Fliteway Technologies, Inc.

Operations and Maintenance Manual

QI2638R2

Coranco – Trenton Co-op

SVE: FV7.582X3-EN858 S/N EN858C035353

Control Panel: S/N CPQ I2638R2C035354

Trailer: 812TRQI2638R2 S/N 812TRQI2638R2C035355

P.O. Box 108 - 6100 Industrial Court - Greendale, WI 53129

(414) 423-5600 1-800-236-3580 FAX (414) 423-9007

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6100 Industrial Court • P.O. Box 108 • Greendale, WI 53129
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Q12638 Rev 2

Coranco Great Plains
Trenton Co-op, NE

- **SVE System** rated fo **228 SCFM at 60" WC. at 2,700 foot elevation**

Fliteway FV1082X3-EN858 with the following equipment

- **Rotron EN858BD72WL Explosion Proof Regenerative Blower with 10 HP 230 / 460 VAC Three Phase Explosion Proof Motor**
- **Fliteway "Cyclonic Action" 82 Gallon Vertical** knockout tank, carbon steel with site gauge, 6" cleanout, and bottom drain.
- **4" inlet**, with vacuum gauge, and sample port.
- **3"** Premium 10 micron inline filter between tank and vacuum pump.
- Mini Magnahelic to monitor differential pressure across filter element.
- 4" Premium carbon steel discharge silencer
- Vacuum relief valve on inlet side of pump, field adjustable
- 2" Dilution valve with filter / silencer
- One (1) 3" Rotron FM30C475Q Direct Read Flow Meter (95-475 SCFM)
- HHL Switch
- 4" Low Flow Switch
    - 4" Inlet Header with Six (6) 2" Ports
    - Six (6) 2" Gate Valves
    - Six (6) Sample Ports
    - Six (6) Vacuum Gauges
    - Six (6) 2" Rotron Direct Flow Meters (13-65 SCFM)
    - Six (6) Air Injection Assemblies
- Explosion Proof Automatic Drain System
    - 1/2 HP Explosion Proof Stainless Steel Centrifugal Pump
    - Two (2) Pump Control Switches
    - Discharge check valve and Two (2) pressure gauges
    - Cartridge Filter
- One (1) Tetrasolve Liquid Phase Carbon Vessel

- **For Possible Future addition of Air Sparge System**
    - Passive finned heat exchanger Tubes mounted underneath Trailer

- **NEMA 4 Control Panel (115/230 VAC Three Phase)**

  - NEMA 4 Box with inner panel
  - Fused Disconnect
  - Circuit breakers for branch circuit protection
    - Trailer Heater
    - Trailer Vent Fan
  - Starters and overload protection for:
    - 10 HP SVE
    - ½ HP Transfer Pump
    - Space for possible addition of 10 HP Air Sparge Motor
  - Three (3) HOA switches
    - SVE
    - SVE Transfer Pump
    - Air Sparge (later addition)
  - Two (2) Amp meter
  - Two (2) Hour meters
    - SVE
    - Air Sparge (later addition)
  - Program Timer for SVE
  - Program Timer for Air Sparge
  - Run lights
  - Five (5) Alarm Lights
    - SVE HHL
    - SVE Motor Fault
    - SVE Low Flow
    - Air Sparge Motor Fault
    - Air Sparge High Discharge Temperature
  - One (1) Warrick 67 Series Pump Control and
  - Two (2) Intrinsically Safe Switch Repeater
  - **Sensaphone 2000** auto dialer with battery backup
  - Surge Protection
  - Lightning Protection
  - Control Box heater with thermostat

- **Enclosed Trailer:**

Pace American Model CS812TA2 Interior Dimensions: 8' wide by 12.5' Long by 6'5" Tall
Dual Axle 7,000 pound GVWR with 4,500 pound payload capacity

  - All Wheel Electric Brakes with 12 VDC Breakaway switch
  - Independent torsion suspension
  - Double Swing Rear Doors with Semi-Style Camlocks
  - Clearance Lights
  - Double Layer ¾" Plywood Floor
  - 3/8" interior Plywood Walls
  - Three (3) Year Trailer Warranty
  - Two Floor Vents

- Front and Rear Stabilizer Jacks
- Spare Tire
- **1" Thermal Insulation inside interior walls**
- **1,800 Watt Explosion Proof Heater and Thermostat**
- **Hazardous Location TEFC Vent fan**
  (To be located away from SVE Blower)
- **Gas Tight Light**
- Installation of all Equipment and manifolds per **Class 1 Div 2 Hazardous Location**

- **One (1) Layer of 2" Convoluted Polyester Noise Absorption Foam panels on interior walls and ceiling**
  (Reduces exterior sound levels by about 10-12 dba.)

Total Equipment Price for Trailer $ 35,116

Estimated Freight $ 1,000

Pricing: FOB Greendale, WI. (Sales taxes not included)

Terms: 2% Ten, Net 45 days
(1.5% per month finance charge on invoice balances over 45 days)

Delivery: No Later then April 7, 2003

Sincerely,

William E. Diehl
President

Fliteway Technologies, Inc.

Soil Vapor Extraction System

P.O. Box 108 - 6100 Industrial Court - Greendale, WI 53129

(414) 423-5600 1-800-236-3580 FAX (414) 423-9007

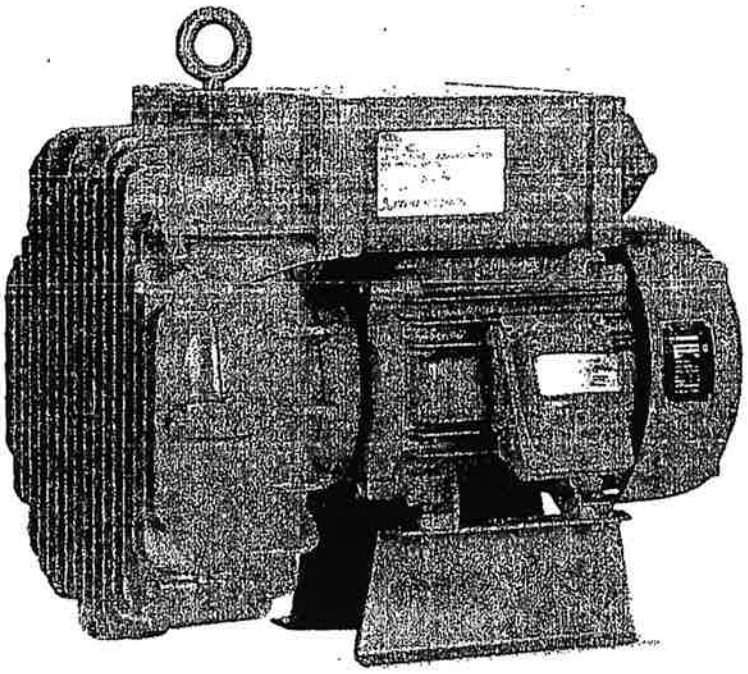
EN 858 & CP 858
Sealed Regenerative Blower w/Explosion-Proof Motor

FEATURES
- Manufactured in the USA – ISO 9001 compliant
- Maximum flow: 400 SCFM
- Maximum pressure: 120 IWG
- Maximum vacuum: 98 IWG
- Standard motor: 10 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

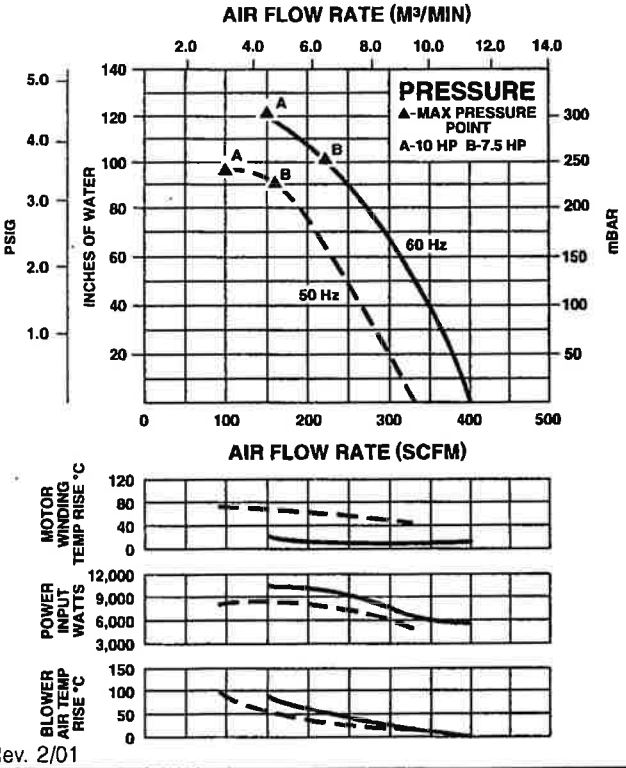
MOTOR OPTIONS
- International voltage & frequency (Hz)
- Chemical duty, high efficiency, inverter duty or industry-specific designs
- Various horsepowers for application-specific needs

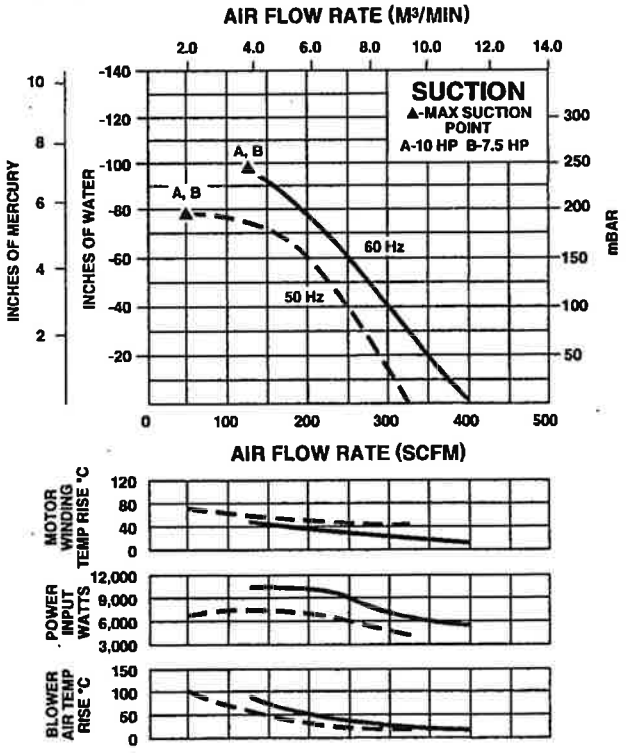
BLOWER OPTIONS
- Corrosion resistant surface treatments & sealing options
- Remote drive (motorless) models
- Slip-on or face flanges for application-specific needs

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



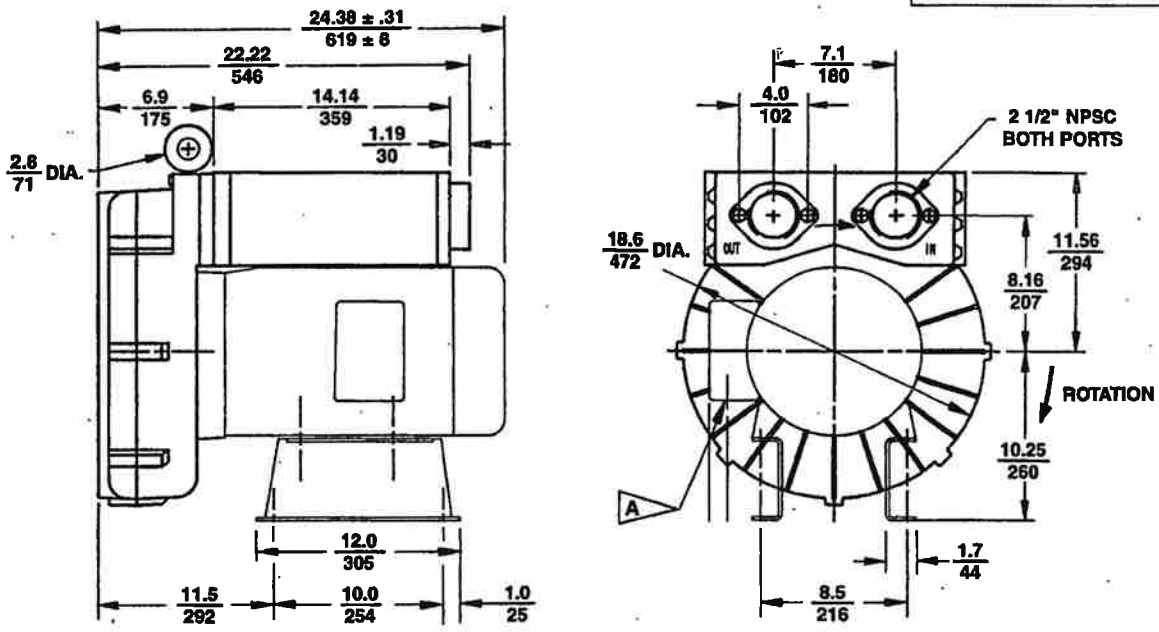


Rev. 2/01

AMETEK Rotron Industrial Products, Saugerties, NY 12477 • e mail: rotronindustrial@ametek.com • internet: www.rotronindustrial.com

EN 858 & CP 858
Sealed Regenerative Blower w/Explosion-Proof Motor

Scale CAD drawing available upon request.



DIMENSIONS: IN / MM
TOLERANCES: .XX ± .1 / 2.5
(UNLESS OTHERWISE NOTED)

A 0.75" NPT CONDUIT CONNECTION AT 12 O'CLOCK POSITION

SPECIFICATIONS

MODEL	EN858BD72WL		EN858BD86WL	EN858BA72WL		CP858FZ72WLR
Part No.	038744		038745	080070		038980
Motor Enclosure – Shaft Material	Explosion-proof – **CS**		Explosion-proof – **CS**	Explosion-proof – **CS**		Chem XP – **SS**
Horsepower	10.0		10.0	7.5		Same as EN858BD72WL – 038744 except add Chemical Processing (CP) features from catalog inside front cover
Phase – Frequency [1]	Three - 60 Hz		Three - 60 Hz	Three - 60 Hz		
Voltage [1]	230	460	575	230	460	
Motor Nameplate Amps	24	12	9.6	17	8.5	
Max. Blower Amps [3]	29	14.5	11.6	26	13	
Inrush Amps	162	81	93	126	63	
Starter Size	2	1	1	1	1	
Service Factor	1.0		1.0	1.0		
Thermal Protection [2]	Class B - Pilot Duty		Class B - Pilot Duty	Class B - Pilot Duty		
XP Motor Class – Group	I-D, II-F&G		I-D, II-F&G	I-D, II-F&G		
Shipping Weight	332 lb (151 kg)		332 lb (151 kg)	320 lb (145 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.

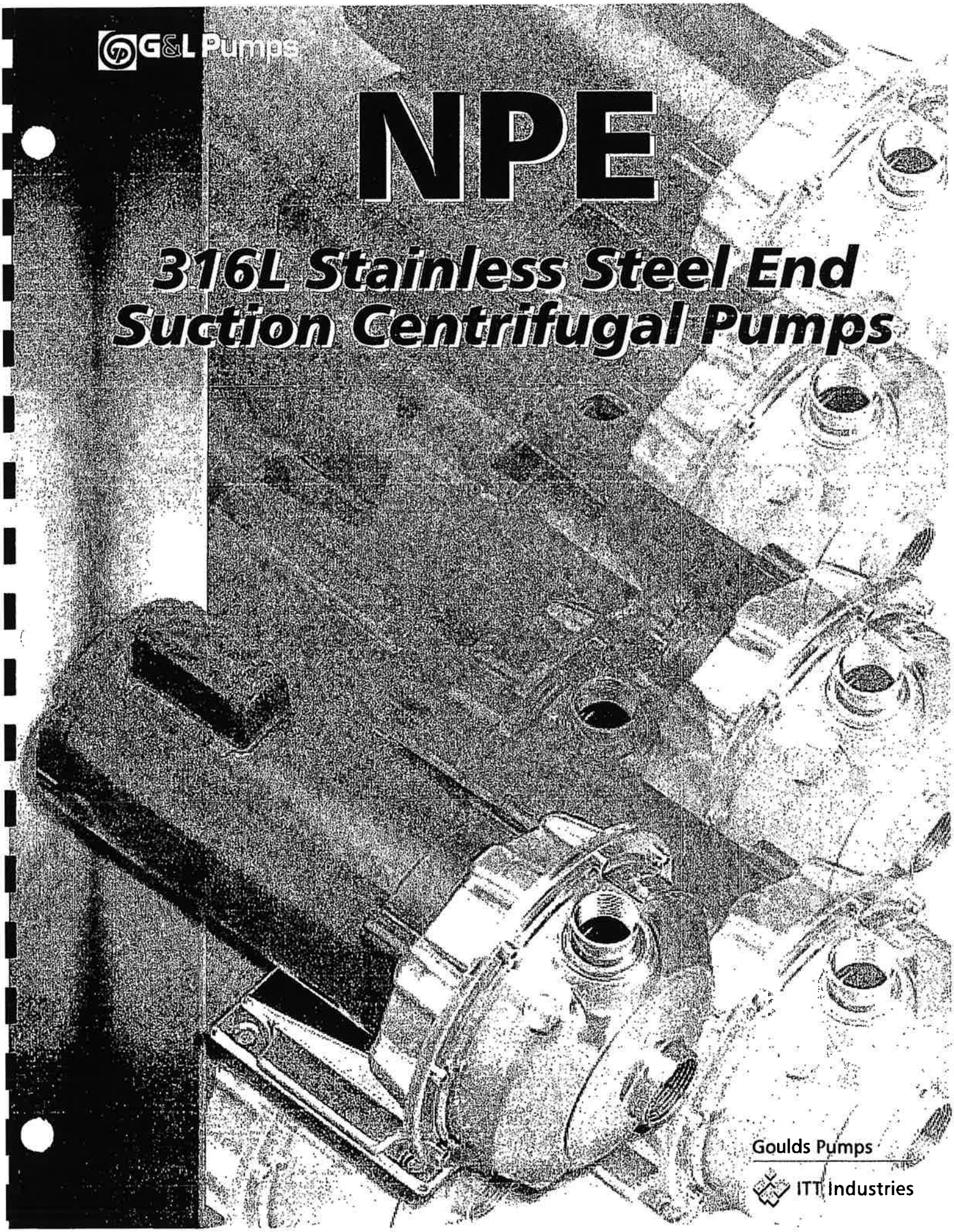
[3] Maximum blower amps corresponds to the performance point at which the motor or blower temperature rise with a 40°C inlet and/or ambient temperature reaches the maximum operating temperature.

Specifications subject to change without notice. Please consult your Local Field Sales Engineer for specification updates. Rev. 2/01

G&L Pumps

NPE

316L Stainless Steel End Suction Centrifugal Pumps



Goulds Pumps

ITT Industries

A FULL RANGE OF PRODUCT FEATURES

- The close coupled compact, flexible design saves space, can be mounted horizontally or vertically, and simplifies maintenance.
- Standard NEMA motors are open drip-proof, totally enclosed fan-cooled or explosion proof enclosure, have stainless steel shaft, and are designed for continuous duty under all conditions with single and three phase available.
- Superior, complete AISI 316L stainless steel liquid handling components for corrosion resistance and improved strength and durability.
- Casing and adapter have NPT threaded centerline connections, easily accessible vent, prime and drain connections with stainless plugs.
- Unique floating O-ring enclosed impeller design maintains maximum efficiencies.
- Standard John Crane mechanical seal of silicon carbide, viton and stainless metal parts with optional high temperature and chemical duty seals available.

TYPICAL APPLICATIONS

Specifically designed for a broad range of general applications traditionally requiring various materials such as all iron, bronze fitted, all bronze or stainless construction.

- Water circulation
- Booster service
- Liquid transfer
- Spray system
- Chillers
- Washing/cleaning systems
- Injection molding cooling
- Reverse osmosis
- Air scrubbers
- Heat exchangers
- Filtration systems
- Jockey pumps
- OEM applications
- General water services

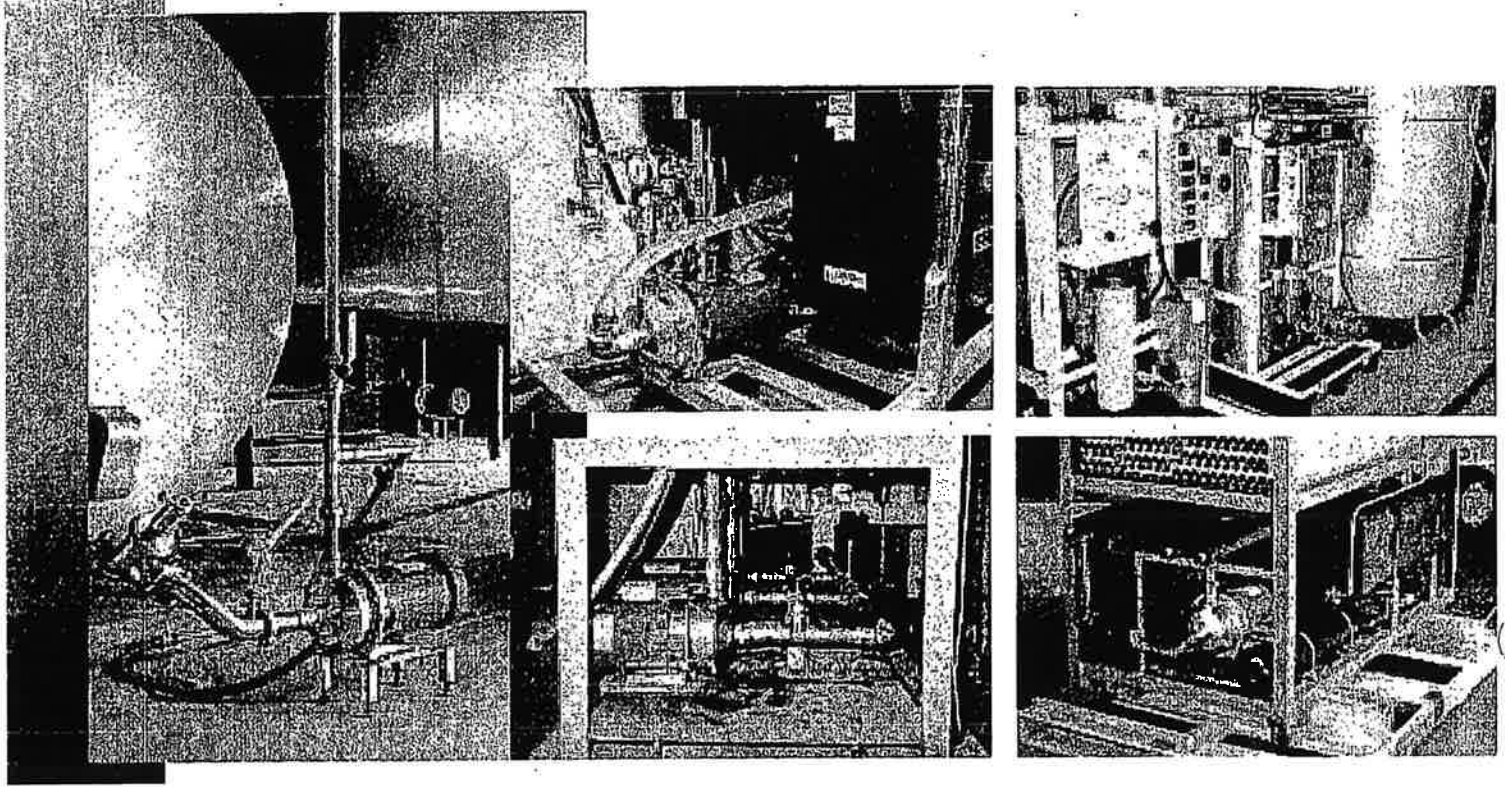
SPECIFICATIONS

Capacities to:
75 GPM (283L/min) at 1750 RPM
150 GPM (550L/min) at 3500 RPM

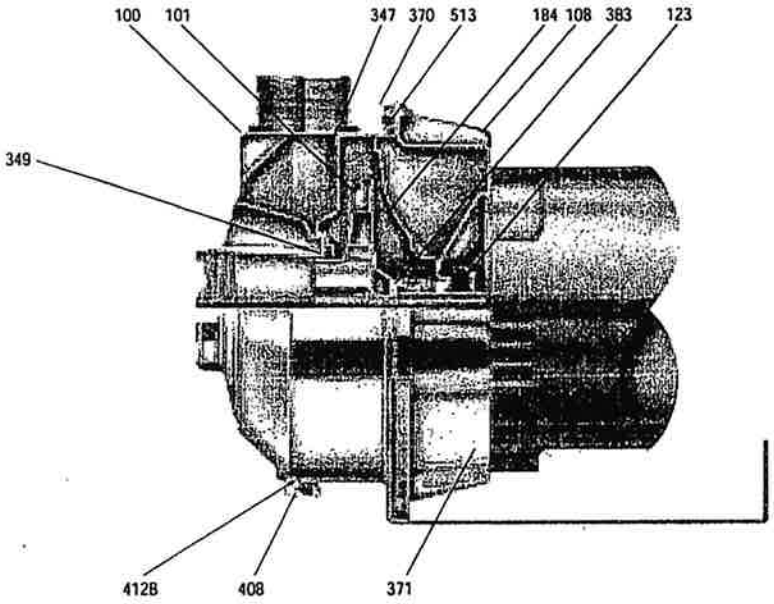
Heads to:
39 feet (11 m) at 1750 RPM
150 feet (50 m) at 3500 RPM

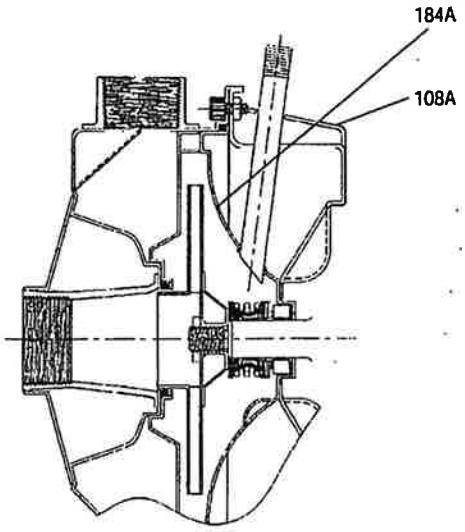
Working pressures to:
125 PSIG (9 bars)

Maximum temperatures to:
212°F (100°C) with standard seal or
250°F (121 °C) with optional high temperature seal.



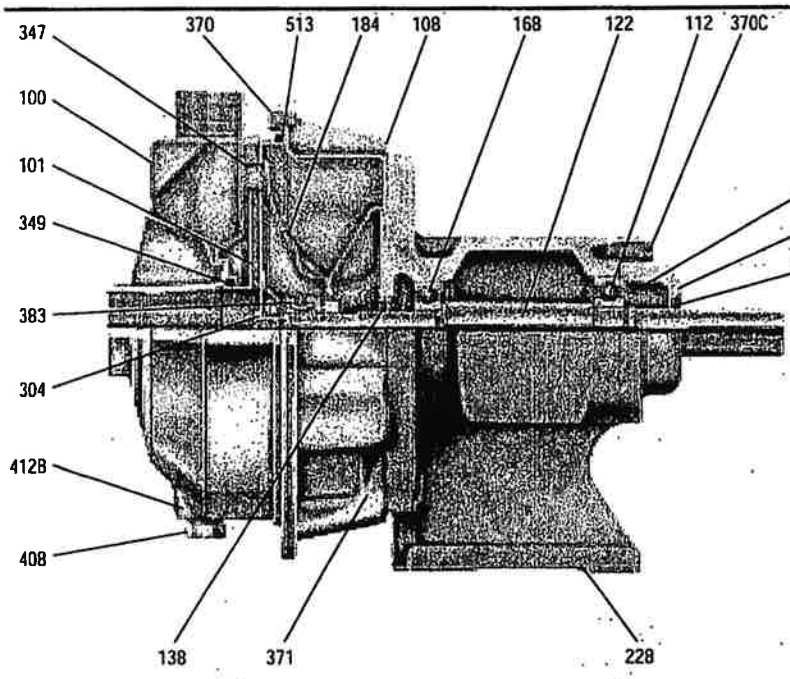
NPE CLOSE COUPLED MAJOR COMPONENTS: MATERIALS OF CONSTRUCTION

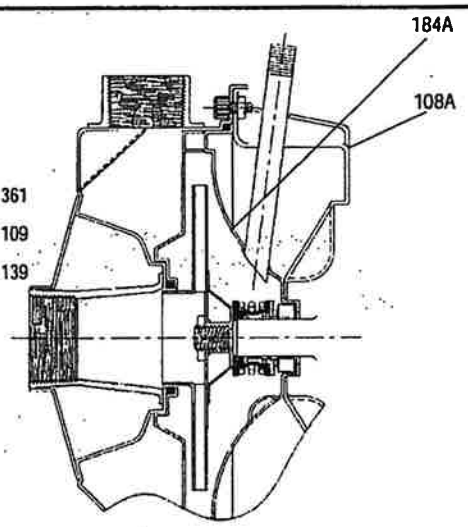




Seal Face Vent/Flush Option

NPE FRAME MOUNTED MAJOR COMPONENTS: MATERIALS OF CONSTRUCTION





Seal Face Vent/Flush Option

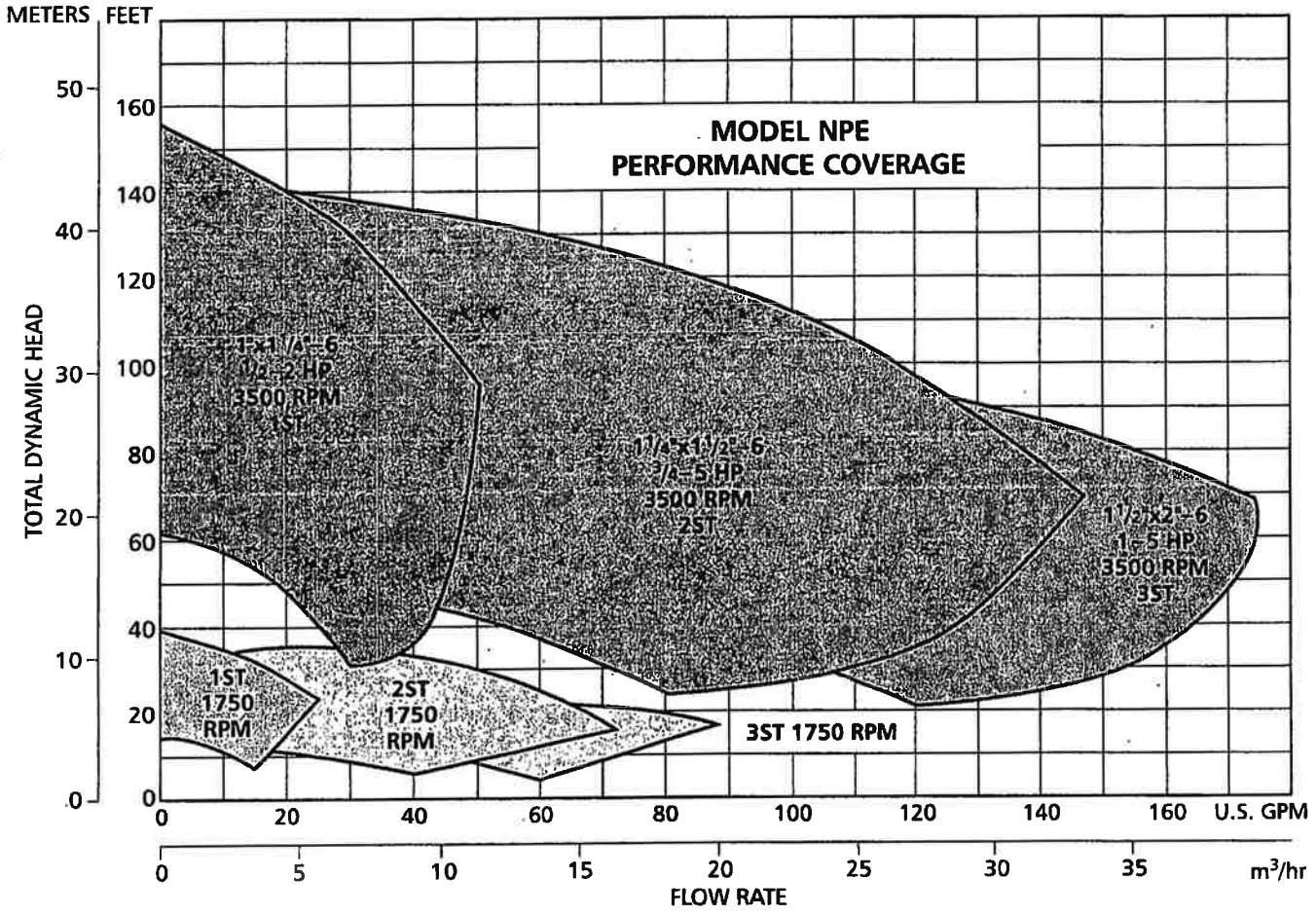
Item No.	Description	Materials
100	Casing	AISI 316 SS
101	Impeller	AISI 316 SS
108	Motor adapter	AISI 304 SS
108A	Motor adapter seal vent/flush	AISI 304 SS
109	Bearing cover	Cast iron
112	Ball bearing (outboard)	Steel
122	Shaft	AISI 316 SS
123	Deflector	BUNA-N
138	Lip-seal (inboard)	BUNA/steel
139	Lip-seal (outboard)	BUNA/steel
168	Ball bearing (inboard)	Steel
184	Seal housing	AISI 316 SS
184A	Seal housing seal vent/flush	AISI 316 SS
228	Bearing frame	Cast iron
304	Impeller locknut	AISI 316 SS
347	Guidevane	AISI 316 SS

Item No.	Description	Materials
349	O-ring	Viton
361	Retaining ring	Steel
370	Socket head screws, casing	AISI 430 SS
370C	Hex head screw, bearing cover	Plated steel
371	Bolts, motor	Plated steel
383	Mechanical seal	Carbon/Sil-Carbide, Viton elastomers, 316 Stainless metal parts*
400	Shaft key	316
408	Drain and vent plug, casing	AISI 316 SS
412B	O-ring, drain and vent plug	Viton
513	O-ring, casing	Viton
Motor	NEMA standard, 56J flange	

**Optional high temperature and chemical duty seals available*

G&L Pumps

NPE PERFORMANCE CURVES 60 Hz USA



www.goulds.com

Goulds Pumps
1 Goulds Drive
Auburn, NY 13021

Goulds Pumps
ITT Industries

G&L
A GOULDS PUMPS COMPANY

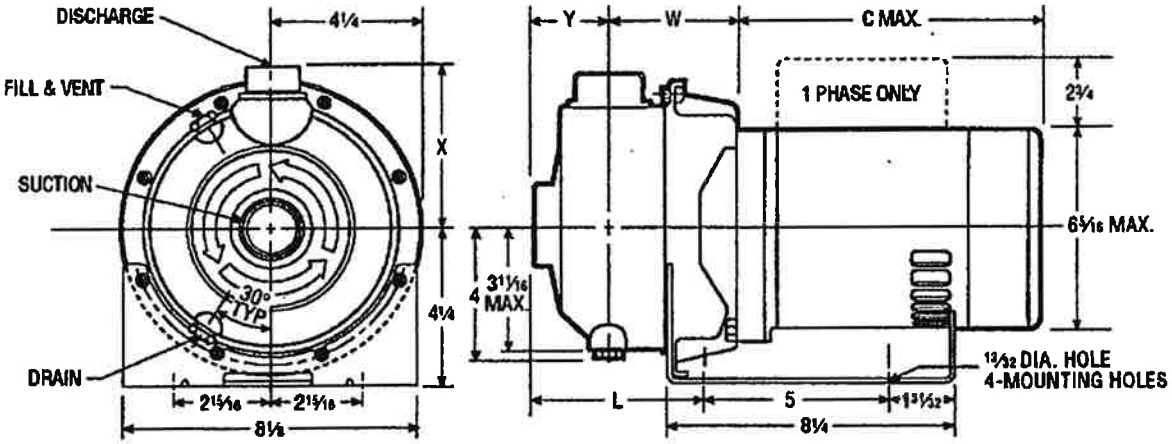
Stainless Steel Close-Coupled Centrifugal Pumps

Dimension Print
SECTION 1
MODEL NPE
Effective February, 1994

ENGINEERING DATA

Clockwise Rotation Viewed from Drive End	Installation Drawing No. 276-81	Certified for construction purposes ☐ For Approval ☐ For Record
		By

Signature *Date*



DIMENSIONS – DETERMINED BY PUMP

Pump	Suction	Discharge	HP	W	X	Y	L
1ST	1¼	1	½ - 2	3 5/16	4⅜	2	4 9/16
2ST	1½	1¼	¾ - 3	3¾	4½	2⅛	5⅛
3ST	2	1½	1 - 3	3¾	4⅝	2⅛	5⅛

Notes:
1. Pumps will be shipped with top vertical discharge as standard, for other orientations, remove casing bolts, rotate to desired position, and tighten ⅜" bolts to 24 lbs.-ft.
2. Dimensions in inches, weight in pounds.
3. Not to be used for construction purposes unless certified.
4. Motor dimensions may vary with motor manufacturers.

AVAILABLE MOTOR WEIGHTS & DIMENSIONS

HP	Motor Weights				C Max. Length
	1 Phase		3 Phase		
	ODP	TEFC	ODP	TEFC	
½	16	21	19	18	9 15/16
¾	19	24	21	21	10¼
1	22	26	23	21	11
1½	28	35	27	27	11 5/16
2	33	39	32	33	12 1/16
3	40	43	41	37	12 7/16

Note: Dimensions in inches, weight in pounds.

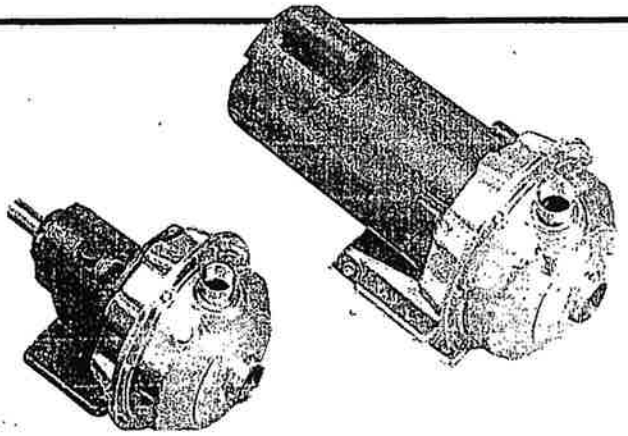
SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

PRINTED IN U.S.A.
DGLNPEC

G&L Pumps

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.

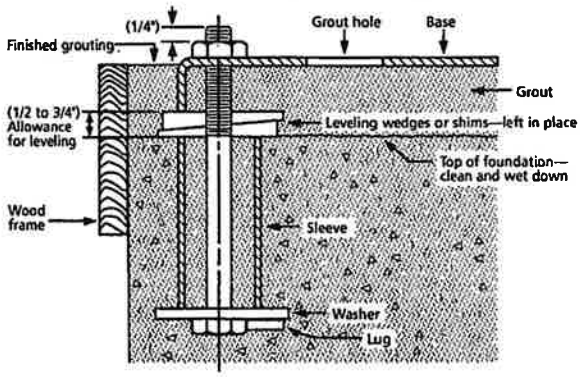


Figure 1

Goulds Pumps

ITT Industries

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.

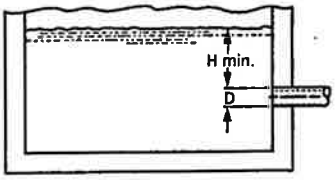


Figure 2

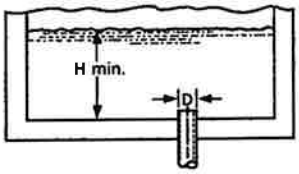


Figure 3

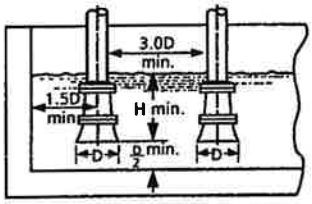


Figure 4

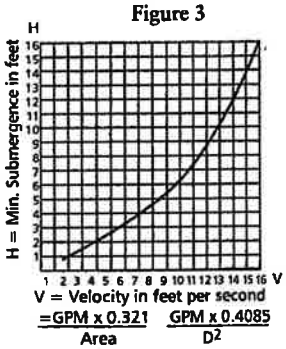


Figure 5

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.

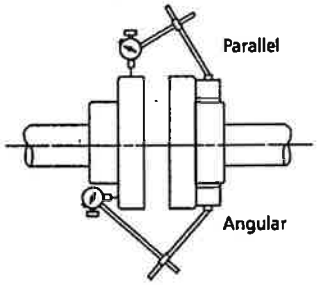


Figure 6

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)

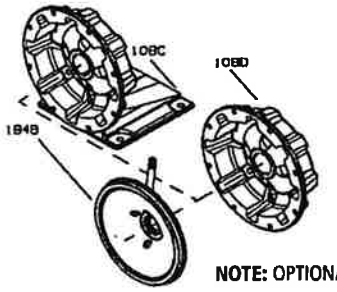
PROBABLE CAUSE:

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

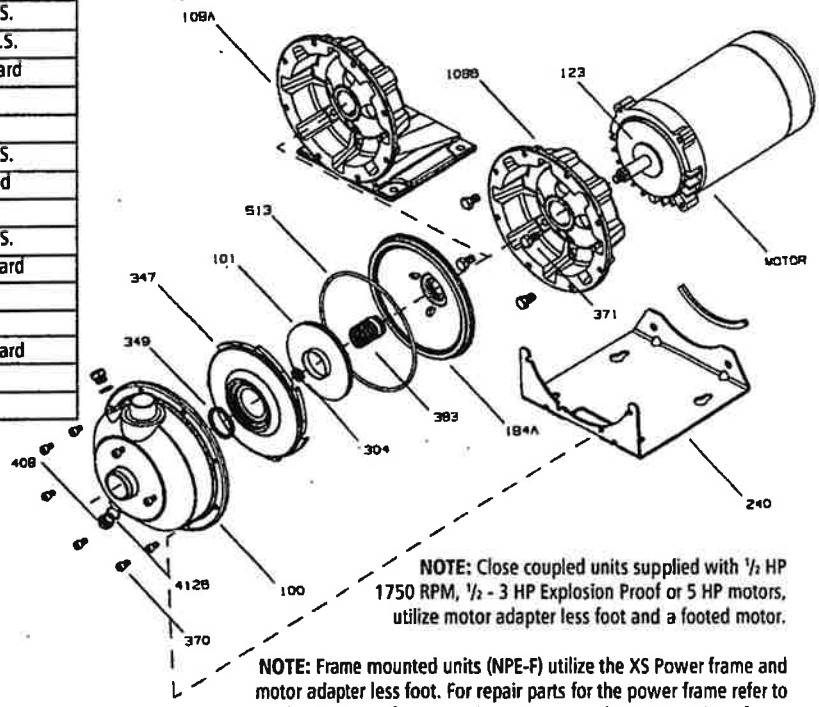
NPE Standard Repair Parts List

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 (⅝" seal)				
Rotary	Stationary	Elastomers	Metal Parts	Part No.
Carbon	Sil-Carbide	EPR	316SS	10K18
		Viton		10K55
Sil-Carbide		EPR		10K81
		Viton		10K62



NOTE: OPTIONAL SEAL FLUSH COMPONENTS



NOTE: Close coupled units supplied with ½ HP 1750 RPM, ½ - 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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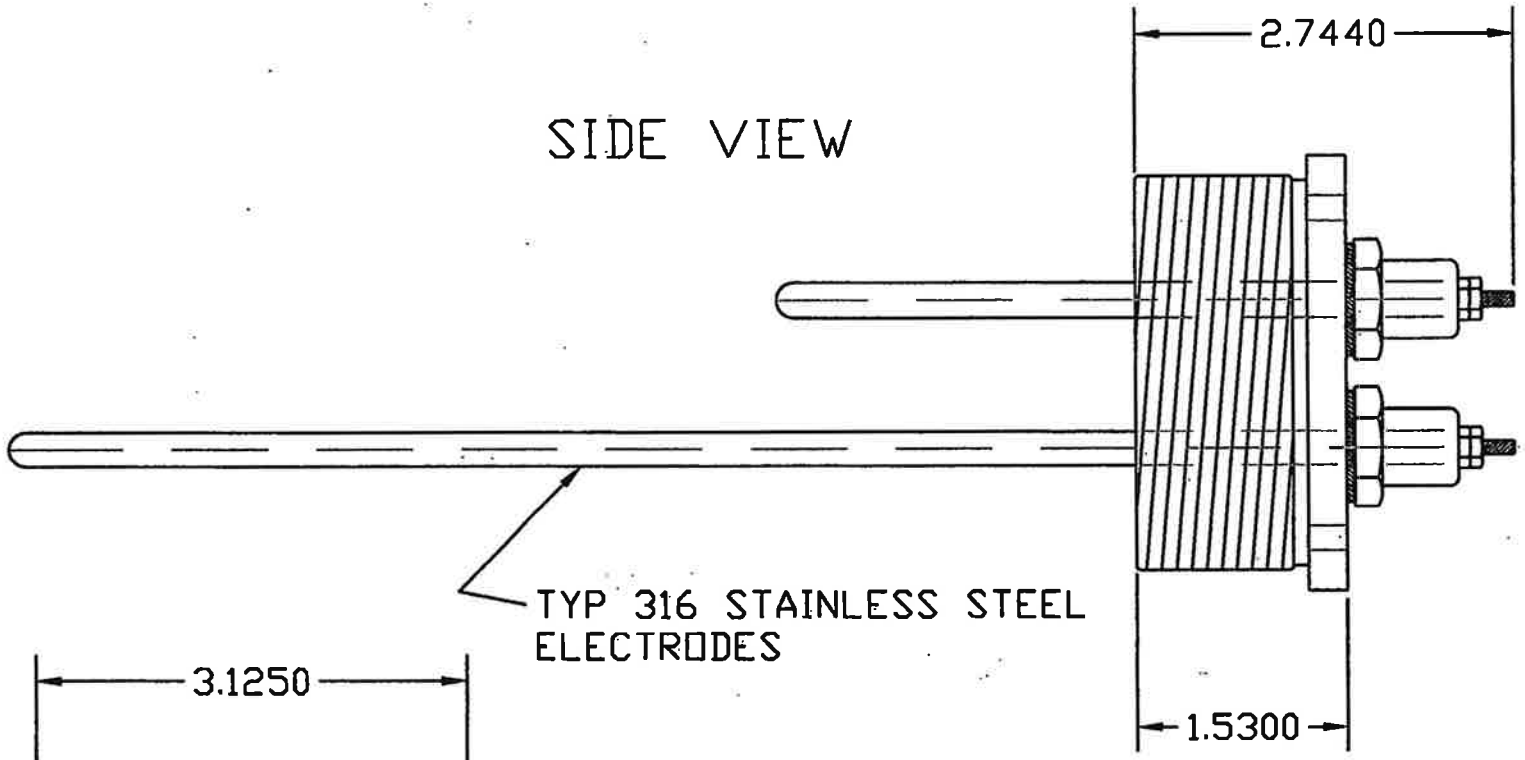
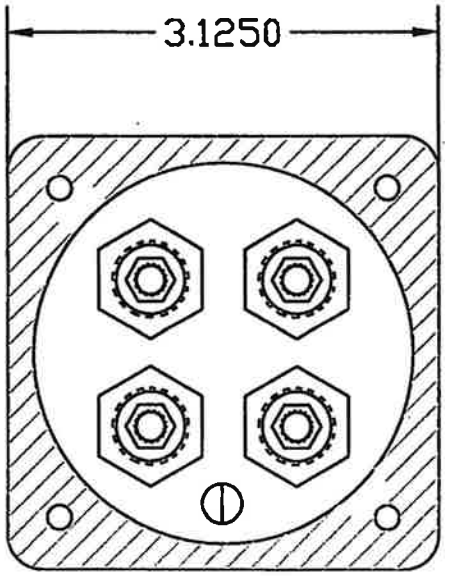
ITT Industries





TOP VIEW

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES

0.X	±.030	ANGLES	±1/2°
0.XX	±.015	FRACTIONS ±1/16	FILLETS .030 TO .060
0.XXX	±.005		SURFACE FINISH 125

REMOVE ALL BURRS & BREAK EDGES

ITEM	QTY	DESCRIPTION	PART/MAT'L NO.
INITIAL	DATE		
	12-19-02		

FLITEWAY TECHNOLOGIES
6100 INDUSTRIAL COURT GREENDALE,WI 53129

ELECTRODE/ WATER LEVEL SWITCH

NONE A

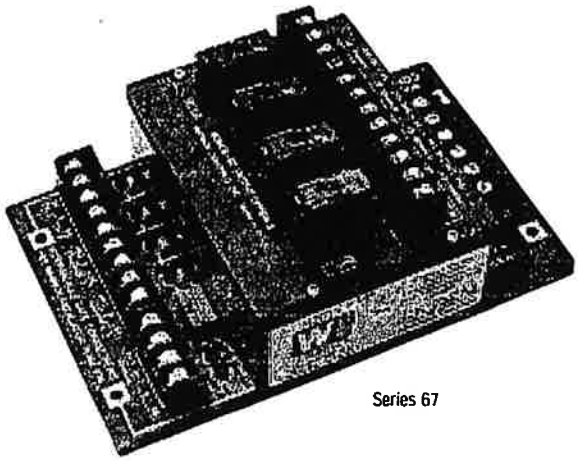
Fliteway Technologies, Inc.

System Control Panel

P.O. Box 108 - 6100 Industrial Court - Greendale, WI 53129

(414) 423-5600 1-800-236-3580 FAX (414) 423-9007

Series 67 – Multi-Function Control
Duplex Pump System Control



Series 67

- Inverse or Direct Acting, Field Selectable
- Solid State Reliability
- Compact Size
- Four Independent Channels - 2 Single, 2 Differential
- Field Adjustable
- LED Channel Indicators
- Built-in Silence/Acknowledge Circuit
- U.L. "Intrinsically Safe"

Warrick's Series 67 four channel level control is an ideal solution to liquid level problems in hazardous applications for the sewage, waste water, chemical and groundwater remediation industries.

Connected to floats or conductance probes this versatile control provides simplex or duplex pump/solenoid valve control; automatic or manual alternation; high and/or low level alarms with silence/ acknowledge capabilities.

The Series 67 can be used in hazardous applications as an intrinsically safe interface to non-powered contacts and sensors such as push button operators, limit, temperature, pressure and vacuum switches.

Designed for hazardous applications, its low cost, integrated features and compact size also make it ideal for non-hazardous applications.

Specifications

Contact Design	Standard N.O., N.C. (form C); Optional N.O., N.C.
Contact Rating (30VDC, 120/240VAC)	10 amp (style C); 5 amp (style A)
Primary Voltage	30 VDC, 120 VAC, 240 VAC (+10%/-15%) 50/60 Hz
Secondary Voltage	12 VAC @ 6mA RMS
Sensitivity	4.7K - 100K ohms maximum specific resistance, factory set
Temperature	-40°F to 150°F
Approvals	U.L. 913 File # 7112 Vol. 1, Sec. 4

How to Order

Use the **Bold** characters from the chart below to construct a product code.

67 X X X X X

Series
67

Sensitivity
A - 4.7K **D** - 50K
B - 10K **E** - 100K
C - 26K

Supply Voltage
1 - 120 VAC **2** - 240 VAC

Contact Design
A - 1 Form A & B (N.O. & N.C. isolated) for each channel
C - 1 Form C (N.O., N.C., Common) for each channel

Enclosure
0 - None **1** - NEMA 1 **4** - NEMA 4

D.C. Probe Circuit Option
A - No option **D** - D.C. Probe Circuit*

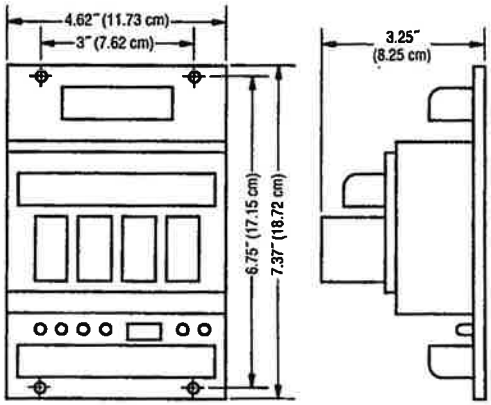
*Eliminates short cycles

- Standard part numbers

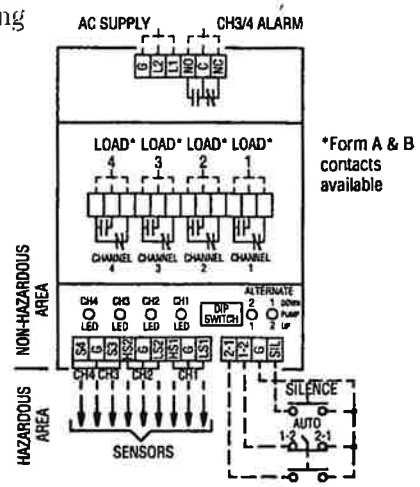
Applications

- Hazardous Atmospheres
- Multiple Functions
- Simplex or Duplex
- High/Low Level Alarms
- Auto or Manual Alternation
- Pump/Solenoid Valves
- Sewage Lift Stations
- Wastewater Treatment
- Chemical Plants
- Groundwater Remediation

Dimensions



Wiring



CONDUCTIVITY

Form 670
Sheet P/N 100501-1
Rev. D

Gems Sensors

Warrick® Series 67
Intrinsically Safe Multi-Function Control
Installation and Operation Bulletin

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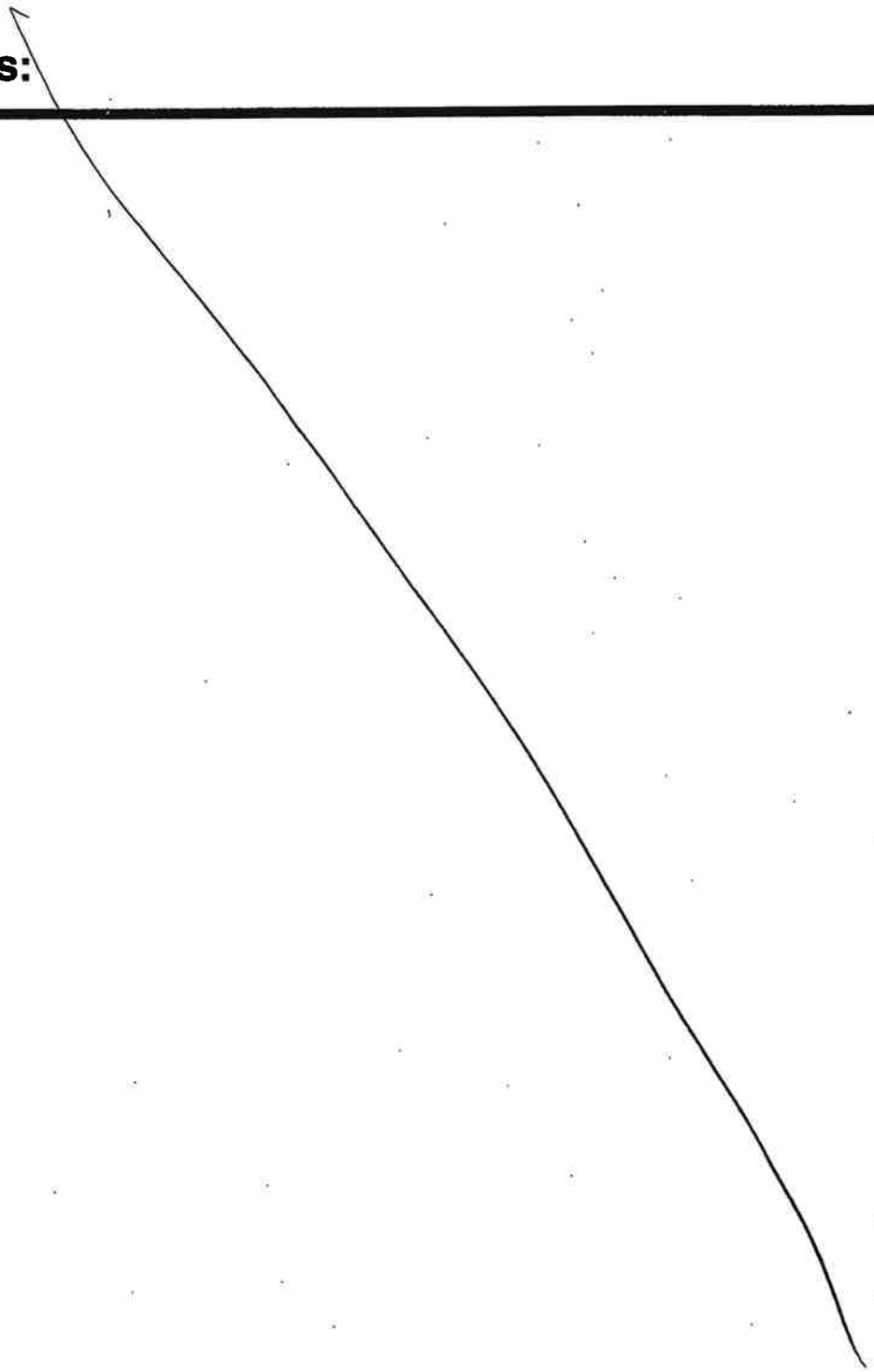


Installation: Intrinsically Safe Sensing Circuits

This bulletin should be used by experienced personnel as a guide to the installation of the series 67. Selection or installation of equipment should always be accompanied by competent technical assistance. We encourage you to contact Gems Sensors or its local representative if further information is required.

IMPORTANT: BEFORE PROCEEDING TO INSTALL AND WIRE THE SERIES 67 CONTROL, READ AND THROUGHLY UNDERSTAND THESE INSTRUCTIONS.

When installing according to these instructions, this device provides intrinsically safe sensing circuits for interface into Class I; Groups C & D, Class II; Groups E, F, & G and Class III; Hazardous Areas. Electrical equipment connected to associated apparatus should not exceed maximum ratings marked on product.

MOUNTING LOCATION

The control must be situated in a non-hazardous area where an explosive atmosphere will not exist at any time; otherwise, it must be mounted in a suitable U.L. approved explosion-proof enclosure with suitable U.L. approved explosion-proof seals.

WIRING: GENERAL INFORMATION

1. Intrinsically safe wiring must be kept separate from non-intrinsically safe wiring.
2. Intrinsically safe and non-intrinsically safe wiring may occupy the same enclosure or raceway if they are at least 2 inches (50mm) apart and separately tied down. Inside panels, field wiring terminals for intrinsically safe circuits must be separated by at least 2 inches (50 mm) from non-intrinsically safe wiring.
3. Wire the control device(s) to the Series 67 relay as shown in figure 1. A separate rigid metallic conduit should be used to enclose the conductors of the intrinsically safe control circuit.
4. An approved seal should be used at the point where the intrinsically safe control circuit wiring enters the hazardous area.

For intrinsically safe output wiring use #14 or #16 AWG type MTW or THHN wire. By using these wire types in conjunction with the following distance recommendations, you will not exceed the maximum capacitance for field wiring. Use Table 1 as a guide for maximum wire runs.

Table 1

Model Number	Sensitivity	Distance
67AXXXA	4.7K Ohms	4,000 Feet
67BXXXA	10K Ohms	2,400 Feet
67CXXXA	26K Ohms	1,200 Feet
67DXXXA	50K Ohms	600 Feet
67EXXXA	100K Ohms	300 Feet

Installation: Intrinsically Safe Sensing Circuits

GROUNDING:

The four mounting holes on the Series 67 provide an electrical connection for earth grounding between the control's internal solid state circuitry and the enclosure chassis. To insure proper grounding, use only metal screws and lock washers when mounting this control. Terminal G on the supply line/load side terminal strip is a redundant system ground terminal and must be connected to earth ground buss of the control's AC supply line feeder.

Note:

1. Intrinsically safe terminals can be connected to any non-energy generating or storing switch device such as a pushbutton, limit or float type switch or any Warrick electrode and fitting assembly.
2. To prevent electrical shock from supply line/load side powered connections, the Series 67 should be mounted in a tool accessible enclosure of proper NEMA rated integrity.
3. For U.L. 913 Listed panels, a metallic partition may be necessary to provide adequate spacing between non-intrinsically safe and intrinsically safe wiring and /or terminals.
4. For additional guidance on "Hazardous Location Installation" and "Intrinsically Safe Devices", consult ANSI/ISA standard RP 12-6 or NEC articles 500-516 and local codes.

SENSOR WIRING

The Series 67 control has four independent intrinsically safe channels, which can be connected to different types of sensors including floats, conductance probes, pressure switches and other non-powered contacts or sensors. The connections of the sensors to the terminals will not vary with normally open or closed sensors. However, the Inverse/Direct DIP switches must be set to the proper mode for each channel to achieve the correct operation. Consult tables 2 and 3 for the proper DIP switch setting for various sensors and functions.

The following sections cover the intrinsically safe sensor connections for single and differential level service.

SINGLE LEVEL SERVICE:

All four channels can be used for single level service. Each channel is independent and can be used for its own single point function. However, only channels 3 and 4 have the alarm bell and silence capabilities. Consult the alarm sections for more information regarding the installation and operation of the alarm circuitry. Table 2 covers the sensor style to terminal connections for all four channels.

Table 2

Sensor Style	Terminal Connections	DIP Switch Settings
Normally Open: Closes on Alarm Condition	Channel 1 - HS1 & G* Channel 2 - HS2 & G* Channel 3 - S3 & G Channel 4 - S4 & G	Inverse Mode - Up Position
Normally Open: Opens on Alarm Condition	Channel 1 - HS1 & G* Channel 2 - HS2 & G* Channel 3 - S3 & G Channel 4 - S4 & G	Direct Mode - Down Position
Normally Closed: Closes on Alarm Condition	Channel 1 - HS1 & G* Channel 2 - HS2 & G* Channel 3 - S3 & G Channel 4 - S4 & G	Inverse Mode - Up Position
Normally Closed: Opens on Alarm Condition	Channel 1 - HS1 & G* Channel 2 - HS2 & G* Channel 3 - S3 & G Channel 4 - S4 & G	Direct Mode - Down Position

* **Note**: Channels 1 & 2 cannot activate the alarm bell contacts and do not have the silence/acknowledge capabilities

Installation: Intrinsically Safe Sensing Circuits

DIFFERENTIAL LEVEL SERVICE:
Channels 1 and 2 are designed to provide differential on/off points to control pumps, solenoid valves or other equipment. These channels can also be used in single level service for alarms and cutoffs, however the control's built-in silence circuitry and bell contacts cannot be used. Consult the Alarm section for more information.

When channels 1 and 2 are used for differential level service, the associated sensors must be normally open. The Inverse/Direct DIP switches must also be set to the proper mode for each channel to achieve the correct operation. Table 3 gives the correct sensor to terminal connections an DIP switch settings for various applications.

FOR APPLICATIONS THAT DO NOT REQUIRE DUPLEX ALTERNATION, A JUMPER WIRE MUST BE PLACED FROM THE "G" TO "1-2" TERMINAL.

Table 3

Application	Sensor Contact Style	Sensor Terminal Connections	DIP Switch Setting
Simplex Pump-Down or Solenoid Valve Drain**	Normally Open - Closes on Rising Level	Start Pump / Open Valve - HS1 & G* Stop Pump / Close Valve - LS1 & G*	Direct - Down Channels 1 or 2
Simplex Pump-Up or Solenoid Valve Fill!!	Normally Open - Closes on Rising Level	Start Pump / Open Valve - LS1 & G* Stop Pump / Close Valve - HS1 & G*	Inverse - Up Channels 1 or 2
Duplex Pump-Down - Common Pump Stop	Normally Open - Closes on Rising Level	Duty Pump Start - HS1 & G* Standby Pump Start - HS2 & G* Duty and Standby Pump Stop - LS1 & G* Jumper - LS1 and LS2	Direct - Down Channels 1 or 2
Duplex Pump-Up - Common Pump Stop	Normally Open - Closes on Rising Level	Duty Pump Start - LS1 & G* Standby Pump Start - LS2 & G* Duty and Standby Pump Stop - HS1 & G* Jumper - HS1 and HS2	Inverse - Up Channels 1 or 2
Duplex Pump-Down - Separate Pump Stops	Normally Open - Closes on Rising Level	Duty Pump Start - HS1 & G* Standby Pump Start - HS2 & G* Duty and Standby Pump Stop - LS1 & G* Jumper - LS2 and G*	Direct - Down Channels 1 or 2
Duplex Pump-Up - Separate Pump Stops	Normally Open - Closes on Rising Level	Duty Pump Start - LS1 & G* Standby Pump Start - LS2 & G* Duty and Standby Pump Stop - HS1 & G* Jumper - HS2 & G*	Inverse - Up Channels 1 or 2

* **Note 1**: If conductance probes are being used, only one "G" connection is required. Terminal "G" must be grounded to the vessel if metallic. If the electrode fitting being used has a metallic body and is supported directly upon a metallic vessel, the ground connection is facilitated by securing that end of the ground connector beneath the head of one of the screws which fasten the terminal housing to the body of the fitting. When the vessel is non-metallic, terminal "G" must be connected to an additional electrode of length equal to or longer than, the longest electrode. If wire suspension electrodes are being used, more than one Ground/Reference probe may be required.

** **Note 2:** This setup is based on the use of a Normally Closed (N.C.) solenoid valve that energizes to open when power is applied to the coil circuit.

Installation: Intrinsically Safe Sensing Circuits

ALARM CHANNEL WIRING:

SILENCE CIRCUITRY:
A normally open pushbutton is required for the Series 67's alarm silence circuitry. The N.O. pushbutton must be connected to the "SIL" and "G" terminals. For more information about the operation of the silence circuitry consult the Alarm Operation section on page 11. **NOTE: THE SILENCE PUSHBUTTON IS CONNECTED TO THE INTRINSICALLY SAFE CIRCUITRY. THEREFORE THE PUSHBUTTON AND ITS ASSOCIATED WIRING SHOULD BE SEPARATED FROM THE NON-INTRINSICALLY SAFE WIRING AND DEVICES. CONSULT GENERAL WIRING INFORMATION FOR MORE INFORMATION.**

ALARM DIP SWITCHES:
The alarm DIP switches for channels 3 and 4 can be set to enable the bell contacts for one or both alarm channels. However, this does not disable the alarm contact for that channel. Table 4 covers the DIP switch settings for various alarm conditions.

Table 4

DIP Switch Settings	Bell Contact Status
3 Off - Down	Channel 3 - Off - Disabled
4 Off - Down	Channel 4 - Off - Disabled
3 On - Up	Channel 3 - On - Enabled
4 Off - Down	Channel 4 - Off - Disabled
3 On - Up	Channel 3 - On - Enabled
4 On - Up	Channel 4 - On - Enabled
3 Off - Down	Channel 3 - Off - Disabled
4 On - Up	Channel 4 - On - Enabled

ALTERNATION CIRCUITRY

AUTO OR MANUAL:
Series 67's built-in alternator can be used to automatically alternate between two loads controlled by channels 1 and 2. However, the automatic alternation may be by-passed to become a manual operation. This can be accomplished with the use of jumper wires or a three position switch connected to the 2-1, 1-2 and "G" terminals. Table 5 covers the jumper connections for manual alternation. Refer to figure 1 for more wiring information on the wiring of the three position selector switch. **NOTE: THE MANUAL ALTERNATION CIRCUITRY IS CONSIDERED INTRINSICALLY SAFE. THEREFORE THE SELECTOR SWTICH, JUMPER WIRES AND THEIR ASSOCIATED WIRING SHOULD BE SEPARATED FROM NON-INTRINSICALLY SAFE WIRING DEVICES. CONSULT GENERAL WIRING INFORMATION FOR MORE INFORMATION ON INTRINSIC SAFETY.**

Table 5

Alternation Status	Jumper Required	LED Status Pump-Down*	LED Status Pump-Up*
Automatic*	None	Either	Either
Manual 1-2	Terminals 1-2 to "G"	No. 1**	No. 1**
Manual 2-1*	Terminals 2-1 to "G"	No. 2**	No. 2**

Notes

* For non-alternation applications jumper 1-2 to "G"

** The position of the 1-2 and 2-1 indicating LED's is dependent on the application. The position changes for pump-up or pump-down. Consult control diagram figure 6-1 for more information.

Installation: High Voltage Circuits

A.C. SUPPLY:

Connect the incoming supply HOT lead to the L1 terminal, NEUTRAL lead to the L2 terminal and EARTH GROUND lead to the "G" Terminal. Note: the incoming power supply should have the same electrical characteristics as indicated on the control's label.

GROUNDING

Terminal "G" on the supply line/load side terminal strip is a redundant system ground terminal and must be connected to the earth ground buss of the panel's AC supply line feeder.

OUTPUT CONTACTS

Channels 1-4: Each channel has a dedicated non-powered contacts. These can be either Form C or Form A & B depending on the model. These contacts will change state when their respective channel activates. In DIRECT mode the relay will energize and the contacts will change state when the probe circuit sensor closes. In INVERSE mode the relay will energize and contacts will change state upon power up. The channel will then de-energize and return the contacts to their shelf state when the probe circuit sensor closes.

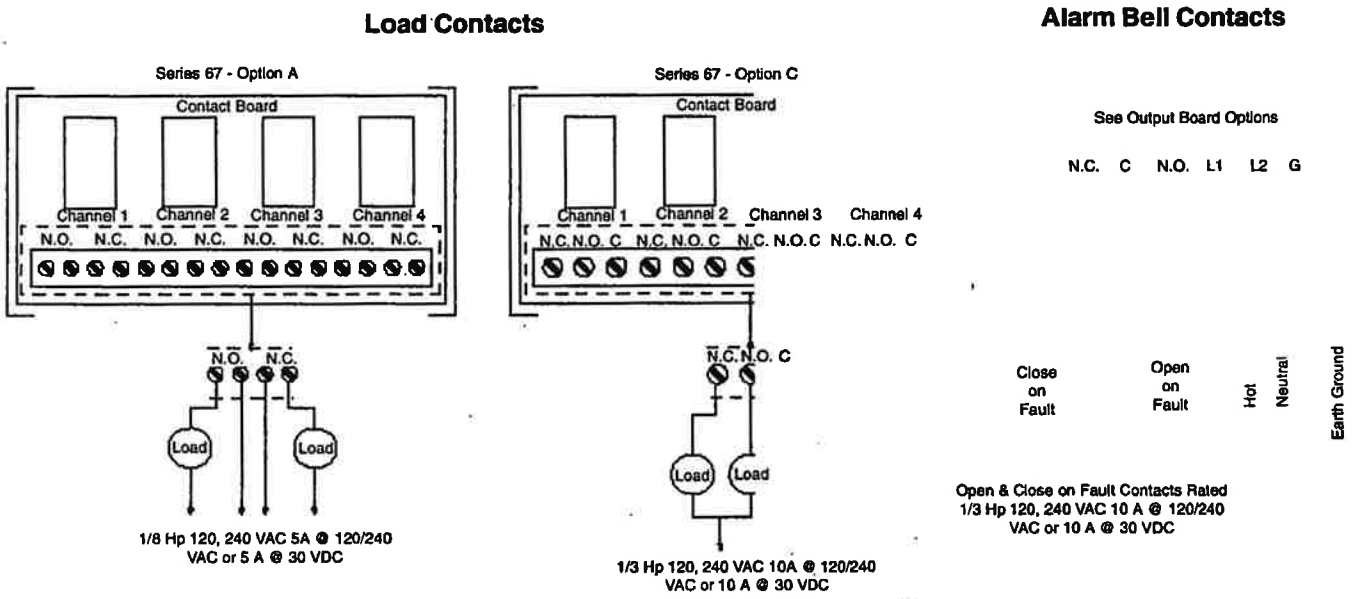
Form C- This contact configuration consists of one (1) Normally Open contact and one (1) Normally Closed contact. There are three terminals for electrical connections, N.O., N.C. and Common. Each terminal will accept up to two (2) #14 AWG wires

Form A & B: This contact configuration consists of one (1) Normally Open contact and one (1) Normally Closed contact which are electrically isolated from each other. There are two terminals for each contact. Each will accept one (1) # 14 AWG wire.

Alarm Bell: The alarm bell contacts are non-powered Form C construction. This contact configuration consist of consists of one (1) Normally Open contact and one (1) Normally Closed contact. There are three terminals for electrical connections, N.O., N.C. and Common. Each terminal will accept up to two (2) #14 AWG wires

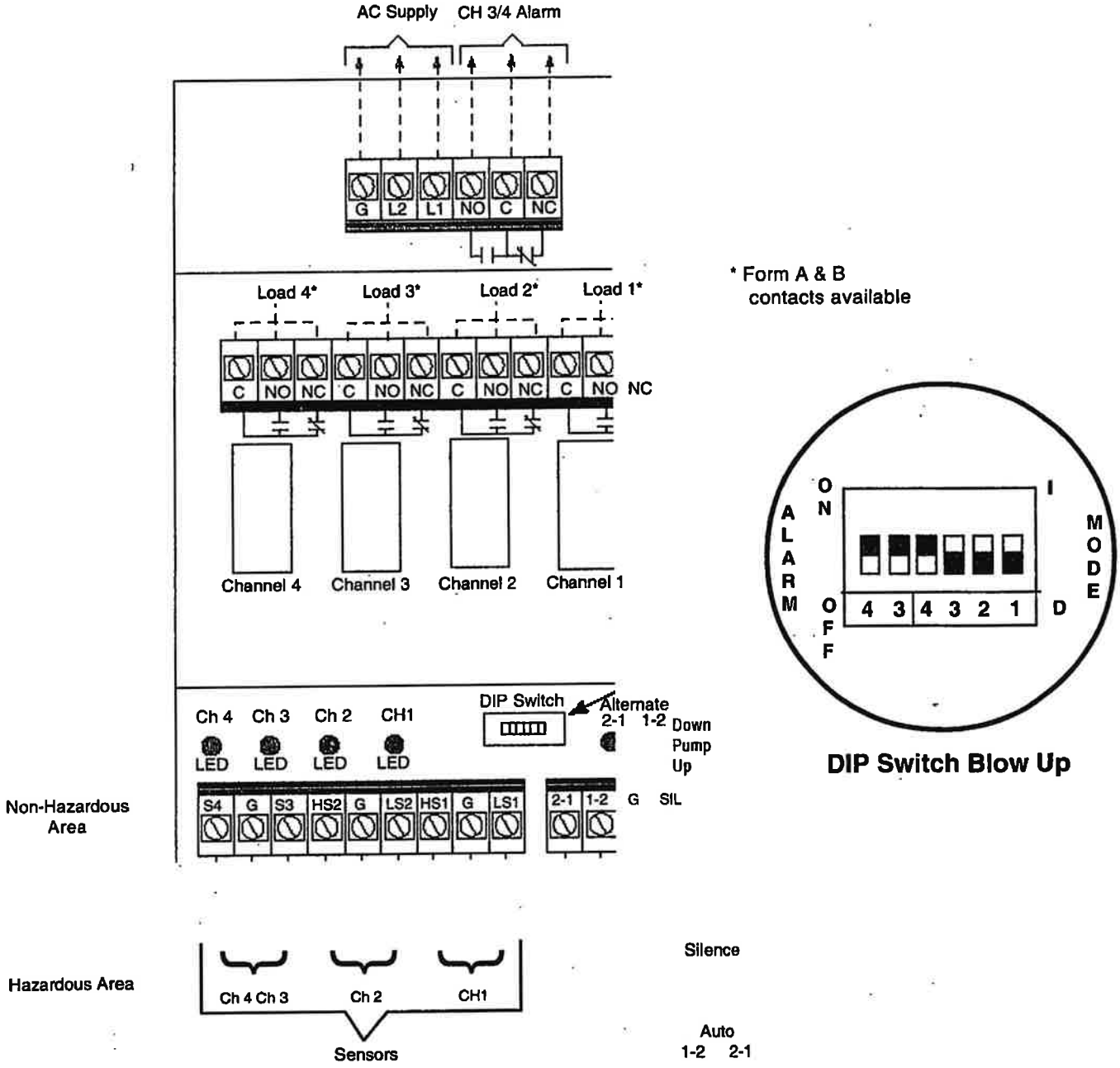
When the output contacts are used to drive loads they should be wired in series with the load. This series branch circuit should then be connected across a power source compatible with the load. See figure 1.

Figure 1



Control Diagram

Figure 2



Note: For applications that do not require duplex alternation, a jumper wire must be placed from the "G" to "1-2" terminal.

Technical Information

SPECIFICATIONS

Contact Design: Standard SPDT (1 form C): one normally open (N.O.) and one normally closed (N.C.), non powered contacts Contact Ratings for each channel. Optional 1 Form A (N.O.) and 1 Form B (N.C.) isolated
Load Contact Ratings: Standard Form C- 10A @ 120/240 VAC resistive and 30 VDC resistive, 1/3 Hp @ 120/240 VAC. Optional Form A & B - 5A @120/240 VAC and 30 VDC resistive, 1/8 Hp @ 120/240 VAC.
Bell Contacts: 1 Form C (N.O.), N.C., C)
Bell Contact Ratings: 10A @ 120/240 VAC and 30 VDC resistive, 1/3 Hp @ 120/240 VAC
Contact Life: Mechanical - 10 million operations. Electrical - 1,000,000 operations minimum at rated load.
Primary Voltage: 120 or 240 VAC models + 10% - 15%, 50/60 Hz.
Supply Current: Relays energized - 60ma @ 120 VAC, 30ma @ 240 VAC
Secondary Circuit: 12 VAC RMS voltage on probes, 6ma current RMS.
Sensitivity: Models operate from 4700-100,000 ohms maximum specific resistance
Temperature: -40° to 150° F Ambient
Electronics Module: Solid state components enclosed in a black nylon housing
Terminals: Standard Form C removable terminal strip containing a size 4 pan head screw with a clamping plate. Will accept up to two (2) #14 AWG wires per terminal. Optional Form A & B relay board will accept up to one (1) #14 AWG wire per terminal. Use copper (60-75° C) wire only. Torque to 20 inch pounds.
Listings: U.L. Intrinsically Safe (UL 913) File Number: E87112

ORDERING INFORMATION

67 X X X X X

A	4.7K
B	10K
C	26K
D	50K
E	100K

1	120 VAC
2	240 VAC

A	1 Form A & B (N.O.) & N.C. Isolated) for each channel
C	1 Form C (N.O., N.C.) for each channel

0	None
1	NEMA 1
4	NEMA 4

A	AC on Probe Circuit
D	DC on Probe Circuit

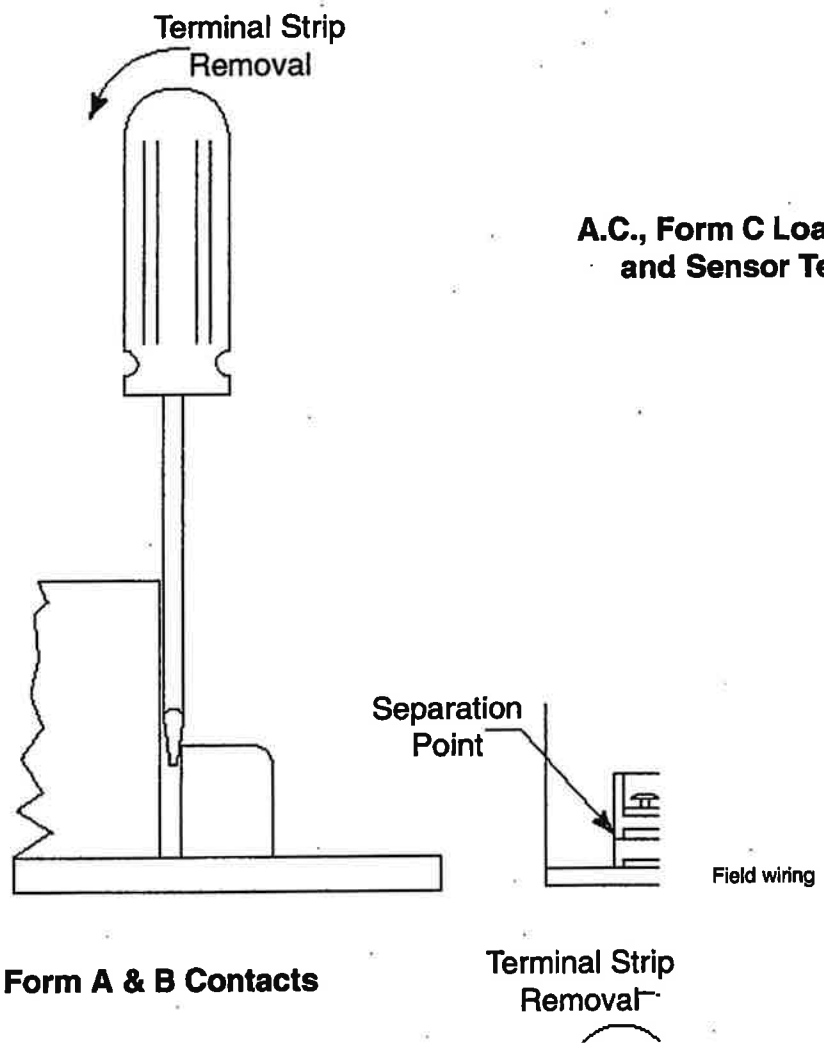
MODULE REPLACEMENT

If the electronic module needs to be replaced:

1. Turn off power to the control and load devices
2. Remove the metal partition located across the center of the module (when required).
3. Remove all field wiring terminal blocks from the electronic module. **The field wires do not need to be removed from the terminal blocks.** The terminal blocks separate from the board as show in figure 8-1.
4. Remove the four (4) retaining screws from the base of the electronic module. The module can now be removed from the control panel.
5. Install a new module and reinstall all of the terminal blocks.
6. Reinstall the metal partition (when required).
7. Set all DIP switches according to previous instructions.

Technical Information: Module Replacement

Diagram 3



A.C., Form C Load Contacts and Sensor Terminals

Form A & B Contacts

Operation Instructions

The Series 67 multi-function control can be used for many different applications including: pump control, solenoid valve control and alarm activation. The following instructions cover the most common applications. If your application is not included, contact Gems Sensors or our authorized representative in your area for assistance.

The operating instructions are broken up into two general categories: SINGLE and DIFFERENTIAL LEVEL SERVICE. The alarm functions are covered under the SINGLE LEVEL SERVICE heading while the pumping and solenoid valve functions are covered under the DIFFERENTIAL LEVEL SERVICE heading.

SINGLE LEVEL SERVICE: CONTACT OPERATION

LOAD CONTACTS: CHANNELS 1-4

The activation of these contacts is dependent upon the type of sensor (normally open or closed) and the mode of operation (direct or inverse). The table 6 gives the sensor activation condition, DIP switch settings, contact status and LED status for various applications and sensors.

Table 6

Application	Warrick Sensor	Sensor" Alarm Activation Condition	DIP Switch Setting	Relay Status Upon Alarm	LED Status Upon Alarm
High Level Alarm Normally Open Float	FE - Reed Switch Float for M Tilt Float	Closes on Rising Level	Inverse UP "I"	De-Energized	ON
High Level Alarm Normally Closed Float	FE - Reed Switch Float for M Tilt Float	Opens on Rising Level	Direct DOWN "D"	De-Energized	OFF
Low Level Alarm Normally Open Float	FE - Reed Switch Float for M Tilt Float	Opens on Falling Level	Direct DOWN "D"	De-Energized	OFF
Low Level Alarm Normally Closed Float	FE - Reed Switch Float for M Tilt Float	Closes on Falling Level	Inverse UP "I"	De-Energized	ON
High Level Alarm Conductance Probes	3R, 3T, 3W, 3Y, 3H or 3S	Probes in Contact with Conductive Liquid	Invers UP "I"	De-Energized	ON
Low Level Alarm Conductance Probes	3R, 3T, 3W, 3Y, 3H or 3S	Probes not in Contact with Conductive Liquid	Direct DOWN "D"	De-Energized	OFF
UNKNOWN SENSOR Normally Open		Closes on Fault	Inverse UP "I"	De-Energized	ON
UNKNOWN SENSOR Normally Closed		Opens on Fault	Direct DOWN "D"	De-Energized	OFF

SINGLE LEVEL SERVICE: ALARM FUNCTIONS

BELL CONTACTS:

Under NORMAL operating conditions the alarm bell relay is held energized. The relay will de-energize to activate an alarm device when an abnormal condition exists on either channels 3 and/or 4. Either one or both alarm bell circuits can be disabled by adjusting the alarm DIP switches. Consult table 4 for more information on the bell DIP switch settings.

SILENCE CIRCUITRY:

Should an abnormal condition exist on either channels 3 and/or 4 the normally closed (N.C.) alarm bell relay contacts will close, activating an alarm device. The N.C. alarm bell contacts can be returned to their normal state (open) silencing the alarm, by depressing a normally open pushbutton connected to the "SIL" and "G" terminals. This will NOT affect the load contacts for channels 3 or 4 as they act independent from the alarm bell contacts.

Operation Instructions

DIFFERENTIAL LEVEL SERVICE:

The following operating instructions are based on correct DIP switch settings and sensor types. Any deviation from these requirements may result in incorrect system operations. Consult table 7 for further instructions.

Table 7

Application	Warrick Sensor	DIP Switch Setting	Activation Condition	Contact Status	LED Status Sensor Closed
Simplex Pump-Down or Solenoid Valve Drain	Normally Open: F, M, FE, FOE 3R, 3T, 3W, 3Y, 3H or 3S	Direct "Down"	Sensor Closes on Rising Level	N.O. - Closes N.C. - Opens	ON
Simplex Pump-Up or Solenoid Valve Fill	Normally Open: F, M, FE, FOE 3R, 3T, 3W, 3Y, 3H or 3S	Inverse "Up"	Sensor Closes on Rising Level	N.O. - Opens N.C. - Closes	OFF
Duplex Pump-Down - Common Pump Stop	Normally Open: F, M, FE, FOE 3R, 3T, 3W, 3Y, 3H or 3S	Direct "Down"	Sensor Closes on Rising Level	N.O. - Closes N.C. - Opens	ON
Duplex Pump-Up - Common Pump Stop	Normally Open: F, M, FE, FOE 3R, 3T, 3W, 3Y, 3H or 3S	Inverse "Up"	Sensor Closes on Rising Level	N.O. - Opens N.C. - Closes	OFF
Duplex Pump-Down - Separate Pump Stop	Normally Open: F, M, FE, FOE 3R, 3T, 3W, 3Y, 3H or 3S	Direct "Down"	Sensor Closes on Rising Level	N.O. - Closes N.C. - Opens	ON
Duplex Pump-Up - Separate Pump Stop	Normally Open: F, M, FE, FOE 3R, 3T, 3W, 3Y, 3H or 3S	Inverse "Up"	Sensor Closes on Rising Level	N.O. - Opens N.C. - Closes	OFF

DIFFERENTIAL LEVEL SERVICE: SIMPLEX

Simplex Pump Down- Should the level rise to the PUMP START sensor the N.O. load contacts will close starting the pump. The pump will remain running until the level recedes below the PUMP STOP sensor and the load contacts open.

Simples Pump UP- Should the level recede below the PUMP START sensor the N.O. load contacts will close starting the pump. The pump will remain running until the level rises to the PUMP STOP sensor and the load contacts open.

Solenoid Valve Drain- Should the level rise to the VALVE OPEN sensor the N.O. load contacts will close energizing the normally closed valve to open. The valve will remain open until the level recedes below the VALVE CLOSE sensor and the load contacts open

Solenoid Valve Fill- Should the level recede below the VALVE OPEN sensor, the N.O. load contacts will close energizing the normally closed valve to open. The valve will remain open until the level rises to the VALVE CLOSE sensor and load contacts open.

Operation Instructions

DIFFERENTIAL LEVEL SERVICE: DUPLEX PUMP DOWN WITH ALTERNATION

Common Pump Stop- The pumps will alternate each cycle with the duty pump starting when the level rises to the DUTY PUMP START sensor and stops when the level recedes below the PUMP(S) STOP sensor.

If the duty pump fails or cannot meet the demand of the system and the level rises to the STANDBY PUMP START sensor, the standby pump will be started and will continue in operation until the level recedes below the PUMP(S) STOP sensor.

Separate Pump Stops- The pumps will alternate each cycle with the duty pump starting when the level rises to the DUTY PUMP START sensor and stops when the level recedes below the DUTY PUMP STOP sensor.

If the duty pump fails or cannot meet the demand on the system and the level rises to the STANDBY PUMP START sensor, the standby pump will be started and will continue in operation until the level recedes below the STANDBY PUMP STOP sensor.

DIFFERENTIAL LEVEL SERVICE: DUPLEX PUMP UP WITH ALTERNATION

Common Pump Stop- The pumps will alternate each cycle with the duty pump starting when the level recedes below the DUTY PUMP START sensor and stops when the level rises to the PUMP(S) STOP sensor.

If the duty pump fails or cannot meet the demand of the system and the level recedes to the STANDBY PUMP START sensor, the standby pump will be started and will continue in operation until the level rises to the PUMP(S) STOP sensor.

Separate Pump Stops- The pumps will alternate each cycle with the duty pump starting when the level recedes to the DUTY PUMP START sensor and stops when the level rises to the DUTY PUMP STOP sensor.

If the duty pump fails or cannot meet the demand on the system and the level recedes to the STANDBY PUMP START sensor, the standby pump will be started and will continue in operation until the level rises to the STANDBY PUMP STOP sensor.

DIFFERENTIAL LEVEL SERVICE: DUPLEX PUMP DOWN WITHOUT ALTERNATION

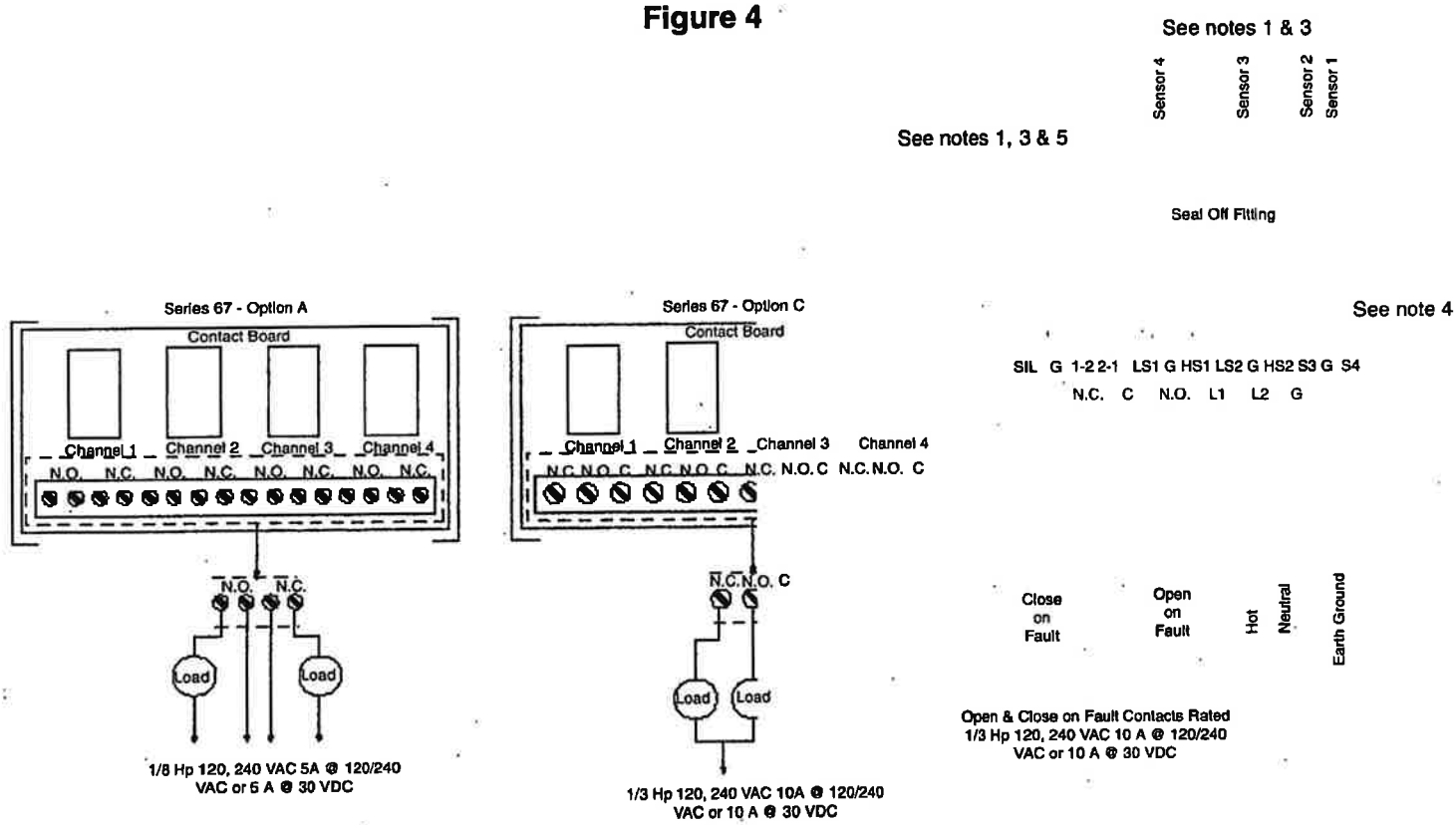
Same operation as above disregarding the alternation sequence. Use appropriate jumper to determine manual pump start sequence. Refer to table 5 for the manual alternation jumper information.

DIFFERENTIAL LEVEL SERVICE: DUPLEX PUMP UP WITHOUT ALTERNATION

Same operation as above disregarding the alternation sequence. Use appropriate jumper to determine manual pump start sequence. Refer to table 5 for the manual alternation jumper information.

General Control Information

Figure 4



Notes:

1. **All intrinsically safe wiring must be installed in accordance with article 504 of the National Electric Code, publication ANSI/NFPA 70 or CEC, Part 1 as applicable.**

2. **Grounding- The four mounting holes on the Series 67 provide an electrical connection for earth grounding between the controls internal solid state circuitry and the enclosure chassis. To insure proper grounding, use only metal screws and lock washers when mounting the control.**

   Terminal "G" on the supply line/load side terminal strip is a redundant system ground terminal and must be connected to the earth ground buss of the controls A.C. supply line feeder. The resistance between the system ground terminals and the earth ground buss must be less than 1 ohm.

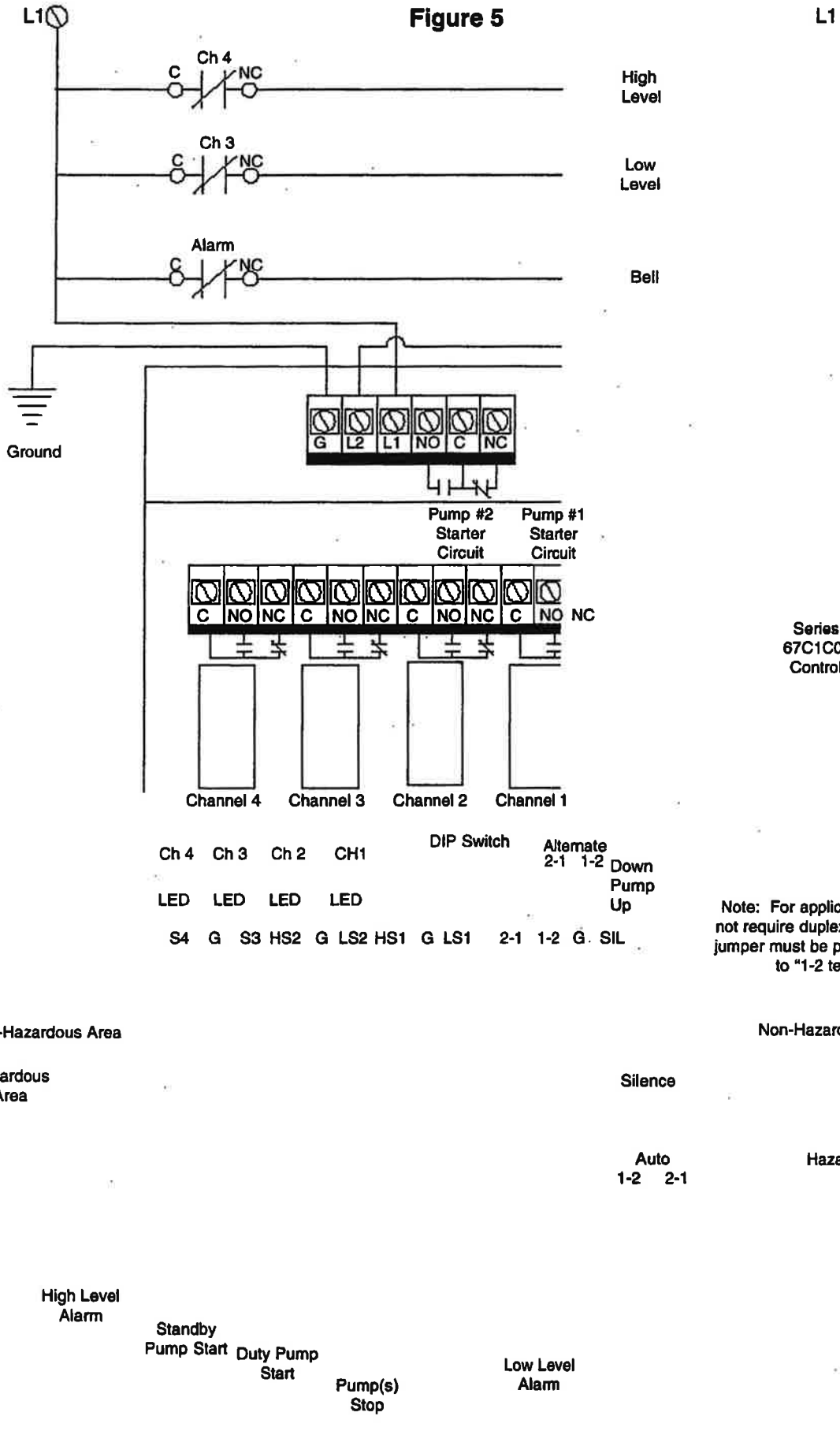
   To prevent electrical shock from supply line/load side powered connections, the Series 67 should be mounted in a metal enclosure of proper NEMA integrity.

3. **The maximum total length of all of the intrinsically safe wiring (of each conductor) shall not exceed an accumulative value of 16,000 feet, excluding any ground wiring.**

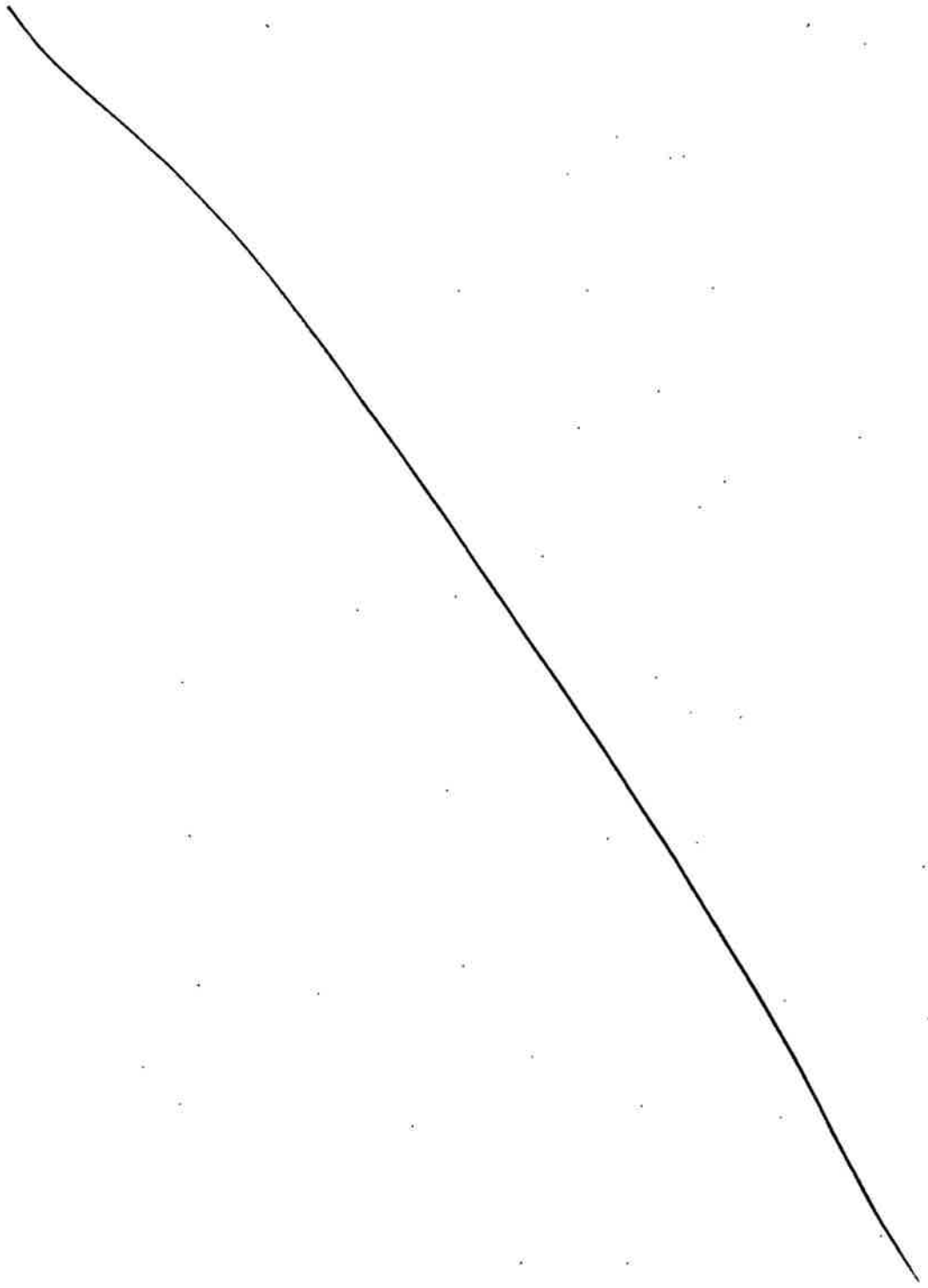
4. **The intrinsically safe terminals of the Series 67 can be connected to any non-energy generating or storing switch device such as a push button, a limit or float type switch or any of Warrick's electrode fitting assemblies.**

5. **When wiring alternation and bell silence switches, the switches and wiring must be separated from non-intrinsically safe circuits and wired in accordance with article 504 of the National Electric Code, publication ANSI/NFPA 70 or CEC, Part 1 as applicable.**

Sample Wiring Diagram



Notes:



Gems Sensors Inc.
One Cowles Road
Plainville, CT 06062-1198
Tel: 860-793-4579
Fax: 860-793-4580

Installation Instructions
Series 9251
Intrinsic Safety Switching Repeater

General Description

The Series 9251 Intrinsic Safety Switching Repeaters are devices which allow the intrinsically safe connection of various dry contact field switches, including NAMUR type proximity sensors, and provide binary signal transmission via a SPDT or DPDT relay. By programming a series of selector switches on the front panel (behind the I.D. Tag Holder) various signal input/ output configurations along with field open and short circuit monitoring may be selected. LEDs on the front panel indicate circuit status. The units may be located in either a nonhazardous or Division 2 hazardous location provided a suitable enclosure is used. For further information as well as agency approval data reference the RST 49 General Catalog (Isolator section 3).

Mounting

NS35/15-RA DIN Rail Assembly
This type of mounting platform contains a specified length of NS35/15 DIN Rail, insulator standoffs (SSO-002), and two ground terminals (821470). The 9251 will mount directly onto the rail.

Panel Mount

The 9251 Switching Repeater may also be mounted directly on an enclosure or panel backplate by using the snap-out screw tabs located on the bottom of the unit. 3/16" mounting screws are required.

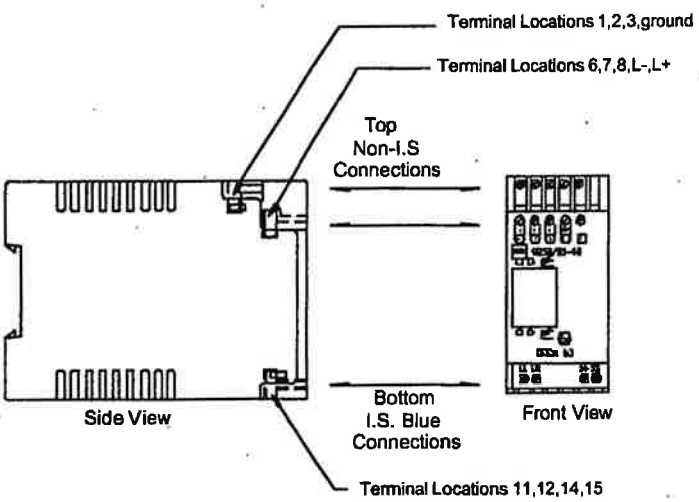
Enclosures

To prevent the build-up of conductive matter surrounding the 9251 it is recommended that they be housed in an enclosure suitable for the environment. Within these enclosures the Switching Repeaters should be mounted vertically for better heat dissipation with the wire connections accessible from the front. A variety of preassembled NEMA 4, 4X, 7, and 9 enclosures are available from stock. Please consult R. Stahl for a complete listing.

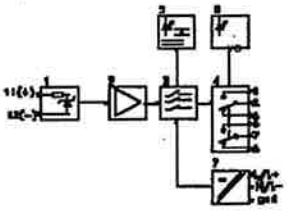
Wiring Instructions

The nonintrinsically safe dc or ac voltage powers the Series 9251 Intrinsic Safety Switching Repeater at terminals L and N for ac connections or L+ and L- for dc connections. The intrinsically safe dc excitation voltage for the field circuit connects at terminals 11(+) 12(-) and 14(+)15(-). The output load connections are selectable through switch settings on the front panel behind the I.D. plate. See the reverse side of this sheet for permissible settings.

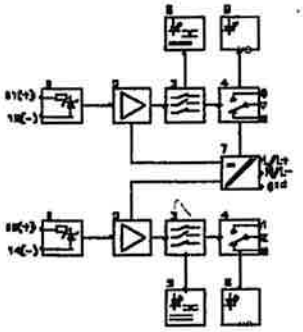
Reference the ANSI/ISA RP 12.6 and NEC Article 504 for further information on the wiring of intrinsically safe circuits.



Terminal orientation diagram



Series 9251/01 single channel basic circuit schematic



Series 9251/02 dual channel basic circuit schematic

Legend for 9251 Circuit Schematic

1. Intrinsically Safe field connection circuitry
2. signal processing
3. selector switches for unit programming
4. signal relay outputs(s)
5. LED Fault indication
6. LED switch status indication
7. Power supply

Installation Instructions
Series 9251
Intrinsic Safety Switching Repeater

Selector Switch Positions for 9251/01 Single Channel Switching Repeater				9251/01 with DPDT Contact Relay Output Contact Configurations				Note: green LED indicates energized relay coil, red LED indicates fault alarm status
S1	S2	S3		Field Contact Position	Relay Contact Position	Field Contact Position	Relay Contact Position	
0	0	1		Control Current < 1.2mA (contact open)	3 2 1 8 7 6	Control Current ≥ 2.1mA (contact closed)	3 2 1 8 7 6	
0	1	0		Control Current ≥ 2.1mA (contact closed)	3 2 1 8 7 6	Control Current < 1.2mA (contact open)	3 2 1 8 7 6	
1	1	0		Control Current < .1mA (contact open) Wire break indication 33k ohms	3 2 1 8 7 6			
				Control Current < 0.15mA to 1.2mA (contact closed) 33k ohms	3 2 1 8 7 6	Control Current ≥ 2.1mA (contact open) 33k ohms	3 2 1 8 7 6	
1	0	1		Control Current >7.5mA (contact closed) shorted wire indication 680 ohms	3 2 1 8 7 6			
				Control Current 2.1mA to 6mA (contact closed) 680 ohms	3 2 1 8 7 6	Control Current ≥ 1.2mA (contact open) 680 ohms	3 2 1 8 7 6	

Selector Switch Positions for 9251/02 Single Channel Switching Repeater						9251/02 with SPDT Contacts per channel Relay Contact Configurations				Note: green LED indicates energized relay coil, red LED indicates fault alarm status
S1	S2	S3	S4	S5	S6	Field Contact Position	Relay Contact Position	Field Contact Position	Relay Contact Position	
0	0	1	0	0	1	Control Current < 1.2mA (contact open)	3 (8) 1 (6) 2 (7)	Control Current ≥ 2.1mA (contact closed)	3 (8) 1 (6) 2 (7)	
0	1	0	0	1	0	Control Current ≥ 2.1mA (contact closed)	3 (8) 1 (6) 2 (7)	Control Current < 1.2mA (contact open)	3 (8) 1 (6) 2 (7)	
1	1	0	1	1	0	Control Current < .1mA (contact open) Wire break indication 33k ohms	3 (8) 1 (6) 2 (7)			
						Control Current < 0.15mA to 1.2mA (contact closed) 33k ohms	3 (8) 1 (6) 2 (7)	Control Current ≥ 2.1mA (contact open) 33k ohms	3 (8) 1 (6) 2 (7)	
1	0	1	1	0	1	Control Current > 7.5mA (contact closed) shorted wire indication 680 ohms	3 (8) 1 (6) 2 (7)		3 (8) 1 (6) 2 (7)	
						Control Current 2.1mA to 6mA (contact closed) 680 ohms	3 (8) 1 (6) 2 (7)	Control Current ≥ 1.2mA (contact open) 680 ohms	3 (8) 1 (6) 2 (7)	

R. Stahl, Inc.
45 Northwestern Drive
Salem, NH 03079
Tel. 800-782-4357 Fax 603-870-9290 E-mail: sales@rstahl.com
Website: www.rstahl.com

RST 1F-a 3/99

ISLATROL/ISLATRAN
INSTALLATION/OPERATION
INSTRUCTIONS AND WARRANTY

ISLATROL, ISLATRON, ISLATRAC (AC Series I, IC, IE, IPF, IC+, BC, LRI, LRIC, LRIC+; DC Series E)

Islatrol power line filters offer the original Active Tracking technology to guard against commonly occurring, but very damaging, lower energy transients and offers excellent noise reduction. Islatrol Plus and Islatron combines rugged, high energy current diverters with the Active Tracking Filter to provide protection against the full spectrum of voltage transients and surges.

ISLATRAN (Series LRA, LRB and LI)

Shielded isolation transformer with Active Tracking Filter technology provides the ultimate in surge suppression/filtering. Totally eliminates noise between the line and ground as well as neutral and ground, recreating the ground to provide zero voltage reference required by many microprocessors and digital logic controllers.

INSTALLATION

Proper installation is required for maximum system performance. Read the following information to assure a quality installation. These instructions do not replace national or local electrical codes.

Environment – For use indoors, in an ambient temperature of -40°C to +50°C, with a relative humidity 0% to 95% (non-condensing).

Maximum Current Capability – The total current draw for all loads that a model may continuously handle is given in the table below. ***Overloading the unit can permanently damage the device.***

Nominal Voltage – The nominal operating voltage for each model is given in the table below. ***Failure to use the unit at its rated voltage can permanently damage the unit*** or provide inadequate surge protection.

Supplemental Enclosures - All units provided with terminal blocks must be installed inside an enclosure and located so as to prevent accidental contact with terminals during maintenance or servicing.

Signal Reference Grounding Lug – Provided on Islatran units in addition to, *not as a replacement for*, the grounding

CONTROL CONCEPTS
A Subsidiary of the Liebert Corporation
328 Water Street, Binghamton, NY 13901
PHONE: 607-724-2484 • 800-288-6169
FAX: 607-722-8713
E-mail: cconcepts@control-concepts.com
WEB: www.control-concepts.com

Islatrol/Islatran Rev.4, 9/00 PIN-80798

SPECIFICATIONS, WIRING DIAGRAMS, AND RECOMMENDED OVERCURRENT PROTECTION

1. In the following table, models are preceded by series designation (AC Islatrol I, IC, IC+, IE, IPF, BC, LRI, LRIC, LRIC+; DC Islatrol E; Islatran LRA, LRB, or LI).
2. Islatrol IC+/IE and all Islatran models are available in 120VAC and 240VAC single phase configurations only, max. 30A.
3. For units provided with a ground connection, a green (with or without one or more yellow stripes) insulated grounding conductor identical in size, insulation material, and thickness to the grounded and ungrounded conductors must be installed (ref. NEC Table 250-95) and referenced back to an acceptable building earth ground. Attachment plugs, receptacles, etc. in the vicinity of the filter must be of a grounding type, with the grounding conductors serving them connected to an acceptable building earth ground.
4. Terminals, lugs, and connectors used in installation must be suitable for the material of the conductors. Conductors of dissimilar metals shall not be intermixed in a terminal or splicing.

Voltage and Config. → / Maximum Current Capability (Amps) ↓	35 VDC	100 VDC	120VAC Single Phase	240VAC Single Phase	120/240VAC Single Phase 3W+G	3 Phase WYE 4W+G	3 Phase DELTA 3W+G	MIN. WIRE SIZE* (AWG Suggested)	FUSE/CIRCUIT BREAKER AMPACITY SUGGEST	MAX
0.25	-025	-	-10	-20	-	-	-	34	0.25A	.3125A
0.5	-05	-	-100	-200	-	-	-	32	0.5A	.625A
1	-1	-	-101	-201	-	-	-	30	1A	1.25A
2.5	-	-2	-102	-202	-	-	-	26	2.5A	3.125A
5	-	-5	-105	-205	-	-	-	22	5A	6.25A
7.5	-	-7	-107	-207	-	-	-	18	7.5A	9.375A
10	-	-10	-110	-210	-	-	-	14	10A	12.5A
15	-	-15	-115	-215	-2-215	-3-215WYE (120/208VAC) -3-315WYE (220/380VAC) -3-415WYE (277/480VAC)	-3-215DELTA (208VAC) -3-315DELTA (380VAC) -3-415DELTA (480VAC)	14	15A	18.75A
20	-	-	-120	-220	-	-	-	12	20A	25A
30	-	-30	-130	-230	-2-230	-3-230WYE (120/208VAC) -3-330WYE (220/380VAC) -3-430WYE (277/480VAC)	-3-230DELTA (208VAC) -3-330DELTA (380VAC) -3-430DELTA (480VAC)	10	30A	37.5A
50	-	-	-150	-250	-2-250	-3-250WYE (120/208VAC) -3-350WYE (220/380VAC) -3-450WYE (277/480VAC)	-3-250DELTA (208VAC) -3-350DELTA (380VAC) -3-450DELTA (480VAC)	4	50A	62.5A
100	-	-100	-1100	-2100	-2-2100	-3-2100WYE (120/208VAC) -3-3100WYE (220/380VAC) -3-4100WYE (277/480VAC)	-3-2100DELTA (208VAC) -3-3100DELTA (380VAC) -3-4100DELTA (480VAC)	2	100A	125A
200	-	-	-1200	-2200	-2-2200	-3-2200WYE (120/208VAC) -3-3200WYE (220/380VAC) -3-4200WYE (277/480VAC)	-3-2200DELTA (208VAC) -3-3200DELTA (380VAC) -3-4200DELTA (480VAC)	3/0	200A	250A
400	-	-	-1400	-2400	-2-2400	-3-2400WYE (120/208VAC) -3-3400WYE (220/380VAC) -3-4400WYE (277/480VAC)	-3-2400DELTA (208VAC) -3-3400DELTA (380VAC) -3-4400DELTA (480VAC)	500 MCM	400A	500A
600	-	-	-1600	-2600	-2-2600	-3-2600WYE (120/208VAC) -3-3600WYE (220/380VAC) -3-4600WYE (277/480VAC)	-3-2600DELTA (208VAC) -3-3600DELTA (380VAC) -3-4600DELTA (480VAC)	2 x 300 MCM	600A	750A
1000	-	-	-11000	-21000	-2-21000	-3-21000WYE (120/208VAC) -3-31000WYE (220/380VAC) -3-41000WYE (277/480VAC)	-3-21000DELTA /208VAC) -3-31000DELTA /380VAC) -3-41000DELTA /480VAC)	6 x 2/0	1000A	1250A
1200	-	-	-11200	-21200	-2-21200	-3-21200WYE (120/208VAC) -3-31200WYE (220/380VAC) -3-41200WYE (277/480VAC)	-3-21200DELTA /208VAC) -3-31200DELTA /380VAC) -3-41200DELTA /480VAC)	6 x 3/0	1200A	1500A

conductor. It is provided for users of static control devices such as floor mats, tablemats, or any other device requiring a separate ground point. To use this feature, remove the nut on the stud, attach the device ground wire to the stud, and replace the nut. To improve performance in systems requiring a secondary ground, use the grounding stud for all externally connected grounds. Run the shortest possible conductor from this stud to the nearest qualified ground point.

Summary Alarm Contacts (IE & IPF units only) – Summary alarm Form C (1 N.O. and 1 .C.) relay contacts rated 125VAC, 5A max. are provided for remote indication of protection status. Connections may be made to these terminals on the unit using 18 AWG conductors.

Grounding - Input and output ground terminals (if provided) must be connected for proper operation. This grounding is not only required for safety, but also for equipment performance. Incorrect grounding can reduce or impede the operation of the unit.

Line Cord Units – Plug unit into wall outlet and turn on power switch (if provided). For best results, plug equipment to be protected directly into the unit (do not use extension cords or power strips). Keep data cables as far away from power cords as possible.

OPERATION

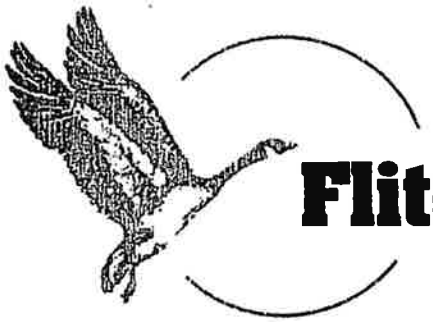
These products are designed for years of trouble-free operation and require little or no operator intervention after installation. Should the unit not appear to be functioning properly and/or the indicator LED (if provided) is extinguished, check all connections, and assure the voltage is correct and that the total current draw on the unit from all loads does not exceed the rated current. If the unit still is not functioning properly, call Control Concepts at (800) 28[illegible]9.

DECLARATION OF CONFORMITY

Control Concepts declares under our sole responsibility that all Islatrol Elite (IE) products conforms to the protection requirements of Council Directives 89/336/EEC (Applicable Standards: BS EN 50081-1; 1992-04, BS EN 50082-1; 1992-04, IEC-1000-4-2; 1995-01, IEC-1000-4-4; 1995-01, IEC-1000-4-5; 1995-02, IEC-1000-4-7; 1991-07, IEC-1000-4-8; 1993-06) and 73/23/EEC (**Low Voltage Directive**) as amended by 93/68/EC (Applicable Standard IEC 61643-1; 1998-02). --- Office of the Director of Engineering, Control Concepts, Binghamton, NY USA, March, 1999.

ASSISTANCE

For installation assistance, servicing, or product information, contact Control Concepts at (800) 288-6169 or (607)[illegible]24-2484.



Fliteway Technologies, Inc.

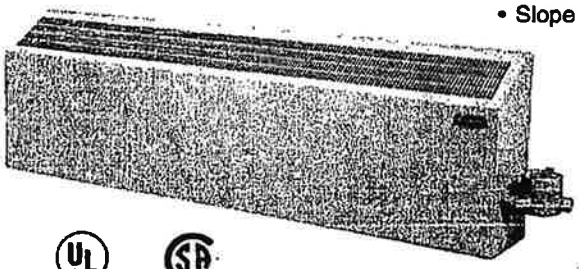
Remediation Equipment Trailer

P.O. Box 108 - 6100 Industrial Court - Greendale, WI 53129

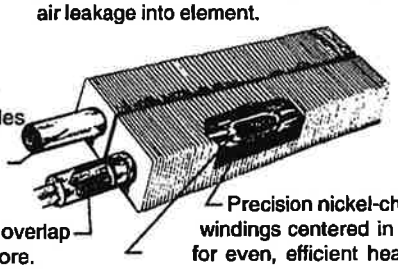
(414) 423-5600 1-800-236-3580 FAX (414) 423-9007

HAZARDOUS LOCATION CONVECTION HEATER

- Cabinet size 18" high, 9" wide
- Color beige powder coat textured finish
- Heavy duty 16 Ga. Steel
- Fully assembled unit
- Slope Top Design



Element assembly pressure tested to 100 pounds per square inch to protect against air leakage into element.



Corrosion-Resistant Sheath provides resistance to oxidation, corrosion, plus a broad range of chemicals and atmospheres.

Lead Arrangement. Solid nickel pins overlap the resistance windings inside the core. Pins are permanently connected during the swaging operation for trouble-free electrical continuity.

Precision nickel-chromium windings centered in the unit for even, efficient heat.

Efficient dielectric compacted to a predetermined density results in good heat transfer, and strength to withstand normal shock and vibration.

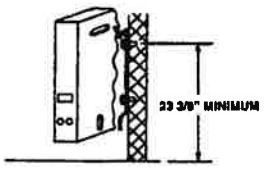
NEMA 4 Hose Down Rated

ALL T-2A Models normal stock items, contact Factory for lead-time on all T-3A Models

LISTINGS	UPC 686334	MODEL	WATTS	BTU	VOLTS	AMPS	CABINET LENGTH	NO.OF. ELEMENTS	MAX FUSE SIZE	WT.
CLASS 1, GROUP B, C & D DIVISION 1 & 2 (T-2A) 280° C / 536° F UL LISTED & CSA NRTL/C CERTIFIED	655002	FEP-1812-1RA	1800	6143	120	15.0	34"	1	20	50 lbs.
	655019	FEP-1820-1RA			208	8.7			10	
	655026	FEP-1824-1RA			240	7.5			10	
	655033	FEP-1827-1RA			277	6.5			10	
	655040	FEP-1848-1RA			480	3.8			5	
	655057	FEP-3620-1RA	3600	12286	208	17.3	34"	2	20	54 lbs.
	655064	FEP-3624-1RA			240	15.0			20	
	655071	FEP-3627-1RA			277	13.0			15	
	655088	FEP-3648-1RA			480	7.5			10	
	655170	FEP-3657-1RA			600	6.0			10	
	655095	FEP-3820-1RA	3800	12969	208	18.3	58"	1	20	80 lbs.
	655101	FEP-3824-1RA			240	15.8			20	
	655118	FEP-38271-RA			277	13.7			15	
	655125	FEP-3848-1RA			480	7.9			10	
	655132	FEP-7620-1RA	7600	25938	208	36.5	58"	2	40	85 lbs.
	655149	FEP-7624-1RA			240	31.7			35	
	655156	FEP-7627-1RA			277	27.4			30	
	655163	FEP-7648-1RA			480	15.8			20	
	655187	FEP-7657-1RA			600	12.7			15	
CLASS 1, GROUP B, C & D DIVISION 1 & 2 (T-3A) 180° C / 356° F CSA NRTL/C CERTIFIED	655194	FEP-0812-1RA	800	2730	120	6.7	34"	1	10	50 lbs.
	655200	FEP-0820-1RA			208	3.8			5	
	655217	FEP-0824-1RA			240	3.3			5	
	655224	FEP-0827-1RA			277	2.9			5	
	655231	FEP-0848-1RA			480	1.7			5	
	655248	FEP-1612-1RA	1600	5460	120	13.3	34"	2	15	54 lbs.
	655255	FEP-1620-1RA			208	7.7			10	
	655262	FEP-1624-1RA			240	6.7			10	
	655279	FEP-1627-1RA			277	5.8			10	
	655286	FEP-1648-1RA			480	3.3			5	
	655385	FEP-1657-1RA			600	2.7			5	
	655293	FEP-1712-1RA	1700	5802	120	14.2	58"	1	20	80 lbs.
	655309	FEP-1720-1RA			208	8.2			10	
	655316	FEP-1724-1RA			240	7.1			10	
	655323	FEP-1727-1RA			277	6.1			10	
	655330	FEP-1748-1RA			480	3.5			5	
	655347	FEP-3420-1RA	3400	11604	208	16.3	58"	2	20	85 lbs.
	655354	FEP-3424-1RA			240	14.2			20	
	655361	FEP-3427-1RA			277	12.3			15	
	655378	FEP-3448-1RA			480	7.1			10	
	655392	FEP-3457-1RA			600	5.7			10	

WARNING: Do not operate heaters in ambient temperatures exceeding 40°C (104°F).

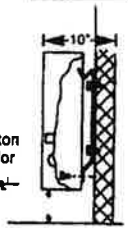
Wall Mounting Brackets
(standard with Heater)



Hazardous Location Heater is easily installed by one person.

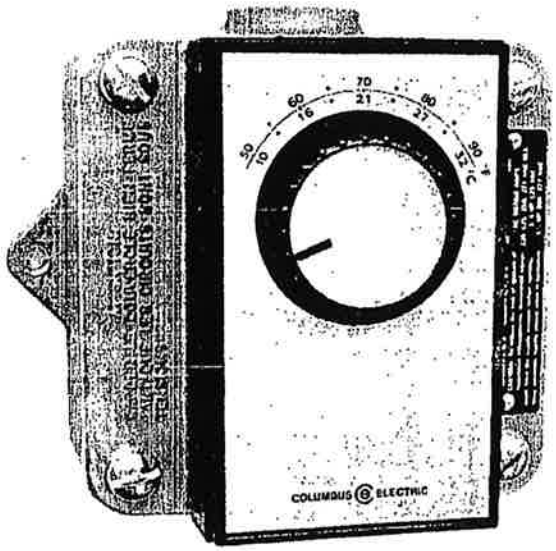
Junction box extends 5-1/2" from the right end of the housing

A 9 inch minimum space from bottom of heater to the floor is required for ample air flow.



HAZARDOUS LOCATION THERMOSTAT - REMOTE MOUNTED

UPC 686334	MODEL	DESCRIPTION	WT.
538107	EPETD8S	50 - 90 °F 24-277 VOLT SPST	5 lbs.
835077	EPETD8D	50 - 90 °F 24-277 VOLT DPST	5 lbs.



Hazardous Location Thermostats Feature:

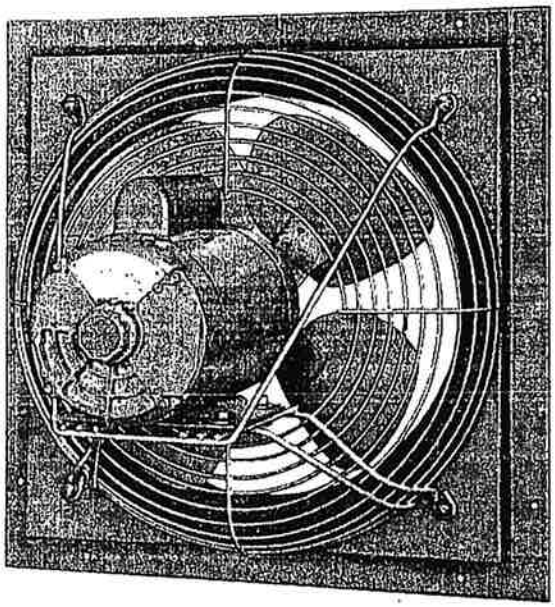
- Single Pole Double Throw Model
- Double Pole Double Throw Model
- Snap Action Switch Operation
- CSA Certified / UL Listed
- Casting Tapped Top & Bottom for 3/4" Conduit
- 1/2" Thick Cast Aluminum Case Explosion/Dust Proof
- Class I Group C & D
- Class II Group E, F & G
- Nema Class Seven Div I Approved

ET & EPET Line Voltage Thermostat Feature Chart

Model #	Heat Anticipator	Hazardous Location	Heat Only	Cool Only	Heat/Cool (SPDT)	Single Pole	Double Pole	2 stage	Thermometer	Wire Leads	Terminals	50-90 Range	35-75 Range	C & F Scale	Positive Off
AET5DWS	●		●				●			●		●		●	●
AET5SWS	●		●			●				●		●		●	
EPETD8D		●			●		●			●		●		●	
EPETD8S		●			●	●				●		●		●	
ET5DS			●				●				●	●		●	●
ET5D4S			●				●				●		●	●	●
ET5DTS			●				●		●		●	●		●	●
ET5DWS			●				●			●		●		●	●
ET5MS			●					●			●	●		●	
ET5SS			●			●					●	●		●	
ET5S4S			●			●					●		●	●	
ET5SRS				●		●					●	●		●	
ET5SRTS				●		●			●		●	●		●	
ET5STS			●			●			●		●	●		●	
ET5SWS			●			●				●		●		●	
ETD5MS*					●			●			●	●		●	
ETD5MTS*					●			●	●		●	●		●	
ETD5SS					●						●	●		●	
ETD5STS					●				●		●	●		●	

* Two Stage Heating, One stage Cooling

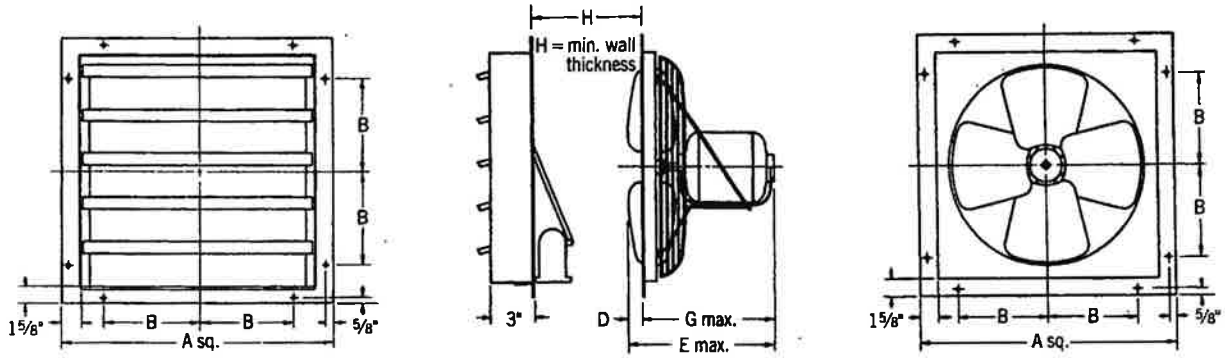
DIRECT-DRIVE PROPELLER FANS



MODEL N

EXHAUST or SUPPLY

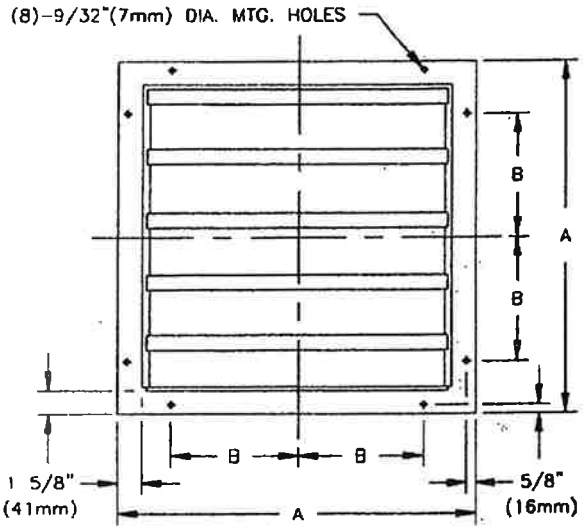
- **Eight wheel diameters**—8" through 24".
- **250 to 6400 CFM**—up to 1/2" static pressure.
- **Panels**—square steel construction with streamlined venturi inlet...venturi is reversed in supply-fan panels...baked-green enamel finish.
- **Wheels**—aluminum blades with steel hubs.
- **Motor mounts**—wire-guard-type motor mount [see photo at left] is standard on all Model N units...guard is zinc-plated steel.
- **Motors**—standard motors are totally enclosed air over with pre-lubricated ball bearings except 1/12 and 1/20 HP motors, which are shaded-pole totally enclosed permanently lubricated sleeve-bearing type. Motors 1/4 HP and larger are suitable for either horizontal or vertical service...specify "for vertical mounting" to have wheel locked to motor shaft...1/20 and 1/12 HP motors are not suitable for vertical service.

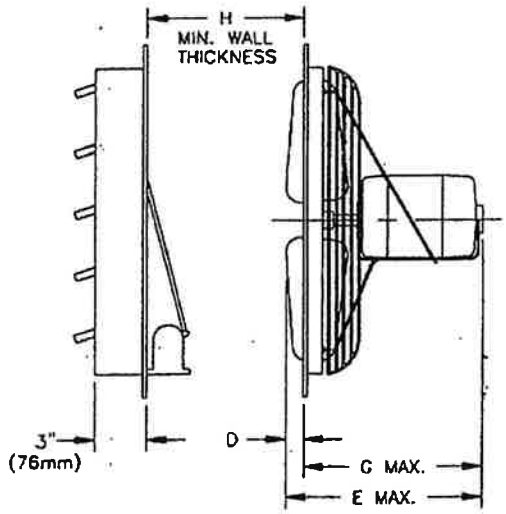


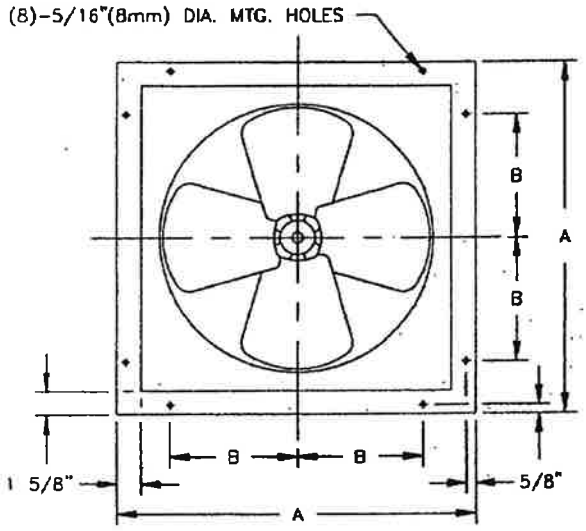
SPECIFICATIONS DIMENSIONS IN INCHES.

Application	Model	Wheel diameter	A	B	D	E†	G†	H minimum		Mounting hole no. and diameter		Weight* [lbs.]
								Auto-matic	Motor-operated	Fan	Shutter	
EXHAUST	EN82-	8	13 1/4	3		10 1/4	10 1/4	1 5/8	4 1/2	8 - 5/16	8 - 9/32	25
	EN102-	10	15 1/4	4	1/4	10 3/8	10 1/8	1 5/8	4 3/4	8 - 5/16	8 - 9/32	29
	EN122-	12	17 1/4	5	7/8	11 1/2	10 3/4	2	5 3/8	8 - 5/16	8 - 9/32	35
	EN142-	14	20 1/4	6 1/2	5/8	11 1/4	10 5/8	2	5 1/8	8 - 5/16	8 - 9/32	40
	EN162-	16	23 1/4	8	1	12	11	2	5 1/2	8 - 5/16	8 - 9/32	50
	EN182-	18	24 1/4	8 1/2	5/8	11 1/2	10 7/8	2	5 1/8	8 - 5/16	8 - 9/32	65
	EN202-	20	27 1/4	10	7/8	12 7/8	12	2	5 3/8	8 - 5/16	8 - 9/32	80
	EN242-	24	30 1/4	11 1/2	1	13 3/8	12 3/8	2	5 1/2	8 - 5/16	8 - 9/32	95
SUPPLY	SN82-	8	13 1/4	3		10 1/4	10 1/4	Auto-matic shutter not available	9 1/2	8 - 5/16	8 - 9/32	25
	SN102-	10	15 1/4	4		10 1/4	10 1/4		9 1/2	8 - 5/16	8 - 9/32	29
	SN122-	12	17 1/4	5		11	11		9 1/2	8 - 5/16	8 - 9/32	35
	SN142-	14	20 1/4	6 1/2		11 5/8	11 5/8		9 1/2	8 - 5/16	8 - 9/32	40
	SN162-	16	23 1/4	8	1/8	11 1/4	11 1/8		9 1/2	8 - 5/16	8 - 9/32	50
	SN182-	18	24 1/4	8 1/2		12	12		9 1/2	8 - 5/16	8 - 9/32	65
	SN202-	20	27 1/4	10		12 1/2	12 1/2		9 1/2	8 - 5/16	8 - 9/32	80
	SN242-	24	30 1/4	11 1/2	1/4	12 1/2	12 1/4		9 1/2	8 - 5/16	8 - 9/32	95

† E and G based on longest motor used for each size fan. * Shipping weights shown are maximum and include totally enclosed motors and weight of packaging.
NOTE: Exhaust units are available with either automatic or motorized shutters. Supply units require motorized supply shutter.
When ordering, specify complete model number as shown on page 3. Dimensions not to be used for construction unless certified. Tolerance: ± 1/8"







EXHAUST UNITS ARE AVAILABLE WITH EITHER AUTOMATIC OR MOTORIZED SHUTTERS. SUPPLY UNITS REQUIRE MOTORIZED SUPPLY SHUTTER.

2-SPEED AND 3-SPEED INCLUDE SWITCH FOR CHANGING SPEED.

MOTORIZED SHUTTERS AVAILABLE FOR 115v. OR 230v. OPERATION. FOR 460v. OPERATION, A TRANSFORMER IS REQUIRED.

ITEM	DIMENSIONS	
	in	mm
A	17 1/4	438
B	5	127
D	7/8	22
E	11 1/2	292
G	10 3/4	-
H (automatic)	2	-
H (motorized)	5 3/8	-

TOLERANCE: ± 1/8" (± 3mm)

nyb The New York Blower Company

7660 Quincy Street, Willowbrook, IL 60521

Propeller Fan Model N Supply

SIZE: 12

Date 12-05-02 Certified SAE

Drawing No. X02886-105-2 Rev.

nyb | The New York Blower Company®
7660 QUINCY STREET–WILLOWBROOK, ILLINOIS 60527-5530
TEL: (630) 794-5700 • FAX: (630) 794-5775 • WEB: http://www.nyb.com • E-MAIL: nyb@nyb.com

INSTALLATION, MAINTENANCE, OPERATING INSTRUCTIONS

IM-200

BELT AND DIRECT DRIVE PROPELLER FANS

A WORD ABOUT SAFETY

Air moving equipment involves electrical wiring, moving parts, sound, and air velocity or pressure which can create safety hazards if the equipment is not properly installed, operated and maintained. To minimize this danger, follow these instructions as well as the additional instructions and warnings on the equipment itself.

All installers, operators and maintenance personnel should study AMCA Publication 410, "Recommended Safety Practices for Air Moving Devices", which is included as part of every shipment. Additional copies can be obtained by writing to New York Blower Company, 7660 Quincy St., Willowbrook, IL 60527.

ELECTRICAL DISCONNECTS

Every motor driven fan should have an independent disconnect switch to isolate the unit from the electrical supply. It should be near the fan and must be capable of being locked by maintenance personnel while servicing the unit, in accordance with OSHA procedures.

MOVING PARTS

All moving parts must have guards to protect personnel. Safety requirements vary, so the number and type of guards needed to meet company, local and OSHA standards must be determined and specified by the user. Never start a fan without having all safety guards installed. Check regularly for damaged or missing guards and do not operate any fan with guards removed. Fans can also become dangerous because of potential "windmilling", even though all electrical power is disconnected. Always block the rotating assembly before working on any moving parts.

SOUND

Some fans can generate sound that could be hazardous to exposed personnel. It is the responsibility of the system designer and user to determine sound levels of the system, the degree of personnel exposure, and to comply with applicable safety requirements to protect personnel from excessive noise. Consult nyb for fan sound power level ratings.

AIR PRESSURE AND SUCTION

In addition to the normal dangers of rotating machinery, fans present another hazard from the suction created at the fan inlet. This suction can draw materials into the fan where they become high velocity projectiles at the outlet. It can also be extremely dangerous to persons in close proximity to the inlet, as the forces involved can overcome the strength of most individuals. Inlets and outlets that are not ducted should be screened to prevent entry and discharge of solid objects.

RECEIVING AND INSPECTION

The fan and accessories should be inspected on receipt for any shipping damage. Turn the propeller by hand to see that it rotates freely and does not bind. If shutters are provided, check these accessories for free operation of all moving parts.

F.O.B. factory shipping terms require that the receiver be responsible for inspecting the equipment upon arrival. Note damage or shortages on the Bill of Lading and file any claims for damage or loss in transit. nyb will assist the customer as much as possible; however, claims must be originated at the point of delivery.

HANDLING AND STORAGE

Fans should be lifted by the panel mounting flanges only. Never lift a fan by the propeller, shaft, motor, motor bracket, panel inlet or any fan part not designed for lifting. A spreader should be used to avoid damage.

Whenever possible, fans and accessories should be stored in a clean, dry location to prevent rust and corrosion of steel components. If outdoor storage is necessary, protection should be provided. The fan should be covered to prevent the accumulation of dirt and moisture. Cover motors with waterproof material. Refer to the bearing section for further storage instructions.

Check shutters for free operation and lubricate moving parts prior to storage. Inspect the stored unit periodically. **Rotate the propeller by hand every two weeks to redistribute grease on internal bearing parts.**

FAN INSTALLATION

nyb propellers are dynamically balanced when fabricated. Complete fans are test run at operating speeds to check the entire assembly for conformance to nyb vibration limits. Nevertheless, all units must be adequately supported for smooth operation.

Rough-in wall opening of sufficient size so that, when framed in, the finished opening will accept the fan. It is preferable to frame in the opening with 2 x 6 material, or other similar suitable material or metal channels adequate to support the fan as shown in Figure 1. Slide the fan into the framed opening in the wall. Securely fasten with bolts or screws around the fan panel. A distance of at least one and one-half times the diameter of the fan should be allowed between the fan inlet or discharge opening and any adjacent wall or large obstruction. Additional framing may be necessary for optional shutters.

If shutters are used, they should be mounted in such a way that the blades are in a horizontal position and overlap like shingles on the side exposed to the weather. The motor on motorized shutters and the tie rods on automatic shutters should face the inside. To install, butt the shutter flange up to the wooden frame on the outside of the wall and secure it with lag screws. Do not bend or twist the shutter frame when tightening the screws. Once the shutter is installed, be certain that the blades open and close freely.

If the shutter is motorized, wire the motor. **When supply type fans are used with motorized shutters, it is necessary that a time delay switch be used between the power source and the fan motor to provide time for the shutter to open fully before the fan is activated.**

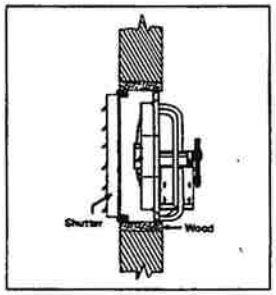


Figure 1

V-BELT DRIVE

Installation (Bare Fans/Replacement)

1. Remove all foreign material from the fan and motor shafts. Coat shafts with machine oil for easier mounting.
2. Mount sheaves on shafts after checking sheave bores and bushings for nicks or burrs. Avoid using force. If resistance is encountered, lightly polish the shaft with emery cloth until the sheave slides on freely.
3. Adjust the motor on its base to a position closest to the fan shaft. Install belts by working each one over the sheave grooves until all are in position. Never pry the belts into place. Sufficient motor adjustment is provided for easy installation of the proper size belts.
4. Adjust sheaves and the motor shaft angle so that the sheave faces are in the same plane. Check this by placing a straightedge across the face of the sheaves. Any gap between the edge and sheave faces indicates misalignment. Important: This method is only valid when the width of the surface between the belt edge and the sheave face is the same for both sheaves. When they are not equal, or when using adjustable-pitch sheaves, adjust so that all belts have approximately equal tension. Both shafts should be at the right angles to the center belt.

Belt Tensioning

1. Check belt tension with a tensioning gage and adjust using the motor slide base. Insufficient tension shortens belt life, can reduce fan performance and may cause vibration. Excess tension shortens bearing life. The lowest allowable tension is that which prevents slippage under full load. Belts may slip during start-up, but slipping should stop as soon as the fan reaches full speed. For more precise tensioning methods, consult the drive manufacturer's literature.
2. Recheck setscrews, rotate the drive by hand and check for rubbing, then complete the installation of optional guards.
3. Belts tend to stretch somewhat after installation. Recheck tension after several days of operation. Check sheave alignment, as well as setscrew and/or bushing bolt tightness.

START-UP

Safe operation and maintenance includes the selection and use of appropriate safety accessories for the specific installation. This is the responsibility of the system designer and requires consideration of equipment location and accessibility as well as adjacent components. All safety accessories must be installed properly prior to start-up.

Safe operating speed is a function of system temperature and propeller design. Do not under any circumstances exceed the maximum safe fan speed published in the nyb bulletin, which is available from your nyb field sales representative.

Procedure

1. If the drive components are not supplied by nyb, verify with the manufacturer that the starting torque is adequate for the speed and inertia of the fan.
2. Inspect the installation prior to starting the fan. Check for any loose items or debris that could be drawn into the fan or dislodged by the fan discharge. Turn the propeller by hand to check for binding.
3. Check drive installation and belt tension.
4. Check the tightness of all setscrews, nuts and bolts. When furnished, tighten hub setscrews with the propeller oriented such that the setscrew is positioned underneath the shaft.

5. Install all remaining safety devices and guards. Verify that the supply voltage is correct and wire the motor. "Bump" the starter to check for proper propeller rotation.

6. Setscrews should be rechecked after a few minutes, eight hours and two weeks of operation (see Table 1 for correct tightening torques).

NOTE: Shut the fan down immediately if there is any sudden increase in fan vibration.

WHEEL SETSCREW TORQUES

Setscrew	Carbon Steel Setscrew Torque	
Diameter (in.)	lb. - in.	lb. - ft.
1/4	75	6.2
5/16	144	12
3/8	252	21
7/16	393	33
1/2	600	50

FAN MAINTENANCE

nyb fans are manufactured to high standards with quality materials and components. Proper maintenance will ensure a long and trouble-free service life.

Do not attempt any maintenance on a fan unless the electrical supply has been completely disconnected and locked. In many cases, a fan can windmill despite removal of all electrical power. The rotating assembly should be blocked securely before attempting maintenance of any kind.

The key to good fan maintenance is regular and systematic inspection of all fan parts. Inspection frequency is determined by the severity of the application and local conditions. Strict adherence to an inspection schedule is essential.

Regular fan maintenance should include the following:

1. Check the fan propeller for any wear or corrosion, as either can cause catastrophic failures. Check also for the build-up of material which can cause imbalance resulting in vibration, bearing wear and serious safety hazards. Clean or replace the propeller as required.

2. Check the V-belt drive for proper alignment and tension (see section on V-belt drives). If belts are worn, replace them as a set, matched to within manufacturer's tolerances.

3. Fans with standard captured bearings in formed housing require no service.

4. During any routine maintenance, all setscrews and bolts should be checked for tightness. See the table for correct torques.

5. When installing a new propeller, the propeller should be positioned in the housing with even spacing between the edge of the orifice and the propeller.

PROPELLER BALANCE

Airstreams containing particulate or chemicals can cause abrasion or corrosion of fan parts. This wear is often uneven and can lead to significant propeller imbalance over time. When such wear is discovered, a decision must be made to rebalance or replace the propeller.

The soundness of all parts should be determined if the original thickness of components is reduced. Be sure there is no hidden structural damage. The airstream components should also be cleaned to remove any build-up of foreign material. Specialized equipment can be used to rebalance a cleaned propeller that is considered structurally sound.

Balance weights should be rigidly attached at a point that will not interfere with other fan components nor disrupt airflow. Remember that centrifugal forces can be extremely high at the outer radius of a fan propeller.

BEARINGS

Storage

Any stored bearing can be damaged by condensation caused by temperature variations. Therefore, nyb fan bearings are filled with grease at the factory to exclude air and moisture. Such protection is adequate for shipment and subsequent immediate installation.

For long term or outdoor storage, mounted bearings should be regreased and wrapped with plastic for protection. **Rotate the fan propeller by hand at least every two weeks to redistribute grease on internal bearing parts.**

Operation

Check the setscrew torque before start-up (see table for correct values). Since bearings are completely filled with grease at the factory, they may run at an elevated temperature during initial operation. Surface temperatures may reach 180°F. This is normal. Bearing surface temperatures will decrease when the internal grease quantity reaches a normal operating level.

Replacement

If captured bearings need replacement, install new bearings into neoprene rings, check correct position of propeller with orifice, position bearings in die-formed recess and tighten setscrews. Replace die-formed bearing cap and tighten four bolts.

COMMON FAN PROBLEMS

Excessive Vibration

A common complaint regarding industrial fans is "excessive vibration". **nyb** is careful to ensure that each unit is precisely balanced prior to shipment; however, there are many other causes of vibration including:

1. Loose mounting bolts, setscrews, or bearings.
2. Misalignment or excessive wear of bearings.
3. Misaligned or unbalanced motor.
4. Bent shaft due to mishandling or material impact.
5. Accumulation of foreign material on the propeller.
6. Excessive wear or erosion of the propeller.
7. Excessive system pressure or restriction of airflow due to closed shutters.
8. Inadequate structural support, mounting procedures or materials.
9. Externally transmitted vibration.

Inadequate Performance

1. Incorrect testing procedures or calculations.
2. Fan running too slowly.
3. Propeller rotating in wrong direction.
4. Propeller not properly centered relative orifice.
5. Poor system design or closed shutters.
6. Obstruction near inlet or outlet.
7. Sharp deflection of airstream at fan inlet or outlet.

Excessive Noise

1. Fan operating near "stall" due to incorrect system design or installation.
2. Vibration originating elsewhere in the system.
3. System resonance or pulsation.
4. Improper location or orientation of fan intake and discharge.
5. Inadequate or faulty design of supporting structures.
6. Nearby sound reflecting surfaces.
7. Loose accessories or components.
8. Loose drive belts.
9. Worn bearings.

Premature Component Failure

1. Prolonged or major vibration.
2. Inadequate or improper maintenance.
3. Abrasive or corrosive elements in the airstream or surrounding environment.
4. Misalignment or physical damage to rotating components or bearings.
5. Bearing failure from incorrect or contaminated lubricant.
6. Excessive fan speed.
7. Extreme ambient or airstream temperatures.
8. Improper belt tension.
9. Improper tightening of propeller setscrews.

REPLACEMENT PARTS

It is recommended that only factory-supplied replacement parts be used. **nyb** fan parts are built to be fully compatible with the original fan, using specific alloys and tolerances. These parts carry a standard **nyb** warranty.

When ordering replacement parts, specify the part name, **nyb** shop and control number, fan size, type, arrangement, and bore. Most of this information is on the nameplate attached to the fan.

For assistance in selecting replacement parts, contact your local **nyb** representative or visit: http://www.nyb.com.

Example: Part required: Propeller
Shop/control number: B-10106-100
Fan description: ED30

Suggested replacement parts include:

Propeller	Component parts: Shutter
Shaft	Motor
Bearing Assembly	V-Belts

LIMITED PRODUCT WARRANTY

All products are warranted by **nyb** to be free from defects in materials and workmanship for a period of one (1) year after shipment from its plant, provided buyer demonstrates to satisfaction of **nyb** that the product was properly installed and maintained in accordance with **nyb**'s instructions and recommendations and that it was used under normal operating conditions.

This warranty is limited to the replacing and/or repairing by **nyb** of any part or parts which have been returned to **nyb** with **nyb**'s written authorization and which in **nyb**'s opinion are defective. Parts not manufactured by **nyb** but installed by **nyb** in equipment sold to the buyer shall carry the original manufacturer's warranty only. All transportation charges and any and all sales and use taxes, duties, imports or excises for such part or parts shall be paid for by the buyer. **nyb** shall have the sole right to determine whether defective parts shall be repaired or replaced.

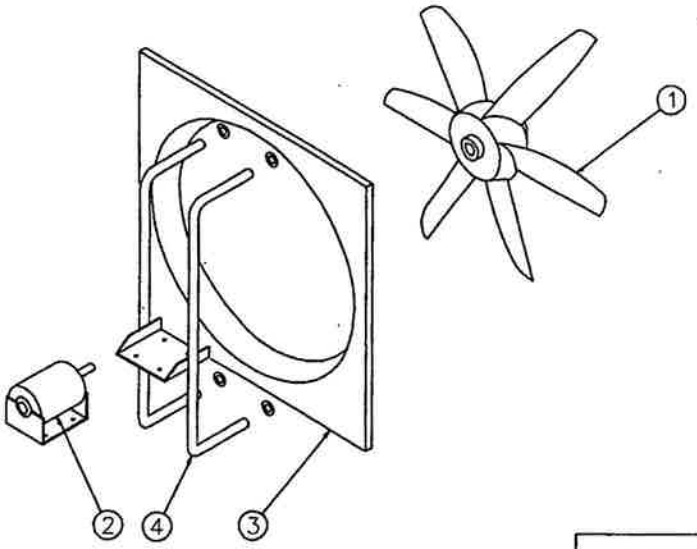
This warranty does not cover any customer labor charges for replacement of parts, adjustments or repairs, or any other work unless such charges shall be assumed or authorized in advance, in writing, by **nyb**.

This warranty does not cover any product which, in the judgement of **nyb**, has been subject to misuse or neglect, or which has been repaired or altered outside **nyb**'s plant in any way which may have impaired its safety, operation or efficiency, or any product which has been subject to accident.

This warranty shall be null and void if any part not manufactured or supplied by **nyb** for use in any of its products shall have been substituted and used in place of a part manufactured or supplied by **nyb** for such use.

There are no warranties, other than those appearing on the acknowledgement form **INCLUDING NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE**, given in connection with the sale of the goods sold hereunder. The buyer agrees that his sole and exclusive remedy, and the limit of **nyb**'s liability for loss from any cause whatsoever, shall be the purchase price of the goods sold hereunder for which a claim is made.

DIRECT DRIVE
MODEL F
PROPELLER FAN

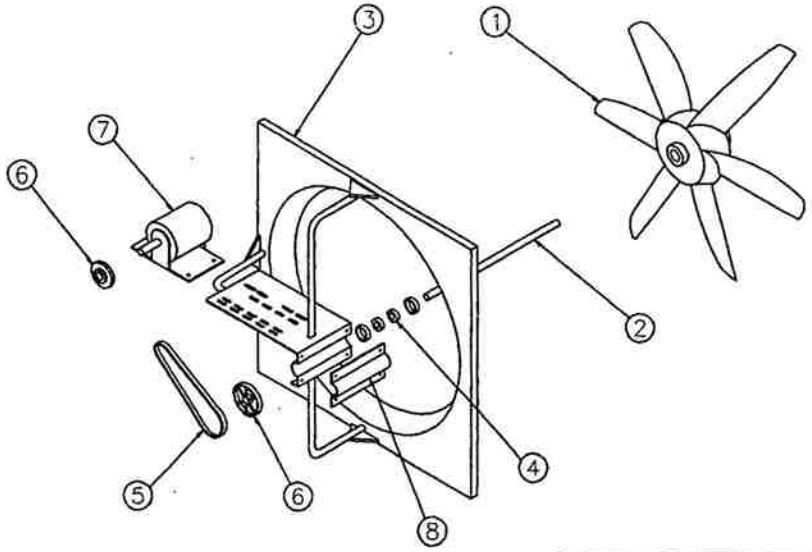


Parts List

1. Propeller
2. Motor
3. Fan Panel
4. Fan Frame

For assistance in selecting replacement parts, contact your local nyb representative or visit: http://www.nyb.com.

BELT DRIVE
MODEL D
PROPELLER FAN



Parts List

1. Propeller
2. Shaft
3. Fan Frame
4. Bearings
5. Belt
6. Sheaves
7. Motor
8. Bearing Cap

For assistance in selecting replacement parts, contact your local nyb representative or visit: http://www.nyb.com.

Form 786 GPB SW
Printed in U.S.A.

Enclosed & Gasketed*

Listed - File E10514

Certified - File LR11713

V SERIES
ENCLOSED & GASKETED

Applications

Locations requiring durable, protected lighting fixtures

Wet and dirt laden locations, such as industrial environments requiring enclosed and gasketed (vaportight) fixtures

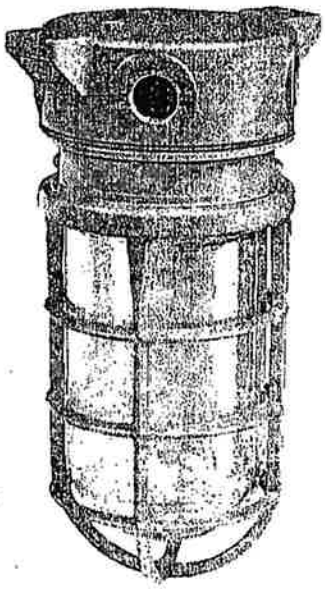
Lighting walkways, tunnels, loading docks, exits, stairwells, etc

Fixtures intended for base-up mounting

Heat resistant glass globes recommended for wet locations

Features

- Electrostatically applied epoxy/polyester finish
- Enclosed and gasketed fixture (vapor-tight). Joint gaskets provided to seal out moisture and dirt
- Splice box selections include pendant, ceiling, bracket and stanchion mounting types
- Modular design permits selection of splice box, fixture body, globe, guard and reflector for specific or custom applications
- Hubs are threaded for attachment to conduit and set screws are provided in pendant fixtures
- Copper-free aluminum (less than 4/10 of 1%) construction with electrostatically applied epoxy/polyester finish resists corrosion



Class I, Div. 2, Groups A,B,C,D
Class I, Zone 2, Groups IIC,IIB,IIA
NEMA 3, 4 - When used with tempered glass

Listed - File E10514

UL-1571 Standard for incandescent fixtures

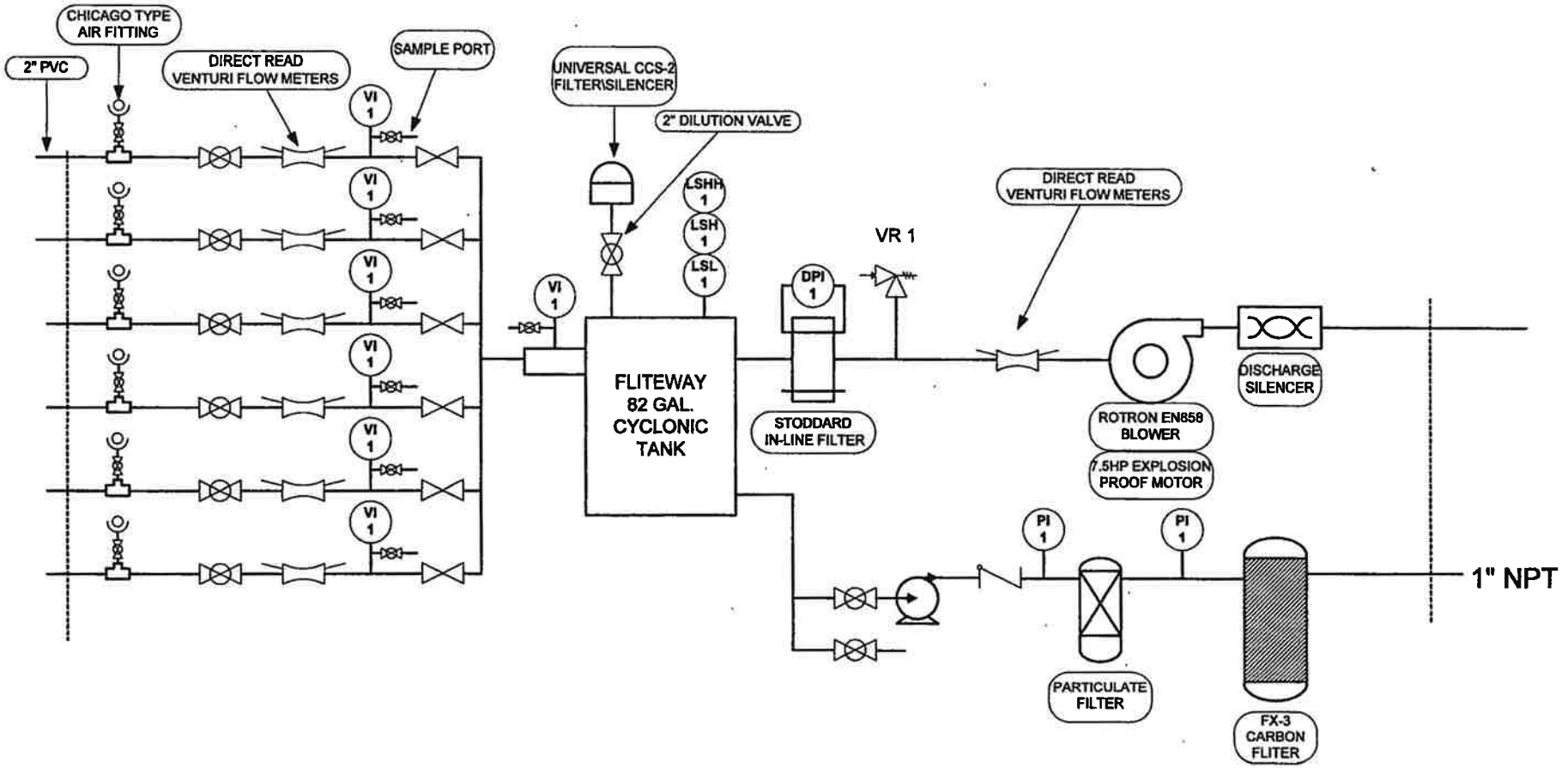
UL-844 Standard for hazardous location fixtures

Certified - File LR11713

CEILING FIXTURE WITH VGX SPLICE BOX

FIXTURE TYPE	LAMP WATT	HUB SIZE	CATALOG NUMBER	CONSISTS OF			
			FIXTURE W/ GLOBE & GUARD	MOUNTING BOX	FIXTURE BODY	CLEAR GLOBE*	GUARD
100	150	1/2"	VUXGG-1-100PX①	VGX-1	VXFC-100 N34	VCGP-100	VAG-100
		3/4"	VUXGG-2-100PX①	VGX-2	VXFC-100 N34	VCGP-100	VAG-100
200	300	1/2"	VUXGG-1-200PX①	VGX-1	VXFC-200 N34	VCGP-200	VAG-200
		3/4"	VUXGG-2-200PX①	VGX-2	VXFC-200 N34	VCGP-200	VAG-200

HUBBELL
KILLARK



VI 1	VACUUM GAUGE	LSHH 1	LEVEL SWITCH HIGH-HIGH LEVEL
DPI 1	DIFFERINTIAL PRESSURE GAUGE	LSH 1	LEVEL SWITCH HIGH - PUMP ON
PI 1	PRESSURE GAUGE	LSL 1	LEVEL SWITCH LOW - PUMP OFF

FLITEWAY TECHNOLOGIES, INC.
P.O. BOX 108
6901 INDUSTRIAL LOOP
GREENDALE, WI 53129
414.423.5600
FAX 414.423.9007

3/12/03

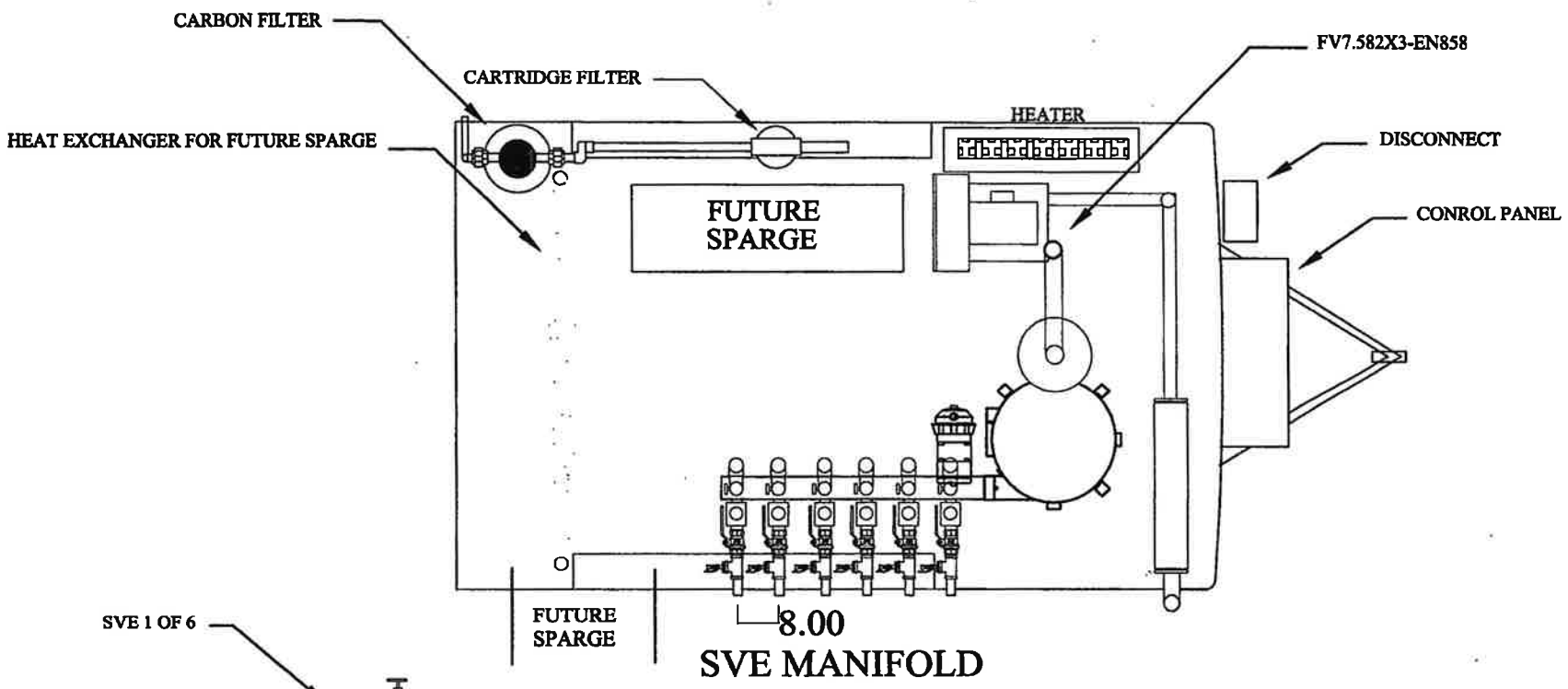
Q12638 Rev 1

SVE UNIT P&ID

Coranco Great Plains, Inc.
Trenton Co-op, NE

SIZE	FSCM NO	APPROVED BY AND DATE	REV

SCALE	1 : 1	TRS	SHEET	1 OF 1



Fliteway Technologies, Inc
6100 Industrial Court
P.O. Box 108
Greendale, WI 53129
414.423.5600 414.423.9007

TRAILER LAYOUT

CORANCO GREAT PLAINS
TRENTON CO-OP, NE

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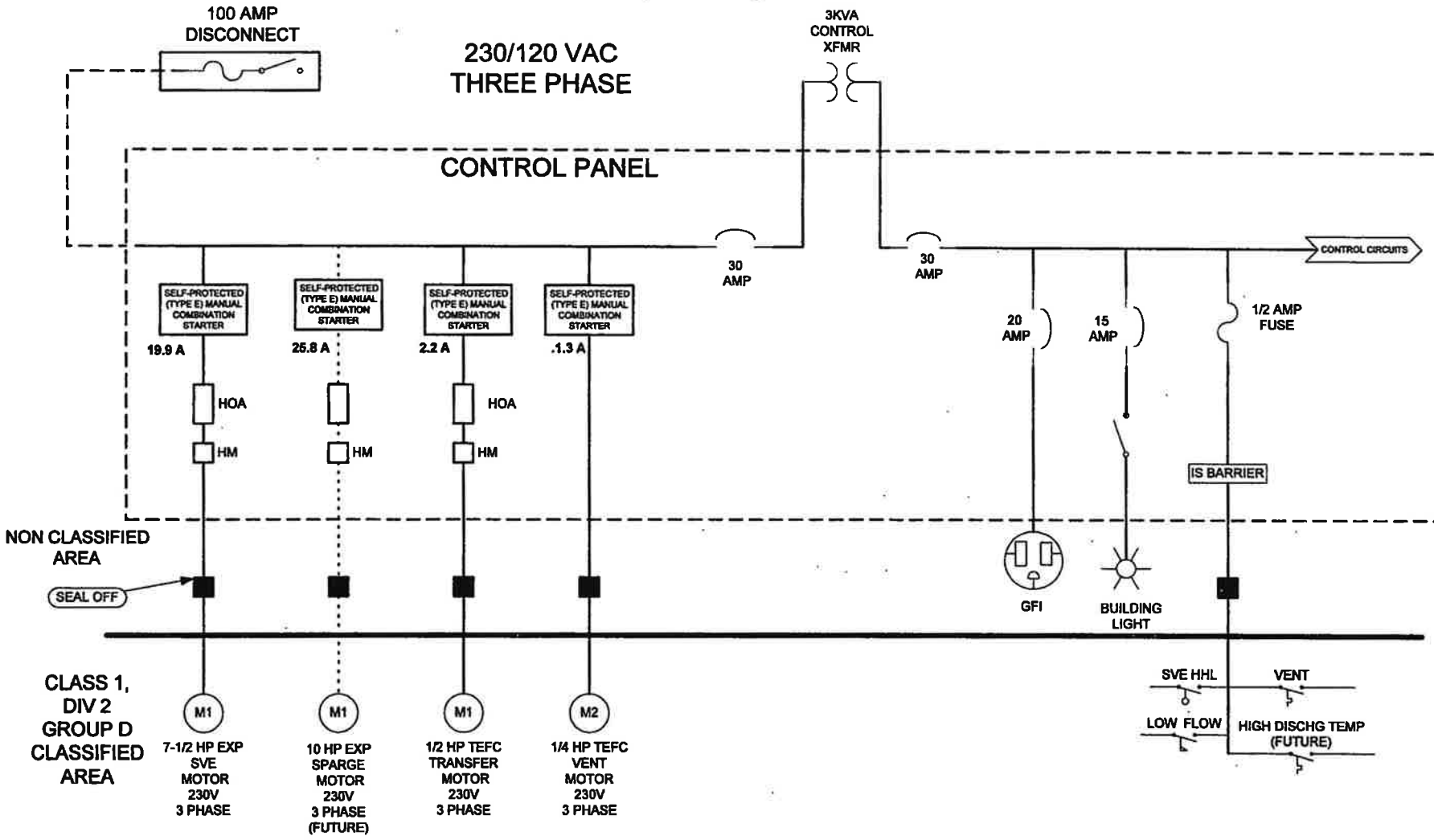
3/17/03	SCALE NONE		SHEET



FLITEWAY TECHNOLOGIES, INC.
P.O. BOX 108
6100 INDUSTRIAL COURT
GREENDALE, WI 53129
414.423.5600
FAX 414.423.9007

ONE LINE ELECTRICAL DIAGRAM

CORANCO GREAT PLAINS
TRENTON CO-OP, NE

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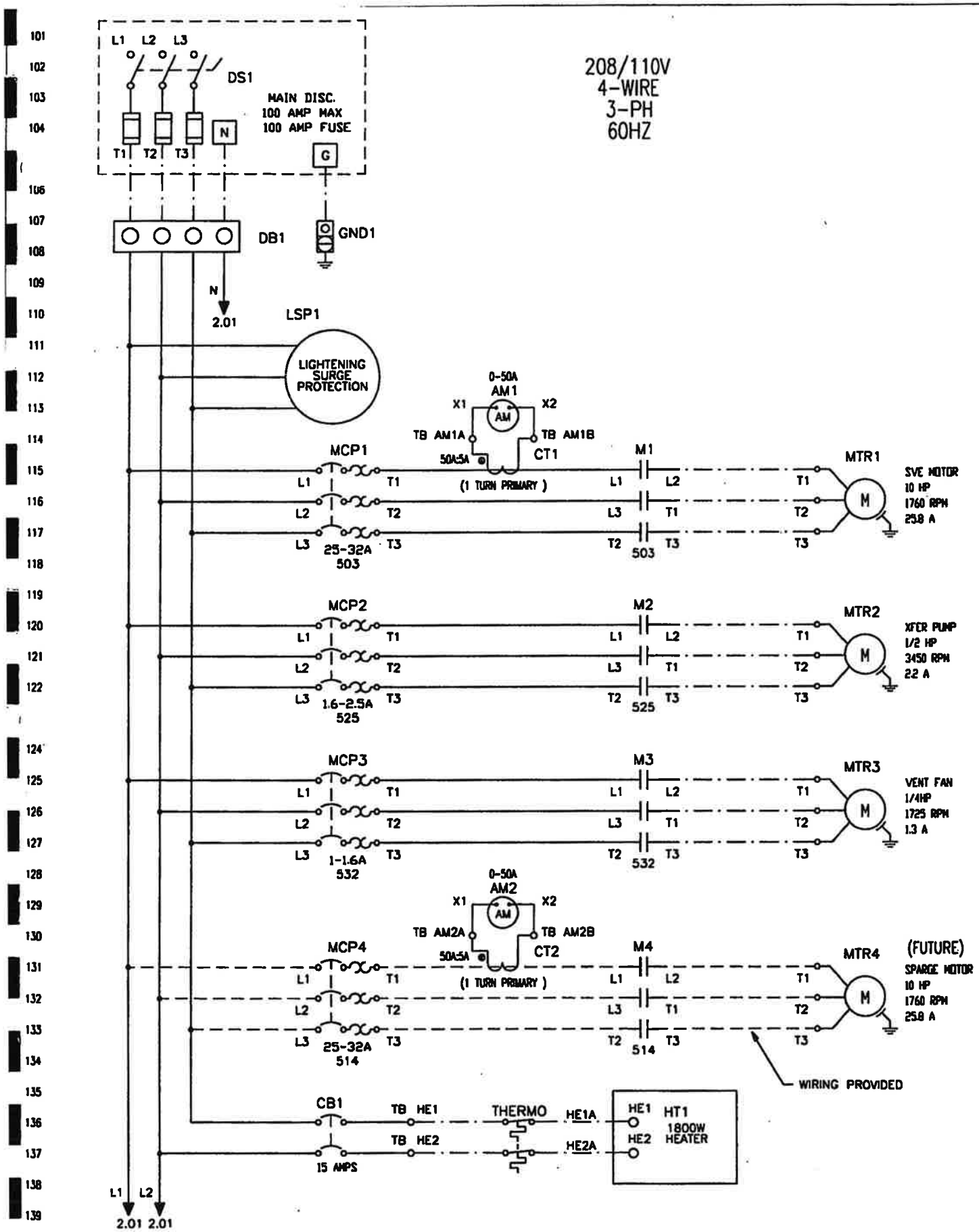
Q12638 Rev 1	SCALE NONE	DWZ	SHEET 1 OF 1



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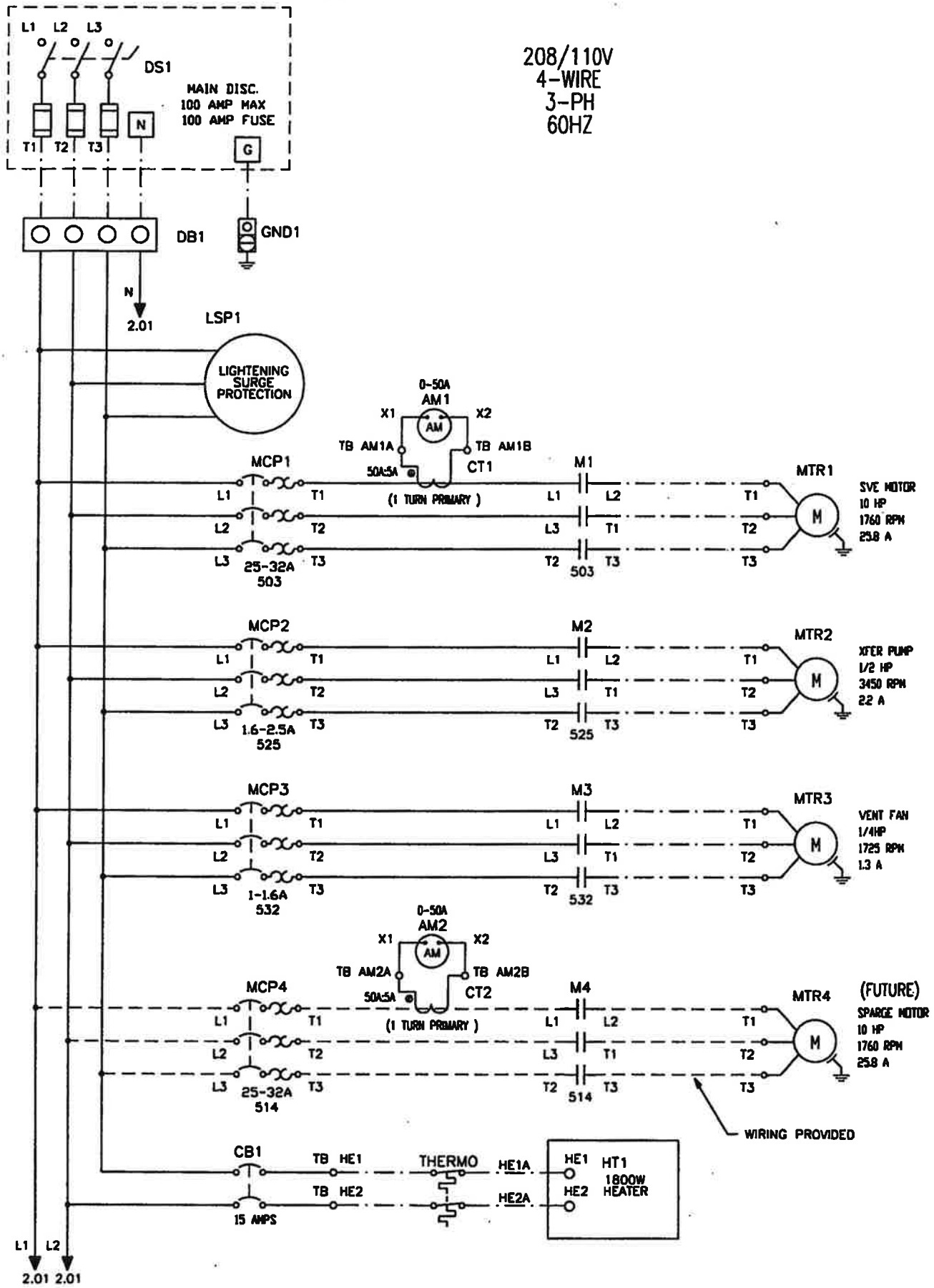

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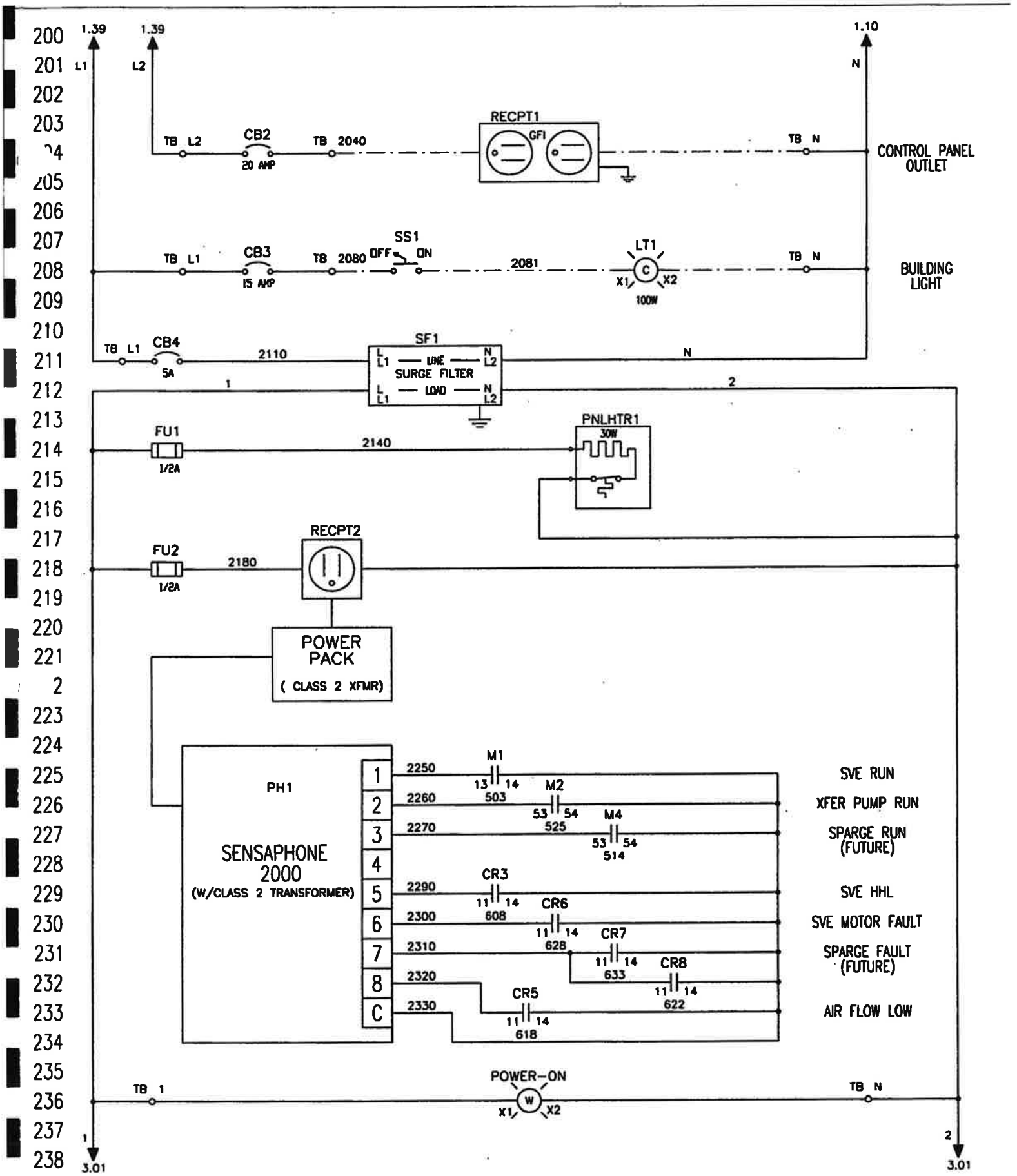

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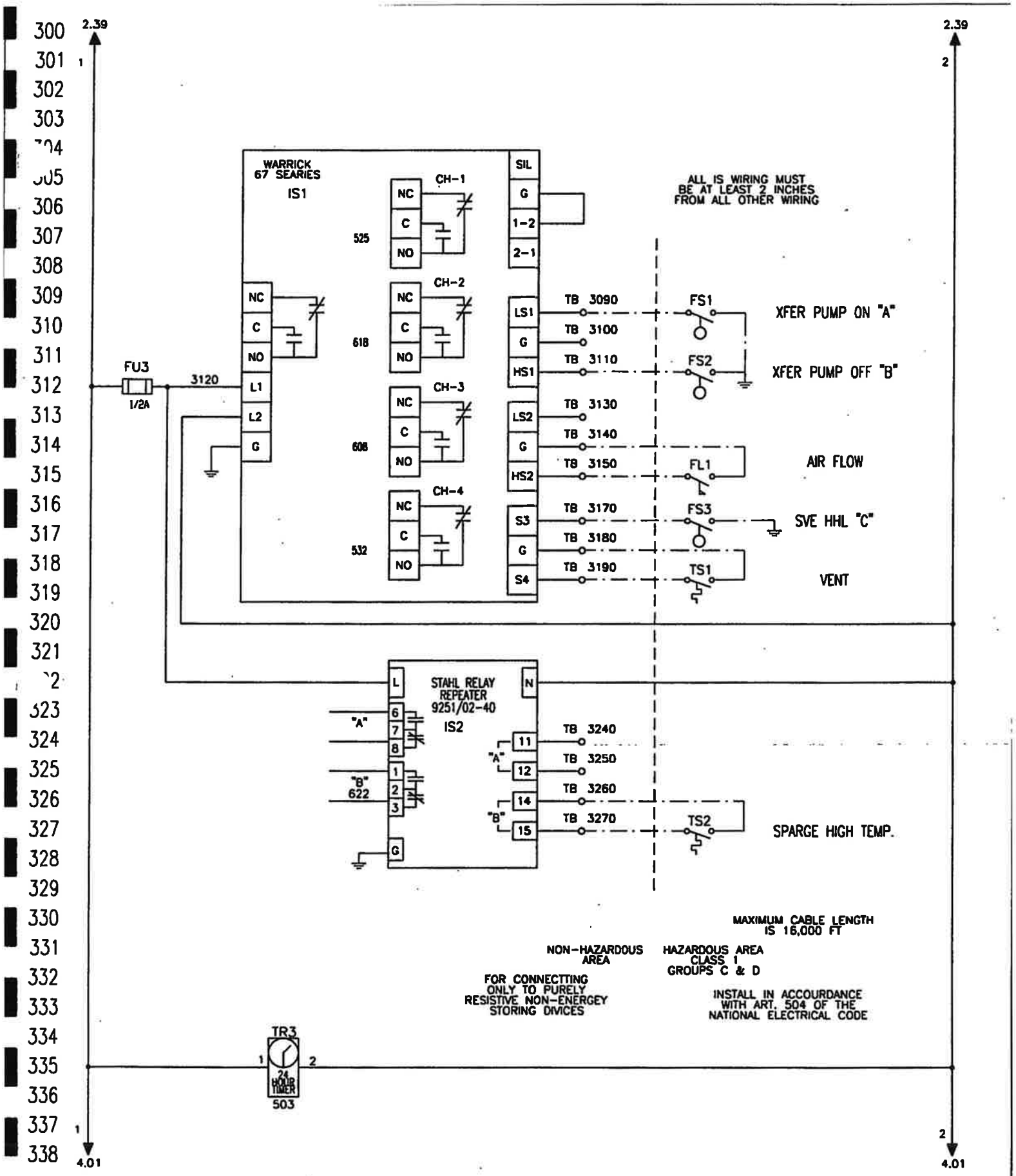

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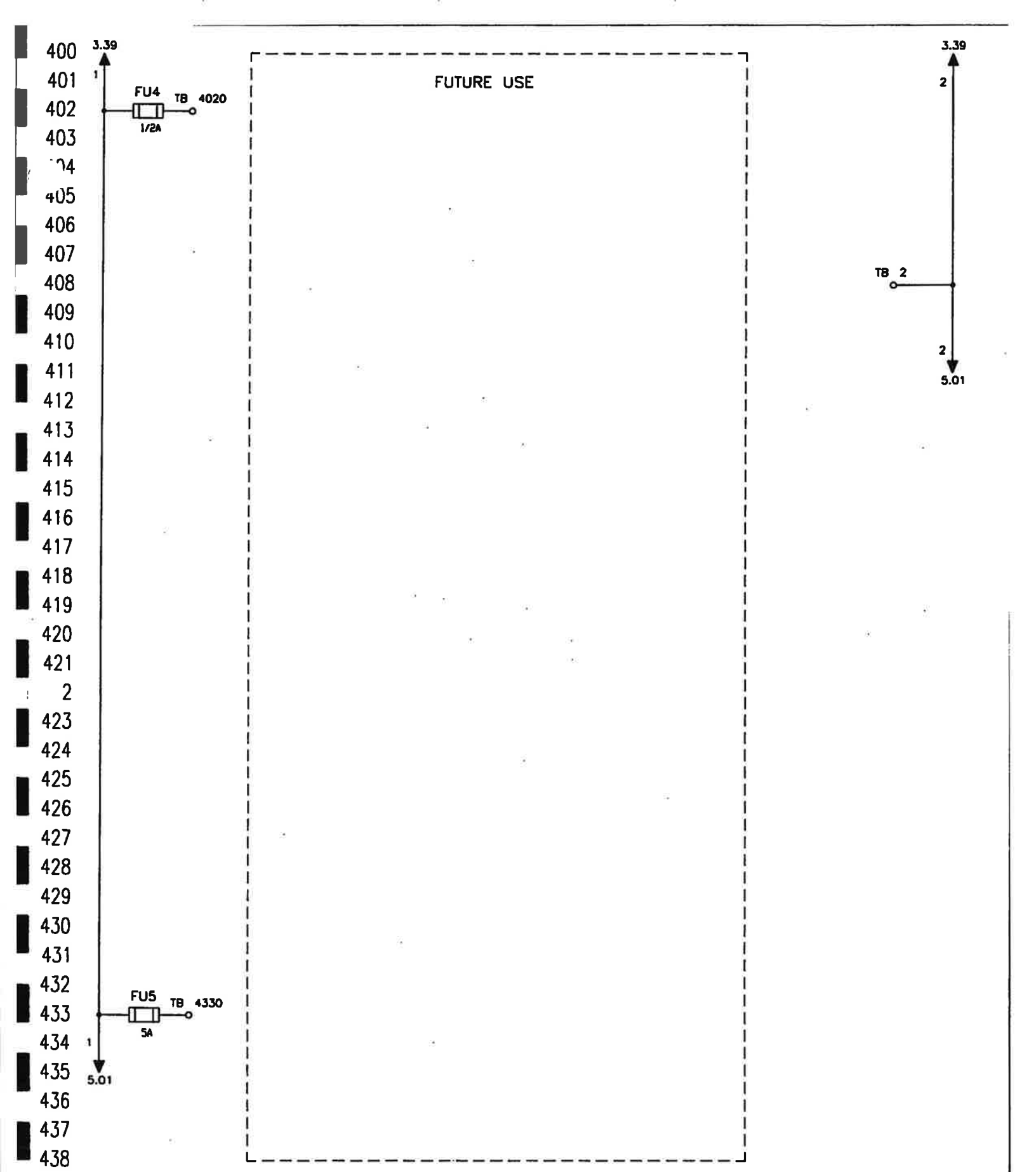

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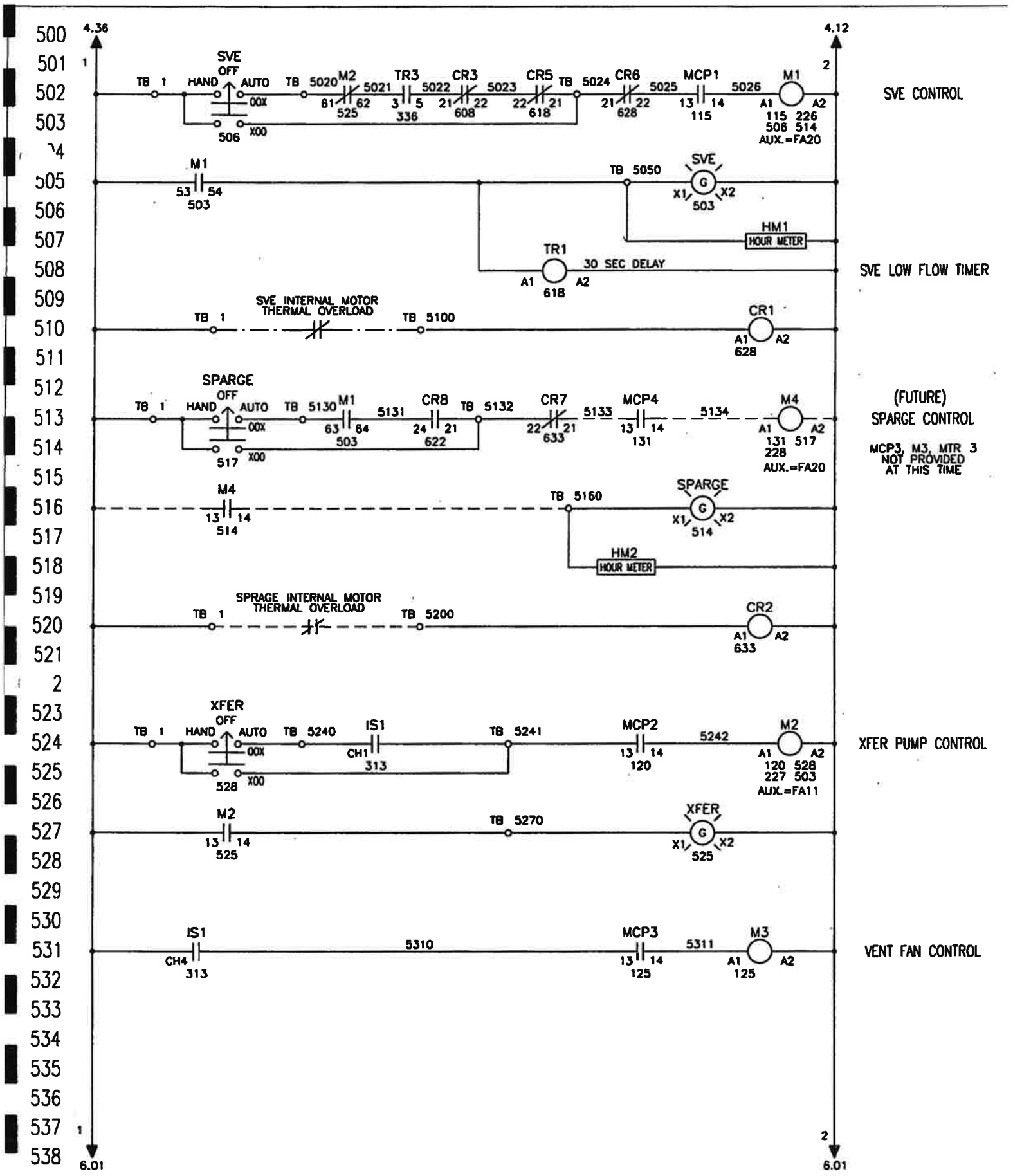

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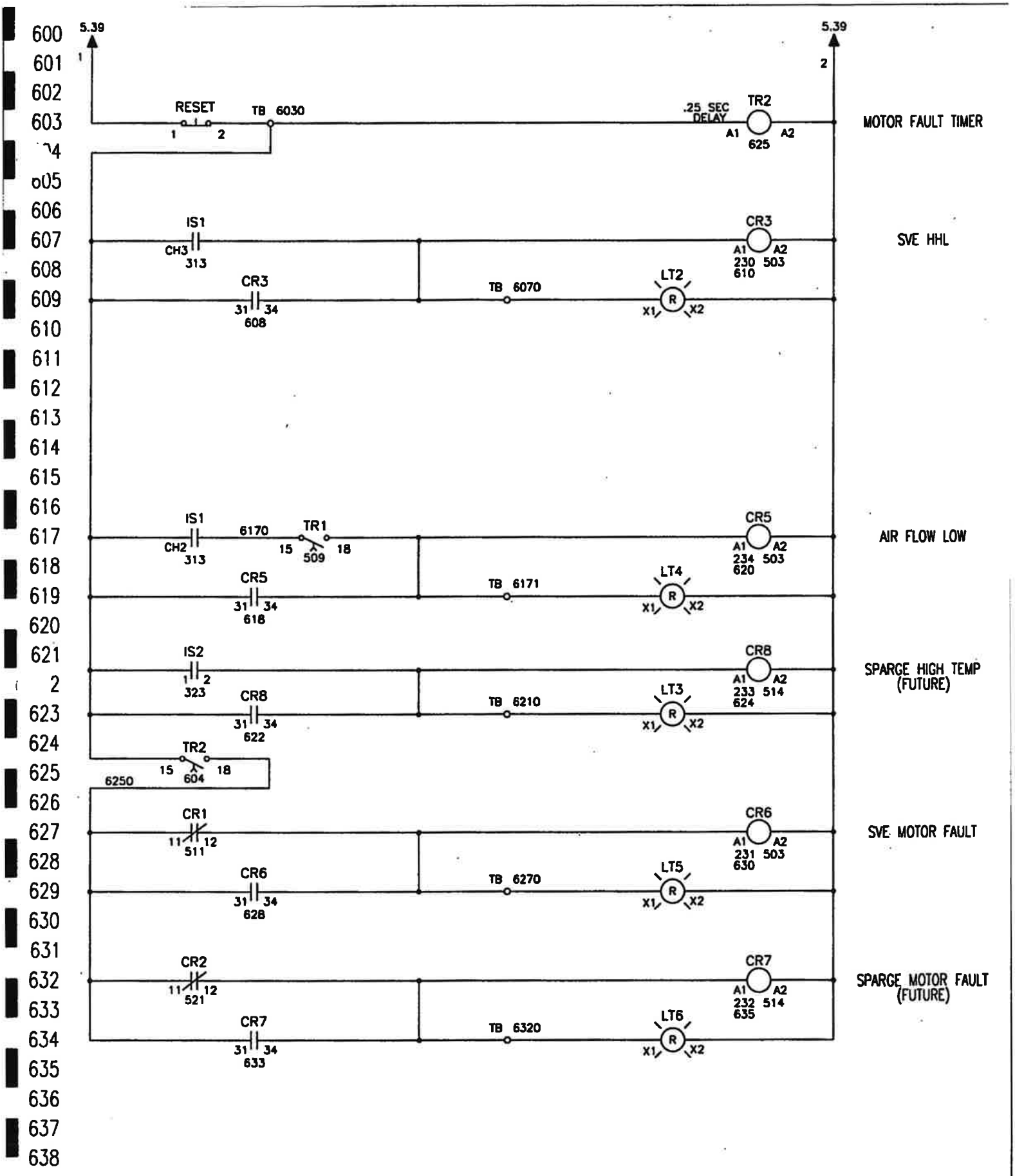

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