

**FTA1930  
DIGITAL SOLID STATE  
SOFT START FIRE PUMP  
CONTROLLERS  
WITH POWER TRANSFER SWITCH**

**STANDARD SUBMITTAL PACKAGE**

***Firetrol***<sup>®</sup>

NOTE: The drawings included herein are for standard controllers.  
Actual "as built" drawings may differ from those seen here.

# FTA1930 Digital Solid State Starting Electric Fire Pump Controllers Product Description



**Description**—Firetrol® FTA1930 Digital Solid State Starting Fire Pump Controllers feature soft start, soft stop and system sensing capabilities that not only provide for reduced current starting, but also offer an improved level of hydro mechanical performance. The controller monitors, displays and records fire pump system information. When called to run, the motor will accelerate beginning at 100% of motor FLA up to a maximum of 300% FLA while rated torque is reduced to 15%. When stopping, the motor will decelerate to a preset level and pause, allowing for a restart if required, limiting stress in the piping system. If no additional starting causes are present, the motor will continue to decelerate to a full stop. This controller helps to reduce water hammer in the system.

**Approvals** – Firetrol fire pump controllers are listed by Underwriters' Laboratories, Inc., in accordance with UL218, *Standard for Fire Pump Controllers*, CSA, *Standard for Industrial Control Equipment*, and approved by Factory Mutual. They are built to meet or exceed the requirements of the approving authorities as well as NEMA and the latest editions of NFPA 20, *Installation of Centrifugal Fire Pumps*, and NFPA 70, *National Electrical Code*.

**Standard Features**—The following are included as standard with each controller:

- Voltage surge protector
- Main Disconnect Switch sized for connected motor horsepower and voltage
- Fire pump Circuit Breaker
- Single handle Isolating Disconnect Switch/Circuit Breaker mechanism
- Motor contactor
- Emergency Manual Run Mechanism to mechanically close motor contactor contacts in an emergency condition
- Built-in Start and Stop push-buttons to bypass automatic start circuits
- Minimum Run Timer / Off Delay Timer

- Daylight Savings Time Option
- Weekly Test Timer
- Elapsed Time Meter
- Door mounted display/interface panel featuring a 128 x 64 pixel backlit LCD Graphical Display, Membrane Type User Control Push-buttons and easy to read LED Indicators for:
  - POWER AVAILABLE
  - ALARM
  - TRANSFER SWITCH NORMAL (If unit ordered with Automatic Power Transfer Switch)
  - TRANSFER SWITCH EMERGENCY (If unit ordered with Automatic Power Transfer Switch)
  - SYSTEM PRESSURE LOW
  - PUMP RUNNING
  - DELUGE OPEN
  - REMOTE START
  - INTERLOCK ON
  - FAIL TO START
  - MOTOR OVERLOAD
  - EMERGENCY ISO SWITCH OFF (If unit ordered with Automatic Power Transfer Switch)
  - PHASE FAILURE
  - PHASE REVERSAL
  - AUTOMATIC SHUTDOWN DISABLED
  - OVERVOLTAGE
  - UNDERVOLTAGE
- Digital Pressure Display
- USB Host Controller and Port
- Solid State Pressure Transducer
- Data Log
- Event Log (3000 Events)
- True RMS Metering with simultaneous 3 Phase Display of Amps, Volts, Frequency, Pressure and Alarm Messages
- Disk Error message
- Disk Near Full message
- Pressure Error message
- Motor Over 320% message
- Local Start message
- Remote Start message
- Emergency Start message
- Fail To Start message
- Undervoltage message
- Overvoltage message
- NEMA Type 2 (IEC IP22) enclosure
- Suitable for use as Service Equipment
- Each standard controller comes with user set options for:
  - Interlock Alarm
  - Low Pressure Audible
  - Low Suction
  - Pump Run
  - User Defined Input
  - Weekly Test

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Network Power

# FTA950 Power Transfer Switch for Electric Fire Pump Controllers

## Product Description



**Description**—Firetrol® Power Transfer Switches are available completely assembled with Firetrol Electric Fire Pump Controllers; full or reduced voltage types. The power transfer switches are built for use with generator set or 2nd utility use. The entire package of power transfer switch and controller is completely factory assembled, wired, tested and shipped as a complete unit for easy field connection to the power sources and the fire pump motor.

**Approvals**—Firetrol power transfer switches are listed by Underwriters' Laboratories, Inc., in accordance with UL218, *Standard for Fire Pump Controllers*; UL1008, *Automatic Transfer Switches*; UL508, *Industrial Control Equipment*, CSA, *Standard for Industrial Control Equipment*; and approved by Factory Mutual. They are built to meet or exceed the requirements of the approving authorities as well as NEMA and the latest editions of NFPA 20, *Installation of Centrifugal Fire Pumps*, and NFPA 70, *National Electrical Code*.

**Standard Features**—The following are included as standard with each transfer switch:

- Emergency power source disconnect switch sized for connected motor horsepower and voltage

- Fire pump circuit breaker
- Mark II monitors for overcurrent tripping (non-thermal) of circuit breaker and alarm indicator for phase failure/phase reversal
- 3-pole, double throw transfer switch mechanism, electrically operated, mechanically held
- ASCO® Group 5 Control module providing for the following:
  - Door mounted operator interface panel with 4 line LCD display
  - In-phase monitor
  - Programmable engine exerciser
  - Transfer switch data logging
  - Differential voltage sensing on all phases of the normal power source
  - Voltage sensing of the emergency power source
  - Frequency sensing of the emergency power source
  - Transfer time delay to compensate for momentary power outages of the normal source
  - Retransfer from emergency to normal source is automatically delayed unless the emergency source fails
  - Cool-down timer for unloaded running of the generator set after retransfer to the normal power source
  - Instantaneous retransfer to normal if the emergency source fails and the normal source is available
  - 3 second transfer restart delay to reduce current surges when transferring to or from the emergency source
  - NO and NC engine control contacts to start the generator set when the normal power source fails
- Transfer Switch Normal LED
- Transfer Switch Emergency LED
- Emergency Isolating Switch Open LED
- Test Selector Switch
- Transfer By-pass Switch
- Silence Alarm Push-button
- Emergency Isolating Switch Open and Transfer Switch in Emergency Audible Alarms
- Output contacts (NO and NC) for Generator Start, Emergency Isolating Switch Open and Transfer Switch position indicators
- NEMA Type 2 enclosure (IEC IP22)

# FTA1000 — FTA1930 Electric Fire Pump Controllers Specifications

## Main Fire Pump Controller

The main fire pump controller shall be a factory assembled, wired and tested unit and shall conform to all the requirements of the latest edition of NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection and NFPA 70, National Electrical Code.

The controller shall be listed by Underwriters Laboratories, Inc., in accordance with UL218, Standard for Fire Pump Controllers, CSA, and Canadian Standards Association CSA-C22.2, Standard for Industrial Control Equipment (cULus), approved by Factory Mutual and approved by the City of New York for fire pump service.

## Starting Method

The controller shall be of the combined manual and automatic type designed for:

- Full Voltage Starting
- Wye (Star)-Delta Open Transition Starting
- Wye (Star)-Delta Closed Transition Starting
- Part Winding Starting
- Primary Resistance Reduced Voltage Starting
- Autotransformer Reduced Voltage Starting
- Digital Soft Start Reduced Current Starting

of the fire pump motor having the horsepower, voltage, phase and frequency rating shown on the plans and drawings. The controller components shall be housed in a NEMA Type 2 (IEC IP22) drip-proof, wall mounted enclosure.

## Withstand Ratings (Short Circuit Current Ratings)

All controller components shall be front mounted, wired and front accessible for maintenance. The minimum withstand rating of the controllers shall not be less than 100,000 Amps RMS Symmetrical at 200-600 Volts\*. If the available system fault current exceeds these ratings, the controllers shall be supplied with a withstand rating of 150,000 or 200,000 Amps RMS Symmetrical, as required.

\*Note: 100,000 Amp withstand rating not available in some larger horsepower. Consult factory for details.

## Isolation Switch and Circuit Breaker

The controller shall include a motor rated combination isolating disconnect switch/circuit breaker, mechanically interlocked and operated with a single, externally mounted handle. When moving the handle from OFF to ON, the interlocking mechanism shall sequence the isolating disconnect switch ON first, and then the circuit breaker. When the handle is moved from ON to OFF, the interlocking mechanism shall sequence the circuit breaker OFF first, and then the isolating disconnect switch.

The isolating disconnect switch/circuit breaker shall be mechanically interlocked so that the enclosure door cannot be opened with the handle in the ON position except by a hidden tool operated bypass mechanism. The isolating disconnect switch/circuit breaker shall be capable of being padlocked in the OFF position for installation and maintenance safety, and shall also be capable of being locked in the ON position without affecting the tripping characteristics of the circuit breaker. The controller door shall have a locking type handle and three point cam and roller vault type hardware. The circuit breaker

trip curve adjustment shall be factory set, tested and sealed for the full load amps of the connected motor. The circuit breaker shall be capable of being field tested to verify actual pick up, locked rotor, and instantaneous trip points after field installation without disturbing incoming line and load conductors.

## Operator Interface

The fire pump controller shall feature an operator interface with user keypad. The interface shall monitor and display motor operating conditions, including all alarms, events, and pressure conditions. All alarms, events, and pressure conditions shall be displayed with a time and date stamp. The display shall be a 128x64 Backlit LCD capable of customized graphics. The display and interface shall be NEMA rated for Type 2, 3R, 4, 4X, and 12 protection and shall be fully accessible without opening the controller door. The display and user interface shall utilize multiple levels of password protection for system security. A minimum of 3 password levels shall be provided.

## Ammeter/Voltmeter

The fire pump controller operator interface shall be capable of displaying true RMS digital motor voltage and current measurements for all three phases simultaneously. Displays requiring push-button and selector switches to toggle between phases or current and voltage shall not be accepted.

Voltage and current shall be measured by True RMS technology to provide the most accurate measurement for all sine waves, including non-sinusoidal waveforms. Average responding meters will not be accepted.

## Digital Status/Alarm Messages

The digital display shall indicate text messages for the status and alarm conditions of:

- Motor On
- Minimum Run Time / Off Delay Time
- Fail to Start
- Under Voltage
- Locked Rotor Trip
- Emergency Start
- Drive Not Installed
- Disk Error
- Disk Near Full
- Sequential Start Time
- Local Start
- Remote Start
- System Battery Low
- Over Voltage
- Over Frequency
- Motor Over 320%
- Motor Overload
- Printer Error
- Pressure Error

The Sequential Start Timer and Minimum Run Timer/Off Delay Timer shall be displayed as numeric values reflecting the value of the remaining time.

## LED Visual Indicators

LED indicators, visible with the door closed, shall indicate:

- Power Available
- Pump Running
- Remote Start
- Deluge Open
- Phase Failure
- Interlock On
- Motor Overload
- Automatic Shutdown
- Overvoltage
- Alarm
- System Pressure Low
- Transfer Switch Normal
- Transfer Switch Emergency
- Phase Reversal
- Fail To Start
- Emerg. Iso. Switch Off
- Undervoltage

### Data Logging

The digital display shall monitor the system and log the following data:

- Motor Calls/Starts
- Pump Last Run Time
- Last Pump Start
- Last Phase Fail/Reversal
- Last Locked Rotor Current
- Max Starting Currents
- Min/Max Voltage per Phase while idle (not running)
- Min Voltage per Phase during Start
- Min/Max Voltage per Phase during Run
- Pump Total Run Time
- Total Controller Pwr On Time
- Min/Max System Pressure
- Last Locked Rotor Trip
- Min/Max Frequency
- Max Run Currents

### Event Recording

Memory - The controller shall record all operational and alarm events to system memory. All events shall be time and date stamped and include an index number. The system memory shall have the capability of storing 3000 events and allow the user access to the event log via the user interface. The user shall have the ability to scroll through the stored messages in groups of 1 or 10.

### USB Host Controller

The controller shall have a built-in USB Host Controller. A USB port capable of accepting a USB Flash Memory Disk shall be provided. The controller shall save all operational and alarm events to the flash memory on a daily basis. Each saved event shall be time and date stamped. The total amount of historical data saved shall solely depend on the size of the flash disk utilized. The controller shall have the capability to save settings and values to the flash disk on demand via the user interface.

### Serial Communications

The controller shall feature a RS485 serial communications port for use with 2 or 4 wire Modbus RTU communications.

### Solid State Pressure Transducer

The controller shall be supplied with a solid state pressure transducer with a range of 0-300 psi (0-20.7 bar)  $\pm 1$  psi. The solid state pressure switch shall be used for both display of the system pressure and control of the fire pump controller. Systems using analog pressure devices or mercury switches for operational control will not be accepted.

The START, STOP and SYSTEM PRESSURE shall be digitally displayed and adjustable through the user interface. The pressure transducer shall be mounted inside the controller to prevent accidental damage. The pressure transducer shall be directly pipe mounted to a bulkhead pipe coupling without any other supporting members. Field connections shall be made externally at the controller coupling to prevent distortion of the pressure switch element and mechanism.

### Seismic Certification

The controller shall be certified to meet or exceed the requirements of the 2006 International Building Code and the 2010 California Building Code for Importance Factor 1.5 Electrical Equipment for Sds equal to 1.88 or less severe seismic regions. Qualifications shall be based upon successful tri-axial shake-table testing in accordance with ICC-ES AC-156. Certification without testing shall be unacceptable. Controller shall be clearly labeled as rated for installation in seismic areas and a Certificate of Conformance shall be provided with the controller. **NOTE:** Not available on Model FTA1500 Controllers

### Operation

A digitally set On Delay (Sequential Start) timer shall be provided as standard. Upon a call to start, the user interface shall display a message indicating the remaining time value of the On Delay timer.

The controller shall be field programmable for manual stop or automatic stop. If set for automatic stopping, the controller shall allow the user to select either a Minimum Run Timer or an Off Delay Timer. Both timers shall be programmable through the user interface.

A nonadjustable restart delay timer shall be provided to allow the residual voltage of the motor to decay prior to restarting the motor. At least 2 seconds, but no more than 3 seconds, shall elapse between stopping and restarting the pump motor.

A weekly test timer shall be provided as standard. The controller shall have the ability to program the time, date, and frequency of the weekly test. In addition, the controller shall have the capability to display a preventative maintenance message for a service inspection. The message text and frequency of occurrence shall be programmable through the user interface.

A Lamp Test feature shall be included. The user interface shall also have the ability to display the status of the system inputs and outputs.

A Audible Test feature shall be included to test the operation of the audible alarm device.

The controller shall not start the fire pump motor under a single-phase condition. If the motor is already running when a phase loss occurs, the controller shall continue to run the motor, but still display a Phase Failure alarm.

The fire pump controller software shall be automatically upgradable through the USB port by simply inserting a flash disk with the new software. Fire pump controllers that require laptop computers, handheld equipment or specialized devices for software upgrades shall be prohibited.

The controller shall be a Firetrol brand.

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# FTA950 Automatic Power Transfer Switches Specifications

## Main Fire Pump Controller with Transfer Switch

The main fire pump controller shall be factory assembled and wired with a power transfer switch listed by Underwriters' Laboratories, Inc. for transfer switch and fire pump service. The power transfer switch shall be approved by Factory Mutual.

The power transfer switch and fire pump controller shall be factory assembled, wired and tested as a single unit and shall conform to all requirements of the latest edition of NFPA 20, *Centrifugal Fire Pumps* and NFPA 70, *National Electrical Code*.

## Power Transfer Switch for Gen Set / Second Utility Emergency Power Source

The power transfer switch shall be housed within the fire pump controller enclosure or in a NEMA Type 2 (IEC IP22) drip-proof enclosure attached directly to the fire pump controller. Where the power transfer switch is provided in an attached enclosure, the enclosures shall be fitted so that the assembly constitutes a single unit. The fire pump controller/power transfer switch shall be factory assembled, wired and tested as a unit prior to shipment.

The power transfer switch shall include a motor rated combination isolating disconnect switch/circuit breaker, mechanically interlocked and operated with a single, externally mounted handle. When moving the handle from OFF to ON, the interlocking mechanism shall sequence the isolating disconnect switch closed first, and then the circuit breaker. When the handle is moved from ON to OFF, the interlocking mechanism shall sequence the circuit breaker open first, and then the isolating disconnect switch.

The isolating disconnect switch/circuit breaker shall be mechanically interlocked so that the enclosure door cannot be opened with the handle in the ON position except by a hidden tool operated bypass mechanism. The

isolating disconnect switch/circuit breaker shall be capable of being padlocked in the OFF position for installation and maintenance safety, and shall also be capable of being locked in the ON position without affecting the tripping characteristics of the circuit breaker. The enclosure door shall have a locking type handle and three point cam and roller type vault hardware.

The circuit breaker trip curve adjustment shall be factory set, tested and sealed for the connected full load amps of the motor.

The fire pump controller/power transfer switch shall have data logging capability for historical operation recording and to aid in annual test, service and trouble shooting. The data logging shall be accessible by front mounted interface panel and also by saving the information via the standard USB port. The data file shall be in text (.txt) format and easily readable by most common text editing or word processing software. The circuit breaker shall be capable of being field tested to verify actual pick up, locked rotor, and instantaneous trip points after field installation without disturbing incoming line and load conductors.

The automatic transfer switch shall consist of an inherently double throw power transfer switch mechanism and a microprocessor control panel to provide automatic operation. The transfer switch and control panel shall be of the same manufacturer. The automatic transfer switch shall be an ASCO 7000 series with a group 5 control panel.

The transfer switch shall be electrically operated and mechanically held. The electrical operator shall be a momentarily energized, single solenoid mechanism. The switch shall be mechanically interlocked to ensure only two possible positions, normal or emergency. Switches having a neutral position shall not be permitted.

The switch shall be positively locked and unaffected by momentary outages, so that con-

tact pressure is maintained at a constant value and contact temperature rise is minimized for maximum reliability and operating life. All main contacts shall be silver composition and inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power.

Designs utilizing components of molded case circuit breakers, contactors, or parts thereof, which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.

The transfer switch control panel shall have a 4 line, 20 character LCD display and keypad for viewing all available data and setting desired operational parameters. Voltage and frequency on both the normal and emergency sources shall be continuously monitored. The normal source pick up shall be set at 95% of nominal voltage and the emergency source pick up set at 90% of nominal voltage and 95% nominal frequency. Source status screens shall be provided for both normal & emergency to provide digital readout of voltage, frequency and phase rotation on all 3 phases.

The transfer switch shall have visible pilot light indication for the following conditions: TRANSFER SWITCH IN NORMAL, TRANSFER SWITCH IN EMERGENCY, NORMAL SOURCE ACCEPTED, EMERGENCY SOURCE ACCEPTED and EMERGENCY ISOLATION SWITCH OPEN. Remote alarm contacts shall be supplied as standard for the following conditions: EMERGENCY SOURCE ISOLATION SWITCH OPEN, NORMAL POWER AVAILABLE, EMERGENCY POWER AVAILABLE and TRANSFER SWITCH POSITION. An audible alarm shall sound if: EMERGENCY ISOLATION SWITCH OPEN and TRANSFER SWITCH IN EMERGENCY. A SILENCE ALARM push-button shall be supplied. A selector switch shall be supplied to manually test the transfer to emergency and the retransfer to normal power.

The transfer switch shall be a Firetrol FTA950 for generator set and second utility emergency power.

Note: FTA950 power transfer switches are designed for use with Firetrol Electric Fire Pump Controllers.

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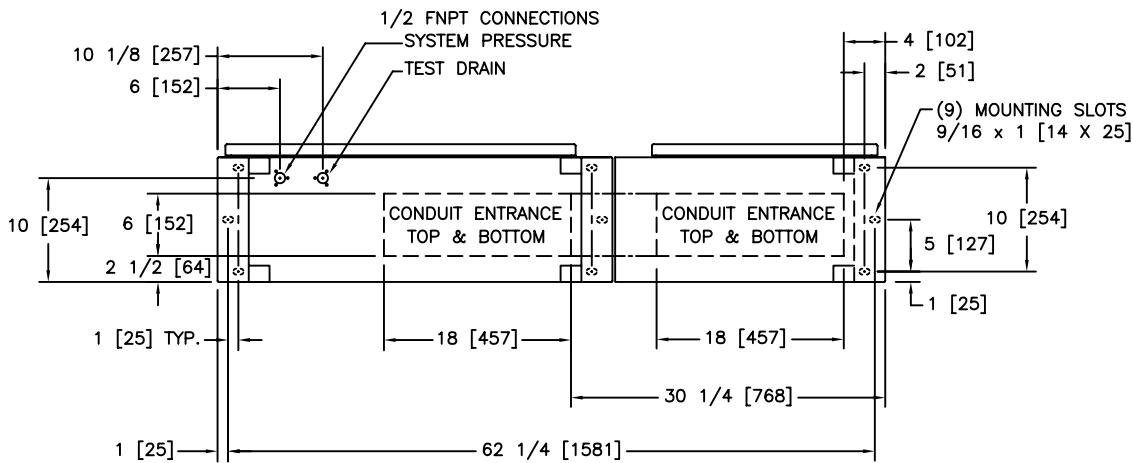
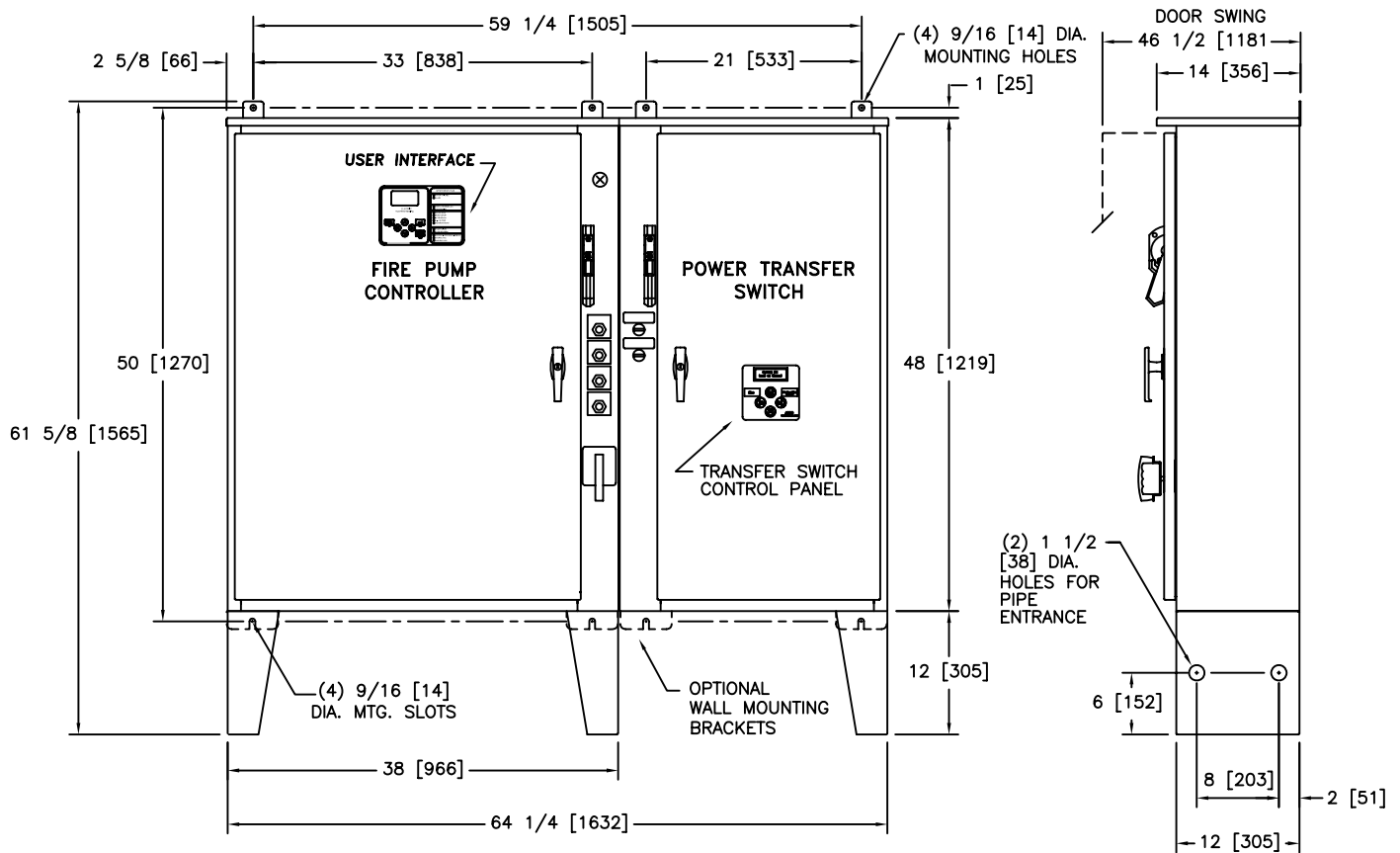
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| STANDARD WITHSTAND RATINGS       |                  |
|----------------------------------|------------------|
| 200-600V - 100,000 Amps RMS Sym. |                  |
| INTERMEDIATE WITHSTAND RATINGS   |                  |
| 200-600V - 150,000 Amps RMS Sym. |                  |
| HIGH WITHSTAND RATINGS           |                  |
| 200-600V - 200,000 Amps RMS Sym. |                  |
| LINE VOLTAGE                     | MOTOR HORSEPOWER |
| 200                              | □ 3-50           |
| 208                              | □ 3-50           |
| 220-240                          | □ 3-60           |
| 380-415                          | □ 3-75           |
| 440-480                          | □ 3-125          |
| 550-600                          | □ 3-150          |

APPROXIMATE SHIPPING WEIGHT

**625 [283]**

DO NOT INSTALL IN AMBIENT TEMPERATURES BELOW 41°F [5°C].

ALL DIMENSIONS - INCHES [MM]  
SHIPPING WEIGHT - POUNDS [KG]

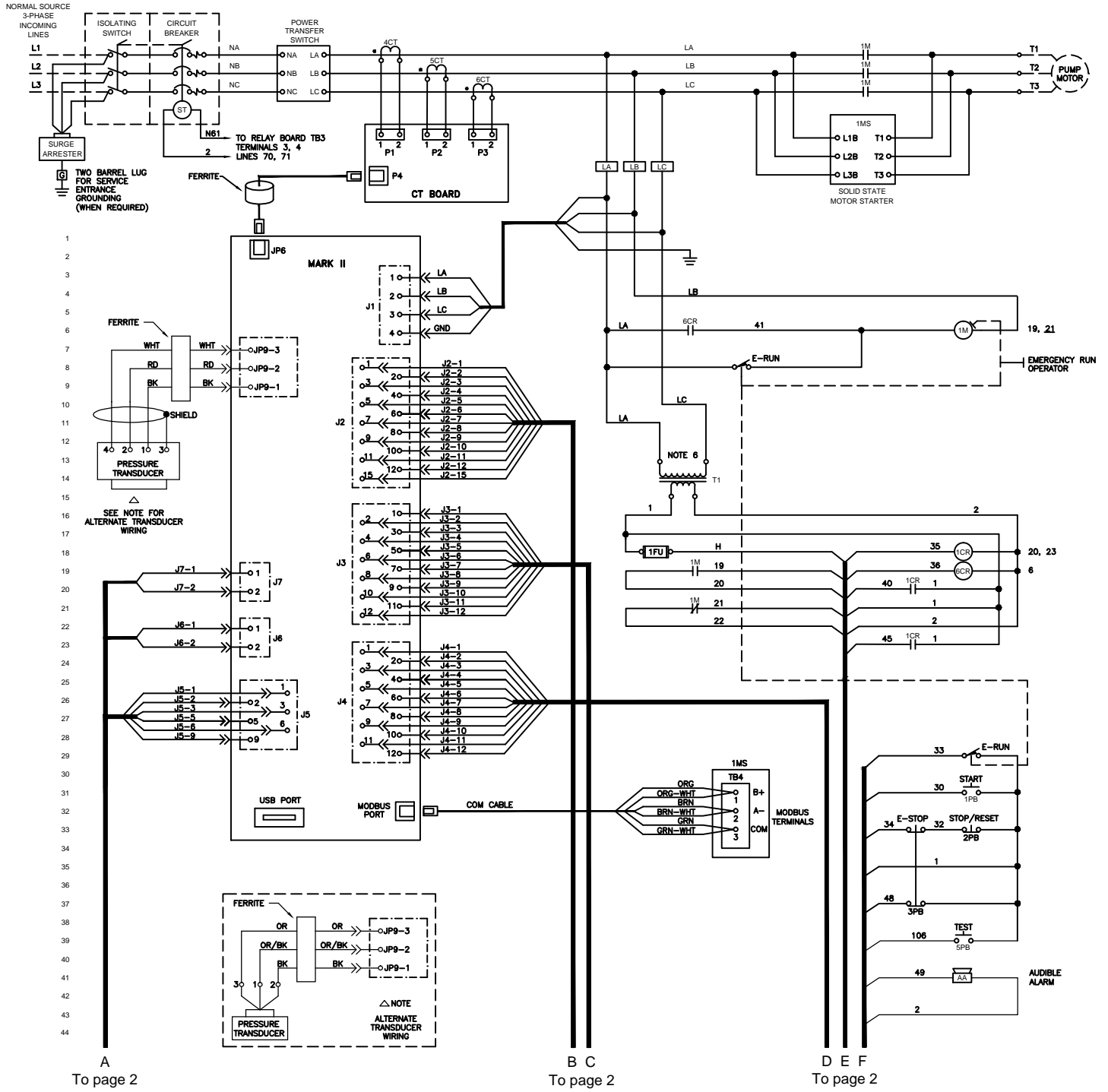
THIS DIMENSION DRAWING COVERS FTA1930 CONTROLLERS AT THE HORSEPOWER, VOLTAGE AND WITHSTAND RATINGS AS LISTED IN THE TABLE. FOR OTHER HORSEPOWER OR WITHSTAND RATINGS, REFER TO ED1930-02

SPECIFICATIONS AND DIMENSIONS SUBJECT TO CHANGE WITHOUT NOTICE. DO NOT USE FOR CONSTRUCTION. REQUEST CONSTRUCTION DRAWINGS FROM FIREtrol OR YOUR LOCAL FIREtrol REPRESENTATIVE.

|   |               |   |  |                            |                |  |          |               |
|---|---------------|---|--|----------------------------|----------------|--|----------|---------------|
| ADDED COMPONENTS TO MEET FM REQUIREMENTS  |               |   |  | REV. TO B                  | ECN NO. 228554 | BY JC                                      | APP. TEF | DATE 08-17-10 |
| UPDATED TO MARK IXG USER INTERFACE  |               |   |  | REV. TO A                  | ECN NO. 225133 | BY JC                                      | APP. TEF | DATE 11-15-09 |
| DIMENSIONS AND SHIPPING WEIGHT FTA1930 WITH FTA950                                  |               |   |  | <br>THIRD ANGLE PROJECTION |                |  |          |               |
| DIGITAL SOLID STATE REDUCED CURRENT FIRE PUMP CONTROLLER WITH POWER TRANSFER SWITCH |               |   |  |                            |                |  |          |               |
| BY TEF  | DATE 06-09-08 | MANUFACTURING TOLERANCES TO BE IN ACCORDANCE WITH ASCO PROCEDURE MP-1-003. FOR PLASTIC PARTS SEE MP-1-055             |  | ASSEM. REF. NO.            |                | COMPUTER GENERATED DRAWING                 |          |               |
| CHECKED   |               | PROPERTY OF ASCO POWER TECHNOLOGIES. USE PERMITTED FOR OUR WORK ONLY. ALL RIGHTS OF DESIGN OR INVENTION ARE RESERVED. |  | SCALE 1:1                  | SIZE A         |  |          |               |
| PROJECT APPROVAL  |               | <br>ASCO POWER TECHNOLOGIES, L.P.<br>FLORHAM PARK, NEW JERSEY 07932 U.S.A.  |  | <b>DD1930-61</b>           |                | DRAWING REV. B ECN NO. 228554 SHEET 1 OF 1 |          |               |
| FINAL APPROVAL  | TEF 06-09-08  |   |  |                            |                |  |          |               |







|  |              |   |                 |                |                            |              |               |
|--|--------------|---|-----------------|----------------|----------------------------|--------------|---------------|
| ADDED TEST SOLENOID AND AUDIBLE ALARM TO COMPLY WITH NEW FM STD. |              |   | REV. TO D       | ECN NO. 228528 | BY JC                      | APP. TEF     | DATE 08-31-10 |
| CHANGED PC-1051 TO CT BOARD                                      |              |   | REV. TO C       | ECN NO. 225139 | BY JC                      | APP. TEF     | DATE 11-15-09 |
| REMOVED CB AUXILIARY CONTACT AND TRANSFORMER T2                  |              |   | REV. TO B       | ECN NO. 222025 | BY JC                      | APP. TEF     | DATE 02-27-09 |
| <b>WIRING SCHEMATIC</b>  |              |   |                 |                | FTA1930 W/FTA950           |              |               |
| <b>DIGITAL SOLID STATE REDUCED CURRENT FIRE PUMP CONTROLLER</b>  |              |   |                 |                |                            |              |               |
| <b>WITH POWER TRANSFER SWITCH</b>                                |              |   |                 |                | THIRD ANGLE PROJECTION     |              |               |
| BY   | DATE         | MANUFACTURING TOLERANCES TO BE IN ACCORDANCE WITH ASCO PROCEDURE MP-1-003. FOR PLASTIC PARTS SEE MP-1-055             | ASSEM. REF. NO. |                | COMPUTER GENERATED DRAWING |              |               |
| CHECKED  |              | PROPERTY OF ASCO POWER TECHNOLOGIES. USE PERMITTED FOR OUR WORK ONLY. ALL RIGHTS OF DESIGN OR INVENTION ARE RESERVED. | SCALE 1:1       |                | SIZE A                     |              |               |
| PROJECT APPROVAL   |              |   | DWG. NO.        |                | WS1930-55                  |              |               |
| FINAL APPROVAL   | TEF 05-29-08 |   | DRAWING REV. D  |                | ECN NO. 228528             | SHEET 1 OF 2 |               |

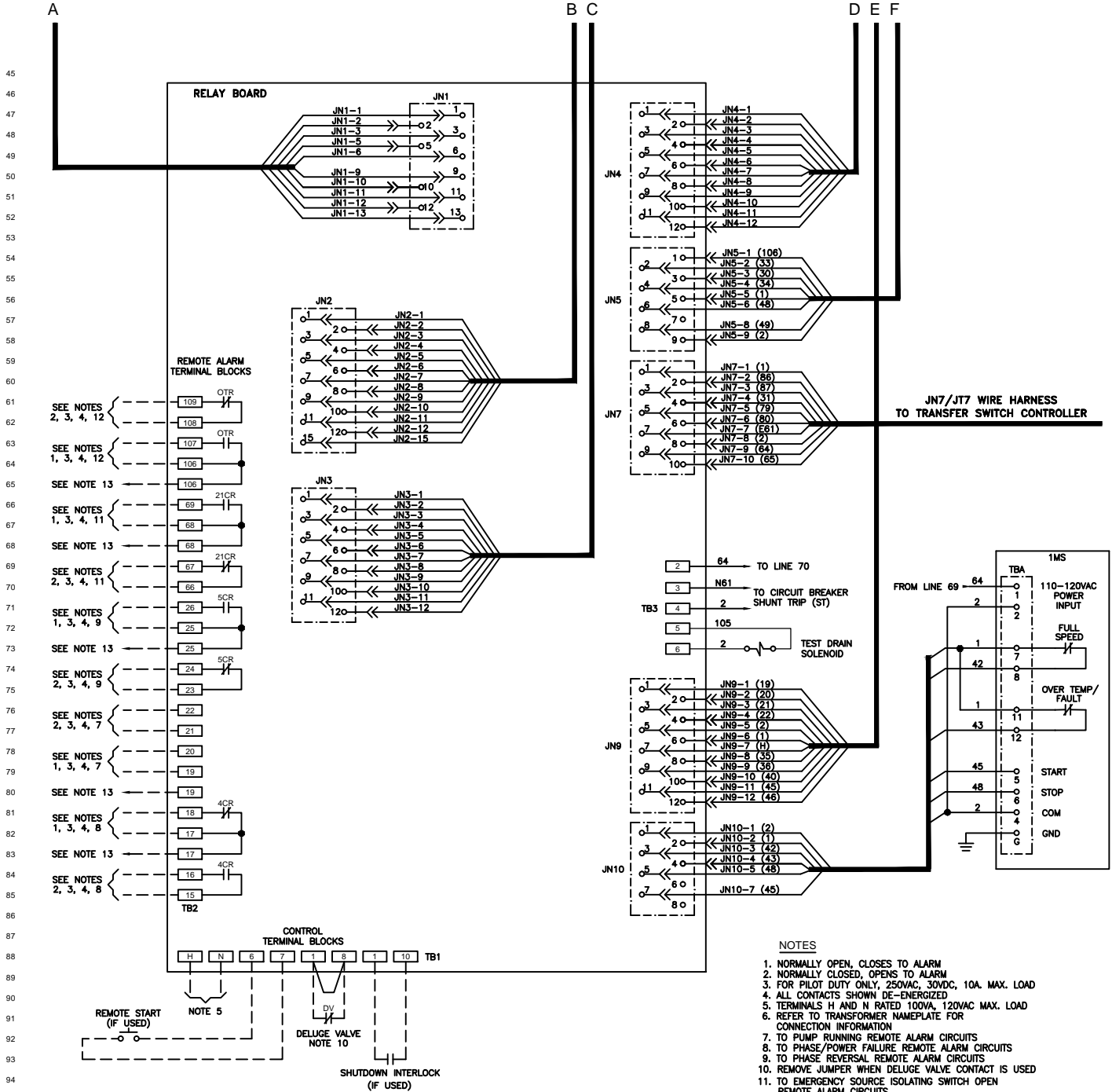


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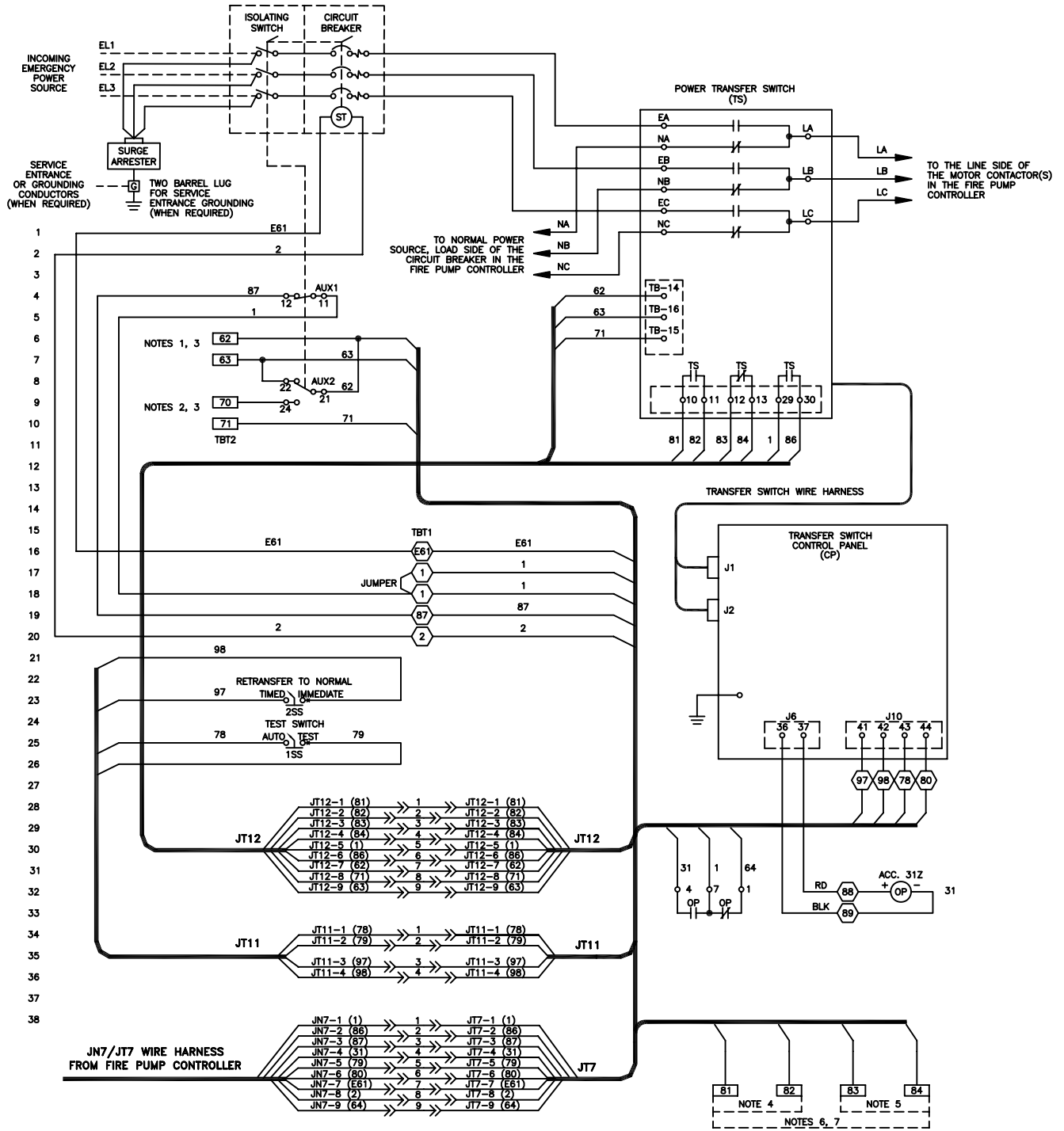
From Page 1



- NOTES**
1. NORMALLY OPEN, CLOSES TO ALARM
  2. NORMALLY CLOSED, OPENS TO ALARM
  3. FOR PILOT DUTY ONLY, 250VAC, 30VDC, 10A. MAX. LOAD
  4. ALL CONTACTS SHOWN DE-ENERGIZED
  5. TERMINALS H AND N RATED 100VA, 120VAC MAX. LOAD
  6. REFER TO TRANSFORMER NAMEPLATE FOR CONNECTION INFORMATION
  7. TO PUMP RUNNING REMOTE ALARM CIRCUITS
  8. TO PHASE/POWER FAILURE REMOTE ALARM CIRCUITS
  9. TO PHASE REVERSAL REMOTE ALARM CIRCUITS
  10. REMOVE JUMPER WHEN DELUGE VALVE CONTACT IS USED
  11. TO EMERGENCY SOURCE ISOLATING SWITCH OPEN REMOTE ALARM CIRCUITS
  12. TO SOLID STATE STARTER OVER TEMPERATURE REMOTE ALARM CIRCUITS
  13. SPARE TERMINAL PROVIDED FOR PARALLEL CONNECTION OF REMOTE ALARMS (IF REQUIRED)

|  |      |   |   |                        |                |                            |              |               |
|--|------|---|---|------------------------|----------------|----------------------------|--------------|---------------|
| ADDED TEST SOLENOID AND AUDIBLE ALARM TO COMPLY WITH NEW FM STD.                           |      |   |   | REV. TO D              | ECN NO. 228528 | BY JC                      | APP. TEF     | DATE 08-31-10 |
| CHANGED PC-1051 TO CT BOARD  |      |   |   | REV. TO C              | ECN NO. 225139 | BY JC                      | APP. TEF     | DATE 11-15-09 |
| REMOVED CB AUXILIARY CONTACT AND TRANSFORMER T2  |      |   |   | REV. TO B              | ECN NO. 222025 | BY JC                      | APP. TEF     | DATE 02-27-09 |
| <b>WIRING SCHEMATIC</b>  |      |   |   | FTA1930 W/FTA950       |                |                            |              |               |
| <b>DIGITAL SOLID STATE REDUCED CURRENT FIRE PUMP CONTROLLER WITH POWER TRANSFER SWITCH</b> |      |   |   | THIRD ANGLE PROJECTION |                |                            |              |               |
| BY   | DATE | MANUFACTURING TOLERANCES TO BE IN ACCORDANCE WITH ASCO PROCEDURE MP-1-003. FOR PLASTIC PARTS SEE MP-1-055             |   | ASSEM. REF. NO.        |                | COMPUTER GENERATED DRAWING |              |               |
| CHECKED  |      | PROPERTY OF ASCO POWER TECHNOLOGIES. USE PERMITTED FOR OUR WORK ONLY. ALL RIGHTS OF DESIGN OR INVENTION ARE RESERVED. |   |                        |                | SCALE 1:1                  | SIZE A       |               |
| PROJECT APPROVAL   |      |   |   |                        |                | DWG. NO. <b>WS1930-55</b>  |              |               |
| FINAL APPROVAL   | TEF  | 05-29-08  | <b>ASCO</b> ASCO POWER TECHNOLOGIES, L.P. FLORHAM PARK, NEW JERSEY 07932 U.S.A. |                        | DRAWING REV. D | ECN NO. 228528             | SHEET 2 OF 2 |               |

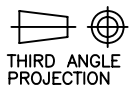


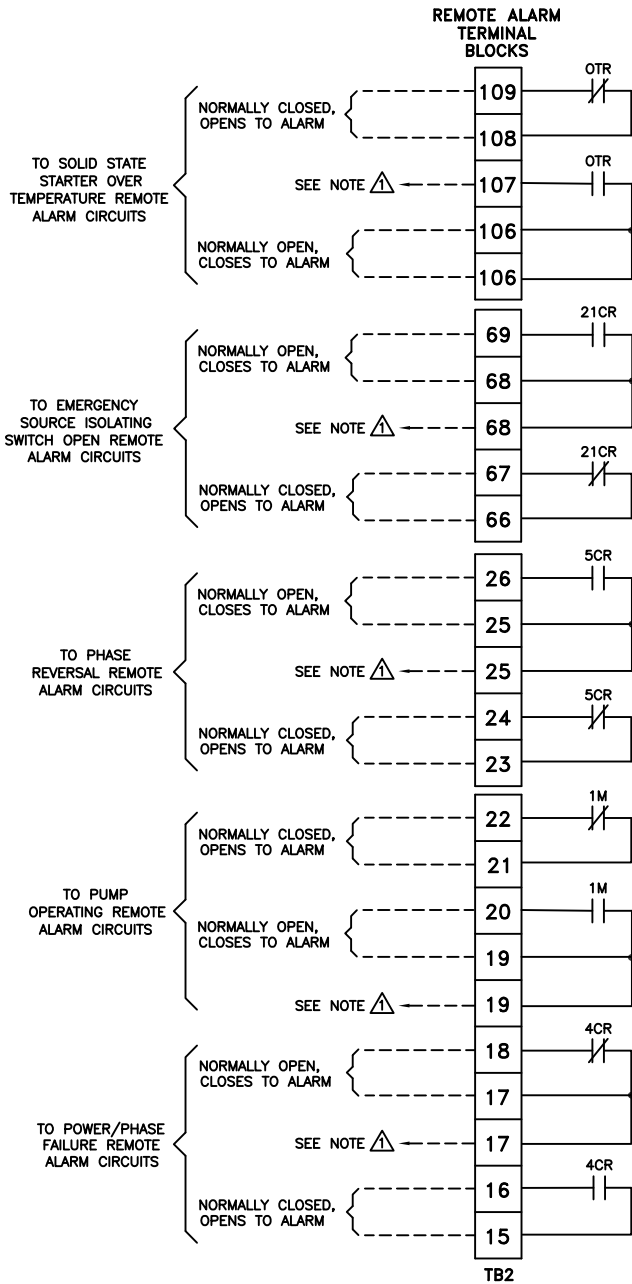


- COMPONENT LOCATION**
- AUX1 - AUXILIARY SWITCH 1, CLOSES WHEN EMERGENCY ISOLATING SWITCH IS OPENED - LINE 4
  - AUX2 - AUXILIARY SWITCH 2, INHIBITS GEN-SET FROM STARTING IF EMERGENCY ISOLATING SWITCH IS OPENED - LINES 8, 9
- FIELD CONNECTION TERMINAL BLOCK  
 - INTERCONNECTION TERMINAL BLOCK (FOR FACTORY USE ONLY)

- NOTES:**
- 1 - NORMALLY CLOSED, OPENS TO START GENERATOR
  - 2 - NORMALLY OPEN, CLOSES TO START GENERATOR
  - 3 - GEN-SET START CONTACTS RATED 1/2 AMP, 30 VDC
  - 4 - NORMALLY OPEN, CLOSES IN EMERGENCY
  - 5 - NORMALLY CLOSED, OPENS IN EMERGENCY
  - 6 - TRANSFER SWITCH POSITION REMOTE ALARM CONTACTS
  - 7 - CONTACT RATING 5 AMP. MAX. 240 VAC, 28 VDC

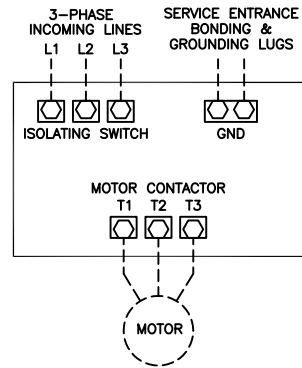
|   |               |   |                |                 |          |                            |
|---|---------------|---|----------------|-----------------|----------|----------------------------|
| UPDATED TO COMPLY WITH NEW FM STD.  |               | REV. TO A   | ECN NO. 228528 | BY JC           | APP. TEF | DATE 8-31-10               |
| WIRING SCHEMATIC  |               |   | FTA950         |                 |          |                            |
| FIRE PUMP POWER TRANSFER SWITCH FOR GEN-SET AND SECOND UTILITY POWER SOURCE |               |   |                |                 |          |                            |
| BY TEF  | DATE 05-25-10 | MANUFACTURING TOLERANCES TO BE IN ACCORDANCE WITH ASCO PROCEDURE MP-1-003. FOR PLASTIC PARTS SEE MP-1-055             |                | ASSEM. REF. NO. |          | COMPUTER GENERATED DRAWING |
| CHECKED   |               | PROPERTY OF ASCO POWER TECHNOLOGIES. USE PERMITTED FOR OUR WORK ONLY. ALL RIGHTS OF DESIGN OR INVENTION ARE RESERVED. |                |                 |          | SCALE 1:1                  |
| PROJECT APPROVAL  |               | <b>ASCO</b> ASCO POWER TECHNOLOGIES, L.P.<br>FLORHAM PARK, NEW JERSEY 07932 U.S.A.                                    |                |                 |          | DWG. NO. <b>WS950-55</b>   |
| FINAL APPROVAL  | TEF 05-25-10  |   |                |                 |          | DRAWING REV. A             |





△ SPARE TERMINALS PROVIDED FOR PARALLEL CONNECTION OF REMOTE ALARMS (IF REQUIRED)

—NOTE—  
ALARM CONTACT RATING PILOT DUTY  
250 VAC, 30 VDC  
10 A. MAX. LOAD

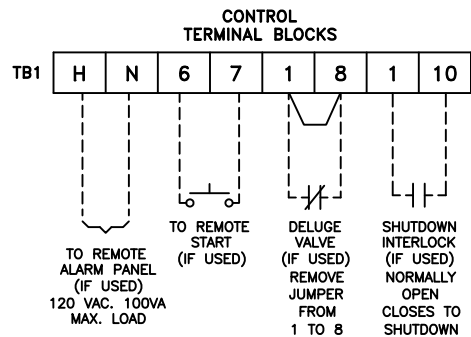


- NOTES**
- 1- Incoming line terminals are provided to accommodate wire sizes at 125% of motor full load current per NFPA 70-2008, *National Electrical Code*, Table 430-250, Section 695.6(c), and Table 310-16, 75° rated Copper conductors.
  - 2- Controller is phase rotation sensitive. Incoming lines L1, L2 and L3 must be in ABC, right hand rotation sequence for proper operation of the phase monitor.
  - 3- Motor connections shown are typical. Since motor connections vary widely, refer to the motor connection diagram for specific wiring arrangement.
  - 4- For incoming line terminals and motor terminals field wire capacity refer to drawing FC1930-51

NOTE: USE COPPER CONDUCTORS ONLY FOR ALL CONNECTIONS

NOTE: TERMINALS FOR CUSTOMER CONNECTIONS REQUIRE 3.5MM SLOTTED SCREW DRIVER

| TERMINAL TIGHTENING TORQUE  |  |                      |
|-----------------------------|--|----------------------|
| TERMINAL TYPE               | WIRE SIZE                              | TIGHTENING TORQUE    |
| CONTROL AND ALARM TERMINALS | #14-12 AWG<br>[2.5-4 MM <sup>2</sup> ] | 5.6 lb-in<br>[.6 Nm] |

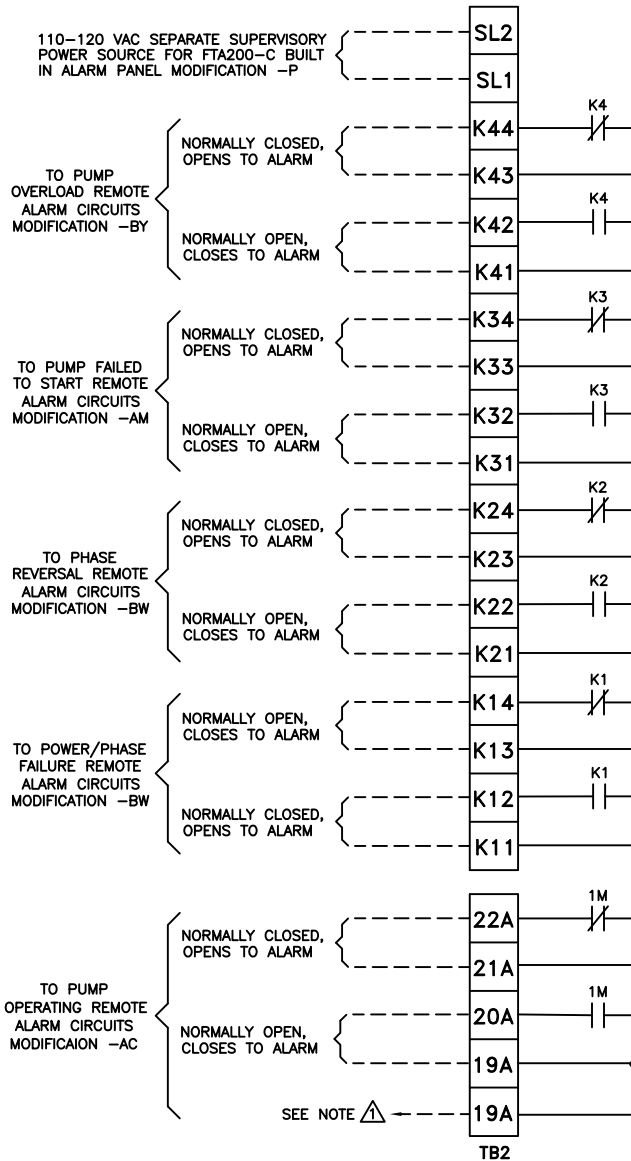


PRESSURE SYSTEM CONNECTION  
1/2" FNPT

**Firetrol**®

|  |      |   |   |                               |           |               |              |
|--|------|---|---|-------------------------------|-----------|---------------|--------------|
| ADD NOTE FOR COPPER CONDUCTORS ONLY-UPDATED LOGO AND TITLE BLOCK                   |      | REV. TO A   | ECN NO. 226253  | BY JC                         | APP. TEF  | DATE 12-10-09 |              |
| FIELD CONNECTIONS  |      | FTA1930 W/FTA900, FTA950  |   | <p>THIRD ANGLE PROJECTION</p> |           |               |              |
| DIGITAL SOFT START REDUCED CURRENT FIRE PUMP CONTROLLER WITH POWER TRANSFER SWITCH |      |   |   |                               |           |               |              |
| BY   | DATE | MANUFACTURING TOLERANCES TO BE IN ACCORDANCE WITH ASCO PROCEDURE MP-1-003. FOR PLASTIC PARTS SEE MP-1-055 |   | COMPUTER GENERATED DRAWING    |           |               |              |
| DRAWN BY   | TEF  | 08-13-08  | ASSEM. REF. NO.   | SCALE                         | 1:1       | SIZE          | A            |
| CHECKED  |      |   | PROPERTY OF ASCO POWER TECHNOLOGIES. USE PERMITTED FOR OUR WORK ONLY. ALL RIGHTS OF DESIGN OR INVENTION ARE RESERVED. | DWG. NO.                      | FC1930-55 |               |              |
| PROJECT APPROVAL   |      |   | <b>ASCO</b> ® ASCO POWER TECHNOLOGIES, L.P. FLORHAM PARK, NEW JERSEY 07932 U.S.A.                                     | DRAWING REV.                  | A         | ECN NO.       | 226253       |
| FINAL APPROVAL   | TEF  | 08-13-08  |   |                               |           |               | SHEET 1 OF 2 |

MODIFICATION  
TERMINAL BLOCKS  
(IF USED)



$\triangle$  SPARE TERMINALS PROVIDED FOR PARALLEL CONNECTION OF REMOTE ALARMS (IF REQUIRED)

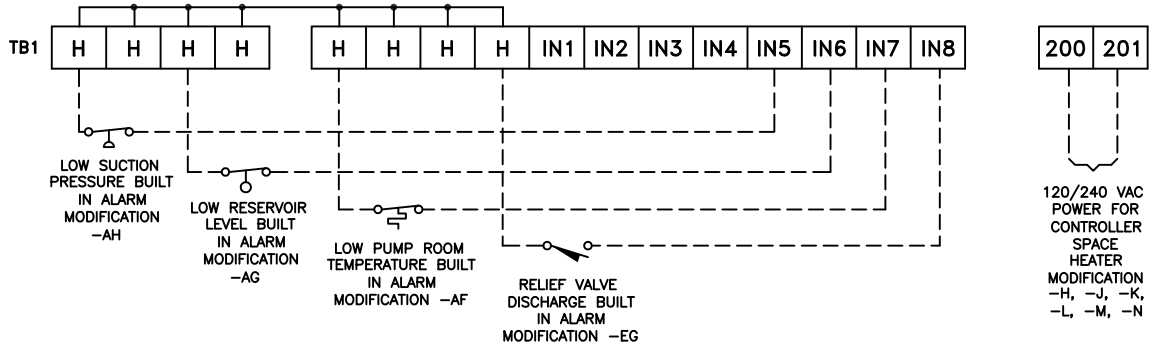
NOTE: TERMINALS FOR CUSTOMER CONNECTIONS REQUIRE 3.5MM SLOTTED SCREW DRIVER

| TERMINAL TIGHTENING TORQUE  |  |                      |
|-----------------------------|--|----------------------|
| TERMINAL TYPE               | WIRE SIZE                              | TIGHTENING TORQUE    |
| CONTROL AND ALARM TERMINALS | #14-12 AWG<br>[2.5-4 MM <sup>2</sup> ] | 5.6 lb-in<br>[.6 Nm] |

-NOTE-  
ALARM CONTACT  
RATING PILOT DUTY  
250 VAC, 30 VDC  
10 A. MAX. LOAD

NOTE: USE COPPER CONDUCTORS ONLY FOR ALL CONNECTIONS

MODIFICATION TERMINAL BLOCKS (IF USED)



|  |                |   |   |                        |                            |               |
|--|----------------|---|---|------------------------|----------------------------|---------------|
| ADD NOTE FOR COPPER CONDUCTORS ONLY-UPDATED LOGO AND TITLE BLOCK                   |                | REV. TO A   | ECN NO. 226253  | BY JC                  | APP. TEF                   | DATE 12-10-09 |
| FIELD CONNECTIONS  |                | FTA1930 W/FTA900, FTA950  |   | THIRD ANGLE PROJECTION |                            |               |
| DIGITAL SOFT START REDUCED CURRENT FIRE PUMP CONTROLLER WITH POWER TRANSFER SWITCH |                |   |   |                        |                            |               |
| BY   | DATE           | MANUFACTURING TOLERANCES TO BE IN ACCORDANCE WITH ASCO PROCEDURE MP-1-003. FOR PLASTIC PARTS SEE MP-1-055 |   | ASSEM. REF. NO.        |                            |               |
| DRAWN BY   | TEF            | 08-13-08  |   |                        |                            |               |
| CHECKED  |                |   | PROPERTY OF ASCO POWER TECHNOLOGIES. USE PERMITTED FOR OUR WORK ONLY. ALL RIGHTS OF DESIGN OR INVENTION ARE RESERVED. |                        |                            |               |
| PROJECT APPROVAL   |                |   |   |                        |                            |               |
| FINAL APPROVAL   | TEF            | 08-13-08  | ASCO <sup>®</sup> ASCO POWER TECHNOLOGIES, L.P.<br>FLORHAM PARK, NEW JERSEY 07932 U.S.A.                              |                        | COMPUTER GENERATED DRAWING |               |
| SCALE 1:1  |                | SIZE A  |   | DWG. NO. FC1930-55     |                            |               |
| DRAWING REV. A   | ECN NO. 226253 | SHEET 2 OF 2  |   |                        |                            |               |

**Firetrol<sup>®</sup>**

LINE TERMINALS—WIRE CAPACITY AND QUANTITY (CU) 1

| MAXIMUM MOTOR HORSEPOWER |      |          |          |          |          | WIRE SIZE<br>(CU)<br>PER PHASE  | WIRE SIZE<br>SERVICE ENTRANCE<br>GROUND LUG (CU) <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">2</span> |
|--------------------------|------|----------|----------|----------|----------|---|--|
| 200V                     | 208V | 220-240V | 380-415V | 440-480V | 550-600V |   |  |
| 25                       | 25   | 30       | 50       | 60       | 75       | (1) #14 AWG—#1/0 AWG<br>(1) 2.5 MM <sup>2</sup> —50 MM <sup>2</sup>     | (2) #14 AWG—#2/0 AWG<br>(2) 2.5 MM <sup>2</sup> —70 MM <sup>2</sup>  |
| 30                       | 30   | 40       | 60       | 75       | 100      | (1) #2 AWG—#4/0 AWG<br>(1) 35 MM <sup>2</sup> —100 MM <sup>2</sup>      | (2) #14 AWG—#2/0 AWG<br>(2) 2.5 MM <sup>2</sup> —70 MM <sup>2</sup>  |
| 50                       | 50   | 60       | 100      | 125      | ---      | (1) #4 AWG—300 kcmil<br>(1) 25 MM <sup>2</sup> —150 MM <sup>2</sup>     | (2) #14 AWG—#2/0 AWG<br>(2) 2.5 MM <sup>2</sup> —70 MM <sup>2</sup>  |
| 60                       | 60   | ---      | ---      | 150      | 150      | (1) #6 AWG—350 kcmil<br>(1) 16 MM <sup>2</sup> —185 MM <sup>2</sup>     | (2) #6 AWG—250 kcmil<br>(2) 16 MM <sup>2</sup> —120 MM <sup>2</sup>  |
| 100                      | 100  | 100      | 150      | 250      | 300      | (1) 250 kcmil—500 kcmil<br>(1) 120 MM <sup>2</sup> —240 MM <sup>2</sup> | (2) #6 AWG—250 kcmil<br>(2) 16 MM <sup>2</sup> —120 MM <sup>2</sup>  |
| ---                      | 125  | 125      | 200      | ---      | ---      | (2) #3/0 AWG—250 kcmil<br>(2) 95 MM <sup>2</sup> —120 MM <sup>2</sup>   | (2) #6 AWG—250 kcmil<br>(2) 16 MM <sup>2</sup> —120 MM <sup>2</sup>  |
| 200                      | 200  | 250      | 350      | 500      | ---      | (3) #2/0 AWG—400 kcmil<br>(3) 70 MM <sup>2</sup> —200 MM <sup>2</sup>   | (2) #6 AWG—250 kcmil<br>(2) 16 MM <sup>2</sup> —120 MM <sup>2</sup>  |
| 250                      | 250  | 300      | 500      | 600      | ---      | (4) #4/0 AWG—500 kcmil<br>(4) 100 MM <sup>2</sup> —240 MM <sup>2</sup>  | (2) #6 AWG—250 kcmil<br>(2) 16 MM <sup>2</sup> —120 MM <sup>2</sup>  |

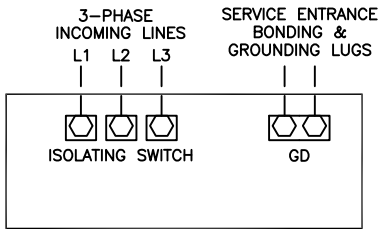
MOTOR TERMINALS—WIRE CAPACITY AND QUANTITY (CU) 1

| MAXIMUM MOTOR HORSEPOWER |      |          |          |          |          | WIRE SIZE<br>(CU)<br>PER PHASE  |
|--------------------------|------|----------|----------|----------|----------|---|
| 200V                     | 208V | 220-240V | 380-415V | 440-480V | 550-600V |   |
| 30                       | 30   | 40       | 60       | 75       | 100      | (1) #6 AWG—#2/0 AWG<br>(1) 16 MM <sup>2</sup> —70 MM <sup>2</sup>       |
| 50                       | 50   | 60       | 75       | 125      | 150      | (1) #6 AWG—250 kcmil<br>(1) 16 MM <sup>2</sup> —120 MM <sup>2</sup>     |
| 75                       | 75   | 100      | 150      | 200      | 250      | (1) #4 AWG—400 kcmil<br>(1) 25 MM <sup>2</sup> —200 MM <sup>2</sup>     |
| 100                      | 100  | ---      | ---      | 250      | 300      | (2) #4 AWG—500 kcmil<br>(2) 25 MM <sup>2</sup> —240 MM <sup>2</sup>     |
| 200                      | 200  | 200      | 350      | 500      | ---      | (2) 250 kcmil—500 kcmil<br>(2) 120 MM <sup>2</sup> —240 MM <sup>2</sup> |
| 250                      | 250  | 250      | 450      | 600      | ---      | (3) #2/0 AWG—500 kcmil<br>(3) 70 MM <sup>2</sup> —240 MM <sup>2</sup>   |

- 1 FOR CORRECT WIRE SIZING, REFER TO **NATIONAL ELECTRICAL CODE**, NFPA 70.
- 2 WHEN REQUIRED BY AUTHORITY HAVING JURISDICTION.



|   |      |   |   |         |                 |              |                            |                               |
|---|------|---|---|---------|-----------------|--------------|----------------------------|-------------------------------|
| UPDATED LINE TERMINAL HP / VOLTAGE CHART  |      |   |   | B       | 235649          | JC           | TEF                        | 02/13/12                      |
| SEE ECN   |      |   |   | A       | 228839          | TEF          | TEF                        | 09/02/10                      |
| PROJECT NAME:   |      |   |   | REV. TO | ECN NO.         | BY           | APP.                       | DATE                          |
| FIELD CONNECTIONS   |      |   |   | FTA1930 |                 |              |                            | <br>THIRD ANGLE<br>PROJECTION |
| SOLID STATE REDUCED CURRENT FIRE PUMP CONTROLLER<br>LINE AND MOTOR FIELD WIRE TERMINAL CAPACITY |      |   |   |         |                 |              |                            |                               |
| BY  | DATE | MANUFACTURING TOLERANCES TO BE IN ACCORDANCE WITH ASCO PROCEDURE MP-1-003. FOR PLASTIC PARTS SEE MP-1-055 |   |         | ASSEM. REF. NO. |              | COMPUTER GENERATED DRAWING |                               |
| DRAWN BY  | TEF  | 05-06-02  |   |         |                 | SCALE 1:1    |                            | SIZE A                        |
| CHECKED   |      |   | PROPERTY OF ASCO POWER TECHNOLOGIES. USE PERMITTED FOR OUR WORK ONLY. ALL RIGHTS OF DESIGN OR INVENTION ARE RESERVED. |         |                 | DWG. NO.     |                            |                               |
| PROJECT APPROVAL  |      |   |   |         |                 | FC1900-51    |                            |                               |
| FINAL APPROVAL  | TEF  | 05-06-02  | ASCO POWER TECHNOLOGIES, L.P.<br>FLORHAM PARK, NEW JERSEY 07932 U.S.A.  |         |                 | DRAWING REV. | B                          | ECN NO. 235649 SHEET 1 OF 1   |



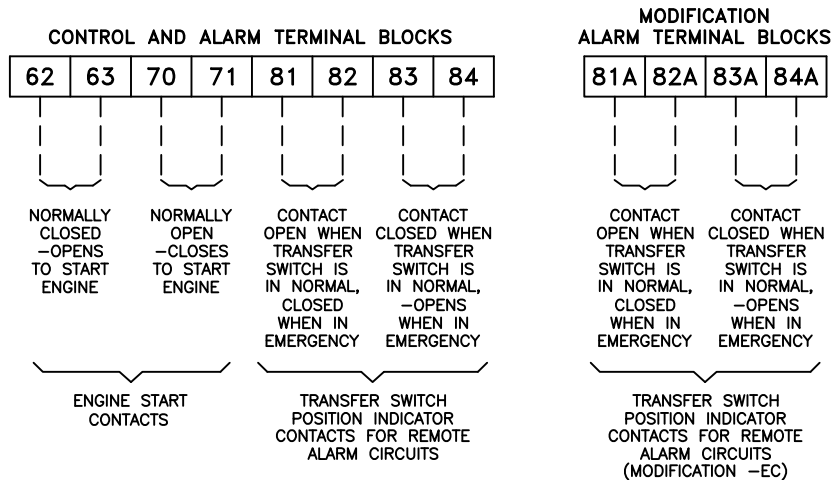
**NOTE**  
Incoming line terminals are provided to accommodate wire sizes at 125% of motor full load current per NFPA 70, *National Electrical Code*, Table 430-250, Section 695.6(c), and Table 310-16, 75° rated Copper conductors.

**-USE COPPER CONDUCTORS ONLY-**

**LINE TERMINALS—WIRE CAPACITY AND QUANTITY (CU)** <sup>1</sup>

| MAXIMUM MOTOR HORSEPOWER |      |          |          |          |          | WIRE SIZE (CU) PER PHASE  | WIRE SIZE SERVICE ENTRANCE GROUND LUG (CU) <sup>2</sup>             |
|--------------------------|------|----------|----------|----------|----------|---|---|
| 200V                     | 208V | 220-240V | 380-415V | 440-480V | 550-600V |   |   |
| 25                       | 25   | 30       | 50       | 60       | 75       | (1) #14 AWG-#1/0 AWG<br>(1) 2.5 MM <sup>2</sup> -50 MM <sup>2</sup>     | (2) #14 AWG-#2/0 AWG<br>(2) 2.5 MM <sup>2</sup> -70 MM <sup>2</sup> |
| 30                       | 30   | 40       | 60       | 75       | 100      | (1) #2 AWG-#4/0 AWG<br>(1) 35 MM <sup>2</sup> -100 MM <sup>2</sup>      | (2) #14 AWG-#2/0 AWG<br>(2) 2.5 MM <sup>2</sup> -70 MM <sup>2</sup> |
| 50                       | 50   | 60       | 100      | 125      | ---      | (1) #4 AWG-300 kcmil<br>(1) 25 MM <sup>2</sup> -150 MM <sup>2</sup>     | (2) #14 AWG-#2/0 AWG<br>(2) 2.5 MM <sup>2</sup> -70 MM <sup>2</sup> |
| 60                       | 60   | ---      | ---      | 150      | 150      | (1) #6 AWG-350 kcmil<br>(1) 16 MM <sup>2</sup> -185 MM <sup>2</sup>     | (2) #6 AWG-250 kcmil<br>(2) 16 MM <sup>2</sup> -120 MM <sup>2</sup> |
| 100                      | 100  | 100      | 150      | 250      | 300      | (1) 250 kcmil-500 kcmil<br>(1) 120 MM <sup>2</sup> -240 MM <sup>2</sup> | (2) #6 AWG-250 kcmil<br>(2) 16 MM <sup>2</sup> -120 MM <sup>2</sup> |
| ---                      | 125  | 125      | 200      | ---      | ---      | (2) #3/0 AWG-250 kcmil<br>(2) 95 MM <sup>2</sup> -120 MM <sup>2</sup>   | (2) #6 AWG-250 kcmil<br>(2) 16 MM <sup>2</sup> -120 MM <sup>2</sup> |
| 200                      | 200  | 250      | 350      | 500      | 500      | (3) #2/0 AWG-400 kcmil<br>(3) 70 MM <sup>2</sup> -200 MM <sup>2</sup>   | (2) #6 AWG-250 kcmil<br>(2) 16 MM <sup>2</sup> -120 MM <sup>2</sup> |
| 250                      | 250  | 300      | 500      | 600      | ---      | (4) #4/0 AWG-500 kcmil<br>(4) 100 MM <sup>2</sup> -240 MM <sup>2</sup>  | (2) #6 AWG-250 kcmil<br>(2) 16 MM <sup>2</sup> -120 MM <sup>2</sup> |

- <sup>1</sup> FOR CORRECT WIRE SIZING, REFER TO *NATIONAL ELECTRICAL CODE*,
- <sup>2</sup> WHEN REQUIRED BY AUTHORITY *NFPA 70*, JURISDICTION.



NOTE: CONTROL AND ALARM TERMINALS FOR CUSTOMER CONNECTIONS REQUIRE 3.5MM SLOTTED SCREW DRIVER

-NOTE-  
ENGINE START CONTACT RATING  
1/2 AMP, 30VDC

| TERMINAL WIRE CAPACITY      |  |
|-----------------------------|--|
| TERMINAL TYPE               | WIRE SIZE                              |
| CONTROL AND ALARM TERMINALS | #14-12 AWG<br>[2.5-4 MM <sup>2</sup> ] |

-NOTE-  
ALARM CONTACT RATING  
PILOT DUTY  
240 VAC, 28 VDC  
5 AMP MAX. LOAD

|  |               |          |   |                            |  |
|--|---------------|----------|---|----------------------------|--|
| REVISED LINE TERMINAL CHART  | B             | 235649   | TEF   | TEF                        | 02/13/12   |
| REVISED LINE TERMINAL CHART  | A             | 228850   | TEF   | TEF                        | 09/02/10   |
| NEW ISSUE  | -             | 228636   | TEF   | TEF                        | 05/06/10   |
| PROJECT NAME:  | REV. TO SHEET | ECN NO.  | BY  | APP.                       | DATE   |
| FIELD CONNECTIONS  |               | FTA950   |   | <br>THIRD ANGLE PROJECTION |  |
| POWER TRANSFER SWITCH FOR GENERATOR OR SECOND UTILITY POWER SOURCE |               |          |   |                            |  |
| DRAWN BY   | BY            | DATE     | MANUFACTURING TOLERANCES TO BE IN ACCORDANCE WITH ASCO PROCEDURE MP-1-003. FOR PLASTIC PARTS SEE MP-1-055             |                            | ASSEM. REF. NO.  |
| CHECKED  |               |          | PROPERTY OF ASCO POWER TECHNOLOGIES. USE PERMITTED FOR OUR WORK ONLY. ALL RIGHTS OF DESIGN OR INVENTION ARE RESERVED. |                            | SCALE 1:1 SIZE A                                       |
| PROJECT APPROVAL   |               |          |   |                            | DWG. NO.   |
| FINAL APPROVAL   | TEF           | 05/06/10 | <br>ASCO POWER TECHNOLOGIES, L.P.<br>FLORHAM PARK, NEW JERSEY 07932 U.S.A.  |                            | WS950-55<br>DRAWING REV. B ECN NO. 235649 SHEET 1 OF 1 |

