reporting Schedule (Appendix E) and the Monitoring Well Level Measurement Protocol (Appendix F – Standard Protocols):

3.3.3 Residential System Monitoring

The site operator is responsible for the residential sump maintenance and upkeep at the basements of 5020, 5022, 5024, and 5026 Platinum Drive on an as-needed basis (recommended monthly during spring/fall, and during times of snow melt) in accordance with the Residential Systems Inspection Report (Appendix D – Monitoring Logs/Reports).

Electrical meters are recorded approximately every two months at 5022 and 5026 Platinum Drive in order to determine appropriate electrical reimbursement for each resident (electricity required for sump pump and heat tape).

3.4 Maintenance

To promote proper operation of the treatment system, some routine and non-routine maintenance activities should be conducted. These activities are described in this subsection. O&M Manuals/vendor cut sheets for all equipment, system pumps, and major instrumentation is contained in Appendix B.

3.4.1 General Facility Maintenance

The site operator performs regular maintenance and upkeep on the building and facilities as required. Maintenance is to include, but is not limited to the following activities:

- Maintaining building and grounds free from clutter and /or hazards;
- Maintaining security fence and gates;
- Maintaining vegetative cover on capped areas; and
- Maintaining snow removal and upkeep of access roadway.

3.4.2 Upgradient and Downgradient Manholes

Maintenance activities are limited for these areas since it would involve confined space entry. In addition, the downgradient manhole, which intercepts (via the trench) potentially VOC-impacted groundwater before leaving the site, is equipped with an installed spare submersible pump.

However, the operator may be required to adjust the flow rate of the Downgradient and Upgradient pumps, based upon water level in the respective manholes. If water level in the manholes is above the incoming trench drain lines (high level alarm at the downgradient manhole), the operator needs to adjust the respective manual ball valves at the treatment building

3.4.3 Polymer System

If the polymer supply tank drops below 10 gallons, the site operator needs to prepare a 0.25% polymer solution per the following two step process in conjunction with the site HASP:

<u>From emulsion to 2% polymer solution</u>

- Place 10 gallons of effluent water in the 2% storage drum;
- Slowly add ½ gallon (1893 ml) of polymer emulsion and mix;
- Fill drum to 25 gallons with effluent water;
- Continue mixing for a period of 35 minutes (mixer setting No. 2)

<u>From 2% to 0.25% polymer solution</u>

- Place 25 gallons of effluent water in a drum;
- Slowly add 6 ¼ gallons of 2% polymer while mixing (mixer setting No. 2);
- Add effluent water to bring total volume to 50 gallon and mix for 30 minutes;

3.4.4 Self-Priming Pumps

Grease motor bearings once every six months.

3.4.5 Solids Removal System (Bag Filter System)

The solids removal system is designed to operate with a minimal amount of maintenance. However, the operator must routinely change out filter bags from the primary and secondary units based on pressure drop. It is recommended that the primary bag filters are changed when the pressure differential reaches 15 to 20 pounds per square inch gauge (psig) and the secondary bag filters are changed when the pressure differential reaches 10 to 15 psig.

Both primary and secondary filters are changed in the same manner. The only difference is that the primary filter is a 35 micron filter bag while the secondary filter is a 9 micron filter bag. Filters within a single housing should be change together. However, it is not necessary to change primary and secondary filters at the same time.

The following steps should be taken in changing a set of filters:

1. Turn both self-priming pumps to the OFF position at the local control panel.
2. Close valves at the bottom of the secondary filters.
3. Utilize a socket wrench to loosen bolts around the filter-housing lid.
4. Pull bag filter screen housing out and pour residual water into the first coagulation/flocculation tank.
5. Pull bag filter out of housing screen. Filters are to be handled and disposed of as non-hazardous waste in accordance with Section 13
6. Place new bag filter in screen housing.
7. Place filter housing, with new filter, into main housing and position so that bag filter is flush with top of housing.
8. Retighten bolts around the filter housing.
9. Return self-priming pumps to the AUTO position.

3.4.6 GAC System

Carbon canisters are to be replaced as dictated by quarterly analytical testing or routine visual inspection (leaks or damage to canister). Results from sampling of secondary (‘B’ position) carbon canister effluent are to be reviewed by the Project Manager. If breakthrough* of any constituents occurs, a carbon changeout is required.

A carbon changeout requires removing the primary (‘A’ position) carbon from the train, moving the secondary (‘B’ position) carbon canister to the primary (‘A’) position, moving the tertiary (‘C’ position) carbon canister to the secondary (‘B’) position, and placing a new carbon canister to the tertiary (‘C’) position.

When installing a new carbon canister, the following steps should be taken:

1. Purge air form the new canister by filling with water through the outlet. Allow to set for a period of 4-6 hours adding water to maintain the canister full.
2. Turn the self-priming pumps to the OFF position.
3. Disconnect the carbon canister to be replaced.
4. Connect the new carbon canister.
5. Cap the replaced canister and place in storage for regeneration. See Carbon Regeneration and Disposal Protocol located in Appendix F – Standard Protocols.

**** Breakthrough is defined as the condition when effluent concentration levels from the secondary carbon canister exceed discharge limitations as established in Table 2.***

3.4.7 Required Spare Parts

A list of recommended spare parts is shown in Table 4. Components critical to treatment system operation include the downgradient collection manhole pumps, the self-priming pumps, bag filter system and GAC system. Installed spares/redundancy exist for each of these critical components. The operator should keep an inventory of required spare parts as compared to Table 4 and inform the project manager when the spare parts inventory is deficient so that new parts may be ordered.

4. Startup and Shutdown Procedures

4.1 General

This section describes general procedures for treatment system startup and shutdown.

4.2 Treatment System Startup

This subsection describes the proper procedures for treatment system startup.

1. Verify all valves to the bag filter system and GAC system are open.

2. Turn the self-priming pumps to the AUTO /RESET position at the control panel located on the south wall of the treatment building. The pump should now be operational based on the level of groundwater in the holding sump.

3. Turn the influent coagulation/flocculation tank mixers to the "ON" position at the control panel located on the eastern wall of the treatment building.

4. Verify that the inlet valves to the influent coagulation/flocculation tanks from the downgradient, upgradient and Area 3 pumps are open

5. Turn the downgradient manhole pumps and upgradient manhole pump to the AUTO position at the respective control panels located at the south and north of the eastern wall in the treatment building respectively. Verify that the Area 3 breaker is in the ON position

6. Verify that the polymer addition system is energized.

7. Adjust ball valves at the influent to the carbon canister trains such that the flow rate to each train does not exceed 10 gpm. This must be done when the self-priming pumps are ON. The self-priming pumps might need to be throttled back as well to accomplish this.

4.3 Treatment System Shutdown

To stop operation of the treatment system, turn the downgradient, upgradient and Area 3 pump to the OFF position at the respective control panels. If the system is to be down for a prolonged period of time, turn the mixers, polymer pump, and submersible pumps to the OFF position at the respective control panels, and also turn the respective disconnect switches for all treatment equipment to the OFF position.

5. Information Management

5.1 General

Records are to be maintained throughout the operation of the treatment system in order to verify performance and document proper treatment system O&M. This section identifies procedures for record keeping and reporting for treatment system operations.

5.2 Record Keeping

Records for the operation of the treatment system should be maintained as described below. All operations, maintenance, monitoring, and sampling documentation should be maintained in separate files (hard copy and/or computer) and segregated by calendar weeks. In addition to the records related to operation activities described below, the following documents should be available on site:

- Site HASP; and
- O&M Manual.

5.2.1 O&M Data

The site operator is responsible for O&M of the treatment system. O&M activities, whether routine or non-routine, should be documented in an operator's daily log book and/or the Weekly Site Inspection Report (Appendix D - Monitoring Logs/Reports).

5.2.2 Sampling Data

Preliminary analytical results and final analytical data packages, including, for the latter, the associated quality assurance/quality control (QA/QC) documentation, are to be maintained in chronological order by sampling date in a sample results file. To the extent practicable, sample results should be segregated by sample location (e.g., plant influent, system effluent, etc.). Sampling results and associated QA/QC documentation should be copied as necessary; the original documents should remain in a designated sample results file. The sampling program associated with operation of the treatment system is described in Section 6.0.

5.2.3 Inspection Log Sheets

Weekly, Quarterly, and Residential Inspection Reports/Logs are maintained in chronological order in an inspection file. Examples of Inspection Reports/Logs are located in Appendix D.

5.2.4 Weekly Summary Reports

Weekly Site Inspection Reports (Appendix D) are maintained in chronological order. The weekly summary reports will be copied as necessary and the originals will remain in a designated binder. At a minimum, the weekly summary reports will include the following:

- Review of site and treatment system (equipment) conditions;
- Pressure readings across the bag filter system;
- Downgradient and upgradient totalizer readings;
- Instantaneous and totalized flow readings to each carbon train;
- Influent pressure readings to each carbon train;
- Condition of carbon canisters;
- Appearance of system effluent; and
- Inventory of waste drums.

5.2.5 Quarterly Groundwater Level Logs

Quarterly Groundwater Level Logs (Appendix D) are maintained in chronological order. The quarterly logs will be copied as necessary and the originals will remain in a designated binder. The Quarterly Groundwater Level Logs will include measurements from the well casing to the top of water (feet below well casing).

5.3 Data Reporting

Data reporting includes the Annual Operations, Monitoring and Maintenance (OMM) Report and a semi-annual Discharge Monitoring Report (DMR) submission.

5.3.1 Annual OMM Report

An OMM Report documenting the performance, operation, and monitoring activities of the previous year are sent to the NYSDEC by the end of the first quarter (March). The table of contents from the 2001 Annual OMM Report is provided in Appendix G as an example of what is required. At a minimum, the report is to include:

- Text outlining the facility operation, including alterations, modifications, down periods, etc;
- Facility Log Sheets;
- Analytical results (including laboratory reports for effluent sampling events);
- Mass removal estimates;
- Site groundwater contour maps (based on quarterly monitoring); and
- Other pertinent information.

5.3.2 DMR Reporting

Effluent sampling occurs semi-annually (June and December) as defined in the Monitoring, Sampling, and Reporting Schedule located in Appendix E. As required by the NYSDEC, results from the effluent sampling are reported to the NYSDEC using discharge monitoring report (DMR) submission forms. An example of a DMR submission is located in Appendix H. Effluent discharge limitations reported on the DMR forms are the same as shown in Table 2.

6. Sampling and Analysis

6.1 Routine Sampling and Analysis

Groundwater sampling will be conducted at the influent/effluent of the treatment plant, at three monitoring wells (MW-1, MW-3 and MW-13), and at the residential sumps in accordance with the sampling schedule shown in Table 5, Monitoring, Sampling, and Reporting Schedule (Appendix E), and the appropriate Standard Protocols (Appendix F).

Sampling and analysis are to be performed in accordance with the schedule shown in Table 5, which also identifies the respective United States Environmental Protection Agency (USEPA) procedures and bottle/preservative requirements. Table 6 lists the analytical parameters and detection limit requirements for analysis. Additional laboratory requirements (including QA/QC requirements) are located in Section 7 – Laboratory Requirements.

6.2 Non-Routine Sampling and Analysis (Sampling by Regulators)

In the event that NYSDEC requests to take a sample at the site, a site technician shall accompany the regulator and take the appropriate split-samples. Additionally, the technician shall request that a copy of the regulator's analytical results (including appropriate quality assurance documentation) be forwarded to the site operator's project manager for review and comparison.

7. Laboratory Requirements

Analysis of all samples collected at the site is to be conducted by a GE-approved laboratory. Samples from this site are to be analyzed in accordance with the appropriate methodology as follows:

- Volatiles analyzed by 8260B and metals analyzed by 6010 are to follow "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (SW846) Third Edition, Update III, December 1996, U.S. Environmental Protection Agency Office of Solid Waste; and

- Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), and Hardness are to follow 40CFR Part 136 "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act" October 26, 1984 (Federal Register) United States Environmental Protection Agency.

In addition to the methods described above, the laboratory is also required to follow the GE Corporate Purchase Agreement (CPA) Minimum Analytical Standards (Appendix I).

8. Termination Criteria

8.1 General

The following termination criteria are used to determine if and when operation of individual treatment system components is terminated.

8.2 Upgradient Collection Trench Termination Criteria

The upgradient collection trench was originally designed to reduce groundwater migration into the ISVE area and operation of the upgradient collection trench was originally intended to be discontinued when operation of the ISVE system was terminated (1997). However, GE has elected to continue operation of the upgradient collection system.

8.3 Area 3 Termination Criteria

Operation of the Area 3 groundwater containment system will be temporarily terminated when three consecutive sampling events indicate that groundwater from the extraction well meets the effluent discharge limitations (Table 2). After the well has been inoperative for a minimum of 30 days, the well will be re-sampled. If this sample fails to meet the discharge criteria (Table 2), operation will resume. Otherwise, operation of the system will be permanently terminated and all wells and piezometers in the vicinity of Area 3 will be abandoned.

8.4 Downgradient Collection Trench Termination Criteria

Operation of the downgradient collection trench will temporarily be terminated when two consecutive sampling events indicate that groundwater from the downgradient trench meets clean-up levels as identified in Table 2. This will be based on the analytical results from the downgradient trench quarterly influent samples. After the trench has been inoperative for a minimum of 30 days, the downgradient collection trench will be restarted.

Following startup, a sample of the groundwater from the downgradient collection trench will be obtained once steady state conditions are observed. Following sampling, the system will be shutdown and the sample will be analyzed against the effluent discharge limitations (Table 2). If the results indicate that the concentrations have remained below the effluent discharge limitations, then the operation of the downgradient collection trench may be permanently terminated. If the results indicate that the effluent discharge limitations have been exceeded, then the operation of the downgradient collection trench will be restarted, operated, and monitored for a minimum of six additional months at which time continued operation will be reassessed.

9. Management of Change

9.1 General

The objective of this Management of Change (MOC) procedure is to ensure that potential impacts to groundwater compliance are reviewed prior to initiating changes to the systems. The MOC exists to review changes that may affect flow, treatment capacity, residence time, and pollutant loading. The MOC procedure is intended to apply to changes in equipment, raw materials, and processing conditions, except "changes in kind" as defined below.

9.2 Procedures

The MOC procedure is initiated when a change to equipment, raw materials, or processing conditions are considered. Changes would typically be proposed by GE or site operator. When the change has been approved in concept, the site operator's project manager (PM) should complete a MOC form (Appendix J). The form is screened by the PM, and site operator's project director (PD). If the change qualifies for the MOC procedure, a series of reviews are performed to determine the potential impacts to wastewater compliance. Changes of a complex nature may require steps in the MOC to be repeated and the proposed changes modified until compliance concerns have been adequately addressed.

9.3 Initiation of MOC

The first step in the MOC procedure is to identify the need for a change in the treatment systems. After the need for a change has been identified by the PM, PD, or GE, the PM fills out the MOC form and the form is submitted for review.

9.4 Screening

The first step in the review is to check if the MOC process applies to the change. Changes that are termed "replacement in kind" are excluded from the MOC process. Replacement in kind means a replacement that satisfies the design specifications. For example, replacing a well pump with one from a different manufacturer where both pumps have the same technical specifications (flow rate, pressure, etc), piping, instrumentation, and controls would be a replacement in kind. If the change is not "replacement in kind," then the MOC review process for the change should be initiated as described below.

9.5 Engineering Review

The purpose of the engineering review is to assure that the technical basis for the change is in accordance with sound engineering practices. The engineering review will typically be provided by the PM performing the change. The engineering review should include discussion of how the change could cause a wastewater release, whether releases could be prevented or mitigated, whether the change could affect other parts of the treatment system to cause a release, and whether modifications to the design could reduce the chance of a release. The review should also consider whether the change would affect other processes at the treatment system, including

recording of data, access to electrical equipment, and other plant processes that might affect wastewater compliance. The review should consider whether the personnel involved with implementing and operating the change are adequately trained for the task. The above list is not intended to be comprehensive, and other factors specific to the change may require additional discussion. The supporting documentation for the proposed change (drawings, specifications, etc.) should be compiled by the PM and included with the MOC form. When the design and engineering of the change is considered to be reasonably complete, the change should be submitted for an operating procedure review.

9.6 Operating Procedures Review

Changes that require a MOC review may require modifications to operating procedures for the system. The MOC form and attached documentation should be reviewed by the PM, PD and GE. A good practice during reviews is to consult with workers who may be involved in implementing and operating the change and include their input in the results of the review. The purpose of the review is to insure that operating procedures continue to be appropriate when the changes have been completed. The reviewer should consider whether changes in operation might require employees or contractors whose job tasks will be affected by the change to receive additional training and written notice. The changes that may also require changing the operating procedures should be made in writing and added to the operating procedures by the PM.

9.7 Recommendations

The recommendations of the MOC review should be assessed by GE, the PM, and the PD. Recommendations should be documented on the MOC form. If the change is complex in nature, the recommendations should be reviewed by a team assembled by the PM, PD, installing contractor and GE. If the change is to be implemented, the reviewers must sign the MOC form or other document that contains the summary of the MOC review prior to initiating the change.

9.8 Pre-Startup Review

A pre-startup safety review should be conducted prior to starting the modified system. The review involves a physical inspection and technical review to ensure that the changes have been installed in accordance with the approved design standards. Any orientation or training on the modified facility, or procedures, must be completed prior to startup.

9.9 Documentation

The results of the MOC review must be documented. For most changes, this can be achieved using the MOC form. For more complex changes, an expanded format may be necessary. MOC documents are to be collected by the PM and retained for the life of the process.

10. Training and Awareness

10.1 Contractor/Operator Training

Every contractor/operator working at the site must complete the requirements established by the Site Specific Training Documentation Form (Appendix K). Copies of the completed forms are to be filed both on site and with the project manager in chronological order.

10.2 Annual Review

Per the Monitoring, Sampling and Reporting Schedule (Appendix E), the project team (including GE) should meet annually to review standard operating procedures conducted at the site and referenced in this manual in order to evaluate effectiveness and applicability.

In addition, at the beginning of each year, the site operator is to review effluent limits and cleanup criteria (Table 2) identified in this manual as compared to the most current groundwater standards and guidance values identified by the NYSDEC. A memorandum documenting results of the review shall be transmitted to GE per the Monitoring, Sampling and Reporting Schedule (Appendix E). An example of the memorandum completed in 2002 is presented in Appendix L.

10.3 Failure Modes and Effects Analysis Review

A Failure Modes and Effects Analysis (FMEA) or similar review of the site shall be conducted every three years, as determined be GE. Recommendations shall be documented, prioritized, and tracked as appropriate.

11. Health and Safety

All activities associated with the operation of the treatment system will be conducted in accordance with site-specific HASP. A copy of the HASP will be kept on site at all times in an accessible location in the treatment building. At a minimum, the site-specific HASP addresses the following health and safety requirements;

- Identification of key health and safety personnel;
- Task/operation health and safety risk analysis;
- Personnel protective equipment (PPE);
- PPE equipment reassessment program;
- Personnel training requirements;
- Medical surveillance;
- Site control measures;
- Personnel decontamination; and
- Emergency response/contingency plan.

12. Emergency Response Plan

The Miller/Duva Site Contingency and Emergency Procedures Plan (CEPP) is included in Appendix C. Phone numbers of key personnel and local emergency services are included in the CEPP. It is the responsibility of the operator of the site to maintain current contacts and phone numbers and to keep them posted near the site telephone.

13. Waste Management

13.1 General

Procedures for the management of wastes at the site are described in the following sections.

13.2 Waste Storage Plan

Completed drums of hazardous waste (GAC canisters) are staged in the designated storage area inside the treatment building prior to shipment for disposal or reactivation. The area is signed with a "Hazardous Waste" caution sign. Non-hazardous waste drums may be staged in the same area or adjacent as space permits. All waste drums containing liquids are staged within the containment area of the treatment building.

13.3 Waste Handling

The following sections present the waste handling procedures are implemented during the operation of the treatment system.

13.3.1 Groundwater

Extracted groundwater is treated at the on site treatment system. Impacted groundwater is not to be stored on-site.

13.3.2 Liquid-phase Carbon

Spent carbon generated by the GAC system to date has been characterized as hazardous. All GAC are sent off site for regeneration to the respective carbon vendor's regeneration facility. Appendix F includes a protocol for carbon disposal/regeneration. Appendix M includes an example of a hazardous waste manifest report that must be completed before sending carbon off site for regeneration.

13.3.3 Bag Filters and Personal Protective Equipment (PPE)

Bag filters and PPE will be containerized in 55-gallon drums and temporarily stored on site in the treatment building. The drums will then be transported off-site to a permitted facility. Approval for off site disposal of the bag filters and PPE and associated debris will be obtained following proper characterization through the waste disposal vendor (Table 1).

13.4 Hazardous Waste Reporting Requirements

Based on the quantities and types of Resource Conservation and Recovery Act (RCRA) hazardous waste routinely generated at the site, the following criteria are used to determine Hazardous Waste Report filing requirements. The criteria specify that a Hazardous Waste Report must be completed and submitted, if, in that calendar year, the site met any of the following criteria:

- The site generated in any single month, 1,000 kg (2,200 lbs.) or more of RCRA or New York State hazardous waste; or

- The site generated in any single month, or accumulated at any time, 1 kg (2.2 lbs.) of RCRA acute hazardous waste; or

- The site generated or accumulated at any time more than 100 kg (220 lbs.) of spill cleanup material contaminated with RCRA acute hazardous waste.

If none of the above listed criteria were valid for a particular calendar year, GE will not be required to submit a Hazardous Waste Report.

14. References

TreaTek – CRA Company. 1995. *Operations, Maintenance, and Monitoring Plan (Volumes I and II).* Duva Inactive Hazardous Waste Site, Town of Clay, NY.

Table 1

Contact List

BBL

Table 1

General Electric Company
Miller/Duva Site
Town of Clay, New York

Contact List

Owner	General Electric Company Corporate Environmental Programs 320 Great Oaks Boulevard, Suite 323 Albany, New York 12203	Steven R. Meier Remedial Project Manager	518-862-2711 (office) 518-862-2702 (fax) Steven.meier@corporate.ge.com
Agency	New York State Department of Environmental Conservation	John Piston	315-426-7411 (office)
Emergency Response	Fire Department	Fire Chief	911
	Ambulance – Medical Response		911
OMM Contractor	ARCADIS-BBL P.O. Box 66 6723 Towpath Road Syracuse, New York 13214-0066	David R. Gerber, P.E. Project Director	315-446-9120 (office) 315-446-5807 (fax) 315-439-0592 (mobile) drg@bbl-inc.com
		Timothy E. Miller, P.E. Project Manager	315-446-9120 (office) 315-446-5807 (fax) tem@bbl-inc.com
		~~Bruce Lader~~ ~~Technician~~	~~315-252-7607~~ (office) ~~315-289-7579~~ (cell)
		Timothy Henson Site Operator	315-243-6511 (cell) ~~315-438-5952~~ (pager) 315-446-9120 (office) 315-446-5807 (fax)
Mechanical/ Demolition Subcontractor/Pump Vendor	Gartner Equipment Company Inc. Spencer and Sand Streets Syracuse, New York 13208	Bruce Ruggles	315-476-8321 (office) 315-476-8349 (fax) 1-800 395-4257
Electrical and Controls Subcontractor	Kay-R Electric	Ron Raimer	315-454-4459 (office)
Carbon	Calgon Carbon	Calgon Carbon Representative	866-225-4660
Waste Disposal	Waste Management 640 Park Place Niagara Falls, New York 14301	Mike Oliver	716-282-4100 (office) 716-282-6986 (fax)
Hazardous Waste Transporter	Hazmat Environmental, Inc. 60 Commerce Drive Buffalo, New York 14218-1040	~~Nancy Smolinski~~ BARB TYCHINSKI	716-827-7229 (office) 716-827-7217(fax)
Bag Filters	Aftec, Inc. 740 Driving Park Rochester, New York 14613	Kathy Russell	585-458-7550 (office) 585-458-7476 (fax)
Security System	ADT Security Systems	Alarm System Operator	1-800-624-2777 (alarm hotline)
Laboratory	~~Severn Trent Laboratories~~ TEST America 10 Hazelewood Drive, Suite 106 Amherst, New York 14228	Candace Fox Jim Stellrecht	716-691-2600 (office) 716-6917991 (fax)

Table 2

Established Discharge Limitations/ Groundwater Clean-up Requirements

BBL

Table 2

General Electric Company
Miller/Duva Site
Town of Clay, New York
Effluent Discharge Limitations and
Groundwater Cleanup Requirements

Parameter	Effluent Limit (ug/l)	Groundwater Cleanup Requirement (ug/l)
cis-1,2-Dichloroethylene	5	5
1,1,1-Trichloroethane	5	5
Trichloroethylene	5	5
Toluene	5	5
1,1-Dichloroethane	5	5
Tetrachloroethylene	1	5
Vinyl Chloride	2	2
Methyl ethyl keytone	10	50
BOD-5	5	NL

Notes:

1. NL = Not Listed.
2. Effluent Limits established by NYSDEC and documented in the 1995 site operations, maintenance, and monitoring manual (TrenTek-CRA, 1995).
3. Groundwater Cleanup Requirment obtained from New York State Department of Environmental Conservation (NYSDEC) Class GA Standards from NYSDEC's document entitled "Division of Water Technical and Operational Guidance Series (TOGS 1.1.1) Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations" (NYSDEC, reissued June 1998 and addended April 2000).

Table 3

Alarm Response Summary

BBL

Table 3

General Electric Company
Miller/Duva Site
Town of Clay, New York

Alarm Response Summary

Alarm	Loop ID	Possible Operator Response
Unauthorized entry through treatment room door or overhead door, while security system is activated.	Zone 1	Meet police at site to perform site inspection.
Soil vapor extraction system alarm	Zone 2	Alarm no longer active.
Motion detected in treatment facility while security system is activated.	Zone 3	Meet police at site to perform site inspection.
Low treatment room temperature.	Zone 4	Inspect wall heaters.
Floor sensor activated.	Zone 5	Check for leaks in piping, bag filter housings, pumps, influent coagulation tanks, etc.
High Level in holding sump or downgradient extraction well.	Zone 6	If high level in holding sump, turn off downgradient, upgradient and Area 3 pumps. The upgradient pump may be required to stay off until level stabilizes. If high level in downgradient extraction well, verify operation of downgradient well pumps; inspect residential sump pumps; and/or increase downgradient well pumps by opening influent valve.

Table 4

Required Spare Parts and Inventory

Table 4

General Electric Company
Miller/Duva Site
Town of Clay, New York

Spare Parts List

Spare Part	Quantity Required	Quantity On-Site
SAFE PAK (Intrinsically safe connection box)	1	1
Galvanized steel 90° elbow for GAC units	1	1
Relays for downgradient and upgradient pumps	2	2
Spare downgradient pump (Hydromatic S3HVX)	1	2 (installed spare)
Spare self-priming pump (Burks Model T330WA6-ME-AI)	1	1 (installed spare)

Notes:
1. GAC = granular activated carbon
2. Operator to inform Project Manager when spare parts inventory is deficient.

Table 5

Sampling Schedule and Requirements

BBL

Table 5

General Electric Company
Miller/Duva Site
Town of Clay, New York

Sampling Schedule and Requirements

Location	No. of Samples	Frequency	Analyses	Container Type	Preservative	Holding Time
System Influent (upgradient, downgradient, and area 3)	3	Quarterly	8260[1]	40 ml VOA Vial Glass	HCl, Cool 4°C	7 Days
System Effluent	1	Semi-annually	8260[1]	40 ml VOA Vial Glass	HCl, Cool 4°C	7 Days
			BOD-5	container	None	24 Hours
Secondary Carbon Effluent (each train)	4	Quarterly	8260[1]	40 ml VOA Vial Glass	HCl, Cool 4°C	7 Days
MW-1. MW-3, and MW-13	1 per well (3)	Annually	8260[1]	40 ml VOA Vial Glass	HCl, Cool 4°C	7 Days
Residential Sumps	1 per residence (4)	Annually[2]	8260[1]	40 ml VOA Vial Glass	HCl, Cool 4°C	7 Days

Notes:

1. Environmental Protection Agency (EPA) Method 8260 modified to include Methyl ethyl ketone.
2. Basement sumps will be monitored annually in the spring.
3. VOA = volatile organic analyte.
4. BOD-5 = biochemical oxygen demand, 5-day.
5. HCl = hydrochloric acid.

Table 6

Required Analytical Parameters and Required Detection Limits

BBL

Table 6

General Electric Company
Miller/Duva Site
Town of Clay, New York

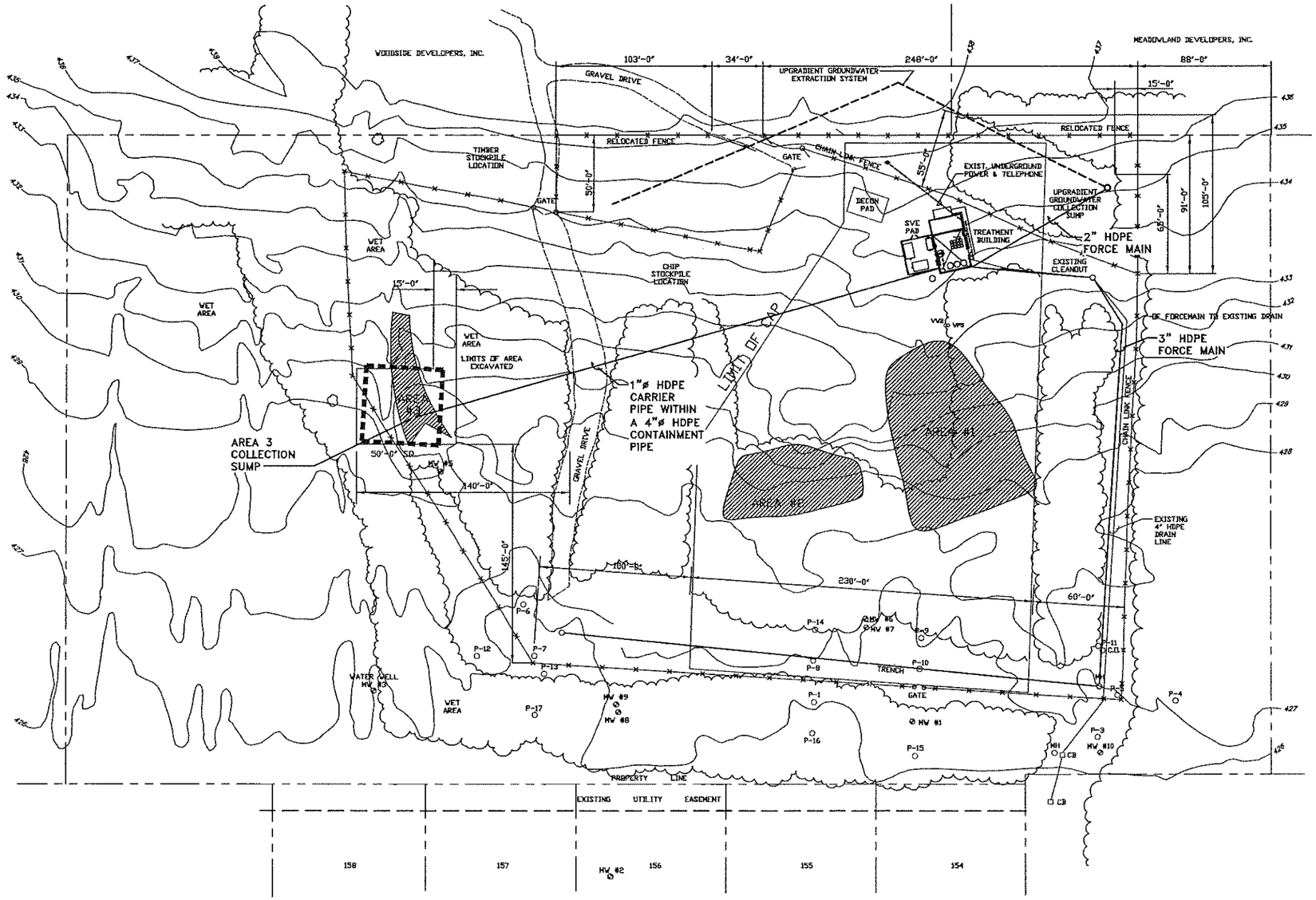
Required Analytical Testing Detection Limits

Parameter	Dectection Limit (ug/l)
cis-1,2-Dichloroethylene	1
1,1,1-Trichloroethane	1
Trichloroethylene	1
Toluene	1
1,1-Dichloroethane	1
Tetrachloroethylene	0.5
Vinyl Chloride	1
Methyl ethyl keytone	5
BOD-5	2

Note:
ug/l = microgram per liter

Record Drawings

BBL



LEGEND

- APPROXIMATE LOCATION OF FORMER DRUM STAGING AREA
- CHAIN LINK FENCE
- PROPERTY LINES
- MW #6 ⊘ MONITORING WELL
- P-17 ○ PIEZOMETER

NOTES:

1. BASE MAP SUPPLIED BY TreaTek-CRA COMPANY (1994).
2. CONTOURS ARE APPROXIMATE ONLY.

RECORD DRAWINGS
TO THE BEST OF OUR KNOWLEDGE, INFORMATION AND BELIEF, THESE RECORD DRAWINGS SUBSTANTIALLY REPRESENT THE PROJECT AS CONSTRUCTED.
BLASLAND, BOUCK & LEE, INC.

(RECORD DRAWING: ADAPTED FROM TreaTek-CRA DRAWING NO. 3, FILE NO. D-0263-5471, DATED 12/10/94) DATE_____ BY_____

X: NONE
L: ON=*,OFF=*REF*
P: PAGESET/PLT-COL, PLTMECH.CTB
3/15/02 SYR-54-SDL
40135004/40135B01.DWG
GE_MILLER_DUVA_CONFIDENTIAL\REPORTS AND PRESENTATIONS\DRAFTS\DWG

Graphic Scale
40' 0 40' 80'
1"=40'

THIS DRAWING WAS PREPARED AT THE SCALE INDICATED IN THE TITLE BLOCK. INACCURACIES IN THE STATED SCALE MAY BE INTRODUCED WHEN DRAWINGS ARE REPRODUCED BY ANY MEANS. USE THE GRAPHIC SCALE BAR IN THE TITLE BLOCK TO DETERMINE THE ACTUAL SCALE OF THIS DRAWING.

No.	Date	Revisions	Init

NO ALTERATIONS PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW

Project Mgr. TEM
Designed by DMS
Drawn by SDL
Checked by TEM

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

GENERAL ELECTRIC COMPANY • TOWN OF CLAY, NEW YORK
MILLER/DUVA SITE

SITE PLAN

File Number 40135B01
Date MARCH 2002

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

1

LEGEND:

- PRIMARY PROCESS PIPING
- SECONDARY PROCESS PIPING
- INSTRUMENTATION SIGNAL
- PLANT AIR
- SAMPLE TAP
- HB — HOSE BIB
- P — PRESSURE GAUGE
- BALL VALVE
- GATE VALVE
- CHECK VALVE
- PUMP
- METERING PUMP
- M — MIXER
- FM — FLOW METER
- FLEXIBLE COUPLING
- PVC COUPLING
- LOCAL, FIELD MOUNT
- LC 300 — LOCAL CONTROL PANEL
- AL — ALARM LIGHT
- 1 — CONTROL INTERLOCK

ABBREVIATIONS:

AL	ALARM LIGHT
CS	CARBON STEEL
ø	DIAMETER
FI	FLOW INDICATOR
FM	FLOW METER
FQI	TOTALIZED FLOW INDICATOR
HDPE	HIGH DENSITY POLYETHYLENE
LAH	LEVEL ALARM HIGH
LIC	LEVEL INDICATING CONTROLLER
LS	LEVEL SWITCH
LSH	LEVEL SWITCH HIGH
LSL	LEVEL SWITCH LOW
P	PRESSURE
PVC	POLY VINYLCHLORIDE
SCH	SCHEDULE
TYP	TYPICAL

MAIN PLC INTERLOCK SCHEDULE:

1. HIGH LEVEL–ONE AT DOWNGRADIENT MANHOLE, TURN LEAD DOWNGRADIENT PUMP ON (LEAD AND LAG PUMP ALTERNATE EVERY CYCLE) AND ENERGIZE POLYMER METERING PUMP AT TREATMENT PLANT.
2. HIGH LEVEL–TWO AT DOWNGRADIENT MANHOLE, TURN LAG DOWNGRADIENT PUMP ON (LEAD AND LAG PUMP ALTERNATE EVERY CYCLE) AND ENERGIZE POLYMER METERING PUMP AT TREATMENT PLANT.
3. LOW LEVEL AT DOWNGRADIENT MANHOLE; TURN OFF DOWNGRADIENT PUMPS AND DE–ENERGIZE POLYMER METERING PUMP AT TREATMENT PLANT.
4. HIGH–HIGH LEVEL AT DOWNGRADIENT MANHOLE, SIGNAL ALARM AT LOCAL CONTROL PANEL AND ACTIVATE AUTODIALER TO CONTACT OPERATOR.
5. HIGH LEVEL AT UPGRADIENT MANHOLE, TURN ON UPGRADIENT PUMP AND ENERGIZE POLYMER METERING PUMP AT TREATMENT PLANT.
6. LOW LEVEL AT UPGRADIENT MANHOLE; TURN OFF UPGRADIENT PUMP AND DE–ENERGIZE POLYMER METERING PUMP AT TREATMENT PLANT.
7. AREA THREE WELL PUMPTEC CONTROLLER DETECTS INCREASE AMP DRAW (PUMP IS DRY), TURN OFF WELL PUMP FOR 1.5 HOURS AND DE–ENERGIZE POLYMER METERING PUMP AT TREATMENT PLANT.
8. HIGH LEVEL–ONE AT TREATMENT SYSTEM HOLDING SUMP, TURN LEAD SELF–PRIMING PUMP ON (LEAD AND LAG PUMP ALTERNATE EVERY CYCLE).
9. HIGH LEVEL–TWO AT TREATMENT SYSTEM HOLDING SUMP, TURN LAG SELF–PRIMING ON (LEAD AND LAG PUMP ALTERNATE EVERY CYCLE).
10. LOW LEVEL AT TREATMENT SYSTEM HOLDING SUMP, TURN OFF SELF–PRIMING PUMPS.
11. HIGH–HIGH LEVEL AT TREATMENT SYSTEM HOLDING SUMP, SIGNAL ALARM AT LOCAL CONTROL PANEL, ACTIVATE AUTODIALER TO CONTACT OPERATOR, AND TURN OFF DOWNGRADIENT, UPGRADIENT, AND AREA 3 PUMPS (INFLUENT PUMPS WILL BE PERMITTED TO RESTART UPON REACHING LOW LEVEL IN THE HOLDING SUMP).
12. HIGH LEVEL AT TREATMENT BUILDING CONTAINMENT (FLOOR SWITCH), SIGNAL ALARM AT LOCAL CONTROL PANEL, ACTIVATE AUTODIALER TO CONTACT OPERATOR, AND TURN OFF ALL PUMPS.
13. BUILDING SECURITY ALARM ACTIVATED, SECURITY COMPANY TO CONTACT LOCAL SHERIFF AND SITE OPERATOR.

X: NONE
L: ON=*,OFF=*REF*
P: PAGESET/PLT–CDL
12/23/02 SYR–54–SDL
40135004/40135N01.DWG
GE_MILLER_DUVA_CONFIDENTIAL\REPORTS AND PRESENTATIONS\DRAFTS\DWG

RECORD DRAWINGS
TO THE BEST OF OUR KNOWLEDGE, INFORMATION AND BELIEF, THESE RECORD DRAWINGS SUBSTANTIALLY REPRESENT THE PROJECT AS CONSTRUCTED.
BLASLAND, BOUCK & LEE, INC.

DATE_____BY_____

Graphic Scale

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No.	Date	Revisions	Init

NO ALTERATIONS PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW

Project Mgr. TEM
Designed by DMS
Drawn by SDL
Checked by TEM

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

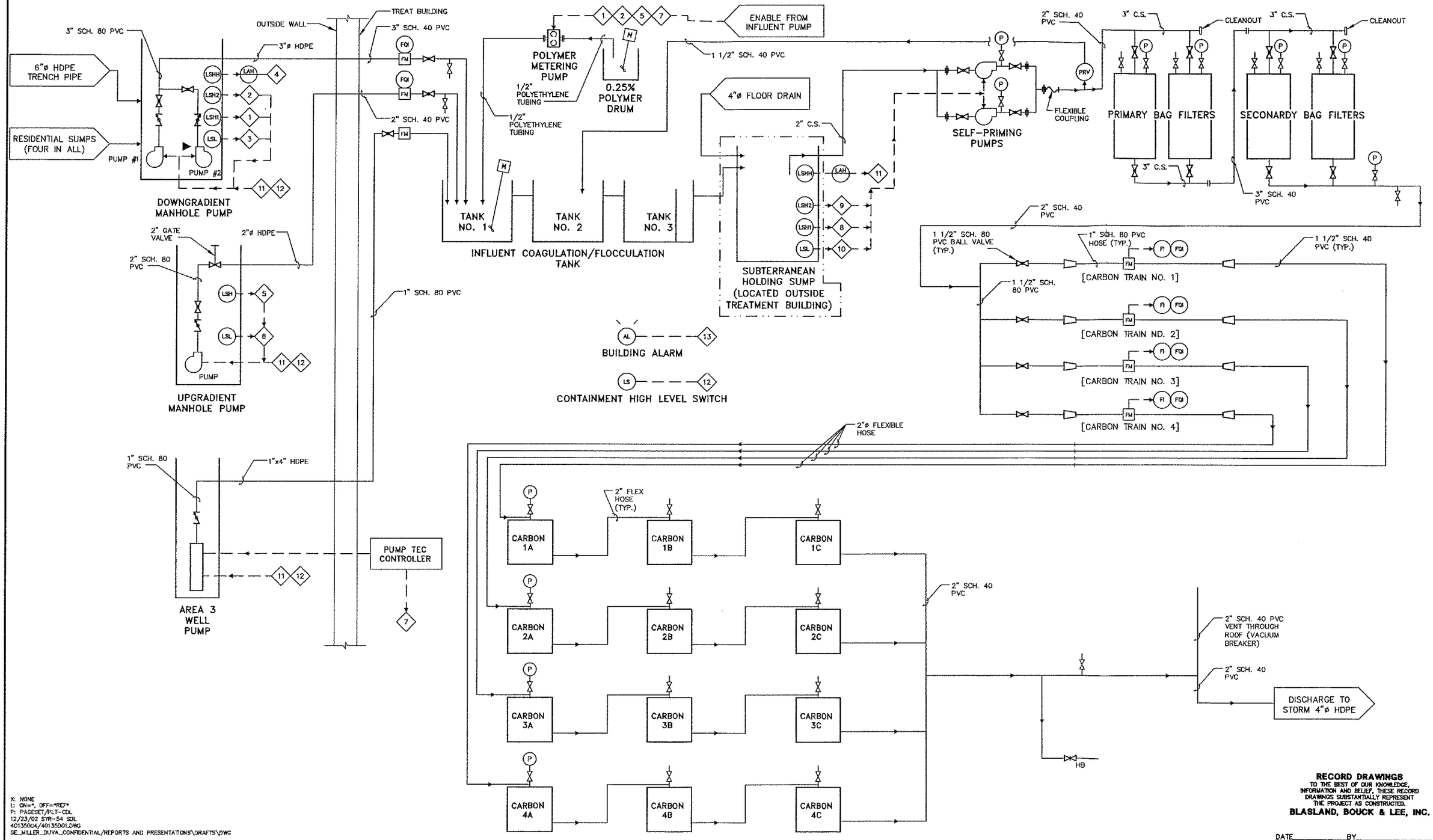
GENERAL ELECTRIC COMPANY • TOWN OF CLAY, NEW YORK
MILLER/DUVA SITE

PIPING AND INSTRUMENTATION LEGEND
MAIN PLC INTERLOCK SCHEDULE, AND ABBREVIATIONS

File Number 40135N01
Date MARCH 2002

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Tawpath Road
Syracuse, NY 13214
315–446–9120

2



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12/23/02 SYR-54 SDL
40135004/40135D01.DWG
GE_MILLER_DUVA_CONFIDENTIAL/REPORTS AND PRESENTATIONS\DRAFTS\DWG

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BLASLAND, BOUCK & LEE, INC.

DATE_____ BY_____

Graphic Scale

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Designed by DMS
Drawn by SDL
Checked by TEM

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

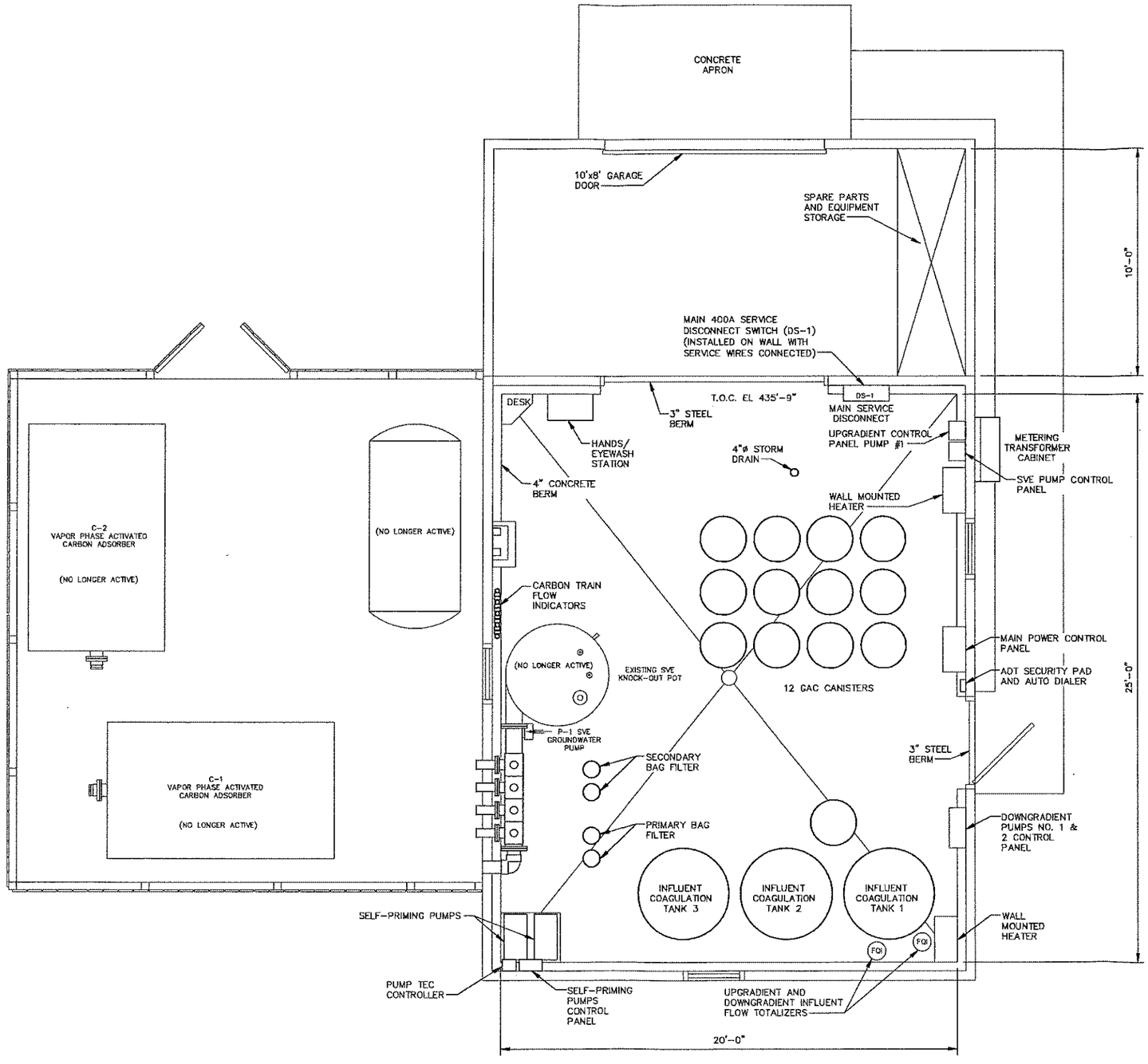
GENERAL ELECTRIC COMPANY • TOWN OF CLAY, NEW YORK
MILLER/DUVA SITE

PIPING AND INSTRUMENT DIAGRAM

File Number 40135D01
Date MARCH 2002

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

3



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P: PAGESET/PLT-CDL PLT-MECH.CTB
3/15/02 SYR-54 SDL
40135004/40135M01.DWG
GE_MILLER_DUVA_CONFIDENTIAL\REPORTS AND PRESENTATIONS\DRAFTS\DWG

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BLASLAND, BOUCK & LEE, INC.

(RECORD DRAWING: ADAPTED FROM TreaTek-CRA DRAWING NO. 6, FILE NO. D-0283-5471, DATED 12/10/94) DATE_____ BY_____

Graphic Scale
3/8"=1'-0" (2' 0 3' 6')

THIS DRAWING WAS PREPARED AT THE SCALE INDICATED IN THE TITLE BLOCK. INACCURACIES IN THE STATED SCALE MAY BE INTRODUCED WHEN DRAWINGS ARE REPRODUCED BY ANY MEANS. USE THE GRAPHIC SCALE BAR IN THE TITLE BLOCK TO DETERMINE THE ACTUAL SCALE OF THIS DRAWING.

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Drawn by SDL
Checked by TEM

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

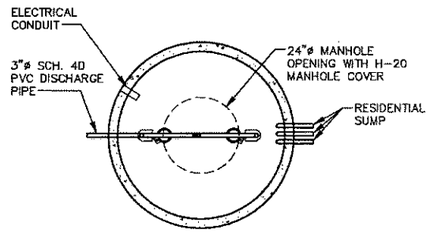
GENERAL ELECTRIC COMPANY • TOWN OF CLAY, NEW YORK
MILLER/DUVA SITE

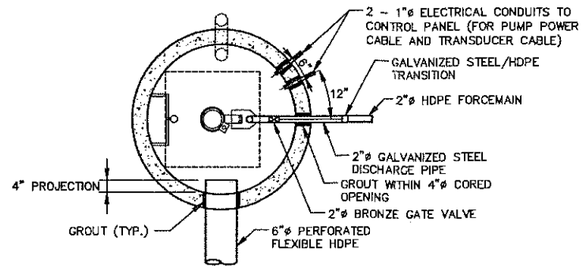
EQUIPMENT LAYOUT

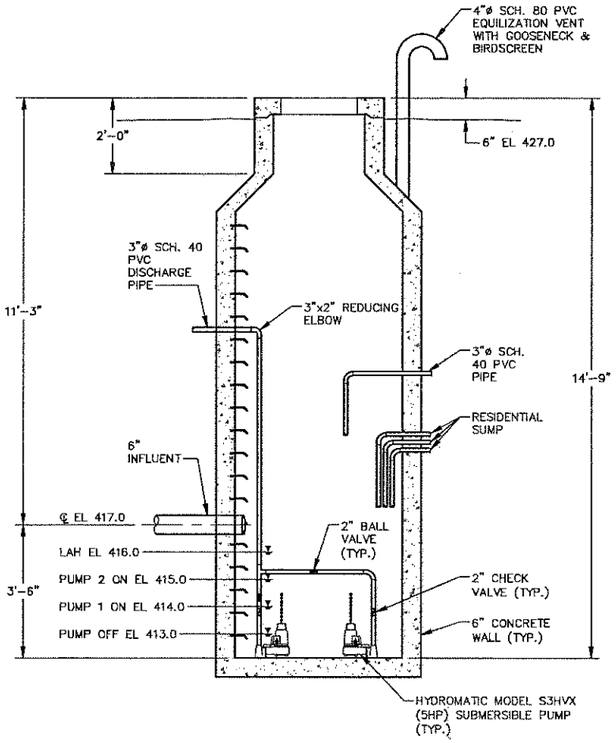
File Number FILE NO.
Date MARCH 2002

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

4

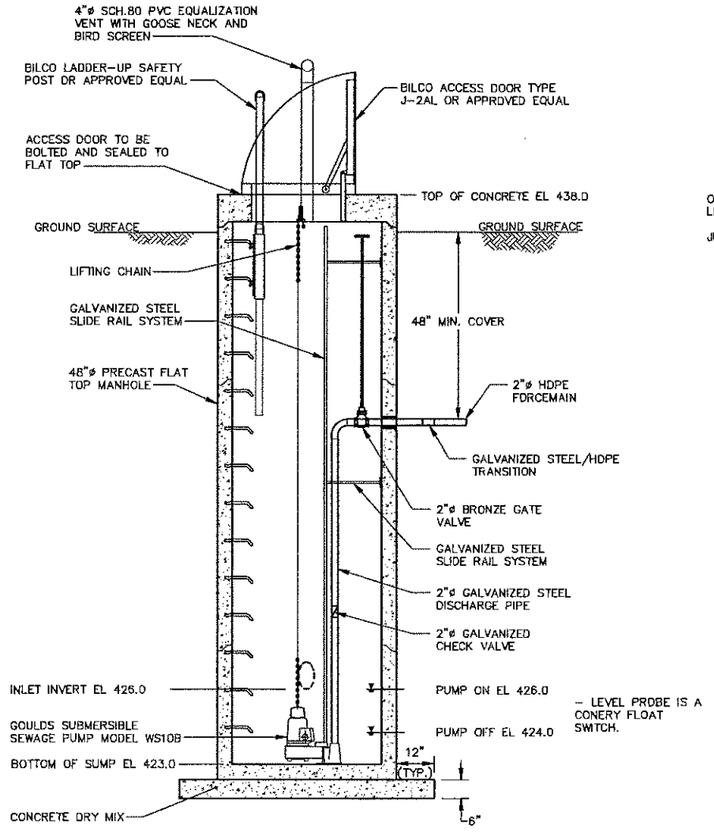






DOWNGRADIENT EXTRACTION WELL DETAIL

NOT TO SCALE



UPGRADIENT EXTRACTION WELL DETAIL

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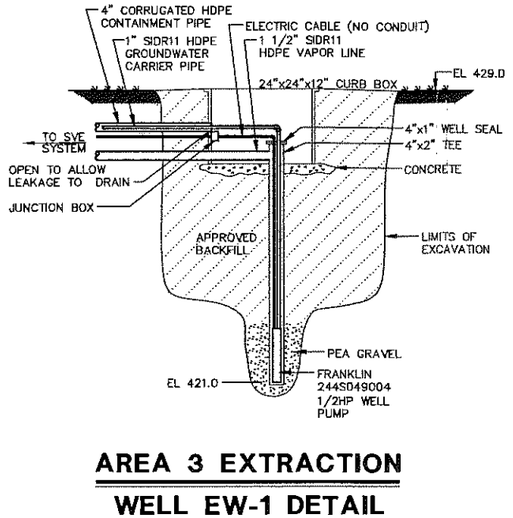
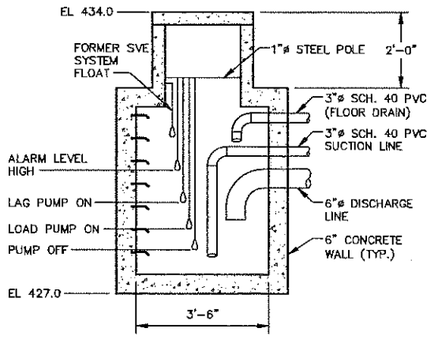


AREA 3 EXTRACTION WELL EW-1 DETAIL

NOT TO SCALE



HOLDING SUMP DETAIL

NOT TO SCALE

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P: PAGESET/PLT-GDL_PLTMECH.CTB
3/14/02 SYR-54 SDL
40135D04/40135G01.DWG
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RECORD DRAWINGS
TO THE BEST OF OUR KNOWLEDGE, INFORMATION AND BELIEF, THESE RECORD DRAWINGS SUBSTANTIALLY REPRESENT THE PROJECT AS CONSTRUCTED.
BLASLAND, BOUCK & LEE, INC.

(RECORD DRAWING: ADAPTED FROM TRE TEK CRA DRAWING NO. 4, FILE NO. D-0263-5471, DATED 12/10/94) DATE_____BY_____

Graphic Scale

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Project Mgr. TEM
Designed by DMS
Drawn by SDL
Checked by TEM

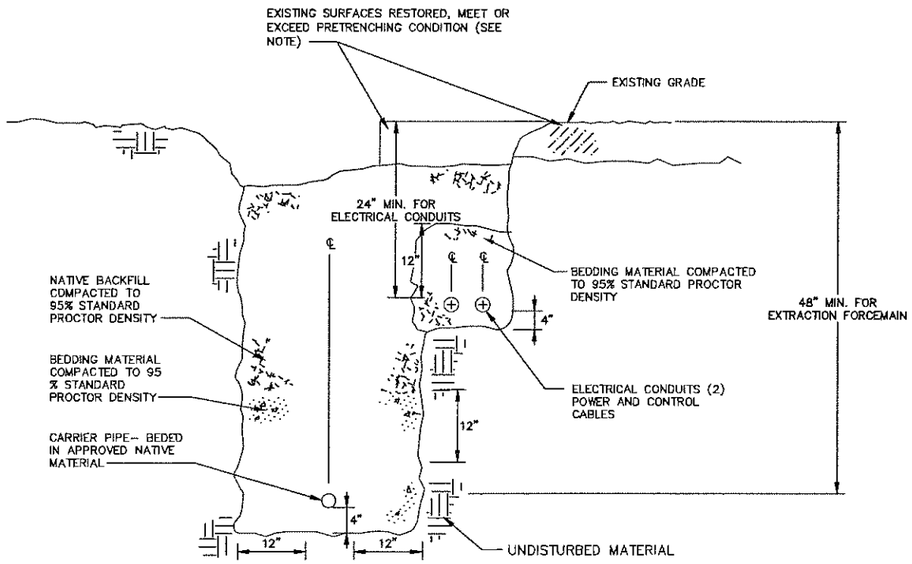
BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

GENERAL ELECTRIC COMPANY • TOWN OF CLAY, NEW YORK
MILLER/DUVA SITE

COLLECTION MANHOLE DETAILS

File Number 40135G01
Date MARCH 2002

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

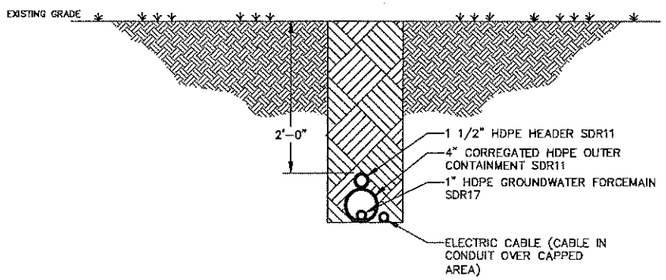


TYPICAL FORCEMAIN TRENCH DETAIL

NOT TO SCALE

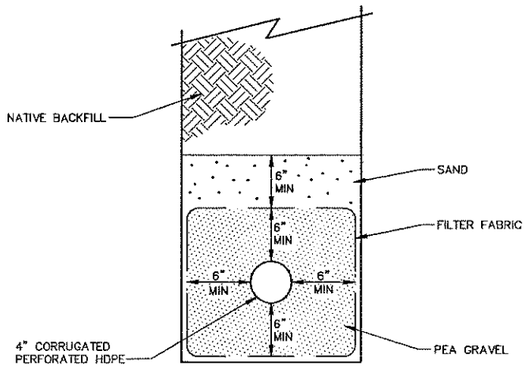
NOTES:

1. MINIMUM FOR GRASSED AREAS: 6" TOPSOIL, SEED, AND MULCH.
2. MINIMUM FOR GRAVEL AREAS: 6" SURFACING GRAVEL COMPACTED TO 95% STANDARD PROCTOR DENSITY.



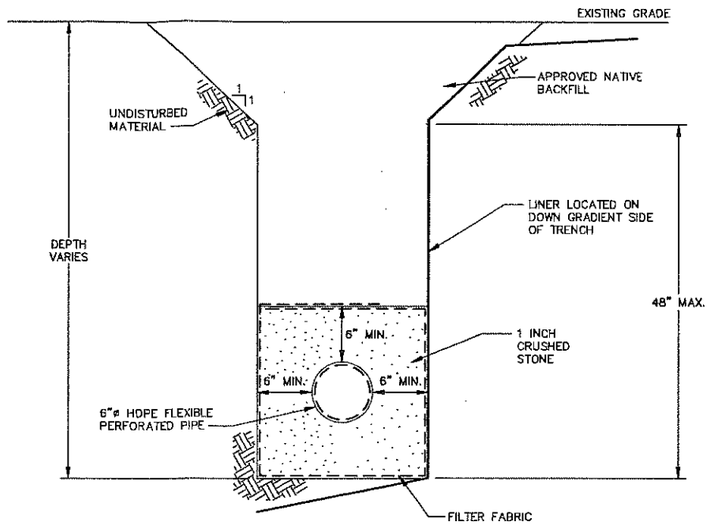
AREA 3 COLLECTION TRENCH DETAIL

NOT TO SCALE



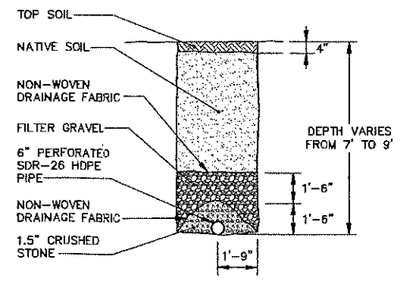
AREA 3 TRENCH PROFILE

NOT TO SCALE



UPGRADIENT COLLECTION TRENCH DETAIL

NOT TO SCALE



DOWNGRADRIENT COLLECTION TRENCH DETAIL

NOT TO SCALE

RECORD DRAWINGS
TO THE BEST OF OUR KNOWLEDGE, INFORMATION AND BELIEF, THESE RECORD DRAWINGS SUBSTANTIALLY REPRESENT THE PROJECT AS CONSTRUCTED.
BLASLAND, BOUCK & LEE, INC.

(RECORD DRAWING: ADAPTED FROM TREATEK-CRA DRAWING NO. 5, FILE NO. D-0263-5471, DATED 12/10/94) DATE_____ BY_____

X: NONE
L: ON=*, OFF=*REF*
P: PAGESET/PLT-SDL, PLTMECH.CTB
3/15/02 SYR-54 SDL
40135004/40135G02.DWG
GE_MILLER_DUVA_CONFIDENTIAL\REPORTS AND PRESENTATIONS\DRAFTS\DWG

Graphic Scale

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Project Mgr. TEM
Designed by DMS
Drawn by SDL
Checked by TEM

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

GENERAL ELECTRIC COMPANY • TOWN OF CLAY, NEW YORK
MILLER/DUVA SITE

TRENCH DETAILS

WORK TASK

File Number 40135G02
Date MARCH 2002

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

Appendices

BBL

Appendix A

Order on Consent

STATE OF NEW YORK: DEPARTMENT OF ENVIRONMENTAL CONSERVATION

In the Matter of the Development and Implementation of an Interim Remedial Measure at an Inactive Hazardous Waste Disposal Site, under Article 27, Title 13, of the Environmental Conservation Law of the State of New York by:

General Electric Company, Estate of Peter Duva, and Donald W. Miller, Inc.,

Respondents.

ORDER ON CONSENT

INDEX # A7-0225-90-03
SITE # 734051

WHEREAS,

1. The New York State Department of Environmental Conservation (the "Department") is responsible for the enforcement of Article 27, Title 13, of the Environmental Conservation Law of the State of New York (the "ECL"), entitled "Inactive Hazardous Waste Disposal Sites".

2. Respondent, General Electric Company ("GE"), a corporation organized and existing under the laws of the State of New York, is doing business in the State of New York with a facility at Electronics Parkway, Syracuse, New York.

3. Respondent, Estate of Peter Duva, is the estate of an individual who died on May 29, 1989 in Onondaga County, New York. Prior to his death, Peter Duva resided in the Town of Clay, State of New York. Frances Duva is the duly appointed representative of his Estate.

4. Respondent, Donald W. Miller, Inc., is a corporation organized and existing under the laws of the State of New York, and is doing business in the State of New York.

5. The Department has identified and classified the Site as an inactive hazardous waste disposal site, as that term is defined in ECL §27-1301(2), and has listed it in the Registry of Inactive Hazardous Waste Disposal Sites in New York State as Site Number 734051. A map of the Site which is located on Taft Road in the Town of Clay, is attached to this Order as Appendix "A".

6. The Department has classified the Site as a Classification "2", pursuant to ECL §27-1305(4)(b), having found that the Site presents a "significant threat to the public health or environment - action required".

7. Pursuant to ECL §27-1313(3)(a), whenever the Commissioner of Environmental Conservation (the "Commissioner") "finds that hazardous wastes at an inactive hazardous waste disposal site constitute a significant threat to the environment, he may order the owner of such site and/or any person responsible for the disposal of hazardous wastes at such site (i) to develop an inactive hazardous waste disposal site remedial program, subject to the approval of the Department, at such site, and (ii) to implement such program within reasonable time limits specified in the order".

8. The Department alleges that the Duva Site is located upgradient from a housing development which has been adversely impacted by the flow of organic contaminants from the Site.

9. The Department and the Respondents acknowledge that the goals of this Order are that the Respondents shall perform

the Approved Interim Remedial Measure at the Site, attached to this Order as Exhibit "B".

10. Respondents hereby waive their rights to a hearing in this matter related to the work to be performed pursuant to this Order, as set forth in Exhibit "B", in the manner provided by law, consent to the issuance and entry of this Order, and agree to be bound by the specific terms hereof. Respondents' consent to and compliance with this Order does not constitute an admission of liability or an admission by any Respondent of any law or fact or of the applicability of any law to conditions at this Site.

NOW, THEREFORE, having considered this matter and being duly advised, IT IS ORDERED THAT:

I. By May 21, 1990, Respondents shall commence implementation of the Approved Interim Remedial Measure which is attached as Appendix "B" and incorporated into this Order, thereby making it an enforceable part hereof.

II. Respondents shall provide the Department and Respondents with notice at least five (5) working days in advance of work to be conducted pursuant to the terms of this Order.

III. Respondents shall permit any duly designated officer, employee, consultant, contractor or agent of the Department to enter upon the Site or areas in the vicinity of the Site which may be under the control of Respondents, and any areas

necessary to gain access thereto, for purposes of inspection and of making or causing to be made such sampling and tests as the Department deems necessary and for assurance that Respondents comply with the terms of this Order.

IV. If any Respondent retains a third-party professional consultant, contractor and/or laboratory to perform the obligations required by this Order, such consultant, contractor, and/or laboratory shall be acceptable to the Department.

V. Respondents shall not suffer any penalty under any of the terms of this Order, or be subject to any proceeding or actions for any remedy or relief, if they cannot comply with any requirements hereof because of an act of God or war, provided, however, that any Respondent shall immediately notify the Department in writing when it obtains knowledge of any such condition and request an extension or modification of the terms of this Order.

VI. The failure of any Respondent to comply with any term of this Order specifically related to its obligation under this Order shall constitute a default and a failure to perform an obligation under this Order and under the ECL.

VII. Nothing contained in this Order shall be construed as barring, diminishing, adjudicating or in any way affecting:

a. any legal or equitable rights or claims, actions, suits, causes of action or demands whatsoever that the Department may have against anyone other than Respondents,

their directors, officers, employees, servants, agents, successors and assigns;

b. the Department's right to enforce at law or in equity the terms and conditions of this Order against Respondents, their directors, officers, employees, servants, agents, successors and assigns in the event that Respondents shall fail to satisfy any of the terms specifically related to their obligations under this Order hereof:

c. the Department's right to bring any action at law or in equity against any person with respect to areas or resources that may have been affected or contaminated as a result of the release or migration of hazardous wastes or constituents or industrial wastes at or from the Site or from areas in the vicinity of the Site including but not limited to claims for natural resources damages;

d. any action or proceeding to which the Department may be entitled in connection with, relating to, or arising out of the presence of hazardous wastes at the Site, or the release or migration of hazardous wastes from the Site; and

e. any of Respondents' defenses against such claims, actions, proceedings, causes of actions or demands.

VIII. The terms of this Order shall not be construed to prohibit the Commissioner or his duly authorized representative from exercising any summary abatement powers, either at common law or as granted pursuant to statute or regulation.

IX. Respondents shall indemnify and hold the Department, the State of New York, and their representatives and employees harmless for all claims, suits, actions, damages and costs of every name and description arising out of or resulting from the fulfillment or attempted fulfillment of the terms of this Order. Said Indemnification shall not include indemnification in any form for negligence or willful misconduct on the part of the State of New York, the Department or their representatives and employees.

X. The effective date of this Order shall be the date it is signed by the Commissioner or his designee.

XI. If Respondents desire to deviate from the provisions of this Order in any way, they shall make timely written application therefore to the Commissioner, setting forth reasonable grounds for the relief sought.

XII. The terms of this Order shall be deemed to bind the Respondents, their officers, directors, agents, servants, employees, successors and assigns to the extent their obligations are set forth herein.

XIII. Nothing herein shall be construed to bind any entity not specifically bound by the specific terms of this Order.

XIV. The terms hereof shall constitute the complete and entire Order between the Respondents and the Department concerning the Site. No terms, conditions, understandings or agreements purporting to modify or vary the terms hereof shall be binding unless made in writing and subscribed by the party

to be bound. No informal advise, guidance, suggestions or comments by the Department regarding reports, proposals, plans, specifications, schedules or any other writing submitted by the Respondents shall be construed as relieving the Respondents of their obligations to obtain such formal approvals as may be required by this Order.

DATED: , New York
, 1989

THOMAS C. JORLING
Commissioner
New York State Department of
Environmental Conservation

BY:

Edward O. Sullivan
Deputy Commissioner

CONSENT BY RESPONDENT

Respondent hereby consents to the issuing and entering of this Order, waive its right to a hearing herein as provided by law, and agrees to be bound by the provisions, terms and conditions contained in this Order.

GENERAL ELECTRIC COMPANY

By: James P. Gallen

Title: Mgr. Mfg. Eng. & Fac.

Date: 5/2/90

STATE OF NEW YORK)
) s.s.:
COUNTY OF Onondaga)

On this 2 day of May, 1990 ~~1989~~, before me personally came James P. Gallen, to me known, who being duly sworn, did depose and say that he resides in Marlins; that he is the Mgr - Mfg Eng & Facilities of the General Electric corporation described in and which executed the foregoing instrument; ~~that he knew the seal~~ of said corporation; that the seal affixed to said instrument ~~was such corporate seal; that~~ it was so affixed ~~by the order~~ of ~~the Board of Directors of said corporation~~, and ~~that he signed his name thereto by like order~~.

Pauline S. Wohn
Notary Public

PAULINE S. WOHN
Notary Public in the State of New York
Qualified in Onondaga County No. 34-4321000
My Commission Expires 30, 1991

CONSENT BY RESPONDENT

Respondent hereby consents to the issuing and entering of this Order, waive its right to a hearing herein as provided by law, and agrees to be bound by the provisions, terms and conditions contained in this Order.

ESTATE OF PETER DUVA

By: x Frances Duva

Title: _____

Date: _____

STATE OF NEW YORK)
) s.s.:
COUNTY OF Onondaga)

On this 23 day of April, 1989, before me personally came FRANCES DUVA, to me known, who being duly sworn, did depose and say that she resides in town of Clay; that she is the EXECUTRIX of the ESTATE OF PETER DUVA corporation described in and which executed the foregoing instrument; ~~that he knew the seal of said corporation; that the seal affixed to said instrument was such corporate seal; that it was so affixed by the order of the Board of Directors of said corporation, and that he signed his name thereto by like order.~~

Notary Public

HERMAN L. HARDING
Notary Public in the State of New York
Qualified in Onondaga Co. No. 34-6768950
My Commission Expires April 30, 1990

CONSENT BY RESPONDENT

Respondent hereby consents to the issuing and entering of this Order, waive its right to a hearing herein as provided by law, and agrees to be bound by the provisions, terms and conditions contained in this Order.

DONALD W. MILLER, INC.

By: _____

Title: PRESIDENT

Date: 4/24/90

STATE OF NEW YORK)
) s.s.:
COUNTY OF)

On this 24th day of April, 1989, before me personally came Donald W. Miller, to me known, who being duly sworn, did depose and say that he resides in Town of Cicero; that he is the President of the Donald W. Miller Inc corporation described in and which executed the foregoing instrument; that he knew the seal of said corporation; that the seal affixed to said instrument was such corporate seal; that it was so affixed by the order of the Board of Directors of said corporation, and that he signed his name thereto by like order.

_____
Notary Public

Michael A. Orgalto
Notary Public of the State of NY
Onondaga Co. My comission
expires in 1991

Appendix B

Manufacturer Cut Sheets

BBL

EQUIPMENT SPECIFICATION FORM

GE/DUVA SITE

EQUIPMENT NO. P-1

NAME SVE Groundwater Pump

LOCATION Treatment Building

MANUFACTURER
Goulds G & L
P. O. Box 330
Seneca Falls, NY 13148
(315) 568-2811

VENDOR
Pump & Compressor Equipment, Inc.
570 Elk Street
Buffalo, NY 14210
(716) 823-1504

DESCRIPTION
Stainless Steel Close-Coupled Centrifugal Pump, Model 1ST2C5F3, 1x1.25-6, 5 GPM Capacity, 0.5 HP, 208V, 1750 RPM

MAINTENANCE

COMPONENENT PARTS

SPARE PARTS

EQUIPMENT SPECIFICATION FORM

GE/DUVA SITE

EQUIPMENT NO. P-2

NAME Upgradient Collection Sump Pump

LOCATION Upgradient Collection Sump

MANUFACTURER Gould G & L
P.O. Box 330
Seneca Falls, NY 13148
(315) 568-2811

VENDOR Marcor Environmental
P.O. Box 630039
Baltimore, MD 21263

DESCRIPTION Model WS1032BF, Cast Iron/S.S. 2" NPT, 76 GPM @ 25'
1 HP, 208V, 1750 RPM, 85 lbs.

MAINTENANCE

COMPONENENT PARTS

SPARE PARTS

INSTALLED 4/9/01 BY RJP + BOYAR (PUMP 1+2)

Pump Installation and Service Manual

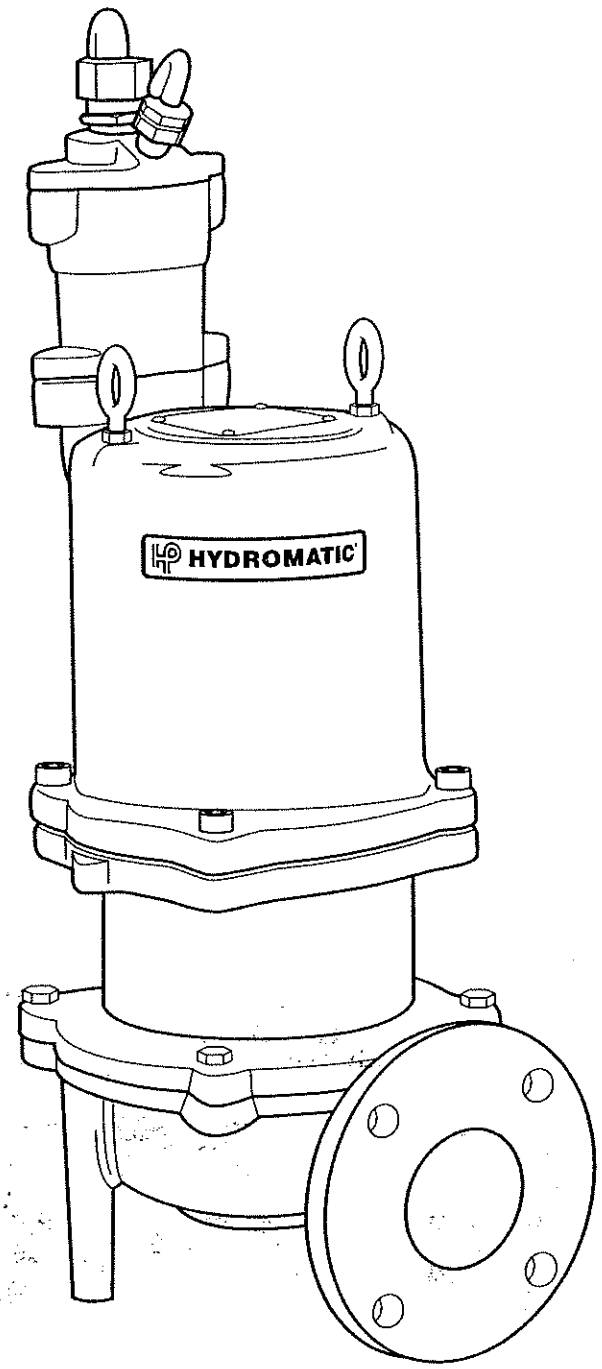
HYDROMATIC®

S3HVX

Explosion Proof Submersible Pump

(Class I, Division 1, Group D): UL

(Class I, Division 1, Group C & D): FM



NOTE! To the installer: Please make sure you provide this manual to the owner of the pumping equipment or to the responsible party who maintains the system.

HYDROMATIC®
Pentair Pump Group

General Information

Thank you for purchasing your HYDROMATIC Pump. To help insure years of trouble free operation, please read the following manual carefully.

Before operation:

Read the following instructions carefully. Reasonable care and safe methods should be practiced. Check local codes and requirements before installation.

Attention:

This manual contains important information for the safe use of this product. Read this manual completely before using this product and refer to it often for continued safe product use. DO NOT THROW AWAY OR LOSE THIS MANUAL. Keep it in a safe place so that you may refer to it often.

Unpacking Pump:

Remove pump from carton. When unpacking unit, check for concealed damage. Claims for damage must be made at the receiving end through the delivery carrier. Damage cannot be processed from the factory.

WARNING: Before handling these pumps and controls, always disconnect the power first. Do not smoke or use sparkable electrical devices or flames in a septic (gaseous) or possible septic sump.

Pump:

The explosion proof submersible pump family was designed in accordance with requirements for hazardous locations. These pumps, connected properly, will provide years of trouble free service. If servicing is required, the repair should be done by a HYDROMATIC approved service center.

Pumps In Storage Or Not Operating:

Pumps with carbon ceramic seals must have impellers manually rotated (6 revolutions) after setting non-operational for 3 months or longer and prior to electrical startup.

Pumps with tungsten carbide seals must have impellers manually rotated (6 revolutions) after setting non-operational for 3 weeks or longer and prior to electrical startup.

Seal Failure Probes:

All explosion proof submersible pumps have two factory installed moisture detectors (seal failure probes). They are in a normally open series circuit, in the seal chamber. Under normal operating conditions, the circuit remains open. If the lower seal leaks and moisture enters this chamber, the moisture would settle to the bottom of the chamber and will complete the circuit between the moisture detectors.

This circuit must be connected to a sensing unit and signaling device (UL listed system has a continuity test circuit). This is supplied in a HYDROMATIC built control panel.

NOTE: Failure to install such a device negates all warranties by HYDROMATIC pumps.

Heat Sensors:

All motors in this family have heat sensors on or embedded in the motor winding to detect excessive heat. This prevents damage to the motor. If sensor trips due to excessive winding temperature, starter in panel breaks power to the pump. Once sensor resets, the starter is to be (manually reset for UL; automatic reset for FM) for continued operation of the pump. This circuitry is supplied in a HYDROMATIC control panel.

The sensors are set to trip at 120°C (248°F).

NOTE: Failure to install such circuitry would negate UL and FM approvals and all warranties by HYDROMATIC pumps.

Power Cords:

The power cord and heat sensor seal failure cord are potted into the connection box cap. The cords must not be spliced.

NOTE: Each cable has a green lead. This is the ground wire and must be grounded properly per N.E.C. and/or local codes. Cords should be inspected for abnormal wear and replaced accordingly.

Overload Heaters:

If the HYDROMATIC electrical panel is not used, starters with 3 leg overload relay must be supplied on 3 phase pumps. Each leg is to have an identical heater sized in accordance with the nameplate

amps on the motor housing. The amp draw on these submersible motors is slightly higher than a corresponding horsepower surface motor so heaters must be sized by the nameplate rating.

Single phase pumps with capacitor start have a run and a start winding each drawing a different current. To adequately protect these windings with the appropriate heaters, consult the factory.

NOTE: Red lead is always start winding of pump using single phase.

Pump Installation

Installing Sump Level Control Float Controls:

In either simplex, duplex or triplex systems the lower or turn-off control is to be set to maintain a minimum level in the sump. This level shall be no more than 3¼" from the top of the motor housing down to the surface of the sewage.

The second or turn-on control is set above the lower turn-off control. The exact distance between the two floats must be a compromise between a frequent pumping cycle (10 starts per hour max.) to control septicity, solids and a slower cycle for energy economy. This distance should be determined by the engineer or consulting engineer depending on the conditions of the application.

For installation of HYDROMATIC supplied level controls refer to your systems installation and service manual.

Installing Pump In Sump:

Before installing pump in sump lay it on side and rotate impeller. Impeller may be slightly stuck due to factory test water so it must be broken loose with small bar or screwdriver in edge of vanes. The impeller should turn freely. *Do not connect the power until after this test.*

Clean all trash and sticks from sump and connect pump to piping. A check valve must be installed on each pump. A gate or plug value in each pump discharge is highly recommended. This valve should be installed on the discharge side of the check valve so if necessary to service the check valve the line pressure can be cut off. Single pump systems are sometimes installed without a check valve where it is desirable to self-drain the discharge line to prevent freezing. This can be done only with short discharge lines; otherwise water will return to the sump and cause short cycling of the pump.

Making Electrical Connections:

All electrical wiring must be in accordance with local code, and only qualified electricians should make the installations. Complete wiring diagrams are included for use in making the installation. All wires should be checked for shorts to ground with an ohmmeter or Megger after the connections are made. This is important, as one grounded wire can cause considerable trouble.

IMPORTANT: If equipment is not properly wired and protected as recommended, HYDROMATIC warranty is void. See Page 5/6.

Heat Sensor And Seal Failure Connections:

If a HYDROMATIC control panel is used, terminal blocks are provided for heat sensor, seal failure connections (See Panel Schematic). If a control panel is supplied by others, it must allow heat sensor and seal failure terminations.

Pump Operations

Starting System:

1. Double check all wire connections.
2. Turn pumps to "off" position on H.O.A. switches.
3. Turn on breakers.

4A. When using single phase pumps make sure red pump lead is connected to capacitor circuit, connect amprobe to pump power cord and turn pump on. Pump will show high amp draw momentarily, then as pump comes off start wirings, amps will drop to normal nameplate amps.

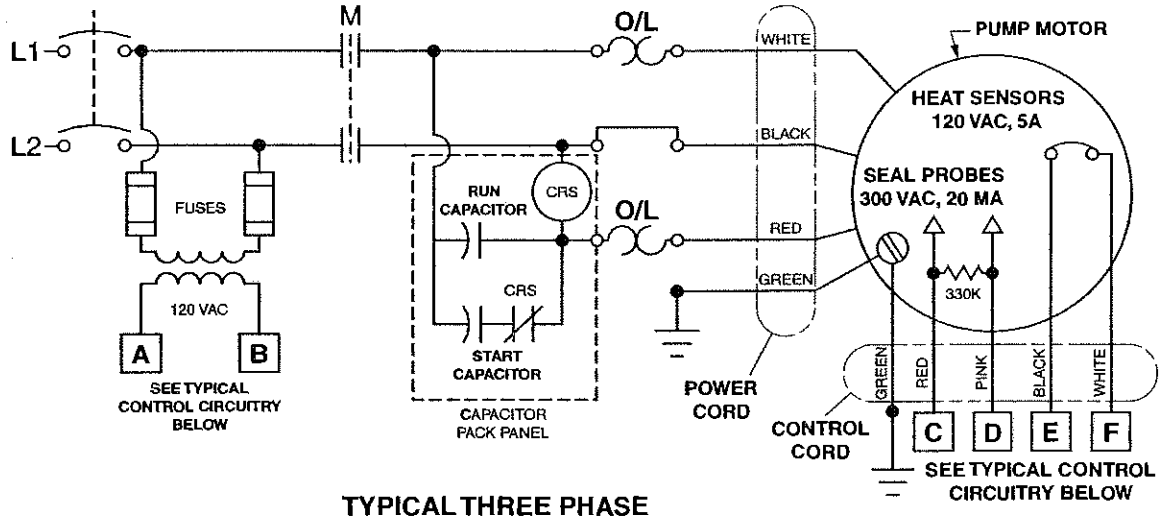
4B. When using three phase pumps (230/460/575).

Turn H-O-A switch to hand position on one pump and notice operation. If pump is noisy and vibrates, rotation is wrong. To change rotation, interchange any two line leads to pump. Do not interchange main incoming lines. Check rotation of all pumps in this same manner.

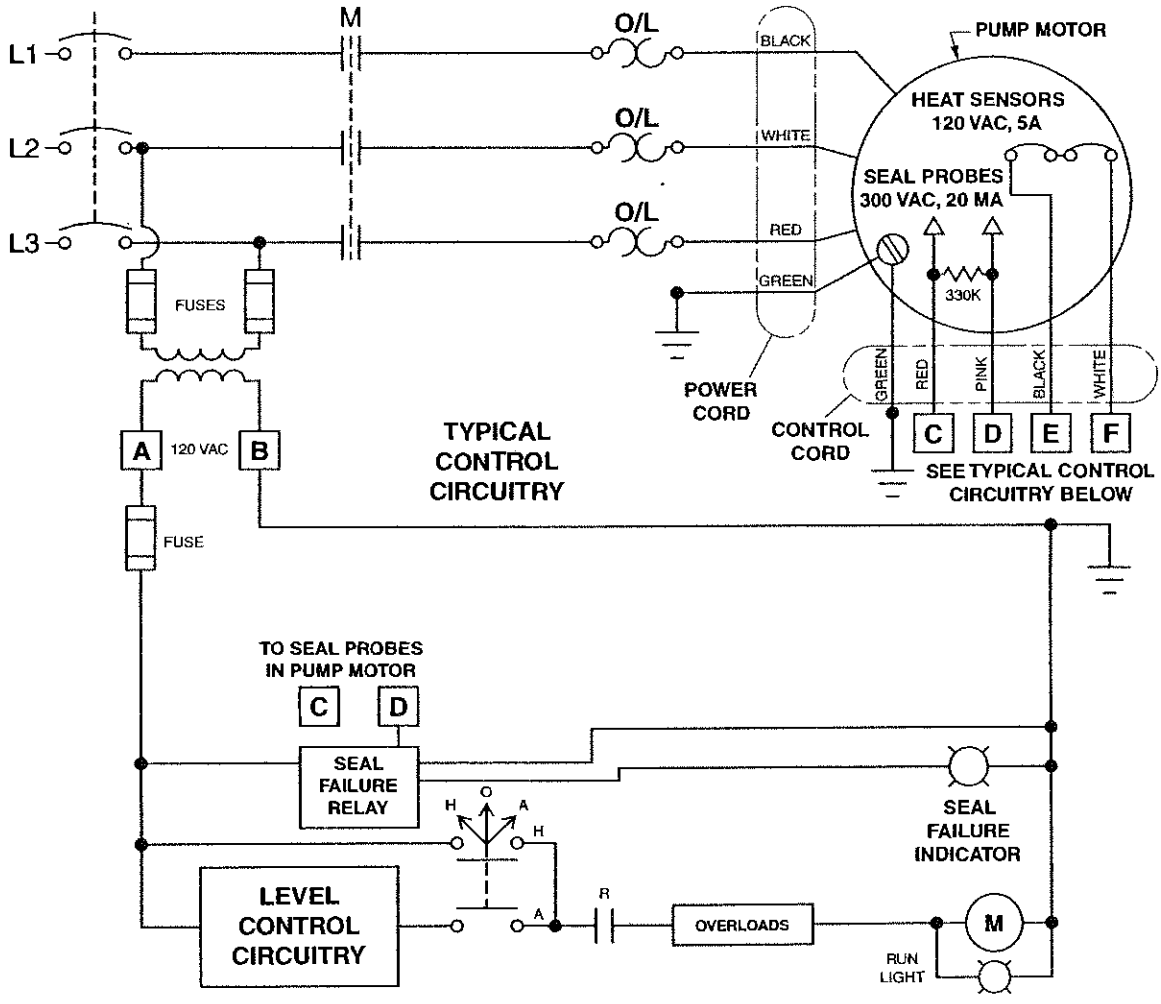
5. Now set both H-O-A switches to auto position and allow water to rise in sump until one pump starts. Allow pump to operate until level drops to turn-off point.
6. Allow sump level to rise to start other pump(s). Notice run

TYPICAL FM ONLY SCHEMATICS

TYPICAL SINGLE PHASE MOTOR CONNECTIONS



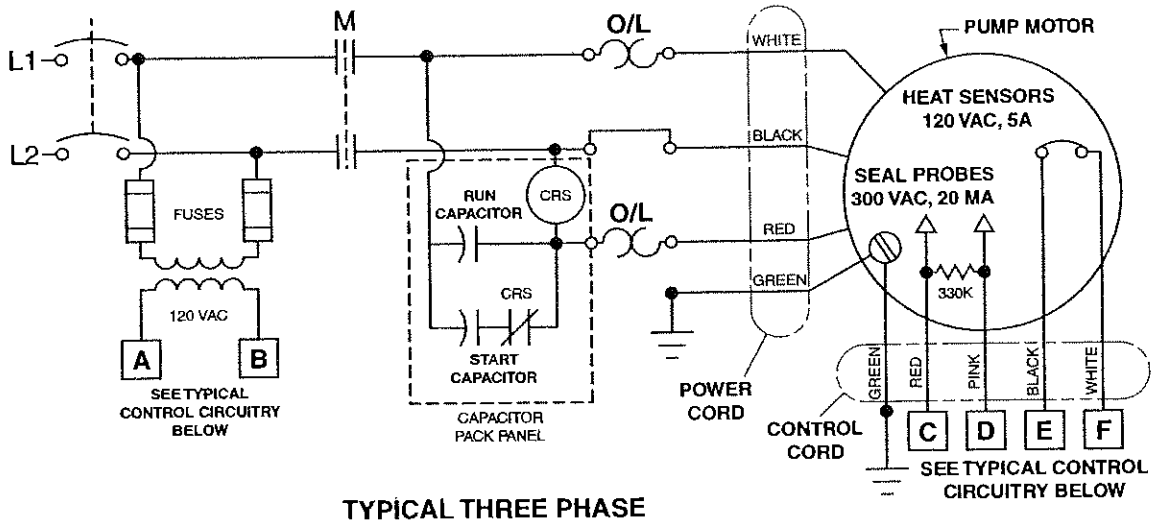
TYPICAL THREE PHASE MOTOR CONNECTIONS



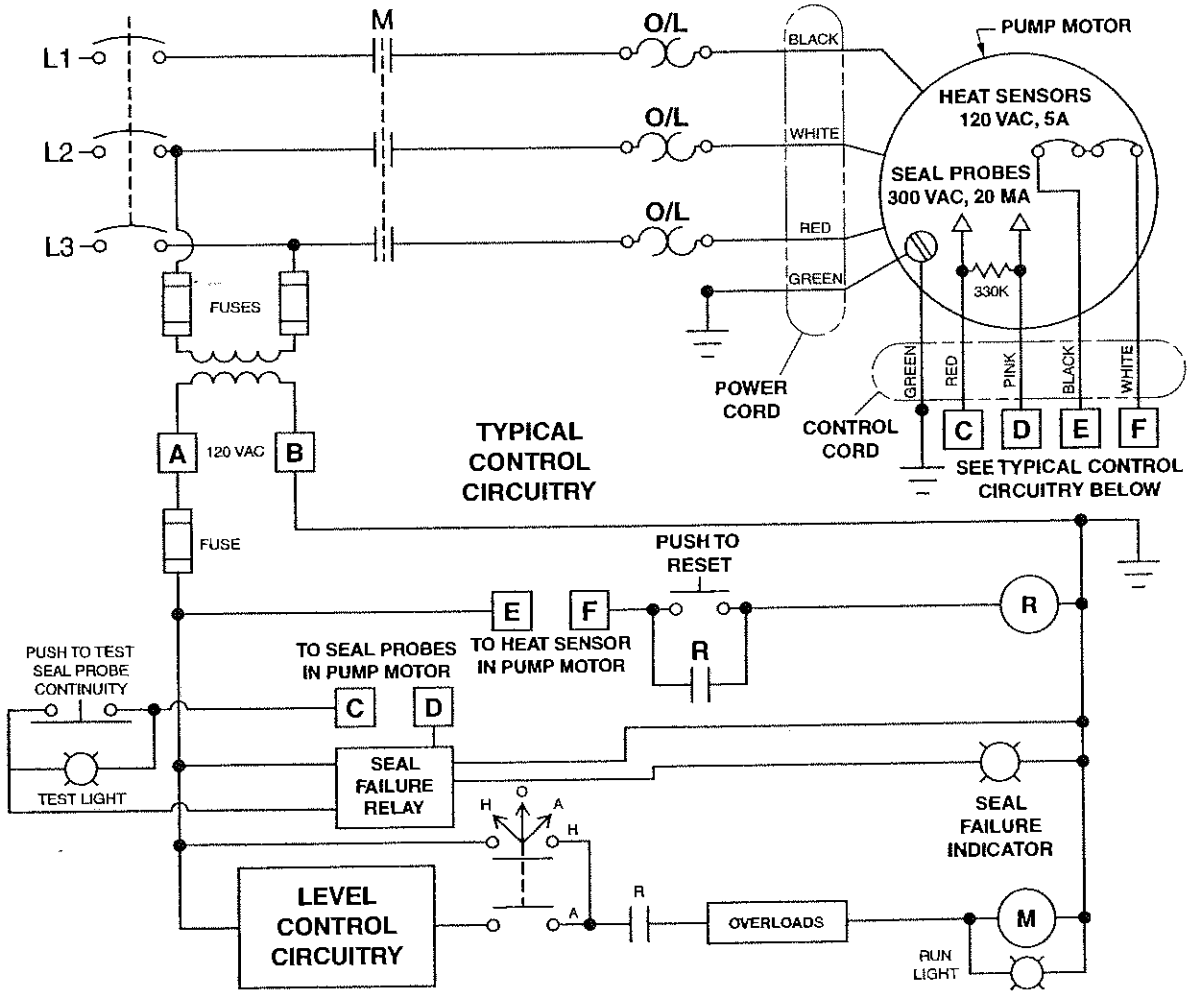
NOTE: CAPACITORS AND/OR CONTROLS SHOULD BE LOCATED OUTSIDE HAZARDOUS AREA AND ENCLOSED IN AN APPROPRIATE ENCLOSURE.

TYPICAL UL ONLY SCHEMATICS

TYPICAL SINGLE PHASE MOTOR CONNECTIONS



TYPICAL THREE PHASE MOTOR CONNECTIONS



NOTE: CAPACITORS AND/OR CONTROLS SHOULD BE LOCATED OUTSIDE HAZARDOUS AREA AND ENCLOSED IN AN APPROPRIATE ENCLOSURE.

Pump Operations

lights to panel. Pumps should alternate on each successive cycle of operation.

7. Turn both H-O-A switches to "off" position and allow sump to fill to the override control level(s).
8. Turn switches to auto position, and pumps should start and operate together until level drops to turn-off point.
9. Repeat this operation cycle several times before leaving job.
10. Check voltage when pumps are operating, and check the amp draw of each pump. Check amps on each wire as sometimes a high leg will exist. One leg can be somewhat higher by 5 to 10 percent without causing trouble. For excessive amp draw on one leg, the electric utility company should be consulted.

Pump Maintenance

As the motors are oil filled, no lubrication or other maintenance is required.

If the heat sensor and seal failure are hooked up properly, no attention is necessary as long as the seal failure indicator light doesn't come on. To insure continuity of the seal sensor leads, a test light is provided on intrinsically safe HYDROMATIC panels as standard equipment.

Pump should be checked every quarter for corrosion and wear.

Servicing Instructions:

IMPORTANT: Read all directions before replacing any parts.

WARNING: Before handling these pumps and controls, always disconnect the power first.

Do not smoke or use sparkable electrical devices or flames in a septic (gaseous) or possible septic sump.

Field Service On Hydromatic Explosion Proof Pumps:

If a HYDROMATIC explosion proof pump is used in a hazardous location, or if the pump is still in warranty, the pump must be returned to the factory for service or repaired in an authorized HYDROMATIC Service Center. Charges will not be allowed if (in warranty) pump is taken to a motor repair shop that is not an authorized HYDROMATIC Service Center. This will insure the integrity of the hazardous location rating of the pump and comply with our warranty requirements. Pumps out of warranty and not used in a hazardous location can be field serviced by any reputable serviceman. When any field servicing is performed on a pump, the following instructions should be followed carefully.

Disconnecting Pump Cords:

If a HYDROMATIC explosion proof pump is to be removed from its location, one of two ways may be used to disconnect the pump cords from the rest of the system.

Pump cords may be disconnected at control panel (on sump mounted control panels) and cord assembly taken with pump.

CAUTION: If cord openings from sump to control panel are open, gases from sump could enter panel and an explosion condition could exist.

Pump cords may be disconnected at pump by removing the cord and cap assembly, unplugging sensor wires, and removing wire nuts.

After removal from pump, reinstall wire nuts in cord and cap assembly and install protective cover. (HYDROMATIC Kit 11159-000-1)

CAUTION: Do not reconnect power to a cord and cap assembly while removing from pump.

Replacing Cords:

The power cord and heat sensor - seal failure cord is potted into the connection box cap, forming the cord and cap assembly.

If cords require replacement due to damage or cords being too short, cord and cap assembly must be replaced as a complete assembly available from factory.

1. Remove cord and cap assembly from connection box.
2. Disconnect wires taking note of color/number coding.
3. Connect wires of new cord and cap assembly in same manner as old one was removed.
4. Check for moisture and dryout.
5. Reinstall cord and cap assembly on connection box taking care not to pinch wires.

6. Check pump for proper rotation before returning to normal service.

Replacing Stator:

If motor winding is burned or shorted, it can be rewound or replaced with new factory wound stator. Refer to sectional drawing of pump and motor, and use the following steps to remove and replace stator.

1. If only the stator is damaged, it may not be necessary to completely dismantle pump as stator and housing can be lifted from pump without disturbing seals or bearings.
2. Drain all oil from upper housing. Remove drain plug in bottom of bearing housing, and remove connection box to allow air to enter.
3. When connection box is lifted off, connection wires to motor will be exposed. These wires are tagged with a metal marker giving wire number. Disconnect wires and remove connection box.
4. After chamber is drained, remove hold-down bolts on motor housing and lift off. Use care in lifting as the seal failure connecting wire must be disconnected before housing is completely removed. See sectional drawing.
5. The stator is held in the housing with a bolted in retaining ring and prevented from rotating by a roll pin.
6. Remove the retaining ring and socket head cap screw.
7. After ring is removed, turn housing upright and bump on hardwood block. This should jar the stator loose and allow it to drop out.
8. Thoroughly clean housing before replacing new stator. Replace stator and make all wire connections to connection box before replacing housing on pump. See motor lead connection drawing. This is important as leads must be tucked behind the windings by using hands up through rotor core.

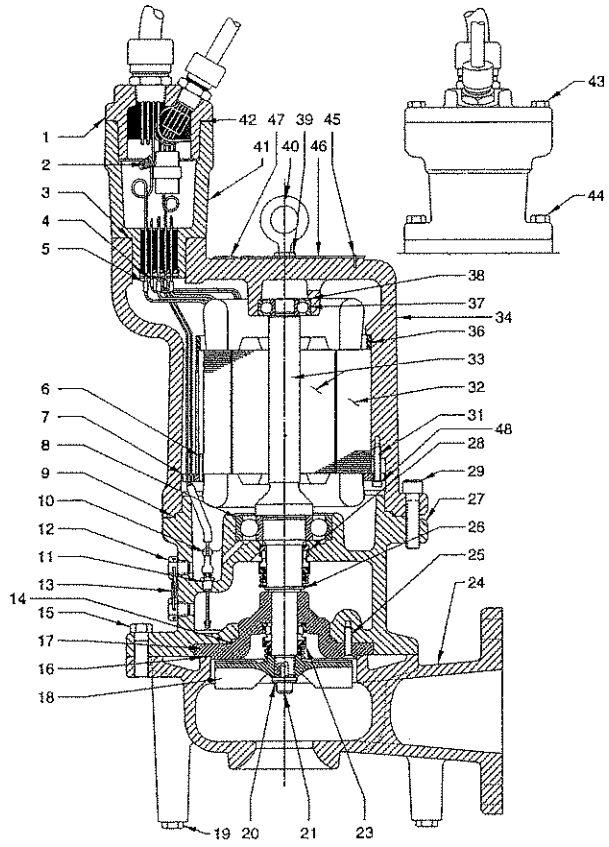
IMPORTANT: Use only butt connections on the wires.

Do not tape leads as oil will deteriorate the tape and cause damage to stator and bearings.

9. Check top bearing. If the bearing is clean and does not turn rough, bearings can be reused. If bearings are damaged with dirt or heat, they must be replaced. See additional instructions on replacing seals and bearings.
10. Replace stator housing onto seal chamber and bolt in place. Be sure seal failure wires are connected before housing is assembled.

    Be sure O-ring seal has been replaced. If O-ring is nicked or cut, replace with new ring. This applies to all O-rings used in assembly.
11. After all leads are reconnected in the connection box, make a high voltage ground test on each wire. The only wire that should show ground is the green power lead and the ground head in the auxiliary control cable.
12. For safety, complete pump should be air checked under water for leaks.

    If seals were okay, refill seal chamber with oil. Lay pump on side for this oil filling with oil fill hole upright. Do not completely fill, leave oil about



Pump Maintenance

1" below plug hole. Use only HYDROMATIC submersible oil or high grade transformer oil in this chamber. Replace plug, use Permatex on threads. Install air valve in plug opening of motor housing and charge housing with about 10 psi of air. Be sure air is dry. Do not use air line where water may be trapped in the line. Submerge complete unit under water and check for leaks.

13. Refill motor chamber with oil through connection box opening. Use high grade, non-synthetic transformer oil or HYDROMATIC special submersible oil. Fill housing until oil covers top of windings. Leave air space in top for expansion.

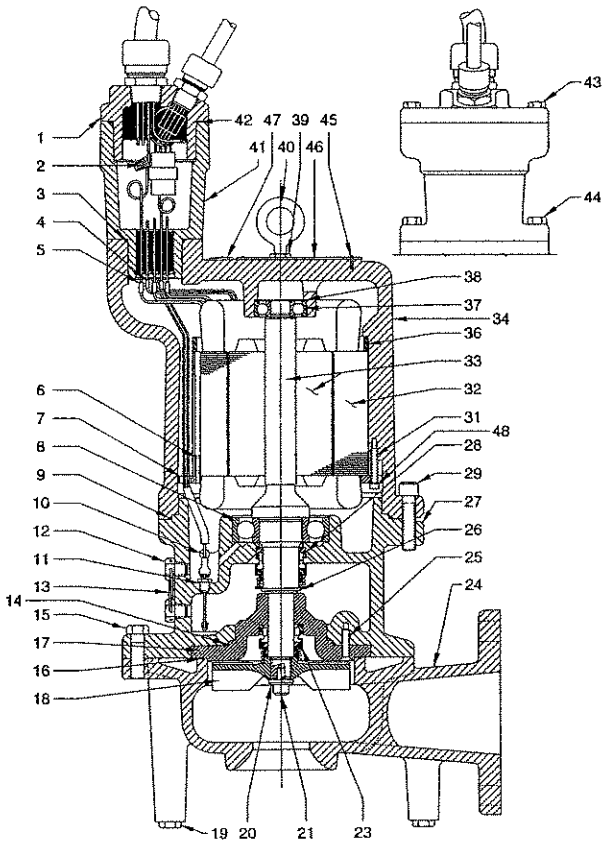
NOTE: Oil must cover top of stator.

Replacing Seals And Bearings:

1. Drain all oil from motor chamber and seal chamber as described.
2. Remove motor housing as described in replacing stator.
3. Remove bolts that hold bearing housing to volute. Lift bearing housing and rotating unit off and set assembly on its side. Remove socket head screw and washer at the impeller end of the shaft. Holding the shaft stationary, unscrew the impeller from the shaft by tapping the end of the impeller blades.
4. To remove seal plate take out socket head screws and using screws in back-off holes pry plate loose. This will also force seal off if not already removed.
5. Remove snap ring. Pull seal if it is free. If not free, it can be forced off when shaft is removed.
6. Set seal housing in upright position and bump end of shaft on hardwood block. This will push the bearing from the housing and will force upper seal from shaft.
7. Use bearing puller to remove bearings. Replace with new bearings. Press only on inner face of bearing when replacing. Pressing on outer face can damage the bearing. Bearings are standard size that can be obtained from any bearing supply house or can be obtained from HYDROMATIC factory.
8. **Important: Do not use any of the old seal parts. Replace with all new seals.**

NOTE: Anytime seal is disturbed replace seal.

9. Thoroughly clean all castings before replacing seals. One grain of dirt between the seal faces can cause failure.
10. Examine all O-rings for nicks before reusing.
11. Use Locktite (red) on socket head locking screw in end of shaft.
12. Before refilling chamber with oil air test as described in replacing stator.
13. Refill both chambers with oil as described in replacing stator.
14. Always check all leads with high voltage or with megger for grounds before operating the pump.
15. Check pump for proper rotation before returning to normal service.



Pump Notes

S3HVX Parts List

ORDERING REPLACEMENT PARTS: Product improvements are made from time to time. The latest part design will be furnished as long as it is interchangeable with the old part.When ordering replacement parts, always furnish the following information: (1) pump serial number, (2) pump model and size, (3) part description, (4) part number, (5) impeller diameter (if ordering impeller), (6) quantity required, and (7) shipping instructions.

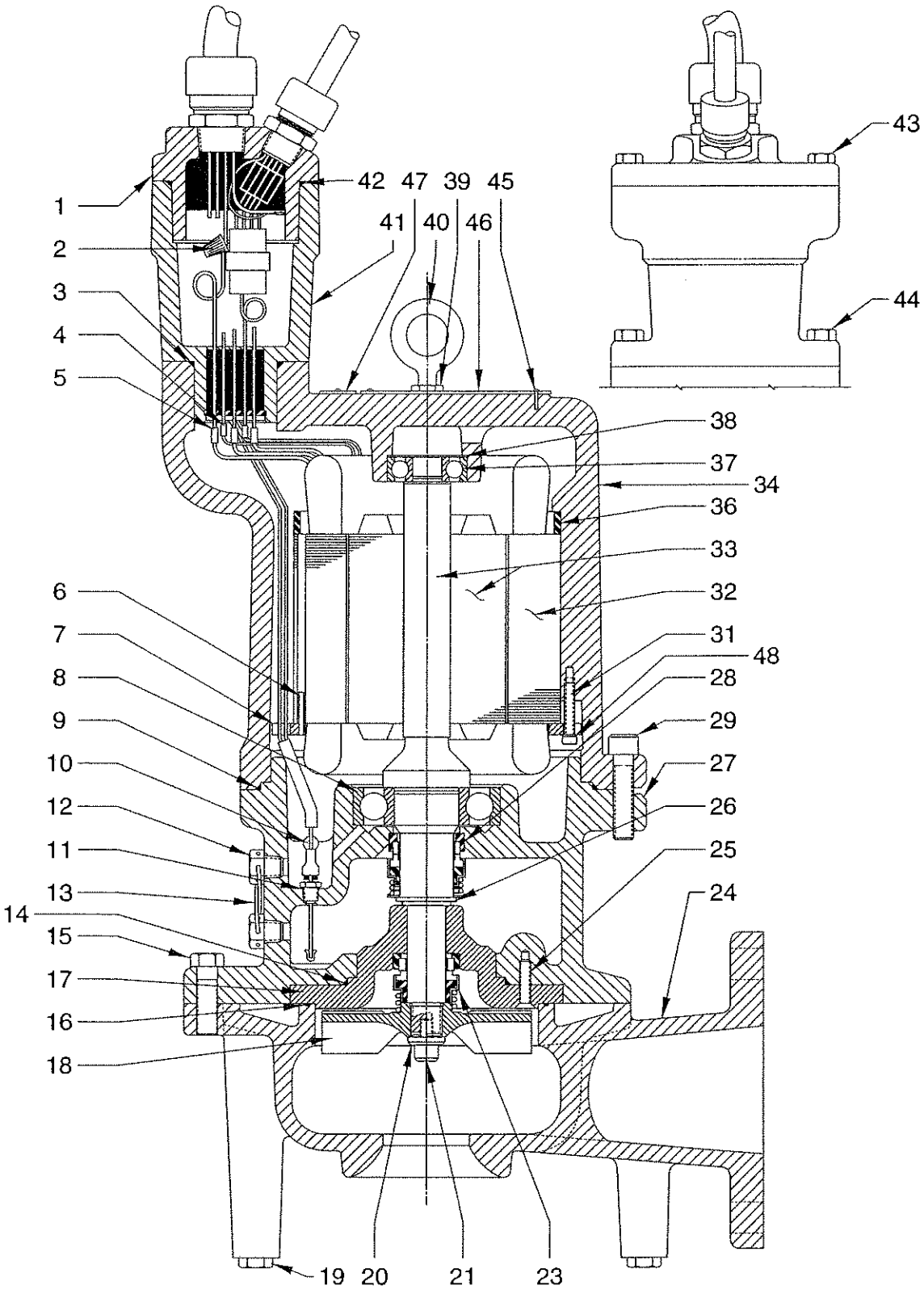
Ref. No.	Part No.	Part Description	Qty.
1	10894-003-5	Cord Cap Assy 30' dual 10/4	1
	10894-005-5	Cord Cap Assy 50' dual 10/4	1
2	00853-000-1	Connector 230/460/3/60	4
	00557-000-1	Connector 200/230/1/60, 200 /575/3/60	3
3	00834-008-1	O-Ring SC	1
4	10898-000-1	Connector	4
5	10899-000-1	Connector 230/460/3/60	9
	10899-000-3	Connector 200/230/1/60, 200 /575/3/60	3
6	05454-001-1	Roll Pin	1
7	00299-002-1	Stator Holding Ring	1
8	00065-020-1	Lower Bearing R	1
9	00150-020-1	O-Ring SC	1
10	10900-001-5	Seal Sensor Assy.	1
11	10901-000-1	Seal Failure, Terminal	2
12	00119-010-1	Pipe Plug	2
13	10902-001-3	Safety Wire	1
14	00150-011-1	O-Ring SC	1
15	00239-007-1	Capscrew	4
16	00834-023-1	O-Ring SC	1
17	10752-000-2	Seal Plate	1
18	07119-009-2	Impeller 3.30 dia. I	1
	07119-007-2	Impeller 3.95 dia. I	1
	07119-006-2	Impeller 4.74 dia. I	1

Ref. No.	Part No.	Part Description	Qty.
19	00238-005-1	Capscrew, Steel (non UL)	3
	00238-009-2	Capscrew, Brz. (UL)	3
20	00519-001-5	Washer I	1
21	00556-003-1	Capscrew I	1
23	00300-000-1	Lower Seal (Ceramic) Std. S	1
	00696-000-1	Lower Seal (Carbide) Opt. C	1
24	10769-000-2	Volute	1
25	00517-004-1	Capscrew	3
26	00975-012-1	Retainer Ring	1
27	10743-001-2	Bearing Housing	1
28	04916-000-1	Upper Seal SC	1
29	00568-007-1	Capscrew	4
31	00517-008-1	Capscrew	4
32	08053-003-1	Stator 2-3HP 230/1/60 3450 RPM R	1
	08053-203-1	Stator 2-3HP 200/1/60 3450 RPM R	1
	08434-003-1	Stator 2-3HP 230/460/3/60 3450 RPM R	1
	08434-203-1	Stator 2-3HP 200/3/60 3450 RPM R	1
	08434-603-1	Stator 2-3HP 575/3/60 3450 RPM R	1
	00765-003-1	Stator 5HP 230/460/3/60 3450 RPM R	1
	00765-203-1	Stator 5HP 200/3/60 3450 RPM R	1
	00765-603-1	Stator 5HP 575/3/60 3450 RPM R	1
33	08053-014-5	Rotor & Shaft 2-3HP 1 ph.	1
	08434-014-5	Rotor & Shaft 2-3HP 3 ph.	1

Ref. No.	Part No.	Part Description	Qty.
	00765-016-5	Rotor & Shaft 5HP 3 ph.	1
34	10765-002-2	Motor Housing 5HP 3ph.	1
	10765-003-2	Motor Housing (All Others)	1
36	00735-002-1	Spacer 2-3HP 3ph.	1
	00736-001-1	Spacer 5HP 3ph.	1
37	00065-021-1	Upper Bearing R	1
38	00064-003-1	Load Spring	1
39	01032-002-1	Nut	1
40	00589-002-1	Eyebolt	1
41	10895-000-5	Conn. Box 230/460/3/60	1
	10895-001-5	Conn. Box 200/230/1/60, 200/575/3/60	1
42	00834-013-1	O-Ring SC	1
43	00101-007-1	Capscrew S/S	2
44	00238-006-1	Capscrew S/S	2
45	04580-001-1	Drive Screw	3
46	13425-034-1	Nameplate	1
47	13425-030-1	Nameplate UL (opt.)	1
	13425-033-1	Nameplate FM (opt.)	1
48	00995-004-1	Lock Washer	4
	51700-056-7	Seal Kit R	
	51700-356-7	Carbide Seal Kit R	
	*	Impeller Kit	
	*	Rebuild Kit	

Notes: S — Parts in Seal Kit C — Parts in Carbide Seal Kit I — Parts in Impeller Kit R — Parts in Rebuild Kit *Consult Factory

S3HVX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WARRANTY

Hydromatic Pumps, Inc. warrants to the original purchaser of each Hydromatic product(s) that any part thereof which proves to be defective in material or workmanship within one year from date of installation or 18 months from manufacture date, whichever comes first, will be replaced at no charge with a new or remanufactured part, F.O.B. factory. Purchaser shall assume all responsibility and expense from removal, reinstallation and freight. Any item(s) designated as manufactured by others shall be covered only by the express warranty of the manufacturer thereof. This warranty does not apply to damage resulting from accident, alteration, design, misuse or abuse. The pump must be installed, operated and maintained in accordance with the published instructions of the appropriate Installation & Service Manual.

All dual seal non-clogs and 3–5 HP grinders must have seal failure and heat sensors attached and functional for Warranty to be in effect. If a seal failure should occur, Hydromatic Pumps will cover only the lower seal and labor thereof. Labor based on Authorized Service Center contract allowance. If the heat sensor is not attached and functional, Warranty is void. If the seal failure sensor is not attached and functional, Warranty is void.

If the material furnished to the Buyer shall fail to conform to this contract or to any of the terms of this written warranty, Hydromatic Pumps, Inc. shall replace such nonconforming material at the original point of delivery and shall furnish instruction for its disposition. Any transportation charges involved in such disposition shall be for the Buyer's account. The Buyer's exclusive and sole remedy on account or in respect of the furnishing of material that does not conform to this contract or to this written warranty, shall be to secure replacement thereof as aforesaid. Hydromatic Pumps, Inc. shall not in any event be liable for the cost of any labor expended on any such material or for any incidental or consequential damages to anyone by reason of the fact that such material does not conform to this contract or to this written warranty.

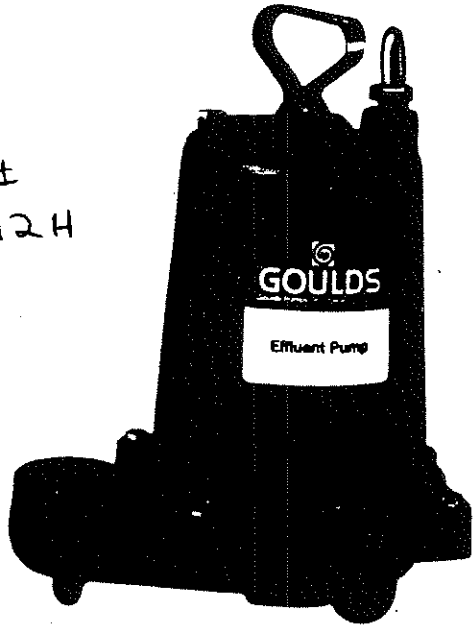
ALL IMPLIED WARRANTIES, INCLUDING THE IMPLIED WARRANTY OF MERCHANTABILITY AND THE IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, ARE DISCLAIMED TO THE SAME EXTENT AS THE EXPRESS WARRANTY CONTAINED HEREIN. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

MANUFACTURER EXPRESSLY DISCLAIMS AND EXCLUDES ANY LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY ARISING IN CONNECTION WITH THIS PRODUCT, INCLUDING WITHOUT LIMITATION, WHETHER IN TORT, NEGLIGENCE, STRICT LIABILITY CONTRACT OR OTHERWISE. Some States do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from State to State.

HYDROMATIC®
Pentair Pump Group
1840 Baney Road Ashland, Ohio 44805
Tel: 419-289-3042 Fax: 419-281-4087
www.hydromatic.com *ISO 9001 Certified*

– Your Authorized Local Distributor –

Model #
WE1012H



Goulds

Submersible Effluent Pumps

MODEL

3885

ETL LISTED
SUBMERSIBLE
PUMP
CLASS I AND II DIV. 2 AND
CLASS III DIV. 1 AND 2

G1086131480

ETL TESTING LABORATORIES, INC.
CORTLAND NEW YORK, 13045

APPLICATIONS

Specifically designed for the following uses:
- Homes
- Farms
- Trailer Courts
- Motels
- Schools
- Hosptitals
- Industry
- Effluent Systems

SPECIFICATIONS

Pump:
- Solids Handling Capabilities: ¾" Maximum
- Discharge size: 2" NPT
- Capacities: Up to 114 GPM
- Total Heads: Up to 123 Feet TDH
- Mechanical Seal: Carbon-Rotary Seat/Ceramic-Stationary Seat 300 Series Stainless Steel Metal Parts BUNA-N Elastomers
- Temperature: 160°F (71°C) Maximum
- Fasteners: 300 Series Stainless Steel
- Capable of Running Dry Without Damage to Components

Motor:
- Single Phase: ⅓ HP, 115 or 230V 60 Hz, 1750 RPM
  ½ HP, 115V, 60 Hz, 3500 RPM
  ½ HP thru 1½ HP, 230V, 60 Hz, 3500 RPM
  Built-in overload with automatic reset
  Class B insulation
- Three Phase: ½ HP thru 1½ HP 208/230V, 460V, 60 Hz, 3500 RPM
  Class B Insulation, overload protection must be provided in starter unit
- Shaft: Threaded, 400 series stainless steel.
- Bearings: Ball bearings upper and lower
- Power Cord: 15 foot standard length (optional lengths available)
  Single Phase: ⅓ and ½ HP-16/3 SJTO with three prong plug.
  ¾ thru 1½ HP-14/3 STO with bare leads
  Three Phase: ½ thru 1½ HP-14/4 STO with bare leads
  On CSA listed models — 20' length SJTW and STW are standard.

FEATURES

Impeller: Cast iron, semi-open, non-clog with pump-out vanes for mechanical seal protection. Balanced for smooth operation. Bronze impeller available as an option.

Casing: Cast iron volute type for maximum efficiency. 2" NPT discharge adaptable for slide rail systems.

Mechanical Seal: Ceramic vs carbon sealing faces. Stainless steel metal parts, BUNA-N elastomers.

Shaft: Corrosion-resistant stainless steel. Threaded design. Locknut on three phase models to guard against component damage on accidental reverse rotation.

Motor: Fully submerged in high-grade turbine oil for lubrication and efficient heat transfer.

Designed for Continuous Operation: Pump ratings are within the motor manufacturer's recommended working limits, can be operated continuously without damage.

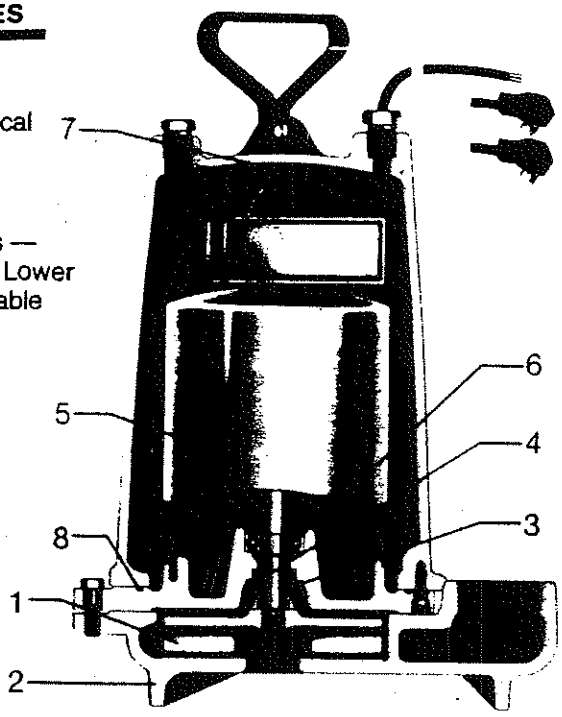
Bearings: Upper and Lower heavy duty ball bearing construction.

Power Cable: Severe duty rated, oil and water resistant. Epoxy seal on motor-end provides secondary moisture barrier in case of outer jacket damage and to prevent oil wicking.

O-Ring: Assures positive sealing against contaminants and oil leakage.

FEATURES

1. Impeller
   sing
   echanical
   Seal
4. Shaft
5. Motor
6. Bearings —
   Upper & Lower
7. Power cable
8. O-Ring



Goulds

Submersible Effluent Pumps

MODEL

3885

MODELS

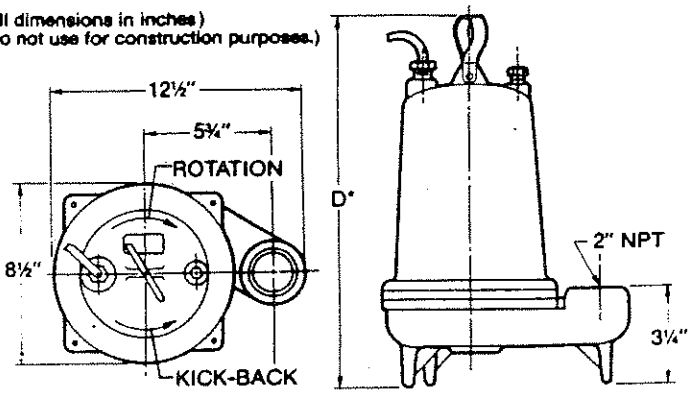
Series	HP	Volts	Phase	Max.Amp.	RPM	Solids	Wt.
WE0311L	⅓	115	1	9.4	1750		56
WE0312L		230		4.7			
311M		115		9.4			
312M		230		4.7			
0511H	½	115	1	13.0			60
WE0512H		230		6.5			
WE0532H		208/230	3	3.4			
WE0534H		460		1.7			
WE0511HH		115	1	13.0			
WE0512HH		230		6.5			
WE0532HH		208/230	3	3.3			
WE0534HH		460		1.65			
WE0712H	¾	230	1	10.0	3500	¾"	70
WE0732H		208/230	3	5.4			
WE0734H		460		2.7			
WE1012H	1	230	1	12.5			
WE1032H		208/230	3	7.0			
WE1034H		460		3.5			
WE1512H	1½	230	1	15.0			80
WE1532H		208/230	3	9.2			
WE1534H		460		4.6			
WE1512HH		230	1	15.0			
WE1532HH		208/230	3	9.2			
WE1534HH		460		4.6			

PERFORMANCE RATINGS (Gallons Per Minute)

Series No.	WE0311L WE0312L	WE0311M WE0312M	WE0511H WE0512H WE0532H WE0534H	WE0712H WE0732H WE0734H	WE1012H WE1032H WE1034H	WE1512H WE1532H WE1534H	WE0511HH WE0512HH WE0532HH WE0534HH	WE1512HH WE1532HH WE1534HH
HP	⅓	⅓	½	¾	1	1½	½	1½
RPM	1750	1750	3500	3500	3500	3500	3500	3500
Total Head Feet of Water 5	100	70	80	90	106	—	60	—
10	80	65	76	87	102	112	56	84
15	60	57	72	84	100	108	53	82
20	36	45	65	79	95	105	48	77
25		25	59	74	91	100	45	75
30			50	67	85	96	40	72
35			40	61	79	92	35	70
40			26	52	72	86	30	67
45			10	43	64	80	25	64
50				30	54	73	18	60
55				17	42	65	12	58
60				6	30	54	3	54
65					16	40		51
70					5	26		47
75						14		43
80						4		40
90								33
100								24
110								15
120								5

DIMENSIONS

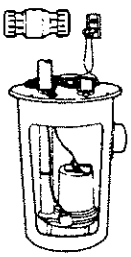
(All dimensions in inches)
(Do not use for construction purposes.)



D* ⅓, ½, ¾ and 1 HP = 15" except for model WE0712H & WE1012H = 18"; 1½ HP = 18"

EFFLUENT EJECTOR SYSTEM

Effluent ejector system offers ease of ordering and installation. A single ... number specifies ...ete system ...ned for most residential and commercial sump and effluent pump applications.

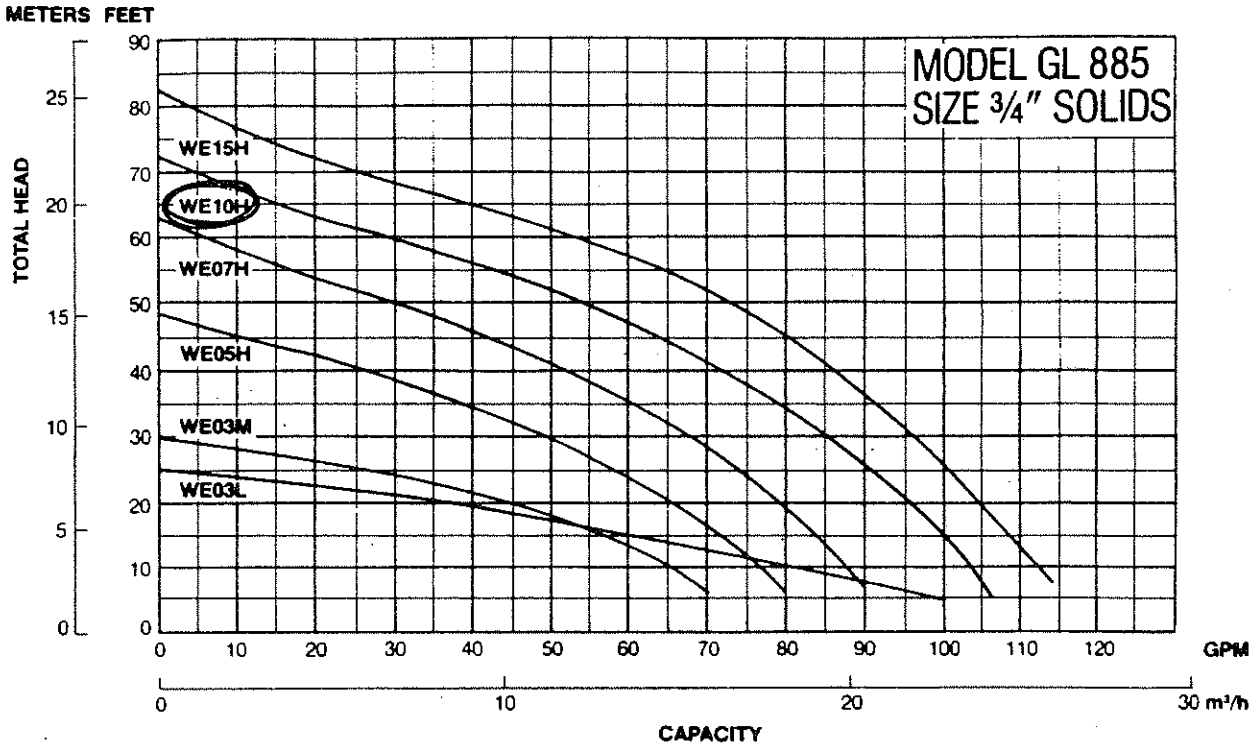


Package Includes:
Submersible Effluent Pump, WE0311L, 12L or WE0311M, 12M, WE0511HH, 12HH
Mercury Level Control Switch A2-5 (115V), A2-6 (230V)
Basin A7-1801S
Basin Cover A8-1822
Check Valve A9-2P
Order No.: SWE0311L, SWE0312L, SWE0311M, SWE0312M, SWE0511HH, SWE0512HH.

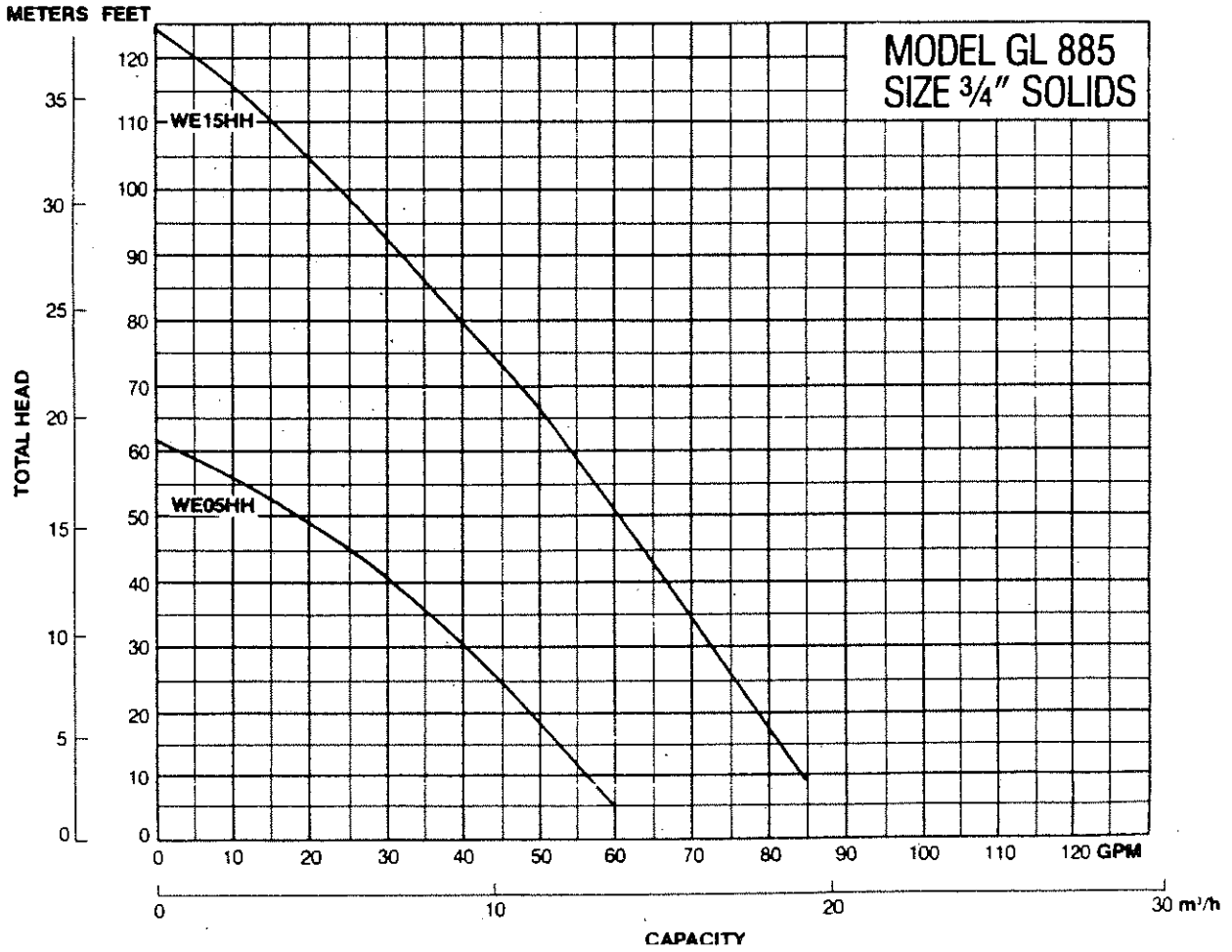
Available Certifications: Canadian Standards Association
Testing Laboratories

Performance Curves

Submersible Effluent Pumps



G&L

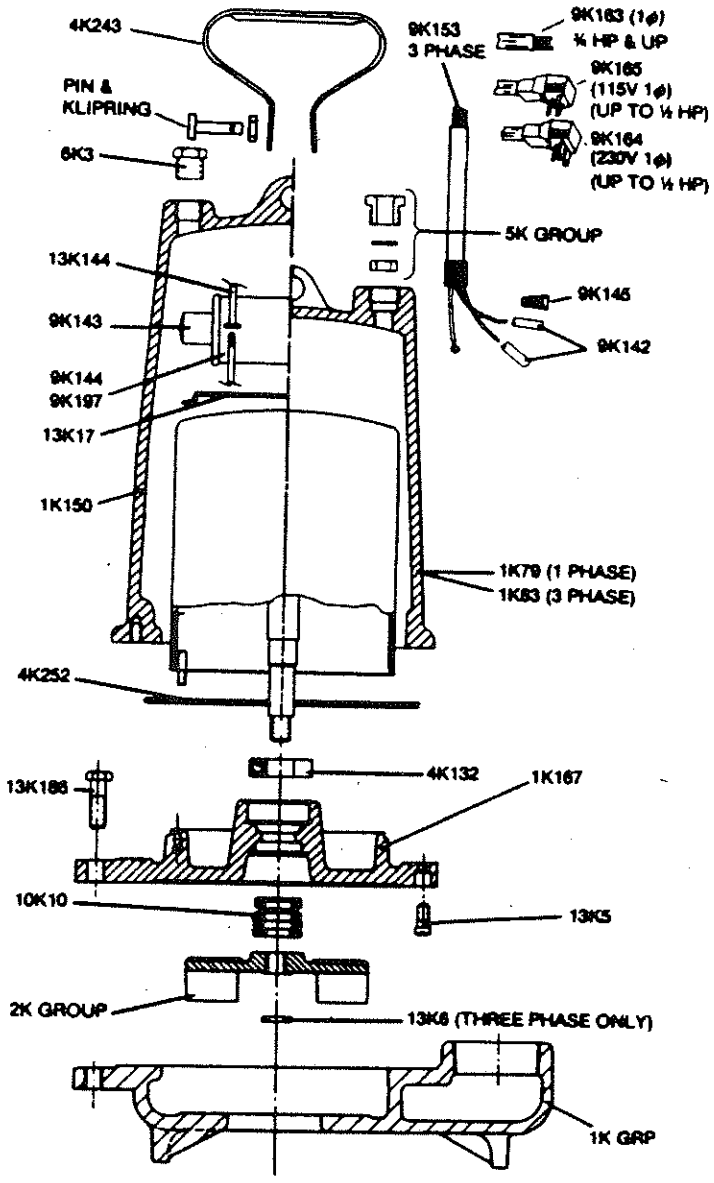


Repair Parts

MODEL GL885

PART NO.		PART NAME	PATTERN NO.
1K170		Casing–All Medium (M), High (H), High–High (HH), Head Models	59114
1K171		Casing–WE0311L, WE0312 Low Head/High Flow Models Only	59115
1K79		Motor Cover–⅓ HP and ½ HP Single Phase	56887
1K83		Motor Cover–½ HP–1 HP Three Phase	56887
1K150		Motor Cover–¾ HP–1½ HP Single and 1½ HP Three Phase	59055
1K167		Stuffing Box	59113
2K158	Cast Iron	Impeller All ⅓ HP	59049
2K220	Cast Iron	Impeller ½ HP WE05(H)	59086
2K219	Cast Iron	Impeller ¾ HP WE07(H)	59051
2K218	Cast Iron	Impeller 1 HP WE10(H)	59050
2K217	Cast Iron	Impeller 1½ HP WE15(H)	59050
2K225	Cast Iron	Impeller ½ HP WE05(HH)	59097
2K221	Cast Iron	Impeller 1½ HP WE15(HH)	59076
2K271	Bronze	Impeller All ⅓ HP	59049
2K272	Bronze	Impeller ½ HP WE05(H)	59086
2K273	Bronze	Impeller ¾ HP WE07(H)	59051
2K274	Bronze	Impeller 1 HP WE10(H)	59050
2K275	Bronze	Impeller 1½ HP WE15(H)	59050
2K276	Bronze	Impeller ½ HP WE05(HH)	59097
2K277	Bronze	Impeller 1½ HP WE15(HH)	59076
4K132		Ball Bearing	
4K243		Lift Handle Assembly	
4K245		Insulating Oil (Gal.) ⅓ & ½ HP 6 Pts. Req.; ¾–1½ HP 8 Pts. Req.	
4K252		"O" Ring	
5K111		Strain Relief Assembly–¾–1½ HP 1 Phase & All 3 Phase	
5K113		Strain Relief Assembly–⅓, ½ HP 1 Phase	
6K3		Plug–⅜" NPT	
9K142		Heat Shrink Tubing–1 Phase Models Only	
9K143		Capacitor Cap	
9K144		Capacitor	
9K145		Insulating Connector–3 Phase Models Only	
9K153		Cord Set–All 3 Phase (Except CSA)	
9K163		Cord Set–¾–1½ HP 1 Phase (Except CSA)	
9K164		Cord Set–⅓ & ½ HP 1 Phase 230 Volt (Except CSA)	
9K165		Cord Set–⅓ & ½ HP 1 Phase 115 Volt (Except CSA)	
9K195		Cord Set–⅓ & ½ HP 1 Phase 115 Volt–CSA	
9K196		Cord Set–⅓ & ½ HP 1 Phase 230 Volt–CSA	
9K180		Cord Set–¾–1½ HP 1 Phase–CSA	
9K181		Cord Set–All 3 Phase–CSA	
9K197		Capacitor ½ HP Single Phase Only	
10K10		Mechanical Seal Assembly	
13K5		Fillister Head Screw–St. Box to Motor Cover	
13K6		Impeller Locknut–3 Phase Only	
13K17		Capacitor Bracket	
13K144		Strap–Capacitor	
13K186		Hex Cap Screw–St. Box to Casing	
AL27121		Loctite #271	

Note: Impellers on 3 ϕ units are Loctited to motor shaft. Impellers and locknuts must be heated to be removed. When replacing impeller, use Loctite AL271121. See instruction manual.

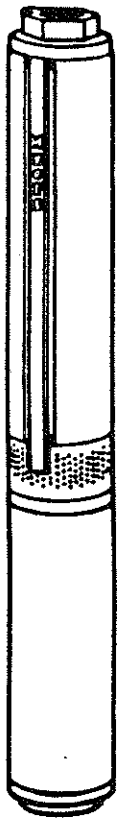


Repair Motor Numbers				
HP	Phase	Voltage	RPM	Order #
⅓	1	115	1750	118-12-01
⅓	1	230	1750	118-12-02
½	1	115	3500	118-12-22
½	1	230	3500	118-12-23
¾	1	230	3500	118-12-24
1	1	230	3500	118-12-25
1½	1	230	3500	118-12-26
½	3	208/230/460	3500	118-13-21
¾	3	208/230/460	3500	118-13-22
1	3	208/230/460	3500	118-13-23
1½	3	208/230/460	3500	118-13-24

G&L

Effective January, 1988

PREDATOR & RAIDER Series Submersible Pumps Installation and Operation Guide 5 - 20 GPM 1/3 - 7-1/2 HP



Myers

For additional electrical information on Franklin motors refer to the "Installation and Field Service" manual published by Franklin Electric.

C Electrical Preparation

1. Motor voltage

Myers Submersible Pumps operate on 115-volts or on 230-volts, single phase current.

a) The motor is NOT dual voltage; therefore, select the pump for one or the other: 115-volt or 230-volt.

b) If available, 230-volt installation is recommended. (Electrical power service today provides both 115-volt and 230-volt.)

SJF Franklin single phase motors are 230 volt only and three phase motors are NOT dual voltage.

Motor control box must be for same horsepower size and voltage as motor.

115-volt Power Supply

115-volt Submersible Pump Motor

230-volt Power Supply

230-volt Submersible Pump Motor

3 Phase Power Supply

3 Phase Submersible Pump Motor

2. Cable size

Submersible pump cable is not just ordinary wire; the copper cable is well insulated to withstand many years of complete submersion in water. Selection of proper size cable is very important. Under-sized cable results in too low a voltage supply to the motor and ultimate motor failure. Over-sized cable will cost much more than proper-sized cable. See chart of proper-sized cable (in chart, the smaller the AWG number, the larger the cable wire size).

For Canadian installations: a) type RWU, TWU, SGOW or SWOW power supply cables are recommended. b) The well seal and motor case shall be bonded to the main A-C ground.

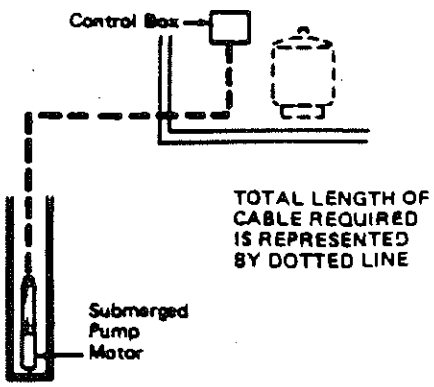
MAXIMUM CABLE LENGTH IN FEET

HP	Wire	Volts	Phase	Max. Amps	Maximum Cable Length Using AWG Cable Size								
					#14	#12	#10	#8	#6	#4	#2	#0	#00
1/3	2	115	1	11.2	105	165	260	420	670	1070	1675	2680	
	2	230	1	4.5	515	825	1305	2085	3335	5335	8335	13335	
	3	115	1	11.8	100	155	250	395	635	1015	1590	2540	
	3	230	1	5.7	410	650	1030	1645	2630	4210	6580	10525	
1/2	2	115	1	14.0	85	130	210	335	535	855	1340	2145	
	2	230	1	6.5	360	570	905	1440	2310	3690	5770	9230	
	3	115	1	15.3	75	120	190	305	490	785	1225	1960	
	3	230	1	7.5	310	495	785	1250	2000	3200	5000	8000	
3/4	2	230	1	9.0	260	410	655	1040	1665	2665	4165	6665	
	3	230	1	10.2	230	360	575	920	1470	2353	3675	5880	
1	2	230	1	9.5	245	390	620	985	1580	2525	3945	6315	
	3	230	1	12.0	195	310	490	780	1250	2000	3125	5000	
1 1/2	2	230	1	11.2	210	330	525	835	1340	2145	3350	5355	
	3	230	1	13.7	170	270	430	685	1095	1750	2735	4380	
	3	200	3	6.1	320	510	800	1260	1960	3060			
	3	230	3	6.4	360	580	920	1450	2260	3510			
	3	460	3	3.2	1700	2710	4270						
2	3	230	1	13.2	150	250	390	620	970	1530	2360	3620	4480
	3	200	3	9.4	240	390	610	970	1520	2360	3610	5420	
	3	230	3	8.2	250	450	700	1110	1740	2710	4130	6200	
	3	460	3	4.1	1300	2070	3210	5150	8050				
3	3	230	1	16.5	120	190	300	470	750	1180	1850	2890	3610
	3	200	3	13.1	180	290	470	740	1160	1810	2760	4130	
	3	230	3	10.6	210	340	540	860	1340	2080	3170	4730	
	3	460	3	5.3	1000	1600	2520	3970	6200				
5	3	230	1	27.5		110	180	280	450	710	1110	1740	2170
	3	200	3	20.0	110	170	280	440	690	1000	1660	2490	3050
	3	230	3	17.4	130	200	320	510	800	1240	1900	2850	
	3	460	3	8.7	540	950	1500	2360	3700	5750			
	3	575	3	7.0	920	1480	2330	3680	5750				
7 1/2	3	200	3	30.8			200	310	490	770	1180	1170	2170
	3	230	3	25.5		140	230	360	540	890	1350	2030	2480
	3	460	3	12.8	420	680	1070	1690	2640	4100	6260		
	3	575	3	10.7	660	1060	1680	2650	4150				

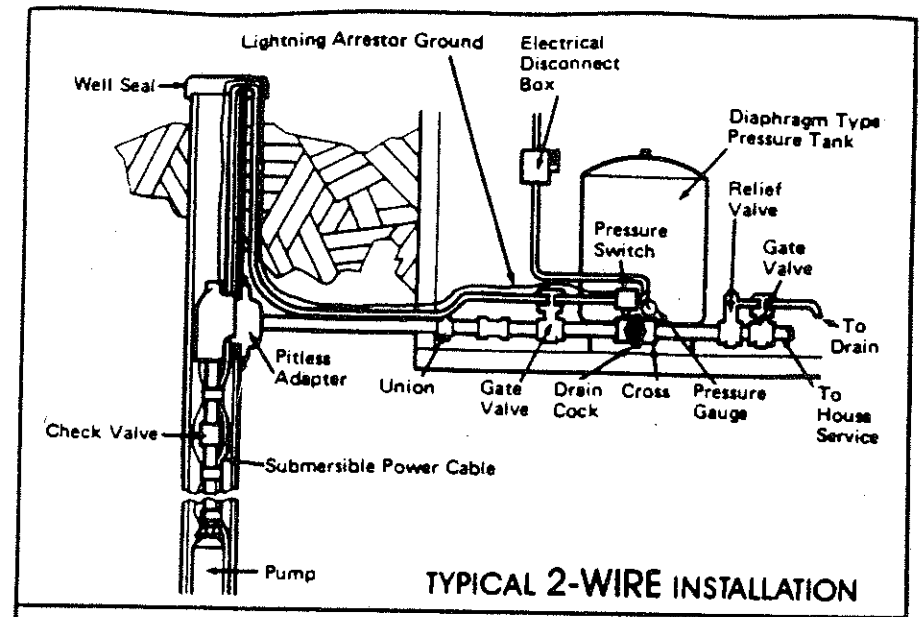
3. Length of cable

Maximum cable length specified for each horsepower size and minimum AWG cable wire size referred to in chart means the total distance from the submerged pump motor to the electrical motor control box as shown in this diagram.

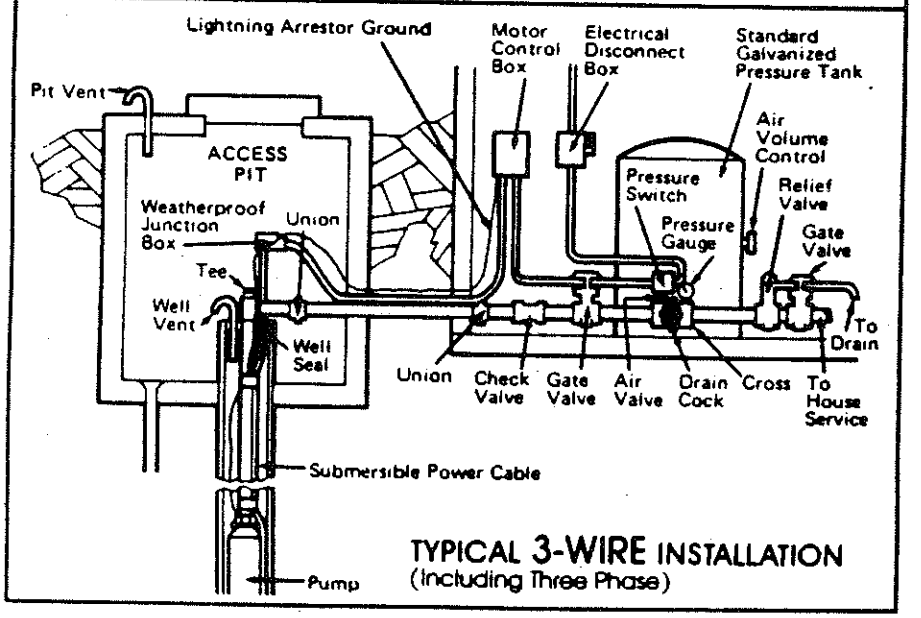
Myers warranty is void if under-sized AWG cable is used or if cable lengths longer than specified for each cable wire size are used.



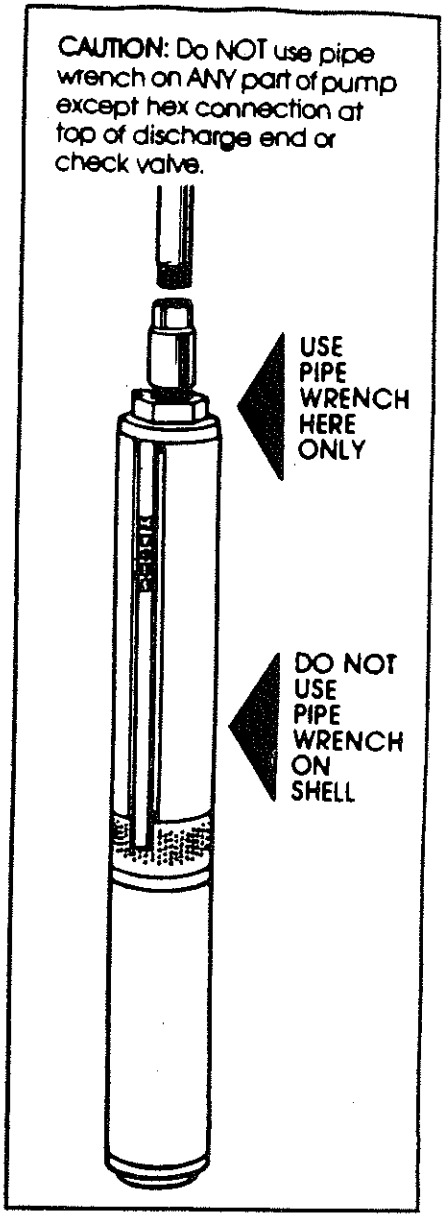
D Installation of Pump in Well



TYPICAL 2-WIRE INSTALLATION



TYPICAL 3-WIRE INSTALLATION
(Including Three Phase)



1. Before lowering pump

a) Smooth out any rough spots or sharp edges on the top lip of the well casing with a hammer or metal file to prevent damage to the pump or power cables, when lowering into well.

b) Safety cable. To aid in lowering pump when plastic PVC or flexible plastic pipe is to be used or to aid in raising the pump for future maintenance — attach nylon or stainless steel cable to lifting eye of pump.

c) The starting torque of the pump motor tends to give a twist which could cause the pump shell to rub against the inside walls of the well casing — especially if rigid PVC or flexible plastic pipe is used. To dampen this twisting, we suggest torque stops be used in all installations.

d) Attach a brass or steel adapter to top end of the pump and tightly band PVC or flexible plastic pipe to the adapter for a tough, long-lasting fit.

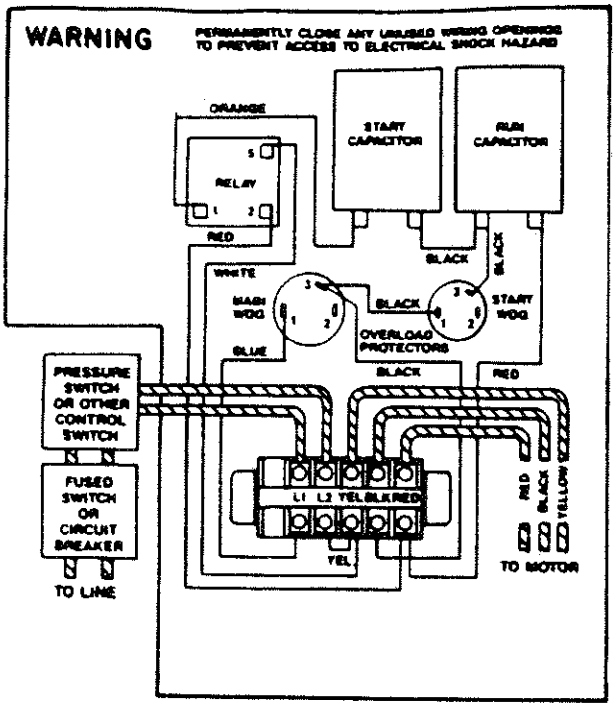
e) As you add additional sections of galvanized iron pipe or rigid plastic PVC pipe, apply pipe compound only to the male threaded ends of each section and tighten to next section.

f) For flexible plastic pipe installations, we recommend 160-lb. pipe for a lasting trouble-free installation.

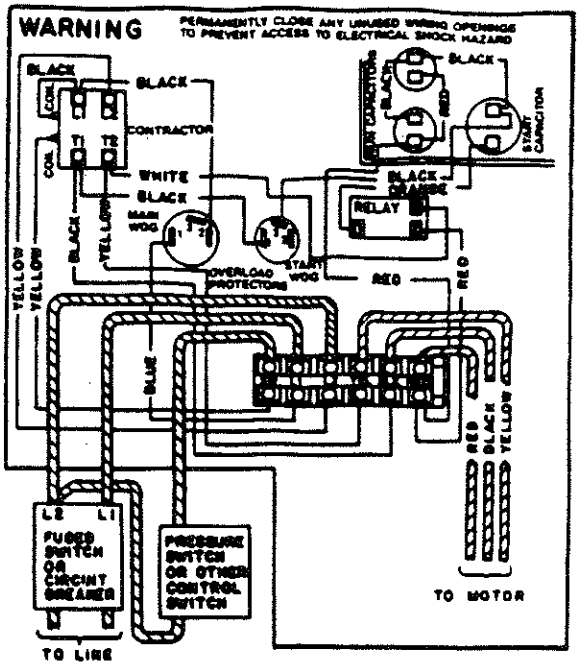
g) Tape the power cables and safety lifting cable to the pipe, straight up from bottom to top. Do NOT spiral cable around the pipe. Use waterproof tape or nylon lock bands every 5-ft on flexible plastic pipe or every 10-ft on PVC plastic or galvanized iron pipe. Do not allow any excess cable between bands; cable must be as flat against pipe as possible.

Franklin Single Phase

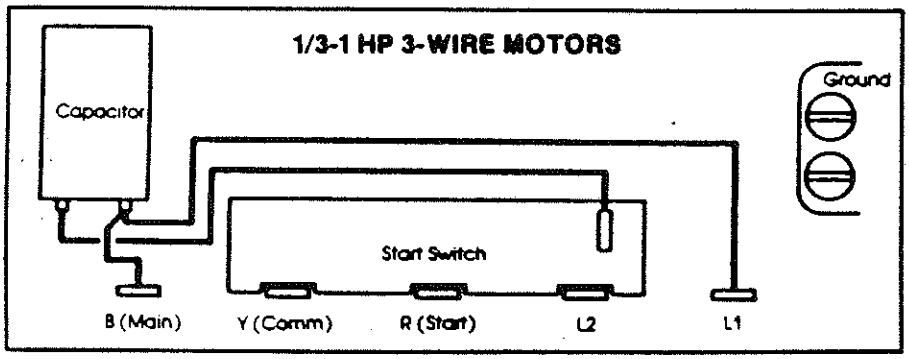
1 PHASE 2 & 3 HP

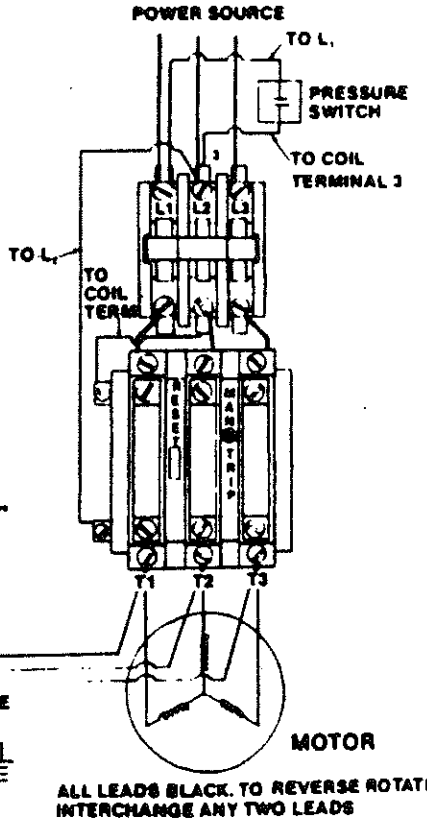


1 PHASE 5 HP



All 3 Phase





THREE PHASE

Run three power lines from the fused disconnect and connect to terminals L_1, L_2 & L_3 of the control box. Connect the pressure switch to L_1 & 3 of the control box. Connect the three leads of the pump motor to T_1, T_2 & T_3. Check for proper rotation. If rotation is reversed, then change any two leads.

F Above-Ground Pipe & Tank Connections

NOTE: Whenever the pump pressure can exceed the pressure rating of the tank, a relief valve must be installed and piped to a suitable drain.

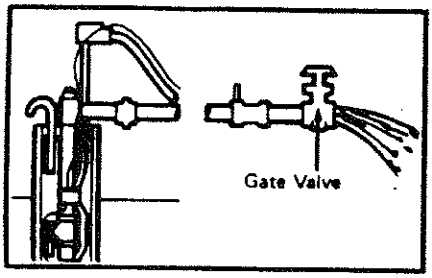
1. Check pump before connecting piping to tank

With all electrical connections complete and pump now lowered to desired depth, install a gate valve in the discharge pipe near well for preliminary test run (see diagram). Turn on power. Gradually open gate valve and let pump run until water is clear of sand and other impurities.

Fully open gate valve. If pump lowers water in the well to a point at which the pump loses its prime, either:

a) Lower pump further down well (if possible); or,

b) "Throttle" the pump to the capacity of the well by using a flow valve (see Section G).



2. Connecting diaphragm tank system

a) Connect all piping as shown in diagram.

b) Precharge tank to specified pressure (see instructions furnished with tank). If the system is to be set to operate at 30/50 pressure settings, the tank should be precharged to 28 psi (or 18 psi if system pressure is to be 20/40). Tank precharge pressure should always be 2 psi below the "cut-in" of the pressure switch.

c) Start pump. Pressure in tank will build up to cut-off pressure of pressure switch setting.

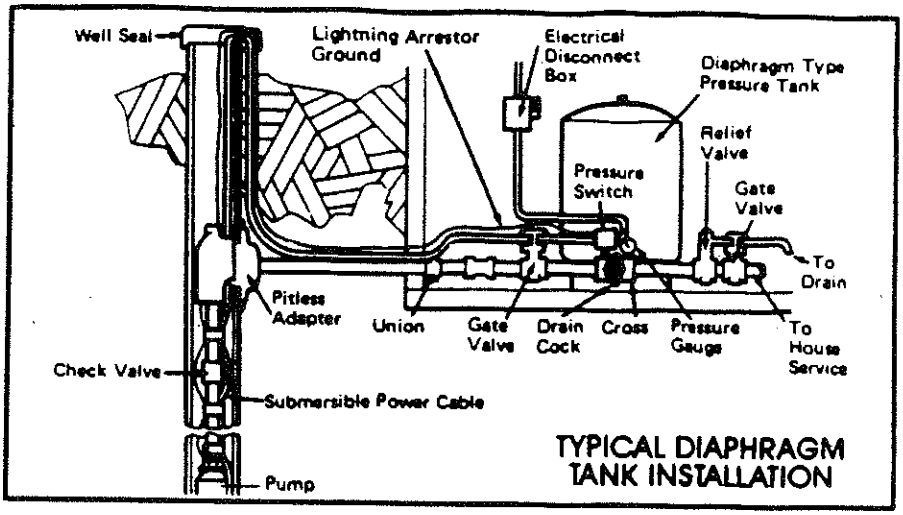
d) The system should now operate automatically.

3. Connecting standard galvanized tank system

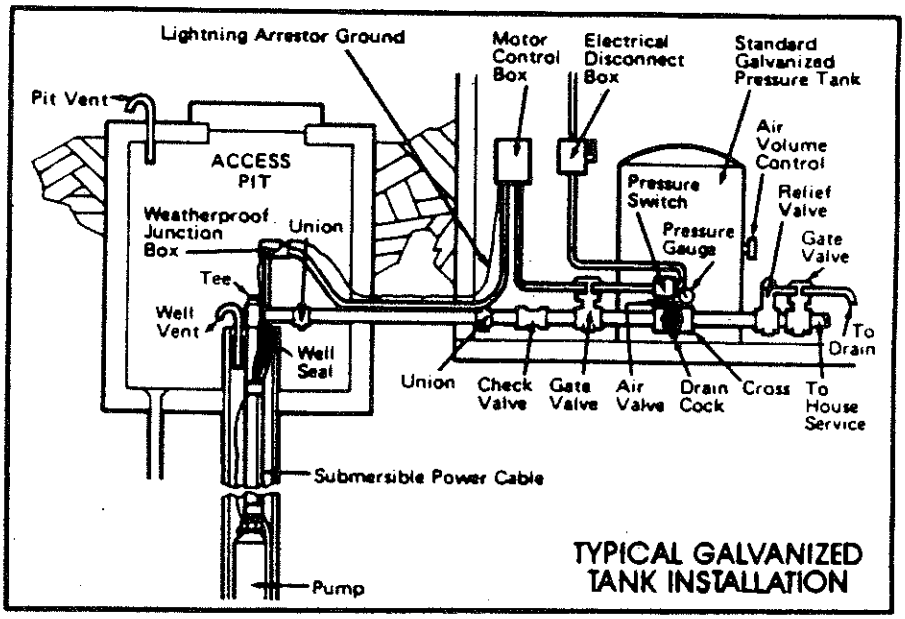
a) Connect all piping as shown in diagram.

b) Start pump. Pressure in tank will build up to cut-off pressure of switch setting.

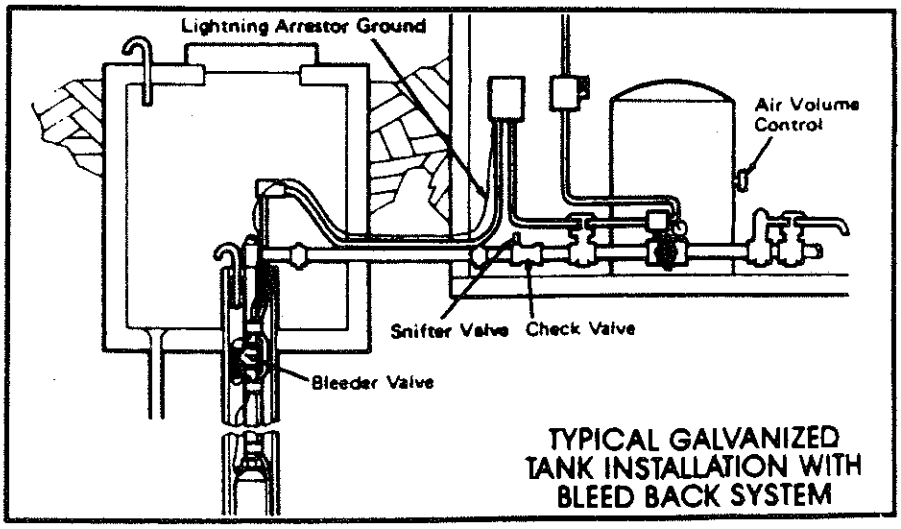
c) The system should now operate automatically.



TYPICAL DIAPHRAGM TANK INSTALLATION



TYPICAL GALVANIZED TANK INSTALLATION



TYPICAL GALVANIZED TANK INSTALLATION WITH BLEED BACK SYSTEM

PROBLEM	PROBABLE CAUSE	SOLUTION
Pump runs, but no water pumped	Check valve installed backwards.	Reverse and re-install.
	Setting too deep for rating of pump.	Check rating table.
	Pump not submerged; not deep enough in well.	Lower pump if possible. Check recovery of well.
	Pump in mud, impeller plugged or intake strainer clogged.	Pull pump and clean. Check well depth. Raise pump if necessary.
Reduced capacity	Strainer or impellers partially clogged or plugged.	Pull pump and clean.
	Corroded discharge pipe.	Replace pipe.
	Excessive pump wear.	Pull pump and replace worn parts. Or, replace pump.
Pressure switch won't cut out	Pressure switch not set correctly.	Revise settings: 20-lb cut-in, 40-lb cut-out; or 30/50 (depending on tank size).
	Water level too low in well for rating of pump.	Check pump setting.
	Switch opening clogged.	Clean out openings or, if neccessary replace switch.
	Excessive wear on parts.	Replace worn parts.
Pump starts too often, runs too long	Water-logged tank (loss of air pressure).	Check tanks for leaks. Re-charge with air pressure to proper level. Check air volume control.
	Check valve leaks.	Replace or repair.
	Pressure switch out of adjustment.	Adjust to proper setting and check to assure setting remains. If not, replace pressure switch.
	Leaks in pipe.	Check above-ground piping for leaks. If none, pull pump and check all pipe connections and connection of pipe to pump.
Any or all the above	All known causes are checked but system won't work properly.	Call your Myers dealer, your waterwell driller or your waterwell serviceman.

For your reference

Fill in the following information and keep this Installation & Operation Guide among your important papers. Information about your Myers Submersible Pump will be found on the owner's information-plate. Whenever necessary to contact your dealer or installer, give him this information.

Motor Model No. _____ Pump Model No. _____

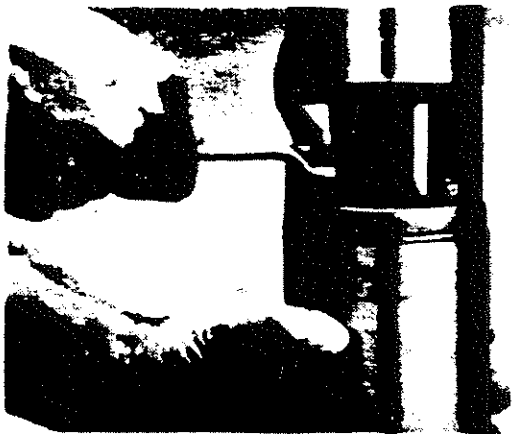
HP _____ Phase _____ Volts _____ Cycles _____

Amps: L1 _____ L2 _____ Date of Installation _____

Well depth _____ ft. Pump depth _____ ft.

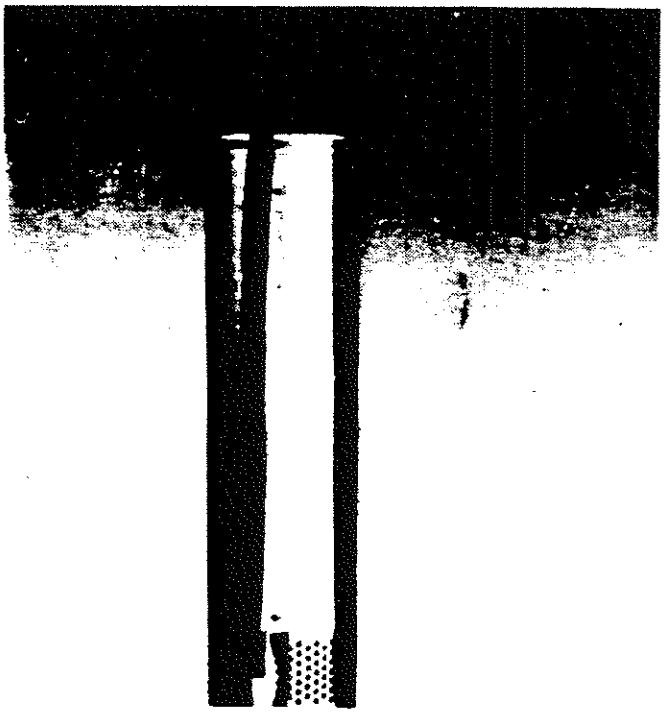
Name of dealer installer from whom pump was bought _____

_____ Date of purchase _____

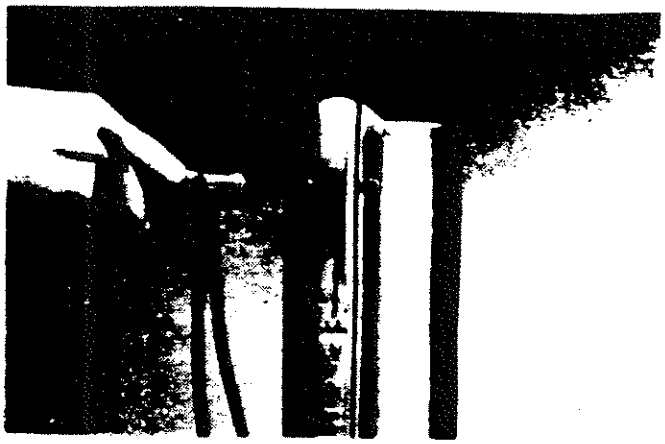


4. Fasten pump suction bowl onto the motor by tightening the (5) hex jam nuts. 2 jam nuts are to be installed on the same stud with the star washer to provide a ground. Be sure these nuts are tight.

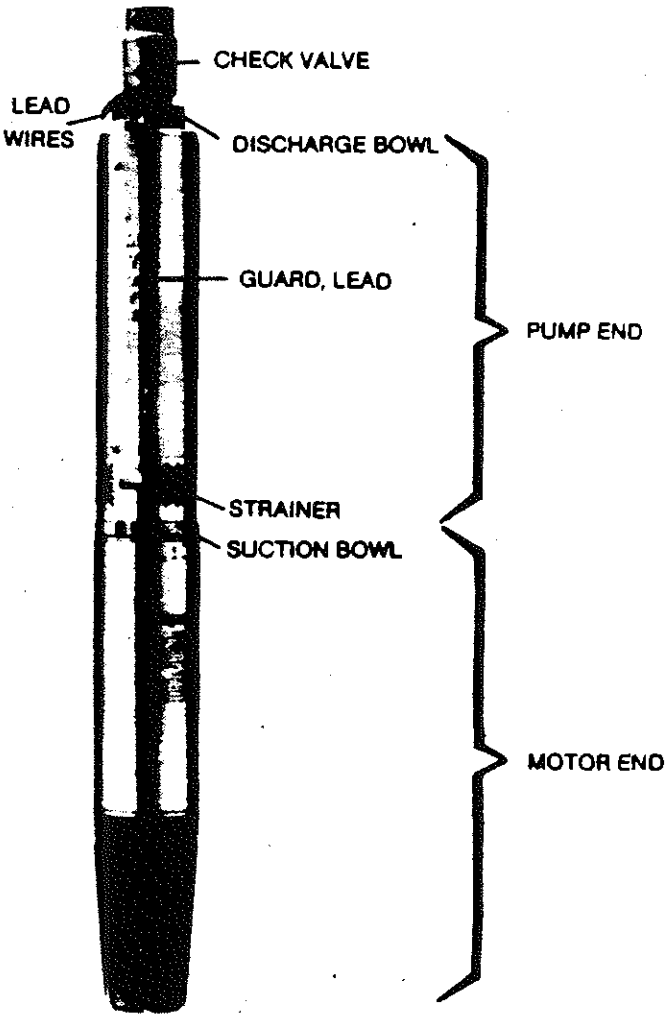
5. Re-assemble the suction strainer to the suction bowl.



6. Straighten motor lead wires, do not pull! Position lower sleeve near bottom of wires. Upper sleeve to be positioned under the top end of guard.



7. Secure lead guard at the bottom with two screws. Lead wires must be straight and under the guard with sleeves in position. Fasten top end to the pump shell with two screws.
8. Install check valve.
9. **CAUTION:** The screws need to be snug only! Do not overtighten. Be sure pump & motor nameplates are fastened to the control box (for 3 wire) or quick disconnect switch (for 2 wire).



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Myers®
F.E. Myers, A Pentair Company
1101 Myers Parkway, Ashland, Ohio 44805-1923
419/289-1144, FAX: 419/289-6658, TLX: 98-7443

EXPLOSION PROOF SUBMERSIBLE PUMP (2)

Manufacturer:

Weil Pump Company
5921 West Dickens Avenue
Chicago, IL 60639
(302) 637-8844

Supplier:

Syracuse Thermal
6750 Old Collamer Road
P.O. Box 398
East Syracuse, NY 13057
(315) 437-7321
Contact - Joe Percival

Features:

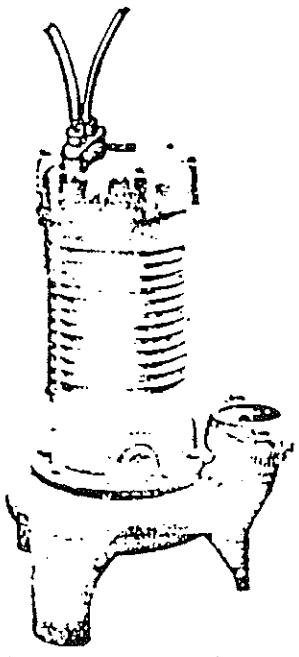
2700 Series
4-27x224
3 HP, 1750 RPM
3 Phase, 208/60
40 GPM @ 42' TDH

F-186-2

INSTRUCTION MANUAL FOR SERIES 2700 (STYLE 2)

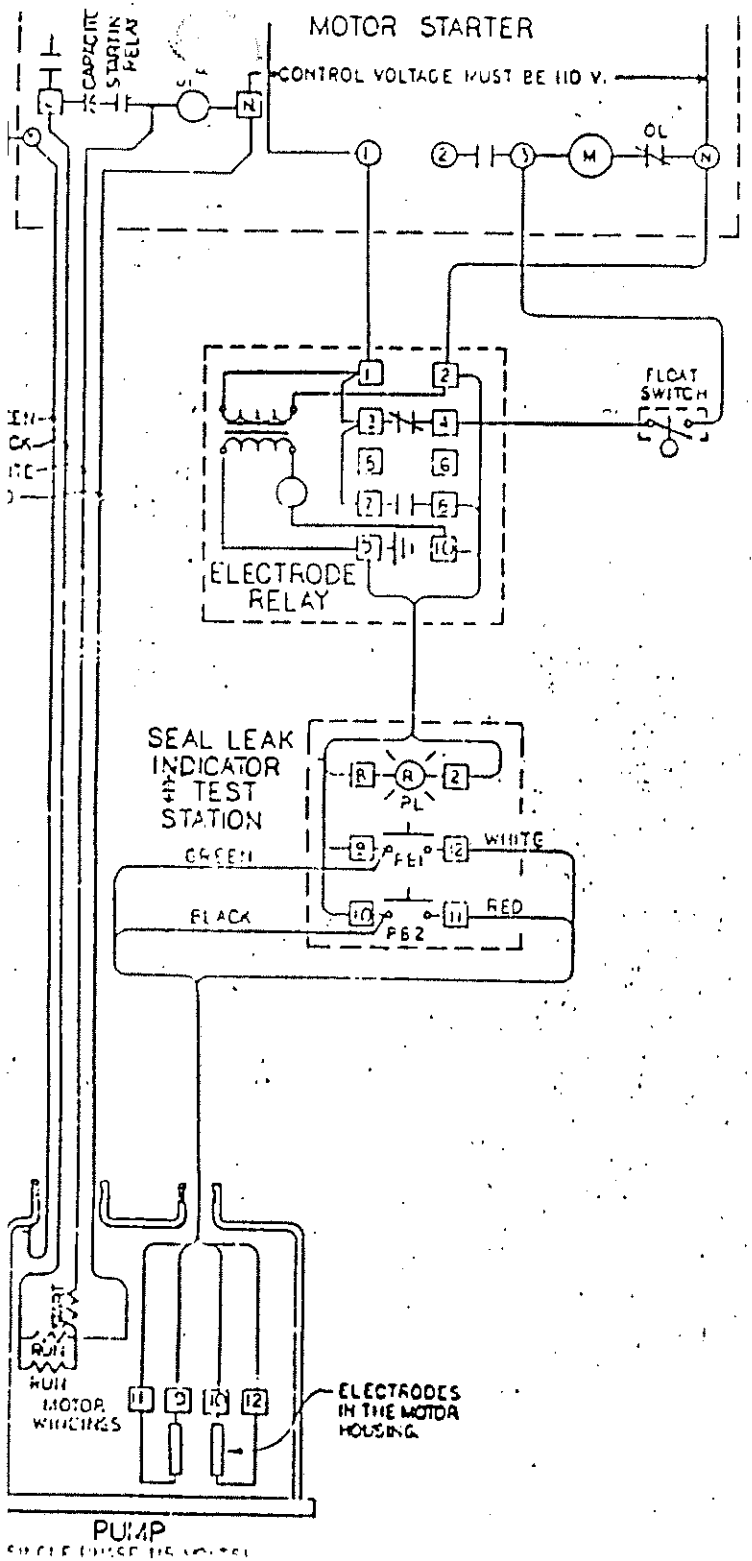
EXPLOSION PROOF SUBMERSIBLE

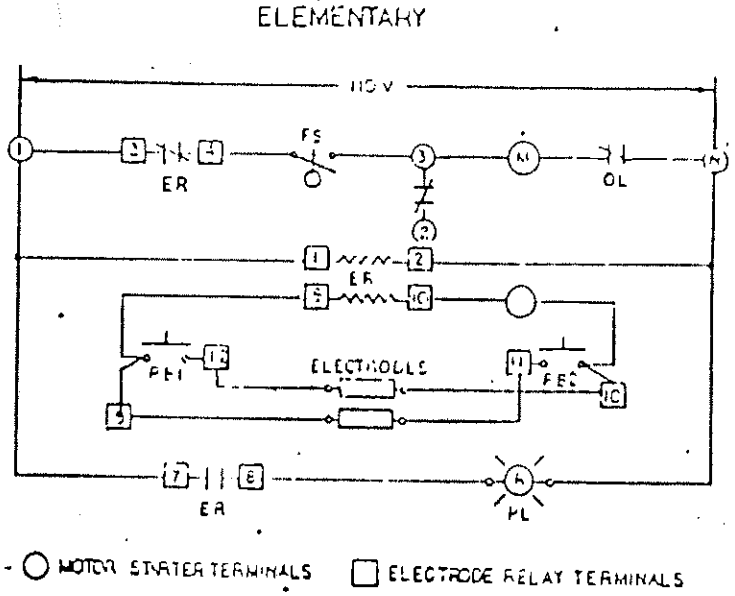
SEWAGE AND SUMP PUMPS FOR CLASS I, GROUP D HAZARDOUS LOCATIONS



Explosion proof motor and pump assembly

This symbol on the product's nameplate means it is Listed by UNDERWRITERS' LABORATORIES, INC.





WEIL EXPLOSION PROOF SEWAGE AND SUMP PUMPS

A DISTINGUISHING FEATURE OF THE WEIL EXPLOSION PROOF PUMPS IS THE ELECTRODE CIRCUIT WITHIN THE PUMP HOUSING.

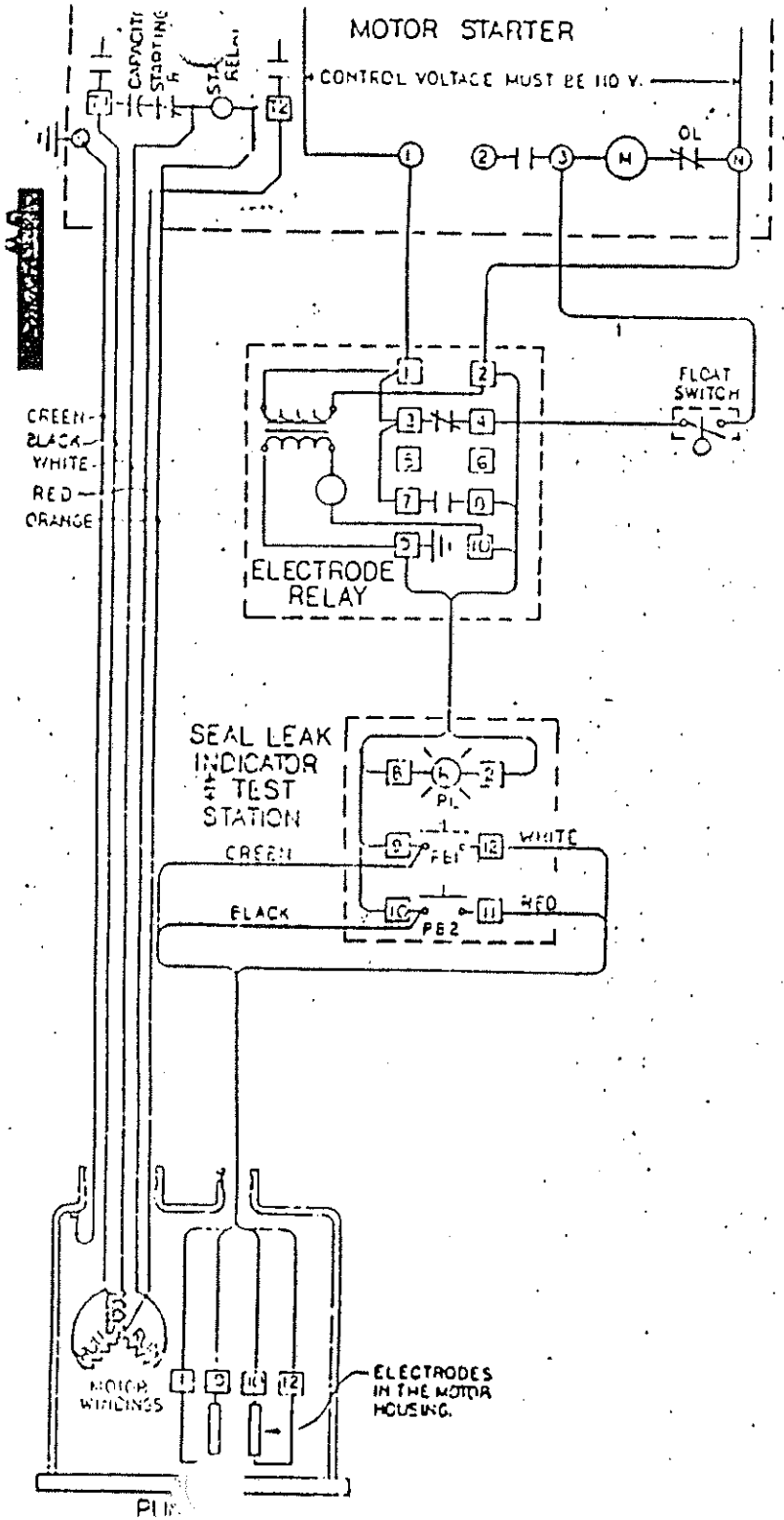
THE PURPOSE OF THESE ELECTRODES IS TO OPEN THE PILOT CIRCUIT TO THE PUMP STARTER IF THERE IS LEAKAGE INTO THE PUMP HOUSING. THE LIQUID COMPLETES THE CIRCUIT ACROSS THE ELECTRODES AND THE SECONDARY OF THE WARRICK CONTROL. THIS OPENS THE CONTACTS WHICH MUST BE CONNECTED IN SERIES WITH THE MOTOR STARTER MAGNET COIL. IT ALSO CLOSES A CIRCUIT TO THE LIGHT IN THE TEST STATION AND SIGNALS FLUID HAS ENTERED THE PUMP HOUSING.

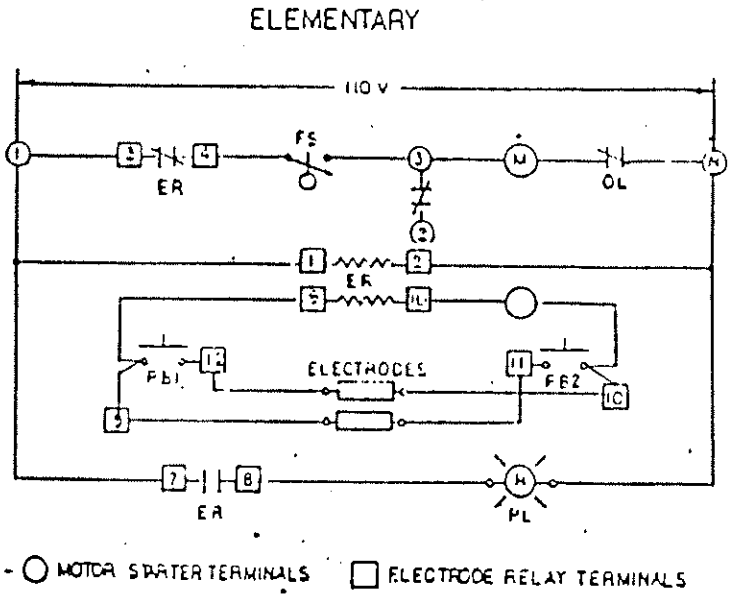
THE TEST STATION HAS TWO BUTTONS FOR THE PURPOSE OF CHECKING THE ELECTRODE CIRCUITS. PRESSING EITHER BUTTON SHOULD SIMULATE LEAKAGE, DROPPING OUT THE PUMP STARTER AND LIGHTING THE TEST SIGNAL LIGHT.

THE PRIMARY VOLTAGE ON THE WARRICK RELAY AND THE TEST STATION LIGHT MUST BE 110 VOLTS.

THIS VOLTAGE MUST BE COMMON WITH THE STARTER COIL.

NOTE: See Page 5 for Materials List.





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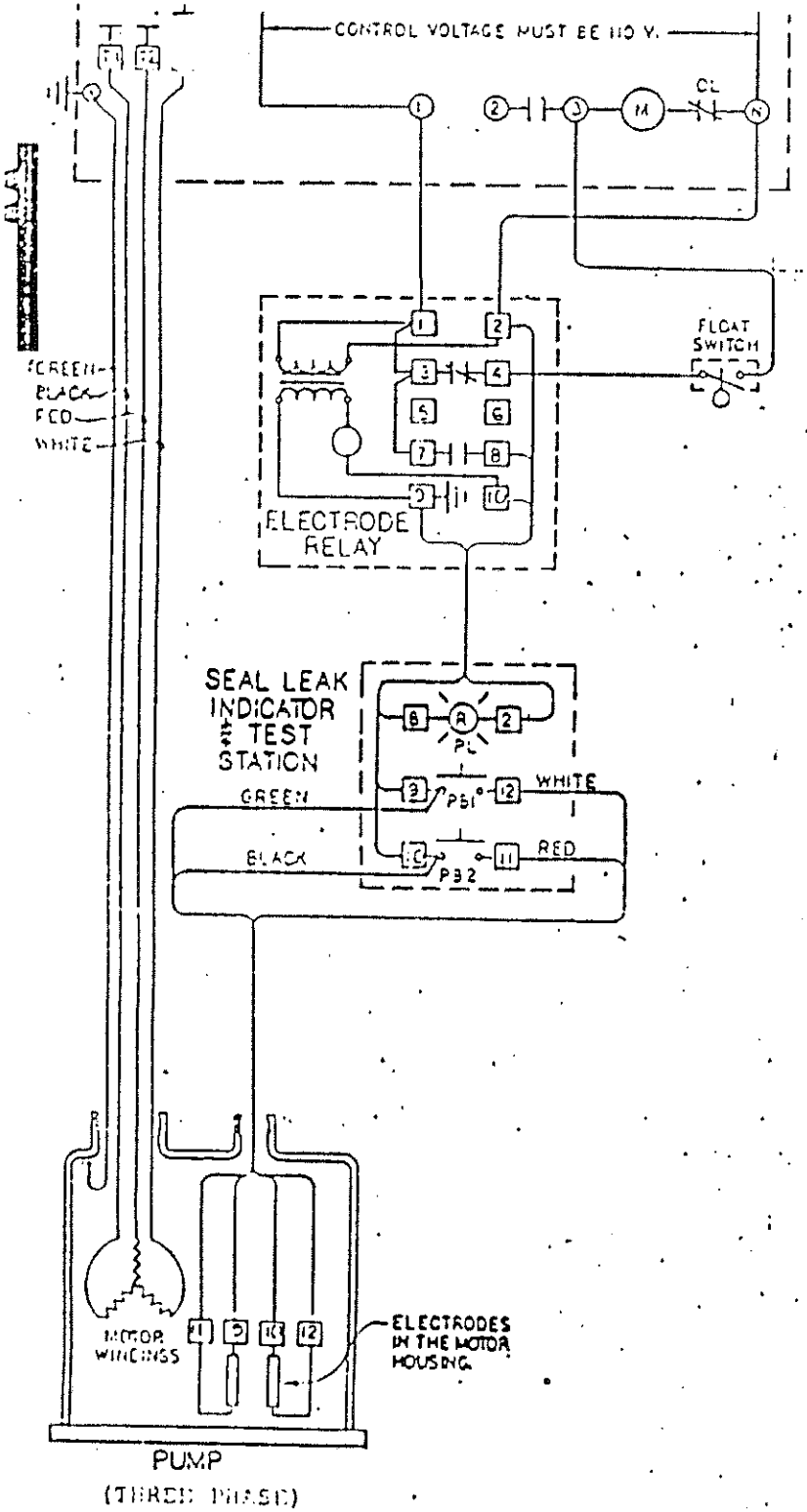

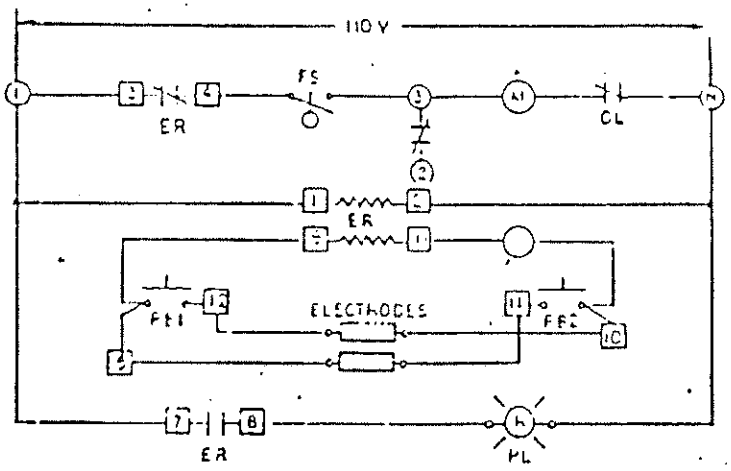

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MATERIALS LISTING

ITEM-1 MOTOR STARTER

STARTER USED MUST BE ADEQUATE FOR MOTOR HP. RATING AND COMPATIBLE WITH ELECTRICAL SERVICE AVAILABLE RE PHASE, VOLTAGE AND FREQUENCY.
ENCLOSURE MUST BE COMPATIBLE WITH ENVIRONMENTAL CONDITIONS OF INSTALLATION.

ITEM-2 ELECTRODE RELAY

TO COMPLETE THE ELECTRODE CIRCUIT AN ELECTRODE RELAY IS REQUIRED. RELAY MUST HAVE 110V. PRIMARY. AND 1 N.O. and 1 N.C. CONTACT.
RECOMMENDED UNIT IS IDIDOU MADE BY G.F. WARRICK CO., 1964 ELEVEN MILE ROAD, BERICELY, MICH.
ENCLOSURE MUST BE COMPATIBLE WITH ENVIRONMENTAL CONDITIONS OF INSTALLATION.

ITEM-3 PUSH BUTTON STATION

TO TEST THE ELECTRODE CIRCUITRY, A PUSH BUTTON STATION IS RECOMMENDED.
STATION SHOULD HAVE A 110V. PILOT LITE AND 2 MOMENTARY CONTACT PUSH BUTTONS, EACH WITH A N.O. AND A N.C. CONTACT.
ENCLOSURE MUST BE COMPATIBLE WITH ENVIRONMENTAL CONDITIONS OF INSTALLATION.

ITEM-4 MOTOR LEAD HUB (INTEGRAL WITH MOTOR)

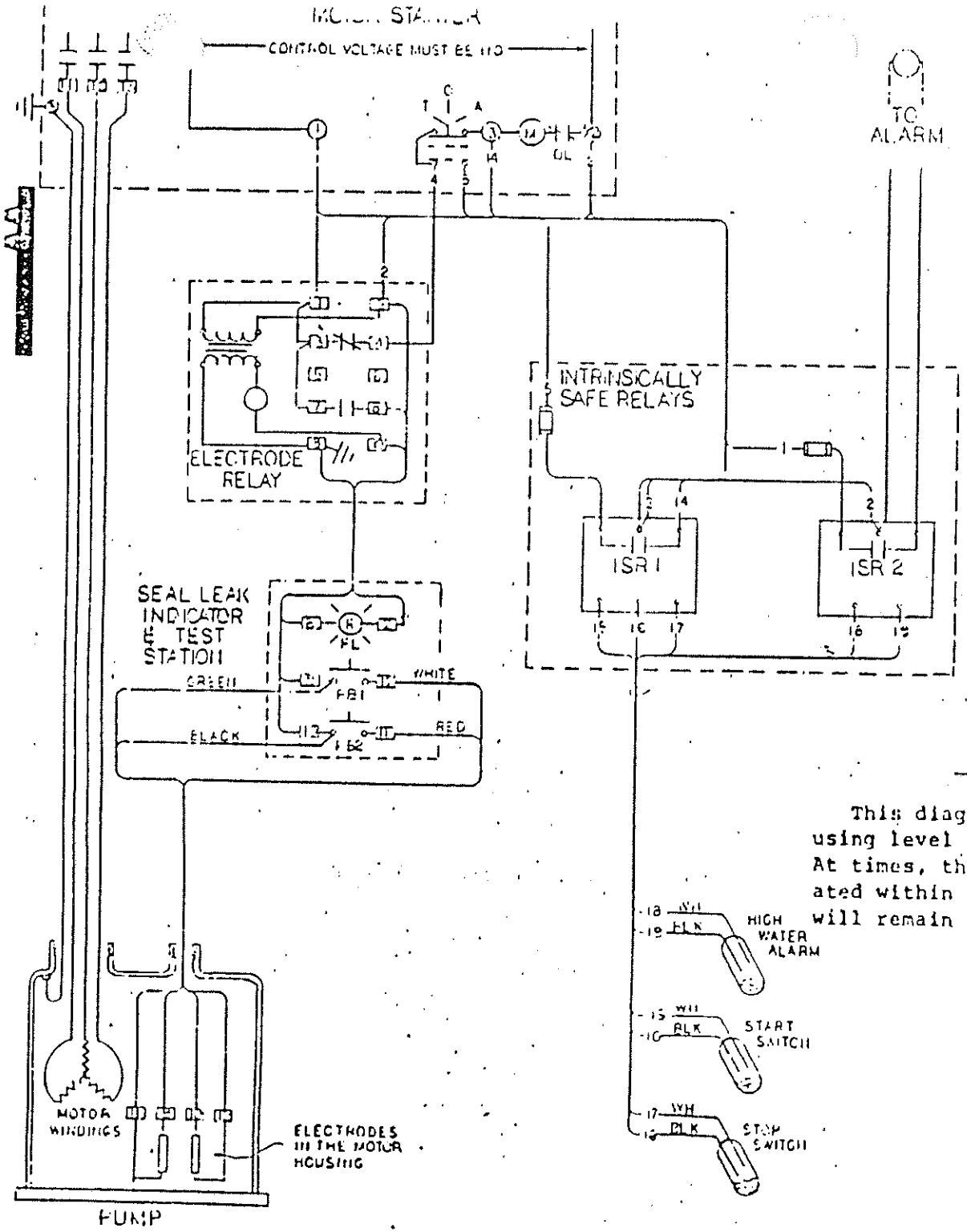
HUB PROVIDED WITH MINIMUM OF 5 - 1½" N.P.T. THREADS FOR ATTACHMENT OF RIGID CONDUIT, RESISTANT TO SEWAGE, TO ENCLOSE MOTOR CABLE TO SUIT LOCAL CODES AND/OR INSTALLATION REQUIREMNETS.

ITEM-5 ELECTRODE LEAD HUB (INTEGRAL WITH MOTOR)

HUB PROVIDED WITH MINIMUM OF 5 - 1" OR 3/4" N.P.T. THREADS FOR ATTACHMENT OF RIGID CONDUIT. RESISTANT TO SEWAGE, TO ENCLOSE ELECTRODE CABLE TO SUIT LOCAL CODES AND/OR INSTALLATION REQUIREMENTS.

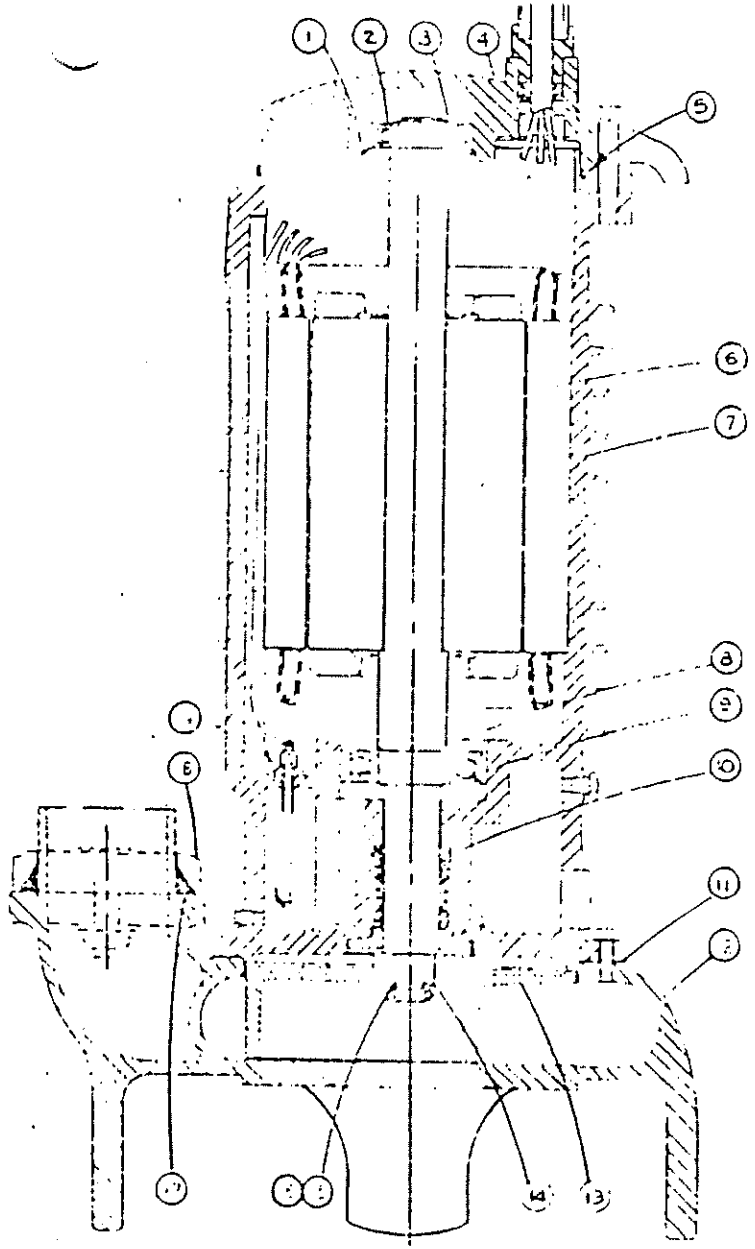
ITEM-6 LEVEL CONTROL

A LIQUID LEVEL CONTROL DEVICE, I.E. FLOAT SWITCH, IS GENERALLY USED FOR PUMP OPERATION.
RATINGS MUST BE ADEQUATE FOR ELECTRICAL SERVICE AND ENCLOSURE MUST BE COMPATIBLE WITH ENVIRONMENTAL CONDITIONS OF INSTALLATION.



TYPICAL WIRING DIAGRAM

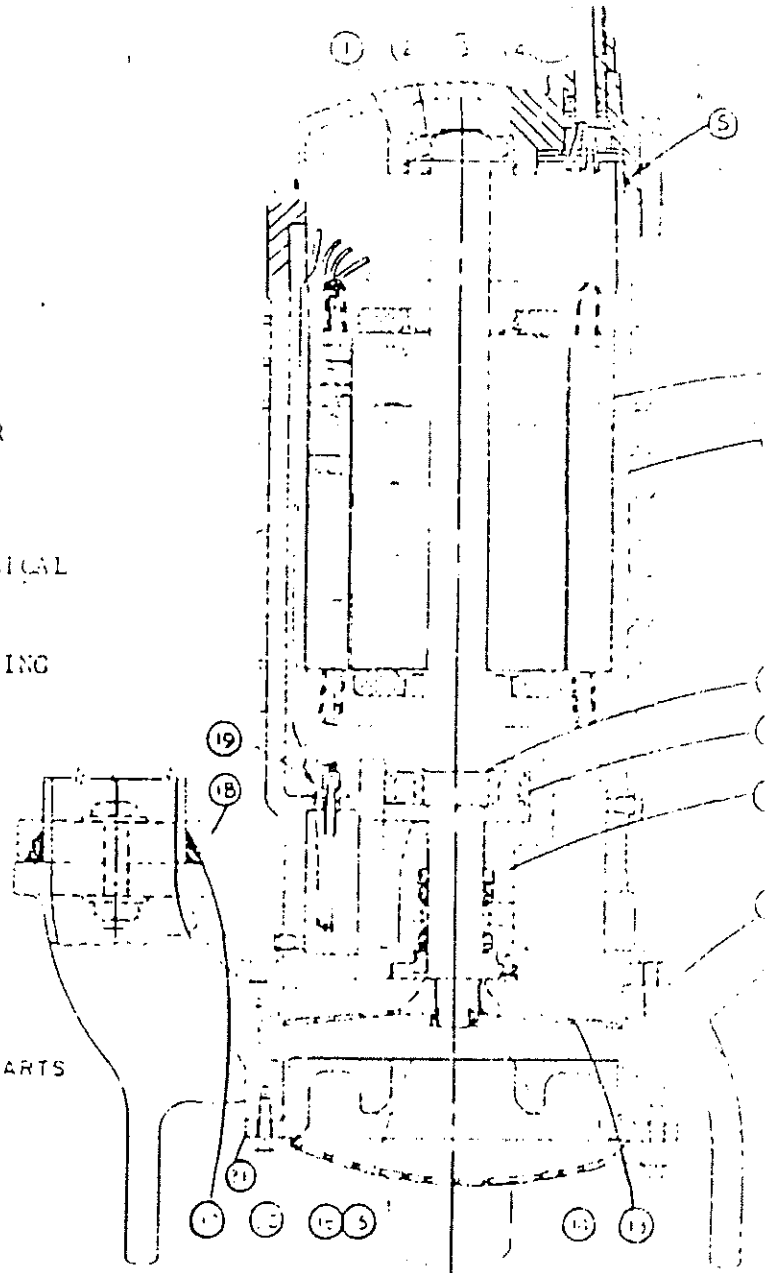
This diagram indicates the connections when using level switches and intrinsically safe relays. At times, the intrinsically safe relays may be located within the starter enclosure, however the wiring will remain as shown.



	1	SNAP RING
●	2	BALL BEARING
	3	SNAP RING
	4	END BELL
●	5	'O' RING
	6	PARTIAL MOTOR
	7	MOTOR SHELL
	8	SNAP RING
●	9	BALL BEARING
●	10	DOUBLE MECHANICAL SEAL
	11	GASKET
	12	DISCHARGE CASING
●	13	IMPELLER
●	14	KEY
●	15	LOCKNUT
●	16	LOCKWASHER
	17	GASKET
	18	FLANGE
●	19	ELECTRODE
	20	STRAINER
	21	SUCTION PLATE

● RECOMMENDED SPARE PARTS

TYPICAL ASSEMBLY OF EXPLOSION PROOF
SUBMERSIBLE SEWAGE EJECTORS



TYPICAL ASSEMBLY OF EXPLOSION PROOF
SUBMERSIBLE SUMP PUMP

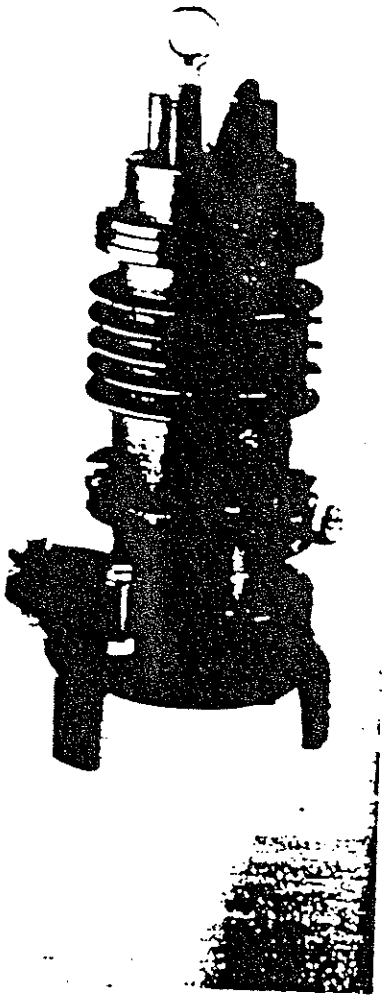
CONSTRUCTION DETAILS

MOTOR-Specially designed and built for Weil Submersible Pumps, unit is of heavy duty construction with Class I high temperature insulation suitable for continous or intermittent duty, 55 C, 1150 or 1750 RPM, 60 cycle, AC, listed by UL for CLASS 1, GROUP D Hazardous Locations (File E40353). MOTOR FRAME, END BELL and C[illegible] G-High strength cast iron. IMPELLERS-Bronze or [illegible] strength cast iron: [illegible] blade non-clog capable of passing 3" solids or [illegible] ciple blade open type for screened liquids. [illegible]

INSTALLATION • OPERATION • MAINTENANCE INSTRUCTION MANUAL FOR SERIES 1700 AND 2700 EXPLOSION PROOF SUBMERSIBLE PUMPS

MODELS: 2A-17X01X-X, 2.5A-17X11X-X, 3A-17X21X-X, 3A-27X21X-X, 4A-27X22X-X, 4A-27X23X-X, 4A-27X31X-X, 4A-27X41X-X

OCTOBER, 1986



INTRODUCTION

This manual contains complete instructions for installation, operation, maintenance and repair of your pump equipment. A careful and thorough study of this manual is advised before use of the equipment.

The pump is a well designed and sturdily constructed machine. When properly installed and reasonably maintained, it will give many years of trouble free service.

RECEIVING

The pump equipment should be checked for shortages and damage immediately upon arrival. Report promptly to the transportation company noting any loss or shortages on the freight bill or bill of lading. Claims for shortages must be made in writing to Weil Pump Co., no more than 14 days after receipt of equipment.

STORAGE

Submersible pumping equipment should be installed and put into operation as soon as possible. If it is necessary to store the equipment, precautions should be taken to prevent damage due to corrosion or oxidation. The storage area should be dry and have relatively constant temperature. If possible store the equipment indoors. Exposed machined surfaces (locknut and shaft end) should be coated with a rust preventative coating similar to "Rust Ban No. PH 6397" manufactured by Humble Oil Co. The entire unit should be sealed in a heavy plastic (polyethlene) bag. A desiccant such as VPI-20 manufactured by the Shell Oil Co., should be inserted in the bag before it is sealed. This particular vapor phase inhibitor, in crystalline form, should be used at a rate of approximately one (1) gram per cubic foot. Before sealing bag, arrange power cable, and moisture sensor cable (if so equipped) in gently curved loops to prevent cables from taking a permanent set.

During storage, the plastic bag should be opened at least once a month, and the rotating assembly of the pump turned several revolutions by hand. This will aid in preventing point of contact corrosion where bearing balls touch their races. Add vapor phase inhibitor before the bag is resealed. When installing pump after storage, check oil level in seal chamber by unscrewing plug. Add oil if level is below plug opening (Exxon-Univolt 60 or equivalent). No other lubrication is necessary. For additional information regarding rust preventation, reader is referred to American Society For Metals Handbook, under contents "Rust Preventive Compounds."

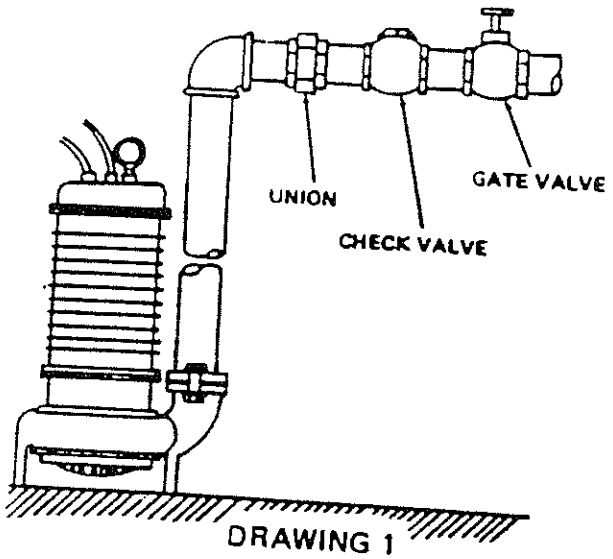
INSTALLATION

The pump is ready for installation as shipped. No lubrication or adjustment is required before initial operation. The pump is designed to stand at the bottom of a pit or sump having a solid floor. The sump/pit should be free of sand or other abrasives, since such materials may damage the mechanical seal. Raise and lower the unit by means of a chain or steel cable fastened to the eyebolt provided. Do not raise, lower or support the unit by means of the electrical power cable or the moisture sensor cable. When moving the pump, avoid placing strain on the electrical cables. Set the pump in its final location before connecting the cable(s). When electrical connections are complete, check that the impeller rotates in the correct direction. Provide adequate headroom above the sump/pit for future maintenance of the equipment. Install the associated liquid level controls so that the pump is properly immersed in the water or sewage. The minimum water level for continuous service is to have the cooling fins completely immersed. For intermittent service, the minimum water level should be at least 1" above the top of the casing.

PIPING CONNECTIONS
(Refer to Drawing 1)

The discharge outlet is flanged vertically upward. A tapered gasket and compression flange are supplied to allow connection of plain ended schedule 40 pipe to the pump. The pipe end should be deburred and lubricated before insertion into the compression gasket, then tighten bolts on compression flange. Piping connected to the outlet must be fixed or supported independent of the pump connection. DO NOT use the pump to support the weight of piping and valves. The discharge line should include a swing check valve and a gate valve near the pump. Piping should be as short as possible, using a minimum number of fittings to reduce friction losses.

In a duplex installation, each pump must have its own check valve. One check valve in the common header is not sufficient, since the pumps will discharge back into the sump.



DRAWING 1

ELECTRICAL CONNECTIONS
(Refer to Drawings 2, 3, 4, 5, 6, or 7)

The pump is shipped with a power cable and sensor cable connected into the pump end bell. If the cables are to be installed inside rigid conduit (whether supplied by Weil Pump Co. or by user), unscrew and remove the phenolic bushings protecting the cables at their entry into the end bell. Pull the cables through their "cut-to-length" and threaded" conduit, and screw the conduit into the end bell. Power cable hub is provided with 3/4", 1-1/4" or 1-1/2" N.P.T. minimum 5 threads). Conduit and cable enclosures used must be compatible with environmental conditions of the installation.

If the cables are not to be installed inside conduit, leave the phenolic bushings in place to protect the cables from the threads inside the compression nuts.

POWER CABLE

The electrical characteristics shown on the pump nameplate describe the power supply required to operate the pump motor. The user is responsible for providing appropriate branch circuit, motor starter and overload protection; also for satisfying local code requirements. Required motor starter must be adequate for motor HP rating and compatible with electrical service provided as regards number of phases, voltage and frequency. Starter enclosure must be compatible with environmental conditions of installation.

Electrical connections made in the pit, even though above the high water level, must be sealed, so that moisture cannot enter the junction boxes in the pit. Wiring diagrams for the pump motor are provided. Since manufacturers differ as to how their motors are to be connected, it is important to make connections according to the wiring diagram provided. Incorrect electrical connections may void the limited warranty.

SENSOR CABLE

This pump is equipped with temperature limiting switches embedded in the stator windings to protect the insulation. A 120 volt relay, an indicating light and a manual restart pushbutton are to be connected (as in the appropriate wiring diagram) to the temperature limiting switches. The relay recommended for this purpose is Cutler-Hammer #D23MR21A (U.L. recognized component #E1230). Enclosure must be compatible with environmental conditions of installation.

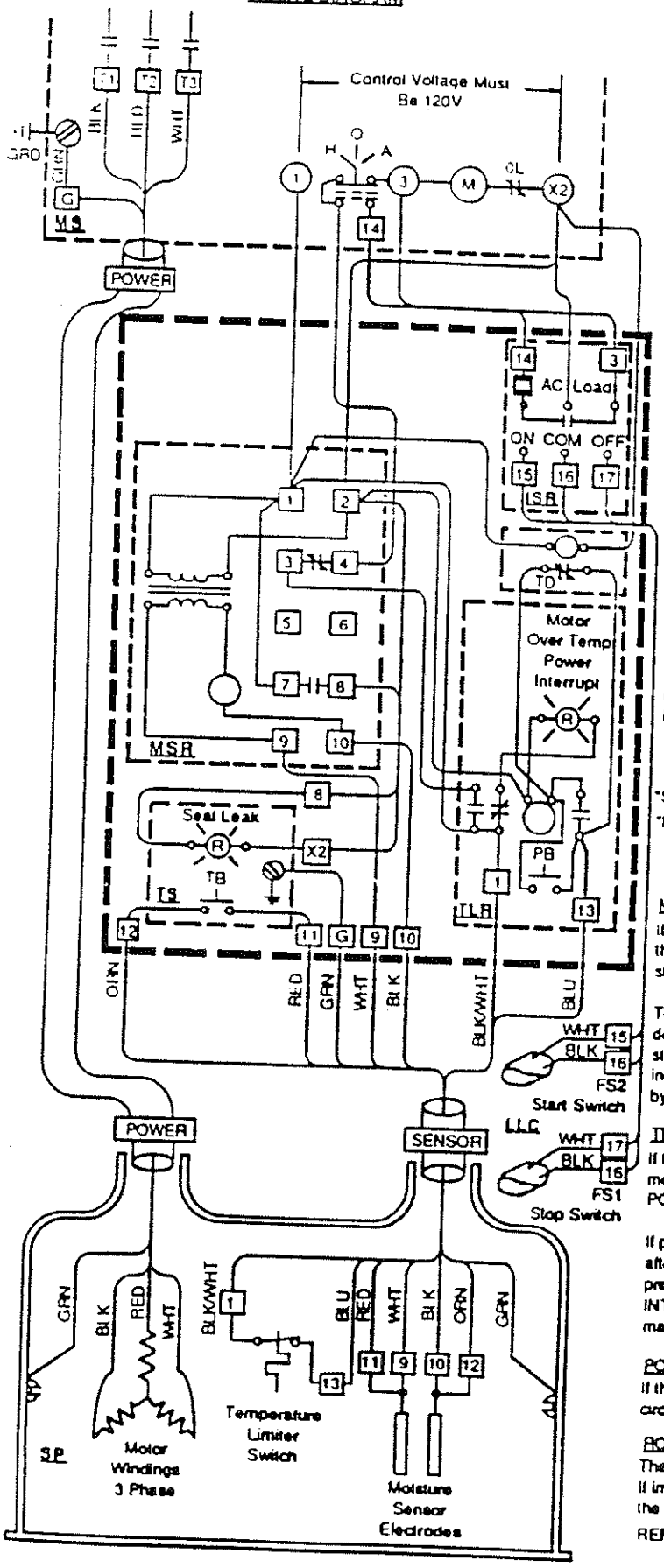
Moisture sensing probes are located in the motor shell to stop the motor if water enters the motor shell. A 120 volt relay, with one normally open and one normally closed set of contacts is to be connected (as in the appropriate wiring diagram) to the moisture sensing probes. The relay recommended for this purpose is C.F. Warwick Co. #1D1D0 FORM 50 (U.L. recognized component #MP1430). Enclosure must be compatible with environmental conditions of installation. A moisture sensor test-station is recommended to test the circuit. This test-station should include a normally open momentary contact pushbutton and an indicating light. Enclosure must be compatible with environmental conditions of installation. If the sensor cable is going to be connected more than 50 feet from the pump controls, contact the factory for proper installation instructions.

LIQUID LEVEL CONTROL

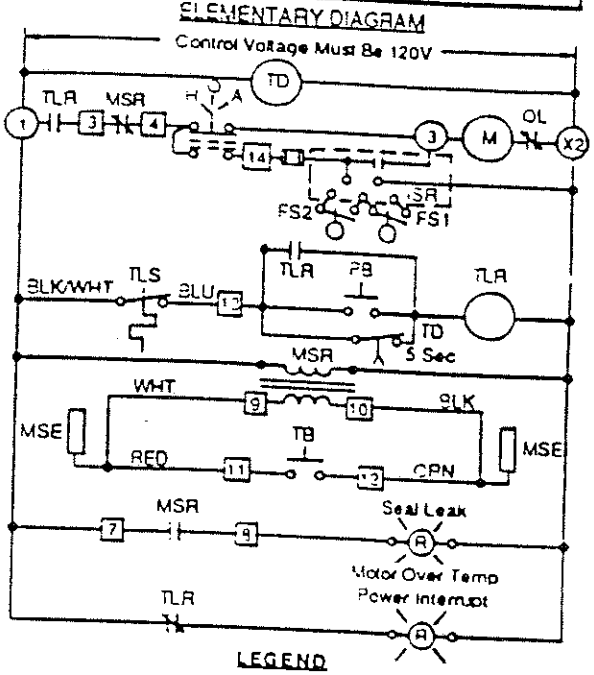
A float switch may be used to control pump operation if the switch contacts are not in a hazardous location. An intrinsically safe relay (SR) should be used when the switch contacts are in a hazardous location. Switch ratings must be adequate for electrical service. Enclosure must be compatible with environmental conditions of the installation.

WIRING OF SIMPLEX EXPLOSION-PROOF CONTROL COMPONENTS (3 PH. 230/460V) (ISR) PUMP MODELS X-171XXX, X-172XXX, X-177XXX, X-271XXX, X-272XXX, & X-277XXX

WIRING DIAGRAM



ELEMENTARY DIAGRAM



LEGEND

ISR	Intrinsically Safe Relay	PB	"Restart" Pushbutton
LLC	Liquid Level Control	TB	Moisture Test Pushbutton
M	Motor Starter Coil	TLR	Temperature Limiter Relay
MS	Motor Starter	TLS	Temperature Limiter Switch
MSE	Moisture Sensor Electrode	TS	Moisture Test Station
MSR	Moisture Sensor Relay	SP	Submersible Pump
OL	Starter Overload Contacts	TD	"On Time" Delay Relay

ALARM INDICATORS

"SEAL LEAK" - - Moisture in motor shell requiring operator attention.

"MOTOR OVER TEMP POWER INTERRUPT" - - Manual operation of "Restart" required to resume automatic operation.

OPERATION NOTES

MOISTURE SENSOR

If water enters the motor shell, the "Seal Leak" indicator will light and the motor starter control circuit will open. The pump cannot be re-started until the leakage condition is corrected.

To simulate leakage, and thereby test the moisture sensor circuit, depress TB. The "Seal Leak" indicator will light, and the motor starter control circuit will open. When TB is released, the "Seal Leak" indicator will extinguish, and the pump will operate as demanded by the liquid level control.

TEMPERATURE LIMITER

If the internal temperature of the motor rises to 155°C (310°F), the motor starter control circuit will open and the "MOTOR OVER TEMP POWER INTERRUPT" indicator will light.

If pump stoppage is due to motor over temp, it can only be restarted after motor temperature has dropped to below 135°C (275°F) by depressing PB. When so restarted, "MOTOR OVER TEMP POWER INTERRUPT" indicator will extinguish, and pump will operate automatically as demanded by the liquid level control.

POWER INTERRUPTION

If the power to the pump is interrupted for any reason the control circuit will be automatically reset for normal operation.

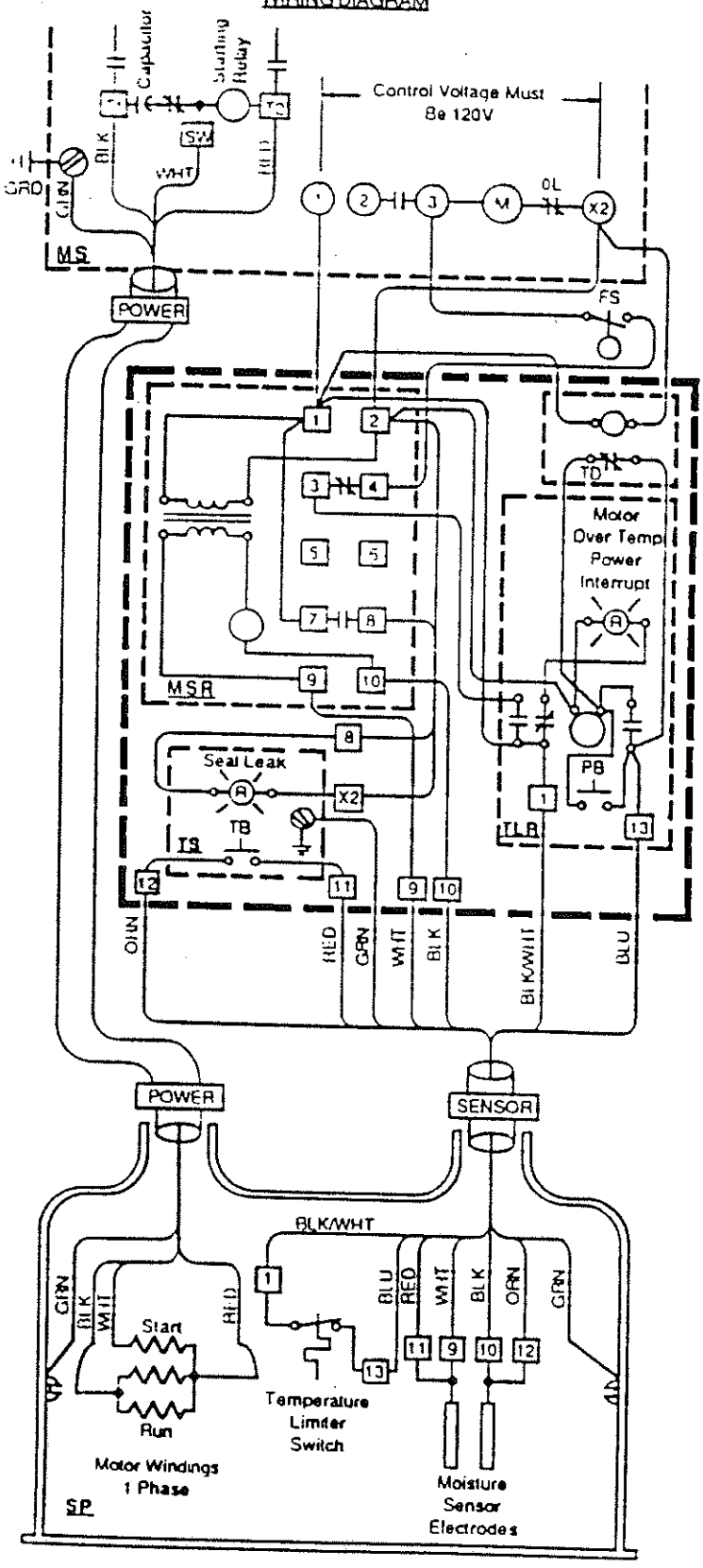
ROTATION

The impeller must rotate in direction shown by arrow on pump casing. If impeller runs backward, interchange any two wires at either end of the power cable, except the green (ground) wire.

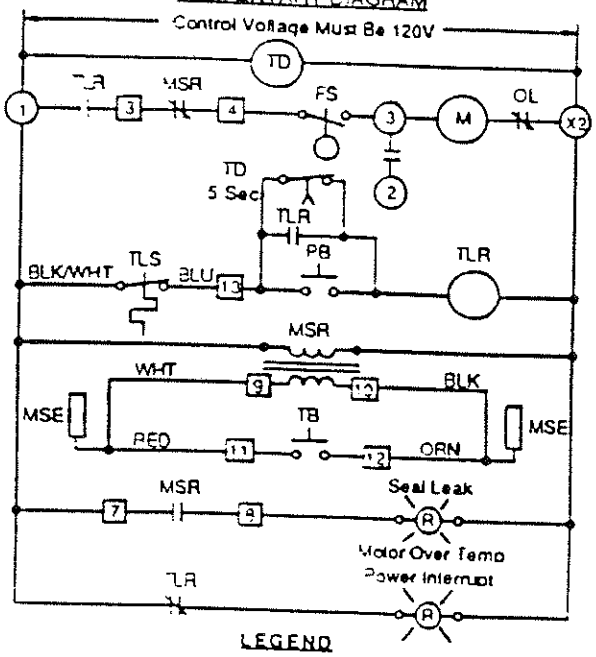
REFERENCE: U.L. File E40352 and E40353

WIRING OF SIMPLEX EXPLOSION-PROOF CONTROL COMPONENTS (1 PH. 115V) PUMP MODELS X-171XXX, X-172XXX, X-177XXX, X-271XXX, X-272XXX, & X-277XXX

WIRING DIAGRAM



ELEMENTARY DIAGRAM



LEGEND

FS	Float Switch	PB	"Restart" Pushbutton
LLC	Liquid Level Control	TB	Moisture Test Pushbutton
M	Motor Starter Coil	TLR	Temperature Limiter Relay
MS	Motor Starter	TLS	Temperature Limiter Switch
MSE	Moisture Sensor Electrode	TS	Moisture Test Station
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TEMPERATURE LIMITER

If the internal temperature of the motor rises to 155°C (310°F), the motor starter control circuit will open and the "MOTOR OVER TEMP POWER INTERRUPT" indicator will light.

If pump stoppage is due to motor over temp, it can only be restarted after motor temperature has dropped to below 135°C (275°F) by depressing PB. When so restarted, "MOTOR OVER TEMP POWER INTERRUPT" indicator will extinguish, and pump will operate automatically as demanded by the liquid level control.

POWER INTERRUPTION

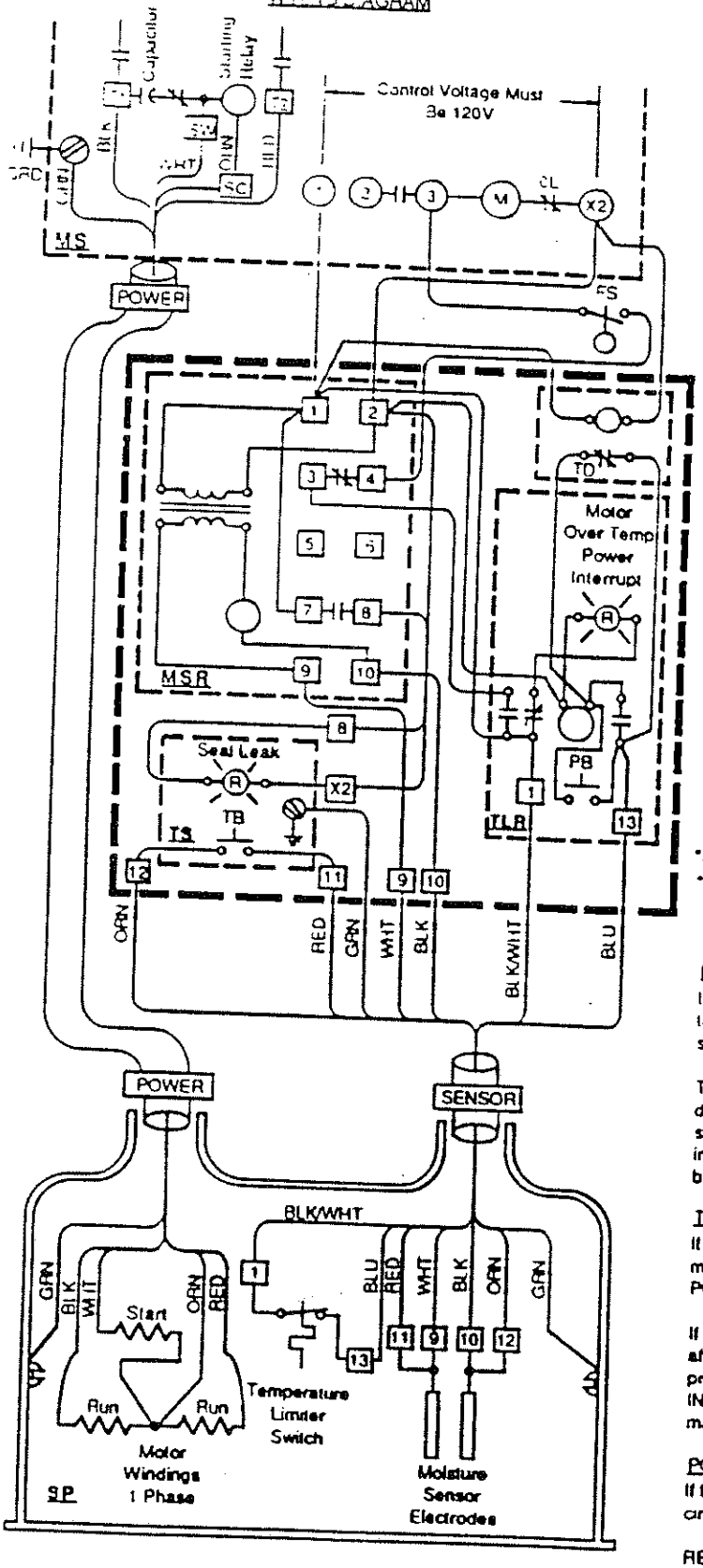
If the power to the pump is interrupted for any reason the control circuit will be automatically reset for normal operation.

REFERENCE: U.L. File E40352 and E40353

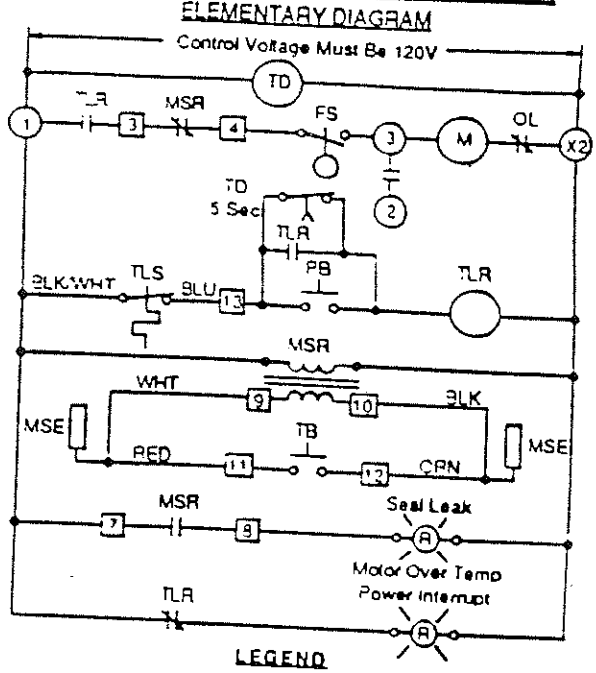
DRAWING 4

WIRING OF SIMPLEX EXPLOSION-PROOF CONTROL COMPONENTS (1 PH. 230V) PUMP MODELS X-171XXX, X-172XXX, X-177XXX, X-271XXX, X-272XXX, & X-277XXX

WIRING DIAGRAM



ELEMENTARY DIAGRAM



LEGEND

FS	Float Switch	PB	"Restart" Pushbutton
LLC	Liquid Level Control	TB	Moisture Test Pushbutton
M	Motor Starter Coil	TLR	Temperature Limiter Relay
MS	Motor Starter	TLS	Temperature Limiter Switch
MSE	Moisture Sensor Electrode	TS	Moisture Test Station
MSR	Moisture Sensor Relay	SP	Submersible Pump
OL	Starter Overload Contacts	TD	"On Time" Delay Relay

ALARM INDICATORS

"SEAL LEAK" -- Moisture in motor shell requiring operator attention.

"MOTOR OVER TEMP POWER INTERRUPT" -- Manual operation of "Restart" required to resume automatic operation.

OPERATION NOTES

MOISTURE SENSOR

If water enters the motor shell, the "Seal Leak" indicator will light and the motor starter control circuit will open. The pump cannot be re-started until the leakage condition is corrected.

To simulate leakage, and thereby test the moisture sensor circuit, depress TB. The "Seal Leak" indicator will light, and the motor starter control circuit will open. When TB is released, the "Seal Leak" indicator will extinguish, and the pump will operate as demanded by the liquid level control.

TEMPERATURE LIMITER

If the internal temperature of the motor rises to 155°C (310°F), the motor starter control circuit will open and the "MOTOR OVER TEMP POWER INTERRUPT" indicator will light.

If pump stoppage is due to motor over temp, it can only be restarted after motor temperature has dropped to below 135°C (275°F) by depressing PB. When so restarted, "MOTOR OVER TEMP POWER INTERRUPT" indicator will extinguish, and pump will operate automatically as demanded by the liquid level control.

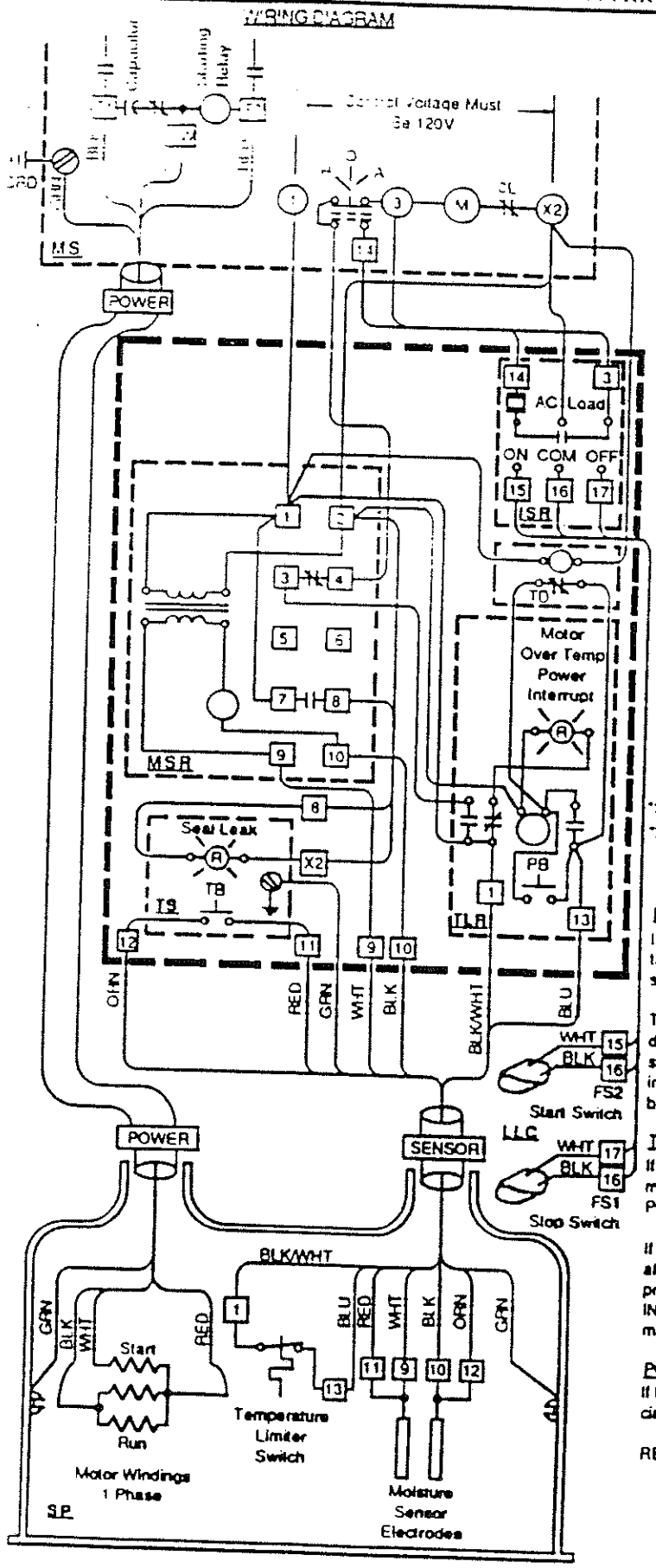
POWER INTERRUPTION

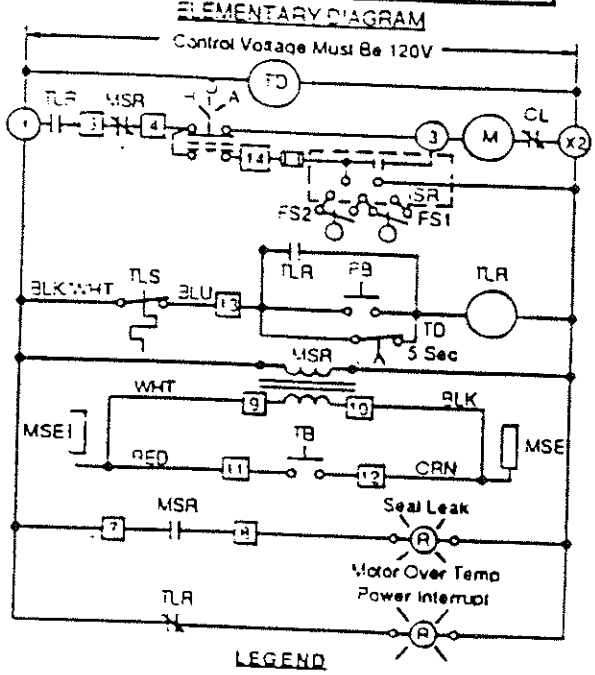
If the power to the pump is interrupted for any reason the control circuit will be automatically reset for normal operation.

REFERENCE: U.L. File E40352 and E40353

DRAWING 5

WIRING OF SIMPLEX EXPLOSION-PROOF CONTROL COMPONENTS (1 PH. 115V) (ISR) PUMP MODELS X-171XXX, X-172XXX, X-177XXX, X-271XXX, X-272XXX, & X-277XXX





LEGEND

ISR	Intrinsically Safe Relay	PB	"Restart" Pushbutton
LLC	Liquid Level Control	TB	Moisture Test Pushbutton
M	Motor Starter Coil	TLR	Temperature Limiter Relay
MS	Motor Starter	TLS	Temperature Limiter Switch
MSE	Moisture Sensor Electrode	TS	Moisture Test Station
MSR	Moisture Sensor Relay	SP	Submersible Pump
OL	Starter Overload Contacts	TD	"On Time" Delay Relay

ALARM INDICATORS

"SEAL LEAK" - - Moisture in motor shell requiring operator attention.

"MOTOR OVER TEMP POWER INTERRUPT" - - Manual operation of "Restart" required to resume automatic operation.

OPERATION NOTES

MOISTURE SENSOR

If water enters the motor shell, the "Seal Leak" indicator will light and the motor starter control circuit will open. The pump cannot be re-started until the leakage condition is corrected.

To simulate leakage, and thereby test the moisture sensor circuit, depress TB. The "Seal Leak" indicator will light, and the motor starter control circuit will open. When TB is released, the "Seal Leak" indicator will extinguish, and the pump will operate as demanded by the liquid level control.

TEMPERATURE LIMITER

If the internal temperature of the motor rises to 155°C (310°F), the motor starter control circuit will open and the "MOTOR OVER TEMP POWER INTERRUPT" indicator will light.

If pump stoppage is due to motor over temp, it can only be restarted after motor temperature has dropped to below 135°C (275°F) by depressing PB. When so restarted, "MOTOR OVER TEMP POWER INTERRUPT" indicator will extinguish, and pump will operate automatically as demanded by the liquid level control.

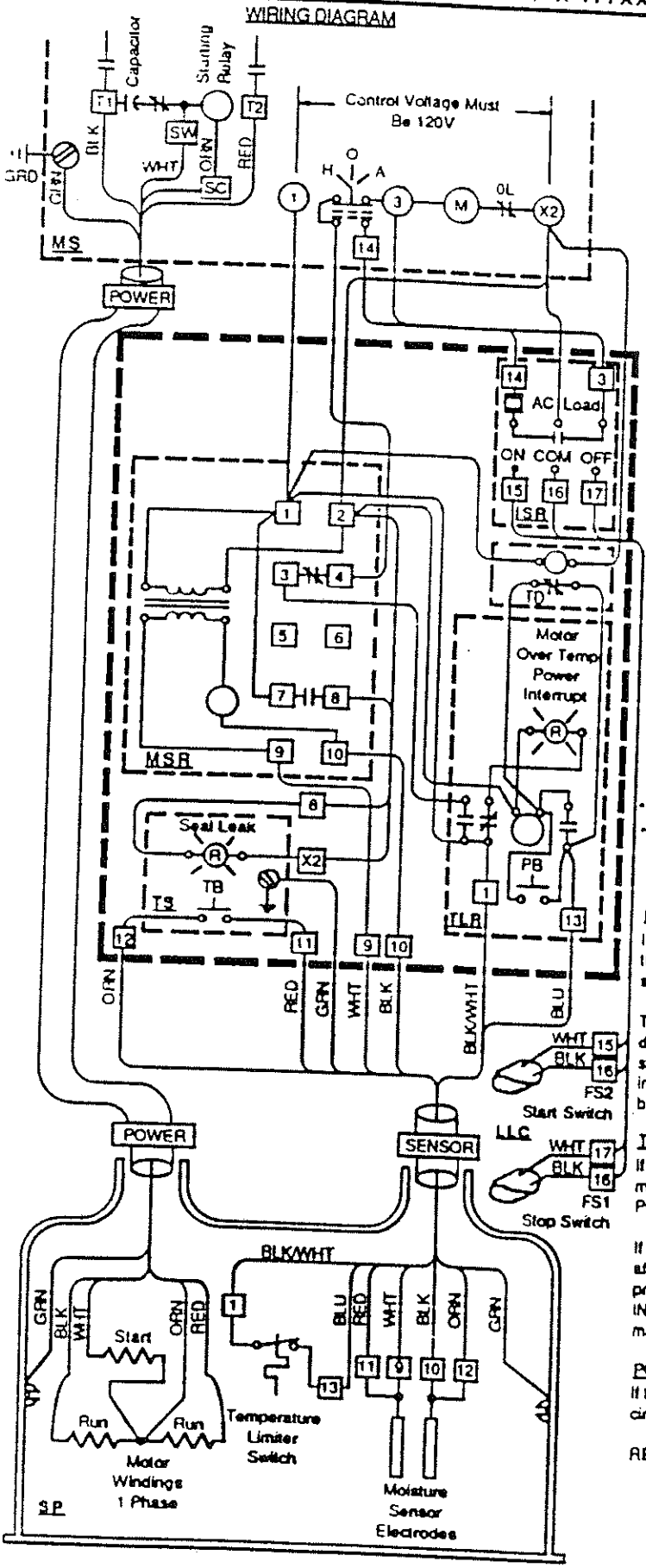
POWER INTERRUPTION

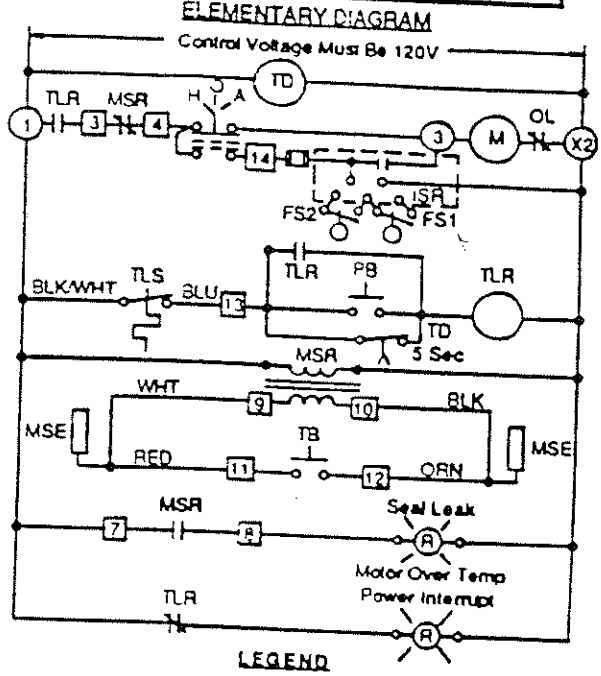
If the power to the pump is interrupted for any reason the control circuit will be automatically reset for normal operation.

REFERENCE: U.L. File E40352 and E40353

DRAWING 6

WIRING OF SIMPLEX EXPLOSION-PROOF CONTROL COMPONENTS (1 PH. 230V) (ISR) PUMP MODELS X-171XXX, X-172XXX, X-177XXX, X-271XXX, X-272XXX, & X-277XXX





LEGEND

ISR	Intrinsically Safe Relay	PB	"Restart" Pushbutton
LLC	Liquid Level Control	TB	Moisture Test Pushbutton
M	Motor Starter Coil	TLR	Temperature Limiter Relay
MS	Motor Starter	TLS	Temperature Limiter Switch
MSE	Moisture Sensor Electrode	TS	Moisture Test Station
MSR	Moisture Sensor Relay	SP	Submersible Pump
OL	Starter Overload Contacts	TD	"On Time" Delay Relay

ALARM INDICATORS

"SEAL LEAK" - - Moisture in motor shell requiring operator attention.

"MOTOR OVER TEMP POWER INTERRUPT" - - Manual operation of "Restart" required to resume automatic operation.

OPERATION NOTES

MOISTURE SENSOR

If water enters the motor shell, the "Seal Leak" indicator will light and the motor starter control circuit will open. The pump cannot be re-started until the leakage condition is corrected.

To simulate leakage, and thereby test the moisture sensor circuit, depress TB. The "Seal Leak" indicator will light, and the motor starter control circuit will open. When TB is released, the "Seal Leak" indicator will extinguish, and the pump will operate as demanded by the liquid level control.

TEMPERATURE LIMITER

If the internal temperature of the motor rises to 155°C (310°F), the motor starter control circuit will open and the "MOTOR OVER TEMP POWER INTERRUPT" indicator will light.

If pump stoppage is due to motor over temp, it can only be restarted after motor temperature has dropped to below 135°C (275°F) by depressing PB. When so restarted, "MOTOR OVER TEMP POWER INTERRUPT" indicator will extinguish, and pump will operate automatically as demanded by the liquid level control.

POWER INTERRUPTION

If the power to the pump is interrupted for any reason the control circuit will be automatically reset for normal operation.

REFERENCE: U.L. File E40352 and E40353

DRAWING 7

PRE-START-UP CHECK LIST

Before initial start-up check the following:

1. Voltage, number of phases and frequency of power supply must agree with values stamped on nameplate of pump.

2. Check direction of rotation by momentarily energizing motor. The impeller must rotate in direction indicated by arrow on casing. Continued rotation of the impeller in incorrect direction will void warranty.

3. See that fuses or heaters in the electrical circuits are correctly sized according to nameplate ratings and are properly installed.

4. If lights dim excessively on pump start-up, check for overloaded electrical circuits.

5. Weil submersible pumps may be run at no load, unsubmerged, without damage. Under load we recommend that the pump be kept submerged at all times (See Drawing 1).

SAFETY PRECAUTIONS

Before Servicing Pump

1. Disconnect the power supply to the pump and pit before servicing, whether for periodic inspections or emergency repairs.

2. In case of severe vibration or unusual noise, **SHUT OFF** the pump at once, then determine the cause.

3. If frequent tripping of overload protection device occurs a qualified electrician should be called to analyze and correct the problem.

TROUBLESHOOTING

Problem	Probable Cause
Insufficient or No Liquid Flow.	1. Discharge head too high. 2. Clogged or damaged impeller. 3. Incorrect direction of rotation. 4. Check valve closed or improperly installed. Gate valve closed. 5. Liquid level below discharge casing (no liquid supply). 6. Tripping of automatic overload protection device, blown fuses, open circuit breaker.

TROUBLESHOOTING (Continued)

Insufficient Pressure.	1. Low or high (more than ± 10%) of specified voltage or unbalanced phases. 2. Clogged or damaged impeller. 3. Incorrect direction of rotation. 4. Liquid level occasionally below discharge casing.
Noisy or Vibrating Pump.	1. Liquid level below discharge casing. 2. Clogged or damaged impeller. 3. Damaged bearings. 4. Incorrect direction of rotation.
Pump Runs Continuously	1. Faulty pilot device. (i.e. liquid level switch). 2. Improper starter wiring.
Pump Does Not Run.	1. Faulty pilot device. 2. Water level does not reach "ON" level of switch. 3. Blown fuse, open circuit breaker or overload device in starter tripped.

LUBRICATION

The Weil submersible pump is equipped with d sealed pre-lubricated bearings, which require no fu...er lubrication.

PERIODIC INSPECTION
(Refer to Drawing 12)

Periodic inspections of the pump and pit should be scheduled at six month intervals. The sump should be cleaned of accumulated abrasive particles. Interior of control cabinet should be cleaned of oil, dirt and moisture. Check condition of contacts of electrical equipment. Pilot device operation (i.e. float switch) should be checked. Seal chamber should be checked for presence of liquid being pumped. Such presence may be determined by placing pump in a horizontal position in a Vee block, with seal chamber plugs (14) and (76) at lowest position. Remove plugs and drain the seal chamber into a transparent container. Allow drained liquid to settle. If no water (pumped liquid) settles to bottom of container, the chamber can be refilled with dielectric oil and plugs (14) and (76) replaced.

If water (pumped liquid) settles in container, the source of the liquid must be determined; and worn or damaged seals, "O"-rings, etc., must be replaced (see "REPLACEMENT OF MECHANICAL SEAL").

IMPORTANT NOTICE

PUMP UNITS UNDER WARRANTY MUST BE RETURNED TO THE FACTORY OR AUTHORIZED REPAIR STATION FOR REPAIR, OR WARRANTY WILL BE VOIDED. Read the warranty statement on the last page of this manual.

The motor, moisture sensor or temperature limiter can only be repaired at the factory or at an authorized repair station.

If service or repair is required during or after the warranty period, the following instructions are to be carefully read and followed.

SERVICE PROCEDURE
(Refer to Drawing 12)

Before service or repair of the unit:

1. Disconnect all electrical power supplied to the pump and pit.
2. Disconnect discharge piping and move pump so that it will clear piping projecting into the pit.
3. Lift pump from pit by means of a steel cable or chain attached to eyebolt at top of pump. Do Not use the electrical cables to lift the pump.
4. Move pump to a clean, dry location for servicing.
5. If the motor housing and/or seal chamber is opened, we recommend new 'O'-rings be used to replace exposed 'O'-rings.
6. If power cable or sensor cable is to be replaced, complete new end bell and cables assembly must be installed.

CLEANING CLOGGED STRAINER
(Refer to Drawings 14 and 15)

Remove screws (86) and remove strainer (84). Remove paper, rags and other debris from passages of strainer and thoroughly flush with water until clean. Reassemble strainer, tightening screws securely.

CLEANING OR REPLACEMENT OF IMPELLER MODEL 2A-17X01X-X AND ALL SERIES 2700 PUMPS (Refer to Drawings 12, 14 and 16)

With pump standing vertically on its feet, remove screws (21). Next, carefully lift motor assembly out of the casing. Lay this unit on its side in Vee blocks with impeller overhanging. Rotate impeller by hand, dislodging any solids (wood, rags, paper, etc.) trapped in the impeller channels and scrape off any deposits on impeller.

After impeller is cleaned, inspect for any damage, cracks or breaks. If necessary, replace impeller according to the following procedure.

Remove locknut (33) with socket wrench, taking care not to mar threads on shaft (12). Tap hub of impeller (24) with lead hammer to loosen, and gently attempt to pry impeller off shaft, using opposed pry bars or medium size screwdrivers. If impeller does not move easily, tap with lead hammer again and attempt to pry impeller off a second time. If this does not permit easy removal of impeller. Set aside the square key (34) and any shims (40).

NOTE: If the pump is equipped with tandem mechanical seals (Refer to Drawings 17 and 18). Do not adjust or remove the mechanical seal parts on the shaft above the impeller.

To reassemble the impeller (new or repaired) on the shaft, replace any shims against shaft shoulder and insert key into its seat. Align the impeller keyway with the key and carefully push the impeller onto the shaft, tapping gently with a lead hammer. The key must be retained in its seat.

When the impeller is mounted on the shaft, install and tighten the locknut. Rotate the impeller by hand to insure that it turns freely. Replace gasket (41) if damaged, and position the motor assembly into the casing (35), insert and tighten screws (21).

CLEANING OR REPLACEMENT OF IMPELLER MODELS 2.5A-17X11X AND 3A-17X21X (Refer to Drawing 15)

Lay unit on its side in Vee block, or wedge unit on its side so it cannot roll. Remove screws (86) and strainer (84). Remove screws (87) and suction plate (29) from casing (35). Immobilize the impeller (24) by wedging a piece of wood into the casing. Remove the locknut (33) using a socket wrench, taking care not to mar the threads on the shaft (12).

Remove the wooden wedge. Loosen the impeller by tapping the hub with a lead hammer. Grasp impeller vanes with two pair of Vise-Grip pliers. Pull impeller off shaft and set aside square key (34) and any shims (40).

Scrape off any deposits on impeller. After impeller is cleaned, inspect for any damage, cracks or breaks. Replace or repair impeller as required.

NOTE: If the pump is equipped with tandem mechanical seals (Refer to Drawings 17 and 18). Do not adjust or remove the mechanical seal parts on the shaft above the impeller.

To reassemble the impeller (24) (new or repaired) on the shaft (12), insert the square key (34) into its seat and replace any shims (40) against the shoulder of the shaft. Align the impeller keyway with the square key and carefully push the impeller onto the shaft, tapping gently with a lead hammer. The key must be retained in its seat.

When the impeller is mounted on the shaft, install and tighten the locknut. Rotate the impeller by hand to insure it turns freely. Replace suction plate (29) and insert and tighten screws. Install strainer (84) tightening screws securely.

OPTIONAL WEARING RINGS REMOVAL AND REPLACEMENT MODELS 4A-27X23X-X AND 4A-27X41X-X (Refer to Drawing 19)

The wearing rings are cemented into specially machined seats on the impeller and in the casing. Removal of the wearing rings can only be achieved after disassembling both the impeller and the casing as described in CLEANING OR REPLACEMENT OF IMPELLER. The wearing rings may then be machined out from the impeller and casing. Take care during machining not to enlarge the seat in the casing.

Replacement wearing rings are available from the Weil Pump Company Service Department. The wearing ring seat of both impeller and casing should be cleaned of deposits, particles, oil or grease. Use any volatile solvent to degrease the surfaces. Apply Loctite RC680 adhesive or other anaerobic adhesive of equivalent strength on the mating surfaces of the wearing ring and impeller, also on the mating surfaces of the wearing ring and casing. Place the wearing rings on their respective mating surfaces, making certain they abut properly. Allow four to six hours for the adhesive to cure. Assemble the unit as described in CLEANING OR REPLACEMENT OF IMPELLER.

REPLACEMENT OF MECHANICAL SEALS (Refer to Drawing 12)

Failure of the lower seal of the standard double seal or optional tandem seals is indicated by the presence of the liquid being pumped (other than oil) in the seal chamber. Failure of the upper seal of the standard double seal or optional tandem seals is indicated by the presence of oil or a mixture of oil and water in the motor shell. Water alone in the motor shell usually indicates electric cable seal, or 'O'-ring failure. Such failures will normally be noticed during the periodic inspection, or by the moisture sensor activating an alarm signal (if so equipped).

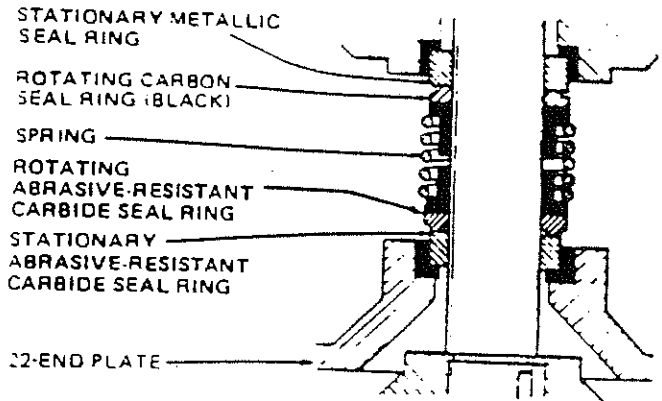
When it is determined that the mechanical seal has to be replaced, check that the replacement is identical in type, shaft size and material.

Disassemble casing (35) from unit and remove impeller (24) as described in CLEANING OR REPLACEMENT OF IMPELLER. Drain oil from seal chamber (19) by removing two pipe plugs (76 and 14) and placing unit on its side with drain holes down.

STANDARD DOUBLE SEAL DISASSEMBLY (Refer to Drawings 8 and 12)

Remove round head machine screws (23) and end plate (22). Press lower stationary seal ring out of end plate. Remove lower shaft mounted seal bellows taking care not to score shaft. Two medium size screwdrivers may assist in this removal. Next remove the spring and upper (rotating) seal bellows (again two screwdrivers may be needed) carefully so as not to damage shaft. Finally the upper stationary seal ring is to be removed. Attempt this first by pulling with a hooked pick either behind the seal ring or between the shaft and the seal ring (be careful not to scratch the shaft). If this method fails, break the seal ring by means of a small chisel and remove pieces.

The mounting seat of both stationary seal rings must be cleaned of any adhering particles or deposits before a replacement seal can be properly installed. Steel wool may be used for this purpose, finally wiping with a clean rag or soft paper. The shaft must also be cleaned carefully.

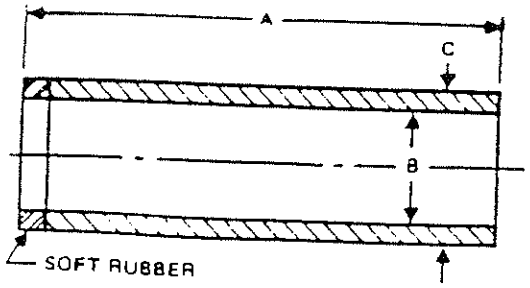


STANDARD DOUBLE SEAL ASSEMBLY

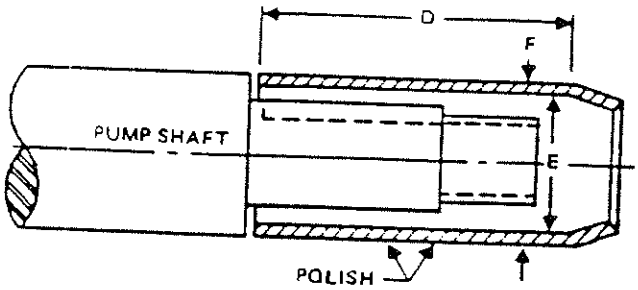
DRAWING 8

STANDARD DOUBLE SEAL ASSEMBLY (Refer to Drawings 8, 9 and 12)

First check replacement seal to insure that it is the same type, shaft size and material as the original seal. Next, check the shaft (12), end plate (22) and seal chamber (19) to insure no particles or deposits are present. These parts must be clean. Apply a thin coating of lubricating oil or jelly to outside surfaces of rubber cup of stationary seal ring with metallic face. TAKE CARE NOT TO MAR OR DAMAGE SEAL FACE. Position seal ring on shaft with polished white face toward threaded end of shaft. Gently press seal into its seat in seal chamber using rubber faced special tool 1 shown in Drawing 9. APPLY EVEN PRESSURE TO SEAL FACE. Cleanliness of the rubber faced special tool is important to the expected life of the seal. The sealing surfaces must be kept clean. The metallic seal may be assumed seated to its full depth, when the rubber seating cup is flush with the surface of the seal chamber (19). The rotating seals must not be interchanged. **Metallic mates with Carbon (Black) in seal chamber. Abrasive-Resistant Carbide mates with Abrasive-Resistant Carbide in end plate.** Install rotating black carbon seal ring onto shaft using special tool 2 in Drawing 9. Apply lubricating oil or jelly to inside surface of bellows and install on shaft so that mating faces touch. Special tool 2 should allow assembly without rubber bellows of rotating seal ring touching threads on shaft. With special tool 2 still in place install spring. Lightly lubricate inside of bellows of remaining rotating seal ring and slide onto shaft so that seal face is toward threaded end of shaft, and spring loads both rotating seals.



SPECIAL TOOL 1



SPECIAL TOOL 2

		TOOL 1			TOOL 2		
		A	B	C	D	E	F
NOMINAL SEAL SIZE EQUALS SHAFT O.D.	1-1/8	6	1-5/32	1-3/4	1-5/8	7/8	1-1/8
	1-1/2	6	1-9/16	2	3	1-5/16	1-1/2

DRAWING 9

Lubricate lower stationary seal ring and using rubber faced special tool 1, press seal ring into mounting seat in end plate with polished surface away from end plate. Again, cleanliness of the seal ring is important to the seal life. Place end plate carefully on shaft. Gently slide end plate into contact with seal chamber, and install and tighten round head machine screws (23). Remove special tool 2. Assemble impeller and casing as described under CLEANING OR REPLACEMENT OF IMPELLER.

Move pump unit to vertical position. Fill seal chamber with dialectric oil (Shell Diala AX or equivalent) by placing funnel in elbow (47). With pipe plugs removed, fill chamber until oil flows outside. Install and tighten plugs.

OPTIONAL TANDEM SEAL DISASSEMBLY (Refer to Drawing 10)

To remove lower seal, first remove the retaining ring (66) from the shaft using external retaining ring pliers. Then remove the spring holder (65) and straight spring (67). Again using pry bars or screwdrivers, slide rotating seal ring carefully off the shaft, taking care not to scratch the shaft.

Next, remove the round head machine screw (23), end plate (63), and press out stationary seal ring from the end plate, using a hand press if necessary. Clean the seal seat with steel wool and wipe with a clean rag.

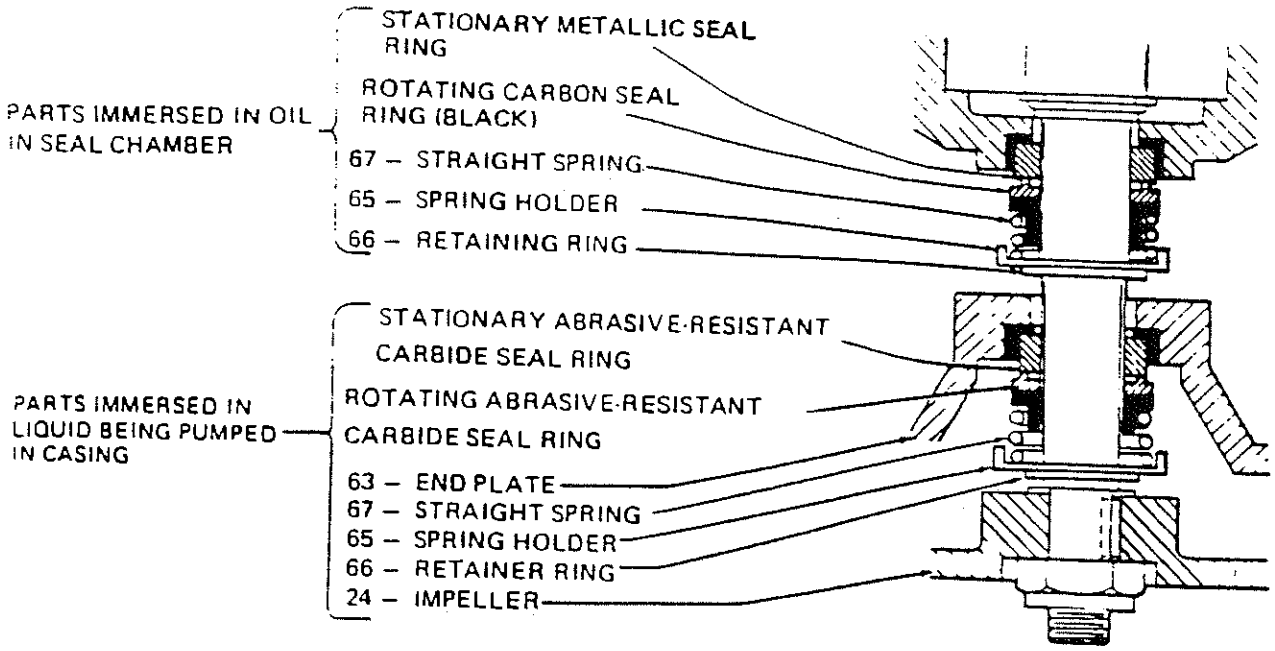
Finally, remove upper seal inside seal chamber in the same manner. It may be necessary to use a hooked pick to remove the upper stationary seal ring. The upper seat must also be cleaned with steel wool then wiped with a soft cloth.

OPTIONAL TANDEM SEAL ASSEMBLY (Refer to Drawings 9, 10 and 12)

Check replacement seal to insure that it is the same type, shaft size and length as the original seal. Check the shaft (12), end plate (63) and seal chamber (19) to insure that no deposits or particles are present. These parts must be clean. Apply a thin coating of lubricating oil or jelly to outside surface of rubber cup of stationary metallic seal ring. TAKE CARE NOT TO MAR OR DAMAGE SEAL FACE. Install seal ring on shaft with polished face toward threaded end of shaft. Gently press seal ring into its seat in seal chamber using rubber faced special tool 1 shown in Drawing 9. APPLY EVEN PRESSURE TO SEAL FACE. Cleanliness of the rubber faced special tool is important to the expected life of the seal. The sealing surfaces must be kept clean. The metallic seal may be assumed seated to its full depth, when the rubber seating cup is flush with surface of the seal chamber (19). The rotating seals must not be interchanged. **Metallic mates with Carbon (Black) in seal chamber. Abrasive-Resistant Carbide mates with Abrasive-Resistant Carbide in end plate.**

Apply lubricating oil or jelly to inside diameter of bellows and slide rotating black carbon seal ring onto shaft, using special tool 2 shown in Drawing 9, until the seal face contacts the metallic ring. Special tool 2 should allow assembly without rubber bore of rotating seal ring touching threads on shaft. Remove special tool 2 from shaft, and install straight spring, spring holder, and retaining ring using retaining ring pliers.

Position end plate on shaft and install and tighten the round head machine screws. Check seal seat in end plate and shaft to insure no particles or deposits are present. Apply a thin coat of lubricating oil or jelly to outside surfaces of rubber cup of stationary seal ring with polished face toward threaded end of shaft. Gently press seal ring into its seat in end plate using rubber faced special tool 1 shown in Drawing 9. APPLY EVEN PRESSURE TO SEAL FACE. Rubber faced tool must be clean. The stationary (Abrasive-Resistant Carbide) seal may be assumed seated to its full depth when the rubber seating cup is flush with the surface of the end plate. Place special tool 2 on end of shaft, and apply a thin coat of lubricating oil or jelly to inside diameter of rubber bellows. Install rotating carbide seal ring on shaft and slide into position so that seal faces touch. Install straight spring, spring holder and retaining ring on shaft. Install key (34), any shims (40), impeller (24) and locknut (33) on the shaft. Move pump unit to vertical position. Fill seal chamber with dielectric oil (Shell Diala AX or equivalent) by placing funnel in elbow (47) with opposing pipe plug removed. Fill through funnel until oil flows out opposite side. Install and tighten plugs (14) and (76).



OPTIONAL TANDEM SEAL ASSEMBLY

DRAWING 10

OPTIONAL TANDEM SEAL DISASSEMBLY WITH CRANE TYPE 9 LOWER SEAL
(Refer to Drawings 11 and 12)

Remove lower seal (Type 9) from shaft by loosening the retainer set screws with an Allen wrench. Slide the retainer off the shaft and repair indentations in the shaft with emery cloth. Remove round head machine screws (23) and slide end plate (63) off the shaft. Press stationary seal ring out of end plate and clean seat with steel wool.

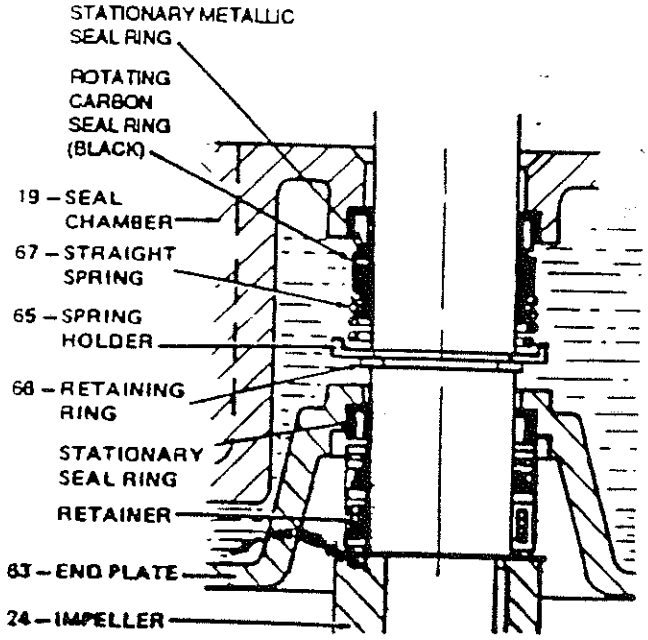
Remove upper seal as described previously. All parts must be kept clean.

OPTIONAL TANDEM SEAL ASSEMBLY WITH CRANE TYPE 9 LOWER SEAL
(Refer to Drawings 9 and 11)

Check replacement seal to insure that it is the same type, shaft size and material as the original seal. Install upper seal as previously described. Install the end plate, inserting round head machine screws.

With end plate installed, apply a thin coat of lubricating oil or jelly to outside surfaces of rubber cup of stationary seal ring. Using special tool 1 with rubber face, gently press stationary seal ring into its seat. Apply even pressure to seal face.

Apply a thin coat of oil or lubricating jelly to inside diameter of rotating assembly. With clips in place, slide rotating assembly onto shaft over special tool 2, with set screws toward the shaft end. Tighten set screws so that they are not at their previous position on the shaft. Remove clips. Reassemble impeller and fill seal chamber as described at the end of "Optional Tandem Seal Assembly".



OPTIONAL TANDEM SEAL ASSEMBLY WITH CRANE TYPE 9 LOWER SEAL

DRAWING 11

IMPORTANT NOTICE

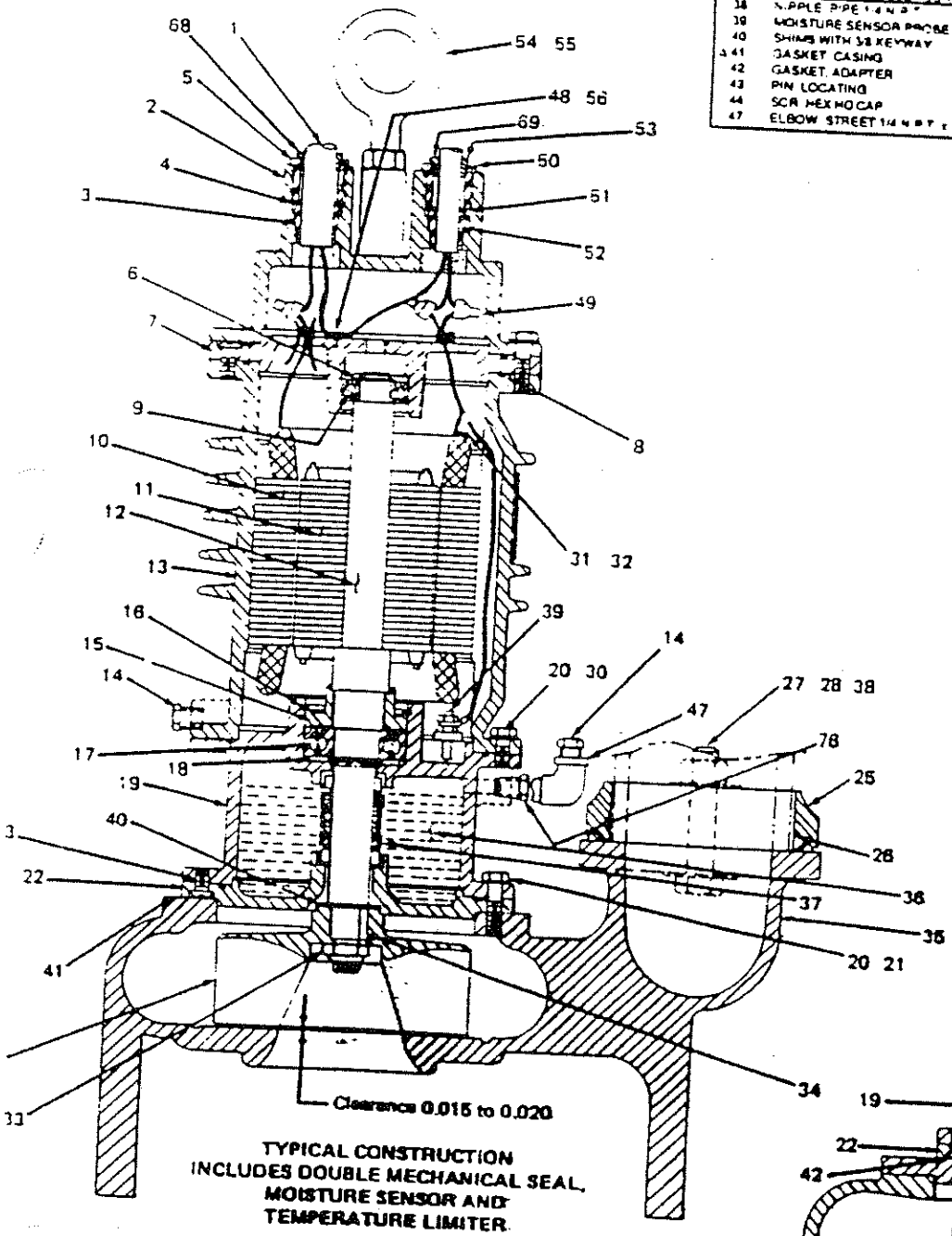
REPAIR OR REPLACEMENT OF ELECTRICAL CABLES, STATOR, ROTOR, MOISTURE SENSOR, TEMPERATURE LIMITER, BEARINGS OR INTERNAL WIRING BY OTHER THAN UNDERWRITERS LABORATORIES APPROVED ELECTRIC MOTOR REPAIR FACILITY WILL VOID UL LISTING AND LIMITED WEIL WARRANTY.

ITEM	PART DESCRIPTION	QTY
1	CABLE POWER	1
2	SHELL END	1
	POWER CABLE SEAL ASSEMBLY	1
3	BUSHING CORD GRIP	1
4	WASHER FLAT	1
5	NUT COMPRESSION	1
6	END RETAINING	1
7	SUPPORT UPPER BRG	1
8	O RING	1
9	BEARING BALL	1
10	MOTOR ASSEMBLY	1
11	STATOR	1
12	ROTOR	1
13	SHAFT	1
14	SHELL MOTOR	1
15	PLUG 1/4 N.P.T. PIPE	1
16	FLAME ARRESTER	2

16	RING RETAINING	1
17	BEARING BALL	1
18	RING RETAINING	1
19	CHAMBER SEAL	1
20	LOCKWASHER	1
21	SCR HEX HD CAP	36
22	END PLATE DOUBLE SEAL	8
23	SCR RD HD MACH	1
24	IMPELLER	6
25	FLANGE DISCHARGE	1
26	GASKET DISCHARGE	1
27	WASHER FLAT	1
28	SCR HEX HD CAP	4
29	PLT SUCTION	2
30	SCR HEX HD CAP	1
31	WIRE 18G	16
32	LIMITER TEMPERATURE	AR
△33	LOCKNUT	3
△34	KEY	1
35	CASING VOLUTE	1
36	OIL DIELECTRIC	1
△37	SEAL MECH DOUBLE ASSY	AR
38	NIPPLE PIPE 1/4 N.P.T.	1
39	MOISTURE SENSOR PROBE ASSY	1
40	SHIMS WITH 5/8 KEYWAY	2
△41	GASKET CASING	AR
42	GASKET ADAPTER	1
43	PIN LOCATING	1
44	SCR HEX HD CAP	1
47	ELBOW STREET 1/4 N.P.T. x 90°	6

48	SCR SELF TAPPING	1
49	CONNECTOR WIRE (ROTAL TYPE)	AR
	SENSOR CABLE SEAL ASSY	1
50	NUT COMPRESSION	1
51	WASHER FLAT	1
52	BUSHING CABLE GRIP	1
53	CABLE SENSOR	1
54	NUT HEX	1
55	BOLT EYE	1
56	TERMINAL WIRE (RING TYPE)	AR
58	BUSHING INSUL POWER	1
59	BUSHING INSUL SENSOR	1
74	SCR HEX HD CAP	1
75	ADAPTER	AR
76	PLUG HEX RECESSED MAGN 1/4	1
△77	GASKET SUCTION PLATE	1
78	LOCKWASHER	1
84	STRAINER	5
85	WASHER FLAT	1
86	SCR HEX HD CAP	3

OPTIONAL CONSTRUCTION		
OPTION B TANDEM SEALS		DWG 17
63	END PLATE (TANDEM SEAL)	1
	TANDEM SEAL ASSY	1
△64	SEAL MECH	2
65	HOLDER SPRING	2
66	RING RET EXT	2
67	SPRING STRAIGHT	1
OPTION E WEARING RINGS		DWG 17
80	IMPELLER MACHD FOR W R	1
81	SUCT PLT MACHD FOR W R	1
△82	WEARING RING FOR IMPELLER	1
△83	WEARING RING FOR CASING	1
OPTION G TANDEM SEALS		DWG 17
△62	SEAL MECH TYPE 6	1
63	END PLATE (TANDEM SEAL)	1
	TANDEM SEAL ASSY	1
△64	SEAL MECH	2
65	HOLDER SPRING	2
66	RING RET EXT	2
67	SPRING STRAIGHT	1



TYPICAL CONSTRUCTION
INCLUDES DOUBLE MECHANICAL SEAL, MOISTURE SENSOR AND TEMPERATURE LIMITER.

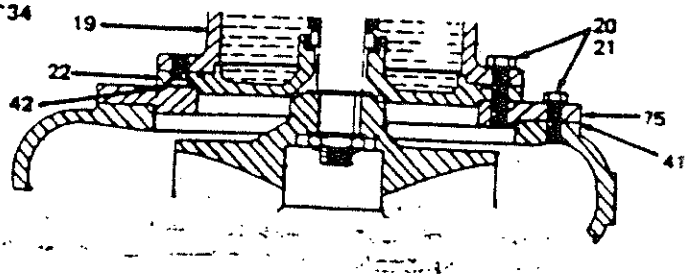
MODEL: 3A-27X21X-X
4A-27X22X-X
4A-27X31X-X
TYPICAL IMPELLER & CASING

DRAWING 12

▲ RECOMMENDED SPARE PARTS

• ITEM NOT ILLUSTRATED

WHEN ORDERING REPLACEMENT PARTS, GIVE THE SALES REPRESENTATIVE IN YOUR TERRITORY THE PUMP SERIAL AND MODEL NUMBERS FROM THE NAMEPLATE AND THE ITEM NUMBERS FROM THIS PAGE.

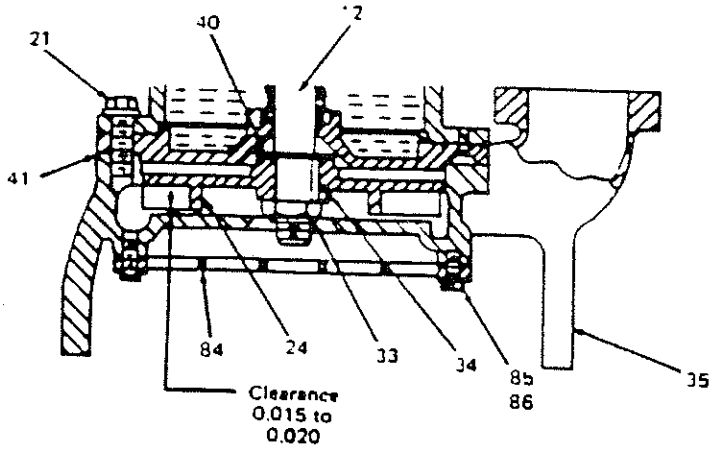


SHOWN WITH ADAPTER AND ALTERNATE MOTOR FRAME

DRAWING 12

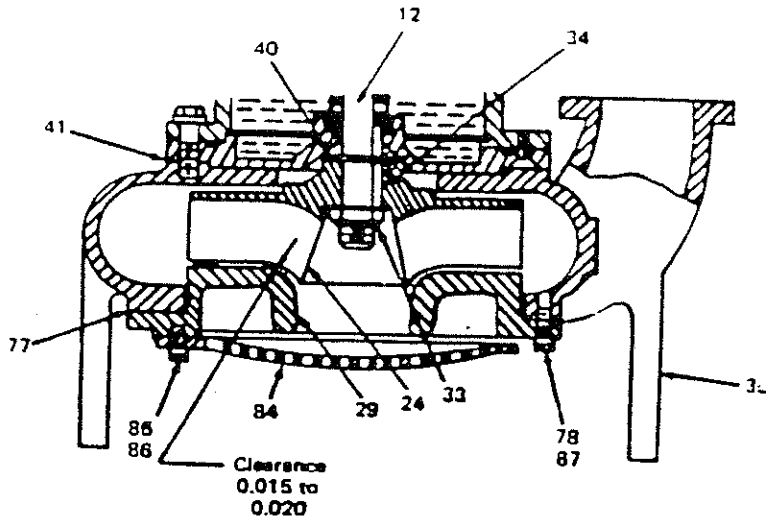
MODEL 2A-17X01X-X
IMPELLER & CASING

DRAWING 14



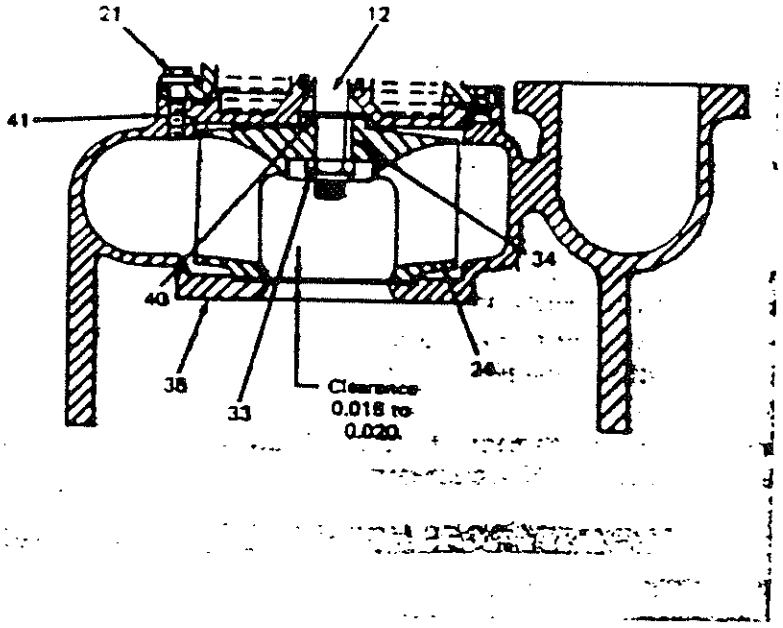
MODEL: 2.5A-17X11X-X
3A-17X21X-X
TYPICAL IMPELLER & CASING

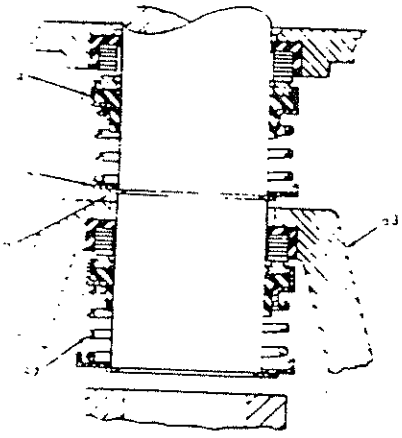
DRAWING 15



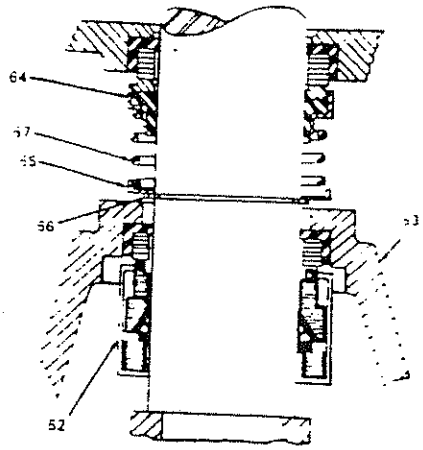
MODEL:4A-27X2[illegible]X
4A-27X4[illegible]X
TYPICAL IMPELLER & CASING

DRAWING 16

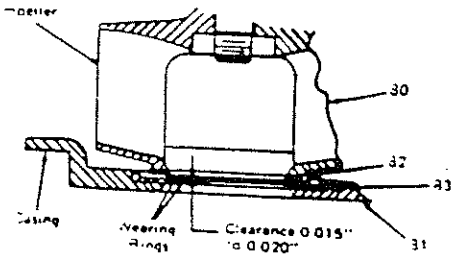




DRAWING 17
OPTION 'B'
TANDEM SEAL ARRANGEMENT



DRAWING 18
OPTION 'G'
TANDEM SEAL ARRANGEMENT
WITH CRANE TYPE 9 LOWER SEAL



DRAWING 19
OPTION 'E'
WEARING RINGS
(AVAILABLE ONLY WITH
MODELS 4A-27X23X-X
AND 4A-27X41X-X

LIMITED FIVE YEAR WARRANTY

The Weil Series 1700 and 2700 Submersible Pumps are warranted to be free from mechanical and/or electrical defects in material or workmanship for a period of five years as provided below:

All repairs and/or replacement parts that may be needed during the first sixteen months after the factory shipment date, will be provided free of charge (F.O.B. Factory).

All repairs and/or replacement parts needed after the first sixteen months until five years after the factory shipment date, will be provided with the cost (F.O.B. Factory) prorated from the factory shipment date.

THIS WARRANTY IS VOID:

If pump or electrical cables have been damaged through negligence, as determined by Weil Pump Company.

If mechanical seals have been disassembled.

If motor has been disassembled other than to effect terminal plate connections.

If power cable or sensor cable have been removed or replaced by other than factory or authorized repair station.

If pump is found to have been handling excessive amounts of sand, mud, construction debris or abrasive, corrosive or volatile industrial wastes in a manner not recommended by manufacturer.

If evidence of improper electrical wiring (incorrect direction of rotation) or mechanical installation is found, or if used with inferior or faulty control equipment not furnished or recommended by Weil Pump Company.

If pump controls are damaged by external causes, such as power failure, lightning or voltage fluctuations (in excess of 10% of rated voltage).

WARRANTY DOES NOT INCLUDE ON SITE LABOR COSTS

Weil PUMP COMPANY 5921 WEST DICKENS AVENUE, CHICAGO, ILLINOIS 60639 312/

TANKS & MIXERS

Manufacturer (Tanks):

Nalge Company
Box 20365
Rochester, NY 14602-0365
(716) 586-8800

Manufacturer (Mixers):

Lightnin' Mixers, Inc.

Supplier:

Buda Equipment & Control, Inc.
6715 Joy Drive
P.O. Box 580
East Syracuse, NY 13057-0580
(315) 437-2911
Contact - Jim McKenna

Features:

Tanks (3)

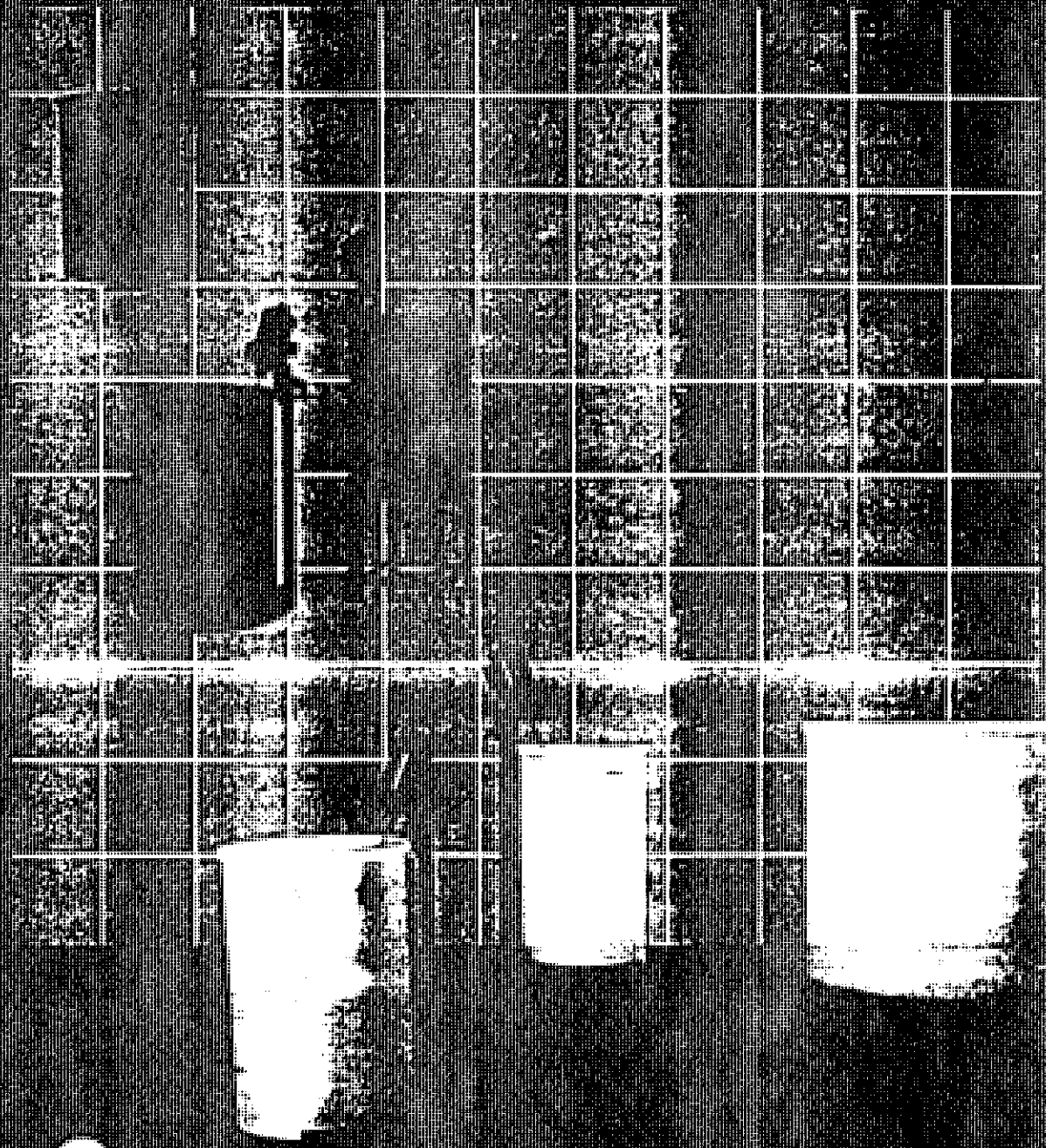
- 360 Gallon Capacity
- 46" Diameter
- 48" Tall
- High Density Polyethylene

Mixers (3)

- 1/3 HP
- Variable Speed
- Single Propellar (3 blade)

Tank & Mixer Packages

Featuring Nalgene® Tanks and Lightnin® Mixers



BUDA

PHONE: (315) 437-2911
(800) 828-3800
FAX: (315) 433-9060

Pre-Engineered, Ready-To-Use Tank And Mixer Packages

Featuring Nalgene® Tanks and Lightnin® Mixers

The top names in liquid storage and mixing—Nalgene® Plastic Tanks and Lightnin® Mixers—have joined forces to offer you **complete mixing packages from one source.** These pre-engineered packages are available for general mixing/medium agitation of up to 1,000 gallons. They come with all components, accessories, and complete instructions for their simple assembly and immediate set-up. And a single call to your authorized Nalgene Industrial Products Distributor is all it takes to order one of these ready-to-use packages.

NOTE: Nalgene Tank And Mixer Packages are designed for liquids and liquid slurries only. Nalge Company does not warrant them for any specific application, only general-purpose mixing up to these maximum limits:

- Solids—20% by weight
- Specific Gravity (batch)—1.2
- Viscosity—500 centipoise

Some possible applications for these Packages include: chemical processing, water/waste treatment, plating, mineral processing and photo finishing.

Lightnin® is a registered trademark of Mixing Equipment Company, A Unit of General Signal.

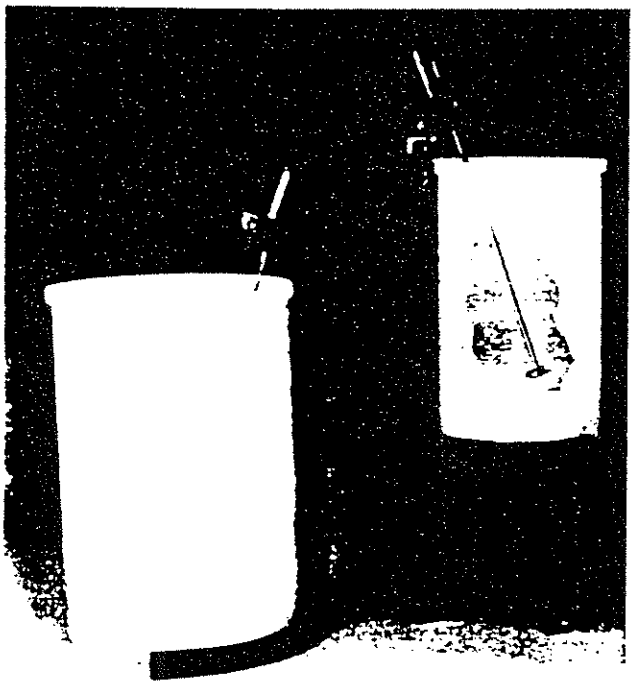
Motors — Precision-matched to Lightnin Mixers. Direct drive or gear drive, depending on tank size. Chemical-resistant housings, 1/4 to 1/2 HP, pre-engineered to applicable Nalgene tanks and stands. *See mixer details in this section.*

Nalgene Plastic Tanks — High-quality cylindrical tanks are seamless, won't leak, have molded-in graduations and come with covers. Can't rust, never need painting. 30- to 1000-gallons, flat or conical-bottom, choice of resins, with or without FRP casings.

Mounts — Lightnin Mixers clamp securely to steel support stands. Mixers up to 55 gals. have swivels and pre-set mixing angle; larger mixers have indexed ball & socket with 90° vertical, 360° horizontal movement for quick, easy, repeatable set-ups. Allen wrench—supplied—fits clamp, motor chuck, ball and socket.

Mixer Supports — Welded steel with chemical-resistant polyurethane paint. Pre-sized for proper mixer elevation. Integral part of stand for security and rigidity.

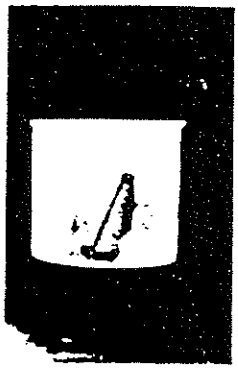
Floor Stands — Steel bases bolt to floor for stability. Most economical Nalgene Stands. Permit easy inspection, in-process sampling. Chemical-resistant polyurethane paint.



Elevated Tank Stands — Heavy-duty braced steel stands. Lifts flat-bottom tanks 22 inches from floor. With 8-in. center hole for drains, cutout on rim for fittings. Chemical-resistant polyurethane paint.

Shafts and Propellers + — Concentric, centerless ground shafts. SuperPitch® (1.5 pitch) investment-cast propellers are sized to each package. Both made of 316 Stainless Steel Adjustable prop positions.

+ All packages are supplied with one propeller.



Conical-Bottom Tanks with Stands — *These tanks require elevated stands.* Specify for complete drainage or better solids dispersion. Stands lift tank bottoms 18-in. off floor, have cutout for fitting. Chemical-resistant polyurethane paint.

Call your distributor
to order these products. And ask for the full-line Nalgene Industrial Products Catalog.

Tank and Mixer Packages

1 Tank
1 Stand
1 Mixer
1 Package

Featuring Nalgene® Tanks and Lightnin® Mixers

It's simple to select your Package. Just determine your capacity and read across the charts on these pages.

For example, to mix 100 gallons, choose:

Package Component	*Catalog No. & Size Code*
A 100-gallon tank (HDPE, natural, flat-bottom)	11100-0100
A stand pre-engineered for this 100 gal. tank (floor stand)	20010-0100
The mixer pre-engineered for this 100 gal. tank and stand	61100-0100

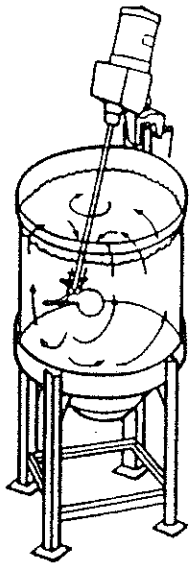
No substitutions from listed Packages.

Conical-Bottom Tanks

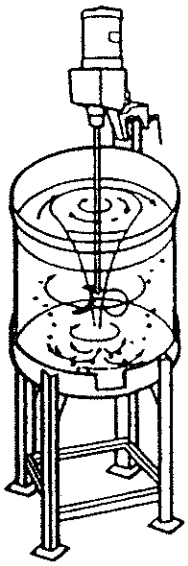
Tank Size	Tank Type	Nalgene Tanks — Material, Cat. No. – Size Code			Lightnin Mixers Cat. No. – Size Code	Elevated Tank Stands with Mixer Supports Cat. No. – Size Code	Package Shipping Weight, Approx. lb.+
		HDPE	PP	XLPE			
30 gallons	N	16120-0030	16220-0030	16320-0030	61600-0030	17110-0030	170
	F	17120-0030	17220-0030	17320-0030		56 in. high	
		HDPE	PP	XLPE			
55 gallons	N	16120-0055	16220-0055	16320-0055	61600-0055	17110-0055	210
	F	17120-0055	17220-0055	17320-0055		64 in. high	
		HDPE	PP	XLPE			
100 gallons	N	16120-0100	16220-0100	16320-0100	61600-0100	17110-0100	285
	F	17120-0100	17220-0100	17320-0100		60 in. high	
		HDPE	PP	XLPE			
250 gallons	N	16120-0250	16220-0250	16320-0250	61600-0250	17110-0250	500
	F	17120-0250	17220-0250	17320-0250		74 in. high	
		HDPE					
500 gallons	N	16120-0500			61600-0500	17110-0500	650
	F	17120-0500				105 in. high	

Tank Type
N = Natural (usually white or off-white)
F = FRP (fiberglass-reinforced polyester) Casing

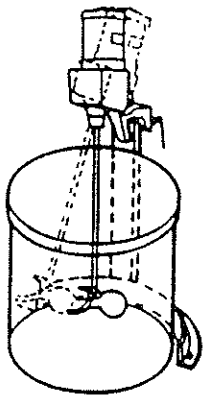
Angular Off Center
Aiming the shaft off-center as shown avoids vortexing. Achieves strong top-to bottom-turnover. Optimal for most mixing and blending.



Centered
Creates vortexing. While undesirable for most work, vortexing speeds up the dispersing and dissolving of light liquids and hard-to-wet powders.



Repositioning during the Batch.
Sometimes more than one kind of mixing action is needed. For example, you may first need to dissolve light powders, so you start with the mixer centered to create a vortex that quickly disperses them into the batch. Then, to maintain a uniform suspension, or to blend in other fluids, you reposition the mixer to angular off-center. These clamp-mount Lightnin mixers make the job easy.



+With elevated tank stands and FRP casings

Tank and Mixer Packages

Flat-Bottom Tanks

Tank Size	Tank Type	Nalgene Tanks — Material, Cat. No. – Size Code				Lightnin Mixers Cat. No. – Size Code	Tank Stands with Mixer Supports Cat. No. – Size Code		Pack. Shipping Weight, lb. Approx.+
							Floor	Elevated	
30 gallons		**HDPE**	**PP**	**XLPE**	**NYLON**				
	N	11100-0030	11200-0030	11300-0030	11600-0030	61100-0030	20010-0030	19010-0030	200
	B	18100-0030		18300-0030	**PVDF**		35 in. high	57 in. high	
	F	19100-0030	19200-0030	19300-0030	19500-0030				
55 gallons		**HDPE**	**PP**	**XLPE**					
	N	11100-0055	11200-0055	11300-0055		61100-0055	20010-0055	19010-0055	215
	B	18100-0055		18300-0055	**PVDF**		38 in. high	61 in. high	
	F	19100-0055	19200-0055	19300-0055	19500-0055				
80 gallons		**HDPE**	**PP**	**XLPE**					
	N	11100-0080	11200-0080	11300-0080		61100-0080	20010-0080	19010-0080	270
	B	18100-0080		18300-0080			48 in. high	70 in. high	
	F	19100-0080	19200-0080	19300-0080					
100 gallons		**HDPE**	**PP**	**XLPE**					
	N	11100-0100	11200-0100	11300-0100		61100-0100	20010-0100	19010-0100	285
	B	18100-0100		18300-0100	**PVDF**		44 in. high	66 in. high	
	F	19100-0100	19200-0100	19300-0100	19500-0100				
150 gallons		**HDPE**	**PP**	**XLPE**					
	N	11100-0150	11200-0150	11300-0150		61100-0150	20010-0150	19010-0150	350
	B	18100-0150		18300-0150	**PVDF**		49 in. high	71 in. high	
	F	19100-0150	19200-0150	19300-0150	19500-0150				
200 gallons		**HDPE**	**PP**	**XLPE**					
	N	11100-0200	11200-0200	11300-0200		61100-0200	20010-0200	19010-0200	440
	B	18100-0200		18300-0200	**PVDF**		51 in. high	73 in. high	
	F	19100-0200	19200-0200	19300-0200	19500-0200				
275 gallons		**HDPE**	**PP**	**XLPE**					
	N	11100-0275	11200-0275	11300-0275		61100-0275	20010-0275	19010-0275	535
	B	18100-0275		18300-0275	**PVDF**		49 in. high	72 in. high	
	F	19100-0275	19200-0275	19300-0275	19500-0275				
360 gallons		**HDPE**	**PP**	**XLPE**					
	N	11100-0360	11200-0360	11300-0360		61100-0360	20010-0360	19010-0360	580
	B	18100-0360		18300-0360			48 in. high	71 in. high	
	F	19100-0360	19200-0360	19300-0360					
500 gallons		**HDPE**							
	N	11100-0500				61100-0500	20010-0500	19010-0500	750
	B	18100-0500					61 in. high	84 in. high	
	F	19100-0500							
1000 gallons		**HDPE**							
	N	11100-1000				61100-1000	20010-1000	19010-1000	1,000
	B	18100-1000					77 in. high	99 in. high	
	F	19100-1000							

Tank Type
N = Natural (usually white or off-white)
B = Black
F = FRP (fiberglass-reinforced polyester) Casing

For Quick Mixer Renewal

Keeping genuine Lightnin® replacement parts on hand minimizes downtime during occasional maintenance. Each kit is clearly marked and packaged for rust-free storage. Costs less than buying separate parts from multiple sources. Available for all Tank and Mixer Packages *except* 30- and 55-gal. sizes. Contact Nalge for details.

+With elevated tank stands and FRP casings

Nalge Company
Nalgene® Brand Products
Nalge Company
A Subsidiary of Sybron Corporation
Box 20365
Rochester, NY 14602-0365
Phone (716) 586-8800
Telex 97-8242
Fax (716) 586-8431

Call your distributor
to order these products. And ask for the full-line Nalgene Industrial Products Catalog.

Tank and Mixer Packages

ıve Steps To Selecting Your Tank and Mixer Package

1. Decide whether a flat- or conical-bottom tank is best for your needs
2. Select your tank size
3. Select your tank's material
4. Select the stand — floor or elevated — needed to support your Lightnin mixer
5. Order the mixer pre-engineered to match your tank and stand

All Package components are shipped together, ready to set up and start mixing.

1. Flat-Bottom and Conical-Bottom Tanks

First you must determine whether a conical-bottom tank or a flat-bottom tank is correct for your application. Conical-bottom tanks offer complete drainage and somewhat better dispersal of solids.

2. Many Tank Sizes

Flat-Bottom tanks come in 10 sizes from 30 to 1,000 gallons. Conical-ıttom tanks come in 5 sizes from / to 500 gallons. If you expect excessive foaming during mixing, order the next larger size tank.

3. Five Resins Offered

PP, HDPE, XLPE, Nylon and PVDF tanks are available.

Refer to the "Resin Selection Guide" in the latest Nalgene Industrial Catalog to pick the best tank material for your application. If you need further details, call your local Nalgene Industrial Products Distribution.

4. Choice of Tank Stands

Unlike metal tanks, plastic tanks **cannot** support the weight of a mixer. You must attach your mixer to the metal support included in your Nalgene Tank and Mixer Package. There are two types of stands:

Floor Stands — Your most economical choice for flat-bottom tanks, which rest on the floor for easy access. Stand bases partially encircle the tanks and bolt to the floor for stability.

Elevated Tank Stands — These are **required** for conical-bottom tanks. They raise conical tanks 18 inches from the floor (22 inches for flat-bottom tanks) — a good working height. Also specify when tanks require bottom fittings for full drainage.

Mixer Supports — Made from rigid, welded steel. Nalge has pre-sized them to properly elevate each mixer for optimum agitation. Painted with a blue polyurethane coating for reliable, chemical-resistant service.

WARNING: Never clamp a mixer directly to a plastic tank. Always attach the mixer to a separate metal support. Directly attaching a mixer to a plastic tank will void all products' warranties. Never position propeller closer than 3 inches from tank wall.

Mounting and Positioning Your Lightnin Mixer

Your process determines the best positioning for your Lightnin Mixer. Its metal support is pre-sized for proper mixer elevation.

All Packages have cylindrical, open-top tanks — the optimum shape for mixing. Tank baffles are not necessary. Liquid levels should be between one and one-and-a-half times the diameter of the tank.

Mixers, shafts and propellers have been sized and matched for each tank size. Propeller location should typically be about one propeller diameter from the bottom of the tank.* *See next page for proper positioning.*

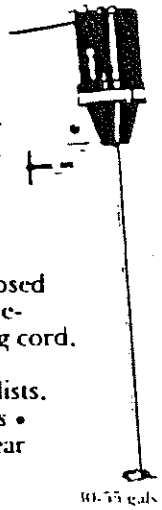
NOTE: All mounting and swivel brackets must be tightened securely to prevent damage to equipment and to maintain efficient mixing. Failure to secure your mixer will void both products' warranties.

*Complete mounting and positioning instructions are included with every package.

5. Lightnin® Mixers For Nalgene Tank/Mixer Packages

All These Lightnin Mixers Feature:

• Shafts and SuperPitch investment-cast propellers made of 316 Stainless Steel • Aluminum housings with chemical-resistant paint • Integral on/off switches • Totally-enclosed motors • 115 volt, single-phase motors • 3-prong cord, 7 feet long • Mounting directions, spare parts lists, maintenance guidelines • Standard Lightnin 1-Year Warranty



10-55 gals

Available As Special Orders:
• Explosion-proof motors
• Chemical-resistant coating for shaft and propeller

CB = conical-bottom tank
FB = flat-bottom tank

10 gals. FB, CB
55 gals. FB, CB

Drive: Direct
HP: 1/4
RPM: 1750
Shaft: 5/8"∅ × 36" long
Prop size: 3.6 in.
Mount: Clamp/swivel

80 gals. FB
100 gals. FB, CB
150 gals. FB

Drive: Direct
HP: 1/3
RPM: 1750
Shaft:
FB - 1/2"∅ × 48" long
CB - 1/2"∅ × 42" long
Prop size: 3.8 in.
Mount: Clamp/indexed ball & socket

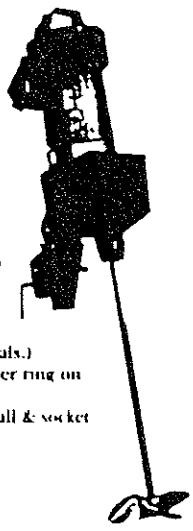
80-150 gals.

200 gals. FB
250 gals. CB
275 gals. FB
360 gals. FB
500 gals. FB, CB

Drive: Gear; 5:1 ratio
HP: 1/3
RPM: 350
Shaft:
FB - 5/8"∅ × 48" long (5/8 × 60 for 500* gals.)
CB - 5/8"∅ × 48" long for 250 gals. (1 × 72 for 500* gals.)
Prop size: 10 in. with stabilizer ring on 500 gals.
Mount: Clamp/indexed ball & socket

1000 gals. FB

Drive: Gear; 5:1 ratio
HP: 1/2
RPM: 350
Shaft: 1"∅ × 72" long*
Prop size: 10.5 in., with stabilizer ring
Mount: Clamp/indexed ball & socket
*With rigid flange coupling



200-1,000 gals.

Call your distributor
to order these products. And ask for

Tank Size, Gallons	Tank Type	Nalgene Tanks Cat. No. – Price						Lightnin Mixers Cat. No. – Price		Tank Stands Cat. No. – Price	
		HDPE		PP		XLPE					
30 Size Code -0030	N	16120	$122.00	16220	$180.60	16320	$152.00	61600	$512.80	17110	$379.60
	F	17120	479.00	17220	506.00	17320	495.00				
55 Size Code -0055	N	16120	164.00	16220	241.50	16320	205.00	61600	512.80	17110	432.20
	F	17120	516.00	17220	553.00	17320	539.00				
100 Size Code -0100	N	16120	281.00	16220	416.90	16320	351.00	61600	775.50	17110	542.00
	F	17120	787.00	17220	879.00	17320	843.00				
250 Size Code -0250	N	16120	408.00	16220	642.60	16320	538.00	61600	1167.90	17110	804.60
	F	17120	1215.00	17220	1446.90	17320	1319.00				
500 Size Code -0500	N	16120	1089.80	**PRICING — Packages with Conical-Bottom Tanks Effective Jan. 1, 1990.**				61600	1505.50	17110	1045.80
	F	17120	2212.60								

		HDPE		PP		XLPE		KYNAR		Lightnin Mixers Cat. No. – Price		Tank Stands Cat. No. – Price	
30 Size Code -0030	N	11100	$93.80	11200	$116.40	11300	$130.80	11600	$215.00	61100	$512.80	20010	$206.00	19010	$291.30
	B	18100	99.70			18300	138.70	PVDF							
	F	19100	344.00	19200	328.80	19300	379.60	19500	$901.60						
55 Size Code -0055	N	11100	129.20	11200	153.50	11300	185.60			61100	512.80	20010	206.00	19010	315.50
	B	18100	137.40			18300	196.80								
	F	19100	461.40	19200	442.00	19300	515.00	19500	1454.90						
80 Size Code -0080	N	11100	247.80	11200	324.70	11300	305.20			61100	775.50	20010	235.80	19010	411.60
	B	18100	266.40			18300	323.70								
	F	19100	661.80	19200	633.20	19300	717.60								
100 Size Code -0100	N	11100	263.20	11200	330.70	11300	377.40			61100	775.50	20010	267.80	19010	454.10
	B	18100	293.40			18300	400.30	PVDF							
	F	19100	707.40	19200	697.20	19300	805.60	19500	2028.20						
150 Size Code -0150	N	11100	357.60	11200	444.80	11300	413.80			61100	775.50	20010	267.80	19010	537.20
	B	18100	387.50			18300	438.80	PVDF							
	F	19100	912.20	19200	872.00	19300	963.60	19500	2644.20						
200 Size Code -0200	N	11100	388.20	11200	490.10	11300	436.60			61100	1167.90	20010	288.40	19010	545.60
	B	18100	418.40			18300	463.10	PVDF							
	F	19100	1052.00	19200	1006.20	19300	1095.40	19500	3053.00						
275 Size Code -0275	N	11100	516.20	11200	623.40	11300	563.20			61100	1167.90	20010	288.40	19010	630.70
	B	18100	564.50			18300	597.20	PVDF							
	F	19100	1300.00	19200	1245.20	19300	1334.00	19500	3715.50						
360 Size Code -0360	N	11100	628.40	11200	891.00	11300	685.80			61100	1167.90	20010	311.40	19010	852.60
	B	18100	694.10			18300	727.20								
	F	19100	1526.00	19200	1534.40	19300	1568.20								
500 Size Code -0500	N	11100	873.00							61100	1284.00	20010	327.40	19010	907.20
	B	18100	953.80												
	F	19100	2218.60												
1000 Size Code -1000	N	11100	1461.80	**PRICING — Packages with Flat-Bottom Tanks Effective Jan. 1, 1990.**						61100	1854.70	20010	503.60	19010	1941.70
	B	18100	1636.70												
	F	19100	3182.80												

Check with Nalge for current list prices and availability of conical-bottom tanks. 123 TANK STANDS: Floor — 17110 & 20010; Elevated — 19010.

BUDA EQUIPMENT AND CONTROLS, INC

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East Syracuse, NY 13057-0580

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LIVERPOOL NY 13088

123 1089

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OPERATING INSTRUCTIONS

LIGHTNIN®

XD AND XJ SERIES

PORTABLE MIXERS

FLUID MIXING SPECIALISTS

IT-1977E
9-30-87

GS

LIGHTNIN

OPERATING INSTRUCTIONS

LIGHTNIN®

PORTABLE MIXERS

A LIGHTNIN Portable Mixer is a precision machine of the highest quality. They are designed to operate satisfactorily under all the conditions normally encountered.

This is a completely proven design — a product of LIGHTNIN Research and Development.

Among its features are:

MAXIMUM MIXING EFFICIENCY
ENERGY EFFICIENT DURA-MIX™ MOTORS
CONVENIENCE OF HANDLING
UNIQUE POSITIVE DRIVE CHUCK
POSITIVE CLAMPING AND POSITIONING
HIGH TECHNOLOGY IMPELLERS
MAINTENANCE FREE OPERATION
MODERN DESIGN STYLING

With proper care this LIGHTNIN Portable will give years of trouble-free service. If you should have any questions regarding its operation which are not answered in this manual, call your authorized LIGHTNIN Mixer Sales Engineer. His telephone number is listed on the back cover.

TABLE OF CONTENTS

SAFETY CHECK LIST

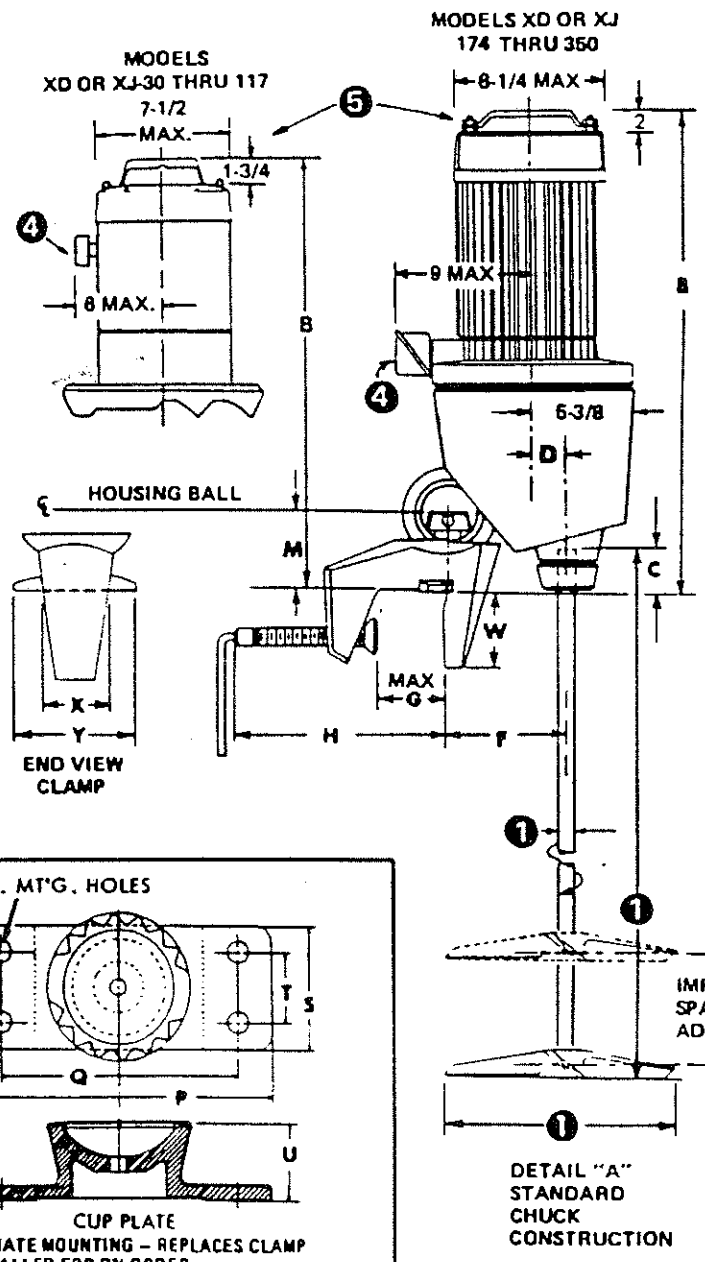
IMPORTANT

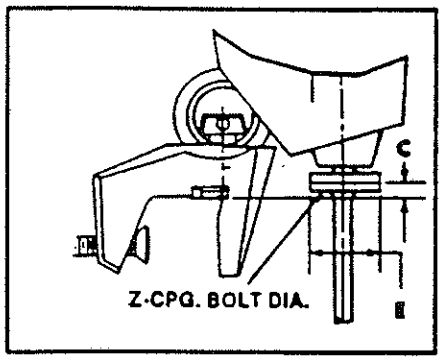
ALL ***LIGHTNIN®*** MIXERS AND AERATORS ARE PROVIDED WITH PROPERLY DESIGNED LIFTING DEVICES AND SAFETY COVERS TO AVOID POTENTIAL INJURY AND/OR EQUIPMENT DAMAGE. THE FOLLOWING SAFETY CHECK LIST SHOULD BE THOROUGHLY REVIEWED AND ADHERED TO BEFORE OPERATING OR PERFORMING MAINTENANCE ON THE MIXER.

1. USE ONLY THE LIFTING DEVICES PROVIDED ON YOUR UNIT TO INSTALL THE MIXER. USE SHOULDERED EYEBOLTS AND TIGHTEN SECURELY TO HANDLE COMPONENT PARTS. WE STRONGLY RECOMMEND THAT THE EYEBOLTS OR HOIST RINGS BE OF THE SAFETY SWIVEL TYPE WITH 360° ROTATIONAL CAPABILITY.
2. DO NOT CONNECT THE PRIME MOVER TO THE POWER SOURCE UNTIL ALL COMPONENTS ARE ASSEMBLED, THE MIXER IS INSTALLED AND ALL HARDWARE IS TIGHTENED TO THE PROPER TORQUE WHICH IS SPECIFIED IN THE OPERATION AND MAINTENANCE MANUALS SUPPLIED BY ***LIGHTNIN®***.
3. DO NOT OPERATE SHAFT SEALING DEVICES AT TEMPERATURES OR PRESSURES HIGHER THAN THOSE SPECIFIED IN THE MANUAL OR ON NAMEPLATES.
4. PRIOR TO SERVICING MIXER, ELECTRICALLY DISCONNECT POWER.
5. DO NOT TOUCH ROTATING MIXER PARTS.
6. DO NOT OPERATE MIXER FOR SERVICE OTHER THAN ITS INTENDED USE.
7. DO NOT MAKE ANY FIELD CHANGES OR MODIFICATIONS (HORSEPOWER, OUTPUT SPEED, SHAFT LENGTHS, IMPELLERS, ETC.) WITHOUT REVIEWING THE CHANGE WITH YOUR ***LIGHTNIN®*** SALES REPRESENTATIVE OR THE ***LIGHTNIN®*** CUSTOMER SERVICE DEPARTMENT.
8. BEFORE OPERATING THE MIXER, IT IS VERY IMPORTANT TO CHECK THE FOLLOWING ITEMS:
   - A) MAKE SURE MIXER IS PROPERLY GROUNDED.
   - B) ENSURE ALL PROTECTIVE GUARDS AND COVERS ARE INSTALLED.
   - C) ENSURE ALL DETACHABLE COMPONENTS ARE SECURELY COUPLED TO THE MIXER.
   - D) THOROUGHLY REVIEW AND COMPREHEND THE MIXER OPERATION INSTRUCTIONS, SUPPLIED BY ***LIGHTNIN®***.
   - E) ENSURE THE DRIVE OR SEAL SHAFT ROTATES FREELY BY HAND.
   - F) ENSURE ALL PERSONNEL AND EQUIPMENT ARE CLEAR OF ROTATING PARTS.
   - G) ENSURE ALL EXTERNAL CONNECTIONS (ELECTRICAL, HYDRAULIC, PNEUMATIC, ETC.) HAVE BEEN COMPLETED PER THE APPLICABLE CODES.
9. DO NOT ENTER THE MIXING VESSEL UNLESS:
   - A) THE MIXER POWER SUPPLY IS LOCKED OUT.
   - B) THE MIXER SHAFT IS FIRMLY ATTACHED TO THE MIXER DRIVE OR THE SHAFT IS SUPPORTED SECURELY FROM BELOW.

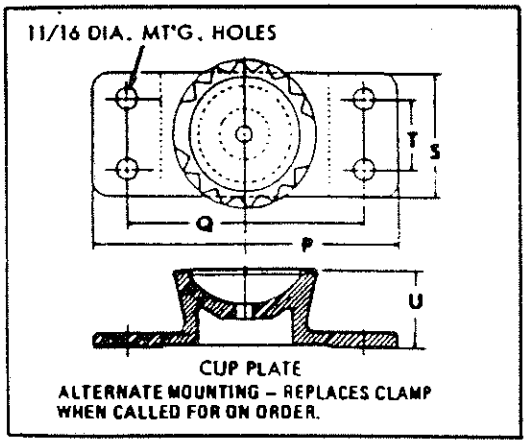
LIGHTNIN® PORTABLE MIXERS

ALL DIMENSIONS IN INCHES





ALTERNATE COUPLING CONSTRUCTION DETAIL



ALTERNATE MOUNTING – REPLACES CLAMP WHEN CALLED FOR ON ORDER.

NOTES:

1. REFER TO ORDER FOR:
   - A. MODEL NUMBER AND MOTOR HORSEPOWER.
   - B. SHAFT DIAMETER AND LENGTH.
   - C. QUANTITY AND SIZE OF IMPELLERS.
   - D. MOTOR SPECIFICATIONS.
   - E. SHAFT CONNECTION – STANDARD CHUCK OR ALTERNATE COUPLING CONSTRUCTION.
2. MIXER WEIGHT CAN VARY WITH MOTOR CHARACTERISTICS, SHAFT AND IMPELLER SELECTION. WEIGHTS SHOWN INCLUDE SHAFT AND STANDARD DUAL IMPELLERS.
3. DIMENSION "8" IS MAXIMUM. CAN VARY SLIGHTLY DEPENDING ON MOTOR ENCLOSURE.
4. CONDUIT BOX NOT INCLUDED WITH EXPLOSION PROOF MOTOR.
5. MOTOR HANDLES SHOWN 90° OUT OF POSITION.
6. "D" OFFSET DOES NOT APPLY TO XD SERIES.

XD SERIES – DIRECT DRIVE MODELS

MODEL	② APPROX. MIXER WT. LBS.	STANDARD IMPELLER DIA'S. ① SINGLE	DUAL	B ③	C WITH CHUCK	C WITH CPLG	E	F	G	H	P	Q	S	T	U	W	X	Y	Z
XD- 30	64	3.8	3.4	18-3/8	4-3/4	7/8	3-7/8	4	3	9	9	7	3-1/2	2	2-1/4	3-1/8	2-3/8	6-3/16	3/8
XD- 43	70	4.6	3.8																
XD- 87	90	6.2	4.6	21	6-1/2	2	3-7/8	4	3-3/4	11	10	8-1/2	3-6/8	2	2-7/16	3-1/2	2-7/8	6-3/4	↓
XD-117	100	6.9	6.2	21-6/8															
XD-174	125	6.3	5.2	23-1/2	6	2-1/8	4-3/4	5	3-3/4	12	10	8-1/2	4	2-1/2	2-15/16	4-3/16	3-1/4	6-7/8	1/2
XD-230	130	6.8	5.8	26-1/4															

XJ SERIES – GEAR DRIVE MODELS

MODEL	② APPROX. MIXER WT. LBS.	STANDARD IMPELLER DIA'S. ① SINGLE	DUAL	B ③	C WITH CHUCK	C WITH CPLG	D	E	F	G	H	P	Q	S	T	U	W	X	Y	Z
XJ- 30	66	11.2	10.0	21	3-7/8	3/8	1-3/8	3-7/8	6	3	9	9	7	3-1/2	2	2-1/4	3-1/8	2-3/8	6-3/16	3/8
XJ- 43	70	11.8	10.0																	
XJ- 66	86	13.6	11.8	22-7/8	4-7/8	0	1-6/8	3-7/8	6-1/2	3-3/4	11	10	8-1/2	3-6/8	2	2-7/16	3-1/2	2-7/8	6-3/4	3/8
XJ- 87	96	16.1	12.8																	
XJ-117	100	15.6	13.6	23-1/8																
XJ-174	126	17.0	16.1	26-6/8	4-6/8	5/8	1-7/8	4-3/4	6-1/2	3-3/4	12	10	8-1/2	4	2-1/2	2-15/16	4-3/16	3-1/4	6-7/8	1/2
XJ-230	136	18.0	15.6	28-3/8																
XJ-350	140	19.0	17.0																	

SECTION 1
INITIAL INSPECTION, SHIPPING ARRANGEMENTS AND STORAGE

1-1. As soon as you have uncrated your mixer, check it for shipping damage and report any damage immediately to the carrier and to our factory.

1-2. Mixer and impellers are packed together. The mixer shaft is packed in a separate container. Carbon steel mixer shafts and impellers are wrapped with Shell VPI-coated paper for domestic shipment. For foreign shippment these parts are coated with a rust inhibitor that is easily removed with kerosene, or similar solvents.

1-3. Do not remove wrappings or protective coating if the mixer is to be stored before it is placed in operation. Store the mixer in a clean, dry location, with circulating air, free from wide or rapid variations in temperature. When gear drive models have been stored for more than a year, the condition of the gear lubricant should be checked before the mixer is installed. (See lubrication instructions.)

SECTION 2 MOUNTING

2-1. Lift the mixer from its crate by the motor handle. Set the clamp squarely on the mounting surface so that both vertical and horizontal lines of clamp contact bare evenly. **Remove the hex key wrench stored in the clamp** and tighten the clamp screw securely. The wrench has been sized to properly tighten the clamp screw, 3/8-inch for XD or XJ 174 thru 350, 7/32-inch for XD or XJ 30 thru 117. DO NOT IMPACT THE WRENCH OR USE AN EXTENSION.

2-2. Impeller rotation must be according to the arrow on the mixer nameplate.

a. Single phase totally enclosed motors are wired at our factory for correct rotation.

b. All three phase and explosion proof motors must be field wired for proper rotation. If rotation does not agree with nameplate reverse any two line leads.

c. Dual voltage motors must be wired for the desired voltage. Refer to the connection diagrams provided on the motor nameplate or inside the conduit cover.

SECTION 3 MOTOR CONNECTIONS

3-1. LIGHTNIN Portables are equipped with ball bearing chemical plant motors specifically designed for mixer service in totally enclosed or explosion-proof construction.

a. Constant speed mixers are furnished with LIGHTNIN DURA-MIX™ energy efficient motors unless otherwise specified.

b. For variable speed mixers with electronic or air driven motors, refer to supplementary instructions for motor control data and connection requirements.

3-2. SINGLE PHASE MOTORS FOR XD/XJ30 THRU 87 (or motors nameplated 1/4 thru 1 Horsepower)

a. Totally enclosed motors are furnished with eight-foot cords fitted with UL approved three prong grounded plugs suitable for the correct voltage.

b. Explosion proof motors are furnished with a pipe tap connection and suitable leads. A conduit box with internal switch is available for explosion proof service.

c. All DURA-MIX™ single phase motors are equipped with an internal over-temperature device with manual reset. If the thermal trips, wait (15) fifteen minutes and depress the reset button on the motor body. A click indicates re-set.

3-3. THREE PHASE MOTORS

a. All totally enclosed motors are equipped with a conduit box and suitable leads.

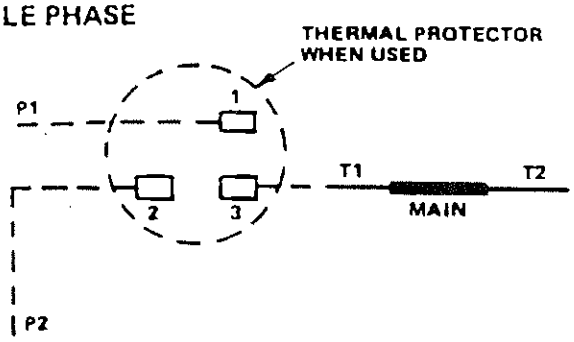
b. All explosion proof motors are furnished with a pipe tap connection and suitable leads.

IMPORTANT: ALL THREE PHASE MOTORS (Except explosion proof on XD/XJ 30 thru 65 or other XP motors nameplated 3/4 horsepower and below) are equipped with over-temperature thermostats which are designed to interrupt current in the holding coil of magnetic starters only. The motor thermostats will reset themselves, but the control panel "start" button must be depressed to start the motor.

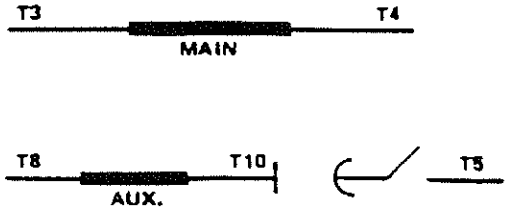
EXPLOSION PROOF MOTORS ON XD/XJ 30 THRU 65 or XP motors nameplated 3/4 horsepower and below are equipped with automatic over-temperature circuits which can trip and reset themselves after the motor cools TO AVOID INJURY DUE TO UNEXPECTED STARTUP, DISCONNECT FROM POWER UNTIL THE MOTOR COOLS.

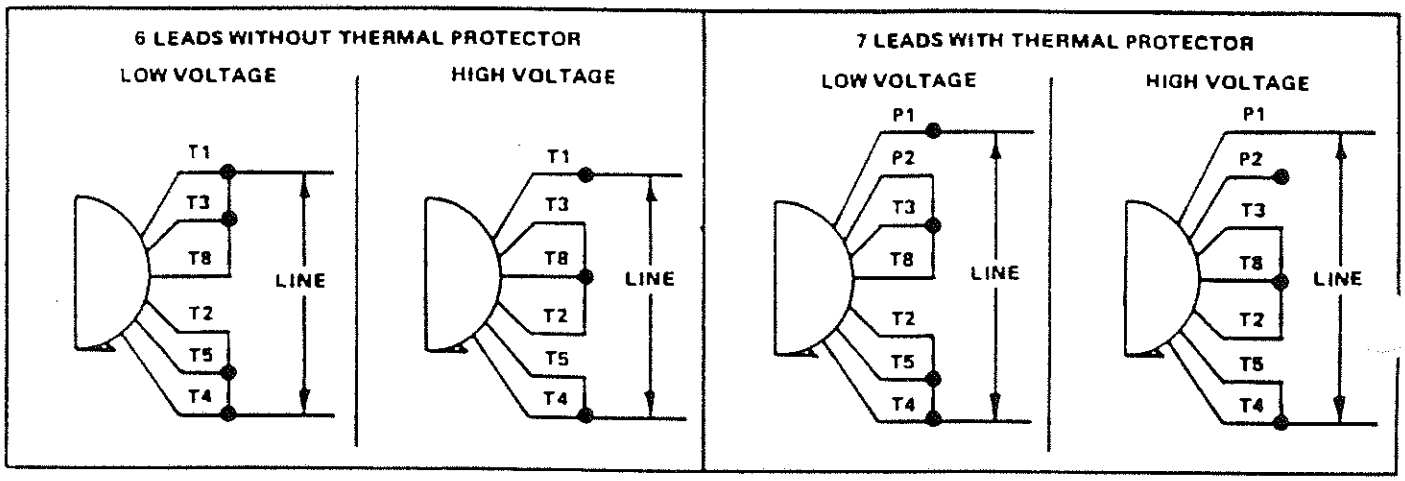
CONNECTION DIAGRAM FOR SINGLE PHASE MOTORS ON LIGHTNIN® PORTABLE AND FIXED MOUNTING MIXERS

SINGLE PHASE



DUAL VOLTAGE REVERSIBLE WITH OR WITHOUT THERMAL PROTECTOR





TO REVERSE ROTATION, INTERCHANGE LEADS T5 AND T8

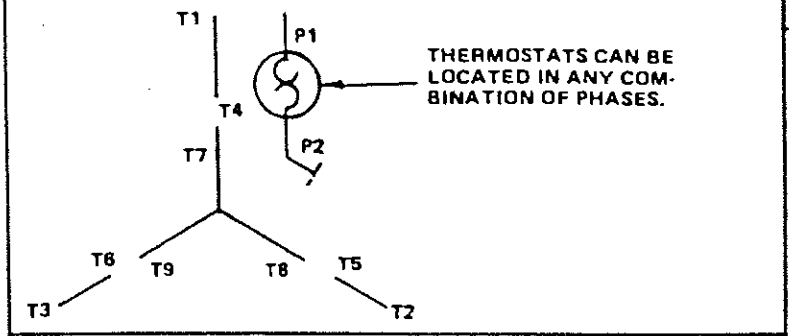
NOTE: All LIGHTNIN DURA-MIX™ totally enclosed or explosion proof single phase motors are equipped with an internal overtemperature device with manual reset. If the motor overheats and the thermal circuit trips, wait (15) fifteen minutes and depress the reset button on the motor body. An audible click indicates re-set.

NON DURA-MIX™ motors may or may not have internal thermal protection depending on construction.

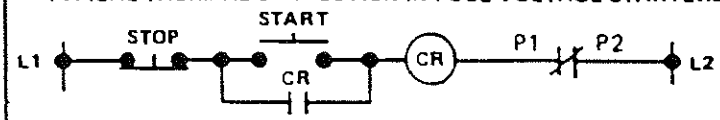
For three phase connections diagrams, see page 7.

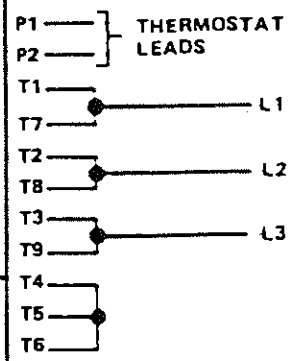
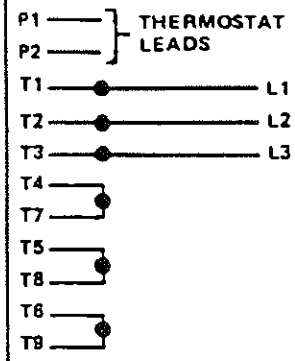
CONNECTION DIAGRAMS FOR THREE PHASE MOTORS ON LIGHTNIN® PORTABLE AND FIXED MOUNTING MIXERS

FIGURE 1A – CONNECTION DIAGRAM



TYPICAL THERMAL CONNECTION IN FULL VOLTAGE STARTERS



LOW VOLTAGE	HIGH VOLTAGE
	

TO REVERSE ROTATION, INTERCHANGE ANY TWO LINE LEADS

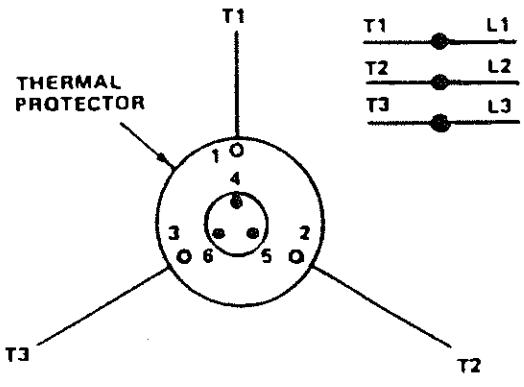
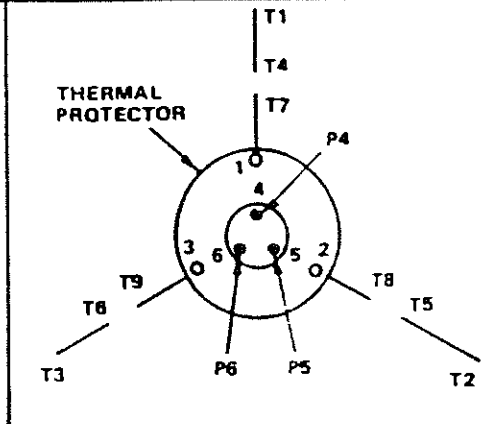
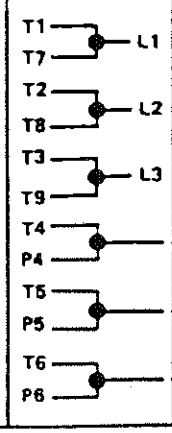
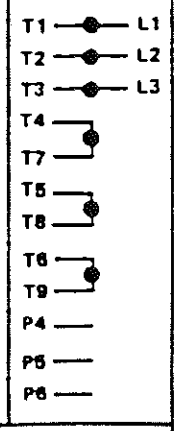
NOTES: (1) The diagram in Figure 1A pertains to:

a. TOTALLY ENCLOSED three phase motors used on XD/XJ Series 30 thru 350, XL 100 thru 500 & SXJ/SXJS 174 & 230 with DURA-MIX™ energy efficient motors or other totally enclosed motors nameplated 1/4 thru 5 horsepower.

b. EXPLOSION PROOF three phase motors used on XD/XJ Series 87 thru 350, XL 100 thru 500 & SX/SXJS 174 & 230 with DURA-MIX™ energy efficient motors or other explosion proof motors nameplated 1 thru 5 horsepower. For XP motors used on XD/XJ Series 30 thru 65 and XP motors nameplated 3/4 H.P. and less, see Figure 1B.

(2) The thermostats in above motors are designed to interrupt current only in the holding coil of magnetic starters and must be wired into the motor control circuit. The thermostats re-set themselves after the motor cools, but the motor must be re-started by depressing the start button on the starter panel.

FIGURE 1B – CONNECTIONS FOR THREE PHASE EXP. PROOF MOTORS ON XD/XJ 30 THRU 65 OR MOTORS NAMEPLATED 3/4 HORSEPOWER OR LESS

SINGLE VOLTAGE WITH THERMAL PROTECTOR	DUAL VOLTAGE WITH THERMAL PROTECTOR	LOW VOLTAGE	HIGH VOLTAGE
			

TO REVERSE ROTATION, INTERCHANGE ANY TWO LINE LEADS

WARNING: THESE MOTOR THERMALS RE-SET AUTOMATICALLY. TO AVOID INJURY DUE TO UNEXPECTED STARTUP, DISCONNECT FROM POWER UNTIL MOTOR COOLS.

SECTION 4
MIXER SHAFT INSTALLATION

4-1. Position the impeller(s) on the mixer shaft. Refer to the specification sheet for recommended dual impeller spacing. The larger wedge shaped portion of the hub body must face up towards the mixer. The top of the hub is stamped "UP". Refer to Figure 2 for general orientation reference.

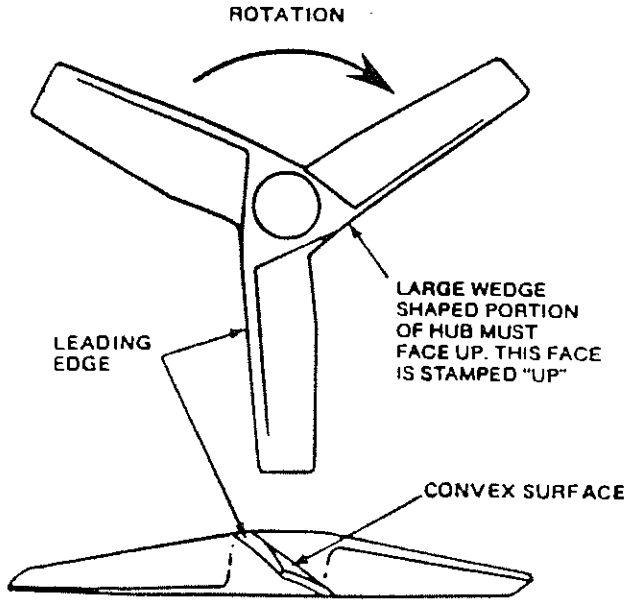


FIGURE 2. IMPELLER ORIENTATION

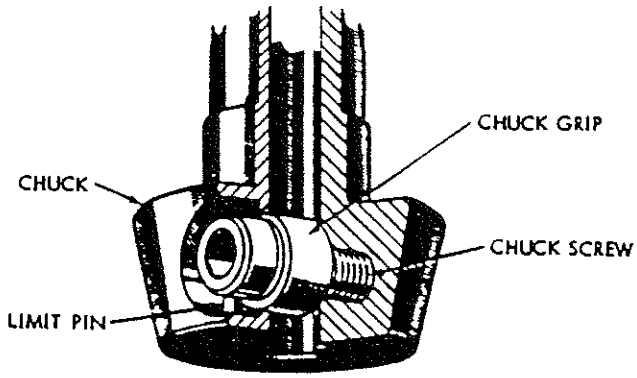


FIGURE 3. CHUCK DETAILS

4-2. To install the mixer shaft, back off the chuck screw (refer to Figure 3) as far as the limit pin will allow. DO NOT FORCE. Insert the mixer shaft into the chuck bore as far as it will go. For stepped shafts, make sure the shaft shoulder seats tightly against the chuck face. Draw up the chuck screw with the wrench provided, rotating the shaft slightly back and forth to make sure that the chuck grip seats against the flat of the shaft. Tighten the chuck screw with the wrench provided. The wrench has been properly sized to tighten the screw. DO NOT IMPACT THE WRENCH OR USE AN EXTENSION. NOTE: A safety feature is provided by a slight taper in the flat on the mixer shaft. The shaft cannot drop out unless the grip is intentionally released.

SECTION 5
POSITIONING

5-1. The positioning device of the mixer combines a vertical index on the ball of the housing and a horizontal index on the ram of the clamp socket. Mixing positions are established by referencing one index against the other. Figure 4 shows the indexes in D-5 position, a typical setting. To change the mixing position, loosen the wedge screw, adjust the mixer by its motor handle, and tighten the wedge screw. The wedge screw has a limited amount of travel before the wedge bottoms against the king bolt. If the wedge does eventually bottom, readjust the wedge assembly per 8-9, Step e.

5-2. The correct position for the mixer will vary in individual cases. Use Table I to position the mixer in relation to tank diameter and height for normal applications. In operation, some adjustment of position may be desirable for best results.

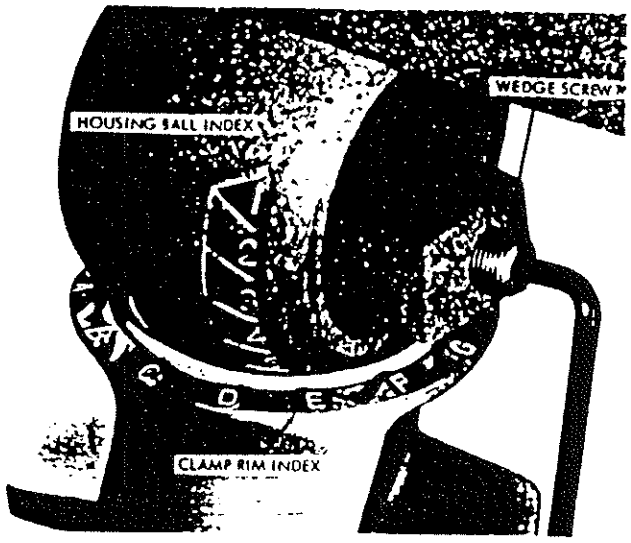


FIGURE 4. POSITIONING INDEXES

TABLE I

MIXING PATTERN	Batch Height (Z) / Tonk Diameter (T)	CLAMP RIM INDEX (HORIZONTAL ANGLE)	HOUSING BALL INDEX (VERTICAL ANGLE)
NORMAL MIXING Off-center position Top to bottom turnover No swirling	Z/T less than 1 Z/T greater than 1	D D	5 6
VORTEXING On-center position	Z/T less than 1 Z/T greater than 1	E E	5 6
SWIRLING Off-center position Usually vortexing	Z/T less than 1 Z/T greater than 1	F F	6 7

Swirling and vortexing positions may be useful for surface introduction of solids, liquids, or gases.

SECTION 6
MIXER OPERATION

6-1. LIGHTNIN MIXERS are designed to operate continuously at normal and low liquid levels and in air. IMPORTANT: Variable speed drives sometimes have critical ranges where the unit should not be operated during drawoff or in air. These ranges will be indicated on a warning decal at the speed control. It is not good practice to operate any mixer continuously when extreme vortexing or surging occurs.

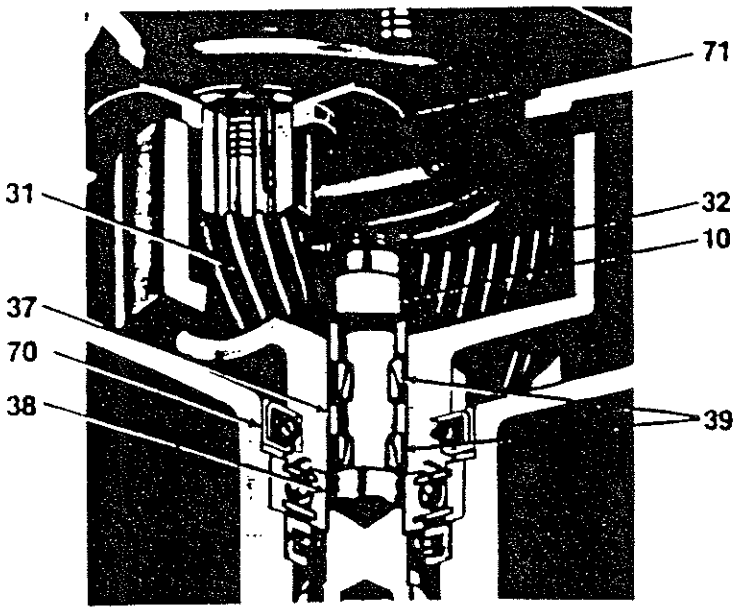
6-2. Turn on the mixer. Allow time enough for the mixing pattern to be established, then make any required adjustment of position.

6-3. At the end of two weeks service, check the housing cap screws, clamp screw, wedge screw, and chuck screw for tightness.

6-4. At the end of the mixing cycle, it is good practice to turn off the mixer before the tank has been drained to a level which will result in exeessive splashing.

6-5. The gear drive models (XJ) include a built-in shock load feature. The grip springs (See Figure 5) provide a keyless friction drive between the gear and the drive shaft, and the springs will slip before the mixer is damaged. Therefore, if the mixer shaft does not rotate when the motor is on, remove the motor (41) from the housing (36), per Paragraph 9-1, and tighten the grip spring locknut (10) securely. (Table 4 on Page 18 lists the recommended tightening torques for this locknut. If a torque wrench is not available, be sure locknut is tightened sufficiently to prevent grip spring slippage.)

NOTE: Item 70, Oil Seal and Item 71, Slinger are furnished on XJ 174 thru 350 only.



31 — Pinion
37 — Grip Spring Spacer
38 — Drive Shaft
32 — Internal Gear
10 — Grip Spring Lock Nut
39 — Grip Spring Set
70 — Oil Seal
71 — Slinger

FIGURE 5. GRIP SPRING ASSEMBLY

SECTION 7
LUBRICATION

7-1. Your LIGHTNIN mixer has been lubricated at the factory with the correct type and amount of high quality lubricants. Lubricant cleanliness is protected by properly designed closures.

7-2. All mixer bearings are sealed type with contact rubbing seals and are pre-packed with lubricant. Relubrication of these bearings is not necessary.

7-3. The gear chamber in XJ series models has been factory filled with a grease suitable for an ambient temperature range of +50°F to +200°F. **Under normal operating conditions, this lubricant need not be changed until the unit has been dismantled for some reason.**

Under adverse operating conditions, periodic changes of lubricant may be necessary. Adverse conditions are defined as operating in very humid, dust laden or chemical atmospheres, or where wide variations in ambient temperature occurs. Such adverse conditions can lead to deterioration of lubricant compounds and additives and it is recommended that the condition of the grease be checked within six months after startup. Reputable lubricant suppliers can analyze the grease and recommend economical, safe change schedules.

7-4. CHANGING GEAR LUBRICANT

a. Make sure the mixer housing is vertical to prevent spillage.

b. Remove the housing to motor capscrews and lift off the motor by its handle.

c. Remove all old grease from the gear chamber and wipe clean.

d. Pack the chamber with fresh grease. (See notes① and ②). Paddle the grease to fill voids and remove air pockets, rotating the shaft and shaking the housing while paddling.

e. Check the "O" ring in the flange of the motor and replace if it is deformed, cut or deteriorated.

f. Carefully align the motor rabbet and guide into the housing bore. Guide the pinion into mesh with the gear and make sure the "O" ring is properly seated in the groove.

g. Check for free movement of all components by rotating the drive shaft.

h. If satisfactory, replace the housing to motor hardware and tighten securely.

7-5. GEAR LUBRICANT RECOMMENDATION

Use only a lubricant suitable for the temperature and operating conditions. See Table 2.

GREASE LUBRICANT

Ambient Temp. Range	NLGI#	Soap Base	Min. Oil Viscosity S.S.U.	Max. Operating Temp.
50°F to 200°F	0	Sodium or Lithium	4,000 @ 100°F 150 @ 210°F	200°F

TABLE 2

For operation in ambient temperatures below +50°F, we recommend use of a synthetic (Mobil SHC 32 or equal) compounded only with synthesized hydrocarbon fluids. This grease is suitable for a wide range of ambient temperatures between -30°F and +200°F and should be considered where seasonal lubricant changes are necessary.

GEAR CHAMBER CAPACITY	
MODEL	GREASE-LBS.
XJ 30 & 43	1.25 ①
XJ 65 THRU 117	2.5 ①
XJ 174 THRU 350	6.0 ②

TABLE 3

① PACK CHAMBER FLUSH WITH TOP OF THE INTERNAL GEAR.

② PACK CHAMBER TO WITHIN 3/4" OF TOP OF INTERNAL GEAR.

LIGHTNIN MIXERS

MIXING EQUIPMENT CO., INC. • 135 Mt. Read Blvd. • Rochester, N.Y. 14611
A UNIT OF GENERAL SIGNAL

MIXER PARTS • MODEL(S) XD-30, XD-43, XDA-33/ NC-4, NS-1, NAR-33

PARTS PRICING BOOK SEC. 2 PAGE 6:00 DATE 03/12/84

NOTE: Reference Drawing No(s). L-16708, L-16710, L-15892, & L-15951

ITEM NO.	IDENT. CODE	DESCRIPTION	REQ'D. PER UNIT	PART NO. DWG NO.	PART NO. MAT'L	PRICE (EACH)
1		Hex Head Cap Screw	2	100126	CPS	
1		Hex Head Cap Screw	2	100126	316	
2		Hex Head Cap Screw	2	100297	CPS	
2		Hex Head Cap Screw	2	100297	316	
3		King Bolt	1	100328	CPG	
3		King Bolt	1	100328	174	
4		Shaft Screw and Lockwasher	1	102007	STL	
5		Clamp Screw (include 15&15A when ordering)	1	105413	CPR	
5		Clamp Screw(Include 15&15A when ordering)	1	105413	174	
6		Wedge Screw	1	105414	CPR	
6		Wedge Screw	1	105414	174	
7	E	Hex Head Cap Screw (For Motor Handle)	2	100122	STL	
7	(1)	Hex Nut	2	107004	CPS	
7	A	Handle Pin	2	108500	PSP	
8	C	Chuck Screw	1	105861	GR5	
8	C	Chuck Screw	1	105861	174	
11	C	Limit Pin	1	108504	PSP	
12		Plain Washer	1	112007	CPS	
12		Plain Washer	1	112007	316	
15		Cup Washer	1	112409	CPS	
15		Cup Washer	1	112409	316	
15A		Retaining Ring	1	205445	PSP	
16		Wedge Bottom	1	112531	BRZ	
16		Wedge Bottom	1	112531	316	
17		Wedge Top	1	112532	ALM	
17		Wedge Top	1	112532	316	
17		Wedge Top	1	112532	STL	
17	(2)	Wedge Top	1	112532	BRZ	
18	C	Chuck Washer	1	112756	S16	
18	C	Chuck Washer	1	112756	175	
20		Washer	1	112762	BRS	
20		Washer	1	112762	316	
21		Snap Ring	1	114276	302	
22	*	Retaining	1	114280	PSP	
24	*	Oil Seal	1	115382	PSP	
27	*	Ball Bearing	1	116223	PSP	
32		Hex Key Wrench	1	127210	BPF	

PLATE

Identity Code: *Recommended Spare Parts: (1) For New Style Motor Design
A-Use with Air Motor (2) Non Stock
C-Use with Chuck Drive Shaft (E) Use with Elec.Motor, (R) Use with Rigid Cplg. Drive Shaft

BLANK CODE DENOTES COMMON PARTS

MIXER PARTS • MODEL(S) XD-30, XD-43, XDA-33/NC-4, NS-1, NAR-33

PARTS PRICING BOOK SEC. 2 PAGE 6.01 DATE 03/12/84

ITEM NO.	IDENT. CODE		DESCRIPTION			REQ'D. PER UNIT	PART NO. DWG NO.	PART NO. MAT'L	PRICE (EACH)
NOTE: Reference Drawing No(s). L-16708, L-16710, L-15892 & L-15951									
33A			Tank Clamp Assy.	Includes	ALM	1	800057	PSP	
		(2)		Items	316	1	800058	PSP	
		(2)		3,5,6,12	BRZ	1	800059	PSP	
		(2)		15,15A,16	STL	1	800060	PSP	
		(2)		17,32,33,40	NAM	1	800061	PSP	
33			Clamp			1	129020	ALM	
33			Clamp			1	129020	316	
33			Clamp			1	129020	BRZ	
33			Clamp			1	129020	STL	
33			Clamp			1	129020	NAM	
33B			Cup Plate Assy.	Includes	ALM	1	801194	PSP	
		(2)		Items	316	1	801195	PSP	
		(2)		3,6,12	BRZ	1	801196	PSP	
		(2)		16,17,32	STL	1	801197	PSP	
		(2)		33,40	NAM	1	801192	PSP	
33			Cup Plate			1	129208	ALM	
33			Cup Plate			1	129208	316	
33		(2)	Cup Plate			1	129208	BRZ	
33			Cup Plate			1	129208	STL	
33			Cup Plate			1	129208	NAM	
34		C	Chuck Grip			1	130013	316	
35		E	Handle Kit - Electric Motor			Consult Factory			
35		A	Handle - Air Motor			1	135215	ALU	
36			Housing			1	136144	ALF	
36		(2)	Housing			1	136157	316	
36			Housing			1	136144	NAL	
36			Housing			1	136157	CIR	
36		(2)	Housing			1	136144	BRZ	
38		C	Drive Shaft with Chuck			1	143788	NPS	
38		C	Drive Shaft with Chuck			1	143786	316	
38		R	Drive shaft with Coupling			1	199338	41L	
38		R	Dirve Shaft with Coupling			1	199338	316	
40			Vibration Pad			1	150332	DUK	
41		E	Electric Motor			1	See Sec.	1-C	
41		A	Air Motor			1	123406	PSP	
42			Mixer Shaft			1	See Sec.	1-D	
43		E	Plain Washer			2	112005	STL	
44/45			Impeller & Set Screw				See Sec.	1-D	
46			Motor Shaft Key			1	114196	STL	
47			Washer (for motor shaft screw)			1	112786	STL	

PLATE 5

Identity Code: *RECOMMENDED SPARE PARTS/ A - Use with Air Motor/ (2) Non Stock
C - Use with Chuck Drive Shaft/ E- Use with Elec.Motor
R - Use with Rigid Coupling Drive Shaft

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A UNIT OF GENERAL SIGNAL

MIXER PARTS • MODEL(S) XD-65, XD-87, XD-117, XDA-100, NS-2, NS-3, NS-4A, NAR-100

PARTS PRICING BOOK SEC. 2 PAGE 7.00 DATE 3/12/84

ITEM NO.	IDENT. CODE	DESCRIPTION	REQ'D. PER UNIT	PART NO. DWG NO.	PART NO. MAT'L	PRICE (EACH)
NOTE: Reference Drawing No(s).		L-16708, L-16710, L-15892, & L-15951				
1		Hex Head Cap Screw	2	100325	CPS	
1		Hex Head Cap Screw	2	100297	316	
2		Hex Head Cap Screw	2	100324	CPS	
2		Hex Head Cap Screw	2	100324	316	
3		King Bolt	1	100329	CPG	
3		King Bolt	1	100329	174	
4		Shaft Screw and Lockwasher	1	102009	CPS	
5		Clamp Screw(include 15,&15A when ordering	1	105412	CPR	
5		Clamp Screw(Include 15,&15A when ordering	1	105412	174	
6		Wedge Screw	1	105414	CPR	
6		Wedge Screw	1	105414	174	
7	E	Hex Head Cap Screw (For motor handle)	2	100122	CPS	
7	(1)	Hex Nut	2	107004	CPS	
7	A	Handle Pin	2	108500	PSP	
8	C	Chuck Screw	1	105861	CPG	
8	C	Chuck Screw	1	105861	174	
11	C	Limit Pin	1	108504	420	
12		Plain Washer	1	112013	STL	
12		Plain Washer	1	112013	316	
15		Cup Washer	1	112407	CPS	
15		Cup Washer	1	112407	316	
15A		Retaining Ring	1	205446	PSP	
16		Wedge Bottom	1	112529	BRZ	
16		Wedge Bottom	1	112529	316	
17		Wedge Top	1	112530	ALM	
17		Wedge Top	1	112530	316	
17		Wedge Top	1	112530	STL	
17	(2)	Wedge Top	1	112530	BRZ	
18	C	Chuck Washer	1	112756	S16	
18	C	Chuck Washer	1	112756	175	
20		Washer	4	112762	BRH	
20		Washer	4	112762	316	
21	C	Snap Ring	1	114276	302	
22	*	Retaining Ring	1	114280	PSP	
24	*	Oil Seal	1	115382	PSP	
27	*	Ball Bearing	1	116223	PSP	
32		Hex Key Wrench	1	127210	BPF	

PLATE

Identity Code: *Recommended Spare Parts : (1) For New Style Motor Design:
(2) Non Stock: A - Use with Air Motor E - With Elec.Motor
C - Use with Chuck Drive Shaft R - Use with Rigid Cplg.Dr.

BLANK CODE DENOTES COMMON PARTS

MIXER PARTS • MODEL(S) XD-65 XD-87, XD-117, XDA-100 NS-2, NS-3 NS-4A, NAR-100

PARTS PRICING BOOK SEC. 2 PAGE 7.01 DATE 3/12/8

ITEM NO.	IDENT. CODE	DESCRIPTION			REQ'D. PER UNIT	PART NO. DWG NO.	PART NO. MAT'L	PRICE (EACH)
NOTE: Reference Drawing No(s). L-16708, L-16710, L-15892, & L-15951								
33A		Tank Clamp Assy	Includes		1	800062	PSP	
	(2)		Items.		1	800063	PSP	
	(2)		3,5,6,12,		1	800064	PSP	
	(2)		15,15A,16		1	800065	PSP	
	(2)		17,32,33,40		1	800066	PSP	
33		Clamp			1	129019	ALM	
33		Clamp			1	129019	316	
33	(2)	Clamp			1	129019	BRZ	
33		Clamp			1	129019	CST	
33		Clamp			1	129019	NAL	
33B		Cup Plate Assy	Includes	ALM	1	801198	PSP	
			Items	316	1	801199	PSP	
			3,6,12,	BRZ	1	801200	PSP	
			16,17,,32	STL	1	801201	PSP	
			33,40	NAM	1	801193	PSP	
33		Cup Plate			1	129207	ALM	
33		Cup Plate			1	129207	316	
33	(2)	Cup Plate			1	129207	BRZ	
33		Cup Plate			1	129207	CIR	
33		Cup Plate			1	129207	NAM	
34		Chuck Grip			1	130012	316	
35	E	Handle Kit- Electric Motor			Consult Factory			
35	A	Handle - Air Motor			1	135215	ALU	
36		Housing			1	136147	ALF	
36	(2)	Housing			1	136154	316	
36	(2)	Housing			1	136147	BRZ	
36	(2)	Housing			1	136154	CIR	
36		Housing			1	136147	NAL	
38	C	Drive Shaft with Chuck			1	143792	NPS	
38	C	Dirve shaft with Chuck			1	143790	316	
38	R	Drive shaft with Coupling			1	143811	41L	
38	R	Drive Shaft with Coupling			1	143811	316	
40		Vibration Pad			1	150333	DUK	
41	E	Electric Motor			1	See Sec.	1-C	
41	A	Air Motor			1	123407	PSP	
42		Mixer Shaft			1	See Sec.	1-D	
43	E	Plain Washer			2	112005	STL	
44/45		Propeller & Set Screw			1	See Sec.	1-D	
46		Motor Shaft Key			1	114196	STL	
47		Washer (For Motor Shaft Screw)			1	112787	STL	

PLATE 5

○ **Identity Code:** *Recommended Spare Parts: (2) Non Stock:
A - Use with Air Motor: E - Use with Electric Motor
C - Use with Chuck Drive Shaft: R - Use with Rigid Coupling Drive Shaft

BLANK CODE DENOTES COMMON PARTS

LIGHTNIN' MIXERS

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A UNIT OF GENERAL SIGNAL

MIXER PARTS • MODEL(S) XDA-150, XDA-300 NS-5, NS-6, NS-7 XD-174, XD-230, / NM-1, NM-3

PARTS PRICING BOOK SEC. 2 PAGE 8.00 DATE 3/12/84

ITEM NO.	IDENT. CODE	DESCRIPTION	REQ'D. PER UNIT	PART NO. DWG NO.	PART NO. MAT'L	PRICE (EACH)
NOTE: Reference Drawing No(s).		L-16708, L-16710, L-15878, & L-15921				
1		Hex Head Cap Screw	2	100147	CPS	
1		Hex Head Cap Screw	2	100147	316	
2		Hex Head Cap Screw	2	100200	CPS	
2		Hex Head Cap Screw	2	100200	316	
3		King Bolt	1	100318	CPG	
3		King Bolt	1	100318	174	
4		Shaft Screw and Lockwasher	1	102561	GR5	
5		Clamp Screw(Include 15 & 15A when ordering)	1	105411	CPR	
5		Clamp Screw(Include 15&15A when ordering)	1	105411	174	
6		Wedge Screw	1	105410	CPR	
6		Wedge Screw	1	105410	174	
7		Hex Head Cap Screw (for motor handle)	2	100137	STL	
8	C	Chuck Screw	1	105860	CPG	
8	C	Chuck Screw	1	105860	174	
11	C	Limit Pin	1	108504	420	
12		Plain Washer	1	112017	STL	
12		Plain Wahser	1	112017	316	
15		Cup Washer	1	112408	STL	
15		Cup Washer	1	112408	316	
15A		Retaining Ring	1	205447	PSP	
16		Wedge Bottom	1	112527	BRZ	
16		Wedge Bottom	1	112527	316	
17		Wedge Top	1	112528	ALM	
17		Wedge Top	1	112528	316	
17		Wedge Top	1	112528	STL	
17	(2)	Wedge Top	1	112528	BRZ	
18	C	Chuck Washer	1	112750	S16	
18	C	Chuck Washer	1	112750	175	
20		Wahser	4	112761	BRS	
20		Washer	4	112761	316	
21	C	Snap Ring	1	114273	302	
22	*	Retaining Ring - Truarc 5100 - 137	1	114275	PSP	
24	*	Oil Seal - Nat. 50451-L	1	115381	PSP	
27	*	Ball Bearing - MRC-2075FF	1	116225	PSP	
32		Hex Key Wrench	1	127209	BPF	

PLATE

Identity Code: *Recommended Spare Parts: (2) Non Stock:
A - Use with Air Motor E- Use with Electric Motor
C - Use With Chuck Drive Shaft: R- Use with Rigid Drive Shaft

BLANK CODE DENOTES COMMON PARTS

LIGHTNIN' MIXERS

MIXING EQUIPMENT CO., INC. • 135 Mt. Read Blvd. • Rochester, N.Y. 14611
A UNIT OF GENERAL SIGNAL

MIXER PARTS • MODEL(S) XDA-150, XDA-300 NS-5, NS-6, NS-7 XD-174, XD-230 / NM-1, NM-3

PARTS PRICING BOOK SEC. 2 PAGE 8.01 DATE 3/12/

ITEM NO.	IDENT. CODE	DESCRIPTION			REQ'D. PER UNIT	PART NO. DWG NO.	PART NO. MAT'L	PRICE (EACH)
NOTE: Reference Drawing No(s). L-16708, L-16710, L-15878, & L-15921								
33A		Tank Clamp Assy.	Includes	ALM	1	800067	PSP	
	(2)		Items	316	1	800068	PSP	
	(2)		3,5,6,12	BRZ	1	800069	PSP	
	(2)		15,15A,16,17	STL	1	800070	PSP	
	(2)		32,33,40	NAM	1	800071	PSP	
33		Clamp			1	129408	ALM	
33		Clamp			1	129408	316	
33		Clamp			1	129408	BRZ	
33		Clamp			1	129408	CST	
33		Clamp			1	129408	NAL	
33B		Cup Plate Assy.	Includes	ALM	1	801202	PSP	
			Items	316	1	801203	PSP	
			3,6,12,16	BRZ	1	801204	PSP	
	(2)		17,32,33,40	STL	1	801205	PSP	
				NAM	1	801206	PSP	
33		Cup Plate			1	129206	ALM	
33		Cup Plate			1	129206	316	
33	(2)	Cup Plate			1	129206	BRZ	
33		Cup Plate			1	129206	CIR	
33		Cup Plate			1	129206	NAM	
34	C	Chuck Grip			1	130010	316	
34	A	Gasket			1	125687	VEL	
35	A	Motor Handle			1	135213	STL	
35	A	Housing Adapter			1	132662	ALF	
36		Housing			1	136146	ALF	
36	(2)	Housing			1	136152	316	
36	(2)	Housing			1	136146	BRZ	
36	(2)	Housing			1	136152	CIR	
36		Housing			1	136146	NAL	
38	C	Drive Shaft with Chuck			1	143775	NPS	
38	C	Drive Shaft with Chuck			1	143778	316	
38	R	Drive Shast with Coupling			1	143809	41L	
38	R	Drive Shaft with Coupling			1	143809	316	
40		Vibration Pad			1	150331	DUK	
41	E	Electric Motor			1	See Sec.	1-C	
41	A	Air Motor			1	123492	PSP	
41	A	Motor Eye Bolt			2	105619	CPS	
43		Mixer Shaft			1	See Sec.	1-D	
44/45		Impeller & Set Screw			1	See Sec.	1-D	
46		Motor Shaft Key			1	190750	STL	

PLATE

Identity Code: *Recommended Spare Parts: A- Use with Air Motor
(2) Non Stock: C- Use with Chuck Drive Shaft
R- Use with rigid coupling dr.shaft. E- Use with Electric Motor

BLANK CODE DENOTES COMMON PARTS

LIGHTNIN MIXERS

MIXING EQUIPMENT CO., INC. • 135 Mt. Read Blvd. • Rochester, N.Y. 14611
A UNIT OF GENERAL SIGNAL

MIXER PARTS • MODEL(S) XJ-30, XJ-43, XJA-33 ND-1, ND-1A, NAG-3

PARTS PRICING BOOK SEC. 2 PAGE 9.00 DATE 3/12/84

ITEM NO.	IDENT. CODE	DESCRIPTION	REQ'D. PER UNIT	PART NO. DWG NO.	PART NO. MAT'L	PRICE (EACH)
NOTE: Reference Drawing No(s).		L-16709 & L-16711				
2		Hex Head Cap Screw	4	100326	CPS	
2		Hex Head Cap Screw	4	100326	316	
3		King Bolt	1	100328	CPG	
3		King Bolt	1	100328	174	
4		Shaft Screw and Lockwasher	1	102007	CPS	
5		Clamp Screw	1	105413	CPR	
5		Clamp Screw	1	105413	174	
6		Wedge Screw	1	105414	CPR	
6		Wedge Screw	1	105414	174	
7	E	Hex Head Cap Screw (For Motor Handle)	2	100122	CPS	
7	A	Handle Pin	2	108500	PSP	
7	A	Hex Nut	2	107004	CPS	
8	C	Chuck Screw	1	105861	CPG	
8	C	Chuck Screw	1	105861	174	
10	*	Crip Spring Locknut	1	107717	STL	
11	C	Limit Pin	1	108504	420	
12		Plain Washer	1	112007	CPS	
12		Plain Washer	1	112007	316	
15		Cup Washer	1	112409	CPS	
15		Cup Washer	1	112409	316	
15A		Retaining Ring	1	205445	PSP	
16		Wedge Bottom	1	112531	BRZ	
16		Wedge Bottom	1	112531	316	
17		Wedge Top	1	112532	ALM	
17		Wedge Top	1	112532	316	
17		Wedge Top	1	112532	STL	
17	(2)	Wedge Top	1	112532	BRZ	
18	C	Chuck Washer	1	112756	S16	
18	C	Chuck Washer	1	112756	175	
20		Washer	4	112762	BRH	
20		Washer	4	112762	316	
21	C	Snap Ring	1	114276	302	
22	*	Retaining Ring	1	114278	PSP	
23	*	Retaining Ring	2	114282	PSP	
24	*	Oil Seal	1	115355	PSP	
25	*	Oil Seal	1	115358	PSP	
26	*	"O" Ring	1	115766	BUN	
27	*	Ball Bearing	1	116243	PSP	
28	*	Outer Ring And Roller Assy.	1	117027	PSP	
29		Inner Ring(sold as set with item 28)	1	117028	PSP	

Identity Code: *Recommended Spare Parts: (2) Non Stock - Consult Factory:
A- Use with Air Motor E- Use with Electric Motor
C- Use with Chuck Drive Shaft R- Use with Rigid Coupling Drive Shaft

BLANK CODE DENOTES COMMON PARTS

PLAT

LIGHTNIN' MIXERS

MIXING EQUIPMENT CO., INC. • 135 Mt. Read Blvd. • Rochester, N.Y. 14611
A UNIT OF GENERAL SIGNAL

MIXER PARTS • MODEL(S) XJ-30, XJ-43, XJA-33 ND-1, ND-1A, NAG-33

PARTS PRICING BOOK SEC. 2 PAGE 9.01 DATE 3/12/84

ITEM NO.	IDENT. CODE	DESCRIPTION	REQ'D. PER UNIT	PART NO. DWG NO.	PART NO. MAT'L	PRICE (EACH)
NOTE: Reference Drawing No(s).		L-16709 & L-16711				
30/31		Gear and Pinion (Set Only)	1	119869	PSP	
32		Hex Key Wrench	1	127210	BPF	
33A		Tank Clamp Assy. Includes	1	800057	PSP	
	(2)	Items	1	800058	PSP	
	(2)	3,5,6,12,15	1	800059	PSP	
	(2)	15A,16,17,	1	800060	PSP	
	(2)	32,33,40	1	800061	PSP	
33		Clamp	1	129020	ALM	
33		Clamp	1	129020	316	
33	(2)	Clamp	1	129020	BRZ	
33		Clamp	1	129020	STL	
33		Clamp	1	129020	NAL	
33B		Cup Plate Assy. Includes ALM	1	801194	PSP	
	(2)	Items 316	1	801195	PSP	
	(2)	3,6,12,16 BRZ	1	801196	PSP	
	(2)	17,32,33, CIR	1	801197	PSP	
	(2)	40 NAM	1	801192	PSP	
33		Cup Plate	1	129208	ALM	
33		Cup Plate	1	129208	316	
33	(2)	Cup Plate	1	129208	BRZ	
33	(2)	Cup Plate	1	129208	CIR	
33		Cup Plate	1	129208	NAM	
34	C	Chuck Grip	1	130012	316	
35	E	Motor Handle Kit - Electric Motor	1	Consult Factory		
35	A	Handle - Air Motor	1	135215	ALU	
36		Housing	1	136142	ALF	
36		Housing	1	136156	316	
36		Housing	1	136142	BRZ	
36		Housing	1	136156	CIR	
36		Housing	1	136142	NAL	
37		Grip Spring Spacer	1	138808	STL	
38	C	Drive Shaft with Chuck	1	143796	NPS	
38	C	Drive Shaft with Chuck	1	143794	316	
38	R	Drive Shaft with Coupling	1	143851	41L	
38	R	Drive Shaft with Coupling	1	143851	316	
39	*	Grip Spring Set	2	147031	PSP	
40		Vibration Pad	1	150332	DUK	
41	E	Electric Motor	1	See Sec.	1-C	
41	A	Air Motor	1	123406	PSP	
42		Mixer Shaft	1	See Sec.	1-D	

PLATE

Identity Code: * Recommended Spare Parts: (2) Non Stock Consult Factory
A - Use with Air Motor E - Use with Electric Motor
C - Usw with Chuck Drive Shaft R - Use with Rigid Coupling Drive Shaft

BLANK CODE DENOTES COMMON PARTS

LIGHTNIN MIXERS

MIXING EQUIPMENT CO., INC. • 135 Mt. Read Blvd. • Rochester, N.Y. 14611
A UNIT OF GENERAL SIGNAL

MIXER PARTS • MODEL(S) XJ-30, XJ-43, XJA-33 ND-1, ND-1A, NAG-33

PARTS PRICING BOOK SEC. 2 PAGE 9.02 DATE 3/12/84

ITEM NO.	IDENT. CODE	DESCRIPTION	REQ'D. PER UNIT	PART NO. DWG NO.	PART NO. MAT'L	PRICE (EACH)
NOTE: Reference Drawing No(s).		L-16709 & L-16711				
43	E	Plain Washer	2	112005	STL	
44/45		Impeller & Set Screw	1	See Sec.	1-D	
46		Motor Shaft Key	1	114196	STL	
47		Washer (For Motor Shaft Screw)	1	112777	STL	
81	A	Pipe Nipple	1	122103	BRS	
82	A	Needle Valve	1	122910	BRS	
83	A	Air Hose Coupling	1	122704	BRS	
84	A	Muffler	1	150000	PSP	
99		Gear Lubr. - 2lb Can. Temp 50° to 200°	1	123620	PSP	

PLATE

Identity Code: * Recommended Spare Parts:
A - Use with Air Motor
E - Use with Electric Motor

BLANK CODE DENOTES COMMON PARTS

MIXER PARTS • MODEL(S) XJA-100

XJ-65/87/117
ND-2,ND-2A,ND-3
NAG-100

PARTS PRICING BOOK SEC. 2 PAGE 10.00 DATE 3/12/

ITEM NO.	IDENT. CODE	DESCRIPTION	REQ'D. PER UNIT	PART NO. DWG NO.	PART NO. MAT'L	PRICE (EACH)
NOTE: Reference Drawing No(s).		L-16709, L-16711, L-15893, L-15952, L-15920				
2		Hex Head Cap Screw	4	100327	CPS	
2		Hex Head Cap Screw	4	100327	316	
3		King Bolt	1	100329	CPG	
3		King Bolt	1	100329	174	
4		Shaft Screw and Lockwasher	1	102009	CPS	
5		Clamp Screw (Includes 15 & 15A)	1	105412	CPR	
5		Clamp Screw (Includes 15 & 15A)	1	105412	174	
6		Wedge Screw	1	105414	CPR	
6		Wedge Screw	1	105414	174	
7		Motor Eye Bolt	2	105620	PCS	
7	A	Hex Nut	2	107004	CPS	
7	A	Handle Pin	2	108500	PSP	
8	C	Chuck Screw	1	105861	GR5	
8	C	Chuck Screw	1	105861	174	
10	*	Grip Spring Locknut	1	107716	STL	
11	C	Limit Pin	1	108504	420	
12		Plain Washer	1	112013	STL	
12		Plain Washer	1	112013	316	
15		Cup Washer	1	112407	CPS	
15		Cup Wahser	1	112407	316	
15A		Retaining Ring	1	205446	PSP	
16		Wedge Bottom	1	112529	BRZ	
16		Wedge Bottom	1	112529	316	
17		Wedge Top	1	112530	ALM	
17		Wedge Top	1	112530	316	
17		Wedge Top	1	112530	STL	
17	(2)	Wedge Top	1	112530	BRZ	
18	C	Chuck Washer	1	112756	S16	
18	C	Chuck Washer	1	112756	175	
20		Washer	4	112762	BRH	
20		Washer	4	112762	316	
21	C	Snap Ring	1	114276	302	
22	*	Retaining Ring	1	114279	PSP	
23	*	Retaining Ring	2	114283	PSP	
24	*	Oil Seal	1	115356	PSP	
25	*	Oil Seal	1	115357	PSP	
26	*	O Ring	1	115766	BUN	
27	*	Ball Bearing	1	116222	PSP	
28	*	Outer Ring and Roller Assy	1	117025	PSP	
29	*	Inner Ring (Set with 28)	1	117026	PSP	

PLATE 51

Identity Code: * Recommended Spare Parts: (2) Non Stock - Consult Factory
A - Use with Air Motor E - Use with Electric Motor
C - Use with Chuck Drive Shaft R - Use with Rigid Coupling Drive Shaft

*Recommended Spare Parts BLANK CODE DENOTES COMMON PARTS

Consult your local LIGHTNIN Sales Office for terms of sale, ordering information and delivery.

MIXER PARTS • MODEL(S) XJ-65, XJ-87, XJ-117, XJA-100, ND-2, ND-2A, ND-3A, NAG-100

PARTS PRICING BOOK SEC. 2 PAGE 10.01 DATE 3/12/84

ITEM NO.	IDENT. CODE		DESCRIPTION			REQ'D. PER UNIT	PART NO. DWG NO.	PART NO. MAT'L	PRICE (EACH)
NOTE: Reference Drawing No(s).			L-16709, L-16711, L-15893, L-15952, L-15920						
30/31		*	Gear and Pinion (set only)			1	119866	PSP	
32			Hex Key Wrench			1	127210	BPF	
33A			Tank Clamp Assy	Includes	ALM	1	800062	PSP	
		(2)		Items	316	1	800063	PSP	
		(2)		3,5,6,12,15	BRZ	1	800064	PSP	
		(2)		15A,16,17,	STL	1	800065	PSP	
		(2)		32,33,40	NAM	1	800066	PSP	
33			Clamp			1	129019	ALM	
33			Clamp			1	129019	316	
33		(2)	Clamp			1	129019	BRZ	
33			Clamp			1	129019	STL	
33			Clamp			1	129019	NAL	
33B			Cup Plate Assy.	Includes	ALM	1	801198	PSP	
		(2)		Items	316	1	801199	PSP	
		(2)		3,6,12,	BRZ	1	801200	PSP	
		(2)		16,17,32,	STL	1	801201	PSP	
		(2)		33,40	NAM	1	801193	PSP	
33			Cup Plate			1	129207	ALM	
33			Cup Plate			1	129207	316	
33		(2)	Cup Plate			1	129207	BRZ	
33			Cup Plate			1	129207	STL	
33			Cup Plate			1	129207	NAL	
34		C	Chuck Grip			1	130011	316	
35			Motor Handle Kit - Electric Motor			1	consult	factory	
35		A	Handle - Air Motor			1	135215	ALU	
36			Housing			1	136143	ALF	
36			Housing			1	136155	316	
36			Housing			1	136143	BRZ	
36			Housing			1	136155	CIR	
36			Housing			1	136143	NAL	
37			Grip Spring Spacer			1	138810	STL	
38		C	Drive Shaft With Chuck			1	143784	NPS	
38		C	Drive Shaft with Chuck			1	143782	316	
38		R	Drive Shaft with Coupling			1	143850	41L	
38		R	Drive Shaft with Coupling			1	143850	316	
39		*	Grip Spring Set			2	147030	PSP	
40			Vibration Pad			1	150333	DUK	
41		E	Electric Motor			1	See Sec.	1-C	
41		A	Air Motor			1	123407	PSP	
42			Mixer Shaft			1	See Sec.	1-D	

PLAT

Identity Code: * Recommended Spare Parts: (2) Non Stock Consult Factory
A - Use with Air Motor
C - Use with Chuck Drive Shaft
E - Use with Electric Motor
R - Use with Rigid Coupling Drive Shaft

MIXER PARTS • MODEL(S) XJ-65, XJ-87 ND-2, ND-2A XJ-117, XJA-100 ND-3A, NAG-100

PARTS PRICING BOOK SEC. 2 PAGE 10.03 DATE 3/12/84

ITEM NO.	IDENT. CODE	DESCRIPTION	REQ'D. PER UNIT	PART NO. DWG NO.	PART NO. MAT'L	PRICE (EACH)
NOTE: Reference Drawing No(s). L-16709, L-16711 , L-15893, L-59952, L-15920						
44/45		Impeller & Set Screw	1	See Sec.	1-D	
46		Motor Shaft Key	1	114196	STL	
47		Washer (For Motor Shaft Screw)	1	112778	STL	
81	A	Pipe Nipple	1	122103	BRS	
82	A	Needle Valve	1	122910	BRS	
83	A	Air Hose Coupling	1	122704	BRS	
84	A	Muffler	1	150000	PSP	
99		Gear Lubricant 2lb.Can(For Ambient Temp 50° to 200°F)	2	123620	PSP	

PLATE 5

Identity Code: A- Use with Air Motor

*Recommended Spare Parts
Consult your local LIGHTNIN Sales Office for terms of sale, ordering information and delivery.

BLANK CODE DENOTES COMMON PARTS

LIGHTNIN' MIXERS

MIXING EQUIPMENT CO., INC. • 135 Mt. Read Blvd. • Rochester, N.Y. 14611
A UNIT OF GENERAL SIGNAL

MIXER PARTS • MODEL(S) XJ-174, XJ-230, XJ-350

ND-3, ND-4
ND-4A, ND-4B

PARTS PRICING BOOK SEC. 2 PAGE 11.00 DATE 3/12/84

ITEM NO.	IDENT. CODE	DESCRIPTION	REQ'D. PER UNIT	PART NO. DWG NO.	PART NO. MAT'L	PRICE (EACH)
NOTE: Reference Drawing No(s).		L-16709, L-16711				
1		Hex Head Cap Screw	2	100306	CPS	
1		Hex Head Cap Screw	2	100306	316	
2		Hex Head Cap Screw	2	100506	CPS	
2		Hex Head Cap Screw	2	100506	316	
3		King Bolt	1	100318	CPG	
3		King Bolt	1	100318	174	
4		Pinion Cap Screw	1	102560	GR5	
5		Clamp Screw (Includes 15 & 15A)	1	105411	CPR	
5		Clamp Screw (Includes 15 & 15A)	1	105411	174	
6		Wedge Screw	1	105410	CPR	
6		Wedge Screw	1	105410	174	
7		Motor Eye Bolt - For 3hp.Motor	2	105619	CPS	
8	C	Chuck Screw	1	105860	CPG	
8	C	Chuck Screw	1	105860	174	
10	*	Grip Spring Locknut	1	107715	STL	
11	C	Limit Pin	1	108504	420	
12		Plain Washer	1	112017	STL	
12		Plain Washer	1	112017	316	
15		Cup Washer	1	112408	STL	
15		Cup Washer	1	112408	316	
15A		Retaining Ring	1	205447	PSP	
16		Wedge Bottom	1	112527	BRZ	
16		Wedge Bottom	1	112527	316	
17		Wedge Top	1	112528	ALM	
17		Wedge Top	1	112528	316	
17		Wedge Top	1	112528	STL	
17	(2)	Wedge Top	1	112528	BRZ	
18	C	Chuck Washer	1	112750	S16	
18	C	Chuck Washer	1	112750	175	
20		Washer	4	112761	BRS	
20		Washer	4	112761	316	
21	C	Snap Ring	1	114273	302	
22	*	Retaining Ring	1	114274	PSP	
23	*	Retaining Ring	2	114284	PSP	
24	*	Oil Seal	1	115349	PSP	
25	*	Oil Seal	1	115350	PSP	
26	*	"O" Ring	1	115763	BUN	
27	*	Ball Bearing	1	116677	PSP	
28	*	Outer Ring and Roller Assy.	1	117023	PSP	
29	*	Inner Ring	1	117024	PSP	

PLATE

Identity Code: * Recommended Spare Parts: (2) Non Stock - Consult Factory
C - Use with Chuck Drive Shaft:
R - Use with Rigid Coupling Drive Shaft

BLANK CODE DENOTES COMMON PARTS

MIXER PARTS • MODEL(S) XJ-174, XJ-230, XJ-350 ND-3, ND-4 ND-4A, ND-4P

PARTS PRICING BOOK SEC. 2 PAGE 11.01 DATE 3/12/8

ITEM NO.	IDENT CODE		DESCRIPTION	REQ'D. PER UNIT	PART NO. DWG NO.	PART NO. MAT'L	PRICE (EACH)
NOTE: Reference Drawing No(s).			L-16709 L-16711				
30/31		*	Gear and Pinion Set-Available in Set	1	119863	PSP	
			Form only includes items 30 & 31				
32			Hex Key Wrench	1	127209	BPF	
33A			Tank Clamp Assy Includes	1	800067	PSP	
			Items	1	800068	PSP	
			3,5,6,15,15A	1	800069	PSP	
			16,17,32,	1	800070	PSP	
			33,40	1	800071	PSP	
33			Clamp	1	129408	ALM	
33			Clamp	1	129408	316	
33			Clamp	1	129408	BRZ	
33			Clamp	1	129408	CST	
33			Clamp	1	129408	NAL	
33B			Cup Plate Assy Includes ALM	1	801202	PSP	
		(2)	Items 316	1	801203	PSP	
		(2)	3,6,12, BRZ	1	801204	PSP	
		(2)	16,17,32, CIR	1	801205	PSP	
		(2)	33,40 NAM	1	801206	PSP	
33			Cup Plate	1	129206	ALM	
33			Cup Plate	1	129206	316	
33		(2)	Cup Plate	1	129206	BRZ	
33			Cup Plate	1	129206	CIR	
33		(2)	Cup Plate	1	129206	NAM	
34		C	Chuck Grip	1	130010	316	
35			Motor Handle	1	135213	STL	
36			Housing	1	136145	ALF	
36			Housing	1	136153	316	
36			Housing	1	136145	BRZ	
36			Housing	1	136153	CIR	
36			Housing	1	136145	NAL	
37			Grip Spring Spacer	1	138812	STL	
38		C	Drive Shaft with Chuck	1	143773	NSP	
38		C	Drive Shaft with Chuck	1	143777	316	
38		R	Drive Shaft with Rigid Coupling	1	143852	41L	
38		R	Drive Shaft with Rigid Coupling	1	143852	316	
39		*	Grip Spring Set	2	147029	PSP	
40			Vibration Pad	1	150331	DUK	
41			Motor	1	See Sec.	1-C	
42			Mixer Shaft	1	See Sec.	1-D	

PLATE 5

Identity Code: * Recommended Spare Parts: (2) Non Stock -Consult Factory
C - Use with Chuck Drive Shaft
R - Use with Rigid Coupling Drive Shaft

BLANK CODE DENOTES COMMON PARTS

LIGHTNIN' MIXERS

MIXING EQUIPMENT CO., INC. • 135 Mt. Read Blvd. • Rochester, N.Y. 14611
A UNIT OF GENERAL SIGNAL

ND-3, ND-4

MIXER PARTS • MODEL(S) XJ-174, XJ-230, XJ-350 ND-4A, ND-4B

PARTS PRICING BOOK SEC. 2 PAGE 11.02 DATE 3/12/84

ITEM NO.	IDENT. CODE	DESCRIPTION	REQ'D. PER UNIT	PART NO. DWG NO.	PART NO. MAT'L	PRICE (EACH)
NOTE: Reference Drawing No(s).		L-16709 L-16711				
44/45		Impeller & Set Screw	1	See Sec.	1-D	
46		Motor Shaft Key	1	190750	STL	
70		Oil Seal	1	115402	PSP	
71		Slinger	1	139054	PSP	
99		Gear Lubricant 2lb.Can (For Ambinet Temperatures 50° to 200°F)	3	123620	PSP	

PLATE

Identity Code:

*Recommended Spare Parts

BLANK CODE DENOTES COMMON PARTS

SECTION 8
ASSEMBLY & DISASSEMBLY INSTRUCTIONS
DIRECT DRIVE — XD SERIES

8-1. REMOVING THE MOTOR FROM THE HOUSING

a. Remove the mixer shaft from the chuck.

b. Remove housing cap screws and washers (1, 2, and 20).

c. Insert an Allen wrench in the chuck screw (8) to prevent the drive shaft from rotating.

d. Remove shaft screw (4) through the drive shaft bore in one of the following ways.

1. Fractional horsepower XD 30 thru 117: Use a Phillips screwdriver.

2. XD 174 thru 350: Use a 5/16-inch long-shank hex wrench.

e. The upper end of the drive shaft is closely fitted to the motor shaft. Use care in separating the motor (41) and housing (36) by one of the following methods.

1. Tap evenly around the upper edge of the housing with a mallet.

2. If the two assemblies do not readily separate, tighten the propeller on the mixer shaft and tighten the mixer shaft in the chuck. Separate motor and housing by tapping the top of the propeller hub with a mallet. Then remove the mixer shaft.

f. On XD 30 thru 117 models the motor shaft key (46) is lightly cemented in the motor shaft keyway.

8-2. REMOVING DRIVE SHAFT, BEARING, AND OIL SEAL FROM THE HOUSING

a. Follow the procedure of Paragraph 8-1.

b. Use Waldes Truarc No. 4 pliers to remove retaining ring (22).

c. Mount housing, large end upward, in an arbor press and press drive shaft (38) through the lower opening of the housing.

d. Turn the housing large end down and press ball bearing (27) and oil seal (24) downward out of the housing.

8-3. DISASSEMBLING THE CLAMP

a. Loosen the wedge screw (6).

b. Remove king bolt (3) and washer (12) to release wedge assembly and clamp assembly from the positioning ball of the housing.

c. Separate wedge top (17) and wedge bottom (16) and remove wedge screw (6).

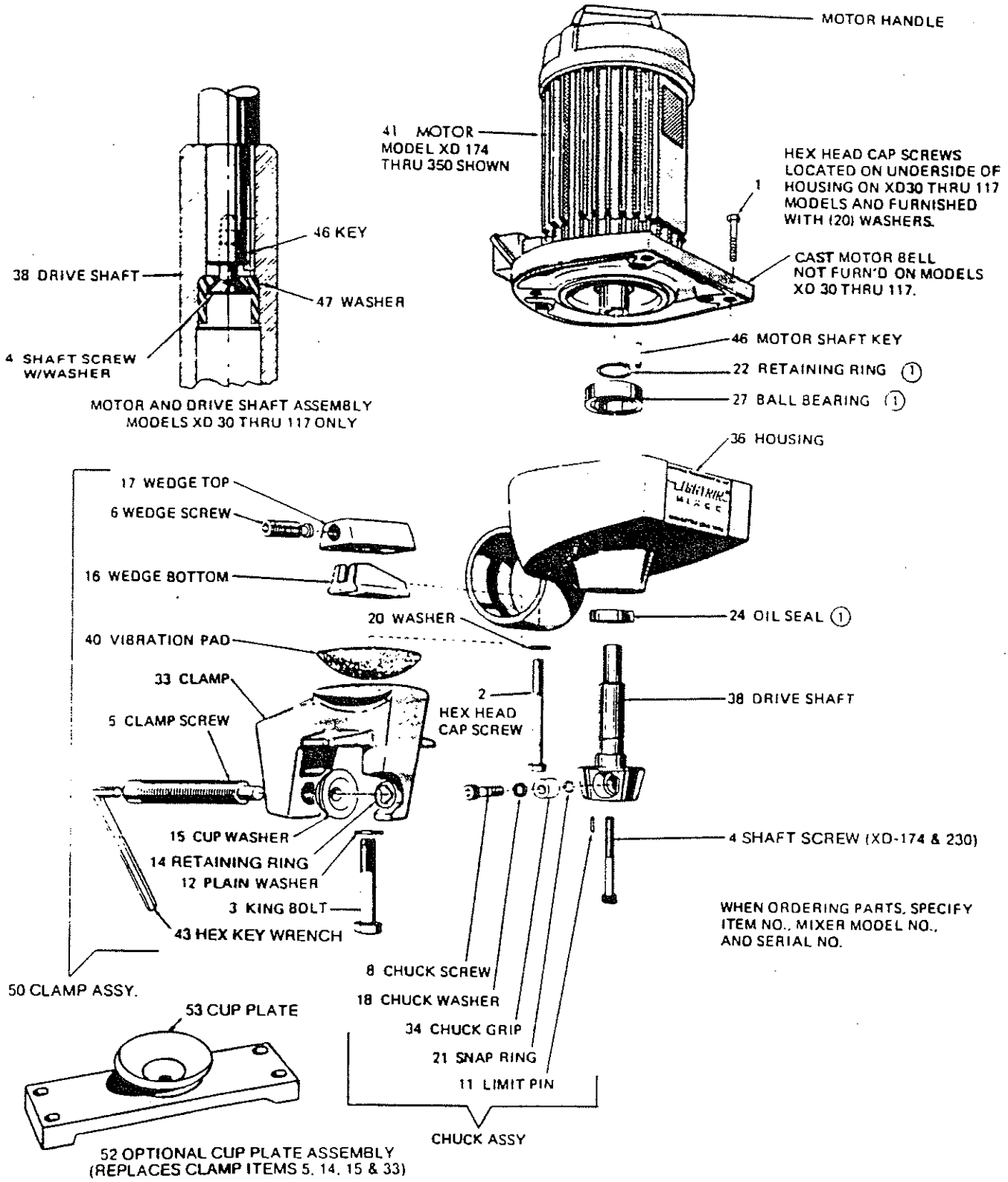
d. Remove vibration pad (40) from clamp (33).

8-4. DISASSEMBLING THE CHUCK

a. Remove the limit pin (11) by driving it into the counterbored hole.

b. Remove the chuck screw (8).

c. Remove snap ring (21), chuck grip (34) and chuck washer (18) from the chuck screw.



(1) RECOMMENDED SPARE PARTS

**EXPLODED VIEW OF DIRECT DRIVE –
MODEL XD SERIES**

8-5. PREPARING FOR ASSEMBLY

a. Clean all parts thoroughly.
b. Inspect for the following defects.
   1. Cracks or damage of the housing.
   2. Dents, gouges, or scoring of the drive shaft, housing bore, and particularly the mating faces of the motor and housing.
   3. Wear or deterioration of the vibration pad.
c. Repair or replace defective parts. It is good practice to replace an oil seal which has been removed from the housing. Apply a small quantity of bearing grease to the housing bore and around the oil seal lip to provide lubrication and to make the seal more effective.
d. Replace the ball bearing if it shows indications of wear.

8-6. ASSEMBLING THE DRIVE SHAFT IN THE HOUSING

a. Mount the housing (36) in an arbor press, large end up.
b. Press the ball bearing (27) on its outer race to the shoulder of the housing bore.
c. Turn the housing large end down and press the oil seal (24), sealing lip inward, flush with the lower end of the housing.
d. Support the housing, large end down, by resting the inner race of the ball bearing on a suitable sleeve.
e. Grease the lip of the oil seal and press the drive shaft (38) into the ball bearing until the shoulder of the shaft registers against the inner race of the bearing.
f. Use Waldes Truarc No. 4 pliers to install retaining ring (22) in the shaft groove.
g. Turn the housing large end down and press the drive shaft until the chuck head contacts the small end of the housing.

8-7. ASSEMBLING THE CHUCK

a. Assemble chuck washer (18), chuck grip (34), and snap ring (21) on chuck screw (8).
b. Thread the chuck screw into the chuck end of the drive shaft far enough to insert the limit pin (11) so that the end of the pin is 3/16 of an inch under flush.

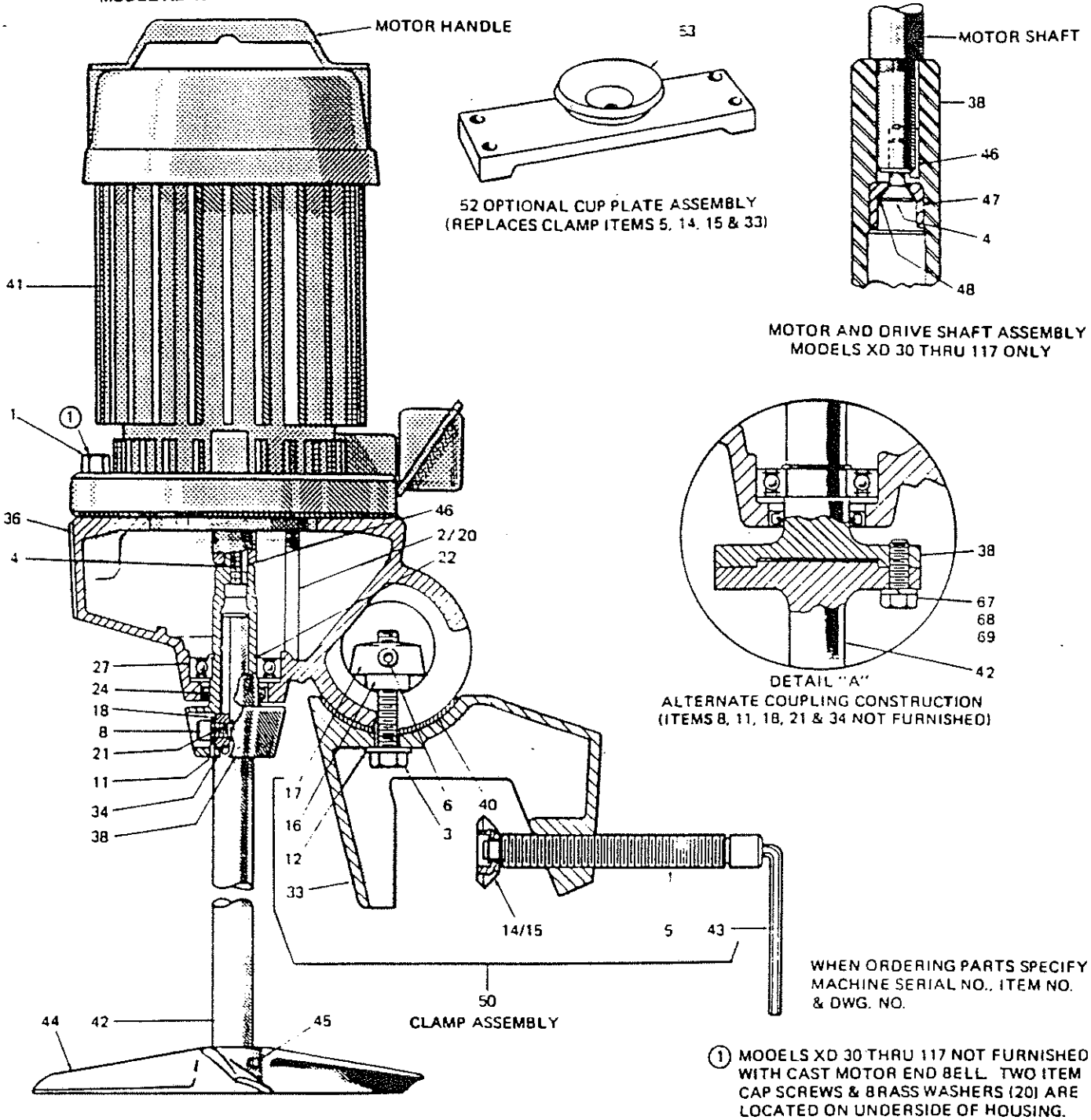
8-8. ASSEMBLING THE MOTOR TO THE HOUSING

a. If the drive shaft has not been removed from the housing, repeat step g, Paragraph 8-6.
b. Install the motor shaft key (46).
   1. On Models XD 174 thru 350 — Install key in drive shaft keyway.
   2. On Models XD 30 thru 117 — If the key has been removed, clean key and motor shaft keyway and apply Loctite Sealant, Grade E. (American Sealants Co.) to both items before reassembling.
c. Apply a light film of oil to both shafts. Align the mating keyways and insert one shaft into the other, without forcing, until the shafts are securely butted. There will be a small gap between the motor face and housing face.
d. Align the motor and housing so that the switch conduit box, or junction box of the motor and the ball of the housing are on the same side.
e. Align the screw holes and install the housing cap screws and washers (1, 2 and 20).
f. Draw up the screws evenly until the housing face is just snug with the motor face, but do not completely tighten the screws.
g. Insert the Allen wrench in the chuck screw to keep the drive shaft from turning, then thread in and tighten the shaft screw (4).
h. Tighten the four housing cap screws evenly.

8-9. ASSEMBLING THE CLAMP

a. Thread the clamp screw (5) through the outer arm of the clamp (33). Slide the cup washer (15) over the end of the clamp screw. Slide the retaining ring (14) onto the clamp screw. Position the retaining ring approximately 3/16" from the end of the clamp screw to allow free movement of the cup washer.
b. Assemble wedge top (17), wedge screw (6), and wedge bottom (16) and set the assembly in place in the ball of the housing.
c. Assemble clamp, vibration pad (40), king bolt (3), and washer (12).
d. Pass king bolt through the slot in the ball of the housing and thread it loosely into the wedge top.
e. Back off the wedge screw all the way, then advance it two turns. With the wedge bottom in this position, tighten the king bolt until the clamp socket can just be moved on the housing ball.

MODEL XD 174 THRU 350 SHOWN



52 OPTIONAL CUP PLATE ASSEMBLY
(REPLACES CLAMP ITEMS 5, 14, 15 & 33)

MOTOR AND DRIVE SHAFT ASSEMBLY
MODELS XD 30 THRU 117 ONLY

DETAIL "A"
ALTERNATE COUPLING CONSTRUCTION
(ITEMS 8, 11, 18, 21 & 34 NOT FURNISHED)

WHEN ORDERING PARTS SPECIFY MACHINE SERIAL NO., ITEM NO. & DWG. NO.

(1) MODELS XD 30 THRU 117 NOT FURNISHED WITH CAST MOTOR END BELL. TWO ITEM CAP SCREWS & BRASS WASHERS (20) ARE LOCATED ON UNDERSIDE OF HOUSING.

ITEM NO.	PART NAME	REQUIRED
1	HEX HEAD CAP SCREW } XD-174 &	2
2	HEX HEAD CAP SCREW } (350 Only)	2
2	HEX HEAD CAP SCREW XD 30-117 Only	4
3	KING BOLT	1
4	SHAFT SCREW (XD 174–350 only)	1
4	SHAFT SCREW & LOCKWASHER XD 30–117 only	1
5	CLAMP SCREW	1
6	WEDGE SCREW	1
8	CHUCK SCREW	1
11	LIMIT PIN	1
12	PLAIN WASHER	1
14	RETAINING RING	1
15	CUP WASHER	1
16	WEDGE BOTTOM	1
17	WEDGE TOP	1
18	CHUCK WASHER	1
20	WASHER (XD 30-117 Only)	4
20	WASHER (XD 174-350 Only)	2

ITEM NO.	PART NAME	REQUIRED
21	SNAP RING	1
22	RETAINING RING, EXTERNAL	1
24	OIL SEAL	1
27	BALL BEARING	1
33	CLAMP	1
34	CHUCK GRIP	1
35	MOTOR HANDLE	1
36	HOUSING	1
38	DRIVE SHAFT	1
40	VIBRATION PAD	1
41	MOTOR	1
42	MIXER SHAFT	1
43	HEX KEY WRENCH	1
44	IMPELLER	Per Order
45	SET SCREW	Per Order
46	MOTOR SHAFT KEY	1
47	WASHER (XD 30-117 Only)	1
48	LOCKWASHER (XD 30-117 Only)	1
67	HEX HEAD CAP SCREW	4
68	LOCKWASHER	4
69	HEX NUT (XD 30-43 Only)	4

When ordering parts, specify item number, machine model number

SECTION 9
ASSEMBLY & DISASSEMBLY INSTRUCTIONS — GEAR DRIVE — XJ SERIES

9-1. REMOVING THE MOTOR FROM THE HOUSING

a. Set the mixer in a vertical position to prevent spilling the gear lubricant.

b. Remove four housing cap screws and washers (1, 2, and 20).

c. Raise motor (41) by its motor handle to separate motor and housing (36).

d. Remove "O" ring (26).

9-2. REMOVING THE PINION FROM THE MOTOR

a. Hold the pinion (31) from turning and remove the pinion cap screw (4) in one of the following ways.

1. XJ 30 thru 117 — Use a Phillips screwdriver.

2. XJ 174 thru 350 — Use a 5/16-inch Allen wrench.

3. For XJ 174 thru 350 — With nylon slinger, the slinger must be removed by breaking it. Place a wooden block under the slinger and strike the opposite side with a chisel.

b. Remove the pinion with a bearing puller.

9-3. REMOVING DRIVE SHAFT, BEARINGS, AND OIL SEALS FROM THE HOUSING

a. Remove the lubricant from the gear chamber.

b. Remove the grip spring locknut (10) from the upper end of the drive shaft. Use one of the following methods to hold the drive shaft from turning.

1. XJ 30 thru 117 — Insert an Allen wrench (43) in the chuck screw.

2. XJ 174 thru 350 — Remove the chuck assembly. (See paragraph 8-4). Insert a 1-foot length of 1-inch diameter bar in the chuck grip bore.

c. Thread a nut on the end of the drive shaft to protect the threads when pressing out the shaft.

d. Mount the housing in an arbor press, large end upward, and press the drive shaft clear of the internal gear bore.

e. Remove the internal gear (30), the two grip spring sets (39), and the grip spring spacer (37).

f. Remove the drive shaft, with the bearing inner ring (29) in place, through the lower opening of the housing.

g. If it is necessary to remove the bearing inner ring, start it from its seat with a thin screwdriver or wedge, then remove it from the drive shaft with a bearing puller.

h. XJ 174 thru 350 only — Pry the oil seal (70) from the housing bore as shown in Figure 6.

1. Insert a 7/8 bolt into the ball bearing (27) bore.

2. Use the bolt head as a fulcrum and pry out the oil seal (70) with pliers.

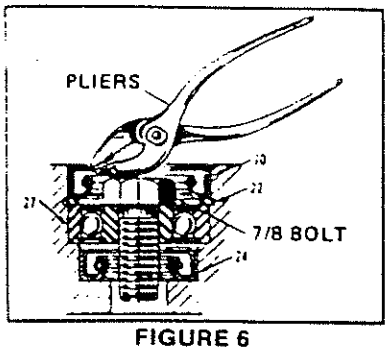


FIGURE 6

i. Use Waldes Truarc No. 4 pliers to remove internal retaining ring (22).

j. Remove ball bearing (27) and upper oil seal (24) through the upper opening of the housing.

k. Remove internal retaining rings (23).

l. Mount the housing, large end upward, in an arbor press and press out oil seal (25) and outer ring and roller assembly (28).

9-4. DISASSEMBLING THE CLAMP
(See Paragraph 8-3).

9-5. DISASSEMBLING THE CHUCK
(See Paragraph 8-4.)

9-6. PREPARATION FOR ASSEMBLY

a. Clean all parts thoroughly.

b. Inspect for the following defects.

1. Cracks or damage of the housing.

2. Dents, gouges, or scoring of the drive shaft, housing bore, and particularly the mating faces of the motor and housing.

3. Wear or deterioration of the vibration pad.

c. Repair or replace defective parts. It is good practice to replace an oil seal which has been removed from the housing. Apply a small quantity of bearing grease to the housing bore and around the oil seal lip to provide lubrication and to make the seal more effective.

d. Replace the "O" ring if it is cut, deformed, or deteriorated.

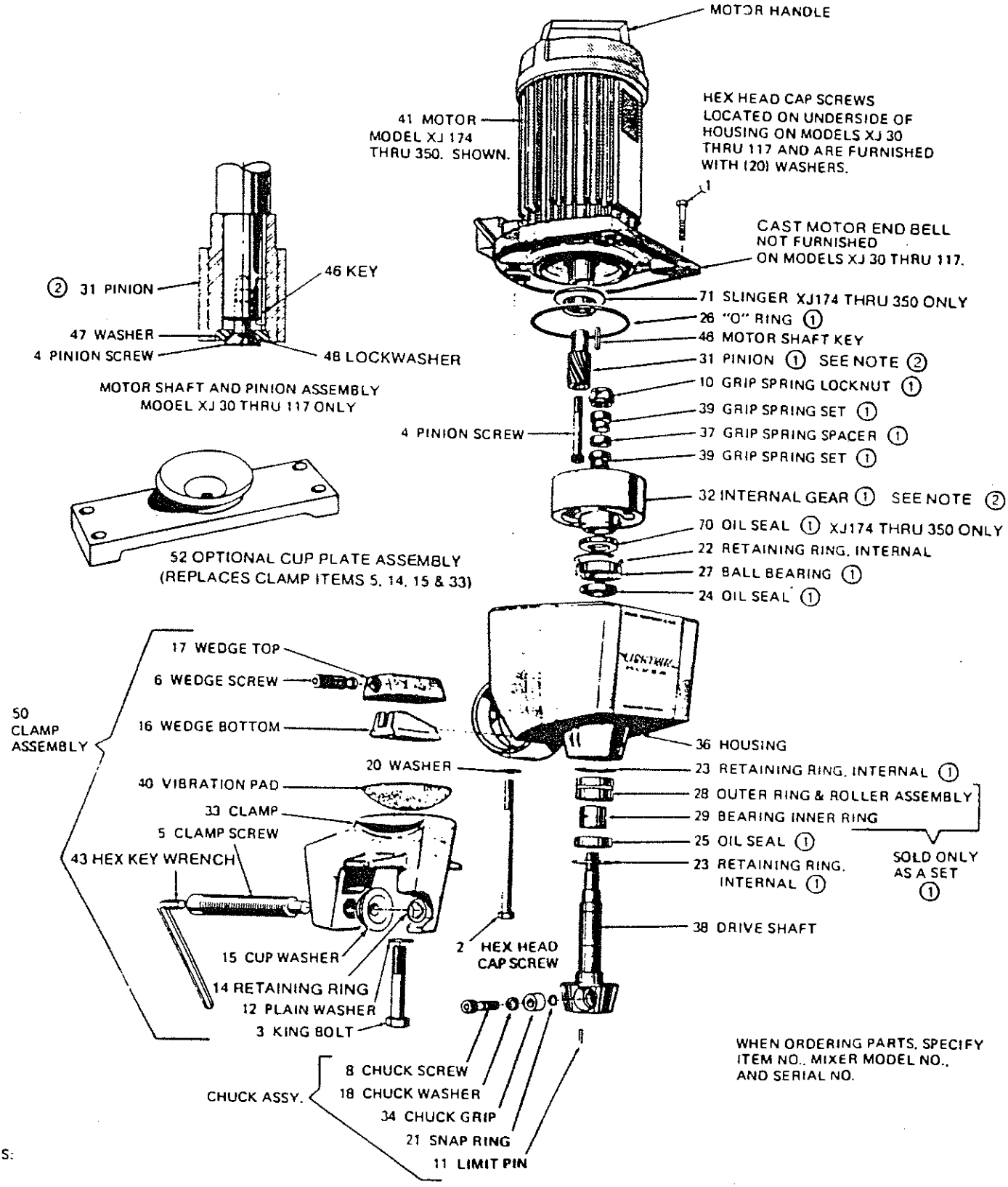
e. Replace the ball bearing and roller bearing (including the bearing inner ring) if they show indications of wear.

9-7. ASSEMBLING THE DRIVE SHAFT IN THE HOUSING

a. Mount the housing (36) in an arbor press, large end upward.

b. Press the upper oil seal (24), sealing lip upward, approximately 1/8-inch below the shoulder of the bore.

c. Press the ball bearing (27) on its outer race against the shoulder of the bore.



NOTES:

(1) RECOMMENDED SPARE PARTS

(2) GEAR & PINION SOLD IN SETS ONLY. HOWEVER PINION (31) IS AVAILABLE AS AN INDIVIDUAL ITEM WITHOUT MECHANICAL GUARANTEE. INTERNAL GEAR (32) NOT AVAILABLE AS INDIVIDUAL ITEM.

EXPLODED VIEW OF GEAR DRIVE MIXER XJ SERIES

d. Install retaining ring (22).

e. XJ 174 thru 350 Only

1. Apply a heavy coating of ball bearing grease to the top of the ball bearing (27).
2. Apply a coating of Loctite "Bearing Mount" grade to the outside of a new oil seal (70).
3. Press the oil seal (70), sealing lip up, into the housing until it seats on the retaining ring (22).

f. Turn the housing large end down in the press and install the inner of the two lower retaining rings (23).

g. Pack the outer ring and roller assembly (28) with a suitable bearing grease and press it into the housing bore until it registers against the retaining ring.

h. Press oil seal (25), with its sealing lip towards the large end of the housing, against the outer ring and roller assembly.

i. Install outer retaining ring.

j. If the bearing inner ring (29) has been removed from the drive shaft (38), press it in place.

k. Apply a thin film of light oil on the tapered surfaces *only* of each grip spring set. CAUTION: For proper operation of the grip springs, oil *must not* get between the grip spring driving surfaces and the drive shaft or gear bore.

l. Install the inner ring of the lower grip spring set (39) so that the thicker edge seats against the shaft shoulder.

m. Place the housing on its side and grease the lips of the oil seals.

n. Hold the internal gear (32) in place in the gear chamber and pass the drive shaft through its bearings as far as it will go into the hub of the gear.

o. With the gear on the end of the shaft, turn the housing large end down and press the shoulder of the drive shaft against the inner race of the ball bearing (27).

p. Turn the housing large end up. Center the internal gear on the drive shaft and install the external ring of the lower grip spring set (39), grip spring spacer (37), and upper grip spring set (39). Both grip spring sets should be installed with the thicker edge of the external ring upward. (See Figure 5 on page 9).

q. Apply a thin coating of light oil on the threads of the drive shaft and the bottom surface of the grip spring locknut.

r. Thread the grip spring locknut (10) onto the end of the drive shaft (finger tight). Rotate the internal gear (32) by hand and at the same time tighten down on the locknut until the internal gear can no longer be rotated. Tighten the locknut securely. (Table 4 lists the recommended tightening torques for this locknut. If a torque wrench is not available, be sure locknut is tightened sufficiently to prevent grip spring slippage.) Use one of the following methods to prevent the drive shaft from turning while performing this operation.

1. XJ 30 thru 117 — Reassemble the chuck assembly. (See Paragraph 8-7.) Insert an Allen wrench in the chuck screw.
2. XJ 174 thru 350 — With the chuck assembly removed from the drive shaft, insert a 1-foot length of 1-inch diameter bar in the chuck grip bore.

9-8. ASSEMBLING THE PINION ON THE MOTOR SHAFT

a. XJ 174 thru 350 only

If the slinger has been removed, reinstall on the motor shaft.

1. For units with aluminum slinger, allow 1/32 to 3/32 gap between the motor oil seal and top of slinger. Check shaft end play and rotate to make sure slinger rotates freely. Coat the set set screw threads with Loctite and tighten the set screw securely.
2. For units with nylon slinger, position on the motor shaft.

b. Apply a thin film of grease to the motor shaft or pinion shaft.

c. Make sure that the motor shaft key (46) is in place in the motor shaft keyway.

d. Assemble the pinion on the motor shaft by driving it into place with light strokes of a mallet. For units with nylon slinger, be sure the pinion teeth mesh with slinger teeth.

e. Make sure that pinion and motor shaft butt securely, then install and tighten the pinion screw (4) with lockwasher (48).

9-9. ASSEMBLING THE CHUCK
(See Paragraph 8-7).

9-10. ASSEMBLING THE MOTOR TO THE HOUSING

a. Fill the gear chamber of the housing (36) level with a suitable lubricant. (See Section 7.) Make sure that grease is solidly packed without air pockets by paddling the grease, rotating the drive shaft by hand, tapping or shaking the housing.

b. Clean the mating surfaces of the motor (41) and housing.

c. Place the "O" ring (26) on the motor.

d. Align motor rabbet with the opening of the housing and lower motor into place using care so as not to damage the "O" ring.

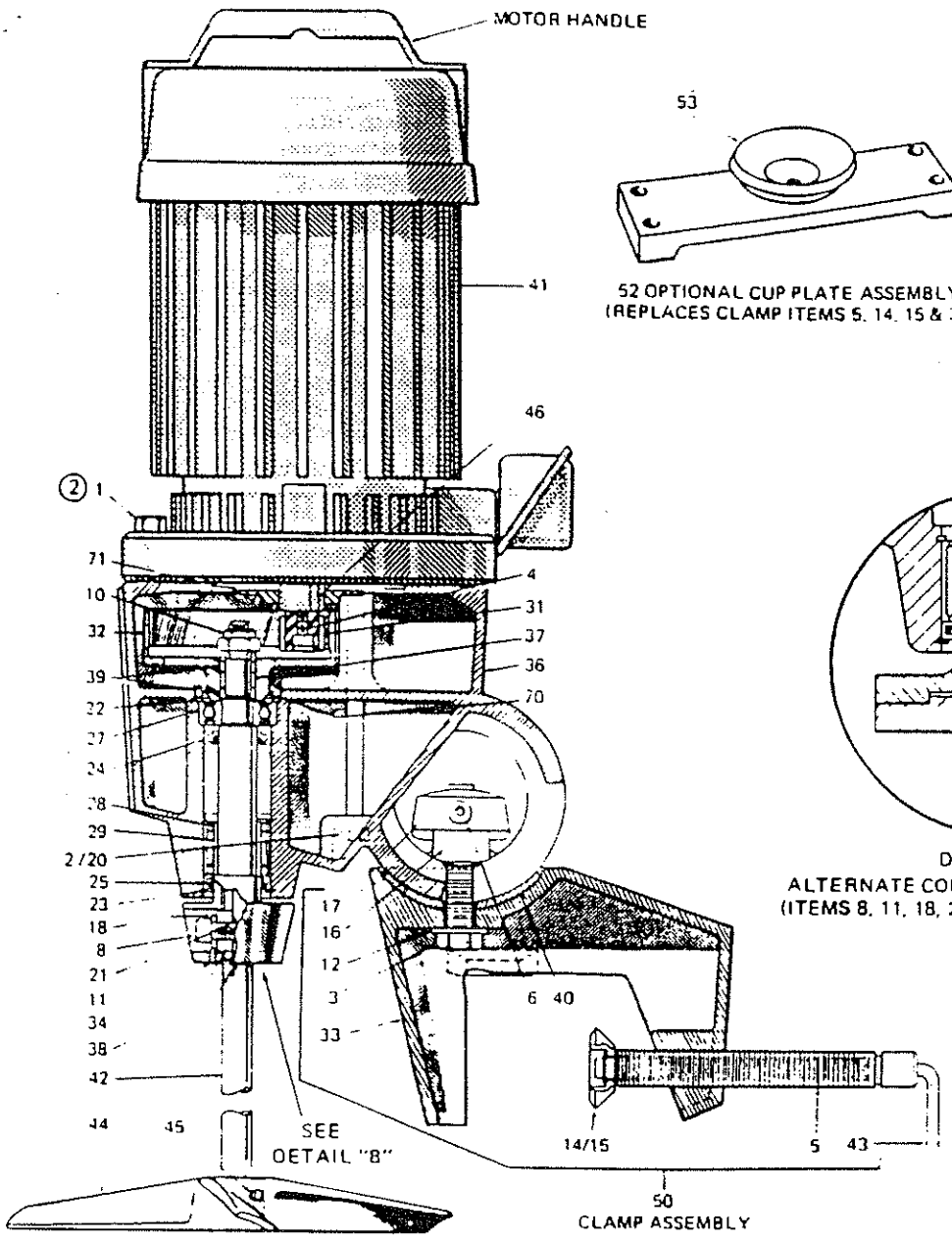
e. Align the motor and housing so that the switch, conduit box, or junction box of the motor and the ball of the housing are on the same side.

f. Align the screw holes and install the housing cap screws and washers (1, 2, and 20).

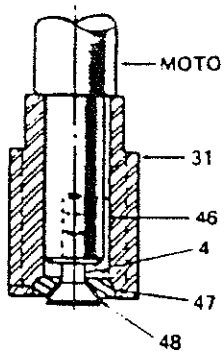
g. Rotate the drive shaft several revolutions by hand to make sure that all parts are running freely.

9-11. ASSEMBLING THE CLAMP. (See Paragraph 8-9.)

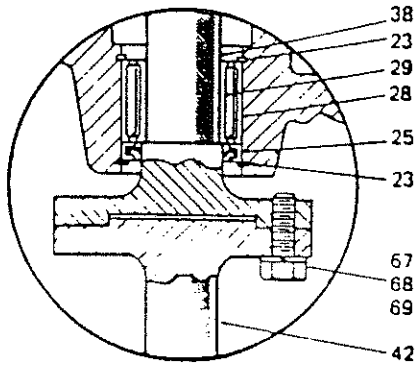
MODEX XJ 174 THRU 350 SHOWN



52 OPTIONAL CUP PLATE ASSEMBLY
(REPLACES CLAMP ITEMS 5, 14, 15 & 33)



MOTOR SHAFT AND PINION ASSEMBLY
MODEL XJ 30 THRU 117 ONLY



DETAIL "B"
ALTERNATE COUPLING CONSTRUCTION
(ITEMS 8, 11, 18, 21 & 34 NOT FURNISHED)

NOTE:

① SOLD IN SETS ONLY

② MODEL XJ 30 THRU 117 NOT FURNISHED WITH MOTOR END BELL (2) ITEM 2 CAP SCREWS AND BRASS WASHERS (20) LOCATED ON UNDER SIDE OF HOUSING.

WHEN ORDERING PARTS SPECIFY MACHINE SERIAL NO., ITEM NO., AND DRAWING NO.

ITEM NO.	PART NAME	REQUIRED	ITEM NO.	PART NAME	REQUIRED
1	HEX HEAD CAP SCREW (XJ 174 thru)	2	28	OUTER RING & ROLLER ASSEMBLY (SOLD ONLY AS A SET)	1
2	HEX HEAD CAP SCREW (350 only)	2	29	BEARING INNER RING (SOLD ONLY AS A SET)	1
2	HEX HEAD CAP SCREW (XJ 30-117 only)	4	30	GEAR/PINION SETS (SOLD IN SETS ONLY)	1
3	KING BOLT	1	31	PINION (SOLD IN SETS ONLY)	1
4	PINION CAP SCREW (XJ 174-350)	1	32	INTERNAL GEAR (SOLD IN SETS ONLY)	1
4	PINION SCREW (XJ 30-117 only)	1	33	CLAMP	1
5	CLAMP SCREW	1	34	CHUCK GRIP	1
6	WEDGE SCREW	1	35	MOTOR HANDLE	1
8	CHUCK SCREW	1	36	HOUSING	1
10	GRIP SPRING LOCKNUT	1	37	GRIP SPRING SPACER	1
11	LIMIT PIN	1	38	DRIVE SHAFT	1
12	PLAIN WASHER	1	39	GRIP SPRING SET	2
14	RETAINING RING	1	40	VIBRATION PAD	1
15	CUP WASHER	1	41	MOTOR	1
16	WEDGE BOTTOM	1	42	MIXER SHAFT	1
17	WEDGE TOP	1	43	HEX KEY WRENCH	1
18	CHUCK WASHER	1	44	IMPELLER	Per Order
20	WASHER (XJ 30-117)	4	45	SET SCREW	Per Order
20	WASHER (XJ 174-350)	2	46	MOTOR SHAFT KEY	1
21	SNAP RING	1	47	WASHER (XJ 30-117 only)	1
22	RETAINING RING, INTERNAL	1	48	LOCKWASHER (XJ 130-117 Only)	1
23	RETAINING RING, INTERNAL	2	67	HEX HEAD CAP SCREW	4
24	OIL SEAL	1	68	LOCKWASHER	4
25	OIL SEAL	1	69	HEX NUT (XJ 30-117 only)	4
26	O' RING	1	70	OIL SEAL (XJ 174 thru)	1
27	BALL BEARING	1	71	SLINGER (350 only)	1

TABLE 4 RECOMMENDED TIGHTENING TORQUES FOR GRIP SPRING LOCKNUT

MODEL	XJ 30	XJ 43	XJ 65	XJ 87 XJ 117	XJ 174	XJ 230 XJ 350

SERVICE RECORD

DATE INSTALLED _____ BY _____

LOCATION (Tank no., Etc. _____

PROCESS _____

RELOCATED	DATE	LOCATION
2.	_____	_____
3.	_____	_____
4.	_____	_____

MAINTENANCE SCHEDULE

REPACK	(Motor) LUBRICATE (Mixer)
_____	_____
_____	_____
_____	_____

OVERHAUL _____

REPAIRS _____

REMARKS _____

The Lightnin Guarantee

Mixing Equipment Co., guarantees that in the case of a failure of any mixer in this manual, which you feel is our responsibility, we will repair or replace it to your satisfaction or we will refund the purchase price. This guarantee applies for the first full year you use your mixer or for 18 months after we ship it, whichever comes first.

Portable mixers were the very first Lightnin products back in 1923. We still occasionally discover an original model going strong after 50 years' service or more.

Every day, we see Lightnin Mixers operating continuously around the clock after 20 years or more. But that's how we build them. For years and years of non-stop mixing.

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Cali, Colombia	Phone 621479
Caracas, Venezuela	(02)545-3088

Or call us at 716-226-6136

LIGHTNIN

MIXING EQUIPMENT CO. **221 Rochester St., P.O. Box 190, Avon, NY 14414**
Members of the Lightnin group are located in Rochester, N.Y., U.S.A.; Toronto, Canada; Mexico, D.F.; Poynton, England; Milano, Italy; Jurong, Singapore; Sydney, Australia.

Printed in U.S.A.

Lightnin Sales Engineers are located in principal cities around the world.

OPERATING INSTRUCTIONS FOR LIGHTNIN' VARI-MIX DRIVE (VM SERIES)

1/3 & 3/4 FRACTIONAL HORSEPOWER TOTALLY ENCLOSED — 60 & 50 CYCLE MOTORS ONLY

SECTION I — GENERAL

This supplement pertains to specifications and operation of the LIGHTNIN "Vari-Mix" motor and control only. For complete mixer installation, operation and maintenance, refer to the instruction manual furnished with the unit.

The motor and control are not watertight and should not be exposed to rain, snow or water sprays. Outdoor use is not recommended unless protection from rain and snow is provided. Maximum ambient temperature is not to exceed 100°F.

SECTION II — SPECIFICATIONS

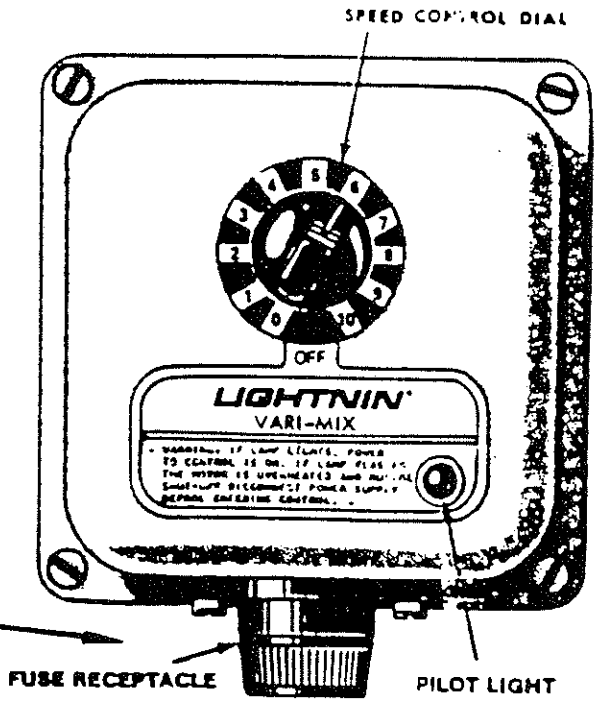
2.1 A.C. line voltage must be within the allowable limits shown in the table. If the performance of the unit is not satisfactory, measure the line voltage. Maximum voltages shown in the table are peak voltages and should not be exceeded. Step up transformers can be obtained from local electrical supply houses if proper line voltages cannot be maintained.

LINE VOLTAGE LIMITS

MOTOR HERTZ (CYCLES)	NOMINAL LINE VOLTAGE	ALLOWABLE LINE VOLTAGE VARIATION
50&60	115 230	120V TO 109V 242V TO 219V

Control Station
Fuse Specifications

BUSS TRON KAA 10 Rectifier Fuse
LIGHTNIN Part No. 120245
(DO NOT Substitute)



OPERATOR'S CONTROL STATION

2.4 Power Connections:

To insure extended motor and mixer life and satisfactory performance, the precautionary measures noted should be followed.

a. DO NOT connect the drive to an AC line that also services heavy motors, starters and contactors. These devices produce transients that can damage the operator control station. Transient voltages can be eliminated by using isolation transformers.

b. Do not over voltage (5% maximum above nameplate voltage) drive on the A.C. side.

c. It is recommended that a switch (not provided by LIGHTNIN) be installed in the line between the power source and the control station. On 3/4 HP motors, the windings are at full voltage even though the speed control is in the off position. The line switch should be turned off or line plug disconnected if the unit is not operated for periods of one hour or more.

d. DO NOT attempt to reverse the drive by means of an external switch.

e. If the unit is to be serviced, disconnect the line to the power source. Turning the speed control to the off position does not isolate the motor or control

2.5 Mixer Shaft Nominal Speed Ranges:

Direct drive models — 100 to 1750 RPM
Gear drive models — 20 to 350 RPM
(Exact speed range depends on A C Voltage.)

SECTION III — INSTALLATION & OPERATION

3.1 An 8 foot power supply cord is furnished by LIGHTNIN. All motors are wired for the correct shaft rotation.

3.2 Before starting the unit:

a. Make sure the mixer is properly located with relation to tank centerlines and angular requirements or offsets shown in the instruction booklet.

b. Fill the mixing vessel so that the fluid level is at least two impeller diameters above the lower impeller.

c. IMPORTANT: Before applying A.C. power to the operators' control station, make sure the speed control dial is in the off position. Switching on the A.C. line with the speed control dial in the on position can cause control failure.

3.3 To Start the Unit:

a. Plug the drive into the correct power source as noted in Section 2.1.

b. Turn the speed control dial in a clockwise direction to the desired speed. The pilot light indicates the switch is on.

c. To select a new speed, adjust the speed control dial.

3.4 To stop the drive, turn the speed control full counterclockwise to the off position until a click is heard and the pilot light goes out. Leaving the control dial on without the motor shaft turning will cause motor damage.

3.5 If the pilot light flashes, the motor is overheated. Stop the drive or reduce speed and allow to cool. Should the pilot light continue to flash, check for overload conditions and/or measure line voltage.

3.6 A BUSS TRON KAA10 rectifier fuse located in the external fuse receptacle protects the control electronics from overload. If the unit does not operate, check the fuse and replace if necessary. NOTE: Only BUSS TRON KAA10 fuses are to be used. There are no substitutes. These fuses are available from our factory as LIGHTNIN Part No. 120245.

3.7 230 volt models have a second fuse. An ABC10 fuse is located inside the unit control box. If the unit does not operate, check fuse and replace if necessary.

3.8 Precautions During Operation:

a. While operating fixed mounting type units in air or during draw-off, the following maximum speeds are not to be exceeded.

DRIVE MODELS	MAXIMUM SPEED	GEAR DRIVE MODELS	MAXIMUM SPEED
XDQ33-VM XDQ75-VM XDC33-VM XDC75-VM	400 IMPELLER RPM	XJQ33-VM XJQ75-VM XJC33-VM XJC75-VM	500 MOTOR RPM OR 100 IMP. RPM

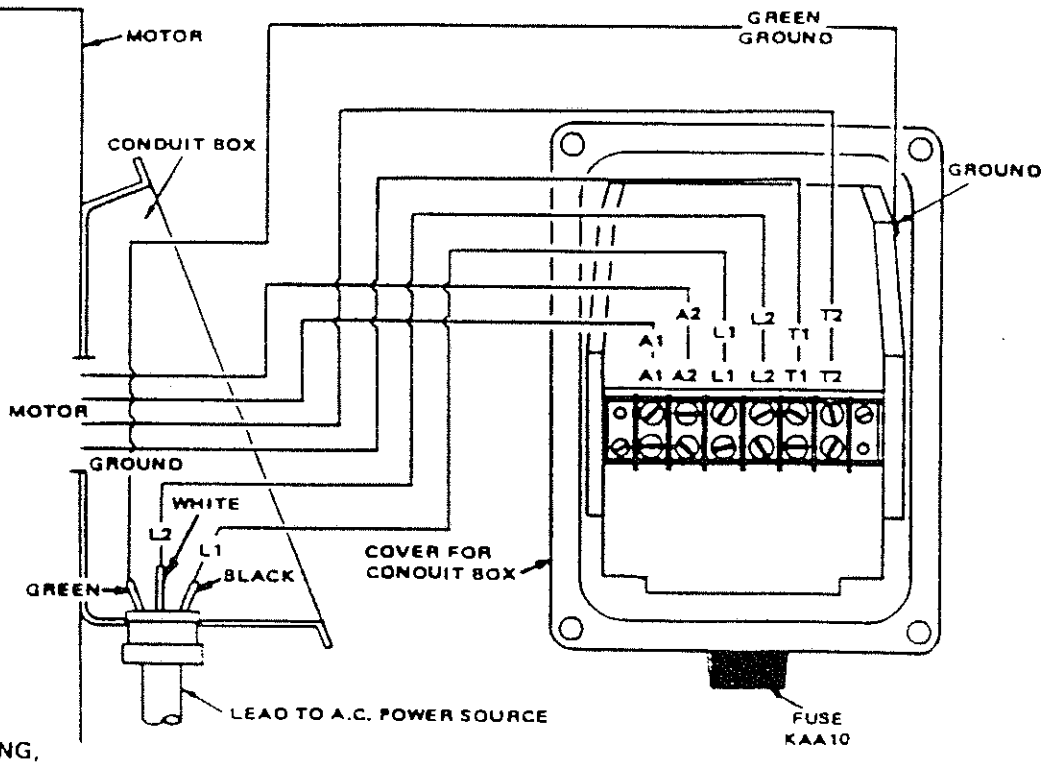
b. XD or XJ SERIES. Clamp mounted portable mixer shafts may vibrate at certain speeds. If the shaft vibration is excessive, adjust the speed up or down until the vibration diminishes.

c. Do not operate under the following adverse conditions unless the control station is protected.

1. Open outdoor service without protection from rain or snow.

2. Ambient temperatures over 100° F.

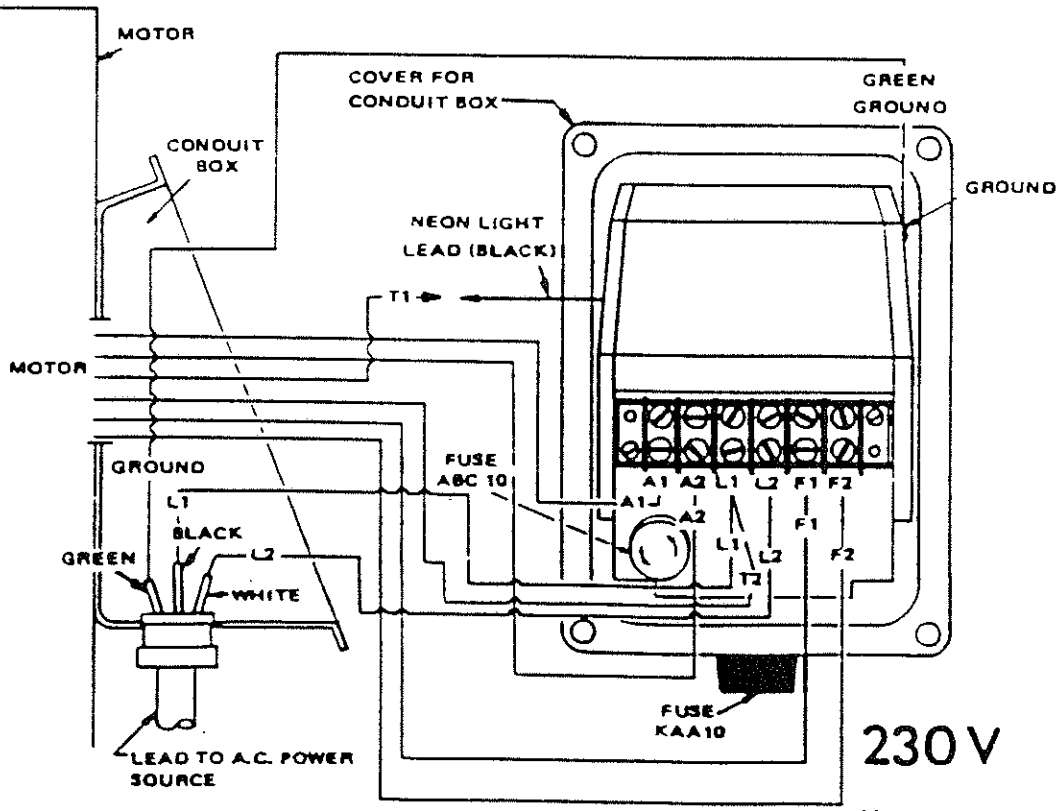
3. Hot humid atmospheres such as steam vapors.



CAUTION:
WHEN SERVICING, DISCONNECT UNIT FROM POWER SOURCE.

115 V

VARI-MIX WIRING DIAGRAM



CAUTION:
WHEN SERVICING, DISCONNECT UNIT FROM POWER SOURCE.

230 V

VARI-MIX WIRING DIAGRAM

DRAWING I
ISSUED — 4/15
REVISED

DIMENSION DRAWING

LIGHTNIN PORTABLE MIXERS

ALL DIMENSIONS IN INCHES

VARI-MIX DRIVE (VM SERIES)

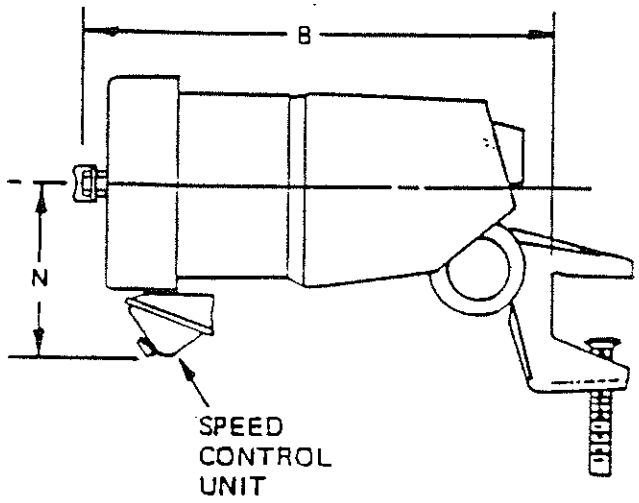


TABLE SHOWS DIMENSIONS "B" & "N" AND WEIGHT FOR YOUR VARI-MIX UNIT. REFER TO THE BASIC MODEL DIMENSION DRAWING FOR ALL OTHER DIMENSIONS.

VARI – MIX MODEL	BASIC MODEL	"B"	"N"	APPROX. UNIT WEIGHT-LBS.
XD33-VM	XD 43	23-1/2	6-5/8	75
XJ33-VM	XJ 43	25		85
XD75-VM	XD 87	25	7	100
XJ75-VM	XJ 87	27-1/8		115

POLYMER AND HYDROGEN PEROXIDE

POLYMER

Manufacturer:

Calgon Corporation
Water Management Division
P.O. Box 1346
Pittsburgh, PA 15230

Supplier:

Calgon Corporation
The Inwood Building
101 Inwood Drive
Syracuse, NY 13219
(315) 488-4901

Features:

POL-E-Z-7736

HYDROGEN PEROXIDE

Supplier:

Kemko Chemical Supplies
6921 Winchell Road
Warner, NY 13164
(315) 451-9558
Contact - David P. Kolcerki

Features:

35% Industrial Grade
Hydrogen Peroxide (5 gallons)

CALGON CORPORATION
SUBSIDIARY OF MERCK & CO., INC.
WATER MANAGEMENT DIVISION
CALGON CENTER • PITTSBURGH, PA

No. 12-330

TEST PROCEDURE: JAR TEST

OBJECTIVE

Jar tests are a viable method used to determine the relative dosages of polymers and inorganic coagulants used in water clarification. It is the easiest method of selecting a treatment to overcome a specific clarification problem. The test provides a comparison between the plant's existing treatment and alternate treatments at various concentrations and sequences of application.

PROCEDURE

1. Collect a representative sample of raw water. If the plant prechlorinates, make certain that the point at which the sample is drawn is prechlorinated. Also, make certain that the sample contains no other chemicals (alum, etc.).
   NOTE: Sample collection becomes more critical during the winter months.
   A sample collected early in the morning and left standing inside will realize a significant increase in temperature. An increase in temperature will yield results that are vastly different when compared to results determined when the water was cold. Use fresh samples for each jar test:
   A. During cold weather
   B. When the water source is substantially colder than the ambient temperature.
2. Record the following:
   A. Water source
   B. Raw water turbidity
   C. Color (if important)
   D. pH
   E. Temperature
3. Determine speed and time sequences to be utilized. Mixing sequence should approximate mix energy available in plant.
4. Run a control sample. This will be either no treatment or current plant treatment. Be sure to run dosages above and below current treatment to be sure you obtain the optimum results.
5. Measure out 1000 mls of raw water into each square jar.
6. Measure out required amount of chemicals at different dosage levels to be used in plastic vials. Dilute with water. DO NOT pipet from one jar to the next.
7. Turn mixer on and set at 100 RPM.
8. Add chemicals as quickly as possible. Rinse vials into sample with water.
9. Start stopwatch after last chemical addition.
10. Estimate speed of floc formation during rapid mix cycle.
11. Estimate floc size halfway through the low mix cycle.
12. At the end of the low mix cycle, withdraw the paddles.
13. Estimate the settling rate and the supernatant clarity (not necessary if measuring turbidity) two to three minutes after withdrawing the paddles.
14. At the end of the settling time, siphon off 50 mls of supernatant for turbidity measurement (200 mls if running filter index).

OPTIMUM PRODUCT SELECTION

The best jar is the one with the lowest dosage that exhibits the best combination of:

A. Speed of floc formation
B. Settling rate
C. Most significant change in clarity or turbidity

RECOMMENDATIONS

1. Always compare your treatment to the plant's existing treatment. Always run a control.
2. If you collect fresh samples for each test, be sure and check the turbidity of each sample. If there is a significant change in turbidity between tests, then run a control with each test.
3. Avoid sloppy techniques—
   A. Measure out the quantity of raw water to be treated, don't guess. Some jobs will require only .1–.2 ppm of polymer and difference in water volume will lead to inconclusive results.
   B. Always use the small vials or some type of container to premeasure the chemicals prior to addition. By using the vials you avoid errors in dosages and speed up the chemical addition, so that the first jar does not mix significantly longer than the last jar.

EQUIPMENT

1 — Phipps & Bird Gang Stirrer
4 — 1 Liter Square Jars
8 — 15 mls Vials
1 — Wash Bottle
1 — Stopwatch

CALGON CORPORATION
SUBSIDIARY OF MERCK & CO., INC.

WATER MANAGEMENT DIVISION

POLYMER PRODUCTS & SERVICES

Bulletin No. 12-327c

POLYMER LABORATORY SOLUTION PREPARATION EMULSION POLYMERS

NON-PAPER PROCESS APPLICATIONS

RECOMMENDED PROCEDURE

1. Add 250 mls of water to a 600 ml beaker.
2. Use a mechanical mixer to develop a good vortex.
3. Using a plastic or glass syringe, add the required volume (10 ml) of polymer slowly to the vortex.
4. When the solution thickens, add an additional 240 ml of distilled water to bring the mixture to a 2% concentration.
5. Examine the solution for solubility (no flakes or polymer should settle to the bottom of the beaker) and polymer accumulation on the mixer.
6. When dissolved, continue mixing for approximately 30 minutes.

ALTERNATE (SIMPLIFIED) PROCEDURE

1. Fill bottle/container with 1/2 volume of water required.
2. Swirl/mix container.
3. Add the appropriate amount of polymer into the swirling water to provide a solution concentration between 10-20 g/l.

   NOTE: Keep neat polymer off sides of container.
4. Seal the container and shake for 5 minutes.
5. Add remainder of water — shake until solution is homogenous.
6. Let sample age 1 hour before using.
7. Further dilutions can be made from the working solution on the test day by adding water and mixing for 5 minutes.

SUGGESTED SOLUTION STRENGTHS

EMULSION POLYMERS — 5-10 gms/liter.

Further dilutions can be made from this working solution by adding water and mixing for 5 minutes. Prepare dilute solution on test day.

If solutions are not going to be used within 24 hours, try to use D.I. water for the makedown and keep your solutions as concentrated as possible. A 2% solution in D.I. water is stable for about one week and can easily be shaken or stirred to the desired concentration. Use plant water to prepare working concentrations.

For more information, contact your local Calgon Representative or write:
Water Management Division, Calgon Corporation, P.O. Box 1346, Pittsburgh, PA 15230.

CALGON CORPORATION
SUBSIDIARY OF MERCK & CO., INC.

T726/T1009I

Hydrogen Peroxide Safety and Handling Precautions

by GEORGE W. AYLING, Industrial Chemical Group Research and Development Center, FMC Corporation, Princeton, N.J.

Hydrogen peroxide is well-established industrially as a versatile deodorizing and bleaching agent. It's uses include organic and inorganic chemical processing, textile and pulp bleaching, metal treating, cosmetic applications, catalysis of polymerization reactions, sewage deodorizing, industrial waste treatment (detoxification), and control of bulking in wastewaters. These uses are continually expanding, making it a necessity not only to understand the mode of hydrogen peroxide application but the safe handling of the chemical as well.

Properties of Hydrogen Peroxide

A basic understanding of the properties of hydrogen peroxide is essential to the safe handling of this chemical. Hydrogen peroxide is clear, colorless, waterlike in appearance, and has a characteristic pungent odor. Nonflammable, it is miscible with water in all proportions and is sold as a water solution.

The amount of hydrogen peroxide in commercial solutions is expressed as a percentage of the solution's weight. Thus, a 35% solution contains 35% hydrogen peroxide and 65% water by weight. Most municipal and industrial applications call for 35% or 50% concentrations.

Delivery and Storage

The methods available for delivery to bulk storage installations accommodate shipments of 70% hydrogen peroxide for dilution to the 35% or 50% storage concentrations. Solutions containing more than 8% hydrogen peroxide are classified by the U.S. Department of Transportation (DOT) as an oxidizer.

Under normal conditions hydrogen peroxide is extremely stable when properly stored. Rate loss in large containers such as tanks is less than 1% per year at normal ambient temperatures; in small containers, such as drums, rate loss is less than 2% per year. The larger the ratio of the storage container surface area to the volume of hydrogen peroxide, the greater the rate loss.

Decomposition of hydrogen peroxide liberates oxygen and heat. In dilute solutions the heat evolved is readily absorbed by the water present. In more concentrated solutions, the heat raises the temperature of the solution and accelerates the decomposition rate. Special stabilizers are added during the manufacture of all grades of hydrogen peroxide, to inhibit the catalytic decomposition effect of metals and other impurities that may accidentally contaminate the chemical during shipment, storage, and handling.

However, since no additive will prevent decomposition if excessive contamination occurs, the best practice is to prevent contamination through proper handling. All handling procedures must, therefore, be directed towards maintaining the same degree of purity and freedom from contamination as is maintained during the manufacturing process:

Storage of hydrogen peroxide should be restricted to its original shipping container or to properly designed containers made of compatible materials which have been thoroughly passivated.

Hydrogen peroxide that has been removed from the original shipping container should not be returned to it.

All containers must be properly vented, and preferably stored away from sources of direct heat and combustible materials.

Adequate ventilation and ample water supply for thorough flushing of accidental spillage on personnel and property should be provided.

Hydrogen peroxide itself will not burn, but its decomposition liberates oxygen which supports combustion. Fires involving hydrogen peroxide are best controlled by using large quantities of water.

Hydrogen peroxide is not considered an explosive. However, when it is mixed with organic substances at significant concentrations, hazardous impact-sensitive compounds may result. Small amounts of other materials that contain catalysts (silver, lead, copper, chromium, mercury, and iron oxide rust) can cause rapid decomposition and an explosive pressure rupture of the containing vessel if it is not properly vented.

In addition to accelerated decomposition through contamination, the decomposition rate of hydrogen peroxide is increased by alkalinity, contact with certain materials of construction, and increasing temperatures. The rate of decomposition increases approximately 2.2 times for each 10 degrees C rise in temperature in the range from 20 degrees C to 100 degrees C, or 1.5 times for each 10 degrees F rise from 68 degrees F to 212 degrees F.

Decreasing temperatures have little effect on hydrogen peroxide until they drop substantially below 0 degrees C. Crystals do not begin to appear in 35% solutions until -33 degrees C (-27.4 degrees F) and -50 degrees C (-58 degrees F), respectively.

Eye Protection

Hydrogen peroxide and its decomposition products are not systematic poisons but contact with hydrogen peroxide can be irritating. Concentrated vapors cause discomfort in the mucous membranes and the eyes. Contact of the eyes with hydrogen peroxide is particularly dangerous because corneal burns can occur very rapidly. Therefore, safety glasses or, preferably, goggles should always be worn when handling concentrated hydrogen peroxide. If, however, any hydrogen peroxide does get in the eyes, flush eyes thoroughly with water and consult a physician promptly.

Protective Clothing

In addition to eye protection, rubber gloves and suitable protective clothing such as aprons or coveralls made of polyester acrylic fiber, polyvinyl chloride, polyethylene, or neoprene should be worn when handling concentrated hydrogen peroxide. Protective clothing, which lacks fire resistance, must be washed thoroughly with water should it come in contact with hydrogen peroxide. If allowed to dry in the fabric, the chemical may cause fire, particularly if the clothing is soiled.

Contact with moderate concentrations of hydrogen peroxide will cause whitening of the skin and stinging sensations. The whitening is due to the formation of gas bubbles in the

epidermal layer of the skin. The stinging, in most cases, subsides quickly after thorough washing, and the skin gradually returns to normal without any damage. Highly concentrated hydrogen peroxide can cause blistering if left on skin surfaces for any length of time.

Inhalation of hydrogen peroxide vapors can cause irritation and inflammation of the respiratory tract. For this reason, The American Conference of Government Industrial Hygienists has determined a Threshold Limit Value (TLV) of 1 ppm (1.4 mg/m^3) of hydrogen peroxide vapor in air as a maximum exposure limit for any eight-hour workday of a normal 40-hour work week. If hydrogen peroxide vapor is inhaled, fresh air should be sought at once; if the inhalation has been prolonged, a physician should be consulted immediately.

Accidental Swallowing

Hydrogen peroxide, a mild disinfectant, is useful in counteracting various microorganisms. Because of their antiseptic action, dilute hydrogen peroxide solutions (3% or less) are frequently used to treat open wounds and can be used as a gargle or mouthwash. However, contact of concentrated solutions (over 3%) with the members of the mouth is to be avoided. Under no circumstances should hydrogen peroxide be taken internally. If hydrogen peroxide is swallowed, drink water immediately to dilute, and contact a physician but do not attempt to cause vomiting.

In using hydrogen peroxide, safety should be first in the minds of everyone, and as with any other chemical, initial steps should be taken to familiarize all personnel with its safe and proper handling. Acceptance of hydrogen peroxide in a wide variety of industrial applications is a reflection of its simplicity in use.

Maximum safety in handling hydrogen peroxide is assured through the use of proper materials of construction, recognition of the need for venting in storage, and overall avoidance of contamination. The oxygen and water by-products of decomposition are innocuous, but splashing, inhaling vapor, and ingesting hydrogen peroxide must be avoided. If by unusual circumstances an accident should take place, flushing with large quantities of plain water is the simple corrective action needed. By adhering to straight-forward common sense procedures, every aspect of your operation will be aimed toward safety and a clean environment.

Model
T330 WA6 - ME-AI

burks pumps.
P.O. Box 603 Piqua, OH 45356
(513) 773-2442 Fax (513) 773-2335

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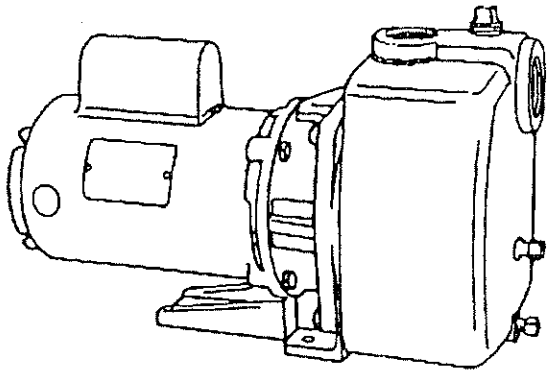
SERIES WA6

SELF-PRIMING CENTRIFUGAL PUMPS



- **Fast Priming** pump stays primed. Flapper and check valves on the suction pipe are not required, but are recommended.
- **Non-Overloading** performance at all catalog ratings.
- **Continuous** duty motors.
- **Leak proof** mechanical shaft seal - self adjusting.
- **Cast Iron Casing** with suction, discharge, prime, vacuum gauge and drain tappings.
- **Glass Filled** Noryl® enclosed impeller with molded-in brass insert.
- **All Bronze or All Iron** construction available.

60 HZ — PERFORMANCE AND SELECTION FOR SUCTION LIFT — 3500 RPM

CATALOG NUMBER	H.P.	SUCTION & DISCHARGE	DISCHARGE PRESSURE POUNDS	CAPACITY G.P.M. AT SUCTION LIFT AND DISCHARGE PRESSURE SHOWN					
				0' SUCTION	5' SUCTION	10' SUCTION	15' SUCTION	20' SUCTION	25' SUCTION
10WA6	1	1½"	20	52	51	48	46	43	36
			30	43	39	36	33	30	25
			40	23	20	14	5	–	–
15WA6	1½	1½"	20	61	61	56	53	49	41
			30	58	58	54	51	47	40
			40	47	43	38	35	30	–
			50	24	19	9	–	–	–
20WA6	2	1½"	20	73	69	67	63	58	50
			30	68	67	64	61	56	48
			40	58	54	50	46	41	34
			50	37	31	23	–	–	–
T 30WA6	3	1½"	20	93	93	93	92	82	66
			30	85	83	83	80	76	64
			40	72	68	64	59	55	46
			50	50	43	35	22	–	–

MATERIALS OF CONSTRUCTION

PART	STANDARD	ALL BRONZE	ALL IRON
Adapter	Cast Iron	Bronze	Cast Iron
Case	Cast Iron	Bronze	Cast Iron
Diffuser	Cast Iron	Bronze	Cast Iron
Impeller		Bronze	Cast Iron
Shaft	#303 S.S.	#303 S.S.	#303 S.S.
Shaft Seal	Carbon-Ceramic S.S.—Buna N	Carbon-Ceramic S.S.—Buna N	Carbon-Ceramic S.S.—Buna N

* Optional Bronze Impeller Available on Standard Design

Noryl® is a registered trademark of General Electric

MOTOR INFORMATION

60 HZ — 3500 RPM — ODP

Single Phase: 1 thru 2 hp. — 115/230V

3 hp. — 230V only

Three Phase: 1 thru 3 hp. — 208-230/460V

Voltages may differ from some suppliers. Consult factory.

Overload Protection: All single phase ODP and totally enclosed motors have built-in overload protection. All three phase motors and all explosion proof motors must be installed with a magnetic starter which provides full 3-leg protection. Failure to use correct starter and overloads will void motor warranty.

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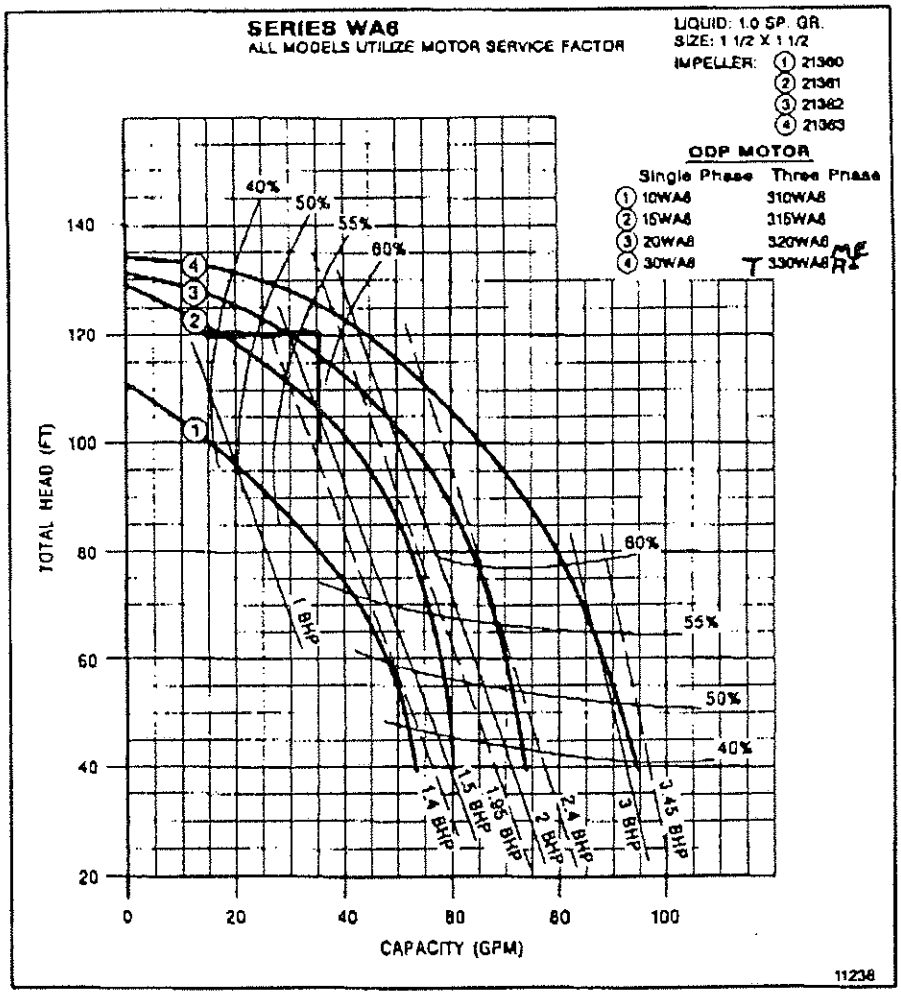
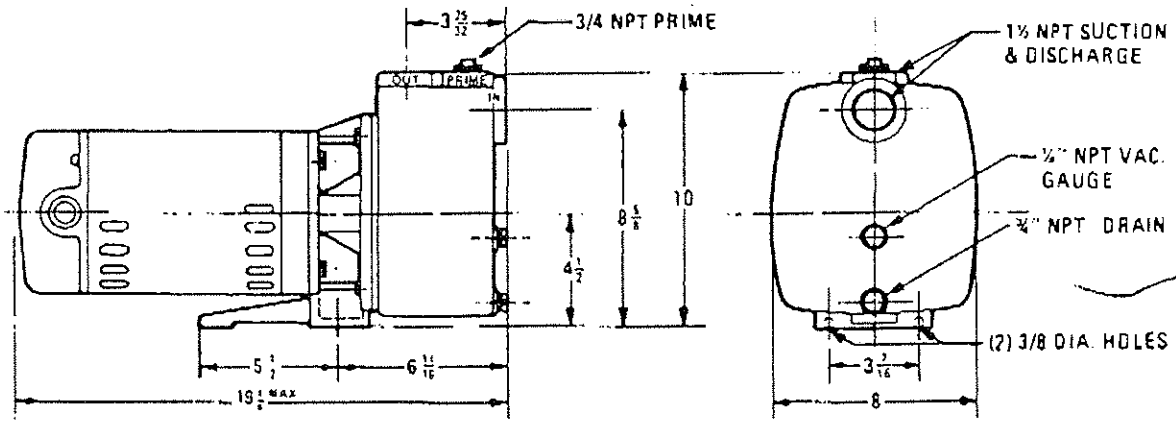
burks pumps.
P.O. Box 603 Piqua, OH 45356
(513) 773-2442 Fax (513) 773-2198

SELF-PRIMING CENTRIFUGAL PUMPS



3500 RPM



DO NOT USE FOR CONSTRUCTION PURPOSES. CERTIFIED DIMENSION DRAWINGS AVAILABLE ON REQUEST.

MAXIMUM OPERATING CONDITIONS

PUMPING SPEED	3500 RPM
TEMPERATURE (For Standard Buna N Seal)	225°F 175°F*
INLET PRESSURE	100 PSI
CASING WORKING PRESSURE	200 PSI

* With Noryl® Impeller

burks pumps.
P.O. Box 603 Piqua, Ohio 45356-0603
Ph: (513) 773-2442 Fax: (513) 773-2238

FORM 706D
REV. 6/94

INSTALLATION, OPERATING AND MAINTENANCE INSTRUCTIONS

CENTRIFUGAL PUMPS

WARNING: Do not work on this pump until you are sure the pump and associated piping are totally depressurized, and if pumping hot liquids that the temperature is safe to handle.

Be sure that electricity to the motor is shut off and locked out, or if the motor is to be tested while running that it is conducted by a qualified person and safe electrical procedures are followed.

To insure safety and a successful repair, if there is anything about the pump and motor you do not completely understand contact your distributor or the factory for instructions.

burks pumps.

Limited Warranty

We warrant to our immediate customer and to the ultimate consumer that products of our manufacture will be free of defects in material and workmanship under normal use and service for the following time periods, when installed and maintained in accordance with our instructions. Pump Products: One (1) year from date of installation or (24) twenty-four months from date of shipment, whichever occurs first. Cleaning Products: Twelve (12) months from date of installation or eighteen (18) months from date of shipment, whichever occurs first. As used herein, "the ultimate consumer" is defined as the purchaser who first uses the product after its initial installation or, in the case of product designed for nonpermanent installation, the first owner who used the product. It is the purchaser's or any sub-vendee's obligation to make known to the ultimate consumer the terms and conditions of this warranty. This warranty gives you specific legal rights, and there may also be other rights which vary from state to state. In the event the product is covered by the Federal Consumer Product Warranties Law (1) the duration of any implied warranties associated with the product by virtue of said law is limited to the same duration as stated herein, (2) this warranty is a LIMITED WARRANTY, and (3) no claims of any nature whatsoever shall be made against us, until the ultimate consumer, his successor, or assigns, notifies us in writing of the defect, and delivers the product and/or defective part(s) freight prepaid to our factory or nearest authorized service station. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply. **THE SOLE AND EXCLUSIVE REMEDY FOR BREACH OF ANY AND ALL WARRANTIES WITH RESPECT TO ANY PRODUCT SHALL BE TO REPLACE OR REPAIR AT OUR ELECTION, F.O.B. POINT OF MANUFACTURE OR AUTHORIZED REPAIR STATION, SUCH PRODUCTS AND/OR PARTS AS PROVEN DEFECTIVE. THERE SHALL BE NO FURTHER LIABILITY, WHETHER BASED ON WARRANTY, NEGLIGENCE OR OTHERWISE.** Unless expressly stated otherwise, guarantees in the nature of performance specifications furnished in addition to the foregoing material and workmanship warranties on a product manufactured by us, if any, are subject to laboratory tests corrected for field performance. Any additional guarantees, in the nature of performance specifications must be in writing and such writing must be signed by our authorized representative. Due to inaccuracies in field testing if a conflict arises between the results of field testing conducted by or for user, and laboratory tests corrected for field performance, the latter shall control. Components or accessories supplied by us but manufactured by others are warranted only to the extent of and by the terms and conditions of the original manufacturer's warranty. **RECOMMENDATIONS FOR SPECIAL APPLICATIONS OR THOSE RESULTING FROM SYSTEMS ANALYSES AND EVALUATIONS WE CONDUCT WILL BE BASED ON OUR BEST AVAILABLE EXPERIENCE AND PUBLISHED INDUSTRY INFORMATION. SUCH RECOMMENDATIONS DO NOT CONSTITUTE A WARRANTY OF SATISFACTORY PERFORMANCE AND NO SUCH WARRANTY IS GIVEN.**

This warranty shall not apply when damage is caused by (a) improper installation, (b) improper voltage (c) lightning (d) sand or other abrasive material (e) scale or corrosion build-up due to excessive chemical content. Any modification of the original equipment will also void the warranty. We will not be responsible for loss, damage or labor cost due to interruption of service caused by defective parts. Neither will we accept charges incurred by others without our prior written approval.
This warranty is void if our inspection reveals the product was used in a manner inconsistent with normal industry practice and/or our specific recommendations. The purchaser is responsible for communication of all necessary information regarding the application and use of the product. **UNDER NO CIRCUMSTANCES WILL WE BE RESPONSIBLE FOR ANY OTHER DIRECT OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOST PROFITS, LOST INCOME, LABOR CHARGES, DELAYS IN PRODUCTION, IDLE PRODUCTION, WHICH DAMAGES ARE CAUSED BY ANY DEFECTS IN MATERIAL AND/OR WORKMANSHIP AND/OR DAMAGE OR DELAYS IN SHIPMENT. THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER EXPRESS OR IMPLIED WARRANTY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**

No rights extended under this warranty shall be assigned to any other person, whether by operation of law or otherwise, without our prior written approval.

CRANE PUMPS & SYSTEMS Crane Pumps & Systems, Inc., Burks Pumps Division
420 Third Street • Piqua, Ohio 45356 • (513) 773-2442 • Fax (513) 773-2238

SAFETY FIRST! PLEASE READ THIS BEFORE INSTALLING OR OPERATING PUMP.

GENERAL

1. Most accidents can be avoided by using **COMMON SENSE.**
2. Read the operation and maintenance instruction manual supplied with the pump.
3. Do not wear loose clothing that may become entangled in the impeller or other moving parts.
4. This pump is designed to handle materials which could cause illness or disease through direct exposure. Wear adequate protective clothing when working on the pump or piping.

PUMPS

5. Pump builds up heat and pressure during operation-allow time for pump to cool before handling or servicing.
6. Only qualified personnel should install, operate and repair pump.
7. Keep clear of suction and discharge openings. **DO NOT** insert fingers in pump with power connected.
8. Do not pump hazardous materials (flammable, caustic, etc.).
9. Do not block or restrict discharge hose-be careful of discharge hose whipping under pressure.
10. Make sure lifting handles are securely fastened each time before lifting.
11. Do not lift pump by the power cord.
12. Do not exceed manufacturers recommendation for maximum performance, as this could cause the motor to overheat.
13. Secure the pump in its operating position so it can not tip over, fall or slide.
14. Keep hands and feet away from impeller when power is connected.
15. Submersible Non-Clog Pumps are not approved for use in swimming pools, recreational water installations, decorative fountains or any installation where human contact with the pumpedfluid is common.
16. Do not operate pump without guards or safety devices in place.
17. For hazardous locations, use pumps that are listed and classified for such locations.
18. When towing pump behind a vehicle; make sure hitch is properly attached, always attach safety chains.
19. Always replace safety devices that have been removed during service or repair.

ELECTRICAL

20. To reduce risk of electrical shock, pump must be properly grounded in accordance with the National Electric Code and all applicable state and local codes and ordinances.
21. To reduce risk of electrical shock, disconnect the pump from the power source before handling or servicing.
22. Any wiring of pumps should be performed by a qualified electrician.
23. Never operate a pump with a power cord that has frayed or brittle insulation.
24. Never allow cords or plugs to lay in water.
25. Never handle connected power cords with wet hands.
26. Never operate a pump with a plug-in type power cord without a ground fault circuit interrupter.

GAS/DIESEL ENGINE POWER PUMPS ONLY

27. Never operate in a enclosed building or area where exhaust gases can accumulate.
28. Do not breath exhaust fumes when working in the area of the engine. (Exhaust gases are odorless and deadly poison.)
29. Never operate near a building where exhaust gases can seep inside.
30. Never operate in a pit or sump without making provisions for adequate ventilation.
31. Allow exhaust system to cool before touching.
32. Never add fuel to the tank while the engine is running. Stop engine and allow to cool.
33. Do not smoke while refueling the engine.
34. Do not refuel near open flame.

IMPORTANT! Burks Pumps® is not responsible for losses, injury, or death resulting from a failure to observe these safety precautions, misuse or abuse of pumps or equipment.

GENERAL INFORMATION

To the Purchaser:

Congratulations! You are the owner of one of the finest pumps on the market today. Burks Pumps® are products engineered and manufactured of high quality components. With years of pump building experience along with a continuing quality assurance program combine to produce a pump which will stand up to the toughest sewage removal projects.

This Burks Pumps manual will provide helpful information concerning installation, maintenance, and proper service guidelines.

Receiving

Upon receiving the pump, it should be inspected for damage or shortages. If damage has occurred, file a claim immediately with the company that delivered the pump. If the manual is removed from the crating, do not lose or misplace.

Storage

Short Term- Burks Pumps are manufactured for efficient performance following long inoperative periods in storage. For best results, pumps can be retained in storage, as factory assembled, in a dry atmosphere with constant temperatures for up to six (6) months.

Long Term- Any length of time exceeding six (6) months, but not more than twenty four (24) months. The units should be stored in a temperature controlled area, a roofed over walled enclosure that provides protection from the elements (rain, snow, wind blown dust, etc.), and whose temperature can be maintained between +40 deg. F and +120 deg. F.
If extended high humidity is expected to be a problem, all exposed parts should be inspected before storage and all surfaces that have the paint scratched, damaged, or worn should be recoated with a water base, air dry enamel paint. All surfaces should then be sprayed with a rust-inhibiting oil.

Pump should be stored in its original shipping container and on initial start up, rotate impeller by hand to assure seal and impeller rotate freely.

If it is required that the pump be installed and tested before the long term storage begins, such installation will be allowed provided:

1) The pump is not installed under water for more than one (1) month.

2) Immediately upon satisfactory completion of the test, the pump is removed, thoroughly dried, repacked in the original shipping container, and placed in a temperature controlled storage area.

SERVICE CENTERS:

For the location of the nearest Burks Pumps Service Center, check your catalog, your Burks Pumps, Inc. representative or Burks Pumps, Inc. Service Department in Piqua, Ohio, telephone (513) 773-2442.

PIPING

RIGHT

WRONG

WIRING

WARNING: DO NOT START PUMP UNTIL IT HAS BEEN FILLED WITH WATER.

1. Motor wiring should conform to national and local electrical codes.
2. Use wire of adequate size to prevent voltage drop.
3. Pump should be on a branch or separate circuit, fused or circuit breaker, protected, with a manual disconnect.
4. Connect the electrical suppy from the switch to the motor terminals, following the wiring diagram on the motor nameplate or terminal coverplate. NOTE: be sure that the connections to the motor terminals correspond with the voltage to be applied. (See Chart)

Check wiring and fuse charts before connecting wires to service line. Make sure the voltage and frequency of the electrical current supply agrees with that stamped on the motor nameplate. If in doubt, check with power company.

Some pumps are equipped with three phase motors. Three phase motors require magnetic starters, and can run in either direction, depending on how they are connected to the power supply.

ROTATION

The rotation is indicated by an arrow on the casing, and the correct rotation of three phase motors should be established before assembling the coupling on base mounted units. The pump should not be operated backwards or in reverse rotation. If the motor operates in the wrong rotation, interchange any two of the lead wires and the correct rotation will result.

Grounding Motor:

WIRING TO THIS PUMP MUST BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE OR YOUR LOCAL ELECTRIC CODE. IF MORE INFORMATION IS NEEDED, CALL YOUR LOCAL LICENSED ELECTRICIAN OR YOUR POWER COMPANY.

It is required that a permanent ground connection be made to the unit using a conductor of appropriate size from a metal underground water pipe or a grounded lead in the service panel. Do not ground to a gas supply line. Do not connect to electric power supply until unit is permanently grounded. Connect the ground wire to the approved ground and then connect to the terminal provided.

NOTE: CENTRIFUGAL PUMPS SHOULD NEVER BE STARTED OR RUN DRY. OPERATING A PUMP DRY WILL CAUSE SCORING OF THE MECHANICAL SEAL, RESULTING IN PREMATURE SEAL FAILURE. TO PREVENT THE PUMP FROM BEING RUN DRY, IT SHOULD BE PRIMED BEFORE STARTING.

FLOODED SUCTION PRIMING

This method of priming a pump is relatively simple. The liquid source is located above the pump and all that is necessary to prime the pump is to open the air vent valve or plug in the pump casing and to crack the gate valve in the suction line. The suction line and pump should be filled slowly until a steady stream of liquid is observed flowing from the air vent. After the pump is operating, it is recommended that the air vent valve or plug be opened again to insure that all air has been expelled from the pump casing.

SUCTION LIFT PRIMING

A foot valve should be used for priming on suction lift applications. The foot valve, located at the end or foot of the suction piping, functions as a check valve and allows flow in one direction only, toward the pump. Otherwise, all the liquid will drain from the pump and suction piping back into the sump after shutdown.

Initial priming is accomplished by completely filling the suction piping and pump casing with the liquid to be pumped. This can be done by removing the air vent valve or plug at the top of the pump casing, and inserting a pipe nipple in the orifice with an appropraite increaser to accomodate a hose connection. A priming line can also be inserted in the discharge piping between the check valve and the pump, or the priming can be done with a bucket and funnel. The important thing is to completely fill the custion pipe and pump casing with liquid.

When the pump is started, the vacuum created by pumping the priming fluid, combined with atmospheric pressure in the liquid well, forces liquid into the suction piping, thus opening the valve and keeping it open until the pump is shut down. When the pump is shut down, the liquid being pumped reverses its flow causing the valve to close. The liquid is now trapped in the suction piping and pump casing, thus maintaining a prime on the pump.

VACUUM PRIMING

Vacuum priming consists of removing air from the pump casing and suction piping and drawing liquid into them by means of a vacuum creating device. The types of vacuum equipment range from a simple hand pump to a complex central priming system. Your specific priming requirements will govern what type of vacuum primer you use.

STARTING

For initial starting, the gate valve in the discharge line should be closed, and opened gradually as the motor approaches full speed . . . usually in from five to ten seconds. After the pump has once been in operation so

that the dishcarge line has been completely filled, it is then unnecessary to close the gate valve in starting.

SEASONAL SERVICE

To Take Out of Service:

1. Drain the liquid from the pump to prevent freezing and damage to the pump body. It is recommended that a good rust inhibitor be put into the liquid end to prevent excessive corrosion. Keep the motor dry and covered.

2. To drain, remove the drain plug which is located below the suction inlet of the pump. Drain the suction pipe to a point below the frost line. All other pipes, which may be exposed to freezing temperatures, should also be drained.

3. Remove the priming plug. This will help the pump body to drain by permitting air to enter the case.

To Place Pump Back Into Service:

1. Replace all drain plugs previously removed, using pipe joint compound on all male threads.

2. If the suction line has been removed, be certain that it is re-connected.

3. Check to be certain that the pump shaft turns freely.

4. Prime and start.

DO NOT START THE PUMP UNTIL IT IS FILLED WITH WATER.

STUFFING BOX - MECHANICAL SEAL:

With the exercise of a few precautions a mechanical seal will furnish very satisfactory operation in pumps. Precautions which should be observed are:

1. Do not run the pump dry. The flat faces of the seal are lubricated by the liquid being pumped.
2. Vent the seal housing if it is the high point in the pump.
3. Purge the system thoroughly to remove welding slag, scale, or dirt which may injure the seal prematurely due to the abrasive condition of liquid.

INSTALLING A NEW MECHANICAL SEAL

CAUTION: This seal is a precision product and should be handled accordingly. Be especially careful not to scratch or chip the lapped sealing faces of the washer and floating seat. If reinstalling a used seal, both sealing faces should be relapped.

INSTALLING STATIONARY ELEMENT

The seat must be seated securely in the seat ring with the lapped face out. The *unlapped* face is marked and correctly assembled when shipped. Oil the seat ring with *light oil* and seat it firmly and squarely. If this cannot be done with the fingers, use a sleeve as shown in Fig. 1, inserting the cardboard shipping disc between the sleeve and the lapped face to prevent scratching sealing face.

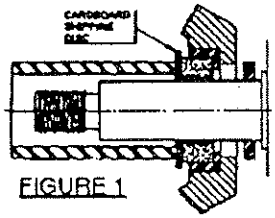


FIGURE 1

INSTALLING ROTATING ELEMENT

Oil shaft with *light oil*. Shaft should be clean and polished smooth. Slide seal body on shaft (washer end *first*) and seat firmly. A sleeve as shown in Fig. 2 will facilitate this operation and prevent the rubber driving ring from pulling out of place as the seal body is slid along the shaft. Assembly of impeller automatically sets seal in proper position.

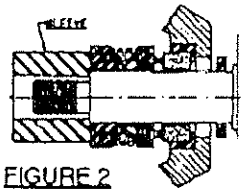


FIGURE 2

Make sure at all times, and particularly before final assembly, that both sealing faces are absolutely clean. Sealing faces should be oiled with clean, light oil.

NOTE: DO NOT USE PETROLEUM BASED PRODUCTS TO LUBRICATE EPT OR EPDM ELASTOMERS - USE ONLY WATER BASED LUBRICANT.

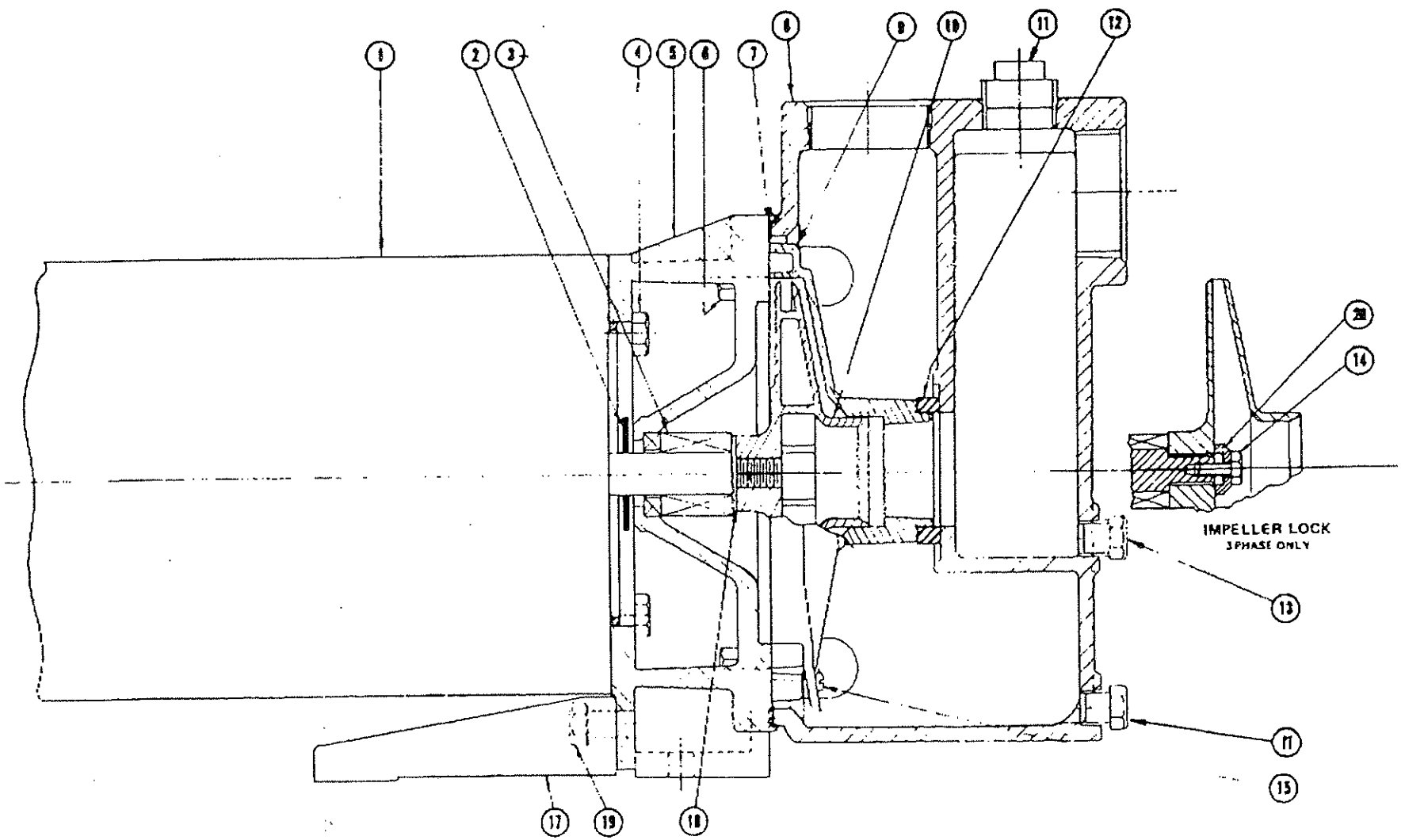
WARNING:
Do not work on this pump until you are sure the pump and associated piping are totally depressurized, and if pumping hot liquids that the temperature is safe to handle.

Be sure that electricity to the motor is shut off and locked out, or if the motor is to be tested while running that it is conducted by a qualified person and safe electrical procedures are followed.

To insure safety and a successful repair, if there is anything about the pump and motor you do not completely understand, contact your distributor or the factory for instructions.

SERVICE GUIDE

TROUBLE AND CAUSE	REMEDY
1. Failure to Pump a. Pump not properly primed b. Suction lift too great c. Speed too slow d. Motor running in wrong direction	a. Be sure that pump case and suction line are full of water. See priming instructions. b. Locate the pump closer to the water source. Make sure that the suction piping diameter is large enough. c. Check the voltage at motor terminals and at the meter when the pump is operating. Check for loose connections. If voltage is low, contact your Power company. Be sure that wire size is adequate. d. Check the wiring diagram on the motor nameplate. If it is a 3-Phase motor, refer to the Wiring instruction.
2. Reduced Capacity and/or Head a. Clogged impeller b. Air pockets or leaks in suction line c. Strainer too small or clogged d. Insufficient submergence of suction pipe e. Excessive suction lift f. Excessively worn impeller	a. Remove and clean b. Check the line for air leaks for excessive lift. c. Check the end of suction pipe or foot vlave to see that is is not plugged or buried in mud or sediment. When installing in pond or lake, support the suction line so that it will be submerged in water, but not imbedded in mud or sediment. A strainer with greater screen area may be required. d. Add sufficient pipe to keep the submerged end well below the water surface. e. If caused by suction pipe friction, increase the size of the pipe; otherwise move the pump closer to the water level. f. Order replacement parts. See repair list.
3. Pump Loses Prime a. Air leaks in suction line b. Excessive suction lift and operating too near shut-off point. c. Water level drops while pumping, exposing suction pipe or strainer	a. Check suction piping. Piping might have frozen, causing it to split. b. Move the pump closer to the water level. c. Check the water supply . Add a length of pipe to the suction line to keep the submerged end under water.
4. Motor Will Not Start a. Blown fuses b. No electric current at motor c. Motor hums but will not start d. Motor damaged by lightning or voltage surge.	a. Replace with new fuses. b. The power supply may be off, the connections may be loose or incorrect, or the wire may have been chewed by rodents. c. Turn power off. Check the rotating element of the pump to see that it turns freely. d. Take the motor to any authorized motor repair shop.



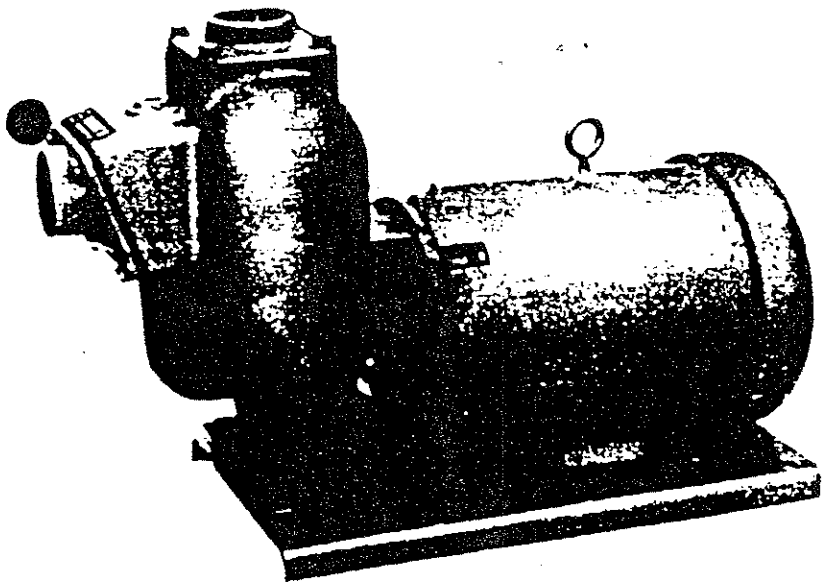
SERIES WA6 SELF PRIMING CENTRIFUGAL PUMPS

SYMBOL NUMBER	PART NUMBER	QUANTITY	DESCRIPTION
			OPEN DRIP-PROOF
1	9650	1	Motor, 1 HP—1 PH
	9653	1	Motor, 1 HP—3 PH
	9675	1	Motor, 1½ HP—1 PH
	9676	1	Motor, 1½ HP—3 PH
	9677	1	Motor, 2 HP—1 PH
	9678	1	Motor, 2 HP—3 PH
	9737	1	Motor, 3 HP—1 PH
	9738	1	Motor, 3 HP—3 PH
			TOTALLY ENCLOSED FAN COOLED
	9692	1	Motor, 1 HP—1 PH
	9693	1	Motor, 1 HP—3 PH
	9774	1	Motor, 1½ HP—1 PH
	9758	1	Motor, 1½ HP—3 PH
	9827	1	Motor, 2 HP—1 PH
	9829	1	Motor, 2 HP—3 PH
	21697	1	Motor, 3 HP—3 PH
			EXPLOSION PROOF
	20515	1	Motor, 1 HP—1 PH
	20516	1	Motor, 1 HP—3 PH
	20517	1	Motor, 1½ HP—1 PH
	20518	1	Motor, 1½ HP—3 PH
	20519	1	Motor, 2 HP—1 PH
	20520	1	Motor, 2 HP—3 PH
	9909	1	Motor, 3 HP—3 PH
2	8105	1	Slinger Washer
3	~~20888~~	1	~~Mechanical Seal—Buna N—Inter-~~
	~~8314~~	~~1~~	~~Mechanical Seal—Buna N changeable~~
		1	~~Mechanical Seal—Viton~~
	20764	1	Mechanical Seal—EPT** 20764
4	5122	4	Cap Screw ⅜ - 16 x ¾
5	~~9740~~	~~1~~	~~Adapter for 10WA6 Only~~
	9740-1	1	Adapter -All exc. 10WA6
6	4235	4	Capscrew ⅜ - 16 x 1¼
7	8988	1	Gasket
8	21123	1	Case
9	21124	1	Diffuser—~~All exc. 10WA6~~

SYMBOL NUMBER	PART NUMBER	QUANTITY	DESCRIPTION
	21157	1	Diffuser—10WA6
* 10	21360	1	Impeller—10WA6—Noryl
	21361	1	Impeller—15WA6—Noryl
	21362	1	Impeller—20WA6—Noryl
	21363	1	Impeller—30WA6—Noryl
11	947	2	Pipe Plug—¼"—Iron
12	~~4231~~	1	~~Suction Sleeve—Buna N~~
	~~9695~~	1	~~Suction Sleeve—Viton~~
	20285	1	Suction Sleeve—EPT
13	~~4236~~	~~1~~	~~Pipe Plug—¼"—Brass~~
14	21182	1	Lock Screw—3 PH—1 HP
	21285	1	Lock Screw—3 PH—1½, 2 & 3 HP
15	21156	2	Screw, Diffuser to Adapter
17	9744	1	Base
18	2029	1	Washer, All exc. 10WA6
19	22804	1	Capscrew
20	~~21181~~	~~1~~	~~Washer—3 PH—All~~
			DIFFERING PARTS FOR ALL BRONZE CONSTRUCTION
5	9740-A	1	Adapter for 10WA6 Only
	9740-A-1	1	Adapter - All exc. 10WA6
6	3122-A	4	Capscrew—⅜ - 16 x 1¼
8	21123-A	1	Case
9	21124-A	1	Diffuser—All exc. 10WA6
	21157-A	1	Diffuser—10WA6
10	9660-5.44	1	Impeller—10WA6—Bronze
	9731-5.66	1	Impeller—15WA6—Bronze
	9729-5.66	1	Impeller—20WA6—Bronze
	9680-5.66	1	Impeller—30WA6—Bronze
11	947A	2	Pipe Plug—¼"—Brass
			DIFFERING PARTS FOR ALL IRON CONSTRUCTION
10	~~9660-B-5.44~~	~~1~~	~~Impeller—10WA6—Iron~~
	~~9731-B-5.66~~	~~1~~	~~Impeller—15WA6—Iron~~
	~~9680-C-5.13~~	~~1~~	~~Impeller—20WA6—Iron~~
	9680-C-5.66	1	Impeller—30WA6—Iron
13	4236A	1	Pipe Plug—¼"—Iron
20	21181-A	1	Washer—S.S.

FLOMAX 10

2" x 2" SELF PRIMING CENTRIFUGAL PUMP



FLOMAX 10 self-priming centrifugal pump is designed to fit standard NEMA "C" frame motors with standard armature shafts. The PUMPAK is completely assembled and can be mounted to a standard motor in minutes.

FLOMAX 10 is made in bronze, aluminum, or cast iron construction to suit a wide variety of liquids. All fasteners are stainless steel to reduce corrosion. Impellers are balanced and trimmed to insure non-overloading conditions. Standard stainless steel and Viton mechanical seal is self-adjusting and corrosion resistant to handle many different liquids. Special seals, optional EPDM gaskets and check valves are also available. Pump assemblies are offered with open drip-proof, TEFC, and explosion-proof NEMA design motors, or as PUMPAKS only to fit customer's standard motors.

PUMP SPECIFICATIONS

Suction & Discharge	2" × 2"
Housing	Cast Iron, bronze or aluminum
Impeller	Cast Iron, bronze or aluminum
Shaft Sleeve	Stainless steel to fit 1⅛" shaft
Fasteners	Stainless Steel
Seals	Standard Viton, Special seal material combinations available. (Consult the factory).

MP PUMPS DIVISION OF TECUMSEH PRODUCTS CO.
34800 Bennett Dr., Fraser, MI 48026 (313) 293-8240 TLX: 358-238

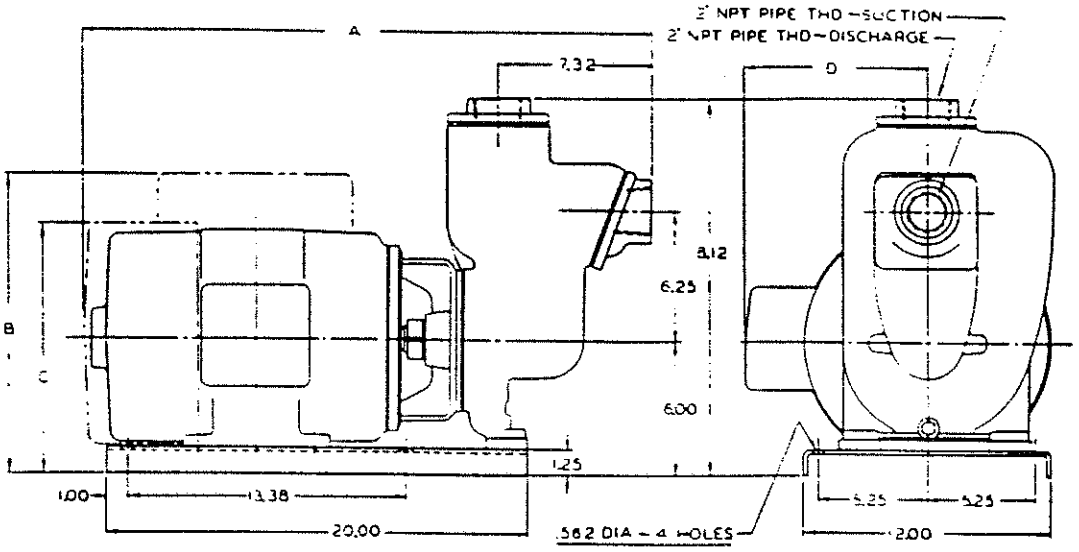
FLOMAX 10

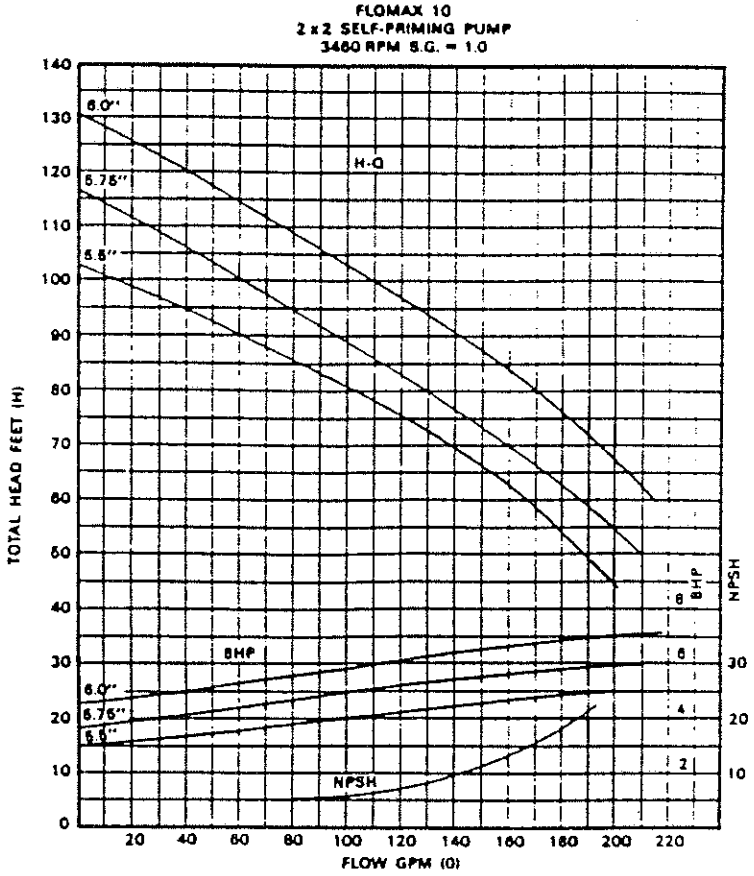
2" x 2"

SELF-PRIMING CENTRIFUGAL ELECTRIC MOTOR DRIVE

FLOMAX 10

MOTOR				DIMENSION			
FRAME	HP		ENCL	A	B	C	D
184TC	5	3	TEFC	26.52		9.70	5.88
184TC	7.5	3	TEFC	28.02		9.70	5.88
213C	5	3	TEFC	26.52		11.32	7.38
213C	5	3	ODP	24.90		11.32	7.38
213C	5		TEFC	28.14	14.08	11.32	7.38
215C	7.5	3	TEFC	28.14		11.32	7.38





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34800 Bennett Dr., Fraser, MI 48026 (313) 293-8240 TLX: 358-238

fumes in moist air; density (25°C) 5.2 g/l. Freely soluble in water. Nonflammable.
Hazard: Toxic; strong irritant.
Use: Making hydriodic acid.
Shipping regulations: (Air) Nonflammable Gas label. Not accepted passenger. (Solution) Corrosive label.

hydrogen ion concentration. See pH.

hydrogenolysis (destructive hydrogenation). A type of hydrogenation reaction in which molecular cleavage of an organic compound occurs, with addition of hydrogen to each portion. An important application is hydrocracking (hydrogenative splitting) of large organic molecules, with formation of fragments that react with hydrogen by use of catalysts and high temperatures. Hydrogenolysis of coal to gaseous and liquid fuels was used in Germany in the 1940's; a similar method (Oil: Gas Process) is under development in the U.S. The German process used pulverized coal made into a paste with heavy oil and a metallic catalyst; the mixture plus the necessary hydrogen was subjected to from 300 to 700 atm at about 500°C. The coal was converted into heavy oil, distillable oil, gasoline, and hydrocarbon gases. Large quantities of hydrogen are necessary. See also gasification; hydrogenation.

hydrogen peroxide H_2O_2 (molecular formula); H—O—O—H (structural formula).
Properties (pure anhydrous): Density, solid, 1.71 grams per cc; density, liquid, 1.450 grams per cc at 20°C; viscosity, liquid, 1.245 centipoises; surface tension, 80.4 dynes per cm at 20°C; f.p., −0.41°C; b.p. 150.2°C. Soluble in water and alcohol. (Solutions): Pure hydrogen peroxide solutions, completely free from contamination, are highly stable; a low percentage of an inhibitor such as acetanilide or sodium stannate, is usually added to counteract the catalytic effect of traces of impurities, such as iron, copper, and other heavy metals. A relatively stable sample of hydrogen peroxide typically decomposes at the rate of about 0.5% per year at room temperature.
Derivation: (a) autoxidation of an alkylanthrahydroquinone, such as the 2-ethyl derivative, in a cyclic continuous process in which the quinone formed in the oxidation step is reduced to the starting material by hydrogen in the presence of a supported palladium catalyst; (b) by electrolytic processes in which aqueous sulfuric acid or acidic ammonium bisulfate is converted electrolytically to the peroxydisulfate which is then hydrolyzed to form H_2O_2; (c) by autoxidation of isopropyl alcohol. Method (a) is most widely used.
Grades: U.S.P. (3%); technical (3, 6, 27.5, 30, 35, 50 and 90%); F.C.C. Most common commercial strengths are 27.5, 35, 50, and 70%.
Containers: Amber glass bottles; carboys; aluminum drums; non-returnable polyethylene drums with fiber and steel overpacks; tank trucks and tank cars.
Hazard: Concentrated solutions are highly toxic and strong irritants. Dangerous fire and explosion risk. Strong oxidizing agent. Tolerance, 1 ppm in air.
Uses: Bleaching and deodorizing of textiles, wood pulp, hair, fur, etc; source of organic and inorganic peroxides; pulp and paper industry; plasticizers; rocket fuel; foam rubber; manufacture of glycerol; antichlor; dyeing; electroplating; antiseptic; laboratory reagent; epoxidation; hydroxylation; oxidation and reduction; viscosity control for starch and cellulose derivatives; refining and cleaning metals; bleaching and oxidizing agent in foods; neutralizing agent in wine distillation; seed disinfectant; substitute for chlorine in water and sewage treatment.
Shipping regulations: (Solid) (Air) Organic Peroxide label. (8 to 40% solution) (Rail, Air) Oxidizer label. (Over 40%) (Rail) Oxidizer label. Not acceptable passenger. (Air) Not acceptable.

hydrogen phosphide. See phosphine

hydrogen, phosphoretted. See phosphine.

hydrogen selenide H_2Se.
Properties: Colorless gas; soluble in water, carbon disulfide, phosgene; b.p. −42°C, f.p. −64°C; sp. gr. 2.00 (air = 1).
Grade: 98% pure.
Containers: Cylinders.
Hazard: Highly toxic by inhalation. Strong irritant to skin; damaging to lungs and liver. Dangerous fire and explosion risk; reacts violently with oxidizing materials. Tolerance, 0.05 ppm in air.
Uses: Preparation of metallic selenides and organoselenium compounds; in doping gas mixtures for preparation of semiconductor materials containing controlled amounts of significant impurities.
Shipping regulations: (Rail) Flammable Gas and Poison labels. Not acceptable passenger. (Air) Not acceptable.

hydrogen slush. A mixture of solid and liquid hydrogen at the hydrogen triple point, 13.8°K and 1.02 psia. It is denser and less hazardous than liquid hydrogen.

hydrogen sulfide (sulfuretted hydrogen) H_2S.
Properties: Colorless gas; offensive odor. Soluble in water and alcohol. Sp. gr. 1.189 (air = 1.00); f.p. −83.8°C; b.p. −60.2°C; sp. vol. 11.23 cu ft/lb (21.1°C, 1 atm). Autoignition temperature 500°F (260°C).
Derivation: (a) By the action of dilute sulfuric acid on a sulfide, usually iron sulfide; (b) by direct union of hydrogen and sulfur vapor at a definite temperature and pressure; (c) as a by-product of petroleum refining.
Containers: Steel cylinders; as liquid at 350–400 psi in 60-ton tank cars or 13-ton trailers (specially designed equipment is required for bulk shipment).
Grades: Technical 98.5%; purified 99.5% min.; C.P.
Hazard: Toxic by inhalation; strong irritant to eyes and mucous membranes. Highly flammable, dangerous fire risk. Explosive limits in air 4.3 to 46%. Tolerance, 10 ppm in air.
Uses: Purification of hydrochloric and sulfuric acids;

SELF PRIMING
CENTRIFUGAL PUMPS

Manufacturer:

MP Pumps
Division of Tecumseh Products, Co.
34800 Bennett Drive
Fraser, MI 48026
(313) 293-8240

Supplier:

Syracuse Thermal
6750 Old Collamer Road
P.O. Box 398
East Syracuse, NY 13057
(315) 437-7321
Contact - Joe Percival

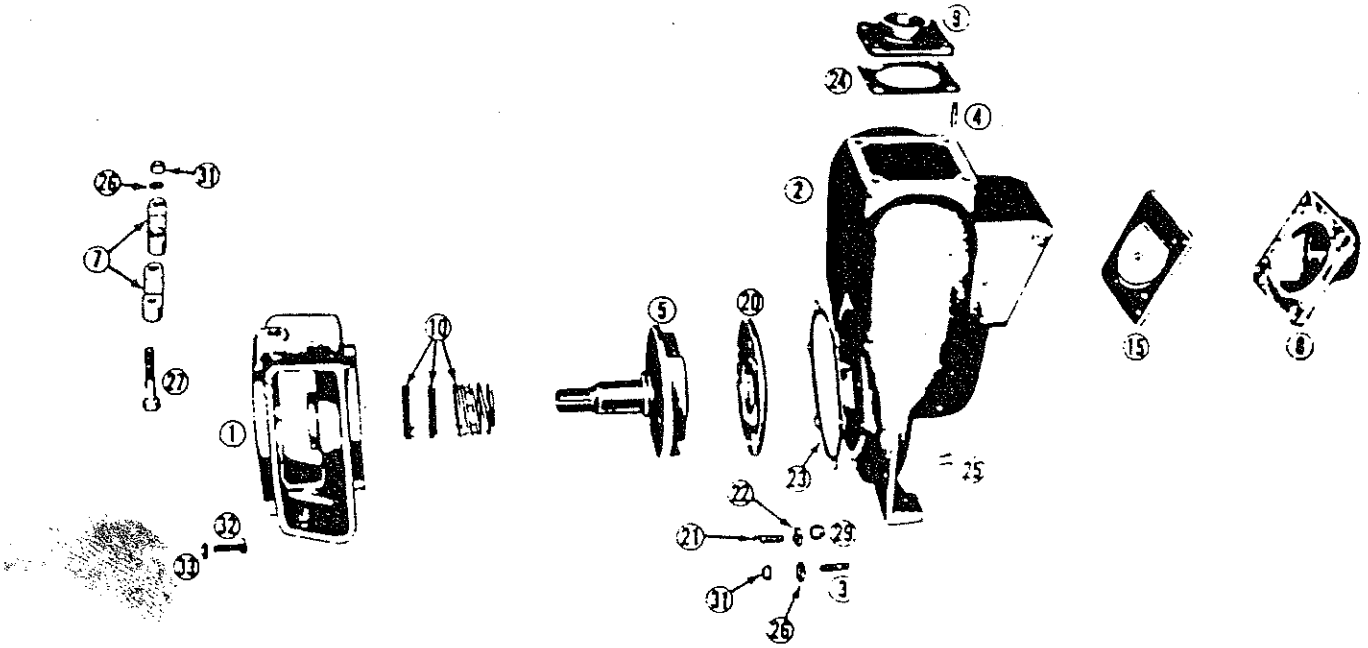
Features:

Flomax 10
2" Suction, 2" Discharge
7½ HP
3 Phase, 230/60

MP PUMPS SERVICE PARTS LIST

- Self-Priming
- Pumpak
- Close Coupled Electric Motor Drive

Flomax 10 2" x 2" Pipe Size
Flomax 15 3" x 3" Pipe Size



IMPORTANT: When ordering parts, specify model and serial number shown on nameplate.
N/S means "not shown" in exploded view of parts.

ITEM	PART NO.	DESCRIPTION	QUANTITY REQUIRED PER MODEL			
			CAST IRON		ALUMINUM	BRONZE
		FLOMAX 10-2"	21366	21421	21364	21365
		FLOMAX 15-3"	21384	21428	21382	21383
HOUSING						
	24304	Housing Assembly - Cast Iron - Inc:	1	1		
2	22351	Housing - Cast Iron	1	1		
3	21261	Stud - S.S. - 3/8"	14	14		
		6 - Housing to Adaptor				
		8 - Inlet and Outlet				
25	21267	Drain Plug - S.S. - 1/4" NPT	1	1		
	24302	Housing Assembly - Aluminum - Inc:			1	
2	22349	Housing - Aluminum			1	
3	21261	Stud - S.S. - 3/8"			14	
		6 - Housing to Adaptor				
		8 - Inlet and Outlet				
25	21267	Drain Plug - 1/4" NPT			1	
	24303	Housing Assembly - Bronze - Inc:				1
2	22350	Housing - Bronze				1
3	21721	Stud - 3/8" - 8				14
		6 - Housing to Adaptor				
		8 - Inlet and Outlet				
25	21186	Drain Plug - S.S. - 1/4" NPT				1
31	21268	Hex Nut - S.S. - 3/8"	14	14	14	
		6 - Adaptor to Housing				
		4 - Inlet Flange				
		4 - Outlet Flange				
31	21230	Hex Nut - Bronze - 3/8"				14
26	21266	Lockwasher - S.S. - 3/8"	14	14	14	
		6 - Adaptor to Housing				
		4 - Inlet Flange				
		4 - Outlet Flange				
26	26051	Lockwasher - Bronze - 3/8"				14
15	23040	Flapper Assembly	1	1	1	1
23	22240	Gasket - Housing to Adaptor	4	4	4	4
24	22358	Gasket - Outlet Flange	1	1	1	1

MP PUMPS
DIVISION OF TECUMSEH PRODUCTS CO.
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(313) 293-8240 TLX: 358-238
FAX: (313) 293-8469

FORM 7006-A
PRINTED IN U.S.A.

ITEM	PART NO.	DESCRIPTION	QUANTITY REQUIRED PER MODEL			
			CAST IRON		ALUMINUM	BRONZE
		FLOMAX 10-2"	21366	21421	21364	21365
		FLOMAX 15-3"	21384	21428	21382	21383
FLANGES						
8	22369	Flange - 2" - Inlet - Cast Iron	1	1		
8	22367	Flange - 2" - Inlet - Aluminum			1	
8	22368	Flange - 2" - Inlet - Br.				1
8	22468	Flange - 3" - Inlet - Cast Iron	1	1		
8	22466	Flange - 3" - Inlet - Aluminum			1	
8	22467	Flange - 3" - Inlet - Br.				1
9	22372	Flange - 2" - Outlet - Cast Iron	1	1		
9	22370	Flange - 2" - Outlet - Aluminum			1	
9	22371	Flange - 2" - Outlet - Br.				1
9	22471	Flange - 3" - Outlet - Cast Iron	1	1		
9	22469	Flange - 3" - Outlet - Aluminum			1	
9	22470	Flange - 3" - Outlet - Br.				1
WEAR PLATE						
	22376	Wear Plate Assembly - Steel - Inc:	1	1		
20	22244	Wear Plate - Steel	1	1		
21	21262	Flat Head Screw - S.S. - 3/8"	2	2		
22	21271	Annular Gasket - 5/8"	2	2		
	22374	Wear Plate Assembly - Aluminum - Inc:			1	
20	22242	Wear Plate - Aluminum			1	
21	21262	Flat Head Screw - S.S. - 3/8"			2	
22	21271	Annular Gasket - 5/8"			2	
	22375	Wear Plate Assembly - Bronze - Inc:				1
20	22243	Wear Plate - Bronze				1
21	22360	Flat Head Screw - S.S. - 3/8"				2
22	21271	Annular Gasket - 5/8"				2
29	21263	Acorn Nut - S.S. - Wear Plate - 3/8"	2	2	2	
29	26053	Acorn Nut - Bronze - Wear Plate 3/8"				2
IMPELLER						
5	23386	Impeller Assembly - Cast Iron - Inc:				
	22417	Locknut - 1-14	1	1		
	22435	Sleeve - 1-1/8" Bore	1	1		
	22499	Impeller - Cast Iron	1	1		
5	23384	Impeller Assembly - Aluminum - Inc:			1	
	22417	Locknut - 1-14			1	
	22435	Sleeve - 1-1/8" Bore			1	
	22497	Impeller - Aluminum			1	
5	23385	Impeller Assembly - Br. - Inc:				1
	22417	Locknut - 1-14				1
	22435	Sleeve - 1-1/8" Bore				1
	22498	Impeller - Br.				1
N/S	22404	Shim - Impeller - S.S. - 3/4"	1	1	1	1
CLAMP						
	23039	Impeller Clamp Assembly - Inc:	1	1	1	1
7	22356	Clamp	2	2	2	2
26	21266	Lockwasher - S.S. - 3/8"	2	2	2	2
27	21269	Capscrew - S.S. - 3/8"	2	2	2	2
31	21268	Hex Nut - S.S. - 3/8"	2	2	2	2
27	21269	Capscrew - S.S. - Clamp - 3/8"	2	2	2	2
SEAL						
10	22361	Seal Assembly - Self-lubricated	1	1	1	1
ADAPTOR						
1	22433	Adaptor - Cast Iron	1	1		
1	22431	Adaptor - Aluminum			1	
1	22432	Adaptor - Bronze				1
32	21246	Capscrew - S.S. - Adaptor to Motor - 1/2"	4	4	4	4
33	21254	Lockwasher - S.S. - Adaptor to Motor	4	4	4	4

TECUMSEH PRODUCTS COMPANY'S LIMITED WARRANTY FOR NEW PUMPS MANUFACTURED BY MP PUMPS

A. PRODUCTS WARRANTED

MP PUMPS, Inc., a subsidiary of Tecumseh Products Company ("Tecumseh"), subject to the limitations contained below, will at its option, repair or replace, without charge for parts or labor only, any part or parts of a new pump manufactured by MP PUMPS ("MP PUMPS") which is found, upon examination by Tecumseh's MP PUMPS factory in Fraser, Michigan, to be DEFECTIVE IN MATERIAL AND/OR WORKMANSHIP if received by such factory for such examination within six months from the date of sale to the original consumer purchaser.

B. PRODUCTS AND ITEMS NOT WARRANTED

1. Alterations or Modifications of MP PUMP

   All obligations under this warranty shall be terminated if the new MP PUMP is altered or modified in any way.

2. Accidents, Normal Maintenance, Failure To Follow MP PUMP Instruction Bulletin

This warranty covers only parts of a new MP PUMP which are found upon examination to be defective in material or workmanship as delivered to the original consumer purchaser. This warranty does not cover defects caused by depreciation or damage caused by normal wear, accidents, improper maintenance, improper use or abuse of the product, failure to follow the instructions contained in an Instruction Bulletin for the operation of the pump and parts. The cost of normal maintenance and replacement of service items which are not defective, shall be paid for by the original consumer purchaser.

C. SECURING WARRANTY SERVICE

Warranty service can be arranged by contacting MP PUMPS, Inc., c/o Service Manager, 34800 Bennett Dr., Fraser, Michigan 48026. Warranty service can only be performed by the MP PUMPS Division of Tecumseh at its factory in Fraser, Michigan. At the time of requesting warranty service, evidence must be presented of the date of sale to the original consumer purchaser. The purchaser shall pay any charges for making service calls and/or for transporting the product to and from the place where the inspection and/or warranty work is performed. The purchaser shall be responsible for any damage or loss incurred in connection with the transportation of the MP PUMP and/or of part or parts of the MP PUMP submitted for inspection and/or warranty work.

D. NO ADDITIONAL WARRANTIES OR REPRESENTATIONS

The foregoing EXPRESSED WARRANTY IS IN LIEU OF ALL OTHER EXPRESSED WARRANTIES. Neither Tecumseh nor any of its affiliates make any warranties, representations or promises, written or verbal, as to the quality of the MP PUMP or its parts other than those set forth herein.

ANY IMPLIED WARRANTIES (INCLUDING, BUT NOT LIMITED TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE) TO THE EXTENT EITHER APPLIES TO PART OR PARTS OF A MP PUMP SHALL BE LIMITED IN DURATION TO THE PERIODS OF THE EXPRESSED WARRANTIES AS DEFINED IN PARAGRAPH A. Some states do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply.

E. DAMAGES

IN NO EVENT WILL TECUMSEH BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES AND/OR EXPENSES. Some states do not allow the exclusion or limitation of incidental or consequential damages; so the above limitation may not apply to you. This warranty gives you specific legal rights and you may have other legal rights which vary from state to state.

F. NO DISTRIBUTOR DEALER WARRANTY

Tecumseh neither assumes nor authorizes any other person, natural or corporate, to assume for Tecumseh any other obligations or liabilities in connection with or with respect to any part or parts of a MP PUMP. The seller, dealer or distributor of part or parts of a MP PUMP has no authority to make any representations or promises on behalf of Tecumseh or to modify the terms or limitations of this warranty in any way. The seller, dealer or distributor makes no warranty of his own on any item warranted by Tecumsen and makes no warranty on other items, unless such seller or dealer delivers to the purchaser a separate written warranty document in which the seller or the dealer individually and specifically on its own behalf, warrants the terms or items.

MP PUMPS, INC.

TECUMSEH PRODUCTS COMPANY

34800 BENNETT DRIVE • FRASER, MI 48026-1694

(313) 293-8240 TLX 358-238 FAX (313) 293-8469

LITHO IN U.S.A.

FORM NO. 985

SYRACUSE THERMAL PRODUCTS, INC.
Fluid Handling Equipment

Joe Percival - 437-7321

TO: MALCOLM ~~CARNEY~~ PIRNIE
7481 HENRY CLAY BLVD.
LIVERPOOL, NEW YORK 13088

DATE: APRIL 30, 1990
PROPOSAL: 90-04-0217 JK
DUE DATE: MAY 1,1990
TERMS: NET 30 DAYS

ATTN: STEVE DARCANGELO

REVISION 1

SUB: MP SELF PRIMING PUMP
G.E. SYRACUSE

TWO MP PUMPS, FLOMAX 10 2" X 2", 7 1/2 HP., TEFC, 208/60/3, CAP: 40 GPM AT 120 FT. WITH SUCTION STRAINER

ONE NEMA I DUPLEX CONTROL PANEL, MAGNETIC STARTERS, CIRCUIT BREAKERS, HIGH WATER ALARM LIGHT, INTRINSICALLY SAFE RELAYS FOR MERCURY FLOAT SWITCHES AND (4) MERCURY FLOAT SWITCHES.

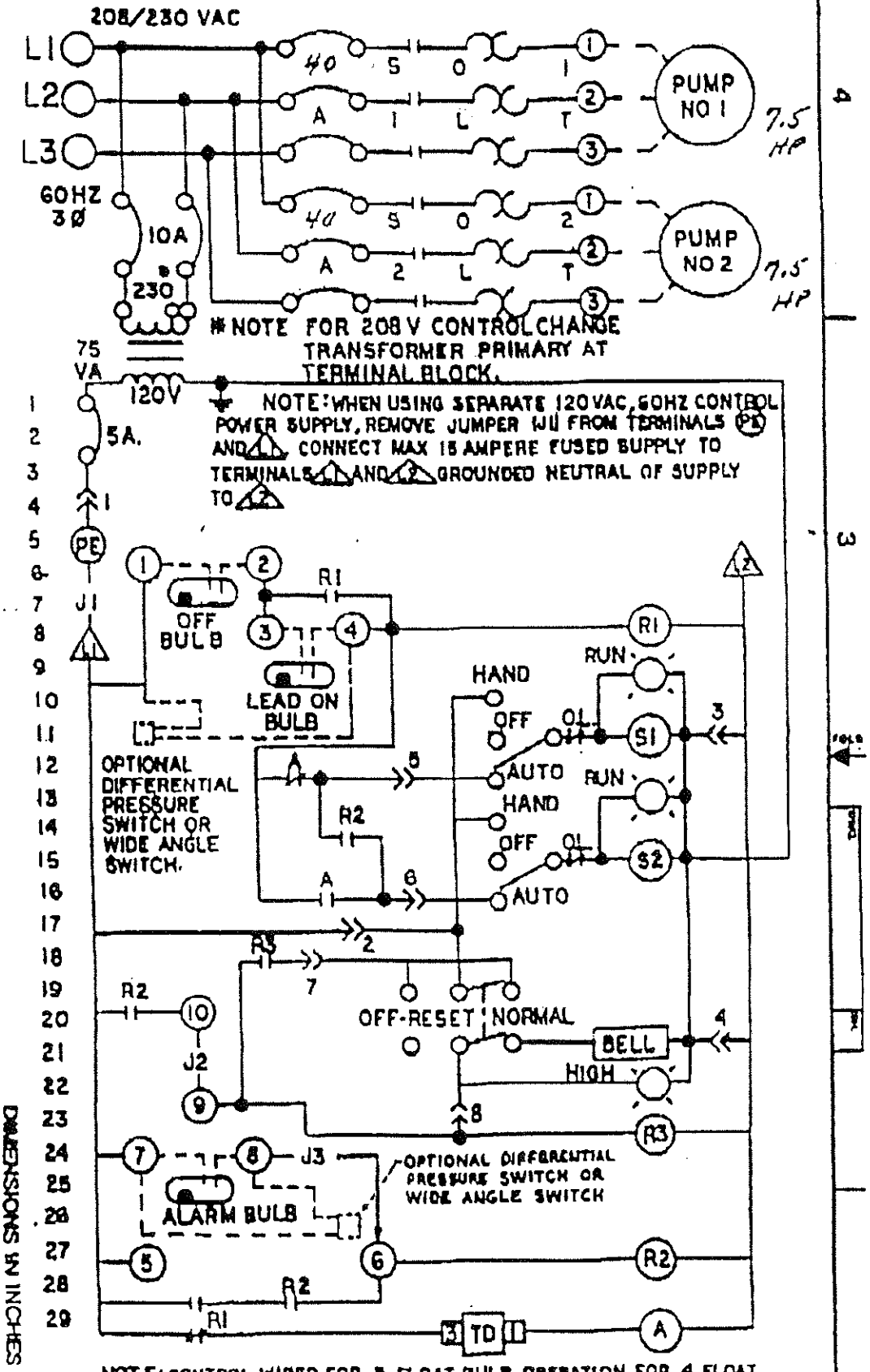
F.O.B. JOBSITE....$ 4,500.00

RESPECTFULLY SUBMITTED,

JOE PERCIVAL

JP/p

6750 Old Collamer Rd. • P.O. Box 398 • East Syracuse, New York 13057 • Phone 315-437-7321 • Fax 315-437-7429



BOULAY FABRICATIONS INC.

BF-4 ?

DIMENSIONS IN INCHES

BOULAY FABRICATION INC.

TITLE

APPROVED

SCALE NONE

SHT 1 OF

DRAWING NO.

INSTRUCTION BULLETIN

FLOMAX SELF-PRIMING CENTRIFUGAL PUMPS

MP PUMPS

This MP FLOMAX pump is a good pump. It was tested under full pressure and at maximum suction before it was shipped. Every precaution has been taken to insure you of trouble-free operation. It will give you many years of service with very little attention.

READ INSTRUCTION BULLETIN CAREFULLY

It is important that this Instruction Bulletin be read over carefully to fully familiarize yourself with the pump assembly arrangement. The instructions contained herein pertain to installation and maintenance of the pump assembly only.

Check unit over carefully to make certain that no parts are missing or broken in shipment.

Packed separately with each unit are instruction booklets, parts lists and performance data.

INSTALLATION:

For optimum performance, place pump as close to liquid source as possible to reduce suction lift to a minimum. For best results, pump should be installed not more than 15 feet above the liquid supply. Set the unit on solid footing and as nearly level as possible.

Pipe or hose of the same size as flanges provided should be used. Reinforced rubber suction hose is recommended because it provides greater flexibility and prevents collapsing due to vacuum in the suction line when pump is in operation. Suction line should be as short as possible and have as few elbows or bends as possible to keep friction loss at a minimum. Use pipe dope on all connections and make certain that all fittings are tight, particularly on the suction line where an air leak can prevent priming or reduce pump capacity.

When necessary, a good suction strainer should be used. Good suction strainers are available from your MP Distributor. Refer to the accessory section of the GENERAL PUMP PRICE LIST for the correct part number.

OPERATION:

The FLOMAX pump is a self-priming centrifugal pump and only requires priming prior to its initial start after which the pump will retain sufficient liquid for self-priming.

CAUTION:

The countersunk pipe plugs or expansion plugs in the pump housing are merely core plugs to facilitate casting and not for the purpose of priming. Do not remove.

Provision for a priming plug can be made by using a close nipple and tee on the discharge opening. A pipe plug installed in the top opening of the tee is easily removed when necessary to prime pump. Prime pump by filling pump housing with liquid.

If pump fails to prime or stops pumping, check for the following possible causes:

1. No liquid in the pump housing.
2. Air leak in the suction line due to loose connections or pin holes in the hose.
3. Collapsed suction line or clogged strainer.
4. Seal worn and leaking air.
5. Worn impeller -- too much clearance between impeller and wear plate.
6. Pump not running fast enough.
7. Suction lift is too high.
8. Trying to prime against too high a discharge head.

MAINTENANCE:

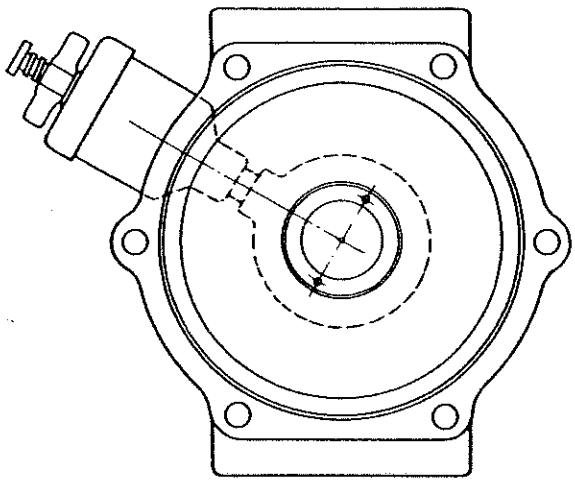
The FLOMAX pump is of simple construction with only one moving part. The impeller on the FLOMAX 5 and 8 is threaded to a stainless steel drive sleeve. The impeller on the FLOMAX 10 and 15 has a stainless steel cover pressed on. The sleeve slips over the drive shaft and is locked to the drive shaft with a two-piece clamp. This means you use a standard drive shaft -- no special tapers or threads. It's easy to adjust or remove the impeller.

FLOMAX pumps are available with either a self-lubricated shaft seal, or a grease lubricated shaft seal.

The self-lubricated seal is lubricated by the liquid in the pump. Do not operate the pump dry because serious damage will result to the seal.

FIGURE 2

INSTALLATION OF SEAL SEAT FOR GREASE SEAL ASSEMBLY



WHEN INSTALLING SEAL SEAT IN PUMP ADAPTER, THE TWO HOLES IN SEAT FACE SHOULD BE AT RIGHT ANGLES TO CENTERLINE OF GREASE FITTING AS SHOWN

This purges the grease cavity of air and insures proper lubrication.

To replace the seal spring, bellows and washer assembly on the impeller sleeve: clean and lubricate the impeller sleeve with light oil, lubricate the inside of the seal bellows (rubber member) with light oil.

Slide the seal bellows, spring and washer assembly onto the impeller sleeve making certain that it seats properly on the shoulder of the impeller. Push the seal down on the sleeve and allow the spring to drive the assembly back up. This insures proper assembly on the sleeve.

IMPORTANT:

The assembly of impeller and seal to drive shaft should take place as soon as the bellows assembly is slipped onto the impeller sleeve so as to avoid bonding of the bellows to the sleeve at improper working height.

MOUNTING IMPELLER:

Do not use drive key between drive shaft and impeller sleeve. The clamp will drive the sleeve. Slide the impeller sleeve onto the drive shaft. Replace impeller clamp and capscrews, lockwashers and nuts.

Before tightening clamp adjust clearance between back face of impeller and adaptor allowing from .015" to .020" clearance. Tighten impeller clamp to lock impeller onto drive shaft. This automatically sets face clearance of impeller when housing is mounted.

MOUNTING PUMP HOUSING:

Replace gaskets on pump housing and mount housing on the adaptor. Replace two lockwashers and nuts on studs diagonally across from each other and tighten. Turn drive shaft over slowly by hand and listen at outlet opening on housing for any rubbing of impeller on the housing or wear plate.

The clearance between the impeller and wear plate can be checked with a feeler gauge. Normal clearance is .015" to .025". If clearance exceeds .025 readjust impeller. If the impeller rubs use an additional gasket to space impeller.

After clearance has been established, replace lockwashers and nuts on remaining studs and tighten. If capscrews and nuts are used to hold housing to mounting base, replace these and tighten.

MOUNTING SEVERE-SERVICE SEAL ASSEMBLY:

The MP PUMPS Severe-Service Seal is a precision assembly requiring care in installation. To insure proper operation it is necessary to install this seal as follows:

1. Thoroughly clean the seal seat cavity in the pump adaptor.
2. Lubricate the seal seat O-Ring with light oil and carefully install the O-Ring in the seal seat cavity in the adaptor. Do not put the seal seat and the O-Ring into the adaptor together.
3. Once the O-Ring is installed and at rest in the cavity without distortion - - then insert the seal seat firmly in the O-Ring in the adaptor.
4. Using a soft clean cloth, clean and lubricate both seal faces with light oil.
   NOTE: Any foreign matter between seal faces will cause leakage and shorten seal life.
5. Complete assembly of seal and pump - - see above.
6. Rotate by hand before start up.

MP PUMPS, INC.
TECUMSEH PRODUCTS COMPANY
34800 Bennett Dr. Fraser, MI 48026-1686
(810) 293-8240
Fax: (810) 293-8469

INSTRUCTION, INSTALLATION AND SERVICE BULLETIN NO. 64558 FOR GEMS LOW SENSITIVITY SAFE-PAK® AND LATCHING SAFE-PAK

This bulletin covers low sensitivity models:
SAFE-PAK 64101
LATCHING SAFE-PAK 64098
for use as an "intrinsically safe switch circuit," for use in a hazardous location with non-voltage-producing sensors. When SAFE-PAK installation is in accordance with this guide, these field sensors are suitable for Class 1, Division 2, Groups A, B, C and D, and Class II, Division 2, Groups E, F and G as defined by Article 500 of the National Electric Code.

IMPORTANT: Read carefully and completely before installing or connecting SAFE-PAK, LATCHING SAFE-PAK.

Associated Equipment—Caution: The Safe-Pak must be mounted outside the hazardous area; only the switch or sensor terminals provide an intrinsically-safe switch circuit (see Fig. 1 or 2).

Mounting and enclosure considerations:

A. Field wiring of intrinsically safe circuits is to be segregated from non-intrinsically safe wiring by use of suitable barriers, separate wireways or trays (see Fig. 3).

B. Intrinsically safe and non-intrinsically safe connection points should be located sufficiently apart to prevent any possibility of bypassing or miswiring during installation or servicing of equipment.

C. The enclosure shall contain a cautionary statement as follows: "CAUTION: ANY SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY."

D. The PAK mounting bracket must be grounded to ensure intrinsic safety. Resistance between bracket and ground electrode should be below one ohm. (See Figs. 4 and 5 for recommended selection of grounding hardware, and refer to Article 250 of the National Electric Code for methods and practice.)

Installation of sensor switch and running of field wiring:

A. The nature of the sensor switch must be that it is a non-voltage-producing, essentially resistive termination, or other device specifically examined and approved for use with the PAK.

B. The conductors of the intrinsically safe circuit should be sealed in a rigid metal conduit at the point where the wiring enters the hazardous area; the wiring and contacting device should be such that conductive dusts in the area will not close the circuit in place of the contacts.

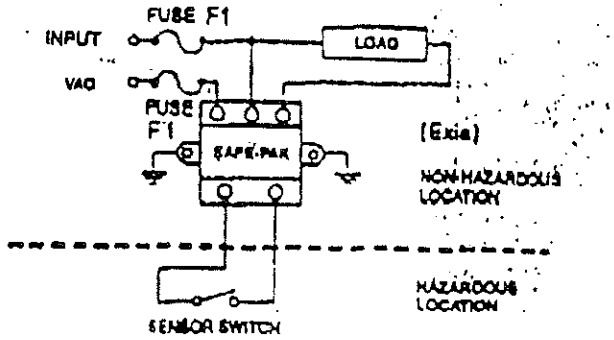


Fig. 1. Connection diagram, Gems SAFE-PAK models.
NOTE: For 120V application, only one fuse is required in the underground conduit of the input line.

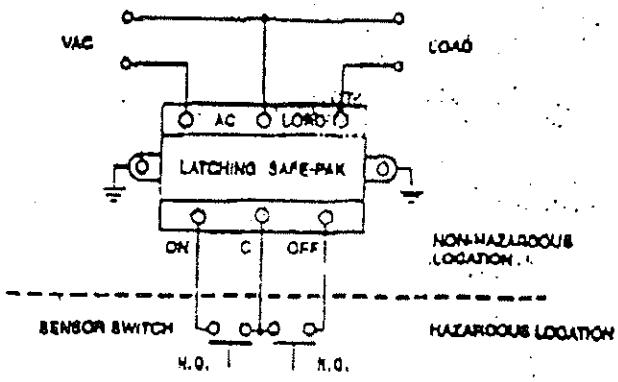
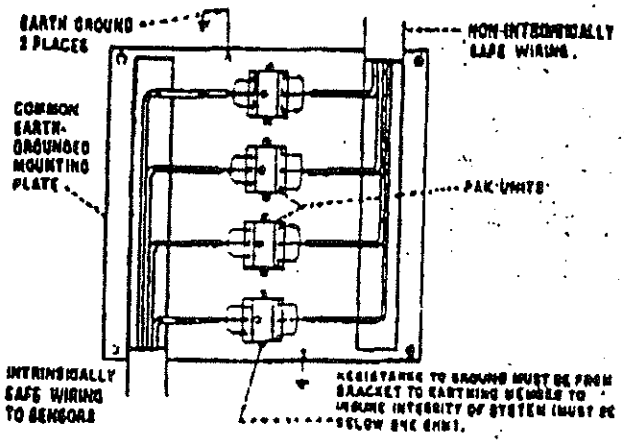


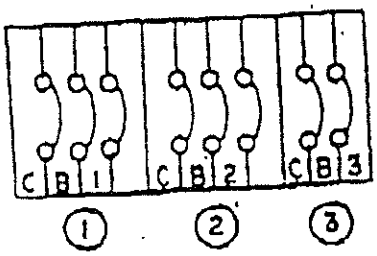
Fig. 2. Connection diagram, Gems LATCHING SAFE-PAK.

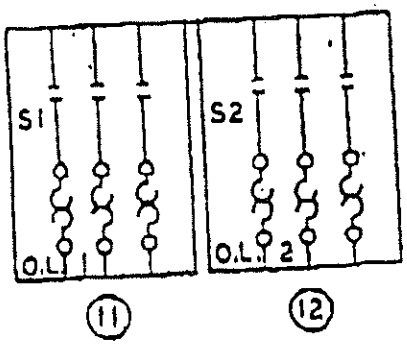


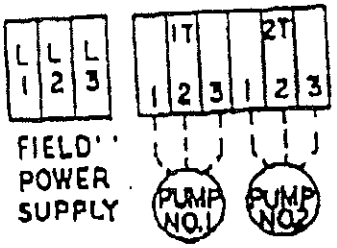
Note: All intrinsically safe-wiring must be segregated from non-intrinsically safe wiring.

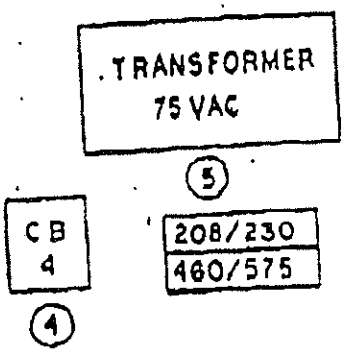
Fig. 3. Multiple PAK units grouped on common, earth-grounded mounting plate.

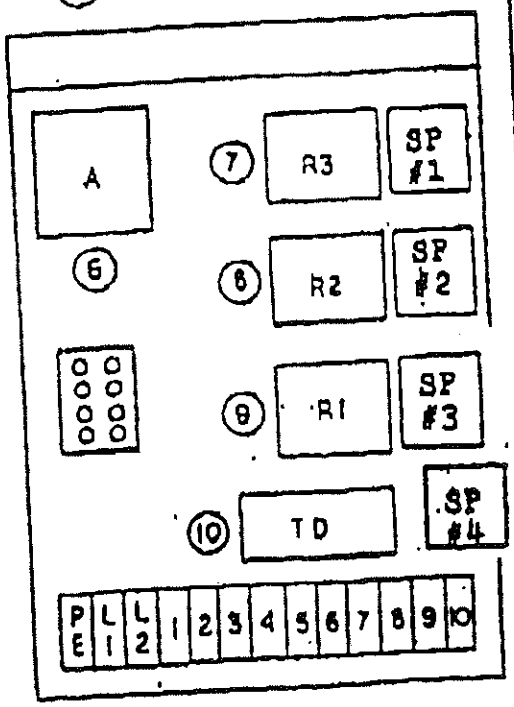
ITEM NO	DESCRIPTION	PART NO.
1,2,3,4	CIRCUIT BREAKER	VARIES WITH SUPPLIER & RATING
5	TRANSFORMER	BF8640
11,12	CONTACTOR./O.L.	~~150F32AF81~~ 16EF32AF81
CONTROL MODULE CONTAINS:		BF-8630
6	RELAY, LATCHING	569R5AB01-120
7, 8, 9	RELAY, 3 PDT	KUP14A15-120
10	RELAY, TIME DELAY	TXL 1001CB











FLOAT BULB TERMINAL
1-2 LOW (PUMP OFF)
3-4 LEAD (PUMP ON)
5-6 LAG (PUMP ON) (4 FLOAT CONTROL ONLY)
7-8 ALARM
9-10 NO FIELD CONNECTION (SEE NOTE ON WIRING DIAGRAM)

COMPONENT ARRANGEMENT AND FIELD CONNECTIONS

DIMENSIONS IN INCHES

BOULAY FABRICATIONS INC.
BF—402/404

BF-402 and 404

GM-44-0217-D

FILTER BAG HOUSINGS AND FILTERS

HOUSINGS

Manufacturer:

Filtration Systems
Division of Mechanical Mfg. Corp.
10304 NW 50th Street
Sunrise, FL 33351
(305) 572-2700

Features:

Carbon Steel
Duplex Chamber
Capacity - 50 gpm

FILTERS

Manufaturer:

3M Filtration Products
3M Center, 76-1W
St. Paul, MN 55144-1000

Features:

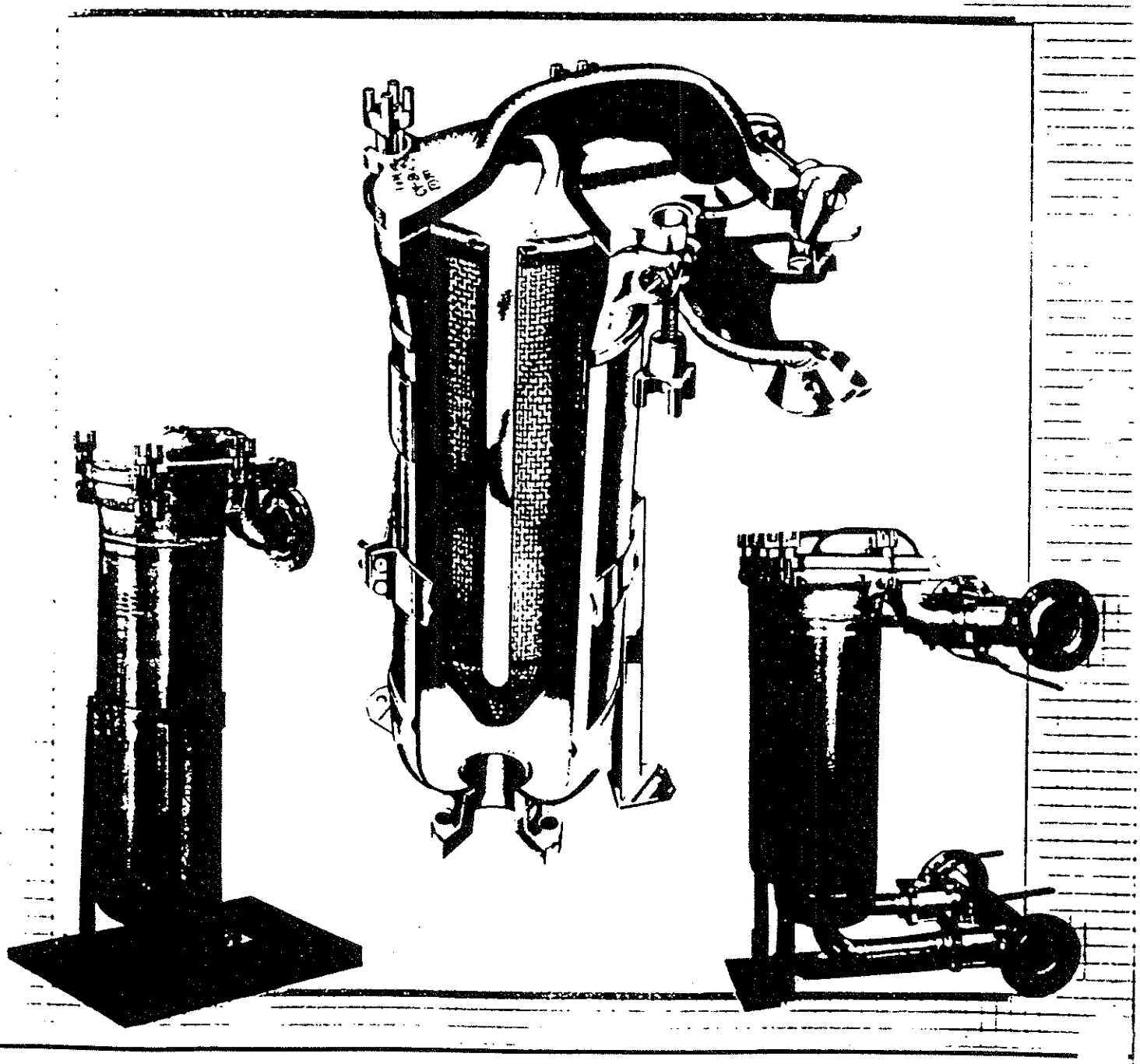
Series 500 High Performance Liquid Liquid Filter Bags
Primary Filter - 529A; Effective Pore Size 23 Micron
Secondary Filter - 527A; Effective Pore Size - 9 Micron

Supplier (Housings & Filters):

AFTEK, Inc.
740 Driving Park
Rochester, NY 14613
(716) 458-7550
Contact - Kathy Russel

Brochure **A**

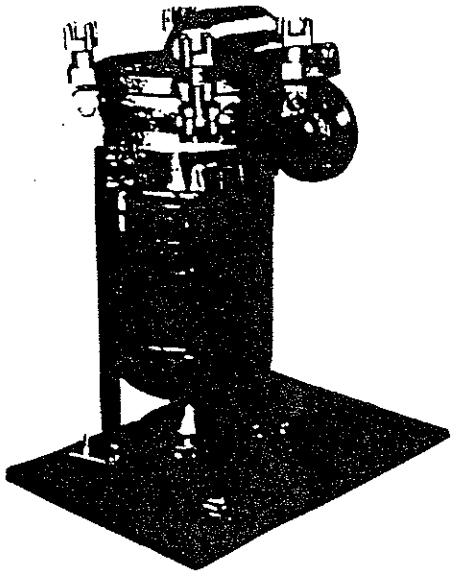
Liquid Filter Bag Housings

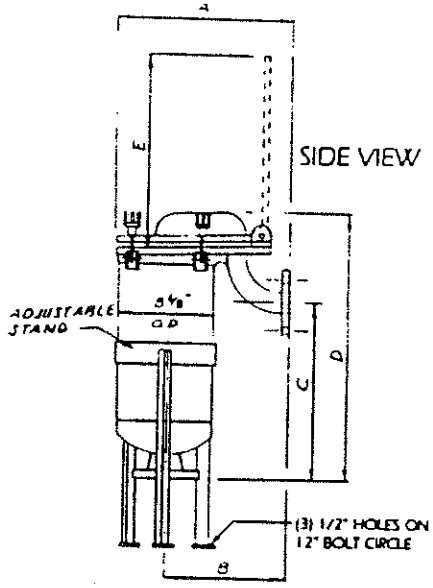


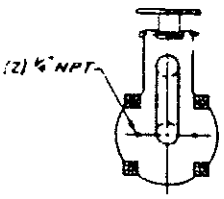
Filtration Systems™

Division of Mechanical Mfg. Corporation

Model S-112 (type 316 stainless)







Description: Model S-112 Bag Filter Housing in T-316 Stainless Steel at 150 or 300 psi (450°F).

Vessel features over the top inlet, hinged closure and accommodates a size #1 filter bag. (#1 bag : 7" dia. x 16" long).

Filter Area: 2.2 sq. ft.
Maximum Water Flow: 110 gpm.
(Does not include a filter bag)

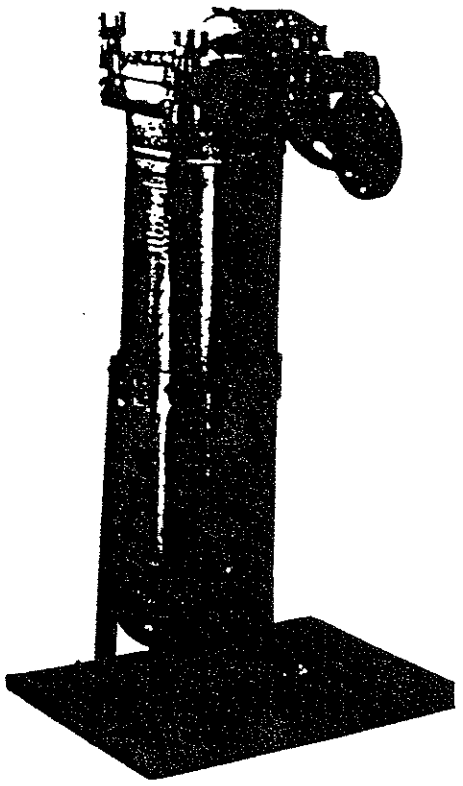
This housing is also available in Carbon Steel (Model C-112) at 150 or 300 psi (650°F).

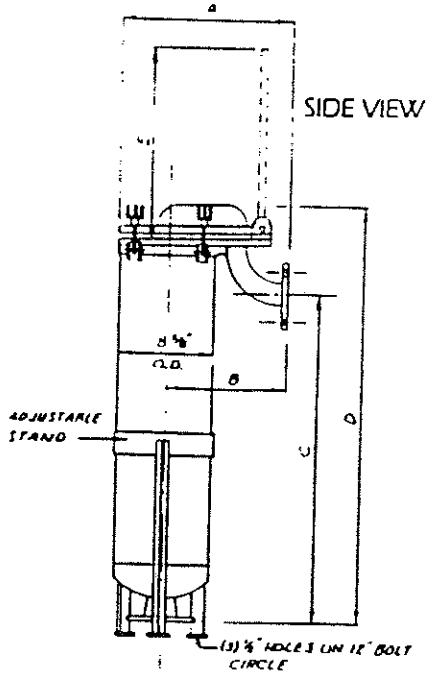
Standard Features:

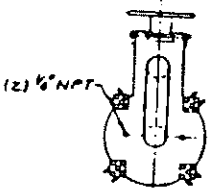
ASME U Stamp (meets OSHA requirements)
ASA B16.5 Raised Face Forged Flanges
Electropolished Exterior Finish (S-112)
One Coat Shop Primer (C-112)
Two 1/4" NPT connections in lid
Perforated T-316 stainless steel support basket
Adjustable Stainless Tripod Stand (S-112)
Adjustable Carbon Steel Tripod Stand (C-112)
Stainless Steel Hardware (S-112)
Carbon Steel Hardware (C-112)
Buna-N O-Rings

Model S-112	A	B	C	D	E	WT. LBS.
Flange Connection 2"	15 1/2"	11"	14 3/8"	21 3/4"	14"	115

Model S-122 (type 316 stainless)







Description: Model S-122 Bag Filter Housing in T-316 Stainless Steel at 150 or 300 psi (450°F).

Vessel features over the top inlet, hinged closure and accommodates a size #2 filter bag. (#2 bag : 7" dia. x 32" long).

Filter Area: 4.5 sq. ft.
Maximum Water Flow: 220 gpm.
(Does not include filter bag)

This housing is also available in Carbon Steel (Model C-122) at 150 or 300 psi (650°F).

Standard Features:

ASME U Stamp (meets OSHA requirements)
ASA B16.5 Raised Face Forged Flanges
Electropolished Exterior Finish (S-122)
One Coat Shop Primer (C-122)
Two 1/4" NPT connections in lid
Perforated T-316 stainless steel support basket
Adjustable Stainless Tripod Stand (S-122)
Adjustable Carbon Steel Tripod Stand (C-122)
Stainless Steel Hardware (S-122)
Carbon Steel Hardware (C-122)
Buna-N O-Rings

Model S-122	A	B	C	D	E	WT. LBS.
Flange Connection 2"	15 1/2"	11"	28"	35 3/4"	14"	140

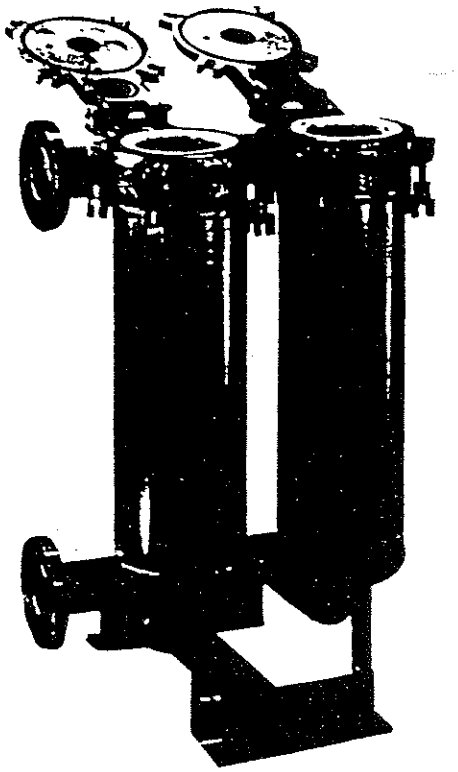
Model S-223 (type 316 stainless)

Description: Model S-223 in T-316 Stainless Steel, at 150 or 300 psi (450°F), is a duplex filtration system utilizing two size #2 filter bags.

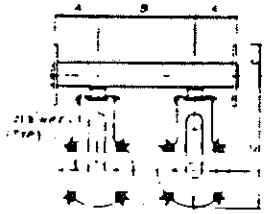
This non-valved, duplex system is also available in Carbon Steel (C-223) at 150 or 300 psi (650°F).

Standard Features:

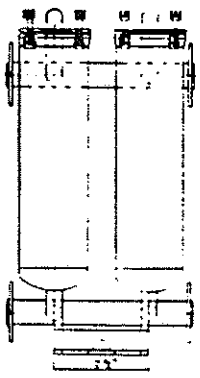
ASME U Stamp (meets OSHA requirements)
ASA B16.5 Raised Face Forged Flanges
Electropolished Exterior Finish (S-223)
One Coat Shop Primer (C-223)
Two 1/4" NPT Connections in Lid
Perforated T-316 stainless steel support baskets
Stainless Steel Frame (S-223)
Carbon Steel Frame (C-223)
Buna-N O-Rings



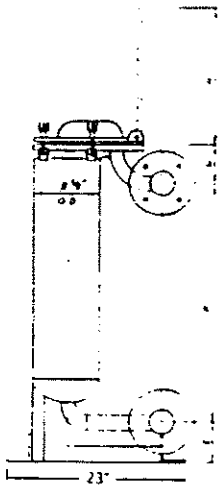
TOP VIEW



FRONT VIEW



SIDE VIEW



Model S-223	A	B	C	D	E	F	G	H	WT. LBS.
Flange Connection 3"	5"	12"	16 1/2"	4"	4 3/4"	29"	4 1/4"	14"	280

Model S-223-V (type 316 stainless)

Description: Model S-223-V in T-316 Stainless Steel, at 150 or 300 psi (450°F), is a valved, duplex filtration system, utilizing two size #2 filter bags.

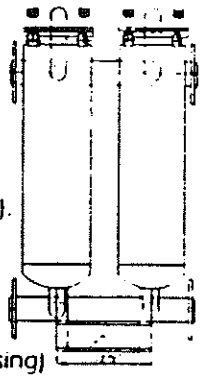
Individually valved modules may operate independently or simultaneously, providing uninterrupted service during filter bag changes. Concurrent operation of both housings doubles the flow rate.

This valved, duplex system is also available in Carbon Steel (C-223-V) at 150 or 300 psi (650°F).

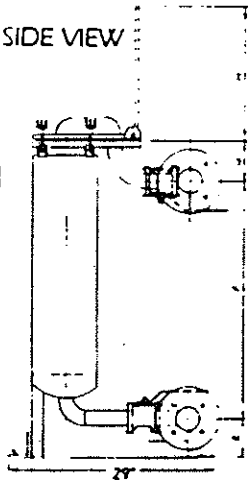
Standard Features:

ASME U Stamp (meets OSHA requirements)
ASA B16.5 Raised Face Forged Flanges
Four (4) full-port, oversize ball valves (2 per housing)
Electropolished Exterior Finish (S-223-V)
One Coat Shop Primer (C-223-V)
Two 1/4" NPT Connections in Lid
Perforated T-316 stainless steel support baskets
Stainless Steel Frame (S-223-V)
Carbon Steel Frame (C-223-V)
Buna-N O-Rings

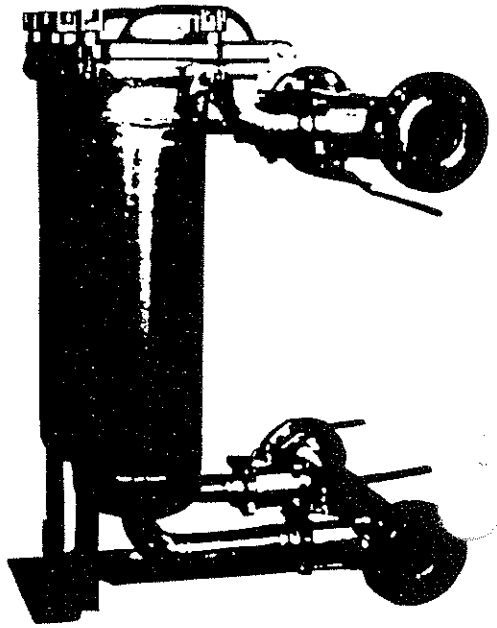
FRONT VIEW
Note: Valves not shown in this view



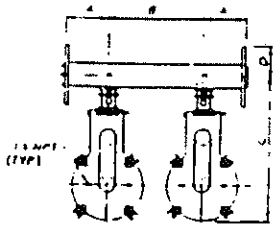
SIDE VIEW



Four Valves for Dual Flow



TOP VIEW



Model S-223-V	A	B	C	D	E	F	G	H	WT. LBS.
Flange Connection 3"	5"	12"	22 1/2"	4"	4 3/4"	29"	4 1/4"	14"	330

Systems Available For All Flow Rate Requirements

NOTE: All Models are available in T-316 stainless steel or carbon steel, 150 or 300 psi, valved or non-valved.

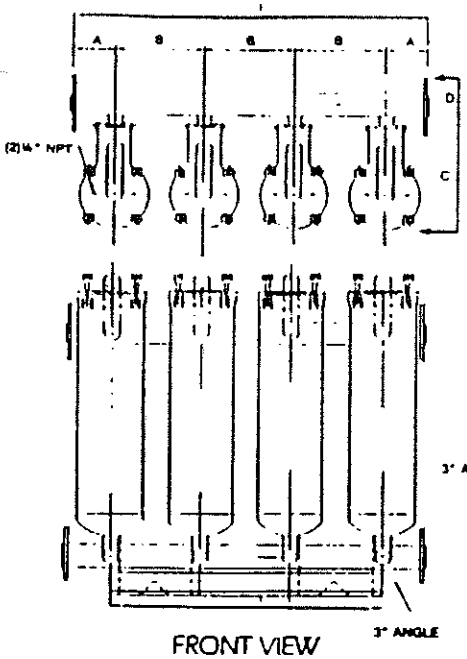
Model	Number of Modules	Flange Size in Inches	*Max Water Flow (gpm)	Filter Area (square feet)	ALL DIMENSIONS ARE IN INCHES										Shipping Wgt. in Lbs.
					A	B	C	D	E	F	G	H	I	J	
223	2	3	440	9	5	12	16 1/2	4	4 3/4	29	4 1/4	14	22	12 1/2	280
324	3	4	660	13.5	5	12	17	4 3/4	5 1/4	29	4 1/4	14	34	24 1/2	420
424	4	4	880	18	5	12	17	4 3/4	5 1/4	29	4 1/4	14	46	36 1/2	560
526	5	6	1100	22.5	5	12	18	5 3/4	6 3/8	29	4 1/4	14	58	48 1/2	700
626	6	6	1320	27	5	12	18	5 3/4	6 3/8	29	4 1/4	14	70	60 1/2	840
726	7	6	1540	31.5	5	12	18	5 3/4	6 3/8	29	4 1/4	14	82	72 1/2	980
826	8	6	1760	36	5	12	18	5 3/4	6 3/8	29	4 1/4	14	94	84 1/2	1120

NOTE: *Flow rates provided are based on the housing without a filter bag. The flow rate achieved is determined by the specific application as well as the characteristics of the filter bag.

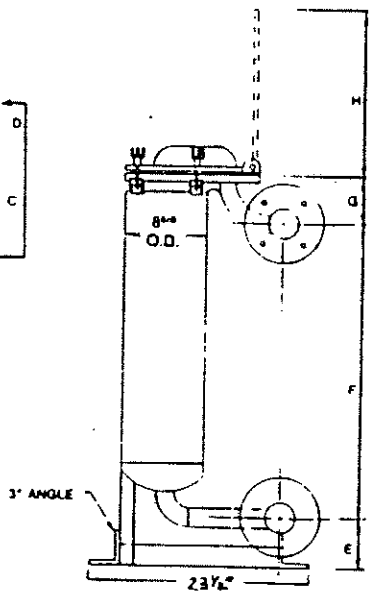
Alternate O-Rings To Meet Compatibility Needs Are Available.

OPTIONS: Modified Flange Connections
Micron Rated Strainer Baskets
Steam and Hot Oil Jackets
***Low-Profile, Horizontal Outlets**
Cartridge Contaminant Chambers

TOP VIEW

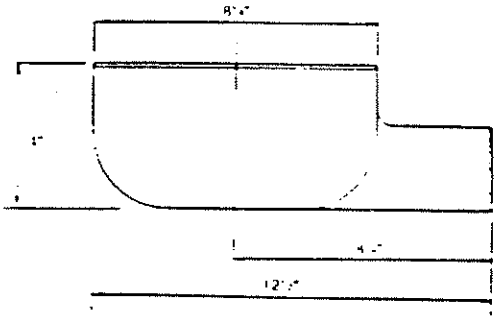


FRONT VIEW



SIDE VIEW

One piece, self-cleaning horizontal outlet is optional for all systems. Reduces filter bag removal clearance height by 4" on single vessels and 3" on modular vessels.



All multi-module units have four (4) full-sized, flanged connections which allow for the following:

- Inspection
- Flange-to-Flange Cleaning
- Alternate Connections

Manufactured By:

Filtration Systems™

Division of Mechanical Mfg. Corporation
10304 NW 50th Street, Sunrise, Florida 33351
Tel: (305) 572-2700
Fax: (305) 572-3401

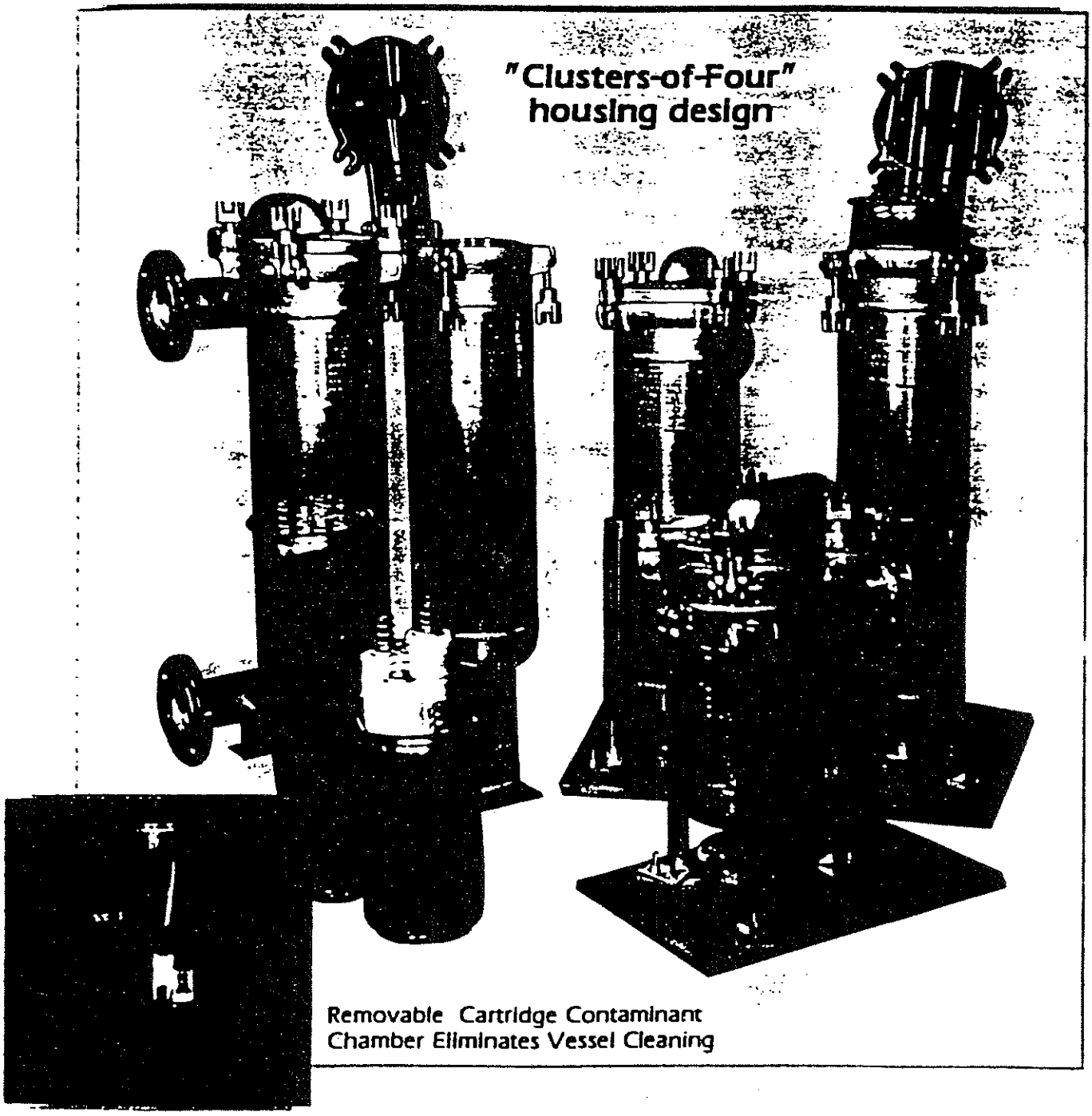
Authorized Distributor

Product Warranty: In the event any vessel is found to be defective in material or workmanship, for a period of one year from date of purchase, Filtration Systems only liability will be to repair or replace the product.

The manufacturer reserves the right to change specifications without notice. There are no expressed or implied warranties, with respect to product merchantability and/or fitness for a specific purpose. Filtration Systems will not be liable for any incidental damages from the use or misuse of our products under any circumstances.

Brochure **D**

Cartridge Filter Housings



Removable Cartridge Contaminant
Chamber Eliminates Vessel Cleaning

Filtration Systems™

Division of Mechanical Mfg. Corporation

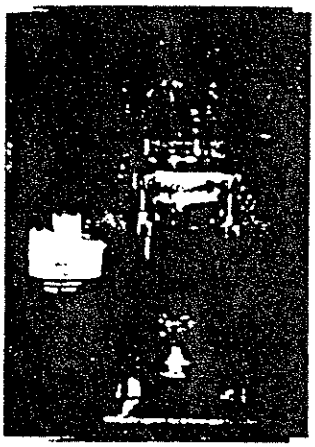
Filtration Systems' Cartridge Filter Housings feature these unique characteristics:

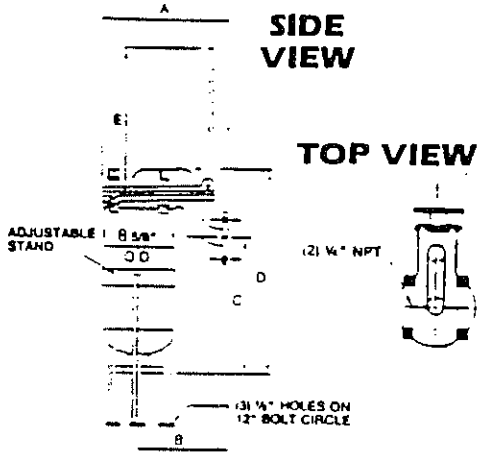
"Clusters-of-Four" cartridge filter arrangement

Housings in three sizes accommodate four 10", 20" or 30" standard cartridge filters or equivalent. Housings are designed to provide flow rates for a broad range of liquid and gas applications.

Removable, positive sealing Cartridge Contaminant Chamber eliminates vessel cleaning. A spare chamber, preloaded with four cartridges, can be quickly inserted to minimize down time. Spent cartridges can be replaced in the reusable chamber and prepared for the next change out.

Filtration Systems' Duplex System (Model S-233-V, shown on page 3) provides uninterrupted service, allowing flow through one housing while the chamber in the other is being changed. Operation of both housings simultaneously doubles the flow rate and increases the cartridge life.





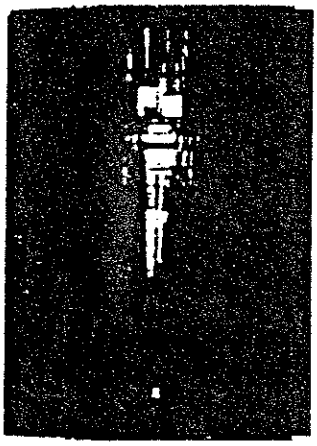
Model S-110 Cartridge Filter Housing in T-316 Stainless Steel at 150 or 300 psi (450°F).

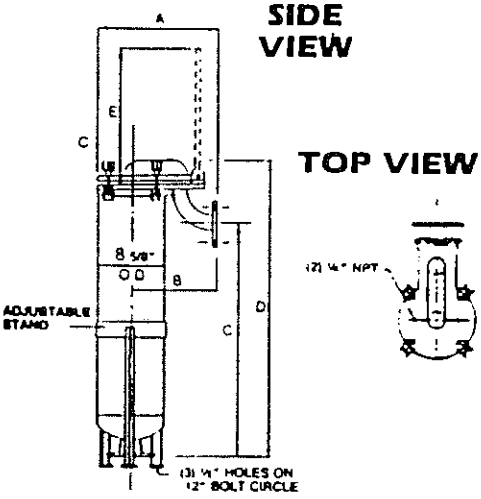
Holds four 10" standard cartridge filters.

This housing is also available in Carbon Steel (Model C-110) at 150 or 300 psi (650°F).

Both types have ASME U Stamp and meet OSHA requirements.

MODEL S-110	A	B	C	D	E	Wt. lbs.
FLANGE CONNECTION 2"	15¾"	11"	14"	21¾"	14"	115





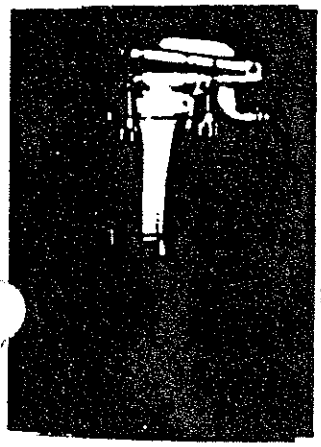
Model S-120 Cartridge Filter Housing in T-316 Stainless Steel at 150 or 300 psi (450°F).

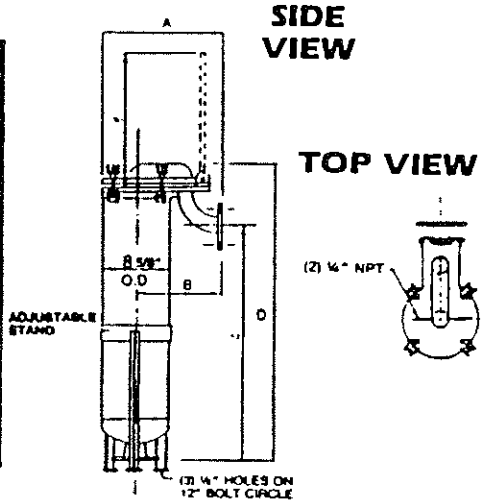
Holds four 20" standard cartridge filters or equivalent.

This housing is also available in Carbon Steel (Model C-120) at 150 or 300 psi (650°F).

Both types have ASME U Stamp and meet OSHA requirements.

MODEL S-120	A	B	C	D	E	Wt. lbs.
FLANGE CONNECTION 2"	15¾"	11"	28"	35¾"	14"	140





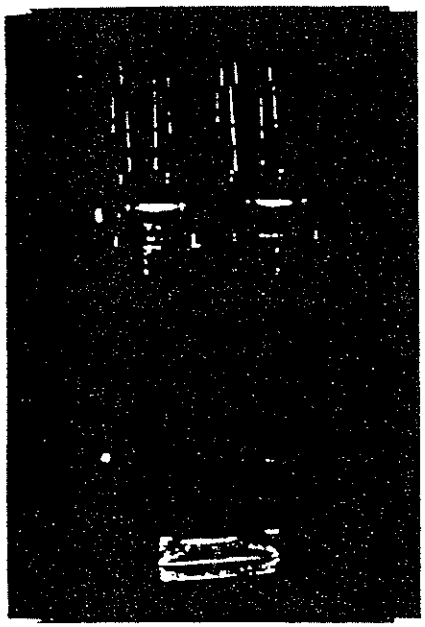
Model S-130 Cartridge Filter Housing in T-316 Stainless Steel at 150 or 300 psi (450°F).

Holds four 30" standard cartridge filters or equivalent.

This housing is also available in Carbon Steel (Model C-130) at 150 or 300 psi (650°F).

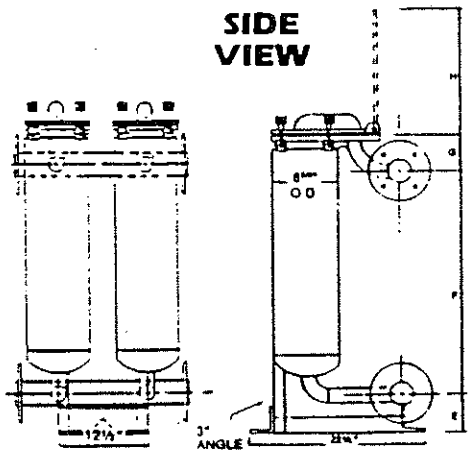
Both types have ASME U Stamp and meet OSHA requirements.

MODEL S-130	A	B	C	D	E	Wt. lbs.
FLANGE CONNECTION 2"	15¾"	11"	32"	39¾"	14"	150

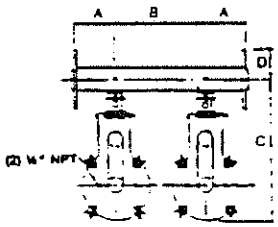


MODEL S-233

SIDE VIEW



TOP VIEW

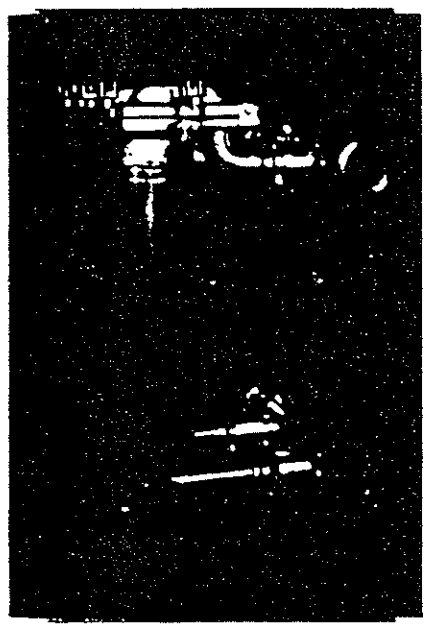


Model S-233 in T-316 Stainless Steel, at 150 or 300 p (450°F), is a duplex filtration system utilizing eight standard 30" cartridges or equivalent.

This non-valved, duplex system is available in Carbon Steel also at 150 or 300 psi (Model C-233).

Both types have ASME U Stamp and meet OSHA requirements.

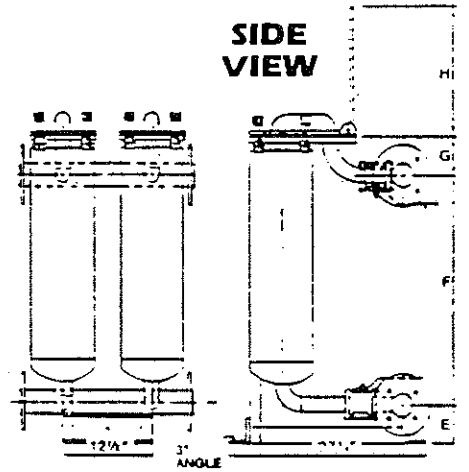
MODEL S-233	A	B	C	D	E	F	G	H	Wt. lbs.
FLANGE CONNECTION 3"	5"	12"	16"	4"	4¼"	33"	4¼"	14"	300



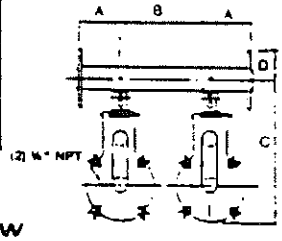
MODEL S-233-V

Valved System for Constant Flow

SIDE VIEW



TOP VIEW



Model S-233-V in T-316 Stainless Steel, at 150 or 300 psi, is a valved, duplex filtration system utilizing eight standar 30" cartridges or equivalent.

This model is available in Carbon Steel also at 150 or 300 psi (Model C-233-V).

Both types have ASME U Stamp and meet OSHA requirements.

MODEL S-233-V VALVED	A	B	C	D	E	F	G	H	Wt. lbs.
FLANGE CONNECTION 3"	5"	12"	20"	4"	4¼"	33"	4¼"	14"	350

Standard Features for all Cartridge Filter Housings

Stainless Steel

Model S-110
Model S-120
Model S-130

ASA B16.5 Raised Face Forged Flanges
Electropolish finish (single housings)
Two ¼" NPT Connections in Lid
T-316 Stainless Steel, removable Contaminant Chamber with cartridge filter hardware:

- top seat plate and spring
- notched v-post cartridge holder
- bottom seat plate

Buna-N positive sealing gasket
Adjustable stainless steel tripod stand
ASME U Stamp

Carbon Steel

Model C-110
Model C-120
Model C-130

ASA B16.5 Raised Face Forged Flanges
One Coat Shop Primer
Two ¼" NPT Connections in Lid
T-316 Stainless Steel, removable Contaminant Chamber with cartridge filter hardware:

- top seat plate and spring
- notched v-post cartridge holder
- bottom seat plate

Buna-N positive sealing gasket
Adjustable carbon steel tripod stand
ASME U Stamp

ALTERNATE GASKET MATERIALS TO MEET COMPATIBILITY NEEDS ARE AVAILABLE

Selection Chart

Systems Available for All Flow Rate Requirements

Note: All Models are available in stainless steel or carbon steel, 150 or 300 psi, valved or non-valved.

Model	Maximum Cartridge Water Flow (gpm)	No. of 30" Cartridges	ALL DIMENSIONS ARE IN INCHES											Shipping Wgt. in lbs.
			Flange Size	A	B	C	D	E	F	G	H	I	J	
233	120	8	3	5	12	16	4	5¼	33	4¼	14	22	12½	300
334	180	12	4	5	12	17	4¾	5¼	33	4¼	14	34	24½	450
434	240	16	4	5	12	17	4¾	5¼	33	4¼	14	46	36½	600
536	300	20	6	5	12	18	5¾	5¼	33	4¼	14	58	48½	750
636	360	24	6	5	12	18	5¾	5¼	33	4¼	14	70	60½	900
736	420	28	6	5	12	18	5¾	5¼	33	4¼	14	82	72½	1050
836	480	32	6	5	12	18	5¾	5¼	33	4¼	14	94	84½	1200

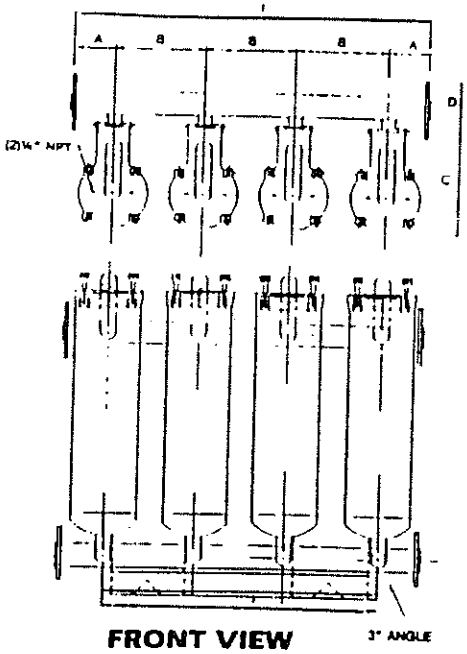
How to Order:

Model S-110, Stainless Steel, single housing holds 4 standard 10" cartridges
Model C-120, Carbon Steel, single housing holds 4 standard 20" cartridges or equivalent
Model S-233, Stainless Steel, duplex system holds 8 standard 30" cartridges or equivalent (four 30" cartridges or equivalent per housing)
Model S-233-V same as S-233 but with valves

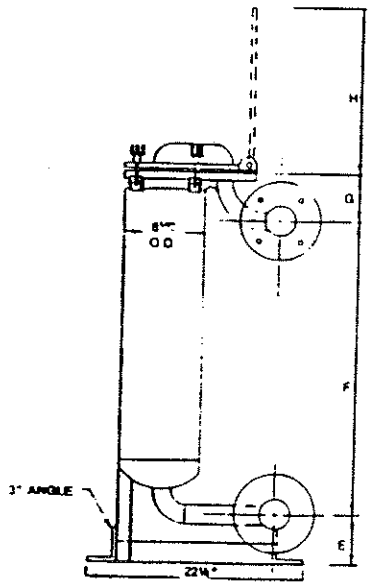
All Housings are designed for "Clusters-of-Four"

(each housing holds four cartridges)

TOP VIEW



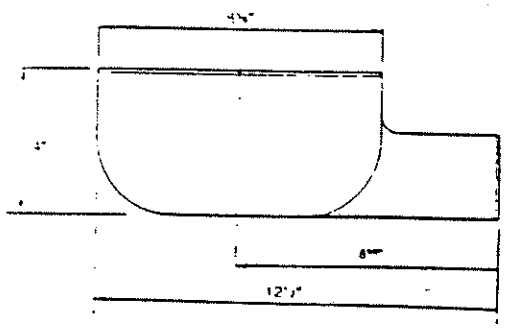
FRONT VIEW



SIDE VIEW

LOW-PROFILE, HORIZONTAL OUTLET AVAILABLE ON ALL MODELS

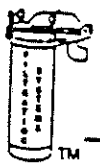
One piece, self-cleaning horizontal outlet is optional for all systems. Reduces filter bag removal clearance height by 4" on single vessels and 3" on modular vessels.



MODEL S-434

All multi-module units have four (4) full-sized, flanged connections which allow for the following:

- **Inspection**
- **Flange-to-Flange Cleaning**
- **Alternate Connections**



Manufactured By:

Filtration Systems TM

Division of Mechanical Mfg. Corporation
10304 NW 50th Street, Sunrise, Florida 33351
Tel: (305) 572-2700
Fax: (305) 572-3401

Authorized Distributor:

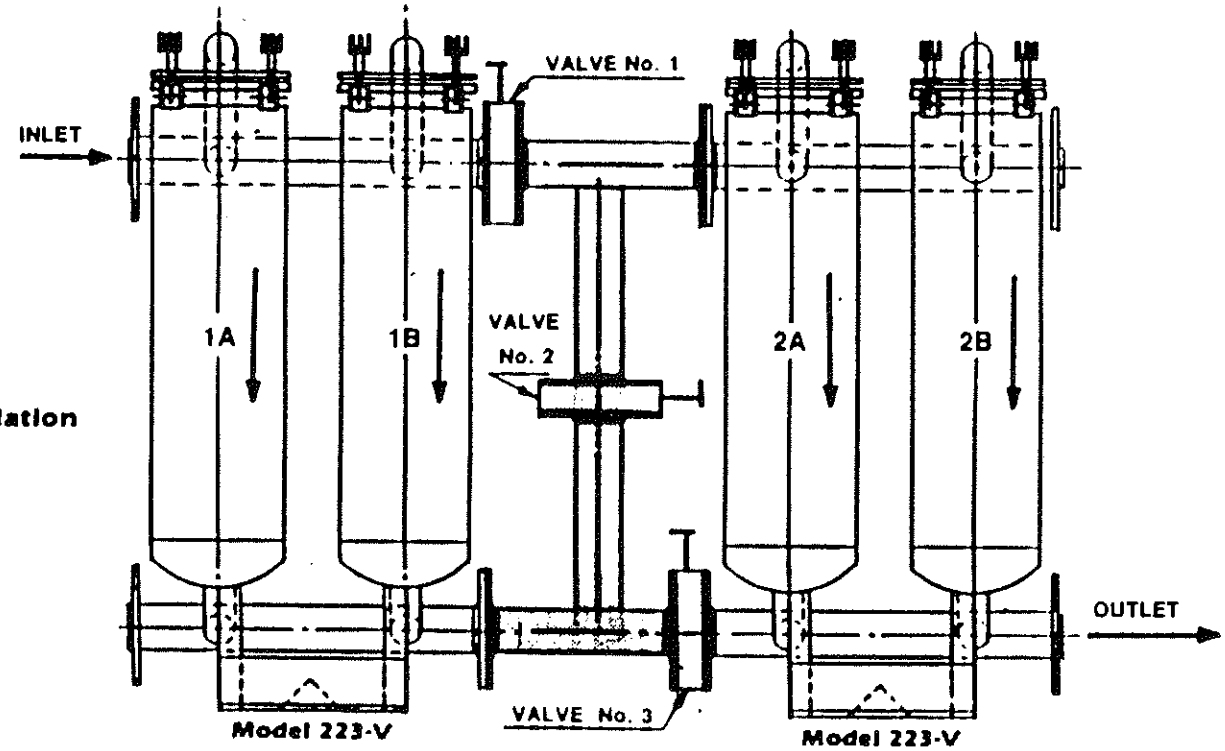
Product Warranty: In the event any vessel is found to be defective in material or workmanship, for a period of one year from date of purchase, Filtration Systems only liability will be to repair or replace the product.

The manufacturer reserves the right to change specifications without notice. There are no expressed or implied warranties, with respect to product merchantability and/or fitness for a specific purpose. Filtration Systems will not be liable for any incidental damages from the use or misuse of our products under any circumstances.

Single & Two Stage Filtration Arrangements for Modular Systems

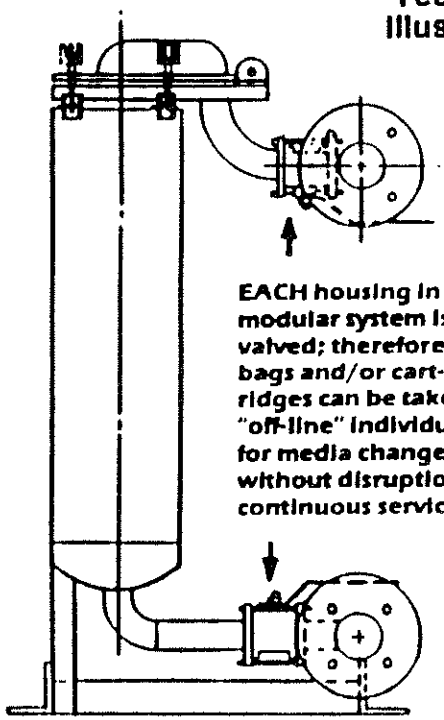
Filtration Systems

Division of Mechanical Mfg. Corporation



*FRONT VIEW

Technical Illustration A



EACH housing in this modular system is valved; therefore, bags and/or cartridges can be taken "off-line" individually for media changes without disruption of continuous service.

SIDE VIEW

Field Installation

IMPORTANT: In all combinations of filtration arrangements and/or Media Selection, a single vessel can be shut down for media change without disruption of service.

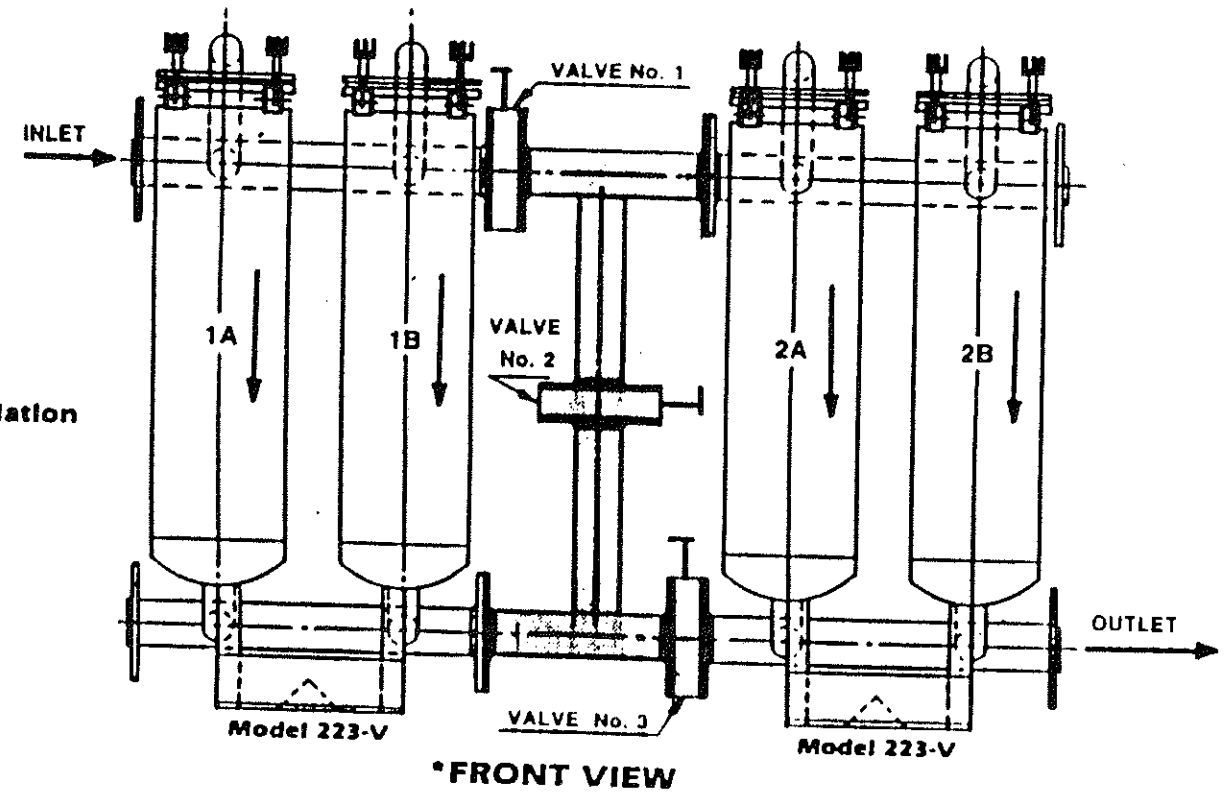
(*Note: For simplification, valves on vessels 1A, 1B, 2A, 2B do not appear in the front view -See Side View)

Filtration Arrangement	Valves Open	Valves Closed	Flow Path	
Single Stage Filtration Filtration takes place in all four vessels simultaneously using micron-rated, strainer baskets, bags or cartridges.	No. 1 & 3	No. 2	Inlet of 1A, 1B & 2A, 2B at top through 1A, 1B & 2A, 2B to outlet at bottom	
Two Stage Filtration Filtration takes [illegible] in vessels 1A & 1B first, then goes to vessels 2A & [illegible]d second, using any combination of	No. 2	No. 1 & 3	Inlet of 1A & 1B at top through 1A & 1B outlet at bottom Then Inlet of 2A & 2B at top	1st Stage 2nd

Single & Two Stage Filtration Arrangements for Modular Systems

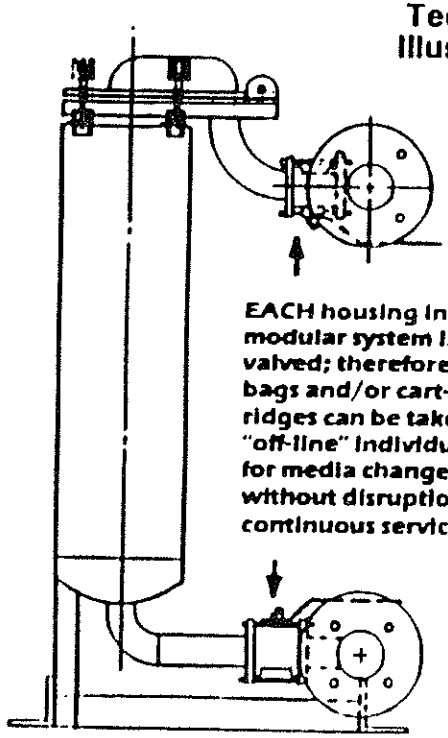
Filtration Systems
Division of Mechanical Mfg. Corporation

Field Installation



*FRONT VIEW

Technical Illustration A



EACH housing in this modular system is valved; therefore, bags and/or cartridges can be taken "off-line" individually for media changes without disruption of continuous service.

SIDE VIEW

IMPORTANT: In all combinations of filtration arrangements and/or Media Selection, a single vessel can be shut down for media change without disruption of service.

(*Note: For simplification, valves on vessels 1A, 1B, 2A, 2B do not appear in the front view -See Side View)

Filtration Arrangement	Valves Open	Valves Closed	Flow Path	
Single Stage Filtration ration takes place in all four vessels simultaneously ıg micron-rated, strainer baskets, bags or cartridges.	No. 1 & 3	No. 2	Inlet of 1A, 1B & 2A, 2B at top through 1A, 1B & 2A, 2B to outlet at bottom	
Two Stage Filtration ltration takes place in vessels 1A & 1B first, then goes to	No. 2	No. 1 & 3	Inlet of 1A & 1B at top through 1A & 1B outlet at bottom Then	] 1st Stage

3M Filtration Products

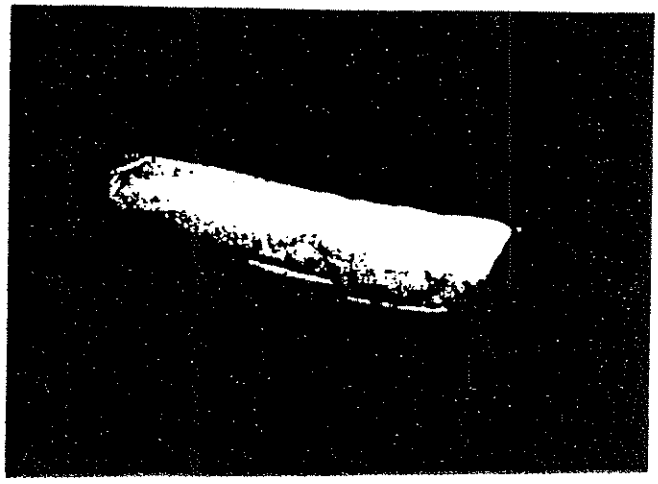
3M Brand High Performance Liquid Filter Bag Series 500

The 3M Brand Series 500 High Performance Liquid Filter Bag is a unique new filter designed to improve filtration performance and reduce operating costs. The 3M Filter contains over 30 sq. ft. of usable filter media. This compares with only 4.4 sq. ft. for most filter bags and .65 sq. ft. for most cartridges. To make use of all this surface area, the Series 500 Liquid Filter Bag is constructed using the Bypass/Transport concept invented by 3M researchers. Specially designed bypass holes are cut into certain areas of the filter media to prevent premature blinding of the filter. In conjunction with the bypass design, a second media called a transport layer helps to distribute fluid flow evenly through the filter. The outermost layers of the filter provide a highly uniform barrier for final particle filtration. This construction results in very high dirt loading capacity, even at high flow rates. In addition, there are no sewn seams used in any of the filtering layers allowing high filtration efficiencies for fine particles.

The 3M Bypass/Transport filter technology is manufactured in a filter bag form to provide additional operational advantages including the following:

- Easier and faster labor saving changeouts
- Bag is compressible, making disposal easier and less costly
- Contaminant is captured inside the bag for easier handling

The 3M Series 500 High Performance Liquid Filter bag components are polypropylene and stainless steel. The filter complies with FDA regulations governing food grade materials allowed for direct food contact in food and beverage processing. For more information please contact your 3M sales or technical service representative by calling toll free 1-800-648-3550.



Filter Material	All Polypropylene
Coverwen Material	All Polypropylene
Transport layer	All Polypropylene
Ring type	Stainless steel
Bottom clamp	Stainless steel
Dimensions	7" X 32"
FDA Compliance for food and beverage contact	Yes
Silicone	No

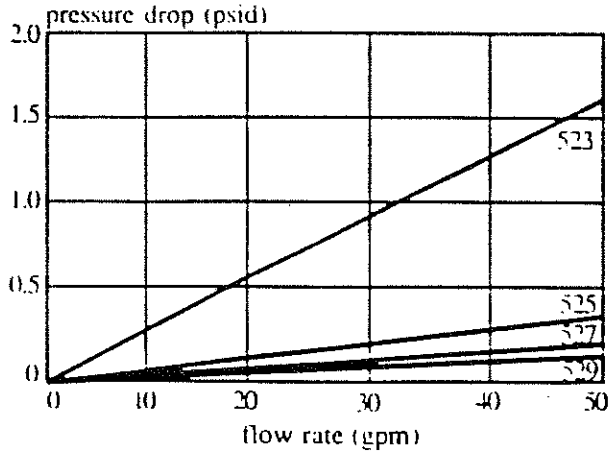
Materials of Construction

The dimensions and the materials of construction for the 3M Series 500 Liquid Filter Bag are shown at left.

Product Number	Efficiency		
	95.0%	99.0%	99.9%
523	1.5 micron	2.5 micron	5.5 micron
525	3.5 micron	5.0 micron	8.0 micron
527	9.0 micron	13.0 micron	20.0 micron
529	23.0 micron	32.0 micron	40.0 micron

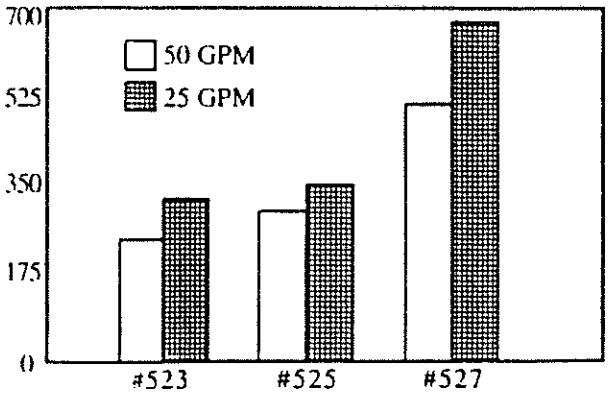
Efficiency Data

The chart at left shows the Series 500 micron ratings at each of three efficiency levels. 3M Liquid Filter Bags are rated using an AC Fine Test Dust challenge in water at 10 GPM.



Pressure Drop Data

The 3M Series 500 has low initial pressure drops as the graph indicates. The graph does not include the pressure drop of the housing, which must be added in when sizing your system.



Loading Information

Dirt holding capacity is very high due to the unique construction of the 3M Series 500 Filter -- even at high flow rates. Dirt Loading capacity is defined here as total AC Test Dust injected (in water), minus dust which penetrates the filter. The test is run to 35 psid (terminal pressure drop).

3M Filtration Products

Building 76-1W, 3M Center

FLOW METERS

Manufacturer:

Signet Manufacturers

Supplier:

Buda Equipment & Controls, Inc.
P.O. Box 580
East Syracuse, NY 13057
437-2911
Contacts - Jim McKenna, Jan Worth

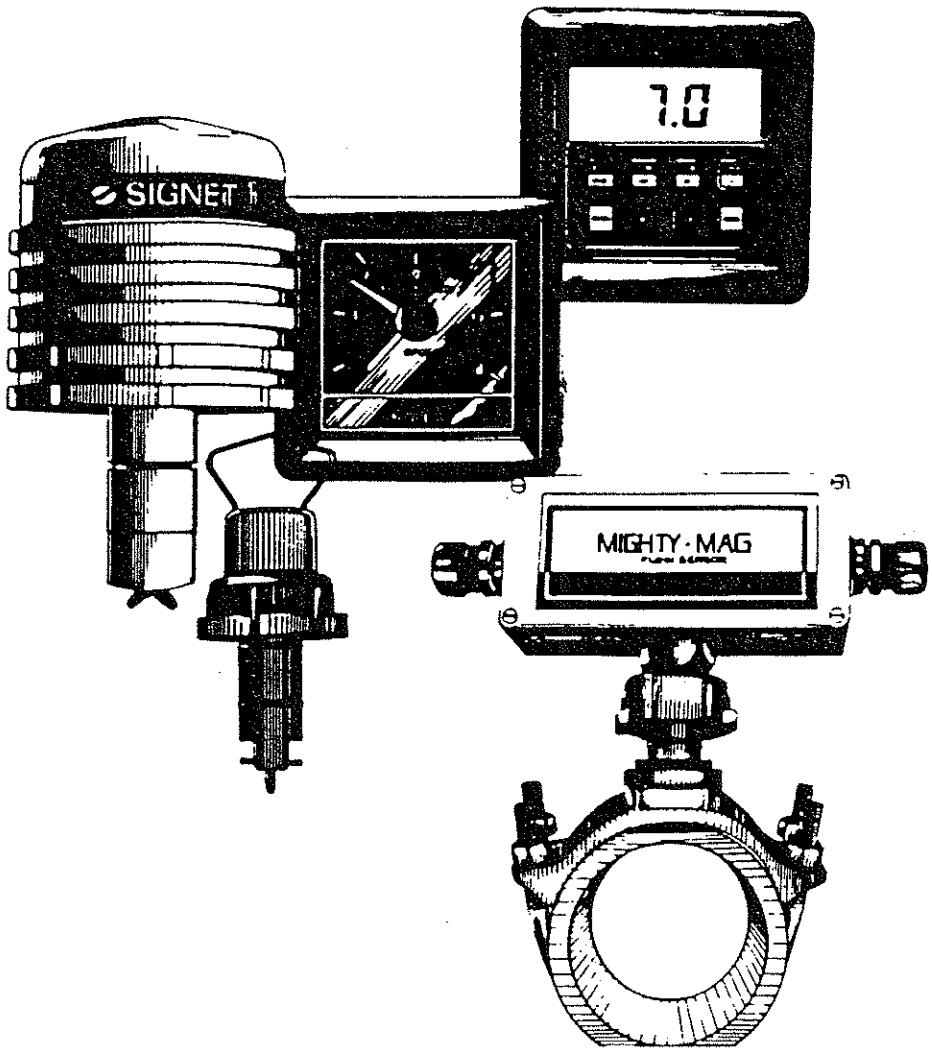
Features:

Sensor - MK515 - PO
Meter - MK575 - ACCUM-U-FLO

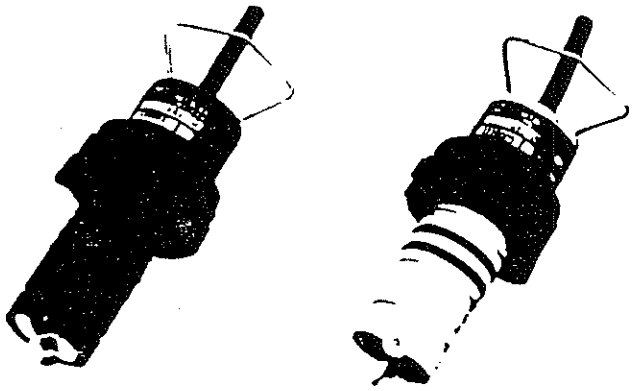
SIGNET SCIENTIFIC

MK 515/415 PADDLEWHEEL FLOSENSORS

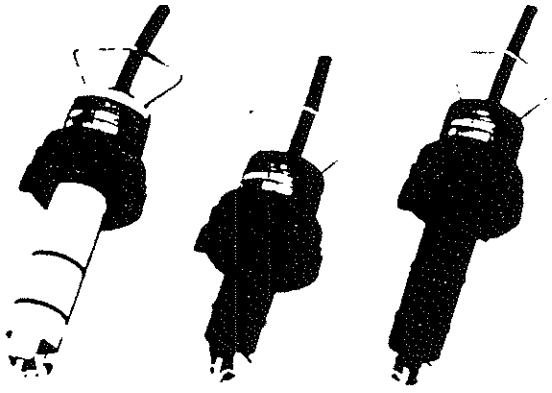
INSTRUCTION MANUAL



MK 515/415 PADDLEWHEEL FLOSENSORS



515 Paddlewheel Flosensor. PVDF (light) and Polypro (dark) shown here in regular and extended housings.



The 415 Hi-Clearance Paddlewheel Flosensor; Polypro (dark) and PVDF (light).

TABLE OF CONTENTS

1.0 INTRODUCTION

This manual contains description, specifications, and instructions for the installation and operation of your Signet MK 515 and 415 Flosensor transducers. PLEASE READ ALL OF THIS INSTRUCTION MANUAL; it will answer most of your questions about these transducers. If you require further assistance, please contact your Signet dealer.

1.1 DESCRIPTION

Your Signet Paddlewheel Flosensor and appropriate Signet indicator measure rate of flow of a liquid in a pipe. The flosensor has a rugged design with no measurable head loss. It is readily removable for inspection and cleaning.

The MK 415 and 515 must be installed in a Signet Installation Fitting for proper operation. The MK 515 is designed for installation in MK 316 fittings or the MK 319 Wet-Tap Assembly. The MK 415 sensor is designed for installation in MK 416 series fittings.

A plug is supplied with each ordered Signet Pipe Fitting to seal the fitting when the flosensor is removed. Both the MK 515 and MK 415 are available with a glass-filled polypropylene or PVDF (polyvinylidene fluonde) housing. The fluid-tight flosensor seal is made with two standard Viton O-rings (see Figure 1) which may be easily replaced. Highly stable corrosion-resistant Kalrez O-rings are available as a separate item. See section 6.1 (Parts List) for specific information. The paddlewheel contains 4 permanent magnets sonically welded into a PVDF paddle.

The MK 515 and MK 415 Flosensors are similar in most respects, with the exception that the MK 415 provides more clearance between the paddlewheel and its surrounding components, to accomodate liquids containing suspended particles comprising up to 10% of the liquid volume. Because of its increased clearance, the MK 415 has a larger body diameter, and must be installed in specially designed Signet MK 416 fittings.

The MK 515 is available in nine versions and the MK 415 in two versions to accommodate various pipe sizes and applications (see Table 1). The -P0, -P1, -P2 polypropylene versions of the MK 515 are for standard applications. The -V0, -V1, -V2 PVDF versions are for severe-environment applications. Housing extensions for all MK 515 flosensors are made from CPVC (Chlorinated Polyvinyl Chloride). The -P3, -P4, -P5 polypropylene specially extended versions are for use with the MK 319 Wet Tap (See Table 2). The Wet Tap is an interface between the sensor and Signet installation fittings. It provides a safe and fast method of removing the flosensor from the pipe fitting, while the pipe is under normal operating pressures up to 100 psig maximum.

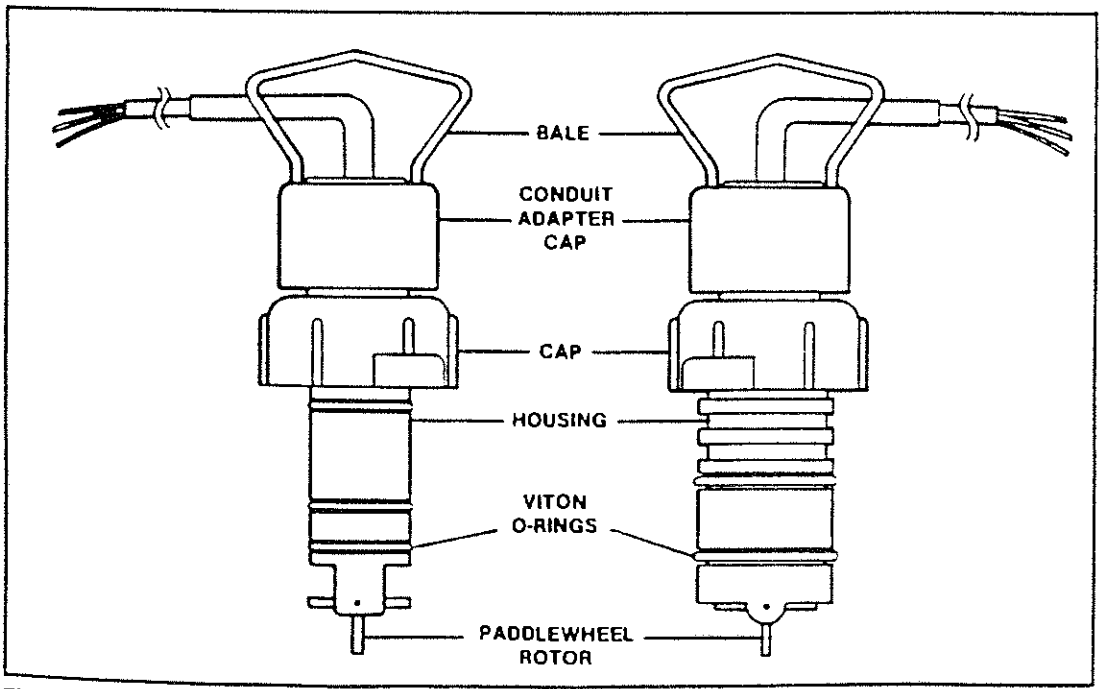


Figure 1. Detailed drawing of the MK 515 (left) and MK 415 (right).

TABLE 1

FLOSENSOR	PART NO.	PIPE SIZE
Standard Polypropylene	MK 515-P0	½" to 4"
Extended Polypropylene	MK 515-P1	5" to 8"
Double Extended Polypropylene	MK 515-P2	10" & up
Standard Polypropylene (for MK 319)	MK 515-P3	½" to 4"
Extended Polypropylene (for MK 319)	MK 515-P4	5" to 8"
Double Extended Polypropylene (for MK 319)	MK 515-P5	10" & up
Standard PVDF	MK 515-V0	½" to 4"
Extended PVDF	MK 515-V1	5" to 8"
Double Extended PVDF	MK 515-V2	10" & up
High-Clearance Polypropylene	MK 415-P0	2" to 12"
High-Clearance PVDF	MK 415-V0	2" to 12"

TABLE 2

MK 515/415 FLOSENSOR MATERIALS AVAILABLE

Model No.	MK 515-0, -1, -2		MK 515-3, -4, -5		MK 415	
Sensor Designation	P	V	P	V	P	V
Part						
Paddlewheel Material	V	V	V	V	V	V
Shaft Material	Ti	H	Ti	H	Ti	H
Main Housing Material	P	V	P	V	P	V
Extension Housing Material (see Note 3)	CP	CP	CP	N/A	N/A	N/A
O-Ring Material	— — — Viton — — —					

Note:

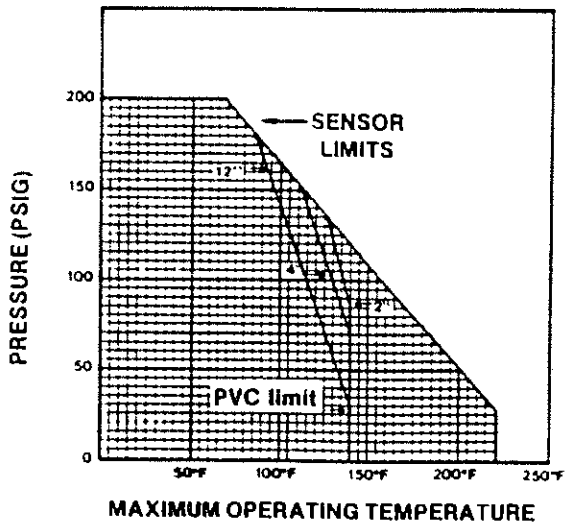
1) P = Polypropylene
V = PVDF (Polyvinylidene Fluoride)
CP = CPVC (Chlorinated Polyvinyl Chloride)
Ti = Titanium
H = Hastelloy

2) Model number and sensor designation must be specified when ordering.

3) -0 version includes main housing material only

1.2 SPECIFICATIONS

	MK 515	MK 415
Output Signal	1 V peak-to-peak per ft/sec.	0.44 V peak-to-peak per ft/sec.
Output Frequency	5-6 Hz per ft/sec.	4-5 Hz per ft/sec.
Source Impedance	8 kilohms	8 kilohms
Flow Rate Range	1 fps to 50 fps	1.5 fps to 50 fps
Linearity	± 1% over full range	± 1% over full range
Output Accuracy	± 1% over full range	± 1% of full range
Repeatability	± 0.5% of full range	± 0.5% of full range
Pressure Rating	200 psig max. @ 20°C (68°F) (see Figure 2); -P3, -P4, and -P5 versions rated @ 100 psig max.	200 psig max. @ 20°C (68°F) (see Figure 2)
Temperature Rating	105°C (220°F) max. @ 25 psig (see Figure 2)	105°C (220°F) max. @ 25 psig (see Figure 2)
Maximum % Solids	1% of fluid volume	10% of fluid volume
Bottom Diameter	1.05	1.36
Standard Cable Length	25 ft.	25 ft.



NOTES: (1) Do not use flosensors in applications where pressure/temperature points are greater than values within the area of the curve. Special fittings may restrict these limits.

(2) To calculate pressure (P) or temperature (T) for any point within the area of the curve, $P = 281.7 - 1.167\,T$, therefore, $T = \frac{281.7 - P}{1.167}$.

Figure 2. Pressure/temperature limitations for Signet flosensor transducers. Note reduced curve for PVC fittings with 2-inch, 4-inch and 12-inch pipes.

2.0 INSTALLATION

2.1 UNPACKING AND INSPECTION

When unpacking your MK 515 or 415 package, be sure you have received everything (see Figure 3). Carefully check each item for any damage incurred during shipment. If damage has occurred, promptly notify your dealer and the shipping carrier.

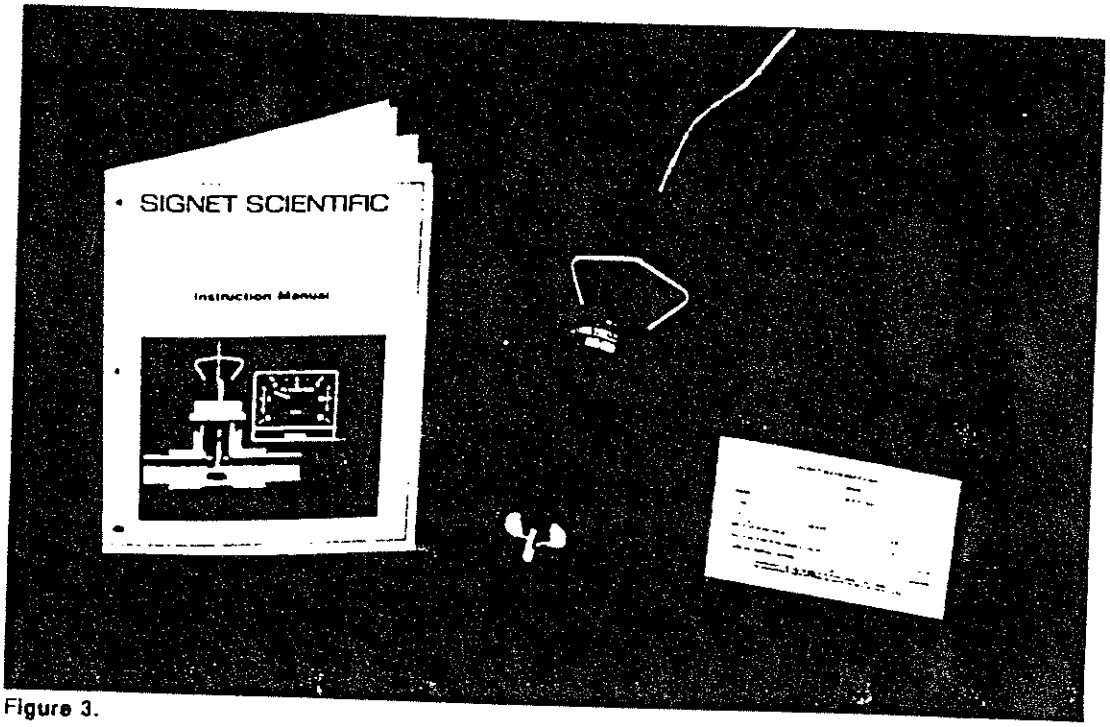


Figure 3.

The following items are included in your flosensor package:

1. MK 515 or MK 415 Flosensor
2. Instruction manual and warranty card

Please fill out and return the warranty card as soon as possible.

2.2 INSTALLATION FITTINGS

Signet Flosensors are designed to measure flow rate in full pipes. To accomplish this, a Signet Pipe Fitting must be installed in the pipe to receive the Flosensor. A wide variety of fittings are available from your dealer for virtually any type and size of pipe.

Side mounting of the fitting and flosensor is most desirable for horizontal pipe runs (see Figure 4A). However, if no suspended particles are present in the liquid, a bottom mounting is best (see Figure 4B). The flosensor may still function adequately in a top or vertically mounted position (see Figure 4B), but there must not be any suspended particles in the liquid and the pipe must be absolutely full.

Vertical mounting of the flosensor runs the risk of having either air bubbles or sediment interfere with the continuous action of the paddlewheel. For vertical pipe runs, the location of any flow disturbance will dictate the best flosensor installation location.

The installation location of the Signet Pipe Fitting and Flosensor must be in a free-flowing straight-run section of the pipe. This section must be at least 10 diameters down-stream of any minor flow changes. There must be at least 5 diameters of free-flowing straight-runs beyond the fitting (see Figure 5). Major up or down-stream obstructions will require longer straight runs. A partially open butterfly valve, for example, may require 50 diameters of free flow for adequate liquid stability at the flosensor.

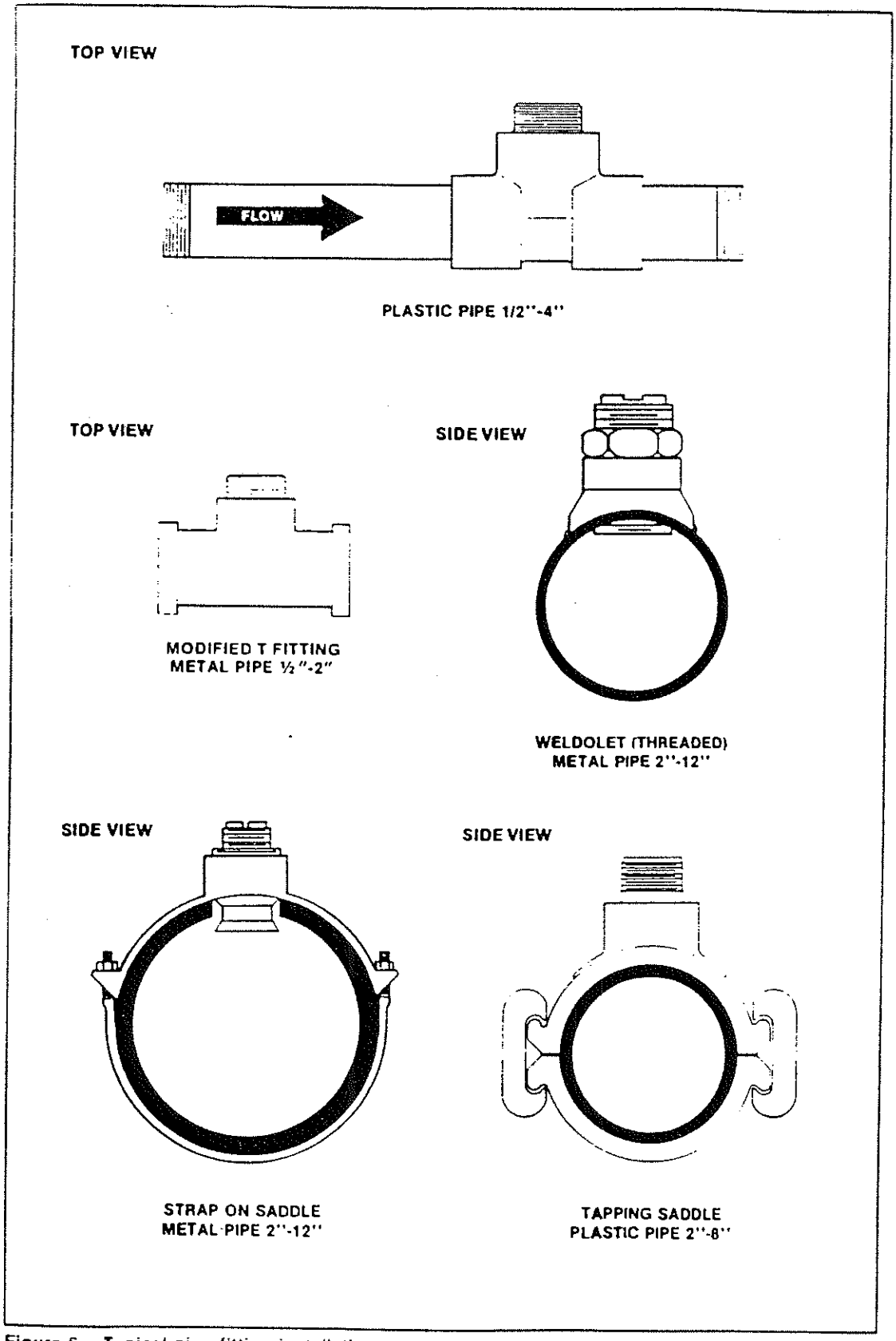


Figure 6. Typical pipe fitting installations.

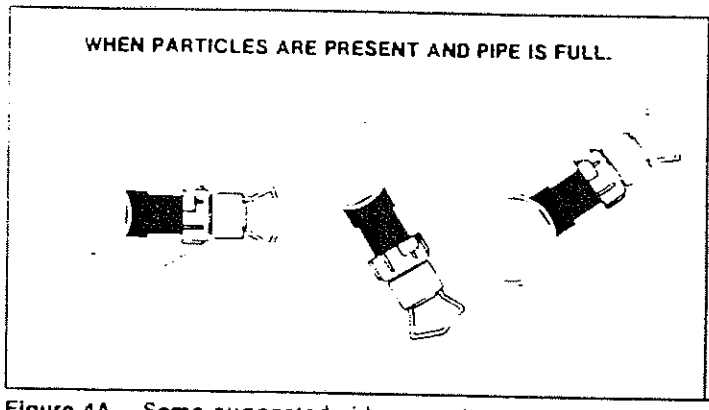


Figure 4A. Some suggested side-mounting positions.

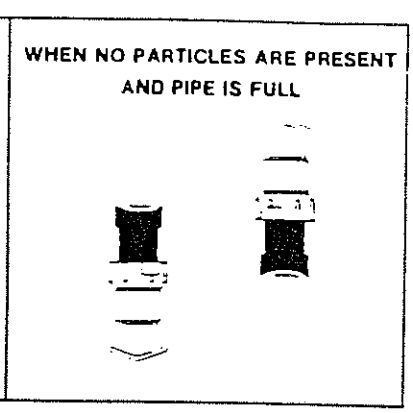


Figure 4B. Bottom and top-mounting positions.

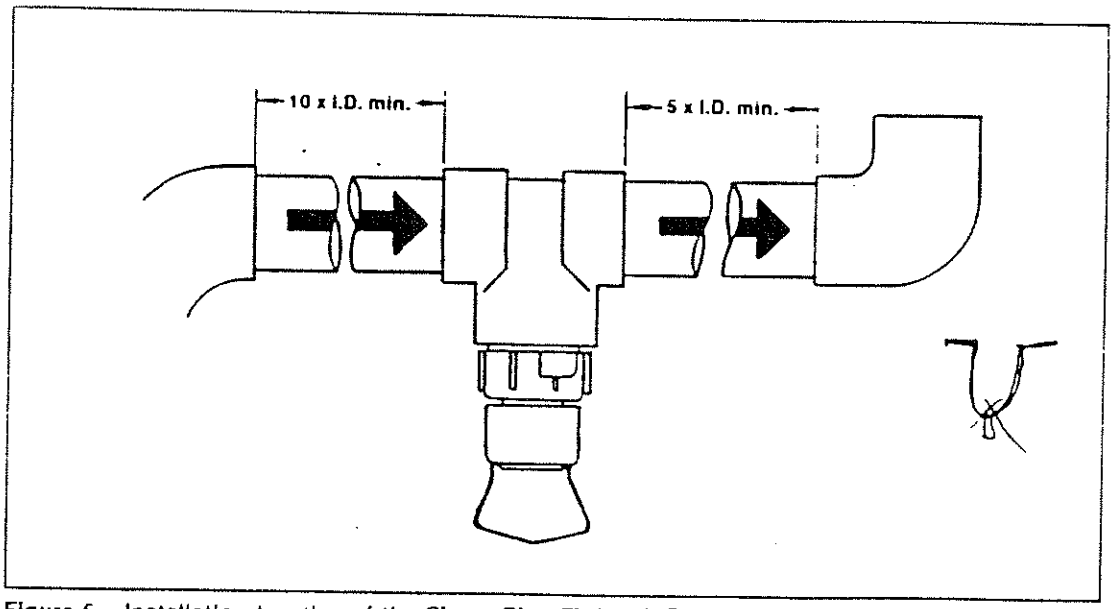


Figure 5. Installation location of the Signet Pipe Fitting & Flosensor.

2.3 INSTALLATION OF SPECIFIC PIPE FITTINGS

The installation of PVC, CPVC, stainless, galvanized, brass, brazolet, and weldolet fittings are covered in this section. Typical pipe-fitting installations are shown in Figure 6.

2.3.1 PVC and CPVC

1. Twist-on PVC and CPVC fittings:
   Wrap threaded pipe ends with Teflon tape and secure fasteners.

2. Tapping saddle for PVC schedule 40 and 80, CPVC; 2 inches to 8 inches:

   A. Select area for fitting installation (see 2.2 Installation Fittings).
   B. Drill a 1-7/16 inch hole in the pipe. For extended flosensors, a 2-¼ inch hole will be needed. This applies to pipes over 4 inches.
   C. Prime the area to be glued with either P-70 PVC primer or P-72 CPVC primer with respect to the fitting material.

(continued)

D. Apply glue (#711 for PVC or #714 for CPVC) to all areas to be glued.
E. Install all fitting pieces so that the insert fits in the hole in the pipe. Put the two saddle pieces around the pipe and alternately tap the wedges over the exposed ears.

> Note: The arrows on the wedges must match the direction of the arrows on the pipe fitting.

3. PVC and CPVC pipe larger than 8 inches must use a strap-on saddle. See 2.3.2 stainless, galvanized, or brass, installation instruction 2, for strap-on saddles.

2.3.2 Stainless, Galvanized, and Brass

1 T fittings:
Apply Teflon tape to the pipe ends, and install the fitting snugly.

2. Strap-on saddles:

A. Drill a 1-7/16 inch hole in the pipe. For Extended Flosensors, a 2-1/4 inch hole will be necessary. This applies to pipes over 4 inches.
B. Install the fitting piece so that the insert fits in the hole in the pipe.
C. Tighten clamping nuts alternately to eliminate any chance of leaks.

2.3.3 Brazolet and Weldolet

1 A certified welder, using the proper techniques, should install these fittings.

A. Remove the insert (see Figure 7) before installing the fitting.
B. Drill a 1-7/16 inch hole in the pipe. For Extended Flosensors, a 2-1/4 inch hole will be necessary. This applies to pipes over 4 inches.
C. Deburr the hole. This hole must be completely free of all burrs and projections.
D. Install the fitting so that the insert will fit into the hole in the pipe.
E. Teflon-tape the insert.
F Reinstall the insert, referring to the "A" dimension in Figure 7

> NOTE: In all cases, the slots in the plastic insert must be parallel to the liquid flow. DO NOT USE ANY TOOL ON THE PLASTIC INSERT. YOU MAY MAR THE THREADS. HAND-TIGHTEN ONLY. RE-TAPE THE INSERT WITH TEFLON WHEN REMOVED.

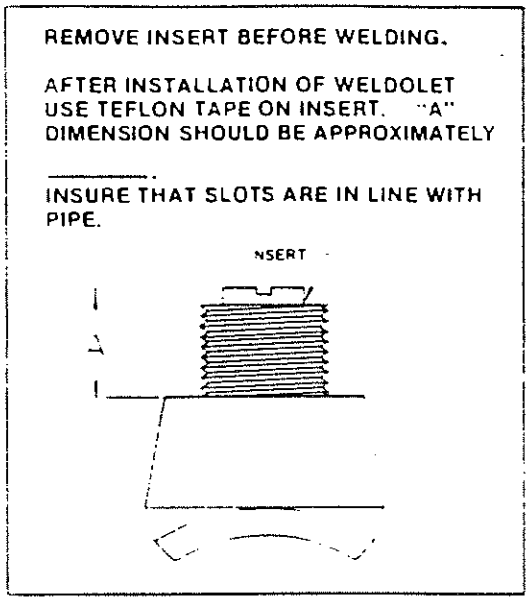


Figure 7. The above Installation Dimension Tag is attached to each fitting.

2.4 FLOSENSOR INSTALLATION

1. Check the paddlewheel. It should rotate freely when flicked with a finger, or by directing a stream of water or air across it to stimulate liquid flow.

2. Insert the flosensor in the Signet Pipe Fitting.

3 Align the ball parallel to the pipe.

4 Make sure that the flosensor is fully seated in the fitting slots. The flosensor will not turn once it is properly installed.

5. Tighten the plastic cap finger-tight to retain the flosensor. DO NOT USE ANY TOOL ON THE CAP. HAND TIGHTEN ONLY TO AVOID DAMAGE.

> NOTE: For cable runs longer than 25 feet, splice additional cable length to the existing flosensor cable, and waterproof the splice with high-quality silicone sealant or the equivalent. Up to 200 feet of total cable length will not affect flosensor operation.

2.5 SENSOR CONDUIT KIT

(See Section 6.2 Optional Accessories)

Signet MK 515/415 Flosensors have a specially designed cap that allows installation of flexible conduiting (Liquitite®). A Signet Sensor Conduit Adapter Kit (MK 515.89) is required for this particular type of installation.

The MK 515.89 Kit consists of two separate adapters. The right angle adapter is designed for insertion in the flosensor, while a straight adapter is included for use with Signet controllers and/or the MK 500.78 waterproof housing. Both adapters are designed for use with ½ inch conduit knockouts. The conduit end accepts 3/8 inch flex conduit

For correct flexible conduiting installation, first remove the cap-plug as shown in Figure 8. Thread the sensor cable through the right angle adapter, and carefully screw it into the adapter cap. (The rubber boot can be discarded when the conduit adapter kit is used).

Once the right angle adapter is screwed into the cap, attach the section of flexible conduit by threading it into the adapter. Complete the installation by connecting the straight adapter to the conduit. This adapter can then be attached to the appropriate Signet junction box.

NOTE: Special conduiting material can be obtained from your local electrical supplier

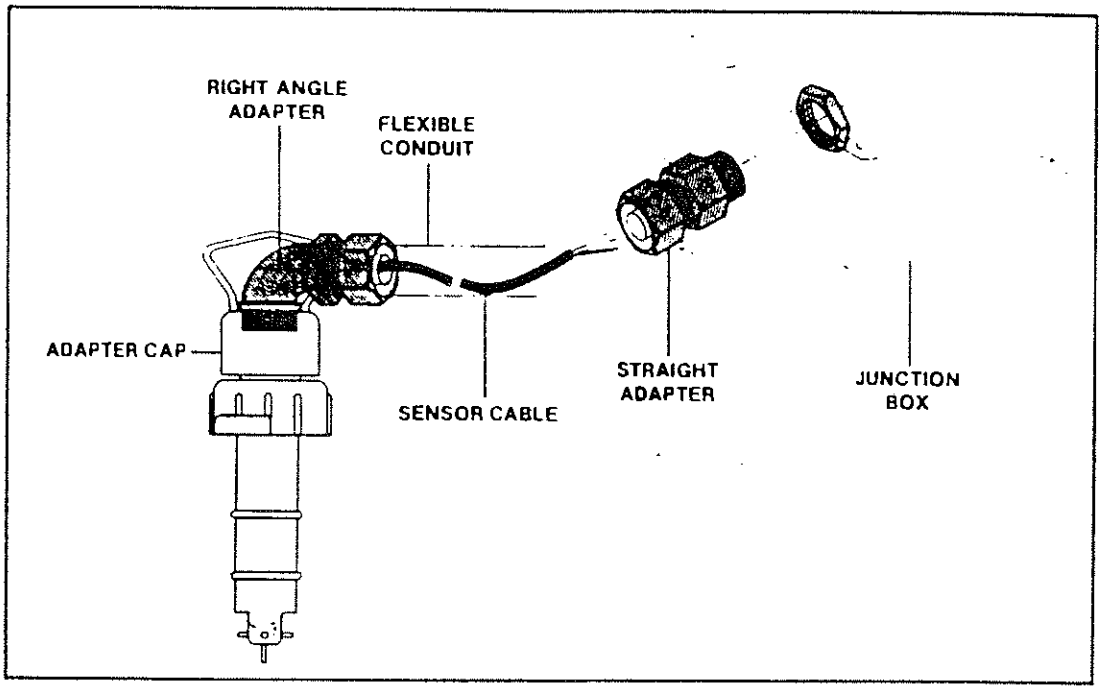


Figure 8. Detailed drawing of the MK 515.89 Sensor Conduit Kit.

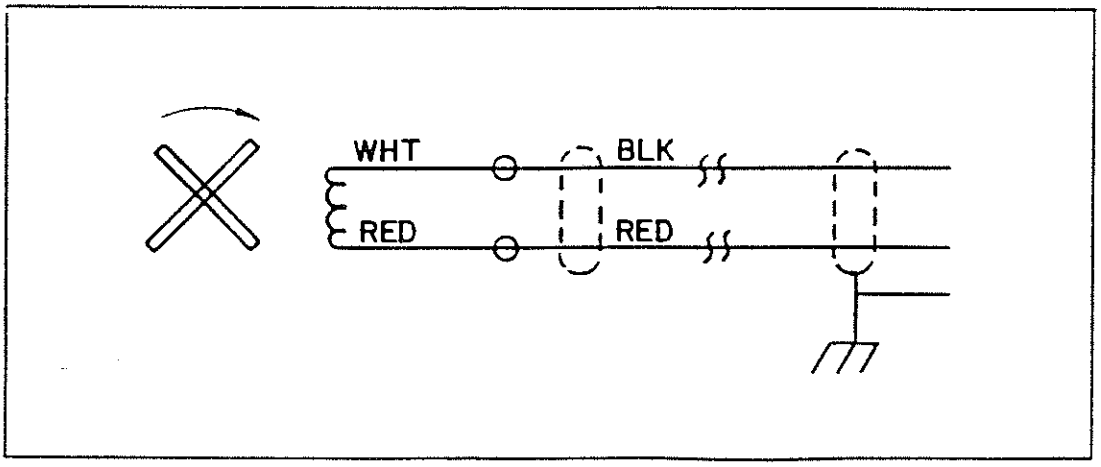


Figure 9. Simplified schematic of the MK 515/415.

3.0 THEORY OF OPERATION

A simplified schematic of the MK 515/415 is shown in Figure 9. The flosensor is installed in a pipe line to measure flow rate. The flow passing by the flosensor paddlewheel rotates the paddlewheel, moving the magnets past a coil in the transducer body. An ac voltage is induced in the coil by the rotating magnets of the paddlewheel.

Both the frequency and the amplitude of the output of the coil are then directly proportional to the velocity of the fluid flow in the pipe. A complete cycle occurs every time two of the paddlewheel blades go by the coil; therefore, two entire cycles are generated for each paddlewheel rotation.

4.0 TROUBLESHOOTING

Major problems with the MK 515/415 can occur when either flosensor is being used for something it was not designed to do, or when it has been improperly installed. The paddlewheel is designed to rotate on the shaft; the shaft should not rotate with respect to the housing. The paddlewheel must turn freely. If it does not, clean the paddlewheel assembly as follows:

1. Remove the flosensor from the pipe and insert the plug into the pipe fitting. Clean any external debris from the paddlewheel.

2. For the MK 515, using a small flat-bladed screwdriver, gently pry one of the paddlewheel mounting ears away from the pin (see Figure 10A). The MK 415 pin does not have a shoulder and may be pressed straight out (see Figure 10B).

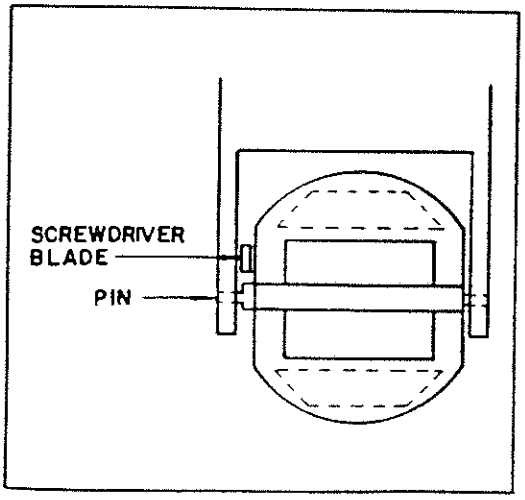


Figure 10A. Removal of MK 515 paddlewheel pin.

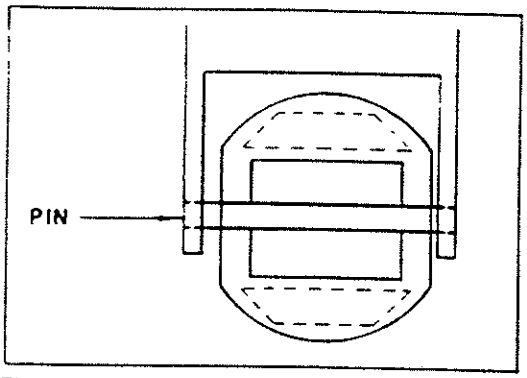


Figure 10B. Removal of MK 415 paddlewheel pin.

3. When one end of the pin is free, gently work the paddlewheel and pin out of the remaining mounting ear.

4. Thoroughly clean the pin, paddle, and pin holes with a wire brush and/or toothpick along with alcohol and/or soap and water.

5. To reinstall the paddlewheel and pin, reverse steps 1, 2, and 3.

6. After cleaning, the paddlewheel should spin freely without binding or sticking.

5.0 CARE AND MAINTENANCE

The MK 515/415 should require minimal care during the life of the flosensor. Periodically, check the O-rings and replace them when necessary. The paddlewheel must always turn freely. Be sure that connections to the Signet indicator and additional cable length, if any, are still intact. Lubricate the barrel and O-rings with G.E. Silicone Compound #G660 every three months. Keep the paddlewheel and pin free of any lubrication. A Spare Rotor Kit consisting of a spare paddlewheel, O-rings, and a pin is available (see 6.2 Optional Accessories). Actual maintenance intervals will have to be determined in operation. It is suggested that you check your flosensor periodically until some history of your specific application can be created.

6.0 APPENDICES

6.1 PARTS LIST

MK 515

Spare Paddlewheel	MK 15.38-1
Titanium Rotor Pin	MK 15.46-1
Hastelloy Rotor Pin	MK 15.46-2
Spare Viton O-rings	PP-1220-0021
Polypropylene Flosensor Cap	MK 515.42

MK 415

Spare Rotor Kit: PVDF paddlewheel, titanium shaft, Viton O-rings (2)	MK 415.31

6.2 OPTIONAL ACCESSORIES/ REPLACEMENT PARTS

Tantalum Rotor Pin	MK 15.46-3
Stainless Steel Rotor Pin	MK 15.46-4
EPR O-Ring	PP-1224-0021
Polypropylene Plug	MK 315.36-1
PVDF Plug	MK 315.36-2
Kalrez O-rings	PP-1228-0021

MK 415

Polypropylene Plug	MK 415 36
PVDF Plug	MK 415 36V

Miscellaneous

Conduit Sensor Kit: one straight and one right-angle ½" NPT adapter for 3/8" conuit.	MK 515.89
Wet Tap: interface between 515-3, -4, and -5 only and pipe fitting to allow flosensor removal while under operating pressure	MK 319
Flow Test Indicator	MK 561
Cable Adapter Kit: Flosensor-to-Tester and Tester-to-Flometer adapter cables for the MK 561	MK 561 60
Cable Adapter Kit: MK 515 415 Flosensor to Series 300 Indicator/Controller, adapter cables	MK 500 61-2

6.3 WARRANTY

SIGNET SCIENTIFIC COMPANY LIMITED TWO-YEAR WARRANTY

Signet Scientific Company warrants its instruments to be free from defects in material and workmanship under normal use for a period of two years from date of purchase by the initial owner, or three years from date of manufacture, whichever comes first, as described in the following paragraphs.

This warranty does not cover defects caused by abuse or electrical damage. Signet will not cover under warranty any instruments damaged during shipment to the factory, less case, or improperly packed. Repair attempts by anyone other than authorized service personnel will void the warranty. Proof of date of purchase will be required before warranty repairs can begin.

Parts which prove to be defective in the first year will be repaired or replaced free of charge including labor, shipped F.O.B. our factory or a designated service center (address furnished upon request).

Only non-moving parts, such as electrical components, which prove defective during the second year are warranted. Meter movements will not be covered. All units qualifying for warranty service after one year are subject to a maximum service charge of $15.00 for replacement of non-moving parts.

Items returned for warranty repair must be shipped prepaid and insured. Warranty claims are processed on the condition that prompt notification of a defect is given to Signet within the warranty period. Signet shall have the sole right to determine whether in fact a warranty situation exists.

The Signet warranty does not cover travel time, mileage expenses, removal, reinstallation, or calibration.

Signet is continually making design changes and improvements that adapt to the original circuit configuration. These will be incorporated as required in older units on a minimal-charge basis while under warranty.

CONSEQUENTIAL DAMAGES

Signet Scientific Company shall not be liable for special consequential damages of any nature with respect to any merchandise or service sold, rendered, or delivered.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

7.C MANUAL CHANGE INFORMATION

Signet continually strives to keep up with the latest electronic and design developments by adding circuit, component, and design improvements to its instruments as soon as they are developed and tested. Sometimes, due to printing and shipping requirements, we cannot immediately get these changes into printed manuals. Therefore, your manual may contain new change information on the following pages. A single change may affect several sections. Be sure to make all changes within the appropriate sections of this manual.

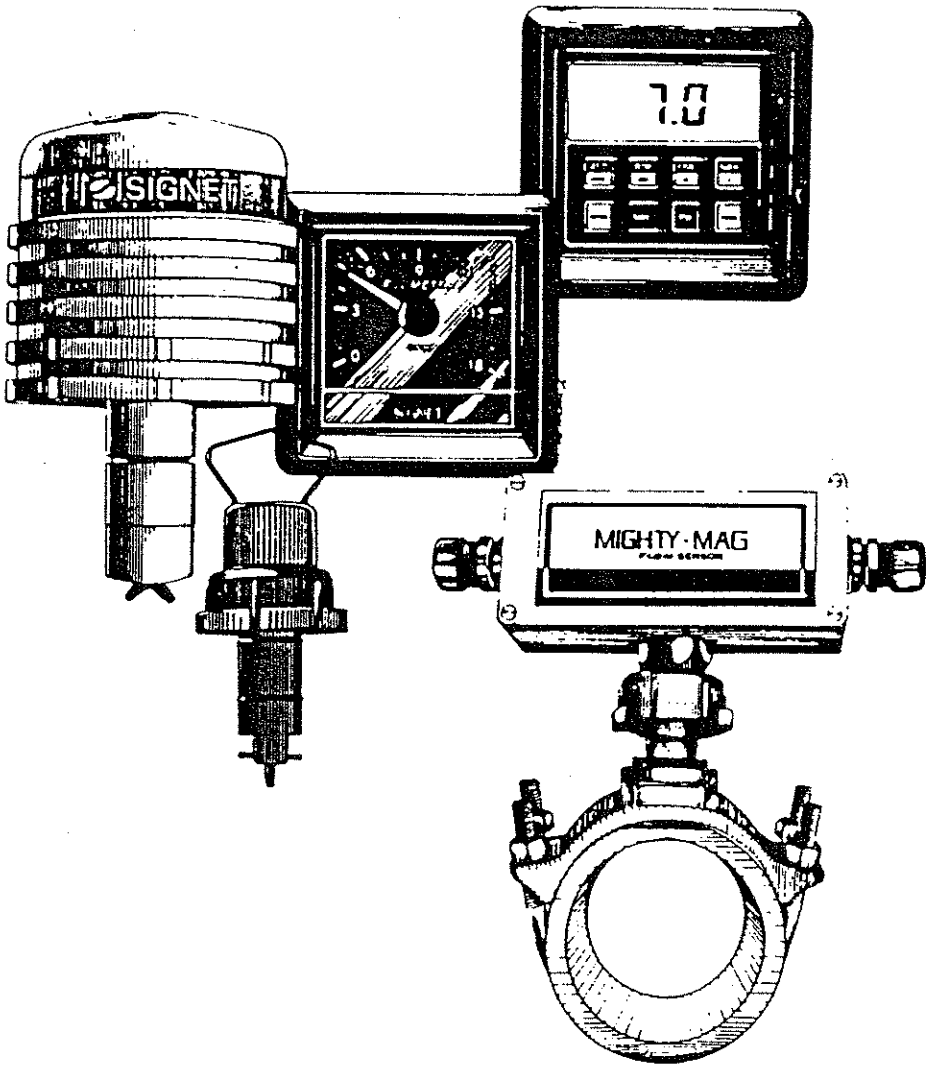
SIGNET
SCIENTIFIC

P.O. BOX 5770 • EL MONTE, CA 91734-1770

SIGNET SCIENTIFIC

MK 575/575R
ACCUM-U-FLO

INSTRUCTION MANUAL



MK 575/575R
ACCUM-U-FLO

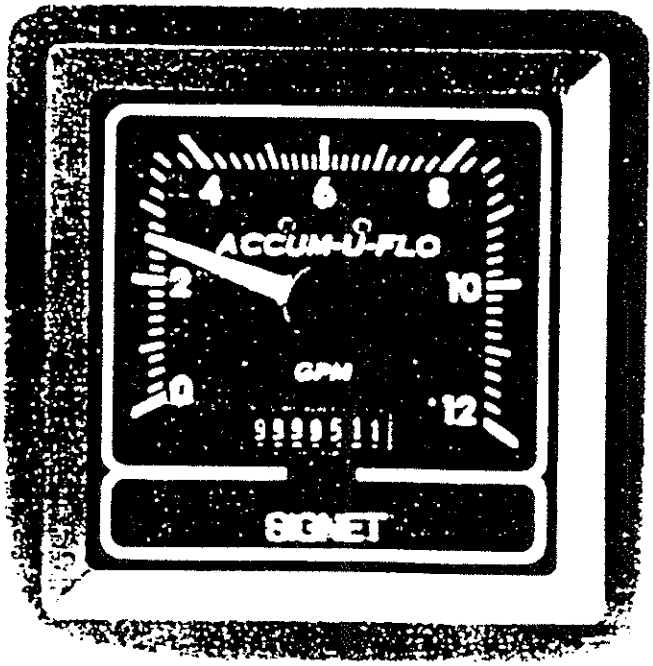


TABLE OF CONTENTS

1. INTRODUCTION

This manual contains description, specifications, and instructions for the installation and operation of your Signet MK 575/575R Accum-u-flo indicators. PLEASE READ ALL OF THIS INSTRUCTION MANUAL; it will answer most of your questions about installation and calibration of this indicator.

The MK 575 indicates flow rate and total flow of a liquid in a pipe by measuring the signal generated by a Signet Flosensor. This measurement is displayed on a large, graduated analog meter. An accumulator counter totalizes the volume of flow.

The MK 575 is compatible with all Signet Flosensor transducers. Using a compatible Flosensor, and other Signet instruments, systems can be assembled to measure, control, and/or integrate flow over a wide range of parameters.

The MK 575 contains a high-torque meter movement to ensure proper operation in high-vibration environments. The MK 575 requires no routine maintenance.

The MK 575 requires 12-volt dc at 315 milliamps. A 12-volt dc converter is included which allows you to power the indicator from 117 volts ac nominal.

cumulated volume on a 7-digit non-resettable counter. The MK 575R performs this measurement on a 5-digit resettable counter. Reset the counter by pushing in the reset button on the front panel immediately below the counter display.

Volume and rate measurements are usually indicated in gallons or liters per minute, but the indicator and counter can be calibrated to measure virtually any volumetric unit from milliliters to acre-feet.

The analog meter of the MK 575 deflects 245 degrees full-scale with large numbers on a 5-½ inch dial for easier reading at a distance. The meter movement has ± ½% of full scale repeatability and is internally damped to reduce pulsation caused by flow fluctuations.

The MK 575 can be mounted in an instrument panel or on the optional mounting bracket (see 6.2 Optional Accessories). The Flosensor output connects to the terminal strip on the rear of the MK 575 case. The meter face is waterproof. However, if the unit is to be installed in a wet or dusty environment, it should be housed in a Signet MK 500.75 NEMA-rated enclosure. The MK 500.78 Conduit Mounting Kit (see 6.2 Optional Accessories) is a waterproof enclosure on the rear of the MK 575. It provides conduit adapters to permit housing all cabling in conduit.

1.1 DESCRIPTION

The MK 575 uses digital electronics to measure both total volume and rate of flow in a system. The indicator is offered in two versions to measure total volume. The MK 575 measures ac-

NOTE.
THE STATEMENTS REFERRING TO THE MK 575 ALSO INCLUDE THE MK 575R

1.2 SPECIFICATIONS

Input Signal Amplitude	0.4 volt peak-to-peak minimum
Input Frequency Range	5 to 200 Hz (5 to 500 Hz when used with MK 505)
Input Impedance	47 kilohms (10 kilohms when used with MK 505)
Rate Display Accuracy	± 1% of full scale
Rate Display Repeatability	± ½% of full scale
Volume Display Accuracy	± 2% of reading at calibrated flow rate, ± quantizing error (usually negligible)
Outputs:	
Pulse: TTL Compatible	source, 6.5 milliamps at 4.6 V sink 25 milliamps at 0.4 V
Frequency	synchronous with input
Pulsewidth	5 milliseconds nominal

(continued)

Counter: TTL Compatible	source, 5 milliamps sink, 5 milliamps
Frequency	synchronous with accumulator
Pulsewidth	100 milliseconds ± 20%
Power Requirements	12 Vdc, 315 milliamps. Not damaged by voltage as high as 25 Vdc. Contains reverse voltage protection.
Ambient Operating Temperature	0°C to 60°C (32°F to 140°F)
Weight	1.8 lbs. (0.82 kilograms)
Power Supply Converter:	
Input	117 Vac nominal at 0.19 amp max
Output	12 Vdc at 1.2 amps

2.0 INSTALLATION

2.1 UNPACKING AND INSPECTION

When unpacking your MK 575 package, be sure you have received everything (see Figure 1). Carefully check each item for any damage incurred during shipment. If damage has occurred, promptly notify your dealer and the shipping carrier.

The following items are included in your MK 575 package:

1. MK 575 Accum-u-flo indicator
2. M15129 Mounting Strap
3. P30075 Power Converter
4. Instruction Manual and Warranty Card

Please fill out and return the Warranty Card as soon as possible.

2.2 INDICATOR INSTALLATION

The MK 575 may be installed as far as 200 feet from the Flosensor. If the indicator location is beyond the standard 25-foot sensor cable length, an extension cable must be used. Additional distances, or systems incorporating several instruments, may require the use of a Signet MK 514 Signal Conditioner. The MK 575 may be used in combination with all Signet indicating and controlling instruments.

The MK 575 may be mounted in an instrument panel having a 5.1 inch square hole with sufficient clearance around it to accommodate the 5-1/2 inch front bezel of the indicator. There must be a minimum 4-3/4 inch rear clearance.

Installation

1. Loosen the clamp ring (see two "A" screws in Figure 2)

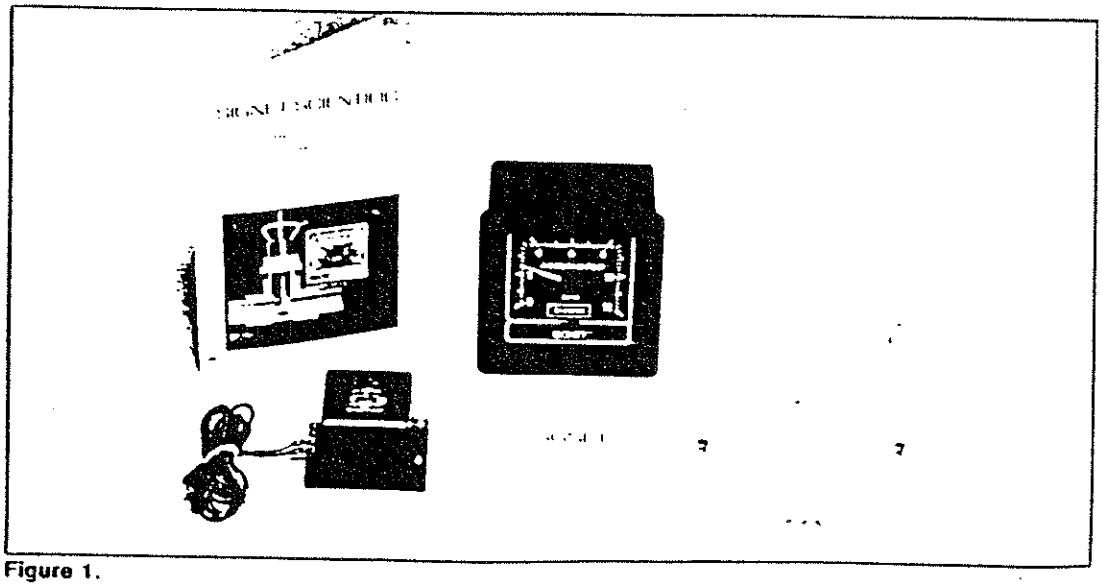


Figure 1.

2. Insert the rear of the indicator through the front of the prepared hole.

3. Slip the clamp ring over the rear of the indicator. With the front flange of the indicator held tightly against the front of the panel, position the clamp ring snugly against the rear of the panel.

4. Tighten the two "A" screws.

5. Seal the front flange firmly against the panel by tightening the two "B" clamping screws hand tight (see Figure 2). Do not overtighten these screws. Overtightening will cause the clamp ring to slip.

6 Remove the plastic safety shield from the rear terminal strip by pinching inward each pair of plastic locking latches. Then connect the Flosensor output cable to the appropriate XDCR (transducer) terminals on the rear of the indicator case (see Figures 3 and 4)

7. Connect a 12 Vdc source or the Signet Power Converter to the Vdc + and − terminals on the rear panel of the MK 575. When using the supplied Signet Power Converter, connect 117 Vac nominal to the input terminals of the converter. Then connect either adjacent + and − output terminal pair of the converter to the 12 Vdc + and − terminals respectively, on the rear panel of the MK 575. The extra pair of 12 Vdc output terminals on the converter is available to power another Signet indicator requiring the same dc source as the MK 575. Make any other desired connections on the terminal strip, such as PULSE OUT and/or CNT (counter) OUT* with circuitlow connected to SIG GND (signal ground). Replace the plastic safety shield on the terminal strip.

NOTE:
FOR FLOSENSOR INSTALLATION, REFER TO APPROPRIATE SIGNET INSTRUCTION MANUAL.

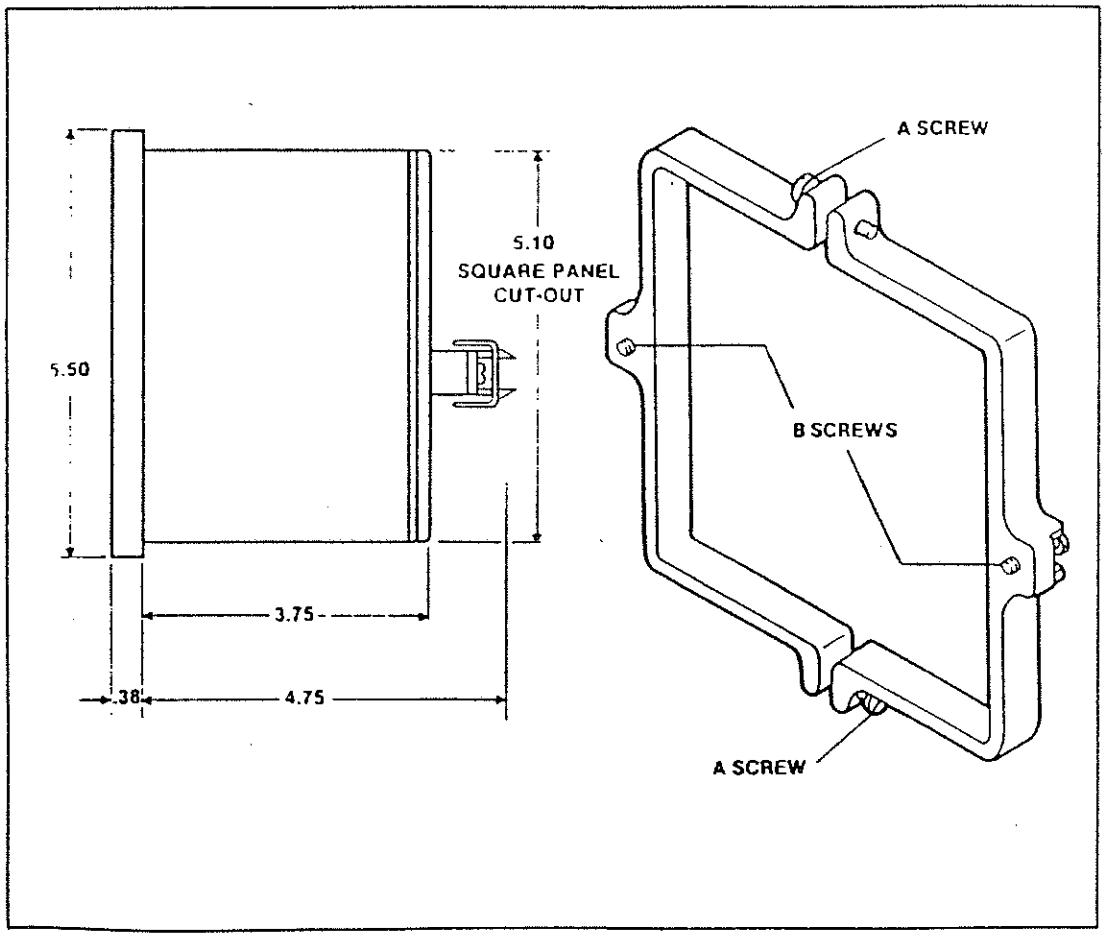


Figure 2. Detailed profile of the MK 575 (left) and isometric view of clamp ring (right).

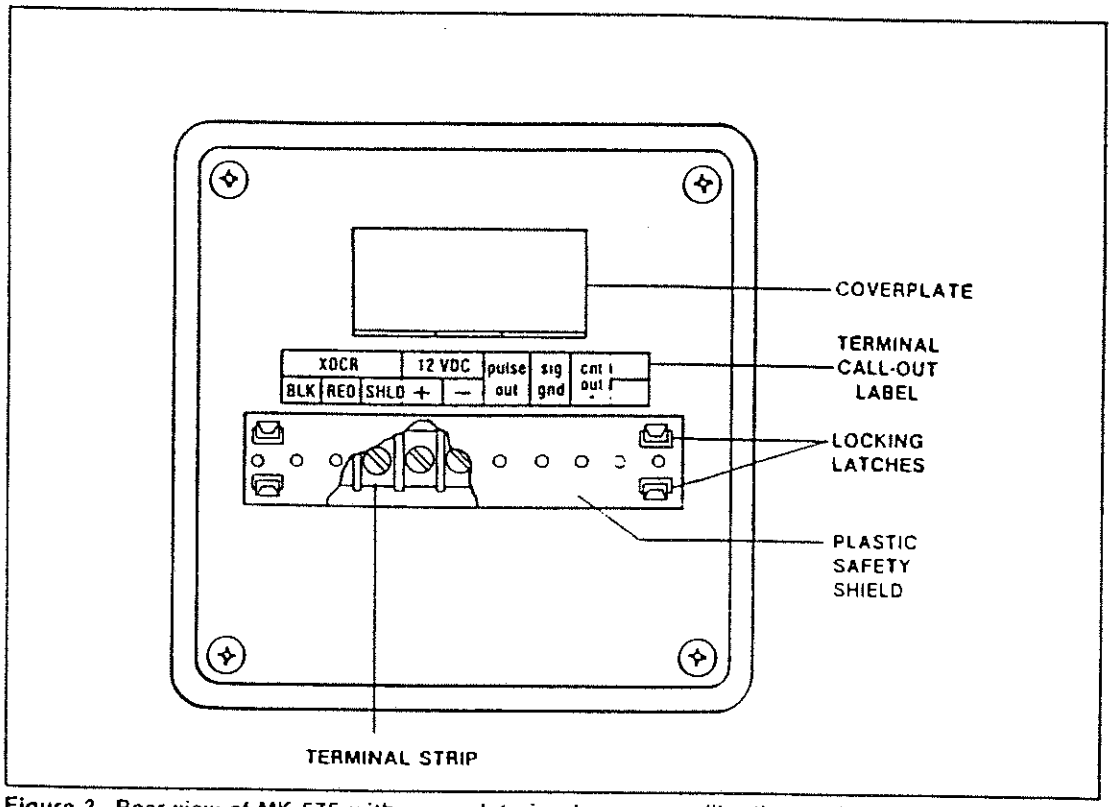


Figure 3. Rear view of MK 575 with coverplate in place over calibration and counter controls.

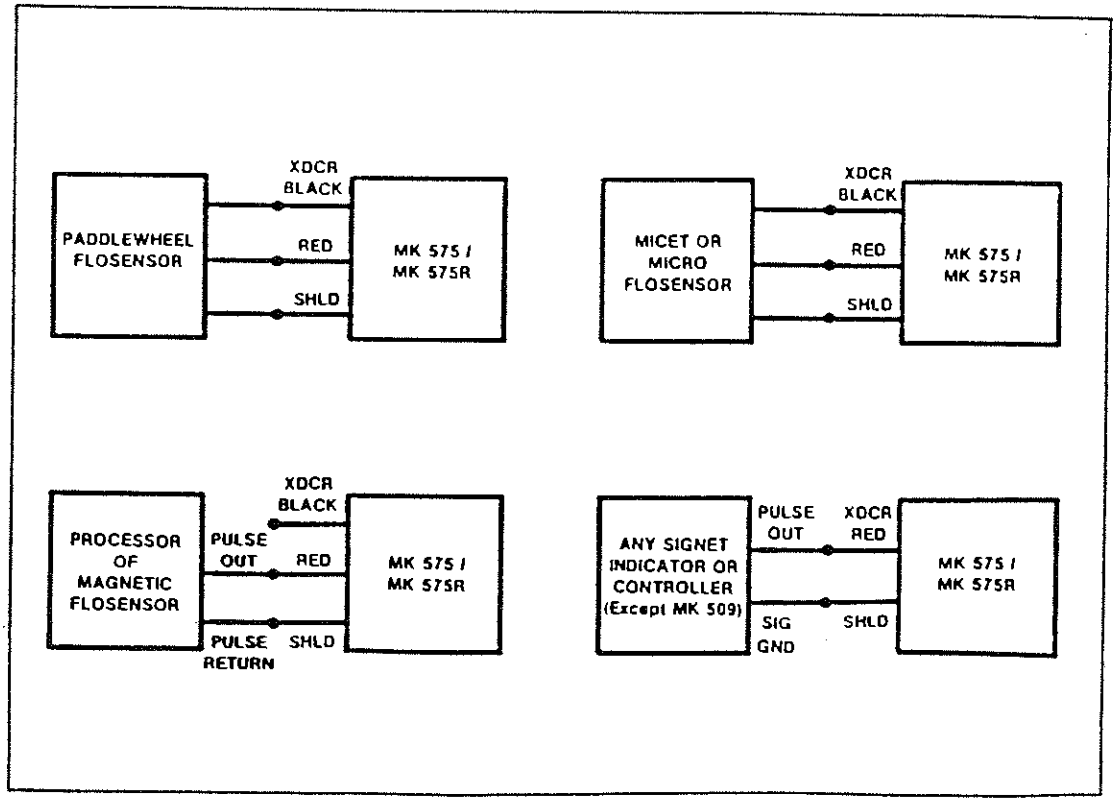


Figure 4. Various inputs to MK 575/575R Accum-u-flo. Verify all flosensor output connections by referring to the appropriate Signet instruction manual.

3.0 THEORY OF OPERATION

Basically, the MK 575 Accum-u-flo electronics convert the sinusoidal ac transducer signal from a Signet Flosensor into fixed-width positive pulses. The time between leading edges of two adjacent pulses is equal to one cycle of transducer output frequency. These pulses are converted into an analog voltage which drives the meter.

The single printed circuit (PC) board of the MK 575 contains the voltage regulator, the input-shaping and processing circuitry, the meter-drive circuitry, and the counter-drive circuitry. The + 12 Vdc power for the electronics is applied to the PC board voltage input. A diode is in series with the + 12 volt line to provide reverse-voltage protection. The unregulated + 12 Vdc is applied to a voltage regulator to provide a regulated + 5 Vdc to power the MK 575.

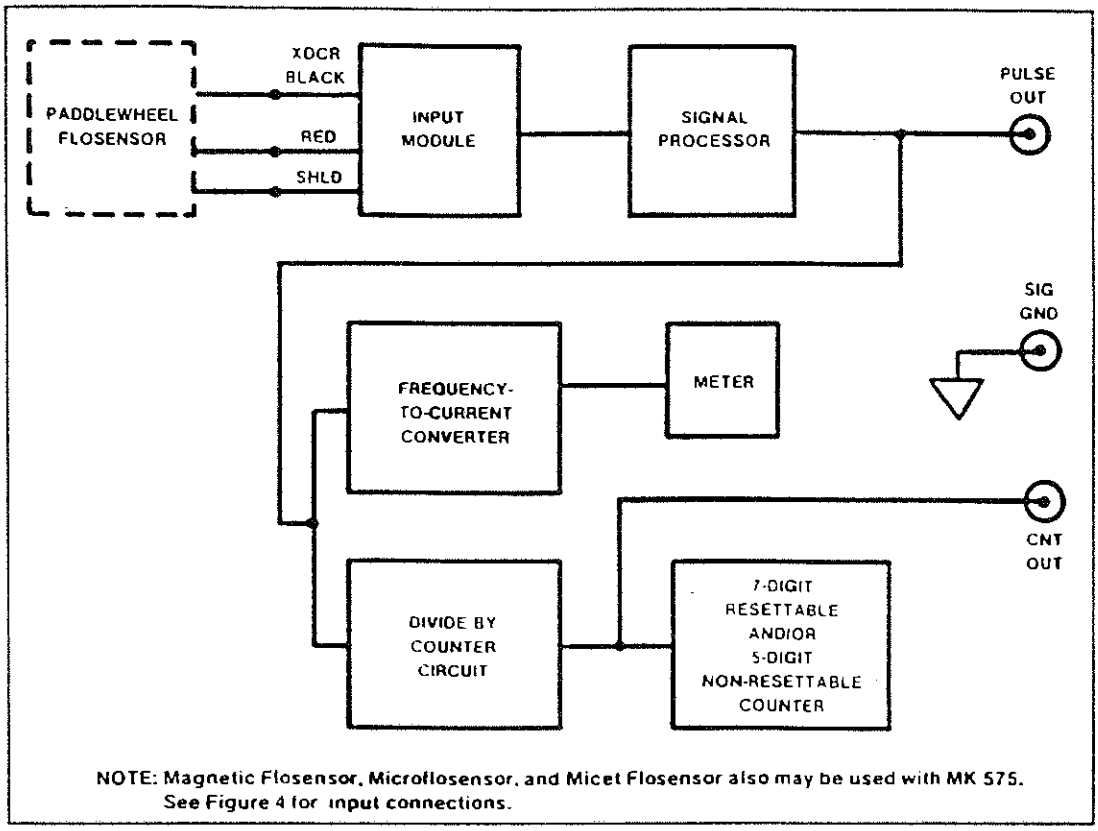
The input module of the MK 575 conditions the Flosensor signal. The processor circuitry then forms the conditioned input signal into square-wave-shaped, precision width, noise-free positive pulses. The pulses are also separately amplified and are available to drive external instrumentation, including other Signet indicators and controllers, at the PULSE OUT terminal on the MK 575's rear panel (see Figure 3). Internally, these pulses are inputed to a frequency-to-current converter. This circuitry employs a constant-current generator where the pulse waveforms are converted to a current in a closed-loop system by charging a capacitor, with this charge being directly proportional to the frequency. This current drives the Flometer's meter.

TABLE 1

	PADDLEWHEEL	MICET/MICROFLO	MAGNETIC
Transducer	MK 515 or MK 415	MK 505 or MK 508	MK 566
Module P N	M0177	P30507	M0177
#1	SIG REF	+ 5V	N/A
#2	SIG HIGH	SIG	SIG HIGH
#3	GND	GND	GND
#4	+ 12V	+ 12V	+ 12V
#5	12V RETURN = POWER GROUND	12V RETURN = POWER GROUND	12V RETURN = POWER GROUND
#6	PULSE OUT	PULSE OUT	PULSE OUT
#7	SIG GND	SIG GND	SIG GND
#8	COUNTER OUT	COUNTER OUT	COUNTER OUT
#9	N/A	N/A	N/A

Reference the simplified block diagram of the indicator circuitry as shown in Figure 5. The Flosensor transducer output signal is applied to the input module of the MK 575. This interchangeable module is available in two configurations which allow the MK 575 to process signals from the various types of Signet Flosensors (Paddlewheel, Magnetic, Microflo, or Micet). The configuration required for your Flosensor is factory installed. Table 1 lists the sensor type with the required input module, and resulting assignments on the terminal strip.

The pulse signal is connected to a presettable divide-by N counter circuit. The counter divides the pulse frequency by a preset number. This number, N, is the number dialed into the rear-panel rotary decade switches, plus one (see Figure 6). For example, if 378 is dialed into the switches, the counter will divide by 379. The divider has a division range of 2 to 10000, corresponding to switch settings from 0001 to 9999. The counter also provides an output to drive an external counter, pump, or other equipment at the CNT OUT* terminal on the rear of the MK 575 (see Figure 3).



NOTE: Magnetic Flosensor, Microflosensor, and Micet Flosensor also may be used with MK 575. See Figure 4 for input connections.

Figure 5. Block diagram of MK 575/575R circuitry.

4.0 CALIBRATION

Your MK 575 Accum-u-flo indicator was factory calibrated to a water standard for your particular pipe fitting and Signet Flosensor type (indicated on the rear of the MK 575 case). If used with this pipe fitting, recalibration should not be necessary unless the viscosity of the fluid used differs substantially from water. This indicator must be used with the Signet Flosensor transducer type specified. Use of another transducer type may require a different input module or recalibration.

The flow measurement and accumulator sections of the MK 575 are independent of one another. Each section is calibrated separately.

4.1 FLOMETER CALIBRATION

Adjusting the MK 575 meter movement for different units of measurement or recalibration can be accomplished using the Signet MK 561 Flow Test Indicator (see 6.2 Optional Accessories). The complete procedure for using this Tester is supplied in its manual.

NOTE:
FOR COMPLETE CALIBRATION DATA AND PROCEDURES, REFER TO SIGNET'S CALIBRATION MANUAL. CONSULT THE FACTORY FOR DETAILS.

4.2 COUNTER RECALIBRATION

Recalibrating the counter circuitry can be accomplished in the field simply by resetting the decade rotary switches on the rear of the MK 575 case (see Figure 6) using the appropriate K factor (pulses/gallon or pulses/liter) from Table 2 in the following equation:

$(K \times I) - 1 =$ Setting of Switches

where I is the number of increments you want counted.

For example, if you want the counter to count in 10-liter increments, and your pipe size is 2-½"-80, the K pulses/liter value is 6.123. Therefore,

$(6.123 \times 10) - 1 = 60.23$

Rounding off the answer to the nearest integer gives 60. Thus switches would be set to 0060.

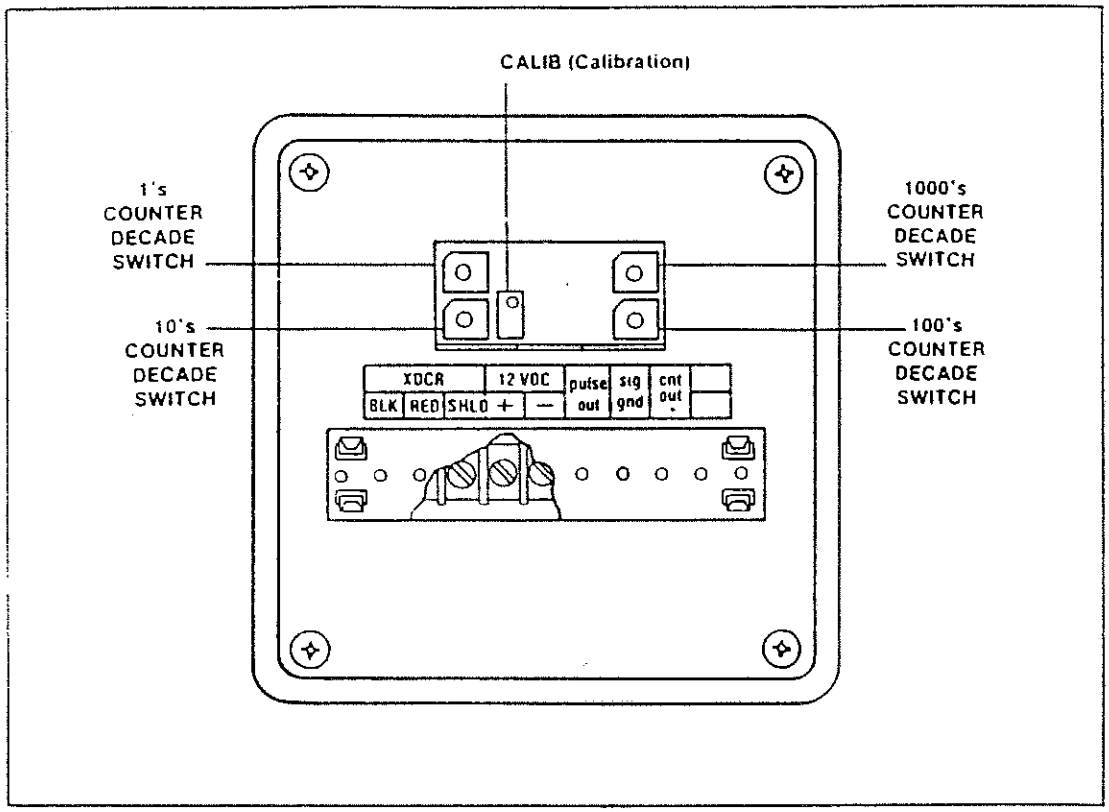


Figure 6. Rear view of MK 575/575R with calibration and counter controls exposed.

NOTE:
THE VALUES SHOWN IN TABLE 2 ARE DERIVED FROM SIGNET'S CALIBRATION CHART. THEY ARE NOT IDENTICAL TO THE CHART VALUES AND ARE NOT MEANT TO REPLACE THE CALIBRATION CHART.

If, because of some peculiarities in your piping system or the material flowing in that system, the MK 575 does not read correctly, you may have to adjust the calibration by some small percentage. This can be done using the following equation:

$$\frac{\text{Indicated Flow Volume}}{\text{Actual Flow Volume}} \times (\text{Setting of Switches} + 1) - 1 = \text{New Setting of Switches}$$

For example, with an actual flow of 100 gallons, the indicator shows 110 gallons. The switches are set at 271. Therefore,

$$\frac{110}{100} \times (271 + 1) - 1 = 298.2$$

Rounding off the answer to the nearest integer gives 298. Thus switches would be set to 298.

NOTE:
FOR COMPLETE CALIBRATION DATA AND PROCEDURES REFER TO SIGNET'S CALIBRATION MANUAL.

Table 2

NOMINAL DIAMETER	PIPE SIZE/ SCHEDULE	ACTUAL I.D.	K* PULSES/ GALLONS	K* PULSES/ LITERS
½"	80	0.526"	451.2	119.2
¾"	80	0.722"	254.9	67.34
1"	80	0.935"	183.5	48.49
1-¼"	80	1.256"	88.27	23.32
1-½"	80	1.476"	59.93	15.83
2"	80	1.913"	33.53	8.861
2-½"	80	2.291"	23.17	6.123
3"	80	2.864"	14.62	3.865
4"	80	3.789"	8.171	2.159

*Illustrative values only.

5.0 MAINTENANCE AND TROUBLESHOOTING

Your MK 575 was designed to require no routine maintenance. After correct installation has been verified, malfunctions will generally be traceable to operating conditions at the flosensor transducer (for example, sediment or particulate matter clogging the free movement of the rotor of a Paddlewheel Flosensor), not within the transducer or indicator. Transducer-oriented problems are explained in detail in the appropriate Signet Flosensor instruction manual. Please refer to it.

Non-transducer problems may be traced to the power supply. Measure the dc voltage from the power source to be sure it is within specifications (see 1.2 Specifications).

Malfunctions isolated to the Flosensor or MK 575 can be checked only by qualified technicians working in a well-instrumented technical laboratory. Attempting repairs inside the Flosensor or MK 575 can void your limited warranty (see 6.3 Warranty).

6.0 APPENDICES

6.1 PARTS LIST

Case (MK 575) . . . . . MK 509.49
Case (MK 575R) . . . . . MK 575.49
Glass (MK 575) . . . . . MK 509.47
Glass (MK 575R) . . . . . MK 575.47
Meter . . . M00108
Mounting Strap Kit M15129
Reset Button Kit (MK 575R) . . MK 75.95
Power Converter . . P30075

6.2 OPTIONAL ACCESSORIES

Mounting Bracket . . . . . MK 500.60
Conduit Mounting Kit . . . . . MK 500.78
Liquid Tight Kit: one ½" NPT Hub and two ¾" NPT hubs for waterproof cable connections to 500 Series Flometers with rear enclosures . . . . . MK 500.75
Flow Test Indicator . . MK 561
Cable Adapter Kit: Flosensor-to-Tester and Tester-to-Flometer adapter cables for the MK 561 . . . . . MK 561.60
Cable Adapter Kit: Series 300 Sensor to MK 575, adapter cables . . . . . MK 500.61-1

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(818) 571-2770 • TLX 6831174SIGNT UW

SIGNET

George Fischer +GF+

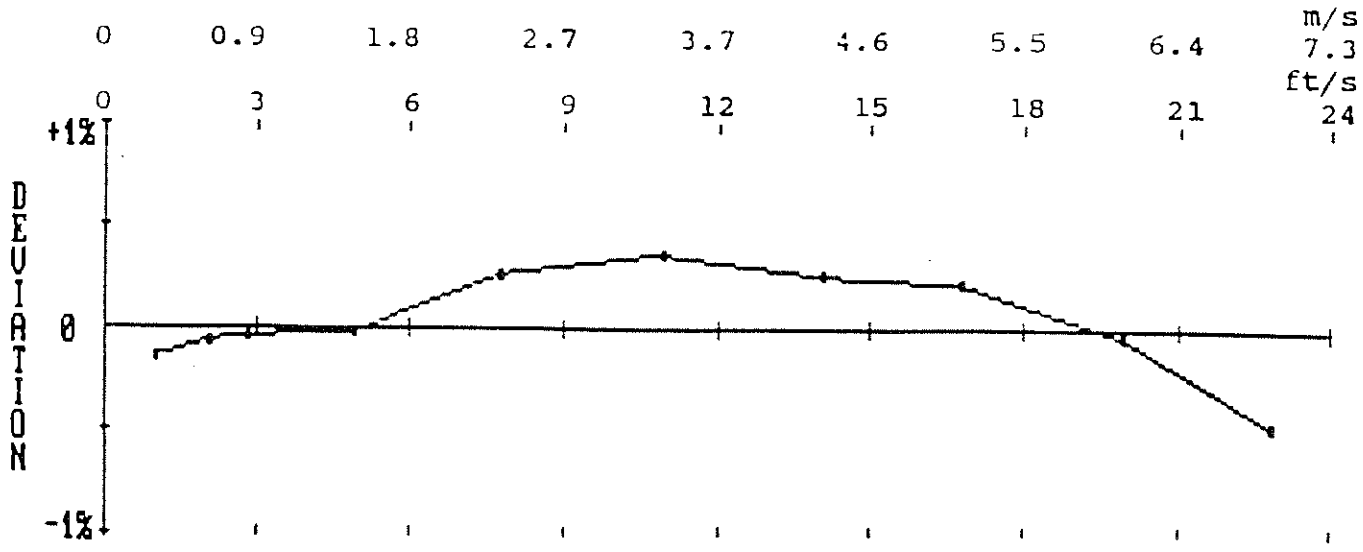
Flow Sensor Test Certificate
Prüfbescheinigung Durchfluss-Sensor
Certificat de test pour capteur de débit

Type : MK515-P0
Model No.: P51530-P0
Serial No: 0030788
Test code: 1.0394-0.9621
Test date: 03/06/90

Water Temperature: 22 degrees C
QA Procedure : QAP-FTCS
Traceable to NIST standards

Flow Velocity Durchflüssgeschwindigkeit Vitesse d'ecoulement (ft/s)	(m/s)	Reynolds No.	Sensor Freq. (Hz)	Sensor % deviation Sensor % Abweichung % deviation de capteur
1.08	0.33	12905.38	5.45	-0.149
2.18	0.66	25926.51	11.22	-0.074
2.92	0.89	34746.35	15.10	-0.051
5.00	1.53	59598.49	25.97	-0.026
7.91	2.41	94134.97	41.36	0.244
11.02	3.36	131222.43	57.67	0.354
14.16	4.32	168626.33	73.85	0.243
16.89	5.15	201135.38	87.99	0.210
20.01	6.10	238233.44	103.87	-0.043
22.92	6.99	272913.08	118.46	-0.495

Flow Velocity/Durchflussgeschwindigkeit/Vitesse d'ecoulement



Test and calibration performed at the automated transducer test facility.

SIGNET

GEORGE FISCHER +GF+

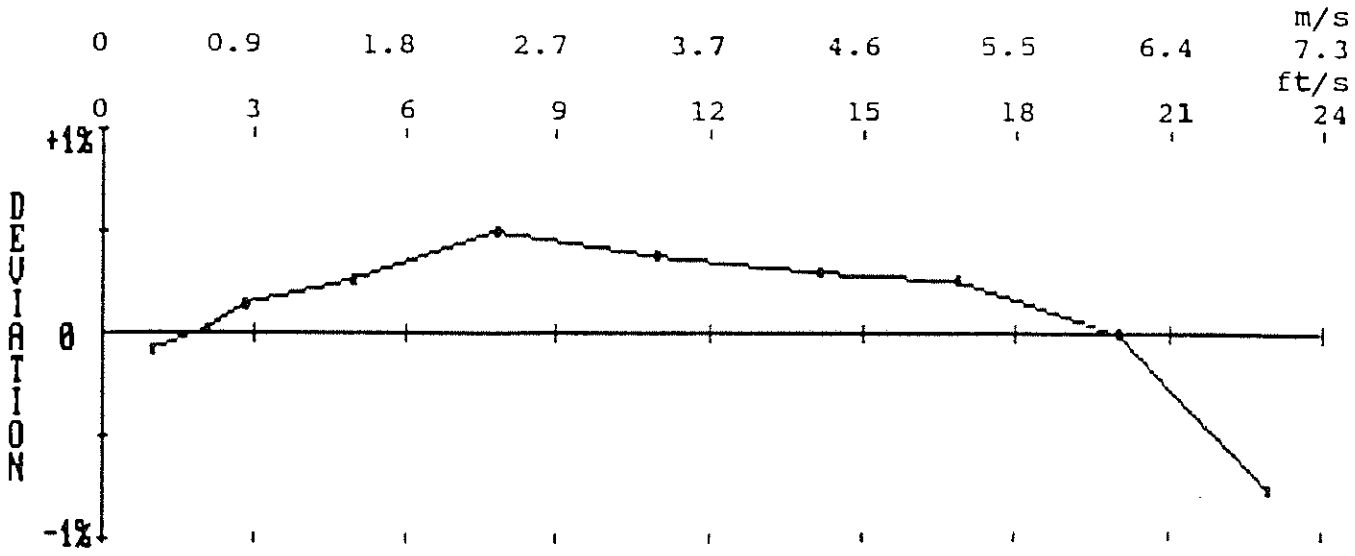
Flow Sensor Test Certificate
Prüfbescheinigung Durchfluss-Sensor
Certificat de test Capteur de débit

Type : MK515-P0
Model No.: P51530-P0
Serial No: 0020760
Test code: 1.0334-0.9677
Test date: 02/15/90

Water Temperature: 22 degrees C
QA Procedure : QAP-FTCS
Traceable to NIST standards

Flow Velocity Durchflussgeschwindigkeit Vitesse d'ecoulement (ft/s)	(m/s)	Reynolds No.	Sensor Freq. (Hz)	Sensor % deviation Sensor % Abweichung % deviation de capteur
1.10	0.34	13144.94	5.65	-0.099
2.20	0.67	26237.35	11.53	0.019
2.95	0.90	35132.68	15.57	0.128
5.04	1.54	60063.67	26.66	0.260
7.95	2.42	94716.92	42.16	0.499
11.08	3.38	131978.71	58.36	0.379
14.23	4.34	169489.67	74.72	0.298
16.97	5.17	202087.88	88.97	0.257
20.10	6.13	239356.73	104.99	-0.018
23.02	7.02	274184.64	119.35	-0.783

Flow Velocity/Durchflussgeschwindigkeit/Vitesse d'ecoulement



Test and calibration performed at the automated transducer test facility.

SIGNET

GEORGE FISCHER +GF+

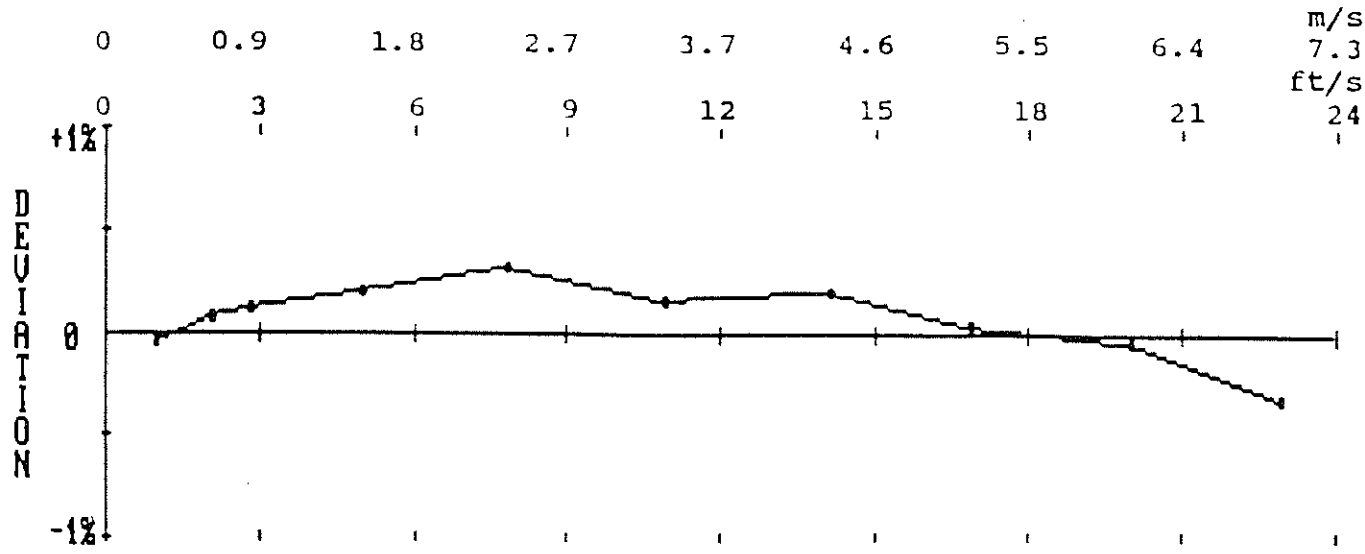
Flow Sensor Test Certificate
Prüfbescheinigung Durchfluss-Sensor
Certificat de test Capteur de débit

Type : MK515-P0
Model No.: P51530-P0
Serial No: 0020725
Test code: 1.0350-0.9662
Test date: 02/15/90

Water Temperature: 22 degrees C
QA Procedure : QAP-FTCS
Traceable to NIST standards

Flow Velocity Durchflussgeschwindigkeit Vitesse d'ecoulement (ft/s)	 (m/s)	Reynolds No.	Sensor Freq. (Hz)	Sensor % deviation Sensor % Abweichung % deviation de capteur
1.10	0.34	13109.45	5.69	-0.044
2.20	0.67	26237.35	11.57	0.067
2.95	0.90	35111.61	15.52	0.116
5.04	1.54	60037.83	26.54	0.196
7.95	2.42	94658.73	41.83	0.303
11.08	3.38	131901.14	57.97	0.154
14.23	4.34	169470.05	74.46	0.184
16.97	5.17	202049.01	88.55	0.028
20.09	6.12	239259.89	104.75	-0.057
23.01	7.01	274028.12	119.65	-0.326

Flow Velocity/Durchflussgeschwindigkeit/Vitesse d'ecoulement



Test and calibration performed at the automated transducer test facility.

SIGNET

GEORGE FISCHER +GF+

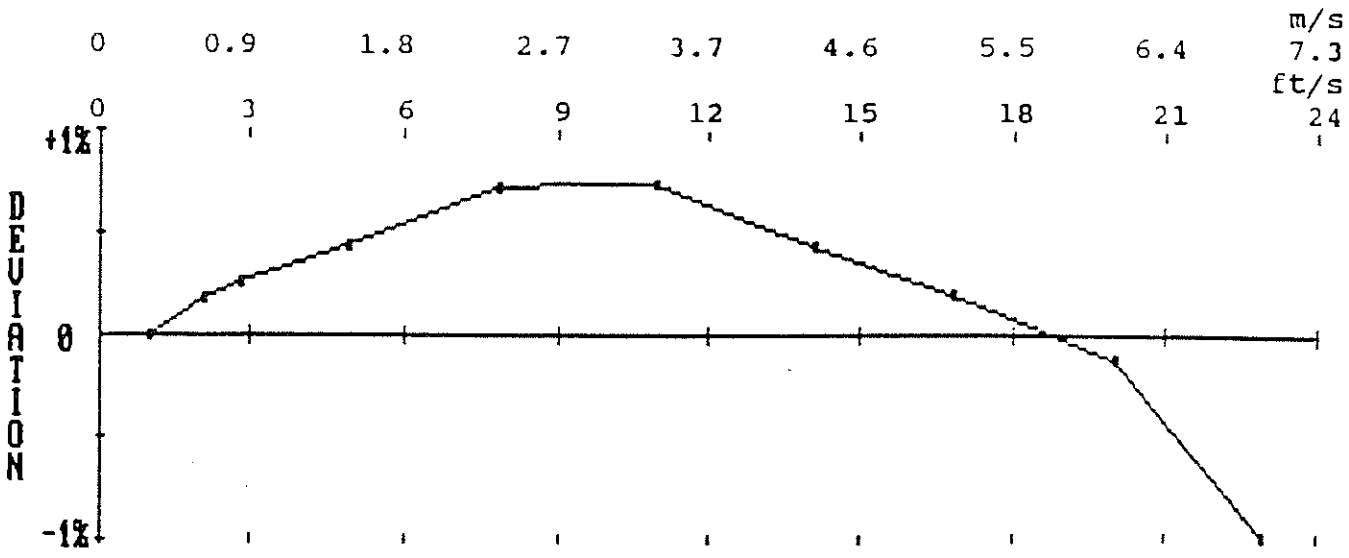
Flow Sensor Test Certificate
Prüfbescheinigung Durchfluss-Sensor
Certificat de test Capteur de débit

Type : MK515-P0
Model No.: P51530-P0
Serial No: 0020737
Test code: 1.0321-0.9689
Test date: 02/15/90

Water Temperature: 22 degrees C
QA Procedure : QAP-FTCS
Traceable to NIST standards

Flow Velocity Durchflussgeschwindigkeit Vitesse d'ecoulement (ft/s)	(m/s)	Reynolds No.	Sensor Freq. (Hz)	Sensor % deviation Sensor % Abweichung % deviation de capteur
1.10	0.34	13124.24	5.76	-0.002
2.20	0.67	26219.41	11.72	0.164
2.95	0.90	35090.54	15.72	0.249
5.04	1.54	60024.91	26.89	0.433
7.95	2.42	94639.33	42.44	0.718
11.07	3.38	131862.36	58.81	0.729
14.22	4.34	169391.57	74.92	0.420
16.96	5.17	201932.38	88.93	0.183
20.08	6.12	239163.05	104.90	-0.136
23.01	7.01	273949.87	119.12	-1.017

Flow Velocity/Durchflussgeschwindigkeit/Vitesse d'ecoulement



Test and calibration performed at the automated transducer test facility.

INSTRUMENTATION

FLOW

Building your liquid flow system is easy with Signet's 3 component design, which consists of a flow sensor, installation fitting, and flow indicator. There is a wide variety of combinations to suit your every flow application.

Start with the heart of the system—The Flow Sensor. Below you will find a selection of Signet Flow Sensors to satisfy your requirements.

SIGNET FLOW SENSORS

MK515—ROTOR-X FLOW SENSOR

Accurate to ±1% of full scale, with repeatability at ±0.55 of full scale, this insertion sensor operates on a simple electromechanical principle. Available in a choice of chemically resistant, non-contaminating housing materials, the ROTOR-X stands up to the harshest environments.

Part No.	Housing Material	Shaft Material	Pipe Size (in.)	Sensor O.D. (in.)	Sensor Length (in.)	Price
MK515 - P0	Polypro	Titanium	½-4	1.05	3.50	$195.00
MK515 - P1	Polypro	Titanium	5-8	1.05	5.00	210.00
MK515 - P2	Polypro	Titanium	10-UP	1.05	7.75	230.00
MK515 - V0	PVDF	Hastelloy C	½-4	1.05	3.50	385.00
MK515 - V1	PVDF	Hastelloy C	5-8	1.05	5.00	400.00
MK515 - V2	PVDF	Hastelloy C	10-UP	1.05	7.75	430.00

MK565—MIGHTY-MAG FLOW SENSOR

The MK565 Mighty Mag magnetic insertion flow sensor combines time-saving, cost-saving features with increased accuracy. It continuously and automatically compensates for zero drift, to give you more accurate information. Digital calibration ensures greater resolution, to ±1% of full scale, from 0.5 to 30 fps. The self-diagnostic mode quickly detects malfunctions, simplifying maintenance.

MK565 - 1P0	Polypro	Stainless Steel	½-4	1.05	3.50	$1570.00
MK565 - 1P1	Polypro	Stainless Steel	5-8	1.05	4.75	1610.00
MK565 - 1P2	Polypro	Stainless Steel	10-UP	1.05	7.50	1640.00
MK565 - 1V0	PVDF	Hastelloy C	½-4	1.05	3.50	1360.00
MK565 - 1V1	PVDF	Hastelloy C	5-8	1.05	4.75	1390.00
MK565 - 1V2	PVDF	Hastelloy C	10-UP	1.05	7.50	1425.00

MK2517—PERMA-FLOW ADJUSTABLE BRASS FLOW SENSOR

Perma-Flow accurately measures a wide variety of fluids from flow rates as low as 0.7 feet per second up to 30 feet per second. Signet's unique "open-cell" paddlewheel generates a sine-wave with a frequency linearly proportional to ±1% over the full dynamic range of flow with ±0.5% repeatability.

Perma-Flow is versatile because it adjusts to various pipe sizes. There is no need to buy a different sensor for every change in pipe size. You can position the Perma-Flow to give you accurate readings in any size pipe, 1½" to 36". This allows you tremendous cost savings.

No special fittings are required. A standard 1½" threadolet or saddle fitting is all you need.

Made of rugged brass, the Perma-Flow can handle harsh environments. The output signal can be sent up to 200 feet without amplification. Each Perma-Flow sensor comes with a 25' cable and all necessary mounting hardware. It is compatible with Signet's line of electronic analog and digital instruments and can be adapted to most other data collection instruments.

Part No.	Description	Price
MK32517	Perma-Flow (brass)	$300.00

Specifications:

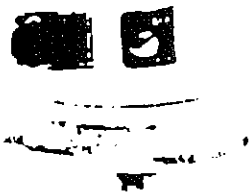
Output Signal	Sine Wave
Output Frequency	Approximately 9-12 Hz/fps
Source Impedance	10,000 Ohms
Flow Rate Range	.7 to 30 feet per second (fps)
Linearity	±1% of full range
Repeatability	±0.5% of full range
Maximum Operating Pressure	225 psi
Maximum Operating Temperature	212°F
Maximum Amount of Suspended Particulate Matter	Up to 10% with particulate size not exceeding 5mm in cross section or length

MK507—MINI-FLO SENSOR

***PRICE: $290.00**

The MK507 sensor is ideal for precision low flow monitoring of hard to handle corrosive chemicals or high purity fluids. The Mini-Flo sensor is available in six flow range configurations, covering a wide range of flows. Typical applications include pilot plant installations, monitoring of critical flows in laboratories, fluid dispensing, bottling lines, and medical flow applications.

* Price includes PVDF adaptor for ¼" threads.



Available Scale—MK507	
200 to 2000 ml/mm	0.053 to 0.528 gpm
400 to 2800 ml/mm	0.106 to 0.740 gpm
700 to 4200 ml/mm	0.185 to 1.110 gpm
1300 to 6000 ml/mm	0.343 to 1.585 gpm
3200 to 12000 ml/mm	0.845 to 3.170 gpm

MK2502—LO-FLOW SENSOR

PRICE: $505.00

Based on an electro-optical design, this precision flow transducer is capable of accurately measuring extremely low flowrates and is suitable for a wide variety of industrial, commercial and laboratory flow applications. Use in conjunction with a Signet instrument, will result in an extremely accurate flow system to measure, control and/or integrate flow over a wide range of parameters. The MK2502 utilizes a paddlewheel to determine the flow rate of the fluid. The rotation rate of the paddlewheel is linear over a wide dynamic range. The electro-optical system consists of a diode, emitting energy in the infra-red spectrum, coupled through the fluid photo-transistor. Each blade of the rotating paddlewheel interrupts the beam creating an output signal approximating a negative-going pulse with an amplitude of 0-5 volts. Stainless steel housing, sapphire jeweled bearings, and a Tefzel paddle make it inert to most chemicals.

Available Scale—MK2502	
0 to 8000 ml/mm	0 to 1.8 gpm
0 to 5000 ml/mm	0 to 1.2 gpm
0 to 3000 ml/mm	0 to 0.8 gpm
0 to 1800 ml/mm	0 to 0.5 gpm
0 to 1200 ml/mm	0 to 0.3 gpm
0 to 800 ml/mm	0 to 0.28 gpm
0 to 500 ml/mm	0 to 0.12 gpm

FLOW INSTRUMENTATION

SNET WET TAP ASSEMBLY

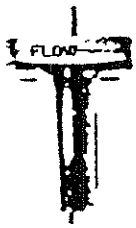
...u can completely eliminate downtime resulting from flow sensor ...maintenance, with the addition of Signet's MK319 Wet Tap Valve Assembly. The MK319 serves as a unique interface between your Signet sensor and matched sensor installation fitting. It provides you with a safe and fast method of removing a specially extended sensor from your pipe—under normal operating pressures. Additionally, the molded PVC design of the Wet Tap Assembly makes it resistant to corrosion and chemical attack by acids, alkalies, salt solutions, and many other harsh chemicals. You can choose from two Signet flow sensor models—the MK515 Rotor-X or the MK565 Mighty-Mag flow sensor. (The MK319 does not include pipe installation fitting.)

MIGHTY-MAG™ WITH WET-TAP VALVE ASSEMBLY

Part No.	Wet-Tap Valve Assem. Material	Sensor Housing Material	Shaft Material	Pipe Size (in.)	Sensor O.D. (in.)	Sensor Length (in.)	Price
319MK565 - V3	PVC	Polypro	Stainless Steel	½-4	1.05	11.75	$1745.00
319MK565 - V4	PVC	Polypro	Stainless Steel	5-8	1.05	13.00	1775.00
319MK565 - V5	PVC	Polypro	Stainless Steel	10-UP	1.05	16.00	1806.00
ROTOR-X WITH WET-TAP ASSEMBLY							
319MK515 - P3	PVC	Polypro	Titanium	½-4	1.05	11.75	580.00
319MK515 - P4	PVC	Polypro	Titanium	5-8	1.05	13.00	610.00
319MK515 - P5	PVC	Polypro	Titanium	10-UP	1.05	16.00	640.00

SIGNET METALEX SYSTEM

MK525—METALEX FLOW SENSOR



The Metalex gives you the strength of an all metal flow sensor which permits you the high degree of accuracy and reliability you demand, to ± 1% of full scale, without the added cost. The all stainless steel Metalex sensor accurately measures a wide variety of fluids—even under high pressure and high ...perature conditions (pressures to 1500 psi, ...peratures to 300°F). Applications of the ...K525 include monitoring and controlling flow in secondary oil recovery, boiler water feed lines, turbine steam condensate, and energy management systems, HVAC. In the sensor housing, a magnet is surrounded by a coil, creating a magnetic field. As the liquid flow causes the rotor to spin, each blade passing this coil concentrates the lines of magnetic force, producing a repeatable AC sine wave output. The Metalex also features Signet's patented "open-cell" rotor for increased linearity at ±1% over the full dynamic range of 1.5 to 30 fps, with negligible head loss.

Part No.	Sensor Pipe Fitting Size*/Style	Length (in.)	Max. Temp.	Max. Press.	Price
MK525 - 1	½-1 Mini-Tap	1.512	300°F	1500psi	$310.00
MK525 - 2	1¼-12 Mini-Tap	2.50	300°F	1500psi	310.00
MK525 - 3	2-12 Saddle	4.50	300°F	300psi	310.00

MK1500—METALEX HOT-TAP — Price: $585.00

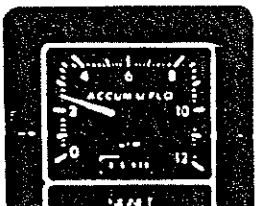
The Metalex Hot-Tap is a specially designed flow sensor with installation hardware that allows quick and easy installation and removal of the sensor, without shutting down the process stream. The flow sensor can be quickly installed into pipe sizes from 2" to 12" (compatible with Mueller drill assemblies) under pressures up to 400 psi and temperatures up to 300°F. The Metalex is a rugged instrument that is ideal for water service and suitable for many kinds of chemical applications. The MK1500 consists of a specially designed Metalex Flow Sensor (with flow through paddlewheel) and hot tap fitting assembly. A high ...pressure hydraulic seal is used to assure ... from insertion and retraction of the sensor, even at maximum pressure. The sensor can be easily adjusted into any insertion depth. In addition to the Metalex sensor and hot tap fitting, the following items are necessary for ...tallation and insertion of the Metalex Hot-Tap: insertion tool, ...lation valve, nipple, and brazolet or weldolet fitting.

3MK8502—METALEX TRANSMITTER — Price: $470.00

The transmitter electronics are totally self-contained in an encapsulated module housed in a NEMA 4 and 7 explosion proof enclosure. This combination makes the transmitter water-tight and corrosion-resistant, thus allowing the transmitter to be installed in extreme temperature, moisture, and hazardous gas environments. The transmitter is designed for use with the Metalex Flow sensor and is mounted directly to it. The 3MK8502 features 4-20mA signal, proportional to flow and compatible with most computers and controllers and linearity to ±1% of full scale, ±0.5% repeatability of full scale. A digital LCD display readout is available as an option for the 3MK8502 Metalex Flow Transmitter.

SIGNET FLOW INDICATORS

MK575/MK575R — ACCUM-U-FLO



MK575

Just a quick glance at Signet's MK575 Accum-u-flo gives you **accurate fluid flow rate and totalized flow volume readings.** By having both these essential flow functions combined on one convenient unit, you'll save space and eliminate additional expense. Flow rate is displayed on an easy-to-read 5½ inch analog dial. While totalized volume is presented on a low-maintenance, electro-mechanical counter. Choose from a 7-digit non-resettable counter (MK575) for continuous totalizing or a 5-digit front resettable counter (MK575R) for periodic totalizing. The MK575's 245 degree, high-torque meter gives you *greater resolution in high-vibration areas.* With a resulting flow rate accuracy of ±1% of full scale—and totalized volume accuracy of ±2% of calibrated flow rate. And, you can easily interface the Accum-u-flo with other TTL compatible equipment. Includes a 117 VAC to 12 VDC power converter.

Part No.	Description	Price
MK575*	Accum-U-Flo Analog dial with 7 digit	$470.00
MK575R*	totalizer, or 5 digit resettable totalizer(R)	470.00
MK578*	Batch accumulator	470.00
MK579*	Flow totalizer 7 digit non-resettable	415.00
MK579R*	or 5 digit resettable(R)	415.00
MK576	Battery operated digital flow meter	330.00
MK586	Battery operated digital flow meter with totalizer	470.00
MK584*	Flow rate indicator – analog dial	330.00
MK577*	Digital flow rate indicator	415.00
MK585	Flow alarm	470.00

* Comes with Power Supply 110VAC/12VDC.
Note: See Flow Rate Chart on page B1-5 for recommended scale ranges and pipe sizes.

ACTIVATED CARBON CANISTERS

Manufacturer:

Carbtrol Corporation

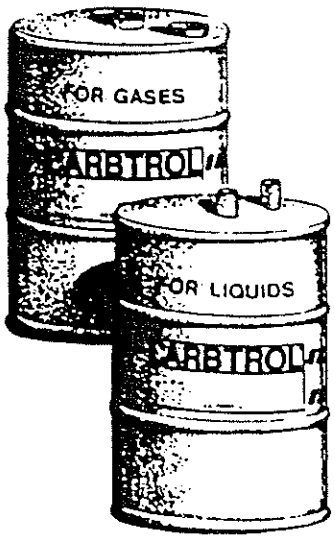
Supplier:

Carbtrol Corporation
39 Riverside Avenue
Westport, CT 06880
(203) 226-5642
Contact - James Davidson

Features:

Model L-1
Inlet, Outlet - 1¼" NPT
Max Flow (Per Canister Line)-10 gpm

CARBTROL®
Activated Carbon Adsorption Canisters



CARBTROL®: A modular system designed for removal of contaminants from liquids and gases.

Typical Carbtrol® Applications:

Gas Phase:

- SEWAGE PLANT ODOR CONTROL
- TANK VENTS
- AIR STRIPPER EXHAUSTS
- EXHAUST HOODS
- WORK AREA AIR PURIFICATION

Liquid Phase:

- GROUNDWATER TREATMENT
- PRODUCT PURIFICATION
- WASTEWATER TREATMENT
- PCB REMOVAL
- LEACHATE TREATMENT

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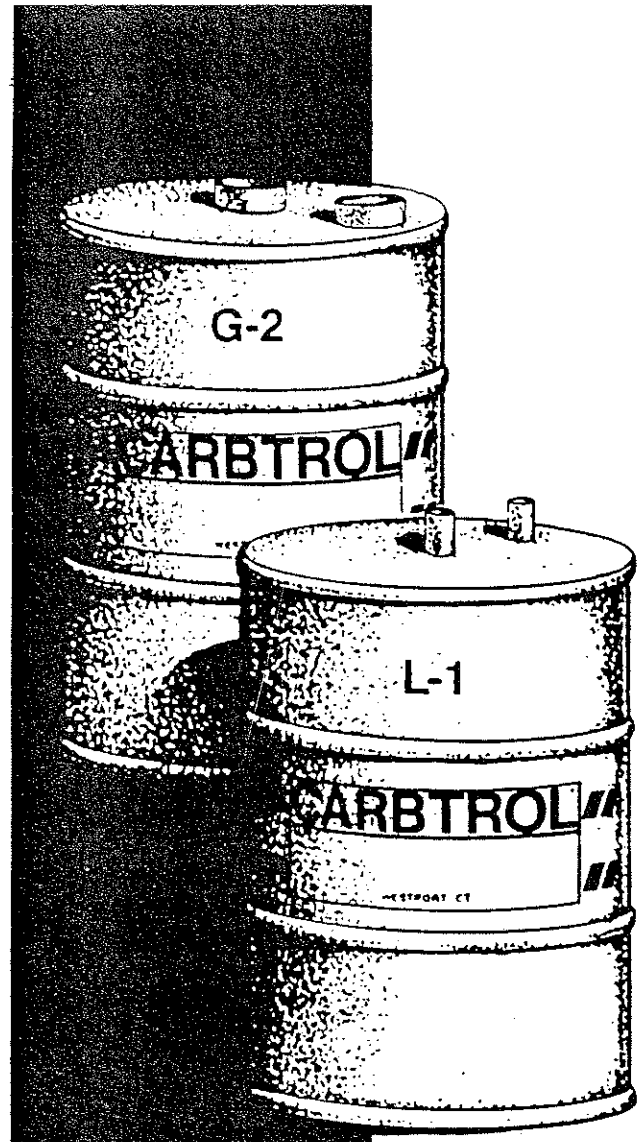
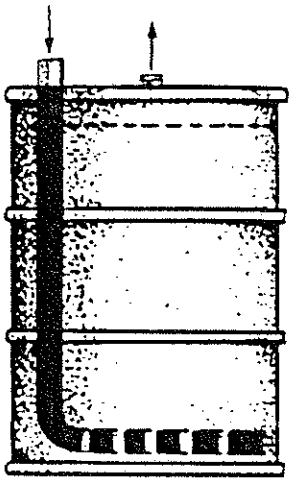


- **CARBTROL®** canisters utilize the proven effectiveness of granular activated carbon to provide economical and effective removal of organic contaminants from air and water.
- The canisters are designed for treatment of gas streams to 500 CFM and liquid systems to 10 gpm.
- **CARBTROL®** adsorption units consist of heavy-duty steel canisters, double epoxy-lined, fitted with chemically inert internal distribution and collection systems.
- The canisters contain between 140 and 200 lbs. of custom-selected activated carbon media (depending on model and application) and can be operated at temperatures to 140°F and pressures to 8 PSIG.
- The **CARBTROL®** adsorption canister system is shipped to your facility ready for easy installation. Normally, all that is required is connection of inlet and outlet piping or ducting.
- When exhausted, the **CARBTROL®** canister can be shipped to an appropriate landfill or regeneration facility, since the canister is a D.O.T. approved container for handling hazardous waste.
- The service life of the **CARBTROL™** canister will vary according to application and concentration of contaminant to be removed. **CARBTROL® Corporation** can provide an estimate of expected service life upon review of proposed operating conditions. (Listing of typical compounds removed by **CARBTROL®** on back page.)

CARBTROL™ options:

- Custom activated carbon and synthetic adsorption media can be provided, including:
  - Potassium Hydroxide Impregnated Carbon
  - Phosphoric Acid Impregnated Carbon
  - Molecular Sieve
  - Silica Gel
  - And others depending on the contaminants to be removed.

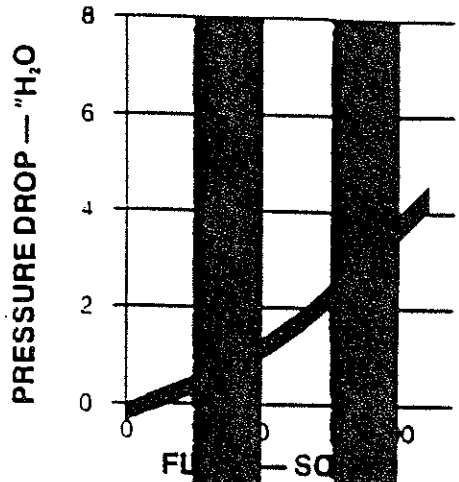
CARBTROL® for gases



Model G-1

SPECIFICATIONS

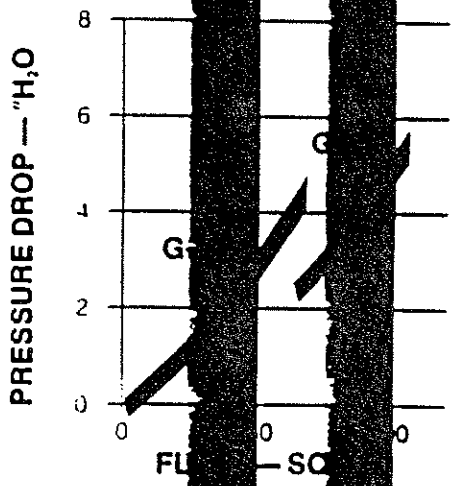
Diameter/Height	24/36"
Carbon	200 lbs.
Shipping Weight	250 lbs.
Inlet	2" NPT
Outlet	2" Bung
Max. Flow	100 CFM



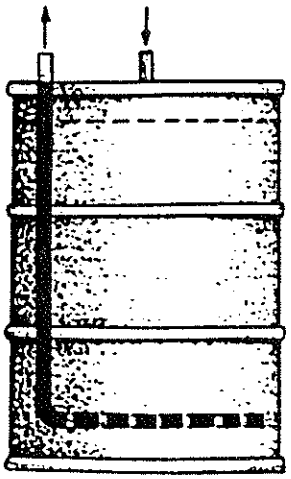
Models G-2, G-3

SPECIFICATIONS

Diameter/Height	24/36"
Carbon (G-2)	170 lbs.
Carbon (G-3)	140 lbs.
Shipping Weight	250 lbs.
Inlet	4" NPT
Outlet	4" NPT
Max. Flow: G-2	300 CFM
Max. Flow: G-3	500 CFM



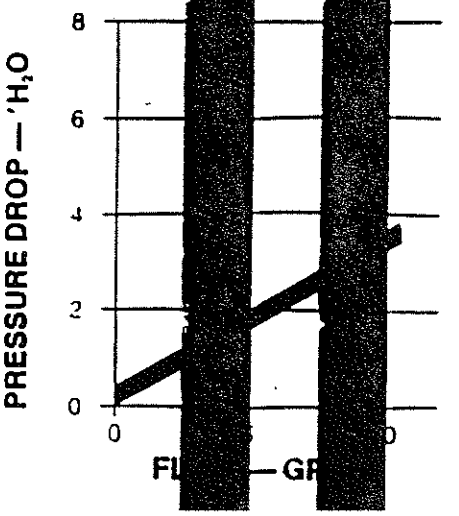
CARBTROL® for liquids



Model L-1

SPECIFICATIONS

Diameter/Height	24/36"
Carbon	200 lbs.
Shipping Weight	250 lbs.
Inlet	1¼" NPT
Outlet	1¼" NPT
Max Flow	10 gpm



Typical compounds removed by CARBTROL® activated carbon canisters:

Acetone
Acrylonitrile
Anthracene

Benzene
Bromochloromethane

Carbon Disulfide
Carbon Tetrachlonde
Chlorocresol
Chloroethane
Chlorohexane
Chloroform
Chloromethylether
Chlorobenzene
Chlorophenol
Chloroethoxymethane

DDD
DDE
DDT
Dichlorobenzene
Dichloroethane
Dichloroethylene
Dichlorophenol
Diethylether
Dimethylamine
Dinitro-cresol
Dinitrotoluene
Dioxin

Ethanol
Ethylbenzene
Ethyl Mercaptan

Freons
Fuel Oils

Gasoline

Heptane
Hexane
Hydrogen Sulfide

Isopropyl Alcohol

Lindane

Methylene Chlonde
Methyl Chlonde
Methyl Mercaptan

Naphthalene
Nitrobenzene
Nitrophenol

Pentanes
Phenol
PCB's

Solvent Odors
Styrene

Tetrachloroethane
Tetrachloroethylene
Toluene
Trichloroethane
Trichloroethylene
Trichlorobenzene
Trichlorophenol

Vinyl Chlonde

Xylene

■ For adsorption capacities for the compounds in your specific application and for information on other compounds not listed, **CARBTROL® Corporation** will provide an estimate of expected service life, suitability and the best system for the existing operating conditions.

CARBTROL®
CORPORATION

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(203) 226-5642

Under certain conditions some chemical compounds may oxidize, decompose or polymerize when exposed to activated carbon. If the reaction of activated carbon is unknown, tests should be conducted before putting **CARBTROL®** units into service.

CARBTROL® 11/88, 840-10M

CARBTROL® CORPORATION data sheet DS-13

Subject: ACTIVATED CARBON CANISTERS

The L-1 (liquid phase) and G-1 (gas phase) CARBTROL® canisters each have 200 pounds of virgin granular activated carbon contained in a 55 gallon drum.

The L-1 canister has capacity of 10 gpm at a pressure drop of 3.5 feet water.

The G-1 canister has capacity of 100 CFM at a pressure drop of 4 inches water.

Advantages include:

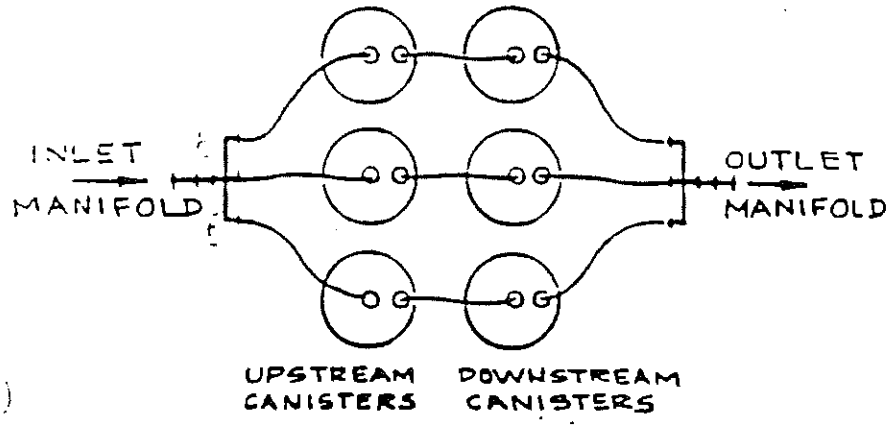
- Full 200 pounds of carbon in each canister. Low cost per pound of carbon.
- Minimum pressure loss because of large piping.
- DOT rated for transport .
- Interconnecting piping kits for flows up to 60 gpm.
- In stock for immediate shipment.

CARBTROL® canisters are well engineered and cost effective.

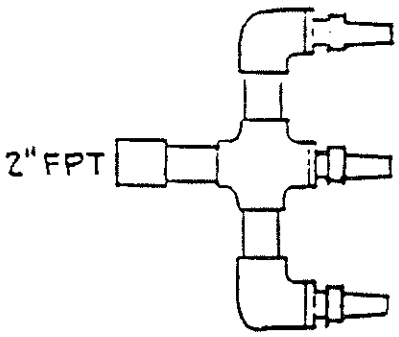
8/28/89

CARBTROL
CORPORATION

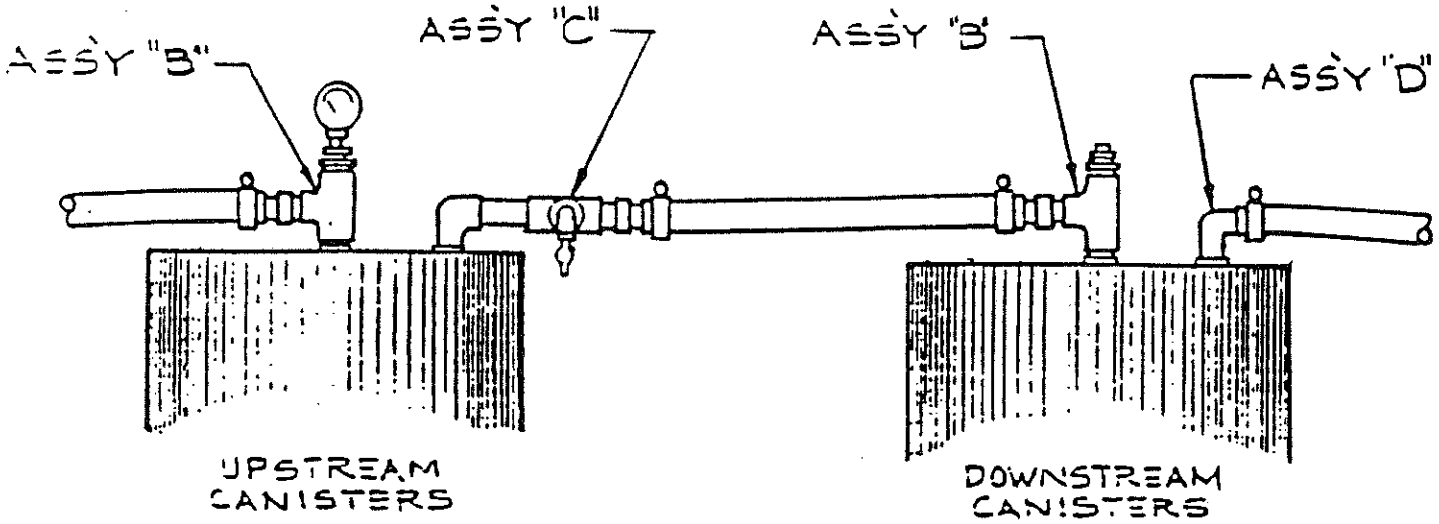
L-1 CARBTROL SPECIAL PIPING KIT
30 GPM



SCHEMATIC



ASSEMBLY "A"
INLET & OUTLET
MANIFOLDS



CANISTER INLET & OUTLET PIPING

CARBTROL®
CORPORATION

39 Riverside Avenue
Westport, Connecticut 06880
1-800-242-1150 • (203) 226-5642

INSTALLATION & OPERATING INSTRUCTIONS
LIQUID PHASE CARBTROL® CANISTERS

INSTALLATION

The CARBTROL® Canister should be placed in an accessible area, preferably close to the source of liquid to be treated. The inlet and outlet plugs on the canister cover should then be removed.

To prevent air pressure buildup during operation, the CARBTROL® Canister must be degassed by filling the canister with water or the liquid to be treated.

This can be accomplished by pumping the liquid at a slow rate (1 - 2 gpm) into the outlet port on the CARBTROL® Canister cover until the canister is filled. The CARBTROL® Unit should then be allowed to stand for 24 hours to permit de-gassing of the bed. Periodically during this time, additional liquid should be added to the canister as the level drops due to gas displacement.

Following the de-gassing period the inlet and outlet hoses can then be connected to the CARBTROL® Canister. During initial startup, the CARBTROL® Effluent Liquid can be recycled for approximately 5 bed volumes, to recycle any carbon fines in theinitial flow. This recycle can be accomplished at a rate equal to the processing rate.

Following this recycle the canister can be put into continuous operation.

OPERATION

Once the CARBTROL® Canister is installed it is designed to operate virtually unattended.

As contaminated liquid flows through the CARBTROL® Canister, the granular activated carbon adsorbs the impurities. The treated liquid flows into a collector at the bottom of the carbon bed and is directed to the outlet nozzle. As impurities are adsorbed on the carbon bed, it will start to become saturated and some impurities will bleed into the effluent. The bed should be replaced before the level of effluent impurity exceeds the treatment objective.

Alternatively, the useful life of a canister can be extended by operating two canisters in a series mode. In this arrangement two canisters are connected in series and operated until the lead canister of the series becomes completely saturated with the impurity (i.e., the effluent concentration equals the influent concentration) or the effluent impurity level of the second canister approaches the treatment objective. This lead canister is then removed from service and replaced with the second CARBTROL® Canister. The second canister is then replaced with a fresh CARBTROL® Canister.

The useful life of the CARBTROL® Canister will differ from one application to another. This is because the capacity of the activated carbon will vary with the type and concentration of contaminants in the liquid passed through it. For that reason the most precise measurement of canister life will come from the practical experience of using it under a specific set of operating conditions.

Spent CARBTROL® Canisters can be drained by use of the 3/4" drain bung on the lower side of the canister. Drained liquids should be returned to the upstream feed point for reprocessing. Replace the bung once the canister is drained.

CAUTION ! ! !

A. Operating pressure for CARBTROL® Canisters should not exceed 7 psig.

B. Activated carbon has been known to react adversely with some contaminants. If the effect of the contaminant you wish to treat on activated carbon is unknown, then it must be tested.

C. Best results are obtained when suspended solids in the untreated liquid are removed prior to treatment in the CARBTROL® Canister. This will prevent fouling of the activated carbon which may result in a reduction of its useful life and in increased back pressure.

D. Reinstall the steel shipping plugs and follow all State and Federal EPA Regulations when disposing of spent carbon canisters.

WARRANTY

This product is designed to remove toxic elements from liquids. However, there is no assurance of its capacity. SELLER WARRANTS THAT THE GOODS ARE AS DESCRIBED, BUT NO OTHER WARRANTY IS GIVEN, WHETHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Seller will not be liable for loss or damage to property or any incidental or consequential loss or expense from property damage due directly or indirectly from the use of the product.

SERIES Z14 & Z15 METERING PUMPS

INSTRUCTIONS
MAINTENANCE
SERVICE

For future reference, please record the following data:

Model No.: _____

Serial No.: _____

Installation date: _____

When ordering replacement parts for your LMI metering pump, please include the complete pump model number and serial number.

LIQUID METRONICS INCORPORATED

19 CRAIG ROAD · ACTON, MA 01720-5495, U.S.A.

TEL: (508) 263-9800
TLX: 95-1781
FAX: (508) 264-9172

1. UNPACKING

A. Remove pump from cardboard box. Notify delivery carrier immediately if there are any signs of damage to the metering pump or parts.

The carton should contain:

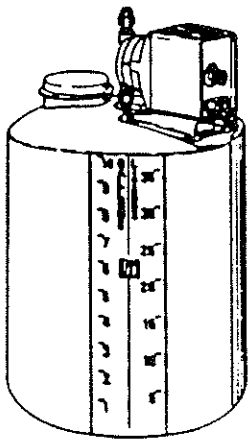
Metering Pump, Stiff Translucent Tubing, Injection Check Valve, Foot Valve, Ceramic Weight, Instruction Manual, LMI 4-Function Valve (for model numbers ending in S only)

II. LOCATION AND MOUNTING

A. Locate the pump in an area which is convenient to both chemical injection point and electrical supply. Series Z metering pumps have corrosion resistant housings but should not be subject to continous temperatures over 100° F(38°C).

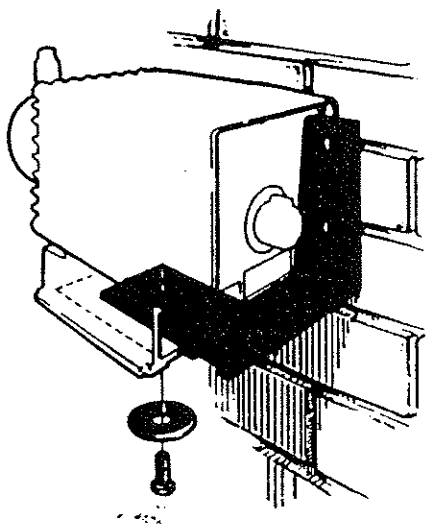
B. TANK MOUNT

Pump may be mounted on top of a molded chemical tank cover, provided there is a recessed mounting location for this purpose. (A molded recess for this purpose is included with Liquid Metronics tank assemblies, available in 10, 35 and 50 gallon sizes as an extra cost option.)



C. BRACKET MOUNT

Pump may be mounted on a bracket such as LMI part number 28272, directly above the chemical supply tank. A pump mounted allows easier changing of chemical tanks.



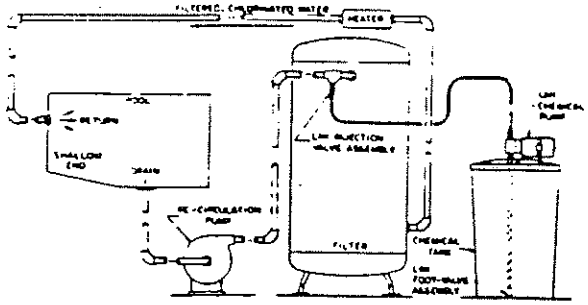
D. If the chemical you are pumping is to be injected into a pipe line, the spring loaded injection check valve assembly should be threaded into a 1" or larger pipe tee. The injection check valve assembly has 1/2 " pipe threads on one end and a connection for .250" polyethylene tubing on the other end. To thread this valve assembly into a 1" or larger pipe tee, the valve assembly should be threaded into a threaded reducing bushing. Pipe thread sealant should be applied to ensure a leakproof connection.
If the chemical you are pumping is to be injected into an open tank, the injection fitting should be threaded into a tapped hole in the tank wall or into a field fabricated retainer to hold it in place. If you are pumping into an open tank, the anti-syphon spring must be installed in the injection valve to prevent syphoning.

E. BACK PRESSURE REQUIREMENT

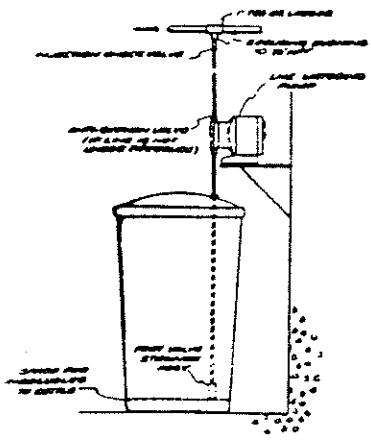
All electronically controlled magnetically driven pumps attain maximum velocity on the discharge portion of their stroke regardless of the stroke frequency setting. If there is little or no resistance (back pressure) the velocity of the pumped fluid will be so great as to cause over-pumping. Because of this characteristic, back pressure equal to approximately 15 psi must be supplied by an anti-syphon/ back pressure valve if the system pressure at the injection point is not high enough to provide the needed back pressure.

Be sure istallation does not constitute a cross connection. Check local plumbing code.

TREATMENT OF SWIMMING POOLS

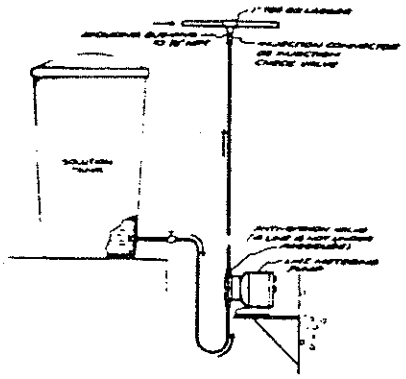


SUCTION LIFT INSTALLATION



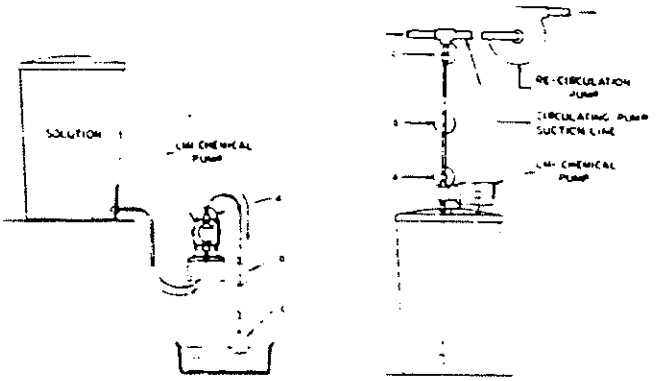
FLOODED SUCTION INSTALLATION

Helpful when pumping at very low rates or when pumping chemical solutions which gasify readily.



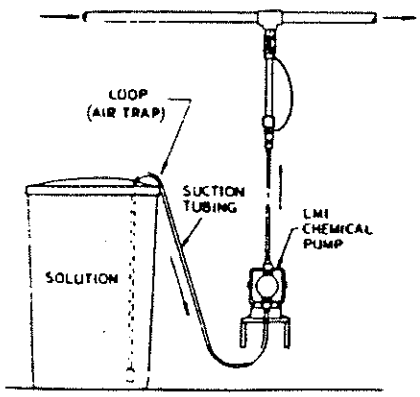
PREVENT SYPHONING WHEN PUMPING DOWN-HILL OR INTO PUMP SUCTION.

Always use an anti-syphon/back pressure valve at metering pump discharge (a), in line (b) or at point of chemical injection (c).



AVOID FALSE FLOODED SUCTION INSTALLATION

The loop at the top of the tank forms a neat air trap. In time, air and gasses can bubble out, accumulate and cause loss of prime.



PREVENT BACKFLOW

Be sure that arrows on injection valve and pump head are pointin straight upwards to prevent backflow. These arrows indicate diection of chemicaf flow.

PREVENT PIPE CORROSION

Do not insert injection fitting into pipe stub in tee. This could cause pipe corrosion from chemical build-up. The injection valve should be installed directly into the pipe tee, in the flow of fluid being treated.

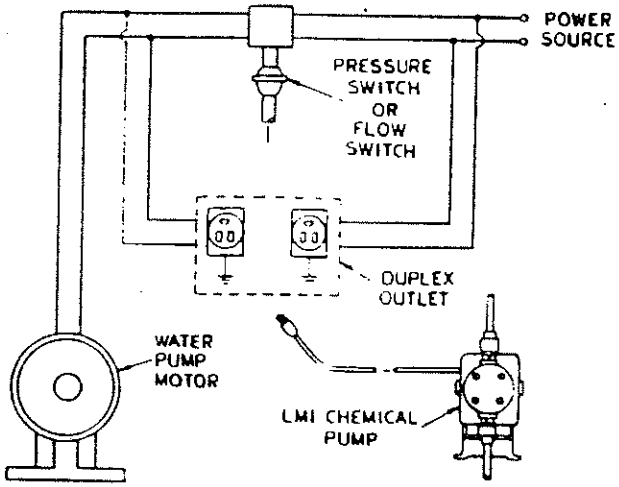
III. ELECTRICAL

The series Z pump should be plugged into a 3-prong grounded electrical outlet with ratings conforming to data on pump panel. DO NOT USE ADAPTERS.

If your Z pump is to be operated in conjunction with a water pump controlled by a pressure switch or other on/off control system, the Z pump may be connected to the same switch or control.

WIRING DIAGRAM PRESSURE OR FLOW SWITCH SYSTEM

NOTE: *If the control voltage is different from the Z pump voltage, a relay or transformer should be installed.*



DRIVE ASSEMBLY	SOLENOID RESISTANCE*
Z141,Z151	209 -241 Ohms
Z142,Z152, Z143, Z153, Z145, Z155, Z146, Z156, Z147, Z157	833 - 959 Ohms

*cold coil resistance: 65°F to 75°F or 18°C to 22°C

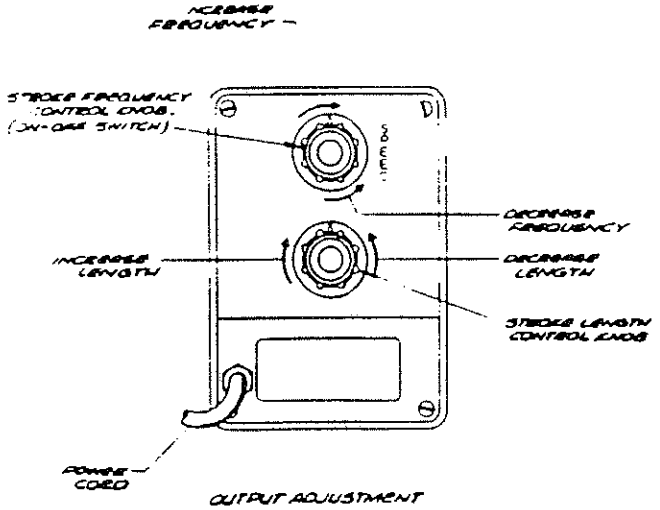
OUTPUT ADJUSTMENT

I. INITIAL APPROXIMATION

1. Stroke frequency control knob is graduated in approximate percent strokes per minute. Maximum strokes per minute is 60.
Output estimate - total output of pump may be estimated by multiplying stroke frequency (percent of maximum) by stroke length setting (percent of maximum).
2. If the exact stroke frequency at any time is required, hold your hand on the top of the pump and listen for each stroke and count the number of strokes in one minute.
3. Stroke length is adjusted by rotating the stroke length control knob to desired setting while pump is operating.

II. SETTING

1. Maximum output - turn stroke frequency control knob to 100.
2. Reduce output - turn stroke frequency knob to the desired percentage of pumps maximum output capability. For maximum volumetric efficiency, set the stroke length knob at 100 and reduce the stroke frequency. If stroke length must be adjusted to reduce output, avoid turning the stroke length knob into the black zone - this will reduce the stroke length so much that volumetric efficiency will be lost.
3. After installation is complete and initial approximation has been made, the pump should be calibrated and the stroke length and/or frequency settings adjusted.



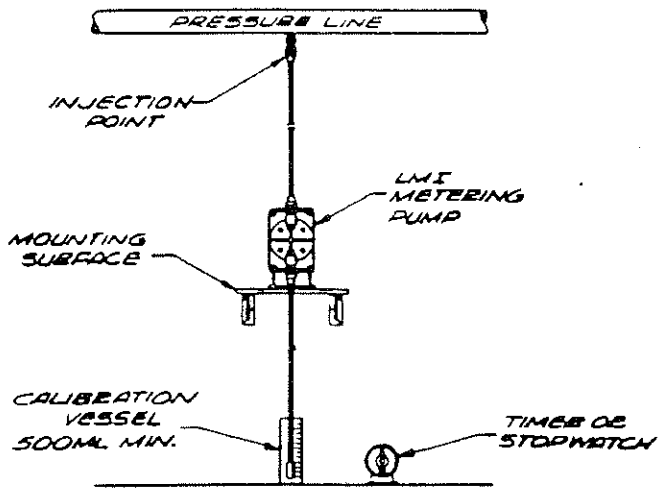
OUTPUT ADJUSTMENT

III. CALIBRATION PROCEDURE

ON-SITE VOLUMETRIC CALIBRATION PROCEDURE

A. With pump primed and discharge tubing connected to the injection point as it would be in normal service, place the foot valve and strainer assembly in a graduated container with a volume of 500 mL or more.
B. Plug in pump and pump until air is exhausted from the suction line and pump head.
C. Unplug pump and note the solution level in the graduate. Refill graduate if necessary.
D. Plug in pump and pump for at least 50 pump strokes. The longer the calibration period, the more accurate the results.
E. Unplug pump and note volume pumped at end of calibration period. Calculate the volume of solution pumped in unit of time you choose.
F. Adjust stroke frequency and/or stroke length knobs to your best estimate for required correction and recalibrate.

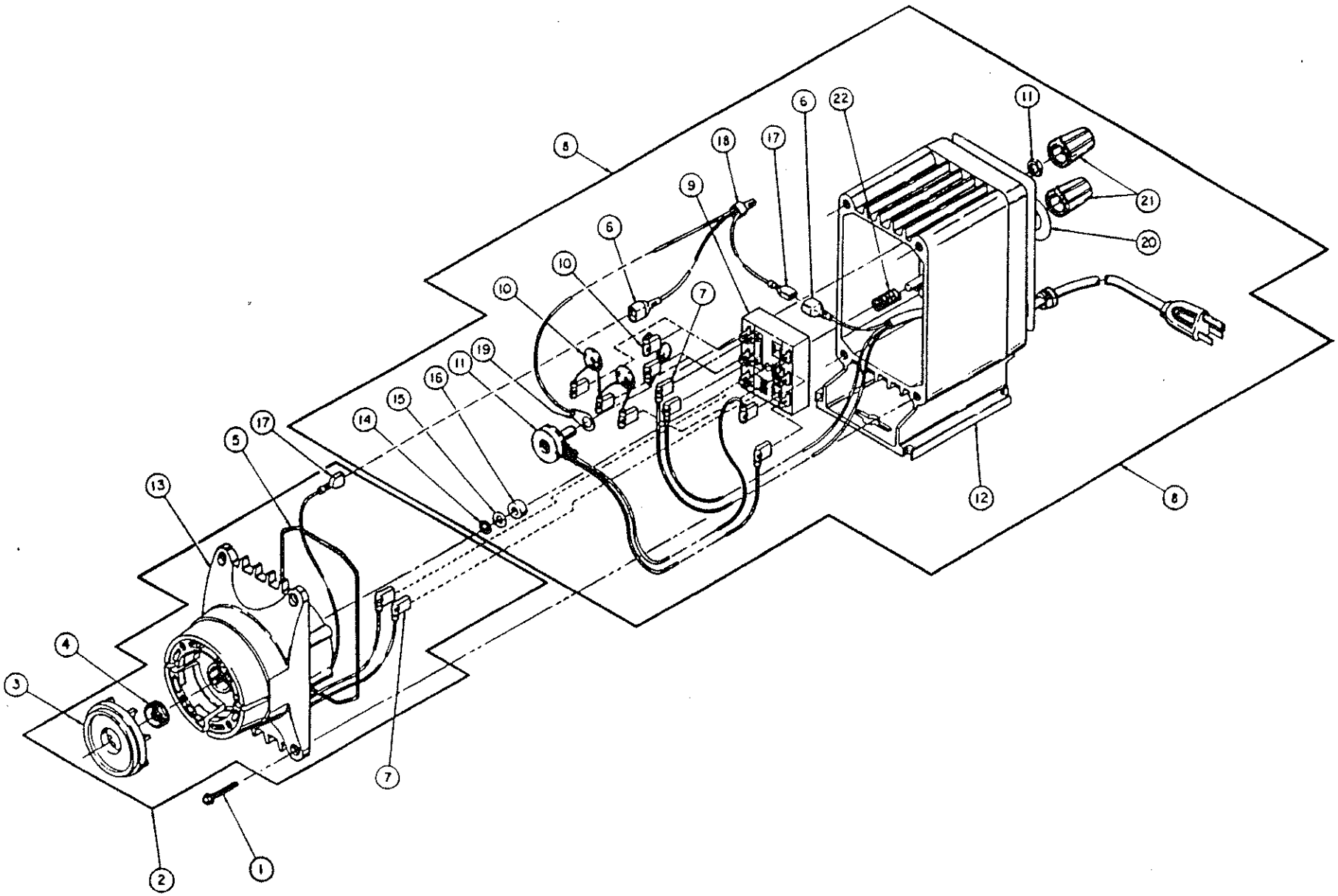
CALIBRATION TEST



TROUBLESHOOTING - LIQUID END

PROBLEM	POSSIBLE CAUSE	SOLUTION
Low pump output	Very low stroke setting	Check position of stroke length knob by decreasing stroke unti Liquifram stops moving with the pump running. The Liquifram should not stop moving or clicking until the knob points to zero.
	Trapped air in pump head	1.Check for leaks in suction line, where suction line joins suction fitting or at seal ring between suction fitting and pump head. Tighten or replace worn fittings or seal rings. 2. To remove trapped air from pump head, operate pump with stroke frequency set at 100%. Disconnect discharge tubing if necessary to relieve the pressure on the pump discharge.
	Air leak through valve seal rings	Tighten fittings by hand until they are snug. If no improvement, replace both seal rings.
	Ruptured Liquifram	Remove Liquifram and check for obvious tears or holes. If Liquifram is damaged, it must be replaced.
	Injection into excessive pressure	If discharge pressure is within 25 PSI of maximum pump rating, remove spring in injection check valve.
Excessive pump output	Syphoning	Move injection point to a pressurized location or install an LMI four function valve to prevent syphoning.
	Low pressure at injection point	If pressure at injection point is less than 25 PSI, an LMI four function valve must be installed.

KEY NO.	MODEL SERIES	PART NO.	DESCRIPTION	QUANTITY
1	Z	30306	Screw	4
2	Z141	30107	EPU ASM w/Disc	1
2	Z142	30108	EPU ASM w/Disc	1
2	Z143	30108	EPU ASM w/Disc	1
2	Z145	30108	EPU ASM w/Disc	1
2	Z146	30108	EPU ASM w/Disc	1
2	Z147	30108	EPU ASM w/Disc	1
2	Z151	30109	EPU ASM w/Disc	1
2	Z152	30110	EPU ASM w/Disc	1
2	Z153	30110	EPU ASM w/Disc	1
2	Z155	30110	EPU ASM w/Disc	1
2	Z156	30110	EPU ASM w/Disc	1
2	Z157	30110	EPU ASM w/Disc	1
3	Z14	29445	Disk	1
3	Z15	29437	Disk	1
4	Z	10973	Seal	1
5	Z	10166	O-Ring	1
6	Z	10368-1	Terminal, Wire	2
7	Z	25070-1	Terminal, Wire	9
8	Z141, Z151	30113	Housing and Pulser Asm 120V	1
8	Z142, Z152	30114	Housing and Pulser Asm 240V	1
8	Z143, Z153	30115	Housing and Pulser Asm 200-240, DIN	1
8	Z145, Z155	30116	Housing and Pulser Asm 200-240, UK	1
8	Z146, Z156	30117	Housing and Pulser Asm 200-240, AUST	1
8	Z147, Z157	30118	Housing and Pulser Asm 200-240, SWISS	1
9	Z141, Z151	25450	Pulser, 120V	1
9	Z142, Z152	25451	Pulser, 240V	1
9	Z143, Z153	25451	Pulser, 240V	1
9	Z145, Z155	25451	Pulser, 240V	1
9	Z146, Z156	25451	Pulser, 240V	1
9	Z147, Z157	25451	Pulser, 240V	1
10	Z141, Z151	10626	Varistor Asm, 120V	1
10	Z142, Z152	27268	Varistor Asm, 240V	1
10	Z143, Z153	10627	Varistor Asm, 200-240	1
10	Z145, Z155	10627	Varistor Asm, 200-240	1
10	Z146, Z156	10627	Varistor Asm, 200-240	1
10	Z147, Z157	10627	Varistor Asm, 200-240	1
11	Z	26307	Potentiometer Asm	1
12	Z141, Z151	30581	Housing Asm 120V	1
12	Z142, Z152	30582	Housing Asm 240V	1
12	Z143, Z153	30583	Housing Asm 200-240 DIN	1
12	Z145, Z155	30584	Housing Asm 200-240 UK	1
12	Z146, Z156	30585	Housing Asm 200-240 AUST	1
12	Z147, Z157	30586	Housing Asm 200-240 SWISS	1
13	Z141, Z151	30530	EPU, 120V	1
13	Z142, Z152	30531	EPU, 240V	1
13	Z143, Z153	30531	EPU, 240V	1
13	Z145, Z155	30531	EPU, 240V	1
13	Z146, Z156	30531	EPU, 240V	1
13	Z147, Z157	30531	EPU, 240V	1
14	Z	10422	Ring, Retaining	1
15	Z	25963	Washer, Flat	1
16	Z	30391	Washer, Rubber	1
17	Z	10182-1	Terminal, Wire	2
18	Z	25038	Terminal, Wire	1
19	Z	25877	Wire Asm	1
20	Z14	30418	Stroke Dial	1
21	Z	30295	Knob	2
22	Z	25414	Spring	1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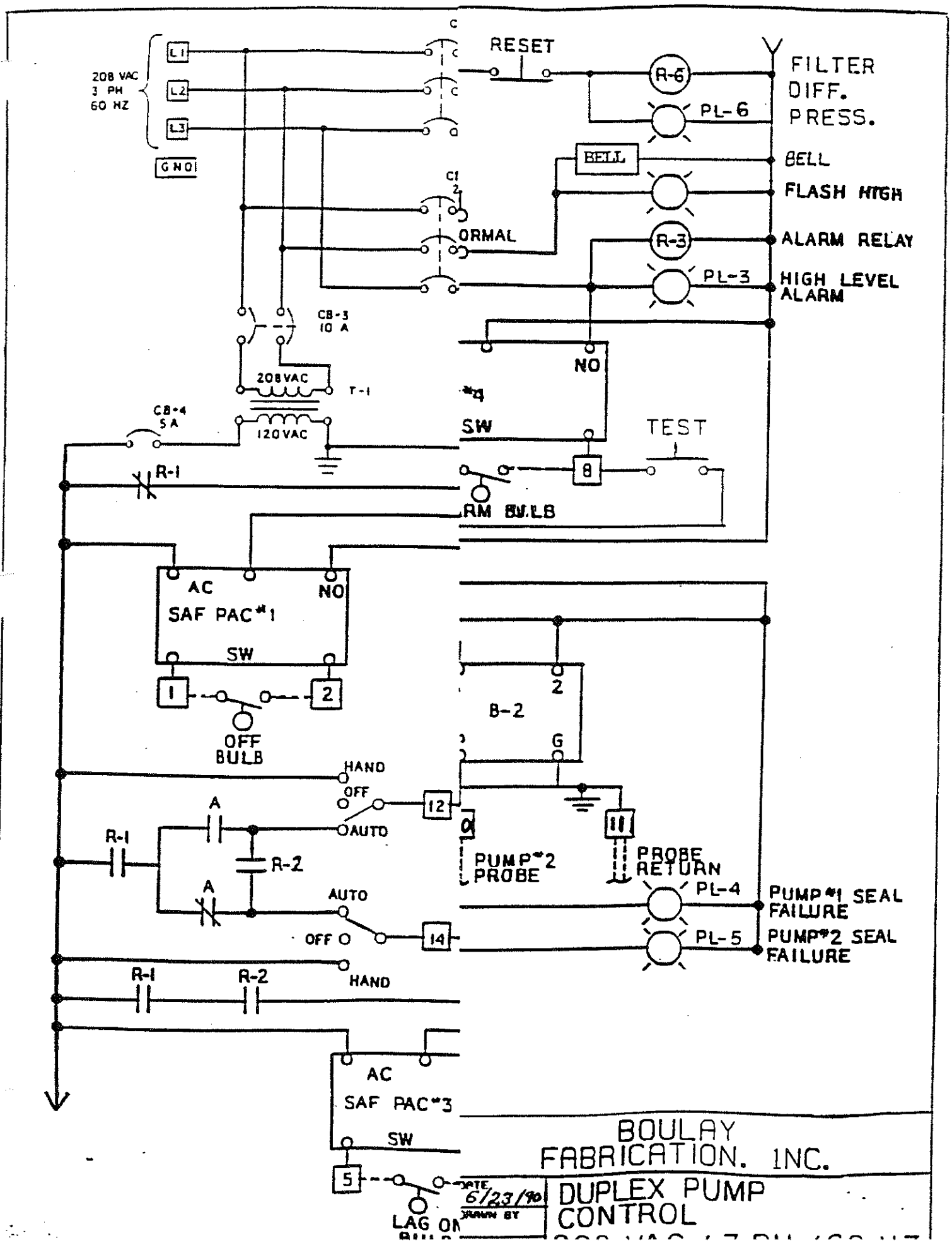
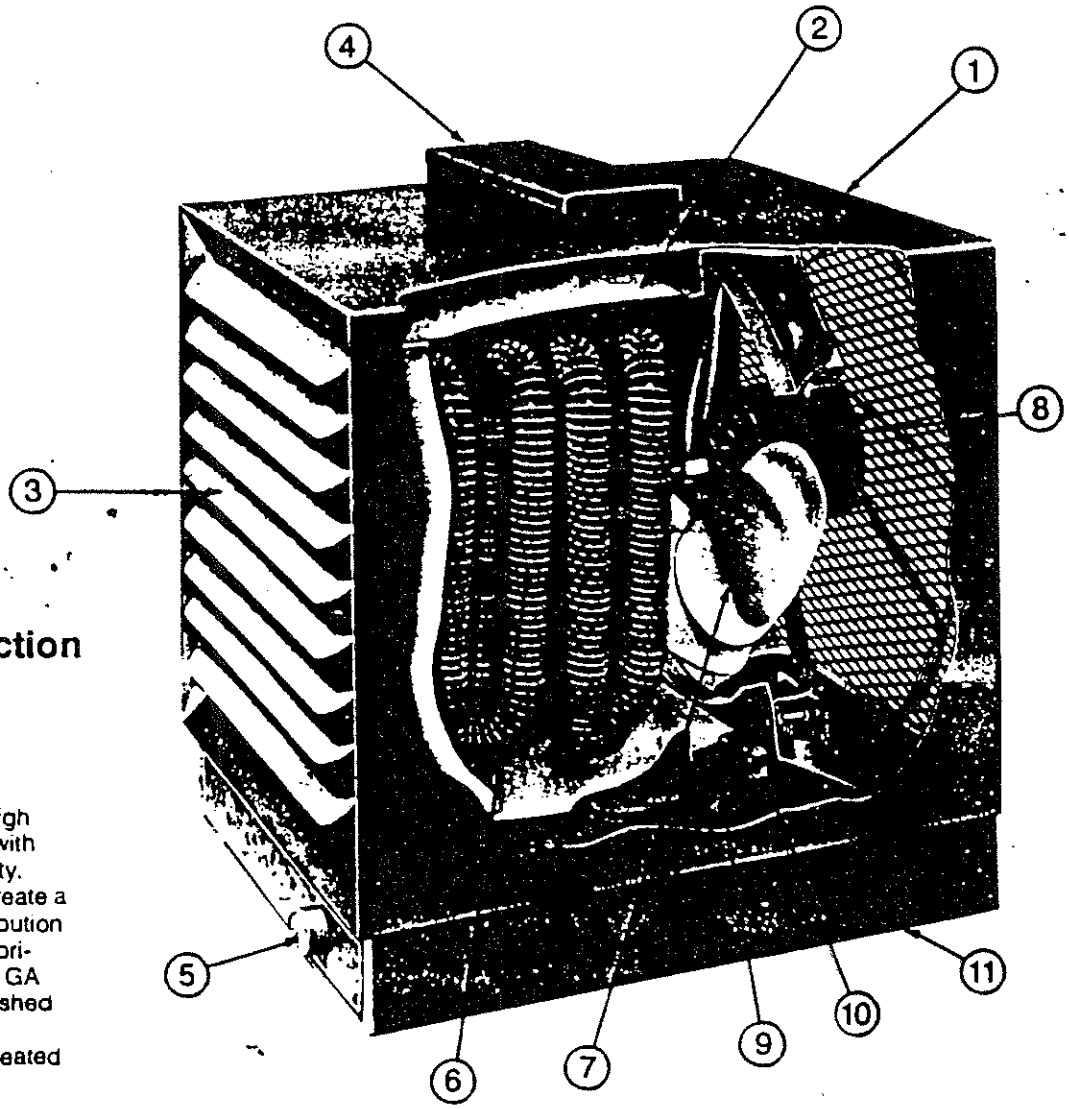
MISCELLANEOUS EQUIPMENT

Pump Control Panels
Heater
Thermostat (to exhaust fan)
Metering Pumps
Pressure Relief Valve


208 VAC
3 PH
60 HZ
L1
L2
L3
GND
RESET
R-6
PL-6
FILTER
DIFF.
PRESS.
BELL
BELL
FLASH HIGH
ALARM RELAY
R-3
PL-3
HIGH LEVEL
ALARM
NORMAL
NO
CB-3
10 A
208VAC
T-1
CB-4
5 A
120VAC
SW
TEST
8
R-1
RM BULB
AC
NO
SAF PAC #1
SW
1
2
OFF
BULB
B-2
2
G
HAND
OFF
AUTO
12
11
A
R-1
R-2
A
PUMP #2
PROBE
PROBE
RETURN
PL-4
PUMP #1 SEAL
FAILURE
AUTO
OFF
14
PL-5
PUMP #2 SEAL
FAILURE
R-1
R-2
HAND
AC
SAF PAC #3
SW
5
LAG ON
BOULAY
FABRICATION. INC.
DATE 6/23/90
DRAWN BY
DUPLEX PUMP
CONTROL

Engineered for rugged and dependable operation



Design and construction features

Cabinets and Liners

External cabinet (1) is of 20 GA high quality steel, chemically treated with beige finish baked on for durability. The inner liner (2), designed to create a pressure chamber for even distribution of airflow over the elements, is fabricated from corrosion resistant 22 GA aluminized steel. Louvers (3), finished in contrasting dark brown, are individually adjustable to direct heated air where desired.

Universal Hanging Bracket

Bracket (4) is prepunched to accept threaded hanging rods or the optional mounting bracket model UHB.

Optional Thermostat

Kits are available for field installation of the optional built-in thermostat (5).

Elements

Heating elements (6) are spiral finned sheath type, totally enclosed. Large fin areas ensure cooler element temperatures and longer life.

Fan

The aluminum axial flow type (7) is finely balanced to ensure quiet, vibration-free operation.

Motors

All motors (8) are shaded pole, industrial rated with thermal overload protection. Motors are unit bearing with rubber mounts to reduce vibration and noise.

Thermal Overload Switches

Two thermal overload switches (9), one manual and one automatic (one automatic only in 3-5 KW units), shut down the unit if temperatures or mechanical difficulties exceed design limits.

Contactors & Fusing

Contactors and fusing (10) are factory installed and wired when required for ease of installation. All 480-Volt units are stepped down to 240 Volt for operation of motor and contactors.

Swing Down Access Panel

Wiring components are quickly exposed for hook-up and maintenance by a swing down access panel (11). Terminal blocks are provided for fast hook-up to power supply.

NOTE: 7KW through 15KW units are field convertible to either single or 3 phase.

Other options

- Summer-Winter switch
- 24 volt control package
- Remote thermostat

NEMA UL

LE-150 LE-151 LE-152
LIQUID HANDLING ASSEMBLIES

CAUTION

When pumping chemicals make certain that all tubing is securely attached to the fittings. It is recommended that tubing or pipe lines be shielded to prevent possible injury in case of rupture or accidental damage. Always wear protective clothing when working on or near chemical metering pump.

NOTE: See parts list for materials of construction

A. INSTALLING INJECTION CHECK VALVE

1. The injection check valve should always be installed as close as possible to the point of chemical injection, at the very end of the tubing run.
2. Purpose of injection check valve is to prevent backflow from treated line.
3. A 1/2" NPT female fitting with sufficient depth will accept the injection check valve.
4. To insure correct seating of the ball inside the check valve, the injection check valve must be installed vertically upwards.

B. CONNECTING DISCHARGE TUBING

NOTE: Cut tubing to length needed for discharge line.

1. Route tubing from injection check valve to chemical metering pump making sure it does not touch hot surfaces, sharp surfaces, or is bent so sharply that it kinks.
2. Slide small end of coupling nut onto tubing.
3. Slide the long, straight end of the ferrule onto tubing such that tubing exits at the cone shaped end of the ferrule.
4. Insert tubing into discharge valve housing so that tubing butts up against valve housing and will not go any further.
5. Slide ferrule down so that cone shaped end fits snugly into discharge valve housing.
6. Slide down the coupling nut until threads are engaged. Tighten coupling nut by hand, maintaining pressure on tubing towards valve housing until tubing is held securely in place.

Excessive force will crack or distort fittings. DO NOT USE PIPE WRENCH.

7. Follow the same procedure for connecting tubing to injection valve.

C. CONNECTING SUCTION TUBING

1. Cut suction tubing to a length that the foot valve hangs just above the bottom of the chemical container. Maximum recommended vertical suction lift is 5 ft. (1.5m).
2. Follow same procedure (see B) in connecting suction tubing to suction valve and foot valve.

D. PRIMING

1. Connect pressure release tubing to pressure release port.
2. Route tubing to solution resevoir and anchor with plastic tie provided.
3. Set pump at 80% speed and 100% stroke. Start pump.
4. Pull on Pressure Release knob (red or black knob), holding knob out until chemical is visible through translucent return tubing.
5. Pump is now primed.

NOTE:

(a) Pump is normally self-priming if suction lift is no more than 5 ft. (1.5m), valves in the pump are wet with water (pump is shipped from factory with water in pump head) and the above steps (D1 thru D5) are followed.

(b) If the pump does not self-prime, remove discharge valve housing and ball and pour water or chemical slowly into discharge port until head is filled. Follow steps D1 thru D5 thereafter.

LMI
LIQUID METRONICS DIVISION
MILTON ROY

19 Craig Road, Acton, MA 01720 U.S.A.
TEL (508) 263-9800 · TLX 95-1781
FAX (508) 264-9172

Catalog Sec 4.0 pg 6050
Replaces same of 10/88

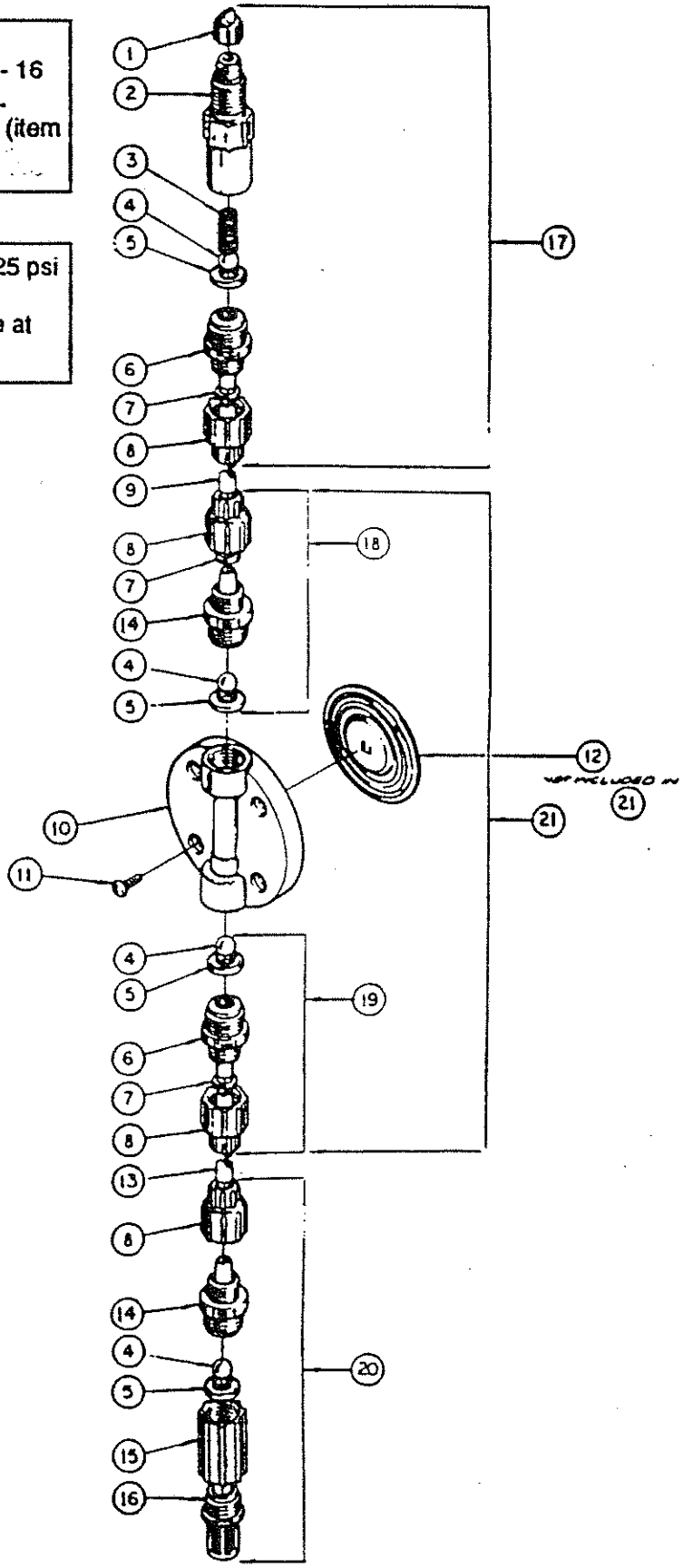
THIS SHEET LISTS PARTS FOR THREE DIFFERENT LIQUID HANDLING ASSEMBLIES. BE SURE YOU ARE USING THE CORRECT PARTS LIST FOR YOUR PUMP. THE LIQUID HANDLING ASSEMBLY NUMBER IS THE LAST THREE DIGITS OF YOUR PUMP MODEL NUMBER.

KEY NO.	PART NO.	DESCRIPTION	QUANTITY		
			LE-150	LE-151	LE-152
1	27352	Flapper Valve	1	1	1
2	10394	Injector Fitting, Polypropylene	1	1	
	26841	Injector Fitting, PVDF			1
3	10339*	Spring	1	1	1
4	10338*	Ball, Ceramic	4	4	4
5	29443*	Seal Ring, Polyprel	4	4	4
6	28664	Valve Seat, GFR Polypropylene	2	2	
	28882	Valve Seat, PVDF			2
8	10299	Coupling Nut	4	4	4
9	25636-16	Tubing, .250" OD Polyethylene	1	1	1
10	29599	Head, 0.5 SI Acrylic	1		
	29608	Head, 0.5 SI GFR Polypropylene		1	
	29609	Head, 0.5SI PVDF			1
11	10340	Screw, 10-24 x 3/4" SS	4	4	4
12	26042*	Liquifram, 0.5 SI Teflon	1	1	1
14	28665	Valve Housing, GFR Polypropylene	2	2	
	28883	Valve Housing, PVDF			2
15	10978	Foot Valve Seat	1	1	1
16	10123	Strainer, Polypropylene	1	1	1
17	28001	Inj. Check/Back Pressure Valve Asm	1	1	
	28037	Inj. Check/Back Pressure Valve Asm			1
18	28005	Discharge Valve Asm	1	1	
	28041	Discharge Valve Asm			1
19	28004	Suction Valve Asm	1	1	
	28040	Suction Valve Asm			1
20	28002	Foot Valve Asm	1	1	
	28038	Foot Valve Asm			1
21	29670	Head Asm, LE-150	1		
	28068	Head Asm, LE-151		1	
	28074	Head Asm, LE-152			1
29	10322	Weight, Ceramic	1	1	1
30	28663	Ferrule	4	4	4

* Parts included in Spare Parts Kit SP-U8

NOTE:
Threaded connections into pump head are 3/4" - 16 straight threads. **DO NOT USE TEFLON TAPE.** These joints are sealed by seal ring valve seats (item 5 on exploded view).

Maximum pump pressure rating is reduced by 25 psi (1.7 bar) with back pressure spring installed.
Do not remove back pressure spring if pressure at injection point is less than 20 psi (1.4 bar).



LMI
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TEL (508) 263-9800 · TLX 95-1781
FAX (508) 264-9172

OPERATING INSTRUCTIONS

LINE VOLTAGE THERMOSTAT

MODEL 2E158A

FORM 5S1370
02966

READ AND SAVE THESE INSTRUCTIONS

0968/269
VP

READ INSTRUCTIONS CAREFULLY BEFORE ATTEMPTING TO INSTALL OR OPERATE THE DAYTON LINE VOLTAGE THERMOSTAT!

RETAIN INSTRUCTIONS FOR FUTURE REFERENCE.

Description

The Dayton line voltage thermostat Model 2E158A is designed for control of either heating or cooling.

The sensitive bi-metal operated snap action switch provides control for resistive or inductive loads.

The metal base mounts directly to standard outlet box and needs no special leveling or mounting plate.

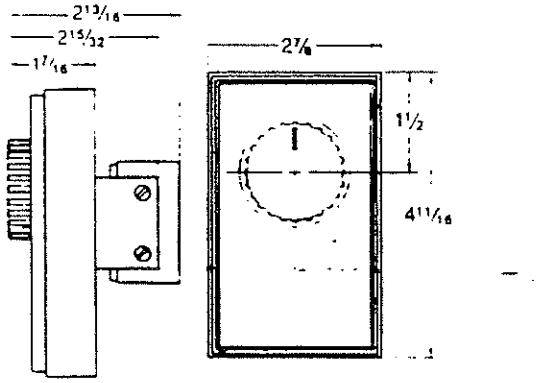


Figure 1 — Dimensions

Specifications

Switch action ..... {Snap action — single pole double throw (SPDT)

Electrical ratings:

Heating (22 amp, 125-277VAC) {3/4 HP, 125VAC; 1½ HP, 250/277VAC

Cooling ..... {3/4 HP, 125VAC; 1½ HP, 250/277VAC

Temperature setting range ..... 50°F-90°F

Fixed differential ..... {Heating: 2°F nominal; Cooling: 4°F nominal

Max. ambient temperature ..... 150°F

Approval ..... UL Listed

General Safety Information

WARNING: READ CAREFULLY BEFORE ATTEMPTING TO INSTALL, OPERATE OR SERVICE THE DAYTON LINE VOLTAGE THERMOSTAT. PROTECT YOURSELF AND OTHERS BY OBSERVING ALL SAFETY INFORMATION AND ADDITIONAL INSTRUCTIONS. FAILURE TO COMPLY WITH INSTRUCTIONS COULD RESULT IN PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

1. Make certain that the electrical ratings of the thermostat conform to the power source and to the load being controlled. Disconnect all power before installing or servicing. If the power disconnect is out of sight, lock it in the open position and tag it to prevent unexpected application of power. Failure to do so could result in fatal electric shock.

WARNING: DO NOT DEPEND UPON THE THERMOSTAT AS THE SOLE MEANS OF DISCONNECTING POWER WHEN INSTALLING OR SERVICING THE PRODUCT IT IS CONTROLLING. ALWAYS DISCONNECT POWER AT THE MAIN CIRCUIT BREAKER AS DESCRIBED ABOVE.

2. This thermostat is intended ONLY for permanent installation in an approved electrical box which has been installed and wired in accordance with the National Electrical Code (NEC) and all applicable local codes and ordinances. All wiring should be done by a qualified electrician, using copper wire only.

3. This thermostat is intended for general heating or cooling ONLY. It must NOT be used in potentially dangerous locations such as flammable, explosive, chemical-laden or wet atmospheres.

CAUTION: In cases in which property damage may result from malfunction of the thermostat, a backup system should be used.

LIMITED WARRANTY

DAYTON ONE YEAR LIMITED WARRANTY Line voltage thermostat, Model 2E158A, is warranted by Dayton Electric Mfg. Co. (Dayton) to the original user against defects in workmanship or materials under normal use for one year after date of purchase. Any part which is determined by Dayton to be defective in material or workmanship and returned to an authorized service location, as Dayton designates, shipping costs prepaid, will be, as the exclusive remedy, repaired or replaced at Dayton's option. For limited warranty claim procedures, see *PROMPT DISPOSITION* below. This limited warranty gives purchasers specified legal rights which may vary from state to state.

LIMITATION OF LIABILITY To the extent allowable under applicable law, Dayton's liability for consequential and incidental damages is expressly disclaimed. Dayton's liability in all events is limited to, and shall not exceed, the purchase price paid.

WARRANTY DISCLAIMER Dayton has made a diligent effort to illustrate and describe the product in this literature accurately; however, such illustrations and descriptions are for the sole purpose of identification, and do not express or imply a warranty that the product is merchantable, or fit a particular purpose, or that the product will necessarily conform to the illustrations or descriptions.

Except as provided below, no warranty or affirmation of fact, expressed or implied, other than as stated in "LIMITED WARRANTY" above is made or authorized by Dayton.

PRODUCT SUITABILITY Many states and localities have codes and regulations governing sales, construction, installation, and/or use of products for certain purposes, which may vary from those in neighboring areas. While Dayton attempts to assure that its products comply with such codes, it cannot guarantee compliance, and cannot be responsible for how the product is installed or used. Before purchase and use of a product, please review the product application, and national and local codes and regulations, and be sure that the product, installation, and use will comply with them.

Certain aspects of disclaimers are not applicable to consumer products; e.g., (a) some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you; (b) also, some states do not allow limitations on how long an implied warranty lasts, consequently the above limitation may not apply to you; and (c) by law, during the period of this Limited Warranty, any implied warranties of merchantability or fitness for a particular purpose applicable to consumer products purchased by consumers, may not be excluded or otherwise disclaimed.

PROMPT DISPOSITION Dayton and many a good faith effort for prompt correction or other adjustment with respect to any product which proves to be defective within limited warranty. For any product believed to be defective within limited warranty, first write or call dealer from whom product was purchased. Dealer will give additional directions. If unable to resolve satisfactorily, write to Dayton at address below, giving dealer's name, address, date and number of dealer's invoice, and describing the nature of the defect. Title and risk of loss pass to buyer on delivery to common carrier. If product was damaged in transit to you, file claim with carrier.

Manufactured for Dayton Electric Mfg. Co., 5959 W. Howard St., Chicago, IL 60648

Installation

NOTE:
If used in 120V circuit, thermostat should interrupt the hot (black) line. Some codes require a double pole disconnect for 208-240-277V circuits. Check before installing this thermostat.

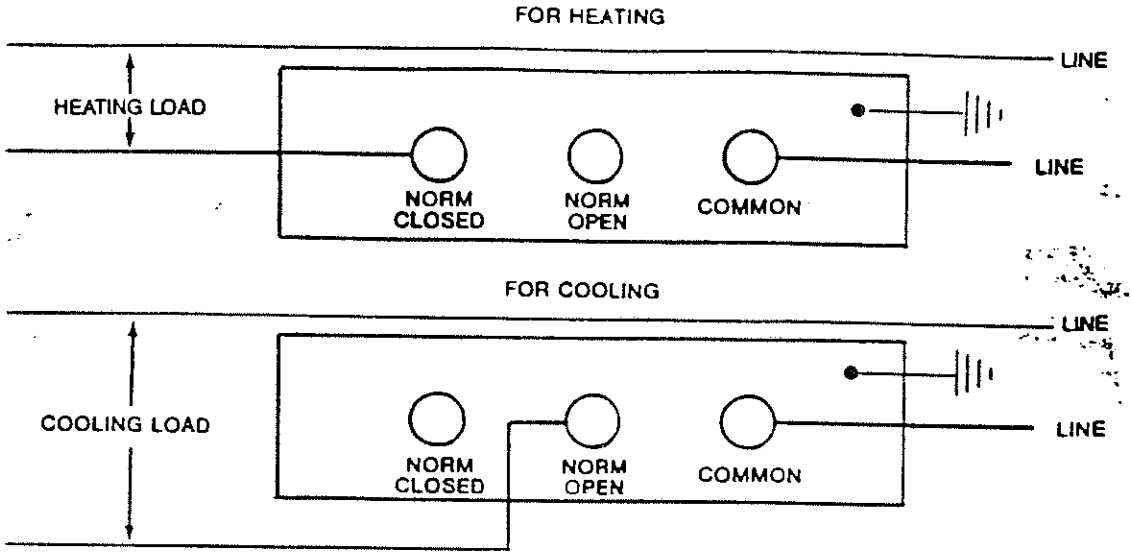


Figure 2 — Wiring Diagrams

SPDT Switch action may be used for either heating or cooling. It cannot be used for combination heating an cooling without a remote heating-cooling switch.

For Cooling: Wire line to common; wire load to normally open.

For Heating: Wire line to common; wire load to normally closed.

1. Turn OFF power. Remove the cover by pulling straight forward from base. Connect the wires to the proper terminals.
2. Assemble thermostat to outlet box using the screws provided. The slotted hole in the base will allow unit to be aligned properly. Once thermostat is mounted, removing the cover will be completely safe as no wires are exposed.

NOTE: Exercise care when fitting thermostat into outlet box so that no pressure is brought to bear upon the bimetal. Distortion of the bi-metal will cause the thermostat to function improperly. Ensure knob is fully counterclockwise prior to mounting.

3. Snap cover back in place and turn ON power. Turn knob and set for proper temperature operation.

LOCATION

The location of the thermostat is extremely important in order to control the temperature accurately. For best results it should be located:

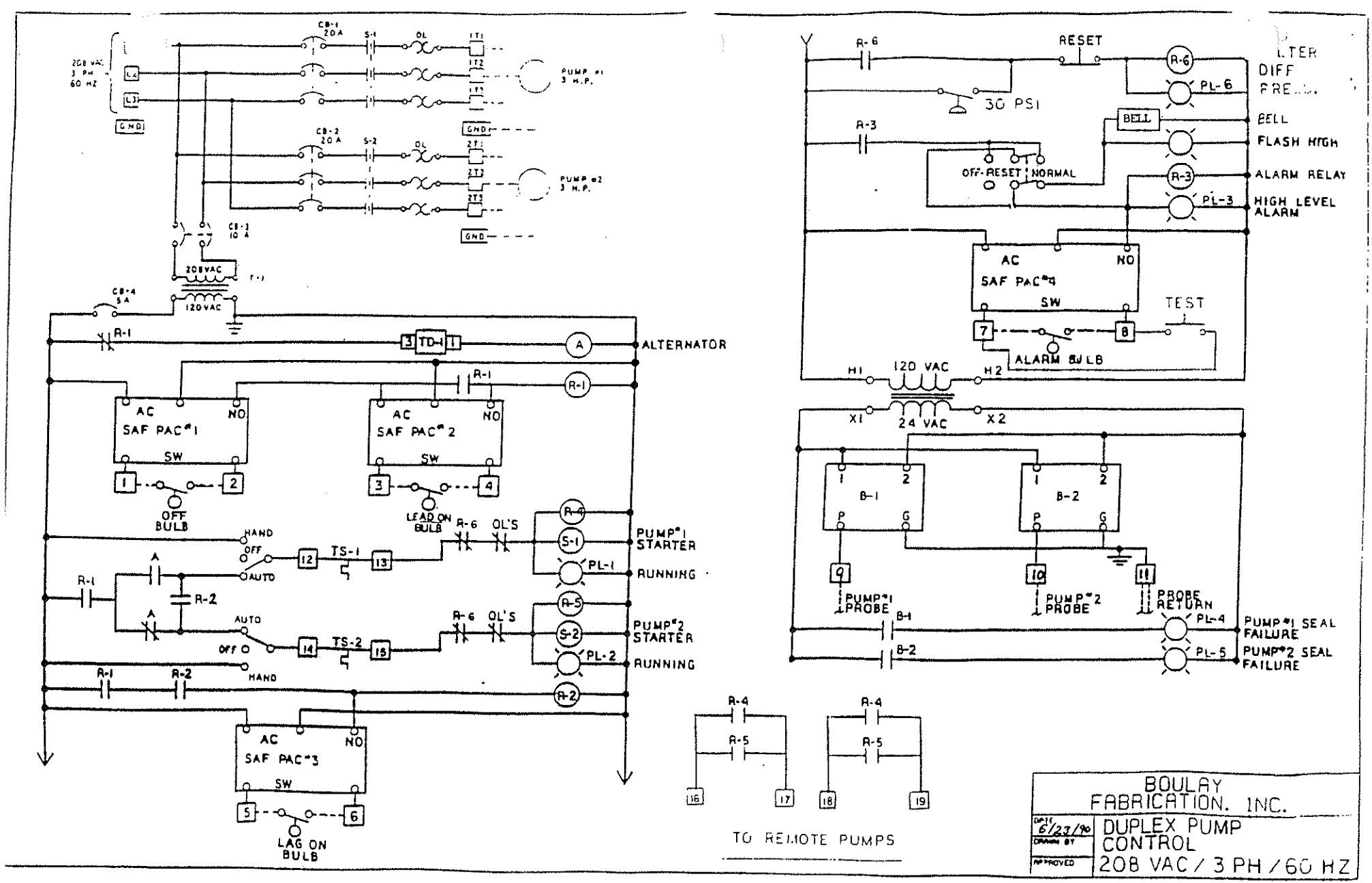
1. On an inside wall at least 3' from the outside wall.
2. Approximately 54" above the floor
3. Where there is free circulation of air.

DO NOT LOCATE Thermostat:

1. Where air circulation is poor.
2. Next to heat ducts or hot water pipes.
3. Close to heat outlets, fireplaces or direct sunlight.
4. Where operation can be affected by heating or drying appliances.
5. In cold areas, such as below windows, stair-wells or next to cold air returns.
6. Where curtains or drape will cover the thermostat.

Troubleshooting Chart

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
Cooling unit or fan does not operate.	1. Improper wiring. 2. Thermostat dial set above space temperature.	1. Check wiring. 2. Set dial to lower temperature.
Cooling unit or fan runs continuously.	1. Improper wiring. 2. Thermostat dial set below space temperature.	1. Check wiring. 2. Set dial to higher temperature.
System operates in reverse.	Improper wiring.	Check wiring.
Heating unit does not operate.	1. Improper wiring. 2. Thermostat dial set below space temperature.	1. Check wiring. 2. Set dial to higher temperature.
Heating unit runs continuously.	1. Improper wiring. 2. Dial set above space temperature.	1. Check wiring. 2. Set dial to lower temperature.


208 VAC 3 PH 60 HZ
L1
L2
GND
CB-1 20 A
S-1
OL
1T1
1T2
1T3
PUMP #1 3 H.P.
CB-2 20 A
S-2
2T1
2T2
2T3
PUMP #2 3 H.P.
CB-3 10 A
208VAC
CB-4 5A
120VAC
R-1
TD-1
A
ALTERNATOR
AC
NO
SAF PAC #1
SW
SAF PAC #2
OFF BULB
LEAD ON BULB
HAND
OFF
AUTO
TS-1
R-6
OL'S
PUMP #1 STARTER
PL-1
RUNNING
R-2
TS-2
PUMP #2 STARTER
PL-2
SAF PAC #3
LAG ON BULB
R-4
R-5
TO REMOTE PUMPS
RESET
30 PSI
BELL
FLASH HIGH
R-3
OFF-RESET
NORMAL
ALARM RELAY
PL-3
HIGH LEVEL ALARM
TEST
ALARM BULB
H1
H2
120 VAC
X1
24 VAC
X2
B-1
B-2
PUMP #1 PROBE
PUMP #2 PROBE
PROBE RETURN
PL-4
PUMP #1 SEAL FAILURE
PL-5
PUMP #2 SEAL FAILURE
BOULAY FABRICATION. INC.
DATE 6/27/90
DRAWN BY
APPROVED
DUPLEX PUMP CONTROL
208 VAC / 3 PH / 60 HZ

Transamerica Delaval

INSTRUCTION, INSTALLATION AND SERVICE BULLETIN NO. 64550 FOR GEMS LOW SENSITIVITY SAFE-PAK® AND LATCHING SAFE-PAK

This bulletin covers low sensitivity models:
SAFE-PAK 64101
LATCHING SAFE-PAK 64098
for use as an "intrinsically safe switch circuit," for use in a hazardous location with non-voltage-producing sensors. When SAFE-PAK installation is in accordance with this guide, these field sensors are suitable for Class 1, Division 2, Groups A, B, C and D, and Class II, Division 2, Groups E, F and G as defined by Article 500 of the National Electric Code.

IMPORTANT: Read carefully and completely before installing or connecting SAFE-PAK, LATCHING SAFE-PAK.

1. **Associated Equipment—Caution:** The Safe-Pak must be mounted outside the hazardous area; only the switch or sensor terminals provide an intrinsically-safe switch circuit (see Fig. 1 or 2).

2. **Mounting and enclosure considerations:**

   A. Field wiring of intrinsically safe circuits is to be segregated from non-intrinsically safe wiring by use of suitable barriers, separate wireways or trays (see Fig. 3).

   B. Intrinsically safe and non-intrinsically safe connection points should be located sufficiently apart to prevent any possibility of bypassing or miswiring during installation or servicing of equipment.

   C. The enclosure shall contain a cautionary statement as follows: "CAUTION: ANY SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY."

   D. The PAK mounting bracket must be grounded to ensure intrinsic safety. Resistance between bracket and ground electrode should be below one ohm. (See Figs. 4 and 5 for recommended selection of grounding hardware, and refer to Article 250 of the National Electric Code for methods and practice.)

3. **Installation of sensor switch and running of field wiring:**

   A. The nature of the sensor switch must be that it is a non-voltage-producing, essentially resistive termination, or other device specifically examined and approved for use with the PAK.

   B. The conductors of the intrinsically safe circuit should be sealed in a rigid metal conduit at the point where the wiring enters the hazardous area; the wiring and contacting device should be such that conductive dusts in the area will not close the circuit in place of the contacts.

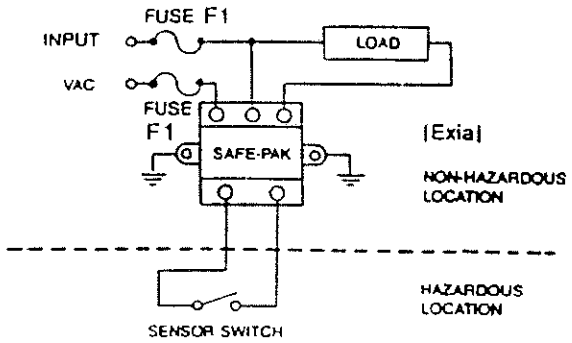


Fig. 1. Connection diagram, Gems SAFE-PAK models.
NOTE: For 120V application, only one fuse is required in the underground conduit of the input line.

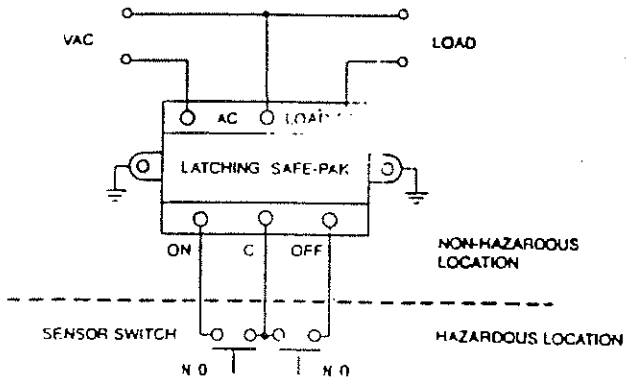
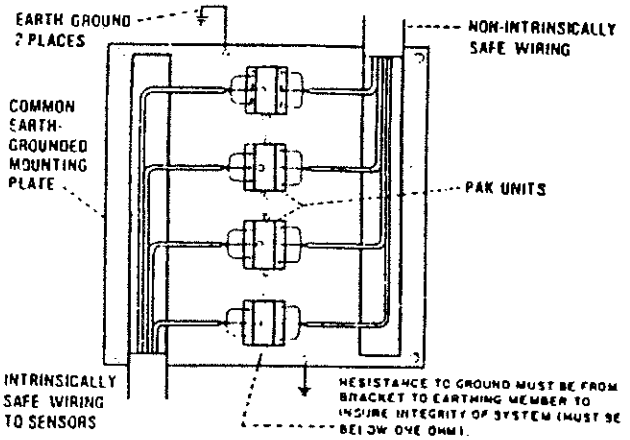


Fig. 2. Connection diagram, Gems LATCHING SAFE-PAK.



Note: All intrinsically safe-wiring must be segregated from non-intrinsically safe wiring.

Fig. 3. Multiple PAK units grouped on common, earth-grounded mounting plate.

BF - SERIES FLOAT BULB OPERATED, DUPLEX PUMP CONTROL PANELS, WITH 120 VAC CONTROL MODULE

MODELS AND RATINGS:

BF-001	1/3 AND 1/2 HP	115 VAC,	60 HZ,	1 θ
BF-101	1 HP MAX.	115/230 VAC,	60 HZ,	1 θ
BF-201	2 HP MAX.	230 VAC,	60 HZ,	1 θ
BF-301	3 HP MAX.	230 VAC,	60 HZ,	1 θ
BF-402	5 HP MAX.	208/230 VAC,	60 HZ,	3 θ
BF-404	5 HP MAX.	460/575 VAC,	60 HZ,	3 θ

FEATURES:

120 VAC MODULAR CONTROL CIRCUIT

120 VAC SUPPLIED, FACTORY WIRED, FROM THE CONTROL PANEL POWER CIRCUIT.

EASILY FIELD MODIFIED TO USE A SEPARATE, 15 AMP. MAX., 120 VAC, CONTROL POWER SUPPLY BY REMOVING JUMPER WIRE J1 FROM CONTROL MODULE TERMINALS PE AND L1 CONNECT SEPARATE SUPPLY TO CONTROL MODULE TERMINALS L1 AND L2, (NEUTRAL TO L2).

CAN BE SERVICED BY EASY FIELD REPLACEMENT OF ENTIRE MODULE.

THREE OR FOUR FLOAT BLUB OPERATION

THESE DUPLEX CONTROLS ARE FACTORY WIRED FOR OPERATION WITH THREE FLOAT BULBS. AN EASY FIELD MODIFICATION FOR FOUR FLOAT BULB OPERATION, USING SEPARATE "LAG-ON" AND "ALARM" BULBS, IS PROVIDED WITHIN THE CONTROL MODULE. TO CONVERT TO FOUR FLOAT OPERATION, REMOVE JUMPER WIRE J2 FROM TERMINALS 9 AND 10, AND MOVE JUMPER WIRE J3 FROM TERMINAL 6 TO TERMINAL 9 ON THE CONTROL MODULE. CONNECT "LAG ON" BULB TO TERMINALS 5 AND 6.

DUAL VOLTAGE THREE-PHASE PANELS

CONTROL TRANSFORMER PRIMARIES, ARE FACTORY WIRED FOR THE MOST POPULAR POWER SUPPLIES OF 230 AND 460 VAC, RESPECTIVELY, SIMPLY MOVE ONE CONTROL TRANSFORMER PRIMARY POWER SUPPLY LEAD, AT THE CONVENIENTLY SUPPLIED TERMINAL BLOCK, TO CONVERT THE PANEL TO THE OTHER VOLTAGE.

INSTALLATION:

CONTROL: MOUNT CONTROL AND MAKE FIELD WIRE CONNECTIONS PER ENCLOSED SCHEMATIC PUMP MOTOR CIRCUITS SHOULD BE SIZED WITH CONSIDERATION GIVEN TO MOTOR RATING AND DISTANCE BETWEEN CONTROL AND MOTORS. POWER SUPPLY CIRCUIT MUST BE ADEQUATE TO ALLOW BOTH PUMPS TO START TOGETHER. FLOAT BULB CONNECTIONS MAY BE NO. 14 WIRE.

NOTE: FOR 115 VOLT POWER SUPPLY, USE FIELD POWER SUPPLY TERMINALS L1 AND NEUTRAL JUMPER TERMINALS L2 AND NEUTRAL.

FLOAT BULBS: HANG FLOAT BULBS FROM BRACKET, ALLOWING AT LEAST 5 INCHES CLEARANCE FOR EACH BULB. BULBS ACTUATE ON A 6 INCH RISE IN LEVEL FROM BOTTOM OF BULB (SET EACH BULB SO THAT BOTTOM IS 6 INCHES BELOW DESIRED ACTUATION LEVEL.)

NOTE: DAMP ATMOSPHERE, ESPECIALLY ON SEWAGE INSTALLATIONS WILL DAMAGE ELECTRICAL EQUIPMENT. IT IS SUGGESTED THAT THE SEALED FEATURE OF THIS EQUIPMENT BE MAINTAINED BY MAKING ALL WIRING CONNECTIONS WITH "O" RING SEAL CONDUIT CONNECTORS AND USING DUCT SEAL COMPOUND TO SEAL WIRES AT ALL CONDUIT TERMINATIONS.

THREE FLOAT BULB OPERATIONS:

AUTOMATIC: HAND-OFF-AUTO PUMP SWITCHES IN AUTO POSITION. ALARM SWITCH IN NORMAL POSITION.

AS THE CONTROL CIRCUIT IS ENERGIZED, LATCHING RELAY A IS MOMENTARILY ENERGIZED THROUGH THE TIME DELAY RELAY PRE-SELECTING THE LEAD PUMP. THE DE-ENERGIZATION OF A THROUGH TD EFFECTIVELY REDUCES THE CONTROL CIRCUIT POWER

TD TO ENERGIZE OR OF ITS CONTACTS TO OPEN WILL NOT AFFECT OPERATION OF THE CONTROL. A RISE IN SUMP LEVEL, ABOVE THE "OFF" BULB AND PAST THE "LEAD-ON" BULB ENERGIZES RELAY R1 STARTING THE PRE-SELECTED LEAD PUMP. AS THE SUMP LEVEL DROPS BELOW THE "LEAD-ON' BULB, THE CIRCUIT IS HELD BY R1 HOLDING CONTACTS UNTIL THE LEVEL IS BELOW THE "OFF" BULB. DE-ENERGIZATION OR R1 AND MOMENTARY ENERGIZATION OF A PRE-SELECTS THE OPPOSITE PUMP AS THE LEAD PUMP.

SHOULD THE LEAD PUMP FAIL TO LOWER THE SUMP LEVEL ADN A CONTINUED R ACTIVATES THE "ALARM" BULB, RELAY R2 WILL ENERGIZE. R2 CONTACTS COMPLETE A CIRCUIT TO BOTH PUMP STARTERS, THE EXTERNAL ALARM BELL AND THE HIGH LEVEL LIGHT. THIS CONDITION IS HELD BY R1 AND R2 HOLDING CONTACTS UNTIL THE LEVEL DROPS BELOW THE "OFF" BULB. AT THIS POINT, THE CONTROL AND PUMPS ARE DE-ENERGIZED WITH THE EXCEPTION OF THE ALARM CIRCUIT WHICH IS HELD BY R3 HOLDING CONTACTS UNTIL THE ALARM SWITCH IS MANUALLY RESET. OPERATION OF THE CONTROL WITH THE OFF-RESET-NORMAL SWITCH IN THE "OFF" POSITION CAUSES THE ALARM SIGNAL TO CONSIST OF THE HIGH LEVEL LIGHT ONLY.

FOUR FLOAT BULB OPERATION:

AUTOMATIC: HAND-OFF-AUTO PUMP SWITCHES IN AUTO POSITION. ALARM SWITCH IN NORMAL POSITION.

AS THE CONTROL CIRCUIT IS ENERGIZED, LATCHING RELAY A IS MOMENTARILY ENERGIZED THROUGH THE TIME DELAY RELAY PRE-SELECTING THE LEAD PUMP. THE DE-ENERGIZATION OF A THROUGH TD EFFECTIVELY REDUCES THE CONTROL CIRCUIT POWER CONSUMPTION AND INCREASES THE RELIABILITY OF THE LATCHING RELAY. FAILURE OF TD TO ENERGIZE OR OF ITS CONTACTS TO OPEN WILL NOT AFFECT OPERATION OF THE CONTROL. A RISE IN SUMP LEVEL, ABOVE THE "OFF" BULB AND PAST THE "LEAD-ON" BULB ENERGIZED RELAY R1 STARTING THE PRE-SELECTED LEAD PUMP. AS THE SUMP LEVEL DROPS BELOW THE "LEAD-ON" BULB, THE CIRCUIT IS HELD BY R1 HOLDING CONTACTS UNTIL THE LEVEL IS BELOW THE "OFF" BULB. DE-ENERGIZATION OF R1 AND MOMENTARY ENERGIZATION OF A PRE-SELECTS THE OPPOSITE PUMP AS THE LEAD PUMP.

SHOULD THE LEAD PUMP FAIL TO LOWER THE SUMP LEVEL AND A CONTINUED ; ACTIVATES THE "LAG-ON" BULB, RELAY R2 WILL ENERGIZE. R2 CONTACTS COMPLET CIRCUIT TO BOTH PUMP STARTERS. THIS CONDITION IS HELD BY R1 AND R2 HOLDING CONTACTS UNTIL THE LEVEL DROPS BELOW THE "OFF" BULB. AT THIS POINT, THE CONTROL AND PUMPS ARE DE-ENERGIZED.

SHOULD THE PUMPS FAIL TO LOWER THE SUMP LEVEL AND A CONTINUED RISE ACTIVATES THE "ALARM" BULB, RELAY R3, THE EXTERNAL ALARM BELL, AND THE HIGH LEVEL LIGHT WILL ENERGIZE. THE ALARM CIRCUIT IS HELD BY R3 HOLDING CONTACTS UNTIL THE ALARM SWITCH IS MANUALLY RESET. OPERATION OF THE CONTROL WITH THE OFF-RESET-NORMAL SWITCH IN THE "OFF" POSITION CAUSES THE ALARM SIGNAL TO CONSIST OF THE HIGH LEVEL LIGHT ONLY.

MANUAL OPERATION:

EITHER OR BOTH PUMPS MAY BE OPERATED AT ANY TIME BU USE OF THE HAND-OFF-AUTO SWITCHES.

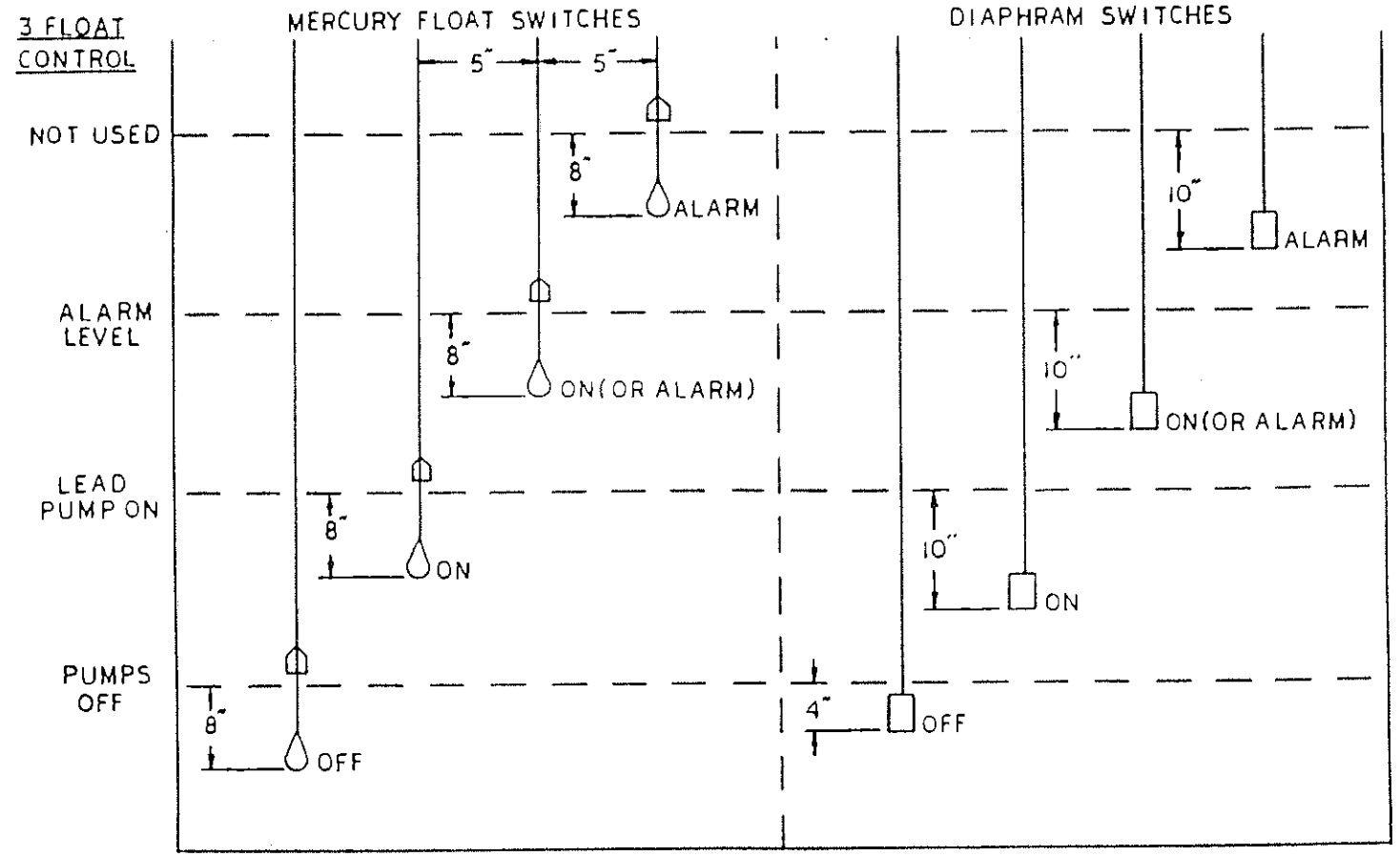
SERVICE:

THE ALARM BELL MAY BE SILENCED DURING REPAIRS BY PLACING THE ALARM SWITCH IN THE "RESET" OF "OFF" POSITION.

CAUTION: BEFORE CHECKING ELECTRICAL CONNECTIONS WITHIN THE CONTROL OR ATTEMPTING TO REPLACE ANY COMPONENTS, TURN OFF ALL BRANCH CIRCUITS SUPPLYING POWER TO THE CONTROL PANEL. A SEPARATE 120 VAC CONTROL CIRCUIT POWER SUPPLY MAY BE CONNECTED TO THE CONTROL PANEL.

NOTE: THE POWER AND CONTROL CIRCUIT BREAKERS SHOULD BE RESET AS THE FIR STEP IN TROUBLE-SHOOTING.

A SECOND STEP IS TO BE SURE THAT ALL PLUG-IN RELAYS ARE SECURELY SEATED IN THEIR SOCKETS.



DIMENSIONS IN INCHES

NOTE DO NOT SCALE DWG

TOLERANCES FOR FINISH DIMS NOT OTHERWISE SPECIFIED

INCHES	
FROM 0 TO 5	± .02
OVER 5 TO 30	± .04
OVER 30	± .08
ANGLES	± 0.5°

- DATUM INDICATING SYM
- PARALLELISM
- PERPENDICULARITY
- ANGULARITY
- TRUE POSITION
- CONCENTRICITY
- FLATNESS

PART

MODEL LEVEL SWITCHES INSTALL. GUIDE

DRAWN DATE CHECKED DATE

APPROVED DATE ORDER

THIRD ANGLE PROJECTION

QA TOOL DESIGN TECH CENTER PATT SHOP BELOIT

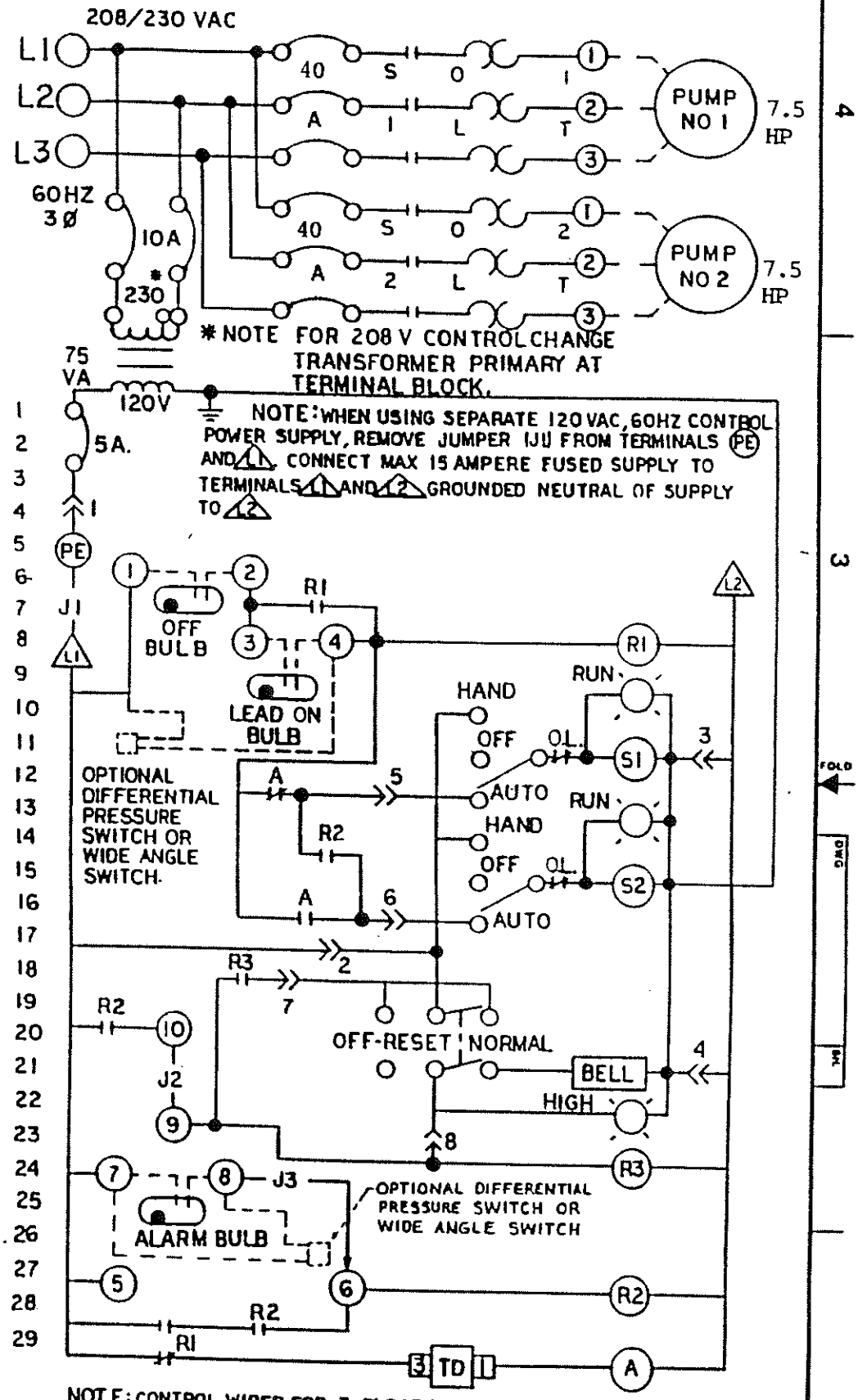
COPIES TO

BOULAY FABRICATIONS INC.

DRAWING REV ISSUE

PATTERN MATL WEIGHT LBS SCALE SHEET

REV ISS ZONE

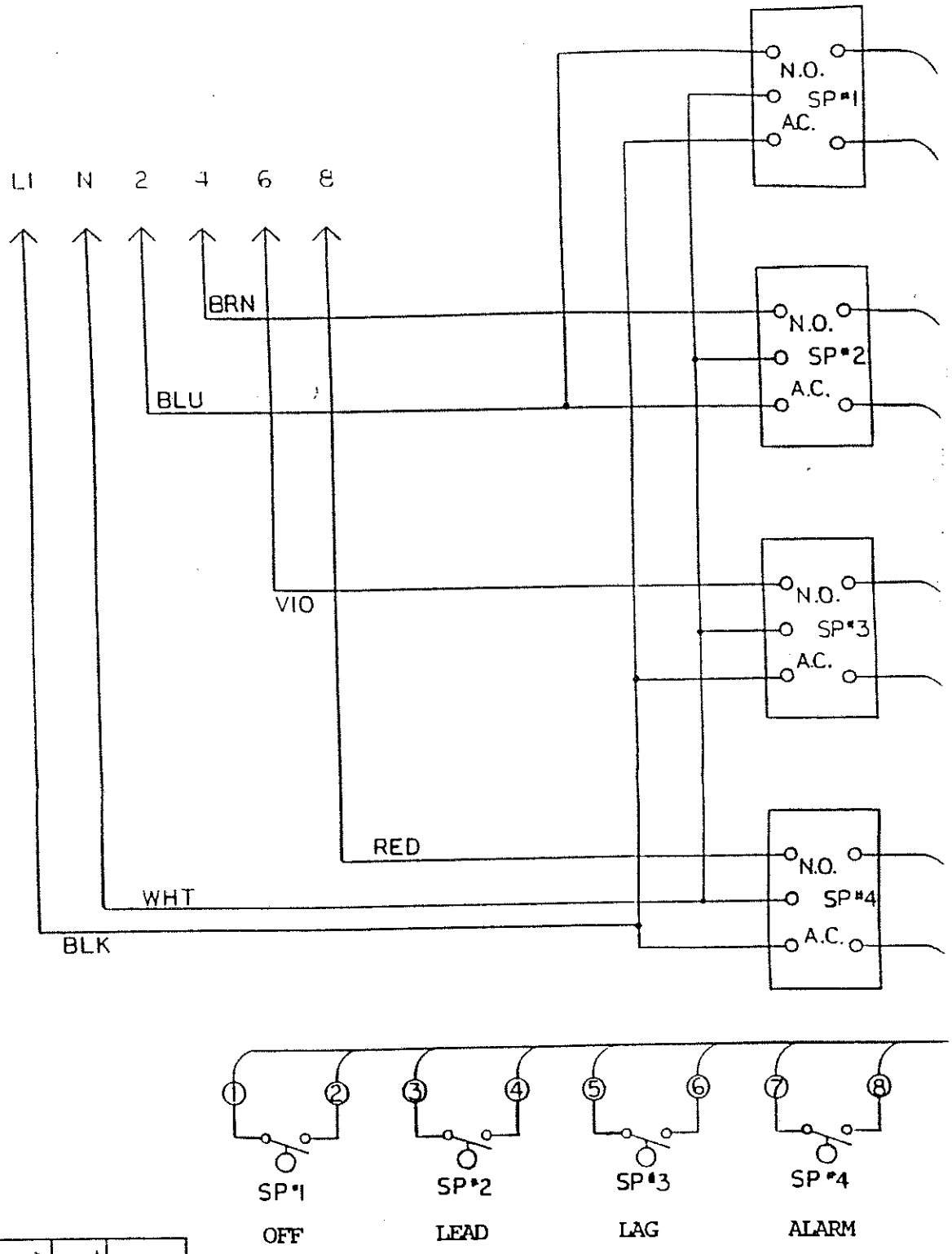


DIMENSIONS IN INCHES

BOULAY FABRICATIONS INC.

BF-402

9033



BOULAY FABRICATION INC.	
TITLE	
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Transamerica Delaval

INSTRUCTION, INSTALLATION AND SERVICE BULLETIN NO. 64558 FOR GEMS LOW SENSITIVITY SAFE-PAK® AND LATCHING SAFE-PAK

This bulletin covers low sensitivity models:
SAFE-PAK 64101
LATCHING SAFE-PAK 64098
for use as an "**intrinsically safe switch circuit," for use in a hazardous location with non-voltage-producing sensors.** When SAFE-PAK installation is in accordance with this guide, these field sensors are suitable for Class 1, Division 2, Groups A, B, C and D, and Class II, Division 2, Groups E, F and G as defined by Article 500 of the National Electric Code.

IMPORTANT: Read carefully and completely before installing or connecting SAFE-PAK, LATCHING SAFE-PAK.

1. **Associated Equipment—Caution:** The Safe-Pak must be mounted outside the hazardous area; only the switch or sensor terminals provide an intrinsically-safe switch circuit (see Fig. 1 or 2).

2. **Mounting and enclosure considerations:**

   A. Field wiring of intrinsically safe circuits is to be segregated from non-intrinsically safe wiring by use of suitable barriers, separate wireways or trays (see Fig. 3).

   B. Intrinsically safe and non-intrinsically safe connection points should be located sufficiently apart to prevent any possibility of bypassing or miswiring during installation or servicing of equipment.

   C. The enclosure shall contain a cautionary statement as follows: "CAUTION: ANY SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY."

   D. The PAK mounting bracket must be grounded to ensure intrinsic safety. Resistance between bracket and ground electrode should be below one ohm. (See Figs. 4 and 5 for recommended selection of grounding hardware, and refer to Article 250 of the National Electric Code for methods and practice.)

3. **Installation of sensor switch and running of field wiring:**

   A. The nature of the sensor switch must be that it is a non-voltage-producing, essentially resistive termination, or other device specifically examined and approved for use with the PAK.

   B. The conductors of the intrinsically safe circuit should be sealed in a rigid metal conduit at the point where the wiring enters the hazardous area; the wiring and contacting device should be such that conductive dusts in the area will not close the circuit in place of the contacts.

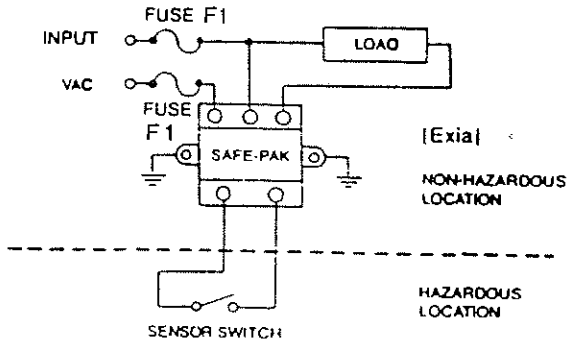


Fig. 1. Connection diagram, Gems SAFE-PAK models.
NOTE: For 120V application, only one fuse is required in the underground conduit of the inout line.

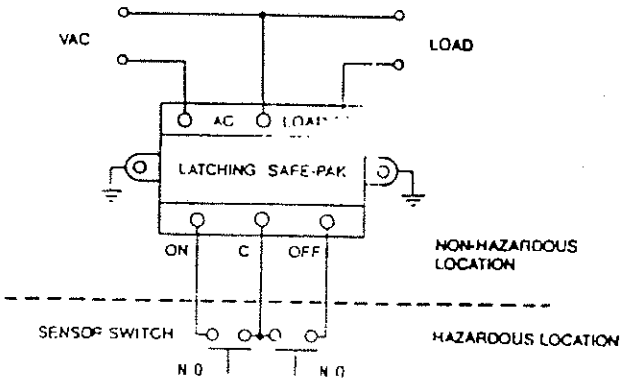
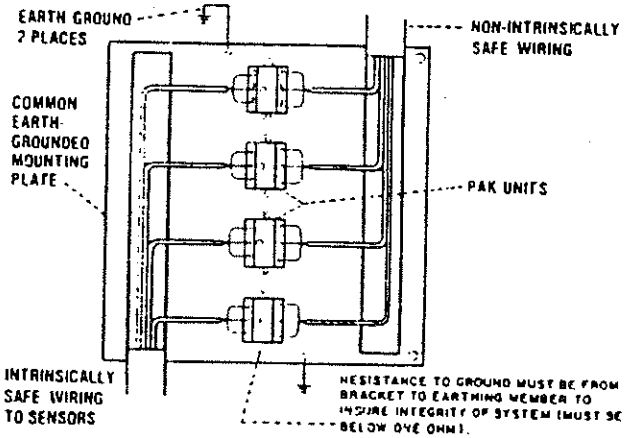


Fig. 2. Connection diagram, Gems LATCHING SAFE-PAK.



Note: All intrinsically safe-wiring must be segregated from non-intrinsically safe wiring.

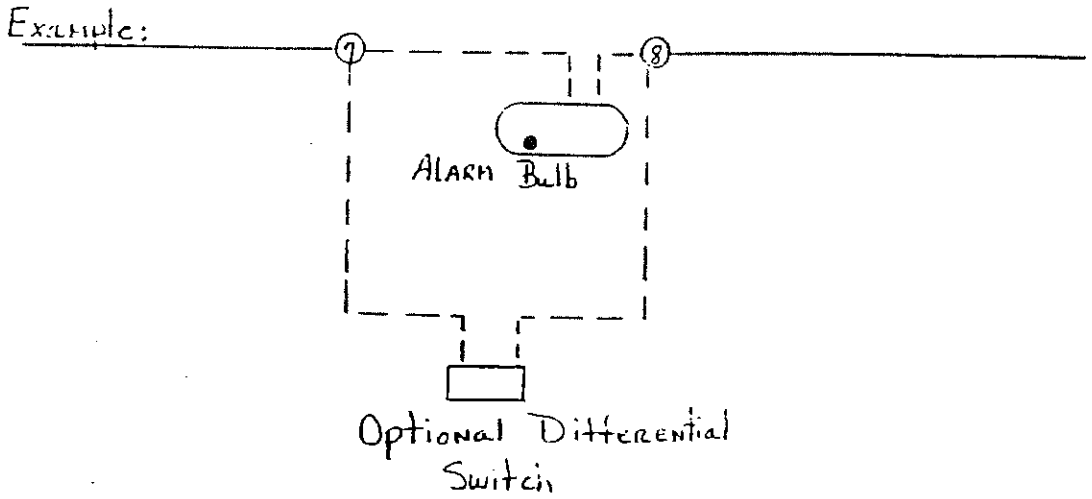
Fig. 3. Multiple PAK units grouped on common, earth-grounded mounting plate.

USE OF OMNIDECTIONAL DIFFERENTIAL MERCURY SWITCHES

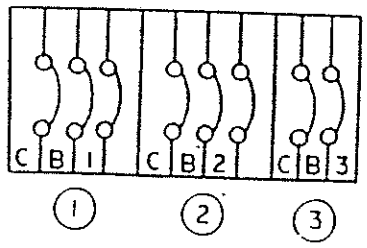
One of these wide angle switches can be used to replace the combination of "off" and "on" float bulbs and is wired as noted in the control schematic for use of optional switches.

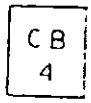
These wide angle switches can also be used in place of either the "Lag On" or "Alarm" bulbs. One switch must be used for each operation and is connected the same as the usual float bulbs.

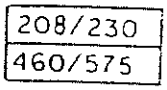
That is, a normal three bulb system requires two wide angle switches and a normal four bulb system requires three wide angle switches.

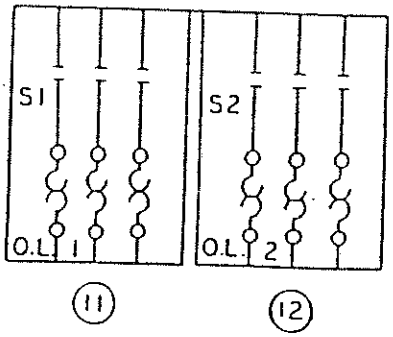


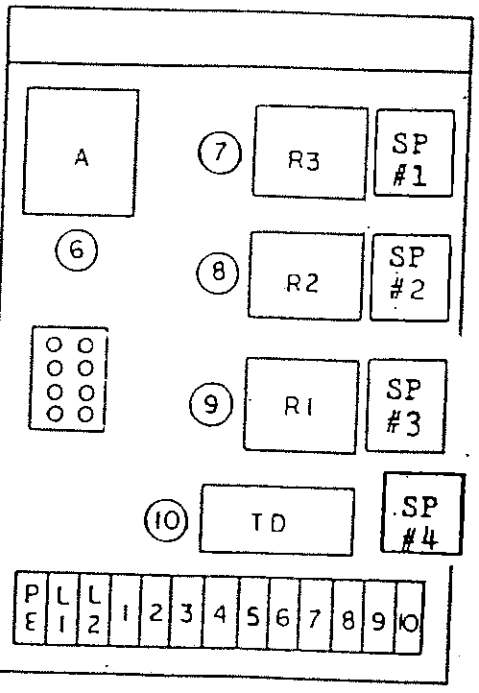
ITEM NO	DESCRIPTION	PART NO.
1,2,3,4	CIRCUIT BREAKER	VARIES WITH SUPPLIER & RATING
5	TRANSFORMER	BF8640
11,12	CONTACTOR /O.L.	15EF32AF81
CONTROL MODULE CONTAINS:		BF-8630
6	RELAY, LATCHING	S89R5ABDI-120
7, 8, 9	RELAY, 3 PDT	KUPI4AI5-120
10	RELAY, TIME DELAY	TXL 1001CB

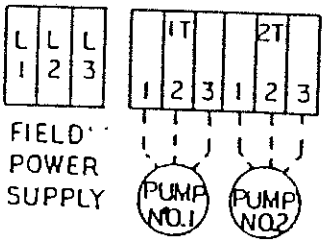












FLOAT BULB TERMINAL
1-2 LOW (PUMP OFF)
3-4 LEAD (PUMP ON)
5-6 LAG (PUMP ON) (4 FLOAT CONTROL ONLY)
7-8 ALARM
9-10 NO FIELD CONNECTION (SEE NOTE ON WIRING DIAGRAM)

COMPONENT ARRANGEMENT AND FIELD CONNECTIONS

BF-402 and 404

DIMENSIONS IN INCHES

BOULAY FABRICATIONS INC.

BF-402/404

Appendix C

Contingency and Emergency Procedures Plan

BBL

TECHNICAL REPORT

Miller/Duva Site Contingency and Emergency Procedures Plan

General Electric Company
Town of Clay, New York

March 2002

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

Table of Contents

1. Introduction

1.1 General

This Plan is intended to provide a safe and immediate response to emergency situations that may be encountered for the Miller/Duva Inactive Hazardous Waste Site (the site) Groundwater Treatment System (treatment system) located at 4958 West Taft Road in the Town of Clay, New York. The purpose of this plan is to act as a guide and reference for repsonse to emergency situations that may occur at the site.

1.2 Site History and Description

The site is currently listed on the New York State Department of Environmental Conservation's (NYSDEC's) Registry of Inactive Hazardous Waste Disposal Sites (Site No. 07-34-051) as a Class 4 site. A Remedial Investigation/Feasibility Study (RI/FS) program was completed for the site in 1992 and a Record of Decision (ROD), dated March 1993, was prepared and issued by the NYSDEC.

Site work is being conducted pursuant to an Order on Consent (Index # A7-0225-90-03 located in Appendix A of the site Operations and Maintenance Manual) entered into between the NYSDEC and the respondents: General Electric Company and the Estate of Peter Duva and Donald W. Miller, Inc.

A groundwater collection and treatment system is currently operated at the site. The groundwater collection and treatment system provides on-site hydraulic containment by pumping and treating volatile organic compound (VOC) –impacted groundwater from the following site areas: the downgradient collection trench (including four residential sump pumps), the upgradient collection trench, and a portion of the site known as Area 3.

A dual-phase ISVE system was installed and began operation on site in 1994. The lSVE system generally consisted of a series of 12 combination vent/extraction trenches, a vacuum blower system, a vapor-phase carbon treatment system, and an impermeable cover installed over a portion of the site to mitigate surface-water infiltration and short-circuiting of the system. During operation, groundwater (condensate) removed by the ISVE system was conveyed to and treated in the groundwater treatment system. In September 1997, operation of the ISVE system was terminated. ISVE system shut down procedures and associated verification soil sampling activities are presented in the 1997 annual report. In September 1999, NYSDEC approved the final shutdown and disassembly of the ISVE System. Finally, in May 2000, the ISVE system blowers, motor starters, variable frequency drives, and heat exchanger were dismantled, cleaned and disposed as scrap off-site. The ISVE system vapor-phase carbon, condensate knock out pot, and condensate transfer pump were left on-site for potential re-use during future site remediation activities.

1.3 Plan Organization

The site pperator will serve as the Emergency Response Coordinator ("ERC") through whom all information and coordination of efforts will occur in the event of an emergency. Potential hazards or emergencies that could arise on-site and may require the services of off-site emergency response personnel and equipment include:

- An on-site accident (i.e., trip or fall related injury);
- On-site fire (chemical fire, brush fire, etc.) or explosion; and

- Immediate or imminent release of spill of hazardous material (See Attachment for hazardous material inventory.

Response procedures to each type of incident are outlined in the following sections.

2. On-Site Accident

1. In the event of an on-site accident, on-site personnel shall immediately notify the ERC or 911 if the ERC is not reachable.

2. The ERC will be responsible for immediate assessment of the response required and providing complete information to the responding personnel. The ERC or designee will call 911, if determined necessary, and advise the dispatcher:

   a) An accident has occurred at the Duva Property located immediately south of West Taft Road and north of Platinum Drive in the Town of Clay;

   b) The type and extent of injuries; and

   c) The victim will be decontaminated (if necessary) and will be transferred to the emergency vehicle in the "clean" zone; or the victim may be partially (or grossly) contaminated and will be transferred to the emergency vehicle in the "clean" zone; or,

   d) The victim is down in a hazardous area and cannot be moved-response personnel must enter the hazardous zone with appropriate protective clothing and breathing apparatus.

3. The ERC or designee will meet the emergency response crew at the Site entrance and provide direction and assistance on entry to the Site and exit from the Site; if personnel and equipment are required to enter the Site, the emergency response personnel shall determine whether sufficient time is available to fully or partially decontaminate the victim on Site, if needed. On-site personnel shall be stationed at the accident site to assist the emergency crew.

4. University Hospital emergency staff shall be contacted at 315-464-5611 and shall be advised of the type and extent of injuries, the level of contamination of the victim (none, partial or gross) and estimated time of arrival at the hospital.

3. On-Site Fire

Response procedures to be implemented in the event of a fire are highly dependent upon the type and location of the fire. On-site personnel must convey as much information as possible to the fire department to allow them to respond in an appropriate manner.

General procedures to be implemented are provided below. In the event the fire department is required to respond, the Fire Chief shall assume full control over all emergency response activities. The ERC shall assist the Fire Chief as requested. All on-site personnel shall be available to assist in the response as directed by the Fire Chief.

If a fire breaks out in the treatment building or other on-site location where waste material may be ignited, the following actions shall be taken:

a) Personnel shall initiate on-site fire fighting procedures, if safe and reasonable to do so, to eliminate or limit the spread of the fire. On-site techniques may involve the use of dry chemical fire extinguishers.

b) If it is not reasonable or safe to conduct on-site fire fighting procedures, personnel shall immediately call 911 and advise the dispatcher that a fire has broken out at the Duva Property immediately south of West Taft Road and north of Platinum Drive and provide all pertinent details of the fire including type of fire, location of fire, and severity of fire.

c) The ERC or designee shall meet the responding emergency personnel at the Site entrance to provide direction and assistance.

d) The ERC shall advise the adjacent businesses and residences of the incident, if deemed necessary.

If a fire breaks out in the treatment building or any potentially hazardous location, the person responsible for calling 911 shall also advise the dispatcher of nearby residences and businesses in the area.

On-site personnel shall advise adjacent residences if deemed appropriate by the ERC.

e) Emergency vehicles and equipment used within potentially contaminated areas shall be decontaminated on-site if deemed necessary by the ERC. On-site personnel shall be available to assist with decontamination activities. Emergency personnel should also follow Site personal decontamination procedures if appropriate.

f) The ERC shall notify GE.

4. Spill or Release of Contaminants

Operating personnel are trained and equipped to deal with the type of release or spill which could be encountered at the Site. All work shall be performed in such a manner as to minimize or eliminate the potential for a spill or release of hazardous material. In the event of a spill or release:

1. On-site personnel shall immediately initiate emergency measures to prevent or contain the spill or release;

2. The ERC shall be contacted.

3. The ERC or designee shall advise the appropriate local emergency personnel (i.e., 911), adjacent businesses and residences if the spill or release cannot be contained and/or threatens the environment. Adjacent businesses and residences may be evacuated or put on standby evacuation, if determined to be appropriate by the local fire department officials;

3. If a release has occurred, on-site personnel shall immediately begin cleanup of the spill once the source has been eliminated and the spill contained;

4. The ERC or designate shall call appropriate Federal, State and local authorities as outlined below and report the incident including type of spill, type of material spilled, quantity of material spilled, and procedures being implemented:

    - EPA National Response Center - (800) 424-8802
    - NYSDEC - (800) 457-7362
    - Fire Department - 911
    - Police (Sheriff) Department - 911

5. On-Site Contingency Plan

In the event of serious injury to on-site personnel or contact with a hazardous material, the following protocol will be followed:

1. Immediate notification of the ERC;

2. Contact the identified medical center at (315) 464-5611 or Poison Control Center at (800)424-8802;

3. Decontaminate the person, if possible, and administer proper emergency first aid; and

4. Transport to the medical facility along predefined route.

In the event of a significant release of toxic or hazardous vapors, the source of such vapors shall be immediately isolated, the material identified, and the ERC notified. If possible, the source of the vapors shall be controlled. All personnel shall utilize self-contained breathing apparatus during such operations. Continuous air monitoring of the area shall commence. Appropriate regulatory and emergency response agencies will be notified of the situation. A list of the phone numbers for each agency will be prominently posted near each telephone.

6. Emergency Contacts

Arrangements have been made with local police departments, hospitals, fire departments, and emergency response teams. These arrangements included familiarization with site layout, properties of hazardous waste handled, and associated hazards, places where personnel might be working, entrances to the site, and evacuation routes.

The emergency numbers for the local agencies and project personnel are as follows:

Tim Henson (Operator) ..... (315) 446-9120
Tim Miller (Operator's project manager) ..... (315) 446-9120
STEVE → ~~John Uruskyj~~ (Owner's project manager) ..... (518) 862-2717
General Emergency 911
Fire Department 911
Ambulance 911
University Hospital (Emergency) ..... (315) 464-5611
NYSDOH (Syracuse) ..... (315) 426-7627
Ron Heerkins (NYSDOH) ..... (315) 426-7613
Henrietta Hamel (NYSDOH) ..... (315) 426-7627
NYSDEC ..... (800) 457-7362
County Health Department ..... (315) 435-3252
Poison Control Center ..... (315) 476-4766
USEPA National Response Center ..... (800) 424-8802
State Police ..... (315) 255-2766
Onondaga County Police (Sheriff) Department ..... (315) 425-2111

The closest hospital is the University Hospital located on Adams Street. The emergency route to this facility described below:

- Travel east on Taft Road to Buckley Road
- Turn right onto Buckley Road
- Travel south to the entrance for Route 81 South
- Take 81 South to the Adams/Harrison Exit
- Turn left onto Adams Street
- The hospital entrance is located on the right hand side

The Emergency Response Coordinator's home addresses and telephone numbers are as follows:

Tim Henson

Home: 107 FLINT PATH
~~221 Lynnhower Drive~~ SYRACUSE, NY 13219
~~North Syracuse, New York 13212~~
~~(315) 458-0604 (home)~~ (315)487-0979

Office: ARCADIS
~~Blasland, Bouck & Lee, Inc.~~
6723 Towpath Road, Box 66
Syracuse, New York 13214-0066
(315) 446-9120 –phone
(315) 243-6511 –cell
~~(315) 438-5952 – pager~~

Tim Miller (Alternate)

Home:
54 Chaucer Circle
Baldwinsville, New York 13027
(315) 638-2507

Office:
Blasland, Bouck & Lee, Inc.
6723 Towpath Road, Box 66
Syracuse, New York 13214-0066
(315) 446-9120

STEVEN MEIER
~~John Urnisky~~ **(Alternate)**

Home:
~~199 Fonda~~ Road
~~Waterford, New York~~ 12188
~~(518) 237-8087~~

Office:
General Electric Company
320 Great Oaks Boulevard,
Suite 323
Albany, New York 12203
(518) 862-2711 – phone 2711
~~(518) 862-2717 - pager~~

The operator has established the following prioritized list for contact purposes in case of an on-site emergency:

Priority	Personnel	Phone Number
1	Tim Henson (cell)	(315) 243-6511
2	Tim Henson (pager)	(315) 438-5952
3	Tim Henson (office)	(315) 446-9120
4	Tim Henson (home)	(315) 458-0604
5	Roger Elliott (cell)	(315) 436-9977
6	Roger Elliott (office)	(315) 432-1529
7	Roger Elliott (home)	(315) 852-9906
8	Tim Miller (office)	(315) 446-9120
9	Tim Miller (home)	(315) 638-2507
10	~~David Sonders (office)~~	~~(315) 446-9120~~
11	~~David Sonders (home)~~	~~(315) 471-8673~~
12	David Gerber (office)	(315) 446-9120
13	David Gerber (home)	(315) 655-2772

8
BRUCE LASER (CELL) 315 289 7579
BRUCE LASER (HOME) 315 264-7978
BRUCE LASER (OFFICE) 315 257-7605

This priority list has been forwarded to the site's security/autodialer system contractor. The security/autodialer system shall be field tested at least twice per year by the ERC.

ATTACHMENT

Hazardous Waste Inventory

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

Miller/Duva Site
Clay, New York

Hazardous Substance/Chemicals Inventory
October 4, 2001

Description	Quantity
Granular Activated Carbon (in-use) – contains VOCs	(12) 200 pound drums
Granular Activated Carbon (spent) – contains VOCs	(4) 200 pound drums
Calgon POL-E-Z 7736 Polymer – 100% solution	2.5 gallons
Calgon POL-E-Z 7736 Polymer – 0.25% solution	45 gallons
IPS Weld-On Plastic Pipe Primer	(1) 16 oz container (25% full)
Oatey Plastic Pipe Cleaner – contains acetone/MEK	(1) 16 oz container (50% full)
Fluorescent spray paint – contains toluen, acetone, hexane, and xylene	(3) 11 oz cans

Appendix D

Monitoring Logs/Reports

BBL

BBL ENVIRONMENTAL SERVICES INC.
Weekly Site Inspection Report
Miller/Duva Site
Town of Clay, New York

This report is to be completed during each site inspection. Note all items needing repair or attention. Use page 4 for additional comments.

BBL Project Personnel Date Time On-Site

Weather _____

	OK	Needs Work
Driveway		
Entrance Gate and Lock		
Site Conditions:		
Fence		
Surface Drainage		
Litter/Debris		
Monitoring Wells		
Wet Well:		
Water Level		
Float Control Free		
Building Exterior:		
Entry Door		
Overhead Door		
Windows		
Building Interior:		
Indications of spills or leaks		
Electrical Systems:		
exhaust fan operational		
phone operational		

	OK	Needs Work
electrical meter reading		
heater operational		
ADT system operational		
Treatment System:		
Polymer		
polymer remaining in make-up drum		
quantity of concentration polymer in stock		
polymer pump operational		
Mixers and Mixing Tanks		
mixer 1 operational		
mixer 2 operational (cut off for settling)		
Sludge level mixing tank 1		
Sludge level mixing tank 2		
Wet Well		
float controls		
water level in wet well		
Suction Lift Pumps		
Pump 1 Operational		
Pump 2 Operational		

Bag Filters:

	Pressure Readings (psi)				
	Primary Filter		**Secondary Filter**		**Downstream**
	Left	**Right**	**Left**	**Right**	
Before Change					
After Change					

primary filter (35 micron) changed out
(use bag filter log) (y/n)_____

Downgradient Totalizer

filter condition_____

Upgradient Totalizer

secondary filter (9 micron) changed out
(use bag filter log) (y/n)_____

Activated Carbon Absorption Units:

	Line 1	Line 2	Line 3	Line 4
totalizer reading (gals)				
flow reading (gals/min)				
pressure reading (psi)				
conditions of absorption units				
position a				
position b				
position c				

Appearence of system effluent_____

Waste Inventory:

Number of drums _____
Condition of drums _____
Days in storage (oldest drum) _____

REMARKS:

_____

_____

_____

BBL ENVIRONMENTAL SERVICES INC.
Weekly Site Inspection Report
Miller/Duva Site
Town of Clay, New York

This report is to be completed during each site inspection. Note all items needing repair or attention. Use page 4 for additional comments.

BBL Project Personnel T. Henson Date 3/7/02 Time On-Site 7:40

Weather Snow 28°

	OK	Needs Work
Driveway	X	
Entrance Gate and Lock		
Site Conditions:		
Fence		
Surface Drainage		
Litter/Debris		
Monitoring Wells		
Wet Well:		
Water Level		
Float Control Free		
Building Exterior:		
Entry Door		
Overhead Door		
Windows		
Building Interior:		
Indications of spills or leaks		
Electrical Systems:		
exhaust fan operational		
phone operational		

mAv 10206 SU 1925	OK	Needs Work
electrical meter reading	X	
heater operational		
ADT system operational		
Treatment System:		
Polymer		
polymer remaining in make-up drum	~20 GALS	
quantity of concentration polymer in stock	~20 GALS	
polymer pump operational	X	
Mixers and Mixing Tanks		
mixer 1 operational		
mixer 2 operational (cut off for settling)		
Sludge level mixing tank 1		
Sludge level mixing tank 2		
Wet Well		
float controls		
water level in wet well		
Suction Lift Pumps		
Pump 1 Operational		
Pump 2 Operational		

Bag Filters:

	Pressure Readings (psi)				
	Primary Filter		Secondary Filter		Downstream
	Left	Right	Left	Right	
Before Change	60	60	46	50	50
After Change					

3/7/02

primary filter (35 micron) changed out
(use bag filter log) (y/n) N/

Downgradient Totalizer
7,601,880

filter condition_____

Upgradient Totalizer
1,163,210

secondary filter (9 micron) changed out
(use bag filter log) (y/n) N/

Activated Carbon Absorption Units:

	Line 1	Line 2	Line 3	Line 4
totalizer reading (gals)	5,700,791	4,934,737	6,135,776	4,118,966
flow reading (gals/min)	9	9	9	9
pressure reading (psi)	2.6	2.0	1.9	1.9
conditions of absorption units	OK	OK	OK	OK
position a	↓	↓	↓	↓
position b				
position c				

Appearence of system effluent CLEAR

Waste Inventory:

Number of drums 4 HAZ 5 NON HAZ
Condition of drums GOOD
Days in storage (oldest drum) 10/25/01

REMARKS:

_____

_____

_____

BLASLAND, BOUCK & LEE ENVIRONMENTAL SERVICES

Quarterly Inspection Report

Miller/Duva

Town of Clay, New York

BBL Project Personnel _____ Date _____ Weather _____

Treatment Plant Sampling:

Line "1"	B____	Plant Influent_____
Line "2"	B____	Carbon Influent_____
Line "3"	B____	Combined Effluent_____
Line "4"	B____	Blind Sample_____

Water Level Readings:

DC-1S:_____	DC-1D:_____
DC-2S:_____	DC-2D:_____
DC-3S:_____	DC-3D:_____
DC-4S:_____	DC-4D:_____
DC-5S:_____	DC-5D:_____
DC-6S:_____	DC-6D:_____
DC-7S:_____	DC-7D:_____
DC-8S:_____	DC-8D:_____
P-1:_____	MW-1:_____
P-3:__Destroyed__	MW-2:_____
P-4:__Destroyed__	MW-3:_____
P-5:_____	MW-4:_____
P-6:_____	MW-5:_Cannot Locate_
P-7:_____	MW-6:_____
P-8:__Obstructed__	MW-7:_____
P-9:__Destroyed__	MW-8:_____
P-10:__Destroyed__	MW-9:_____

Water Level (cont'd):

P-11:_____

P-12:_____

P-13:_____

P-14: Destroyed

P-15:_____

P-16:_____

P-17:_____

MW-10:_____

MW-11:_____

MW-12:_____

MW-13:_____

OFFICE copy

BLASLAND, BOUCK & LEE ENVIRONMENTAL SERVICES

Quarterly Inspection Report

Miller/Duva

Town of Clay, New York

T. HENSON — BBL Project Personnel

3/7/02 — Date

SNOW 28° — Weather

Treatment Plant Sampling:

UGCT 1010

Line "1" B 1020 — Plant Influent 1000

Line "2" B 1030 — Carbon Influent 1100

Line "3" B 1040 — Combined Effluent N/A

Line "4" B 1050 — Blind Sample LINE 4B

Water Level Readings: NO LEVELS REQUIRED — AREA 3. 1110

DC-1S: _____ DC-1D: _____

DC-2S: _____ DC-2D: _____

DC-3S: _____ DC-3D: _____

DC-4S: _____ DC-4D: _____

DC-5S: _____ DC-5D: _____

DC-6S: _____ DC-6D: _____

DC-7S: _____ DC-7D: _____

DC-8S: _____ DC-8D: _____

P-1: _____ MW-1: _____

P-3: Destroyed MW-2: _____

P-4: Destroyed MW-3: _____

P-5: _____ MW-4: _____

P-6: _____ MW-5: Cannot Locate

P-7: _____ MW-6: _____

P-8: Obstructed MW-7: _____

P-9: Destroyed MW-8: _____

P-10: Destroyed MW-9: _____

Water Level (cont'd):

P-11:_____

P-12:_____

P-13:_____

P-14: Destroyed

P-15:_____

P-16:_____

P-17:_____

MW-10:_____

MW-11:_____

MW-12:_____

MW-13:_____

BBL ENVIRONMENTAL SERVICES, INC. REMEDIATION

Residential System Inspection Report Form

Miller/Duva Site
Town of Clay, New York

BBLES Project Personnel	Date	Time	Weather
Residence:			
Owner Present: Y / N			

System Inspection:

Sump Pump Operational: Y / N

Sump Well Cover in Place: Y / N

Indication of Overflow or Backup: Y / N

Water Present in Sump: Y / N

Air Blower Operational: Y / N

Air Handler Inspection:

Unit Operational: Y / N

Filter Clean: Y / N

Heater Operational: Y / N

Electrical Meter Reading: _____

Notes:

_____

_____

_____

_____

_____

_____

CRANBURY REMEDIATION

Residential System Inspection Report Form

Miller/Duva Site
Town of Clay, New York

T. HENSON 10/5/99

Cranbury Project Personnel | Date | Time | WEATHER

Residence: KUDERASIUS

Owner Present: (Y) / N

System Inspection:

Sump Pump operational: (Y) / N

Sump Well Cover in place: (Y) / N

Indication of overflow or backup: Y / (N)

Water Present in sump: Y / N

Air blower operational: (Y) / N

Air Handler Inspection:

Unit Operational: (Y) / N

Filter Clean: Y / (N)

Heater Operational: (Y) / N

Electric Meter Reading: _____

Notes: 9733 X 2

8/12/94

SITE

CRANBURY REMEDIATION

Residential System Inspection Report Form

Miller/Duva Site
Town of Clay, New York

T HENSON — 10/5/99 — :

Cranbury Project Personnel — Date — Time — WEATHER

Residence: POLINSKI

Owner Present: (Y) / N

System Inspection:

Sump Pump operational: (Y) N

Sump Well Cover in place: (Y) N

Indication of overflow or backup: Y (N)

Water Present in sump: Y (N)

Air blower operational: (Y) N

Air Handler Inspection:

Unit Operational: (Y) N

Filter Clean: (Y) N

Heater Operational: (Y) N

Electric Meter Reading: N/A

Notes:

- CLEANED OUTSIDE AIR INTAKES

12/94

CRANBURY REMEDIATION

Residential System Inspection Report Form

Miller/Duva Site
Town of Clay, New York

T. Henson / 10/5/99 / 8:30 / Overcast 40's

Cranbury Project Personnel / Date / Time / Weather

Residence: Scullin

Owner Present: (Y) N

System Inspection:

Sump Pump operational: (Y) / N

Sump Well Cover in place: (Y) / N

Indication of overflow or backup: Y / (N)

Water Present in sump: Y / (N)

Air blower operational: (Y) / N

Air Handler Inspection:

Unit Operational: (Y) N

Filter Clean: Y / (N)

Heater Operational: (Y) / N

Electric Meter Reading: 9002 X 2
5441 X 8

Notes:

- VACUUMED FILTERS
- DISASSEMBLED PRETREATOR + CLEANED. REINSTALLED, WORKING O.K.
- CLEANED OUTSIDE AIR INTAKES

V12/94

CRANBURY REMEDIATION

Residential System Inspection Report Form

Miller/Duva Site
Town of Clay, New York

T. Henson 10/5/99

Cranbury Project Personnel | Date | Time | WEATHER

Residence: DAWLEY

Owner Present: (Y) N

System Inspection:

Sump Pump operational: (Y) / N

Sump Well Cover in place: (Y) N

Indication of overflow or backup: Y / (N)

Water Present in sump: Y (N)

Air blower operational: (Y) / N

Air Handler Inspection:

Unit Operational: (Y) N

Filter Clean: Y / (N)

Heater Operational: (Y) N

Electric Meter Reading: N/A

Notes:

- CLEANED FILTERS
- CLEANED OUTSIDE AIR INTAKES

12/94

Mille..Duva Site
4958 West Taft Road
Clay, New York

Site Sign-In Sheet

	Date	Name	Company	Time In	Time Out	Reason
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
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Miller Cuva Site
4958 West Taft Road
Clay, New York

Site Sign-In Sheet

	Date	Name	Company	Time In	Time Out	Reason
1	10/15/01	T. Miller	BBLES	8:00	9:00	Carbon Removal
2	"	H. Beecher	HAZMAT	8:00	9:00	" "
3	10/16/01	T. Miller	BBLES	11:40	12:00	Carbon drop-off
4	"	John Benjamin	Penn Traffic	11:40	12:00	" "
5	10/18/01	Tim Henson	BBLES	7:55	9:30	O+M Visit
6	10/25/01	Tim Henson	BBLES	7:30	10:15	O+M Visit
7	10/31/01	T. Henson	BBLES	6:55	8:30	O+M visit
8	11/1/01	T. Henson	BBLES	7:05	1430	O+M Visit.
9	11/9/01	Tim Miller	"	9:40	1330	Annual Meeting
10	11/9/01	J. Urbski	GE			"
11	11/9/01	D. Gerber	BBLES			"
12	11/15/01	T. Henson	BBLES	1300	1530	O+M
13	11/16/01	R. Elliott	BBLES	13:45	14:15	Drop off replacement filter stock
14	11/20/01	T. Henson	BBLES	6:55	8:30	O+M
15	11/30/01	T. Henson	BBLES	16:00		O+M
16	12/6/01	T. Henson	BBLES	00:15	1130	O+M
17	12/6/01	R. Elliott	BBLES	10:30	11:30	O+M
18	12/13/01	T. Henson	BBLES	7:45	1630	O+M + Meet J.J. Lane
19	12/18/2001	R Perrine	JJ Lane	8:00	8:30	Security
20	12-19-01	T. Postell	" "	8:00	1430	"
21	12-13-01	R Elliott	BBLES	14:00	14:30	Check on JJ Lane work
22	12/17/01	T. Henson	BBLES	6:20 Am	7:00	Chem. Bac. Blues
23	12/19/01	T. Henson	"	7:50 Am		O+M + Compliance Sampling
24	12/24/01	T. Henson	BBLES	6:35 Am		O+M
25	12/31/01	T. Henson	"	1600		O+M
26	1/9/02	T. Henson	"	1600		O+M + Plow
27	1/10/02	T. Henson	"	1500		Check Bac. Cultures
28	1/18/02	T. Henson	"	7:30		O+M
29	1/24/02	T. Henson	"	1430	1600	O+M
30	1/30/02	T. Henson	"	1300		O+M Planning

Appendix E

Monitoring, Sampling, and Reporting Schedule

General Electric Company
Miller/Duva Site
Town of Clay, New York

2001 Monitoring, Sampling, and Reporting Schedule

Date	Task	Assigned Personnel	Date Completed	Initials
Prior to January 27, 2001	December DMR submission to DEC – (BBLES submit to GE prior to January 21, 2001).	Timothy Miller	1/26/2001	TEM
First Week of February 2001	Collect groundwater level measurements at specified on-site monitoring wells.	Timothy Henson	2/8/2001	TJH
March 1, 2001	Submit draft 2001 Annual Report to GE for review.	Timothy Miller	3/1/2001	TEM
First Week of March 2001	Operational Monitoring (including non-permitted constituents) – two week turnaround (If VOC breakthrough is detected between carbon units, arrange for carbon changeout).	Timothy Henson	3/12/2001	TJH
March 14, 2001	Submit final 2001 Annual Report to NYSDEC.	Timothy Miller	3/26/2001	TEM
Third Week of April 2001	Annual monitoring well and residential sump sampling – standard turnaround.	Timothy Henson	4/3/2001	TJH
First Week of May 2001	Operational Monitoring – one week turnaround (If breakthrough is detected between carbon units, arrange for carbon changeout before end of month).	Timothy Henson	5/7/2001	TJH
	Collect groundwater level measurements at specified on-site monitoring wells.	Timothy Henson	5/1/2001	TJH
First Week of June 2001	Compliance Effluent Sampling – one week turnaround.	Timothy Henson	6/7/2001	TJH
Prior to July 27, 2001	June DMR submission to NYSDEC – (BBLES submit to GE prior to July 19, 2001).	Timothy Miller	7/17/2001	TEM
First Week of August 2001	Collect groundwater level measurements at specified on-site monitoring wells.	Timothy Henson	8/3/2001	TJH
First Week of September 2001	Operational Monitoring (including non-permitted constituents) – two week turnaround (If VOC breakthrough is detected between carbon units, arrange for carbon changeout).	Timothy Henson	9/6/2001	TJH
November 2001	Annual site meeting to review standard operating procedures.	John Uruskyj	11/9/2001	JMU
		Tim Miller	11/9/2001	TEM
		Tim Henson	11/9/2001	TJH
First Week of November 2001	Collect groundwater level measurements at specified on-site monitoring wells.	Timothy Henson	11/9/2001	TJH
First Week of December 2001	Operational Monitoring – one week turnaround (If breakthrough is detected between carbon units, arrange for carbon changeout before compliance sampling event).	Timothy Henson	12/6/2001	TJH
Third Week of December 2001	Compliance Effluent Sampling – one week turnaround.	Timothy Henson	12/19/2001	TJH

Note:

1. Operational Monitoring includes collection of samples at the Upgradient Collection Trench, Plant Influent, Carbon Influent, and Secondary Carbon Effluent Lines.
2. Non-permitted constituents include iron, total suspended solids, calcium, BOD, and pH.
3. GE = General Electric Company.
4. BBLES = Blasland, Bouck, and Lee, Inc. Environmental Services.
5. VOC = volatile organic compounds.
6. DMR = discharge monitoring report.
7. NYSDEC = New York State Department of Environmental Conservation.

General Electric Company
Miller/Duva Site
Town of Clay, New York

2002 Monitoring, Sampling, and Reporting Schedule

Date	Task	Assigned Personnel	Date Completed	Initials
Prior to January 27, 2002	December DMR submission to DEC – (BBLES submit to GE prior to January 21, 2002).	Timothy Miller	1/14/2002	TEM
		John Uruskyj	1/23/2002	JMU
First Week of February 2002	Collect groundwater level measurements at specified on-site monitoring wells.	Timothy Henson	2/7/2002	TJH
March 1, 2002	Submit draft 2001 Annual Report to GE for review.	Timothy Miller	3/1/2002	TEM
March 2002	Submit memo to GE summarizing current discharge/cleanup limits.	Timothy Miller	3/15/2002	TEM
First Week of March 2002	Operational Monitoring (including non-permitted constituents) – two week turnaround (If VOC breakthrough is detected between carbon units, arrange for carbon changeout).	Timothy Henson	3/7/2002	TJH
March 14, 2002	Submit final 2001 Annual Report to NYSDEC.	Timothy Miller	3/14/2002	TEM
Third Week of April 2002	Annual monitoring well and residential sump sampling – standard turnaround.	Timothy Henson	4/18/2002	TJH
First Week of May 2002	Operational Monitoring – one week turnaround (If breakthrough is detected between carbon units, arrange for carbon changeout before end of month).	Timothy Henson	5/7/2002	TJH
	Collect groundwater level measurements at specified on-site monitoring wells.	Timothy Henson	5/7/2002	TJH
First Week of June 2002	Compliance Effluent Sampling – one week turnaround.	Timothy Henson	6/7/2002	TJH
Prior to July 27, 2002	June DMR submission to NYSDEC – (BBLES submit to GE prior to July 19, 2002).	Timothy Miller	7/19/2002	TEM
First Week of August 2002	Collect groundwater level measurements at specified on-site monitoring wells.	Timothy Henson	8/9/2002	TJH
First Week of September 2002	Operational Monitoring (including non-permitted constituents) – two week turnaround (If VOC breakthrough is detected between carbon units, arrange for carbon changeout).	Timothy Henson	9/6/2002	TJH
November 2002	Annual site meeting to review standard operating procedures.	John Uruskyj	12/5/2002	JMU
		Tim Miller	12/5/2002	TEM
		Tim Henson	12/5/2002	TJH
First Week of November 2002	Collect groundwater level measurements at specified on-site monitoring wells.	Timothy Henson	11/8/2002	TJH
First Week of December 2002	Operational Monitoring – one week turnaround (If breakthrough is detected between carbon units, arrange for carbon changeout before compliance sampling event).	Timothy Henson	12/3/2002	TJH
Third Week of December 2002	Compliance Effluent Sampling – one week turnaround.	Timothy Henson	12/10/2002	TJH

Note:

1. Operational Monitoring includes collection of samples at the Upgradient Collection Trench, Plant Influent, Carbon Influent, and Secondary Carbon Effluent Lines.
2. Non-permitted constituents include iron, total suspended solids, calcium, BOD, and pH.
3. GE = General Electric Company.
4. BBLES = Blasland, Bouck, and Lee, Inc. Environmental Services.
5. VOC = volatile organic compounds.
6. DMR = discharge monitoring report.
7. NYSDEC = New York State Department of Environmental Conservation.

Appendix F

Standard Protocols

BBL

Table of Contents

Groundwater Sampling Protocol

I. Introduction

This protocol describes the procedures to be followed during the collection of groundwater samples from sumps and treatment system components.

II. Materials

The following materials, as required, will be available during groundwater sampling.

- Health and safety equipment, as required;
- Appropriate water sample containers (see Table 5);
- Pyrex beaker;
- Peristaltic pump;
- Project sampling log book;
- Appropriate packing, labeling, and shipping materials with ice.

III. Procedures

The procedures for collecting groundwater samples are as follows:

1. Don health and safety equipment, as required.

2. Record the sample location (sketch if necessary), time, date, and personnel in the project sampling log book.

3. Collect the groundwater sample using a beaker and fill the sample container completely. After filling, cap the bottle and place on ice in the cooler. If collecting the sample from a in-line sample tap, fill the sample container directly.

4. Record the sample I.D. number in the log book then properly handle, code, pack, and ship the sample, as necessary.

Groundwater Sampling from Monitoring Wells Protocol

I. Introduction

This protocol describes the procedures to be used to collect ground-water samples from monitoring wells. New wells (if any) will not be sampled until well development has been performed. Existing wells, which are determined to require development, will not be sampled until well development has been performed. During precipitation events, groundwater sampling will be discontinued until precipitation ceases.

II. Materials

The following materials, as required, will be available during groundwater sampling:

- Photoionization detector (PID) - HNU or equivalent;
- Appropriate health and safety equipment;
- Plastic sheeting (for each sampling location);
- Disposable teflon bailers (minimum one per well);
- Polypropylene rope;
- Buckets to measure purge water;
- Water level well probe;
- Conductivity/temperature meter;
- Dissolved oxygen meter;
- pH meter;
- Sample filtration equipment (if required);
- Appropriate water sample containers per Table 5;
- One blank (trip) per transport container (for VOC analysis only);
- Transport containers (coolers) with ice and appropriate labeling, packing, and shipping materials;
- Ground-water sampling logs;
- Chain-of-Custody forms;
- Indelible ink pens;
- Site map with well locations and ground-water contours maps;
- Keys to wells; and
- Project sampling log book.

III. Procedures

The procedures for collecting ground-water samples from monitoring wells will be as follows:

1. Review materials check list (Part II) to ensure the appropriate equipment has been acquired.

2. Identify the site and the well to be sampled on sampling log sheets, along with date, arrival time, and weather conditions. Identify the personnel and equipment utilized and other pertinent data requested on the logs.

3. Properly label all sample containers.

4. Don safety equipment, as required. New disposable gloves will be donned prior to collecting ground-water samples at each monitoring well.

5. Place plastic-sheeting adjacent to well to use as a clean work area.

6. Establish the background reading with an OVA/HNU and record the reading on the field log.

7. Remove lock from well and if rusted or broken replace with a new brass keyed-alike lock.

8. Unlock and open the well cover while standing upwind of the well. Remove well cap and place on the plastic sheeting. Insert OVA/HNU probe in the breathing zone above the well casing. Proceed if OVA/HNU reading is below 1 ppm. If OVA\HNU reading is above 1 ppm, move upwind from well for approximately 5 minutes to allow the well headspace volatiles to dissipate. Repeat OVA/HNU reading.

9. Obtain a water level depth and bottom of well depth using an electric well probe and record on sampling log sheet. Clean the well probe after each use with a soapy (Alconox) water wash and a distilled water rinse. [Note: water levels may be measured at all wells prior to initiating any sampling activities].

10. Calculate the number of gallons of water in the well using the length of water column (in feet) multiplying by 0.163 for a 2-inch-diameter well or by 0.653 for a 4-inch-diameter well. Record the well volume on the ground-water sampling field log.

11. Remove the required purge volume of water from the well (measure purge water volume in measuring buckets). The required purge volume shall be three well volumes, unless the well runs dry, in which case the water that comes into the well will be sampled (RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, EPA, September 1986).

12a. After the appropriate purge volume of ground water in the well has been removed or if the well has been bailed dry and allowed to recover, obtain the ground water sample needed for analysis with a bailer and pour the ground water directly from the sampling device in the appropriate container and tightly screw on the caps.

- OR -

12b. For samples requiring filtration, pour ground water from the bailer into a pre-cleaned glass bowl and transport the ground-water sample to the laboratory. Using a peristaltic pump, dedicated or pre-cleaned tubing, and dedicated 0.45 micron in-line filter, pump the sample from the bowl into the sample container.

13. Place the custody seal around the cap and the sampler container. Note the time on the sample label. Secure with packing material and store at 4ıC on wet ice in an insulated transport container provided by the laboratory.

14. Cap and lock well.

15. Record the time sampling procedures were completed in the field log book.

16. Place all disposable sampling materials (plastic sheeting, bailer, and health and safety equipment) in an appropriately marked 55-gallon container at the site. Go to next well and repeat Step 1 through Step 16 until all wells are sampled.

Monitoring Well Visual Inspection and Level Measurement Protocol

I. Introduction

This protocol describes the procedures to be used to visually inspect and measure levels of groundwater in monitoring wells. Water levels will be measured using an electric well probe. Water level readings will be made twice at each location.

II. Materials

The following materials, as required, will be available during monitoring well visual inspection and level measurement:

- OVA/HNU;
- Appropriate health and safety equipment;
- Water Level Probe;
- Disposable plastic bailer;
- Laboratory-type Soap (Alconox or equivalent);
- Distilled water; and
- Project sampling log book.

III. Procedures

The procedures for visually inspecting and obtaining water level measurements from monitoring wells are as follows:

1. Identify site and well number in the project sampling log book along with date, time, personnel and weather conditions.

2. Don safety equipment as required.

3. Clean the water level probe and cable with a soapy (Alconox) water rinse followed by a distilled water rinse.

4. Establish a background reading with the PID, as necessary.

5. Unlock and open the well cover while standing up wind from the well. Place the well cap on the plastic sheeting. Monitor the air in the breathing zone above the well casing with the PID. If the meter reads greater than 1 ppm meter units, move up wind from the well and allow the air inside the casing to vent for approximately 5 minutes and repeat PID reading.

6. Using a clear plastic disposable bailer, fill and retrieve the bailer and visually observe the collected water for signs of oil sheen and record observations in the log book.

7. Locate a measuring reference point on the well casing. If one is not found, initiate a reference point by notching the inner casing (or outer if an inner casing is not present) casing with a hacksaw. All down hole

measurements will be taken from one reference point (RP) established at each well on the inner casing (on the outer only if an inner casing is not present).

8. Measure to the nearest hundredth of a foot and record the height of the inner and outer casing from reference point to ground level.

9. Lower the water level indicator probe until it indicates the top of water. Measure to the nearest hundredth foot and record the depth to water from the reference point.

10. Remove probe from the well.

11. Repeat Step 9 once and record.

12. Clean the instrument with a soapy (Alconox) water rinse followed by a distilled water rinse.

13. Lock the well when all activities are completed.

14. Repeat Steps 1 through 16 for each monitoring well as required.

Sample Handling, Packing, and Shipping Protocol

I. Introduction

This protocol describes the general procedures to be followed for handling, packing, and shipping of samples.

II. Materials

None at this time.

III. Procedures

The procedures for properly handling, packing, and shipping are as follows:

Handling

1. Fill in sample label with:

    a. Sample media (e.g., soil, ground water, surface water, sludge, oil, etc.);
    b. Project number and site name;
    c. Sample identification code and other sample identification information, if applicable;
    d. Analysis required;
    e. Date;
    f. Time sampled;
    g. Name, affiliation, and contact phone number;
    h. Sample type (composite or grab); and
    i. Preservative added, if applicable.

2. Cover the label with clear packing tape to secure the label onto the container.

3. Check the caps on the sample containers to ensure that they are tightly sealed.

4. Mark the level of the sample in the container using an indelible ink marker or grease pencil.

5. Wrap the sample container cap with clear packing tape to prevent it from becoming loose.

6. Initiate chain-of-custody by designated sampling personnel responsible for sample custody (after sampling or prior to sample packing). Note: If the designated sampling person relinquishes the samples to other sampling or field personnel for packing or other purposes, the samplers will complete the chain-of-custody prior to this transfer. The appropriate personnel will sign and date the chain-of-custody form to document the sample custody transfer.

Packing

1. Using duct tape, secure the outside and inside of the drain plug at the bottom of the cooler that is used for sample transport.

2. Place each sample container or package in individual polyethylene bags (ZiplocR-type) and seal.

3. Place one to two inches of vermiculite at the bottom of the cooler as a cushioning material.

4. Package the sealed sample containers upright in the cooler.

5. Repackage ice (if required) in small ZiplocR-type plastic bags and place loosely in the cooler. Do not pack ice so tightly that it may prevent addition of sufficient cushioning material.

6. Fill the remaining space in the cooler with vermiculite.

7. Place the completed chain-of-custody forms in a large ZiplocR-type bag and tape the forms to the inside of the cooler lid.

8. Close the lid of the cooler and fasten with duct tape.

9. Wrap strapping tape around both ends of the cooler at least twice.

10. Mark the cooler on the outside with the following information: shipping address, return address, "Fragile" labels on the top and on one side, and arrows indicating "This Side Up" on two adjacent sides.

11. Place custody seal over front and back of the cooler lid and cover with clear plastic tape.

Shipping

1. All samples will be hand delivered or delivered by an express carrier within 24 hours or less from the date of sample collection.

2. The following chain-of-custody procedures will apply to sample shipping:

    a. Relinquish the sample containers to the laboratory via express carrier. The signed and dated forms should be included in the cooler. The express carrier will not be required to sign the chain-of-custody forms. The sampler should retain the express carrier receipt or bill of lading.

    b. When the samples are received by the laboratory, the laboratory personnel shall complete the chain-of-custody forms by recording receipt of samples, measure and record the internal temperature of the shipping container, and then check the sample identification numbers on the containers to the chain-of-custody forms.

Granular Activated Carbon Changeout Protocol

I. Introduction

This protocol describes the procedures to be followed during the change out of granular activated carbon (GAC) canisters.

II. Materials

The following materials, as required, will be available during GAC changeout.

- Health and safety equipment, as required; and
- Wrench;

III. Procedures

The procedures for GAC canister changeout are as follows:

1. Don proper safety equipment.
2. De-gas new GAC canisters. Allow 24 hours for proper de-gassing to take place.
3. Close valve to GAC treatment trains.
4. Remove fitting from existing GAC canister in position "A" and plug opening.
5. Move GAC canister from position "B" to position "A".
6. Move GAC canister from position "C" to position "B".
7. Place new GAC canister in position "C."
8. De-water removed GAC canister by opening up the drain fitting located at the bottom of the canister. Draining the canisters shall only occur in the contained/bermed area of the building near the floor drain.

The procedures for GAC disposal are as follows:

1. Contact Calgon Carbon (Calgon) and arrange for the GAC canisters to be returned to the regeneration plant (Big Sandy Plant located Cattletsburg, Kentucky). The following information will be required by Calgon:

   - Number and model of canisters (including quantity and type of carbon, i.e, 200 pound, liquid phase);
   - Account Number (4010020) and Contract Number (40001585); and
   - Carbon Acceptance Number (14494)

2. Calgon shall provide/fax a Return Material Authorization (RMA) form.
3. Contact the hazardous waste transporter (Hazmat Environmental) and arrange for a carbon pick-up. The hazardous waste transporter should request the RMA number. Due to site constrictions, a short-flat bed truck with lift gate is a necessity for pick-ups/deliveries.
4. Complete a hazardous waste manifest and land disposal notification and certification form (Calgon form) prior to pick-up.
5. Fax a completed hazardous waste manifest to GE for review.
6. Obtain written authorization from GE in order to the sign hazardous waste manifest as a GE representative.
7. Follow instructions necessary to accurately complete the hazardous waste manifest (obtain proper signatures and retain proper copies).

Appendix G

2001 OMM Report Table of Contents

Table of Contents

Appendix H

DMR Submission Example

BBL

John M. Uruskyj
Remedial Project Manager

Corporate Environmental Programs
General Electric Company
320 Great Oaks Office Park, Suite 323
Albany, New York 12203
Phone: (518) 862-2717; Fax: (518) 862-2702

Transmitted Via U.S. Mail

July 17, 2001

Mr. Gerald Rider
Operation and Maintenance Section
New York State Department of Environmental Conservation
625 Broadway
Albany, NY 12233-7014

Re: Notice of DMR Transmittal, January - June 2001
Miller/Duva Site, Clay, New York
NYS DEC Registry No. 07-34-051
Order on Consent Index # A7-0225-90-03

Dear Mr. Rider:

Enclosed is a copy of the Discharge Monitoring Report(DMR) for January to June of 2001. The report was prepared by BBL Environmental Services, Inc. pursuant to the New York State Department of Environmental Conservation (NYDEC) approved Operations and Monitoring and Maintenance Manual (OMM).

Effluent measurements for the identified period of operation indicate that the system has operated in conformance with the established effluent limitations.

This DMR is submitted to NYSDEC for your review. Please contact me if you have any questions or if I can be of assistance regarding the enclosed DMR.

Sincerely,

GENERAL ELECTRIC COMPANY

John M. Uruskyj
Remedial Project Manager

cc: L. Flockey, NYSDEC
David R. Gerber, P.E., BBL Environmental Services, Inc.
R. Parker, NYSDEC

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if different)

NAME ~~General Electric Company~~

ADDRESS ~~320 Great Oaks Boulevard, Suite 323~~
~~Albany, NY 12203~~

FACILITY ~~Miller/Duva Property~~

LOCATION ~~Liverpool, New York~~

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

DISCHARGE MONITORING REPORT (DMR)

(2-16) ~~Site Code 7-34-051~~ PERMIT NUMBER

(17-19) DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
FROM	91	01	01	TO	91	06	30
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

Form Approved.
OMB No. 2040-0004
Approval expires 10-31-94

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
cis-1,2-Dichloroethene	SAMPLE MEASUREMENT						<1	ug/L	0	1/184	grab
	PERMIT REQUIREMENT						5				
1,1,1-Trichloroethane	SAMPLE MEASUREMENT						<1	ug/L	0	1/184	grab
	PERMIT REQUIREMENT						5				
Trichloroethene	SAMPLE MEASUREMENT						<1	ug/L	0	1/184	grab
	PERMIT REQUIREMENT						5				
~~Toluene~~ Toluene	SAMPLE MEASUREMENT						<1	ug/L	0	1/184	grab
	PERMIT REQUIREMENT						5				
1,1-Dichloroethane	SAMPLE MEASUREMENT						<1	ug/L	0	1/184	grab
	PERMIT REQUIREMENT						5				
Tetrachloroethene	SAMPLE MEASUREMENT						<0.5	ug/L	0	1/184	grab
	PERMIT REQUIREMENT						1				
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER

John Uruskyj

TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319. *(Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years.)*

John M. Uruskyj

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: AREA CODE 518, NUMBER 862-2717

DATE: YEAR, MO, DAY

COMMENT AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

PERMITTEE NAME/ADDRESS (*Include Facility Name/Location if different*)
NAME — General Electric Company
ADDRESS — 320 Great Oaks Boulevard, Suite 323
Albany, NY 12203
FACILITY — Hiller/Duva Property
LOCATION — Liverpool, New York

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

(2-16) PERMIT NUMBER: Site Code 7-34-051 | (17-19) DISCHARGE NUMBER:

Form Approved.
OMB No. 2040-0004
Approval expires 10-31-94

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM	01	01	01	TO	01	06	30
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

NOTE: Read Instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
Vinyl Chloride	SAMPLE MEASUREMENT						< 1	ug/L	0	1/184	
	PERMIT REQUIREMENT						2				
Methyl Ethyl Ketone	SAMPLE MEASUREMENT						< 5	ug/L	0	1/184	
	PERMIT REQUIREMENT						10				
BOD-5	SAMPLE MEASUREMENT						< 2	mg/L	0	1/184	
	PERMIT REQUIREMENT						5				
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER

John Uruskyj

TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319. (*Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years.*)

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: AREA CODE 518 — NUMBER 862-2717

DATE: YEAR — MO — DAY

COMMENT AND EXPLANATION OF ANY VIOLATIONS (*Reference all attachments here*)

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Action • Management and Construction

Transmitted Via U.S. Mail

ORIGINAL

July 2, 2001

John M. Uruskyj
General Electric Company
320 Great Oaks Boulevard, Suite 323
Albany, NY 12203

Re: Miller/Duva Site
Town of Clay, New York
Discharge Monitoring Report
Project #: 0100.10075 #2

Dear Mr. Uruskyj:

Enclosed is the completed semi-annual (January to June 2001) Discharge Monitoring Report (DMR) for the groundwater treatment plant at the Miller/Duva site located in the Town of Clay, New York. On June 7, 2001, compliance samples were collected at the GE Miller/Duva facility and shipped to Severn Trent Laboratories to be analyzed for volatile organic compounds, including MEK and BOD_5. During this monitoring period, there were no observed exceedences of the effluent limitations established for the treatment system.

Please sign the enclosed DMR and submit it directly to the New York State Department of Environmental Conservation. Also, at your convenience, please send a copy of your cover letter for the January to June 2001 DMR to BBL Environmental Services, Inc. for our records.

Sincerely,

BBL ENVIRONMENTAL SERVICES, INC.

David R. Gerber, P.E.

TEM/cmd
Enclosure

cc: Lowell W. McBurney, P.E., Blasland, Bouck & Lee, Inc.

SEVERN TRENT SERVICES

STL Buffalo
10 Hazelwood Drive
Suite 106
Amherst, NY 14228

Tel: 716 691 2600
Fax: 716 691 7991
www.stl-inc.com

June 26, 2001

Mr. David Gerber
Blasland, Bouck & Lee, Inc.
6723 Towpath Road
Syracuse, NY 13214

RE: Analytical Results for A01-5410

Dear Mr. Gerber:

Please find enclosed analytical results concerning the samples recently submitted by your firm. The pertinent information regarding these analyses is listed below.

Quote #:	NY96-211
Project Name:	Miller/Duva Site
Matrix :	Water
Samples Received:	06/08/01
Sample Date:	06/07/01

If you have any questions concerning these data, please contact the Program Manager at (716) 691-2600 and refer to the I.D. number listed below. It has been our pleasure to provide Blasland, Bouck & Lee, Inc. with environmental testing services. We look forward to serving you in the future.

Sincerely,

STL Buffalo

Candace L. Fox

Candace L. Fox
Program Manager

CLF/ltb
Enclosure

I.D. #A01-5410
#NY6A6377

This report contains 21 pages which are individually numbered.

DATA COMMENT PAGE

ORGANIC DATA QUALIFIERS

ND or U	Indicates compound was analyzed for, but not detected.
J	Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when the data indicates the presence of a compound that meets the identification criteria but the result is less than the sample quantitation limit but greater than zero.
C	This flag applies to pesticide results where the identification has been confirmed by GC/MS.
B	This flag is used when the analyte is found in the associated blank, as well as in the sample.
E	This flag identifies compounds whose concentrations exceed the calibration range of the instrument for that specific analysis.
D	This flag identifies all compounds identified in an analysis at the secondary dilution factor.
N	Indicates presumptive evidence of a compound. This flag is used only for tentatively identified compounds, where the identification is based on the Mass Spectral library search. It is applied to all TIC results.
P	This flag is used for a pesticide/Aroclor target analyte when there is greater than 25% difference for detected concentrations between the two GC columns. The lower of the two values is reported on the data page and flagged with a "P".
A	This flag indicates that a TIC is a suspected aldol-condensation product.
‡	Indicates coelution.
*	Indicates analysis is not within the quality control limits.

INORGANIC DATA QUALIFIERS

ND or U	Indicates element was analyzed for, but not detected. Report with the detection limit value.
J or B	Indicates a value greater than or equal to the instrument detection limit, but less than the quantitation limit.
N	Indicates spike sample recovery is not within the quality control limits.
K	Indicates the post digestion spike recovery is not within the quality control limits.
S	Indicates value determined by the Method of Standard Addition.
M	Indicates duplicate injection results exceeded quality control limits.
W	Post digestion spike for Furnace AA analysis is out of quality control limits (85-115%) while sample absorbance is less than 50% of spike absorbance.
E	Indicates a value estimated or not reported due to the presence of interferences.
H	Indicates analytical holding time exceedance. The value obtained should be considered an estimate.
*	Indicates analysis is not within the quality control limits.
+	Indicates the correlation coefficient for the Method of Standard Addition is less than 0.995.

Sample Data Package

Client ID		COMBINED EFFLUENT							
Job No	Lab ID	A01-5410	A1541001						
Sample Date		06/07/2001							
Analyte	Units	Sample Value	Reporting Limit	Sample Value	Reporting Limit	Sample Value	Reporting Limit	Sample Value	Reporting Limit
cis-1,2-Dichloroethene	UG/L	ND	1.0	NA		NA		NA	
1,1,1-Trichloroethane	UG/L	ND	1.0	NA		NA		NA	
Trichloroethene	UG/L	ND	1.0	NA		NA		NA	
Toluene	UG/L	ND	1.0	NA		NA		NA	
1,1-Dichloroethane	UG/L	ND	1.0	NA		NA		NA	
Tetrachloroethene	UG/L	ND	0.50	NA		NA		NA	
Vinyl chloride	UG/L	ND	1.0	NA		NA		NA	
Methyl Ethyl Ketone	UG/L	ND	5.0	NA		NA		NA	
IS/SURROGATE(S)									
Chlorobenzene-D5	%	85	50-200	NA		NA		NA	
1,4-Difluorobenzene	%	92	50-200	NA		NA		NA	
1,4-Dichlorobenzene-D4	%	71	50-200	NA		NA		NA	
Toluene-D8	%	85	76-123	NA		NA		NA	
p-Bromofluorobenzene	%	86	77-115	NA		NA		NA	
1,2-Dichloroethane-D4	%	108	70-129	NA		NA		NA	

A = Not Applicable ND = Not Detected

Client ID		COMBINED EFFLUENT							
Job No	Lab ID	A01-5410	A1541001						
Sample Date		06/07/2001							
Analyte	Units	Sample Value	Reporting Limit	Sample Value	Reporting Limit	Sample Value	Reporting Limit	Sample Value	Reporting Limit
Biochemical Oxygen Demand	MG/L	ND	2.0	NA		NA		NA	

A = Not Applicable ND = Not Detected

Chronology and QC Summary Package

Client ID		VBLK21							
Job No	Lab ID	A01-5410	A1541005						
Sample Date									
Analyte	Units	Sample Value	Reporting Limit	Sample Value	Reporting Limit	Sample Value	Reporting Limit	Sample Value	Reporting Limit
cis-1,2-Dichloroethene	UG/L	ND	1.0	NA		NA		NA	
1,1,1-Trichloroethane	UG/L	ND	1.0	NA		NA		NA	
Trichloroethene	UG/L	ND	1.0	NA		NA		NA	
Toluene	UG/L	ND	1.0	NA		NA		NA	
1,1-Dichloroethane	UG/L	ND	1.0	NA		NA		NA	
Tetrachloroethene	UG/L	ND	0.50	NA		NA		NA	
Vinyl chloride	UG/L	ND	1.0	NA		NA		NA	
Methyl Ethyl Ketone	UG/L	ND	5.0	NA		NA		NA	
IS/SURROGATE(S)									
Chlorobenzene-D5	%	87	50-200	NA		NA		NA	
1,4-Difluorobenzene	%	85	50-200	NA		NA		NA	
1,4-Dichlorobenzene-D4	%	74	50-200	NA		NA		NA	
Toluene-D8	%	86	76-123	NA		NA		NA	
p-Bromofluorobenzene	%	92	77-115	NA		NA		NA	
1,2-Dichloroethane-D4	%	115	70-129	NA		NA		NA	

Client ID		Matrix Spike Blank							
Job No	Lab ID	A01-5410	A1541006						
Sample Date									
Analyte	Units	Sample Value	Reporting Limit	Sample Value	Reporting Limit	Sample Value	Reporting Limit	Sample Value	Reporting Limit
cis-1,2-Dichloroethene	UG/L	ND	1.0	NA		NA		NA	
1,1,1-Trichloroethane	UG/L	ND	1.0	NA		NA		NA	
Trichloroethene	UG/L	11	1.0	NA		NA		NA	
Toluene	UG/L	9.5	1.0	NA		NA		NA	
1,1-Dichloroethane	UG/L	ND	1.0	NA		NA		NA	
Tetrachloroethene	UG/L	ND	0.50	NA		NA		NA	
Vinyl chloride	UG/L	ND	1.0	NA		NA		NA	
Methyl Ethyl Ketone	UG/L	ND	5.0	NA		NA		NA	
IS/SURROGATE(S)									
Chlorobenzene-D5	%	104	50-200	NA		NA		NA	
1,4-Difluorobenzene	%	99	50-200	NA		NA		NA	
1,4-Dichlorobenzene-D4	%	87	50-200	NA		NA		NA	
Toluene-D8	%	86	76-123	NA		NA		NA	
p-Bromofluorobenzene	%	89	77-115	NA		NA		NA	
1,2-Dichloroethane-D4	%	116	70-129	NA		NA		NA	

A = Not Applicable ND = Not Detected

Client ID		TB							
Job No	Lab ID	A01-5410	A1541002						
Sample Date		06/07/2001							
Analyte	Units	Sample Value	Reporting Limit	Sample Value	Reporting Limit	Sample Value	Reporting Limit	Sample Value	Reporting Limit
cis-1,2-Dichloroethene	UG/L	ND	1.0	NA		NA		NA	
1,1,1-Trichloroethane	UG/L	ND	1.0	NA		NA		NA	
Trichloroethene	UG/L	ND	1.0	NA		NA		NA	
Toluene	UG/L	ND	1.0	NA		NA		NA	
1,1-Dichloroethane	UG/L	ND	1.0	NA		NA		NA	
Tetrachloroethene	UG/L	ND	0.50	NA		NA		NA	
Vinyl chloride	UG/L	ND	1.0	NA		NA		NA	
Methyl Ethyl Ketone	UG/L	ND	5.0	NA		NA		NA	
IS/SURROGATE(S)									
Chlorobenzene-D5	%	88	50-200	NA		NA		NA	
1,4-Difluorobenzene	%	87	50-200	NA		NA		NA	
1,4-Dichlorobenzene-D4	%	70	50-200	NA		NA		NA	
Toluene-D8	%	82	76-123	NA		NA		NA	
p-Bromofluorobenzene	%	81	77-115	NA		NA		NA	
1,2-Dichloroethane-D4	%	121	70-129	NA		NA		NA	

A = Not Applicable ND = Not Detected

METHOD 8260 - SELECT VOLATILE ORGANICS

Client Sample ID Job No & Lab Sample ID	COMBINED EFFLUENT A01-5410 A1541001				
Sample Date	06/07/2001 07:00				
Received Date	06/08/2001 09:45				
Extraction Date					
Analysis Date	06/20/2001 08:24				
Extraction HT Met?	-				
Analytical HT Met?	YES				
Sample Matrix	WATER				
Dilution Factor	1.0				
Sample wt/vol	0.025 LITERS				
% Dry					

000040

NA = Not Applicable

METHOD 8260 - SELECT VOLATILE ORGANICS

Client Sample ID Job No & Lab Sample ID	TB A01-5410 A1541002				
Sample Date	06/07/2001 07:00				
Received Date	06/08/2001 09:45				
Extraction Date					
Analysis Date	06/20/2001 08:59				
Extraction HT Met?	-				
Analytical HT Met?	YES				
Sample Matrix	WATER				
Dilution Factor	1.0				
Sample wt/vol	0.025 LITERS				
% Dry					

NA = Not Applicable

METHOD 8260 - SELECT VOLATILE ORGANICS

Client Sample ID Job No & Lab Sample ID	Matrix Spike Blank A01-5410 A1541006				
Sample Date					
Received Date					
Extraction Date					
Analysis Date	06/20/2001 01:09				
Extraction HT Met?	-				
Analytical HT Met?	-				
Sample Matrix	WATER				
Dilution Factor	1.0				
Sample wt/vol	0.025 LITERS				
% Dry					

NA = Not Applicable

000012

METHOD 8260 - SELECT VOLATILE ORGANICS

Client Sample ID	VBLK21				
Job No & Lab Sample ID	A01-5410 A1541005				
Sample Date					
Received Date					
Extraction Date					
Analysis Date	06/20/2001 01:46				
Extraction HT Met?	-				
Analytical HT Met?	-				
Sample Matrix	WATER				
Dilution Factor	1.0				
Sample wt/vol	0.025 LITERS				
% Dry					

000013

NA = Not Applicable

Client Sample ID: VBLK21 Matrix Spike Blank
Lab Sample ID: A1541005 A1541006

Analyte	Units of Measure	Concentration Blank Spike	Spike Amount	% Recovery Blank Spike	QC LIMITS
METHOD 8260 - SELECT VOLATILE ORGANICS					
Trichloroethene	UG/L	11.3	10.0	114	71-123
Toluene	UG/L	9.49	10.0	95	71-120

* Indicates Result is outside QC Limits
NC = Not Calculated ND = Not Calculated

Client ID Job No Sample Date	Lab ID	Method Blank A01-5410	A1B0498902						
Analyte	Units	Sample Value	Reporting Limit	Sample Value	Reporting Limit	Sample Value	Reporting Limit	Sample Value	Reporting Limit
Biochemical Oxygen Demand	MG/L	ND	2.0	NA		NA		NA	

NA = Not Applicable ND = Not Detected

Client ID		LCS							
Job No	Lab ID	A01-5410	A1B0498901						
Sample Date									
Analyte	Units	Sample Value	Reporting Limit	Sample Value	Reporting Limit	Sample Value	Reporting Limit	Sample Value	Reporting Limit
Biochemical Oxygen Demand	MG/L	195	2.0	NA		NA		NA	

NA = Not Applicable ND = Not Detected

Lab ID	Sample ID	Units	Analyte	Method	Dilution Factor	Sample Date	Receive Date	TCLP Date	THT	Analysis Date	AHT	Matrix
A1541001	COMBINED EFFLUENT	MG/L	Biochemical Oxygen Demand	405.1	1.00	06/07/2001 07:00	06/08 09:45	NA	NA	06/08 08:55	Yes	WATER

AHT = Analysis Holding Time Met
THT = TCLP Holding Time Met
A = Not Applicable

Lab ID	Sample ID	Units	Analyte	Method	Dilution Factor	Sample Date	Receive Date	TCLP Date	THT	Analysis Date	AHT	Matri
A1B0498901	LCS	MG/L	Biochemical Oxygen Demand	405.1	1.00	-	- 09:45	NA	NA	06/08 08:55	Yes	WATER
A1B0498902	Method Blank	MG/L	Biochemical Oxygen Demand	405.1	1.00	-	- 09:45	NA	NA	06/08 08:55	Yes	WATER

000018

AHT = Analysis Holding Time Met
THT = TCLP Holding Time Met
NA = Not Applicable

Client Sample ID: Method Blank
Lab Sample ID: A1B0498902

LCS
A1B0498901

Analyte	Units of Measure	Concentration Blank Spike	Spike Amount	% Recovery Blank Spike	QC LIMITS
WET CHEMISTRY ANALYSIS METHOD 405.1 - BIOCHEMICAL OXYGEN DEMA	MG/L	195.0	198	98	84-114

* Indicates Result is outside QC Limits
NC = Not Calculated ND = Not Calculated

Chain of Custody

Chain Custody Record

SEVERN TRENT SERVICES — Severn Trent Laboratories, Inc

STL-4124 (0700)

Client: BBL INC.	Project Manager: DAVE GERBER	Date: 6/7/01	Chain of Custody Number: 015419
Address: 6723 TOWPATH RD	Telephone Number (Area Code)/Fax Number: 315 446-2570 X 431	Lab Number:	Page 1 of 1
City: SYRACUSE / State: NY / Zip Code: 13214	Site Contact:	Lab Contact:	
Project Name and Location (State): GE MILLER / OU#4	Carrier/Waybill Number: FED EX		
Contract/Purchase Order/Quote No.:			

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Analysis: # 8260	# 8015	Special Instructions/ Conditions of Receipt
COMBINED EFFLUENT	6/7/01	700		X						X			2	1	5°
TRIP BLANK				X						X			1		ANALYZE FOR THE FOLLOWING: - CIS 1,2 DICHLOROETH; - 1,1,1-TRICHLOROETHA - TRICHLOROETHYLEN - TOLUENE - 1,1-DICHLOROETHANE - TETRACHLOROETHYLE - VINYL CHLORIDE - METHYL ETHYL KE

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 3 months)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☑ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify):

	Date	Time		Date	Time
1. Relinquished By: Jim Henson	6/7/01		1. Received By: Travis Jones STL	6/8/01	0945
2. Relinquished By:			2. Received By:		
3. Relinquished By:			3. Received By:		

Comments:

DISTRIBUTION: WHITE - Stays with the Sample; CANARY - Returned to Client with Report; PINK - Field Copy

000021

In order to differentiate between the unspiked and post-digestion spike analyses, the laboratory must add to the GE sample number a suffix of "A" for the post-digestion spike analysis.

Individual component percent recoveries (%R's) are calculated as follows:

$$\% \text{ Recovery} = \frac{(SSR - SR)}{SA} \times 100$$

where:

SSR	=	Spiked sample result
SR	=	Sample result
SA	=	Spike added

When the sample concentration is less than the instrument detection limit, SR = 0 should only be used for purposes of calculating the percent recovery. The recovery limit for the GFAA post-digestion analytical spike analysis is 85-115%.

i) If the analytical spike recovery is <40%, the sample must be diluted and rerun with another spike. The laboratory should dilute the sample by a factor of 5 or 10 (maximum). If the spike percent recovery is still <40%, the data should be flagged to the data users (e.g., with an "E" to indicate matrix interference).

ii) If the spike recovery is ≥40% and the sample concentration is <50% of the spike concentration, the results should be reported to the IDL. However, if the spike recovery is <85% or >115%, the result should be flagged to the data users (e.g., with a "W").

iii) If the sample concentration is ≥ 50% of the spike concentration and the spike recovery is 85% < %R <115%, the sample result is quantitated from the calibration curve and reported down to the IDL.

iv) If the sample concentration ≥50% of the spike concentration and the spike recovery is <85% or >115%, the sample must be quantitated by MSA.

C) Method of Standard Additions (MSA)

The MSA is performed when the post-digestion analytical spike recovery did not meet the recovery limit specified in Section B above. The sample and three analytical spikes

must be analyzed consecutively for MSA quantitation. The spikes must be prepared so that the first spike is ~50% of the sample concentration; the second spike is ~100% of the sample concentration; and the third spike is ~150% of the sample concentration.

Reported values from the MSA must be flagged with an "S" on the summary form if the correlation coefficient is ≥ 0.995. If the correlation coefficient is <0.995, then the MSA must be repeated once, and if the correlation coefficient is still <0.995, then the better result (the result with the higher correlation coefficient) is to be reported and flagged with a "+".

The vast majority of sample analyses will be performed using the CLP Statements of Work (OLM03.2 and ILM04.0) or the SW-846 methods. The CLP analyses are very rigid in the frequency, criteria, and corrective actions required in case of failing quality control analyses. However, the SW-846 methods are not as explicit as the CLP analyses or are open to interpretation by the laboratories in regard to the frequency, criteria, and corrective actions for quality control analyses. In an effort to have all laboratories involved in the Corporate Purchase Agreement program performing analyses in the same manner and under the same criteria, Tables A-2 through A-14 have been developed to address the ambiguities in several select SW-846 methods. All laboratories are required to follow the quality control requirements presented in the Tables. In addition, Table A-1 is presented to detail the quality control requirements necessary for the documentation of sample receipt. Table A-15 specifies what will be considered a billable sample for each SDG and what will be considered nonbillable for each SDG for the GE Corporate Purchase Agreement.

Section 2 Data Package Deliverables

The following sections describe in detail the types of data packages designed for GE projects. These details are provided to allow several laboratories participating in GE projects to produce similar data packages in format, order of presentation and content. The data packages detailed in Section 2.1 have been developed for SW-846 methods by which most GE work is performed. The US EPA Contract Laboratory Program Statement of Work (CLP SOW) has additional details concerning data packages which are specific to the CLP analyses. The most recent Statement of Work should be referenced for details concerning CLP-style data packages. Note: the summary forms provided in these data packages should be in similar format and content to the Contract Laboratory Program (CLP) forms listed (as references) next to the form title. These CLP forms references are only provided as guidance on content and format and should be modified by the laboratory to meet SW-846 requirements. The GE CPA Laboratory Spot Bidding Form will indicate if the laboratory will be required to report the results of library searches for tentatively identified compounds (TICs) in the GC/MS analyses. For projects which do not require TIC searches, the deliverables specified in Sections 2.1 and 2.2 for TICs will not be required. Projects that do not require TICs to be reported must indicate this on the Chain-of-Custody. Section 2.2 provides details concerning specific contents of the data deliverables described in Section 2.1.

The GE data package deliverables are categorized into three distinct levels as follows:

GE Level 1	-	Case Narratives, analytical results, and Chain-of-Custody Records for the SDG.
GE Level 2	-	Case Narratives, analytical results, QC summary forms, sample raw data, and Chain-of-Custody Records.
GE Level 3	-	Complete CLP-like data package.

The completeness and level of information provided in the data packages increase with increasing number. The GE Level 1 data package is a basic "results-only" style of data package that includes a cover letter, SDG narrative, field Chain-of-Custody Records, analytical results summaries, and a glossary of qualifier codes. A GE Level 2 package includes all Level 1 information, summary forms for internal quality control procedures such as calibrations, surrogates, tuning, etc. and raw data for investigatory samples submitted to the laboratory. The GE Level 3 package is the highest level of data deliverables required and closely resembles the information required by the CLP SOW. This type of package includes all information provided in Level 1 and Level 2 packages but also includes raw data to support the quality control results reported on the summary forms.

These data packages were designed to serve a wide variety of project data quality objectives. It is the responsibility of the GE and engineering firm project managers to define the type of data packages

appropriate for the project. Several questions should be asked prior to determining the type of data packages required:

- Do regulatory requirements or consent orders specify the type of data package ?
- What is the "political" sensitivity of the project?
- What types of decisions will be made from the sample data?
- Will data quality objectives be met?
- What is the intended use of the data?

An investigation that is regulatory driven, in the public's eye, or potentially brought to trial are highly "politically" sensitive projects. These types of projects need a high level of supporting data to be accepted by an agency, accepted in court and by the public, and for performing data validation and risk assessment. Sample data that will be used to make remediation decisions that may cost significant resource allocations or sample data collected to verify compliance with remediation goals must be closely scrutinized and therefore the level of supporting data is of paramount importance. Validation of data prior to a risk assessment also require a higher level of package to ensure data used in the risk calculations are accurate. It should be noted that selecting a Level 2 or Level 3 data package does not necessarily mean the data validation should be or will be performed. Again, this is a project management decision. In some cases, a Level 2 or Level 3 package may be solely requested so that supporting data is readily available for validation at some future date or to support decisions previously made and available as solid supporting documentation of the results.

As an example of determining data package level the following scenario is provided. An initial investigation at a site which contains unknown contamination might warrant a Level 3 package. This package could be validated to determine the qualitative and quantitative accuracy of the samples collected. This data would be further used to base risk assessment and remediation plans. The Level 3 package would also support the results when reported to a regulatory agency. Upon the remediation step at a site a Level 1 package may suffice since they can be used for a yes/no type of remediation (i.e., keep digging or stop). However, during the remediation the Level 1 results start to indicate the potential for the presence of other pollutants at the site. These sample results could then be upgrade to a Level 2 package to prove or disprove the qualitative and quantitative presence of the new pollutant. Upon completion of remediation a Level 2 or Level 3 data package can be requested and validated to support the cleanliness of the remediated area.

Environmental Standards (610-935-5577) can also be contacted through GE as a project resource for guidance on the type and frequency of data deliverables for individual projects. The level of data deliverables will be specified on the Chain-of-Custody Records to indicate to the laboratory the data format required.

2.1 Data Package Contents and Order of Presentation

The laboratory will be required to submit supporting documentation for the reported analytical results. The supporting documentation and the analytical results will be required to be reported in one of three data package delivery categories. The categories are defined below. The data package deliverables must be submitted in the order in which the deliverables appear in the text. The laboratory need not include the documentation for any fraction not required for an SDG.

2.1.1 General Format for GE Level 3 Deliverables

For some analyses, GE Level 3 Sample Data Package deliverables may be requested instead of GE Level 1 or Level 2 Sample Data Package deliverables. When Level 3 deliverables are required, a complete Sample Data Package will be prepared. A Level 1 Data Package will also be required with the Level 3 package as a summary package.

The Level 3 Sample Data Package shall include data for analyses of all samples in one SDG, including field samples, reanalyses, secondary dilutions, blanks, laboratory control samples, matrix spikes, matrix spike duplicates, and/or laboratory duplicates. The complete Sample Data Package is divided into 15 units as described below. Units F-N are each specific to an analytical fraction. A fraction-specific unit is not a required deliverable if the analysis of that fraction was not required for samples in the SDG. The Sample Data Package must be complete before submission and must be consecutively paginated. The Sample Data Package will be arranged in the following order:

A) Cover Letter/Letter of Transmittal

B) Title Page

C) Table of Contents

D) Sample Delivery Group (SDG) Narrative

This document shall be clearly labeled "SDG Narrative" and shall contain: laboratory name; SDG number; GE sample identifications; laboratory sample numbers; and detailed documentation of any quality control, sample, shipment, and/or analytical problems encountered in processing the samples reported in the data package. A glossary of qualifier codes used in the SDG must also be provided.

The laboratory must also include any problems encountered, both technical and administrative, corrective actions taken and resolution, and an explanation of all flagged edits (i.e., exhibit edits) on quantitation reports.

Additionally, the SDG Narrative must be signed and dated by the laboratory manager.

E) Field and Internal (Laboratory) Chain-of-Custody Records and Sample Receipt Documentation Log

Copies of both the external and internal Chain-of-Custody Records for all samples within the SDG must be included in the deliverables. The Sample Receipt Documentation Log must include the items listed in Table A-1 of this exhibit. The Chain-of-Custody Records will list all pH measurements for all samples requiring pH adjustment for preservation. (Note: the pH values for VOA samples are recorded at the instrument at the time of analysis and then transcribed onto the Chain-of-Custody Records.)

F) GC/MS Volatile Organic Data.

1. Quality Control (QC) Summary.

   a. Surrogate Percent Recovery Summary (modified CLP SOW288 Form II VOA).

   b. Matrix Spike/Matrix Spike Duplicate Summary (modified CLP SOW288 Form III VOA).

   c. Laboratory Control Sample Summary (modified CLP SOW288 Form III VOA).

   d. Method Blank Summary (modified CLP SOW288 Form IV VOA) – arranged in chronological order by date of analysis of the blank, by instrument.

e. GC/MS Tuning and Mass Calibration Summary (modified CLP SOW288 Form V VOA) – arranged in chronological order, by instrument.

f. Internal Standard Area and Retention Time Summary (modified CLP SOW288 Form V VOA) – arranged in chronological order, by instrument.

2. Sample Data

Sample data shall be arranged in packets consisting of the Analytical Results Summaries followed by the raw data for volatile samples. These sample packets should then be placed in increasing alphanumeric order by GE sample identification. The order of each sample packet is as follows:

a. Target Compound Results (modified CLP SOW288 Form I VOA).

b. Tentatively Identified Compounds (modified CLP SOW288 Form I VOA-TIC).

c. Reconstructed total ion chromatogram (RIC) and quantitation reports.

d. Copies of raw spectra and copies of background-subtracted mass spectra of each target compound identified in the sample and corresponding background-subtracted target compound standard mass spectra.

e. Copies of mass spectra of up to 10 non-target surrogate volatile tentatively identified compounds (TICs) and the associated best-match spectra (best three matches) from the GC/MS library search for each TIC.

f. Quantitation/Calculation of TIC concentrations.

3. Standards Data

a. Initial Calibration Data (modified CLP SOW288 Form VI VOA and associated volatile standard reconstructed ion chromatograms and quantitation reports) – for all initial calibrations associated with analyses in the SDG, in chronological order, by instrument.

b. Continuing Calibration Data (modified CLP SOW288 Form VII VOA and associated volatile standard reconstructed ion chromatograms and quantitation reports) -- for all continuing calibrations associated with analyses in the SDG, in chronological order, by instrument.

4. Raw QC Data

a. For each GC/MS tuning and mass calibration (in chronological order, by instrument):

1. Bromofluorobenzene (BFB) bar graph spectrum.

2. BFB mass listing.

b. Method/Storage Blank Data - in chronological order, by instrument:

i. Target Compound Results (modified CLP SOW288 Form I VOA).

ii. Tentatively Identified Compounds (modified CLP SOW288 Form I VOA-TIC) -- if required.

iii. Reconstructed total ion chromatogram (RIC) and quantitation reports.

iv. Copies of raw spectra and copies of background-subtracted mass spectra of each target compounds identified in the blank and corresponding background-subtracted target compound standard mass spectra.

v. Copies of mass spectra of non-target surrogate volatile tentatively identified compounds (TICs) and the associated best-match spectra (best three matches) from the GC/MS library search for each TIC.

vi. Quantitation/Calculation of TIC concentrations.

c. Laboratory Control Sample Data:

i. Target Compound Results (modified CLP SOW288 Form I VOA).

ii. Reconstructed total ion chromatogram (RIC) and quantitation reports.

d. Matrix Spike Data:

i. Target Compound Results (modified CLP SOW288 Form I VOA).

ii. Reconstructed total ion chromatogram (RIC) and quantitation reports.

e. Matrix Spike Duplicate Data:

i. Target Compound Results (modified CLP SOW288 Form I VOA).

ii. Reconstructed total ion chromatogram (RIC) and quantitation reports.

G) GC Volatile Data

1. QC Summary

a. Surrogate Percent Recovery Summary ("CLP SOW288-like" Form II VOA).

b. Matrix Spike/Matrix Spike Duplicate Summary ("CLP SOW288-like" Form III VOA).

c. Laboratory Control Sample Summary ("CLP SOW288-like" Form III VOA).

d. Method Blank/Storage Blank Summary ("CLP SOW288-like" Form IV VOA) -- arranged in chronological order by date of analysis of the blank, by instrument.

2. Sample Data

Sample data shall be arranged in packets consisting of the Analytical Results Summaries followed by the raw data for volatile samples. These sample packets should then be placed in increasing alphanumeric order by GE sample identification. The order of each sample packet is as follows:

a. Analytical Results Summary ("CLP SOW288-like" Form I VOA).

b. Copies of volatile chromatograms.

c. Copies of volatile chromatograms from second gas chromatograph (GC) column confirmation (if performed).

d. GC integration reports or data system printouts.

e. Exhibit work sheets (including example calculation showing how sample results are calculated using initial calibration standard peak areas/heights and sample peak areas/heights for at least one sample).

3. Standards Data

a. Analytical Sequence Form -- in chronological order, by GC column, by instrument.

b. Initial Calibration Data (Initial Calibration Summary Form - inclusive of retention time windows, calibration factors, %RSDs, %Ds, etc., volatile standard chromatograms and integration reports) -- for each initial calibration associated with SDG in chronological order, by GC column, by instrument.

c. Continuing Calibration Data (Continuing Calibration Summary Form - inclusive of retention time windows, calibration factors, %RSDs, %Ds, etc., volatile standard chromatograms and integration reports) -- for each continuing calibration associated with an SDG in chronological

order, by GC column, by instrument, following the associated initial calibrations identified in Section 2.1.1, G), 3b.

4. Raw QC Data

a. Blank Data -- in chronological order, by instrument:

i. Target Compound Results ("CLP SOW288-like" Form I VOA).

ii. Volatile chromatograms and integration reports.

b. Laboratory Control Sample Data:

i. Target Compound Results ("CLP SOW288-like" Form I VOA).

ii. Volatile chromatograms and integration reports.

c. Matrix Spike Data:

i. Target Compound Results ("CLP SOW288-like" Form I VOA).

ii. Volatile chromatograms and integration reports.

d. Matrix Spike Duplicate Data:

i. Target Compound Results ("CLP SOW288-like" Form I VOA).

ii. Volatile chromatograms and integration reports.

H) GC/MS Semivolatile Organic Data

1. QC Summary

a. Surrogate Percent Recovery Summary (modified CLP SOW288 Form II SV).

b. Matrix Spike/Matrix Spike Duplicate Summary (modified CLP SOW288 Form III SV).

c. Laboratory Control Sample Summary (modified CLP SOW288 Form III SV).

d. Method Blank Summary (modified CLP SOW288 Form IV SV) -- arranged in chronological order by date of analysis of the blank, by instrument.

e. GC/MS Tuning and Mass Calibration Summary (modified CLP SOW288 Form V SV) -- arranged in chronological order, by instrument.

f. Internal Standard Area and Retention Time Summary (modified CLP SOW288 Form VIII SV-1, SV-2) -- arranged in chronological order, by instrument.

2. Sample Data

Sample data shall be arranged in packets consisting of the Analytical Results Summaries, followed by the raw data for semivolatile samples. These sample packets should then be placed in increasing alphanumeric order by GE sample identification. The order of each sample packet is as follows:

a. Target Compound Results (modified CLP SOW288 Form I SV-1, SV-2).

b. Tentatively Identified Compounds (modified CLP SOW288 Form I SV-TIC).

c. Reconstructed total ion chromatogram (RIC) and quantitation report.

d. Copies of raw spectra and copies of background-subtracted mass spectra of each target compounds identified in the sample and corresponding background-subtracted target compound standard mass spectra.

e. Copies of mass spectra of up to 20 non-surrogate semivolatile tentatively identified compounds (TICs) and the associated best-match

spectra (best three matches) from the GC/MS library search for each TIC.

f. Quantitation/Calculation of TIC concentrations.

g. Gel Permeation Chromatography (GPC) chromatograms (if performed).

3. Standards Data

a. Initial Calibration Data (modified CLP SOW288 Form VI SV-1, SV-2 and associated semivolatile standard reconstructed ion chromatograms and quantitation reports) -- for all initial calibrations associated with analyses in the SDG, in chronological order, by instrument.

b. Continuing Calibration Data (modified CLP SOW288 Form VII SV-1, SV-2 and associated semivolatile standard reconstructed ion chromatograms and quantitation reports) -- for all continuing calibrations associated with analyses in the SDG, in chronological order, by instrument.

4. Raw QC Data

a. For each GC/MS tuning and mass calibration (in chronological order, by instrument):

i. Decafluorotriphenylphosphine (DFTPP) bar graph spectrum.

ii. DFTPP mass listing.

b. Blank Data -- in chronological order, by instrument:

i. Target Compound Results (modified CLP SOW288 Form I SV-1, SV-2).

ii. Tentatively Identified Compounds (modified CLP SOW288 Form I SV-TIC).

iii. Reconstructed total ion chromatogram (RIC) and quantitation reports.

iv. Copies of raw spectra and copies of background-subtracted mass spectra of each target compounds identified in the blank and corresponding background-subtracted target compound standard mass spectra.

v. Copies of mass spectra of non-surrogate semivolatile tentatively identified compounds (TICs) and the associated best-match spectra (best three matches) from the GC/MS library search for each TIC.

vi. Quantitation/Calculation of TIC concentrations.

c. Laboratory Control Sample Data:

i. Target Compound Results (modified CLP SOW288 Form I SV-1, SV-2).

ii. Reconstructed total ion chromatogram (RIC) and quantitation reports.

d. Matrix Spike Data:

i. Target Compound Results (modified CLP SOW288 Form I SV-1, SV-2).

ii. Reconstructed total ion chromatogram (RIC) and quantitation reports.

e. Matrix Spike Duplicate Data

i. Target Compound Results (modified CLP SOW288 Form I SV-1, SV-2).

ii. Reconstructed total ion chromatogram (RIC) and quantitation reports.

I) GC Organochlorine Pesticide/PCB Data

1. QC Summary

a. Surrogate Percent Recovery Summary (modified CLP SOW288 Form II PEST).

b. Matrix Spike/Matrix Spike Duplicate Summary (modified CLP SOW288 Form III PEST).

c. Laboratory Control Sample Summary (modified CLP SOW288 Form III PEST).

d. Method Blank Summary (modified CLP SOW288 Form IV PEST) – arranged in chronological order by date of analysis of the blank, by instrument.

2. Sample Data

Sample data shall be arranged in packets consisting of the Analytical Results Summaries followed by the raw data for organochlorine pesticide/PCB samples. These sample packets should then be placed in increasing alphanumeric order by GE sample identification. The order of each sample packet is as follows:

a. Analytical Results Summary (modified CLP SOW288 Form I PEST).

b. Copies of organochlorine pesticide/PCB chromatograms.

c. Copies of organochlorine pesticide/PCB chromatograms from second GC column confirmation (if performed).

d. GC integration reports or data system printouts.

e. Exhibit work sheets (including example calculation showing how sample results are calculated using initial calibration standard peak areas/heights and sample peak areas/heights for at least one sample).

f. UV traces from GPC (if performed).

g. If organochlorine pesticides/PCBs are confirmed by GC/MS, the laboratory must submit copies of raw spectra and copies of background-subtracted mass spectra of target compounds that are identified in the sample and corresponding background-subtracted target compound standard mass spectra. For multicomponent pesticides/PCBs confirmed by GC/MS, the laboratory will submit mass spectra of three major peaks of multicomponent compounds from samples and standards.

3. Standards Data

a. Analytical Sequence Form -- in chronological order, by GC column, by instrument.

b. Initial Calibration Data (Initial Calibration Summary Form - inclusive of retention time windows, calibration factors, %RSDs, %Ds, etc.) organochlorine pesticide/PCB standard chromatograms and integration reports) -- for each initial calibration associated with SDG in chronological order, by GC column, by instrument.

c. Continuing Calibration Data (Continuing Calibration Summary Form - inclusive of retention time windows, calibration factors, %RSDs, %Ds, etc., organochlorine pesticide/PCB standard chromatograms and integration reports) -- for each continuing calibration associated with SDG in chronological order, by GC column, by instrument following the associated initial calibrations identified in Section 2.1.1, I), 3b.

d. 4,4'-DDT and Endrin Breakdown Data (Percent Breakdown Summary Form, organochlorine pesticide/PCB chromatograms and integration reports) -- for each standard associated with SDG in chronological order by GC column, by instrument.

4. Raw QC Data

a. Blank Data -- in chronological order, by instrument:

i. Target Compound Results (modified CLP SOW288 Form I PEST).

ii. Organochlorine pesticide/PCB chromatograms and integration reports.

b. Laboratory Control Sample Data:

i. Target Compound Results (modified CLP SOW288 Form I PEST).

ii. Organochlorine pesticide/PCB chromatograms and integration reports.

c. Matrix Spike Data:

i. Target Compound Results (modified CLP SOW288 Form I PEST).

ii. Organochlorine pesticide/PCB chromatograms and integration reports.

d. Matrix Spike Duplicate Data:

i. Target Compound Results (modified CLP SOW288 Form I PEST).

ii. Organochlorine pesticide/PCB chromatograms and integration reports.

e. Raw GPC data, arranged in chronological order (if performed).

i. UV traces for the initial calibration standards and blanks. Compound names shall be written over the peaks or printed over the peaks, or retention times shall be written over the peaks, and a separate table listing compounds and retention times shall be provided.

ii. Chromatographs and data system reports for all standards used to quantify compounds in the GPC blanks.

iii. Chromatographs and data system reports for the GPC calibration check solution and all standards used to quantify

compounds in the GPC calibration check solution (or used to assess the Aroclor pattern).

f. Raw Florisil data, arranged in chronological order.

i. Chromatographs and data system reports for the analysis of the Florisil cartridge performance check.

ii. Chromatographs and data system reports for the standards used to quantify compounds in the Florisil cartridge performance check analysis (i.e., INDA, INDB, and the 2,4,5-trichlorophenol standards).

J) GC Organophosphorus Pesticide Data

1. QC Summary

a. Surrogate Percent Recovery Summary ("CLP SOW288-like" Form II PEST).

b. Matrix Spike/Matrix Spike Duplicate Summary ("CLP SOW288-like" Form III PEST).

c. Laboratory Control Sample Summary ("CLP SOW288-like" Form III PEST).

d. Method Blank Summary ("CLP SOW288-like" Form IV PEST) - arranged in chronological order by date of analysis of the blank, by instrument.

2. Sample Data

Sample data shall be arranged in packets consisting of the Analytical Results Summaries followed by the raw data for organophosphorus pesticide samples. These sample packets should then be placed in increasing alphanumeric order by GE sample identification. The order of each sample packet is as follows:

a. Analytical Results Summary ("CLP SOW288-like" Form I PEST).

b. Copies of organophosphorus pesticide chromatograms.

c. Copies of organophosphorus pesticide chromatograms from second GC column confirmation (if performed).

d. GC integration reports or data system printouts.

e. Exhibit work sheets (including example calculation showing how sample results are calculated using initial calibration standard peak areas/heights and sample peak areas/heights for at least one sample).

f. UV traces from GPC (if performed).

g. If organophosphorus pesticides are confirmed by GC/MS, the laboratory must submit copies of raw spectra and copies of background-subtracted mass spectra of target compounds that are identified in the sample and corresponding background-subtracted target compound standard mass spectra.

3. Standards Data

a. Analytical Sequence Form – in chronological order, by GC column, by instrument.

b. Initial Calibration Data (Initial Calibration Summary Form - inclusive of retention time windows, calibration factors, %RSDs, %Ds, etc., organophosphorus pesticide standard chromatograms and integration reports) – for each initial calibration associated with SDG in chronological order, by GC column, by instrument.

c. Continuing Calibration Data (Continuing Calibration Summary Form - inclusive of retention time windows, calibration factors, %RSDs, %Ds, etc., organophosphorus pesticide standard chromatograms and integration reports) – for each continuing calibration associated with SDG in chronological order, by GC column, by instrument following the associated initial calibrations identified in Section 2.1.1, J), 3b.

4. Raw QC Data

a. Blank Data – in chronological order, by instrument:

i. Target Compound Results ("CLP SOW288-like" Form I PEST).

ii. Organophosphorus pesticide chromatograms and integration reports.

b. Laboratory Control Sample Data

i. Target Compound Results ("CLP SOW288-like" Form I PEST).

ii. Organophosphorus pesticide chromatograms and integration reports.

c. Matrix Spike Data

i. Target Compound Results ("CLP SOW288-like" Form I PEST).

ii. Organophosphorus pesticide chromatograms and integration reports.

d. Matrix Spike Duplicate Data

i. Target Compound Results ("CLP SOW288-like" Form I PEST).

ii. Organophosphorus pesticide chromatograms and integration reports.

e. Raw GPC data, arranged in chronological order (if performed).

i. UV traces for the initial calibration standards and blanks. Compound names shall be written over the peaks, or printed over the peaks, or retention times shall be written over the

peaks and a separate table listing compounds and retention times shall be provided.

ii. Chromatographs and data system reports for all standards used to quantify compounds in the GPC blanks.

iii. Chromatographs and data system reports for the GPC calibration check solution and all standards used to quantify compounds in the GPC calibration check solution (or used to assess the Aroclor pattern).

f. Raw florisil data, arranged in chronological order.

i. Chromatographs and data system reports for the analysis of the Florisil cartridge performance check.

ii. Chromatographs and data system reports for the standards used to quantify compounds in the Florisil cartridge performance check analysis (i.e., INDA, INDB, and the 2,4,5-trichlorophenol standards).

K) GC Herbicide Data

1. QC Summary

a. Surrogate Percent Recovery Summary ("CLP SOW288-like" Form II PEST).

b. Matrix Spike/Matrix Spike Duplicate Summary ("CLP SOW288-like" Form III PEST).

c. Laboratory Control Sample Summary ("CLP SOW288-like" Form III PEST).

d. Method Blank Summary ("CLP SOW288-like" Form IV PEST). -- arranged in chronological order by date of analysis of the blank, by instrument.

2. Sample Data

Sample data shall be arranged in packets consisting of the Analytical Results Summaries followed by the raw data for herbicide samples. These sample packets should then be placed in increasing alphanumeric order by GE sample identification. The order of each sample packet is as follows:

a. Analytical Results Summary ("CLP SOW288-like" Form I PEST).

b. Copies of herbicide chromatograms.

c. Copies of herbicide chromatograms from second GC column confirmation (if performed).

d. GC integration reports or data system printouts.

e. Exhibit work sheets (including example calculation showing how sample results are calculated using initial calibration standard peak areas/heights and sample peak areas/heights for at least one sample).

f. UV traces from GPC (if performed).

g. If herbicides are confirmed by GC/MS, the laboratory must submit copies of raw spectra and copies of background-subtracted mass spectra of target compounds that are identified in the sample and corresponding background-subtracted target compound standard mass spectra.

3. Standards Data

a. Analytical Sequence Form -- in chronological order, by GC column, by instrument.

b. Initial Calibration Data (Initial Calibration Summary Form - inclusive of retention time windows, calibration factors, %RSDs, %Ds, etc., herbicide standard chromatograms and integration reports) -- for each initial calibration associated with SDG in chronological order, by GC column, by instrument.

c. Continuing Calibration Data (Continuing Calibration Summary Form - inclusive of retention time windows, calibration factors, %RSDs, %Ds, etc., herbicide standard chromatograms and integration reports) -- for each continuing calibration associated with SDG in chronological order, by GC column, by instrument following the associated initial calibrations identified in Section 2.1.1, K), 3c.

4. Raw QC Data

a. Blank Data -- in chronological order, by instrument:

i. Target Compound Results ("CLP SOW288-like" Form I PEST).

ii. Herbicide chromatograms and integration reports.

b. Laboratory Control Sample Data:

i. Target Compound Results ("CLP SOW288-like" Form I PEST).

ii. Herbicide chromatograms and integration reports.

c. Matrix Spike Data:

i. Target Compound Results ("CLP SOW288-like" Form I PEST).

ii. Herbicide chromatograms and integration reports.

d. Matrix Spike Duplicate Data:

i. Target Compound Results ("CLP SOW288-like" Form I PEST).

ii. Herbicide chromatograms and integration reports.

e. Raw GPC data, arranged in chronological order (if performed).

i. UV traces for the initial calibration standards and blanks. Compound names shall be written over the peaks or printed over the peaks, or retention times shall be written over the peaks and a separate table listing compounds and retention times shall be provided.

ii. Chromatographs and data system reports for all standards used to quantify compounds in the GPC blanks.

iii. Chromatographs and data system reports for the GPC calibration check solution and all standards used to quantify compounds in the GPC calibration check solution (or used to assess the Aroclor pattern).

L) GC/MS (Low Resolution or High Resolution) Dioxin/Furan Data

1. Quality Control (QC) Summary

a. Matrix Spike/Matrix Spike Duplicate Summary.

b. Laboratory Control Sample Summary.

c. Duplicate Analysis Summary.

2. Sample Data

Sample data shall be arranged in packets consisting of the Analytical Results Summaries followed by the raw data for dioxin/furan samples. These sample packets should then be placed in increasing alphanumeric order by GE sample identification. The order of each sample packet is as follows:

a. Analytical Results Summary.

For each sample including peak retention times, ion ratios, reported concentrations, EMPC/EDL designation, and internal standard recoveries.

b. Calculation of Toxicity Equivalence.

c. Dioxin/Furan Review Worksheet and Quantitation Report.

d. EICP Chromatograms.

e. Second Column Confirmation Data (if necessary will include 2.1.1.L, Section 2, items a, b, c, and d).

3. Standards Data

a. Window-defining mix and isotope ratios data for each calibration associated with the SDG, in chronological order by GC column, by instrument.

b. Chromatographic Resolution Summary and raw data in chronological order by GC column, by instrument.

c. Initial Calibration Data (Initial Calibration Summary Form, quantitation report, and EICP Chromatograms) for each initial calibration associated with the SDG, in chronological order by GC column, by instrument.

d. Continuing Calibration Data (Continuing Calibration Summary Form, quantitation report, and EICP Chromatograms) for each continuing calibration associated with the SDG, in chronological order, by GC column, by instrument.

4. Raw QC Data

a. Blank Data – in chronological order, by instrument:

i. Analytical Results Summary.

For each blank including peak retention times, ion ratios, reported concentrations, EMPC/EDL designation, and internal standard recoveries.

ii. Dioxin/Furan Review Worksheet and Quantitation Report.

iii. EICP Chromatograms.

b. Laboratory Control Sample Data:

i. Dioxin/Furan Review Worksheet and Quantitation Report.

ii. EICP Chromatograms.

c. Matrix Spike Data:

i. Matrix Spike Quality Control Summary.

ii. Dioxin/Furan Review Worksheet and Quantitation Report.

iii. EICP Chromatograms.

d. Matrix Spike Duplicate Data:

i. Matrix Spike Quality Control Summary.

ii. Dioxin/Furan Review Worksheet and Quantitation Report.

iii. EICP Chromatograms.

e. Laboratory Duplicate Data - if required by method:

i. Laboratory Duplicate Quality Control Summary.

ii. Dioxin/Furan Review Worksheet and Quantitation Report.

iii. EICP Chromatogram.

5. GC/MS Instrument Run Logs.

M) Inorganic Data for ICP or ICP/MS

1. Cover Page for the Inorganic Analyses Data Package.

2. Sample Results Summaries (modified CLP SOW390 Form I-INs) -- for all samples in the SDG, arranged in increasing alphanumeric order by GE sample identification.

3. Quality Control and Quarterly Verification of Instrument Parameters Summaries:

   a. Initial and Continuing Calibration Verification summaries (modified CLP SOW390 Form II [PART 1]-INs).

   b. PRDL Standards summaries (modified CLP SOW390 Form II [PART 2]-INs).

   c. Blanks summaries (modified CLP SOW390 Form III-INs).

   d. ICP Interference Check Sample summaries (modified CLP SOW390 Form IV-INs).

   e. Matrix Spike/Matrix Spike Duplicate Sample Recovery summary (modified CLP SOW390 Form V [PART 1]-IN).

   f. Post-Digest Spike Sample Recovery forms (modified CLP SOW390 Form V [PART 2]-IN).

   g. Duplicates summary (modified CLP SOW390 Form VI-IN).

   h. Laboratory Control Sample summary (modified CLP SOW390 Form VII-IN)

   i. Method of Standard Addition Results summary (modified CLP SOW390 Form VIII-IN).

   j. ICP Serial Dilution summary (modified CLP SOW390 Form IX-IN).

   k. Instrument Detection Limits (Quarterly) (modified CLP SOW390 Form X-IN).

   l. ICP Interelement Correction Factors (Annually) (modified CLP SOW390 Form XI [PART 1]-IN).

   m. ICP Linear Ranges (Quarterly) (modified CLP SOW390 Form XII-INs).

n. Preparation Logs (modified CLP SOW390 Form XIII-INs).

o. Analytical Run Logs (modified CLP SOW390 Form XIV-INs).

4. ICP/MS Data Package will also include the following additional forms. The forms for ICP analysis listed 2.1.1.M Sections 1-3 are also required using the SOW1091-LCIN protocol.

a. Linear Range Standard Summary (modified CLP For IV-LCIN).

b. ICP and ICP/MS Interference Check Sample (modified CLP Form VI-LCIN).

c. ICP/MS Tuning and Response Factor Criteria (modified CLP Form XIV-LCIN).

d. ICP/MS Internal Standards Summary (modified Form XV-LCIN).

5. Raw Data

For each reported value, the contracted laboratories will provide all raw data used to obtain that value. This applies to all required QA/QC measurements, instrument standardization, as well as all sample analysis results. This statement does not apply to the Quarterly Verifications Parameters submitted as part of each data package (Section 2.1.1.M, items 3k-3m). Raw data must contain all instrument readouts used for the sample results. Each exposure or instrumental reading must be provided, including those readouts that may fall below the IDL. All AA and ICP instruments must provide a legible hard copy of the direct real-time instrument readout (i.e., stripcharts, printer tapes, etc.). A photocopy of the instrument's direct sequential readout must be included. A hard copy of the instrument's direct instrument readout for cyanide must be included if the instrumentation has the capability.

The order of raw data in the data package shall be ICP-AES, ICP/MS, flame AA, furnace AA, mercury, and cyanide. All flame and furnace AA data will be grouped by element.

N) Wet Chemistry/Conventionals Data

The wet chemistry data will be arranged in the following order by individual parameter requested for the samples in the SDG.

1. Analytical Results Summaries -- for all samples in the SDG, arranged in increasing alphanumeric order by GE sample identification.

2. Quality Control Summaries

   a. Initial and Continuing Calibration Verification summaries.

   b. Blanks summaries.

   c. Spike Sample/Spike Duplicate Recovery summary.

   d. Duplicates summary.

   e. Laboratory Control Sample summary.

   f. Analytical Run Logs for instrumental analyses.

3. Raw Data

   For each reported value, the contracted laboratories will provide all raw data (instrument printouts or logbook pages) used to obtain that value. This applies to all required QA/QC measurements, instrument standardization, as well as all sample analysis results. Raw data must contain all instrument readouts/logbooks pages used for the sample results. Each exposure or instrumental reading must be provided, including those readouts/logbook pages that may fall below the quantitation limit. A photocopy of the instrument's direct sequential readout must be included if the instrumentation has the capability.

O) Preparation Logs

1. TCLP Extraction Logs (if TCLP extraction was performed).

2. Volatile Extraction Logs (if medium-level volatile analyses performed).

3. Semivolatile Extraction Logs.

4. Organochlorine Pesticide/PCB Extraction Logs.

5. Organophosphorus Pesticide Extraction Logs.

6. Herbicide Extraction Logs.

7. Dioxin/Furan Extraction Logs

8. Metals Digestion Logs.

9. Mercury Preparation Logs.

10. Cyanide Distillation Logs.

11. Wet Chemistry Preparation Logs (by parameter).

2.1.2 General Format for GE Level 2 Deliverables

For some analyses, GE Level 2 Sample Data Package deliverables may be requested instead of complete Sample Data Package deliverables. The Level 2 Sample Data Package shall contain data for all samples in one SDG. The Level 2 Data Package is essentially the same as the Level 3 Data Package except that the only raw data that is included in the data package are the data for the project (field) samples and not for the QC samples. No initial or continuing calibration standard raw data is required. A Level 1 Data Package will also be required with the Level 2 package as a summary package. All Level 2 Sample Data Packages will be arranged in the following order:

A) Cover Letter/Letter of Transmittal

B) Sample Delivery Group (SDG) Narrative

This document shall be clearly labeled "SDG Narrative" and shall contain laboratory name; SDG number; GE sample identifications; laboratory sample numbers; and detailed documentation of any quality control, sample, shipment, and/or analytical problems encountered in processing the samples reported in the data package. A glossary of qualifier codes must also be provided.

The laboratory must also include any problems encountered, both technical and administrative, corrective actions taken and resolution, and an explanation of all flagged edits (i.e., exhibit edits) on quantitation reports.

Additionally, the SDG Narrative must be signed and dated by the laboratory manager.

C) Field and Internal (Laboratory) Chain-of-Custody Records and Sample Receipt Documentation Log

Copies of both the external and internal Chain-of-Custody Records for all samples within the SDG must be included in the deliverables. The Sample Receipt Documentation Log must include the items listed in Table A-1 of this Exhibit. The Chain-of-Custody will list all pH measurements for all samples requiring pH adjustment for preservation. (Note: the pH values for VOA samples are recorded at the instrument at the time of analysis and then transcribed onto the Chain-of-Custody Records.)

D) GC/MS Volatile Data consisting of all summary forms as specified for the GE Level 3 Deliverables and the raw data for the project samples only.

E) GC Volatile Data consisting of all summary forms as specified for the GE Level 3 Deliverables and the raw data for the project samples only.

F) Semivolatile Data consisting of all summary forms as specified for the GE Level 3 Deliverables and the raw data for the project samples only.

G) Organochlorine Pesticide/PCB Data consisting of all summary forms as specified for the GE Level 3 Deliverables and the raw data for the project samples only.

H) Organophosphorus Pesticide Data consisting of all summary forms as specified for the GE Level 3 Deliverables and the raw data for the project samples only.

I) Herbicide Data consisting of all summary forms as specified for the GE Level 3 Deliverables and the raw data for the project samples only.

J) Dioxin/Furan Data consisting of all summary forms as specified for the GE Level 3 Deliverables and the raw data for the project samples only.

K) Metals and Cyanide Data consisting of all summary forms as specified for the GE Level 3 Deliverables and the raw data for the project samples only.

L) Wet Chemistry Data consisting of all summary forms as specified for the GE Level 3 Deliverables and the raw data for the project samples only (by parameter: Sample Analytical Results summaries, Preparation Blank summaries, Spike Sample/Spike Duplicate summary, Laboratory Duplicate summary, and Laboratory Control Sample summary).

M) All preparation logs.

2.1.3 General Format for GE Level 1 Deliverables

A GE Level 1 Data Package will be prepared concurrently with each complete Sample Data Package prepared for quality assurance review. The Level 1 Data Package shall contain data for all samples in one Sample Delivery Group (SDG). All Level 1 Data Packages will be arranged in the following order:

A) Cover Letter/Letter of Transmittal

B) Sample Delivery Group (SDG) Narrative

This document shall be clearly labeled "SDG Narrative" and shall contain: laboratory name, SDG number, GE sample identifications, and laboratory sample numbers, and detailed documentation of any quality control, sample, shipment, and/or analytical problems encountered in processing the samples reported in the data package. A glossary of qualifier codes used in the SDG must also be provided.

The laboratory must also include any problems encountered, both technical and administrative, and corrective actions taken.

Additionally, the SDG Narrative must be signed and dated by the laboratory manager.

C) Field and Internal (Laboratory) Chain-of-Custody Records and Sample Receipt Documentation Log

Copies of both the external and internal Chain-of-Custody Records for all samples within the SDG must be included in the deliverables. The Sample Receipt Documentation Log must include the items listed in Table A-1 of this Exhibit. The

Chain-of-Custody will list all pH measurements for all samples requiring pH adjustment for preservation. (Note: the pH values for VOA samples are recorded at the instrument at the time of analysis and then transcribed onto the Chain-of-Custody Records.)

D) Analytical Results Summaries

2.2 Deliverables Reporting Requirements for GC Volatile, GC/MS Volatile and Semivolatile Organic Analyses

The laboratory will be required to submit the following information as support documentation for the reported analytical results. The quality control summary forms must include the acceptance criteria (i.e., recovery ranges, relative percent difference limits, etc.) and spike-added amounts (where applicable). Additionally, the quality control summary forms must indicate any recoveries that are outside of the acceptance criteria. The raw data associated with the samples, blanks, and standards must clearly identify the GE sample identifier, the laboratory sample number, the instrument, the laboratory file number for the analysis, and the peak areas/heights and retention times that correspond to the compounds of interest observed in all analyses reported. If the requirement of a summary form is not applicable to a particular sample, standard, or blank, the requirement should still appear on the form; however, no entry will be necessary on the form for that sample, standard, or blank.

A) 1. An analysis summary of the results for all target compounds for all sample analyses, matrix spike analyses, matrix spike duplicate analyses, laboratory control sample analyses and method/storage blank analyses must be supplied. The summary must include an entry for each target compound, date(s) and time(s) of analysis, GE sample identification, laboratory sample number, date of sample collection, sample matrix, sample weight or volume, sample percent solids, heated or unheated purge, column type(s), column internal diameter, dilution factor, solid extract volume, solid aliquot volume, concentration units, and sample results. For semivolatile analysis, date of sample extraction, final extract volume, injection volume, and GPC (yes/no) is also required. If the laboratory is required to report positive results below the GE required quantitation limits and above the laboratory method detection limits, the positive result below the GE required quantitation limit must be flagged as estimated ("J") on the analysis summary unless otherwise requested by the GE Project Manager. "Not-detected" results will be represented by the GE required quantitation limit and a "U" flag. If a compound was detected in a

sample as well as in the method blank associated with the sample, the result must be flagged with a "B" on the summary form. Additionally, if a dilution is performed on a sample because a target compound is above the calibration range, then the positive result for the particular compound should be flagged with a "D." If the compound is still above the calibration rage after a dilution is performed on the sample, then the compound should be flagged with an "E."

2. When required for volatile organic analysis by GC/MS, an analysis summary of the concentrations and identifications of up to 10 of the largest non-target non-surrogate peaks, or tentatively identified compounds (TICs), for volatiles and up to 20 for semivolatiles for all sample and method blank analyses must be supplied. The summary must include the date and time of analysis, GE sample identification, laboratory sample number, analysis file number, date of sample collection, date of sample analysis, sample matrix, sample weight or volume, sample percent solids, heated or unheated purge, column type, column internal diameter, dilution factor, solid extract volume, solid aliquot volume, concentration units, and sample results. All TICs shall be flagged as estimated concentrations ("J"). The TICs identified with a specific name (i.e., 1,2-dimethylphenol) and Chemical Abstracts Service Registry number shall be flagged with an "N" to indicate a tentative identification of the compound. This summary is not required for the matrix spike and matrix spike duplicate analyses or laboratory control sample. If a TIC was detected in a sample as well as in the method blank associated with the sample, the TIC must be flagged with a "B" on the summary form. For semivolatiles, date of sample extraction, final extract volume, injection volume GPC (yes/no) is also required.

3. The raw data for the sample analyses, method blank analyses and storage blank analyses by GC/MS methodologies, will include the reconstructed ion chromatograms, mass spectra for all target compounds identified, mass spectral searches for all TICs reported, quantitation reports for the target compounds and surrogates, and total areas for the TICs and the associated internal standards. The raw data for the matrix spike and matrix spike duplicate analyses will include the reconstructed ion chromatogram and quantitation report for the target compounds.

4. The raw data for the sample analyses, matrix spike analyses, matrix spike duplicate analyses, and method blank analyses performed by non-GC/MS (GC/FID, GC/PID, etc.) methodologies, will include the chromatogram(s)

indicating the surrogate peaks, internal standard peaks (if used), target compound peaks, and quantitation reports for the target compounds and surrogates.

B) A surrogate percent recoveries summary for all of the reported analyses (samples, blanks, etc.). The surrogate recovery forms should be segregated by matrix and method (i.e., high-level solid samples separate from low-level solid samples). The summary form should also include the surrogate recovery limits and the laboratory should flag the compounds that do not meet the recovery limits on the summary form.

C) A matrix spike/matrix spike duplicate concentration and percent recovery/relative percent difference summary for each matrix spike/matrix spike duplicate pair analyzed. The matrix spike/matrix spike duplicate summary form will indicate the GE identification of the unspiked sample, the MS/MSD sample, the matrix and the concentrations of the compounds present in the unspiked sample and the MS/MSD sample. The summary form should also include the MS/MSD recovery criteria and RPD criterion. The laboratory should mark the compounds that do not meet the criteria. A similar form for the LCS should be included with the deliverables.

D) A method/storage blank summary form for each method/storage blank which identifies the samples associated with each method/storage blank. The date of analysis, time of analysis, lab file number and matrix of the method/storage blank must also be reported on the summary form. Storage blanks are only required for volatiles analysis.

E) 1. A GC/MS tuning summary which summarizes the percent abundances for the mass ions of interest and the acceptance criteria for the mass ions. Additionally, the summary must include all of the analyses (sample names, file numbers, and times of analysis) associated with the GC/MS tune. The summary should indicate the instrument identification, date and time of analysis, column type, diameter of the column, and the type of purge (heated or unheated for volatiles) used to analyze the samples.

2. The raw data for the GC/MS tuning summary, consisting of a summary of the mass ion abundances and a mass spectral representation of the tuning peak.

F) 1. For the internal standard calibration method, an initial calibration summary for each initial calibration performed, summarizing all of the relative response factors for each calibration standard, the average relative response factor, and the relative standard deviation among the relative response factors.

Additionally, the summary should indicate the compounds which must meet a minimum relative response factor or a maximum relative standard deviation criterion and the compounds that did not meet the acceptance criteria. The summary should indicate the instrument identification, the file identifications of the analyses, the dates and times of calibration commencement and completion, column type, diameter of the column, and the type of purge (heated or unheated for volatiles) used to analyze the samples.

2. For the external standard calibration method, an initial calibration summary for each initial calibration performed, summarizing all of the calibration factors for each calibration standard, the average calibration factor, and the relative standard deviation among the calibration factors. Additionally, the summary should indicate any compounds which must meet a minimum calibration factor or a maximum relative standard deviation criterion and the compounds that did not meet the acceptance criteria. The summary should indicate the instrument identification, the file identifications of the analyses, the dates and times of calibration commencement and completion, column type, diameter of the column, and the type of purge (GC only) (heated or unheated) used to analyze the samples.

3. The raw data for the initial calibration, consisting of the reconstructed ion chromatogram and the raw quantitation report for each calibration standard.

G) 1. For the internal standard calibration method, a continuing calibration summary for each continuing calibration standard analyzed, summarizing the average relative response factors of the initial calibration associated with the continuing calibration standard, the relative response factors of the continuing calibration standard, and the percent differences between the average relative response factors of the initial calibration and the relative response factors of the continuing calibration. Additionally, the summary must indicate the compounds that are subject to a minimum relative response factor criterion, the compounds that are subject to a maximum percent difference criterion, and the compounds that did not meet the acceptance criteria. The summary should indicate the instrument identification, the date of the initial calibration, the date and time of analysis, column type, diameter of the column, and the type of purge (heated or unheated for volatiles) used to analyze the samples.

2. For the external standard calibration method, a continuing calibration summary for each continuing calibration standard analyzed, summarizing the observed

concentrations of all target compounds, the true concentrations of all target compounds, and the percent recovery (or percent difference) for all target compounds. Additionally, the summary must indicate any compounds that are outside of the specified percent recovery (or percent difference) criteria.

3. The raw data for the continuing calibration, consisting of the reconstructed ion chromatogram and the raw quantitation report for each calibration standard.

H) An internal standard area counts summary, containing a summary of the area counts and retention times for the internal standards for a continuing calibration. The summary must indicate the acceptance windows for the internal standard retention times and area counts. Additionally, the summary must include a listing of the internal standard retention times and area counts for all of the samples, method blanks, matrix spikes, and matrix spike duplicates associated with the continuing calibration standard.

I) A copy of all of the extraction log information for semivolatiles is required. At a minimum, the extraction information must include the date the extraction was started, the date the extraction was completed, the initial sample weight or volume, final extraction volume, laboratory sample number, the amount and concentration of surrogate spike added, and the amount and concentration of matrix spike solution added. Additionally, the extraction log should indicate if a cleanup procedure was performed on the sample.

2.3 Deliverables Reporting Requirements for Organochlorine Pesticide/PCB, Organophosphorus Pesticide, and Herbicide Analysis

The laboratory will be required to submit the following information as support documentation for the reported analytical results. The quality control summary forms must include the acceptance criteria (i.e., recovery ranges, relative percent difference limits, etc.) and spike-added amounts (where applicable). Additionally, the quality control summary forms must indicate any recoveries that are outside of the acceptance criteria. The raw data associated with the samples, blanks, and standards must clearly identify the GE sample identification, the laboratory sample number, the instrument, the laboratory file number for the analysis, and the peak areas/heights and retention times that correspond to the compounds of interest observed in all analyses reported. If the requirement of a summary form is not applicable to a particular sample, standard or blank, the requirement should still appear on the form; however, no entry will be necessary on the form for that requirement.

A) 1. An analysis summary of the concentrations of all target compounds for all sample analyses, matrix spike analyses, matrix spike duplicate analyses, and blank analyses. The blank analyses must consist of all of the extraction (method) blank analyses, injection blank analyses and any blanks associated with cleanup procedures. The summary must include dates and times of analysis, GE sample identifications, laboratory sample numbers, dates of sample collection, date of sample receipt, dates of sample extraction, sample matrices, sample weights or volumes, sample percent solids, column types, column internal diameters, dilution factors, initial extract volumes/weights, final extract volumes, concentration units, the type of cleanup performed, and sample results. If the laboratory is required to report positive results below the GE required quantitation limits and above the laboratory method quantitation limits, the positive results below the GE required quantitation limits and above the laboratory method quantitation limits must be flagged as estimated ("J") on the analysis summary unless otherwise requested by the GE Project Manager. "Not-detected" results will be represented by the GE required quantitation limit and a "U" flag. If a compound was detected in a sample as well as in the method blank associated with the sample, the result must be flagged with a "B" on the summary form. Additionally, if a dilution is performed on a sample because a target compound is above the calibration range then the positive result for the particular compound should be flagged with a "D." If the compound is still above the calibration range after a dilution is performed on the sample, then the positive result for the compound should be flagged with an "E."

2. The raw data for the sample analyses, matrix spike analyses, matrix spike duplicate analyses, and blank analyses, consisting of the chromatograms indicating the surrogate peaks and target compound peaks and quantitation reports for the target compounds and surrogates.

B) A surrogate percent recoveries summary for all of the reported analyses (samples, blanks, etc.). The surrogate recovery forms should be segregated by matrix and method (i.e., medium-level solid samples separate from low-level solid samples). The summary form should also include the surrogate recovery limits and the laboratory should mark the compounds that do not meet the recovery limits on the summary form.

C) A matrix spike/matrix spike duplicate concentration and percent recovery/relative percent difference summary for each matrix spike/matrix spike duplicate pair analyzed. The matrix spike/matrix spike duplicate summary form will indicate the GE

identification of the unspiked sample, the MS/MSD sample, the matrix and the concentrations of the compounds present in the unspiked sample and the MS/MSD sample. The summary form should also include the MS/MSD recovery criteria and RPD criterion. The laboratory should mark the compounds that do not meet the criteria. A similar form for the LCS should be included with the deliverables.

D) A method blank summary form for each method blank, identifying the samples associated with each method blank. The date, time, lab file number and matrix of the method blank must also be reported on the summary form.

E) Initial Calibration Data: A summary of the initial calibration retention times, mean retention time, and a retention time window for all target compounds and surrogates must be provided for all initial calibrations. A second summary of the initial calibration standard calibration factors, average calibration factors, and relative standard deviations for all target compounds and surrogates. Both summaries should include the SDG number, instrument identification, GC column type and diameter, date(s) of analysis, the concentration level for each initial calibration standard as a multiplication of the low calibration standard, and the acceptance limit for the relative standard deviation. Copies of the pesticide, herbicide, and PCB standard chromatograms and integration reports associated with summaries should immediately follow the summary. Each initial calibration associated with the SDG must be presented in chronological order, by GC column and by instrument.

F) Continuing Calibration Data: A summary of the observed retention times, calculated compound concentrations, true concentrations, percent differences, and retention time window from the initial calibration must be provided for all continuing calibration standards. The summary should list the SDG number, GC column type and diameter, date and time of analysis, laboratory sample number, initial calibration dates, and acceptance limits. Copies of the pesticide, herbicide, and PCB standard chromatograms and integration reports associated with summaries should immediately follow the summary. Each continuing calibration associated with an SDG must be presented in chronological order, by GC column and by instrument.

G) 4,4'-DDT and Endrin Breakdown Data (organochlorine pesticides/PCBs only): A summary of the observed 4,4'-DDT, endrin, and combined percent breakdowns must be presented for each breakdown check performed. (Alternatively, if this data is obtained from a continuing calibration standard rather than a specific breakdown standard, this information may be reported on the associated continuing calibration summary form.) The summary should list the SDG number, GC column type and

diameter, date and time of analysis, laboratory sample number, initial calibration dates, and acceptance limits. Copies of the pesticide/PCB standard chromatograms and integration reports associated with summaries should immediately follow the summary. Each initial calibration associated with an SDG must be presented in chronological order, by GC column and by instrument.

H) A summary of the analytical sequence for each column and instrument used for the analysis of the project samples. The summary must contain the GC column number, the internal diameter of the column, initial calibration dates associated with the sequence, the instrument identification, the mean retention time(s) for the surrogate(s) utilized, a listing of the GE sample names, the laboratory sample numbers, dates and times of analysis, and the retention times for the surrogate(s). The summary should also indicate the retention time window for all surrogates used and any surrogate retention times that do not meet the acceptance criterion. The summary must contain all of the analyses for the samples, blanks, initial calibration standards and the continuing calibration standards associated with the sequence. All sequences will begin with an initial calibration and will terminate with a standard that meets all acceptance criteria.

I) When a gel permeation chromatography (GPC) cleanup procedure is required for the samples, a summary for each check standard associated with the GPC calibration. The summary must contain the GPC column identification, the calibration date of the GPC column, the GC column(s) used for the analysis of the standard, the GC column internal diameter, the theoretical concentrations of the compounds in the GPC standard, the observed concentrations of the GPC standard, the percent recovery for each compound in the GPC standard, the GE sample identification, laboratory sample number and the date(s) of analysis for all samples associated with the GPC standard. The limits for each compound in the GPC standard should be listed on the summary form. The laboratory should flag any compound if the percent recovery was not within the control limits.

J) When a Florisil cartridge cleanup procedure is required for the samples, a summary for each check standard associated with a Florisil cartridge lot. The summary must contain the Florisil cartridge lot number, the date of analysis of the Florisil cartridge check standard, the GC column(s) used for the analysis of the standard, the GC column internal diameter(s), the theoretical concentrations of the compounds in the Florisil cartridge check standard, the observed concentrations of the Florisil cartridge check standard, the percent recovery for each compound in the Florisil cartridge check standard, the GE sample identifications, the laboratory sample number and the date(s)

of analysis for all samples in the data deliverable associated with each lot of Florisil cartridges.

K) Second column confirmation is required for all pesticide/Aroclor, Aroclor, herbicide, and organophosphorus pesticide analyses when there is a positive result reported for a project sample. In addition, second column confirmation is required for the volatile organics analyses by Gas Chromatography when performing analyses for samples collected in the State of California. When the laboratory performs a dual column quantitative analysis for organochlorine pesticides/PCBs, herbicides or organophosphorus pesticides, a summary of the identified compounds and observed concentrations for two quantitative columns are utilized for sample analyses. The summary must contain the GE sample identification, the laboratory sample number, the dates and times of analysis, the instruments used for analysis, the GC columns, the GC column internal diameters, the retention time windows for each peak used to quantitate the compound, the observed retention time for each peak used to quantitate the compound, the calculated concentration for each peak used, the mean concentration for each column for each compound identified, and the percent difference between the mean concentrations calculated for each column.

If the percent difference between the two GC columns is greater than 25% for the analysis, then the lower of the two values is reported and flagged with a "P." Finally, the "C" flag is used when the identification of a pesticide result is confirmed by GC/MS.

2.4 Deliverables Reporting Requirements for Dioxin/Furan Analyses

The laboratory will be required to submit the following information as support documentation for the reported analytical results. The quality control summary forms must include the acceptance criteria (i.e., recovery ranges, relative percent difference limits, etc.) and spike-added amounts (where applicable). Additionally, the quality control summary forms must indicate any recoveries that are outside of the acceptance criteria. The raw data associated with the samples, blanks, and standards must clearly identify the GE sample identifier, the laboratory sample number, the instrument, the laboratory file number for the analysis, and the peak areas/heights and retention times that correspond to the compounds of interest observed in all analyses reported. If the requirement of a summary form is not applicable to a particular sample, standard, or blank, the requirement should still appear on the form; however, no entry will be necessary on the form for that requirement.

A) 1. An analysis summary of the results for all target compounds for all sample analyses, second column confirmation analyses, matrix spike analyses, laboratory control sample analyses, and method blank analyses must be supplied. The summary must include an entry for each target 2,3,7,8-substituted compound and total homologue concentrations, date(s) and time(s) of analysis, GE sample identification, laboratory sample number, date of sample collection, date of sample preparation, sample matrix, sample weight or volume, sample percent solids, column type(s), column internal diameter, dilution factor, concentrated extract volume, concentration units peak retention times, isotope ratios, and sample results. If the laboratory is required to report positive results below the GE required quantitation limits and above the laboratory detection limits, the positive result below the GE required quantitation limit must be flagged as estimated ("J") on the analysis summary. "Not-detected" results will be represented by the estimated detection limit (EDL) and a "U" flag. If a compound was detected in a sample as well as in the method blank associated with the sample, the result must be flagged with a "B" on the summary form. Additionally, if a dilution is performed on a sample because a target compound is above the calibration range then the positive result for the particular compound should be flagged with a "D". If the compound is still above the calibration rage after a dilution is performed on the sample, then the positive result for the compound should be flagged with an "E". Sample results can also be labeled as estimated maximum possible concentration "EMPC" if the peak does not meet all qualitative criteria.

2. The raw data for the sample analyses and method blank analyses by GC/MS methodologies, consisting of the extracted ion current profiles (EICPs), quantitation reports for the target compounds, and the associated areas or height for each peak within the established retention time window. The raw data for the matrix spike and matrix spike duplicate analyses will include the EICP chromatogram and quantitation report for the target compounds.

B) A matrix spike concentration and percent recovery summary for each matrix spike analyzed is required. The matrix spike summary form will indicate the GE identification of the unspiked sample, the sample, the matrix and the concentrations of the compounds present in the unspiked and spiked sample. The summary form should also include the MS recovery criteria. The laboratory should mark the compounds that do not meet the criteria. A similar form for the LCS should be included with the deliverables.

C) A summary of the laboratory duplicate analysis. This form will summarize the percent differences observed between the sample and laboratory duplicate analyses. The appropriate control limit must need to be completed by the laboratory and a summary of the sample and laboratory duplicate analyses must be provided.

D) A method blank summary form for each method blank which identifies the samples associated with each method blank. The date of extraction, date of analysis, time of analysis, lab file number, sample weight or volume, and matrix of the method blank must also be reported on the summary form.

E) A window defining mix summary form for each window defining analysis should identify the sample number, lab file identification, date and time of analysis, the instrument identification, and GC column identification. This form should include the retention time of the first eluting and last eluting isomer for each congener group.

F) A chromatographic resolution summary should identify the sample number, lab file number, instrument ID, date and time of analysis, the GC column and instrument identification and percent valley determination between $^{13}C_{12}$-2,3,7,8-TCDD and $^{13}C_{12}$-1,2,3,4-TCDD. In addition, if second column confirmation is required, percent valley for 2,3,7,8-TCDD and the closest isomers should be calculated and reported.

G) A summary of the analytical sequence for each column and instrument used for the analysis of the project samples. The summary must contain the GC column number, the internal diameter of the column, initial calibration dates associated with the sequence, the instrument identification, a listing of the GE sample names, the laboratory sample numbers, and dates and times of analysis. The summary must contain all of the analyses for the samples, blanks, initial calibration standards and the continuing calibration standards associated with the sequence.

H) 1. An initial calibration summary for each initial calibration performed, summarizing all of the relative response factors for each calibration standard, the average relative response factor, and the relative percent difference between the relative response factors. Additionally, the summary should indicate a maximum relative standard deviation criterion and the compounds that did not meet the acceptance criteria. The summary should indicate the instrument identification, the dates and times of calibration commencement and completion, column type, and diameter of the column.

2. The raw data for the initial calibration, consisting of the EICPs and the raw quantitation report for each calibration standard.

I) 1. A continuing calibration summary for each continuing calibration standard analyzed, summarizing the average relative response factors of the initial calibration associated with the continuing calibration standard, the relative response factors of the continuing calibration standard, and the percent differences between the average relative response factors of the initial calibration, the relative response factors of the continuing calibration and the isotope ratios and retention times. Additionally, the summary must indicate the compounds that are subject to a minimum relative response factor criterion, the compounds that are subject to a maximum percent difference criterion, and the compounds that did not meet the acceptance criteria. The summary should indicate the instrument identification, the date of the initial calibration, the date and time of analysis, column type, and diameter of the column.

2. The raw data for the continuing calibration, consisting of the EICPs and the raw quantitation report for each calibration standard.

2.5 Deliverables Reporting Requirements for Inorganic Analyses

The laboratory will be required to submit the following information as support documentation for the reported analytical results. The quality control summary forms must include the acceptance criteria (i.e., recovery ranges, relative percent difference limits, etc.) and spike-added amounts (where applicable). Additionally, the quality control summary forms must indicate any quality control results that are outside the acceptance criteria. All instrument raw data printouts for the points discussed below must be provided in an orderly fashion. This applies to all required QA/QC measurements, and instrument standardization, as well as sample analysis results. Additionally, all associated extraction, digestion, and distillation logs must be supplied. The order of the raw data in the data package shall be ICP-AES, ICP/MS, flame AA, furnace AA, mercury, and cyanide. All flame and furnace AA data shall be grouped by element. All raw data shall be grouped by analysis date for all analytical results.

A) 1. A sample reference list for all samples present in an analytical group or Sample Delivery Group (SDG). This reference list must summarize and correlate the laboratory sample number, the GE designated sample identification, and any laboratory code (i.e., truncation of GE designated sample number by the laboratory) for each sample in an SDG.

2. A Table of Contents listing page numbers associated with information such as:

   a. Methodology Summary

   b. Case Narrative

   c. Sample Results

   d. Quality Control Data

   e. Verification of Instrument Parameters

   f. Preparation and Analysis Logs

   g. Raw Data, including but not limited to:

      i. ICP-AES, ICP/MS, Flame AA, and GFAA Data

      ii. Extraction/Distillation/Digestion Logs

      iii. Confirmation Data

   h. Chain-of-Custody Records

B) Analysis summaries of the concentrations of all target analytes for all sample analyses. The summary must include the GE designated sample number, the laboratory sample number, date of sample collection, date of sample receipt, sample matrix, sample percent solids (if applicable), concentration units, sample results, data qualifier codes, analysis method codes, description of sample before and after analysis, and any comments relating to the sample.

C) A summary of the initial and continuing calibration verifications for each calibration performed. This summary will include the concentrations observed as well as the true value of the analyte in the initial and continuing calibrations. A percent recovery will be summarized based on the observed and true values for each analyte.

D) A summary of the Project Required Detection Limit (PRDL) standard analyses for both Atomic Absorption (AA) and Inductively Coupled Plasma (ICP) analyses. This summary will include the concentrations observed as well as the true value of the

analyte in the PRDL standard. A percent recovery will be summarized based on the observed and true values for each analyte.

E) A summary of the initial and continuing laboratory blank analyses for each calibration performed. This summary will include the concentrations observed of any analyte in the initial and continuing blank analyses. The summary should also include the concentrations of any analyte observed in the laboratory preparation blank associated with each calibration sequence performed by the laboratory.

F) A summary of the ICP interference check sample analysis for each analytical sequence performed. This form will summarize the true and found values (positive, negative, or zero) of all analytes present in Solutions A and AB of the ICP interference check sample analysis. This form will also summarize the percent recoveries of the analytes/interferences present in the standards.

G) A summary of the pre-digestion matrix spike analysis. This form will summarize the percent recovery control limit for each analyte. Also, the sample result, the spike sample result, and the spike-added amount must be summarized on this form for all parameters analyzed. The laboratory-calculated percent recovery as well as the laboratory qualifier stating whether the calculated percent recovery was within control limits must also be summarized on this form.

H) A summary of the post-digestion matrix spike analysis. This form will require the same information described in item G.

I) A summary of the laboratory duplicate analysis. This form will summarize the percent differences observed between the sample and laboratory duplicate analyses. The appropriate control limit must need to be completed by the laboratory and a summary of the sample and laboratory duplicate analyses must be provided. The percent solids for the sample and the duplicate sample should be included on the summary form.

J) A summary of the Laboratory Control Sample (LCS) analysis. This form will summarize the percent recovery for aqueous sample analyses as well as the percent recovery, control limits, and true and found values for the solid sample analyses.

K) A summary of any required Method of Standard Additions (MSA) determinations. This form will summarize the concentrations and absorbencies of all samples and analytes that require analysis by MSA. The correlation coefficient for the MSA analysis will be calculated and summarized on this form. Also, the sample

concentration determined from the MSA determination will be summarized on this form.

L) A summary of the ICP Serial Dilution analyses performed by the laboratory. This summary will show the result of the initial sample analysis (in aqueous units, as observed from the raw data), the result of the five-fold serial dilution analysis, and the percent difference between the two analyses.

M) The summaries necessary for the verification of instrument parameters. These include an Instrument Detection Limit Summary (updated quarterly) for each instrument used for analysis, an ICP Interelement Correction Factor Summary (updated annually) for each ICP used for analysis, and an ICP Linear Range Summary (updated quarterly) for each ICP used for analysis.

N) The analysis log summaries. These include a Sample Preparation log that provides the sample identification; the preparation date; the sample weight (in grams) or volume (in mL) used; and the extraction/digestion/distillation volume (in mL) used and an Analysis Run Log that provides the instrument identification, the sample identification, any dilution factors employed in the analysis, the date and time of analysis, the method of analysis, and the parameters analyzed. Additionally, the GFAA post-digestion analytical spike sample recoveries are listed on the Analysis Run Log.

2.6 Deliverables Reporting Requirements for Wet Chemistry/Conventionals Analysis

The laboratory will be required to submit the information detailed in Sections 2.6.1 A) -C), 2.6.1, .E) and 2.6.1, G) - J) and 2.6.1-N as support documentation for the reported analytical results. The quality control summary forms must include the acceptance criteria (i.e., recovery ranges, relative percent difference limits, etc.) and spike-added amounts (where applicable). Additionally, the quality control summary forms must indicate any quality control results that are outside the acceptance criteria. All instrument raw data printouts for the points discussed in the above mentioned sections must be provided in an orderly fashion. This applies to all required QA/QC measurements, and instrument standardization, as well as sample analysis results. Additionally, a direct sequential readout must be included if the instrument has the capability.

Section 3.0 Turn-Around Time, Data Reporting, and Data Flow

3.1 Determining Data Turn-Around Time

The determination of an appropriate turn-around time (TAT) for project data is an important aspect in keeping other portions of the project running smoothly and efficiently. Requesting to long a TAT may inhibit on-going remediation or sampling efforts. On the other hand, requesting a short TAT may cause unneeded expenses to be incurred during the project. A delicate balance of cost versus TAT must be weighed in order to gain the most benefit. It is the responsibility of the GE and engineering firm project manager to decide the appropriate TAT necessary for their individual project. The following is a list of TATs based on data package levels that are available for selection.

GE Level 1	GE Level 2	GE Level 3
1 calendar day	1 business day	5 business days
1 business day	2 business days	10 business days
2 calendar days	5 business days	20 business days (standard TAT)
2 business days	10 business days	
3 business days	20 business days (standard TAT)	
10 business days (standard TAT)		

Expedited turnaround times will require that results only be reported for each of the levels specified with data deliverable being required at the standard turnaround time for each category. Turn-around times are based on the verified time of sample receipt (VTSR) at the laboratory. A calendar day is defined as 24 clock hours (i.e., 9:00 a.m. to 9:00 a.m.) including weekends. A business day is defined as 24 hours during a business week (Monday through Friday). For example, a sample is received at a laboratory at 10:00 a.m. Friday morning. A two business day TAT requires that sample results be provided to the GE Project Manager by 10:00 a.m. the following Tuesday. A two calendar day TAT requires that sample results be provided to the GE Project Manager by 10:00 a.m. Sunday.

It is important to remember that some analyses cannot be completed in a 24 hour TAT (such as TCLP leachate, extraction and analysis). The Laboratory Bidding Sheet for GE Projects lists all short-term

turn-around times and will be reviewed by the laboratory to verify the laboratory's ability to report the data in the required time period.

Project managers should ask the following question to determine if short holding times are necessary. Remember that the use of expedited holding times should not be used to make up for poor project planning.

- Will the benefit of the short TAT outweigh the cost?

In the scenario of remediation, short holding times are usually requested since much more expense is being used for the remediation effort (i.e., workers, backhoes, dump trucks etc.) These workers are waiting for analytical results promptly to either continue remediating in a specific area or to stop. Time and effort in stopping work or remobilization would far outweigh the added expense of expedited TATs. Another area for a request for expedited TAT would be in an emergency response type scenario where time is of great importance.

Standard holding times, should be used during investigatory phases or routine monitoring events. These type of projects do not require data immediately since future planning, reviewing and validation of results, and writing of reports may be necessary for future work to proceed.

3.2 Reporting of Data

The accurate reporting of results is an important part of gathering information in a way which is consistent and appropriate for the project. Federal, state, or local requirements may cause data to be reported in a certain format, with specific compounds, and quantitation limits for reporting. In addition, an approved site-specific QAPP may indicate minimum detection limits, and reporting requirements, such as reporting or not reporting "J" (estimated) values less than the quantitation or reporting limit of the method. Specific requests for data reporting requirements must be discussed, by the GE and engineering firm project managers, with the laboratory.

One typical scenario involves the reporting of "J" (estimated) values. These estimated values are so called because the concentration quantitated and reported by the laboratory is less than the quantitation limit (or reporting limit) but above the instrument detection limit. These concentrations are typically estimated because the concentration quantitated is below the low concentration standard in the initial calibration curve making the result a quantitative estimate. However, a review of mass spectra by the laboratory indicate that the compound is qualitatively presence in the sample based on the comparison of the sample mass spectra to a standard mass spectra. In summary, the compound is present in the sample (unless blank contamination is present for that compound) but the concentration is variable.

In some instances it is advisable to report "J" values. These might include initial investigation of a site, where low concentrations may help to delineate plumes or lead to potential secondary sources or types of contamination. During the risk assessment phase, a reduced risk may be calculated since these estimated values are used in calculations, instead of 1/2 of the quantitation limit which may be a higher number if no estimated results were reported. Some projects may not require estimated values to be reported. Projects involving cleanups may require that results be reported less than a certain action limit. Samples results above the action limit indicate continuing remediation while remediated areas with confirmatory results reported as "not detected" at the limit are deemed acceptable.

Project Managers must be aware that currently the data deliverables as listed in Section 2.1, require that "J" values for organic compounds be reported by the laboratory. Requests for this and other variances in reporting procedures must be made to the laboratories by the General Electric Project Manager.

3.3 Data Process Flow

Upon completion of the evaluation of the Bid Sheets and selection of a laboratory, the project begins and bottles are sent to the site for sample collection. The samples are collected and returned to the laboratory for analysis. After completion of the analysis the data packages are prepared (i.e., GE Level 1, 2, or 3). A copy of the data package is maintained at the laboratory for five years, or the maximum time specified in any applicable Administrative Consent Order (ACO), unless directed otherwise by the GE Project Manager. After completion of the data package, a decision to have third party data validation performed by a GE consultant is made. In the event that no validation is necessary, the data packages will be forwarded directly to the engineering firm's project manager. In the event that third party data validation is required, the copy of the data can be forwarded by the laboratory to the designated consultant. Conversely, engineering firms may at their discretion have the data first delivered to the engineering firm for in-house processing, data table preparation, sample tracking after which the data is sent to the designated consultant. Typically, a Level 2 or Level 3 data package is required for validation. Upon receipt of the data package, a project manager is assigned to oversee the validation effort and staff chemists given portions of the data for review. After initial completion of the review, a report is prepared, a senior chemist reviews the report, the report is finalized and approved and shipped to the engineering firm. The copy of the data is maintained by the designated consultant for 3 months, to answer follow up questions by the engineering firm and/or regulatory agency after which the data is returned to the engineering firm. Data validation reports being sent to the US EPA require that the data reviewed becomes the copy of record and is forwarded with the report to the US EPA. If a second copy of the data has been provided to the designated consultant, this data is archived for 5 years or the maximum time specified in the ACO, whichever is longer. At the end of this period of time, the laboratory shall contact the GE Project Manager and request guidance as to the

final deposition of the analytical data. Under no circumstances shall the laboratory destroy or erase data for GE projects without written permission. The engineering firm is responsible for maintaining and archiving all laboratory data produced at a locked and secure facility until project completion at which time the data and all reports are forwarded to GE for final archiving.

Table A-1

Sample Receipt
Quality Control Requirements

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Temperature	Temperature bottle or IR gun on random sample per cooler.	4 ± 2 °C (include calibration correction factor). Record this information on the Chain-of-Custody (COC) Record.	Notify General Electric immediately and provide a fax to the designated GE consultant and Environmental Standards if samples are received out of acceptable temperature range. Resampling may be required for some programs.
Preservation	Check pH of every preserved sample except VOAs. Do not check VOAs until analysis.	pH must meet method requirements.	Notify General Electric immediately and provide a fax to the designated GE consultant and Environmental Standards. If General Electric directs the addition of preservative, the preservative is added to sample; it must be added to the equipment blank/field blank also.
Holding Time	Check each sample/parameter for holding time.	Holding time must meet method requirements.	Notify General Electric and provide a fax to the designated GE consultant and Environmental Standards.
Sample Integrity	Reference Air Bill No. on COC Record. Check condition of each sample bottle (e.g., broken or leaking containers, presence of bubbles in VOA vials). Check for presence of custody seals.	The air bill number must be written on the COC Record. The integrity of every sample bottle should be intact. No broken or leaking bottles are acceptable. VOA vials should not contain headspace. Custody seals should be present and intact on each cooler.	Notify General Electric if any of the acceptance criteria are not met and provide a fax to the designated GE consultant and Environmental Standards.

Table A-1

Sample Receipt
Quality Control Requirements
(Continued)

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Sample Integrity (Cont.)	Check for discrepancies between sample labels and COC Record. Document signatures, dates, and times on COC when relinquishing or receiving samples.	No discrepancies should be noted between the sample labels and COC Record. All samples must be accounted for on the COC Record. All signatures, dates, and times of sampling must be documented on the COC Record.	Notify General Electric if any of the acceptance criteria are not met and provide a fax to the designated GE consultant and Environmental Standards.
Sample Storage	Store VOA samples separate from other lab samples. All samples requiring temperature preservation must be stored at 4 ± 2°C. Verify refrigeration storage temperatures are within 4± 2°C each working day.	The temperature of the sample storage areas must be maintained at 4± 2°C.	Notify General Electric and fax the designated GE consultant and Environmental Standards if the acceptance criteria are not met.
Sample Identification	Assign each sample a unique laboratory ID.	NA	NA

Table A-2

Gasoline Range Organics (GRO), Diesel Range Organics (DRO), and Glycols — SW-846 Method 8015A
Quality Control Requirements

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Initial Calibration	Each time the instrument is set up and when CVS acceptance criteria is not met. Initial calibration consists, at a minimum, of five concentration levels (low standard at or below project required quantitation limit [PRQL]). Heated purge required for calibration standards associated with solid samples for GRO analysis.	%RSD ≤20% for RFs for each target compound or generate a quadratic calibration curve for compounds which do not meet this criteria.	%RSDs >20% require quantitation using quadratic calibration curve forced through origin.
Calibration Verification Std. (CVS)	Must bracket each set of 10 sample analyses (inclusive of all laboratory and field QC). The concentration of the CVS must be at or near the mid-point of the calibration range of the instrument. Heated purge required for calibration standards associated with solid samples for GRO analysis.	1. <15%D based on "true" concentration when quantitated as a sample. 2. RT of each target compound must be within RT window reset daily at the beginning of the sequence for the 24-hour day and only permitted once per 24 hours.	Correct cause of noncompliant CVS. A compliant initial calibration must then be generated. Reanalyze all samples and QC not bracketed by compliant CVS. Exception for reanalysis: If the associated samples are <PRQL for the respective target compound, and if the noncompliant CVS shows increased sensitivity (i.e., CCV target compound recovery >115% R), false positives would be favored. Therefore, if associated samples are <PRQL for the respective target compound, results may be reported with no corrective action for those samples.
Method Blank	One per batch of ≤ 20 samples/matrix/ concentration level per day must undergo all preparative procedures.	1. Concentration may not exceed the PRQL of the compound. Not applicable if positive results were not reported for any associated samples. 2. Must meet surrogate criteria.	Reanalyze blank. If still out and in hold, reprep and reanalyze associated samples containing the same contaminant, unless samples contain >10× amount found in blank. If samples are past hold or if blank is still out after reprep/reanalysis, report first analysis and notify General Electric Data Manager and Environmental Standards.

Table A-2

Gasoline Range Organics (GRO), Diesel Range Organics (DRO), and Glycols — SW-846 Method 8015A
Quality Control Requirements
(Continued)

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Laboratory control sample (LCS)	One per batch of ≤ 20 samples per matrix must undergo all preparative procedures. The LCS must be from a second source (different from the initial calibration standards) and have a concentration at the mid-point of the calibration range.	%Recoveries of all compounds within laboratory-generated limits.	1. Reanalyze LCS. If still out, 2. Reprep and reanalyze all associated samples and a new LCS. Exception: If LCS recovery is high and no associated positives, then address in Case Narrative and no further action needed.
Matrix Spike/Matrix Spike Duplicate	One per extraction batch per matrix per concentration level ≤ 20 samples. Must undergo all sample preparative procedures. Must be spiked with all target analytes at concentrations at or near the mid-point of the calibration range.	1. % Recoveries within laboratory-generated limits. 2. RPDs within laboratory-generated limits.	If LCS is acceptable, then report in the Case Narrative that there was probable matrix interference.
Retention Time (RT) Windows	1. Established at ±3× std. dev. of RT of three standard analyses over 72 hours. 2. Recentered daily based on RT of each of the compounds in first calibration check standard of day.	RT of sample peak within +/- std. dev. per frequency description. RT windows for target compounds must not overlap and recentering the retention time windows is only permitted once per 24 hours.	Adjust system and recalibrate.

Table A-2

Gasoline Range Organics (GRO), Diesel Range Organics (DRO), and Glycols — SW-846 Method 8015A
Quality Control Requirements
(Continued)

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Retention Time (RT) Shift	Each CCV analysis: RT of analytes in the CCV are evaluated against the daily ICV.	Column and compound specific, varies with each ICV: compound should be within window established by ICV RT ± the calculated RT window or a default based on the calculated RT window.	• Inspect chromatographic system for malfunctions, if appropriate. • Evaluate data based on a comparison with other standards run during the analytical sequence, consider the RTs for the surrogate and spiked compounds analyzed before and after the sample in question. – Expand the RT windows to encompass the shift in compound location. – If no peaks are found in the expanded window, report the compound as non-detected.
Surrogate	1. Added to all standards, blanks, samples, and QC samples. 2. Calibrated and quantitated as target compounds.	%Recovery within method limits.	If recovery of any one surrogate is not within limits: 1. Check to be sure that there are no errors in calculations and surrogate solutions. Also, check instrument performance. 2. If no problem is found, reprep and reanalyze the sample. 3. If the reanalysis is within limits, then report only the reanalysis. 4. If the reanalysis is within limits, but out of hold, then report both sets of data. 5. If the reanalysis is still out of limits, then report both sets of data. 6. No reanalysis is required if the MS and/or MSD are outside limits.

Table A-2

Gasoline Range Organics (GRO), Diesel Range Organics (DRO), and Glycols — SW-846 Method 8015A
Quality Control Requirements
(Continued)

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Qualitative/Quantitative Issues	1. If instrument level of any compound in a sample exceeds the instrument level of that compound in the highest level standard, the sample must be diluted to approximately mid-level of the calibration range and reanalyzed. 2. If the concentration of the target analyte that exceeded the calibration range is present in another sample analyzed immediately after the high level sample and is greater than the PRQL but ≤5× PRQL, then that sample must be reanalyzed to determine if carryover occurred. 3. If chromatographic interference is observed during the RTW of any target compound, then report in the Case Narrative that the reported results are quantitatively estimated and are tentative identifications (flag "N").	1. The instrument level of all compounds must be within the calibration range for all samples. 2. The sample analyzed immediately after a high-level sample must display concentrations of the high-level target compounds less than the PRQL or greater than 5× PRQL. 3. Sample chromatographs should not display levels of interference in the RTW of any target compound at a level greater than the PRQL.	1. Dilute the sample to bring the level of the highest concentration of target compounds within the calibration range. 2. A sample displaying concentrations of target compounds between the PRQL and 5× the PRQL which was analyzed immediately after a high-level sample must be reanalyzed. If the results do not agree within the PRQL, report only the second analysis. 3. A discussion regarding the qualitative and quantitative reliability of the analyses must be included in the Case Narrative.

Table A-3

BTEX — SW-846 Method 8021A
Quality Control Requirements

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Initial Calibration	Each time the instrument is set up and when the CVS criteria are not met. Initial calibration consists, at a minimum, of five standards (low standard must be at or below the PRQL). Heated purge is required for low-level solid samples analysis.	%RSD of the response factors for any analyte is <20% or generate a quadratic calibration curve for compounds that do not meet this criteria.	%RSDs >20% require quantitation using quadratic calibration curve forced through origin.
Calibration Verification Standard (CVS)	Must bracket each set of 10 sample analyses (inclusive of all laboratory and field QC). The CVS must have a concentration at or near the mid-point of the calibration range of the instrument. Heated purge is required for low-level solid samples analysis.	1. <15% D based on "true" concentration when quantitated as a sample. 2. RT of each target compound must be within RT window reset daily at the beginning of the sequence for the 24-hour day and recentering the retention time window is only permitted once per 24 hours.	Correct cause of noncompliant CVS. A compliant initial multipoint must be generated. Reanalyze all samples and QC not bracketed by compliant CVS. Exception for reanalysis: If the associated samples are <PRQL for the respective target compound and if the noncompliant CVS shows increased sensitivity (i.e., CCV target compound recovery >115% R), false positives would be favored. Therefore, if associated samples are <PRQL for the respective target compound, results may be reported with no corrective action for those samples.
Retention Time Windows	1. Established at ± 3× std. dev. of RT of 3 standard analyses over 3-day period. If the std. dev. of 3 analyses equals 0, then analyze 7 more standards and recalculate the std. dev. 2. Recentered daily based on RT of each of the compounds in first CVS of the day.	RT of sample peak within ± 3 std. dev. per frequency description. RT windows for target compounds must not overlap and recentering the retention time window is only permitted once per 24 hours.	Terminate analysis, correct problem, recalibrate instrument, verify calibration, and reanalyze all analytical samples since the last complaint calibration verification.

Table A-3

BTEX SW-846 Method 8021A
Quality Control Requirements
(Continued)

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Retention Time (RT) Shift	Each CCV analysis: RT of analytes in the CCV are evaluated against the daily ICV.	Column and compound-specific, varies with each ICV: compound should be within window established by ICV RT ± the calculated RT window or a default based on the calculated RT window.	• Inspect chromatographic system for malfunction; correct identified malfunctions, if appropriate. • Evaluate data based on a comparison with other standards run during the analytical sequence, consider the RTs for the surrogate and spiked compounds analyzed before and after the sample in question. – Expand the RT windows to encompass the shift in compound location. – If no peaks are found in the expanded window, report the compound as non-detected.
Method Blank	1 per batch of <20 samples/matrix/ concentration level/per day must undergo all preparative procedures.	1. Concentration does not exceed the PRQL of the compound. Not applicable if positive results are not reported for any associated samples. 2. Must meet surrogate criteria.	Reanalyze blank. If still out and in hold, reprep and reanalyze associated samples containing the same contaminant, unless samples contain >10× amount found in blank. If samples are past hold or if blank is still out after reprep/reanalysis, report first analysis and notify General Electric Data Manager and Environmental Standards.
Laboratory Control Sample (LCS)	1 per batch of <20 samples per matrix must undergo all preparative procedures. The LCS must be from a second source and have a concentration at the mid-point of the calibration curve.	% Recoveries of all compounds within laboratory-generated limits.	Reanalyze LCS. If still out, reprep and reanalyze all associated samples. Exception: If LCS recovery is high and no associated positives, then address in Case Narrative and no further action needed.

Table A-3

BTEX SW-846 Method 8021A
Quality Control Requirements
(Continued)

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Matrix Spike/Matrix Spike Duplicate	1 per batch of < 20 samples/matrix/ concentration must undergo all preparative procedures. The spiking level must be at or near the mid-point of the calibration curve.	1. % Recoveries within laboratory-generated limits. 2. RPDs within laboratory-generated limits.	If LCS is acceptable, then report in the Case Narrative that there was probable matrix interference.
Surrogate	1. Added to all blanks and samples. 2. Calibrated and quantitated as target compounds.	Recoveries within method limits.	If recovery is not within limits: 1. Check to be sure that there are no errors in calculations, surrogate solutions, and internal standards. Also, check instrument performance. 2. If no problem is found, reprep and reanalyze the sample. 3. If the reanalysis is within limits, then report only the reanalysis. 4. If the reanalysis is within limits, but out of hold, then report both sets of data. 5. If the reanalysis is still out of limits, then report both sets of data. 6. No reanalysis is required if the MS and/or MSD are outside limits.

Table A-3

BTEX SW-846 Method 8021A
Quality Control Requirements
(Continued)

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Qualitative/Quantitative Issues	1. If instrument level of any compound in a sample exceeds the instrument level of that compound in the highest level standard, the sample must be diluted to approximately mid-level of the calibration range and reanalyzed. 2. If the concentration of the target analyte that exceeded the calibration range is present in the high level sample and analyzed immediately after is greater than the PRQL but ≤5× PRQL, then that sample must be reanalyzed to determine if carryover occurred. 3. If chromatographic interference is observed during the RTW of any target compound, then report in the Case Narrative that the reported results are quantitatively estimated and are tentative identifications (flag "N").	1. The instrument level of all compounds must be within the calibration range for all samples. 2. The sample analyzed immediately after a high-level sample must display concentrations of the high-level target compounds less than the PRQL or greater than 5× PRQL. 3. Sample chromatographs should not display levels of interference in the RTW of any target compound at a level greater than the PRQL.	1. Dilute the sample to bring the level of the highest concentration of target compounds within the calibration range. 2. A sample displaying concentrations of target compounds between the PRQL and 5× the PRQL which was analyzed immediately after a high-level sample must be reanalyzed. If the results do not agree within the PRQL, report only the second analysis. 3. A discussion regarding the qualitative and quantitative reliability of the analyses must be included in the Case Narrative.

Table A-4

Pesticides/Aroclors — SW-846 Method 8081
Quality Control Requirements

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Sulfuric Acid Cleanup	All samples analyzed for PCBs only.	Not applicable.	Not applicable.
Initial Calibration Primary Column - used for all samples	Established initially and when CCV fails criteria at 5 concentration levels - low standard at or below PRQL for all target compounds.	%RSD≤20% for CFs for each target compound quantitated using average CF or linear calibration curve. • For pesticides: Evaluate endrin and 4,4´-DDT for degradation (degradation of each compound must not exceed 15%).	1. %RSDs>20% require quantitation using quadratic calibration curve forced through origin. 2. Reanalyze the initial calibration curve and/or evaluate/correct instrument malfunction to obtain curve which meets criteria. 3. Sample results above highest standard concentration require dilution and reanalysis.
Confirmation Column	One standard at PRQL	Must display distinctive pattern for multipeak analytes.	Correct system and reanalyze.
Calibration Check Verification (CCV) Standard Primary Column	• ICV at the beginning of the daily sequence (when >2-hour break in continuous analysis, all analytes), unless initial calibration is performed. • ICV will consist of all *single-component* analytes, and CCV will be a set consisting of *single-component* analytes every 10 samples. Note: if analysis request is for PCB only, ICV/CCV will contain Aroclors-1016 and -1260.	1. <15% D based on "true" concentration when quantitated as a sample. 2. RT of each target compound must be within RT window reset daily at the beginning of the sequence for the 24-hour day.	Correct system, if necessary, and recalibrate. Criteria must be met before sample analysis may begin. • If a failed CCV (e.g., for an autosampler analysis) returns to acceptable calibration later in the sequence, samples following the acceptable CCV will be reported; samples between the failed CCV and subsequent compliant CCV and between the failed CCV and the previous compliant CCV will be reanalyzed.
Retention Time (RT) Windows	1. Established at ± 3× std. dev. of RT of three standard analyses over 72-hour period. Must establish whenever a new column is installed. 2. Recentered daily based on RT of each of the compounds in first calibration check std. of day.	RT windows for quantitation peaks of target compounds must not overlap. RT of sample peaks must be within established windows. Recentering windows is permitted once per 24 hours.	Adjust system and recalibrate.

Table A-4

Pesticides/Aroclors – SW-846 Method 8081
Quality Control Requirements
(Continued)

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Retention Time (RT) Shift	Each CCV analysis: RT of analytes in the CCV are evaluated against the daily ICV.	Column and compound-specific, varies with each ICV: compound should be within window established by ICV RT ± the calculated RT window or a default based on the calculated RT window.	• Inspect chromatographic system for malfunction; correct identified malfunctions, if appropriate. • Evaluate data based on a comparison with other standards run during the analytical sequence, consider the RTs for the surrogate and spiked compounds analyzed before and after the sample in question. – Expand the RT windows to encompass the shift in compound location. – If no peaks are found in the expanded window, report the compound as non-detect. – If peaks are present, use the confirmation column to verify identification.
Instrument Blank	Must bracket each set of 10 sample analyses.	1. All target compounds < PRQL. 2. Must meet surrogate criteria.	Reanalyze blank and associated samples.

Table A-4

Pesticides/Aroclors – SW-846 Method 8081
Quality Control Requirements
(Continued)

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Method Blank	One per extraction batch of ≤20 samples of the same matrix. Must be analyzed on each instrument used to analyze system. Must undergo all sample preparative procedures.	1. Concentration does not exceed the PRQL of the compound. Not applicable if positive results were not reported for any associated samples. 2. Must meet surrogate criteria.	1. Reanalyze blank to determine if instrument contamination was the cause. If the method blank is still non-compliant, then follow 2 or 3 below. 2. If the samples are within the extraction holding time, then reextract and reanalyze all associated samples. 3. If samples are past hold or if blank is still out after reprep/reanalysis, report first analysis and notify General Electric Data Manager and Environmental Standards.
Sample Analysis	Each positive result must be qualitatively confirmed by analysis on a second, dissimilar column.	All results must be quantitated on and reported from the primary column but confirmed on a second dissimilar column.	Not applicable.
Laboratory Control Sample (LCS)	One per extraction batch of ≤20 samples/matrix. The LCS must be from a second source and have concentrations of the target analytes at the mid-point of the calibration curve.	%Recoveries of all compounds within laboratory-generated limits.	Reanalyze LCS. If still out, reextract and reanalyze all associated samples. (Exception: If LCS recovery is high and no associated positives, then address in Case Narrative and no further action needed.)
Matrix Spike/Matrix Spike Duplicate (MS/MSD)	One per extraction batch of ≤20 samples/matrix. The MS/MSD sample must be a project sample and must be spiked with all target analytes (exception: PCB analysis only; then spike with Aroclors-1016 and -1254) at concentrations at or near the mid-range of the calibration curve.	1. % Recoveries within laboratory-generated limits. 2. RPDs within laboratory-generated limits.	• If recoveries for the spiked compounds are not within advisory limits, check for documentable errors (e.g., calculations and spike preparation). • Check unspiked sample results and surrogate recoveries for indications of matrix effects. • If no errors are found and the associated LCS are within advisory limits, then sample matrix effects are the most likely cause. Note in narrative.

Table A-4

Pesticides/Aroclors – SW-846 Method 8081
Quality Control Requirements
(Continued)

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Surrogate (Recovery calculated from result obtained on the primary column.)	1. Added to all standards, blanks, samples, and QC samples. 2. Calibrated as a target compound in the Aroclor-1660 standards.	%Recovery of at least one surrogate within method limits.	If recovery is not within limits: 1. Check to be sure that there are no errors in calculations and surrogate solutions. Also, check instrument performance. 2. If no problem is found, reextract and reanalyze the sample. 3. If the reanalysis is within limits, then report only the reanalysis. 4. If the reanalysis is within limits but out of hold, then report both sets of data. 5. If the reanalysis is still out of limits, then report both sets of data. 6. No reanalysis is required if the MS and/or MSD are outside limits.
Qualitative/Quantitative Issues	1. If instrument level of any compound in a sample exceeds the instrument level of that compound in the highest level standard, the sample must be diluted to approximately mid-level of the calibration range and reanalyzed. 2. If chromatographic interference is observed during the RTW of any target compound, then report in the Case Narrative that the reported results are quantitatively estimated and are tentative identifications (flag "N").	1. The instrument level of all compounds must be within the calibration range for all samples. 2. Sample chromatographs should not display levels of interference in the RTW of any target compound at a level greater than the PRQL.	1. Dilute the sample to bring the level of the highest concentration of target compounds within the calibration range. 2. A discussion regarding the qualitative and quantitative reliability of the analyses must be included in the Case Narrative.

Table A-5

Herbicides — SW-846 Method 8150B
Quality Control Requirements

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Initial Calibration	Each time the instrument is set up and when the CVS acceptance criteria are not met. Initial calibration consists, at a minimum, of five standards (one standard must be at or below the PRQL).	%RSD ≤20% for CFs for each target compound quantitated using average CF on linear calibration curve or generate a quadratic curve forced through the origin.	%RSDs>20% require quantitation using quadratic calibration curve forced through origin.
Calibration Verification Standard (CVS)	Must bracket each set of 10 sample analyses (inclusive of all laboratory and field QC).	<15% D based on "true" concentration when quantitated as a sample.	Correct cause of noncompliant CVS. Generate a compliant initial calibration curve. Reanalyze all samples and QC not bracketed by compliant CVS. Exception for reanalysis: If the associated samples are <PRQL for the respective target compound and if the noncompliant CVS shows increased sensitivity (i.e., CCV target compound recovery >115% R), false positives would be favored. Therefore, if associated samples are <PRQL for the respective target compound, results may be reported with no corrective action for those samples.
Retention Time Windows	1. Established at ± 3× std. dev. of RT of 3 standard analyses over 3-day period. If the std. dev. of 3 analyses equals 0, then analyze 7 more standards and recalculate the std. dev. 2. Recentered daily based on RT of each of the compounds in first CVS of the day.	RT of sample peak within ± 3 std. dev. per frequency description. Recentered RT windows are permitted only once per 24 hour period. RT windows for target compounds must not overlap.	Terminate analysis, correct problem, recalibrate instrument, verify calibration, and reanalyze all analytical samples since the last complaint calibration verification.

Table A-5

Herbicides — SW-846 Method 8150B
Quality Control Requirements
(Continued)

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Retention Time (RT) Shift	Each CCV analysis: RT of analytes in the CCV are evaluated against the daily ICV.	Column and compound specific, varies with each ICV: compound should be within window established by ICV RT ± the calculated RT window or a default based on the calculated RT window.	• Inspect chromatographic system for malfunction; correct identified malfunctions, if appropriate. • Evaluate data based on a comparison with other standards run during the analytical sequence, consider the RTs for the surrogate and spiked compounds analyzed before and after the sample in question. – Expand the RT windows to encompass the shift in compound location. – If no peaks are found in the expanded window, report the compound as non-detect. – If peaks are present, use the confirmation column to verify identification.
Method Blank	1 per extraction batch of <20 samples/per matrix must undergo all preparative procedures. Must be analyzed on each instrument used for analysis.	1. Concentration does not exceed the PRQL of the compound. Not applicable if positive results were not reported for any associated samples. 2. Must meet surrogate criteria.	Reanalyze blank. If still out and in hold, reextract and reanalyze associated samples containing the same contaminant, unless samples contain >10× amount found in blank. If samples are past hold or if blank is still out after reprep/reanalysis, report first analysis and notify General Electric Data Manager and Environmental Standards.
Laboratory Control Sample (LCS)	1 per batch of <20 samples/per matrix. Must undergo all preparative procedures. The LCS must be from a second source and have concentrations of the target analytes at the mid-point of the calibration curve.	% Recoveries of all compounds within laboratory-generated limits.	Reanalyze LCS. If still out, reextract and reanalyze all associated samples and LCS. Exception: If LCS recovery is high and no associated positives, then address in Case Narrative and no further action needed.

Table A-5

Herbicides — SW-846 Method 8150B
Quality Control Requirements
(Continued)

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Matrix Spike/Matrix Spike Duplicate (MS/MSD)	1 per extraction batch ≤20 samples/per matrix. Must undergo all preparative procedures. The MS/MSD must be spiked with all target compounds at levels at or near the mid-point of the calibration range.	1. % Recoveries within laboratory-generated limits. 2. RPDs within laboratory-generated limits.	If LCS is acceptable, then report in the Case Narrative that there was probable matrix interference.
Surrogate	1. Added to all standards, blanks, samples, and samples. 2. Calibrated and quantitated as target compounds.	Recoveries within method limits.	If recovery is not within limits: I. Check to be sure that there are no errors in calculations, surrogate solutions, and internal standards. Also, check instrument performance. 2. If no problem is found, reextract and reanalyze the sample. 3. If the reanalysis is within limits, then report only the reanalysis. 4. If the reanalysis is within limits, but out of hold, then report both sets of data. 5. If the reanalysis is still out of limits, then report both sets of data. 6. No reanalysis is required if the MS and/or MSD are outside limits.

Table A-5

Herbicides — SW-846 Method 8150B
Quality Control Requirements
(Continued)

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Qualitative/Quantitative Issues	1. If instrument level of any compound in a sample exceeds the instrument level of that compound in the highest level standard, the sample must be diluted to approximately mid-level of the calibration range and reanalyzed. 2. If chromatographic interference is observed during the RTW of any target compound, then report in the Case Narrative that the reported results are quantitatively estimated and are tentative identifications (flag "N"). 3. Each positive result must be qualitatively confirmed by analysis on a second, dissimilar column.	1. The instrument level of all compounds must be within the calibration range for all samples. 2. Sample chromatographs should not display levels of interference in the RTW of any target compound at a level greater than the PRQL. 3. All results must be quantitated on and reported from the primary column but confirmed on a second dissimilar column.	1. Dilute the sample to bring the level of the highest concentration of target compounds within the calibration range. 2. A discussion regarding the qualitative and quantitative reliability of the analyses must be included in the Case Narrative. 3. Not applicable.

Table A-6

Polynuclear Aromatic Hydrocarbons (PAHs) — SW-846 Method 8310
Quality Control Requirements

Procedure	Frequency	Acceptance Criteria	Corrective Action
Initial Calibration	Established initially at five concentration levels or when CVS criteria are not met - low standard at ≤project required quantitation limit (PRQL).	%RSD ≤ 20% for RFs for each target compound quantitated using average RF or linear calibration curve or generate a quadratic calibration curve for compounds which do not meet this criteria.	1. %RSDs > 20% require quantitation using quadratic calibration curve forced through origin.
Calibration Verification Standard (CVS)	Must bracket each set of 10 sample analyses (including laboratory and field QC) and must be at concentrations at or near the mid-point of the calibration range.	1. < 15% D based on "true" concentration when quantitated as a sample. 2. RT of each target compound must be within RT window reset daily at the beginning of the sequence for the 24-hour day and recentering the RT windows is only permitted once per 24 hours.	Correct cause of noncompliant CVS. Generate a new initial calibration. Reanalyze all samples and QC not bracketed by compliant CVS. Exception for reanalysis: If the associated samples are < PRQL for the respective target compound and if the noncompliant CVS shows increased sensitivity (i.e., CCV target compound recovery > 115% R), false positives would be favored. Therefore, if associated samples are < PRQL for the respective target compound, results may be reported with no corrective action for those samples.
Retention Time (RT) Windows	1. Established at ± 3× std. dev. of RT of three standard analyses over 72 hours. 2. Recentered daily based on RT of each of the compounds in first calibration check standard of day.	RT of sample peak within ±3 std. dev. per frequency description. RT windows for target compounds must not overlap and recentering the RT windows is only permitted once per 24 hours.	Adjust system and recalibrate.

Table A-6

Polynuclear Aromatic Hydrocarbons (PAHs) — SW-846 Method 8310
Quality Control Requirements
(Continued)

Procedure	Frequency	Acceptance Criteria	Corrective Action
Retention Time (RT) Shift	Each CCV analysis: RT of analytes in the CCV are evaluated against the daily ICV.	Column and compound specific, varies with each ICV: compound should be within window established by ICV RT ± the calculated RT window or a default based on the calculated RT window.	• Inspect chromatographic system for malfunction; correct identified malfunctions, if appropriate. • Evaluate data based on a comparison with other standards run during the analytical sequence, consider the RTs for the surrogate and spiked compounds analyzed before and after the sample in question. – Expand the RT windows to encompass the shift in compound location. – If no peaks are found in the expanded window, report the compound as non-detect.
Method Blank	One per batch of ≤ 20 samples/fraction per day. Must undergo all preparative procedures.	1. Concentration does not exceed the PRQL of the compound. Not applicable if positive results were not reported for any associated samples. 2. Must meet surrogate criteria.	Reanalyze blank. If still out and in hold, reprep and reanalyze associated samples containing the same contaminant, unless samples contain > 10× amount found in blank. If samples are past hold or if blank is still out after reprep/reanalysis, report first analysis and notify General Electric Data Manager and Environmental Standards.

Table A-6

Polynuclear Aromatic Hydrocarbons (PAHs) — SW-846 Method 8310
Quality Control Requirements
(Continued)

Procedure	Frequency	Acceptance Criteria	Corrective Action
Laboratory Control Sample (LCS)	One per extraction batch of ≤ 20 samples/matrix. Must undergo all preparative procedures. The LCS must be from a second source and must contain all target compounds with concentrations at or near the mid-point of the calibration range of the instrument.	% Recoveries within laboratory-generated limits.	Reanalyze LCS. If still out, reextract and reanalyze all associated samples and new LCS. (Exception: If LCS recovery is high and no associated positives, then address in case narrative and no further action needed.)
Matrix Spike/Matrix Spike Duplicate	One per extraction batch of ≤ 20 samples/matrix. Must undergo all preparative procedures. The MS/MSD must be spiked with all target compounds with concentrations at or near the mid-point of the calibration range of the instrument.	1. % Recovery within laboratory-generated limits. 2. RPDs within laboratory-generated limits.	If LCS is acceptable, then report in the Case Narrative that there was probable matrix interference.
Surrogate	1. Added to all standards, blanks, samples, and QC samples. 2. Calibrated and quantitated as target compounds.	% Recoveries within method limits.	If recovery is not within limits: 1. Check to be sure that there are no errors in calculations, surrogate solutions, and internal standards. Also, check instrument performance. 2. If no problem is found, reprep and reanalyze the sample. 3. If the reanalysis is within limits, then report only the reanalysis. 4. If the reanalysis is within limits, but out of hold, then report both sets of data. 5. If the reanalysis is still out of limits, then report both sets of data. 6. No reanalysis is required if only the MS and/or MSD are outside limits.

Table A-6

Polynuclear Aromatic Hydrocarbons (PAHs) — SW-846 Method 8310
Quality Control Requirements
(Continued)

Procedure	Frequency	Acceptance Criteria	Corrective Action
Qualitative/ Quantitative Issues	1. If instrument level of any compound in a sample exceeds the instrument level of that compound in the highest level standard, the sample must be diluted to approximately mid-level of the calibration range and reanalyzed. 2. If chromatographic interference is observed during the RTW of any target compound, then report in the Case Narrative that the reported results are quantitatively estimated and are tentative identifications (flag "N").	1. The instrument level of all compounds must be within the calibration range for all samples. 2. Sample chromatographs should not display levels of interference in the RTW of any target compound at a level greater than the PRQL.	1. Dilute the sample to bring the level of the highest concentration of target compounds within the calibration range. 2. A discussion regarding the qualitative and quantitative reliability of the analyses must be included in the Case Narrative.

Table A-7

Volatile Organic Compounds - SW-846 Method 8260A
Quality Control Requirements

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Tune Check (50ng BFB)	Every 12 hours.	Ensure correct mass assignment. BFB % Relative abundance criteria as specified in method.	Retune. Do not proceed with analysis until tune meets criteria.
Initial calibration	Each time the instrument is set up and when CCCs and SPCCs in the continuing calibration do not meet criteria. 1. Established initially at five concentration levels - low standard at or below project required quantitation limit (PRQL). 2. Heated purge for low-level soils.	1. Ave RRF for SPCCs chloromethane, 1,1-dichloroethane and bromoform ≥0.10 and for SPCCs chlorobenzene and 1,1,2,2-tetrachloroethane ≥0.30. 2. %RSD for RRFs for each CCC <20%. 3. %RSD for RRFs for non-CCC ≤ 15%.	1. Correct system and recalibrate. Criteria must be met before sample analysis may begin. 2. If non-CCC >15% RSD, generate linear regression.
Continuing calibration	Every 12 hours. Must be at or near the mid-point calibration range for all target compounds, CCCs, SPCCs and surrogates. Heated purges for low-level soils.	1. RRF for SPCCs chloromethane, 1,1-dichloroethane and bromoform ≥0.10 and for SPCCs chlorobenzene and 1,1,2,2-tetrachloroethane ≥0.30. 2. %D for RRFs of each CCC ≤ 20%, for non-CCCs - <25% - 2 can be out but <40%.	Correct system, if necessary, and recalibrate. Criteria must be met before sample analysis may begin.
Internal standards	Added to all blanks, standards, and samples.	1. Peak area within -50% to +100% of area in associated continuing calibration standard. 2. Retention time (RT) within 30 sec of RT for associated continuing calibration standard.	1. Inspect instrument for malfunctions; correct identified malfunctions, then reanalyze samples. 2. If no instrument malfunction identified proceed as follows: - Reanalyze sample. - If reanalysis is out, report both sets of data. If in, report only second set.

Table A-7

Volatile Organic Compounds – SW-846 Method 8260A
Quality Control Requirements
(Continued)

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Method Blank	1. After each continuing calibration standard (before sample analysis). 2. After the initial calibration if samples are to be analyzed immediately following the calibration.	1. Common laboratory contaminants ≤5×PRQL. All other target compounds ≤PRQL. 2. Must meet internal standard criteria. 3. Must meet surrogate criteria.	Reanalyze to determine if instrument contamination was the cause. If the method blank is still non-compliant, reprep an analysis blank and samples.
Laboratory Control Sample (LCS)	One per matrix/per extraction batch (if applicable)/ per set of 20 samples/matrix. Must undergo all sample preparative procedures. Must be from a second source and contain all target compounds at concentrations at or near the mid-point of the calibration range.	%Recoveries (and RPDs, if applicable) within laboratory-generated limits.	If still out, reprep, reanalyze associated samples and new LCS. Exception: If LCS recovery is high and no associated positives, then address in Case Narrative and no further action needed.
Matrix Spike/Matrix Spike Duplicate (midpoint)	One per matrix/per extraction batch (if applicable)/ per set of 20 samples/matrix/ concentration level. Must undergo all sample preparative procedures. Must be spiked with all target compounds at concentrations at or near the mid-point of the calibration range.	1. % Recoveries within laboratory-generated limits. 2. RPDs within laboratory-generated limits.	If LCS is acceptable, then report in the Case Narrative that there was probable matrix interference.

Table A-7

Volatile Organic Compounds – SW-846 Method 8260A
Quality Control Requirements
(Continued)

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Qualitative/Quantitative Issues	1. If instrument level of any compound in a sample exceeds the instrument level of that compound in the highest level standard, the sample must be diluted to approximately mid-level of the calibration range and reanalyzed. 2. If the concentration of the target analyte that exceeded the calibration range is present in the high level sample and analyzed immediately after is greater than the PRQL but ≤5× PRQL, then that sample must be reanalyzed to determine if carryover occurred.	1. The instrument level of all compounds must be within the calibration range for all samples. 2. The sample analyzed immediately after a high-level sample must display concentrations of the high-level target compounds less than the PRQL or greater than 5× PRQL.	1. Dilute the sample to bring the level of the highest concentration of target compounds within the calibration range. 2. A sample displaying concentrations of target compounds between the PRQL and 5× the PRQL which was analyzed immediately after a high-level sample must be reanalyzed. If the results do not agree within the PRQL, report only the second analysis.
Surrogate	1. Calibrated as target compounds. 2. Added to all blanks, samples, and QC samples.	All % Recoveries within method limits.	If recovery is not within limits: 1. Check to be sure that there are no errors in calculations, surrogate solutions, and internal standards. Also, check instrument performance. 2. If no problem is found, reprep and reanalyze the sample. 3. If the reanalysis is within limits, then report only the reanalysis. 4. If the reanalysis is within limits, but out of hold, then report both sets of data. 5. If the reanalysis is still out of limits, then report both sets of data. 6. No reanalysis is required if the MS and/or MSD are outside limits.

Table A-8

Semivolatile Organic Compounds — SW-846 Method 8270B
Quality Control Requirements

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Tune Check (50ng DFTPP)	Every 12 hours.	Ensure correct mass assignment. DFTPP % Relative abundance criteria as specified in method.	Retune. Do not proceed with analysis until tune meets criteria.
Initial calibration	Upon initial instrument set-up and when CCCs and SPCCs in the calibration do not meet criteria. Established initially at five concentration levels - low standard at or below project required quantitation limit (PRQL).	1. Ave RRF for each SPCC ≥0.050. 2. %RSD for RRFs for each CCC <30%. 3. %RSD for RRFs for non-CCC ≤ 15% or linear regression.	1. Correct system and recalibrate. Criteria must be met before sample analysis may begin. 2. If non-CCC >15% RSD, generate linear regression.
Continuing calibration	Every 12 hours. Must be at or near the mid-point calibration range for all target compounds, SPCCs, CCCs, and surrogates.	1. RRF for each SPCC ≥ 0.050. 2. %D for RRFs of each CCC ≤ 20%, for non-CCC - <25% - except four must be <40%.	Correct system, if necessary, and recalibrate. Criteria must be met before sample analysis may begin.
Internal standards	Added to all blanks, standards, and samples.	1. Peak area within -50% to +100% of area in associated continuing calibration standard. 2. Retention time (RT) within 30 sec of RT for associated continuing calibration standard.	1. Inspect instrument for malfunctions; correct identified malfunctions, then reanalyze samples. 2. If no instrument malfunction identified proceed as follows: - Reanalyze sample. - If reanalysis is out, report both sets of data. If in, report only second set.
Method Blank	One per extraction batch of 20 or fewer samples/matrix. Must undergo all sample preparative procedures. Must be run on each instrument used for sample analysis.	1. Target phthalate esters ≤5×PRQL. All other target compounds ≤PRQL. 2. Must meet internal standard criteria. 3. Must meet surrogate criteria.	Reanalyze to determine if instrument contamination was the cause. If the method blank is still non-compliant, reextract and reanalyze all samples unless >10× the blank, or there are no positive results.

Table A-8

Semivolatile Organic Compounds — SW-846 Method 8270B
Quality Control Requirements
(Continued)

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Laboratory Control Sample (LCS)	One per matrix/per extraction batch (if applicable)/ per set of 20 samples. Must undergo all sample preparative procedures. Must be from second source and contain all target compounds at concentrations at the mid-point of the calibration range.	% Recoveries (and RPDs, if applicable) within laboratory-generated limits.	Reanalyze the LCS to determine if instrumental conditions or analytical preparation was the cause. If still out reprep and reanalyze associated samples and LCS. Exception: If LCS recovery is high and no associated positive results are reported, then address the issue in the Case Narrative and no further action is needed.
Matrix Spike/Matrix Spike Duplicate	One per matrix/per extraction batch (if applicable)/ per set of 20 samples. Must undergo all sample preparative procedures. Must be spiked with all target compounds at concentrations at or near the mid-point of the calibration range.	1. % Recoveries within laboratory-generated limits. 2. RPDs within laboratory-generated limits.	If LCS is acceptable, then report in the Case Narrative that there was probable matrix interference.
Qualitative/Quantitative Issues	If instrument level of any compound in a sample exceeds the instrument level of that compound in the highest level standard, the sample must be diluted to approximately mid-level of the calibration range and reanalyzed.	The instrument level of all compounds must be within the calibration range for all samples.	Dilute the sample to bring the level of the highest concentration of target compounds within the calibration range.

Table A-8

Semivolatile Organic Compounds — SW-846 Method 8270B
Quality Control Requirements
(Continued)

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Surrogate	1. Calibrated as target compounds. 2. Added to all blanks, samples, and QC samples.	1. All recoveries ≥10%. 2. Not more than one % recovery per fraction outside method limits.	If recovery acceptance criteria is not within limits: 1. Check to be sure that there are no errors in calculations, surrogate solutions, and internal standards. Also, check instrument performance. 2. If no problem is found, reprep and reanalyze the sample. 3. If the reanalysis is within limits, then report only the reanalysis. 4. If the reanalysis is within limits, but out of hold, then report both sets of data. 5. If the reanalysis is still out of limits, then report both sets of data. 6. No reanalysis is required if the MS and/or MSD are outside limits.

Table A-9

Total Petroleum Hydrocarbons — EPA Method 418.1
Quality Control Requirements

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Initial Calibration (ICAL)	Established initially upon instrument set-up and when CCV fails criteria at three concentration levels - low standard at or below project required quantitation limit (PRQL)	Correlation coefficient ≥ 0.995	If correlation coefficient < 0.995, then correct system and recalibrate.
Continuing Calibration Verification (CCV) Standard	1. Mid-range standard. 2. Must bracket each set of 10 sample analyses (inclusive of all field and laboratory QC).	< 20% Difference based on "true" concentration when quantitated as a sample.	Correct cause of noncompliant CCV. Generate a new ICAL Reanalyze all samples and QC not bracketed by compliant CCV. Exception for reanalysis: If the associated samples are < PRQL for the respective target compound and if the noncompliant CCV shows increased sensitivity (e.g., CCV target compound recovery > 115% R), false positives would be favored. Therefore, if associated samples are < PRQL for the respective target compound, results may be reported with no corrective action for those samples.
Method Blank	One per extraction batch of ≤ 20 samples/matrix.	Concentration may not exceed the PRQL of the compound. Not applicable if positive results were not reported for any associated samples.	Reanalyze blank. If still out and in hold, reprep and reanalyze associated samples containing the same contaminant, unless samples contain > 10× amount found in blank. If samples are past hold or if blank is still out after reprep/reanalysis, report first analysis and notify General Electric Data Manager and Environmental Standards.

Table A-9

Total Petroleum Hydrocarbons — EPA Method 418.1
Quality Control Requirements
(Continued)

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Laboratory Control Sample (LCS)	One per batch of ≤ 20 samples Must undergo all sample preparative procedures. Must be from a second source and must contain TPH at a concentration at the mid-point of the calibration range.	% Recoveries within laboratory-generated limit.	Reanalyze LCS. If still out, reprep and reanalyze all associated samples and LCS. (Exception: If LCS recovery is high and no associated positives, then address in case narrative and no further action needed.)
Matrix Spike/Matrix Spike Duplicate	One per extraction batch of ≤ 20 samples/matrix. Must undergo all sample preparative procedures. Must be spiked with TPH at a concentration at or near the mid-point of the calibration range.	1. % Recoveries within laboratory-generated limits. 2. RPDs within laboratory-generated limits.	If LCS is acceptable, then report in the Case Narrative that there was probable sample matrix interference.
Qualitative/Quantitative Issues	If instrument level of any compound in a sample exceeds the instrument level of that compound in the highest level standard, the sample must be diluted to approximately mid-level of the calibration range and reanalyzed.	The instrument level of all compounds must be within the calibration range for all samples.	Dilute the sample to bring the level of the highest concentration of target compounds within the calibration range.

Table A-10

Cyanide (Total) — SW-846 Method 9010A
Quality Control Requirements

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Multi-Point Calibration Curve (a blank and 5 standards)	Daily prior to sample analysis. It is recommended that two initial calibration standards be distilled with samples.	R≥0.995 Standards distilled before analysis must display results within 10% of the true value.	• Recalibrate. • Prepare new standards and recalibrate if still out.
Mid-Range Initial Calibration Verification (ICV)	After calibration curve. Must be second source, distilled with samples.	85-115% True value	• Reanalyze. Redistill and reanalyze if still out. • Troubleshoot and recalibrate if still out.
Initial Calibration Blank (ICB)	After calibration curve. Immediately after ICV.	<RL	• Reanalyze, recalibrate if still out.
Continuing Calibration Verification (CCV)	After every 10 samples and at beginning and end of run.	85-115% True value	• Recalibrate. Reanalyze all samples after last acceptable CCV.
Continuing Calibration Blank (CCB)	Immediately after each CCV.	<RL	• Recalibrate. Reanalyze all samples after last acceptable CCB.
Distilled Blank	Per batch, per matrix, per day.	<RL	• Reanalyze, If still out, • Redistill along with associated samples, and reanalyze
Laboratory Control Sample	Per batch, per matrix.	Within 80-120% for aqueous samples; within specified limits for solid samples.	• Reanalyze. If still out, • Redistill along with associated samples, and reanalyze
Matrix Spike Analysis	One per batch, per matrix.	75-125% Recovery. Not applicable if sample concentration is greater than four times the spike concentration.	• Report any unacceptable recoveries in the Case Narrative.
Duplicate Sample Analysis	One per batch, per matrix.	20% RPD.	• Report any unacceptable precision in the Case Narrative.
Sample Quantitation	Dilutions must be performed on samples displaying instrument levels greater than the calibration range of the instrument.	Appropriate dilutions are made to samples to bring the instrument levels of samples to near the mid-range of the instrument calibration.	If a sample displays a level of cyanide greater than the calibration range, the sample must be dilution and reanalyzed. If the diluted is deemed excessive (the instrument level is less than the detection limit after dilution), a more appropriate dilution factor will be used and the sample must be reanalyzed.

Table A-11

Metals by ICP – SW-846 Method 6010A
Quality Control Requirements

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Initial Calibration and Verification	Once per 24 hours and each time the instrument is set up. Initial calibration consists, at a minimum, of a blank and three standards (one standard must be at the PRDL). Immediately after instrument calibration, the high level initial calibration standard must be reanalyzed and the results must be within 5% of the true value. An initial calibration blank (ICB) is analyzed immediately following the ICV.	ICV is within 95-105% recovery. Absolute value of ICB is ≤ PRDL.	1. Terminate analysis, correct problem, recalibrate instrument, and verify calibration. 2. Sample results above highest standard concentration require dilution and reanalysis.
Continuing Calibration (CCV/CCB)	At the beginning and end of each analysis run and once per 10 samples or every two hours, whichever is more frequent.	CCV is within 90-110% recovery. Absolute value of CCB is ≤ PRDL.	Terminate analysis, correct problem, recalibrate instrument, verify calibration, and reanalyze all analytical samples since the last compliant CCV/CCB.
PRDL Standard	At the beginning and end of each analysis run, or a minimum of twice per 8-hour working shift, whichever is more frequent, but not before the CCV.	Recoveries must be between 80-120%.	Note any unacceptable recoveries in the Case Narrative.
ICP Interference Check Samples (ICSA and ICSAB)	At the beginning and end of each analysis run, or a minimum of twice per 8 hour working shift, whichever is more frequent, but not before the CCV.	ICSA and ICSAB is within 80-120% recovery for the analytes included. Absolute value of the concentrations for analytes not included in ICSA and ICSAB must be less than 2×PRDL.	If either if the criteria are not met, terminate the analysis, correct the problem, recalibrate the instrument, and reanalyze all project samples and QC samples since last compliant ICSA/ICSAB.

Table A-11

Metals by ICP – SW-846 Method 6010A*
Quality Control Requirements
(Continued)

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Preparation Blank	One per digestion batch of ≤ 20 samples, per matrix.	The absolute value of the concentration must not exceed the PRDL of the analyte. Not applicable if sample concentration is >10x blank level or if positive result is reported for the blank but the analyte is not detected in the sample.	Redigest and reanalyze all associated samples.
Laboratory Control Sample (LCS)	One per batch of ≤ 20 samples per matrix. Must be from a second source.	80-120% recovery for aqueous, within vendor limits for solids.	Redigest and reanalyze all associated samples.
Pre-Digestion Matrix Spike	One per batch of ≤ 20 samples, per matrix. Must be performed on a project sample.	75-125% recovery. Not applicable if sample concentration is >4x spike added.	1. Perform a post-digestion spike (except for Ag). 2. Flag data.
Laboratory Duplicate	One per batch of ≤ 20 samples, per matrix. Must be performed on a project sample.	RPD ±20% for results ≥5x PRDL or ±PRDL if sample or duplicate results is <5x PRDL.	Flag data and report unacceptable precision in Case Narrative.
ICP Serial Dilution (five-fold)	One per digestion batch of ≤ 20 samples, per sample matrix. Must be performed on a project sample.	Within 10% difference if the original sample concentration is ≥50x IDL.	Flag data and report unacceptable percent differences in Case Narrative.
Coefficient of Variation: (Metals Only)	All multiple injections/integrations.	±20% CV.	If the concentration is >PRDL, rerun once. Report the results for the analysis displaying the lower CV.

*Trace ICP may be used, provided CLP ILMO4.0 requirements for specific interference check criteria are met. Use of GFAA are an acceptable alternative.

Table A-12

Metals — SW-846 Method 7470 (Mercury in Water) and Method 7471A (Mercury in Soil)
Quality Control Requirements

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Initial Calibration	Once per 24 hours and each time the instrument is set up. Initial calibration consists, at a minimum, of a blank and five standards (one standard must be at the PRDL). An initial calibration verification (ICV) is analyzed immediately following the initial calibration. An initial calibration blank (ICB) is analyzed immediately following the ICV.	ICV is within 90-110% recovery. Absolute value of ICB is ≤PRDL.	1. Terminate analysis, correct problem, recalibrate instrument, and verify calibration. 2. Sample results above highest standard concentration require dilution and reanalysis.
Calibration Verification Standard (CCV/CCB)	At the beginning and end of each analysis run and once per 10 samples or every two hours, whichever is more frequent.	CCV is within 80-120% recovery. Absolute value of CCB is ≤ PRDL.	Terminate analysis, correct problem, recalibrate instrument, verify calibration, and reanalyze all analytical samples since the last compliant CCV/CCB.
PRDL Standard	At the beginning and end of each analysis run, or a minimum of twice per 8 hour working shift, whichever is more frequent, but not before the ICV.	The recovery of the PRDL standard should be 80-120%.	Note any unacceptable recoveries and the associated samples in the Case Narrative.
Preparation Blank	One per batch of ≤ 20 samples per matrix.	Absolute value of the concentration must not exceed the PRDL of the analyte. Not applicable if sample concentration is >10× blank level or if a positive result is reported for the preparation blank and mercury was not detected in the project sample.	Redigest and reanalyze all associated samples.
Laboratory Control Sample (LCS)	One per batch of ≤ 20 samples per matrix.	80-120% Recovery for aqueous samples; within vendor-specified limits for solid samples.	Check calculations and spike preparation for documentable errors. If no errors are noted, redigest and reanalyze all associated samples.
Pre-Digestion Matrix Spike	One per batch of ≤ 20 samples per matrix. Must be performed on a project sample.	75-125% recovery. Not applicable if sample concentration is >4× spike added.	Flag data and note the unacceptable recoveries in the Case Narrative.

Table A-12

Metals — SW-846 Method 7470 (Mercury in Water) and Method 7471A (Mercury in Soil)
Quality Control Requirements
(Continued)

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Laboratory Duplicate	One per batch of ≤ 20 samples, not to exceed 20 samples of a given matrix. Must be performed on a project sample.	RPD ±20% for results ≥5x PRDL or ±PRDL if sample or duplicate results is <5x PRDL.	Flag data and note the unacceptable precision in the Case Narrative.

Table A-13

Hexavalent Chromium [Cr (VI)] — SW-846 Method 7196A
Quality Control Requirements

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Multi-Point Calibration Curve (a blank and 5 standards)	Daily prior to sample analysis.	R≥0.995 Standards must be treated as samples for preparation and color development.	• Recalibrate. • Prepare new standards and recalibrate if still out.
Mid-Range Initial Calibration Verification (ICV)	After calibration curve. Must be from a second source (different from the calibration standards).	90 - 110% True value	• Troubleshoot and recalibrate if still out.
Initial Calibration Blank (ICB)	Immediately after ICV.	<RL	• Recalibrate.
Continuing Calibration Verification (CCV)	After every 10 samples and at the beginning and end of run.	90-110% True value	• Recalibrate. Redigest and reanalyze all samples since last acceptable CCV.
Continuing Calibration Blank (CCB)	Immediately after the CCV.	<RL	• Recalibrate. Reextract and reanalyze all samples after last acceptable CCB.
Prep Blank	One per matrix per batch	<RL	• If >RL, redigest and reanalyze all associated samples displaying positive results for hexavalent chromium up to 10× the blank level.
LCS	One per batch, per matrix.	80-120% Recovery for aqueous samples; within vendor-specific limits for solid samples.	• Redigest and reanalyze all associated samples.
Laboratory Duplicate	One per batch per matrix. Must be performed on a Columbia sample.	RPD ≤20% for results ≥5% PRDL and within ±PRDL for sample results <5× PRDL.	• Flag data and report the unacceptable precision in the Case Narrative.
Matrix Spike	One per batch, per matrix. Must be performed on a Columbia sample.	Recovery of 75-125%. Not applicable if level in unspiked sample is greater than 4 times the spike concentration.	• Flag data and report the unacceptable recoveries in the Case Narrative.

Table A-14

Metals by GFAA - SW-846 Method 7000A
Quality Control Requirements

Procedure	Frequency	Acceptance Criteria	Corrective Action
Initial Calibration and Verification	Once per 24 hours and each time the instrument is set up. Initial calibration consists, at a minimum, of a blank and three standards (one standard must be at the PRDL). An initial calibration verification (ICV) of a source different from the calibration standards is analyzed immediately following the initial calibration. An initial calibration blank (ICB) is analyzed immediately following the ICV.	ICV is within 90-110% recovery. Absolute value of ICB is ≤ PRDL.	Terminate analysis, correct problem, recalibrate instrument, and verify calibration.
Continuing Calibration (CCV/CCB)	At the beginning and end of each analysis run and once per 10 samples or 20 injections or every 2 hours, whichever is more frequent.	CCV is within 80-120% recovery. Absolute value of CCB is ≤ PRDL.	Terminate analysis, correct problem, recalibrate instrument, verify calibration, and reanalyze all analytical samples since the last compliant CCV/CCB.
PRDL Standard	At the beginning and end of each analysis run, or a minimum of twice per 8-hour working shift, whichever is more frequent, but not before the ICV. Performed at a concentration equal to the PRDL/CRDL.	The recovery must be within 80-120% for each analyte.	Note any unacceptable recoveries in the Case Narrative.
Preparation Blank	One per batch of ≤ 20 samples per matrix.	Concentration does not exceed the PRDL of the analyte. Not applicable if sample concentration is ≥ 10 × blank level or if positive result is observed for blank ≥ PRDL and samples display "not-detected" results for the analyte.	Redigest and reanalyze all associated samples.
Laboratory Control Sample (LCS)	One per batch of ≤ 20 samples per matrix.	80-120% recovery for aqueous, 70-130% recovery limits for solids.	Redigest and reanalyze all associated samples.
Pre-Digestion Matrix Spike	One per batch of ≤ 20 samples per matrix. Must be performed on a General Electric sample.	75-125% recovery. Not applicable if sample concentration is ≥ × spike added.	Flag data and report the unacceptable recoveries in the Case Narrative.

Table A-14

Metals by GFAA - SW-846 Method 7000A
Quality Control Requirements
(Continued)

Procedure	Frequency	Acceptance Criteria	Corrective Action
Post-Digestion Matrix Spike	Each project and QC sample (but not ICV/CCV/ICB/CCB). Analyzed immediately following the associated sample.	85-115% recovery.	1. If the recovery (%R) is ≤40%, dilute sample by a factor of 5 to 10 and rerun. If after dilution the recovery is still ≤40%, flag data and report the unacceptable recoveries in the Case Narrative. Report the sample result with the higher PDS recovery. 2. If sample absorbance or concentration is ≥50% that of the spike added and %R ≤85% or ≥115%, sample shall be quantitated by the method of standard additions. (MSA). 3. MSA is performed using single injections of sample spiked with concentrations of 0%, 50%, 100%, and 150% the expected level of analyte in the sample. If the correlation coefficient of the four MSA injections is less than 0.995, repeat the analysis. If the correlation coefficient is again less than 0.995, flag the data and note the unacceptable MSA analysis in the Case Narrative. Report the sample result with the higher correlation coefficient.
Laboratory Duplicate	One per batch of ≤20 samples per matrix. Must be performed on a General Electric sample.	RPD ≤20% results ≥5×PRDL or ± PRDL if sample or duplicate result is ≤5 × PRDL.	Flag data.

Table A-14

Metals by GFAA - SW-846 Method 7000A
Quality Control Requirements
(Continued)

Procedure	Frequency	Acceptance Criteria	Corrective Action
Sample Quantitation	Each Sample	1. Sample results greater than the highest calibration standard must be diluted to the mid-range of the calibration curve. 2. All samples must be analyzed using duplicate injections (except MSA) and the CV for the duplicate injections must be less than 20% for positive results greater than the PRDL.	1. Perform an appropriate dilution (to the mid-range of the calibration curve) and reanalyze the sample. 2. If a sample result is greater than the PRDL and the CV was above 20%, reanalyze the sample (in duplicate). If the CV is again above 20% and the sample result is greater than the PRDL, report the result for the sample with the lower CV and note this in the Case Narrative. Flag the data.

TABLE A-15

SUMMARY OF BILLABLE AND NON-BILLABLE ANALYSES FOR THE GE CORPORATE PURCHASE AGREEMENT

Billable Units	Nonbillable Units
• Project samples	• Instrument blanks
• Field blanks	• Method blanks
• Trip blanks	• Preparation blanks
• Equipment blanks	• Storage blanks
• Rinse blanks	• Serial dilution analysis samples
• Field duplicate samples	• Post-digestion spike analyses samples
• Laboratory duplicate samples	• Laboratory control samples
• Matrix spike samples[1]	• Blank spike samples
• Matrix spike duplicate samples[1]	• Method of Standard Addition spiked samples
• GC/MS confirmation of herbicide, organochlorine pesticide, organophosphorus pesticide, or Aroclor positive results[2]	• Batch QC samples (MS/MSD/laboratory duplicate analyses performed on non-GE project samples)
	• Sample reextraction or reanalysis, or both
	• Sample cleanup (GPC, etc.) check standards
	• All initial calibration standards
	• All continuing calibration checks

1 If performed on a GE project sample.

2 Billed at standard GC/MS analysis costs. If the confirmation is neither positive or unambiguous nor both, the unit shall be deemed nonbillable.

Appendix J

Management of Change Form

MANAGEMENT OF CHANGE FORM

General Electric Company
Miller/Duva Site, Town of Clay, New York

Date: Person Initiating Change: Change #:
(e.g. 2002.1)

1.0 DESCRIPTION OF CHANGE

_____

_____

_____

_____

2.0 SCREENING

Change is replacement in kind, MOC does not apply

Change approved Initials _____ Date _____

3.0 ENGINEERING REVIEW

3.1 Technical basis for change (flow rates, pressures, etc.):_____

_____

_____

_____

_____

3.2 Can change cause a release anywhere in the facility? How can a release be avoided or mitigated?

_____

_____

_____

3.3 Will training be needed to make the change or operate after the change? _____

_____

_____

_____

_____

3.4 Will change affect other processes at the plant (electrical, access, etc.)? _____

_____

_____

_____

_____

3.5 Other factors considered:

_____

_____

_____

_____

3.6 Engineering Reviewers:

Maintenance Supervisor: _____ Date: _____

Other Involved Personnel or Contractor: _____ Date: _____

_____ _____

4.0 OPERATING PROCEDURES REVIEW

4.1 Will operating procedures require changes?

_____

_____

_____

_____

4.2 Will affected personnel require training in new operating procedures and/or written notice?

_____

_____

_____

_____

4.3 Other factors considered: _____

_____

_____

_____

_____

4.4 Operating Procedure Reviewers:

Maintenance Supervisor: _____ Date: _____

Other Involved Personnel or Contractor: _____ Date: _____

_____ _____

5.0 PRE-STARTUP REVIEW

5.1 Change was inspected by _____ Date: _____

_____

5.2 Technical review of change was conducted by: _____ Date: _____

5.3 Safety procedures and training are in place: _____ Date: _____

5.4 Startup of modified system approved: _____ Date: _____

ATTACHMENTS

This form provides additional space for discussion of MOC form elements.

Section Number _____ Change Number _____

Appendix K

Site Specific Training Documentation Form

Miller/Duva Site
4958 West Taft Road
Town of Clay, New York

SITE SPECIFIC TRAINING DOCUMENTATION FORM

Name: _____ Date: _____

I have completed the following site-specific training:

Groundwater Treatment System

Walk-through inspection and description of the system components _____

Demonstration of the operating procedures _____

Demonstration of the shutdown procedures, including emergency shutdown _____

Review of the Operation and Maintenance (O&M) Plan _____

Review of the Health and Safety Plan (HASP) _____

Treatment Plant sampling and shipping procedures _____

Review of Sampling Protocals _____

Other Activities

Overview of work task to be completed _____

Discussion of potential hazards specific to the work task to be conducted _____

Review of the HASP _____

Name (Signature):_____

Project Manager/Director (Signature): _____

Miller/Duva Site
4958 West Taft Road
Town of Clay, New York

SITE SPECIFIC TRAINING DOCUMENTATION FORM

Name: David Sanders Date: 3/20/02

I have completed the following site-specific training:

Groundwater Treatment System

Walk-through inspection and description of the system components	DMS
Demonstration of the operating procedures	DMS
Demonstration of the shutdown procedures, including emergency shutdown	DMS
Review of the Operation and Maintenance (O&M) Plan	DMS
Review of the Health and Safety Plan (HASP)	DMS
Treatment Plant sampling and shipping procedures	DMS
Review of Sampling Protocals	DMS

Other Activities

Overview of work task to be completed	
Discussion of potential hazards specific to the work task to be conducted	
Review of the HASP	

Name (Signature): David Sanders

Project Manager/Director (Signature):

Miller/Duva Site
4958 West Taft Road
Town of Clay, New York

SITE SPECIFIC TRAINING DOCUMENTATION FORM

Name: Timothy Miller Date: 3/15/02

I have completed the following site-specific training:

Groundwater Treatment System

Walk-through inspection and description of the system components	
Demonstration of the operating procedures	
Demonstration of the shutdown procedures, including emergency shutdown	
Review of the Operation and Maintenance (O&M) Plan	
Review of the Health and Safety Plan (HASP)	

Other Activities

Overview of work task to be completed	
Discussion of potential hazards specific to the work task to be conducted	
Review of the HASP	

Name (Signature): Timothy S Miller

Appendix L

Review of Permit/Clean-up Values Memo

MEMORANDUM

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

To: John Uruskyj, CPG
General Electric Company

Date: March 15, 2002

From: Timothy E. Miller, P.E.
BBL Environmental Services, Inc.

cc: David R. Gerber, PE
BBL Environmental Services, Inc.

Re: General Electric Company
Miller-Duva Site
Effluent Limits vs. Regulatory Standards

Pursuant to your request, existing effluent limits for the General Electric Company (GE) Miller-Duva site were compared against existing regulatory standards. Regulatory criteria consulted during this process included the groundwater standards and guidance values presented in the New York State Department of Environmental Conservation (NYSDEC) document entitled, "Division of Water Technical and Operational Guidance Series (TOGS 1.1.1) Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations" (NYSDEC, reissued June 1998 and addended April 2000) and the maximum contaminant levels in the New York State Department of Health (NYSDOH) State Sanitary Code Part 5 - Drinking Water Supplies (10 NYCRR Part 5).

Effluent limits for all parameters, except tetrachloroethylene and methyl ethyl ketone, are equivalent with groundwater standards and/or guidance values presented in TOGS 1.1.1 and/or the maximum contaminant levels presented in 10 NYCRR Part 5. The effluent limit for tetrachloroethylene is equivalent with the human consumption of fish water standard (in TOGS 1.1.1). The effluent limit for methyl ethyl ketone is less than the groundwater guidance value (in TOGS 1.1.1). Standards and/or guidance values for biological oxygen demand (BOD_5) could not be found in either TOGS 1.1.1 or 10 NYCRR Part 5. A comparison of existing effluent criteria versus regulatory limits is presented in the attached table.

The NYSDEC was contacted to determine whether or not the standards and/or guidance values presented in TOGS 1.1.1 would be updated in the near future. Mr. Dick Draper, Director of Watershed Management, indicated that no such revisions would be made within the next few months. However, revisions are expected in approximately one year. A conversation record of the telephone conversation with Mr. Draper is attached for your information.

Please do not hesitate to contact me if you have any questions or require additional information.

TEM/jlc

General Electric Company
Miller-Duva Site
Comparison of Existing Effluent Limits vs. Regulatory Standards

Parameter	Effluent Limit (ug/l)	Detection Limit (ug/l)	TOGS 1.1.1		10 NYCRR Part 5
			Source of Drinking Water Standard (ug/l)	Human Consumption of Fish Standard (ug/l)	Maximum Contaminant Level (ug/l)
cis-1,2-Dichloroethylene	5	1	5	NL	5
1,1,1-Trichloroethane	5	1	5	NL	5
Trichloroethylene	5	1	5	40	5
Toluene	5	1	5	6,000	5
1,1-Dichloroethane	5	1	5	NL	5
Tetrachloroethylene	1	0.5	5	1 (G)	5
Vinyl Chloride	2	1	2	NL	2
Methyl ethyl ketone	10	5	50 (G)	NL	NL
BOD-5	5	5	NL	NL	NL

Notes:

1. NL = Not Listed.
2. G = Guidance Value.
3. Effluent Limits and Detection Limits obtained from Miller-Duva Site Table 8.2 Effluent Discharge Limitations and Analytical Testing Detection Limits located in the TreaTek-CRA OMM manual (1995).
4. New York State Department of Environmental Conservation (NYSDEC) Class GA Standards from NYSDEC's document entitled "Division of Water Technical and Operational Guidance Series (TOGS 1.1.1) Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations" (NYSDEC, reissued June 1998 and addended April 2000).
5. 10 NYCRR Part 5 Standards from the New York State Department of Health (NYSDOH) New York Environmental Codified Regulations document, Title 10 - Department of Health, Chapter 1 - State Sanitary Code, Part 5 - Drinking Water Supplies, Subpart 5-1 Public Water Systems, 5-1.52 Tables.

CONVERSATION RECORD

To	Dick Draper	By	Meghan Myles
Date	March 5, 2002	Time	14:45 p.m.
Individual			
Project No.	40135.003	Project Title	GE – Miller-Duva Site
Organization	NYSDEC	Title	Director of Watershed Management
Location	Albany, NY	Phone No.	(518) 402-8251
Subject	Miller-Duva Site – Status of Existing TOGS 1.1.1		

Items Discussed:

Will the NYSDEC be making any changes/revisions to TOGS 1.1.1 in the near future?

- Some additions will be made within the next year or so (will not come out for minimum few months).
- No firm date on when the revisions will be made.
- Constituents that will change are unknown at this time (too soon in the process to know).

Comments or Action Required:

May be appropriate to contact NYSDEC in 2003 to discuss potential revisions to TOGS 1.1.1.

Appendix M

Hazardous Waste Manifest

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Action • Management and Construction

Transmitted Via U.S. Mail

October 15, 2001

Mr. John Uruskyj
Remedial Project Manager
Corporate Environmental Programs
General Electric Company
320 Great Oaks Boulevard, Suite 323
Albany, New York 12203

Re: Miller/Duva
Town of Clay, New York
BBL Project #: 0201.10075 #2

Dear Mr. Uruskyj:

Please find enclosed the generator copy (Copy 8) of the New York State Hazardous Waste Manifest documentation prepared for the shipment of four used liquid phase granular activated carbon canisters. The generator copy is to be retained by General Electric for record keeping purposes.

The four carbon canisters were shipped from the above-referenced site to the Calgon Carbon Corporation regeneration facility located in Catlettsburg, Kentucky on October 15, 2001. The generator state copy (Copy 4) of the Hazardous Waste Manifest has been mailed to the New York State Department of Environmental Conservation, Manifest Section. The disposer state copy (Copy 3) is typically mailed to the disposer state (i.e., Kentucky). However, based on discussions with the Kentucky Department of Environmental Protection, Division of Waste Management, Kentucky does not maintain a hazardous waste manifesting program and does not require a copy of the manifest. Therefore, BBLES will retain this copy in our project files.

If you have any questions, please do not hesitate to contact me.

Sincerely,

BBL ENVIRONMENTAL SERVICES, INC.

Timothy E. Miller, P.E.

TEM/cmd
Enclosure

cc: Mr. David R. Gerber, P.E., Blasland, Bouck & Lee, Inc.

NYG 1719333

DIVISION OF SOUD & HAZARDOUS MATERIALS

Please type or print. Do not staple

HAZARDOUS WASTE MANIFEST

P.O. Box 12820, Albany, New York 12212

(Hazardous Waste Manifest 1/5/90)

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.	Manifest Doc. No.	2. Page 1 of	Information within heavy bold line is not required by Federal Law.
N Y D 9 6 9 3 4 1 6 7	0 3 0 0 2	1	

3. Generator's Name and Mailing Address

Miller Dava Site
4955 West Taft Road - Vacant Lot
Clay, New York 13212

General Electric Company
128 Great Oaks Boulevard
Albany, New York 12203
Attn: J. Crosby (518) 342-2717

4. Generator's Telephone Number ( )

A. NYG 1719333

B. Generator's ID Miller Dava Site West Taft Road, Clay, New York

5. Transporter 1 (Company Name): WASTE Environmental Group, Inc.

6. US EPA ID Number: N Y D 9 6 9 7 6 9 3 4 7

C. State Transporter's ID

D. Transporter's Telephone (715) 827-7200

7. Transporter 2 (Company Name)

8. US EPA ID Number

E. State Transporter's ID

F. Transporter's Telephone ( )

9. Designated Facility Name and Site Address
Calgon Carbon Corporation
Big Sandy Plant
Route 23
Catlettsburg, KY 41129

10. US EPA ID Number: K Y D 0 6 5 0 0 9 4 1 3

G. State Facility ID

H. Facility Telephone (606) 739-8651, ext. 326

11. US DOT Description (Including Proper Shipping Name, Hazard Class and ID Number)	12. Containers Number	12. Containers Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.	
a. Waste, Environmentally Hazardous Substance, Solid n.o.s. 9, PG III, (F002), RQ, UN 3077	0 0 6	M	0 0 5 2 0	P	EPA F002	
					STATE	
b.					EPA	
					STATE	
c					EPA	
					STATE	
d.					EPA	
					STATE	

J. Additional Descriptions for Materials listed Above

a. Used activated carbon 1 0

b.

c.

d.

K. Handling Codes for Wastes Listed Above

a. T

b.

c.

d.

15. Special Handling Instructions and Additional Information

Emergency Contact No.: (606) 478-9340 (Chem Trec)
Calgon Carbon Acceptance No.: 19495

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations and state laws and regulations.
If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name	Signature	Mo.	Day	Year
as Agent for General Electric Company				

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Mo.	Day	Year
[illegible]	[illegible]			

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Mo.	Day	Year

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Mo.	Day	Year

8802 and the NYS Department of Environmental Conservation (518) 457

GENERATOR

TRANSPORTER

CILITY

In c f emergency or spill immediately call the National Response Center (800

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Action • Management and Construction

Transmitted Via Registered Mail

October 15, 2001

New York State Department of
Environmental Conservation
Manifest Section
50 Wolf Road
Albany, NY 12233

Re: Miller/Duva
Town of Clay, New York
BBLES Project #: 0201.10075 #2

To Whom It May Concern:

Please find enclosed the generator state copy (copy 4) of the New York State Hazardous Waste Manifest documentation prepared for the shipment of four used liquid phase carbon canisters which were transported from the above-referenced site to the Calgon Carbon Corporation regeneration facility located in Catlettsburg, Kentucky.

If you have any questions, please do not hesitate to contact me at your convenience.

Sincerely,

BBL ENVIRONMENTAL SERVICES, INC.

Timothy E. Miller, P.E.

TEM/cmd
Enclosure

cc: Mr. John Uruskyj, General Electric Company
Mr. David R. Gerber, P.E., Blasland, Bouck & Lee, Inc.

NYG 1719333

DIVISION OF SOLID & HAZARDOUS MATERIALS

Please type or print. Do not staple

HAZARDOUS WASTE MANIFEST

P.O. Box 12820, Albany, New York 12212

(Hazardous Waste Manifest 1/5/99)

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.	Manifest Doc. No.	2. Page 1 of	Information within heavy bold line is not required by Federal Law.
N Y D 9 8 6 9 5 4 1 6 7	G 0 0 0 2	1	

3. Generator's Name and Mailing Address

Miller Duva Site
4958 West Taft Road - Vacant Lot
Clay, New York 13212

General Electric Company
320 Great Oaks Boulevard
Albany, New York 12203
Attn: J. Uruskyj (518) 862-2717

4. Generator's Telephone Number ( )

A. NYG 1719333

B. Generator's ID Miller Duva Site West Taft Road, Clay, New York

5. Transporter 1 (Company Name)	6. US EPA ID Number
HAZMAT Environmental Group, Inc.	N Y D 9 8 0 7 6 9 9 4 7
7. Transporter 2 (Company Name)	8. US EPA ID Number

C. State Transporter's ID 1207 NY

D. Transporter's Telephone (716) 827-7200

E. State Transporter's ID

F. Transporter's Telephone ( )

9. Designated Facility Name and Site Address	10. US EPA ID Number
Calgon Carbon Corporation Big Sandy Plant Route 23 Catlettsburg, KY 41129	K Y D 0 0 5 0 0 9 9 2 3

G. State Facility ID

H. Facility Telephone (606) 739-8681, ext. 326

11. US DOT Description (Including Proper Shipping Name, Hazard Class and ID Number)	12. Containers Number	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a. Waste, Environmentally Hazardous Substance, Solid n.o.s. 9, PG III, (F002), RQ, UN 3077	0 0 4	D M	0 0 5 0 0	P	EPA F002
					STATE
b.					EPA
					STATE
c					EPA
					STATE
d.					EPA
					STATE

J. Additional Descriptions for Materials listed Above

a. used activated carbon | 1 0 0

b.

c.

d.

K. Handling Codes for Wastes Listed Above

a. T

b.

c.

d.

15. Special Handling Instructions and Additional Information

Emergency Contact No.: (800) 424-9300 (Chem Trec)
Calgon Carbon Acceptance No.: 1449K

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations and state laws and regulations.
If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name	Signature	Mo.	Day	Year
as agent for General Electric Company		10	15	01

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Mo.	Day	Year
HENRY BEECHER		10	15	01

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Mo.	Day	Year

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Mo.	Day	Year

GENERATOR

TRANSPORTER

FACILITY

-8802 and the NYS Department of Environmental Conservation (518) 457

If emergency or spill immediately call the National Response Center (800

COPY

LAND DISPOSAL NOTIFICATION AND CERTIFICATION FORM

Generator Name: General Electric Company Manifest Document No.: [redacted] 00001

Carbon Acceptance No.: 1449R State Manifest No.: NYB5664564

This form is submitted to Calgon Carbon Corporation in accordance with 40 CFR Part 268, which restricts the land disposal of certain hazardous wastes.

I. MANAGEMENT AND IDENTIFICATION OF THE WASTE

Check the classification(s) below that indicate the Land Ban status of the waste. For any waste(s) that meets part of the treatment standard and requires additional treatment, you must mark Box A (the waste requires treatment).

X A. RESTRICTED WASTE REQUIRES TREATMENT

I am the initial generator of a restricted waste (i.e. solvent/dioxin, California List, or scheduled waste) which must be treated to the applicable treatment standards set forth in 40 CFR Part 268 Subpart D and all applicable prohibitions set forth in 40 CFR 268.32 or RCRA Section 3004(d) prior to land disposal. This requirement applies to EPA hazardous waste number(s) F002. AND/OR the following California List constituents: (check all that apply):

____ Acid, ____ Metals, ____ Cyanides, ____ HOC's, ____ PCB's,

a. If applicable, the constituents to be monitored for wastes F001-F005, F039, D001, D002 and D012-D043 are also identified on the attached page(s).
b. For all other waste codes, complete the table below:

EPA HAZARDOUS WASTE NUMBER	WW or NWW	TREATMENT STANDARD SUBPART D - 40 CFR 268.40	SUBCATEGORY DESCRIPTION (if applicable)

To list additional USEPA hazardous waste number(s) and subcategory(s), use a supplemental sheet. If a supplemental page is used, check here: ____

___ B. RESTRICTED WASTE CAN BE LAND DISPOSED WITHOUT FURTHER TREATMENT

I am the initial generator of the following EPA hazardous waste number(s) _____. I have determined that the waste meets all applicable treatment standards set forth in 40 CFR 268 Subpart D, and all applicable prohibitive levels set forth in Section 268.32 or RCRA Section 3004(d) and therefore, can be land disposed without further treatment. A copy of all applicable treatment standards and specified treatment methods is maintained at the treatment, storage and disposal facility named above.

"I certify under penalty of law that I personally have examined and am familiar with the waste through analysis and testing or through knowledge of the waste to support this certification that the waste complies with the treatment standards specified in 40 CFR Part 268 Subpart D and all applicable prohibitions set forth in 40 CFR 268.32 or RCRA Section 3004(d). I believe that the information I submitted is true, accurate and complete. I am aware that there are significant penalties for submitting false certification, including the possibility of a fine and imprisonment."

___ C. WASTE SUBJECT TO AN EXEMPTION

The waste identified further is subject to an exemption from a prohibition on the type of land disposal method such as a national capacity variance, a treatability variance, or a case-by-case extension and the waste is not prohibited from land disposal.

a. If applicable, the constituents to be monitored for wastes F001-F005, F039, D001, D002, and D012-D043 are also identified on the attached page(s).
b. For all other waste codes, complete the table below:

EPA HAZARDOUS WASTE NUMBER	WW or NWW	TREATMENT STANDARD SUBPART D - 40 CFR 268.40	SUBCATEGORY DESCRIPTION (if applicable)

___ D. CHARACTERISTIC WASTES D001, D002, AND D012-D043 WITH UNDERLYING HAZARDOUS CONSTITUENTS TREATED ON-SITE

The subject waste has been treated on-site and is being sent off-site for treatment of underlying hazardous constituents.

"I certify under penalty of law that the waste has been treated in accordance with the requirements of 40 CFR 268.40 to remove the hazardous characteristic. This decharacterized waste contains underlying hazardous constituents that require further treatment to meet universal treatment standards. I am aware there are significant penalties for submitting a false certification, including the possibility of fine and imprisonment.

I hereby certify that all information submitted in this and all associated documents is complete and accurate, to the best of my knowledge and information.

Signature [redacted] Title AGENT FOR GENERAL ELECTRIC Date [redacted]

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