

AS BUILT REPORT

**KRUGER FEED AND SEED
NORTH BEND, NEBRASKA**

UG#: 042298-GW-1045

**REMEDIAL IMPLEMENTATION
PERFORMED BY:
CORANCO GREAT PLAINS, INC.
141 W 10TH ST, PO BOX 23
WAHOO, NE 68066**

REPORT PREPARED BY:

A handwritten signature in black ink, appearing to read "Richard L. Hahler".

**RICHARD L. HAHLER
FIELD GEOLOGIST, CGP**

REPORT REVIEWED BY:

A handwritten signature in black ink, appearing to read "Matthew M. Kralik".

**MATTHEW M. KRALIK, P.E.
PROJECT ENGINEER, CGP**

SUBMITTAL DATE: March 24, 2003



| | |
|---|---|
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SECTION 1.0 DISCUSSION

1.1 Report Summary

This is the as-built report for the system installation at Kruger Feed and Seed in North Bend, Nebraska. The report details the activities of the installation of the remediation system. In addition, the report is a record of components of the system.

The site was investigated after a 500 gallon UST was removed on April, 22 1998. A Tier 1 investigation was conducted in October 1999, with a subsequent Tier 2 investigation being performed on June 20, 2002. Free product was discovered in MW1 during the Tier 2 investigation.

Soil vapor extraction was determined to be the most feasible alternative for removal of the free product, with the possibility of installing air sparging (AS) if needed in the future. SVE 1 well was installed on October 11, 2002. It was constructed with 10 feet of 4 inch PVC with 0.020 inch screen, 16/30 gravel pack, and a bentonite seal. The screened interval was 4 to 14 feet.

A 7 foot by 12 foot single axle cargo trailer was placed at the site over SVE 1 and 2 inch PVC was used to connect the treatment systems. The SVE influent is drawn through a moisture separator, by the SVE blower (Ametek Rotron TMD EN 303). The SVE blower is a 0.5 horsepower (Hp) explosion-proof (EXP) regenerative blower. Vacuum gauges and flow meters were placed at intervals to monitor pressure in the lines.

Before the SVE blower motor, the influent is drawn through a knock out tank (Ametek moisture separator) model # MS300D2S. Condensate water is filtered then treated by a granular activated carbon unit and surface discharged. The effluent from the SVE is discharged to the atmosphere.

A control panel with necessary interlocks is located on the outside front end of the trailer. Float switches are installed on the knock out tank to regulate the condensate water release. A Marley electric heater and Dayton exhaust fan was installed to maintain conditions in the trailer.

1.2 Soil and Groundwater Contamination

Soil contamination at Kruger Feed and Seed is being addressed by soil vapor extraction. A 0.5 Hp EXP Ametek regenerative blower creates vacuum for the SVE system. The blower is connected through a moisture separator tank to one SVE well. The radius of influence of this SVE well should be 35 to 40 feet which will encompass the entire extent of soil contamination and free product at the site. Although groundwater contamination will not be addressed at this time the treatment enclosure has adequate space for an air sparge blower if it is necessary based on Tier 2 evaluation.

The SVE line air flow is pulled through a condensate tank, "make-up" air can be added to assist in adjustment of flow rates and vacuum to the well. Following the condensate tank the air flows through an intake filter prior to the blower. Following the blower, the air passes through a discharge silencer and is discharged to the atmosphere 20 feet above the ground surface. The condensate that accumulates in the tank is pumped with a ½ Hp transfer pump through a filter and a carbon bed for treatment. The treated condensate is surface discharged.

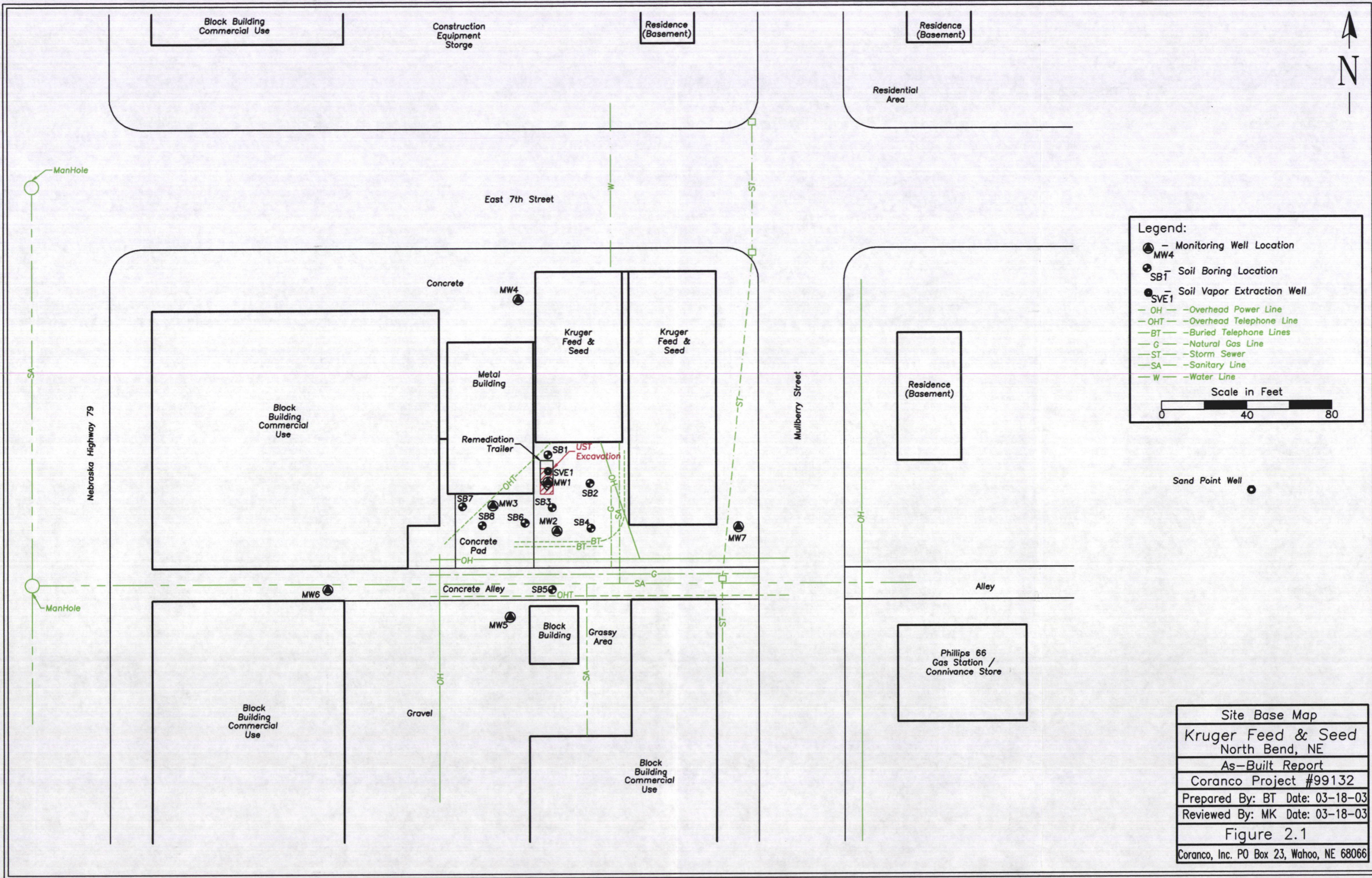
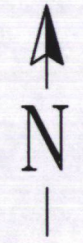
Table 1 : well details

| Well Number | Type of Well Head | Well Diameter (inches) | Screen Interval (feet) | Slot Size (inches) | Gravel Pack Interval (feet) | Gravel Pack Size |
|-------------|-------------------|------------------------|------------------------|--------------------|-----------------------------|------------------|
| SVE 1 | Flush mount | 4 | 4.0 - 14.0 | 0.020 | 3.0 - 14.0 | 16/30 |

1.3 Start-Up of System

Start up of the system was performed on Monday, February 10, 2003. On Wednesday, February 12, 2003, Mr. Kruger reported gas odors in his shop and office. CGP immediately contacted NDEQ and dispatched technicians to the site who confirmed Mr. Kruger's report. Our technicians indicated that gas odors were noticeable in the office shop and very strong odors around the remediation trailer, but no odors were evident in the remediation trailer. After shutting down the system CGP decreased the vacuum by increasing the "make-up" air to dilute the gas odors. It has been the experience of CGP that odors and vapors from SVE systems are highest during the first month after start-up of a system. After a couple of months, CGP will increase the vacuum. If vapors remain a problem CGP will first put a timer on the system to allow gas odors to dissipate between run times. If problems consist, off gas treatment such as vapor phase carbon will be investigated.

SECTION 2.0 SITE REMEDIATION PLAN/ AS-BUILT
DRAWINGS



Legend:

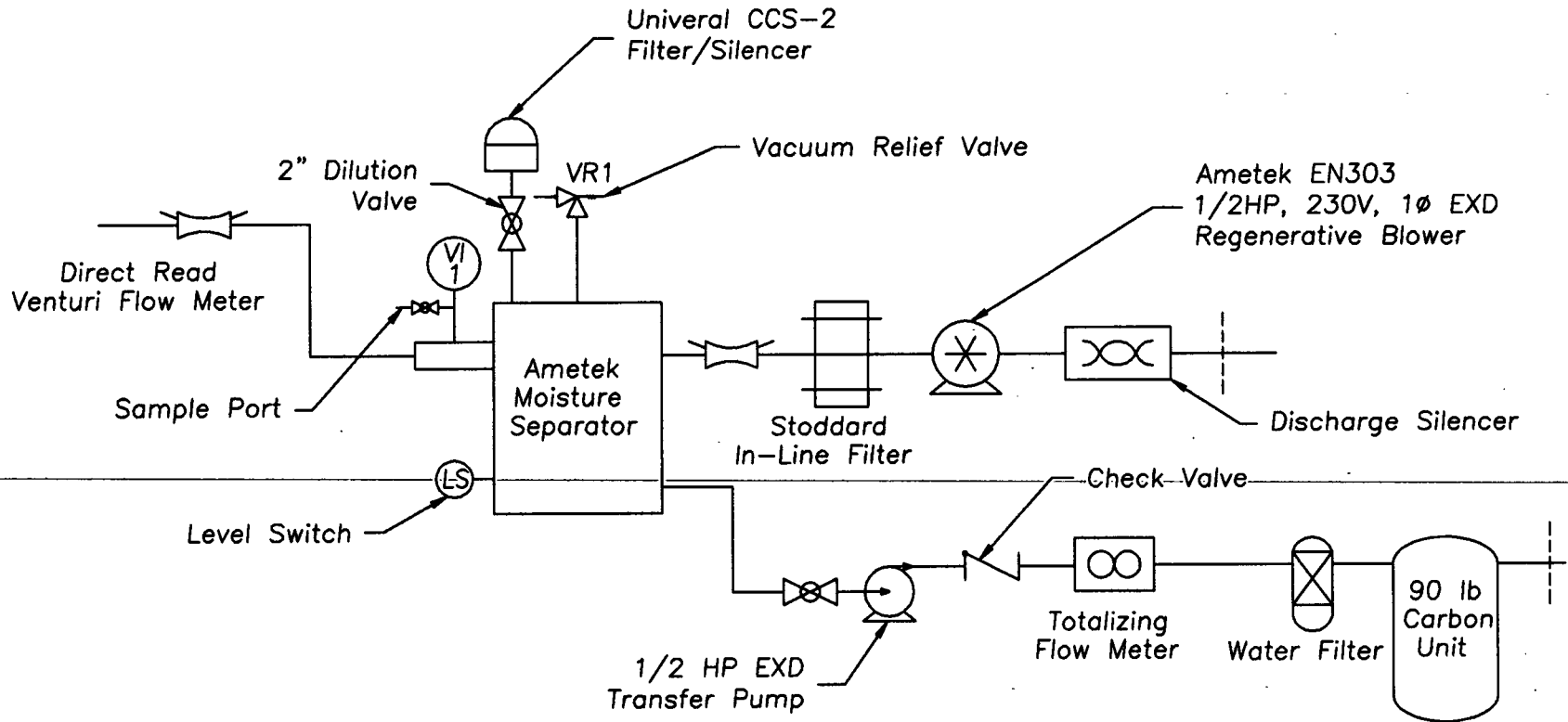
- - Monitoring Well Location
MW4
- - Soil Boring Location
SB1
- - Soil Vapor Extraction Well
SVE1
- OH - Overhead Power Line
- OHT - Overhead Telephone Line
- BT - Buried Telephone Lines
- G - Natural Gas Line
- ST - Storm Sewer
- SA - Sanitary Line
- W - Water Line

Scale in Feet

Sand Point Well ●

| |
|--|
| Site Base Map |
| Kruger Feed & Seed North Bend, NE |
| As-Built Report |
| Coranco Project #99132 |
| Prepared By: BT Date: 03-18-03 |
| Reviewed By: MK Date: 03-18-03 |
| Figure 2.1 |
| Coranco, Inc. PO Box 23, Wahoo, NE 68066 |

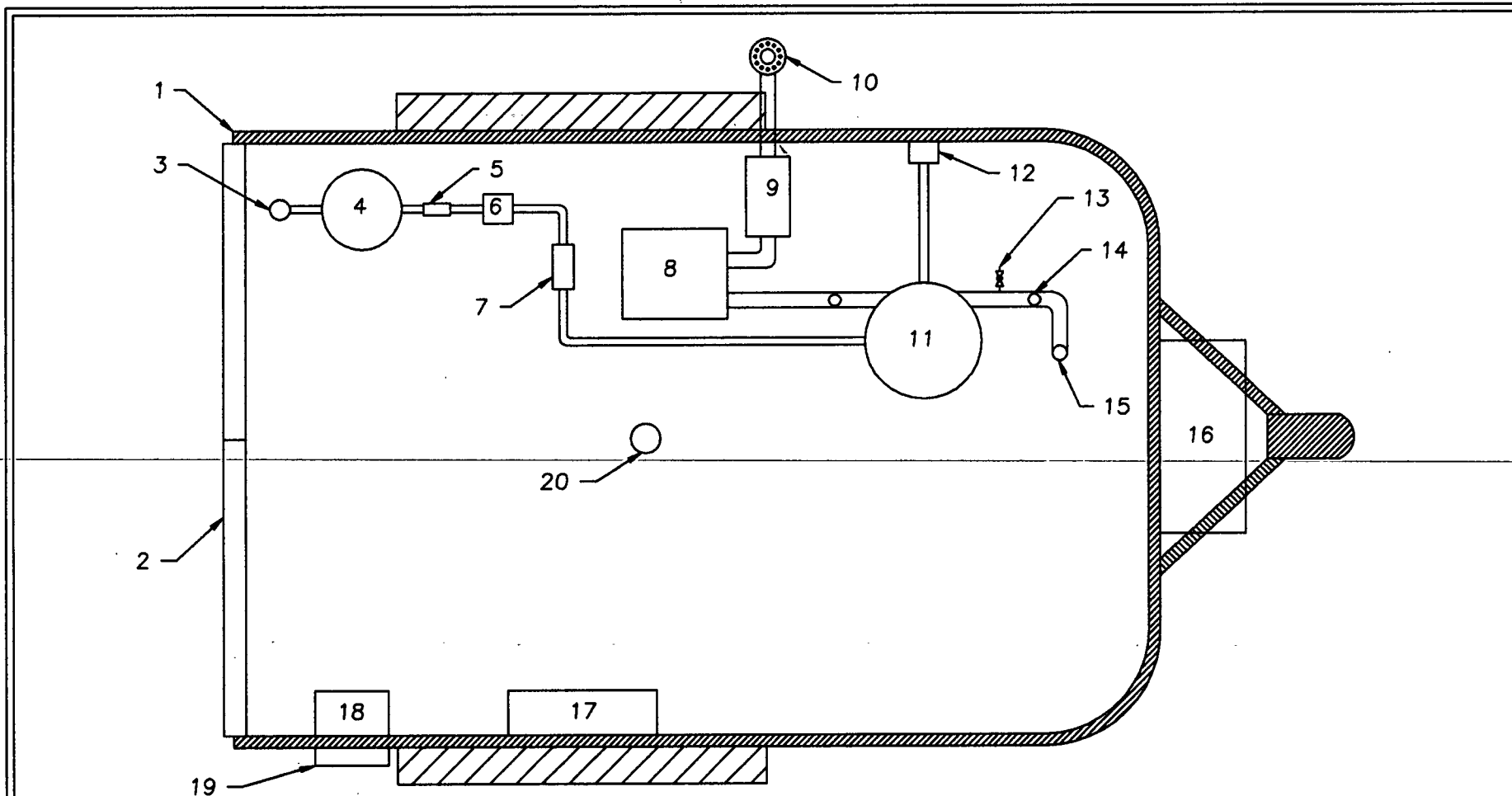
FIGURE 2.2 PROCESS AND INSTRUMENT
DIAGRAM



Not To Scale

| |
|--------------------------------------|
| SVE Unit P&ID |
| Kruger Feed & Seed |
| North Bend, NE |
| As-Built Report |
| CGP Project #99132 |
| Prepared By: BT Date: 03-18-03 |
| Reviewed By: MK Date: 03-18-03 |
| Figure 2.2 |
| CGP, Inc. PO Box 23, Wahoo, NE 68066 |

FIGURE 2.3 TREATMENT TRAILER LAYOUT

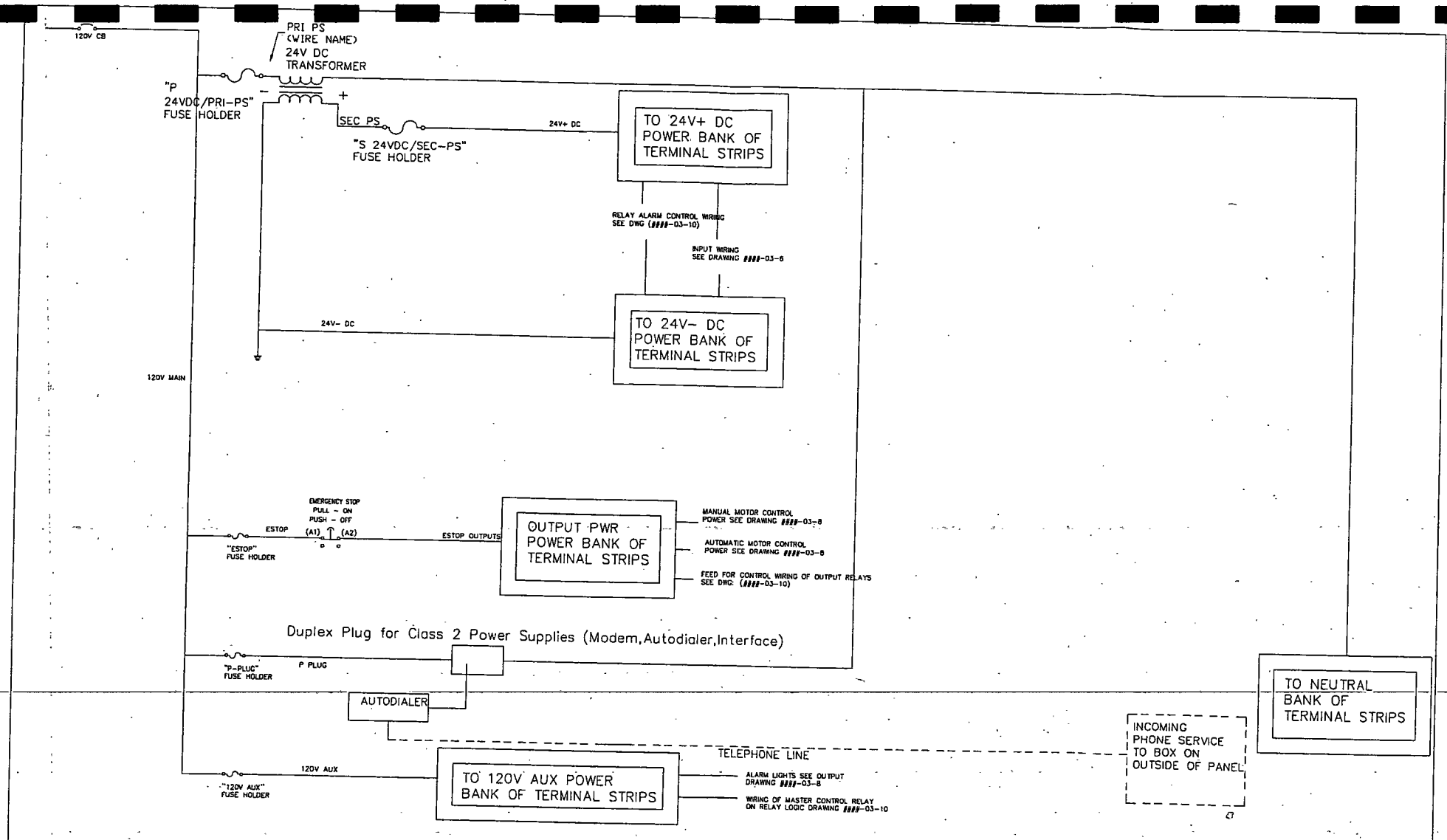


Not To Scale

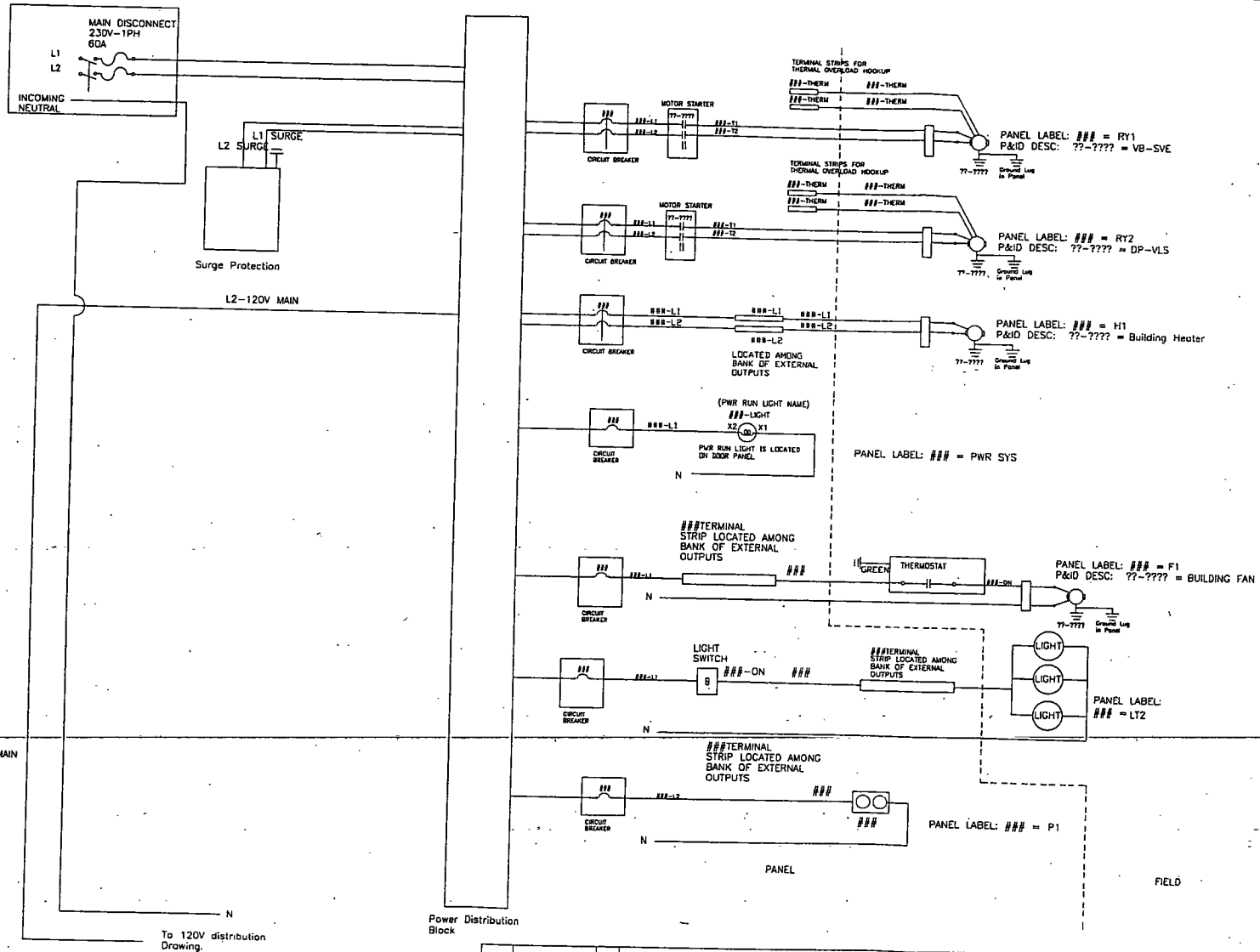
| Legend | |
|------------------------------------|---------------------------------|
| 1- Doolittle Cargo Trailer | 11- 10 Gallon Knockout Tank |
| 2- Trailer Door | 12- Make-up Air Inlet Filter |
| 3- Condensate Drain | 13- Ball Valve (Sample Port) |
| 4- 90 Pound Carbon Unit | 14- Vacuum Gauge |
| 5- Flow Totalizer | 15- SVE Influent |
| 6- In-Line Filter | 16- NEMA 4 Control Panel |
| 7- 1/2 HP Transfer Pump | 17- Explosion Proof Heater |
| 8- 1/2 HP SVE Unit | 18- Hazardous Location Vent Fan |
| 9- Carbon Steel Discharge Silencer | 19- Aluminum Exhaust Shutters |
| 10- 2" Steel SVE Discharge | 20- Vapor Tight Light |

| |
|--------------------------------------|
| Trailer Layout |
| Kruger Feed & Seed |
| North Bend, NE |
| As-Built Report |
| CGP Project #99132 |
| Prepared By: BT Date: 03-18-03 |
| Reviewed By: MK Date: 03-18-03 |
| Figure 2.3 |
| CGP, Inc. PO Box 23, Wahoo, NE 68066 |

FIGURE 2.4 WIRING DIAGRAMS
(2 PAGES)

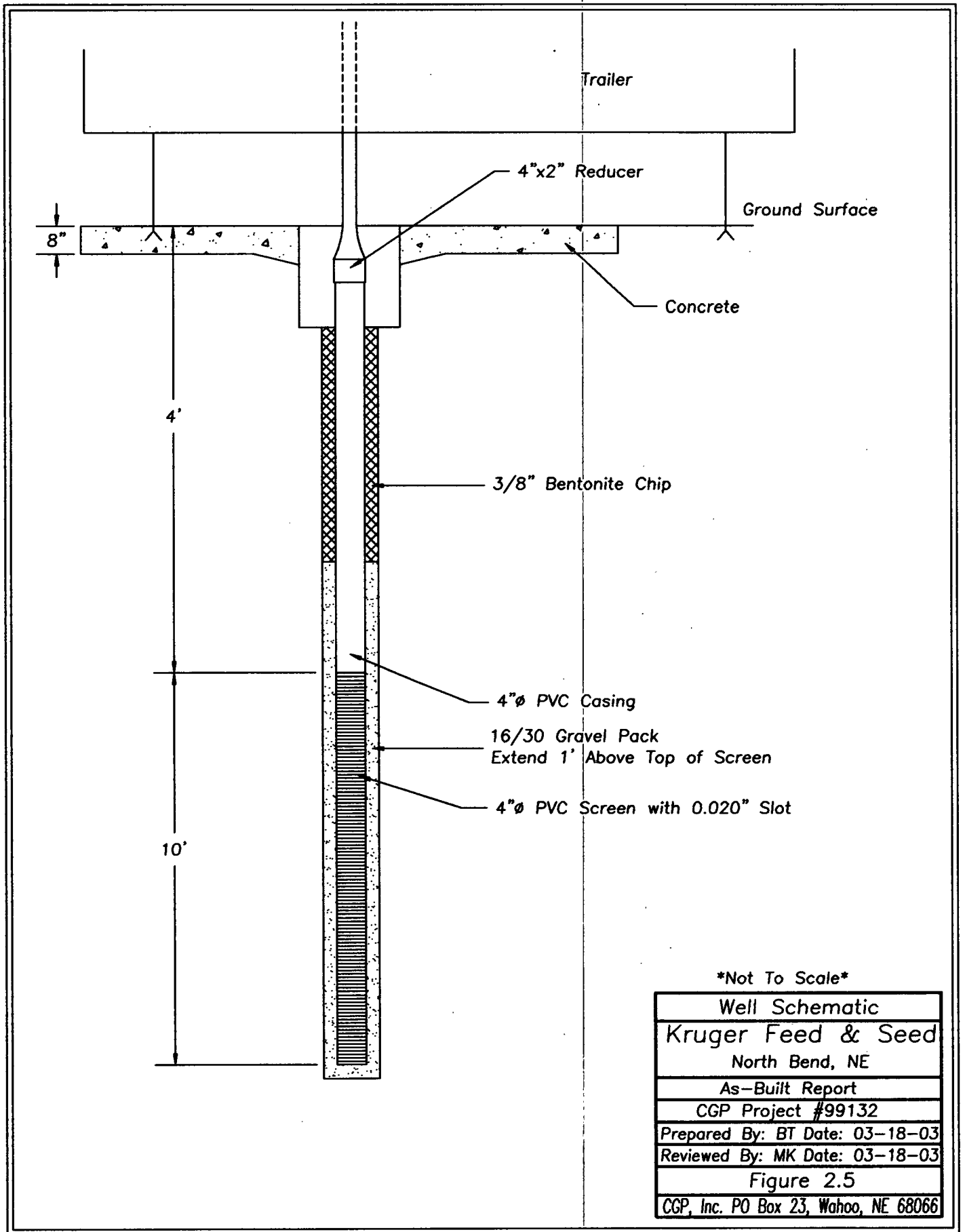


| | | | | | |
|-------|------------|----|----------------|---|-------------------------|
| | | | | MAPLE LEAF ENVIRONMENTAL EQUIPMENT LTD. | |
| | | | | TITLE: 120V DISTRIBUTION | |
| C | DEC. 5.02 | PK | AS BUILT | DRAWN BY: JK | CUSTOMER: CORANCO PANEL |
| B | NOV. 27.02 | JK | FOR PRODUCTION | DATE: NOV. 27.02 | ABE |
| LEVEL | DATE: | BY | REVISION: | APPROVED: | DWG. NO. 8247 -03-4 |



| | | | | | |
|-------|-------------|----|----------------|---|---------------------------|
| | | | | MAPLE LEAF ENVIRONMENTAL EQUIPMENT LTD. | |
| | | | | TITLE: Motor and Fuse Drawing | |
| C | DEC. 5,02 | PK | AS BUILT | DRAWN BY: JK | CHECKED BY: CORANCO PANEL |
| B | NOV. 27,020 | JK | FOR PRODUCTION | DRAWN BY: ABE | CHECKED BY: ABE |
| LEVEL | DATE | BY | REVISION | DATE | DWG. NO: 8247 -03-3 |

FIGURE 2.5 WELL SCHEMATICS



SECTION 3.0
EQUIPMENT DOCUMENTATION



Maple Leaf Environmental Equipment Ltd.

CORANCO PANEL

PROJECT # 8247

Site:

Coranco Great Plains

Prepared For

Coranco Great Plains

Attention: Matt Kralik
141 West 10th Street
PO Box 23
Wahoo, Nebraska 68066

Operation and Maintenance Manual

Prepared by
Maple Leaf Environmental
1-800-420-4056

Copy to:
A Better Earth
Gunner Peterson 66071

Equipment Description

RELAY BASED CONTROL PANEL

- Includes
- Nema 4 control panel to be shipped loose
 - Relays for control circuitry
 - Sensaphone 1104 autodialer
 - Primary circuit protection using ~~30~~ **60 amp** fused main disconnect
 - Branch circuit protection with breakers for:
 - SVE motor
 - VLS Transfer pump motor
 - Building ventilation fan
 - Building heater
 - Building light
 - GFCI receptacle
 - Two (2) motor starters with overload protection:
 - SVE motor
 - VLS Transfer pump motor
 - System inputs to include:
 - VLS high level switch
 - VLS high level pump control switch
 - System outputs to include:
 - SVE blower
 - VLS transfer pump
- The outside cover of the control panel to contain the following:
- Two (2) HOA switches with green run lights:
 - SVE motor
 - VLS Transfer pump motor
 - One (1) HO switch:
 - Building light
 - One (1) amber light:
 - Main power on/off
 - One (1) Red alarm indicator light
 - VLS HHL
 - One (1) alarm reset button
 - Two (2) hour meters for:
 - SVE motor
 - VLS Transfer pump motor

One (1) adjustable delay timer – to be used with VLS high level switch to shut pump off (adjustable from 1 to 5 minutes)

One 24 V power supply

Two (2) IS Barriers:

- VLS HHL alarm switch
- VLS High level pump control switch

Wired and installed

Factory tested prior to shipping

Detailed manuals

FREIGHT AS INCURRED

INCLUDED

Detailed manuals

Shipping

NOT INCLUDED

Electrical service and hook-up to system

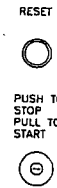
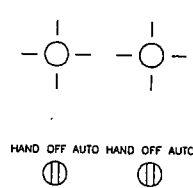
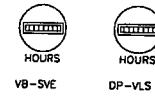
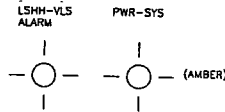
Federal, State/Provincial, or Local taxes unless otherwise stated

Local approvals and certificates

CONTROL PANEL

WARNING:
INTRINSICALLY SAFE
CIRCUIT INSIDE

THIS UNIT IS DESIGNED TO OPERATE AT 24VDC. THE USER MUST BE AWARE OF THE FACT THAT THE UNIT IS NOT TO BE OPERATED AT ANY OTHER VOLTAGE. THE USER MUST BE AWARE OF THE FACT THAT THE UNIT IS NOT TO BE OPERATED AT ANY OTHER VOLTAGE. THE USER MUST BE AWARE OF THE FACT THAT THE UNIT IS NOT TO BE OPERATED AT ANY OTHER VOLTAGE.



CAUTION:
DISCONNECT POWER
BEFORE OPENING

MAIN
DISCONNECT

EXTERNAL
DISCONNECT
NEMA 3R

NEMA 4 PANEL

Lights & Switches mounted on inner
swing panel door.

| | | | | | | | |
|-------|------------|----|----------------|---|----------|-----------|---------------|
| | | | | Maple Leaf Environmental Equipment Ltd. | | | |
| | | | | TITLE: Panel Layout | | | |
| C | DEC. 5.02 | PK | AS BUILT | DRAWN BY: | DAM | CUSTOMER: | coronco panel |
| B | NOV. 27.02 | JK | FOR PRODUCTION | DATE: | 15-11-02 | ABC | |
| A | 15-11-02 | JD | FOR APPROVAL | APPROVED: | | DWG. NO: | 8247 -03-1 |
| LEVEL | DATE | BY | REVISION | | | | |

Note: Fuses Listed here should be ordered from the Fuse Schedule on the Electrical Components list.

**Main Disconnect
Details on Main Disconnect found in Control Module!**

| | |
|--|--------------------|
| Main Power Block | Part Number |
| Description | 67583 |
| For Normal System, 175 A Rating, 8 poles | 1 Gould |

Total Balanced System Power Consumption

Main Equipment Power Consumption: 8656
Main Equipment Amps: 37

Power Consumption of main equipment listed below

Main Equipment Power Consumption: 8656
Main Equipment Amps: 53

**MOTORS WITH
CONTACTORS, OVERLOADS, AND CIRCUIT BREAKERS**

Note: Part number for Cuttler Hammer Din rail mounted breakers is QC3015 where 30 is three pole and 15A Total Amperage :
Total Power : 2944

| | Label | HP | V | Power Amps | Quant | Make | Part Number |
|-------------------|-------|-----|------|------------|-------|----------------|-----------------|
| VB-SVE | RY1 | 2 | 230T | 9.1 | | | |
| Amps | | | | | | | |
| Contact | RY1 | | | | 1 | Square D | LC1D1210G6 |
| Overload | RY1 | | | | 1 | Square D | LR2D1314(7-10) |
| Circuit Breaker | RY1 | | | | 1 | Cuttler Hammer | QC2015H |
| Breaker Size | | | | | 15 | | |
| Wire Gauge | | | | | 14 | | |
| Power Consumption | | | | 2192 | | | |
| DB-VLS | RY2 | 0.5 | 230T | 3.1 | | | |
| Amps | | | | | | | |
| Contact | RY2 | | | | 1 | Square D | LC1D0910G6 |
| Overload | RY2 | | | | 1 | Square D | LR2D1308(2.5-4) |
| Circuit Breaker | RY2 | | | | 1 | Cuttler Hammer | QC2015H |
| Breaker Size | | | | | 15 | | |
| Wire Gauge | | | | | 14 | | |
| Power Consumption | | | | 752 | | | |

Power Wiring with Circuit Breakers

Total Amperage : 25.0
Total Power : 2875

| | F1 | Watts |
|---------------------|------|-------|
| BUILDING FAN | 1000 | 115 |
| Amps | | |
| Circuit Breaker | F1 | 8.33 |
| Breaker Size | | |
| Wire Gauge | | |
| Power Consumption | | 958 |

| | H1 | 1800 | 230T |
|------------------------|----|------|------|
| BUILDING HEATER | | | |
| Amps | | | |
| Circuit Breaker | H1 | 7.83 | |
| Breaker Size | | | |
| Wire Gauge | | | |
| Power Consumption | | 1878 | |

| | LT1 | 1000 | 115 |
|------------------------|-----|------|-----|
| BUILDING LIGHTS | | | |
| Amps | | | |
| Circuit Breaker | LT1 | 8.33 | |
| Breaker Size | | | |
| Wire Gauge | | | |

*****NOTE BUILDING LIGHTS REQUIRE SWITCH AS WELL MOUNTED ON PANEL SIDE

| | QC1015H | 15 | 14 |
|-----------------|---------|----|----------------|
| Circuit Breaker | QC1015H | 1 | Cuttler Hammer |
| Breaker Size | | | |
| Wire Gauge | | | |

Power Consumption

958

GFI PLUG P1 1400 115

Amps 11.7
 Circuit Breaker P1 1 Cutler Hammer QC1015H
 Breaker Size
 Wire Gauge
 Power Consumption 1342

15
14

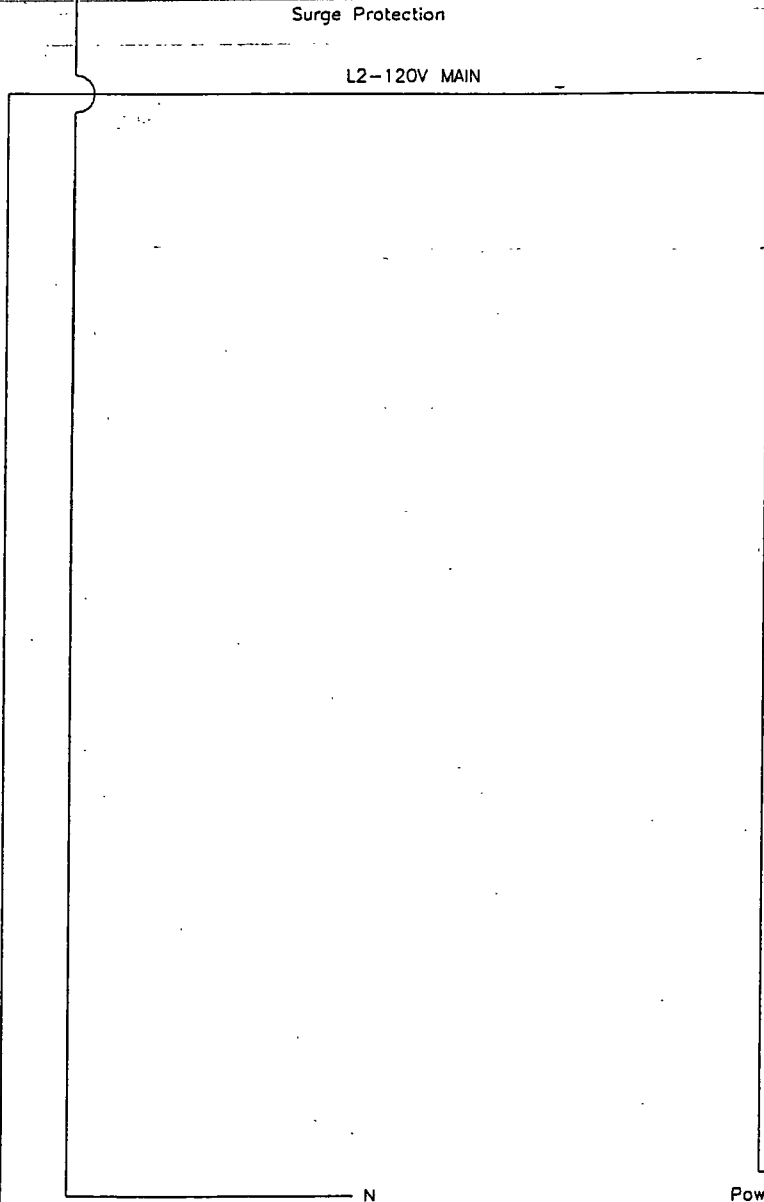
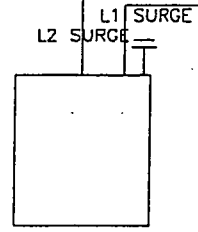
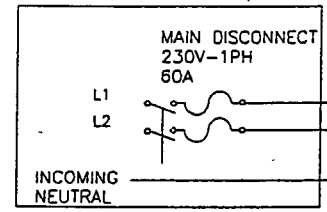
CONTROL BREAKER FOUND ON 120V DISTRIBUTION DRAWING

CONTROL POWER 120VCB 600 115

Amps 5
 Circuit Breaker 120VCB 1 Cutler Hammer QC1015H
 Breaker Size
 Wire Gauge
 Power Consumption 575

15
14

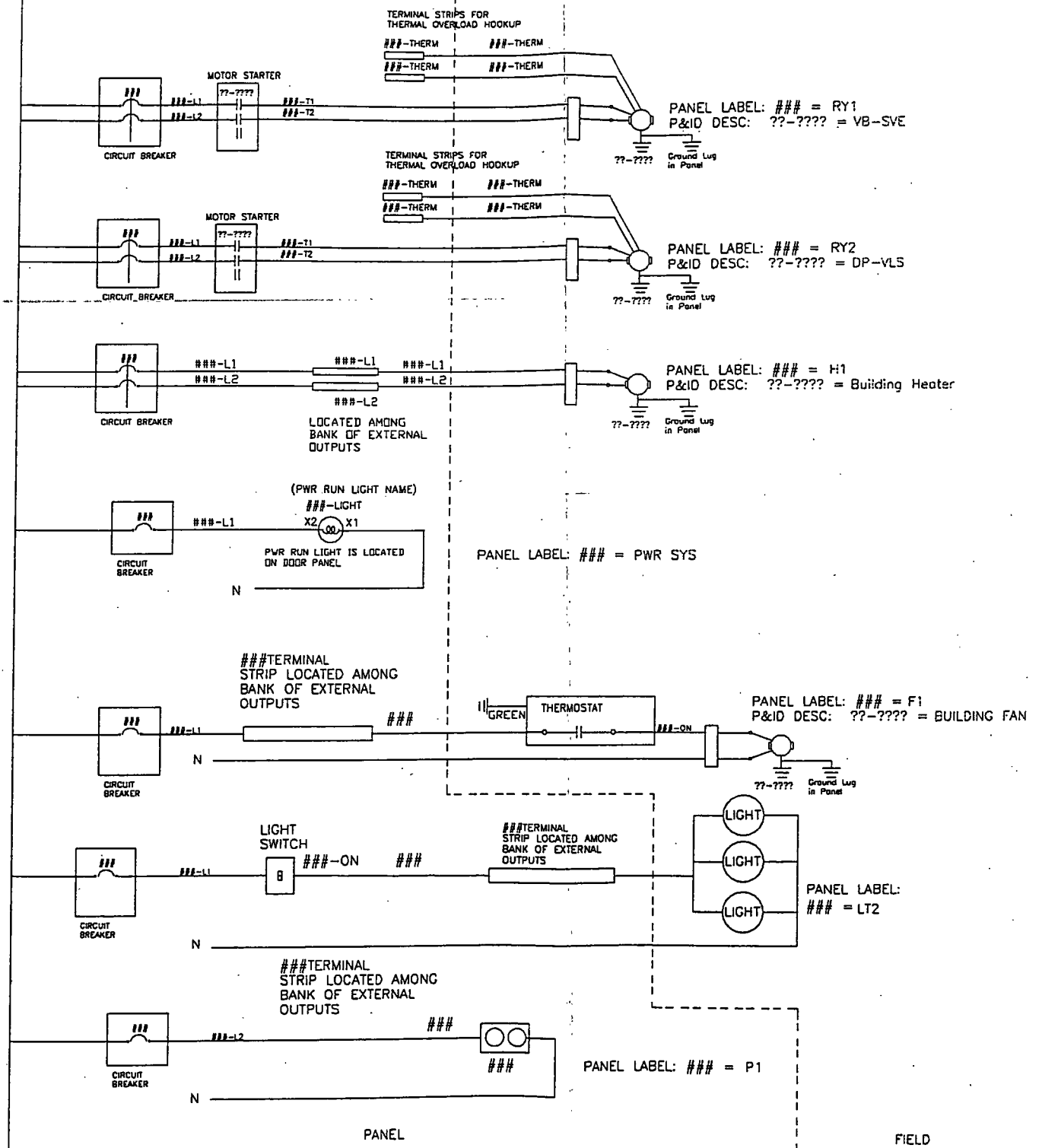
| | | | | | |
|-------|-----------|----|----------------|------------------------------------|-----------------------------------|
| | | | | MAPLE LEAF ENVIRONMENTAL EQUIPMENT | |
| | | | | MOTOR AND FUSE SCHEDULE | |
| C | DEC 5,02 | PK | AS BUILT | DRAWN BY: JD | CUSTOMER: CORANCO PANEL ABE |
| B | NOV 27,02 | JK | FOR PRODUCTION | | |
| A | 15-11-02 | JD | FOR APPROVAL | DATE: 15-11-02 | |
| Level | DATE | BY | REVISION | APPROVED | DWG. - NO: 8247 - 03 -2 |



L2-120V MAIN

To 120V distribution Drawing.

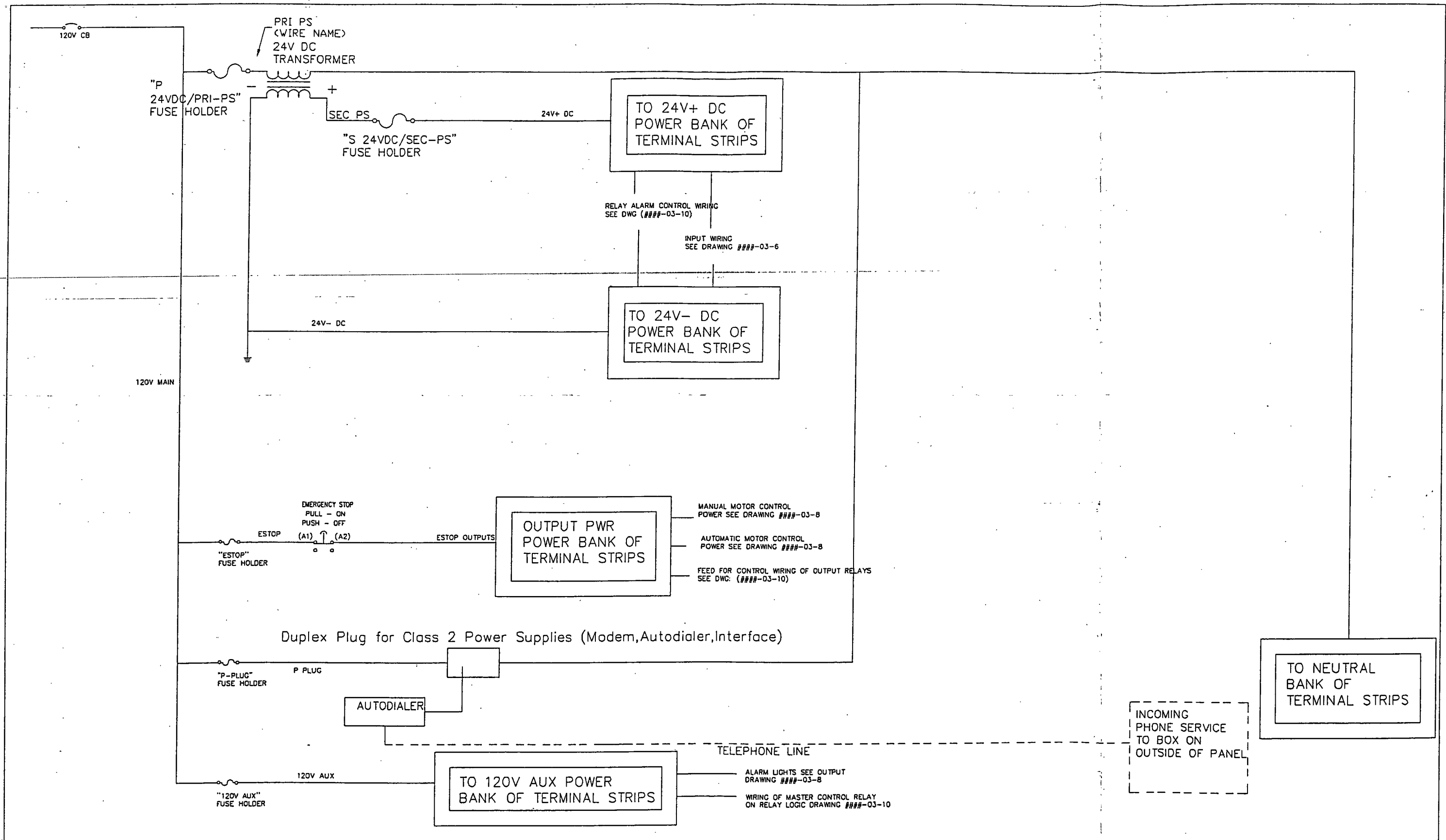
Power Distribution Block



PANEL

FIELD

| | | | | | |
|-------|-------------|----|----------------|---|-------------------------|
| | | | | MAPLE LEAF ENVIRONMENTAL EQUIPMENT LTD. | |
| | | | | Motor and Fuse Drawing | |
| | | | | DRWN BY: JK | CUSTOMER: CORANCO PANEL |
| | | | | DATE: NOV. 27,020 | ABE |
| | | | | APPROVED: | DWG. NO: 8247-03-3 |
| LEVEL | DATE: | BY | REVISION: | | |
| C | DEC. 5,02 | PK | AS BUILT | | |
| B | NOV. 27,020 | JK | FOR PRODUCTION | | |



| | | | | | |
|-------|-------|------------|----|---|-----------------------------|
| | | | | MAPLE LEAF ENVIRONMENTAL EQUIPMENT LTD. | |
| | | | | TITLE: 120V DISTRIBUTION | |
| C | | DEC. 5,02 | PK | AS BUILT | DRAWN BY: JK |
| B | | NOV. 27,02 | JK | FOR PRODUCTION | CUSTOMER: CORANCO PANEL ABE |
| LEVEL | DATE: | | BY | REVISION: | APPROVED: |
| | | | | | DWG. NO: 8247 -03-4 |

Input Table

| DESCRIPTION INPUT NAME LOCATION | P&ID DESCRIP. | | PANEL LABEL | NO/ NC | Test | Input Configuration | | | | | | | | | | | |
|--|---------------|------|-------------|--------|------|---------------------|-----|-----|-----|------|------|-----|-----|------|-----|-----|--|
| | INPUT | LOC. | | | | IS | Alm | Int | Ext | Ball | 120V | Ser | Par | 4-20 | xpf | dis | |
| Level Switch HiHi - Vapor Liquid Separator | LSHH | VLS | RX1 | NO | | y | y | | | | y | | | | | | |
| Level Switch High - Vapor Liquid Separator | LSH | VLS | RX2 | NO | | y | | | | | y | | | | | | |
| Reset - System | RST | SYS | | NO | | | | | | y | | | | | | | |
| Kill Switch - System | KILL | SYS | | NO | | | y | | y | | | | | | | | |

NOTE: When using 2DL05 CPU's always use inputs X0-X7 & outputs Y0-Y5 for "PLC A" & use inputs X20-X27 & outputs Y20-Y25 on "PLC B"

Column Descriptions

Description: This is the description of the input.

P&ID Description: This is the symbol that describes the Input. These symbols are used on Process Flow and Instrumentation Drawings and are explained in the drawing legend.

Panel Label: This is the Input Label name used in the control panel for labeling motor starters, overloads, wires, terminal strips as per the input, output standard wiring drawings

NO/NC: This indicates how the switch is wired in the field. Regardless of the position of the switch under normal operation.

Test: Indicated that the logic for this Input has been tested

Input Configuration: These columns include descriptors that explain the configuration of the inputs. If a "y" is present then the configuration parameter applies to that input.

IS- Intrinsically Safe Input running through IS Barriers

Alm - This input has an alarm tied to it.

ext- External input found in the external inputs block of terminal strips and is wired to a device external from the panel.

int- Internal input found in the internal inputs block of terminal strips and is wired to a device internal to the panel.

Ball- Ball float level switch is used here and is self latching. It will eliminate the need for two level switches to pump down a pump

120V- 120V Inputs

Ser- This input is wired in series with another input.

Par - This input is wired in parallel with another input

4-20 - Analogue input, 4 to 20 Milli-amps.

xpf - This is an explosion proof input device

dis-Input is generated from the user interface screen

| MAPLE LEAF ENVIRONMENTAL EQUIPMENT | | | | | |
|------------------------------------|-------------|----|----------------|----------------|-----------------------------|
| | | | | INPUT TABLE | |
| C | DEC. 5, 02 | PK | AS BUILT | DRAWN BY: JD | CUSTOMER: Coranco Panel ABE |
| B | NOV. 26, 02 | JK | FOR PRODUCTION | DATE: 15-11-02 | |
| A | 15-11-2 | jd | Approval | APPROVED | DWG. - NO: 8247 - 03 -5 |
| Level | DATE | BY | REVISION | | |

Output Table

| Output Description | | P&ID Description | Panel | PLC | Tested | Output Configuration | | | | | | | | | | Dialer | Output | Control Description | Stop Requirements | | |
|--------------------|--------------------------|------------------|-------|-------|--------|----------------------|----|-----|-----|-------|--------|-----|----|-----|-----|--------|--------|---------------------|-------------------|-----------------------|---|
| Output | Location | Output Loc. | Label | POINT | | ms | wv | dct | hoa | therm | thrmst | run | hr | amp | vid | psav | msav | Input | | Type | Start Requirements |
| Vacuum Blower | - Soil Vapor Extraction | VB SVE | RY1 | | | y | | | y | y | | y | y | | | | | | Int | System On | System is off. |
| Discharge Pump | - Vapor Liquid Separator | DP VLS | RY2 | | | y | | | y | y | | y | y | | | | | | Int | system on +lsh-vls on | system off or lsh-vls off for timer time (adjustable) |

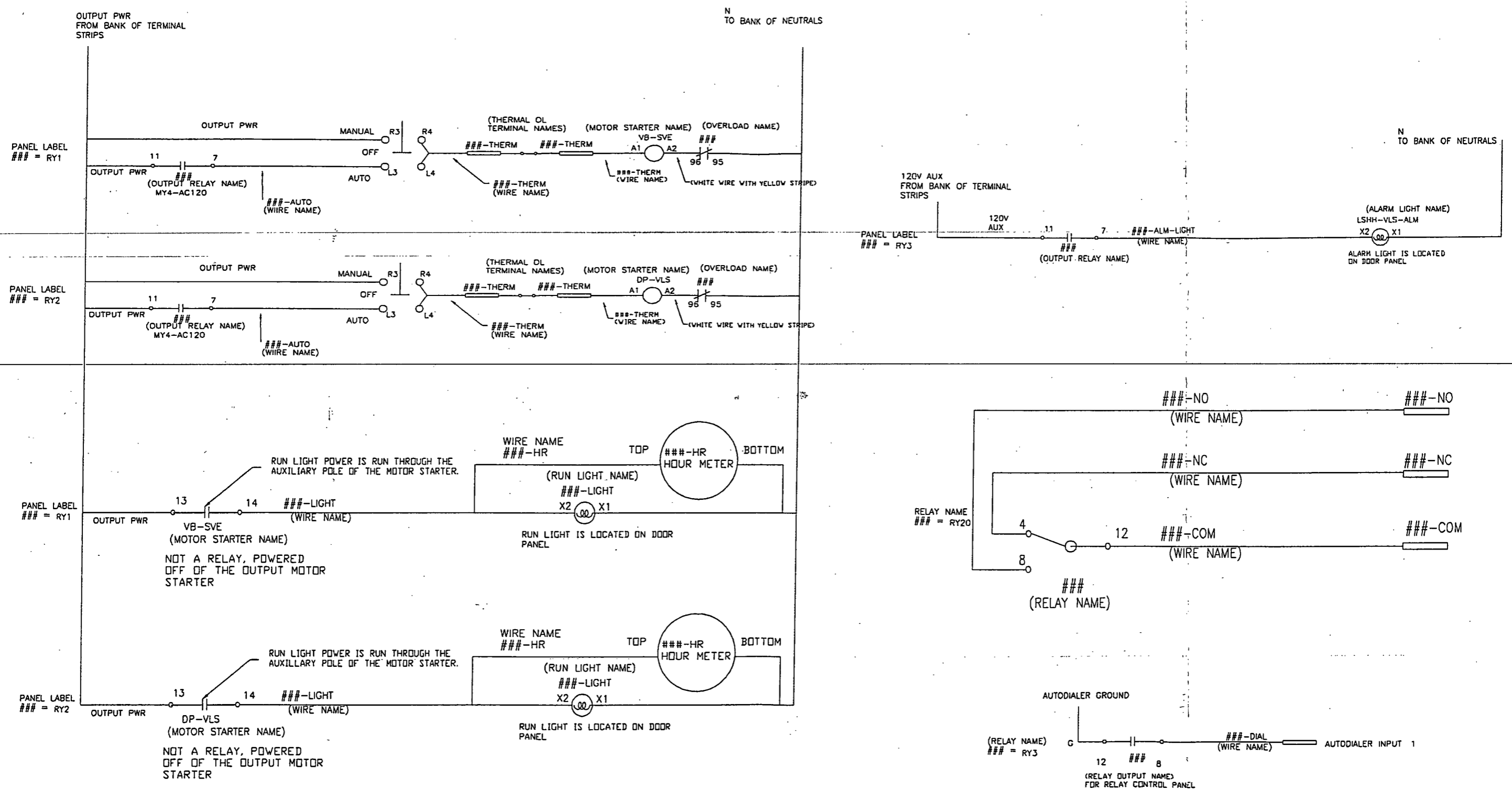
| Alarm Description | | | P&ID Description | Panel | PLC | Tested | Alarm Configuration | | | | | | | Dialer | Output | Control Description | Stop Requirements | |
|--------------------|--------------------------|--------|------------------|-------|-------|--------|---------------------|------|-----|-----|-----|------|----|--------|--------|---------------------|-------------------------------------|----------------------|
| Input | Location | Alm | Input Loc. | Label | POINT | | alm | sens | dct | dis | sys | dial | lt | rmf | Input | Type | | Start Requirements |
| Level Switch Hi-Hi | - Vapor Liquid Separator | -Alarm | LSHH VLS -ALM | RY3 | | | y | y | | y | | | | | 1 | int | Alarm input is on for 5 seconds | Reset Button Pressed |
| System | - Panel | -Alarm | SYS PAN -ALM | RY20 | | | | y | | | | | | | | int | any system alarm listed above is on | Reset Button Pressed |
| Power | - System | -Alarm | pwr sys | | | | amber | | y | | | | | | | int | amber light is on if power is on | Reset Button Pressed |

Power Failure Restart: System Operation: Automatic Start up after power failure.

Column Descriptions

Description: This is the description of the output.
 P&ID Description: This is the symbol that describes the Output. These symbols are used on Process Flow and Instrumentation Drawings and are explained in the drawing legend.
 Panel Label: This is the Output Label name used in the control panel for labeling motor starters, overloads, wires, terminal strips as per the input, output standard wiring drawings
 PLC POINT: This is the terminal name that the output is connected to the PLC. This information is often listed when the production package is put together.
 Tested: This column will be checked once the control logic has been tested for this device.
 Output Configuration: This column indicates the various output properties. The symbols used here are described below.
 ms- This output operates a motor starter (contactor).
 wv- This output operates a valve.
 therm- Thermal Overloads present at motor and must be wired into motor starter control line.
 thrmst- Thermister present at motor and must be wired into motor starter control line.
 hoa- Hand / Off / Auto switches are present to operate output.
 Run- Run Light is present indicating when the Contactor is activated.
 Hr- Hour meter is present counting the hours of operation when the contactor is activated and a run light is on.
 Amp- Ammeter is present measuring the amps of one of the pumps.
 vid- Variable frequency drive is used.
 psav- A pump saver is used on this well pump to monitor the amps drawn and shut the system down when they well runs dry.
 msav- A motor saver is used on this motor to monitor the power through the contactor. If the power looses a phase or has a voltage spike the motor saver will kill the control power to the contactor.
 Alarm Configuration: This column indicates the various alarm properties. The symbols used here are described below.
 ALM Code - This is the code in the PLC for the alarm that ties to the MLEE remote access system.
 alm- Alarm output used to run an alarm light.
 dct- This output relay is used to provide a dry contact to indicate when the output is on.
 sens- This output is used to provide an input to the autodialer.
 dis- Alarm is displayed on the user interface screen
 sys- "Y" Output sets the system alarm, "Wts" Output sets water treatment system alarm, "sve" Output sets SVE system alarm, blank means no system alarms are set
 dial- Output sets the dialout alarm
 lt- Output sets a system alarm light.
 rmt- This alarm can be read with the remote interface system.
 Output Type: This can be either internal or external.
 Internal- Input is generated within the panel and the input terminal strip is located among the bank of internal inputs.
 External- Input is generated outside of the panel and the input terminal strip (for non IS inputs) is located among the bank of external inputs.
 Dialer Input: This is the input in an autodialer that is wired the particular output condition. See Sensaphone wiring diagram.
 Control Description Start Requirements: Requirements that must be met to start this output relay.
 Control Description Stop Requirements: Requirements that must be met to stop this output relay.
 Note: + is used to indicate that both items must be present to cause the system to start or stop
 Note: or is used to indicate that either one or the other or both items will cause the system to start or stop.

| MAPLE LEAF ENVIRONMENTAL EQUIPMENT | | | | | |
|------------------------------------|------------|----|----------------|---------------|-------------------------|
| OUTPUT TABLE | | | | | |
| C | DEC. 5,02 | PK | AS BUILT | DRAWN BY: JRD | CUSTOMER: Coranco Panel |
| B | NOV. 27,02 | JK | For PRODUCTION | DATE: 15-11-2 | ABE |
| A | 15-11-02 | jd | For Approval | APPROVED | DWG. NO: 8247-03-7 |
| Level | DATE | BY | REVISION | | |

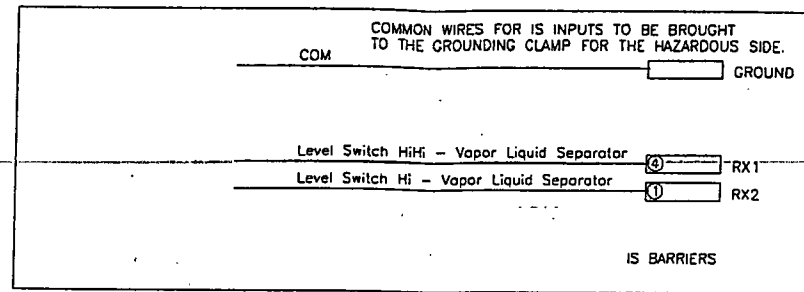


FIELD WIRING TO BE COMPLETED
 ACCORDING TO THE CANADIAN ELECTRICAL CODE
 OR THE NATIONAL ELECTRICAL CODE DEPENDING ON
 LOCATION OF THE INSTALLATION.

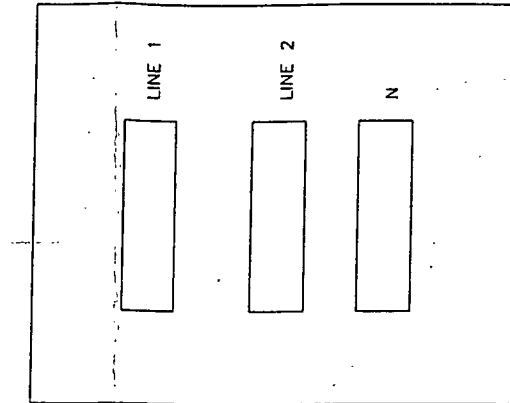
| | | | |
|---|------------|-------------------------|----------------|
| MAPLE LEAF ENVIRONMENTAL EQUIPMENT LTD. | | | |
| OUTPUT DRAWING | | | |
| LEVEL | DATE | BY | REVISION |
| C | DEC 5,02 | PK | AS BUILT |
| B | NOV. 27,02 | JK | FOR PRODUCTION |
| DRAWN BY: JK | | CUSTOMER: CORANCO PANEL | |
| DATE: NOV. 27,02 | | ABE | |
| APPROVED: | | DWG. NO: 8247-03-8 | |

NOTE SEE INPUT DRAWING
 ###-03-6 FOR DETAILED
 WIRING OF IS BARRIERS IF REQUIRED

Intrinsically Safe Connections at Top, Left side
 of Panel

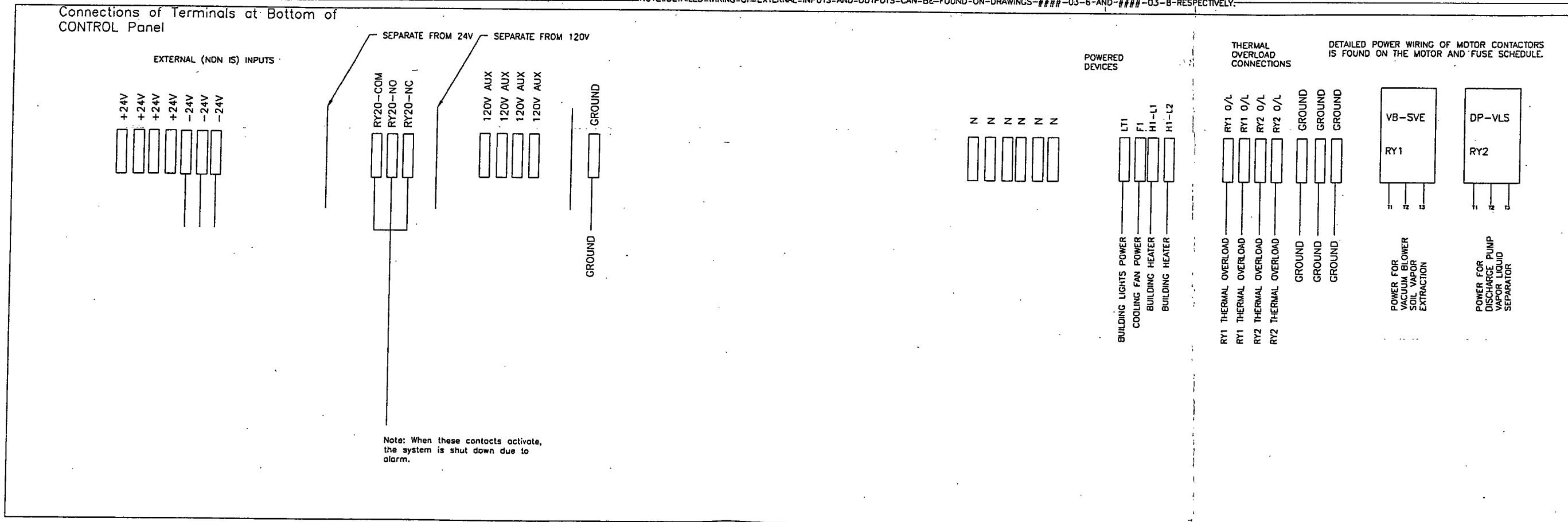


MAIN DISCONNECT NEXT TO PANEL



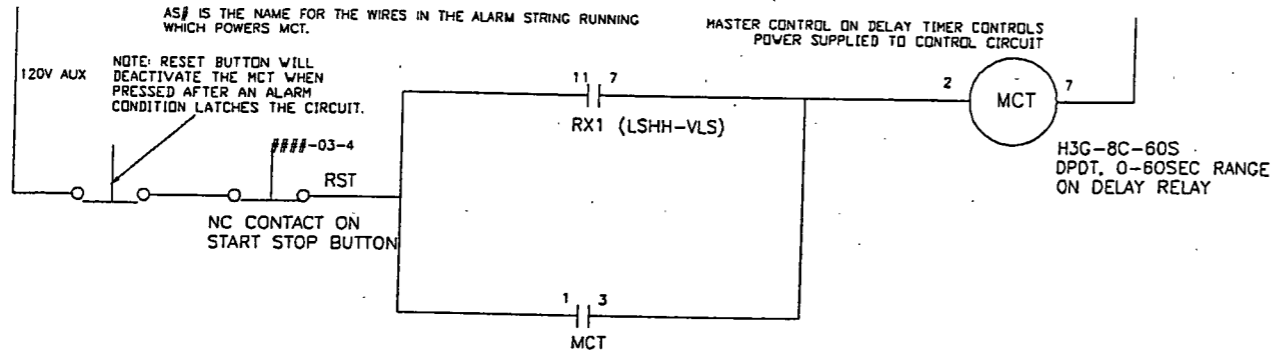
NOTE - DETAILED WIRING OF EXTERNAL INPUTS AND OUTPUTS CAN BE FOUND ON DRAWINGS ###-03-6 AND ###-03-8 RESPECTIVELY.

Connections of Terminals at Bottom of
 CONTROL Panel



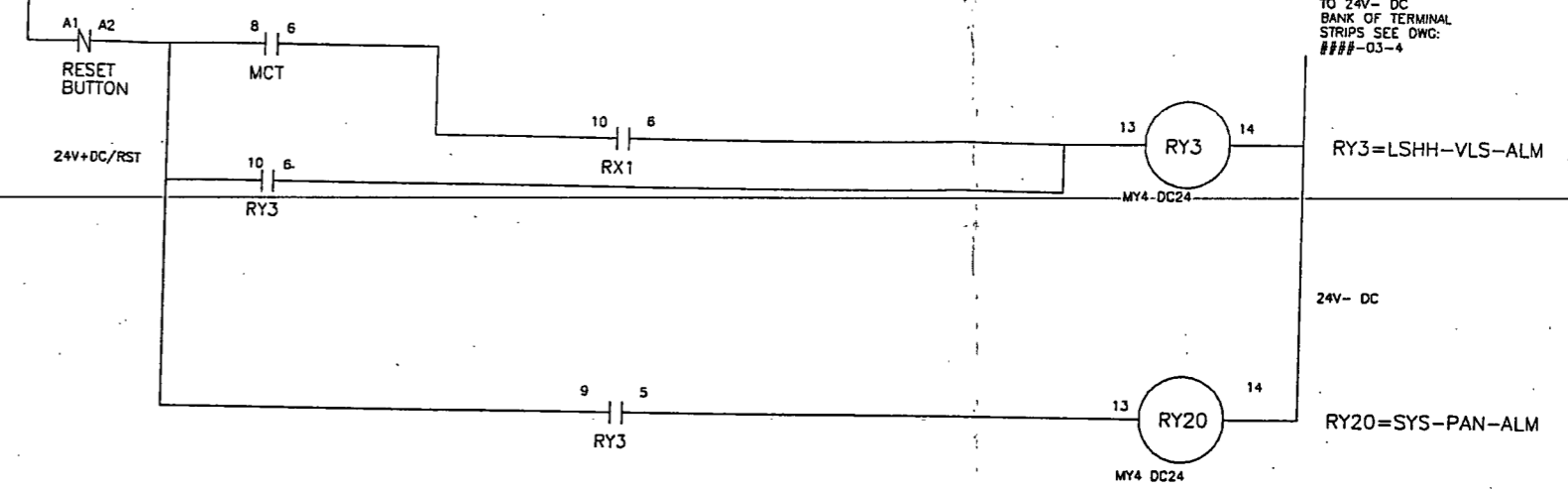
| | | | | | |
|-------|-----------|----|----------------|---|------------|
| | | | | MAPLE LEAF ENVIRONMENTAL EQUIPMENT LTD. | |
| | | | | Field Wiring | |
| C | DEC 5,02 | PK | AS BUILT | NOV | JK |
| B | NOV 27,02 | JK | FOR PRODUCTION | NOV | JK |
| LEVEL | DATE | BY | REVISION | PROJECT | DWG. NO. |
| | | | | | 8247-03-10 |

FROM 120V AUX BANK OF TERMINAL STRIPS SEE DWG:



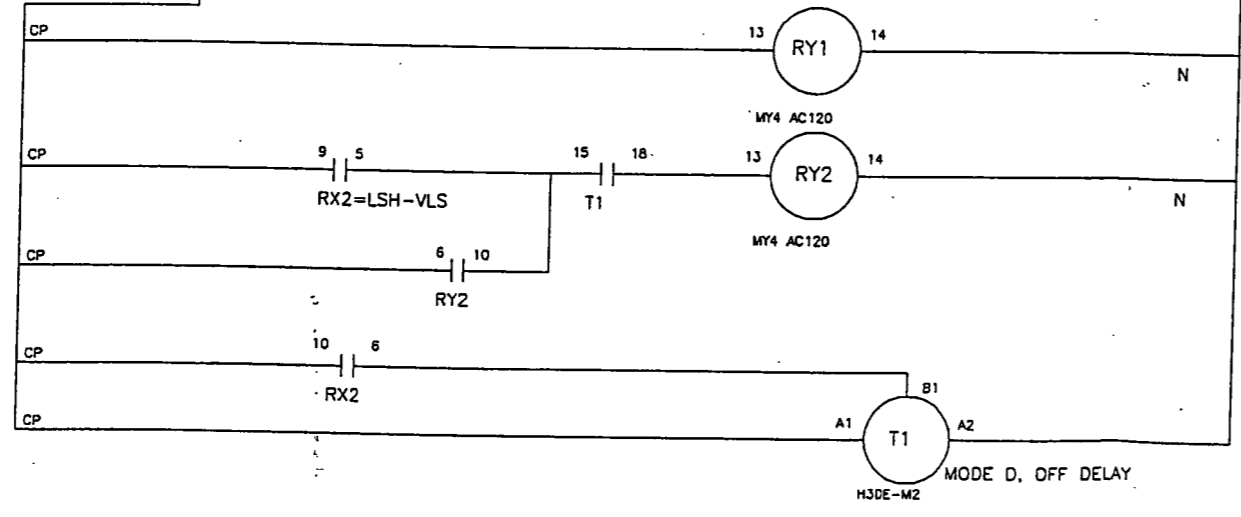
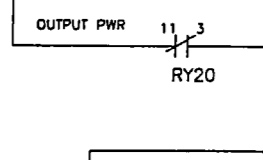
WIRING OF MASTER CONTROL POWER DELAY TIMER (used to delay the alarm inputs to eliminate nuisance shutdowns)

FROM 24V+ DC BANK OF TERMINAL STRIPS SEE DWG: ###-03-4



WIRING OF HARD ALARM RELAYS

FROM THE OUTPUT PWR BANK OF TERMINAL STRIPS SEE DWG: ###-03-4

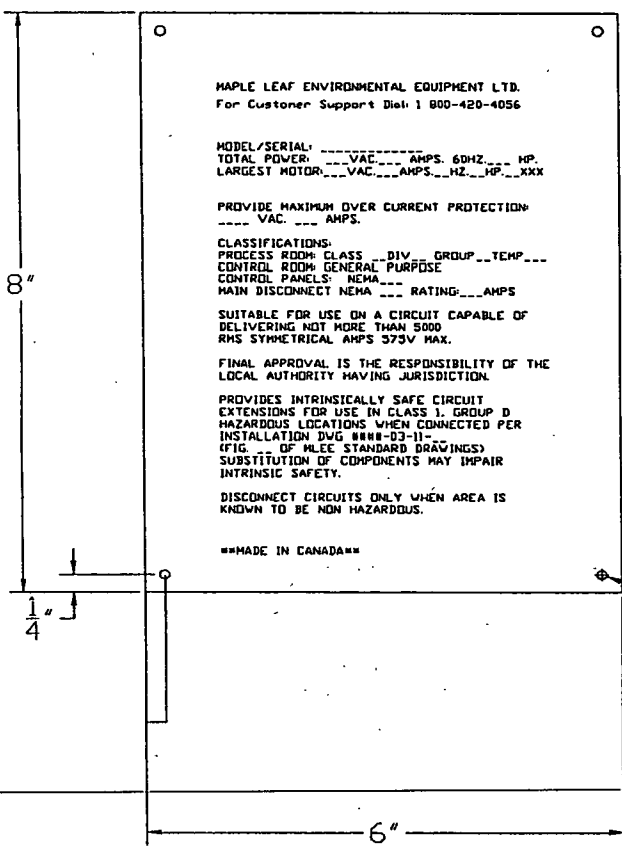


CONTROL WIRING OF OUTPUT RELAYS

STANDARD WIRING LABEL FORMAT
 WIRING LABELS FOR WIRES NOT SHOWN IN THIS BOX WILL BE IN THE FOLLOWING FORMAT: RX4/3-RY6/8. THIS DESCRIBES WHERE THE WIRE IS COMING FROM AND WHERE THE WIRE IS GOING. IN THE GIVEN EXAMPLE THE WIRE IS COMING FROM TERMINAL 3 OF RELAY RX4 AND IS GOING TO TERMINAL 8 OF RELAY RY6.

| | | | | | |
|--------|------------|-----|----------------|---|-------------------------|
| | | | | MAPLE LEAF ENVIRONMENTAL EQUIPMENT LTD. | |
| | | | | Relay Logic Drawing | |
| C | DEC 5,02 | PK | AS BUILT | DRAWN BY: JK | CUSTOMER: CORANCO PANEL |
| B | NOV. 28,02 | JK | FOR PRODUCTION | DATE: NOV. 28,02 | ABE |
| LEVEL: | DATE: | BY: | REVISION: | APPROVED: | DWG. NO: 8247-03-9 |

Fig. 19 UL Label for Classified Areas



MAPLE LEAF ENVIRONMENTAL EQUIPMENT LTD.
For Technical Support Dial: 1 800-420-4056

MODEL/SERIAL: 8247

TOTAL POWER: 230 VAC. 37 AMPS. 60HZ. 3 HP, 1 PH
LARGEST MOTOR: 230 VAC. 91 AMPS. 60HZ. 2 HP, 1 PH

PROVIDE MAXIMUM OVER CURRENT PROTECTION:
230 VAC. 60 AMPS.

CLASSIFICATIONS:
CONTROL PANEL BUILT ACCORDING TO UL 698: INDUSTRIAL
CONTROL PANELS RELATING TO HAZARDOUS LOCATIONS
CONTROL PANELS: NEMA 4
MAIN DISCONNECT NEMA 3R RATING: 60 AMPS

SUITABLE FOR USE ON A CIRCUIT CAPABLE OF
DELIVERING NOT MORE THAN 5000
RMS SYMMETRICAL AMPS 575V MAX.

EVALUATED BY APPROVAL AUTHORITY FOR ELECTRICAL
FEATURES ONLY

FINAL APPROVAL IS THE RESPONSIBILITY OF THE
LOCAL AUTHORITY HAVING JURISDICTION.

PROVIDES INTRINSICALLY SAFE CIRCUIT
EXTENSIONS FOR USE IN CLASS 1, GROUP D
HAZARDOUS LOCATIONS WHEN CONNECTED PER
INSTALLATION DWG #####-03-6
SUBSTITUTION OF COMPONENTS MAY IMPAIR
INTRINSIC SAFETY.

DISCONNECT CIRCUITS ONLY WHEN AREA IS
KNOWN TO BE NON HAZARDOUS.

MADE IN CANADA

METAL NAME PLATE WITH BLACK WRITING

| | |
|-----------------|------------|
| ATT: _____ | FAX: _____ |
| NAME: _____ | |
| PD#: _____ | |
| REQ DATE: _____ | |

| | | | | | |
|-------|------|----|----------|--|---------------------------------|
| | | | | MAPLE LEAF ENVIRONMENTAL EQUIPMENT LTD. | |
| | | | | TITLE: Fig 19. UL Label for Classified Areas | |
| | | | | DRAWN BY: JRD | CUSTOMER: MLEE Standard Drawing |
| | | | | DATE: 2001-03-23 | |
| | | | | APPROVED: | DWG. NO: 8247-03-11-19 |
| LEVEL | DATE | BY | REVISION | | |

Maple Leaf Environmental Equipment Ltd.

Proj: 8247

| DESCRIPTION: | MODEL: | MANUFACTURER: | QTY. | M | S | D | P&ID Desc | PO # |
|--|--------------------------------------|---------------|---------------|-----|------|---|-----------|------|
| Parts for ordering with Mechanical Equipment | | | | | | | | |
| Main Disconnect | | | | | | | | |
| 1ph | | | | | | | | |
| 60A, UL, 240V, 1PH, Nema 3R Fusible Disconnect | D222NRB | Square D | 1 | | | | | 001 |
| Disconnect Fuses | | | | | | | | |
| 240V DISCONNECT FUSE | TR60R | GOULD | 2 | | | | | 001 |
| IS Barriers and Chassis | | | | | | | | |
| Zener Diode Barriers 2 input circuit | Z779.H | Pepperl+Fuchs | 1 | | x | x | | 002 |
| Insulating Spacers for Barriers | ZH-Z AB/NS | Pepperl+Fuchs | 2 | | x | x | | 002 |
| Grounding Clamps | ZH-Z USLKG10 | Pepperl+Fuchs | 2 | | x | x | | 002 |
| Communications Modules | | | | | | | | |
| Sensaphone Autodialer, 4 channel Input | 1104 | Sensaphone | 1 | | X | X | | 003 |
| Electrical Parts to be Ordered with Production Package with Parts on Motor Schedule | | | | | | | | |
| 120V Fuse Holders (not Listed on Motor and Fuse Schedule) | | | | | | | | |
| Mini Fuse Holder | 199 095.13 | Entrelec | 5 | | | | | |
| Fuse Schedule | | | | | | | | |
| Name | Description | Part Number | Manufacturer | Qty | Amps | | | |
| Main Disconnect | | | | | | | | |
| "Main Disconnect" Fuses | Power Distribution Fuses | TR60R | Gould | 2 | | | | |
| RY1 | CIRCUIT BREAKER | QC2015H | Cutler Hammer | 1 | 15 | | | |
| RY2 | CIRCUIT BREAKER | QC2015H | Cutler Hammer | 1 | 15 | | | |
| F1 | CIRCUIT BREAKER | QC1015H | Cutler Hammer | 1 | 15 | | | |
| H1 | CIRCUIT BREAKER | QC2015H | Cutler Hammer | 1 | 15 | | | |
| LT1 | CIRCUIT BREAKER | QC1015H | Cutler Hammer | 1 | 15 | | | |
| P1 | CIRCUIT BREAKER | QC1015H | Cutler Hammer | 1 | 15 | | | |
| 120V and Control Fuses | | | | | | | | |
| Main 120V CB | 15 A Breaker | QC1015 | SQD | 1 | 15 | | | |
| P 24V DC | Primary 24V DC Transformer Fuse | GDL1 | Gould | 1 | 1 | | | |
| S 24V DC | Secondary 24V DC Transformer Fuse | GDL2 | Gould | 1 | 2 | | | |
| ESTOP | Emergency Stop Fuse for Output Power | GDL2 | Gould | 1 | 2 | | | |
| P-PLUG | Panel Plug Fuse | GDL2 | Gould | 1 | 2 | | | |
| 120V AUX | 120V Auxillary Power Fuse | GDL2 | Gould | 1 | 2 | | | |

Maple Leaf Environmental Equipment Ltd.

Proj: 8247

| DESCRIPTION: | MODEL: | MANUFACTURER: | QTY. | M | S | D | P&ID Desc | PO # |
|--|--------------------|---------------------|------------|----------|----------|----------|----------------------|------------------|
| M: Manual is provided for this item S: Spec sheet (with flow curve if relevant) is provided D: Drawing is required for this part | | | | | | | | |
| Circuit Breaker Lockout Clips | QC123PL | Cuttler Hammer | 6 | | | | | |
| 24VDC Power Transformer | | | | | | | | |
| Description | Part Number | Manufacturer | Qty | M | S | S | P&ID Desc | PO Number |
| 24V DC Transformer 7.5W covered 0.6A | S82K-01524 | OMRON | 1 | | | | | |
| Buttons and Lights and Panel Meters | | | | | | | | |
| EMERGENCY STOP BUTTON | | | | | | | | |
| BUTTON | | | | | | | | |
| HEAD | ZB4BZ101 | SQD | 1 | | | | | |
| NC CONTACT | ZB4BT4 | SQD | 1 | | | | | |
| | ZBE102 | SQD | 2 | | | | | |
| RESET BUTTON | | | | | | | | |
| Momentary Black Button | ZB4 BA2 | Telemechanique | 1 | | | | | |
| Collar with NC Contact Blocks | ZB4 BZ102 | Telemechanique | 1 | | | | | |
| NC Addon Block | ZBE 102 | Telemechanique | 1 | | | | | |
| Switch, 3 Position, HOA, | ZB4 BD3 | Telemechanique | 2 | | | | | |
| Switch Base, 3 Position, HOA | ZB4BZ103 | Telemechanique | 2 | | | | | |
| Panel Lights | | | | | | | | |
| 120V Light, Green | ZB4 BV03 | Telemechanique | 2 | | | | | |
| 120V Light, Red | ZB4 BV04 | Telemechanique | 1 | | | | | |
| 120V Light, Amber | ?????? | Telemechanique | 1 | | | | | |
| Light Base | ZB4 BV6 | Telemechanique | 4 | | | | | |
| Light Bulbs | 967 | Haskellite | 4 | | | | | |
| HOUR METER | | | | | | | | |
| 110V Hour meter, Non resettable | 0779516-201 | Danaher | 2 | | | | | |
| Relays and Timers | | | | | | | | |
| Relay, 4 pole, DT, 120VAC coil | MY4 120AC | Omron | 2 | | X | X | | |
| Relay, 4 pole, DT, 24VDV coil | MY4 24DC | Omron | 4 | | X | X | | |
| Relay Base, 4 Pole, DT, Din-Rail Mounted | PYF14A-E | Omron | 6 | | | | | |
| Master Control Timer, On Delay, DPDT, 120V, 0-60Sec Range | H3G-8C-60S | Omron | 1 | | X | X | | |
| Master Control Timer Base, 2 Pole, DT, Din-Rail Mounted | PF083A-E | Omron | 1 | | | | | |
| Multi purpose timer with built in base. On delay, Signal off delay, 24VDC TO 120VAC, DPDT | H3DE-M2-AC120 | Omron | 1 | | X | X | | |
| CONTROL PANELS | | | | | | | | |
| | Panels | | | | | | | |
| 30x30x12, Nema4, inner panel included | 1073600 | Rittal | 1 | | | | | |
| 30x30, Swing Panel | SZ9962960 | Rittal | 1 | | | | | |
| CONTROL PANEL LABEL | | | | | | | | |
| PANEL LABEL | SEE DRAWING | JD ENGRAVING | 1 | | X | X | | |

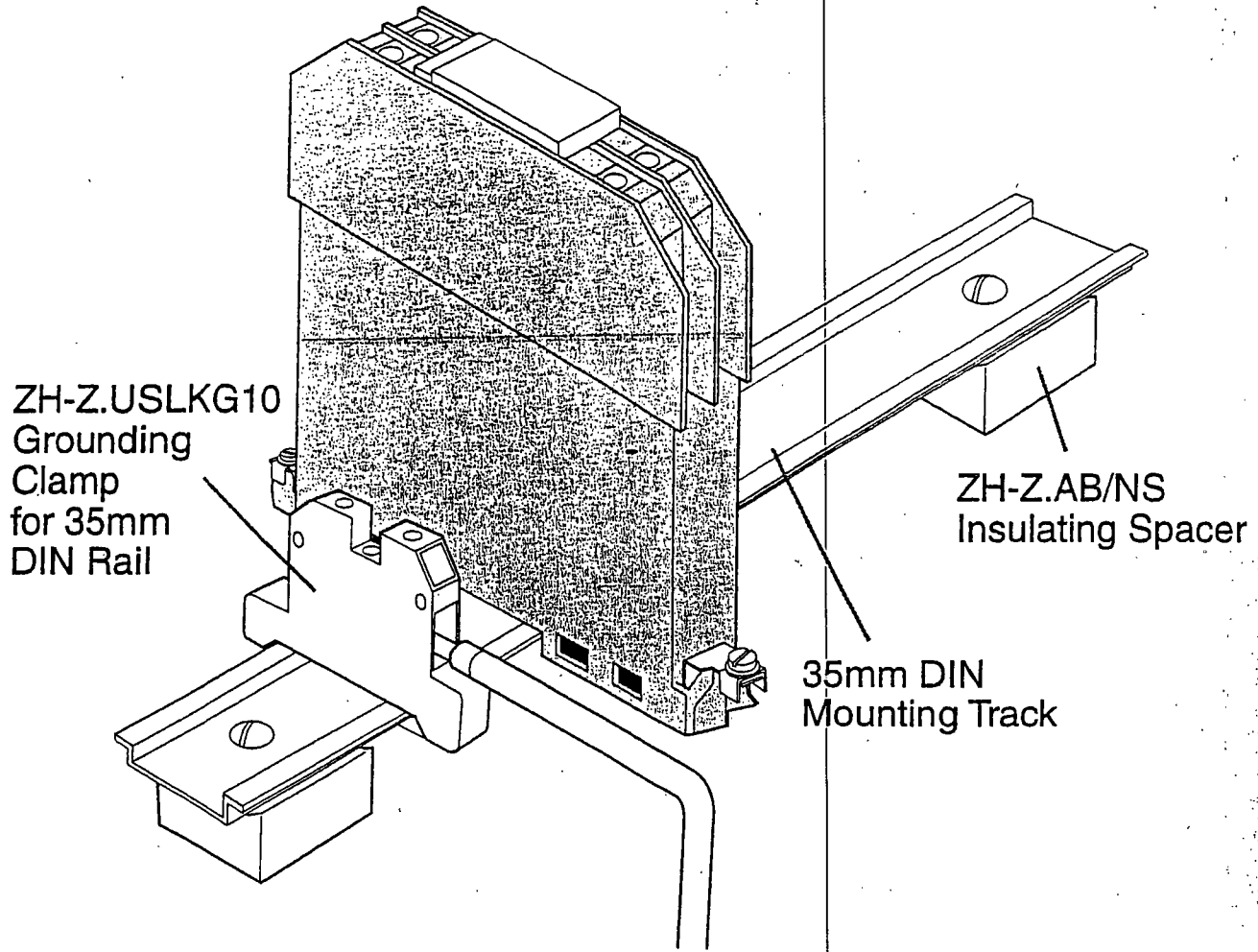
Maple Leaf Environmental Equipment Ltd.

Proj: 8247

| DESCRIPTION: | MODEL: | MANUFACTURER: | QTY. | M | S | D | P&ID Desc | PO # |
|------------------------------|--------------|---------------|------|---|---|---|-----------|------|
| ACCESSORIES FOR PANEL | | | | | | | | |
| GFI Duplex Plug, 15A | 6599-I | LEVETON | 1 | | | | | |
| Plug Cover, Nema 4 | 4996-GY | LEVETON | | | | | | |
| Plug Box, Nema 4 | 3/4FS | ipex | | | | | | |
| Light Switch | 1451-I | Leveton | 1 | | | | | |
| Nema 4 Box | PVC 34FS | IPEX | 1 | | | | | |
| Nema 4 Cover | PVC VSC15/10 | IPEX | 1 | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

M: Manual is provided for this item
 S: Spec sheet (with flow curve if relevant) is provided
 D: Drawing is required for this part

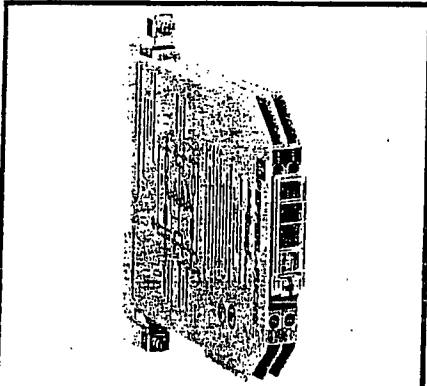
58



Zener Diode Barriers

58

SafeSnap



- Model Numbers**
DC Models Dual Channel
- Z778 (Z878) ■ Z788.H (Z888.H)
 - Z779.H (Z879.H) ■ Z796 (Z896)
 - Z786 (Z886)
 - Z788 (Z888)

- Narrow 12.5 mm profile
- Snaps-on for easy mounting and grounding
- Dedicated terminal for each connection

SafeSnap dual-channel zener barriers feature a narrow profile of just 12.5 mm to maximize control panel space. Available in positive or negative polarity, these barriers simply snap on for easy installation and maintenance.

Note: All diodes are orientated in the opposite direction for the negative polarity versions.

Zener Diode Barriers

| Model No. | Working voltage at 10 μ A leakage | Max. end to end resistance | Fuse rating max. current | Max. voltage |
|---------------|---------------------------------------|----------------------------|--------------------------|--------------|
| Pos / Neg | (V) | (Ω) | (mA) | (V) |
| Z778/Z878 | 27 | 646 | 50 | 28.0 |
| Z779/Z879 | 27 | 327 | 50 | 28 |
| Z779.H/Z879.H | 27 | 250 | 80 | 28 |
| Z786/Z886 | 27 | 36 + 0.9 V | 50 | 28 |
| Z788/Z888 | 27.0 | 327 | 50 | 28.0 |
| | 6.5 | 64 | 50 | 9.1 |
| Z788.H/Z888.H | 27.0 | 250 | 80 | 28.0 |
| | 6.5 | 64 | 80 | 9.1 |
| Z796/Z896 | 24.0 | 340 | 50 | 25.1 |
| | 18 | 437 | 50 | 19.5 |

FM Entity Parameters

| Model No. | Terminals | Voc (V) | Isc mA | A & B | |
|-----------------|-----------|---------|--------|---------------|---------|
| | | | | Ca (μ F) | La (mH) |
| Z778 (Z878) | 1-2, 3-4 | 28 | 46 | 0.13 | 15.6 |
| Z779 (Z879) | 1-2, 3-4 | 28 | 93 | 0.13 | 3.91 |
| Z779.H (Z879.H) | 1-2, 3-4 | 28 | 119.2 | 0.40 | 10.2 |
| Z786 (Z886) | 1-2, 3-4 | 28 | 0.0 | 0.11 | 4.29 |
| Z788 (Z888) | 1-4 | 29 | 293 | 0.12 | 0.21 |
| Z788.H (Z888.H) | 1-4 | 30 | 321.8 | - | - |
| Z796 (Z896) | 1-4 | 29.5 | 139 | 0.12 | 1.60 |

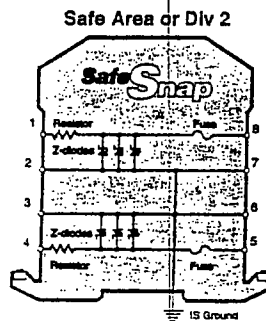
Mechanical

| | |
|-----------------------|-----------------------|
| Operating Temperature | -4°F to 131°F |
| Max. Wire Size | (2) #14AWG |
| Housing Material | MAKROLON #6485 |
| Housing | Type K (see page 302) |

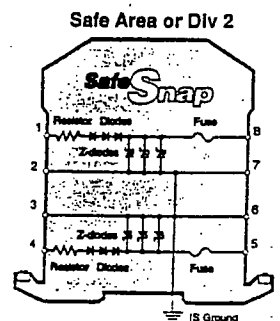


Class I, Div 1, Group A-G, Zone 0, IIC

Hazardous Area



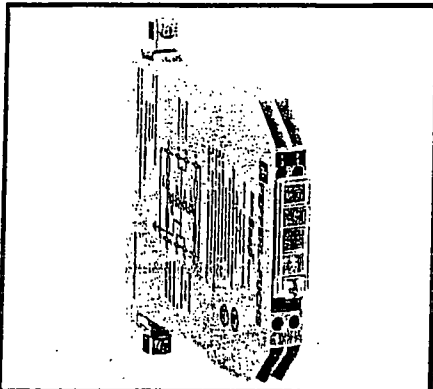
Hazardous Area



Types Z786 and Z886

SS

SafeSnap



- Model Numbers**
DC Models, Single Channel
- Z705 (Z805) ■ Z715.1K (Z815.1K)
 - Z710 (Z810) ■ Z722 (Z822)
 - Z713 (Z813) ■ Z728 (Z828)
 - Z715 (Z815) ■ Z728.H (Z828.H)

- Narrow 12.5 mm profile
- Snaps-on for easy mounting and grounding
- Dedicated terminal for each connection

SafeSnap single-channel zener barriers feature a narrow profile of just 12.5 mm to maximize control panel space. Available in positive or negative polarity, these barriers simply snap on for easy installation and maintenance.

Note: All diodes are orientated in the opposite direction for the negative polarity versions.

Zener Diode Barriers

| Model No. | Working voltage at 10 μ A leakage | Max. end to end resistance | Fuse rating max. current | Max. voltage |
|-----------------|---------------------------------------|----------------------------|--------------------------|--------------|
| Polarity | (V) | (Ω) | (mA) | (V) |
| Z705/Z805 | 0.9 (1 μ A) | 18.18 | 250 | 4.8 |
| Z710/Z810 | 6.5 | 55 | 100 | 8.9 |
| Z713/Z813 | 13.9 | 29.0 | 160 | 14.6 |
| Z715/Z815 | 13.0 | 106 | 100 | 13.6 |
| Z715.1K/Z815.1K | 13.0 | 1024 | 100 | 13.6 |
| Z722/Z822 | 19.0 | 166 | 50 | 20.1 |
| Z728/Z728 | 27.0 | 327 | 50 | 28.0 |
| Z728.H/Z828.H | 27.0 | 250 | 80 | 28.0 |

FM Entity Parameters

| Model No. | Terminals | Voc (V) | Isc mA | A & B | |
|-------------------|-----------|---------|--------|---------------|---------|
| | | | | Ca (μ F) | La (mH) |
| Z705 (Z805) | 1-2 | 4.97 | 507 | 1000 | 0.10 |
| Z710 (Z810) | 1-2 | 9.77 | 200 | 3.51 | 0.48 |
| Z713 (Z813) | 1-2 | 15.75 | 724 | 0.67 | 0.07 |
| Z715 (Z815) | 1-2 | 15.2 | 155 | 0.76 | 1.09 |
| Z715.1k (Z815.1k) | 1-2 | 15.2 | 15.5 | 0.76 | 137 |
| Z722 (Z822) | 1-2 | 22.7 | 155 | 0.24 | 1.10 |
| Z728 (Z828) | 1-2 | 28.0 | 93 | 0.13 | 3.91 |
| Z728.H (Z828.H) | 1-2 | 28.0 | 119.2 | - | - |

Mechanical

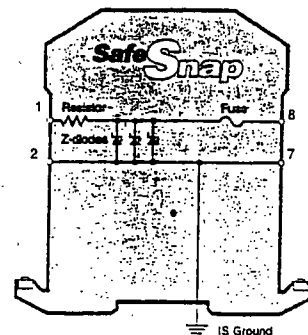
| | |
|-----------------------|-----------------------|
| Operating Temperature | -4°F to 131°F |
| Max. Wire Size | (2) #14AWG |
| Housing Material | MAKROLON #6485 |
| Housing | Type K (see page 302) |



Class I, Div 1, Group A-G, Zone 0, IIC

Hazardous Area

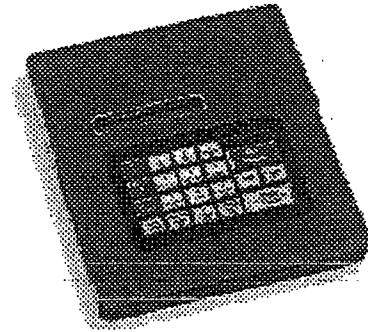
Safe Area or Div 2



1104 | 1106 | 4100 | Express | Express II | Model 2000 | SCADA 3000 | Accessories | Comparison

Sensaphone® 1104

Desktop Monitoring System



Environmental/Process monitoring over telephone lines with full programming capabilities.

- ❑ The versatile Model 1104 is designed for programming **flexibility**.
- ❑ Variable alarm recognition and "listen-in" time, with alarm disable, security code access, remote sensing, and other programming **features**.
- ❑ Monitors power, temperature, and other important environmental conditions to protect computers, equipment, and processes.
- ❑ Automatically **contacts you** at up to 4 locations if unsafe conditions occur.
- ❑ Allows you to contact your system using any telephone, to receive **status reports** and listen-in to on-site sounds.
- ❑ Helps you **detect problems** before they turn into disasters.

Now you can protect your equipment and processes even when you can't be there -The Sensaphone 1104 monitors your computer rooms, equipment centers, offices, or **any unattended facility** to detect **power failures, temperature extremes, intrusions, water incursion**, sounds such as **smoke and burglar alarms**, and other conditions of your choice.

Alerts you immediately if problems arise -The Sensaphone 1104 automatically **contacts you by phone at up to four different phone numbers**, to alert you of unsafe conditions. The system communicates in voice-synthesized English, and even lets you "listen-in" to actual on-site sounds.

Ideal for a variety of applications - The Sensaphone is useful wherever there is a need for monitoring of temperature, humidity, or other conditions. Sensors and input devices are available to suit a wide range of applications.

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- HVAC Equipment
- Computer rooms
- Refrigeration and freezers
- Health care centers
- Offices
- Warehouses
- Livestock and egg/poultry
- Home & property
- Greenhouses...and many others!

BUILT-IN FEATURES

- 4 User-selectable inputs, temperature or dry-contact
- Microphone monitors high sound alarms and enables remote listen-in
- AC Power failure sensing with variable recognition time
- Battery condition monitor
- Clock

ADVANCED CAPABILITIES

- User Programmable: Alarm recognition time, Call delay, Inter-call delay, Message repetitions
- Temperature sensing in Fahrenheit (-20 F to 150 F), or Celsius (-29 C to 65 C)
- Individual temperature input calibration
- Nonvolatile memory for all programmed parameters

VERSATILE DIAL-OUT CAPABILITIES

- Alert sensors trigger pulse or tone dialout automatically
- Dials up to 4 numbers, up to 32 digits each
- Continues dialing numbers in sequence, until acknowledged
- Call Progress: Intelligently detects ringing or busy signal
- Intelligent dial out to beepers and pagers

EASY CONTROL ACCESS

- Keypad for local programming and status report
- Unit can be called from any phone to verify status of all monitored conditions
- Local or remote enabling/disabling of all dial-out conditions
- Can share a single phone line with an answering machine, allowing full operation of both units
- Programmable security code access

General Purpose Relay

MY

Features

- Designed small, 2- and 3-pole types break 5 A loads and 4-pole type, 3 A load
- High reliability, long life
- Ultra-high sensitivity with quick response
- High vibration/shock resistance
- 3- and 4-pole types have an arc barrier
- UL and CSA approved
- Withstands dielectric strength of 2,000 V
- Relays with high capacity, LED indicator, diode surge suppression, push-to-test button, or RC circuit are available.

To Order

Select the part number from the available types chart and add the desired coil voltage rating.

MY4-**DC6**

Coil Rating

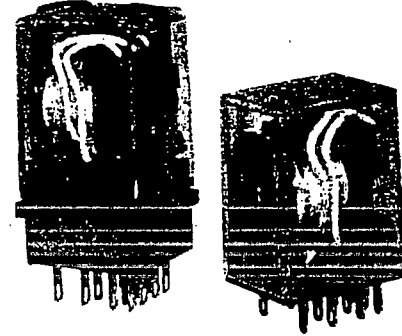
NOTE: AgCdO contacts are also available (MY2E, MY3E, MY4E). Contact your OMRON sales representative for details.

TO ORDER connecting sockets and mounting tracks, see Accessories Section.

For SEV approved type, order the following:

MY4-**5V**-DC6

(Lloyd's Register approval, see Approved by Standards Chart.)



See page 251

Available Types

| | | | Standard contact | | | Dipole mounting bracket | | | |
|---|-------------------|----------------|------------------|--------|------|-------------------------|---------|-------|-------|
| | | | DPDT | MY2 | MY2F | MY2S | MY2Z | MY2ZF | MY2ZS |
| | | | 3PDT | MY3 | MY3F | MY3S | MY4Z | MY4ZF | MY4ZS |
| | | | 4PDT | MY4 | MY4F | MY4S | MY4Z-02 | MY4ZF | MY4ZS |
| Standard | Unsealed | Plug-in/solder | DPDT | MY2-02 | — | — | MY2Z-02 | — | — |
| | | PCB | 3PDT | MY3-02 | — | — | MY4Z-02 | — | — |
| | | 4PDT | MY4-02 | — | — | — | — | — | — |
| Sealed | Plug-in/solder | 4PDT | MYQ4 | — | — | MYQ4Z | — | — | — |
| | PCB | 4PDT | MYQ4-02 | — | — | MYQ4Z-02 | — | — | — |
| Hermetically sealed | Plug-in/solder | 4PDT | MY4H | — | — | MY4ZH | — | — | — |
| | PCB | 4PDT | MY4H-0 | — | — | MY4ZH-0 | — | — | — |
| LED indicator | Plug-in/solder | DPDT | MY2N | — | — | MY2ZN | — | — | — |
| | | 3PDT | MY3N | — | — | MY4ZN | — | — | — |
| | | 4PDT | MY4N | — | — | — | — | — | — |
| High capacity | w/o LED indicator | Plug-in/solder | DPDT | MY2-Y | — | — | — | — | — |
| | w/LED indicator | | DPDT | MY2N-Y | — | — | — | — | — |
| Diode surge suppression | Plug-in/solder | DPDT | MY2-D | — | — | MY2Z-D | — | — | — |
| | | 3PDT | MY3-D | — | — | MY4Z-D | — | — | — |
| | | 4PDT | MY4-D | — | — | — | — | — | — |
| LED indicator and diode surge suppression | Plug-in/solder | DPDT | MY2N-D2 | — | — | MY2ZN-D2 | — | — | — |
| | | 3PDT | MY3N-D2 | — | — | MY4ZN-D2 | — | — | — |
| | | 4PDT | MY4N-D2 | — | — | — | — | — | — |
| RC circuit | Plug-in/solder | DPDT | MY2-CR | — | — | MY2Z-CR | — | — | — |
| | | 3PDT | MY3-CR | — | — | MY4Z-CR | — | — | — |
| | | 4PDT | MY4-CR | — | — | — | — | — | — |
| Push-to-test button | Plug-in/solder | DPDT | MY2N-CR | — | — | — | — | — | — |
| | | 3PDT | MY4N-CR | — | — | — | — | — | — |
| | | 4PDT | — | — | — | — | — | — | — |
| LED indicator/push-to-test button | Plug-in/solder | DPDT | MY2I4 | — | — | MY2ZI2 | — | — | — |
| | | 3PDT | MY3I4 | — | — | MY4ZI2 | — | — | — |
| | | 4PDT | MY4I4 | — | — | — | — | — | — |
| LED indicator/push-to-test button | Plug-in/solder | DPDT | MY2I4N | — | — | MY2ZI2N | — | — | — |
| | | 4PDT | MY4I4N | — | — | MY4ZI2N | — | — | — |

Contact Data

| | | | | | | | | | |
|-------------------------|--|---------------------------------|---------------------------------|-------------------------------------|--|-------------------------------------|---------------------------------|-------------------------------------|-----------------------------|
| | | | | | | | | Hermetically sealed | |
| | | | | | | | | APDT | |
| | | | | | | | | Resistive load (p.f. = 1) | Inductive load (p.f. = 0.3) |
| | | | | | | | | (msec) | (L/R = 7 msec) |
| Rated load | 220 VAC 5 A 24 VDC 5 A | 220 VAC 2 A 24 VDC 2 A | 220 VAC 3 A 24 VDC 3 A | 220 VAC 0.8 A 24 VDC 1.5 A | 220 VAC 1 A 24 VDC 1 A | 220 VAC 0.5 A 24 VDC 0.5 A | 110 VAC 3 A 24 VDC 3 A | 110 VAC 0.8 A 24 VDC 1.5 A | |
| Contact material | Ag | | Ag (Au Flash) | | Ag (Au Flash) | | Ag (Au Flash) | | |
| Carry current | 5 A | | 3 A | | 1 A | | 3 A | | |
| Max. operating voltage | 250 VAC; 125 VDC | | | | 250 VAC; 125 VDC | | 125 VAC; 125 VDC | | |
| Max. operating current | 5 A | | 3 A | | 1 A | | 3 A | | |
| Max. switching capacity | 1,100 VA 120 W | 440 VA 48 W | 660 VA 72 W | 176 VA 36 W | 220 VA 24 W | 110 VA 12 W | 330 VA 72 W | 88 VA 36 W | |
| Min. permissible load* | Standard type: 100 mA, 5 VDC Bifurcated type: 100 µA, 1 VDC | | | | Standard and high sensitivity types: 1 mA, 1 VDC Bifurcated type: 100 µA, 1 VDC | | | | |

*Note: P level: $\lambda_{60} = 0.1 \times 10^{-6}$ /operation.

Coil Data

| | | | | | | | | |
|----|---------|-----------|---------|--------|-------|----------|----------|--------------------|
| | 6 | 214.1 | 183 | 12.2 | 0.04 | 0.08 | | |
| | 12 | 106.5 | 91 | 46 | 0.17 | 0.33 | | |
| | 24 | 53.8 | 46 | 180 | 0.69 | 1.30 | | |
| AC | 50 | 25.7 | 22 | 788 | 3.22 | 5.66 | 30% min. | Approx. 1.0 to 1.2 |
| | 100/110 | 11.7/12.9 | 10/11 | 3,750 | 14.54 | 24.6 | | |
| | 110/120 | 9.9/10.8 | 8.4/9.2 | 4,430 | 19.20 | 32.1 | | Approx. 0.9 to 1.1 |
| | 200/220 | 6.2/6.8 | 5.3/5.8 | 12,950 | 54.75 | 94.07 | 80% max. | 110% max. |
| | 220/240 | 4.8/5.3 | 4.2/4.6 | 18,790 | 83.50 | 136.40 | | |
| | 6 | 150 | 40 | 0.17 | 0.33 | | | |
| | 12 | 75 | 160 | 0.73 | 1.37 | | | |
| DC | 24 | 36.9 | 650 | 3.20 | 5.72 | 10% min. | | Approx. 0.9 |
| | 48 | 18.5 | 2,600 | 10.60 | 21.00 | | | |
| | 100/110 | 9.1/10 | 11,000 | 45.60 | 86.20 | | | |

- NOTE: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with tolerances of +15%, -20% for AC rated current and ±15% for DC rated coil resistance.
 2. The AC coil resistance and inductance are reference values at 60 HZ.
 3. The performance characteristics are measured at a coil temperature of 23°C.
 4. Because the coil is designed for low power consumption, connect a bleeder resistor (if necessary after confirming the leakage current), when the coil is driven by an SCR.

Characteristics

Data shown are of initial value

50 mΩ max.

20 ms max.

20 ms max.

Mechanical: 18,000 operations/hour
Under rated load: 1,800 operations/hour

100 MΩ min. (at 500 VDC)

SINGLE CONTACT TYPE

Unsealed type: 2,000 VAC, 50/60 Hz for 1 minute (1,000 VAC, 50/60 Hz for 1 minute between contacts of the same polarity)

Sealed type: 1,500 VAC, 50/60 Hz for 1 minute (1,000 VAC, 50/60 Hz for 1 minute between contacts of the same polarity)

Hermetically sealed type: 1,000 VAC, 50/60 Hz for 1 minute (700 VAC, 50/60 Hz for 1 minute between contacts of the same polarity)

BIFURCATED CONTACT TYPE

1,500 VAC, 50/60 Hz for 1 minute (1,000 VAC 50/60 Hz for 1 minute between non-continuous contacts)

Mechanical durability: 10 to 55 Hz; 1 mm double amplitude
Malfunction durability: 10 to 55 Hz; 1 mm double amplitude

Mechanical durability: 1,000 m/s² (approx. 100 G)
Malfunction durability: 200 m/s² (approx. 20 G)

Operating: -55 to +70°C (unsealed type) -55 to +60°C (sealed type)
-25 to +60°C (hermetically sealed type)

35 to 85% RH

SINGLE CONTACT TYPE

Mechanical: AC: 50,000,000 operations min. (at operating frequency of 18,000 operations/hour)
DC: 100,000,000 operations min. (at operating frequency of 18,000 operations/hour)

Electrical: See "Characteristic Data."

BIFURCATED CONTACT TYPE

Mechanical: 2-pole: 50,000,000 operations min.
4-pole: 20,000,000 operations min.

(5,000,000 operations min. for the sealed/hermetically sealed types)
(at operating frequency of 1,800 operations/hour)

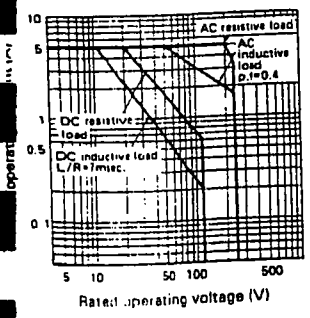
Electrical: See "Characteristic Data."

Approx. 1.23 oz. (35g): sealed/unsealed
1.76 oz. (50g): hermetically sealed

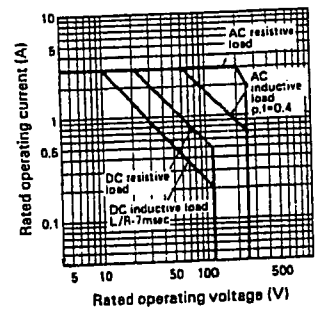
Characteristic Data

Maximum switching capacity

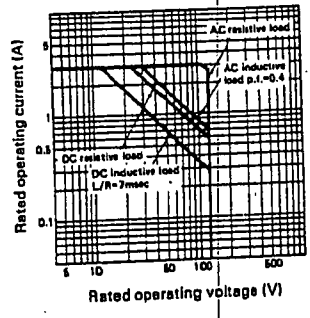
MY2, MY3



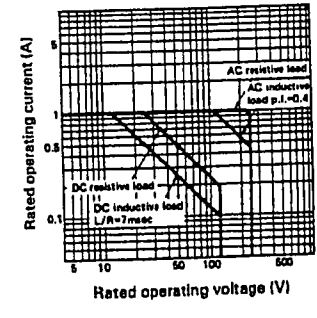
MY4



MY4(Z)H



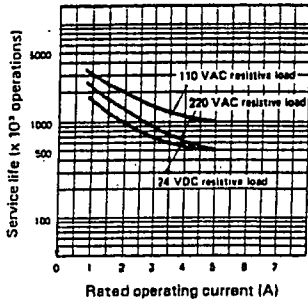
MYQ4(Z)



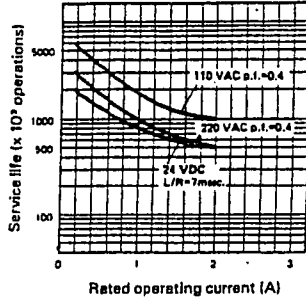
Characteristic Data

Electrical service life

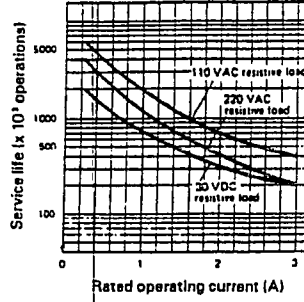
MY2, MY3 (Resistive Load)



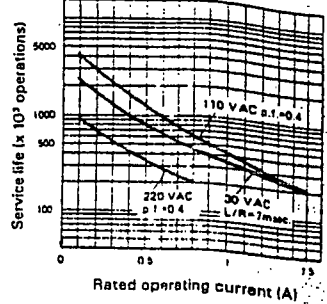
MY2, MY3 (Inductive Load)



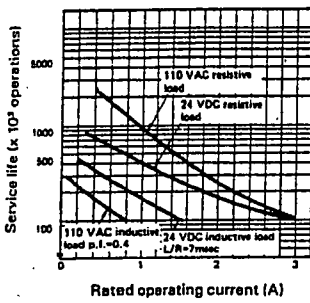
MY4 (Resistive Load)



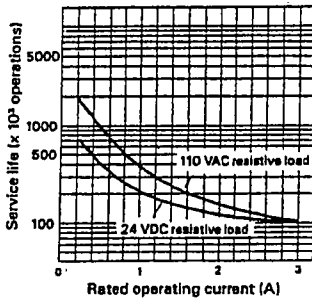
MY4 (Inductive Load)



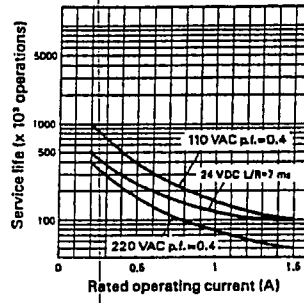
MY4H



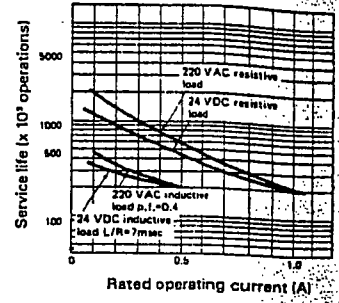
MY4Z (Resistive Load)



MY4Z (Inductive Load)



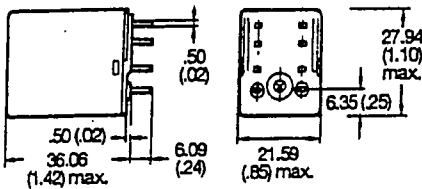
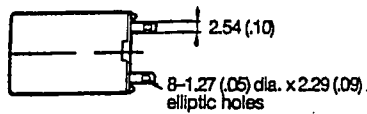
MYQ4



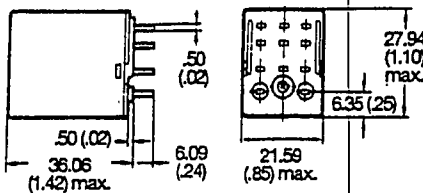
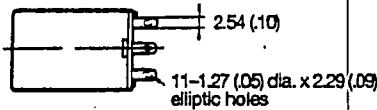
Dimensions

[Unit: mm (inch)]

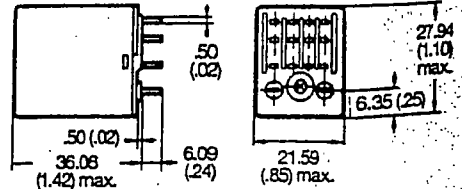
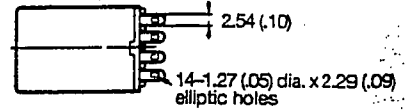
MY2



MY3



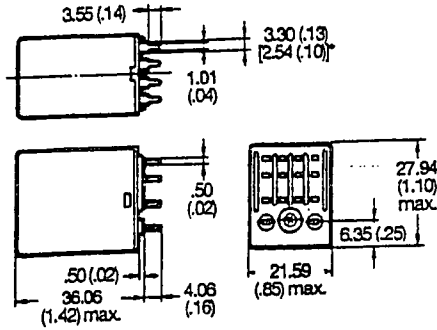
MY4



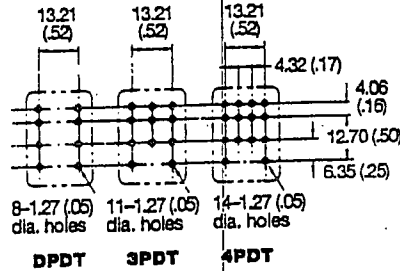
Dimensions

[Unit: mm (inch)]

MY□-02

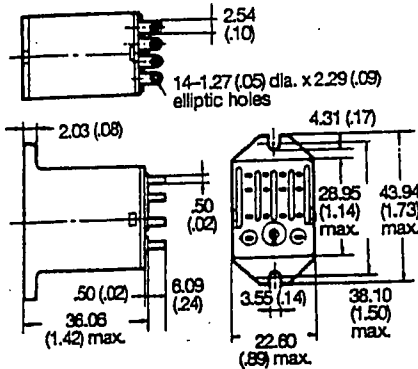


Mounting holes MY□-02

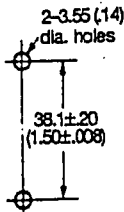


* Dimensions in brackets apply to Type MY4-02.

MY□F

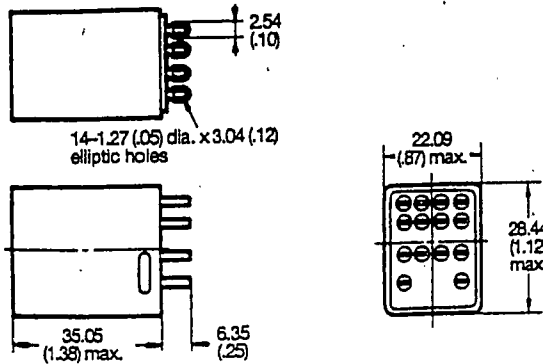


Mounting holes MY□F

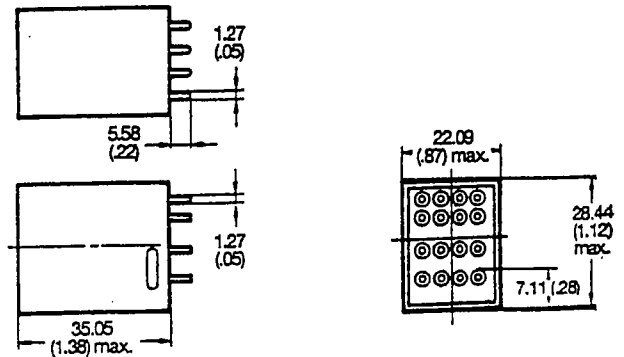


NOTE: The above dimensioned drawing shows the 4-pole type. The dimensions of the 2- and 3-pole types are identical to the 4-pole type.

MY(Z)H



MY4(Z)H-0

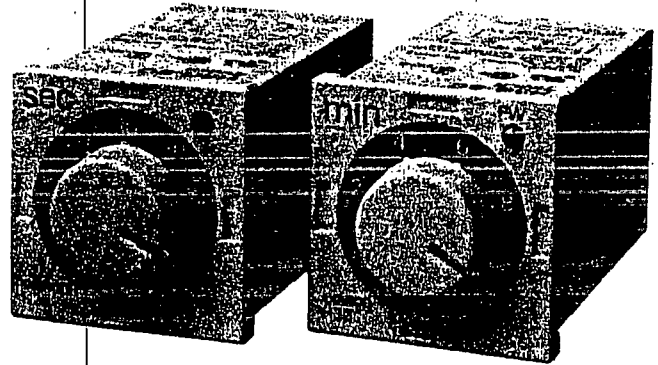


Solid-State Timer

H3G

Low-Cost, Plug-In Timer with Large Switching Capacity

- Up to 7-amp switching capacity
- Choose SPDT or DPDT contact form
- 12 time ranges
- Fits standard 8-pin sockets
- Ideal replacement for time relays
- Subminiature DIN size, 36 x 36 mm
- LED power-ON indicator
- Timer hold-down clips supplied
- Panel mounting adapter, sockets, and accessories may be ordered separately



Ordering Information

■ TIMERS

Add the supply voltage and time range code to the part number when you order. For example, H3G-8A AC100/110/120-60s.

| | | | |
|------------------|---------------|---|--------|
| Timing function | | ON-delay | |
| Contact type | Time limit | SPDT | DPDT |
| | Instantaneous | - | - |
| Terminal form | | 8-pin round socket | |
| Part number | | H3G-8A | H3G-8C |
| Supply voltages | AC | 24 V, 100/110/120 V or 200/220/240 V; 50/60 Hz | |
| | DC | 12 V or 24 V | |
| Time range codes | | 1 s, 3 s, 5 s, 10 s, 30 s, 60 s, 3 m, 5 m, 10 m, 30 m, 60 m, or 3 h | |

■ TIME RANGES

| Code | Range | Code | Range | Code | Range |
|------|------------------|------|------------------|------|-----------------|
| 1s | 0.1 to 1 second | 30 s | 3 to 30 seconds | 10m | 1 to 10 minutes |
| 3 s | 0.3 to 3 seconds | 60 s | 6 to 60 seconds | 30 m | 3 to 30 minutes |
| 5 s | 0.5 to 5 seconds | 3 m | 0.3 to 3 minutes | 60 m | 6 to 60 minutes |
| 10 s | 1 to 10 seconds | 5 m | 0.5 to 5 minutes | 3 h | 0.3 to 3 hours |

■ ACCESSORIES

| Description | Part number | |
|------------------------|--|----------|
| Sockets | Bottom surface or track mounting, top screw terminals, molded standoff ring | PF083A-E |
| | Bottom surface or track mounting, top screw terminals | PF085A |
| | Back mounting, for use with Y92F-31 mounting adapter, bottom screw terminals | P3G-08 |
| Panel mounting adapter | Fits behind panel. Use P3G-08 socket. | Y92F-31 |
| Mounting track | DIN rail, 50 cm (1.64 ft) length | PFP-50N |
| | DIN rail, 1 m (3.28 ft) length | PFP-100N |
| | End plate | PFP-M |
| | Spacer | PFP-S |

■ REPLACEMENT PARTS

| Description | Part number |
|---------------------------------|-------------|
| Timer hold-down clips, one pair | Y92H-6 |

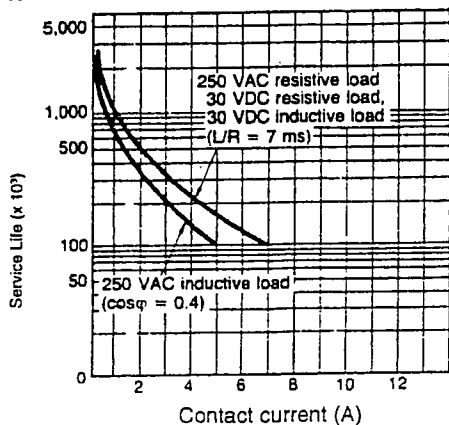
Specifications

| | | | |
|-------------------------------------|------------------------|---|-----------------------------------|
| Part number | | H3G-8A | H3G-8C |
| Supply voltage | AC | 24 V, 100/110/120 V or 200/220/240 V; 50/60 Hz | |
| | DC | 12 V or 24 V | |
| Operating voltage | | 85 to 110% of rated voltage | |
| Power consumption | AC | 3.4 VA at 200 VAC | |
| | DC | - | |
| Timing functions | | ON-delay | |
| Control inputs | | - | |
| Control output | Type | SPDT | DPDT |
| | Time limit | Instantaneous | - |
| | Max. load | 7 A, 125/250 VAC (resistive load) | 5 A, 125/250 VAC (resistive load) |
| | Min. load | 100 mA, 5 VDC | 100 mA, 5 VDC |
| Repeat accuracy | | ± 2% max. | |
| Setting error | | ± 10% max. | |
| Resetting system | | Power-off | |
| Resetting time | | 100 ms | |
| Indicators | | Power ON (red LED) | |
| Materials | | Plastic case, knob | |
| Mounting | | Panel, track or surface | |
| Connections | | 8-pin round socket | |
| Weight | | 55 g (2.0 oz.) | |
| Approvals | | UL/CSA | |
| Operating ambient temperature | | -10° to 55°C (14° to 131°F) | |
| Humidity | | 35 to 85% RH | |
| Vibration | Mechanical durability | 10 to 55 Hz; 0.75 mm (0.03 in) double amplitude | |
| | Malfunction durability | 10 to 55 Hz; 0.5 mm (0.02 in) double amplitude | |
| Shock | Mechanical durability | 100 G | |
| | Malfunction durability | 10 G | |
| Variation due to voltage change | | ± 2% max. | |
| Variation due to temperature change | | ± 5% max. | |
| Insulation resistance | | 100 MΩ min. at 500 VDC | |
| Dielectric strength | | 2,000 VAC, 50/60 Hz for 1 minute between current-carrying and non-current-carrying parts, and between contact carrying and control circuit and between contacts of different poles. 1,000 VAC, 50/60 Hz for 1 minute between non-continuous contacts | |
| Service life | Mechanical | 10 million operations min. | |
| | Electrical | 100,000 operations min. at maximum ratings | |

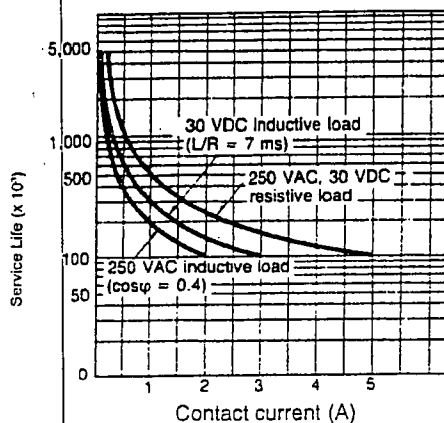
Engineering Data

ELECTRICAL SERVICE LIFE

H3G-8A



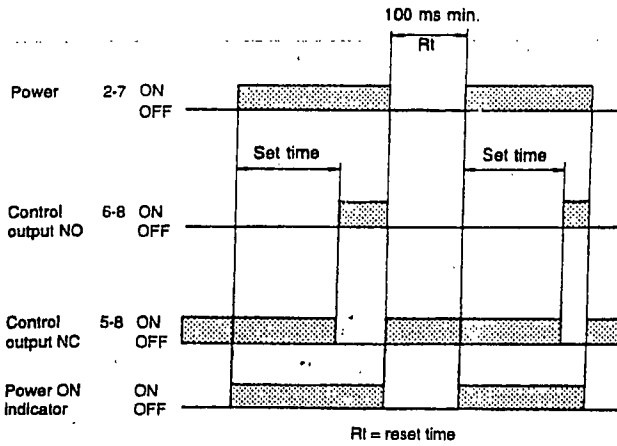
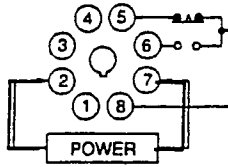
H3G-8C



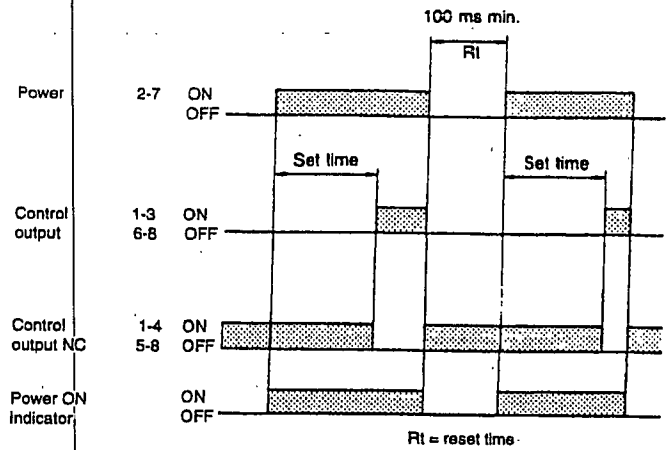
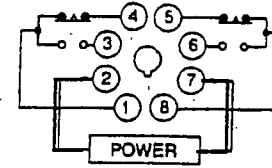
Timing Charts

In the schematic diagrams, each thick line indicates the external wiring.

H3G-8A



H3G-8C

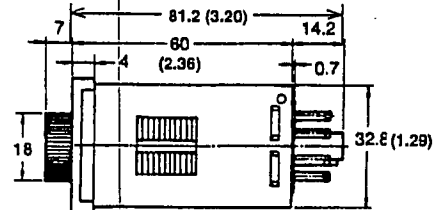
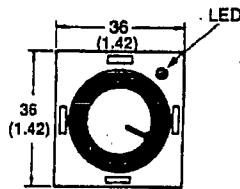
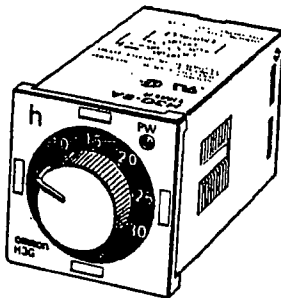


Dimensions

Unit: mm (inch)

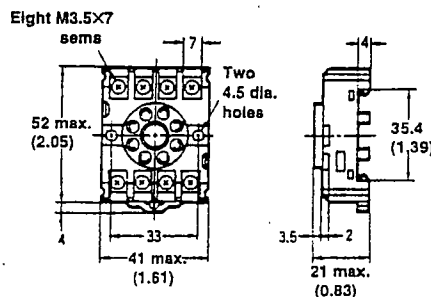
TIMERS

H3G-8A, H3G-8C

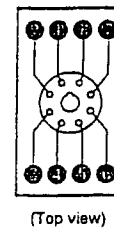


SOCKETS

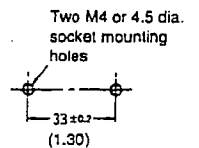
PF083A-E Bottom Surface or Track Mounting Socket with Molded Standoff Ring



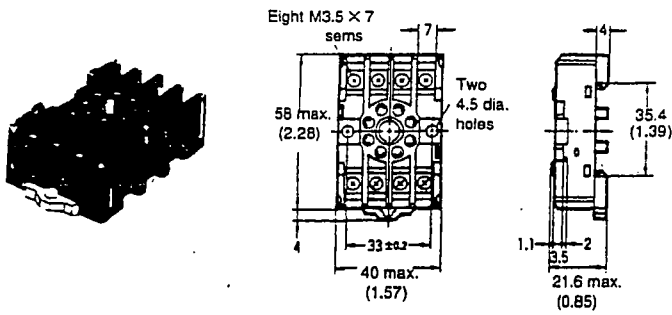
Terminal arrangement



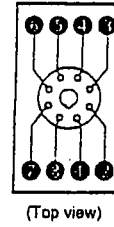
Mounting holes



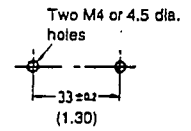
PF085A Bottom Surface on Track Mounting Socket



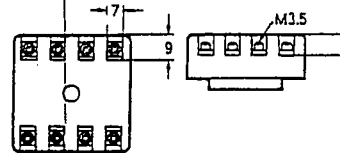
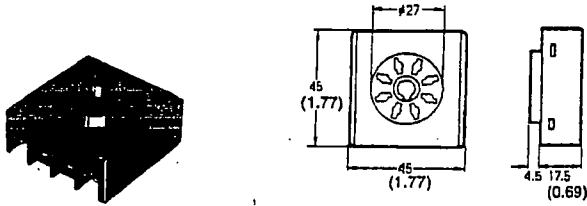
Terminal arrangement



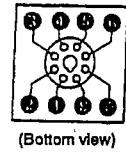
Mounting holes



P3G-08 Back Mounting Socket



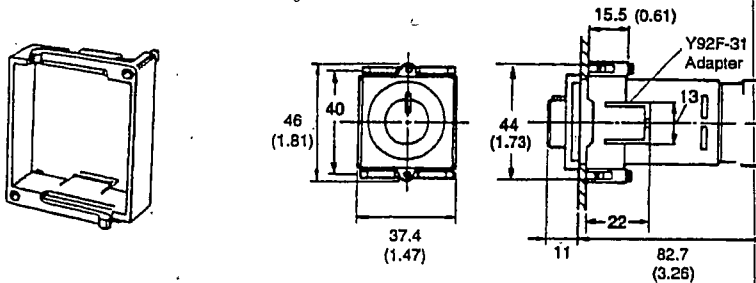
Terminal arrangement



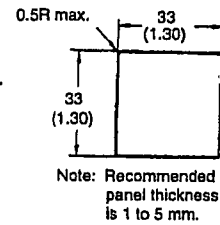
■ PANEL MOUNTING ADAPTER

Y92F-31 Mounting Adapter

Adapter installs behind the panel. It is ideal for side by side installation. Use P3G-08 socket.

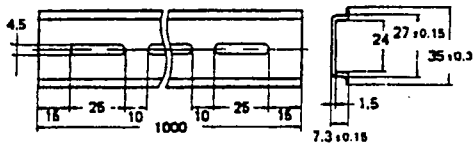


Panel cutout

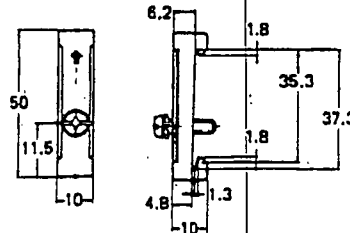


■ MOUNTING TRACK AND ACCESSORIES

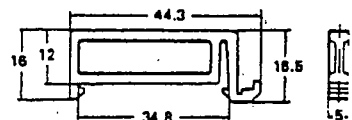
PFP-100N/PFP-50N DIN Rail Track



PFP-M End Plate



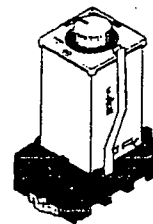
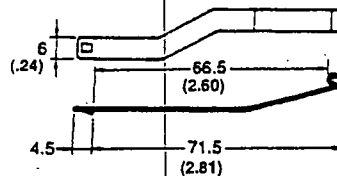
PFP-S Spacer



REPLACEMENT PARTS

Y92H-6 Hold-Down Clips

One pair of clips are packed with the H3G timer.



Connections

| Part number | Power supply terminal numbers | | Output terminal numbers | | |
|-------------|-------------------------------|---------------|-------------------------|----|----|
| | AC (common), DC- | AC (hot), DC+ | COM | NC | NO |
| H3G-8A | 2 | 7 | 8 | 5 | 6 |
| H3G-8C | 2 | 7 | 1 | 4 | 3 |

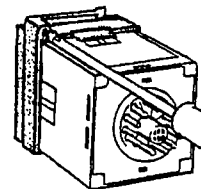
Mounting

PANEL MOUNTING

Insert the timer through the panel cutout. Push the Y92F-31 adapter from the rear of the timer as far forward toward the panel as possible.

Using Y92F-31 Adapter

Push the P3G-08 onto the rear of the timer, then wire the socket. Tighten the two retaining screws on the adapter. To release the adapter, lift the tab at the rear of the adapter.



TRACK MOUNTING

PF083A-E and PF085A

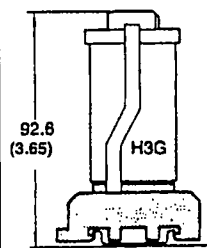
Mounting

Insert the timer into the socket then clip the rear of the socket onto the track. Push the bottom onto the track until the latch fastens securely.

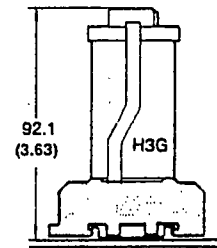
Removal

Pull the latch on the socket with a flat-blade screwdriver and remove the timer and socket as one unit.

PF083A-E



PF085A



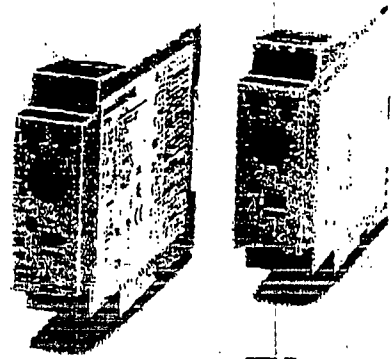
NOTE: ALL DIMENSIONS ARE IN MILLIMETERS. To convert millimeters into inches divide by 25.4.

Solid-state Timer

H3DE-M/-S

DIN Track Mounted, Standard 22.5-mm Width Timer Range

- A wide AC/DC power supply range (24 to 230 VAC/DC) reduces the number of timer models kept in stock.
- Eight operating modes (H3DE-M) and four operating modes (H3DE-S) cover a wide range of applications.
- Programmable contact enables the building of a self-holding relay circuit.
- A wide time setting range of 0.10 s to 120 h.
- Nameplate provided for easy timer identification and management.
- Terminal clamp left open when delivered.
- Finger protection terminal block.
- Enables easy sequence checks through instantaneous outputs for a zero set value at any time range.
- Incorporates environment-friendly, cadmium-free contacts.
- High immunity to inverter noise.
- Approved by UL and CSA.
- Conforms to VDE0435/P2021.
- Conforms to VDE0110 4 kV/2.
- Conforms to EMC standards.



Ordering Information

H3DE

| Rated voltage | Control output | Model | |
|------------------|--|--------------------|---------------|
| | | Multifunction type | Standard type |
| 24 to 230 VAC/DC | Contact output: DPDT (time-limit output SPDT and switchable SPDT (time-limit ↔ instantaneous)) | H3DE-M2 | H3DE-S2 |
| | Contact output: SPDT (time-limit output SPDT) | H3DE-M1 | H3DE-S1 |

Model Number Legend

H3DE -
 1 2

1. M: Multifunction type
S: Standard type
2. 2: DPDT
1: SPDT

Accessories (Order Separately)

| | | |
|----------------|------------------------|-----------|
| Mounting Track | 50 cm (l) x 7.3 mm (t) | PFP-50N |
| | 1 m (l) x 7.3 mm (t) | PFP-100N |
| | 1 m (l) x 16 mm (t) | PFP-100N2 |
| End Plate | PFP-M | |
| Spacer | PFP-S | |

Specifications

■ General

| Item | H3DE-M2 | H3DE-M1 | H3DE-S2 | H3DE-S1 |
|--------------------|--|-------------|---|-------------|
| Operating mode | A: ON-delay (Signal or Power) B: Flicker OFF start (Signal or Power) B2: Flicker ON start (Signal or Power) C: Signal ON/OFF-delay D: Signal OFF-delay E: Interval (Signal or Power) G: Signal ON/OFF-delay J: One-shot (Signal or Power) | | A: ON-delay B2: Flicker ON start E: Interval J: One-shot | |
| Terminal block | Clamps 2 x 2.5 mm ² max. bar terminal without sleeves. | | | |
| Input type | Voltage input | | | |
| Output type | Relay: DPDT | Relay: SPDT | Relay: DPDT | Relay: SPDT |
| Mounting method | DIN track mounting | | | |
| Attachment | Nameplate | | | |
| Approved standards | UL508, CSA 22.2 No.14 Conforms to VDE 0435/P2021, VDE0110 4 kV/2, VDE0106/Part 100 Conforms to IEC947-5-1 (AC-13; 250 V 5A/AC-15; 250 V 3 A/DC-13; 30 V 0.1 A) Conforms to EN50081-1 and EN50082-2 | | | |

■ Time Ranges

| Time unit | s (sec) | min | h (hrs) | x10 h (10 h) |
|-----------|-------------------|---------------------------------|---------|--------------|
| Setting | 0 | Instantaneous output (see note) | | |
| | Time scale: x 0.1 | 0.1 to 1.2 | | 1 to 12 |
| | Time scale: x 1 | 1 to 12 | | 10 to 120 |

Note: To obtain instantaneous output, set the value below zero. Use this for checking the sequence.

■ Ratings

| | | |
|-----------------------------------|---|---|
| Rated supply voltage (see note 1) | 24 to 230 VAC/DC (50/60 Hz) | |
| Operating voltage range | 85% to 110% of rated supply voltage | |
| Power reset | Minimum power-off time: 0.1 s | |
| Reset voltage | 2.4 VAC/DC max. | |
| Power consumption (see note 2) | H3DE-M1 | AC: approx. 2.31 VA (1.47 W) at 230 VAC DC: approx. 0.51 W at 24 VDC |
| | H3DE-M2 | AC: approx. 2.75 VA (1.76 W) at 230 VAC DC: approx. 0.81 W at 24 VDC |
| | H3DE-S1 | AC: approx. 2.25 VA (1.34 W) at 230 VAC DC: approx. 0.53 W at 24 VDC |
| | H3DE-S2 | AC: approx. 2.63 VA (1.59 W) at 230 VAC DC: approx. 0.79 W at 24 VDC |
| Voltage input | H-level: 20.4 to 253 VAC/DC L-level: 0 to 2.4 VAC/DC | |
| Control output | Contact output: 5 A at 250 VAC with resistive load (cosφ = 1) 5 A at 30 VDC with resistive load (cosφ = 1) | |
| Ambient temperature | Operating: -10°C to 55°C Storage: -25°C to 65°C | |
| Ambient humidity | Operating: 35% to 85% | |

- Note: 1. Since an inrush current of 0.25 A will occur when using the power supply voltage at 24 VDC, pay careful attention when turning on or off the power supply to the Timer with a solid-state output such as a sensor.
2. The power consumption is for mode A after the Timer counts the time-up time and for the AC input at 50 Hz. The power consumption of the H3DE-M□ includes the input circuit with the B1 and A1 terminals short-circuited.

■ Characteristics

| | | |
|----------------------------|--|---|
| Accuracy of operating time | ±1% max. of FS (±1% ±10 ms max. at 1.2-s range) | |
| Setting error | ±10% ±0.05 s max. of FS | |
| Signal input time | 50 ms min. | |
| Influence of voltage | ±0.5% max. of FS (±0.5% ±10 ms max. at 1.2-s range) | |
| Influence of temperature | ±2% max. of FS (±2% ±10 ms max. at 1.2-s range) | |
| Insulation resistance | 100 MΩ min. at 500 VDC | |
| Dielectric strength | Between current-carrying metal parts and exposed non-current-carrying metal parts: 2,000 VAC for 1 min. Between control output terminals and operating circuit: 2,000 VAC for 1 min. Between contacts not located next to each other: 1,000 VAC for 1 min. | |
| Vibration resistance | Malfunction: 0.5-mm single amplitude at 10 to 55 Hz Destruction: 0.75-mm single amplitude at 10 to 55 Hz | |
| Shock resistance | Malfunction: 100 m/s ² (approximately 10G) Destruction: 1,000 m/s ² (approximately 100G) | |
| Contact material | AGNi+gold plating (Use the G6RN-1 at 12 VDC.) | |
| Impulse withstand voltage | 3 kV (between power terminals) 4.5 kV (between current-carrying metal parts and exposed non-current-carrying metal parts) | |
| Noise immunity | Square-wave noise generated by noise simulator (pulse width: 100 ns/1 μs, 1-ns rise) ±1.5 kV | |
| Static immunity | Malfunction: 4 kV Destruction: 8 kV | |
| Life expectancy | Mechanical: 10 million operations min. (under no load at 1,800 operations/h) Electrical: 100,000 operations min. (5 A at 250 VAC, resistive load at 360 operations/h) (see note) | |
| EMC | Emission Enclosure: Emission AC Mains: Immunity ESD: Immunity RF-Interference: Immunity Conducted Disturbance: Immunity Burst: | EN55022 class B EN55022 class B EN51000-4-2: 4 kV contact discharge (level 2) 8 kV air discharge (level 3) EN50140: 10 V/m (80 MHz to 1 GHz) (level 3) EN50204: 10 V/m (900 MHz±5 MHz) (level 3) EN50141: 10 V (0.15 to 80 MHz) (level 3) EN61000-4-4: 2 kV power-line (level 3) 2 kV I/O signal-line (level 4) |
| Enclosure rating | IP30 (Terminal block: IP20) | |
| Weight | 120 g | |

Note: For reference:
 A maximum current of 0.15 A can be switched at 125 VDC (cosφ=1).
 A maximum current of 0.1 A can be switched if L/R is 7 ms.
 In both cases, a life of 100,000 operations can be expected.
 The minimum applicable load is 10 mA at 5 VDC (failure level: P).

ALARM DESCRIPTIONS

PROJECT: 8247

| ALARM | DESCRIPTION |
|-------|-------------|
|-------|-------------|

| | |
|------------|--|
| LSHH - VLS | Level Switch HiHi Soil Vapor Extraction |
|------------|--|

Where is the alarm:

Details on this device can be found in the Soil Vapor Extraction Module of the manual. This module may include: a vacuum blower, inlet and discharge silencer, inline filter/silencer, vacuum relief valve, and related piping and instrumentation.

What is the alarm:

This is a Level Switch High-High alarm. This alarm will occur when the fluid level rises above this high-high level switch. To troubleshoot this input: First locate the switch in the system.

This can be done by using the location part of the alarm. (LSHH-VLS-ALM will indicate the high-high level switch in the vapor liquid separator.) Reference the P&ID drawing in the manual to find exactly where this input is located in the process. The manual will also provide a specification sheet for this input to help identify what this level switch looks like. Second, determine if the fluid is actually rising above the switch. If the fluid rises above the high-high level switch then the water entering the tank is flowing at a higher rate than the water leaving the tank. Check the operation of pumps removing water from the tank to ensure that they are pumping properly. See the troubleshooting guide in your manual for help troubleshooting pumps. Check the process downstream of the pump to ensure that there is nothing that is not allowing the pump to run. If there are no critical problems with the system then the process may require adjustment to increase the flow rate of water leaving the tank or decrease the flow rate of water entering the tank. If the switch is installed in a Liquid Ring Pump Seal fluid tank then see troubleshooting of Liquid Ring Pump packages in the troubleshooting tables provided in the manual.

Factory Test Record

MLE

Maple Leaf Environmental Equipment Ltd.

System Test Record

The purpose of this report is to test and record electrical control and mechanical components to ensure the system operates as designed.

Factory: Date: Dec 5/09 Test by: AL Nolley
Field: Date: _____ Test by: _____

System Information:

Project: *8247 CORANGO PANEL

Certification:

| |
|--|
| UL: 508: Panel Relating to Non-Hazardous Locations |
| UL: 698: Panel Relating to Hazardous Locations |
| UL: PQVJ: System Building or Trailer |
| Ont. Hydro: |
| CSA: |
| ✓ None: ✓ <u>AL</u> |

System Criteria: From System Design Criteria Sheet in production book.

Flow Rate Vapor: _____
Flow Rate Liquid: _____
Site Voltage: 230V 1ph

Control System Test Record

The purpose of this report is to test and record the control system logic and components to ensure the system operates as designed.

System Logic: PLC: _____

Relay: ✓

- ?? Dielectric Test: 1 minute @ 1000 volts plus twice the rated voltage of the equipment: TESTED: ✓
- ?? Continuity Test of All Ground Terminals in Panel: TESTED: ✓
- ?? Remote Communications: TESTED: NONE
- ?? MLEE Rating Plate Installed on Panel Door: TESTED: ✓
- ?? Fuse Schedule installed inside Panel Door: TESTED: ✓

Controls Tested:

- ?? Inputs to be tested refer to the project **Input Table**.
- ?? Outputs to be tested refer to the project **Output Table**.

Final Check: All test equipment removed.

- Fuse and wire covers in place.
- Terminal strip screws tightened.
- Where applicable, all switches returned to off position.
- Panel doors secured
- Key if required included.

EN 303 & CP 303 Explosion-Proof Regenerative Blower

FEATURES

- Manufactured in the USA – ISO 9001 compliant
- Maximum flow: 55 SCFM
- Maximum pressure: 38 IWG
- Maximum vacuum: 35 IWG
- Standard motor: 0.5 HP, explosion-proof
- Cast aluminum blower housing, cover, impeller & manifold; cast iron flanges (threaded); teflon lip seal
- UL & CSA approved motor with permanently sealed ball bearings for explosive gas atmospheres Class I Group D minimum
- Sealed blower assembly
- Quiet operation within OSHA standards

MOTOR OPTIONS

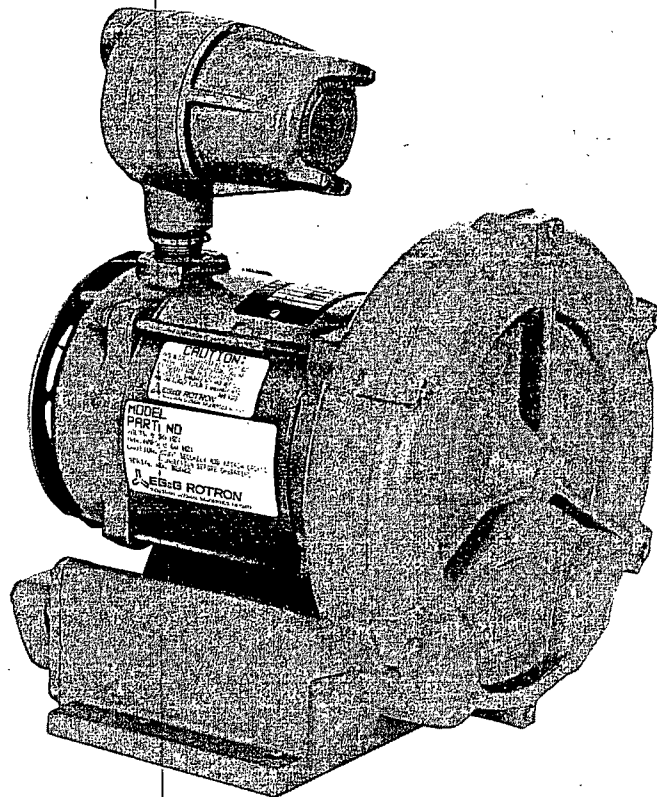
- International voltage & frequency (Hz)
- Chemical duty, high efficiency, inverter duty or industry-specific designs
- Various horsepower for application-specific needs

BLOWER OPTIONS

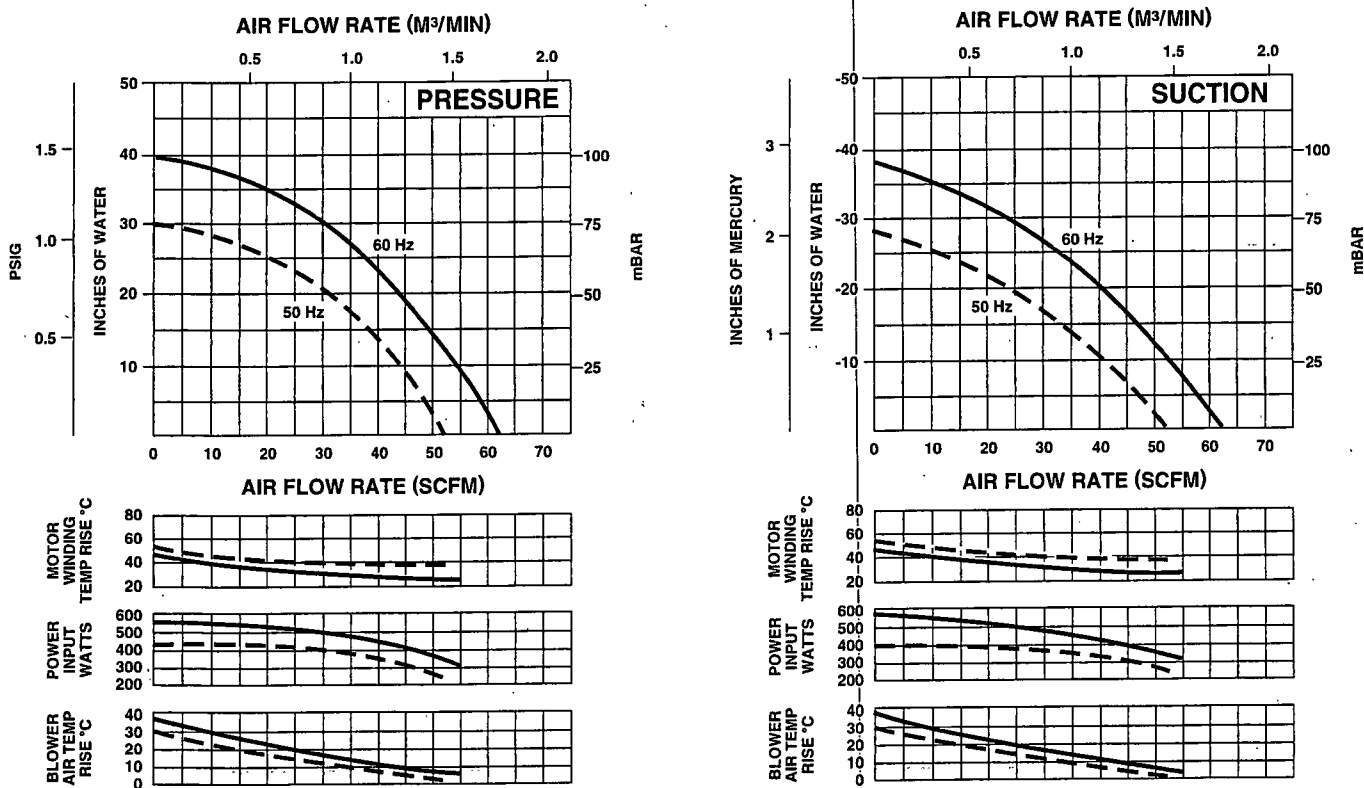
- Corrosion resistant surface treatments & sealing options
- Remote drive (motorless) models
- Slip-on or face flanges for application-specific needs

ACCESSORIES (See Catalog Accessory Section)

- Flowmeters reading in SCFM
- Filters & moisture separators
- Pressure gauges, vacuum gauges & relief valves
- Switches – air flow, pressure, vacuum or temperature
- External mufflers for additional silencing
- Air knives (used on blow-off applications)
- Variable frequency drive package

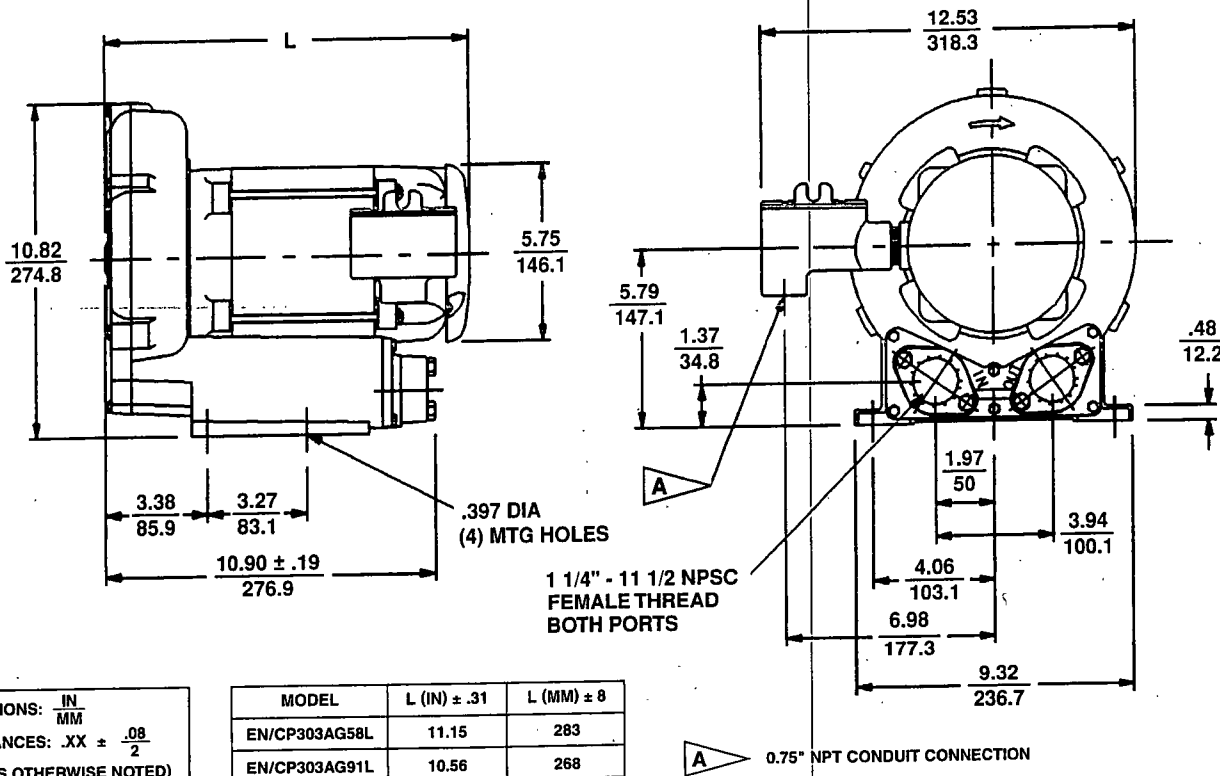


BLOWER PERFORMANCE AT STANDARD CONDITIONS



EN 303 & CP 303 Explosion-Proof Regenerative Blower

Scale CAD drawing available upon request.



DIMENSIONS: $\frac{IN}{MM}$
TOLERANCES: $.XX \pm \frac{.08}{2}$
(UNLESS OTHERWISE NOTED)

| MODEL | L (IN) ± .31 | L (MM) ± 8 |
|---------------|--------------|------------|
| EN/CP303AG58L | 11.15 | 283 |
| EN/CP303AG91L | 10.56 | 268 |

SPECIFICATIONS

| MODEL | EN303AG58L | EN303AG91L | CP303FN58LR | CP303FN91LR | | |
|----------------------------------|----------------------|----------------------|--|--|--------------|------|
| Part No. | 038172 | 038026 | - | 038954 | | |
| Motor Enclosure - Shaft Material | Explosion-proof - CS | Explosion-proof - CS | Chem XP - SS | Chem XP - SS | | |
| Horsepower | 0.5 | | Same as EN303AG58L - 038172 except add Chemical Processing (CP) features from catalog inside front cover | Same as EN303AG91L - 038026 except add Chemical Processing (CP) features from catalog inside front cover | | |
| Phase - Frequency ¹ | Single - 60 Hz | Three - 60 Hz | | | | |
| Voltage ¹ | 115 | 230 | | | 230 | 460 |
| Motor Nameplate Amps | 9.0 | 4.5 | | | 1.5 | .75 |
| Max. Blower Amps ³ | 7.2 | 3.6 | | | 1.63 | 0.83 |
| Inrush Amps | 38 | 19 | | | 8.9 | 4.45 |
| Starter Size | 0 | 00 | | | 00 | 00 |
| Service Factor | 1.0 | | | | 1.35 | |
| Thermal Protection ² | Not Required | | | | Not Required | |
| XP Motor Class - Group | I-D | | | | I-D | |
| Shipping Weight | 52 lb (24 kg) | | 52 lb (24 kg) | | | |

¹ Rotron motors are designed to handle a broad range of world voltages and power supply variations. Our dual voltage 3 phase motors are factory tested and certified to operate on both: **208-230/415-460 VAC-3 ph-60 Hz** and **190-208/380-415 VAC-3 ph-50 Hz**. Our dual voltage 1 phase motors are factory tested and certified to operate on both: **104-115/208-230 VAC-1 ph-60 Hz** and **100-110/200-220 VAC-1 ph-50 Hz**. All voltages above can handle a ±10% voltage fluctuation. Special wound motors can be ordered for voltages outside our certified range.

² Maximum operating temperature: Motor winding temperature (winding rise plus ambient) should not exceed 140°C for Class F rated motors or 120°C for Class B rated motors. Blower outlet air temperature should not exceed 140°C (air temperature rise plus inlet temperature). Performance curve maximum pressure and suction points are based on a 40°C inlet and ambient temperature. Consult factory for inlet or ambient temperatures above 40°C.

³ Maximum blower amps corresponds to the performance point at which the motor or blower temperature rise with a 40°C inlet and/or ambient temperature reaches the maximum operating temperature.

Specifications subject to change without notice. Please consult your Local Field Sales Engineer for specification updates.

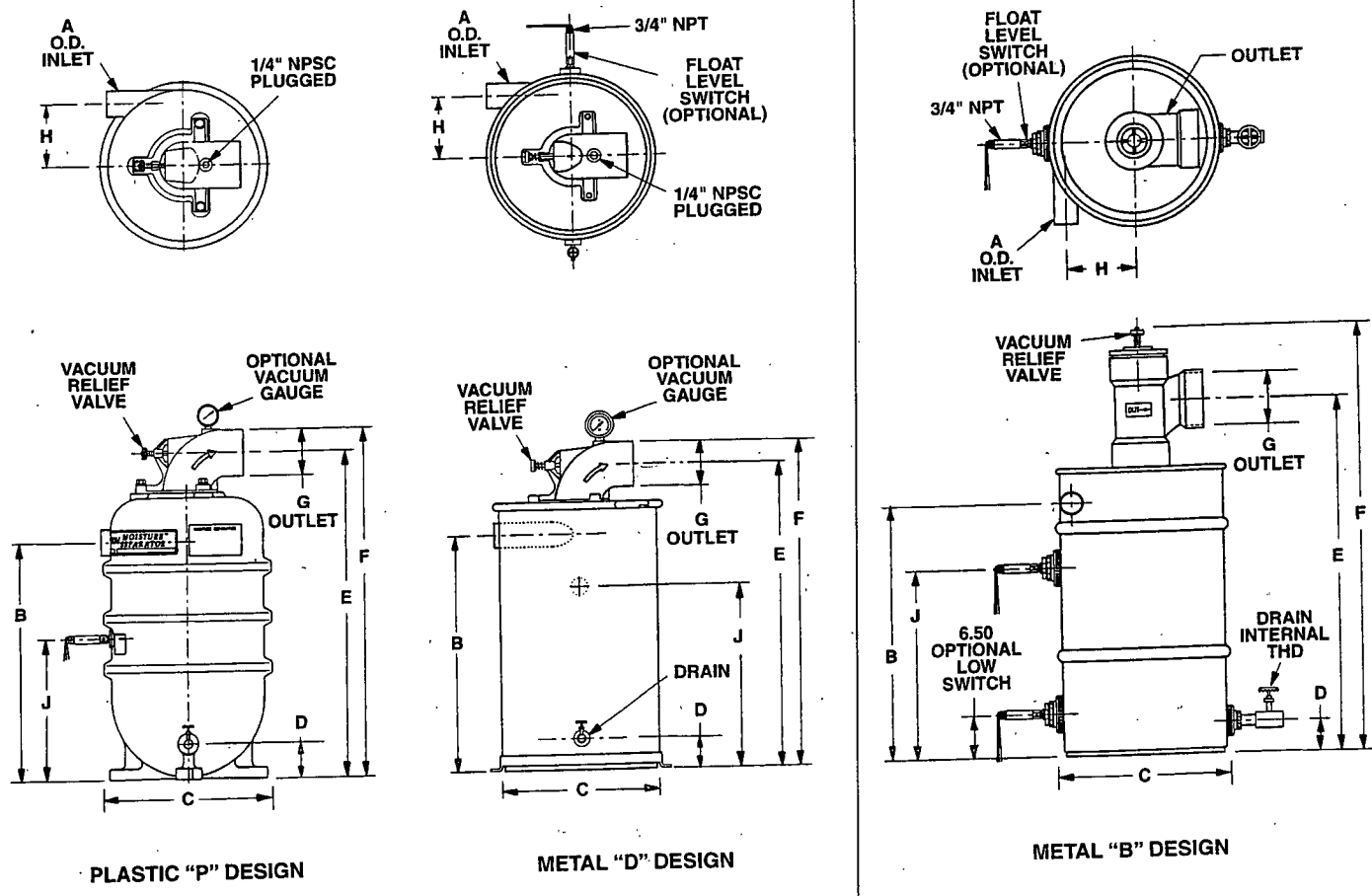
Filtration Accessories

| Blower Connection Key | |
|-----------------------|---|
| NPT | American National Standard Taper Pipe Thread (Male) |
| NPSC | American National Standard Straight Pipe Thread for Coupling (Female) |
| SO | Slip On (Smooth - No Threads) |

Moisture Separator™

By separating and containing entrained liquids, Rotron's moisture separator helps protect our regenerative blowers and the end treatment system from corrosion and mineralization damage. Recommended for all soil vacuum extraction applications.

SPECIFICATIONS:
 SEPARATION METHOD – High Efficiency Cyclonic
 RELIEF VALVE MATERIAL – Brass & Stainless Steel
 FLOAT MATERIAL – Copper
 FLOAT SWITCH – SPDT, Explosion-proof
 NEMA 7&9, 5 Amp max.



| Model | Part No. | CFM Max. | A Dia. | B | C Dia. | D | E | F | G Dia. | H | J Switch | Drain Internal THD | Shipping Weight |
|----------|----------|----------|--------|-------|--------|-------|---------|-------|---------|-------|----------|--------------------|-----------------|
| MS200PS | 038519 | 200 | 2.38 | 22.46 | 16.42 | 3.25 | 31.05 | 33.30 | 4.50 OD | 6.00 | 13.25 | 3/4" NPT | 42 lb. |
| MS300PS | 038520 | 300 | 2.88 | | | | | | | | | | |
| MS200DS | 080086 | 200 | 2.00 | 24.50 | 14.00 | 3.00 | 39.00 | 6.01 | | 15.00 | | | |
| MS300DS | 080087 | 300 | 2.50 | | | | | | | | | | |
| MS350BS | 038357 | 350 | 3.25 | 28.39 | 23.00 | 5.00 | 30.75 | 41.25 | 6.63 ID | 9.75 | 16.87 | 1" NPT | 82 lb. |
| MS500BS | 038354 | 500 | | | | | | | | | | | 37.37 |
| MS600BS | 038353 | 600 | 4.00 | 27.87 | 46.00 | 59.00 | 9.25 OD | 10.50 | | 24.00 | | | 96 lb. |
| MS1000BS | 038914 | 1000 | 6.00 | 31.00 | | | | | | | | | 27.00 |

Models without float switch available. Metal MS200/300DS models are not the standard stocked, but are available.

| Blower Model Reference Key | |
|---|--|
| A = SPIRAL | E = DR/EN/CP 606, S543, 6, 623, S7, S75 |
| B = DR/EN/CP 068, 083, 101, 202 | F = DR/EN/CP 707, 808, S85, 858, S9, P9 (Inlet Only) |
| C = DR/EN/CP 303, 312, 313, 353 | G = DR/EN/CP 823, S13, P13 (Inlet Only) |
| D = DR/EN/CP 404, 454, 513, 505, 555, 523 | H = DR/EN/CP 909, 1223, 14, S15, P15 (Inlet Only) |

2.0 Moisture Separator™ Specifications

2.1 DUTY

The moisture separator shall be designed for use in a soil vapor extraction system capable of continuous operation with a pressure drop of less than six inches of water at the rated flow of _____ SCFM. The separator shall be capable of operation under various inlet conditions ranging from a fine mist to slugs of water with high efficiency.

2.2 PRINCIPLE OF OPERATION

The moisture separator shall incorporate cyclonic separation to remove entrained water. The separator must protect against an overflow by fail safe mechanical means. An electrical switch or contact(s) alone is not an acceptable means of protection against overflow, but is a good backup.

2.3 CONSTRUCTION

The body of the moisture separator shall be constructed of heavy wall plastic or heavy gauge cold rolled steel. The steel interior and exterior shall be epoxy (powder) coated to resist abrasion, corrosion, and chipping that might expose the surface. The inlet shall be tangentially located and welded to the body. The outlet port shall be constructed of PVC or cast aluminium alloy, flanged and sealed to the center of the top of the separator. The separator shall incorporate a non-sparking copper

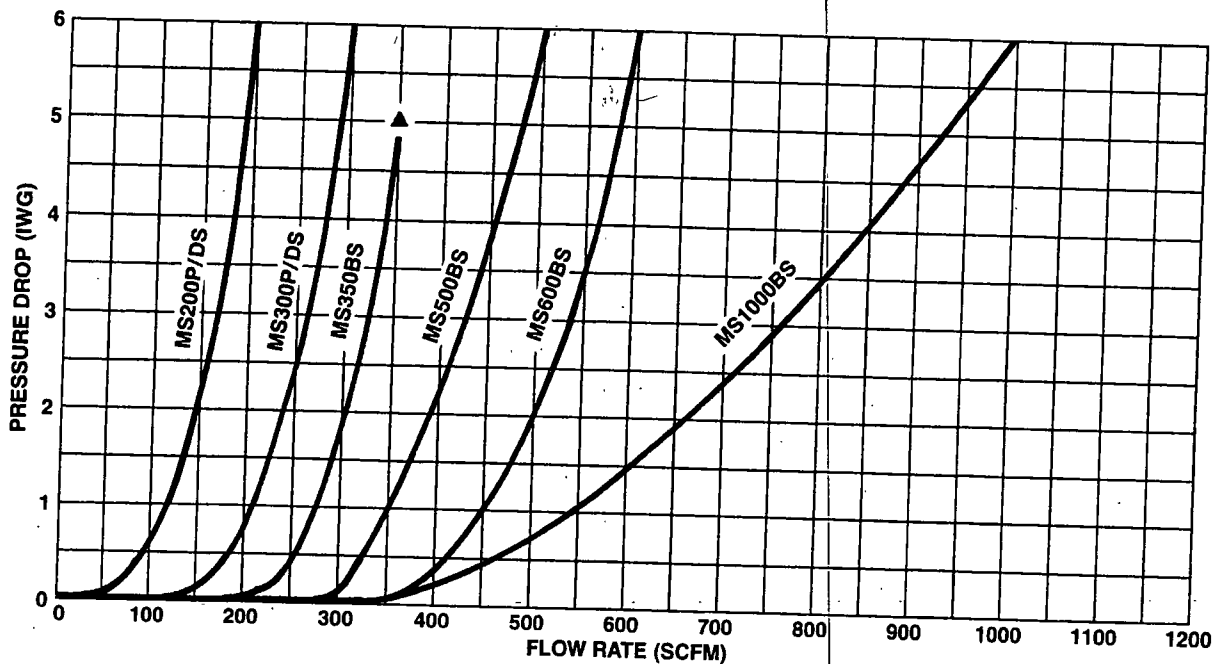
float ball and an adjustable relief valve to protect against overflow and overheating the blower.

2.4 CAPACITY AND DIMENSIONS

The moisture separator must have a liquid capacity of _____ gallons. The inlet shall be _____ inch OD slip-on type. The outlet shall be _____ inch OD slip-on type.

| For DR/EN/CP Blower Model | Selector Moisture Separator Model | Liquid-holding Capacity (gallons) | Inlet (OD) | Outlet | Max Vacuum Allowed (IHg) |
|--|-----------------------------------|-----------------------------------|--------------|----------|--------------------------|
| 404 454 505 513 523 555 623 823 | MS200PS | 7 | 2.38 | 4.5" OD | 12 |
| | MS200DS | 10 | 2.0 | | 22 |
| 606 6 707 | MS300PS MS300DS | 7 10 | 2.88 2.5 | | 12 |
| 808 858 1223 | MS350BS MS500BS | 40 | 3.25 | 6.63" ID | 22 |
| 909 14 | MS600BS MS1000BS | | 4.0" 6.0" | | |

2.5 PRESSURE DROP





ROTRON® INDUSTRIAL PRODUCTS

75 North Street, Saugerties, NY 12477 U.S.A.
 Telephone: 914-246-3401 Fax: 914-246-3802

Rotron Moisture Separator

Thank you for purchasing an AMETEK Rotron MS series moisture separator. When matched with the correct Rotron blower, and properly installed and maintained, this separator will effectively and efficiently remove moisture from the air stream. To ensure good results, please take the time to read these instructions before starting the installation of your moisture separator.

Sizing for Optimal Efficiency

| Separator | Max. CFM | Max. Vac | Capacity | Blowers – DR, EN & CP |
|------------|----------|----------|----------|------------------------|
| MS200P(S) | 200 | 12* IHg | 7 gal. | 101-555, 513, 523, 623 |
| MS200D(S) | 200 | 22 IHg | 10 gal. | 101-555, 513, 523, 623 |
| MS300P(S) | 300 | 12* IHg | 7 gal. | 606, 6, 707, 823 |
| MS300D(S) | 300 | 22 IHg | 10 gal. | 606, 6, 707, 823 |
| MS350B(S) | 350 | 22 IHg | 40 gal. | 808, 1223 |
| MS500B(S) | 500 | 22 IHg | 40 gal. | 858 |
| MS600B(S) | 600 | 22 IHg | 40 gal. | 909 |
| MS1000B(S) | 1000 | 22 IHg | 65 gal. | 14 |

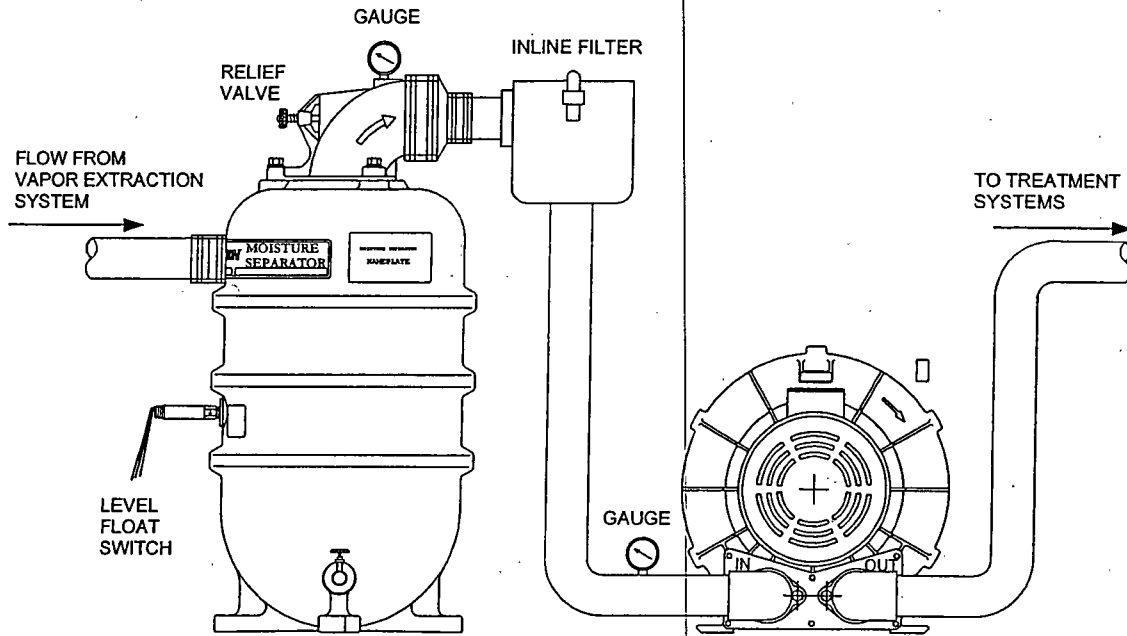
Note: "S" suffix denotes presence of XP high level switch.
 * Special Construction with 20 IHg capability available.

Installation

- Unpacking** - For MS200/300, remove drain valve taped to packing material and box containing liquid level switch, if so equipped. For MS350/500/600, remove box containing valve hardware as well as box containing liquid level switch (if so equipped) and remove internal cardboard packaging and cable ties from screen assembly.
- Bolt Down** (w/ feet included) - For MS200/300 models, built-in feet or a mounting ring is included. It is recommended that these units be bolted in place. All models will only work in an upright position.
- Piping** - Attach to system piping with flexible couplings to minimize stress incurred by rigid system piping. The connections should be airtight but not sealed with an adhesive for ease of disassembly during routine maintenance. Install drain valve, using teflon tape on threads.
- Installation and Wiring of Liquid Level Switch** - Remove plug from the bulkhead fitting. Thread the switch by hand until snug with index arrow pointing down. Wire in accordance with the nameplate wiring schematic. Typically, the wiring is connected back to the starter to shut down the system but can be used for other purposes.
- Install/Adjust Relief Valve** - For MS500/600, first install the relief valve with teflon tape on threads. Use a wrench, but tighten only enough to prevent leakage. Next step for all MS units, back off the relief valve adjuster relaxing spring pressure. Then block the moisture separator inlet while measuring the motor current. Adjust the valve until the motor current is 90% of the max. nameplate blower amps.
- Continuous Service** - For cold weather service, appropriate steps should be taken to prevent freezing. Also, the maximum vacuum ratings are based on 115°F maximum. Consult factory for higher potential ambients.

Note: A moisture separator is not a substitute for an inline air filter. A Rotron inline filter should be used to remove particles that pass through the separator.

Typical Vapor Extraction System



Operation

Moisture-laden air enters the separator through the tangential inlet. Cyclonic action removes free moisture from the air stream and allows the air to discharge through the top of the separator. When the separator is full, the float valve shuts off the air flow through the separator, and the relief valve opens to limit the vacuum of the blower.

To drain the separator, turn off the blower and open the drain valve at the bottom of the separator. Caution: The liquid contained in the separator should be analyzed before it is released back into the environment. It may be considered hazardous waste in certain geographical areas and require special treatment/disposal. Once the liquid is drained, the unit can be reset by turning the blower back on.

Automatic draining options are at the discretion of the customer.

Maintenance

This MS series moisture separator has been designed to require minimal maintenance. During normal operation a layer of sludge may build up on the bottom of the separator. As necessary, the top assembly of the moisture separator should be removed and the inside cleaned out with water. Keeping the inside clean will prevent the valve from becoming clogged with sediment. The relief valve should be inspected upon emptying the separator and readjusted (per installation instruction 5) upon restart.

If you have any questions regarding this product, contact your local sales representative or our Application Engineering Department at the factory.



ROTRON TECHNICAL MOTOR DIVISION
REGENERATIVE BLOWER GROUP

75 North Street
Saugerties, New York 12477
Phone: (845) 246-3401
Fax: (845) 246-3802

EXPLOSION-PROOF BLOWERS



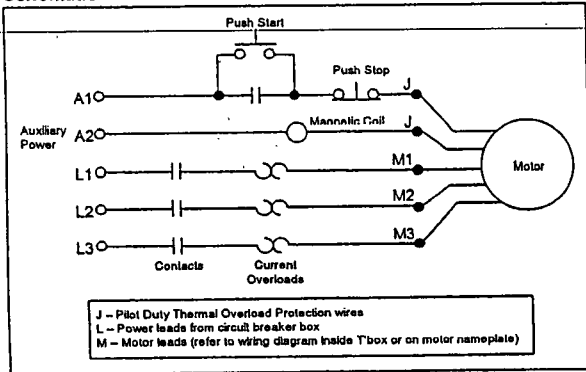
IMPORTANT: Read before wiring this Explosion-proof Blower

This AMETEK Rotron Explosion-proof Regenerative Blower may be equipped with Pilot Duty Thermal Overload (PDTO) or Automatic Thermal Overload (ATO) protection. When properly wired to a motor starter, this protection limits the motor winding temperature rise per the National Electric Code (NEC) article 500. Failure to properly wire this blower is an NEC violation and could cause an explosion. AMETEK Rotron assumes no responsibilities for damages incurred by negligent use of this product, and will not warranty a blower on which the PDTO is not properly connected. Some blowers 1 HP and under do not require PDTO and have built in ATO. Consult the factory if verification of wiring connections is required.

In all cases, follow the motor controller manufacturer's instructions. The following schematic is for conceptual understanding only, and may not apply to all motor/controller combinations.

The manufacturer's wiring diagram found on the motor takes precedent over reference diagrams supplied by AMETEK Rotron Technical Motor Division.

Schematic



The schematic is shown for a three phase motor. For a single phase motor disregard L3 and M3. Pushing the START button completes the auxiliary control circuit, allowing current to flow through the magnetic coil. The contacts are magnetically closed, starting the motor and latching the auxiliary circuit. The motor will continue to run until the STOP push button is depressed, the motor reaches the overload temperature, or the current sensing overloads trip out.

POLICY REGARDING INSTALLATION OF AMETEK ROTRON REGENERATIVE BLOWERS IN HAZARDOUS LOCATIONS

AMETEK Rotron will not knowingly specify, design or build any regenerative blower for installation in a hazardous, explosive location without the proper NEMA motor enclosure. AMETEK Rotron does not recognize sealed blowers as a substitute for explosion-proof motors. Sealed units with standard TEFC motors should never be utilized where local, state, and/or federal codes specify the use of explosion-proof equipment.

AMETEK Rotron has a complete line of regenerative blowers with explosion-proof motors. Division 1 & 2, Class I, Group D; Class II, Groups F & G requirements are met with these standard explosion-proof blowers.

AMETEK Rotron will not knowingly specify, design or build any regenerative blower for installation in a hazardous, corrosive environment without the proper surface treatment and sealing options.

AMETEK Rotron has a complete line of Chemical Processing and Nasty Gas™ regenerative blowers with Chem-Tough™, stainless steel parts, and seals.

AMETEK Rotron offers general application guidance; however, suitability of the particular blower selection is ultimately the responsibility of the purchaser, not the manufacturer of the blower.

FS2 Rev B 3/10/98

If you have any questions, contact AMETEK Rotron at 914-246-3401 for the location of your area representative.



ROTRON INDUSTRIAL PRODUCTS
75 North Street, Saugerties, NY 12477 U.S.A.
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GENERAL INSTALLATION INSTRUCTIONS

Rotron Regenerative Blowers

Installation Instructions for SL, DR, EN, CP, and HIE Series Blowers

1. **Bolt It Down** - Any blower must be secured against movement prior to starting or testing to prevent injury or damage. The blower does not vibrate much more than a standard electric motor.

2. **Filtration** - All blowers should be filtered prior to starting. Care must be taken so that no foreign material enters the blower. If foreign material does enter the blower, it could cause internal damage or may exit at extremely high velocity.

Should excessive amounts of material pass through the blower, it is suggested that the cover(s) and impeller(s) be removed periodically and cleaned to avoid impeller imbalance. Impeller imbalance greatly speeds bearing wear, thus reducing blower life. Disassembling the blower will void warranty, so contact the factory for cleaning authorization.

3. **Support the Piping** - The blower flanges and nozzles are designed as connection points only and are not designed to be support members.

Caution: Plastic piping should not be used on blowers larger than 1 HP that are operating near their maximum pressure or suction point. Blower housing and nearby piping temperatures can exceed 200°F. Access by personnel to the blower or nearby piping should be limited, guarded, or marked, to prevent danger of burns.

4. **Wiring** - Blowers must be wired and protected/fused in accordance with local and national electrical codes. All blowers must be grounded to prevent electrical shock. Slo-Blo or time delay fuses should be used to bypass the first second of start-up amperage.

5. **Pressure/Suction Maximums** - The maximum pressure and/or suction listed on the model label should not be exceeded. This can be monitored by means of a pressure or suction gage (available from Rotron), installed in the piping at the blower outlet or inlet. Also, if problems do arise, the Rotron Field representative will need to know the operating pressure/suction to properly diagnose the problem.

6. **Excess Air** - Bleed excess air off. DO NOT throttle to reduce flow. When bleeding off excess air, the blower draws less power and runs cooler.

Note: Remote Drive (Motorless) Blowers - Properly designed and installed guards should be used on all belts, pulleys, couplings, etc. Observe maximum remote drive speed allowable. Due to the range of uses, drive guards are the responsibility of the customer or user. Belts should be tensioned using belt gauge.

For further information regarding Rotron regenerative blowers (including service & parts manuals), please contact your local field sales engineer.

Maintenance Procedure

When properly piped, filtered, and applied, little or no routine maintenance is required. Keep the filter clean. Also, all standard models in the DR, EN, CP, and HIE series have sealed bearings that require no maintenance. Bearing should be changed after 15,000 to 20,000 hours, on average. Replacement bearing information is specified on the chart below.

| Bearing Part Number | Size | Seal Material | Grease | Heat Stabilized |
|---------------------|------|---------------|-------------------------------------|-----------------|
| 510217 | 205 | Polyacrylic | Nye Rheotemp 500 30% +/- 5% Fill | Yes - 325 F |
| 510218 | 206 | | | |
| 510219 | 207 | | | |
| 510449 | 203 | Buna N | Shell Dolium "R" 25-40% Fill | NO |
| 516440 | 202 | | | |
| 516648 | 307 | | | |
| 516840 | 206 | Buna N | Shell Dolium "R" 30% +/- 5% Fill | NO |
| 516841 | 207 | | | |
| 516842 | 208 | | | |
| 516843 | 210 | | | |
| 516844 | 309 | | | |
| 516845 | 310 | | | |
| 516846 | 311 | | | |
| 516847 | 313 | | | |

Troubleshooting

| | | POSSIBLE CAUSE | | OUT OF WARRANTY REMEDY *** |
|------------------------------------|--|---|---|---|
| | | | | |
| IMPELLER DOES NOT TURN | Humming Sound | 1. * One phase of power line not connected | 2. * One phase of stator winding open | 1. Connect 2. Rewind or buy new motor 3. Change bearings 4. Clean and add filter 5. Adjust 6. Change capacitor |
| | No Sound | 3. Bearings defective | 4. Impeller jammed by foreign material | |
| IMPELLER TURNS | Blowin Fuse | 5. Impeller jammed against housing or cover | 6. ** Capacitor open | 1. Connect 2. Rewind or buy new motor |
| | Motor Overheated Or Protector Trips | 1. * Two phases of power line not connected | 2. * Two phases of stator winding open | |
| | Abnormal Sound | 1. Insufficient fuse capacity | 2. Short circuit | 1. Use time delay fuse of proper rating 2. Repair |
| | | Performance Below Standard | 1. High or low voltage | |
| | 1. Impeller rubbing against housing or cover | | 2. Impeller or air passages clogged by foreign material | 1. Adjust 2. Clean and add filter 3. Change bearings |
| 1. Bearings defective | 3. Bearings defective | 1. Tighten 2. Clean 3. Check wiring 4. Tighten cover, flange 5. Check input voltage | | |
| 1. Leak in piping | 4. Leak in blower | | 1. Tighten 2. Clean 3. Check wiring 4. Tighten cover, flange 5. Check input voltage | |
| 2. Piping and air passages clogged | 5. Low voltage | | | |

* 3 phase units

*** 1 phase units

Disassembly and repair of new blowers or motors will void the Rotron warranty. Factory should be contacted prior to any attempt to field repair an in-warranty unit.

OPERATION & MAINTENANCE MANUAL



ROTRON® INDUSTRIAL PRODUCTS
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 e-mail: rotronindustrial@ametek.com website: www.rotronindustrial.com

Air Flow Meter

Thank you for purchasing an AMETEK Rotron Flow Meter. When matched with the correct Rotron blower, and properly installed and maintained, this meter will quickly and accurately measure the pipe flow. To ensure good results, please take the time to read these instructions before starting the installation of your air flow meter.

Sizing for Optimal Efficiency

| CURRENT MODELS | | FLOW RANGE (SCFM) | THREADS | LENGTH | WIDTH | GAUGE PART # | BODY STYLE | PRIOR MODELS | |
|----------------|--------|-------------------|-------------------|--------|-------|--------------|------------|--------------|--------|
| MODEL | PART # | | | | | | | MODEL | PART # |
| FM20C030Q | 550599 | 6-30 | 2.0" 11.5 NPSC | 6.94" | 5.49" | 550321 | A | FM20A030Q | 550312 |
| FM20C045Q | 550600 | 9-45 | | | | | | FM20A045Q | 550313 |
| FM20C065Q | 550601 | 13-65 | | | | | | FM20A065Q | 550314 |
| FM20C125Q | 550602 | 25-125 | 2.0" 11.5 NPSC | 5.34" | 5.49" | 550290 | B | FM20A125Q | 550256 |
| FM20C175Q | 550603 | 35-175 | | | | | | FM20A175Q | 550255 |
| FM20C225Q | 550604 | 45-225 | | | | | | FM20A225Q | 550254 |
| FM30C250Q | 550605 | 50-250 | 3.0" 8.0 NPSC | 7.38" | 7.62" | 550293 | C | FM30A250Q | 550259 |
| FM30C350Q | 550606 | 70-350 | | | | | | FM30A350Q | 550258 |
| FM30C475Q | 550607 | 95-475 | | | | | | FM30A475Q | 550257 |
| FM40C450Q | 550608 | 90-450 | 4.0" 8.0 NPSC | 7.68" | 8.62" | 550296 | D | FM40A450Q | 550262 |
| FM40C600Q | 550609 | 120-600 | | | | | | FM40A600Q | 550261 |
| FM40C850Q | 550610 | 170-850 | | | | | | FM40A850Q | 550260 |

Installation

1. Piping – The flow meter should be installed horizontally on the inlet side of the blower. Since this device is directional, please observe the flow direction arrow. Rotron suggests using a length of straight pipe equivalent to three to five pipe diameters prior to the meter for any elbows, valves, etc., unless there is a tee. If there is a tee, the suggested equivalent length is eight to ten pipe diameters. The flow meter should have two pipe diameters of straight pipe after the flow exits the meter before any elbows, tees, valves, etc.

2. Continuous Service – Moisture and debris should not be allowed to enter the tubes leading into the gauge, as it may affect the gauge. Orient the gauge between 10 o'clock and 2 o'clock when viewed from end. (See Figure 1).

If the gauge does not read zero, gently press down on gauge cover while turning counterclockwise to remove cover. Zero the gauge with the Allen wrench and reattach cover.

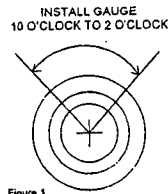


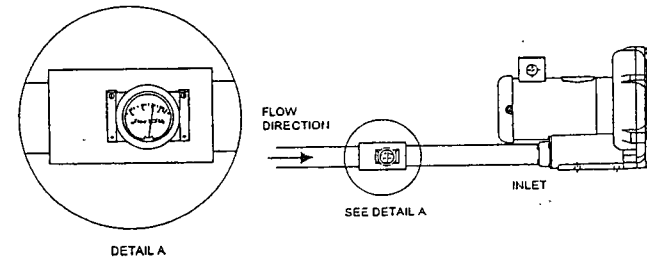
Figure 1

3. Interchangeability – Gauges within a body style are interchangeable to better match your systems actual flow rate to the Gauge Scale. For example:

| Body Style | Gauges Available | Flow Range Available |
|------------|------------------|----------------------|
| A | 550599 | 6-30 SCFM |
| A | 550600 | 9-45 SCFM |
| A | 550601 | 13-65 SCFM |

Similar options for each body style are available. Gauges may be purchased separately and field installed without removing the flow meter from the piping.

Typical Arrangement



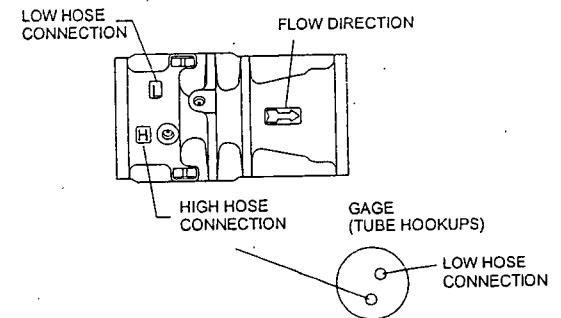
Operation

Rotron's Flow Meter is a venturi style design. After air enters the inlet, the pressure is measured in the high-pressure tap. The second tap measures the pressure at the throat. The differential between the taps registers across a specially calibrated gauge to provide accurate readings. The throat is then expanded back to the original size to keep pressure loss to under 2-4 IWG.

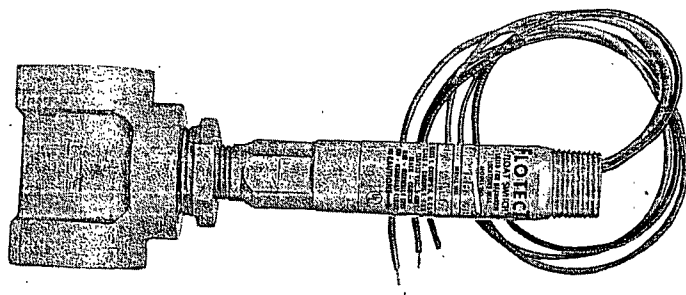
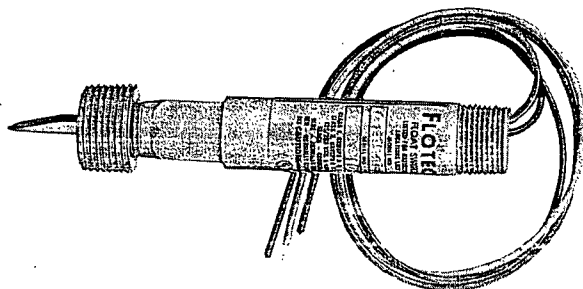
Maintenance

This air flow meter has been designed to require minimal maintenance. During normal operation, little maintenance is required. Care should be taken to ensure no debris enters the meter.

If the tubes become plugged, remove and clean. Do not switch the low and high hoses. Note proper orientation of hoses.



W. Anderson

FLOTECT. MODEL L-6 FLOAT SWITCH**Installation and Operating Instructions**

Explosion-Proof; U.L. and C.S.A. Listed - Class I, Groups *A, B, C & D Class II, Groups E, F & G
CENELEC: EExd IIC T6 (T amb=75°C)
 *(Group A, stainless steel body only)

PHYSICAL DATA

Temperature Limit: 220°F (105°C) maximum
Maximum Pressure: See chart below
Switches: One or two SPDT snap switches
Electrical Rating: U.L.: 5A @ 125/250 VAC.
C.S.A. and CENELEC: 5A @ 125/250 VAC, 5A resistive, 3A inductive @ 30 VDC.
 Optional ratings: MV option—Gold contacts for dry circuits. Rated 0.1A @ 125 VAC MT option: 400°F (205°C) 5A @ 125/250 VAC (not listed).

Wiring Connections: 3-18" (460mm) wire leads, 18 ga. CENELEC models only: push-in type terminal blocks
 Black = common, blue = N.O., red = N.C.

Minimum Specific Gravity:

Polypropylene float - 0.9
 Round SS float - 0.7
 Cylindrical SS float - 0.5

Switch Body: Brass 3/4" NPT conduit connection.
 For SS switch body, change model no. to L6EPS.

Piping/Mounting Connection: 1" NPT

Installation: Horizontal, index arrow pointing down.

Weight: 1 lb. (.5 KG); w/external chamber 1-3/4 lb. (.8 KG)

WETTED MATERIALS CHART

| Model | Brass | Bronze | Ceramic | Polypropylene | 301SS | 303SS | 304SS |
|---------|-------|--------|---------|---------------|-------|-------|-------|
| B-S-3-A | X | | X | | X | | X |
| B-S-3-B | X | X | X | X | X | | X |
| B-S-3-C | X | | X | | X | | X |
| B-S-3-H | X | X | X | | X | | X |
| B-S-3-O | X | | X | X | X | | X |
| S-S-3-A | | | X | X | X | | X |
| S-S-3-C | | | X | | X | X | X |
| S-S-3-L | | | X | | X | X | X |
| S-S-3-O | | | X | X | X | X | X |
| S-S-3-S | | | X | X | X | X | X |

MAXIMUM PRESSURE CHART

| Model Number | Float | Pressure Rating PSIG (KG/CM ²) |
|---------------|----------------|--|
| L6EPB-B-S-3-A | Cylindrical SS | 200 (14) |
| L6EPB-B-S-3-B | Polypropylene | 250 (18) |
| L6EPB-B-S-3-C | Round SS | 350 (25) |
| L6EPB-B-S-3-H | Round SS | 250 (18) |
| L6EPB-B-S-3-O | Polypropylene | 1000 (70) |
| L6EPB-S-S-3-A | Cylindrical SS | 200 (14) |
| L6EPB-S-S-3-C | Round SS | 350 (25) |
| L6EPB-S-S-3-L | Round SS | 350 (25) |
| L6EPB-S-S-3-O | Polypropylene | 2000 (140) |
| L6EPB-S-S-3-S | Polypropylene | 2000 (140) |

INSTALLATION:

Unpack switch and remove any packing material found inside lower housing or float chamber.

Switch must be installed with body in a horizontal plane and arrow on side pointing down.

If switch has an external float chamber (tee), connect it to vertical sections of 1" NPT pipe installed outside vessel walls at appropriate levels. If unit has no external float chamber, it must be mounted in a 1" NPT half coupling welded to the vessel wall. The coupling must extend through the wall.

Inspect and clean wetted parts at regular intervals.

ELECTRICAL CONNECTIONS:

Connect wire leads in accordance with local electrical codes and switch action required. N.O. contacts will close and N.C. contacts will open when liquid level causes float to rise. They will return to "normal" condition on decreasing liquid level. Black = common, Blue = N.O. and Red = N.C.

For units supplied with both internal and external grounds, the ground screw inside the housing must be used to ground the control. The

external ground screw is for supplementary bonding when allowed or required by local code. Some CSA listed models are furnished with a separate green ground wire. Such units must be equipped with a junction box, not supplied but available on special order.

CENELEC certified models include a junction box. Cable should enter enclosure through an approved EX cable gland, not supplied. Push stripped and tinned leads into appropriate openings in terminal block(s). To connect fine stranded leads or to remove any wire, depress spring release with small screwdriver first.

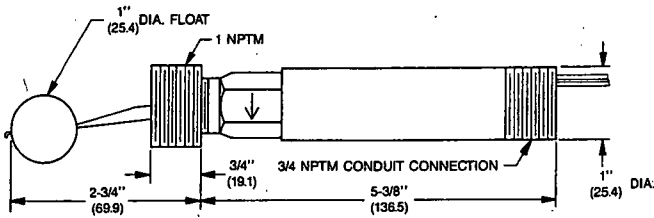
All wiring, conduit and enclosures must meet applicable codes for hazardous areas. Conduits and enclosures must be properly sealed. For outdoor or other locations where temperatures vary widely, precautions should be taken to prevent condensation inside switch or enclosure. Electrical components must be kept dry at all times. **CAUTION:** To prevent ignition of hazardous atmospheres, disconnect the device from the supply circuit before opening. Keep assembly tightly closed when in use.

Dimensions on reverse

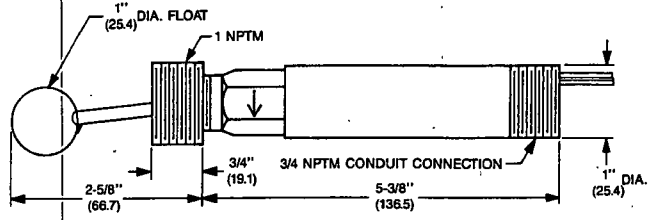
W.E. ANDERSON DIV., DWYER INSTRUMENTS, INC.
 P. O. BOX 358 • MICHIGAN CITY, INDIANA 46360, U.S.A.

Telephone 219/879-8000
 Fax 219/872-9057

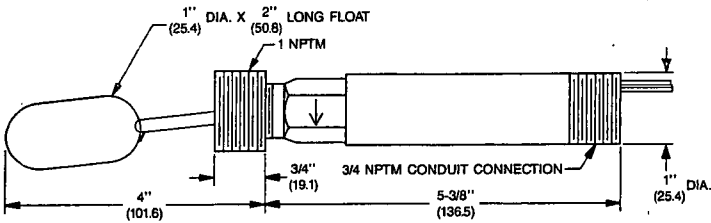
FLOTECT™ MODEL L-6 FLOAT SWITCH — DIMENSION DRAWINGS



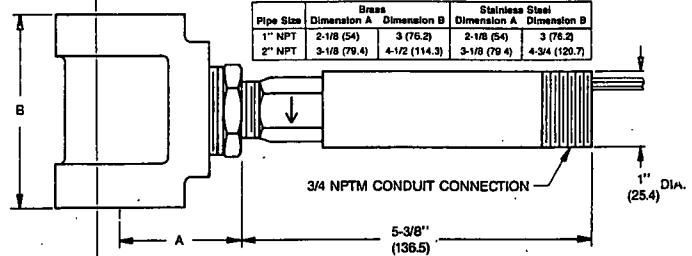
Polypropylene Float



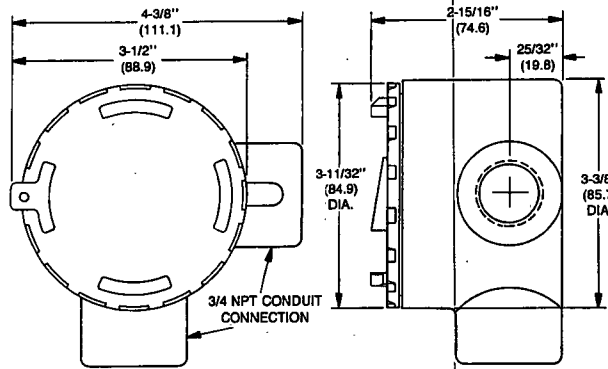
Round Stainless Steel Float



Cylindrical Stainless Steel Float



With External Float Chamber (Tee)



CSA, CENELEC Conduit Enclosure

Limited Warranty: The Seller warrants all Dwyer instruments and equipment to be free from defects in workmanship or material under normal use and service for a period of one year from date of shipment. Liability under this warranty is limited to repair or replacement F.O.B. factory of any parts which prove to be defective within that time or repayment of the purchase price at the Seller's opinion provided the instruments have been returned, transportation prepaid, within one year from the date of purchase. All technical advice, recommendations and services are based on technical data and information which the Seller believes to be reliable and are intended for use by persons having skill and knowledge of the business, at their own discretion. In no case is Seller liable beyond replacement of equipment F.O.B. factory or the full purchase price. This warranty does not apply if the maximum ratings label is removed or if the instrument or equipment is abused, altered, used at ratings above the maximum specified, or otherwise misused in any way.

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 Fax: 219/872-9057

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Installation, Operation and Maintenance Instructions

Model NPE/ NPE-F

DESCRIPTION & SPECIFICATIONS:

The Models NPE (close-coupled) and NPE-F (frame-mounted) are end suction, single stage centrifugal pumps for general liquid transfer service, booster applications, etc. Liquid-end construction is all AISI Type 316 stainless steel, stamped and welded. Impellers are fully enclosed, non-trimable to intermediate diameters. Casings are fitted with a diffuser for efficiency and for negligible radial shaft loading.

Close-coupled units have NEMA 48J or 56J motors with C-face mounting and threaded shaft extension. Frame-mounted units can be coupled to motors through a spacer coupling, or belt driven.

1. Important:

1.1. Inspect unit for damage. Report any damage to carrier/dealer immediately.

1.2. Electrical supply must be a separate branch circuit with fuses or circuit breakers, wire sizes, etc., per National and Local electrical codes. Install an all-leg disconnect switch near pump.

CAUTION

Always disconnect electrical power when handling pump or controls.

1.3. Motors must be wired for proper voltage. Motor wiring diagram is on motor nameplate. Wire size must limit maximum voltage drop to 10% of nameplate voltage at motor terminals, or motor life and pump performance will be lowered.

1.4. Always use horsepower-rated switches, contactor and starters.

1.5. Motor Protection

1.5.1. Single-phase: Thermal protection for single-phase units is sometimes built in (check nameplate). If no built-in protection is provided, use a contactor with a proper overload. Fusing is permissible.

1.5.2. Three-phase: Provide three-leg protection with properly sized magnetic starter and thermal overloads.

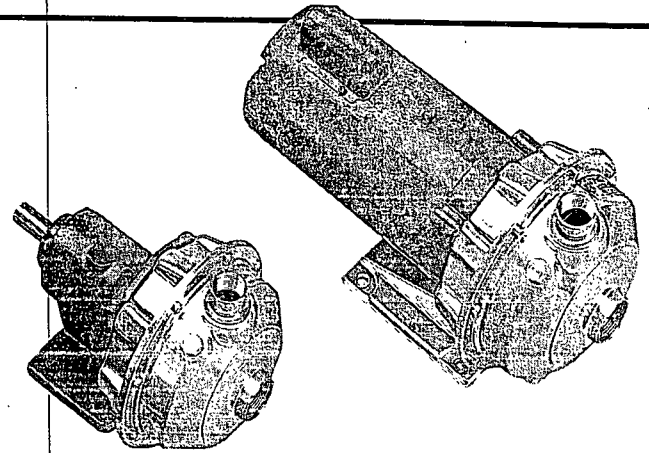
1.6. Maximum Operating Limits:

Liquid Temperature: 212° F (100° C) with standard seal.
250° F (120° C) with optional high temp seal.

Pressure: 75 PSI.

Starts Per Hour: 20, evenly distributed.

1.7. Regular inspection and maintenance will increase service life. Base schedule on operating time. Refer to Section 8.



2. Installation

2.1. General

2.1.1. Locate pump as near liquid source as possible (below level of liquid for automatic operation).

2.1.2. Protect from freezing or flooding.

2.1.3. Allow adequate space for servicing and ventilation.

2.1.4. All piping must be supported independently of the pump, and must "line-up" naturally.

CAUTION

Never draw piping into place by forcing the pump suction and discharge connections.

2.1.5. Avoid unnecessary fittings. Select sizes to keep friction losses to a minimum.

2.2. Close-Coupled Units:

2.2.1. Units may be installed horizontally, inclined or vertically.

CAUTION

Do not install with motor below pump. Any leakage or condensation will affect the motor.

2.2.2. Foundation must be flat and substantial to eliminate strain when tightening bolts. Use rubber mounts to minimize noise and vibration.

2.2.3. Tighten motor hold-down bolts before connecting piping to pump.

2.3. Frame-Mounted Units:

2.3.1. It is recommended that the bedplate be grouted to a foundation with solid footing. Refer to Fig. 1.

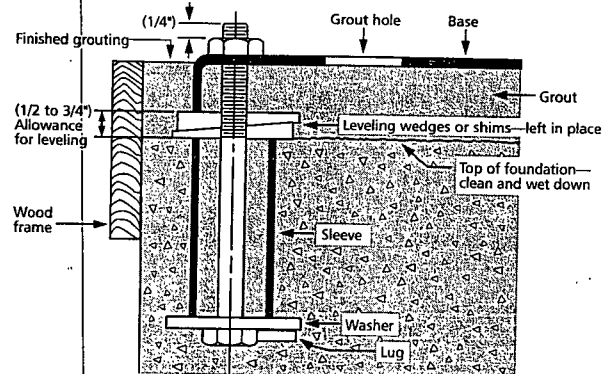


Figure 1

2.3.2. Place unit in position on wedges located at four points (two below approximate center of driver and two below approximate center of pump). Adjust wedges to level unit. Level or plumb suction and discharge flanges.

2.3.3. Make sure bedplate is not distorted and final coupling alignment can be made within the limits of movement of motor and by shimming, if necessary.

2.3.4. Tighten foundation bolts finger tight and build dam around foundation. Pour grout under bedplate making sure the areas under pump and motor feet are filled solid. Allow grout to harden 48 hours before fully tightening foundation bolts.

2.3.5. Tighten pump and motor hold-down bolts before connecting the piping to pump.

3. Suction Piping:

3.1. Low static suction lift and short, direct, suction piping is desired. For suction lift over 10 feet and liquid temperatures over 120 F, consult pump performance curve for Net Positive Suction Head Required.

3.2. Suction pipe must be at least as large as the suction connection of the pump. Smaller size will degrade performance.

3.3. If larger pipe is required, an eccentric pipe reducer (with straight side up) must be installed at the pump.

3.4. Installation with pump below source of supply:

3.4.1. Install full flow isolation valve in piping for inspection and maintenance.

CAUTION

Do not use suction isolation valve to throttle pump.

3.5. Installation with pump above source of supply:

3.5.1. Avoid air pockets. No part of piping should be higher than pump suction connection. Slope piping upward from liquid source.

3.5.2. All joints must be airtight.

3.5.3. Foot valve to be used only if necessary for priming, or to hold prime on intermittent service.

3.5.4. Suction strainer open area must be at least triple the pipe area.

3.6. Size of inlet from liquid source, and minimum submergence over inlet, must be sufficient to prevent air entering pump through vortexing. See Figs. 2-5

3.7. Use 3-4 wraps of Teflon tape to seal threaded connections.

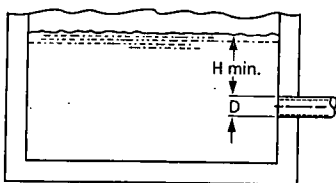


Figure 2

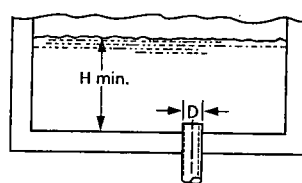


Figure 3

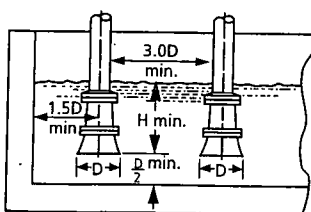


Figure 4

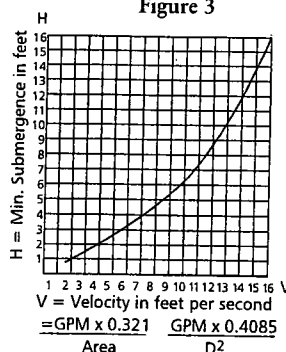


Figure 5

4. Discharge Piping:

4.1. Arrangement must include a check valve located between a gate valve and the pump. The gate valve is for regulation of capacity, or for inspection of the pump or check valve.

4.2. If an increaser is required, place between check valve and pump.

4.3. Use 3-4 wraps of Teflon tape to seal threaded connections.

5. Motor-To-Pump Shaft Alignment:

5.1. Close-Coupled Units:

5.1.1. No field alignment necessary.

5.2. Frame-Mounted Units:

5.2.1. Even though the pump-motor unit may have a factory alignment, this could be disturbed in transit and must be checked prior to running. See Fig. 6.

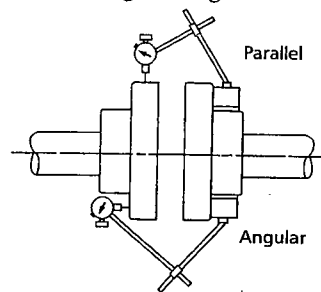


Figure 6

5.2.2. Tighten all hold-down bolts before checking the alignment.

5.2.3. If re-alignment is necessary, always move the motor. Shim as required.

5.2.4. Parallel misalignment - shafts with axis parallel but not concentric. Place dial indicator on one hub and rotate this hub 360 degrees while taking readings on the outside diameter of the other hub. Parallel alignment occurs when Total Indicator Reading is .005", or less.

5.2.5. Angular misalignment - shafts with axis concentric but not parallel. Place dial indicator on one hub and rotate this hub 360 degrees while taking readings on the face of the other hub. Angular alignment is achieved when Total Indicator Reading is .005", or less.

5.2.6. Final alignment is achieved when parallel and angular requirements are satisfied with motor hold-down bolts tight.

CAUTION

Always recheck both alignments after making any adjustment.

6. Rotation:

6.1. Correct rotation is right-hand (clockwise when viewed from the motor end). Switch power on and off quickly. Observe shaft rotation. To change rotation:

6.1.1. Single-phase motor: Non-reversible.

6.1.2. Three-phase motor: Interchange any two power supply leads.

7. Operation:

7.1. Before starting, pump must be primed (free of air and suction pipe full of liquid) and discharge valve partially open.

CAUTION

Pumped liquid provides lubrication. If pump is run dry, rotating parts will seize and mechanical seal will be damaged. Do not operate at or near zero flow. Energy imparted to the liquid is converted into heat. Liquid may flash to vapor. Rotating parts require liquid to prevent scoring or seizing.

7.2. Make complete check after unit is run under operating conditions and temperature has stabilized. Check for expansion of piping. On frame-mounted units coupling alignment may have changed due to the temperature differential between pump and motor. Recheck alignment.

8. Maintenance:

8.1. Close-Coupled Unit. Ball bearings are located in and are part of the motor. They are permanently lubricated. No greasing required.

8.2. Frame-Mounted Units:

8.2.1. Bearing frame should be regreased every 2,000 hours or 3 month interval, whichever occurs first. Use a #2 sodium or lithium based grease. Fill until grease comes out of relief fittings, or lip seals, then wipe off excess.

8.2.2. Follow motor and coupling manufacturers' lubrication instructions.

8.2.3. Alignment must be rechecked after any maintenance work involving any disturbance of the unit.

9. Disassembly:

Complete disassembly of the unit will be described. Proceed only as far as required to perform the maintenance work needed.

9.1. Turn off power.

9.2. Drain system. Flush if necessary.

9.3. Close-Coupled Units: Remove motor hold-down bolts.

Frame-Mounted Units: Remove coupling, spacer, coupling guard and frame hold-down bolts.

9.4. Disassembly of Liquid End:

9.4.1. Remove casing bolts (370).

9.4.2. Remove back pull-out assembly from casing (100).

9.4.3. Remove impeller locknut (304).

CAUTION

Do not insert screwdriver between impeller vanes to prevent rotation of close-coupled units. Remove cap at opposite end of motor. A screwdriver slot or a pair of flats will be exposed. Using them will prevent impeller damage.

9.4.4. Remove impeller (101) by turning counter-clockwise when looking at the front of the pump. Protect hand with rag or glove.

CAUTION

Failure to remove the impeller in a counter-clockwise direction may damage threading on the impeller, shaft or both.

9.4.5. With two pry bars 180 degrees apart and inserted between the seal housing (184) and the motor adapter (108), carefully separate the two parts. The mechanical seal rotary unit (383) should come off the shaft with the seal housing.

9.4.6. Push out the mechanical seal stationary seat from the motor side of the seal housing.

9.5. Disassembly of Bearing Frame:

9.5.1. Remove bearing cover (109).

9.5.2. Remove shaft assembly from frame (228).

9.5.3. Remove lip seals (138 & 139) from bearing frame and bearing cover if worn and are being replaced.

9.5.5. Use bearing puller or arbor press to remove ball bearings (112 & 168).

10. Reassembly:

10.1. All parts should be cleaned before assembly.

10.2. Refer to parts list to identify required replacement items. Specify pump index or catalog number when ordering parts.

10.3. Reassembly is the reverse of disassembly.

10.3.1. Impeller and impeller locknut assembled onto motor shaft with 10 ft-lbs of torque.

10.4. Observe the following when reassembling the bearing frame:

10.4.1. Replace lip seals if worn or damaged.

10.4.2. Replace ball bearings if loose, rough or noisy when rotated.

10.4.3. Check shaft for runout. Maximum permissible is .002" T.I.R.

10.5. Observe the following when reassembling the liquid-end:

10.5.1. All mechanical seal components must be in good condition or leakage may result. Replacement of complete seal assembly, whenever seal has been removed, is good standard practice.

It is permissible to use a light lubricant, such as glycerin, to facilitate assembly. Do not contaminate the mechanical seal faces with lubricant.

10.5.2. Inspect casing O-ring (513) and replace if damaged. This O-ring may be lubricated with petroleum jelly to ease assembly.

10.5.3. Inspect guidevane O-ring (349) and replace if worn.

CAUTION

Do not lubricate guidevane O-ring (349). Insure it is not pinched by the impeller on reassembly.

10.6. Check reassembled unit for binding. Correct as required.

10.7. Tighten casing bolts in a star pattern to prevent O-ring binding.

11. Trouble Shooting Chart:

MOTOR NOT RUNNING

(See causes 1 thru 6)

LITTLE OR NO LIQUID DELIVERED:

(See causes 7 thru 17)

POWER CONSUMPTION TOO HIGH:

(See causes 4, 17, 18, 19, 22)

EXCESSIVE NOISE AND VIBRATION:

(See causes 4, 6, 9, 13, 15, 16, 18, 20, 21, 22)

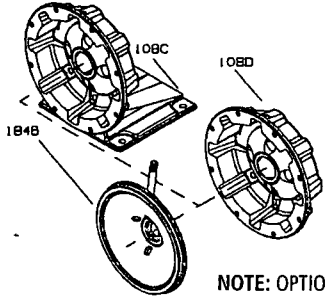
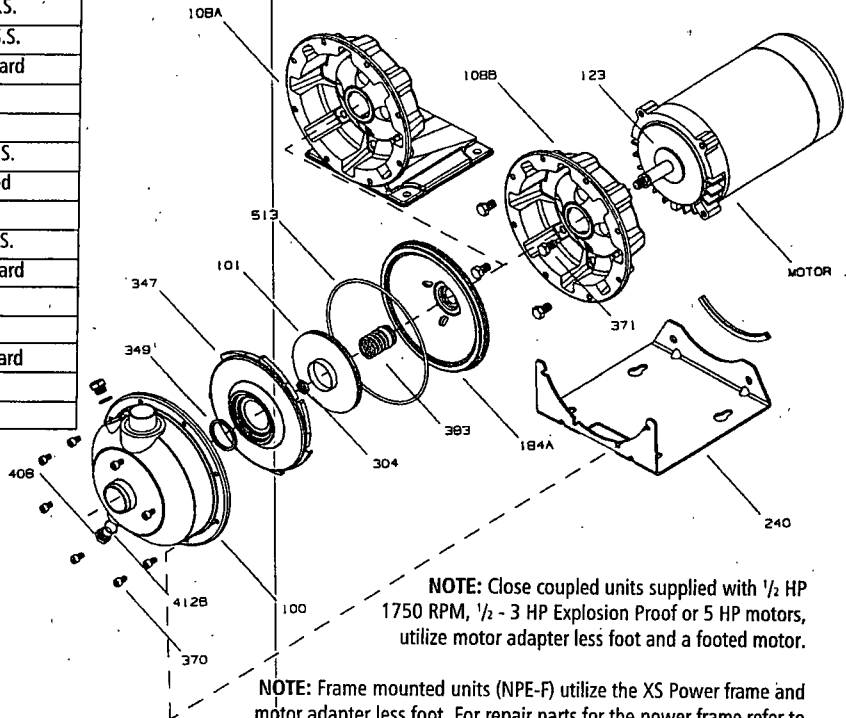
PROBABLE CAUSE:

1. Tripped thermal protector
2. Open circuit breaker
3. Blown fuse
4. Rotating parts binding
5. Motor wired improperly
6. Defective motor
7. Not primed
8. Discharge plugged or valve closed
9. Incorrect rotation
10. Foot valve too small, suction not submerged, inlet screen plugged.
11. Low voltage
12. Phase loss (3-phase only)
13. Air or gasses in liquid
14. System head too high
15. NPSHA too low:
Suction lift too high or suction losses excessive.
Check with vacuum gauge.
16. Impeller worn or plugged
17. Incorrect impeller diameter
18. Head too low causing excessive flow rate
19. Viscosity or specific gravity too high
20. Worn bearings
21. Pump or piping loose
22. Pump and motor misaligned

NPE Standard Repair Parts List

| Item No. | Description | Materials of Construction |
|----------|------------------------------------|------------------------------|
| 100 | Casing | AISI 316L Stainless Steel |
| 101 | Impeller | |
| 108A | Motor adapter with foot | |
| 108B | Motor adapter less foot | |
| 108C | Motor adapter with foot and Flush | |
| 108D | Motor adapter less foot with Flush | |
| 123 | Deflector | BUNA-N |
| 184A | Seal housing std. | AISI 316L S.S. |
| 184B | Seal housing with seal flush | |
| 240 | Motor support | 300 S.S. |
| | Rubber channel | Rubber |
| 304 | Impeller locknut | AISI 316 S.S. |
| 347 | Guidevane | AISI 316L S.S. |
| 349 | Seal-Ring, guidevane | Viton Standard |
| | | EPR |
| | | BUNA |
| 370 | Socket head screw, casing | AISI 410 S.S. |
| 371 | Bolts, motor | Steel/plated |
| 383 | Mechanical seal | |
| 408 | Drain and vent plug, casing | AISI 316 S.S. |
| 412B | O-Ring, drain plugs | Viton, standard |
| | | EPR |
| | | BUNA |
| 513 | O-Ring, casing | Viton, standard |
| | | EPR |
| | | BUNA |

| Item 383 Mechanical Seal (% seal) | | | | |
|-----------------------------------|-------------|------------|-------------|----------|
| Rotary | Stationary | Elastomers | Metal Parts | Part No. |
| Carbon | Sil-Carbide | EPR | 316SS | 10K18 |
| | | Viton | | 10K55 |
| EPR | | 10K81 | | |
| Viton | | 10K62 | | |



NOTE: OPTIONAL SEAL FLUSH COMPONENTS

NOTE: Close coupled units supplied with 1/2 HP 1750 RPM, 1/2 - 3 HP Explosion Proof or 5 HP motors, utilize motor adapter less foot and a footed motor.

NOTE: Frame mounted units (NPE-F) utilize the XS Power frame and motor adapter less foot. For repair parts for the power frame refer to the XS-Power frame repair parts page in the parts section of your catalog. To order the power frame complete order item 14L61

GOULDS PUMPS LIMITED WARRANTY

This warranty applies to all water systems pumps manufactured by Goulds Pumps.

Any part or parts found to be defective within the warranty period shall be replaced at no charge to the dealer during the warranty period. The warranty period shall exist for a period of twelve (12) months from date of installation or eighteen (18) months from date of manufacture, whichever period is shorter.

A dealer who believes that a warranty claim exists must contact the authorized Goulds Pumps distributor from whom the pump was purchased and furnish complete details regarding the claim. The distributor is authorized to adjust any warranty claims utilizing the Goulds Pumps Customer Service Department.

The warranty excludes:

- (a) Labor, transportation and related costs incurred by the dealer;
- (b) Reinstallation costs of repaired equipment;
- (c) Reinstallation costs of replacement equipment;
- (d) Consequential damages of any kind; and,
- (e) Reimbursement for loss caused by interruption of service.

For purposes of this warranty, the following terms have these definitions:

- (1) "Distributor" means any individual, partnership, corporation, association, or other legal relationship that stands between Goulds Pumps and the dealer in purchases, consignments or contracts for sale of the subject pumps.
- (2) "Dealer" means any individual, partnership, corporation, association, or other legal relationship which engages in the business of selling or leasing pumps to customers.
- (3) "Customer" means any entity who buys or leases the subject pumps from a dealer. The "customer" may mean an individual, partnership, corporation, limited liability company, association or other legal entity which may engage in any type of business.

THIS WARRANTY EXTENDS TO THE DEALER ONLY.

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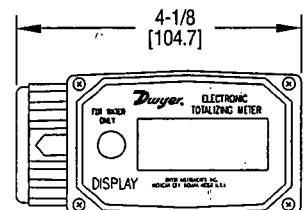
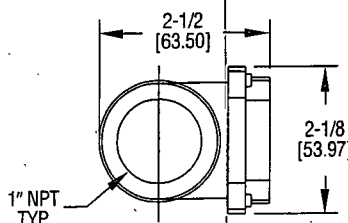
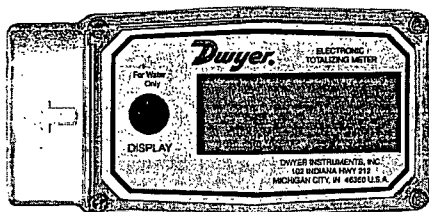
Goulds Pumps





SERIES TTM TOTALIZING FLOWMETER

Specifications - Installation and Operating Instructions



GENERAL

Measure batch and cumulative totals in liquid transfer systems with the Series TTM Electronic Totalizing Meter. The meter is designed for any pump, pressure, or gravity feed system with a 3 to 30 GPM (10 to 100 LPM) flow range. View batch and cumulative totals on the large 4-digit LCD display. Batch totals can be reset to measure flow during a single use. The cumulative total will automatically reset to zero when a maximum reading of 9999 is obtained. Models designed for use in water applications are constructed of Nylon® and rated to 150 psig (10.3 bar). Aluminum models are calibrated for fuels and rated to 300 psig (20.7 bar).

GENERAL INSTALLATION

Battery Connections

1. Remove the four Phillips-head screws and lift the faceplate from meter.
2. Remove tape from the end of one battery.
3. Replace the battery. Make sure the positive post is in the correct position.
4. Make sure the O-ring is fully seated and secure the faceplate with the four screws.

Calibration

The meter is permanently factory calibrated for measuring water or fuels depending on model. If installed and used correctly, inaccuracies of no greater than $\pm 5\%$ will be obtained.

Installation

This meter may be installed in-line either vertically or horizontally or at the end of a hose adjacent to a nozzle if present.

PHYSICAL DATA

Flow Range: 3 to 30 GPM (10 to 100 LPM).

Accuracy: $\pm 5\%$.

Batch Total Maximum: 9,999.

Cumulative Total Maximum: 9,999.

Display: 4-digit LCD .5/8" H

Maximum Pressure: Nylon models: 150 psig (10.3 bar); Aluminum models: 300 psig (20.7 bar).

Pressure Drop: 5 psi (12.4 mbar) @ maximum flow.

Maximum Particulate Size: 350 microns.

Auto Shut-off: After 1 minute.

Operating Temperature: 14 to 130°F (-10 to 54°C).

Storage Temperature: -40 to 158°F (-40 to 70°C).

Housing: Nylon or aluminum.

Connections: 1" NPT(F).

Power: Two AAA alkaline batteries (included).

Battery Life: Approx. 9,000 hours.

Weight: Nylon models: 0.4 lbs (190 g); Aluminum models: 0.7 lbs (340 g).

| Model Number | Application | Material | Units |
|--------------|-------------|----------|-------|
| TTM10 | Water* | Nylon | GPM |
| TTM11 | Water* | Nylon | LPM |
| TTM20 | Fuels† | Aluminum | GPM |
| TTM21 | Fuels† | Aluminum | LPM |

*Calibrated for use with water; †Calibrated for use with gasoline, diesel fuel and kerosene

NOTE: If using the Nylon meter for measuring water, it is not recommended to installation with metal connection or fittings. Install as follows:

1. If necessary, remove nozzle from hose.
2. Wrap all connections with 3 to 4 wraps of Teflon® tape. Ensure the tape does not intrude into the flow path.
3. Attach meter to hose or plumbing with the arrow on the outlet port pointed in the direction of flow.
4. If necessary, attach nozzle to meter.
5. Hand tighten the meter at the housing ends. Do not use a wrench or similar tools to tighten the meter housing. The housing may be damaged.

OPERATION

Batch and Cumulative Totals

The meter maintains two totals. The batch total may be reset to measure flow during a single use. The cumulative total provides continuous measurement and may not be manually reset. The batch total is labeled TTL 1. The cumulative total is labeled TTL2.

When the cumulative total reaches a maximum reading of 9999, it will automatically reset to zero.

Press the DISPLAY button briefly to switch between the batch and cumulative totals.

Activate the Meter

Turn the meter ON by staring flow or briefly pressing the DISPLAY button. The meter will display the batch or cumulative total from last use.

Press DISPLAY briefly to display the batch total. Hold the DISPLAY button down for three seconds to reset the batch total to zero.

The meter is programmed to turn off automatically if not used for more than one minute.

MAINTENANCE

Proper handling and care will extend the life and service of the meter.

Turbine Rotor

The meter is virtually maintenance-free. However, it is important the rotor moves freely. Keep the meter clean and free of contaminants.

If the rotor does not turn freely, apply a penetrating lubricant on the rotor, shaft, and bearings. Remove any debris or deposits from the rotor using a soft brush or small probe. Be careful not to damage the turbine rotor or supports.

CAUTION: Blowing compressed air through the turbine assembly could damage the rotor.

Battery Replacement

The meter is powered by two AAA alkaline batteries which may be replaced while the meter is installed. When batteries are removed or lose power, the batch and cumulative totals reset to zero but the factory calibration is retained.

If the meter display becomes dim or blank, replace the batteries as follows:

1. Remove the four Phillips-head screws and lift the faceplate from meter.
2. Remove the old batteries and clean any corrosion from the terminals.
3. Install new batteries. Make sure the positive post is in the correct position.
4. When batteries are replaced, the faceplate will power ON. Check the display to ensure normal functions have resumed before assembling again.
5. Reseat the batteries, if necessary, and position the faceplate on the turbine housing. To avoid moisture damage, make sure the O-ring is fully seated. Tighten the four screws on the faceplate.

If the unit should need repairs, please contact Dwyer Instruments, Inc. before returning unit to review information relative to your application and obtain a return authorization number. When returning a product to the factory, carefully package and ship freight pre-paid. Be sure to include a complete description of the application and problem and identify any hazardous material used with the product.

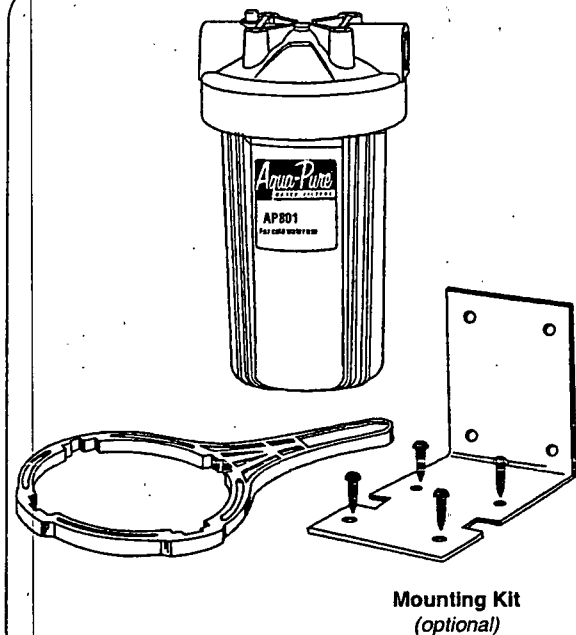
INSTALLATION & OPERATING INSTRUCTIONS

FOR

Aqua-Pure®

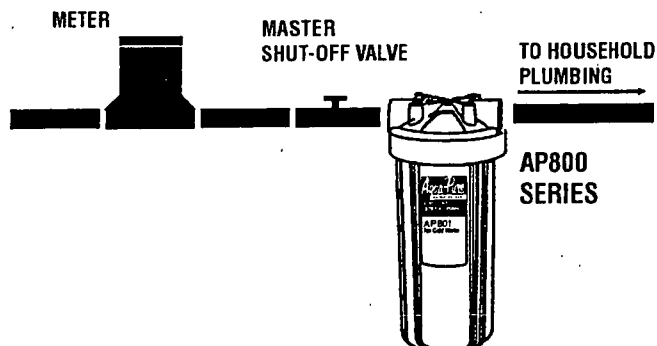
WATER FILTERS

AP 800 SERIES WATER FILTER

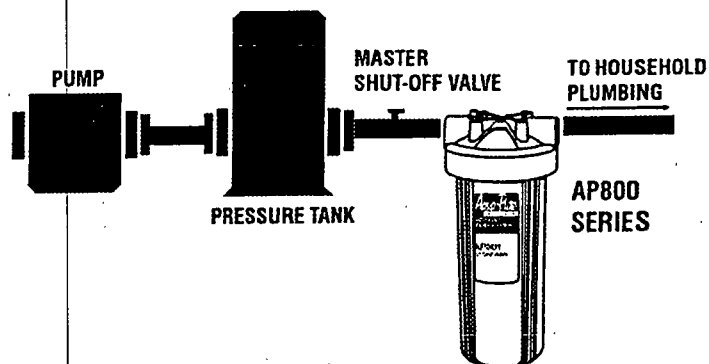


Your new Aqua-Pure® Water Filter installs on the main cold water line after it enters your home.

CITY WATER



WELL WATER

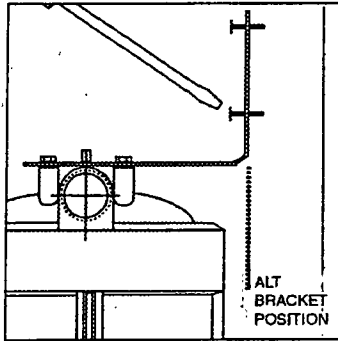
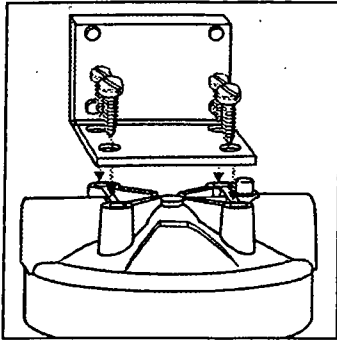


INSTALLATION PRECAUTIONS :

- DO NOT install on line pressure above 100 psi (689.5 kPa), minimum 25 psi (172.4 kPa).
- DO NOT overtighten pipe fittings.
- DO NOT use wicking or pipe dope sealer for fitting connections into head of filter. Teflon® tape is recommended.
- DO NOT use wrench to tighten sump to head. This unit is designed to seal by hand tightening.
- DO NOT use with water that is microbiologically unsafe or of unknown quality without adequate disinfection before or after the system.
- DO NOT use torch near plastic housing: All sweated joints should be made prior to assembling piping to the filter head.
- Installation must comply with existing state or local plumbing codes.
- Replace gasket seal if there is visible damage.
- Maximum temperature allowed is 100° F (37.7° C), minimum 40° F (4.4° C). Special hot water filters are available for higher temperature.
- Protect from freezing.
- DO NOT install in direct sunlight.
- Allow minimum of 2" (5.1cm) clear space under filter to facilitate cartridge change.
- Use only soap and water to clean housing.

Teflon tape is a registered trademark of DuPont.

PROCEDURE FOR INSTALLING AP800 BRACKET (OPTIONAL)



STEP 1: Attach the mounting bracket to the filter head as follows:

Assemble bracket to head in a convenient position. Tighten the 4 lag screws.

STEP 2: Install filter cartridge into sump (see step 3 under replacement cartridge change instructions). Determine the most convenient location of the filter on your wall or panel. Allow at least 2" (5.1 cm) of clearance below the filter to allow room for cartridge removal. Mark the bracket mounting hole locations on wall or panel. Secure bracket to mounting surface using appropriate mounting hardware.

STEP 3: Inlet/outlet connections are 1" female tapered pipe threads. Appropriate fittings, piping, tubing, and/or tools vary by requirements of each installation. A shut-off valve should be installed at the inlet and outlet water line, before and after the filter head.

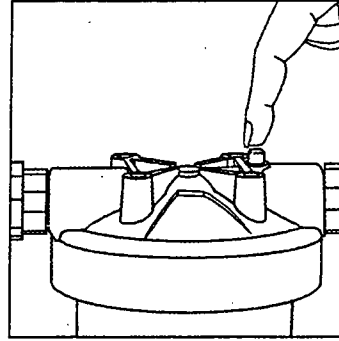
Be sure to use Teflon® tape as a thread sealant.

IMPORTANT: Do not use acid base sealers or wicking on plastic filter head.

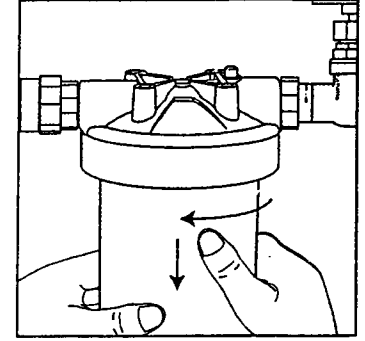
The filter is now ready for service.

Teflon tape is a registered trademark of DuPont.

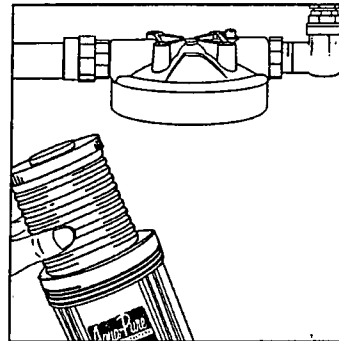
OPERATING INSTRUCTIONS TO REPLACE CARTRIDGE



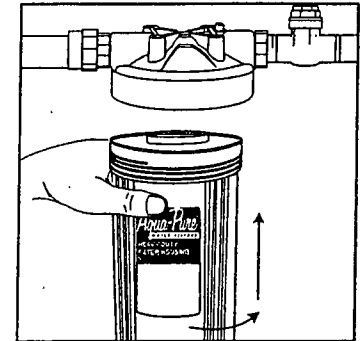
STEP 1: Shut off inlet and outlet valves - depress pressure relief button on top of filter head to relieve pressure in filter.



STEP 2: Unscrew sump from filter head and remove cartridge, emptying water from sump. Use plastic wrench if sump cannot be removed by hand.



STEP 3: Clean and inspect all components. Lubricate gasket with a light coating of petroleum jelly. Replace gasket seal if there is visible damage.



STEP 4: Install new cartridge into sump, making sure outside diameter of cartridge is lined up with pegs inside the filter head.

STEP 5: Place lubricated gasket on the sump. Screw sump firmly onto head until a definite stop is felt and cartridge is sealed. Hand tight is normally sufficient. However, be sure not to overtighten or force sump.

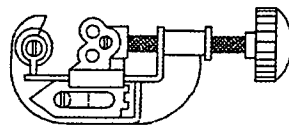
STEP 6: Turn on inlet valve and depress pressure relief button until air is purged from filter. Release button and turn on outlet valve.

PROCEDURE FOR INSTALLING AP800 SERIES HEAVY DUTY WATER FILTER ON MAIN WATER LINE

Required Materials:

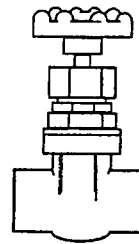
- Tube Cutter • 1" C x M Cast Union
- Teflon® Tape • Gate Valve
- 1" x M ST Adapter Wrought (Valve at main water meter can be used as a second valve.)

Teflon tape is a registered trademark of DuPont.

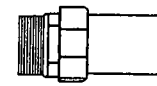


TUBE CUTTER

GATE VALVE OR BALL VALVE (SUGGESTED)



TEFLON TAPE



C x M CAST UNION

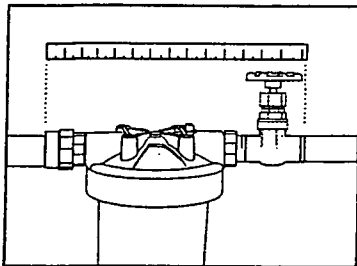


M ST ADAPTER WROUGHT

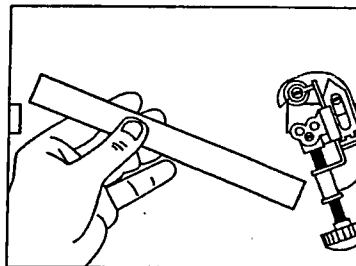
Note: Filter can be adapted to various pipe sizes by using reduced adapters on either end. Installation fittings can be sweated or threaded. Use galvanized fittings for installation on galvanized pipe.

Installation Procedure: See diagrams for corresponding steps. First read "Precautions" on page one.

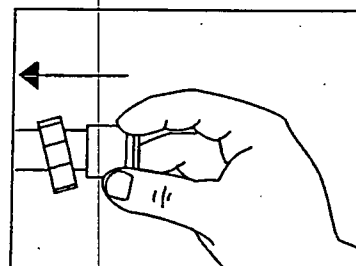
BEFORE STARTING, SHUT OFF MAIN WATER SUPPLY AND DRAIN PIPES



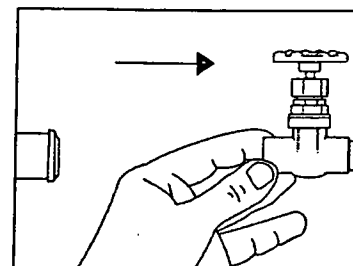
STEP 1: Loose fit all parts and calculate length of pipe to be removed.



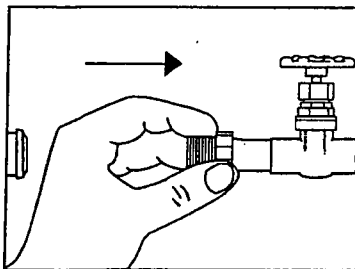
STEP 2: Cut tubing.



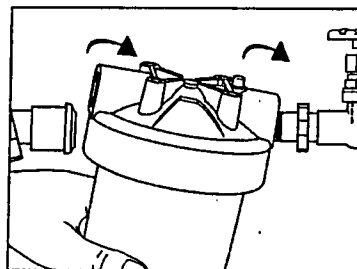
STEP 3: Install sweat side of 1" C x M cast union onto pipe.



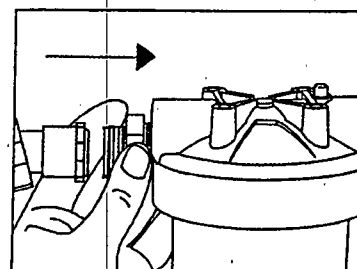
STEP 4: Sweat 1" x M ST adapter to valve.



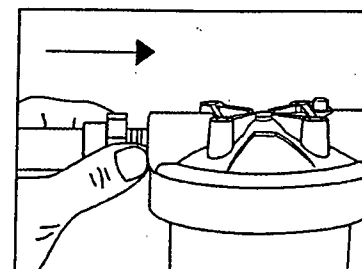
STEP 5: Sweat 1" x M ST adapter to valve.



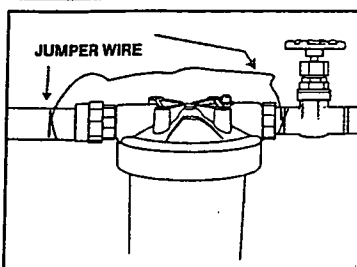
STEP 6: Screw filter head to the adapter after covering threads with Teflon tape. Make a tight connection but do not overtighten. If space is limited remove sump from head while making connection.



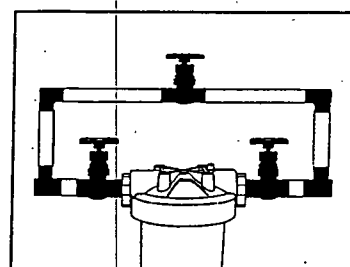
STEP 7: Screw CM part of cast union into filter. Will be tight so it may be necessary to slightly spring tubing out of alignment in order for tubing to enter cast union.



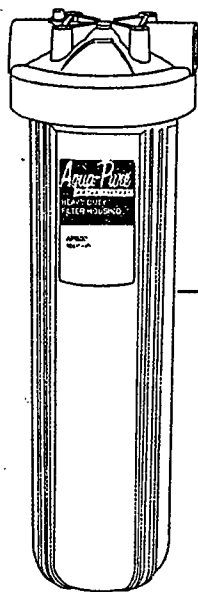
STEP 8: Connect two halves of cast union and tighten, making sure filter is in a straight vertical position.



Caution Note: If water pipes are used to ground electrical system, appliances, or phone, be sure to install a jumper wire.



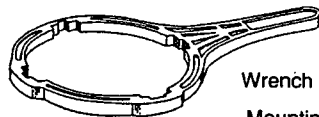
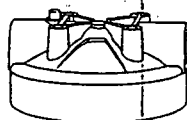
By Pass Section can be installed around unit if desired using either threaded or sweated fittings.



Head - 62009-01 1" NPT
 62009-02 1 1/2" NPT
 62009-03 1" BSP

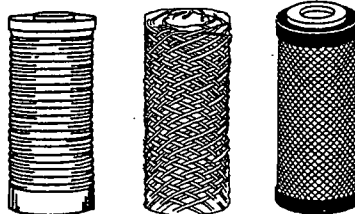
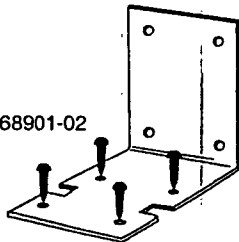
Gasket - 68898-32

Sump - 62010-31 (AP801) -
 62010-32 (AP802)



Wrench - 68900-32

Mounting Kit (optional) - 68901-02

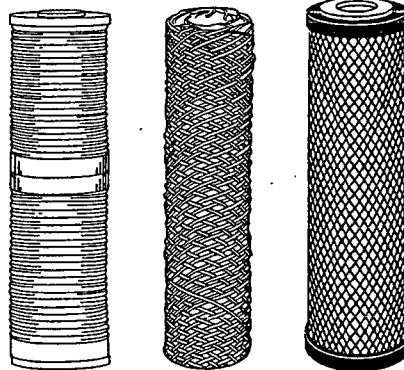


Dirt & Rust

AP810 55779-05 5 micron
 AP811 55779-04 25 micron
 AP814 55994-01 50 micron

Taste, Odor & Chlorine

AP815 55898-01 5 micron



Dirt & Rust

AP810-2 55779-07 5 micron
 AP811-2 55779-09 25 micron
 AP814-2 55994-03 50 micron

Taste, Odor & Chlorine

AP815-2 55898-03 5 micron

REPLACEMENT CARTRIDGES AND PARTS ARE AVAILABLE THROUGH YOUR LOCAL AQUA-PURE DEALER

| Model | Inlet/Outlet Size | Dimensions | | Maximum Flow Rate | Maximum Water Temp. | Maximum Water Pressure | Cartridge Used | Function |
|-----------|-------------------|--------------------|------------------|--------------------|---------------------|------------------------|----------------|------------------|
| | | Height | Maximum Diameter | | | | | |
| AP801 | 1" NPT | 12 1/16" (30.6 cm) | 8 1/8" (20.6 cm) | 20 gpm (76 lpm) | 100° F (38° C) | 100 psi (690 kPa) | AP810 | 5 micron nominal |
| AP801-1.5 | 1.5" NPT | 12 1/16" (30.6 cm) | 8 1/8" (20.6 cm) | 28 gpm (106 lpm) | | | AP810 | 5 micron nominal |
| AP802 | 1" NPT | 23 5/8" (60 cm) | 8 1/8" (20.6 cm) | 45 gpm (170.3 lpm) | | | AP810-2 | 5 micron nominal |
| AP802-1.5 | 1.5" NPT | 23 5/8" (60 cm) | 8 1/8" (20.6 cm) | 60 gpm (227.1 lpm) | | | AP810-2 | 5 micron nominal |

Limited Two Year Warranty

Cuno, Incorporated warrants the original purchaser-consumer of its Product that is free of defects in materials and workmanship. Any defect, malfunction, or other failure of the Product to conform to this warranty will be remedied by CUNO in the manner provided below.

This Warranty, together with any warranties implied by law, shall be limited to a duration of two (2) years from the original date of purchase by the consumer.

This Warranty does not apply to defects that result from abuse, misuse, alteration or damage not caused by CUNO. **IMPORTANT:** To file a claim under this warranty you must complete and mail the Warranty Registration Card supplied with this product to CUNO at the address below within ten (10) days of original purchase date.

THIS WARRANTY DOES NOT COVER, AND IS INTENDED TO EXCLUDE ANY LIABILITY ON THE PART OF CUNO, WHETHER UNDER THIS WARRANTY OR UNDER ANY WARRANTY IMPLIED BY LAW, FOR ANY INDIRECT OR CONSEQUENTIAL DAMAGES FOR BREACH HEREOF OR THEREOF.

Note: Some states prohibit limitations on the duration of implied warranties and on the exclusion of indirect or consequential damages; and so the limitation on implied warranties and on incidental and consequential damages may not be applicable to you.

RESPONSIBILITY OF CUNO

CUNO's responsibility under this warranty shall be to repair at its expense, at no charge to the original purchaser-consumer, any product that is actually defective, malfunctioning, or otherwise in violation of this warranty. If Cuno for any reason cannot repair a Product covered hereby within two (2) weeks after receipt of the original purchaser-consumer's notification of a Warranty claim, then CUNO's responsibility shall be, at its option, either to replace the defective Product with a comparable new unit at no charge to the consumer or to refund the full purchase price. CUNO's obligations of repair, replacement, or refund are conditioned upon return of the defective Product to CUNO.

If any Product covered hereby is actually defective within the terms of this Warranty, then CUNO will bear all the reasonable and proper shipping and mailing charges actually incurred in the consumer's return of the Product set forth herein. If the Product proves not to be defective within the terms of this Warranty, then all costs and expenses in connection with the processing of the consumer's claim hereunder shall be borne by the consumer.

RESPONSIBILITY OF THE CONSUMER

The original purchaser-consumer's sole responsibility in the instance of a warranty claim shall be to notify CUNO of the defect, malfunction, or other manner in which the terms of this Warranty are violated. You may secure:

1. Identifying the Product involved (by model or serial number or other sufficient description that will allow CUNO to determine which product is defective).
2. Specifying where, when, and from whom the Product was purchased.
3. Describing the nature of the defect, malfunction, or other violation of this Warranty.
4. Sending such notification together with the defective Product and \$5.00 check or money order to cover postage and handling to:

CUNO, Inc., 400 Research Parkway, Meriden, Connecticut 06450, USA

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS, WHICH VARY FROM STATE TO STATE.

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CUNO, Inc., manufacturer of Aqua-Pure water filters, has been designing and producing premium performance water filtration systems for over 80 years. CUNO is a world leader in fluid purification for major Restaurant Chains, Food and Beverage Processors, Cruise Ships, Hospitals and Pharmaceutical Companies.

Aqua-Pure brand water filters are the choice of quality-conscious Plumbing Professionals, Builders and Specifying Engineers. Today, Aqua-Pure water filters can be found in **MILLIONS** of homes around the world!



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 400 Research Parkway
 Meriden, CT 06450, USA
 Toll Free: 1-800-222-7880
 Worldwide: 203-237-5541
 Fax: 203-238-8701
 Visit us at www.cuno.com



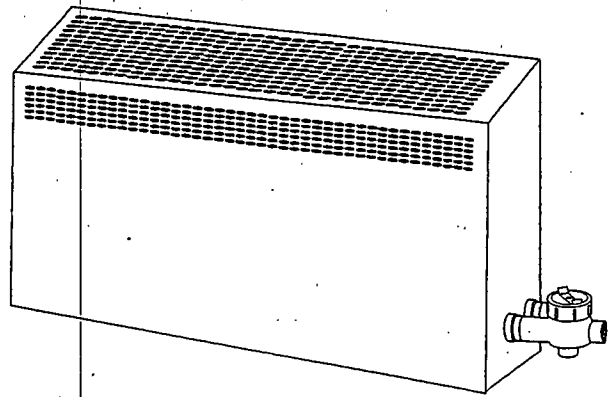
Marley Electric Heating

A United Dominion Company

G Series

(Model B)

Convactor Heater for Hazardous Locations



GENERAL

Type G-Series Convection Heaters are designed for use in Class I, Div. I hazardous environments. Units without control options are suitable for areas classified as Groups B, C & D. Units with built-in controls can be supplied for Groups C and D or B, C and D. Refer to classification stamped on heater nameplate.

WARNING: To prevent ignition of hazardous atmospheres, this heater should not be installed in areas where vapors or gases having an ignition temperature less than 280°C (536°F) (T2A) at 1.8kW, 3.6kW, 4.5kW, 7.6kW, 9.0kW or 180°C (536°F)(T3A) at 1.6kW, 3.2kW, 4.0kW are present.

WARNING: These heaters must not be operated in ambient temperatures exceeding 40°C (104°F).

NOTE: Article 500 of the National Electric Code (NEC) out-lines requirements for installation of electrical equipment in hazardous (Classified) locations.

1. Only connect heaters to the same line voltage as on heater nameplate.

2. All controls such as thermostat and contactor, when required, must have the same explosion-proof rating as heater.
3. Do not install one unit above the other.
4. Units must be mounted a minimum of 8" above the floor.
5. Heaters must be mounted on wall in a horizontal position with terminal end at right only. Never recess heater into wall.
6. All unit electrical installation fittings, conduit, wiring, and seals must meet NEC and local codes for hazardous locations. External line fusing or circuit breaker protection is required.
7. **Hazard of Shock.** Heater must be effectively grounded in accordance with the National Electrical Code.
8. Failure to understand and follow these installation instructions and the "WARNING" notes contained therein may result in severe personal injury, death, or substantial property damage.

SAVE THESE INSTRUCTIONS

INSTALLATION

WARNING: Hazard of electric shock. Disconnect all power before installing heater.

Note: Heaters can be mounted individually end to end. Heaters can be mounted directly on any type of surface (masonry, concrete, block, plastered walls, metal framework, etc.) using appropriate hardware

1. Remove front panel by removing threaded bolts.
2. Locate desired heater position on wall.
3. Locate mounting holes for rear panel. Rear panel must be a minimum of 8" from the floor.

4. Refer to Figure 1A, 1B, or 1C for mounting hole layout for each cabinet size.
5. Drill a pilot hole in wall mounting surface at each mounting hole location. Use a convenient small size drill.
6. Drill the mounting holes in accordance with size in Table 1. Insert anchors where applicable.
7. Fasten rear panel to wall with screws noted in Table 1.

WARNING: Never operate heater with front panel off. Air flow across heating elements requires the front panel in place. Injury from hot heating element possible with front cover removed.

INSTALLATION

G SERIES MODELS WITHOUT CONTROLS — GROUPS B, C AND D

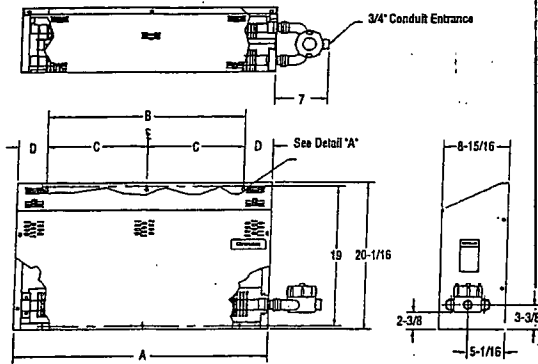


Figure 1A

Dimensions (In.)

| kW | A | B | C | D |
|-----|----|----|----|----|
| 1.6 | | | | |
| 1.8 | 34 | 20 | 10 | 7 |
| 3.6 | | | | |
| 3.2 | 58 | 32 | 16 | 13 |
| 7.6 | | | | |
| 4.0 | 70 | 48 | 24 | 11 |
| 4.5 | | | | |
| 9.0 | | | | |

G SERIES MODELS WITH BUILT-IN CONTROLS — GROUPS B, C AND D

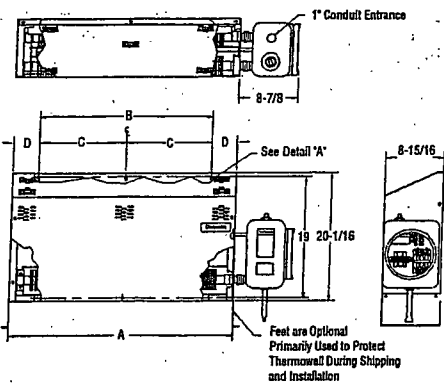


Figure 1B

Dimensions (In.)

| kW | A | B | C | D |
|-----|----|----|----|----|
| 1.6 | | | | |
| 1.8 | 34 | 20 | 10 | 7 |
| 3.6 | | | | |
| 3.2 | 58 | 32 | 16 | 13 |
| 7.6 | | | | |
| 4.0 | 70 | 48 | 24 | 11 |
| 4.5 | | | | |
| 9.0 | | | | |

G SERIES MODELS WITH THERMOSTAT ONLY — GROUPS C AND D

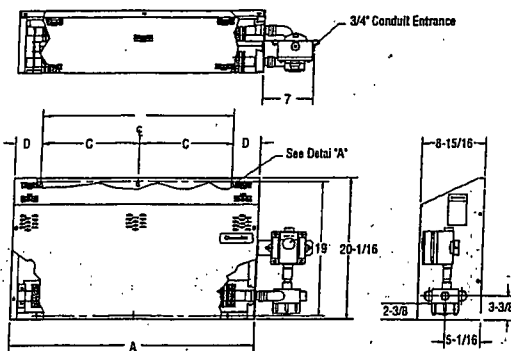


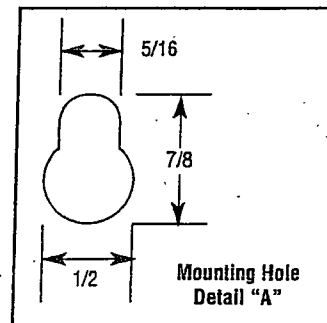
Figure 1C

Dimensions (In.)

| kW | A | B | C | D |
|-----|----|----|----|----|
| 1.6 | | | | |
| 1.8 | 34 | 20 | 10 | 7 |
| 3.6 | | | | |
| 3.2 | 58 | 32 | 16 | 13 |
| 7.6 | | | | |
| 4.0 | 70 | 48 | 24 | 11 |
| 4.5 | | | | |
| 9.0 | | | | |

Table 1 — Suggested Heater Mounting Screws — Types and Sizes

| Type of Mounting Surface | ** Accessory Hardware | Screw Type | Drill Size and Type | Screw Size to Fit Mtg Hole Size |
|-------------------------------------|-----------------------|--|---------------------|---------------------------------|
| Concrete Block Masonry | Ackerman | Rd. Hd. Mach. Steel | 1/2" Masonry | † 1/4" x 20 xlg |
| | Lead Anchor | Rd. Hd. Mach Steel or Pan Hd. Metal (Self Tapping) | 5/16" Masonry | † # 1/4" xlg |
| Wood Studs | --- | Wood or Metal (Self Tapping) | --- | † # 1/4" xlg |
| Plaster wall Hollow or Similar Type | --- | Toggle Bolt | #7 Twist | † # 1/4" xlg |
| * Metal Beam, Channel, etc. | Nuts Washers | Rd. Hd. Mach. Steel | #7 Twist | † 1/4" x 20 xlg |



*If clearance permits use washer, lock washer and nut; otherwise drill and tap to these lengths, add thickness of beam, washers, nut, etc.
 **If mounting structure permits. Except plastered hollow walls explosive type anchors can be used. Suggested size noted in Table and/or sketches should be used to determine size of anchors.

†Select overall length of screw to provide a minimum penetration of 1 Inch into base wall material.

WIRING

WARNING: Hazard of Shock. Any installation involving electric heaters must be effectively grounded in accordance with the National Electrical Code.

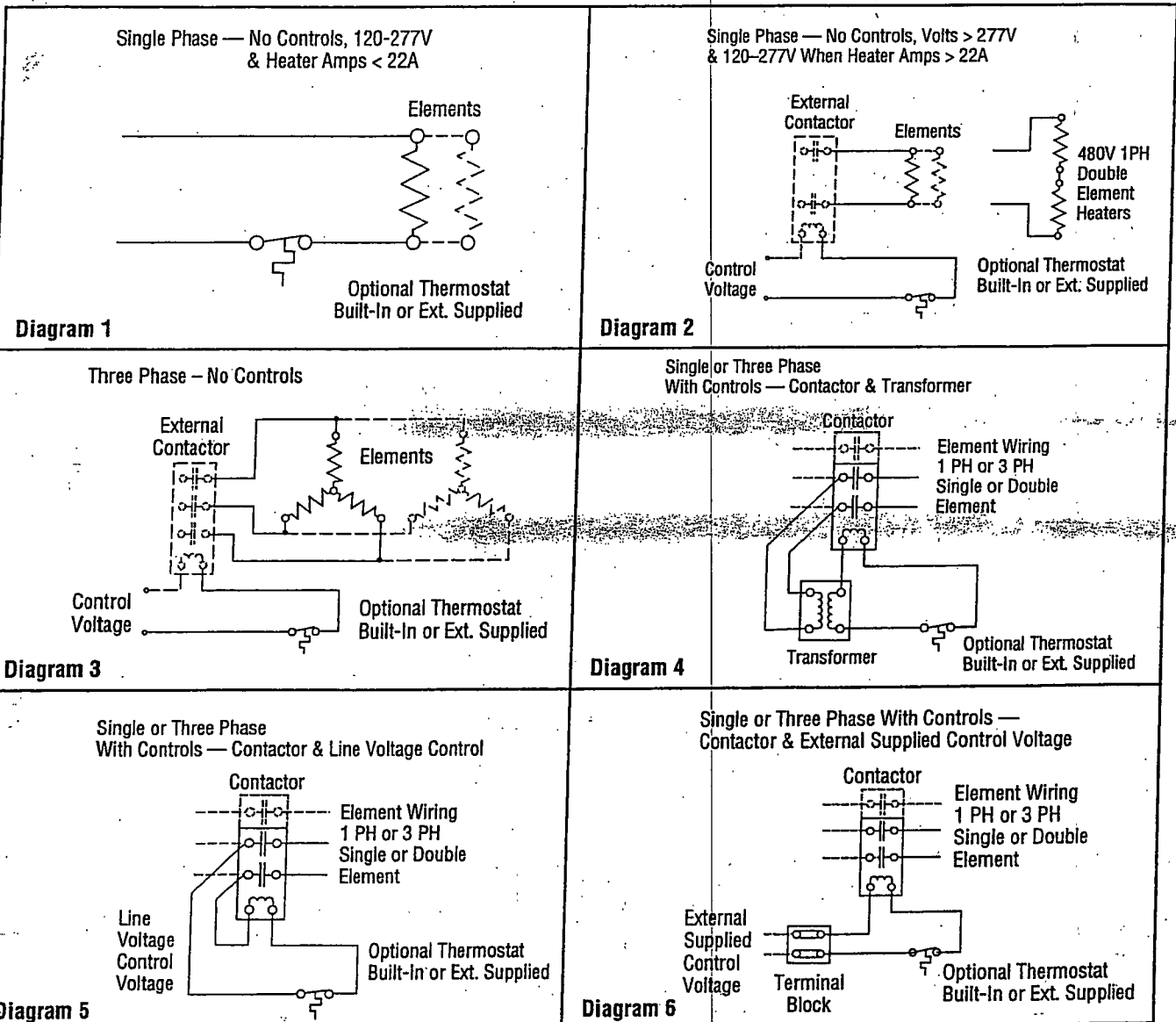
- All wiring must be done in accordance with local codes and the National Electrical Code by a qualified person as defined in the NEC.

WARNING: Use copper conductors only.

- Rough-in-line-wiring to unit in manner approved for hazardous locations. (See warning below.)
- Wire per diagrams 1 through 6 based on the rating and control options listed in table 2. Refer to table 3 for amperage specifications.

- Remove cover of conduit box for connections. Use either opening and plug the other with the plug provided.
- In single phase units (except 480 V) the heaters must be wired in parallel, combining L1 to L1, L2 to L2 and for 3 phase unit, L3 to L3. On 480V single phase units the elements must be wired in series.
- Re-assemble cover with a minimum of 7 turns.

WARNING: (Group B atmospheres) To prevent ignition of Group B atmospheres, conduit runs must not exceed 3/4" in size and all conduit runs 1/2" size and larger must have a sealing fitting connected within 2", 6" or 18" of the terminal enclosure depending on the exact model. For correct placement, refer to data located on the enclosure label.



OPERATION

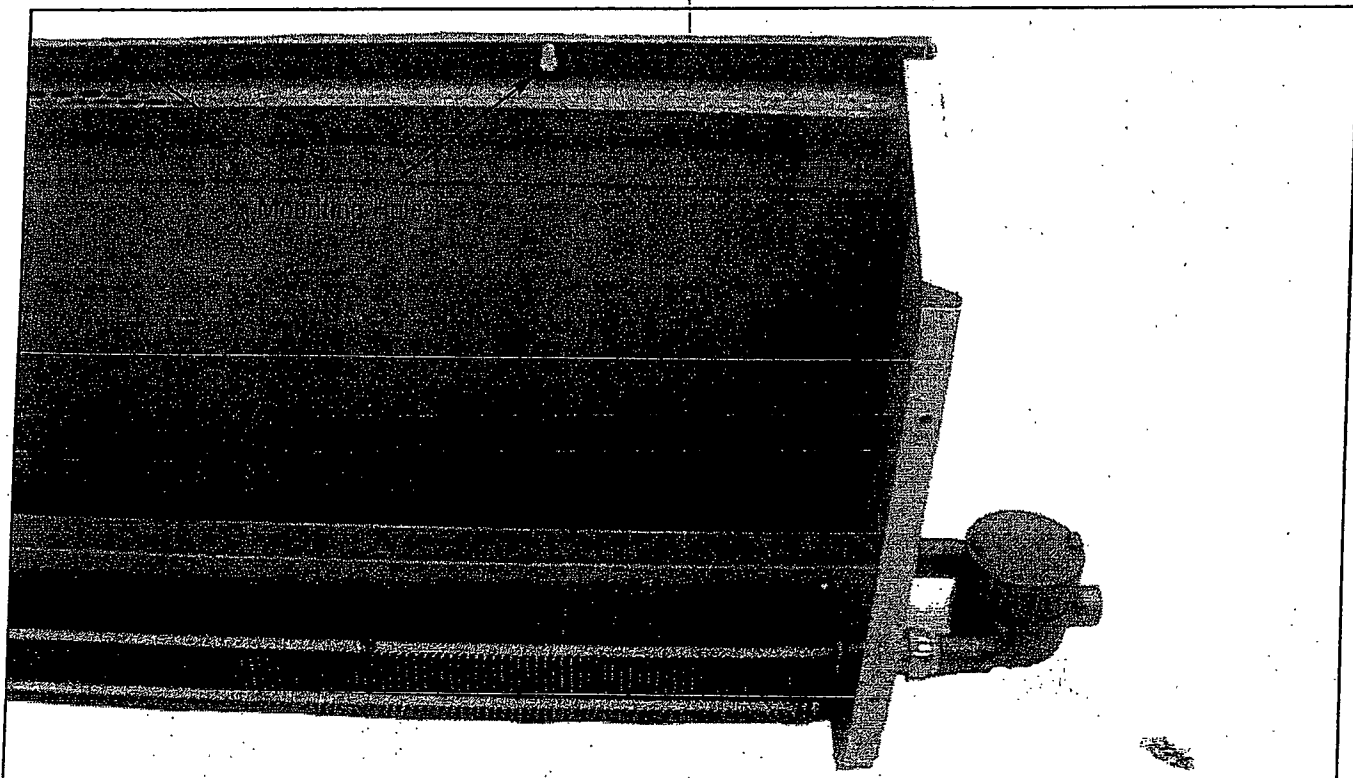
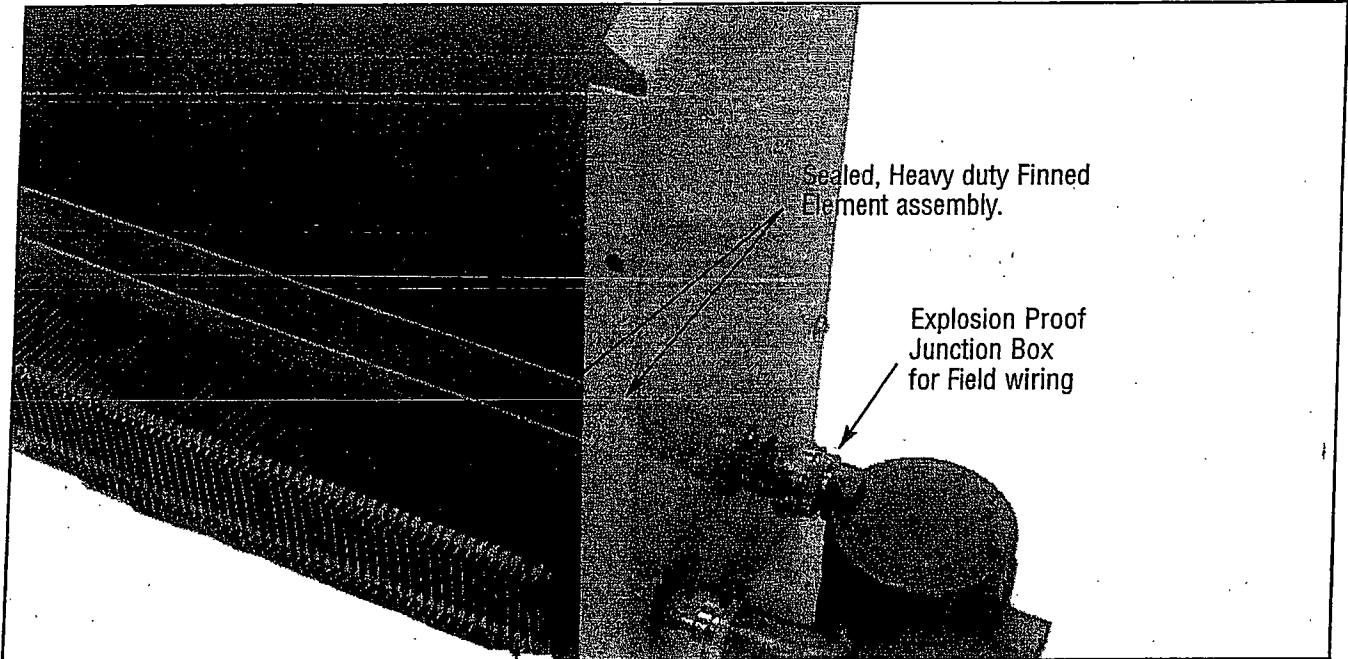
CAUTION: Users should install adequate controls and safety devices with their electric heating equipment. Where the consequences of failure may be severe, back-up controls are essential. The safety of the installation is the responsibility of the user.

- Do not operate heater at voltages in excess of that stamped on the heater since excess voltage will shorten heater life and cause high element temperatures which may exceed allowable temperatures of operation in a hazardous atmosphere.

MAINTENANCE

WARNING: Hazard of Shock. Disconnect all power to heater before servicing or replacing heaters.

1. Before activating for next heating season, vacuum or use compressed air to remove accumulated dust or lint, which otherwise may restrict proper air flow.
2. Periodically check all electrical connections and retighten to avoid electrical wiring difficulties.
3. Check to ensure terminal cover is tightly closed before energizing.



MODEL NUMBER BREAKDOWN

Model

G-Series

Explosion Proof Convection Heater

| G | Code | kW | Temperature Rating | | °C | (BTU) |
|---|------|-----|--------------------|-----|-----|--------|
| | | | ID Number | °F | | |
| | 160 | 1.6 | T3A | 356 | 180 | 5,500 |
| | 180 | 1.8 | T2A | 536 | 280 | 6,150 |
| | 320 | 3.2 | T3A | 356 | 180 | 11,000 |
| | 360 | 3.6 | T2A | 536 | 280 | 12,300 |
| | 400 | 4.0 | T3A | 356 | 180 | 13,600 |
| | 450 | 4.5 | T2A | 536 | 280 | 15,350 |
| | 760 | 7.6 | T2A | 536 | 280 | 25,930 |
| | 900 | 9.0 | T2A | 536 | 280 | 30,700 |

| Code | Voltage | Maximum kW Allowable |
|------|---------|----------------------|
| 0 | 120 | 1.8 |
| 4 | 240 | 9.0 |
| 38 | 380 | 9.0 |
| 48 | 480 | 9.0 |
| 6 | 600 | 9.0 |
| 7 | 277 | 9.0 |
| 8 | 208 | 9.0 |

| Code | Phase |
|------|---------------------------------|
| 1 | 1Ø |
| 3 | 3Ø (Not available in 120, 277V) |

| Code | Control Combination | |
|------|---------------------|-----------------------|
| | Contactor Coil | Transformer Secondary |
| CX | None | None |
| CX* | 24 Volt 120 Volt | 24 Volt 120 Volt |

| Code | Temperature Control |
|------|--|
| TB | None |
| T | Thermostat 40 - 90°F Group B, C & D |
| | Thermostat Group C & D 50 - 90°F |

| | | | | | |
|---|-----|----|---|----|---|
| G | 760 | 48 | 3 | DX | T |
|---|-----|----|---|----|---|

Note: Letter "B" will appear after phase code to indicate engineering version.

TABLE 2 — TEMPERATURE SPECIFICATIONS
DIMENSIONS REPLACEMENTS ELEMENTS REQUIREMENTS

Temperature Rating T3A 356°F (180°C)

Common To Units W & W/O Suffix B

| kW | BTU | Volts | Phase | Amps | Model | Width A | Height B | Depth C | Wt. (Lbs.) | Element P/N | Qty. |
|-----|-------|-------|-------|------|---------|---------|----------|---------|------------|----------------|------|
| 1.6 | 5,500 | 208 | 1 | 7.7 | G16081 | 34" | 20" | 9" | 58 | 003-304650-002 | 2 |
| 1.6 | 5,500 | 208 | 3 | 4.4 | G16083 | 34" | 20" | 9" | 58 | 003-304650-005 | 2 |
| 1.6 | 5,500 | 240 | 1 | 6.7 | G16041 | 34" | 20" | 9" | 58 | 003-304650-003 | 2 |
| 1.6 | 5,500 | 240 | 3 | 3.8 | G16043 | 34" | 20" | 9" | 58 | 003-304650-006 | 2 |
| 1.6 | 5,500 | 277 | 1 | 5.8 | G16071 | 34" | 20" | 9" | 58 | 003-304650-004 | 2 |
| 1.6 | 5,500 | 480 | 1 | 3.3 | G160481 | 34" | 20" | 9" | 58 | 003-304650-003 | 2 |
| 1.6 | 5,500 | 480 | 3 | 1.9 | G160483 | 34" | 20" | 9" | 58 | 003-304650-009 | 2 |
| 1.6 | 5,500 | 575 | 3 | 1.6 | G16063 | 34" | 20" | 9" | 58 | 003-304650-010 | 2 |

| | | | | | | | | | | | |
|-----|--------|-----|---|------|---------|-----|-----|----|----|----------------|---|
| 3.2 | 11,000 | 208 | 1 | 15.4 | G32081 | 58" | 20" | 9" | 94 | 003-304650-023 | 2 |
| 3.2 | 11,000 | 208 | 3 | 8.9 | G32083 | 58" | 20" | 9" | 94 | 003-304650-026 | 2 |
| 3.2 | 11,000 | 240 | 1 | 13.3 | G32041 | 58" | 20" | 9" | 94 | 003-304650-024 | 2 |
| 3.2 | 11,000 | 240 | 3 | 7.7 | G32043 | 58" | 20" | 9" | 94 | 003-304650-027 | 2 |
| 3.2 | 11,000 | 277 | 1 | 11.6 | G32071 | 58" | 20" | 9" | 94 | 003-304650-025 | 2 |
| 3.2 | 11,000 | 480 | 1 | 6.7 | G320481 | 58" | 20" | 9" | 94 | 003-304650-024 | 2 |
| 3.2 | 11,000 | 480 | 3 | 3.8 | G320483 | 58" | 20" | 9" | 94 | 003-304650-030 | 2 |
| 3.2 | 11,000 | 575 | 3 | 3.2 | G32063 | 58" | 20" | 9" | 94 | 003-304650-031 | 2 |

| | | | | | | | | | | | |
|-----|--------|-----|---|------|---------|-----|-----|----|-----|----------------|---|
| 4.0 | 13,600 | 208 | 1 | 19.2 | G40081 | 70" | 20" | 9" | 112 | 003-304650-045 | 2 |
| 4.0 | 13,600 | 208 | 3 | 11.1 | G40083 | 70" | 20" | 9" | 112 | 003-304650-048 | 2 |
| 4.0 | 13,600 | 240 | 1 | 16.7 | G40041 | 70" | 20" | 9" | 112 | 003-304650-046 | 2 |
| 4.0 | 13,600 | 240 | 3 | 9.6 | G40043 | 70" | 20" | 9" | 112 | 003-304650-049 | 2 |
| 4.0 | 13,600 | 277 | 1 | 14.4 | G40071 | 70" | 20" | 9" | 112 | 003-304650-047 | 2 |
| 4.0 | 13,600 | 480 | 1 | 8.3 | G400481 | 70" | 20" | 9" | 112 | 003-304650-046 | 2 |
| 4.0 | 13,600 | 480 | 3 | 4.8 | G400483 | 70" | 20" | 9" | 112 | 003-304650-052 | 2 |
| 4.0 | 13,600 | 575 | 3 | 7.0 | G40063 | 70" | 20" | 9" | 112 | 003-304650-053 | 2 |

Temperature Rating T2A 536°F (280°C)

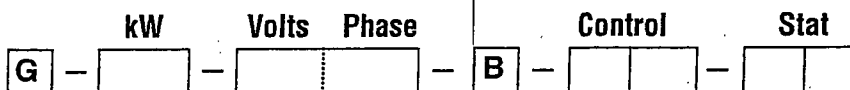
| kW | BTU | Volts | Phase | Amps | Model | Width A | Height B | Depth C | Wt. (Lbs.) | Element P/N | Qty. |
|---------|--------------|-------|-------|----------|--------------|---------|----------|---------|------------|--------------------|--------|
| 1.8/3.6 | 6,150/12,300 | 208 | 1 | 8.7/17.3 | G(180)36081 | 34" | 20" | 9" | 46/58 | 003-304650-034 | 1 or 2 |
| 1.8/3.6 | 6,150/12,300 | 208 | 3 | 5.0/10.0 | G(180)36083 | 34" | 20" | 9" | 46/58 | 003-304650-038 | 1 or 2 |
| 1.8/3.6 | 6,150/12,300 | 240 | 1 | 7.5/15.0 | G(180)36041 | 34" | 20" | 9" | 46/58 | 003-304650-035 | 1 or 2 |
| 1.8/3.6 | 6,150/12,300 | 240 | 3 | 4.3/8.7 | G(180)36043 | 34" | 20" | 9" | 46/58 | 003-304650-039 | 1 or 2 |
| 1.8/3.6 | 6,150/12,300 | 277 | 1 | 6.5/13.0 | G(180)36071 | 34" | 20" | 9" | 46/58 | 003-304650-036 | 1 or 2 |
| 1.8/3.6 | 6,150/12,300 | 480 | 1 | 3.8/7.5 | G(180)360481 | 34" | 20" | 9" | 46/58 | 003-304650-037/035 | 1 or 2 |
| 1.8/3.6 | 6,150/12,300 | 480 | 3 | 2.2/4.3 | G(180)360483 | 34" | 20" | 9" | 46/58 | 003-304650-042 | 1 or 2 |
| 1.8/3.6 | 6,150/12,300 | 575 | 3 | 1.8/3.6 | G(180)36063 | 34" | 20" | 9" | 46/58 | 003-304650-043 | 1 or 2 |

| | | | | | | | | | | | |
|-----|--------|-----|---|------|---------|-----|-----|----|----|----------------|---|
| 7.6 | 25,930 | 208 | 1 | 36.5 | G76081 | 58" | 20" | 9" | 94 | 003-304650-055 | 2 |
| 7.6 | 25,930 | 208 | 3 | 21.1 | G76083 | 58" | 20" | 9" | 94 | 003-304650-058 | 2 |
| 7.6 | 25,930 | 240 | 1 | 31.7 | G76041 | 58" | 20" | 9" | 94 | 003-304650-056 | 2 |
| 7.6 | 25,930 | 240 | 3 | 18.3 | G76043 | 58" | 20" | 9" | 94 | 003-304650-059 | 2 |
| 7.6 | 25,930 | 277 | 1 | 27.4 | G76071 | 58" | 20" | 9" | 94 | 003-304650-057 | 2 |
| 7.6 | 25,930 | 480 | 1 | 15.8 | G760481 | 58" | 20" | 9" | 94 | 003-304650-056 | 2 |
| 7.6 | 25,930 | 480 | 3 | 9.1 | G760483 | 58" | 20" | 9" | 94 | 003-304650-062 | 2 |
| 7.6 | 25,930 | 575 | 3 | 7.6 | G76063 | 58" | 20" | 9" | 94 | 003-304650-063 | 2 |

| | | | | | | | | | | | |
|---------|---------------|-----|---|-----------|--------------|-----|-----|----|--------|--------------------|--------|
| 4.5/9.0 | 15,350/30,700 | 208 | 1 | 21.6/43.3 | G(450)90081 | 70" | 20" | 9" | 87/112 | 003-304650-065 | 1 or 2 |
| 4.5/9.0 | 15,350/30,700 | 208 | 3 | 12.5/25.0 | G(450)90083 | 70" | 20" | 9" | 87/112 | 003-304650-069 | 1 or 2 |
| 4.5/9.0 | 15,350/30,700 | 240 | 1 | 18.8/37.5 | G(450)90041 | 70" | 20" | 9" | 87/112 | 003-304650-066 | 1 or 2 |
| 4.5/9.0 | 15,350/30,700 | 240 | 3 | 10.8/21.7 | G(450)90043 | 70" | 20" | 9" | 87/112 | 003-304650-070 | 1 or 2 |
| 4.5/9.0 | 15,350/30,700 | 277 | 1 | 16.2/32.5 | G(450)90071 | 70" | 20" | 9" | 87/112 | 003-304650-067 | 1 or 2 |
| 4.5/9.0 | 15,350/30,700 | 480 | 1 | 9.4/18.8 | G(450)900481 | 70" | 20" | 9" | 87/112 | 003-304650-068/070 | 1 or 2 |
| 4.5/9.0 | 15,350/30,700 | 480 | 3 | 5.4/10.8 | G(450)900483 | 70" | 20" | 9" | 87/112 | 003-304650-073 | 1 or 2 |
| 4.5/9.0 | 15,350/30,700 | 575 | 3 | 4.5/9.0 | G(450)90063 | 70" | 20" | 9" | 87/112 | 003-304650-074 | 1 or 2 |

REPLACEMENT PARTS

| Model Any Voltage | Front Cover Assembly | Rear Cover Assembly | Right Side Panel | Left Side Panel | Element Support Bracket |
|----------------------|-------------------------|------------------------|---------------------|--------------------|----------------------------|
| 1.6, 1.8, 3.6 KW | 207-304644-101 | 207-304644-001 | 207-304644-201 | 304-304644-301 | 027-304646-001 |
| 3.2, 7.6 KW | 207-304644-102 | 207-304644-002 | 207-304644-201 | 304-304644-301 | 027-304646-001 |
| 4.0, 4.5, 9.0 KW | 207-304644-103 | 207-304644-003 | 207-304644-201 | 304-304644-301 | 027-304646-001 |



| Control Combination | | |
|---------------------|-----------------------------|-----------------------------|
| Code | Contactor Coil | Transformer Secondary |
| CX CX* | None 24 Volt 120 Volt | None 24 Volt 120 Volt |

| Code | Phase |
|------|-------|
| 1 | 1Ø |
| 3 | 3Ø |

| Code | Thermostat |
|------|----------------|
| | None |
| TB | 300-049197-003 |
| T | 300-113075-002 |

| Contactor | | |
|--------------|----------------|----------------|
| Coil Voltage | 30 Amp | 50 Amp |
| 24V | 072-304551-001 | 072-304551-002 |
| 120V | 072-304551-007 | 072-304551-008 |

| Primary Voltage | Secondary Voltage | Transformer |
|--------------------|----------------------|----------------|
| 208/240/480 | 24 | 315-304252-002 |
| 208/240/480 | 120 | 315-304252-001 |
| 277 | 24 | 315-304252-004 |
| 575 | 24 | 315-304252-005 |
| 277/575 | 120 | 315-304252-003 |

LIMITED WARRANTY

All products manufactured by Marley Electric Heating are warranted against defects in workmanship and materials for one year from date of installation. This warranty does not apply to damage from accident, misuse, or alteration; nor where the connected voltage is more than 5% above the nameplate voltage; nor to equipment improperly installed or wired or maintained in violation of the product's installation instructions. All claims for warranty work must be accompanied by proof of the date of installation. The customer shall be responsible for all costs incurred in the removal or reinstallation of products, including labor costs, and shipping costs incurred to return products to Marley Electric Heating Service Center. Within the limitations of this warranty, inoperative units should be returned to the nearest Marley authorized service center or the Marley Electric Heating Service Center, and we will repair or replace, at our option, at no charge to you with return freight paid by Marley. It is agreed that such repair or replacement is the exclusive remedy available from Marley Electric Heating. THE ABOVE WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED. AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WHICH EXCEED THE AFORESAID EXPRESSED WARRANTIES ARE HEREBY DISCLAIMED AND EXCLUDED FROM THIS AGREEMENT. MARLEY ELECTRIC HEATING SHALL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGES ARISING WITH RESPECT TO THE PRODUCT, WHETHER BASED UPON NEGLIGENCE, TORT, STRICT LIABILITY, OR CONTRACT. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion or limitation 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. For the address of your nearest authorized service center, contact Marley Electric Heating in Bennettsville, SC, at 1-800-642-4328. Merchandise returned to the factory must be accompanied by a return authorization and service identification tag, both available from Marley Electric Heating. When requesting return authorization, include all catalog numbers shown on the products.

How to order repair parts:

In order to obtain any needed repair or replacement parts, warranty service or technical information, please contact the Marley Electric Heating Service Center toll-free by calling 1-800-642-HEAT.

When ordering replacement parts, always give the information listed as follows:

1. The Part Number
2. The Model Number
3. The Part Description
4. Date of Manufacture

PPD
031
9-99

5200-2472-000



**Marley Electric
Heating**

A United Dominion Company

470 Beauty Spot Rd.
Bennettsville, SC 29512 USA

COLUMBUS ELECTRIC MANUFACTURING

OPERATION & INSTALLATION MANUAL

EP-ETD-8D
EP-ETD-8S

DPDT HEAT/COOL
SPDT HEAT/COOL

EXPLOSION PROOF THERMOSTAT

The Columbus Electric Explosion Proof Thermostat is designed to control heating only, cooling only, heating and cool or ventilation systems in oil refineries, grain elevators, munition plants, hospital operating rooms and other hazardous locations.

The switch mechanism is enclosed in a 1/2" thick cast aluminum case which is dust proof and dust resistant. A reliable sensing element provides accurate response to temperature change and does not require leveling during installation.

The casing is tapped top and bottom for 3/4" conduit, a 1/2" adaptor is provided.

SPECIFICATIONS

Electrical Rating: 22 Amp 125-277 VAC
3/4 HP at 125 VAC
1 1/2 HP 250/277 VAC

Dimensions: 5.62" x 6.37" x 4.43"
Approvals: U.L. AND C.S.A.
Class I Groups C & D
Class II Groups E, F, & G

Differential: Heat: 2°F/Cool: 4°F

Temp Set Range: 50°F to 90°F

INSTALLATION

ALL WIRING MUST COMPLY WITH NFPA-70(NEC), LOCAL CODES AND ORDINANCES:

Locate the thermostat approximately five feet (5') above the floor in a location that will sense the average temperature of the area to be controlled. Do not mount the thermostat adjacent to water pipes, in drafty areas, or other locations that would adversely affect the operation of the thermostat.

- 1) Remove the cover of the thermostat and set it aside. Exercise care not to mar the mating surface or damage the temperature sensing/operating components. CAUTION: Marring of the mating surfaces of the enclosure could destroy the integrity of the seal causing an unsafe condition during operation of the thermostat.
- 2) Mount the thermostat base on the surface selected. See Fig. 1 for dimensions.
- 3) The base is tapped for 3/4" conduit; a 1/2" conduit adaptor and a 3/4" plug is provided. Two openings are provided. Unused openings must be properly plugged, with plugs provided, prior to applying power to the unit.
- 4) Connect the conduit to the mounted base and place the required wire into the base.
- 5) Connections are to be made to the switch terminals on the cover, see Fig. 2. The cover can then be installed to the base and securely fastened utilizing the four (4) mounting screws. Immediately prior to assembly, inspect the mating surfaces of the cover and enclosure. Do not connect if surfaces are uneven or gaps exist between the cover and enclosure. Install the four (4) cover screws to enclosure and TIGHTEN TO A MINIMUM OF 40 INCH POUNDS.
- 6) The installer must seal each conduit run within 18" of the thermostat enclosure. This seal must be a suitable listed hazardous location fitting.

DIAGRAMS

FIG 1

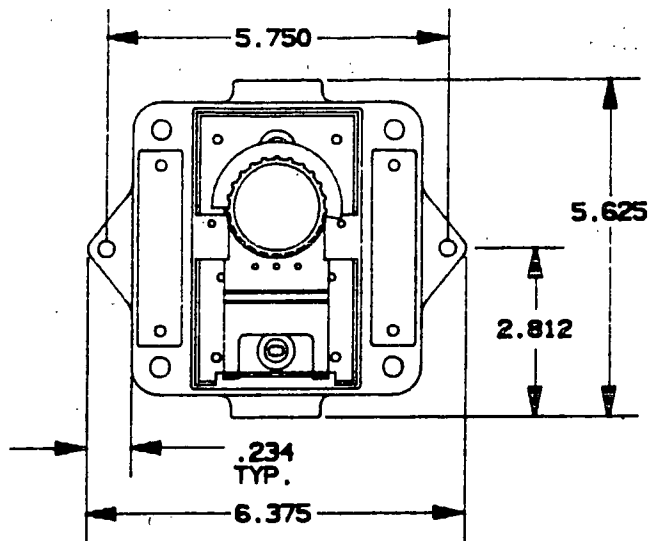
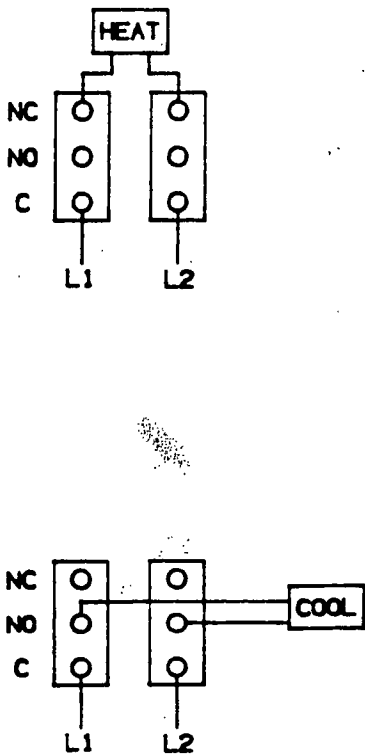
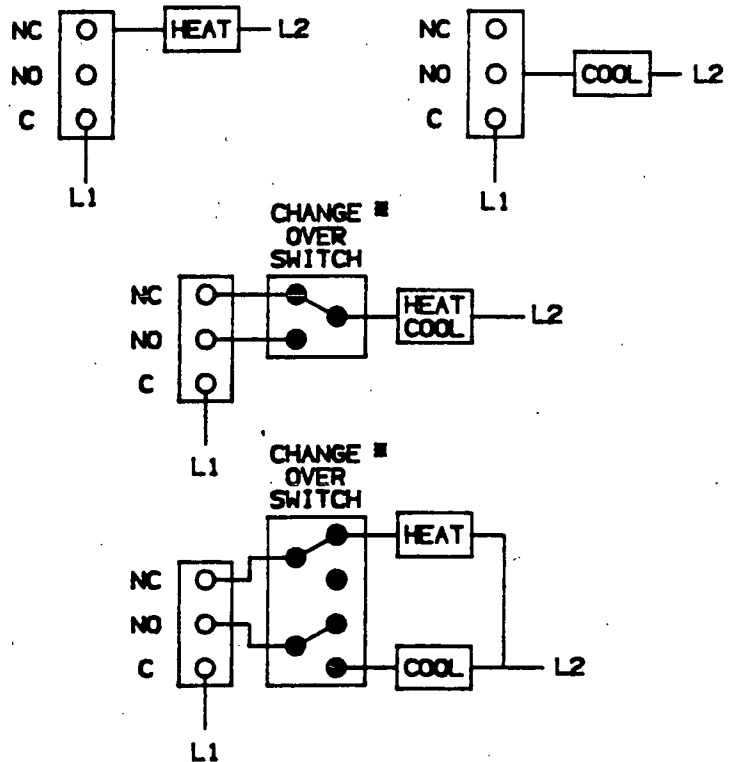


FIG 2 TYPICAL WIRING DIAGRAMS

EP-ETD-8D



EP-ETD-8S



■ TO BE PROVIDED BY INSTALLER

P.O. BOX 4973, JOHNSON CITY, TENNESSEE 37602

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

Dayton® Cast and Stamped Aluminum D.D. Venturi Fans

Description

The Dayton heavy duty exhaust fan for wall mounting is designed for use in commercial and industrial applications. Each fan is equipped with a ball bearing, totally enclosed motor. Unit is furnished with powder coated steel venturi and stamped or cast aluminum propeller.

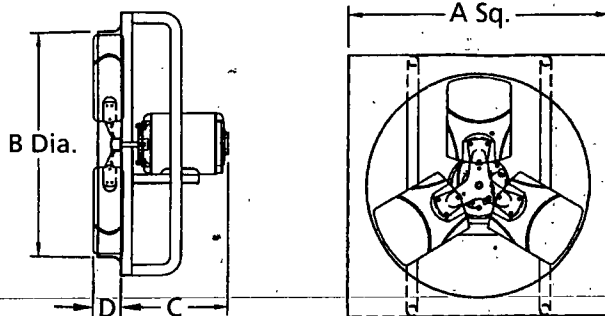


Figure 1 - Dimensions



Dayton Electric Mfg. Co. certifies that the fans shown, hereon are licensed to bear the AMCA seal. The ratings shown are based on tests and procedures performed in accordance with

AMCA Publication 211 and AMCA Publication 311 comply with the requirements of the AMCA Certified Ratings Program.

The Sound Ratings shown are loudness values in fan sones at five (5) feet in a hemispherical free field calculated per AMCA Standard 301. Values shown for ventilators listed are for: Installation Type A: Free inlet fan sone levels.

Dimensions

| Model No. | Propeller Dia. | Propeller Type | A Sq. | B | C | D | Shipping Weight (lbs.) |
|-----------|----------------|----------------|-------|---------|---------|---------|------------------------|
| 3XK45 | 12" | Stamped | 16" | 12 3/8" | 10 5/8" | 2 3/4" | 26 |
| 3XK50A | 12 | Cast | 16 | 12 3/8 | 10 1/8 | 1 13/16 | 27 |
| 3XK51A | 12 | Cast | 16 | 12 3/8 | 11 1/4 | 1 13/16 | 27 |
| 3XK37 | 16 | Cast | 20 | 16 1/2 | 11 1/16 | 2 3/8 | 32 |
| 3XK40 | 16 | Stamped | 20 | 16 1/2 | 10 | 2 1/4 | 29 |
| 3XK52 | 16 | Cast | 20 | 16 1/2 | 10 | 2 5/16 | 32 |
| 3XK53 | 16 | Cast | 20 | 16 1/2 | 9 1/16 | 2 5/16 | 43 |
| 3XK41 | 18 | Stamped | 22 | 18 1/2 | 10 5/8 | 2 3/16 | 30 |
| 3XK46 | 18 | Stamped | 22 | 18 1/2 | 10 5/8 | 2 3/16 | 34 |
| 3XK54 | 18 | Cast | 22 | 18 1/2 | 10 3/8 | 2 5/8 | 40 |
| 3XK55 | 18 | Cast | 22 | 18 1/2 | 11 3/4 | 2 5/8 | 40 |
| 3XK56 | 18 | Cast | 22 | 18 1/2 | 9 7/16 | 2 5/8 | 42 |
| 3XK42 | 20 | Stamped | 24 | 20 1/2 | 9 15/16 | 2 3/16 | 38 |
| 3XK47 | 20 | Stamped | 24 | 20 1/2 | 9 15/16 | 2 15/16 | 42 |
| 3XK48 | 20 | Stamped | 24 | 20 1/2 | 9 | 2 15/16 | 36 |
| 3XK57 | 20 | Cast | 24 | 20 1/2 | 9 15/16 | 2 15/16 | 46 |
| 3XK58 | 20 | Cast | 24 | 20 1/2 | 9 | 2 15/16 | 48 |
| 3XK59 | 20 | Cast | 24 | 20 1/2 | 12 3/8 | 2 15/16 | 46 |
| 3XK39 | 24 | Stamped | 28 | 24 3/8 | 8 11/16 | 3 1/8 | 40 |
| 3XK44 | 24 | Stamped | 28 | 24 3/8 | 9 5/8 | 2 15/16 | 46 |
| 3XK49 | 24 | Stamped | 28 | 24 3/8 | 9 7/16 | 3 1/16 | 39 |
| 3XK60 | 24 | Cast | 28 | 24 3/8 | 9 7/16 | 3 5/16 | 48 |
| 3XK61 | 24 | Cast | 28 | 24 3/8 | 11 7/8 | 3 3/8 | 48 |
| 3XK62 | 24 | Cast | 28 | 24 3/8 | 8 3/16 | 3 1/4 | 49 |
| 3XK63 | 24 | Cast | 28 | 24 3/8 | 8 15/16 | 3 1/4 | 43 |
| 3XK64 | 24 | Cast | 28 | 24 3/8 | 12 1/16 | 3 5/16 | 49 |
| 3XK43 | 30 | Stamped | 34 | 30 1/2 | 10 1/4 | 3 11/16 | 55 |
| 3XK65 | 30 | Stamped | 34 | 30 1/2 | 9 5/16 | 3 11/16 | 56 |
| 3XK66 | 30 | Cast | 34 | 30 1/2 | 8 5/16 | 3 3/16 | 57 |
| 3XK67 | 30 | Cast | 34 | 30 1/2 | 9 1/4 | 3 3/16 | 51 |

Dayton® Cast and Stamped Aluminum D.D. Venturi Fans

Performance

| Model No. | Prop. Dia. | Motor RPM | Max. Operating Amps | Motor | | Volts | Sones @ 0.0" SP | Exhaust CFM at Static Pressure Shown | | | |
|-----------|------------|-----------|---------------------|----------|--------------|-------------|-----------------|--------------------------------------|----------|----------|-----------|
| | | | | Motor HP | Type & Phase | | | .000" SP | .125" SP | .250" SP | 0.375" SP |
| 3XK45 | 12" | 1725 | 5.1 | *1/4 | †1 | 115/230 | 13.5 | 1477 | 1329 | 1094 | 767 |
| 3XK50A | 12 | 1725 | 4.9 | *1/4 | †1 | 115/230 | 11.4 | 1239 | 1110 | 937 | 757 |
| 3XK51A | 12 | 1725 | 4.5 | *1/4 | ‡1** | 115 | 12.1 | 1217 | 1104 | 925 | 626 |
| 3XK37 | 16 | 1725 | 4.3 | *1/4 | ‡1** | 115 | 16.9 | 2547 | 2151 | 1681 | 1339 |
| 3XK40 | 16 | 1725 | 5.3 | *1/4 | †1 | 115/230 | 22 | 2512 | 2365 | 2172 | 1915 |
| 3XK52 | 16 | 1725 | 5.6 | *1/4 | †1 | 115/230 | 17.2 | 2561 | 2168 | 1692 | 1361 |
| 3XK53 | 16 | 1725 | 1.4 | 1/4 | 3 | 208-220/440 | 17.2 | 2571 | 2164 | 1963 | 1352 |
| 3XK41 | 18 | 1725 | 5.6 | *1/4 | †1 | 115/230 | 19.2 | 2958 | 2752 | 2521 | 2217 |
| 3XK46 | 18 | 1725 | 7.2 | *1/3 | †1 | 115/230 | 22 | 3348 | 3125 | 2876 | 2570 |
| 3XK54 | 18 | 1725 | 7.0 | *1/3 | †1 | 115/230 | 22 | 3257 | 2826 | 2371 | 1954 |
| 3XK55 | 18 | 1725 | 6.0 | *1/3 | ‡1** | 115 | 22 | 3247 | 2807 | 2368 | 1930 |
| 3XK56 | 18 | 1725 | 1.6 | 1/3 | 3 | 208-220/440 | 22 | 3316 | 2875 | 2413 | 1990 |
| 3XK42 | 20 | 1725 | 7.3 | *1/3 | †1 | 115/230 | 18.2 | 3664 | 3364 | 3071 | 2757 |
| 3XK47 | 20 | 1725 | 9.1 | *1/2 | †1 | 115/230 | 21 | 4386 | 4139 | 3880 | 3564 |
| 3XK48 | 20 | 1725 | 2.2 | 1/2 | 3 | 208-220/440 | 20 | 4403 | 4158 | 3897 | 3565 |
| 3XK57 | 20 | 1725 | 8.8 | *1/2 | †1 | 115/230 | 25 | 4400 | 3917 | 3320 | 2758 |
| 3XK58 | 20 | 1725 | 2.0 | •1/2 | 3 | 208-220/440 | 25 | 4487 | 3974 | 3371 | 2828 |
| 3XK59 | 20 | 1725 | 8.9 | *1/2 | ††1** | 115/230 | 25 | 4438 | 3937 | 3302 | 2775 |
| 3XK39 | 24 | 1725 | 2.2 | 1/2 | 3 | 208-220/440 | 30 | 5230 | 4891 | 4550 | 4200 |
| 3XK44 | 24 | 1725 | 9.0 | *1/2 | †1 | 115/230 | 21 | 4348 | 3894 | 3406 | 2843 |
| 3XK49 | 24 | 1140 | 6.2 | *1/3 | †1 | 115/230 | 14.8 | 3931 | 3315 | 2513 | 1174 |
| 3XK60 | 24 | 1725 | 8.9 | *1/2 | †1 | 115/230 | 37 | 5918 | 5332 | 4712 | 4049 |
| 3XK61 | 24 | 1725 | 9.0 | *1/2 | ††1** | 115/230 | 38 | 5969 | 5364 | 4745 | 4079 |
| 3XK62 | 24 | 1725 | 10.3 | *3/4 | †1 | 115/230 | 36 | 6621 | 5585 | 4937 | 4288 |
| 3XK63 | 24 | 1725 | 2.5 | 3/4 | 3 | 208-220/440 | 39 | 6312 | 5711 | 5079 | 4433 |
| 3XK64 | 24 | 1725 | *10.6 | *3/4 | ††1** | 115/230 | 37 | 6267 | 5640 | 4991 | 4359 |
| 3XK43 | 30 | 1140 | 3.0 | 3/4 | 3 | 208-220/440 | 24 | 8722 | 8104 | 7440 | 6724 |
| 3XK65 | 30 | 1075 | 7.9 | *3/4 | ‡‡PSC/1 | 115/230 | 24 | 8615 | 7965 | 7263 | 6470 |
| 3XK66 | 30 | 1075 | 8.0 | *3/4 | ‡‡PSC/1 | 115/230 | 20 | 9902 | 8222 | 5756 | — |
| 3XK67 | 30 | 1140 | 3.2 | 3/4 | 3 | 208-220/440 | 21 | 9927 | 8257 | 5844 | — |

Performance shown are for units without inlet and outlet ducts. The ratings shown are based on procedures performed in accordance with United States AMCA Publication 211 and comply with the requirements of the AMCA Certified Ratings Program.

(*) Thermally Protected.

(†) Capacitor Start.

(††) Capacitor Start Hazardous Location.

(‡) Split Phase Hazardous Location. (‡‡) Permanent Split Capacitor.

(**) These units are UL Listed fans for use in Class 1 Group C & D and Class 2 Groups E, F, & G

Models 3XK37, 3XK39 thru 3XK49, 3XK50A, 3XK51A, 3XK52 thru 3XK67

LIMITED WARRANTY

DAYTON ONE-YEAR LIMITED WARRANTY. Cast and Stamped Aluminum D.D. Venturi Fans, Models covered in this manual, are 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 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 specific legal rights which vary from jurisdiction to jurisdiction.

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 products 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 products are MERCHANTABLE, or FIT FOR A PARTICULAR PURPOSE, or that the products 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 the "LIMITED WARRANTY" above is made or authorized by Dayton.

PRODUCT SUITABILITY. Many jurisdictions 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, review the product applications, and all applicable 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 jurisdictions 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 jurisdictions do not allow a limitation on how long an implied warranty lasts, consequentially the above limitation may not apply to you; and (c) by law, during the period of this limited warranty, any implied warranties of implied merchantability or fitness for a particular purpose applicable to consumer products purchased by consumers, may not be excluded or otherwise disclaimed.

PROMPT DISPOSITION. Dayton will make 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 the 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., Niles, Illinois 60714 U.S.A.

Models 3XK37, 3XK39 thru 3XK49, 3XK50A, 3XK51A, 3XK52 thru 3XK67

Unpacking

1. When unpacking the fan, inspect carefully for any damage that may have occurred during transit. Check for possible loose parts, missing parts, or damaged parts.
2. Shipping damage claim must be filed with carrier.

General Safety Information

⚠ WARNING *Do not depend on any switch as sole means of disconnecting power when installing or servicing the fan. If the power disconnect is out-of-sight, lock it in the open position and tag to prevent application of power. Failure to do so may result in fatal electrical shock.*

⚠ AVERTISSEMENT *Lors de l'installation ou d'une réparation du ventilateur, ne pas compter sur un sélecteur comme seul moyen de coupure de l'alimentation électrique. Si l'interrupteur d'alimentation est hors de vue, le verrouiller en position d'arrêt et apposer une plaquette interdisant son utilisation. À défaut, un choc électrique pourrait être fatal.*

⚠ WARNING *This fan should be assembled and installed by a qualified technician.*

1. Follow all local electrical and safety codes in the United States and Canada, as well as the National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA) in the United States, and the Canadian Electric Code (CEC) in Canada.
2. Motor must be properly grounded.
3. Lock and tag power disconnect to prevent unexpected application of power.

⚠ CAUTION *In United States to reduce the risk*

of injury to persons, OSHA complying guards are required when fan is installed within 7 feet of floor or working level.

⚠ CAUTION *In Canada to reduce the risk of injury to persons, CSA complying guards are required when fan is installed below 2.5 meters (8.2 feet) above floor or grade level.*

⚠ WARNING *Motor will restart without warning after protector trips.*

4. Be careful when touching the exterior of an operating motor; it may be hot enough to be painful or cause injury. With modern motors this condition is normal if operated at rated load and voltage. Modern motors are built to operate at higher temperatures.
5. Protect the power cable from coming in contact with sharp objects.

⚠ WARNING *To reduce the risk of fire or electric shock, do not use this fan with any solid state speed control device.*

6. Do not kink power cable and never allow the cable to come in contact with oil, grease, hot surfaces, or chemicals.
7. Make certain that the power source conforms to the requirements of your equipment.
8. Keep cleaning rags and other flammable waste material in a tightly closed metal container and dispose of later in the proper fashion.
9. Use an approved cleaning agent, such as dry cleaning solvent, for cleaning electrical or electronic equipment.

Electrical Connections

1. Connect motor per nameplate to correct power supply.
2. Install all wiring, protection, and grounding in accordance with National Electrical Code and local requirements.
3. Follow all local electrical and safety codes in the United States and Canada, as well as the National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA) in the United States, and the Canadian Electric Code (CEC) in Canada.
4. Refer to wiring diagram on motor nameplate.

Installation

⚠ CAUTION *These fans have rotating propellers that require use of safety precautions during installation, operation, and maintenance.*

1. The fan should be securely mounted within a rigid framework to prevent flexing or movement of the fan frame during operation. The fan frame should be equally supported on all sides within the framework and caution should be taken to avoid twisting or cocking of the fan frame during installation.

⚠ CAUTION *Allowing the fan frame to flex or move during operation will create harmful vibrations which may damage the unit.*

2. Fans should be mounted in opening within 1/4" clearance around perimeter. Venturi framing should be secured to building structure utilizing corrosion resistant fasteners.

Dayton® Cast and Stamped Aluminum D.D. Venturi Fans

Installation (Continued)

3. Check rotation after wiring of ventilator to be sure propeller rotates clockwise when facing motor shaft.
4. Dampers, if used, must be mechanically operated and clear propeller by at least 2". Fan motor could overheat if operated with damper in closed position.

Operation

With air system in full operation, measure correct input (amps) to motor and compare with nameplate rating to determine if motor is operating under safe load conditions.

Fans, except Cast Aluminum Blade, Model No.'s 3XK37, 3XK51A, 3XK55, 3XK59, 3XK61, and 3XK64; should not

be used in hazardous location applications. Refer to the National Electrical Code Para 500 for definition of dangerous locations. In Canada, refer to the Canadian Electric Code for definition of dangerous locations.

Maintenance

⚠ WARNING *Do not depend on any switch as sole means of disconnecting power when installing or servicing the fan. If the power disconnect is out-of-sight, lock it in the open position and tag to prevent application of power. Failure to do so may result in fatal electrical shock.*

⚠ AVERTISSEMENT *L'installation ou d'une réparation du ventilateur, ne pas compter sur un sélecteur comme seul moyen de coupure de l'alimentation électrique. Si l'interrupteur d'alimentation est hors de*

vue, le verrouiller en position d'arrêt et apposer une plaquette interdisant son utilisation. À défaut, un choc électrique pourrait être fatal.

1. Periodically clean any guards, dampers, motors, and propeller to prevent decrease in airflow and overheating motor, and make sure all bolts are tight.

⚠ CAUTION *The fan motor must be securely and adequately grounded to a suitable electrical ground such as a grounded water pipe or ground wire system!*

Troubleshooting Chart

| Symptom | Possible Cause(s) | Corrective Action |
|-----------------|---------------------------------------|---|
| Excessive noise | 1. Defective motor bearing | 1. Replace motor |
| | 2. Crooked or damaged propeller | 2. Replace propeller |
| | 3. Motor not securely fastened | 3. Tighten motor |
| | 4. Loose propeller | 4. Align and tighten propeller to motor shaft |
| Fan inoperative | 1. Blown fuse or open circuit breaker | 1. Replace fuse or circuit breaker |
| | 2. Loose or disconnected wiring | 2. Shut power OFF and check wiring for proper connections |
| | 3. Defective motor | 3. Repair or replace motor |

For Repair Parts, call 1-800-323-0620

24 hours a day - 365 days a year

Please provide following information:

- Model number
- Serial number (if any)
- Part description and number as shown in parts list.

Address parts correspondence to:

Grainger Parts
P.O. Box 3074
1657 Shermer Road
Northbrook, IL 60065-3074 U.S.A.

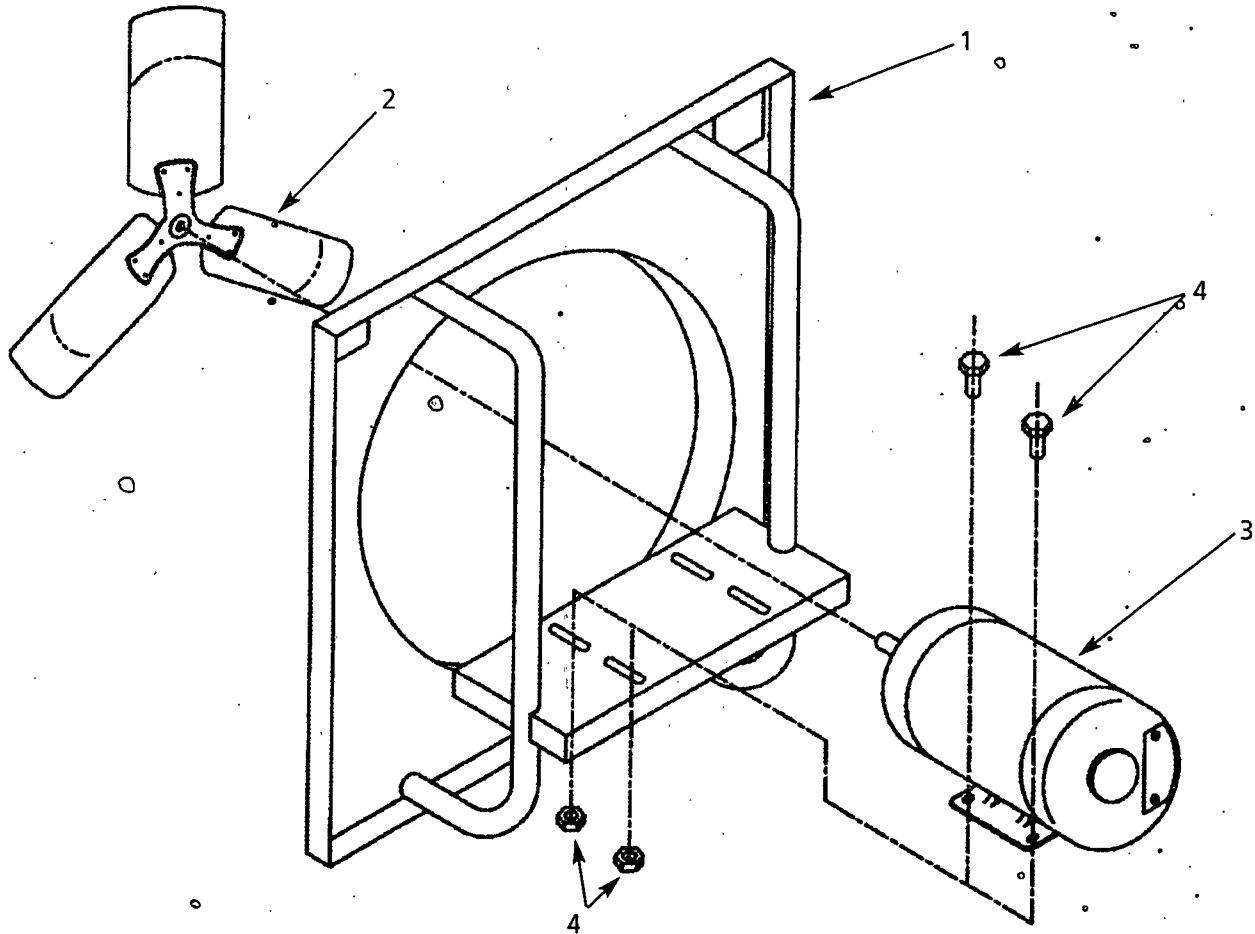


Figure 2 - Repair Parts Illustration

Repair Parts List

| Ref. No. | Description | Part Number For Models: | | | | | Qty. | |
|----------|------------------------------|-------------------------|----------|----------|----------|----------|----------|-------|
| | | 3XK45 | 3XK50A | 3XK51A | 3XK37 | 3XK40 | | 3XK52 |
| 1 | Venturi panel | 4C545 | 4C545 | 4C545 | 4C546 | 4C546 | 4C546 | 1 |
| 2 | Propeller | 03294001 | 03450001 | 03450001 | 03212002 | 03277001 | 03212002 | 1 |
| 3 | Motor | 5K410 | 5K410 | 6K734 | 6K734 | 5K410 | 5K410 | 1 |
| 4 | 5/16-18 Flagspin locknut | * | * | * | * | * | * | 4 |
| Δ | 5/16-18 x 3/4" Carriage bolt | * | * | * | * | * | * | 4 |
| Δ | 5/8" ID Split bushing | — | 27516001 | 27516001 | — | — | — | 1 |

(* Standard hardware item, available locally.

(Δ) Not shown.

Repair Parts List (Continued)**Repair Parts List (Continued)**

| Ref. No. Description | Part Number For Models: | | | | | | Qty. |
|----------------------------------|-------------------------|----------|----------|--------|--------|--------|------|
| | 3XK53 | 3XK41 | 3XK46 | 3XK54 | 3XK55 | 3XK56 | |
| 1 Venturi panel | 4C546 | 4C547 | 4C547 | 4C547 | 4C547 | 4C547 | 1 |
| 2 Propeller | 03212002 | 03292001 | 03266001 | 4C137A | 4C137A | 4C137A | 1 |
| 3 Motor | 2N863 | 5K410 | 5K411 | 5K411 | 6K738 | 2N864 | 1 |
| 4 5/16-18 Flagspin locknut | * | * | * | * | * | * | 4 |
| Δ 5/16-18 x 3/4" Carriage bolt * | | * | * | * | * | * | 4 |
| Δ 5/8" ID Split bushing | — | — | — | — | — | — | 0 |

(*) Standard hardware item, available locally.

(Δ) Not shown.

Repair Parts List (Continued)

| Ref. No. Description | Part Number For Models: | | | | | | Qty. |
|----------------------------------|-------------------------|----------|----------|----------|----------|----------|------|
| | 3XK42 | 3XK47 | 3XK48 | 3XK57 | 3XK58 | 3XK59 | |
| 1 Venturi panel | 3C304 | 3C304 | 3C304 | 3C304 | 3C304 | 3C304 | 1 |
| 2 Propeller | 03296001 | 03259001 | 03259001 | 03207002 | 03207002 | 03207002 | 1 |
| 3 Motor | 5K411 | 6K477 | 2N865 | 6K477 | 2N865 | 6K039 | 1 |
| 4 5/16-18 Flagspin locknut | * | * | * | * | * | * | 4 |
| Δ 5/16-18 x 3/4" Carriage bolt * | | * | * | * | * | * | 4 |
| Δ 5/8" ID Split bushing | — | — | — | — | — | — | 0 |

(*) Standard hardware item, available locally.

(Δ) Not shown.

Repair Parts List (Continued)

| Ref. No. Description | Part Number For Models: | | | | | | Qty. |
|----------------------------------|-------------------------|----------|----------|----------|----------|----------|------|
| | 3XK39 | 3XK44 | 3XK49 | 3XK60 | 3XK61 | 3XK62 | |
| 1 Venturi panel | 3C305 | 3C305 | 3C305 | 3C305 | 3C305 | 3C305 | 1 |
| 2 Propeller | 03293001 | 03262001 | 03295001 | 03210002 | 03210002 | 03089001 | 1 |
| 3 Motor | 2N865 | 6K477 | 13423001 | 6K477 | 6K039 | 6K123 | 1 |
| 4 5/16-18 Flagspin locknut | * | * | * | * | * | * | 4 |
| Δ 5/16-18 x 3/4" Carriage bolt * | | * | * | * | * | * | 4 |
| Δ 5/8" ID Split bushing | — | — | — | — | — | — | 0 |

(*) Standard hardware item, available locally.

(Δ) Not shown.

Repair Parts List (Continued)

| Ref. No. Description | Part Number For Models: | | | | | | Qty. |
|-------------------------------|-------------------------|----------|----------|----------|-------|-------|------|
| | 3XK63 | 3XK64 | 3XK43 | 3XK65 | 3XK66 | 3XK67 | |
| 1 Venturi panel | 3C305 | 3C305 | 3C378 | 3C378 | 3C378 | 3C378 | 1 |
| 2 Propeller | 03089001 | 03089001 | 03251001 | 03251001 | 3C379 | 3C379 | 1 |
| 3 Motor | 2N866 | 6K040 | 3N427 | 3M742 | 3M742 | 3N427 | 1 |
| 4 Flagspin locknut 5/16-18 | * | * | * | * | * | * | 4 |
| Δ Carriage bolt 5/16-18 x 3/4 | * | * | * | * | * | * | 4 |
| Δ 5/8" ID Split bushing | — | — | — | — | — | — | 0 |

(*) Standard hardware item, available locally.

(Δ) Not shown.

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

Dayton® Aluminum/Galvanized/ PVC Wall/Gable Shutters

**Use Optional Motors: 2C831B on 10 - 36" Single Panel,
2C832B on 36 - 48" Double Panel, 4C885A on 54 - 60" Double Panel**

We recommend shutter not be mounted closer to the fan than 1/3 the diameter of fan blade.

Do not force shutter into opening!

Do not open shutter by lifting individual blades!

Do not install shutter leaning forward or backward!

Installation

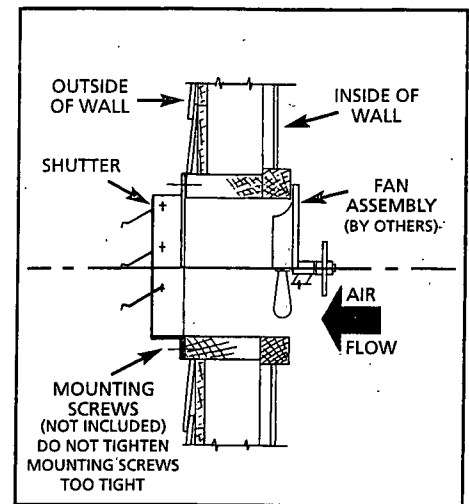
1. Shutter frame should be mounted level and squarely on outside wall. Care should be taken not to twist

the shutter frame. Never cover shutter with siding or masonry work. Shutter should be mounted so it can be removed any time in case of damage.

2. Shutter should operate as freely after installation as it did before.

3. Caulking compound is recommended between shutter frame edges and the wall.

4. Clean and lubricate shutter at the same time that the fan is lubricated and cleaned.



Por favor lea y guarde estas instrucciones. Léelas cuidadosamente antes de intentar montar, instalar, operar o reparar el producto descrito. Para su propia protección y la de los demás cumpla con lo indicado en la información de seguridad. ¡El no hacerlo podría ocasionar lesiones personales, daños materiales o ambos! Guarde las instrucciones para referencia en el futuro.

Persianas de piñón/pared de PVC/aluminio/galvanizado Dayton®

**Usar motores opcionales: 2C831B en el panel simple de 25.4 - 91.4cm,
2C832B en panel doble de 91,4 - 121,9cm, 4C885A en panel doble de 137,2 - 152,4cm**

Recomendamos que no se instale a una distancia menor de 1/3 de diámetro de las hojas del ventilador.

¡No forzar la persiana para abrirla!

¡No abrir la persiana levantando las hojas individualmente!

¡No instalar la persiana inclinada hacia adelante o hacia atrás!

Instalación

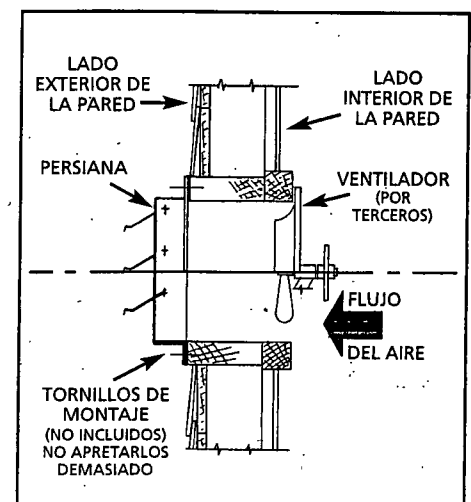
1. El marco de la persiana debe instalarse bien nivelado y recto en la pared exterior. Procurar no torcer el marco. Nunca cubrir la persiana con

las tablas de revestimiento material de albañilería. La persiana debe instalarse de modo que se puede extraer en cualquier momento en caso de dañarse.

2. La persiana debe funcionar tan libremente después de instalada como antes de instalarse.

3. Se recomienda calafatear el espacio entre el borde del marco de la persiana y la pared.

4. Limpiar y lubricar la persiana al mismo tiempo que el ventilador.



Veillez lire ces instructions et les conserver. Lisez-les attentivement avant d'essayer d'assembler, d'installer, d'utiliser ou d'entretenir l'équipement décrit. Protégez-vous et protégez les autres en observant toutes les consignes de sécurité. Ne pas respecter ces instructions peut entraîner des blessures ou des dégâts matériels! Allez lire les instructions pour pouvoir les consulter ultérieurement.

Volets Dayton® en aluminium/ galvanisés/en PVC pour murs et toitures

Employer les moteurs optionnels 2C831B pour 1 panneau de 25.4 - 91.4cm, 2C832B pour 2 panneaux de 91.4 - 121.9cm et 4C885A pour 2 panneaux de 137.2 - 152.4cm

Nous recommandons de ne pas monter le volet à moins de 1/3 du diamètre de la pale de ventilateur par rapport au ventilateur.

Ne forcez pas le volet dans l'ouverture!

N'ouvrez pas le volet en soulevant les pales individuelles!

N'installez pas le volet penché!

Installation

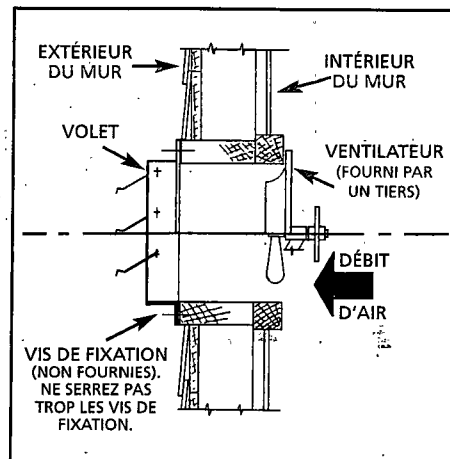
1. Le cadre du volet doit être monté droit et être bien d'équerre sur le mur extérieur. Il faut faire attention

de ne pas tordre le cadre du volet. Ne recouvrez jamais le volet de parement ni de maçonnerie. Le volet doit être monté de manière à pouvoir être retiré à tout moment en cas de détérioration.

2. Le volet doit fonctionner aussi librement après installation qu'avant.

3. Il est recommandé d'appliquer du mastic entre les bords du cadre du volet et le mur.

4. Nettoyez et lubrifiez le volet en même temps que le ventilateur.



Garantie

Limited Warranty
Dayton One-Year Limited Warranty. Dayton® Wall Shutter. Models covered in this manual, are 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 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. This limited warranty claim procedures, see PROMPT DISPOSITION below. This limited warranty gives purchasers specific legal rights which vary from jurisdiction to jurisdiction.

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 provide product information and illustrate the products in this literature accurately; however, such information and illustrations are for the sole purpose of identification, and do not express or imply a warranty that the products are MERCHANTABILITY, OR FIT FOR A PARTICULAR PURPOSE, or that the products 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 the "LIMITED WARRANTY" above is made or authorized by Dayton.

Product Suitability. Many jurisdictions 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, review the product applications, and all applicable 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 jurisdictions 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 jurisdictions do not allow a limitation 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 implied merchantability or fitness for a particular purpose applicable to consumer products purchased by consumers, may not be excluded or otherwise disclaimed.

Prompt Disposition. Dayton will make 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 the 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., Niles, Illinois 60714 U.S.A.

Garantía

Garantía Limitada
La garantía limitada Dayton por un año en los modelos de persianas murales de aluminio Dayton®, están cubiertas en este manual por Dayton Mfg. Co. (Dayton), garantizado al comprador original por defectos en la mano de obra o materiales, bajo un uso normal un año después de la fecha de compra. Cualquier parte que se encuentre defectuosa, tanto en el material como en la mano de obra, y sea devuelta a un lugar de servicio autorizado designado por Dayton, con los costos de envío pagados por adelantado, será reparada o reemplazada a la discreción de Dayton como remedio exclusivo. Para obtener la información sobre los procedimientos de reclamo cubiertos en la garantía limitada vea ATENCIÓN OPORTUNA a continuación. Esta garantía limitada confiere a los compradores derechos legales específicos que varían de jurisdicción a jurisdicción.

Límites de Responsabilidad. Hasta el punto que las leyes aplicables lo permitan, la responsabilidad de Dayton por los daños emergentes o incidentales está expresamente excluida. La responsabilidad de Dayton expresamente está limitada y no puede exceder el precio de compra pagado por el artículo.

Exclusión de Responsabilidad de la Garantía. Dayton se ha esforzado diligentemente para proporcionar información sobre el producto en esta literatura en forma apropiada; sin embargo, tal información y las ilustraciones y descripciones tienen como único propósito la identificación del producto y no expresan ni implican garantía de que los productos son VENDIBLES O ADECUADOS PARA UN PROPÓSITO EN PARTICULAR o que se ajustan necesariamente a las ilustraciones o descripciones. Con excepción de lo que se establece a continuación, Dayton no hace ni autoriza ninguna garantía o afirmación de hecho, expresa o implícita, que no sea estipulada en la GARANTÍA LIMITADA anterior.

Adaptación del Producto. Muchas jurisdicciones tienen códigos o reglamentos que rigen las ventas, la construcción, la instalación y/o el uso del producto para ciertos propósitos que pueden variar con respecto a los aplicables a las zonas vecinas. Si bien Dayton trata de que sus productos cumplan con dichos códigos, no puede garantizar su conformidad y no puede hacerse responsable por la forma en que su producto se instala o usa. Antes de comprar y usar el producto, revise su aplicación y todos los códigos y regulaciones nacionales y locales aplicables y asegúrese que el producto, la instalación y el uso los cumplan.

Ciertos aspectos de limitación de responsabilidad no se aplican a los productos del consumidor; es decir (a) algunas jurisdicciones no permiten la exclusión o la limitación de daños incidentales o emergentes, de modo que las limitaciones o exclusiones anteriores puede que no se apliquen en su caso; (b) también, algunas jurisdicciones no permiten limitar el tiempo que una garantía implícita dura, por lo tanto, la limitación anterior puede que no se aplique en su caso; y (c) por ley, durante el período que dura esta Garantía Limitada, las garantías implícitas de comerciabilidad o de adecuación para un propósito en particular aplicables a los productos del consumidor comprados por consumidores no pueden ser excluidas o no pueden excluirse de la responsabilidad en alguna otra forma.

Atención Oportuna. Dayton hará un esfuerzo de buena fe para corregir puntualmente, o hacer otros ajustes, con respecto a cualquier producto que resulte defectuoso dentro de los términos de esta garantía limitada. En el caso de que encuentre un producto defectuoso y que está cubierto dentro de los límites de esta garantía haga el favor de escribir primero, o llame, al distribuidor de quien compró el producto. El distribuidor le dará las instrucciones adicionales. Si no puede resolver el problema en forma satisfactoria, escriba a Dayton a la dirección a continuación, dando el nombre del distribuidor, su dirección, la fecha y el número de la factura del distribuidor y describa la naturaleza del defecto. La propiedad del artículo y el riesgo de pérdida pasan al comprador en el momento de la entrega del artículo a la compañía de transporte. Si el producto se daña durante el transporte debe presentar su reclamo a la compañía de transporte. Fabricado para Dayton Electric Mfg. Co., 5959 W. Howard St., Niles, Illinois 60714 EE.UU.

Garantie limitée

Garantie Dayton limitée à 1 an. Les modèles de registre Dayton® contenus dans le manuel sont garantis par Dayton Mfg. Co. (Dayton) en faveur du premier utilisateur contre tous défauts de main d'œuvre ou de matériaux lors d'un usage normal pour 1 an après la date d'achat. Toute pièce qui est déclarée défectueuse en matière première ou en maintenance et qui est renvoyée à un lieu de service autorisé, désigné par Dayton, en port payé sera, en seule option, réparée ou remplacée au choix de Dayton. Pour le procédé de réclamation sous garantie limitée, voir DISPOSITION RAPIDE ci-dessous. Cette garantie limitée donne aux acheteurs des droits légaux spécifiques qui varient de juridiction à juridiction.

Limites de responsabilité. La responsabilité de Dayton, dans les limites permises par la loi, pour les dommages indirects ou fortuits est expressément déniée. Dans tous les cas la responsabilité de Dayton est limitée et ne dépassera pas la valeur du prix d'achat payé.

Désistement de garantie. Dayton a fait de diligents efforts pour fournir avec précision les informations et illustrations des produits décrits dans cette brochure; cependant, de telles informations et illustrations sont pour la seule raison d'identification, et n'expriment ni n'impliquent que les produits sont COMMERCIALISABLES, OU ADAPTÉS À UN BESOIN PARTICULIER, ni que ces produits sont nécessairement conformes aux illustrations ou descriptions.

Sauf pour ce qui suit, aucune garantie ou affirmation de fait, énoncée ou impliquée, autre que ce qui est énoncé dans la "GARANTIE LIMITÉE" ci-dessus n'est faite ou autorisée par Dayton.

Conformité du produit. De nombreuses juridictions ont des codes et règlements qui gouvernent les ventes, constructions, installation et/ou usage de produits pour certains usages qui peuvent varier par rapport à une zone voisine. Pendant que Dayton essaie de s'assurer que ses produits s'accordent avec ces codes, il ne peut pas garantir, cet accord, et ne peut pas être responsable de la façon dont le produit est installé ou utilisé. Avant l'achat et l'usage d'un produit, revoir les applications de ce produit, ainsi que tous les codes et règlements nationaux et locaux applicables, et s'assurer que le produit, son installation et son usage sont en accord avec eux.

Certains aspects de désistement ne sont pas applicables aux produits pour consommateur; ex: (a) certaines juridictions ne permettent pas l'exclusion ou la limitation des dommages indirects ou fortuits et donc la limitation ou l'exclusion ci-dessus peut ne pas s'appliquer dans le cas présent; (b) également, certaines juridictions n'autorisent pas de limitations de durée de la garantie implicite, en conséquence, la limitation ci-dessus peut ne pas s'appliquer dans le cas présent; et (c) par force de loi, pendant la période de cette Garantie Limitée, toutes garanties implicites de commerciabilité ou d'adaptabilité à un besoin particulier applicables aux produits de consommateurs achetés par des consommateurs, peuvent ne pas être exclues ni autrement désistées.

Disposition rapide. Dayton fera un effort de bonne foi pour corriger ou ajuster rapidement tout produit prouvé défectueux pendant la période de la garantie limitée. Pour tout produit considéré défectueux pendant la période de garantie limitée, écrire ou appeler tout d'abord le concessionnaire ou l'appareil à été acheté. Le concessionnaire doit donner des instructions supplémentaires. S'il est impossible de résoudre le problème de façon satisfaisante, écrire à Dayton à l'adresse ci-dessous, en indiquant le nom et l'adresse du concessionnaire, la date et le numéro de la facture du concessionnaire, et en décrivant la nature du défaut. Le titre et le risque de perte passent à l'acheteur au moment de la livraison par le transporteur. Si le produit a été endommagé pendant le transport, une réclamation doit être faite auprès du transporteur.

Fabriqué pour Dayton Electric Mfg. Co., 5959 W. Howard St., Niles, Illinois 60714 États-Unis

Manufactured for:
Fabricado para:
Fabriqué pour:

Dayton Electric Mfg. Co.
Niles, Illinois 60714 U.S.A.

Dayton®

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

Dayton® Intake Guards

Description

Dayton intake guards are to be used with Dayton 12 thru 30" direct-drive and 24 thru 60" belt-drive exhaust fans. These guards are strongly recommended for use on fans located in any area accessible to personnel or where there is a possibility of loose objects being drawn into the fan. Guards comply with OSHA Federal 1/2" max. opening requirement. Each unit consists of four (4) side panels, perforated guard, and assembly hardware. All guards have a galvanized finish.

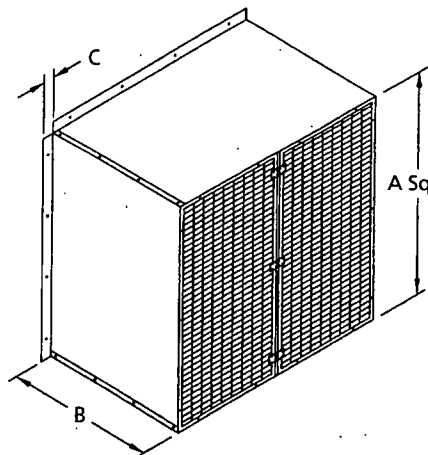


Figure 1 - Dimensions

Specifications

| Model | Fan Size | Dayton Stock No. | Dimensions | | | Guard Grid Sections | Side Panel Gage | Total Free Area % Opening |
|-------|----------|----------------------------|------------|-----|--------|---------------------|-----------------|---------------------------|
| | | | A | B | C | | | |
| 6D581 | 12" | 4C545* | 16 1/8" | 13" | 1 1/4" | 1 | 20 | 85 |
| 6D582 | 16 | 4C546* | 20 1/8 | 13 | 1 1/4 | 1 | 20 | 85 |
| 6D583 | 18 | 4C547* | 22 1/8 | 13 | 1 1/4 | 1 | 20 | 85 |
| 6D584 | 20 | 3C304* | 24 1/8 | 14 | 1 1/4 | 1 | 20 | 85 |
| 6D585 | 24 | 3C305*, 3CC73, 5C193 | 28 1/8 | 20 | 1 1/2 | 1 | 20 | 85 |
| 6D586 | 30 | 3C378*, 3CC74, 5C194 | 34 1/8 | 20 | 1 1/2 | 1 | 20 | 85 |
| 6D587 | 36 | 3CC75, 3CC78, 3C606, 3C705 | 40 1/8 | 27 | 2 | 2 | 20 | 85 |
| 6D588 | 42 | 3CC76, 3C607, 3C706 | 46 1/8 | 30 | 2 | 2 | 20 | 85 |
| 6D589 | 48 | 3CC77, 3C608, 3C707 | 54 1/4 | 32 | 2 | 2 | 18 | 85 |
| 6D590 | 54 | 3C671, 3C708 | 60 1/4 | 34 | 2 | 2 | 18 | 85 |
| 6D591 | 60 | 3C609, 3C709 | 66 1/4 | 37 | 2 | 2 | 18 | 85 |

(*) Venturi frame listed. Contact Grainger for motors and propellers.

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Dayton® Intake Guards

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General Safety Information

⚠ WARNING Intake guards to be used in conjunction with exhaust fans. Care should be taken to ensure that power source to fan is locked off before intake guard is installed so that the fan creates no hazard to installer.

⚠ CAUTION Intake guard complies with OSHA regulations. Make sure intake guard is securely in place before placing fan into operation.

Installation

INTAKE GUARD HOUSING FOR EXHAUST FANS

IMPORTANT: Fan should be securely mounted to wall prior to installation of intake guard housing.

1. Bolt (4) side panels together with 1/4 dia. x 1/2" long bolts and lock nuts (supplied).
2. Fasten housing to wall or directly to fan frame; hardware not supplied.

- a) Use 1/4" x 2" masonry anchor for masonry walls.
 - b) Use 1/4 x 2" lag screw if fastening to a frame wall.
 - c) If fastening directly to fan frame, which is already mounted on wall, use 1/4-20 x 1/2" bolts and nuts.
3. Install center channel post with #10 x 1/2" sheet metal screws (supplied) on sizes 36" or larger which have two piece guards. Post not required with 12 thru 30" models which have a single grid.
 4. Fasten intake guard to face of housing with hinges and #10 x 1/2" sheet metal screws (supplied) Refer to Figure 3.

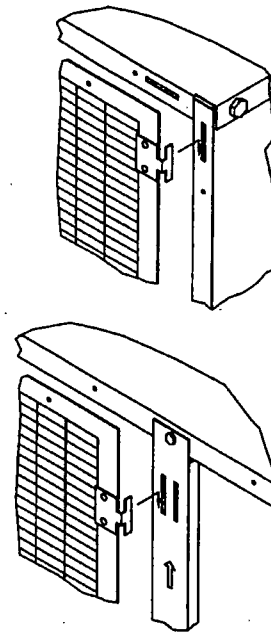


Figure 3 - Assembly of Hinges

Maintenance

⚠ CAUTION Make certain that the power source is disconnected before attempting to service or disassemble any components! If the power disconnect is out-of-sight, lock it in open position and tag to prevent application of power.

CLEANING

Clean intake guard and housing of any accumulated dirt which would restrict air flow.

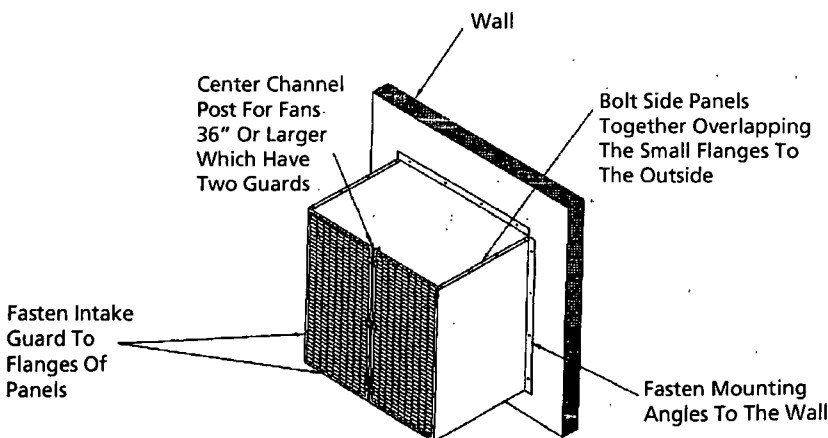


Figure 2 - Illustration

For Repair Parts, call 1-800-323-0620

24 hours a day - 365 days a year

Please provide following information:

- Model number
- Serial number (if any)
- Part description and number as shown in parts list

Address parts correspondence to:

Grainger Parts
 P.O. Box 3074
 1657 Shermer Road
 Northbrook, IL 60065-3074 U.S.A.

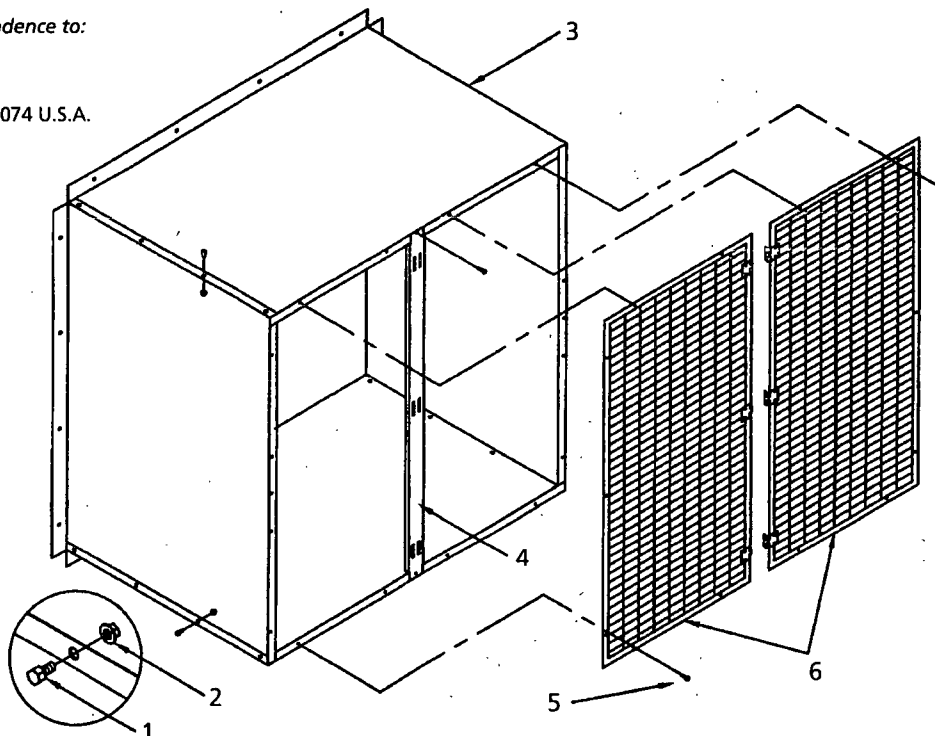


Figure 4 — Repair Parts Illustration

Repair Parts List

| Ref. No. | Description | Part Number For Models: | | | | | | Qty. |
|----------|--------------------|-------------------------|----------|----------|----------|----------|----------|--------|
| | | 6D581 | 6D582 | 6D583 | 6D584 | 6D585 | 6D586 | |
| 1 | 1/4-20 x 1/2" Bolt | * | * | * | * | * | * | 12 |
| 2 | 1/4"-20 Locknut | * | * | * | * | * | * | 12 |
| 3 | Side panel | 90262001 | 90263001 | 90264001 | 90265001 | 90266001 | 90267001 | 4 |
| 4 | Channel support | — | — | — | — | — | — | 1 |
| 5 | 10 x 1/2" SM screw | * | * | * | * | * | * | 6 to 9 |
| 6 | Guard assembly | 90289001 | 90290001 | 90291001 | 90292001 | 90293001 | 90294001 | 1 |

(* Standard hardware items, available locally.

| Ref. No. | Description | Part Number For Models: | | | | | Qty. |
|----------|--------------------|-------------------------|----------|----------|----------|----------|----------|
| | | 6D587 | 6D588 | 6D589 | 6D590 | 6D591 | |
| 1 | 1/4-20 x 1/2" Bolt | * | * | * | * | * | 16 |
| 2 | 1/4"-20 Locknut | * | * | * | * | * | 16 |
| 3 | Side panel | 90268001 | 90269001 | 90270001 | 90271001 | 90272001 | 4 |
| 4 | Channel support | 90273001 | 90274001 | 90275001 | 90276001 | — | 1 |
| 5 | 10 x 1/2" SM screw | * | * | * | * | * | 16 to 26 |
| 6 | Guard assembly | 90295001 | 90296001 | 90297001 | 90298001 | 90299001 | 2 |

(* Standard hardware items, available locally.

Dayton® Intake Guards

LIMITED WARRANTY

DAYTON ONE-YEAR LIMITED WARRANTY. Intake Guards, Models covered in this manual, are 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 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 specific legal rights which vary from jurisdiction to jurisdiction.

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.

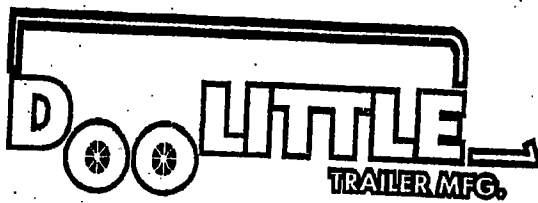
WARRANTY DISCLAIMER. Dayton has made a diligent effort to illustrate and describe the products in this literature accurately; however, such illustrations and descriptions are for the sole purpose of identification, and do not express or imply a warranty that the products are MERCHANTABILITY, or FIT FOR A PARTICULAR PURPOSE, or that the products 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 the "LIMITED WARRANTY" above is made or authorized by Dayton.

PRODUCT SUITABILITY. Many jurisdictions 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, review the product applications, and all applicable 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 jurisdictions 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 jurisdictions do not allow a limitation on how long an implied warranty lasts, consequentially the above limitation may not apply to you; and (c) by law, during the period of this limited warranty, any implied warranties of implied merchantability, or fitness for a particular purpose applicable to consumer products purchased by consumers, may not be excluded or otherwise disclaimed.

PROMPT DISPOSITION. Dayton will make 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 the 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., Niles, Illinois 60714 U.S.A.



22 POINT INSPECTION

ALL AREAS
ALL AREAS
ALL AREAS

- FLOOR SCUFF FREE
- PROPER OPTIONS
- TRAILER FREE OF SCRATCHES AND DENTS

FINISH
FINISH
FINISH
FINISH
FINISH
FINISH
FINISH
FINISH
FINISH
FINISH

- ALL LIGHTS IN WORKING ORDER
- CAMS AND BAR LOCKS FASTENED PROPERLY
- DOOR HOLD BACKS STRAIGHT AND PROPER LOCATION
- DOOR SEALED PROPERLY/FOAM WEATHER STRIPPING STRAIGHT
- DUST CAPS IN PLACE
- HINGES MOUNTED STRAIGHT
- LICENSE PLATE BRACKET INSTALLED
- LUG NUTS TORQUED TO 95FT LBS
- PROPER CAULKING INSIDE AND OUTSIDE
- PROPER CUSTOMER NAME ON TONGUE
- SAFETY OR REFLECTORS IN PLACE

FINISH/SKIN/PAINT

- TONGUE AND REAR MEMBER PREPPED AND PAINTED PROPERLY

PAINTER

- NO PAINT ON SAFETY CHAINS

PREP

- ALL EXTERNAL WELDS MUST BE GROUND

ROOF

- ROOF COVE AND FRONT CAP CLEANED

ROOF/FINISH

- 1" VINYL INSERT STRETCHED TIGHTLY

ROOF/FINISH

- PROPER STICKERS AND DECALS

SKINNERS

- PAINT UNDERNEATH PROPERLY

SKINNERS/WOOD

- NO MISSED SCREWS INSIDE/OUTSIDE

INSPECTED BY

Al Nash

DATE

10 - 15 2002

Local: 573 896-5155
 Fax: 573 896-8123



Out of State
 800 654-4948

"Above the Rest"

INSTRUCTIONS PLEASE READ CAREFULLY

HITCH HEIGHT

IT IS RECOMMENDED TO ADJUST THE HITCH HEAD HEIGHT TO POSITION THE TRAILER IN A LEVEL CONDITION. THIS LOADS THE AXLES EQUALLY AND GIVES A DESIRABLE TONGUE WEIGHT. UNDER THESE CONDITIONS YOUR TRAILER SHOULD NOT SWAY BACK AND FORTH REGARDLESS OF SPEED.

STABILIZING JACKS

STABILIZING JACKS ARE RECOMMENDED ON MOST TRAILERS. CONCESSION UNITS AND CAR HAULING TRAILERS SHOULD HAVE STABILIZING JACKS ON ALL FOUR CORNERS. THE TONGUE JACK IS NOT ADEQUATE AS A STABILIZER JACK.

ELECTRICAL

IF AN AUXILIARY BATTERY IS ADDED TO THE TRAILER, THERE MUST BE A FUSE INSTALLED BETWEEN THE BATTERY AND THE LOAD.

TIRES

THIS TRAILER IS EQUIPPED WITH QUALITY TUBELESS TIRES. THE RECOMMENDED AIR PRESSURE IS FOUND ON THE TIRE SIDEWALL. THE CORRECT TORQUE RANGE FOR WHEEL LUGS IS MINIMUM OF 85FT./LB MAXIMUM OF 95FT./LB *INCORRECT TORQUE WILL RESULT IN SNAPPING THE WHEEL STUDS.*

LOADING

LOAD 60% OF THE CARGO WEIGHT IN THE FRONT OF THE TRAILER THIS WILL PLACE ABOUT 10% OF THE LOADED TRAILER WEIGHT ON THE HITCH. IF THERE IS INSUFFICIENT HITCH WEIGHT THE TRAILER WILL BE VERY UNSTABLE, DIFFICULT TO CONTROL, PROPER WEIGHT DISTRIBUTION IS IMPERATIVE FOR SAFE PULLING.

COUPLER

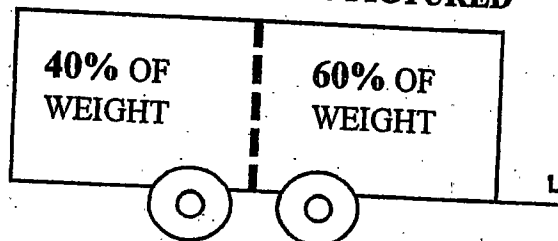
PERIODIC INSPECTION OF THE COUPLER WILL ENSURE SAFE PULLING. CHECK FOR CRACKS IN THE COUPLER AND TEST THE LOCK MECHANISM TO SEE THAT IT WILL NOT COME OFF THE BALL. ALWAYS USE A BLOT OR OTHER DEVICE THROUGHOUT THE LATCH MECHANISM WHEN HOOKED TO THE TOW VEHICLE.

SECURE THE LOAD

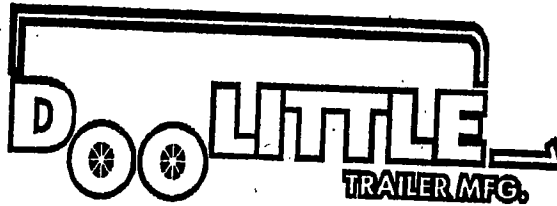
THE CORRECT METHOD OF SECURING A CAR INSIDE A TRAILER IS TO ATTACH BINDINGS BELOW THE SUSPENSION SYSTEM OF THE CAR.

| | | | |
|---------------|-----------------------------------|--------------------------|-----------------------|
| GREEN | 4-WAY PLUG TRAILER END | <input type="checkbox"/> | RIGHT TURN |
| YELLOW | | <input type="checkbox"/> | LEFT TURN |
| BROWN | | <input type="checkbox"/> | RUNNING LIGHTS |
| YELLOW | | <input type="checkbox"/> | |
| WHITE | | <input type="checkbox"/> | GROUND |

POSITION LOAD AS PICTURED



Local: 573 896-5155
Fax: 573 896-8123



Out of State
800 654-4948

"Above the Rest"

DOOLITTLE PREVENTIVE MAINTENANCE INSTRUCTIONS

Dear Customer:

Congratulations on the purchase of your new Doolittle Trailer. It is important to us that you care for your trailer in order to keep it looking new for years to come. To assist you we have compiled a few helpful care instructions that will benefit you.

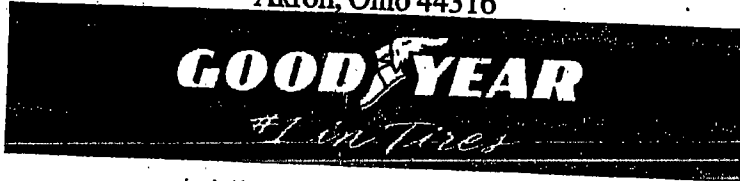
1. Check lug nuts for tightness the first 25-50 miles and thereafter.
2. We recommend that the tire pressure is checked frequently.
3. Grease wheel bearings every 5,000 miles or once a year.
4. Trailer brakes must be inspected and serviced once a year, or as needed.
5. If the unit has a breakaway battery, test it occasionally to make sure that it has a charge.
6. Double check electrical connections each time you hook up to be sure it is clean, clear and not frayed.
7. Wash trailer at least twice a year or more if needed.
8. Wax trailer at least once a year or more if needed.
9. If the unit comes in contact with road salt, it is suggested that you rinse it as soon as possible.
10. Proper tire treatment, along with washing and waxing the rims will help extend the life of your wheels and tires.
11. If the trailer floor comes in constant contact with water, it is recommended that you treat the floor with a water sealant.
12. Ramp doors are extremely heavy, and can be dangerous if not properly maintained. Check cables and fasteners frequently. Always stand to one side when opening or closing.
13. Lubricate ramp door hinges with lithium grease periodically.
14. Lubricate side door and back door hinges with penetrating oil periodically.

WITH PROPER MAINTENANCE AND CARE YOU WILL ENJOY MANY YEARS OF SERVICE.

THANK YOU FOR CHOOSING A DOOLITTLE TRAILER

LIMITED WARRANTY Highway Auto & Light Truck Tire Adjustment Policy

The Goodyear Tire & Rubber Company
1144 E. Market St.
Akron, Ohio 44316



LIMITED WARRANTY AUTO AND LIGHT TRUCK (EXCLUDES UNISTEEL RADIAL LIGHT TRUCK) HIGHWAY TIRE ADJUSTMENT POLICY

ELIGIBILITY

You are eligible for the benefits of this policy if you are the owner or authorized agent of the owner of new Goodyear highway auto and light truck tires (including mud and snow and on/off-road tires, but excluding Unisteel radial light truck tires, motorcycle, antique, and classic tires) bearing Department of Transportation prescribed tire identification numbers, and if your tires have been used only on the vehicle on which they were originally installed according to the vehicle manufacturer's or Goodyear's recommendations. Light truck tires are defined as all tires identified with the "LT" designation in the sidewall stamping plus the 8-195 and 8R19.5 sizes which do not carry the "LT" designation.

COVERAGE (REPLACEMENT FREE) RADIAL AUTO AND RADIAL LIGHT TRUCK TIRES

Any new Goodyear highway radial auto tire or radial light truck tire, except Unisteel radial light truck tires, covered by this policy, that does not deliver satisfactory highway service due to a workmanship or material-related condition (see Adjustment Policy Limitations) during the first 25% of useable treadwear or twelve months from date of purchase, whichever comes first, will be replaced with a comparable new Goodyear tire without charge. Mounting and balancing are included. The mounting and balancing provision for Light Truck tires, included in the free replacement portion of this warranty, is effective with tires purchased or produced January 1, 1989 (019) or later. If proof of purchase date is not available, tires manufactured January 1, 1989 or later are covered.

ALL OTHER HIGHWAY TIRES

Any new Goodyear highway auto or light truck tire, other than radial auto, radial light truck, or Unisteel radial light truck tire, that does not deliver satisfactory highway service due to a workmanship or material-related condition (see Adjustment Policy Limitations) during the first 10% of useable treadwear will be replaced with a comparable new Goodyear tire without charge. Mounting and balancing are included. The mounting and balancing provision for Light Truck tires, included in the free replacement portion of this warranty, is effective with tires purchased or produced January 1, 1989 (019) or later. If proof of purchase date is not available, tires manufactured January 1, 1989 or later are covered.

Any Goodyear temporary spare tire that does not deliver satisfactory highway service due to a workmanship or material-related condition during the first 50% of useable tread depth (1/32nd of an inch) will be replaced with a comparable new Goodyear temporary spare tire without charge. Mounting is included. After the first 50% of useable treadwear you pay only an adjustment charge for the treadwear received, plus any mounting charge.

COVERAGE (PRORATED ADJUSTMENT)

Tires not eligible for no charge adjustment that do not deliver satisfactory service due to a workmanship or material-related condition will be.

replaced with comparable new Goodyear tires on a pro rata basis. The replacement price will be calculated by multiplying the current Goodyear "predetermined price for adjustment" or current advertised price at adjustment location (whichever is lower) by the percentage of useable original tread that has been worn off at the time of the adjustment. You pay for mounting, balancing, and an amount equal to the full current Federal Excise Tax applicable to the comparable new replacement tire.

EXAMPLE: If your disabled tire had an original 8/32nd of useable treadwear and is worn to 4/32nd useable tread remaining, you have used 50% of the adjustment or advertised price of the comparable tire plus an amount equal to the full current Federal Excise Tax applicable to the comparable new replacement tire at time of adjustment. If the price of the new comparable tire is \$80.00 and FET is \$2.00, the cost to you would be \$42.00. The "predetermined price for adjustment," available at all Goodyear Auto Service Centers and participating dealers, fairly represents the actual regular retail selling price of the comparable tire at the time of adjustment. If a "predetermined price for adjustment" is not available, adjustment will be based on the price at which you are entitled to buy at the time of adjustment.

A tire has delivered its full original tread life and this warranty ends when the treadwear indicators become visible regardless of age or mileage.

DEFINITION OF COMPARABLE TIRE

A "comparable" new Goodyear tire may either be the same line of tire or, in the event the disabled tire is out of production, the same basic construction and quality with different sidewall or tread configuration. If a higher priced tire is accepted as replacement, the difference in price will be additional.

Any tire replacement under this warranty will be covered by the Goodyear warranty in effect at time of replacement.

ADJUSTMENT POLICY LIMITATIONS

This limited warranty is applicable only in the United States and Canada. For countries other than the United States and Canada, consult your local Goodyear dealer or distributor. No representative or dealer has authority to make any representation, promise, or agreement on behalf of Goodyear, except as stated herein. The following are not covered by this policy:

- Goodyear does not warrant and will not give credit in any adjustment transaction for any kind of material, added to the tire after leaving a Goodyear factory, nor will it adjust any tire which has failed as a result of adding any such material. (Example: Tire fillers, sealants, or balancing substances.)
- Irregular wear or tire damage due to:
 - Road hazards (including punctures, cuts, snags, impact breaks, etc.)
 - Wreck, collision or fire.
 - Improper inflation, overloading, high speed spinup, misapplication, misuse, negligence, racing, chain damage or improper mounting or demounting.
 - Mechanical condition of the vehicle.
 - Ride disturbance after the first 25% of useable treadwear or due to damaged wheels or any vehicle condition.

• Temporary spare tires used on vehicles used in racing and on passenger cars in special applications such as police pursuit service.

• Any tire intentionally altered after leaving a Goodyear factory to change its appearance. (Example: White inlay on a black tire.)

• Tires with weather cracking which were purchased more than four (4) years prior to presentation for adjustment. If you have no proof of purchase date, tires manufactured four (4) or more years prior to presentation are not covered.

• Loss of time, inconvenience, loss of use of the vehicle, or consequential damage.

• 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.

• Any tire no matter how well-constructed may fail in service or otherwise become unserviceable due to conditions beyond the control of the manufacturer. This warranty is not intended as a representation that a tire failure cannot occur.

OWNER'S OBLIGATIONS:

A. You must present the tire to be adjusted to a Goodyear Auto Service Center or Goodyear Tire Dealer. (Please consult your telephone directory for locations.) Tires replaced on an adjustment basis become the property of the Goodyear Tire & Rubber Company.

B. You must pay for taxes or any additional service you order at the time of adjustment.

C. No claim will be recognized unless submitted on a Goodyear claim form (supplied by Goodyear Dealer or Auto Service Center) completely filled out and signed by you, the owner of the tire presented for adjustment or your authorized agent.

TIRE ROTATION

The purpose for regular rotation is to achieve more uniform wear for all tires on the vehicle. The first rotation is the most important. Before rotating tires, always consult your vehicle owner's manual for recommended rotation patterns and intervals. Tires should be inspected every 6,000 to 5,000 miles (10,000 to 13,000 km) for any signs of unusual wear. If unusual wear is present, rotate your tires as soon as possible and check wheel alignment.

LEGAL RIGHTS

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

SAFETY WARNING

- Serious injury may result from:
 - Tire failure due to underinflation/overloading—follow owner's manual or tire placard in vehicle.
 - Explosion of tire/rim assembly due to improper mounting—only specially trained persons should mount tires.

Radial tires must be mounted on approved rims.

TIRE SPINNING CAUTION

On slippery surfaces such as snow, mud, ice, etc., do not spin tires in excess of 35 MPH as indicated on the speedometer. Personal injury and severe damage may result from excessive wheel spinning, including tire disintegration or axle failure.

FOR SERVICE IN THE UNITED STATES

For service assistance or information, first contact the nearest Goodyear outlet.

1. For assistance in locating the nearest Goodyear outlet, call the Goodyear Trench Map Locator System at 1-800-GOODYEAR.

2. If additional assistance is required, call the Goodyear Assistance Center at 1-800-321-2136, or write the Goodyear Consumer Relations Department, 1144 East Market Street, Akron, Ohio 44316-0001.

FOR SERVICE IN CANADA

For service assistance or information, first contact the nearest Goodyear outlet.

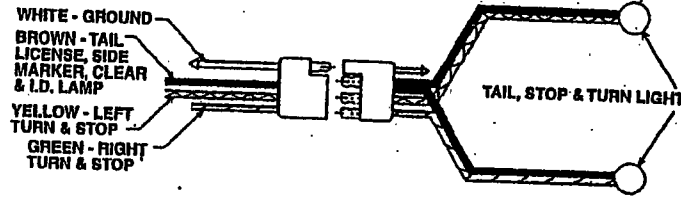
If additional assistance is required, call or write the Goodyear Assistance office listed below.

Atlantic-607 St. George St.
Moncton, New Brunswick E1C 8M7
(506) 857-4800
Quebec-909 Henri Bourassa Blvd. W.
St. Laurent, PQ H4S 1H9
(514) 334-1112
Ontario-450 Kipling Ave.
Toronto, Ontario M2Z 5E1
(416) 255-1355
Manitoba, 1725 Sargent Ave.
Winnipeg, Manitoba, ASH OCS
(204) 772-0391
Alberta-1130 143rd St., R.O. Box 896
Edmonton, Alberta T5J 2L8
(403) 455-7191
British Columbia-2625 Rupert St.
P.O. Box 6620
Vancouver, British Columbia V6B 4B5
(604) 255-3442

NOTE: Anyone desiring a copy of this warranty printed in French may contact the Quebec Service Department at
Quebec-9091 Henri Bourassa Blvd. W.
St. Laurent, PQ H4S 1H9
(514) 334-1112

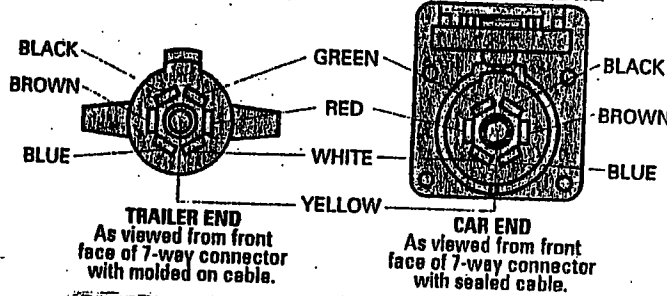
4 Pole Molded Rubber Trailer Split Wiring Harness Kits

Used to wire stop, turn and tail lights on boat and utility trailers, complete harness includes the tow vehicle plug, and a "wishbone" type 4-conductor harness designed to split at the trailer tongue and run down each side of the trailer. The polarized flat connectors with color coded 18 gauge wires meet SAE specifications:

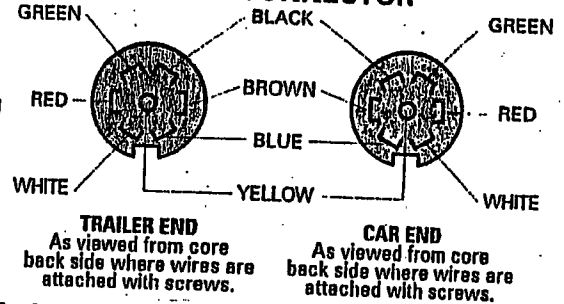


7-WAY CONNECTOR WIRING DIAGRAM

7-WAY MOLDED TRAILER/SEALED CAR CONNECTOR & CABLE



7-WAY THERMO-PLASTIC/METAL CONNECTOR

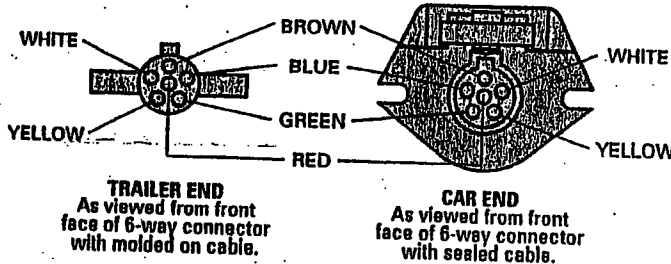


7 - WAY WIRING INDEX

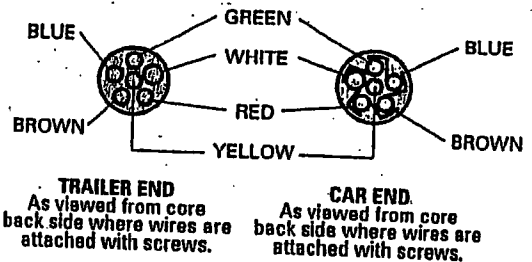
| Wire Color & Gauge | Molded Trailer/Sealed Car Connector Terminal | Thermo-Plastic/Metal Connector Terminal |
|--------------------|--|---|
| White / 10 gauge | Common Ground | #1 Common Ground |
| Blue / 12 gauge | Electric Brake | #2 Electric Brake |
| Green / 14 gauge | Tail & License | #3 Tail & License |
| Black / 10 gauge | Battery Charge | #4 Battery Charge |
| Red / 14 gauge | Left Stop & Turn | #5 Left Stop & Turn |
| Brown / 14 gauge | Right Stop & Turn | #6 Right Stop & Turn |
| Yellow / 14 gauge | Center Auxiliary | #7 Center Auxiliary |

6-WAY CONNECTOR WIRING DIAGRAM

6-WAY MOLDED TRAILER/SEALED CAR CONNECTOR & CABLE



6-WAY ZINC DIE-CAST CONNECTOR



6 - WAY WIRING INDEX

| Wire Color & Gauge | Molded Trailer/Sealed Car Connector Terminal | Zinc Die-Cast Connector Terminal |
|---------------------|--|----------------------------------|
| White / 10/14 gauge | Common Ground | GD - Common Ground |
| Blue / 10/14 gauge | Electric Brake | S - Electric Brake |
| Green / 14 gauge | Right Stop & Turn | TM - Tail & License |
| Red / 10/14 gauge | Auxiliary | LT - Left Stop & Turn |
| Brown / 14 gauge | Tail & License | RT - Right Stop & Turn |
| Yellow / 14 gauge | Left Stop & Turn | A - Auxiliary |



ELECTRIC BRAKE TROUBLE SHOOTING GUIDE

| PROBLEM | CAUSES | REMEDIES |
|--------------------------------|-------------------------------|----------------------|
| NO BRAKES | OPEN CIRCUITS | FIND AND CORRECT |
| | SEVERE UNDER ADJUSTMENT | ADJUST BRAKES |
| | FAULTY CONTROLLER | TEST AND CORRECT |
| | SHORT CIRCUITS | FIND AND CORRECT |
| WEAK BRAKES | GREASE/OIL ON MAGNETS/LININGS | CLEAN OR REPLACE |
| | CORRODED CONNECTIONS | CLEAN/CORRECT CAUSE |
| | WORN LININGS OR MAGNETS | REPLACE |
| | SCORED/GROOVED BRAKE DRUMS | MACHINE OR REPLACE |
| | IMPROPER SYNCHRONIZATION | CORRECT |
| | UNDER ADJUSTMENT | ADJUST BRAKES |
| | BLAZED LININGS | REBURNISH OR REPLACE |
| OVERLOADED TRAILER | CORRECT | |
| LOCKING BRAKES | UNDER ADJUSTMENT | ADJUST |
| | IMPROPER SYNCHRONIZATION | CORRECT |
| | FAULTY CONTROLLER | TEST AND CORRECT |
| | LOOSE, BROKEN BRAKE PARTS | REPLACE COMPONENTS |
| | OUT OF ROUND BRAKE DRUMS | MACHINE OR REPLACE |
| INSUFFICIENT WHEEL LOAD | ADJUST SYSTEM RESISTOR | |
| INTERMITTENT BRAKES | FAULTY CONTROLLER | TEST AND CORRECT |
| | BROKEN WIRES | REPAIR OR REPLACE |
| | LOOSE CONNECTIONS | FIND AND REPAIR |
| BRAKES PULL TO ONE SIDE | INCORRECT ADJUSTMENT | ADJUST |
| | GREASE/OIL ON LININGS/MAGNET | CLEAN OR REPLACE |
| | BROKEN WIRES | FIND AND REPAIR |
| | BAD CONNECTIONS | FIND AND REPAIR |
| HARSH BRAKES | UNDER ADJUSTMENT | ADJUST |
| | IMPROPER SYNCHRONIZATION | CORRECT |
| | IMPROPER CONTROLLER | CHANGE |
| | FAULTY CONTROLLER | TEST AND CORRECT |
| NOISY BRAKES | UNDER ADJUSTMENT | ADJUST BRAKES |
| | LACK OF LUBRICATION | LUBRICATE |
| | BROKEN BRAKE PARTS | REPLACE COMPONENT |
| | INCORRECT BRAKE PARTS | REPLACE |
| SURGING BRAKES | GREASE/OIL ON LININGS/MAGNET | CLEAN OR REPLACE |
| | OUT OF ROUND BRAKE DRUMS | MACHINE OR REPLACE |
| | FAULTY CONTROLLER | TEST AND CORRECT |
| DRAGGING BRAKES | OVER ADJUSTMENT | READJUST |
| | OUT OF ROUND BRAKE DRUMS | MACHINE OR REPLACE |
| | INCORRECT BRAKE PARTS | REPLACE |
| | BROKEN BRAKE PARTS | REPLACE |
| | FAULTY BREAKAWAY SWITCH | REPAIR OR REPLACE |
| | LOOSE WHEEL BEARING ADJ. | ADJUST |
| BENT SPINDLE | REPLACE AXLE | |

AXIS

PRODUCTS

23852 Reedy Drive Elkhart, IN 46514 Phone (574) 266-8282 Fax (888) 411-8333

OPERATION MAINTENANCE MANUAL 2000 – 7000 lbs. AXLES

IMPORTANT SAFETY NOTICE

Appropriate service methods and proper repair procedures are essential for the safe, reliable operation of all running gear as well as the personal safety of the individual doing the work. This manual provides general directions for performing service and repair work with tested, effective techniques. Following these guidelines will help assure reliability.

There are numerous variations in procedures, techniques, tools, and parts for servicing axles, as well as in the skill of the individual doing the repair. This manual cannot anticipate all such variations and provide advice or cautions as to each. Accordingly, anyone who departs from this manual must first establish that they neither compromise their personal safety nor the vehicle integrity by their choice of methods, tools, or parts.

SET-UP AND ADJUSTMENT

For proper performance, all new axles should have the following checked at the specified intervals:

- WHEEL NUT TORQUE: at 10, 25, and 50 miles
- BRAKE ADJUSTMENT: at 200 and 3000 miles
- TIRE PRESSURE: to manufactures requirements

HUBS/DRUMS/BEARINGS

HUB REMOVAL

Whenever the hub equipment on your axle must be removed for inspection or maintenance the following procedure should be followed.

1. Elevate and support the trailer unit per manufactures' instructions.
2. Remove the wheel assembly.
3. Remove the grease cap by carefully prying progressively around the flange of the cap.
4. Remove the cotter pin from the spindle nut or in the case of Safe-T-Lube, bend the tang washer to the free position.
5. Unscrew the spindle nut counter clockwise and remove the D-washer.
6. Remove the hub from the spindle, being careful to not let the outer bearing fall out.

BRAKE DRUM INSPECTION

There are two areas of the brake drum that are subject to wear and require periodic inspection. These two areas are the drum surface where the brake shoes make contact during stopping and the armature surface where the magnets contacts (only on electric brakes.)

The drum surface should be inspected for excessive wear or heavy scoring. If worn more than .020" oversized, or the drum has worn out of round more than .015", then the drum surface should be turned. If scoring or other wear is greater than .090" on the diameter, the drum must be replaced. When turning the drum surface, the maximum rebore diameter is as follows:

- 7" Brake Drum-.7.090"
- 10" Brake Drum-10.090"
- 12" Brake Drum-12.090"

The machined inner surface of the brake drum that contacts the Brake magnet is called the armature surface. If the armature surface is scored or worn unevenly, it should be refaced to a 120 micro inch finish by removing not more than .030" of material. To insure proper contact between the armature face and the magnet face, the magnets should be replaced whenever the armature surface is refaced and the armature surface should be refaced whenever the magnets are replaced.

NOTE: It's important to have wheel-bearing bores free of metallic chips and contamination. Make sure all cavities are free of contamination before reinstalling the bearing and seals.

BEARING INSPECTION

Wash all grease and oil from the bearing cone using a suitable solvent. Dry the bearings with clean, lint free cloth and inspect the rollers completely. If any pitting, spalling, or corrosion is present, then replace the bearing. The bearing cup inside the hub must be inspected also. **ALWAYS REPLACE THE BEARINGS AND CUPS IN SETS.**

When replacing the bearing cup proceed as follows:

1. Place the hub on a flat work surface with the cup to be replaced on the bottom side.
2. Using a brass drift punch, carefully tap around the small diameter end of the cup to drive it out.
3. After cleaning the hub bore area, replace the cup by tapping in with the brass drift punch. Be sure the cup is seated all the way up against the retaining shoulder in the hub.

Replace only with bearings as specified in the accompanying Bearing Replacement Chart.

BEARING LUBRICATION

Along with bearing adjustment, proper lubrication is essential to the current function and reliability of your trailer axle. Bearing should be lubricated every 12 months or 12,000 miles. Repack bearings as follows:

1. Place a quantity of grease into the palm of your hand.
2. Press a section of the widest end of the bearing into the outer edge of the grease pile closest to the thumb forcing grease into the interior of the bearing.
3. Repeat this while rotating the bearing from roller to roller.
4. Continue this process until you have the entire bearing completely filled with grease.
5. Before installing, apply a light coat of grease on the bearing cup.

BEARING AND SEAL REPLACEMENT CHART

| AXLE CAPACITY | SPINDLE DIAMETER | INNER BEARING/CUP | OUTER BEARING/CUP | SEAL NUMBER |
|---------------|------------------|-------------------|-------------------|-------------|
| 2,000 lbs. | 1" | 44643/44610 | 44643/44610 | 12192TB |
| 2,200 lbs. | 1-1/16" | 44649/44610 | 44649/44610 | 15192TB |
| 3,500 lbs. | 1-1/16" – 1-3/8" | 68149/68111 | 44649/44610 | 171255TB |
| 6,000 lbs. | 1-1/4" – 1-3/4" | 25580/25520 | 15123/15245 | 21333TB |
| 7,000 lbs. | 1-1/4" – 1-3/4" | 25580/25520 | 14125/14276 | 21333TB |

SEAL INSPECTION AND REPLACEMENT

Whenever the hub is removed, it's recommended to replace the seals to assure that the seal properly seals the bearing cavity. To replace the seal:

1. Pry the seal out of the hub with a screwdriver. Never drive the seal out with the inner bearing as you may cause damage to the bearing.
2. Apply Permatex sealant to the outside of the new seal.
3. Tap the new seal into place using a clean wood block.

BEARING ADJUSTMENT AND HUB REPLACEMENT

If the hub has been removed or bearing adjustment is required, the following adjustment procedure must be followed:

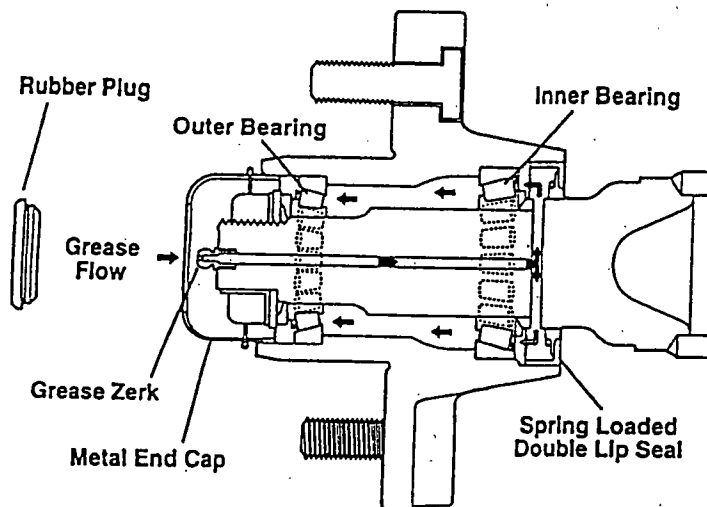
1. After placing the hub, bearings, washers, and spindle nut back on the axle spindle in reverse order as detailed in the previous section on hub removal, rotate the hub assembly slowly while tightening the spindle nut to approximately 50 lbs.-ft.
2. Then loosen the spindle nut to remove the torque. Do not rotate the hub.
3. Finger tighten the spindle nut until snug.
4. Back the spindle nut out slightly until the first castellation lines up with the cotter keyhole and insert the cotter pin (or locking tang in case of Safe-T-Lube.)
5. Bend over the cotter pin legs to secure the nut (or locking tang washer in the case of Safe-T-Lube.)
6. Nut should be free to move with only restraint being the cotter pin (or locking Tab.)

RECOMMENDED LITHIUM WHEEL BEARING GREASE:

Approved Sources:

- Mobil Oil – Mobil grease HP
- Exxon/Standard – Ronex MP
- Kendall Refining Co. – Kendall L-427
- Ashland Oil Co. – Valvoline Val-plex EP Grease

SAFE-T-LUBE



If your axle is equipped with Axis Safe-T-Lube Feature, the bearings can be periodically lubricated without removing the hubs from the axle. This feature consists of axle spindles that have been specially drilled and fitted with a grease zerk in their ends. When grease is pumped into the zerk, it is channeled to the inner bearing and then flows back to the outer bearing and eventually backs out the grease cap hole.

The procedure is as follows:

1. Remove the rubber plug from the end of the grease cap.
2. Place a standard grease gun onto the grease zerk located in the end of the spindle. Make sure the grease gun nozzle is fully engaged on the fitting.
3. Pump grease into the zerk. The old, displaced grease will begin to flow back out of the cap around the grease gun nozzle.
4. When the new, clean grease is observed, remove the grease gun, wipe off any excess, and replace the rubber plug in the cap.

Note: The Safe-T-lube feature is designed to allow immersion. Axles not equipped with Safe-T-Lube are not designed for immersion and bearings should be repacked after each immersion.

Note: Even with the Safe-T-Lube Feature, periodic inspection and repacking must be done every 12 months or 12,000 miles. Do not pack hub full of grease. Excessive grease may leak into brake drums causing brake failure.

SUSPENSION

TYPES

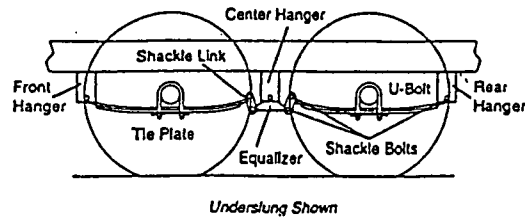
The suspension systems incorporated into Axis axles are designed to provide the trailer owner three basic functions:

1. Attach the axle to the trailer.
2. Dampen the effects of road shock.
3. Provide stability to the trailer.

All Axis suspension systems are available in single and multiple axle configurations. These are discussed in the following:

DOUBLE EYE LEAF SPRINGS

Double eye springs have eyes formed in each end of the spring and are attached to the trailer as follows:



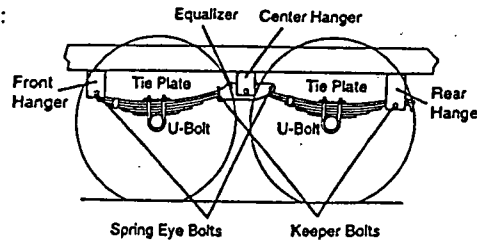
1. The front spring eye is attached directly to the front hanger with a bolt and nut.
2. The rear spring eye is attached to a pair of shackle links, which are attached to either a rear hanger (in case of a single installation), or an equalizer.

The articulation of this suspension occurs when the spring becomes loaded and consequently lengthens. The double-pivot action of the shackle links accommodates this articulation and allows the system to move freely.

In multiple axle installations the action is the same, but with the additional movement of the equalizer assembly that serves to transfer instantaneous loads from one axle to another, in effort to "equalize" the load between the axles.

SLIPPER SPRINGS

Slipper springs have an eye formed in one end only with the other end formed into a reverse curve. The attachment of these springs is as follows:



1. The front eye is attached directly into the front hanger with a nut and a bolt.
2. The rear end of the spring is captured in the rear hanger or equalizer with a "keeper bolt" that prevents the spring from coming out when the trailer is jacked up for service.

The articulation of this suspension occurs when the rear end of each slipper spring slides against the wear surfaces provided in the rear hangers or equalizers. This suspension is also available in single and multiple axle configurations.

RUBBER TORSION SUSPENSION

The RUBBER TORSION suspension system is a torsion arm type suspension, which is completely self-contained within the axle tube. It attaches directly to the trailer frame using brackets, which are an integral part of the axle assembly. The RUBBER TORSION axle provides improved suspension characteristics relative to leaf spring axles through the unique arrangement of a steel torsion bar surrounded by four natural rubber cords incased in the main structural member of the axle beam. The wheel/hub spindle is attached to a lever, called the torsion arm, which is fastened to the rubber-encased bar. As the load applied, the bar rotates causing a rolling/compressive resistance in the rubber cords. This action provides the same functions as conventional sprung axles with operating advantages including independent suspension.

INSPECTION AND REPLACEMENT

All the components of your suspension system should be visually inspected at least every 6,000 miles for signs of excess wear, elongation of bolt holes, and loosening of fasteners. Whenever loose or replaced, the fasteners in your suspension system should be torqued as in the chart below.

SUSPENSION FASTNER TORQUE VALUES

| Item | Torque (lbs/ft) | |
|--|--|-----|
| | Min. | Max |
| ½" U-Bolt | 45 | 60 |
| Shackle Bolt Spring Eye Bolt Equalizer | Snug fit only. Parts must rotate freely. Locking nuts or cotter pins are provided to retain nut-bolt assembly. | |
| Shoulder Type Shackle Bolt | 30 | 50 |

Worn spring eye bushings, sagging springs, or broken springs should be replaced using the following method.

1. Support the trailer with the wheels just off the ground. *Follow the trailer manufacturer's recommendations for lifting and supporting the unit.* Do not lift or place supports on any part of the suspension system.
2. After the unit is properly supported place a suitable block under the axle tube near the end to be repaired. This block is to support the weight of the axle only so that suspension COMPONENTS can be removed.
3. Disassemble the U-bolts, nuts, and tie plates.
4. Remove the spring eye bolts and remove the spring and place on a suitable work surface.
5. If the spring eye bushings are to be replaced, drive out the old bushing using a suitable drift punch.
6. Drive the new bushing into the spring eye using a piloted drift punch or a close fitting bolt inserted through the bushing.
7. Reinstall replaced components in reverse order. NOTE: For multiple axle units, the weight of each axle must be supported as outlined in step 2 before disassembly of any component of the suspension system.

If the equalizer or equalizer bushing must be replaced, follow the instructions above for lifting and supporting the trailer unit and then proceed as follows:

1. With both axles blocked up, remove the spring eye bolt, shackle bolt, and equalizer bolt from the equalizer to be repaired or replaced.
2. Take the equalizer to a suitable work surface and remove the worn bushings using a drift punch.
3. Drive the new bushing into place using a piloted drift punch or a close fitting bolt through the bushing.
4. Reassemble in reverse order.

All of the pivot points on your suspension system have been fitted with anti friction bearing materials which do not require routine lubrication. However, when otherwise servicing the unit, these pivot points may be lubricated if you so desire.

Except for periodic inspection of the fasteners used to attach the RUBBER TORSION axle to the vehicle frame, no other suspension maintenance is required on RUBBER TORSION axles. They are, of course subject to the maintenance and inspection procedures regarding brakes, hubs, bearings, wheels, and tires as outlined in this manual.

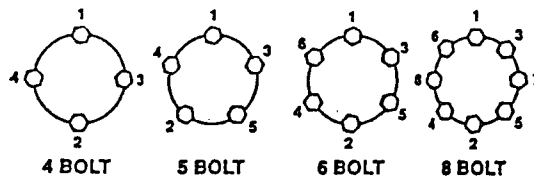
WHEEL AND TIRES

TORQUE REQUIREMENTS

It is extremely important to apply and maintain proper wheel mounting torque on your trailer axle. Torque is a measure of the amount of tightening applied to a fastener (nut or bolt) and is expressed as length times force. For example, a force of 90 pounds applied at the end of a wrench one foot long will yield 90 lbs.-ft of torque. Torque wrenches are the best method to assure the proper amount of torque is being applied to a fastener. **NOTE:** Wheel nut or bolts must be applied and maintained at the proper torque levels to prevent loose wheels, broken studs, and possible dangerous separation of wheels from your axle.

Be sure to use only the fasteners matched to the cone angle of your wheel (usually 60 or 90 degrees.) The proper procedure for attaching your wheels is as follows:

1. Start all bolts or nuts by hand to prevent cross threading.
2. Tighten bolts or nuts in the following sequence.









3. The tightening of the fasteners should be done in stages. Following the recommended sequence, tighten fasteners per the wheel torque chart.
4. Wheel nuts/bolts should be torqued before the first road use and after each wheel removal. Check and re-torque after the first 10 miles, 25 miles, and again at 50 miles. Check periodically thereafter.

CAUTION: Incorrect wheel nuts or improperly tightened wheel nuts can cause the wheel to become loose and even come off. Be sure to use the correct wheel nuts.

WHEEL TORQUE REQUIREMENTS

| Wheel Size | Torque Sequence | | |
|------------|-----------------------|-----------------------|-----------------------|
| | 1 st Stage | 2 nd Stage | 3 rd Stage |
| 12" | 20-25 | 35-40 | 50-75 |
| 13" | 20-25 | 35-40 | 50-75 |
| 14" | 20-25 | 50-60 | 90-120 |
| 15" | 20-25 | 50-60 | 90-120 |
| 16" | 20-25 | 50-60 | 90-120 |

TIRE WEAR DIAGNOSTIC CHART

| Wear Pattern | Cause | Action |
|---|-------------------------------|---|
|  Center Wear | Over Inflation | Adjust pressure to particular load per tire catalog |
|  Edge Wear | Under Inflation | Adjust pressure to particular load per tire catalog |
|  Side Wear | Loss of camber or overloading | Make sure load doesn't exceed axle rating. Align at alignment shop. |
|  Toe Wear | Incorrect toe-in | Align at alignment shop. |
|  Cupping | Out-of-balance | Check bearing adjustment and balance tires. |
|  Flat Spots | Wheel lockup & tire skidding | Avoid sudden stops when possible and adjust brakes. |

STORAGE PREPARATION

1. Jack up the trailer and place jack stands under the trailer frame so that the weight will be off the tires. Follow trailer manufacturers guidelines to lift and support the unit. Never jack up or place jack stands on the axle tube or on the equalizers.
2. Lubricate mechanical parts such as the hitch, and the suspension parts, that are exposed to the weather.
3. Boat trailer axles are subject to repeated immersion. Before storing, remove brake drums; inspect bearings – clean and lubricate.

PROLONGED STORAGE INSPECTION PROCEDURES

Before removing trailer from jack stands:

1. Remove all wheels and hubs or brake drums. Note which spindle and brake that the drum was removed from so that it can be reinstalled in the same location.
2. Inspect suspension for wear.
3. Check tightness of the hanger bolt, shackle bolt, and U-bolt nuts per recommended torque values.
4. Check brake linings, brake drums and armature faces for excessive wear or scoring.
5. Lubricate all brake moving parts.
6. Remove any rust from surface of drums with fine emery paper.
7. Inspect grease seals for wear or nicks. Replace if necessary.
8. Lubricate hub bearings.
9. Reinstall hubs and adjust bearings per instructions in this manual.
10. Mount and tighten wheels nuts per instructions in manual.

MAINTENANCE SCHEDULE

Weekly – Check tire pressure

3000 miles or 3 months – Brake adjustment, Torque on wheel nuts, and Tire inspection for wear.

6000 miles or 6 months – Inspect brake magnets for wear, Inspect suspension parts for wear.

12,000 miles or 12 months – Inspect brake lining wear, Brake cylinder leaks, brake lines, Grease bearings, Check hub for wear, Inspect grease seal, Inspect springs for any wear or loss of arch.

 **Pace Analytical**[®]
www.pacelabs.com

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
Phone: 913.599.5665
Fax: 913.599.1759

February 13, 2003

Mr. Matt Kralik
CORANCO GREAT PLAINS
P.O. Box 23
Wahoo, NE 68066

RE: Lab Project Number: 6067131
Client Project ID: KRUGER FEED + SEED

Dear Mr. Kralik:

Enclosed are the analytical results for sample(s) received by the laboratory on February 5, 2003. Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report.

If you have any questions concerning this report please feel free to contact me.

Sincerely,



Adam Taylor
adam.taylor@pacelabs.com
Project Manager

Kansas/NELAP Certification Number E-10116

Enclosures

REPORT OF LABORATORY ANALYSIS

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SAMPLE SUMMARY

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
Phone: 913.599.5665
Fax: 913.599.1759

Lab Project Number: 6067131
Client Project ID: KRUGER FEED + SEED

| Project | Sample | | | | |
|----------------------|---------------|-------------------------|---------------|-----------------------|----------------------|
| <u>Sample Number</u> | <u>Number</u> | <u>Client Sample ID</u> | <u>Matrix</u> | <u>Date Collected</u> | <u>Date Received</u> |
| 6067131-001 | 605797695 | KRUGER FEED+SEED_MW2 | Water | 01/31/03 10:54 | 02/05/03 07:30 |
| 6067131-002 | 605797703 | KRUGER FEED+SEED_MW3 | Water | 01/31/03 10:45 | 02/05/03 07:30 |
| 6067131-003 | 605797711 | KRUGER FEED+SEED_MW4 | Water | 01/31/03 10:35 | 02/05/03 07:30 |
| 6067131-004 | 605797729 | KRUGER FEED+SEED_MW5 | Water | 01/31/03 10:28 | 02/05/03 07:30 |
| 6067131-005 | 605797737 | KRUGER FEED+SEED_MW6 | Water | 01/31/03 10:20 | 02/05/03 07:30 |
| 6067131-006 | 605797745 | KRUGER FEED+SEED_MW7 | Water | 01/31/03 10:45 | 02/05/03 07:30 |

REPORT OF LABORATORY ANALYSIS

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Lab Project Number: 6067131
Client Project ID: KRUGER FEED + SEED

| Project | | | Analysis | | Analytes |
|---------------|-----------|----------------------|------------|--------------------------------|----------|
| Sample Number | Sample No | Client Sample ID | Code | Analysis Description | Reported |
| 6067131-001 | 605797695 | KRUGER FEED+SEED_MW2 | 826LL WEPA | GC/MS VOCs by 8260 (Low Level) | 11 |
| | | | 0A2 WL60 | Total Extractable Hydrocarbons | 9 |
| 6067131-002 | 605797703 | KRUGER FEED+SEED_MW3 | 826LL WEPA | GC/MS VOCs by 8260 (Low Level) | 11 |
| | | | 0A2 WL60 | Total Extractable Hydrocarbons | 9 |
| 6067131-003 | 605797711 | KRUGER FEED+SEED_MW4 | 826LL WEPA | GC/MS VOCs by 8260 (Low Level) | 11 |
| | | | 0A2 WL60 | Total Extractable Hydrocarbons | 10 |
| 6067131-004 | 605797729 | KRUGER FEED+SEED_MW5 | 826LL WEPA | GC/MS VOCs by 8260 (Low Level) | 11 |
| | | | 0A2 WL60 | Total Extractable Hydrocarbons | 9 |
| 6067131-005 | 605797737 | KRUGER FEED+SEED_MW6 | 826LL WEPA | GC/MS VOCs by 8260 (Low Level) | 11 |
| | | | 0A2 WL60 | Total Extractable Hydrocarbons | 9 |
| 6067131-006 | 605797745 | KRUGER FEED+SEED_MW7 | 826LL WEPA | GC/MS VOCs by 8260 (Low Level) | 11 |
| | | | 0A2 WL60 | Total Extractable Hydrocarbons | 9 |

REPORT OF LABORATORY ANALYSIS

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Lab Project Number: 6067131
Client Project ID: KRUGER FEED + SEED

Lab Sample No: 605797695 Project Sample Number: 6067131-001 Date Collected: 01/31/03 10:54
Client Sample ID: KRUGER FEED+SEED_MW2 Matrix: Water Date Received: 02/05/03 07:30

| Parameters | Results | Units | Report Limit | DF | Analyzed | By | CAS No. | Qual | RegLmt |
|--------------------------------|------------------------|-------|--------------|-----|----------------|-----|------------|------|--------|
| GC Semivolatiles | | | | | | | | | |
| Total Extractable Hydrocarbons | Prep/Method: 0A2 / 0A2 | | | | | | | | |
| Mineral Spirits | ND | mg/l | 0.40 | 1.0 | 02/08/03 05:46 | MIM | | | |
| Jet Fuel | ND | mg/l | 0.40 | 1.0 | 02/08/03 05:46 | MIM | | | |
| Kerosene | ND | mg/l | 0.40 | 1.0 | 02/08/03 05:46 | MIM | | | |
| Diesel Fuel | ND | mg/l | 0.40 | 1.0 | 02/08/03 05:46 | MIM | | | |
| Fuel Oil | ND | mg/l | 0.40 | 1.0 | 02/08/03 05:46 | MIM | 68334-30-5 | | |
| Motor Oil | ND | mg/l | 0.40 | 1.0 | 02/08/03 05:46 | MIM | 68334-30-5 | | |
| p-Terphenyl (S) | 91 | % | | 1.0 | 02/08/03 05:46 | MIM | | | |
| n-Tetracosane (S) | 93 | % | | 1.0 | 02/08/03 05:46 | MIM | 92-94-4 | | |
| Date Extracted | 02/05/03 | | | 1.0 | 02/08/03 05:46 | MIM | 646-31-1 | | |
| | | | | | 02/05/03 | | | | |

| | | | | | | | | | |
|---|-----|------|-----|-----|----------------|-----|------------|--|--|
| GC/MS Volatiles | | | | | | | | | |
| GC/MS VOCs by 8260 (Low Level) Method: EPA 8260 | | | | | | | | | |
| Benzene | ND | ug/l | 1.0 | 1.0 | 02/12/03 20:41 | PAH | 71-43-2 | | |
| Ethylbenzene | ND | ug/l | 1.0 | 1.0 | 02/12/03 20:41 | PAH | 100-41-4 | | |
| n-Hexane | ND | ug/l | 2.0 | 1.0 | 02/12/03 20:41 | PAH | 110-54-3 | | |
| Methyl-tert-butyl ether | ND | ug/l | 1.0 | 1.0 | 02/12/03 20:41 | PAH | 1634-04-4 | | |
| Naphthalene | ND | ug/l | 1.0 | 1.0 | 02/12/03 20:41 | PAH | 91-20-3 | | |
| Toluene | ND | ug/l | 1.0 | 1.0 | 02/12/03 20:41 | PAH | 108-88-3 | | |
| Xylene (Total) | ND | ug/l | 3.0 | 1.0 | 02/12/03 20:41 | PAH | 1330-20-7 | | |
| Toluene-d8 (S) | 99 | % | | 1.0 | 02/12/03 20:41 | PAH | 2037-26-5 | | |
| 4-Bromofluorobenzene (S) | 101 | % | | 1.0 | 02/12/03 20:41 | PAH | 460-00-4 | | |
| Dibromofluoromethane (S) | 105 | % | | 1.0 | 02/12/03 20:41 | PAH | 1868-53-7 | | |
| 1,2-Dichloroethane-d4 (S) | 102 | % | | 1.0 | 02/12/03 20:41 | PAH | 17060-07-0 | | |

Date: 02/13/03

REPORT OF LABORATORY ANALYSIS

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Lab Project Number: 6067131
 Client Project ID: KRUGER FEED + SEED

Lab Sample No: 605797703 Project Sample Number: 6067131-002 Date Collected: 01/31/03 10:45
 Client Sample ID: KRUGER FEED+SEED_MW3 Matrix: Water Date Received: 02/05/03 07:30

| Parameters | Results | Units | Report Limit | DF | Analyzed | By | CAS No. | Qual | RegLmt |
|--------------------------------|------------------------|-------|--------------|-----|----------------|-----|------------|------|--------|
| GC Semivolatiles | | | | | | | | | |
| Total Extractable Hydrocarbons | Prep/Method: OA2 / OA2 | | | | | | | | |
| Mineral Spirits | ND | mg/l | 0.40 | 1.0 | 02/08/03 07:21 | MIM | | | |
| Jet Fuel | ND | mg/l | 0.40 | 1.0 | 02/08/03 07:21 | MIM | | | |
| Kerosene | ND | mg/l | 0.40 | 1.0 | 02/08/03 07:21 | MIM | | | |
| Diesel Fuel | ND | mg/l | 0.40 | 1.0 | 02/08/03 07:21 | MIM | 68334-30-5 | | |
| Fuel Oil | ND | mg/l | 0.40 | 1.0 | 02/08/03 07:21 | MIM | 68334-30-5 | | |
| Motor Oil | ND | mg/l | 0.40 | 1.0 | 02/08/03 07:21 | MIM | | | |
| p-Terphenyl (S) | 99 | % | | 1.0 | 02/08/03 07:21 | MIM | 92-94-4 | | |
| n-Tetracosane (S) | 94 | % | | 1.0 | 02/08/03 07:21 | MIM | 646-31-1 | | |
| Date Extracted | 02/05/03 | | | | 02/05/03 | | | | |

GC/MS Volatiles

| GC/MS VOCs by 8260 (Low Level) | Method: EPA 8260 | Results | Units | Report Limit | DF | Analyzed | By | CAS No. | Qual | RegLmt |
|--------------------------------|------------------|---------|-------|--------------|----------------|----------|----|------------|------|--------|
| Benzene | ND | ug/l | 1.0 | 1.0 | 02/12/03 20:20 | PAH | | 71-43-2 | | |
| Ethylbenzene | ND | ug/l | 1.0 | 1.0 | 02/12/03 20:20 | PAH | | 100-41-4 | | |
| n-Hexane | ND | ug/l | 2.0 | 1.0 | 02/12/03 20:20 | PAH | | 110-54-3 | | |
| Methyl-tert-butyl ether | ND | ug/l | 1.0 | 1.0 | 02/12/03 20:20 | PAH | | 1634-04-4 | | |
| Naphthalene | ND | ug/l | 1.0 | 1.0 | 02/12/03 20:20 | PAH | | 91-20-3 | | |
| Toluene | ND | ug/l | 1.0 | 1.0 | 02/12/03 20:20 | PAH | | 108-88-3 | | |
| Xylene (Total) | ND | ug/l | 3.0 | 1.0 | 02/12/03 20:20 | PAH | | 1330-20-7 | | |
| Toluene-d8 (S) | 104 | % | | 1.0 | 02/12/03 20:20 | PAH | | 2037-26-5 | | |
| 4-Bromofluorobenzene (S) | 101 | % | | 1.0 | 02/12/03 20:20 | PAH | | 460-00-4 | | |
| Dibromofluoromethane (S) | 101 | % | | 1.0 | 02/12/03 20:20 | PAH | | 1868-53-7 | | |
| 1,2-Dichloroethane-d4 (S) | 99 | % | | 1.0 | 02/12/03 20:20 | PAH | | 17060-07-0 | | |

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REPORT OF LABORATORY ANALYSIS

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Lab Project Number: 6067131

Client Project ID: KRUGER FEED + SEED

Lab Sample No: 605797711

Project Sample Number: 6067131-003

Date Collected: 01/31/03 10:35

Client Sample ID: KRUGER FEED+SEED_MW4

Matrix: Water

Date Received: 02/05/03 07:30

| Parameters | Results | Units | Report Limit | DF | Analyzed | By | CAS No. | Qual | ReqLmt |
|--------------------------------|------------------------|-------|--------------|-----|----------------|-----|------------|------|--------|
| GC Semivolatiles | | | | | | | | | |
| Total Extractable Hydrocarbons | Prep/Method: OA2 / OA2 | | | | | | | | |
| Mineral Spirits | ND | mg/l | 0.40 | 1.0 | 02/08/03 07:52 | MIM | | | |
| Jet Fuel | ND | mg/l | 0.40 | 1.0 | 02/08/03 07:52 | MIM | | | |
| Kerosene | ND | mg/l | 0.40 | 1.0 | 02/08/03 07:52 | MIM | | | |
| Diesel Fuel | ND | mg/l | 0.40 | 1.0 | 02/08/03 07:52 | MIM | | | |
| Fuel Oil | ND | mg/l | 0.40 | 1.0 | 02/08/03 07:52 | MIM | 68334-30-5 | | |
| Motor Oil | ND | mg/l | 0.40 | 1.0 | 02/08/03 07:52 | MIM | 68334-30-5 | | |
| Total Petroleum Hydrocarbons | 2.6 | mg/l | 0.40 | 1.0 | 02/08/03 07:52 | MIM | | | |
| p-Terphenyl (S) | 92 | % | | 1.0 | 02/08/03 07:52 | MIM | 92-94-4 | | 1 |
| n-Tetracosane (S) | 91 | % | | 1.0 | 02/08/03 07:52 | MIM | 646-31-1 | | |
| Date Extracted | 02/05/03 | | | | 02/05/03 | | | | |

GC/MS Volatiles

| GC/MS VOCs by 8260 (Low Level) | Method: EPA 8260 | Results | Units | Report Limit | DF | Analyzed | By | CAS No. | Qual | ReqLmt |
|--------------------------------|------------------|---------|-------|--------------|------|----------------|-----|------------|------|--------|
| Benzene | | 2600 | ug/l | 20. | 20.0 | 02/12/03 21:44 | PAH | 71-43-2 | | |
| Ethylbenzene | | 470 | ug/l | 20. | 20.0 | 02/12/03 21:44 | PAH | 100-41-4 | | |
| n-Hexane | | 110 | ug/l | 40. | 20.0 | 02/12/03 21:44 | PAH | 110-54-3 | | |
| Methyl-tert-butyl ether | | ND | ug/l | 20. | 20.0 | 02/12/03 21:44 | PAH | 1634-04-4 | | |
| Naphthalene | | 160 | ug/l | 20. | 20.0 | 02/12/03 21:44 | PAH | 91-20-3 | | |
| Toluene | | 410 | ug/l | 20. | 20.0 | 02/12/03 21:44 | PAH | 108-88-3 | | |
| Xylene (Total) | | 1800 | ug/l | 60. | 20.0 | 02/12/03 21:44 | PAH | 1330-20-7 | | |
| Toluene-d8 (S) | | 103 | % | | 1.0 | 02/12/03 21:44 | PAH | 2037-26-5 | | |
| 4-Bromofluorobenzene (S) | | 98 | % | | 1.0 | 02/12/03 21:44 | PAH | 460-00-4 | | |
| Dibromofluoromethane (S) | | 100 | % | | 1.0 | 02/12/03 21:44 | PAH | 1868-53-7 | | |
| 1,2-Dichloroethane-d4 (S) | | 99 | % | | 1.0 | 02/12/03 21:44 | PAH | 17060-07-0 | | |

REPORT OF LABORATORY ANALYSIS

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Lab Project Number: 6067131
Client Project ID: KRUGER FEED + SEED

Lab Sample No: 605797729 Project Sample Number: 6067131-004 Date Collected: 01/31/03 10:28
Client Sample ID: KRUGER FEED+SEED_MW5 Matrix: Water Date Received: 02/05/03 07:30

| Parameters | Results | Units | Report Limit | DF | Analyzed | By | CAS No. | Qual | RegLmt |
|---|----------|-------|--------------|-----|----------------|-----|------------|------|--------|
| GC Semivolatiles | | | | | | | | | |
| Total Extractable Hydrocarbons Prep/Method: OA2 / OA2 | | | | | | | | | |
| Mineral Spirits | ND | mg/l | 0.40 | 1.0 | 02/08/03 08:24 | MIM | | | |
| Jet Fuel | ND | mg/l | 0.40 | 1.0 | 02/08/03 08:24 | MIM | | | |
| Kerosene | ND | mg/l | 0.40 | 1.0 | 02/08/03 08:24 | MIM | | | |
| Diesel Fuel | ND | mg/l | 0.40 | 1.0 | 02/08/03 08:24 | MIM | | | |
| Fuel Oil | ND | mg/l | 0.40 | 1.0 | 02/08/03 08:24 | MIM | 68334-30-5 | | |
| Motor Oil | ND | mg/l | 0.40 | 1.0 | 02/08/03 08:24 | MIM | 68334-30-5 | | |
| p-Terphenyl (S) | 93 | % | | 1.0 | 02/08/03 08:24 | MIM | | | |
| n-Tetracosane (S) | 90 | % | | 1.0 | 02/08/03 08:24 | MIM | 92-94-4 | | |
| Date Extracted | 02/05/03 | | | 1.0 | 02/08/03 08:24 | MIM | 646-31-1 | | |
| | | | | | 02/05/03 | | | | |

GC/MS Volatiles

| GC/MS VOCs by 8260 (Low Level) Method: EPA 8260 | | | | | | | | | |
|---|-----|------|-----|-----|----------------|-----|------------|--|--|
| Benzene | ND | ug/l | 1.0 | 1.0 | 02/12/03 22:05 | PAH | 71-43-2 | | |
| Ethylbenzene | ND | ug/l | 1.0 | 1.0 | 02/12/03 22:05 | PAH | 100-41-4 | | |
| n-Hexane | ND | ug/l | 2.0 | 1.0 | 02/12/03 22:05 | PAH | 110-54-3 | | |
| Methyl-tert-butyl ether | ND | ug/l | 1.0 | 1.0 | 02/12/03 22:05 | PAH | 1634-04-4 | | |
| Naphthalene | ND | ug/l | 1.0 | 1.0 | 02/12/03 22:05 | PAH | 91-20-3 | | |
| Toluene | ND | ug/l | 1.0 | 1.0 | 02/12/03 22:05 | PAH | 108-88-3 | | |
| Xylene (Total) | ND | ug/l | 3.0 | 1.0 | 02/12/03 22:05 | PAH | 1330-20-7 | | |
| Toluene-d8 (S) | 102 | % | | 1.0 | 02/12/03 22:05 | PAH | 2037-26-5 | | |
| 4-Bromofluorobenzene (S) | 101 | % | | 1.0 | 02/12/03 22:05 | PAH | 460-00-4 | | |
| Dibromofluoromethane (S) | 103 | % | | 1.0 | 02/12/03 22:05 | PAH | 1868-53-7 | | |
| 1,2-Dichloroethane-d4 (S) | 101 | % | | 1.0 | 02/12/03 22:05 | PAH | 17060-07-0 | | |

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REPORT OF LABORATORY ANALYSIS

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Lab Project Number: 6067131

Client Project ID: KRUGER FEED + SEED

Lab Sample No: 605797737

Client Sample ID: KRUGER FEED+SEED_MW6

Project Sample Number: 6067131-005

Matrix: Water

Date Collected: 01/31/03 10:20

Date Received: 02/05/03 07:30

| Parameters | Results | Units | Report Limit | DF | Analyzed | By | CAS No. | Qual | RegLmt |
|---|----------|-------|--------------|-----|----------------|-----|------------|------|--------|
| GC Semivolatiles | | | | | | | | | |
| Total Extractable Hydrocarbons Prep/Method: OA2 / OA2 | | | | | | | | | |
| Mineral Spirits | ND | mg/l | 0.40 | 1.0 | 02/08/03 08:55 | MIM | | | |
| Jet Fuel | ND | mg/l | 0.40 | 1.0 | 02/08/03 08:55 | MIM | | | |
| Kerosene | ND | mg/l | 0.40 | 1.0 | 02/08/03 08:55 | MIM | | | |
| Diesel Fuel | ND | mg/l | 0.40 | 1.0 | 02/08/03 08:55 | MIM | | | |
| Fuel Oil | ND | mg/l | 0.40 | 1.0 | 02/08/03 08:55 | MIM | 68334-30-5 | | |
| Motor Oil | ND | mg/l | 0.40 | 1.0 | 02/08/03 08:55 | MIM | 68334-30-5 | | |
| p-Terphenyl (S) | 88 | % | | 1.0 | 02/08/03 08:55 | MIM | | | |
| n-Tetracosane (S) | 86 | % | | 1.0 | 02/08/03 08:55 | MIM | 92-94-4 | | |
| Date Extracted | 02/05/03 | | | 1.0 | 02/08/03 08:55 | MIM | 646-31-1 | | |
| | | | | | 02/05/03 | | | | |

GC/MS Volatiles

| GC/MS VOCs by 8260 (Low Level) | Method: EPA 8260 | Results | Units | Report Limit | DF | Analyzed | By | CAS No. | Qual | RegLmt |
|--------------------------------|------------------|---------|-------|--------------|-----|----------------|-----|------------|------|--------|
| Benzene | | ND | ug/l | 1.0 | 1.0 | 02/12/03 21:02 | PAH | 71-43-2 | | |
| Ethylbenzene | | ND | ug/l | 1.0 | 1.0 | 02/12/03 21:02 | PAH | 100-41-4 | | |
| n-Hexane | | ND | ug/l | 2.0 | 1.0 | 02/12/03 21:02 | PAH | 110-54-3 | | |
| Methyl-tert-butyl ether | | ND | ug/l | 1.0 | 1.0 | 02/12/03 21:02 | PAH | 1634-04-4 | | |
| Naphthalene | | ND | ug/l | 1.0 | 1.0 | 02/12/03 21:02 | PAH | 91-20-3 | | |
| Toluene | | ND | ug/l | 1.0 | 1.0 | 02/12/03 21:02 | PAH | 108-88-3 | | |
| Xylene (Total) | | ND | ug/l | 3.0 | 1.0 | 02/12/03 21:02 | PAH | 1330-20-7 | | |
| Toluene-d8 (S) | | 103 | % | | 1.0 | 02/12/03 21:02 | PAH | 2037-26-5 | | |
| 4-Bromofluorobenzene (S) | | 99 | % | | 1.0 | 02/12/03 21:02 | PAH | 460-00-4 | | |
| Dibromofluoromethane (S) | | 106 | % | | 1.0 | 02/12/03 21:02 | PAH | 1868-53-7 | | |
| 1,2-Dichloroethane-d4 (S) | | 101 | % | | 1.0 | 02/12/03 21:02 | PAH | 17060-07-0 | | |

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REPORT OF LABORATORY ANALYSIS

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Lab Project Number: 6067131

Client Project ID: KRUGER FEED + SEED

Lab Sample No: 605797745

Project Sample Number: 6067131-006

Date Collected: 01/31/03 10:45

Client Sample ID: KRUGER FEED+SEED_MW7

Matrix: Water

Date Received: 02/05/03 07:30

| Parameters | Results | Units | Report Limit | DF | Analyzed | By | CAS No. | Qual | RegLmt |
|--------------------------------|------------------------|-------|--------------|-----|----------------|-----|------------|------|--------|
| GC Semivolatiles | | | | | | | | | |
| Total Extractable Hydrocarbons | Prep/Method: OA2 / OA2 | | | | | | | | |
| Mineral Spirits | ND | mg/l | 0.40 | 1.0 | 02/08/03 09:26 | MIM | | | |
| Jet Fuel | ND | mg/l | 0.40 | 1.0 | 02/08/03 09:26 | MIM | | | |
| Kerosene | ND | mg/l | 0.40 | 1.0 | 02/08/03 09:26 | MIM | | | |
| Diesel Fuel | ND | mg/l | 0.40 | 1.0 | 02/08/03 09:26 | MIM | 68334-30-5 | | |
| Fuel Oil | ND | mg/l | 0.40 | 1.0 | 02/08/03 09:26 | MIM | 68334-30-5 | | |
| Motor Oil | ND | mg/l | 0.40 | 1.0 | 02/08/03 09:26 | MIM | | | |
| p-Terphenyl (S) | 92 | % | | 1.0 | 02/08/03 09:26 | MIM | 92-94-4 | | |
| n-Tetracosane (S) | 91 | % | | 1.0 | 02/08/03 09:26 | MIM | 646-31-1 | | |
| Date Extracted | 02/05/03 | | | | | | | | |

GC/MS Volatiles

| GC/MS VOCs by 8260 (Low Level) | Method: EPA 8260 | Results | Units | Report Limit | DF | Analyzed | By | CAS No. | Qual | RegLmt |
|--------------------------------|------------------|---------|-------|--------------|----------------|----------|----|------------|------|--------|
| Benzene | ND | ug/l | 1.0 | 1.0 | 02/12/03 21:23 | PAH | | 71-43-2 | | |
| Ethylbenzene | ND | ug/l | 1.0 | 1.0 | 02/12/03 21:23 | PAH | | 100-41-4 | | |
| n-Hexane | ND | ug/l | 2.0 | 1.0 | 02/12/03 21:23 | PAH | | 110-54-3 | | |
| Methyl-tert-butyl ether | ND | ug/l | 1.0 | 1.0 | 02/12/03 21:23 | PAH | | 1634-04-4 | | |
| Naphthalene | ND | ug/l | 1.0 | 1.0 | 02/12/03 21:23 | PAH | | 91-20-3 | | |
| Toluene | ND | ug/l | 1.0 | 1.0 | 02/12/03 21:23 | PAH | | 108-88-3 | | |
| Xylene (Total) | ND | ug/l | 3.0 | 1.0 | 02/12/03 21:23 | PAH | | 1330-20-7 | | |
| Toluene-d8 (S) | 101 | % | | 1.0 | 02/12/03 21:23 | PAH | | 2037-26-5 | | |
| 4-Bromofluorobenzene (S) | 100 | % | | 1.0 | 02/12/03 21:23 | PAH | | 460-00-4 | | |
| Dibromofluoromethane (S) | 100 | % | | 1.0 | 02/12/03 21:23 | PAH | | 1868-53-7 | | |
| 1,2-Dichloroethane-d4 (S) | 99 | % | | 1.0 | 02/12/03 21:23 | PAH | | 17060-07-0 | | |

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PARAMETER FOOTNOTES

Dilution factor shown represents the factor applied to the reported result and reporting limit due to changes in sample preparation, dilution of the extract, or moisture content

- ND Not detected at or above adjusted reporting limit
- NC Not Calculable
- J Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit
- MDL Adjusted Method Detection Limit
- (S) Surrogate
- [1] Quantitation of the Total Petroleum Hydrocarbon fraction was achieved using No. 2 diesel fuel as a reference standard from C10 to C28. The TPH fingerprint was indicative of gasoline range hydrocarbons.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Lab Project Number: 6067131
Client Project ID: KRUGER FEED + SEED

QC Batch: 138439
QC Batch Method: OA2
Associated Lab Samples: 605797695 605797703 605797711 605797729 605797737
605797745

Analysis Method: OA2
Analysis Description: Total Extractable Hydrocarbons

METHOD BLANK: 605799170
Associated Lab Samples: 605797695 605797703 605797711 605797729 605797737 605797745

| Parameter | Units | Blank Result | Reporting Limit | Footnotes |
|-------------------|-------|--------------|-----------------|-----------|
| Mineral Spirits | mg/l | ND | 0.40 | |
| Jet Fuel | mg/l | ND | 0.40 | |
| Kerosene | mg/l | ND | 0.40 | |
| Diesel Fuel | mg/l | ND | 0.40 | |
| Fuel Oil | mg/l | ND | 0.40 | |
| Motor Oil | mg/l | ND | 0.40 | |
| p-Terphenyl (S) | % | 86 | | |
| n-Tetracosane (S) | % | 89 | | |

LABORATORY CONTROL SAMPLE: 605799188

| Parameter | Units | Spike Conc. | LCS Result | LCS % Rec | % Rec Limits | Footnotes |
|-------------------|-------|-------------|------------|-----------|--------------|-----------|
| Diesel Fuel | mg/l | 12.50 | 11.77 | 94 | 59-131 | |
| p-Terphenyl (S) | | | | 91 | 44-138 | |
| n-Tetracosane (S) | | | | 96 | 56-131 | |

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 605799196 605799204

| Parameter | Units | 605797695 Result | Spike Conc. | MS Result | MSD Result | MS % Rec | MSD % Rec | % Rec Limits | RPD | Max RPD | Footnotes |
|-------------------|-------|------------------|-------------|-----------|------------|----------|-----------|--------------|-----|---------|-----------|
| Diesel Fuel | mg/l | 0 | 16.67 | 14.47 | 13.87 | 87 | 83 | 54-137 | 4 | 20 | |
| p-Terphenyl (S) | | | | | | 84 | 82 | 44-138 | | | |
| n-Tetracosane (S) | | | | | | 88 | 87 | 56-131 | | | |

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QUALITY CONTROL DATA

Lab Project Number: 6067131
Client Project ID: KRUGER FEED + SEED

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 605804210 605804228

| Parameter | Units | 605797729 | Spike | MS | MSD | MS | MSD | % Rec | Max | | Footnotes |
|---------------------------|-------|-----------|-------|--------|--------|-------|-------|--------|-----|-----|-----------|
| | | Result | Conc. | Result | Result | % Rec | % Rec | Limits | RPD | RPD | |
| Benzene | ug/l | 0 | 10.00 | 9.995 | 9.889 | 100 | 99 | 61-140 | 1 | 22 | |
| Toluene | ug/l | 0 | 10.00 | 11.39 | 10.41 | 114 | 104 | 59-140 | 9 | 24 | |
| Toluene-d8 (S) | | | | | | 103 | 100 | 90-110 | | | |
| 4-Bromofluorobenzene (S) | | | | | | 95 | 95 | 86-115 | | | |
| Dibromofluoromethane (S) | | | | | | 97 | 100 | 88-113 | | | |
| 1,2-Dichloroethane-d4 (S) | | | | | | 89 | 99 | 83-120 | | | |

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QUALITY CONTROL DATA PARAMETER FOOTNOTES

Consistent with EPA guidelines, unrounded concentrations are displayed and have been used to calculate % Rec and RPD values.

- LCS(D) Laboratory Control Sample (Duplicate)
- MS(D) Matrix Spike (Duplicate)
- DUP Sample Duplicate
- ND Not detected at or above adjusted reporting limit
- NC Not Calculable
- J Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit
- MDL Adjusted Method Detection Limit
- RPD Relative Percent Difference
- (S) Surrogate

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

CROSS REFERENCE TABLE

Lab Project Number: 6067131
Client Project ID: KRUGER FEED + SEED

| Lab Sample No Identifier | Client Sample Identifier | QC Batch Method | QC Batch Identifier | Analytical Method | Analytical Batch Identifier |
|--------------------------|--------------------------|-----------------|---------------------|-------------------|-----------------------------|
| 605797695 | KRUGER FEED+SEED_MW2 | 0A2 | 138439 | 0A2 | 138648 |
| 605797703 | KRUGER FEED+SEED_MW3 | 0A2 | 138439 | 0A2 | 138648 |
| 605797711 | KRUGER FEED+SEED_MW4 | 0A2 | 138439 | 0A2 | 138648 |
| 605797729 | KRUGER FEED+SEED_MW5 | 0A2 | 138439 | 0A2 | 138648 |
| 605797737 | KRUGER FEED+SEED_MW6 | 0A2 | 138439 | 0A2 | 138648 |
| 605797745 | KRUGER FEED+SEED_MW7 | 0A2 | 138439 | 0A2 | 138648 |
| 605797695 | KRUGER FEED+SEED_MW2 | EPA 8260 | 138507 | | |
| 605797703 | KRUGER FEED+SEED_MW3 | EPA 8260 | 138507 | | |
| 605797711 | KRUGER FEED+SEED_MW4 | EPA 8260 | 138507 | | |
| 605797729 | KRUGER FEED+SEED_MW5 | EPA 8260 | 138507 | | |
| 605797737 | KRUGER FEED+SEED_MW6 | EPA 8260 | 138507 | | |
| 605797745 | KRUGER FEED+SEED_MW7 | EPA 8260 | 138507 | | |

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