



# TRANSPORTATION ELECTRICAL EQUIPMENT SPECIFICATIONS

## TEES 2009 ERRATA No.2



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**STATE OF CALIFORNIA  
DEPARTMENT OF TRANSPORTATION**



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The TEES dated March 12th, 2009, Chapter 4 (BBS) dated July 7, 2009 and Errata No. 1 dated January 21<sup>st</sup>, 2010 shall be modified as specified in this Errata No. 2.

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## 1.4.8 Thumb Screw Devices

Thumb Screw Devices (TSDs) shall be of the following type: retractable screw fastener with projecting stainless steel screw, spring and natural aluminum knob finish. (TSD No. 2 shall be flat black.)

TSD No.1 - 8-32 SOUTHCO #47-62-301-20 or equal.

TSD No.2 - 8-32 SOUTHCO #47-62-301-60 or equal.

TSD No.3 - M3 SOUTHCO #47-81-181-10 or equal.

## 1.4.9 PCB Modules

All PCB Modules shall be mounted vertically in their corresponding host assembly.

### 2.5.3 Functional Requirements

The Model 400N Ethernet Module shall interface to the 170 controller using controller's Main Port EIA-232.

The Main and User Serial Ports shall operate EIA-232 Asynchronous communications and shall support data rates of 1.2, 2.4, 9.6, 19.2, 38.4, 57.5 and 115.2Kbps. The Model 400N Ethernet Module Network Interface shall meet IEEE 802.3 and ANSI 8802-3 Standards and support 10/100 Mbps.

The Auxiliary Port shall be configurable to operate as a DCE or DTE.

The Model 400N shall have an option to enable or disable Dynamic DCD.

### 4.1.2 Battery Backup System Configuration

The Battery Backup System (BBS) shall include **(See A4-1 – BBS Block Diagram)**, but not be limited to the following:

Inverter /Charger	Installation Wiring Kit
Power Transfer Relay	Hardware Kit
Manual Bypass Switch	Battery Cable Harness
EIA mounting Brackets	Manuals

The Installation Wiring Kit shall include all necessary 10 AWG color-coded wiring for all required 18 AWG wiring for relays contacts, and a minimum of twenty (20), cable ties and/or adhesive backed panel mount style cable tie holders.

The Hardware Kit shall include all necessary bolts and washers for mounting all BBS components.

The Manuals shall include (2 each per BBS Unit) Operational and Maintenance Manuals.

### 4.3.4 Display

The BBS shall have a backlit LCD type display that is easily seen in both bright sunlight and in darkness. **The screen shall be a minimum of a 4 line display. The following information shall be displayed on a continuous basis; operating mode (STANDBY, Buck/Boost), utility input voltage, BBS output voltage, charger status, percent battery**

charge, battery voltage, BBS status (Standby, Backup, Buck, Boost), any alarms and faults, and relay status information.

#### **4.3.13 System Configuration Mode**

The BBS shall provide the user with a system configuration mode that would allow the user to view system configuration parameters on the front panel display. As a minimum, network settings shall be displayed under the systems configuration mode.

## CHAPTER 5-SECTION 1 GENERAL REQUIREMENTS

Delete Chapter 5-Section 1, Paragraph 5.1.4

## CHAPTER 5-SECTION 4 MODEL 242L TWO-CHANNEL DC ISOLATOR REQUIREMENTS

### 5.4.1 Model 242 DC Isolator Channel

The Model 242 DC Isolator Channel shall provide isolation between a VDC input circuit (external electrical switch closure) and the controller unit input. The minimum isolation shall be 1000 MegaOhms and 2,500 VDC measured between the input and the output of the same channel.

### 5.4.2 Test Switch

Each isolation channel shall have a front panel mounted test switch to simulate valid input. The test switch shall be a single-pole double-throw, three position CONTROL test switch: The position assignment shall be UP – constant ON; MIDDLE – OFF; and DOWN – momentary ON.

### 5.4.3 Power Source

The DC Isolator operating voltage shall be obtained from the cabinet's 24 VDC power supply. The isolator shall have an internal isolated dc-dc power supply supplying 20 +/- 4 VDC to the field input side of the isolation channels. This internal isolated power supply shall provide at least 1500 Vrms of isolation from the cabinet 24 VDC power supply. The isolator shall not draw more than 2.0 watts of DC power. PCB should be two layer design minimum, using plated-thru vias, and Gold Plated Fingers on Both Sides of PCB.

### 5.4.4 Onboard Jumper

An onboard two-post shunt jumper shall be provided to allow for minimized output durations of less than 100 ms when the jumper is in the OPEN position.

### 5.4.5 Channel Contact Closure Input

A valid channel input shall cause a channel Ground True Output to the controller unit of a minimum 100 ms in duration. A channel contact closure input of 5 ms or less shall not cause an output (ground true) to the controller. A contact closure between 5 and 10 ms may or may not cause an output to the controller. A contact closure input of 10 ms or greater shall cause an output to the controller. The output pulse width shall be a minimum of 100ms upon a valid input, unless onboard jumper is in the OPEN position, in which

case the output pulse width shall be minimized, and return to a false state immediately following completion of valid input.

#### **5.4.6 Field Input**

Each isolation channel field input shall be turned on (true) when a contact closure causes an input voltage of less than 8 VDC, and shall be turned off (false) when the contact opening causes the input voltage to exceed 12 VDC. Each input shall deliver no less than 15 mA nor more than 40 mA to an electrical contact closure or short from the power supply. Each input shall be provided with electrical transient protection.

#### **5.4.7 Outputs**

Each isolation channel output shall be an opt-isolated NPN open collector capable of sinking 50 mA at 30 Volts. The outputs shall be compatible with Model 2070 controller.

## **CHAPTER 5-SECTION 5**

### **MODEL 252 TWO-CHANNEL AC ISOLATOR**

#### **5.5.1 Model 252 Two-Channel AC Isolator**

The Model 252 Two-Channel AC Isolator shall contain 2 isolation channels which provide isolation between external 120 VAC input circuits and the controller unit input circuits.

#### **5.5.2 Channel Input Voltage “Von”**

A channel input voltage “Von” of 80 +/- 5 VAC applied for a minimum duration of 110 ms ± 10 ms shall cause an output (Ground True) to the controller unit.

#### **5.5.3 Channel Input Voltage “Voff”**

A channel input voltage “Voff” (Von minus 10 VAC) applied for a minimum duration of 110 ms ± 10ms shall cause an output (Ground False) to the controller unit.

#### **5.5.4 Post Jumper**

A two post jumper shall be provided to select inverted output states for Von and Voff. When in CLOSED position (Grounded) Von shall cause a Ground False output. An indicator shall be provided on the front panel labeled ‘RR’ which shall indicate a Voff input, Ground True output.

#### **5.5.5 Input Impedance**

The input impedance of each channel shall be between 6,000 - 15,000 Ohms at 60 Hz.

#### **5.5.6 Minimum Isolation**

The minimum isolation shall be 1000 MegaOhms between the input and output terminals at 500 AC applied voltage.

#### **5.5.7 Power Source**

The AC Isolator operating voltage shall be obtained from the cabinet’s 24 VDC power supply. The isolator shall not draw more than 2.0 watts of DC power. PCB should be two layer design minimum, using plated-thru vias, and Gold Plated Fingers on Both Sides of PCB.

#### **5.5.8 Outputs**

Each isolation channel output shall be an opt-isolated NPN open collector capable of sinking 50 mA at 30 Volts. The outputs shall be compatible with Model 2070 controller.

#### **5.5.9 Input Transient Protection**

Each isolation channel shall be provided with electrical transient protection.

**CHAPTER 6**  
**CABINET SPECIFICATIONS**  
**MODELS 332L, 334L, 336L, 342LX, 344LX & 346LX**

## CHAPTER 6-SECTION 1 GENERAL REQUIREMENTS AND CABINET MODEL COMPOSITION

### 6.1.1 Composition

Unless otherwise specified the model shall be furnished, ready for operation with the following composition.

### 6.1.2 Model 332L Cabinet

Model 332L Cabinet shall consist of:

Housing 1 B	Output File #1L
Mounting Cage 1	C1 Harness #1
Power Distribution Assembly #2L	Service Panel #1
Input Files I & J	Input Panel #1
C11 Harness	

### 6.1.1.1 Model 334L Cabinet

Model 334L Cabinet shall consist of:

Housing 1 B	PDA Assembly #3L
Mounting Cage 1	C1 Harness #2
Input File I	Service Panel #1
Input Panel #3	

### 6.1.1.2 Model 336L Cabinet

MODEL 336L CABINET shall consist of:

Housing 2	Output File #1L
Mounting Cage 2	C1 Harness #3
Power distribution Assembly #2L	Service Panel #2
Input File I	Input Panel #4
C11 Harness	

### 6.1.1.3 Model 342LX Cabinet

Model 342LX Cabinet shall consist of Housing 3 and two ITS Mounting Cages.  
First Mounting Cage shall consist of:

Power Distribution Assembly #2LX	C1 Harness #1
Input Files LX I & J	Service Panel #1
Output File #1LX	Input Panel #1
C11 Harness	

Second Mounting Cage shall consist of:

(2) Blank Side Panels	(2) Shelves
Service / PDA Assembly	

**6.1.1.4 Model 344LX Cabinet**

Model 344L Cabinet shall consist of Housing 3 and two ITS Mounting Cages.

First Mounting Cage shall consist of:

- |                   |                  |
|-------------------|------------------|
| Input File LX I   | C1 Harness #2    |
| Input Panel #3    | Service Panel #1 |
| PDA Assembly #3LX |                  |

Second Mounting Cage shall consist of:

- |                        |             |
|------------------------|-------------|
| (2) Blank Side Panels  | (2) Shelves |
| Service / PDA Assembly |             |

**6.1.1.5 Model 346LX Cabinet**

Model 346LX Cabinet shall consist of Housing 4 and two ITS Mounting Cages.

First Mounting Cage shall consist of:

- |                                  |                  |
|----------------------------------|------------------|
| Power Distribution Assembly #2LS | C1 Harness #3    |
| Input Files LX I                 | Service Panel #2 |
| Output File #1LX                 | Input Panel #4   |
| C11 Harness                      |                  |

**6.1.1.6 Assemblies and Files**

All assemblies and files shall be mounted on the cage mounting rails per cabinet model detail. Cabinet model interface wiring shall be per specified C1 Harness, detailed wiring lists and required One Line Wiring.

**6.1.3 Cabinet Shipping Requirements**

The cabinet shall be delivered mounted on a plywood shipping pallet. The pallet shall be bolted to the cabinet base. The cabinet shall be enclosed in a slipcover cardboard packing shell. The housing doors shall be blocked to prevent movement during transportation.

**6.1.4 Cabinet Adaptors**

When specified, adaptors shall be provided. The adaptor shall be fabricated of the same material and finish as the cabinet housing.

**6.1.5 Stainless Steel**

All bolts, nuts, washers, screws (size 8 or larger), hinges and hinge pins shall be stainless steel unless otherwise specified.

**6.1.6 Cage Mounting**

A cage mounting clear area for the controller unit shall be provided. The area shall extend 1.5 inches in front of and 16 inches behind the front EIA mounting angles.

**6.1.7 Protection**

All conductors, terminals and parts which could be hazardous to maintenance personnel shall be protected with suitable insulating material.

## CHAPTER 6-SECTION 2 HOUSING REQUIREMENTS

### 6.2.1 Housing

The housing shall include, but not be limited to, the following:

Enclosure	Police Panel
Doors	Ventilization
Latches/Locks	Gasketing
Hinges and Door Catches	Cage Supports and Mounting

### 6.2.2 Housing Construction

#### 6.2.2.1 Waterproof

The housing shall be rainproof with the top of the enclosure crowned to prevent standing water. It shall have single front and rear doors, each equipped with a lock.

#### 6.2.2.2 Fabricating

The enclosure, doors, lifting eyes, gasket channels, police panel, and all supports welded to the enclosure and doors shall be fabricated of 0.125 in minimum thickness aluminum sheet. Bolted on supports shall be either the same material and thickness as the enclosure or 0.105 in minimum steel. **The side panels and filter shell shall be fabricated of 0.125 in minimum thickness aluminum sheet.**

#### 6.2.2.3 Exterior

All exterior seams for enclosure and doors shall be continuously welded and shall be smooth. All edges shall be filed to a radius of 0.03125 in minimum. Exterior cabinet welds shall be done by gas Tungston arc TIG process only. ER5356 aluminum alloy bare welding electrodes conforming to AWS A5.10 requirements shall be used for welding on aluminum. Procedures, welders and welding operators shall conform to the requirements and practices in AWS B3.0 and C5.6 for aluminum. Internal cabinet welds shall be done by either gas metal arc MIG or gas Tungston arc TIG Process.

#### 6.2.2.4 Aluminum surfaces

Aluminum surfaces shall conform to the following:

##### 6.2.2.4.1 Anodic Coating

An anodic coating shall be applied to the aluminum surface after the surface has been cleaned and etched. The cleaning and etching procedure shall be to immerse in inhibited alkaline cleaner at 159.8 °F for 5 minutes (Oakite 61A, Diversey 909 or equivalent in mix of 6 ounces to 8 ounces per gallon to distilled water). Rinse in cold water. Etch in a sodium solution at 150.8 °F for 5 minutes 0.5 ounce sodium fluoride plus 5 ounces of sodium hydroxide mix per gallon to distilled water. Rinse in cold water. Desmut in a 50% by volume nitric acid solution at 68 °F for 2 minutes. Rinse in cold water.

##### 6.2.2.4.2 Conforming

The anodic coating shall conform to MIL-A-8625F (Anodic Coatings for Aluminum and Aluminum Alloys) for Type II, Class I Coating except the outer housing surface coating shall have a 0.0007 inch minimum thickness and a 0.952 ounces per square inch minimum coating weight. The anodic coating shall be sealed in a 5% aqueous solution of nickel acetate (PH 5.0 to 6.5) for 15 minutes at 210.2 °F.

#### **6.2.2.4.3 Powder Coating**

The Model 342LX, 344LX and 346LX Cabinets shall be Powder Coated with a coating that is at least 2 mils thick. The color shall be an Aluminum finish, Federal Standard 595C, # 17178.

#### **6.2.2.5 Enclosure Doorframes**

The enclosure doorframes shall be double flanged out on all 4 sides and shall have strikers to hold tension on and form a firm seal between the door gasketing and the frame. The dimension between the door edge and the enclosure external surface when the door is closed and locked shall be 0.156 (+/- 0.08) in.

#### **6.2.2.6 Gasketing**

Gasketing shall be provided on all door openings and shall be dust-tight. Gaskets shall be 0.25 inch minimum thickness closed cell neoprene or silicone (BOYD R-10480 or equal) and shall be permanently bonded to the metal. If neoprene is used the mating surface of the gasketing shall be covered with a silicone lubricant to prevent sticking to the mating metal surface. A Gasket Top Channel shall be provided to support the top gasket on the door (prevent gasket gravitational fatigue).

#### **6.2.2.7 Cage Bottom Support Mounting Angles**

##### **The Model 332L, 334L & 336L**

Cage bottom support mounting angles shall be provided on either side, level with the bottom edge of the door opening, for horizontal support and bolt attachment; side cage supports shall be provided for the bracket cage supports; and bracket cage support attachments.

##### **Model 342LX , 344LX and 346LX**

Cage bottom supports shall be provided on either side, level with the bottom edge of the door opening, for horizontal support and bolt attachment. In addition, side cage supports shall be provided for the upper cage bolt attachments. Spacer brackets between the side cage supports and the cage shall be a minimum thickness of either 0.188 in aluminum or 0.105 in steel.

#### **6.2.2.8 Lifting Eyes**

The housing shall be provided with 2 lifting eyes for placing the cabinet on its foundation. Each eye opening shall have a minimum diameter of 0.75 in. Each eye shall be able to support a weight load of 1000 pounds.

#### **6.2.2.9 Exterior Bolt Heads**

All exterior bolt heads shall be tamperproof type.

## **6.2.3 Door Latches & Locks**

### **6.2.3.1 Latching Handles**

The latching handles shall have provision for padlocking in the closed position. Each handle shall be 0.75 in minimum diameter stainless steel with a minimum 0.5 in shank. The padlocking attachment shall be placed at 4.0 in from the handle shank center to clear the lock and key. An additional 4.0 in minimum gripping length shall be provided.

### **6.2.3.2 Latching Mechanism**

The latching mechanism shall be a three-point draw roller type. The pushrods shall be turned edgewise at the outward supports and have a cross section of 0.25 in thick by 0.75 in wide, minimum.

### **6.2.3.3 Locks and Handles for Model 332L, 334L and 336L**

When the door is closed and latched, the door shall be locked. The locks and handles shall be on the right side of the front door and left side of the rear door. The lock and lock support shall be rigidly mounted on the door. In the locked position, the bolt throw shall extend a minimum of  $0.25 \pm 0.03125$  in into the latch Cam area. A seal shall be provided to prevent dust or water entry through the lock opening.

### **6.2.3.4 Locks**

The locks shall be Corbin 2 type, or equal. **Two keys shall be supplied with each cabinet.** The keys shall be removable in the locked position only.

### **6.2.3.5 Bolts**

The locks shall have rectangular, spring-loaded bolts. The bolts shall have a 0.281 in throw and shall be 0.75 in wide by 0.75 in thick (tolerance is  $\pm 0.035$  in).

### **6.2.3.6 Center Latch Cam**

The center latch cam shall be fabricated of a minimum thickness 0.1875 in steel or aluminum. The bolt surface shall horizontally cover the cam thickness. The cam shall be structured to only allow the door to open when the handle is moved toward the center of the door.

### **6.2.3.7 Rollers**

Rollers shall have a minimum diameter of 0.875 in with nylon wheels and steel ball bearings.

## **6.2.4 Ventilation**

The housing ventilation including intake, exhaust, filtration, fan assembly and environmental control are as follows:

### **6.2.4.1 Front Door**

The **Model 332L, 334L and 336L** front door shall be provided with louvered vents. The louvered vent depth shall be a maximum of 0.25 in. A removable and reusable air filter shall be housed behind the door vents. The filter filtration area shall cover the vent opening area. A filter shell shall be provided that fits over the filter providing mechanical

support for the filter. The shell shall be louvered to direct the incoming air downward. The shell sides and top shall be bent over a minimum of 0.25 in to house the filter. The filter resident in its shell shall be held firmly in place with a bottom bracket and a spring loaded upper clamp. No incoming air shall bypass the filter. The bottom filter bracket shall be formed into a waterproof sump with drain holes to the outside housing. **The Model 342LX, 344LX and 346LX left front door and right rear door shall be provided with louver vents.**

#### **6.2.4.2 Intake and Exhaust Areas**

The intake (including filter with shell) and exhaust areas shall pass a minimum of 60 cubic feet of air per minute for housing #1, 26 cubic feet of air per minute for housing #2 **and 120 cubic feet of air per minute for housing #3.**

#### **6.2.4.3 Electric Fan**

The **Model 332L, 334L and 336L** housing shall be equipped with an AC powered electric fan with ball or roller bearings and a capacity of at least 100 cubic feet of free air delivery per minute. The fan shall be mounted within the housing and vented. **The Model 342LX, 344LX and 346LX housing shall be equipped with two AC powered electric fans.**

#### **6.2.4.4 Temperature Controlling**

**Each** fan shall be thermostatically controlled and shall be manually adjustable to turn on between 32 °F and 140 °F with a differential of not more than 20 °F between automatic turn on and off. The fan circuit shall be protected at 125% of the fan motor ampacity. The manual adjustment shall be graded in 20 °F increment scale. The Thermostat shall be an Omega KT01101141900 or equal.

#### **6.2.4.5 Filter**

The filter shall be 16 in wide by 12 in high by 0.875 in thick. The filter shall be an ECO-AIR Products E35S or equal.

### **6.2.5 Hinges & Door Catches**

#### **6.2.5.1 Leave Hinges**

Two-bolt per leave hinges shall be provided to bolt the enclosure to the door. Housing **1B and 3** shall have 4 hinges and Housing 2 three hinges. Each hinge shall be 3.5 in minimum length and have a fixed pin. The pin ends shall be welded to the hinge and ground smooth. The pins and bolts shall be covered by the door edge and not accessible when the door is closed.

#### **6.2.5.2 Front and Rear Doors**

Front and rear doors shall be provided with catches to hold the door open at both 90 and 180 ±10 degrees. The catch minimum diameter shall be either 0.375 in for plated steel or aluminum rods or 0.25 in for Stainless steel. The catches shall be capable of holding the door open at 90 degrees in a 60 mph wind acting at an angle perpendicular to the plane of the door.

## **6.2.6 Police Panel**

### **6.2.6.1 Police Panel Assembly**

A police panel assembly shall be provided to allow the police officers limited access to intersection control. **The police panel assembly including switches shall not extend into the cabinet more than 2.5 in.**

### **6.2.6.2 Police Panel Door**

The police panel door shall be equipped with a lock. The lock shall be keyed for a master police key. One key shall be furnished with each police lock. Each police key shall have a shaft at least 1.75 inches in length.

### **6.2.6.3 Toggle Power Switches**

The police panel shall contain 2 DPST Toggle Power Switches.

#### **6.2.6.3.1 Model 334L and 344LX**

One switch shall be labeled "ON-OFF LIGHTS" and the other "POLICE CONTROL ON-OFF".

#### **6.2.6.3.2 Models 332L, 336L, 342LX and 346LX**

One switch shall be labeled "ON-OFF" and the other "FLASH/AUTOMATIC".

#### **6.2.6.3.3 Front and Back of the Panel**

The front and back of the panel shall be enclosed with a rigid metal covering so that no parts having line voltage are exposed.

#### **6.2.6.3.4 Panel Assembly**

The panel assembly shall have a drain to prevent water collecting within the assembly. The drain shall be channeled to the outside.

## CHAPTER 6-SECTION 3 CABINET CAGE REQUIREMENTS

### 6.3.1 EIA 19-inch Rack Cage

A standard EIA 19-in rack cage shall be installed inside the **Model 332L, 334L, and 336L** housing for mounting of the controller unit and cabinet assemblies. Two standard EIA 19-in rack cages shall be installed inside the **Model 342LX, 344LX and 346LX** housing for mounting of the controller unit and cabinet assemblies.

### 6.3.2 EIA Cage Rack Portion

The EIA rack portion of the cage shall consist of 2 pairs of continuous, adjustable equipment mounting angles. The angles nominal thickness shall be either 0.1345 in plated steel or 0.105 Stainless Steel. The angles shall be tapped with 10-32 threads with EIA universal spacing. The angles shall comply with Standard EIA RS-310-D and shall be supported at the top and bottom by either welded or bolted support angles to form a cage.

### 6.3.3 Clearance

Clearance between rails for mounting assemblies shall be 17.75 in.

### 6.3.4 Angles

Two steel supporting angles extending from the front to the back rails shall be supplied to support the controller unit. The angles shall be designed to support a minimum of 50 pounds each. The horizontal side of each angle shall be a minimum of 3 in. The angles shall be vertically adjustable.

### 6.3.5 Cage

The cage shall be bolted to the cabinet at 4 points, via the housing cage supports and associated spacer brackets, 2 at the top and 2 at the bottom of the rails.

### 6.3.6 Cage Position

The cage(s) shall be centered within the cabinet(s).

## **CHAPTER 6-SECTION 4 CABINET ASSEMBLIES**

### **6.4.1 General**

#### **6.4.1.1 Equipment**

The following equipment shall be completely removable from the cabinet without removing any other equipment and using only a slotted or Phillips screwdriver:

- Power Supply Assembly
- Power Distribution Assembly
- Input File
- Output File
- Monitor Unit Assembly

#### **6.4.1.2 Fuses, Circuit Breakers, Switches and Indicators**

All fuses, circuit breakers, switches (except Police Panel Switches and Fan Fuse) and indicators shall be readily visible and accessible when the cabinet front door is open.

#### **6.4.1.3 Equipment in the Cabinet**

All equipment in the cabinet, when required shall be clearly and permanently labeled. The marker strips shall be made of material that can be easily and legibly written on using a pencil or ballpoint pen. Marker strips shall be located immediately below the item they are to identify and must be clearly visible with the items installed.

#### **6.4.1.4 Resistor-Capacitor Transient Suppression**

Resistor-capacitor transient suppression shall be provided at all AC relay sockets (across relay coil) except for the Flash Transfer Relays (FTR) in the output files where one suppression device may be common for all.

#### **6.4.1.5 Leakage Resistor**

A leakage resistor, which permits a small amount of current to pass through the heavy duty relay coil, shall be installed across the terminals of a relay socket to overcome the residual magnetism.

#### **6.4.1.6 Assembly**

Assembly or file depth dimension shall include terminal blocks.

#### **6.4.1.7 Air Circulation**

All assemblies and files shall allow air circulation through its top and bottom unless specifically called out otherwise.

#### **6.4.1.8 Socket Types**

Socket types for the following equipment shall be

Switch Pack	BEAU S-5412-XX (or equal)
Heavy Duty Relay	BEAU S-5408-XX (or equal)
Flasher Unit & Power Sup Mod	BEAU S-5406-XX (or equal)
208 Monitor Unit	PCB 22/44S
210 Monitor Unit	PCB 28/56S

#### 6.4.1.9 Mounting

Connector sockets for Flasher Unit, Power Supply, and Switch Pack modules shall be mounted with their front face 7.5 in deep from assembly or file front panel (Note: Output File Exception).

#### 6.4.1.10 Guides

Guides (Top and Bottom) shall be provided for Switch Pack Modules, Flasher Units, Monitor Unit, Watchdog Timer Module, Detector & Isolator Modules, and Power Supply Module (Bottom only). The guides shall begin 1.0±0.5 inches in from the front panel surface and extend to within 0.5 inches from the connector socket face.

#### 6.4.1.11 Fabricating

Assemblies and Files shall be fabricated of 0.060 in minimum thickness aluminum or stainless steel sheet. The metal surface shall be treated with clear chromate.

### 6.4.2 Power Supply Assembly

#### 6.4.2.1 Power Supply

A power supply shall be provided to supply +24 VDC to the Input and Output Files for use by their associated devices. The power supply shall be compliant with Chapter 3, Section 4 under Model 206L Power Supply Unit of these specifications.

### 6.4.3 Power Distribution Assembly (PDA)

#### 6.4.3.1 Equipment

The following equipment shall be provided with the power distribution assemblies:

##### 6.4.3.1.1 PDA #1L

- 1 -- Duplex NEMA 5-15R Controller Receptacle
- 2 -- Duplex NEMA 5-15R Equipment Receptacle (one with GFCI)
- 1 -- 1 Pole 15 Amperes minimum, 120 VAC Clean Power Circuit Breaker
- 1 -- 1 Pole 15 Amperes, 120 VAC Equipment Circuit Breaker
- 1 -- 6 Pole Ganged, 10 Amperes, 120 VAC Signal Bus Circuit Breaker
- 1 -- 2 Pole Ganged, 10 Amperes, 120 VAC Flash Bus Circuit Breaker
- 1 -- Solid State Relay (Normally Closed) - rated minimum 50 Amperes, 120 VAC, Crydom A2450-B or equal.
- 2 -- Model 204 Flasher Unit and Socket
- 1 -- AUTO/FLASH Control Switch

- 1 -- FLASH Indicator Light
- 1 -- Model 430 Heavy Duty Relay (Transfer Relay) & Socket
- 2 -- 10 Position Terminal Blocks (TBK) T1 & T2

#### 6.4.3.1.2 PDA #2L/2LX

- 1 -- Duplex NEMA 5-15R Controller Receptacle
- 2 -- Duplex NEMA 5-15R Equipment Receptacle (one with GFCI)
- 1 -- 1 Pole 15 Amperes minimum, 120 VAC Signal Bus Circuit Breaker
- 1 -- 1 Pole 15 Amperes minimum, 120 VAC Clean Power Circuit Breaker
- 6 -- 1 Pole Ganged, 10 Amperes, 120 VAC Signal Bus Circuit Breaker with Auxiliary Switch
- 1 -- 1 Pole 15 Amperes, 120 VAC Equipment Circuit Breaker
- 1 -- 2 Pole Ganged, 10 Amperes, 120 VAC Flash Bus Circuit Breaker
- 1 -- Solid State Relay (Normally Closed) - rated minimum 50 Amperes, 120 VAC, A2450-B or equal.
- 2 -- Model 204 Flasher Unit and Socket
- 1 -- Model 206L Power Supply Module and Socket
- 1 -- AUTO/FLASH Control Switch
- 1 -- Flash On Indicator Light
- 3 -- 10 Position TBK T1, T2 & T4
- 1 -- 4 Position TBK T3
- 1 -- SSR Fault Indicator Light
- 1 --HI Health Indicator Relay
- 1 --K24 VDC Controlled Relay

#### 6.4.3.1.3 PDA #2LS

- 1 -- Duplex NEMA 5-15R Controller Receptacle
- 2 -- Duplex NEMA 5-15R Equipment Receptacle (one with GFCI)
- 1 -- 1 Pole 15 Amperes minimum, 120 VAC Signal Bus Circuit Breaker
- 1 -- 1 Pole 15 Amperes minimum, 120 VAC Clean Power Circuit Breaker
- 6 -- 1 Pole Ganged, 10 Amperes, 120 VAC Signal Bus Circuit Breaker with Auxiliary Switch
- 1 -- 1 Pole 15 Amperes, 120 VAC Equipment Circuit Breaker
- 1 -- 2 Pole Ganged, 10 Amperes, 120 VAC Flash Bus Circuit Breaker
- 1 -- Solid State Relay (Normally Closed) - rated minimum 50 Amperes, 120 VAC, A2450-B or equal.
- 2 -- Model 204 Flasher Unit and Socket
- 1 -- **Model 206LS Power Supply Module and Socket**
- 1 -- AUTO/FLASH Control Switch
- 1 -- Flash On Indicator Light
- 3 -- 10 Position TBK T1, T2 & T4
- 1 -- 4 Position TBK T3
- 1 -- SSR Fault Indicator Light
- 1 --HI Health Indicator Relay

1 --K24 VDC Controlled Relay

#### 6.4.3.1.4 PDA #3L/3LX

- 1 -- Duplex NEMA 5-15R Controller Receptacle
- 2 -- Duplex NEMA 5-15R Equipment Receptacle
- 1 -- 1 Pole 15 Amperes, 120 VAC Equip. Circuit Breaker
- 2 -- 1 Pole 10 Amperes, 120 VAC Field Circuit Breakers
- 1 -- 1 Pole 15 Amperes, 120 VAC Clean Power CB
- 1 -- Model 206L Power Supply Module and Socket
- 1 -- Model 208 Monitor Unit and Socket
- 1 -- Model 430 Heavy Duty Relay and Socket  
(Transfer Relay)
- 1 -- Watchdog Timer ON/OFF-RESET Control Switch
- 3 -- Model 200 Switch Pack Sockets
- 3 -- 10 Position TBK T1, T2 & T4
- 1 -- 4 Position TBK T3

#### 6.4.3.2 Rating of Breakers

Rating of breakers shall be shown on face of breaker or handle. Breaker function shall be labeled below breakers on front panel.

#### 6.4.3.3 Equipment Receptacle

The first equipment receptacle in the circuit shall have ground-fault circuit interruption as defined in the National Electrical Code. Circuit interruption shall occur on 6 mA of ground-fault current and shall not occur on less than 4 mA of ground-fault current.

#### 6.4.3.4 AUTO/FLASH Switch

The AUTO/FLASH Switch when placed in FLASH position (down) shall energize the Solid State Relay (SSR). When the switch is placed in the AUTO Position (up) the switch packs shall control the signal indications. The switch shall be a SPST Toggle Control Switch.

#### 6.4.3.5 FLASH Indicator Light

The FLASH Indicator Light labeled "Flash On" shall be mounted on the PDA Front Panel. The lamp shall be driven by Flasher Unit/Output through Flash Relay Circuit No. 1 or per Circuit Breaker.

#### 6.4.3.6 SSR Fault Indicator Light

The SSR Fault Indicator Light labeled “SSR Fault” shall be mounted on the PDA Front Panel. The lamp shall be driven by the SSR output when the Health Indicator Relay is energized.

#### **6.4.3.7 Conductors**

All conductors from the power distribution assembly routed to the cabinet wiring shall be connected to the terminal block on the common side, except for the AC power conductor between the service terminal block and main circuit breaker. All internal conductors terminating at the blocks shall be connected to the other side of the blocks.

#### **6.4.3.8 Ganged Circuit Breakers**

Ganged Circuit Breakers shall be certified by the circuit breaker manufacturer that their circuit breakers shall gang trip.

#### **6.4.3.9 Monitor Unit**

The Monitor Unit ON/OFF-RESET Switch shall be a DPST Toggle Control mounted on the PDA #3L's front panel. When placed in DOWN Position (OFF-RESET) a grounded input shall be presented at the Monitor Unit Pin 22 (resetting the WDT Circuitry) and the other side switch circuit closes by passing the Monitor Unit.

#### **6.4.3.10 Circuit Breaker with Auxiliary Switch**

##### **6.4.3.10.1 Single Pole**

Six Single Pole 10 Ampere Circuit Breakers with Auxiliary Switch Feature and Medium Trip Delay Characteristic shall be provided.

##### **6.4.3.10.2 Breakers**

The six breakers shall be wired and routed per the Option One Line Diagram. The breaker auxiliary switch circuit shall be open when the breaker is in ON Position. The auxiliary circuits shall be wired in parallel so that any tripped breaker shall energize the Solid State Relay input, Flash Transfer Relay Coils and the "FLASH ON" Indicator. The Auxiliary Contacts shall be rated at 5 Amperes, 120 VAC Minimum (fast on type connection).

##### **6.4.3.10.3 Terminals**

Breaker switches shall be bussed using straight solid non-insulated bus wire which is soldered directly to the “fast-on” terminals.

#### **6.4.3.11 Model 206L/LS Power Supply Module**

##### **6.4.3.11.1 Requirements**

The module shall meet the requirements specified in 6.4.2.1.

##### **6.4.3.11.2 Module Chassis**

The module chassis shall be vented. Its top and sides shall be open except for unit supports

#### **6.4.3.11.3 PDA Assembly**

When resident in the PDA assembly, the module shall be held firmly in place by its stud screw, assembly connector support panel and a wing nut.

#### **6.4.3.11.4 Wire-Wound Power Resistors**

Two 0.5 Ohm, 10 watt minimum wire-wound power resistors with a 0.2uH inductance shall be provided (1 on the AC+ power line and 1 on the AC- line). Three MOV surge arrestors rated for 20 Joules minimum shall be supplied between AC+ and EG, AC- and EG, and between AC+ and AC-. A 0.68uF capacitor shall be placed across AC+ and AC- between the two power resistors and the MOV's.

#### **6.4.3.12 Terminal Screw Sizes**

Terminal screw size shall be 10-32 for TBK T1, T2 & T4 and 6-32 for TBK T3.

### **6.4.4 Input File**

#### **6.4.4.1 Depth**

The file shall have a maximum depth of 8.5 in and shall intermit with and support 14 two-channel detector sensor or isolator units.

#### **6.4.4.2 Connectors**

The file shall provide a PCB 22/44S connector centered vertically for each two-channel detector. The associated number and letter side connectors shall be shorted internally. Pins D, E, F, J, K, L and W shall be brought out to a 8 position terminal block on the back of the file. The output emitters shall be common grounded with the ground terminating at TB 15, Position 4. Position 8 of the terminal block is assigned to Equipment Ground and is used to terminate lead in shields.

#### **6.4.4.3 Marker Strips**

The input file shall be provided with marker strips to identify isolators and detectors in the file.

#### **6.4.4.4 Screw Size**

Terminal Block (TB) terminal screw size shall be 8-32.

### **6.4.5 Output File**

#### **6.4.5.1 General Requirements**

##### **6.4.5.1.1 Marker Strips**

The Output File shall be provided with marker strips to identify switch packs when mounted in the file.

##### **6.4.5.1.2 Connectors**

Switch pack connectors, monitor unit connectors, flash transfer relay sockets and flash programming connectors shall be accessible from the back of the Output File without the use of tools or removal of any other equipment.

#### **6.4.5.1.3 Terminal Positions**

TBK O1 and O3 terminal positions shall be labeled functionally. A permanent label reading "Channels 9 & 10 Separated" placed on the right Output File mounting flange.

#### **6.4.5.1.4 Field Wire**

Field wire terminal blocks shall be mounted vertically on the back of the assembly. Output File #1 shall have 3 terminal blocks with 12 positions and Output File #2 shall have 3 terminal blocks with 6 positions. Terminal position screw size shall be 10-32.

#### **6.4.5.1.5 Flash Transfer Relays**

The Flash Transfer Relays shall be Heavy Duty Type. The coil of the relay shall be energized only when the signals are in flashing operation and the police panel ON/OFF switch is ON. The relay shall transfer the field outputs from switch pack output to flash control. The transfer shall not interrupt the controller unit operation.

#### **6.4.5.1.6 Depth**

The depth of the file shall not exceed 14.5 in.

#### **6.4.5.1.7 Flash Programming Connectors**

The flash programming connectors shall be Molex Type 1375 or equal. The receptacle shall be mounted on the file with a programmable plug connected. The plug connector, with programming jumpers, shall be furnished for each circuit to allow red or yellow flash programming. Plug pins shall be crimped and soldered.

#### **6.4.5.1.8 TB O1,O2,O3& O4 Terminal Screw Sizes**

Terminal Block (TB) O1 and O3 terminal screw size shall be 8-32 and TBK O2 & O4 shall be 6-32.

### **6.4.5.2 Output File #1L**

#### **6.4.5.2.1 Containing**

The output file shall be capable of containing 12 Model 200 Switch Packs, 4 Flash Transfer Relays, and the Model 210 Monitor Unit. Four Flash Transfer Relays and 1 Model 210 Monitor Unit shall be furnished with each output file.

#### **6.4.5.2.2 Output Circuits**

The red and yellow output circuits of switch packs 1, 2, 3, 4, 5, 6, 7 and 8 shall be made available at individual pack Molex receptacle /plug connection for flash select-ability. Eight red & 4 yellow Molex Plugs shall be provided.

#### **6.4.5.2.3 Model 210 Monitor Unit**

It shall be possible to remove the Model 210 Monitor Unit without causing the intersection to go into flashing operation. The cabinet shall be wired so that with the front cabinet door closed and with the monitor unit removed, the intersection shall go into flashing operation (See One Line Diagram). The cabinet shall contain a conspicuous warning against operation with the Model 210 Monitor Unit removed.

#### **6.4.5.2.4 Monitor Unit Compartment**

The monitor unit compartment including the housed Model 210 Monitor Unit exclusive of handle shall extend no farther than 1.25 in front of the 19-in rack front surface. The switch pack socket connector front surface shall be no more than 8.5 inches in depth from the front surface of the output file.

#### **6.4.5.3 Output File #2L (Model 420)**

##### **6.4.5.3.1 Switch Packs and Flash Transfer Relays**

The Output File #2 shall be capable of containing 6 Model 200 Switch Packs and 2 Flash Transfer Relays. Two Flash Transfer Relays shall be provided with the file.

##### **6.4.5.3.2 Output Circuits**

The red and yellow output circuits of Switch Packs No. 1, 2, 4 and 5 shall be made available at a Molex receptacle/plug connection for flash select ability.

#### **6.4.5.4 Output File #1LX**

The Output File #1LX shall meet the requirements as specified in Section 6.4.5.2 except that it shall be touch safe as indicated in the plan details.

#### **6.4.5.5 Output File #2LX**

The Output File #2LX shall meet the requirements as specified in Section 6.4.5.3 except that it shall be touch safe as indicated in the plan details.

#### **6.4.6 Heavy Duty Relay (Model 430)**

##### **6.4.6.1 Electromechanical Type**

Heavy duty relays shall be the electromechanical type designed for continuous duty.

##### **6.4.6.2 Enclosing**

Each relay shall be enclosed in a removable, clear plastic cover. The manufacturer's name, electrical rating and part number shall be placed on the cover. They shall be permanent, durable and readily visible.

##### **6.4.6.3 DPDT Contacts**

Each relay shall be provided with DPDT contacts. Contact points shall be of fine silver, silver alloy or superior alternative material. Contact points and arms shall be capable of switching a 20 Amperes at 120 VAC tungsten load per contact once every 2 seconds with

a 50% duty cycle for at least 250,000 operations without contact welding or excessive burning, pitting or cavitation.

#### **6.4.6.4 Relay Coil**

The relay coil shall have a power consumption of 10 Volt-Amperes maximum.

#### **6.4.6.5 Potential & Surge Rating**

Each relay shall withstand a potential of 1500 VAC at 60 Hz between insulated parts and between current carrying or non-carrying parts. Each relay shall have a 1 cycle surge rating of 175 Amperes RMS.

#### **6.4.7 Side Panels**

##### **6.4.7.1 Viewing**

Two panels shall be provided and mounted on the cage parallel to the cabinet sides. In viewing from the back door, the left side panel shall be designated as the "Input Panel" and the right side panel shall be designated as the "Service Panel".

#### **6.4.8 Cabinet Harnesses**

##### **6.4.8.1 C1 Harness**

The C1 Harness shall be a minimum of 4 ft in length. The harness wire bundle shall be provided with external protection and routed on the Input Panel Side of the cabinet. Adequate length shall be provided to allow the C1P Connector to properly connect any State Approved **Model 2070** Controller Unit mounted in the cabinet.

##### **6.4.8.2 Ends**

One end of the C1 Harness shall be the C1P Connector with pin contacts wired per the detail assignment. The other ends of the harnesses shall terminate as follows:

Harness #1 - C4S Connector (connected to C4P on Output File #1)  
C5S Connector (connected to C5P on either the Input Panel or Output File #2)  
Assigned Input Files I & J Positions and Logic Ground Bus

Harness #2 - C5S Connector (same as Harness #1)  
C6S Connector (connected to C6P on the Output/PDA Assembly)  
Assigned Input File I Positions and Logic Ground Bus

Harness #3 - C4S Connector (same as Harness #1)  
Assigned Input File I Positions  
Input Panel Terminal Block and Logic Ground Bus

##### **6.4.8.3 C1 Harness #3/Output File #2 Adaptor**

C1 Harness #3/Output File #2 Adaptor shall be comprised of a C4P Connector on one end and a C5S on the other. The adaptor shall interface the first 24 pins of C4 Connector to the 24 pins of C5.

#### **6.4.8.4 Conductors**

Conductors between the C1 Connector and the Input File(s) shall be of adequate length to allow any conductor to be connected to any detector output terminal (Positions S, F, or W).

## **CHAPTER 6-SECTION 5 CABINET WIRING**

### **6.5.1 Cabinet Wiring Diagram**

#### **6.5.1.1 Diagrams/Drawings Supply**

Four sets of nonfading (comparable to Xerox 2080) cabinet wiring diagram and drawing sheets shall be supplied with each cabinet. The diagrams shall be nonproprietary. They shall identify all circuits in such a manner as to be readily interpreted. The cabinet drawing sheets shall show the equipment layout in an elevation view as viewed from the rear of the cabinet with the left and right cabinet walls shown in their relative positions. The diagram and drawing sheets shall be placed in a heavy duty side opening clear plastic pouch and attached to the front cabinet door.

#### **6.5.1.2 Pouch**

A pouch that would hold the Cabinet Manuals, Cabinet Wiring and Drawing Sheets, and Cabinet Keys shall be provided as part of the Cabinet.

The pouch shall be of such design and material that it provides adequate storage and access to the wiring diagram sheets and cabinet manuals. The pouch shall be of size and strength to easily hold the documents and keys without tearing.

#### **6.5.1.3 Manuals**

Two cabinet manuals shall be provided in the pouch together with the wiring diagram and drawing sheets.

### **6.5.2 Conductors**

#### **6.5.2.1 General**

All conductors used in cabinet wiring shall terminate with properly sized non-insulated (if used, for DC Logic Only) or clear insulated spring-spade type terminals except when soldered to a through-panel solder lug on the rear side of the terminal block or as specified otherwise. All crimp-style connectors shall be applied with a power tool which prevents opening of the handles until the crimp is completed.

#### **6.5.2.2 Sizes**

Conductors between the service terminal AC- and Equipment Ground and their associated bus, the equipment ground bus conductor to Power Distribution Assembly and cage rail, AC- Bus to Power Distribution Assembly shall be No. 8 or larger.

#### **6.5.2.3 Types**

All conductors unless otherwise specified shall be No. 22, or larger, with a minimum of 19 copper strands. Conductors shall conform to Military Specification: MIL-W-16878D, Type B, or better. The insulation shall have a minimum thickness of 10 mils and shall be

nylon jacketed polyvinyl chloride except that Conductors No. 14 and larger may have Type THHN insulation (without Nylon Jacket), and shall be stranded with a minimum of 7 copper strands.

#### **6.5.2.4 Labels**

All conductors, except those which can be readily traced, shall be labeled. Labels attached to each end of the conductor shall identify the destination of the other end of the conductor.

#### **6.5.2.5 Color-Code Requirements**

All conductors shall conform to the following color-code requirements:

##### **6.5.2.5.1 Grounded Conductors**

The grounded conductors of AC circuits shall be identified by a solid white or solid gray color.

##### **6.5.2.5.2 Equipment Grounding**

The equipment grounding conductors shall be identified by a solid green color or by a continuous green color with 1 or more yellow stripes.

##### **6.5.2.5.3 DC Logic Ground**

The DC logic ground conductors shall be identified by a continuous white color with a red stripe.

##### **6.5.2.5.4 Ungrounded AC+ Conductors**

The ungrounded AC+ conductors shall be identified by a solid black or continuous black with colored stripe.

##### **6.5.2.5.5 Logic Ungrounded Conductors**

The logic ungrounded conductors shall be identified by any color not specified above.

#### **6.5.2.6 DC Logic Ground and Equipment Ground**

Within the cabinet, the DC logic ground and equipment ground shall be electrically isolated from the AC grounded conductor and each other by 500 Mega Ohms when tested at 250 VDC.

#### **6.5.2.7 AC- Copper Terminal Bus**

The AC- copper terminal bus shall not be grounded to the cabinet or connected to logic ground. Nylon screws with a minimum diameter of 0.25 in shall be used for securing the bus to the service panel.

#### **6.5.2.8 Power Supply DC Ground**

The cabinet power supply DC Ground shall be connected to the DC logic ground bus using a No. 14, or larger, stranded copper wire.

#### **6.5.2.9 Input Terminal**

Each detector lead-in pair, from the field terminals in the cabinet to the sensor unit rack connector, shall be a cable of UL Type 2092 or better. The stranded tinned copper drain wire shall be connected to a terminal on the input file terminal block. This input terminal shall be connected to the equipment grounding bus through a single conductor.

### **6.5.3 Terminal Blocks**

#### **6.5.3.1 Terminal Screws**

The terminal blocks shall be barrier type rated at 20 Amperes, 600 volts RMS minimum. The terminal screws shall be 0.3125 in minimum length nickel plated brass binder head type with screw inserts of same material. Screw size is called out under associated cabinet assembly, file or side panel.

## **CHAPTER 6-SECTION 6 SERVICE PANEL ASSEMBLY**

### **6.6.1 General Requirements**

A Service Panel Assembly shall be provided. The assembly shall function as the entry point for AC Power to the cabinet including main and secondary circuit breakers, cabinet transient and voltage surge protection, clean power filtering, and Raw and Clean AC Power Sources.

### **6.6.2 Location**

The assembly shall be located on the lower right Cage when viewed from the back door.

### **6.6.3 Service Terminal Block**

The terminals of the Block shall be labeled AC+, AC-, AC+ In , AC+ Out and EQ GND and shall be covered with a clear insulating material to prevent inadvertent contact. The Terminating Lugs shall be large enough to accommodate # 2 conductors. A AWG #8 Jumper Conductor shall be provided between AC+ In and AC+ Out.

### **6.6.4 Surge Protector**

The surge protector shall be the EDCO Model SHA-1250 **ITS** or equal.

#### **6.6.4.1 Impulse Breakdown**

Less than 1,000 volts in less than 0.1 us at 10 kilovolts/us.

#### **6.6.4.2 Standby Current**

Less than 1 mA.

#### **6.6.4.3 Striking Voltage**

Greater than 212 VDC.

#### **6.6.4.4 Ranges**

Capable of withstanding 15 pulses of peak current each of which will rise in 8 us and fall in 20 us to 0.5 of the peak voltage at 3-minute intervals. Peak current rating shall be 20,000 Amperes.

## **CHAPTER 6-SECTION 7 SERVICE POWER DISTRIBUTION ASSEMBLY**

### **6.7.1 General Requirements**

A Service Power Distribution Assembly (Service PDA) shall be provided. The assembly shall function as the entry point for AC Power to the LX cabinets including main and secondary circuit breakers, cabinet transient and voltage surge protection, clean power filtering, and Raw and Clean AC Power Sources.

**6.7.2 Location**

The Service PDA shall be located on the lower left rack when viewed from the back door.

**6.7.3 Service Terminal Block**

The terminals of the Block shall be labeled AC+, AC-, EQ GND , AC+ , AC- and EQ GND and shall be covered with a clear insulating material to prevent inadvertent contact. The Terminating Lugs shall be large enough to accommodate # 2 conductors.

**6.7.4 Surge Protector**

The surge protector shall be the EDCO Model SHA-1250 **ITS** or equal.

**6.7.4.1 Impulse Breakdown**

Less than 1,000 volts in less than 0.1 us at 10 kilovolts/us.

**6.7.4.2 Standby Current**

Less than 1 mA.

**6.7.4.3 Striking Voltage**

Greater than 212 VDC.

**6.7.4.4 Ranges**

Capable of withstanding 15 pulses of peak current each of which will rise in 8 us and fall in 20 us to 0.5 of the peak voltage at 3-minute intervals. Peak current rating shall be 20,000 Amperes.

**CHAPTER 6-SECTION 8**  
**332L, 334L, 336L, 342LX, 344LX & 346LX CABINET DETAILS**

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## CHAPTER 9-SECTIONS 1, 2, 3, 4 & 5

### 9.1.1 Controller Unit

The Controller Unit shall be composed of the Unit Chassis, modules and assemblies per their version. The following is a list of 2070 Versions, their interface rolls and composition:

UNIT VERSION	DESCRIPTION
2070V UNIT	Provides directly driven VME and mates to 170 & ITS cabinets. It consists of: UNIT CHASSIS, 2070-1A TB, 2070-1A MCB, 2070-2E+ FI/O, 2070-3A FRONT PANEL, 2070-4A POWER SUPPLY, and 2070-5 VME CAGE ASSEMBLY.
2070E UNIT	LITE Unit mates to the 170 & ITS cabinets. It consists of: UNIT CHASSIS, 2070-1E CPU, 2070-2E+ (2C if ITS CABINET), FI/O, 2070-3B FRONT PANEL and 2070- 4A POWER SUPPLY
2070EC UNIT	LITE unit mates to ITS cabinets only. It consists of: UNIT CHASSIS, 2070-1E CPU, 2070-2E+ FI/O, 2070-3C FRONT PANEL and 2070-4A POWER SUPPLY
2070LX UNIT	LX Unit mates to the 170 & ITS cabinets. It consists of: UNIT CHASSIS, 2070-1C CPU, 2070-2E+ (2C if ITS CABINET), FI/O, 2070-3B FRONT PANEL and 2070- 4A POWER SUPPLY
Note: See Chapter 11 for 2070 NEMA Versions	

### 9.1.6 EIA-485 Communications Links

All circuitry associated with the EIA-485 Communications links shall be capable of reliably passing a minimum of 1.0 Mbps. Isolation circuitry shall be by **optical/digital isolator technologies**.

### 9.2.4.3 Ram Memory

A minimum of **32 MB of DRAM/pseudo SRAM** memory, organized in 32-bit words, shall be provided. A minimum of 512 KB of SRAM will be available for agency use, organized in 16 or 32-bit words shall be provided. The time from the presentation of valid RAM address, select lines, and data lines to the RAM device to the acceptance of data by the RAM device shall not exceed 80 ns and shall be less as required to fulfill zero wait state RAM device write access under all operational conditions.

### 9.2.4.6 CPU\_Reset

A software-driven CPU\_Reset signal (Active LOW) shall be provided to reset other controller systems, such as the FCU and FPA. The signal output shall be driver capable of sinking 30 mA at 30 VDC. Execution of the program module “cpureset” in the boot image shall assert the CPU\_Reset signal once. **The assertion of the CPU\_Reset signal shall cause the FCU firmware to reset. The FCU shall become operational and respond to the Modules Status Request with the P bit set, within 33ms after a firmware reset. The cpureset shall be executed when the controller starts up or is rebooted using the OS-9 break command.**

### 9.2.4.10 Network Switch, Model 2070 -1E

The Model 2070-1E CPU Module shall be provided with an integrated Store-and-Forward Network Switch per the IEEE 802.3, 802.3u and 802.3 x specifications. The switch shall be configured with two ports connected to the front panel RJ-45 connectors (C14S) and a third port shall be connected to the CPU. A fourth Port on the Network Switch shall be used to route, **via magnetics**, to Ethernet across the Motherboard to the “A” Connector’s Network Lines. DC Grounding around the network connectors and lines shall be provided. The Network Lines shall be assigned as: NetP5 TX+, TX-, RX+ and RX- respectively.

### 9.2.6 Datakey

When programmed, Byte 3 of the header shall contain the Key Type value as defined in the following table:

Key	Model No.	Memory Size	Sector Size	Part Number	Color
-----	-----------	-------------	-------------	-------------	-------

## Type

	DK1000	1Kb	2 Byte	611-0006-002A	Black
	LCK16000	16Kb	2 Byte	611-0070-008A	Gray
	SFK2Mb	2Mb	64KBytes	611-0089-004A	Yellow
	SFK4Mb	4Mb	64KBytes	611-0104-002A	Red
	SFK8Mb	8Mb	64KBytes	611-0132-006A	Blue
	SFK32Mb	32Mb	64KBytes	611-0164-005A	Green

### 9.2.7.1 Operating System

The CPU Module shall be supplied with Microware Embedded OS-9 Release 1.3.1 or later with kernel edition #380 or later. The following modules shall be included:

- Embedded OS-9 Real Time Kernel
- Sequential Character File Manager (SCF)
- Stacked Protocol File Manager (SPF)
- Pipe File Manager (PEMAN)
- Random Block File Manager (RBF)
- C Shared Library (CSL)

Boot Image shall include the following utility modules:

Break	Date	Deiniz	Devs	Free	Copy
Dir	Tmode	Edt	List	Load	Deldir
Dump	Del	Ident	Iniz	Irqs	Events
Echo	Format	Dcheck	Login	Link	Kermit
Tsmon	Mdir	Mfree	Pd	Makdir	Save
Attr	Rename	Procs	Unlink	Sleep	Xmode
Shell	Build	Setime	Merge	Grep	Mat
Tee	Printenv	Chown	Cudo	Mkdatmod	

The Boot Image with the above utilities and including the network driver and descriptor shall be loaded into RAM as part of OS-9 initialization as defined in Section 9.2.7.3.2.

### 9.2.7.2.2 Memory Drivers

Drivers shall be provided to access the FLASH, SRAM, and DRAM memories. The following descriptors shall apply:

/f0	FLASH drive	non-volatile, writeable
/dd	FLASH drive	OS-9 default device for /f0
/f0wp	FLASH Drive	as /f0 except write protected
/f0fmt	FLASH Drive	as /f0 except format enabled
/r0	SRAM Drive	non-volatile ramdisk
/r0fmt	SRAM Drive	as /r0 except format enabled
/r2	DRAM Drive	volatile 2 MB ramdisk, not automatically initialized

/r4	DRAM Drive	volatile 4 MB ramdisk, not automatically initialized
/r8	DRAM Drive	volatile 8 MB ramdisk, not automatically initialized

### 9.2.7.5.3 Multi-user functionality

The boot image init module shall be configured with a “default directory name” as /f0wp. This will allow login and tsmon to provide the user with login prompt from the terminal port or from the network via a telnet session.

The login and tsmon OS-9 modules should be included in the operating system boot image for the implementation of multi-user mode. A “.login” file with an entry of date shall be included in the /f0 directory. The attributes of the .login file shall be set using the command “attr -pwprwr .login “ and the ownership shall be set to group.user ID of “0.0”

The following startup file shall be provided resident in the /f0 directory. The startup file shall have the ownership group.user ID of “20.70”.

Include the following startup file:

```
*
*-t -np
*
* Startup File
*/f0/sys/startspf
*/f0/sys/startnfs
ex tsmon /sp4
*
*
```

### 9.2.7.5.4 Network Configuration

The modules inetdb, inetdb2 and rpcdb shall be generated by the make utility via the use of a makefile and the network configuration files residing the /f0/ETC directory. The generated inetdb, inetdb2 and rpcdb modules should be re-located to the /f0/CMDS/BOOTOBJS directory where they will be pick-up by the network configuration shell scripts located at /f0/SYS. The modules shall be configured with the network default values as defined in Section 9.2.6 (Data Key) or via the interfaces.conf shell script and all services shall be comment out in the Internet Daemon Services List inetd.conf located in the /f0/ETC directory.

### 9.2.7.5.6 ETC

A set of example configuration files consistent with the above networking modules shall be provided in the /f0/ETC directory. This directory shall contain following standard of OS-9 files: hosts, hosts.equiv, networks, protocols, services, inetd.conf, resolv.conf, hosts.conf, rpc, interfaces.conf, routes.conf., nfs.map, nfsd.map in addition to the following makefile:

Include the following makefile:

```
#####
###                               Model 2070 Controller
#
#                               Makefile
#####
# This makefile will make the inetdb,inetdb2 and rpcdb data modules
#
#
#####

-b
-bo

TRGTS      =      inetdb rpcdb
DEL        =      del -qf
COPY       =      copy
RPCDBGGEN  =      rpcdbgen
ATTR       =      attr -rweprpwpe
IDBGEN     =      idbgen
OS         =      OSK
CPU        =      68k

ODIR       =      /f0/CMDS/BOOTOBS
SDIR       =      /f0/ETC

SFILES     =      $(SDIR)/hosts $(SDIR)/hosts.equiv
$(SDIR)/protocols \
            $(SDIR)/networks $(SDIR)/services $(SDIR)/inetd.conf
\
            $(SDIR)/resolv.conf $(SDIR)/host.conf \
            $(SDIR)/interfaces.conf $(SDIR)/routes.conf
$(SDIR)/rpc
RFILES     =      $(SDIR)/nfs.map $(SDIR)/nfsd.map
RPCOPT     =      # -s -c -d

all: $(TRGTS)
      $(COPY) -f $? -w=$(ODIR)
      $(COPY) -f inetdb2 -w=$(ODIR)

rpcdb: $(RFILES)
      $(DEL) $@
      $(RPCDBGGEN) -to=$(OS) -tp=$(CPU) -w=$(SDIR) -o=$@ $(RPCOPT)
      $(ATTR) $@
```

```

inetdb: $(SFILES)
        $(DEL)  $@
        $(DEL)  $@2
        $(IDBGEN) -to=$(OS) -tp=$(CPU) -d=$(SDIR) $@
        $(ATTR)  $@
        $(ATTR)  $@2
clean:
        $(DEL)  $(ODIR)/inetdb
        $(DEL)  $(ODIR)/inetdb2
        $(DEL)  $(ODIR)/rpcdb

#####

```

### 9.2.7.6.1 Directories

The 2070 shall follow Standard Microware File System Configuration. A /f0/CMD5, /f0/CMD5/BOOTOBS, /f0/ETC and /f0/SYS directories shall be implemented. Execute permission shall be included in the attributes of files in the /f0/CMD5 directory. Sysgo should set its execution directory to /f0wp/CMD5 prior to spawning opexec or other processes. The /f0/CMD5/BOOTOBS shall contain the modules as identified above and other customizable descriptors and modules. **The /f0/SYS shall contain the files named “motd” and “errmsg” as defined elsewhere in this section and the following four standard OS-9 network configuration shell script files: startspf, startnfs, loadspf and loadnfs.**

**Include the following startspf file:**

```

*-t -np
*
* startspf
* Shell Script to Start SPF System
*
* Set default directories before starting daemon programs
*
* chd /h0
* chx /h0/cmds
*
* Load SPF modules
*
/f0/sys/loadspf
*
* Load and start mbuf handler (May be done via p2 list in init module)
* Allow for error returned in case sysmbuf is already initialized.
*
*-nx
* mbininstall
*-X
*
* Start SPF system using ipstart
*
ipstart

```

```

*
* Add interfaces not specified in inetdb2
*
*ifconfig enet0 <my_address> binding /<dev>/enet
*ifconfig ppp0 binding /ipcp0
*
* Add any static routes. Even if running routed it may be useful
*   to add multicast routes.
*
*route add -net 224.0.0.0 <my_address>
*
* Start service daemons
*   routed: Dynamic routing server
*   inetd: FTP/Telnet and other protocols server
*   telnetd: Remote terminal server
*   ftpd: Remote file-transfer server (FTP)
*   bootpd: Network boot protocol server
*   tftpd: Trivial file transfer protocol server
*
*routed <>>>/nil&
inetd <>>>/nil&
*telnetd <>>>/nil &
*ftpd <>>>/nil &
*bootpd /h0/TFTPBOOT/bootptab <>>>/nil&
*tftpd /h0/TFTPBOOT <>>>/nil &
*
*   spfndpd: Hawk User state debugging daemon
*   spfnppd: Hawk Profiling daemon
*
*spfndpd <>>>/nil &
*spfnppd <>>>/nil &
*
* End
*

```

**Include the following loadspf file:**

```

*-t -np
*
* loadspf for SPF LAN Communication Package
* Load SPF System Modules
*
load -d /f0wp/cmds/bootobjs/inetdb
load -d /f0wp/cmds/bootobjs/inetdb2
*load -d sysmbuf * System Mbuf module
load -d /f0wp/cmds/bootobjs/pkman
load -d /f0wp/cmds/bootobjs/pkdvr
load -d /f0wp/cmds/bootobjs/pk
load -d /f0wp/cmds/bootobjs/pks
*load -d spf * SPF file manager
load -d /f0wp/cmds/bootobjs/spip
load -d /f0wp/cmds/bootobjs/ip0
load -d /f0wp/cmds/bootobjs/sptcp
load -d /f0wp/cmds/bootobjs/tcp0
load -d /f0wp/cmds/bootobjs/spudp
load -d /f0wp/cmds/bootobjs/udp0

```

```

load -d /f0wp/cmds/bootobjs/spraw
load -d /f0wp/cmds/bootobjs/raw0
load -d /f0wp/cmds/bootobjs/sproute
load -d /f0wp/cmds/bootobjs/route0
*
* Load LAN Trap library and Commands
* Load one of the following Netdb name resolution trap handlers
*
*load -d /f0wp/cmds/bootobjs/netdb_local
*
* Load trap handler for DNS name resolution
*
load -d /f0wp/cmds/bootobjs/netdb_dns
*
* Load SPF Ethernet Drivers and Descriptors
*
load -d /f0wp/cmds/bootobjs/spenet
load -d /f0wp/cmds/bootobjs/enet

* Serial Drivers and Descriptors
*
*load -d spslip      spsl0          * Slip /t1
*load -d spipcp     ipcp0          * PPP IPCP
*load -d splcp      lcp0           * PPP LCP
*load -d sphdlc     hdlc0          * PPP HDLC
*chd ../..
*load -d chat pppd ppplog pppauth; chd BOOTOBS/SPF * PPP Utilities
*
*
* Chd up to CMDS directory
*
*load -d mbininstall          * Load mbininstall memory handler
*                             * (or can be done within init)
*
load -d /f0wp/cmds/ipstart
*
*
*load -d /f0wp/cmds/routed
*load -d telnet telnetd telnetdc      ;* Telnet support modules
*load -d ftp ftpd ftpdc               ;* FTP support modules
*load -d tftpd tftpd dc bootpd        ;* Bootp/TFTP support modules
load -d /f0wp/cmds/inetd

*load -d idbggen idbdump ndbmod      ;* Development tools
load -d /f0wp/cmds/ifconfig
load -d /f0wp/cmds/route
*load -d route hostname ifconfig arp ;* Runtime tools
load -d /f0/cmds/ping
load -d /f0/cmds/netstat
*
* Loads the Hawk Daemons.
*
*load -d /f0/cmds/spfndpd
*load -d /f0/cmds/ndpio
*load -d /f0/cmds/spfndpdc
*

```

```
* End
*
```

Include the following startnfs file:

```
*-t -np
*
* startnfs for NFS provided with LAN Communication Package
*
* Shell Script to Start NFS Client System and mount file systems
*
* NOTE: NFS client modules may be loaded into memory using loadnfs
*
chd /f0                ;* Set default directories for NFS mounts
chx /f0/cmds          ;* Programs are located in CMDS directory
SYS/loadnfs
*
* Start NFS client and mount remote file systems
*
iniz nfs_devices      ;* attach NFS client devices
*
* Example mount commands to connect to server systems remote device
*
*mount -m peer:/ /peer    ;* mount remote file systems
*mount alpha:/h0 /alpha <>>>/nil&
*mount electron:/home/joe/dat/Modules /h0 <>>>/nil&
*
* Start NFS Server System
*
*
* Specify file systems to export (Necessary if acting as a NFS Server)
*
*exportfs -s /f0          ;* specify remote mountable devices
*exportfs -s /r0          ;* specify remote mountable devices
*
* start rpc services daemons
* Uncomment portmap, mountd and nfsd if acting as a NFS Server
*
*portmap<>>>/nil&        ;* start portmap server      (rpcinfo)
*mountd<>>>/nil&         ;* mount server                (mount, showmount)
*nfsd<>>>/nil&           ;* nfs server                    (..)
*
* End
*
```

Include the following loadnfs file:

```
*-t -np
*
* loadnfs for NFS modules provided with LAN Communication Package
*
* Load NFS Client Modules
*
* chd /f0/cmds/bootobjs
```

```

* NFS file manager, driver and descriptor
load -d /f0wp/cmds/bootobjs/nfs
load -d /f0wp/cmds/bootobjs/nfsnul
load -d /f0wp/cmds/bootobjs/nfs_devices
load -d /f0wp/cmds/bootobjs/rpcdb
*
* Load NFS Client Commands
*
* chd /f0wp
*
*load -d nfsc      mount          * Client connection handler
*load -d rpcdbgen rpcdump nfsstat * RPC data module utilities
*load -d rpcinfo
*
* Load NFS Server Modules
*
*load -d exportfs portmap * NFS server required utilities/daemons
*load -d nfsd mountd      * NFS server required utilities/daemons
*load -d showmount
*
* Load RPC Client Modules
*
*load -d rcopy rload rpr on rup rusers spray
*
* Load RPC Server Modules
*
*load -d rldd rexdc rexd rstatd rusersd sprayd
*
*
* End
*

```

The motd file shall contain the Manufacturer's Name and TEES and Erratas Release information. The attributes of the motd file shall be set using the command `attr -pwprwr motd` and the ownership shall be set to group.user ID of "0.0"

Include the following motd file:

```

*****
*****      Manufacturer's Name          *****      **
**          TEES Release 2009, Errata No.1 and Errata No. 2
*****

```

The errmsg file shall be the standard OS-9 errormsg file which defines OS-9 error codes 000:001 through 010:068. The attributes of the errormsg file shall be set using the command `attr -pwprwr errormsg` and the ownership shall be set to group.user ID of "0.0"

### 9.2.7.6.2 Password

The /f0/SYS shall contain a "password" file with one entry, `reg user`. The password file should follow Microware's password file format for the addition and configuration of

multiuser functionality and password protection. A user account with the name “reg”, the password as “user” shall be defined as listed in the password file. The attributes of all files in the /f0/sys directory, except for those files as mentioned elsewhere in these specifications, shall be set using the following command:

```
$ attr -nprnpwnpenewr *  
and the ownership shall be group.user ID of “0.0”.
```

Include the following password file:

```
*  
* Password File  
* Model 2070 Controller*  
*  
reg,user,20.70,128,/f0wp/cmds,/f0,shell -p="Reg:"  
*  
*
```

A Termcap text file shall be include in the /f0/SYS directory. This Termcap file shall contain description fields defining the capability names and values of the front panel DISPLAY.

### 9.3.8.3 Outputs

Simultaneous assertion of all outputs shall occur within 100  $\mu$ s. Each output shall be capable of being individually configured in state to ON, OFF (Cases A and D), or an optional state synchronized with either phase of LINESYNC (Cases B and C). The condition of the outputs shall only be "ON" if the FI/O continues to receive active communications from the CPU Module. If there is no valid communications with the CPU Module for 2.0 seconds, all outputs shall revert to the OFF condition, and the Module Status Byte shall be updated to reflect the loss of communication from the CPU Module.

#### 9.3.8.4 Standard Function

Each output shall be controlled by the data and control bits in the CPU Module Field I/O frame protocol as follows:

**Output Bit Translation**

Case	Output Data Bit	Output Control Bit	Function
A	0	0	Output in the OFF state
B	1	1	Output is a square wave, synchronized to the LINESYNC signal. When LINESYNC is ON (1), the output is OFF, and when LINESYNC is OFF (0), the output is ON.
C	0	1	Output is a square wave, synchronized to the LINESYNC signal. When LINESYNC is ON (1), the output is ON, and when LINESYNC is OFF (0), the output is OFF
D	1	0	Output is in the ON state.

##### 9.3.8.4.1 Case A

In Case A above, the corresponding output shall be turned OFF if previously ON and if previously OFF remain OFF until otherwise configured. For **optional** half-cycle switching (Cases B and C), all outputs to be changed shall be changed within 50  $\mu$ s after the corresponding LINESYNC transition and shall remain in the same state during the entire half cycle. In Case D above, the corresponding output shall be turned ON if previously OFF and if previously ON **should** remain ON until otherwise configured. All outputs shall neither glitch nor change state unless configured to do so.

### 9.3.8.7 Communication Processing

This task shall be to process the command messages received from the CPU Module, prepare, and start the response transmission. **The response message transmission shall begin within 4 ms of the receipt of the last byte of the command message for all command message types.**

**Processing time for the Set Outputs command shall be less than 1.5ms. The FI/O shall be able to process 1000 Set Outputs command messages within 1.5 seconds, where each command toggles all outputs utilizing Case A and D as defined elsewhere in these specifications. Each output shall consist of a square wave with a 50% duty cycle and a time period of less than 3 ms.**

### 9.4.5.16 C50 Enable Function

C50 ENABLE function when grounded by Connector C50 Pins 1 and 5 shall be brought to Connector A1 Pin B21 for the purpose of disabling the module Channel 2.

### 9.5.5.1 AC Fail/Power Down Output Lines

The AC Fail/Power Down Output Lines shall go Low (ground true) immediately upon Power Failure. The Lines shall transition to High within 50 ms after both Power Restoration and supply is fully recovered. The Lines shall be driven separately. The Sysreset/Powerup Output Lines shall transition to Low 525 +/-25 ms after AC Fail/Power Down transition to Low. The Lines shall transition to HIGH 225 +/- 25 ms after both Power Restoration and the supply is fully recovered **(e.g. after +5 VDC is within the range specified in section 9.5.6)**. The Lines shall be driven separately.

**CHAPTER 10-SECTION 2  
MODEL 2070-7A & 7B ASYNC / SYNC  
SERIAL COMM MODULE**

**10.2.1 Circuits**

Two opto-isolated independent circuits designated circuits #1 (Channel 1) and circuits #2 (Channel 2), shall be provided. Their functions are identical, except for the CPU Serial Communications Port and external connector (circuits #1 to SP1 [or SP3] and Connector C21S and circuits #2 to SP2 [or SP4] and Connector C22S). Line drivers/receivers shall be socket or surface mounted.

The 2070-7x module's isolation circuitry shall be capable of reliably passing a minimum of 1.0 Mbps. The EIA-485 drivers to the external connectors must be capable of supporting either two times the maximum applicable baud rate for the port or 1Mbps, which ever is less. The EIA-232 drivers to the external connectors must be capable of supporting a minimum of 115,200 bits per second.

**10.2.2 2070 -7A**

Each circuit shall convert its EIA-485 signal lines (RX, TX, RTS, CTS and DCD) to/from board TTL Level Signals; isolate both signal and ground; and drive / receive external EIA-232 devices via C21 / C22 Connectors. Connectors shall be DB-9S type.

<b>2070-7A (DB-9S)</b>	
<b>C21S &amp; C22S CONNECTOR PINOUT</b>	
<b>PIN</b>	<b>FUNCTION</b>
1	DCD
2	RXD
3	TXD
4	NA
5	IFC GND
6	NA
7	RTS
8	CTS
9	NA

IFC GND is isolated from the internal ground system & is the voltage reference for the EIA-232 & EIA-485 signals.

**10.2.3 2070 - 7B**

Each circuit's drivers/receivers and associated signal ground shall be matched with an associated EIA-485 receiver/driver; isolating both signal and ground, and driver/receiver

from external EIA-485 devices via C21/C22 Connectors. Connectors shall be DB-15S type.

Each circuit EIA -485 signal lines, (RX, TX, TXC (I), TXC (O) and RXC) and associated signal ground shall be board terminated to matching drivers/receivers; isolating both signal and ground, and drive/receiver external EIA-485 devices via C21/C22 Connectors. Connectors shall be DB-15S type.

<b>2070-7B (DB-15S)</b>			
<b>C21S &amp; C22S CONNECTOR PINOUT</b>			
<b>PIN</b>	<b>FUNCTION</b>	<b>PIN</b>	<b>FUNCTION</b>
1	TXD +	9	TXD -
2	IFC GND	10	IFC GND
3	TXC +	11	TXC -
4	IFC GND	12	IFC GND
5	RXD +	13	RXD -
6	IFC GND	14	IFC GND
7	RXC +	15	RXC -
8	NA		

#### **10.2.4 EIA-485 Termination Requirements**

The EIA-485 Line Drivers/Receivers shall be socket mounted or Surface mounted and shall not draw more than 35 mA in active state and 20 mA in inactive state. A 100-Ohm Termination Resistor shall be provided across each Differential Line Receiver Input.

#### **10.2.5 LED Indicator**

Each circuit signal TX and RX line shall have an LED Indicator mounted on the front plate and labeled according to function.

#### **10.2.6 Enable/Disable Features**

The 2070-7x modules shall provide circuitry to disable their Channel 2 and EIA 232 control lines when a ground-true state is presented at Connector A1 Pin B21 (C50 Enable). C50 Enable shall disable Channel 2 via disabling the RS-485 signals to and from the motherboard. The Disable line shall be pulled up on these modules.

The 2070-7x modules shall provide circuitry to manually disable Channel 1. When Channel 1 is manually disabled, the "Ch. A Disable" LED indicator shall be turned ON.

The Enable/Disable function shall be controlled from an option switch or jumper located on the PCB. Channel A denotes C21S and Channel B denotes C22S.

**10.2.7 Hot Swappable**

The 2070-7x module shall be “Hot” swappable without damage to its circuitry or operations. A communication “glitch” occurring during insertion/removal is acceptable since the application program should be able to recover/retry. Power-on and hot-swap current surges shall not exceed a 10 ms surge at three times (3x) the maximum rating of each voltage supply used by the module.

**10.2.8 Power Requirements**

The power requirements of the 2070-7x Module shall be within the power limitations of the Model 2070 Unit as described in Section 9.2.5 of these specifications.

<b>Models</b>	<b>+5 VDC</b>	<b>+12 VDC iso</b>	<b>+12 VDC ser</b>	<b>-12 VDC ser</b>
2070-7 All Comm	250mA		50 mA	50 mA

## CHAPTER 10-SECTION 9 MODEL 2070-7G UNIVERSAL TIME BASE MODULE

### 10.9.1 Model 2070-7G Universal Time Base Module

The Model 2070-7G Universal Time Base Module shall consist of a GPS receiver with antenna and a microprocessor-based circuit. It shall read raw GPS time data and accept user commands via Com 2 as defined elsewhere in these specifications. The Model 2070-7G Universal Time Base Module shall be a Plug-in Style Card version for the Model 2070 Controller. The Model 2070-7G shall be provided with two communications channels Com 1 and Com 2. Com 1 shall be use to establish serial communications between the Model 2070 Controller and a GPS receiver resident in the Model 2070-7G Universal Time Base Module. Com 2 shall be switch selectable between a Config Mode to the GPS receiver and a straight serial port for the Model 2070 Controller.

### 10.9.2 GPS Receiver/Antenna

The Model 2070-7G shall be provided with a Land-Based L1, C/A code GPS Receiver operating at a frequency of 1575.42MHz. The GPS Receiver shall contain a **minimum of 16 Channels**. The receiver shall have a tracking sensitivity level greater than **-141dBm** at the receiver input.

The Model 2070-7G shall be provided with an active permanently mount GPS Antenna. The Antenna mount shall consist of GPS roof-mount antenna with double threaded bolt, through hole, wing nut fastener, and locking nuts. The mounting shall consist of a Bulkhead mount with 0.8 inch threaded wing nut.

The Antenna System shall be comprised of an Antenna Element, Cable and Connector, and Low Noise Amplifier (LNA).

The Cable and Connector shall consist of a 2 Meter RG174/U Coaxial cable terminated at the non-antenna end with a **BNC male/SMA female** straight connector.

The Antenna Element shall use Right Handed Circular Polarization (R.H.C.P) and shall have a minimum Gain of +5 dBi. The antenna shall have a VSWR of 1.5:1 max. and an output impedance of 50 Ohms.

The Low Noise Amplifier shall operate from a 3.3 to 5.5 V DC source and shall provide an Outer Band Attenuation of 20 dB min. at  $F_o \pm 50$  MHz and a Gain of 31 dB min.

The Overall Performance of the Antenna System including Antenna Element, LNA and Coax Cable shall be a follows:

Center Frequency: 1575	1575.42 MHz
Gain	26 dB min.
Noise Figure	2.0 dB max.
Axial Ratio	3.0 dB max.
Bandwidth	2 MHz min.
VSWR	2.0:1 max.
Output Impedance	50 Ohms

### 10.9.3 Default Configurations

The Model 2070-7G Universal Time Base Module shall have the following default configuration parameters:

Baud Rate	1200 bps
Time Zone	8, Pacific Time Zone
New Line Character	ASCII Carriage Return, Except QC, which CR+LF
Hour Format	24 hour ( Military Time)
Daylight Savings Time	Enabled
Begin DST Clock Correction	March, Second Sunday at 02:00AM
End DST Clock Correction	November, First Sunday at 2:00 AM

These parameters shall configurable using the Q & S Command Set as defined in Section 10.9.4 of these specifications.

### 10.9.4 Q & S Command Set

The “Q” Commands

“Q” commands shall be used to request information from the Model 2070-7G, such as global position, date and time. The Model 207-7G shall support the “Q” commands as listed in the following table.

<b>Model 2070-7G "Q" COMMANDS</b>			
<b>COMMAND</b>	<b>RETURNS</b>	<b>FORMAT</b>	<b>EXAMPLES</b>
QA n1 n2 0 0	Status, DOY, time	13 byte Binary string	See detail comments below
QD	Date and Day of year	YY/MM/DD/day {newline}	02/02/05/036
QT	TIME	mHH:MM:SS:Thtd {newline}	A10:51:21:697 17:45:05:489D
QC	Date, time status and day of week	YYMMDDHHmmSSThLW {cr+lf}	020821231706945Y6
QD, QT, QL & QC	Message	ASCII string “NOT LOCKED ON”	NOT LOCKED ON
QM	Data stored in ROM	Bw:Dx:My:Ncr:Oz Baud: DST: 12/24: new line: TimeZone	B7:D0:M1:Ncr:O6 {newline}
QV	Firmware version	ASCII version number	v1.2
QI	Get Daylight saving time configuration	bMbsbhbmeMesehem {newline}	0302020011010200 {newline}
QL	Get Position (latitude and longitude)	DD.MM.SS.THTA ddd.mm.ss.thtO	38.53.23.123N 077.00.27.123W

**“Q” Commands**

**QD** When the “QD” command is received by the Model 2070-7G it shall respond with either the ASCII message “NOT LOCKED ON” or with the date in the format YY/MM/DD/day followed by the new line character. “doy” is the day of the year in a 3 digit format, January 1 being 001. If the Model 2070-7G has not yet found at least one satellite to insure correct data, the response shall be “NOT LOCKED ON”.

An example of a normal response from the Model 2070-7G to a “QD” command sent to it would be “02/02/05/036(new line character)”. This sample data stream would represent February 5, 2002 and that date would be the 36<sup>th</sup> day of the year 2002.

Note: If the device is configured for a time zone other than the local time zone, the date and “doy” shown could differ from the local date, depending on the time of day.

**QT** When the “QT” command is received by the Model 2070-7G it shall respond with either the ASCII message “NOT LOCKED ON” or with the time of day in the format of an A or a P or an ASCII space (to signify A.M. or P.M. or 24 hour time format) immediately followed by “HH:MM:SS:Tht” and a “D”, if Daylight Savings Time function is “Enabled” and ending with the new line character.

Two sample “QT” responses are:

“A10:51:21:697{NEW LINE}”, which could be interpreted as 10:51 A.M. plus 21.697 seconds and not corrected for daylight savings time.

“\_ 17:45:05:489D{new line}”, which could be interpreted as 1745 plus 5.489 seconds (using the 24 hour format), with Daylight Savings Time Enabled. The “\_” represents an ASCII “space” character and signifies that the output is in 24 hour format.

As with the “QD” command, if the Model 2070-7G is not receiving a valid signal from at least one satellite, the response to a “QT” command shall be the ASCII message “NOT LOCKED ON”.

**QC** This command reply shall provide a combination of the information found in the “QT” and “QD” commands but in slightly different format and with some additional information.

As with the “QT”, “QL” and “QD” commands, the message “NOT LOCKED ON” shall be the reply if the Model 2070-7G does not have at least one satellite in view to determine the precise time and date.

A special synchronization character in the data stream (either Y or N) shall signify whether or not the date and time data are synchronized with UTC (Universal Coordinated Time).

In order for the Model 2070-7G to report fully synchronized data with the special character changed to “Y”, the unit must be tracking at least 4 satellites. If the synchronization character is “N” the time reported will be less precise but still within a few milliseconds of the UTC synchronized time. The “QC” command hour format is always 24 hour (military time) since there is no character in the data stream to indicate A.M. or P.M. An additional bit of information included in the “QC” data stream is a “day of the week” number. The number 0 (zero) indicates Sunday, 1 indicates Monday and so on through 6, which indicates Saturday. Unlike the “QT” and “QD” commands, the “new line” character shall not be changed. It shall always be ASCII “carriage return

+ line feed”. The format of the “QC” data stream shall be YYMMDDHHmmSSThtLW followed by an ASCII carriage return and line feed.

A sample “QC” data steam generated by the Model 2070-7G would be:

“02032123176945Y6{cr+lf}”. This data stream would be interpreted as March 21, 2002, the time, in 24 hour format, would be 2317 plus 6.945 seconds, the time is synchronized to UTC (Y) and the day of the week is Saturday (6). Note that the data stream does not indicate whether or not Daylight savings time is “Enabled or Disabled”.

**QM** The “QM” command shall reply with the parameters stored in non-volatile memory, which shall be the baud rate, daylight savings time enable-disable, time format, new line character and time zone. Parameters shall be separated by a colon and the data stream shall be terminated with the new line character. The data stream

B7:DO:M1:Ncr:O6{newline} would represent a baud rate = 19200 bps, Daylight savings time = disabled, 12 hour time reporting format, new line character = carriage return and Time Zone = Central. This command shall be used to determine the current configuration.

**QV** When the “QV” command is received by the Model 2070-7G it shall reply with the firmware version number. The format for the firmware version shall be as VX.X where X.X shall digits from 0 to9. An example of a response to the QV command would be “V1.2” without the quotation marks. The “NOT LOCKED ON” message shall never reply to this query command.

**QI** The “QI” command shall replay the currently loaded Daylight saving time parameters; these shall be stored in the non-volatile memory. A total of 8 parameters are shall be sent. The data stream is bMbsbhbmeMesehem{newline} and the parameters are as follow:

Begin Month (bM). The month when starts to observe the DST changes. This value shall be a two digits number. 01 means January, 02 February, 03 March and so on.

Begin Sunday (bs). The Sunday number of “begin month (bM)”. This value shall be a two digits number.

Begin Hour (bh) and Begin Minutes (bm). The time when starts to observe the DST. This time shall be expressed in a 24 hour format.

End Month (eM). The month when ends the DST changes. This value shall be a two digits number. 01 means January, 02 February, 03 March and so on.

End Sunday (es). The Sunday number of “end month (eM)”. This value shall be a two digits number.

End Hour (eh) and End Minutes (em). The time when the DST observation ends. This time shall be expressed in a 24 hour format.

An example data stream 0302020011010200{newline} would represent DST clock adjust will begin at second Sunday of March at 02:00 AM and DST will end at first Sunday of November at 02:00 AM.

When the Model 2070-7G module detects any of both DST conditions, either Begin or End, it corrects the time by adding or subtracting one hour to local time. Once “begin DST” conditions met (Month, Sunday and time) it adds one hour to local time. When “end DST” conditions met (Month, Sunday and time) it subtracts one hour to local time. The Model 2070-7G shall always respond to this command.

**QL** The “QL” command will replay the latitude and longitude of the current Global Position expressed in degrees, minutes, seconds and milliseconds, north (N) or south(S) for Latitude, east (E) or west (W) for longitude. The data stream shall be expressed as follows, DD.MM.SS.THTA\_ddd.mm.ss.thtO{newline}.

DD = latitude degrees  
MM = latitude minutes  
SS = latitude seconds  
THT = latitude milliseconds  
A = latitude, North or South  
ddd = longitude degrees  
mm = longitude minutes  
ss = longitude seconds  
tht = longitude milliseconds  
O = longitude, East or West

An example data stream 38.53.23.123N\_077.00.27.123W{newline} would represent 38 degrees latitude north, with 53 minutes, 23 seconds and 123 milliseconds and 077 degrees longitude west with 00 minutes, 27 seconds and 123 milliseconds. As with the “QT”, “QC” and “QD” commands, the message “NOT LOCKED ON” shall be the response if the Model 2070-7G does not have at least one satellite in view to determine the precise position.

Please note: the “\_” represent an ASCII space.

**QA** The “QA” command differs from the other Q commands in that it must include two additional user selected variables n1 and n2, and two fixed variables n3 and n4, which are always zero. The output from the QA command depends on the variables sent with the command. It also differs from the other Q commands in that the information returned is not ASCII but rather binary. A list of the user defined variables and the information returned follows.

#### **User defined variables**

n1– Time zone. The variable entered must be the sum of an ASCII 0 + (0 – 11) depending on the time zone desired. For example ASCII 38 signifies time zone 8, Pacific.  
n2 – Daylight savings time correction, 0 = disabled, 1 = enabled.

## **Possible replies from the Model 2070-7G to a QA command**

### **Byte 0**

Bits 1-3 are not used.

Bit 4 is 0 if valid time is not currently available and 1 if time is valid.

Bit 5 is 1 during the initialization phase only (before first lock on, i.e. LED changes to green for the first time. This bit changes to 0 at the first lock on and never changes even in subsequent amber conditions.

Bit 6 is 1 if GPS detects internal fault that could affect time reporting, otherwise is 0.

Bit 7 is normally 0 but if no satellite information is received for 24 hours, this bit will be 1.

Bit 8 is not used.

### **Byte 1**

Bits 1-4 are not used, always zero.

Bits 5-6 are always 0 indicating that the time is in 24-hour format.

Bit 7, Daylight Savings Time indicator is 1 when DST is enabled and the date is within the DST period. This bit is 0 if DST correction is disabled or the date is outside of the DST period.

Bit 8 is not used, always zero.

### **Bytes 2 and 3**

Milliseconds portion of current time, the Hex equivalent of BCD.

### **Byte 4**

Seconds portion of current time, the Hex equivalent of BCD.

### **Byte 5**

Minutes portion of current time, the Hex equivalent of BCD.

### **Byte 6**

Hours portion of current time, the Hex equivalent of BCD.

### **Bytes 7 and 8**

Day of Year, the Hex equivalent of BCD.

### **Byte 9**

Year (this byte is actually the offset from 1986) i.e. 18 = 2004, the Hex equivalent of BCD.

### **Bytes 10 and 11**

Always zero.

### **Byte 12**

Always a new line character (CR).

The "S" Commands

The Model 2070-7G shall accept instructions from the user in the form of “S” (Set) commands. The “S” commands, their variables, and their meanings that shall be supported shall consist of the following:

Model 2070-7G "S" COMMANDS				
COMMAND	NAME OF COMMAND	"n" variable	SETTING (default)	(Notes)
SB <sub>n</sub>	SET BAUD RATE	0	Reserved	
		1	Reserved	
		2	Reserved	
		<b>3</b>	<b>(1200)</b>	
		4	2400	
		5	4800	
		6	9600	
		7	19200	
		8	38400	
SD <sub>n</sub>	SET DAYLIGHT SAVINGS TIME	0	Disabled	
		<b>1</b>	<b>(Enabled)</b>	
SM <sub>n</sub>	SET 12 OR 24 HOUR TIME FORMAT	<b>0</b>	<b>(24 Hour)</b>	
		1	12 Hour (AM/PM)	
SN <sub>n</sub>	SET NEW LINE CHARACTER	ASCII characters except colon and /	<b>(carriage return)</b>	
SO <sub>n</sub>	SET TIME ZONE	0	Time zone 0	UTC
		1	Time zone 1	
		2	Time zone 2	
		3	Time zone 3	
		4	Time zone 4	
		5	Time zone 5	Eastern
		6	Time zone 6	Central
		7	Time zone 7	Mountain
		<b>8</b>	<b>(Time zone 8)</b>	<b>Pacific</b>
		9	Time zone 9	Alaska
		: (colon)	Time zone 10	Hawaii
		; (semi-colon)	Time zone 11	
SI1bMbsbhbmeMesehem	SET DAYLIGHT SAVING TIME	bM (Begin	03	

	CONFIGURATION	month)		
		bs (Begin Sunday)	02	
		bh (Begin hour)	02	
		bm (Begin minutes)	00	
		eM (End month)	11	
		es (end Sunday)	01	
		eh (end hour)	02	
		em (End minutes)	00	

### “S” Commands

“S” Commands shall be sent to the Model 2070-7G without an “end of line” character.

The Model 2070-7G shall not send any acknowledgement when it receives an “S” command however the QM command can be used to confirm the change was made. All setting changes shall be stored in non-volatile memory and used in place of the factory default settings.

The following describes the “S” commands that shall be supported by Model 2070-7G:

**SBn** (Set Baud Rate). This command shall be used to change the Model 2070-7G’s serial communication speed. The baud rate of the controller and the Model 2070-7G must be the same. When the unit is first powered up it shall be configured with the factory default baud rate of 1200.

When communications between the Model 2070-7G and the controller is established, the SB command can be used to change the baud rate to the preferred speed. The available baud rates are shown in "S" Commands table. Generally the highest baud rate, that provides reliable communication, should be used. For example, to change the unit’s default baud rate to 4800 baud, the proper “S” command to send would be “SB5” (without quotation marks). Any baud rate changes will go onto effect immediately.

**SDn** (Enable/Disable Daylight Savings Time). This command shall be used to enable or disable the device's one hour offset to accommodate Daylight Savings Time rules. If the unit is to be used to output local time in an area that observes Daylight Savings Time rules, the "SD1" command should be used. The factory default setting is "Enabled", which means the Model 2070-7G will automatically adjust the local time output by one hour at the beginning and end of the Daylight Savings Time period. Users can change the configuration when these changes must occur with the S11 command. If the unit will be used in areas that do not observe Daylight Savings Time, the appropriate "S" command to use would be "SD0".

**SMn** (Set time output format). This command shall be used to specify how the time of day data will be formatted. The factory default setting is the 24 hour, Military Time, format. If the user prefers to have the data output in a 12 hour format, (with A.M. or P.M. noted) the "SM1" (without the quotation marks) command must be sent once to change the format setting.

**SNn** (Set new line character). The Model 2070-7G's response to a valid "Q" command shall be a data stream that ends with a "new line" character. The default new line character is an ASCII carriage return. If the user prefers to have the data stream end in different ASCII character it can be changed using the "SN" command. Any ASCII character except the "/" (slash) and the ":" (colon) characters may be used as the variable. For example to use "#" as the new line character the proper command to send would be "SN#" (without the quotation marks). Only one "new line character" is permitted.

**SO n** (Set time zone). This command allows the user to set the Model 2070-7G's output to reflect the local time. Each time zone is assigned a number or ASCII character that is used as the variable for the "SO" command. The Model 2070-7G firmware shall accommodate time zones 0 through 11. Time zone 0 shall be used to output UTC (Universal Coordinated Time) or GMT (Greenwich Mean Time) if the user prefers that reference instead of local time. The default factory value shall be 8, as listed under default configurations, which shall represent Pacific Standard Time in the United States.

**S11bMbsbhbmeMesehem** (Set daylight saving time parameters). This command shall allow the user to set the Model 2070-7G's daylight saving time settings. The modification of these parameters will determine when DST begin & end:

**Begin Month(bM)**. The month when starts to observe the DST changes. This value shall be a two digits number. 01 means January, 02 February, 03 March and so on.

**Begin Sunday(bs)**. The Sunday number of "begin month (bM)". This value shall be a two digits number.

**Begin Hour(bh) and Begin Minutes(bm)**. The time when starts to observe the DST. This time shall be expressed in a 24 hour format.

**End Month(eM)**. The month when ends the DST changes. This value shall be a two digits number. 01 means January, 02 February, 03 March and so on.

End Sunday(es). The Sunday number of “end month(eM)”. This value shall be a two digits number.

End Hour(eh) and End Minutes(em). The time when the DST observation ends. This time shall be expressed in a 24 hour format.

These parameters shall be set in the Non-Volatile memory.

### 10.9.5 Config Mode

The Model 2070-7G Module shall be provided with a switch allowing the user to switch Com 2 into Config Mode. In Config Mode, Com 2 loops back to the GPS Receiver and provides the user with a communications port to run Q and S Commands to configure the GPS receiver or query it for data. During Config Mode, the Config Mode LED indicator shall be turn ON to indicate configuration mode. When the Config Model is OFF, Com 2 shall consist of a serial port (serial pass through) to the Model 2070 Controller.

### 10.9.6 Connectors

The Model 2070-7G Universal Time Base Module shall contain the following connectors in the Faceplate:

Antenna	SMA Connector
Com 2 Port (C22S)	DB9 Female Connector

### 10.9.7 Data Output

When communicating to the GPS Receiver, the Date, Time, Day of Week, Signal Status, and Global Position shall be available. Data format shall be as defined in Section 10.9.4 of these specifications and the NMEA 0183 Standard. Serial Communications shall be software selectable at 1200, 2400, 4800, 9600, 19200 or 38400 bps.

### 10.9.8 Protocols

The Model 2070-7G shall support the NMEA 0183 Standard, Version 2.1 or later, as defined by the National Marine Electronics Association and the QC Command Set as defined in Section 10.9.4 of these specifications. A dipswitch marked "CMode" shall be provided which allows for the selection of one of three modes. The communication modes shall consist of a "NORM" (Normal Mode), "NB" (Normal Broadcast Mode) and GPS. When the CMode is in the "NORM" (Normal Mode) ON position, the Model 2070-7G shall respond to the QS command set as defined elsewhere in these specifications. When the dipswitch CMode is in the "NB", (Normal Broadcast Mode) ON Position, and the Model 2070-7G shall operate in a broadcast mode and shall not

respond to the QS command set. When operating in the NB mode, the Model 2070-7G shall use the default settings as defined in section 10.9.2.

When the CMode is in the "GPS", (GPS pass through mode) ON position, the Model 2070-7G shall act like a standard NMEA 0183 compliant GPS receiver. As a minimum, when set on GPS mode, the Model 2070-7G shall support the following NMEA 2.0 Standard sentences: RMC, GGA, GSA, GSV, GLL and ZDA. The sentences shall be preceded by the standard generic Global Positioning System (GPS) talker ID "GP".

=== GLL - Geographic Position - Latitude/Longitude ===

	1	2	3	4	5	6	7	8
\$-- GLL	,lll.ll	,a	,yyyy.yy	,a	,hhmmss.ss	,a	,m	,*hh

\$-GLL,lll.ll,a,yyyy.yy,a,hhmmss.ss,a,m,\*hh<CR><LF>

Field Number:

1. Latitude
2. N or S (North or South)
3. Longitude
4. E or W (East or West)
5. Universal Time Coordinated (UTC)
6. Status A - Data Valid, V - Data Invalid
7. FAA mode indicator (NMEA 2.3 and later)
8. Checksum

=== GGA - Global Positioning System Fix Data ===

Time, Position and fix related data for a GPS receiver.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
--	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----

										0		2			5
\$-- GG A	,hhmmss .ss	,llll. ll	, a	,yyyyy. yy	, a	, x	,x x	,x. x	,x. x	, M	,x. x	, M	,x. x	,xxx x	*h h

\$--GGA,hhmmss.ss,llll.ll,a,yyyyy.yy,a,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx\*hh<CR><LF>

Field Number:

1. Universal Time Coordinated (UTC)
2. Latitude
3. N or S (North or South)
4. Longitude
5. E or W (East or West)
6. GPS Quality Indicator,
  - 0 - fix not available,
  - 1 - GPS fix,
  - 2 - Differential GPS fix  
(values above 2 are 2.3 features)
  - 3 = PPS fix
  - 4 = Real Time Kinematic
  - 5 = Float RTK
  - 6 = estimated (dead reckoning)
  - 7 = Manual input mode
  - 8 = Simulation mode
7. Number of satellites in view, 00 - 12
8. Horizontal Dilution of precision (meters)
9. Antenna Altitude above/below mean-sea-level (geoid) (in meters)
10. Units of antenna altitude, meters
11. Geoidal separation, the difference between the WGS-84 earth ellipsoid and mean-sea-level (geoid), "-" means mean-sea-level below ellipsoid
12. Units of geoidal separation, meters
13. Age of differential GPS data, time in seconds since last SC104 type 1 or 9 update, null field when DGPS is not used
14. Differential reference station ID, 0000-1023
15. Checksum

Example:

\$GPGGA,180844.000,3211.10532,N,11055.20380,W,0,00,99.0,779.59,M,-27.7,M, ,\*69

=== RMC - Recommended Minimum Navigation Information ===

	1	2	3	4	5	6	7	8	9	10	11	12	13
\$-- RMC	,hhmmss.ss	,A	,llll.ll	,a	,yyyyy.yy	,a	,x.x	,x.x	,xxxx	,x.x	,a	,m	*hh

\$--RMC,hhmmss.ss,A,llll.ll,a,yyyyy.yy,a,x.x,x.x,xxxx,x.x,a,m\*hh<CR><LF>

Field Number:

1. UTC Time
2. Status, V=Navigation receiver warning A=Valid
3. Latitude
4. N or S
5. Longitude
6. E or W
7. Speed over ground, knots
8. Track made good, degrees true
9. Date, ddmmyy
10. Magnetic Variation, degrees
11. E or W
12. FAA mode indicator (NMEA 2.3 and later)
13. Checksum

A status of V means the GPS has a valid fix that is below an internal quality threshold, e.g. because the dilution of precision is too high or an elevation mask test failed.

Example:

\$GPRMC,180845.000,V,3211.105,N,11055.204,W,0.0,0.0,271009,9.4,E\*6E

=== ZDA - Time & Date - UTC, day, month, year and local time zone ===

	1	2	3	4	5	6	7
\$-- ZDA	,hhmmss.ss	,xx	,xx	,xxxx	,xx	,xx	*hh

\$--ZDA,hhmmss.ss,xx,xx,xxxx,xx,xx\*hh<CR><LF>

Field Number:

1. UTC time (hours, minutes, seconds, may have fractional subsecond)
2. Day, 01 to 31
3. Month, 01 to 12
4. Year (4 digits)
5. Local zone description, 00 to +- 13 hours
6. Local zone minutes description, apply same sign as local hours
7. Checksum

Example: \$GPZDA,160012.71,11,03,2004,-1,00\*7D

### 10.9.9 LED Indicators

Function		LEDs
Com 1	TxD	Green or Red
	RxD	
Com 2	TxD	Green or Red
	RxD	
Config Mode		Green or Red
Tracking		Tri-Color

### 10.9.10 Model 2070-7G Tracking

The Model 2070-7G Universal Time Base Module shall be provided with the following tracking functionality:

The Model 2070-7G shall be equipped with a tri-color LED (Light Emitting Diode) to indicate the unit's status during operation; the LED shall be located at the faceplate and labeled as TRACKING as shown in detail A10-9.

The various states of the TRACKING LED indicator and their meanings shall be as described in the section below.

Power up phase: At power up, the 2070-7G's microprocessor shall read the five parameters stored in the unit's non-volatile memory. These parameters are Baud Rate, Daylight Savings Time mode and configuration, Time Zone, Military Time format and new line character. The default values shall be read from memory if they have not been modified. Next, the communications port shall be initialized and the speed set to the stored baud rate parameter. The remaining three communications parameters shall be fixed at 8 data bits, no parity and 1 stop bit.

The power up process shall take no more than 200 milliseconds. During this period the unit may not respond to any "S" or "Q" commands and the LED shall be **amber** for less than one second.

GPS initialization phase: After the power up phase is complete the unit will query the GPS receiver to see if it is already initialized. This is usually the case when the unit is powered up. If there is no data output, the GPS receiver will be initialized by the firmware program, using initialization commands and known variables. This process shall not take longer than 6 seconds. During this period, the Model 2070-7G reply to the commands "QA", "QD", "QT", and "QC" shall be the message "NOT LOCKED ON" and the LED shall **flash red**, once per second.

Signal acquisition phase: Once the GPS initialization phase is complete, it shall take from 3 to 180 seconds for the unit to acquire and process the first satellite's signal. When the Model 2070-7G has received and processed the first satellite's information, unsynchronized time/date information shall be available using the "QC" data stream and the synchronization character shall be "N". When the synchronization character is "N", the "QC", and "QT" and "QD" replies will be complete but time is not fully synchronized to UTC. When unsynchronized data is available, the LED shall **flash amber**, once per second.

Fully synchronized phase: When the 2070-7G has acquired information from 4 satellites its output will be synchronized to UTC (Universal Coordinated Time. When the unit is synchronized to UTC it is said to be "LOCKED ON". At this point the "QT", "QD", "QL" and "QC" replies will contain the most accurate information (time and location) possible. When the unit is fully synchronized (LOCKED ON); the synchronization character shall the letter "Y" in the "QC" data stream and the LED indicator shall **flash green**, once per second.

### **10.9.11 Power Requirements**

The power requirements of the Model 2070-7G Universal Time Base Module shall be within the power limitations of the Model 2070 UNIT as describe elsewhere in this specifications.

### **10.9.12 Environmental**

The Model 2070-7G Universal Time Base Module shall operate within the specifications listed in Chapter 1 Section 1.8.4.

### **10.9.13 Form Factor**

See A10-9 for Details

## **CHAPTER 10-SECTION 10**

### **MODEL 2070-EX NETWORK SWITCH MODULE**

#### **Model 2070-Ex Network Switch Module**

The Model 2070-Ex Module shall provide 4 ports for Network Communications to and from the Model 2070 Controller.

An integrated Store-and-Forward Network Switch shall be used as the core for the Model 2070-Ex Module. A network port shall be used to route Ethernet Traffic across the Motherboard to the “A” Connector’s Network Lines. DC Grounding around the network connectors and lines shall be provided. The Network Lines shall be assigned as: NetP5 TX+, TX-, RX+ and RX- respectively. Three network ports shall be brought to RJ-45 Connectors on the Front Panel.

The Model 2070-Ex Module shall be a Plug-in Card style version for the 2070 Controller.

#### **Mechanical/Electrical Requirements.**

The Model 2070-Ex Modules card edge connector shall be fully compatible with the 2070 Controller’s Motherboard Ax Card Slots.

The Model 2070-Ex Module shall be powered direct from the 2070 Controller’s edge connector.

#### **Model 2070-Ex Module Requirements**

The Model 2070-Ex shall be provided with Network Magnetics for each port including the network port routed to the Controller's Motherboard.

#### **Network Standards**

The Model 2070-Ex Module shall meet the IEEE802.3 10Base-T, IEEE 802.3u, and IEEE 802.3x.

#### **Modes of Operation**

The Model 2070-Ex Module shall have auto-negotiation for 10/100 Mbps Connection speed and Half/Full-Duplex modes on all RJ-45 ports.

The Model 2070-Ex Module shall be provided with Auto-MDIX for all RJ-45 ports.

The network port routed to the Controller's Motherboard shall have Auto-negotiation for 10/100Mbps connection speed and the Half/Full-Duplex communications mode shall be manually settable.

### **Network Media Support**

The Model 2070-Ex Module shall be configured as a Multiple Channel Media Converter to route network traffic between the Model 2070 CPU, Three RJ-45 Front Panel Connectors.

The Model 2070-Ex Module shall support the following Media:

100Base-TX: Cat. 5, EIA/TIA-568B, 100-Ohm UTP cables.

### **LED Indicators**

The Model 2070-Ex Module shall be provided with RJ-45 Connectors containing Link/Activity and 10/100 Speed LED indicators. Network Link/Activity and 10/100 Speed indicators for the port routed to the Controller's Motherboard shall be provided on the Front Plate of the Model 2070-Ex Module.

### **Form Factor**

See A10-10 for Details

### **Power Requirements**

The power requirements of the 2070-Ex Module be within the power limitations of the Model 2070 Unit as describe in Section 9.2.5 of these specifications.

<b>Models</b>	<b>5 VDC</b>	<b>+12 VDC iso</b>	<b>+12 VDC ser</b>	<b>-12 VDC ser</b>
2070-6A & Others	900mA		300 mA	300 mA

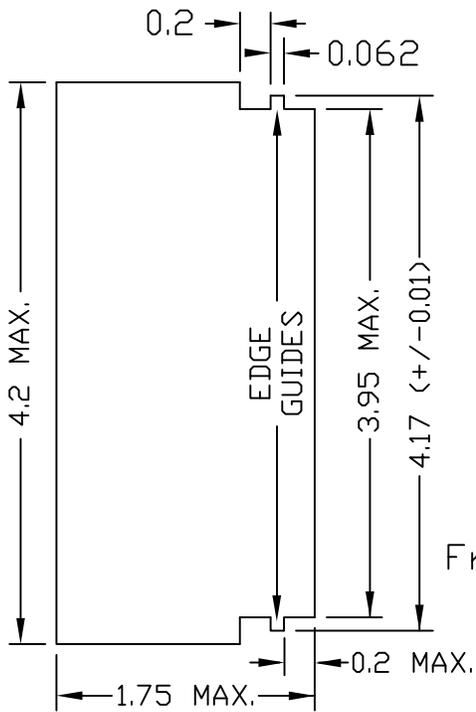
### **Environmental**

The 2070-Ex Module shall operate within the specifications listed in Chapter 1 Section 1.8.4.

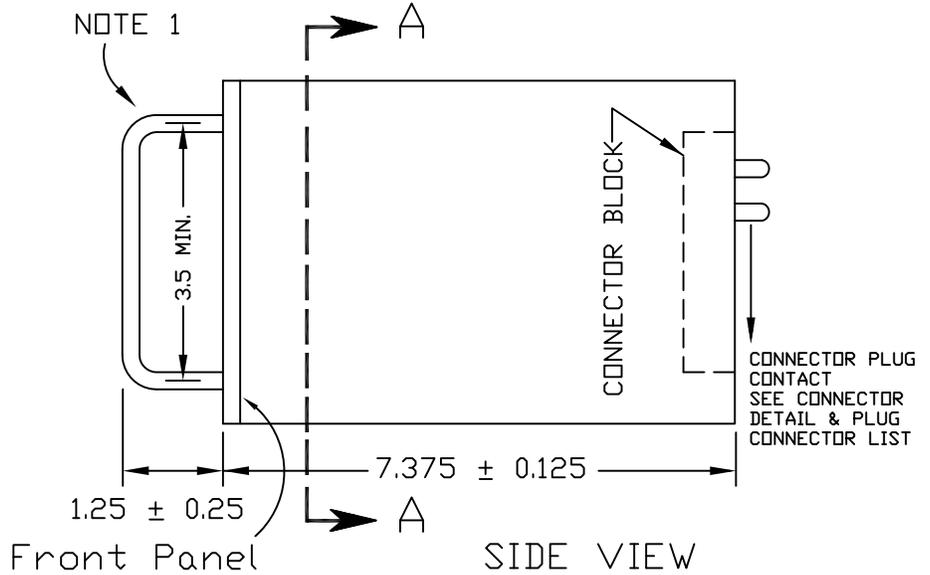
**APPENDIX A**  
**CHAPTER DETAILS**

**APPENDIX A3**  
**CHAPTER 3 DETAILS**

<b>Model 200 Switch Pack, 204 &amp; 205 CONNECTOR DETAILS</b>	<b>A3-1</b>
<b>Model 208 T170 Monitor Unit</b>	<b>A3-2</b>
<b>Model 210 T170 Monitor Unit Programming Card Connector &amp; Wiring Assignments</b>	<b>A3-4</b>
<b>C2 Modem Harness</b>	<b>A3-5</b>
<b>C2 Serial Harness</b>	<b>A3-8</b>
<b>C1 Cable Harness</b>	<b>A3-9</b>
<b>Model 206LS Power Supply</b>	<b>A3-10</b>



CROSS SECTION A-A



MODEL PLUG CONNECTORS LIST  
(OR EQUAL)

- MODEL 200 - BEAU P-5412-LAB
- MODEL 204 - BEAU P-5406-LAB
- MODEL 205 - BEAU P-5408-LAB

MODEL 200  
CONNECTOR DETAIL

PIN	FUNCTION
1	AC+
2	Equip. Ground
3	Red Output
4	Not Assigned
5	Yellow Output
6	Red Input
7	Green Output
8	Yellow Input
9	+24 VDC
10	Green Input
11	AC-
12	Not Assigned

MODEL 204  
CONNECTOR DETAIL

PIN	FUNCTION
7	Load Circuit #1
8	Load Circuit #2
9	Equip. Ground
10	AC-
11	AC+
12	Not Assigned

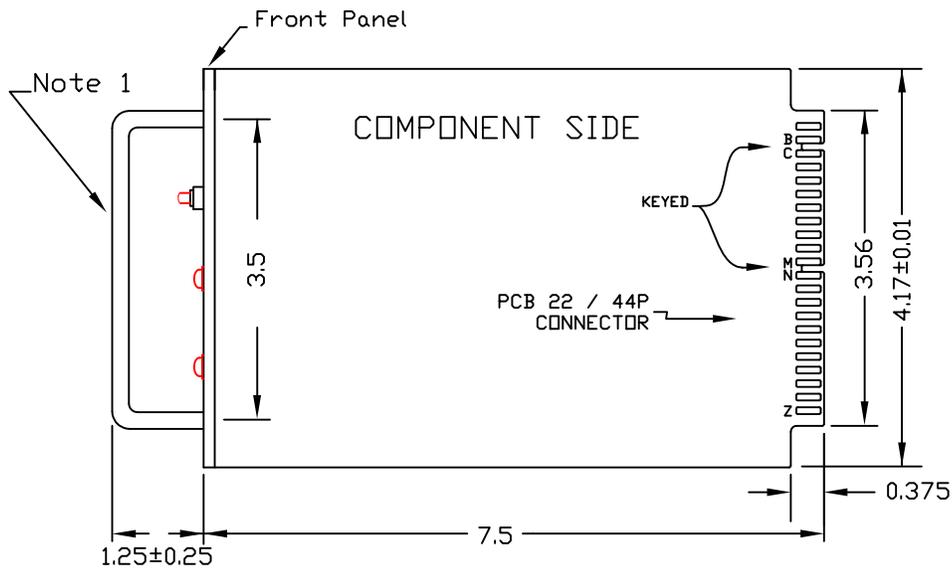
MODEL 205  
CONNECTOR DETAIL

PIN	FUNCTION
1	Coil
2	Coil
3	NC CKT1
4	NC CKT2
5	Common CKT1
6	Common CKT2
7	NO CKT1
8	NO CKT2

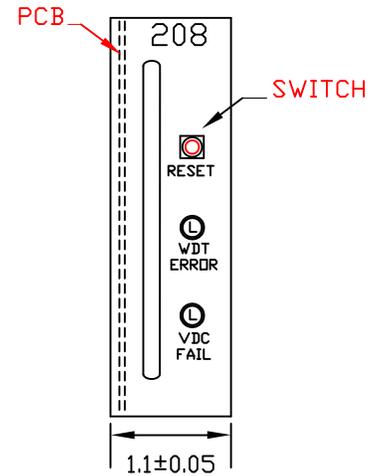
NOTES:

1. "U" shape rod handle shall be fabricated of 0.18in to 0.26in diameter, aluminum stock to form a handle.
2. All dimensions shown are in inches.

TITLE: MODEL 200 SWITCH PACK, 204 <b>FLASHER</b> & 205 <b>TRANSFER RELAY</b> CONNECTOR DETAILS	
<b>ERRATA 2</b>	NO SCALE
TEES 2009	A3-1



SIDE VIEW



FRONT VIEW

MODEL 208 MONITOR UNIT PIN ASSIGNMENT

PIN	FUNCTION
1 / A	DC GROUND
2 / B	WDT Ext. Reset
5 / E	WDT IN
10 / L	+24 VDC
15 / S	AC-
17 / U	Normally Open, Circ. #2
19 / W	AC+
20 / X	WDT Lamp (External)
21 / Y	Circ. Common #1 & #2
22 / Z	Normally Closed, Circ. #1

NOTES:

- "U" shape rod handle shall be fabricate of 0.18 to 0.26 in diameter, aluminum stock to form a handle.
- All dimensions shall be in inches.

TITLE: MODEL 208 T170 MONITOR UNIT	
ERRATA 2	NO SCALE
TEES 2009	A3-2

MODEL 210 MONITOR UNIT  
CONNECTOR WIRING ASSIGNMENTS

PIN	FUNCTION	PIN	FUNCTION
1	Channel #2 Green	A	Channel #2 Yellow
2	Channel #13 Green	B	Channel #6 Green
3	Channel #6 Yellow	C	Channel #15 Green
4	Channel #4 Green	D	Channel #4 Yellow
5	Channel #14 Green	E	Channel #8 Green
6	Channel #8 Yellow	F	Channel #16 Green
7	Channel #5 Green	H	Channel #5 Yellow
8	Channel #13 Yellow	J	Channel #1 Green
9	Channel #1 Yellow	K	Channel #15 Yellow
10	Channel #7 Green	L	Channel #7 Yellow
11	Channel #14 Yellow	M	Channel #3 Green
12	Channel #3 Yellow	N	Channel #16 Yellow
13	Channel #9 Green	P	NA
14	NA	R	Channel #10 Green
15	Channel #11 Yellow	S	Channel #11 Green
16	Channel #9 Yellow	T	NA
17	NA	U	Channel #10 Yellow
18	Channel #12 Yellow	V	Channel #12 green
19	NA	W	NA
20	Equipment Ground	X	NA
21	AC- *	Y	DC Ground
22	Watchdog Timer	Z	External Reset
23	+24 VDC	AA	+24 VDC
24	( Pins 24 & 25 ) Tied together	BB	Stop Time
25		CC	NA
26	NA	DD	NA
27	NA	EE	Output SW, Side #2
28	Output SW, Side #1	FF	AC+

MODEL 210 PROGRAMMING CARD  
CONNECTOR WIRING ASSIGNMENTS

PIN	FUNCTION (Circuit Side)	PIN	FUNCTION (Component Side)
1	Channel #2 Green	A	Channel #1 Green
2	Channel #3 Green	B	Channel #2 Green
3	Channel #4 Green	C	Channel #3 Green
4	Channel #5 Green	D	Channel #4 Green
5	Channel #6 Green	E	Channel #5 Green
6	Channel #7 Green	F	Channel #6 Green
7	Channel #8 Green	H	Channel #7 Green
8	Channel #9 Green	J	Channel #8 Green
9	Channel #10 Green	K	Channel #9 Green
10	Channel #11 Green	L	Channel #10 Green
11	Channel #12 Green	M	Channel #11 Green
12	Channel #13 Green	N	Channel #12 Green
13	Channel #14 Green	P	Channel #13 Green
14	Channel #15 Green	R	Channel #14 Green
15	Channel #16 Green	S	Channel #15 Green
16	DC Ground	T	CONFLICT
17	Channel #1 Yellow	U	Channel #9 Yellow
18	Channel #2 Yellow	V	Channel #10 Yellow
19	Channel #3 Yellow	W	Channel #11 Yellow
20	Channel #4 Yellow	X	Channel #12 Yellow
21	Channel #5 Yellow	Y	Channel #13 Yellow
22	Channel #6 Yellow	Z	Channel #14 Yellow
23	Channel #7 Yellow	AA	Channel #15 Yellow
24	Channel #8 Yellow	BB	Channel #16 Yellow
25	NA	CC	NA
26	NA	DD	NA
27	NA	EE	Output SW, Side #2
28	Output SW, Side #1	FF	AC+

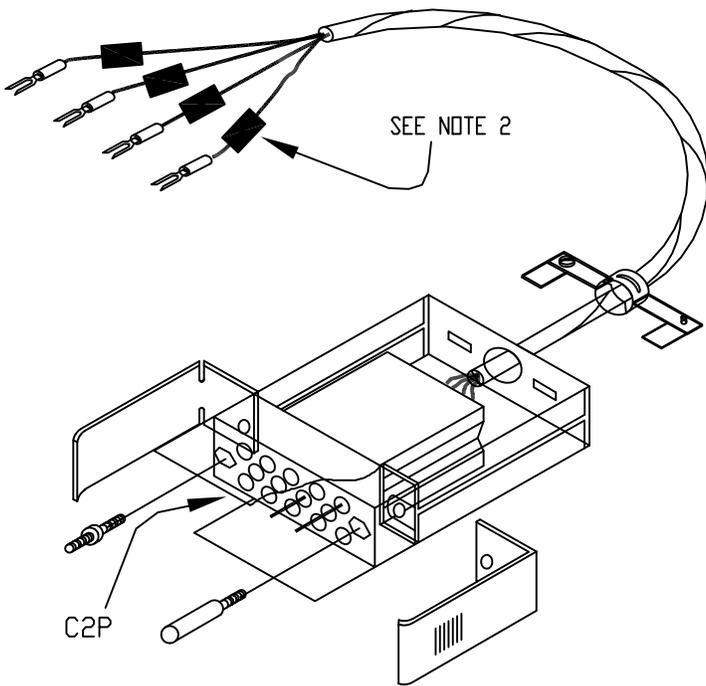
TITLE: MODEL 210 T170 MONITOR UNIT PROGRAMMING  
CARD CONNECTOR & WIRING ASSIGNMENTS

ERRATA 2

NO SCALE

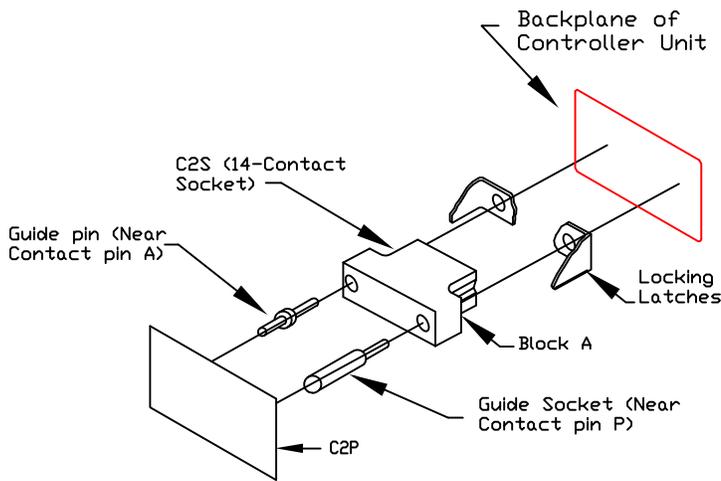
TEES 2009

A3-4

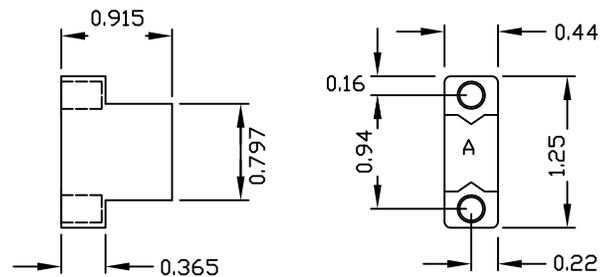


C2 MODEM HARNESS

C2P CONNECTOR ASSIGNMENT			
PIN	FUNCTION	PAIR	WIRE COLOR
A	AUDIO IN	PAIR 2	WHITE
B	AUDIO IN		GREEN
C	AUDIO OUT	PAIR 1	RED
E	AUDIO OUT		BLACK



CONNECTOR C2 DETAIL

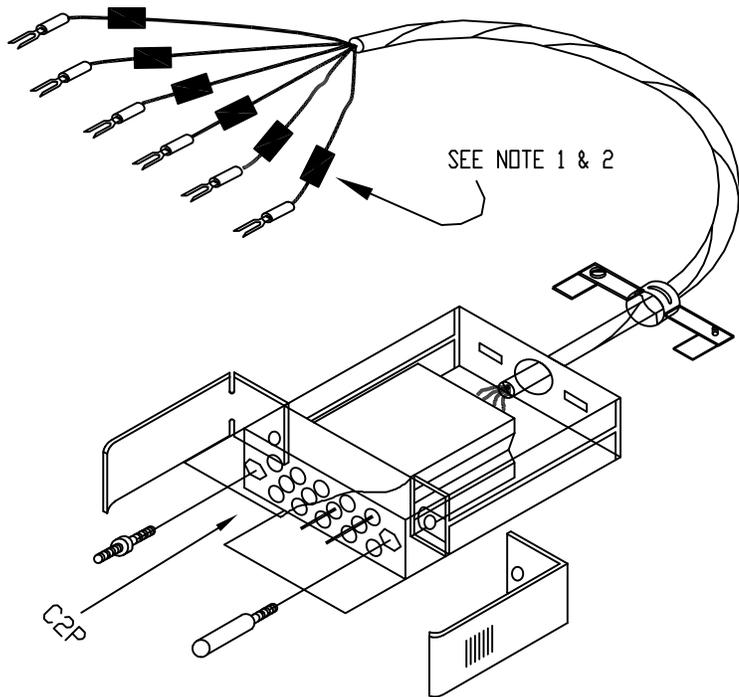


CONNECTOR C2S

NOTES:

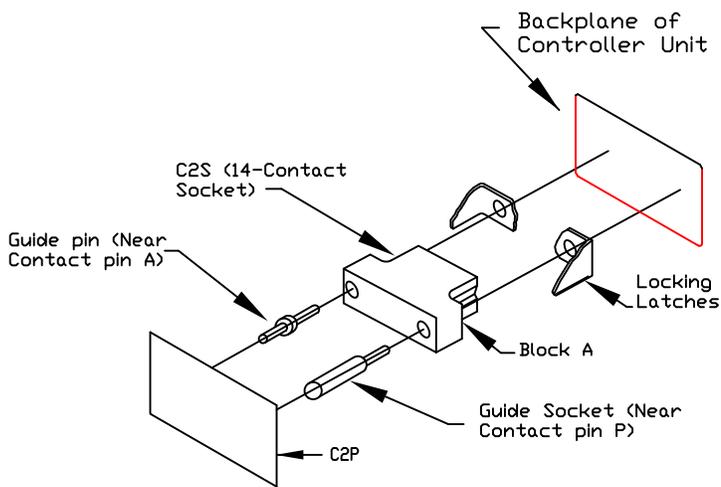
1. Cable length shall be 36.00in minimum. The cable shall be 2-pair #20 cable conductors, Belden 9402 or equal. The field end connections shall be #8 stud spring spade type.
2. Each conductor (AUDIO IN or AUDIO OUT) shall be labeled.
3. All dimensions shown are in inches.

TITLE:		C2 MODEM HARNESS	
ERRATA 2		NO SCALE	
TEES 2009		A3-5	

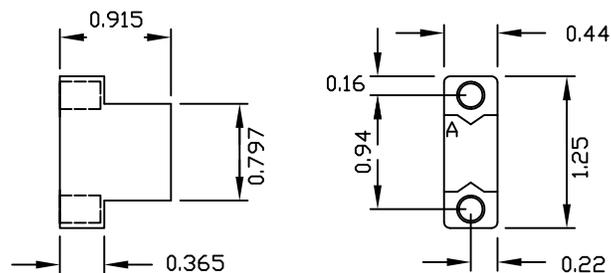


C2 SERIAL HARNESS

C2P CONNECTOR ASSIGNMENT			
PIN	FUNCTION	PIN	FUNCTION
A	NA	J	RTS
B	NA	K	RXD
C	NA	L	TXD
D	NA	M	CTS
E	NA	N	GND
F	NA	P	NA
H	DCD	R	NA



CONNECTOR C2 DETAIL

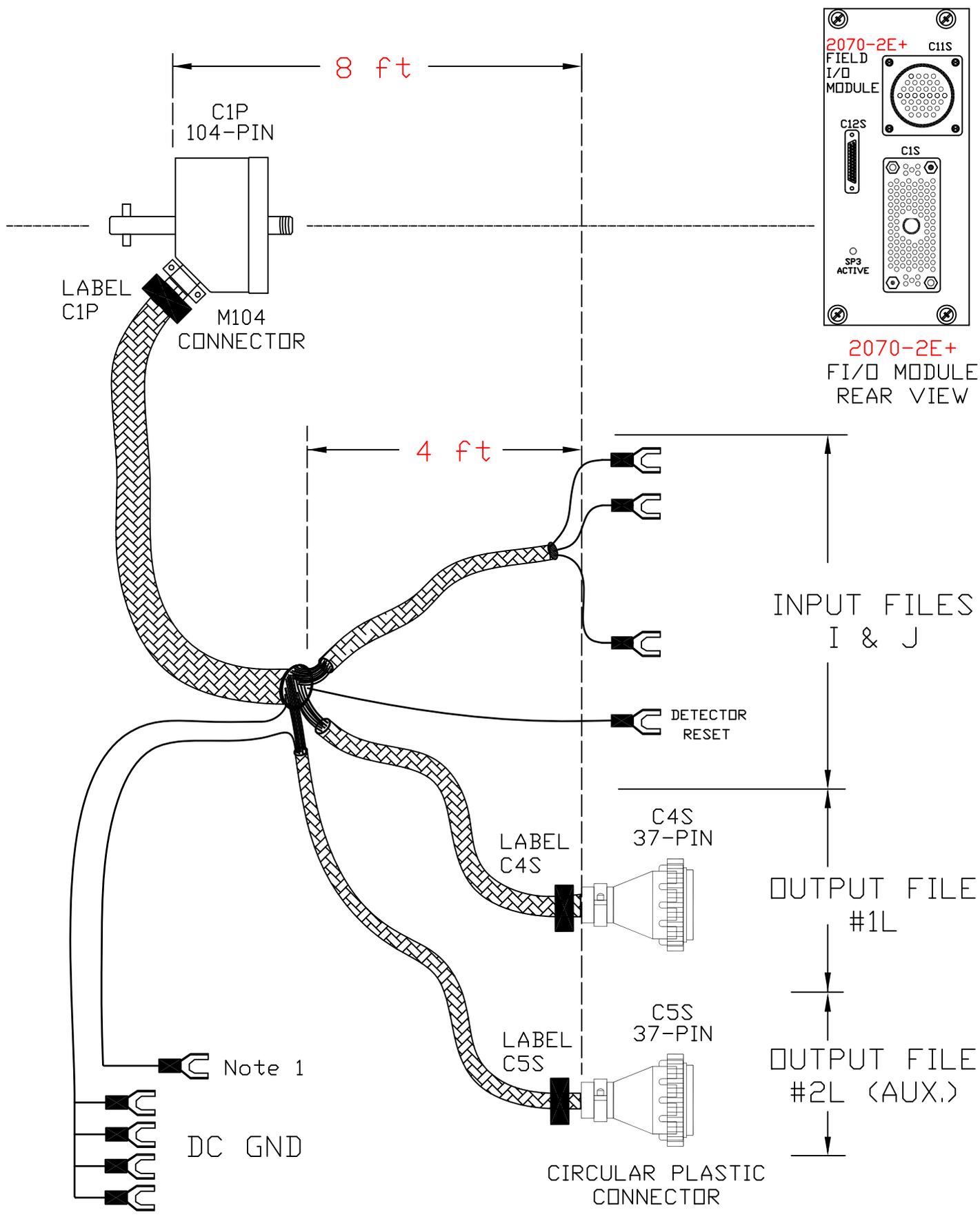


CONNECTOR C2S

NOTES:

1. Cable length shall be 36.00in minimum. The cable shall be 24AWG, 6 conductors, Belden 9536 or equal. The field end connections shall be #6 stud spring spade type.
2. Each conductor (DCD, RTS, RXD, TXD, CTS, GND) shall be labeled.
3. All dimensions shall be inches.

TITLE:		C2 SERIAL HARNESS	
ERRATA 2		NO SCALE	
TEES 2009		A3-8	



NOTE:

1. Input Panel #1, TB1 (+24VDC) to C5S, pin #24.

TITLE: C1 HARNESS  
SIGNAL CABINET

ERRATA 2

NO SCALE

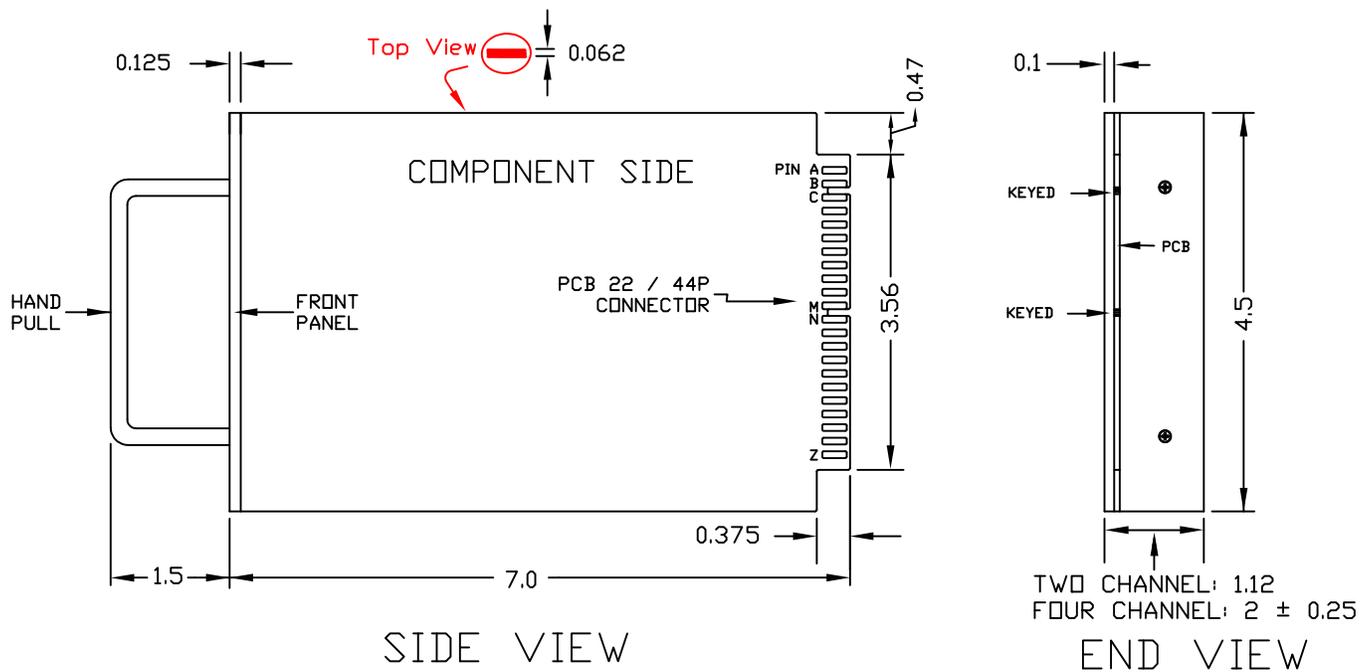
TEES 2009

A3-9



**APPENDIX A5  
CHAPTER 5 DETAILS**





MODEL 222, 224 & 232  
CONNECTOR ASSIGNMENTS

PIN	FUNCTION (SENSORS)
*A	DC GROUND
*B	+24 VDC
---	
*C	DETECTOR RESET
D	INPUT #1
E	INPUT #1
F	OUTPUT #1 (C)
H	OUTPUT #1 (E)
J	INPUT #2
K	INPUT #2
L	EQUIPMENT GROUND
M	AC-
---	
N	AC+
P	INPUT #3
R	INPUT #3
S	OUTPUT #3 (C)
T	OUTPUT #3 (E)
U	INPUT #4
V	INPUT #4
W	OUTPUT #2 (C)
X	OUTPUT #2 (E)
Y	OUTPUT #4 (C)
Z	OUTPUT #4 (E)

MODEL 242L & 252  
CONNECTOR ASSIGNMENTS

PIN	FUNCTION (ISOLATORS)
A	DC GROUND
B	+24 VDC
---	
C	NA
D	INPUT #1
E	INPUT #1
F	OUTPUT #1 (C)
H	OUTPUT #1 (E)
J	INPUT #2
K	INPUT #2
L	EQUIPMENT GROUND
M	*AC-
---	
N	*AC+
P	NA
R	NA
S	NA
T	NA
U	NA
V	NA
W	OUTPUT #2 (C)
X	OUTPUT #2 (E)
Y	NA
Z	NA

NOTES:

- Tolerance dimensions are  $\pm 0.02$  in except as noted
- Sheet definitions:  
 ---- = Slotted for keying  
 (C) = Collector  
 (E) = Emitter  
 \* = NA for these connections on Models 232 & 242L
- "U" shape rod handle shall be fabricate of 0.18 in to 0.26 in diameter, **aluminum stock**.
- All dimensions shall be in inches.

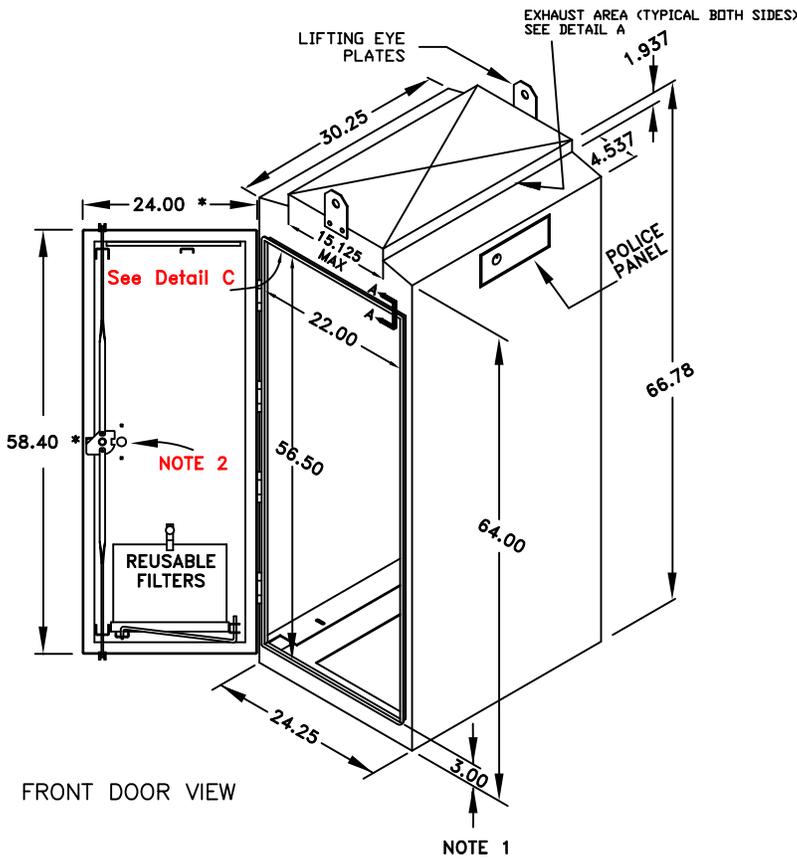
TITLE: SENSOR UNIT AND ISOLATOR DETAILS	
ERRATA 2	NO SCALE
TEES 2009	A5-1

## APPENDIX A6 CHAPTER 6 DETAILS

<b>Cabinet Housing Details - sheet 1 of 4</b>	<b>A6-1</b>
<b>Cabinet Housing Details - sheet 2 of 4</b>	<b>A6-2</b>
<b>Cabinet Equipment Mounting Details sheet 2 of 4</b>	<b>A6-5</b>
<b>Model 332L and 336L One Line Diagram</b>	<b>A6-7</b>
<b>PDA #2L SSR Installation Details</b>	<b>A6-8</b>
<b>Model 334L One Line Diagram</b>	<b>A6-9</b>
<b>Service Panel Assembly Details – sheet 1 of 3</b>	<b>A6-10</b>
<b>Service Panel Assembly Details – sheet 2 of 3</b>	<b>A6-11</b>
<b>Service Panel Assembly Details - sheet 3 of 3</b>	<b>A6-12</b>
<b>PDA #2L &amp; #3L Details sheet 1 of 8</b>	<b>A6-13</b>
<b>PDA #2L &amp; #3L Details sheet 2 of 8</b>	<b>A6-14</b>
<b>PDA #2L &amp; #3L Details sheet 3 of 8</b>	<b>A6-15</b>
<b>Input/Output Files Details - sheet 1 of 9</b>	<b>A6-16</b>
<b>Input/Output Files Details - sheet 2 of 9</b>	<b>A6-17</b>
<b>Input/Output Files Details - sheet 3 of 9</b>	<b>A6-18</b>
<b>Input/Output Files Details - sheet 4 of 9</b>	<b>A6-19</b>
<b>Input/Output Files Details - sheet 5 of 9</b>	<b>A6-20</b>
<b>Side Panel Details - sheet 1 of 4</b>	<b>A6-21</b>
<b>Side Panel Details - sheet 2 of 4</b>	<b>A6-22</b>
<b>Side Panel Details - sheet 3 of 4</b>	<b>A6-23</b>
<b>Side Panel Details - sheet 4 of 4</b>	<b>A6-24</b>
<b>Harness Wiring Details sheet 1 of 4</b>	<b>A6-25</b>
<b>Harness Wiring Details sheet 2 of 5</b>	<b>A6-26</b>
<b>C11 Harness Termination Details</b>	<b>A6-31</b>
<b>Cabinet Housing # 3 – sheet 1 of 7</b>	<b>A6-32</b>
<b>Cabinet Housing # 3&amp; #4 Details sheet 2 of 7</b>	<b>A6-33</b>
<b>Cabinet Housing # 3 – sheet 3 of 7</b>	<b>A6-34</b>
<b>Cabinet Housing # 3 – sheet 4 of 7</b>	<b>A6-35</b>
<b>Model 342LX Side Panel Detail</b>	<b>A6-36</b>
<b>Model 344LX Side Panel Detail</b>	<b>A6-37</b>
<b>Cabinet Equipment Mounting Details</b>	<b>A6-38</b>
<b>Service PDA Details – sheet 1 of 2</b>	<b>A6-39</b>
<b>Service PDA Details – sheet 2 of 2</b>	<b>A6-40</b>
<b>Cage # 1 Drawer and Shelf Installation Details</b>	<b>A6-41</b>
<b>Model 342LX &amp; 346LX One Line Diagram</b>	<b>A6-42</b>
<b>Cabinet Door Handle Details</b>	<b>A6-43</b>
<b>Model 344LX One Line Diagram</b>	<b>A6-44</b>
<b>PDA #2LX &amp; #3LX Details – sheet 4 of 8</b>	<b>A6-45</b>
<b>PDA #2LX &amp; #3LX Details – sheet 5 of 8</b>	<b>A6-46</b>
<b>PDA #2LS SSR Installation Detail – sheet 6 of 8</b>	<b>A6-47</b>
<b>PDA #2LS Details – sheet 7 of 8</b>	<b>A6-48</b>

<b>PDA #2LS Details – sheet 8 of 8</b>	<b>A6-49</b>
<b>Input/Output File LX Details sheet 6 of 9</b>	<b>A6-50</b>
<b>Input/Output File LX Details sheet 7 of 9</b>	<b>A6-51</b>
<b>Input/Output File LX Details sheet 8 of 9</b>	<b>A6-52</b>
<b>Input/Output File LX Details sheet 9 of 9</b>	<b>A6-53</b>
<b>Cabinet Housing #4 Details sheet 5 of 7</b>	<b>A6-54</b>
<b>Cabinet Housing #4 Details sheet 6 of 7</b>	<b>A6-55</b>
<b>Cabinet Housing #4 Details sheet 7 of 7</b>	<b>A6-56</b>
<b>Model 346LX Side Panel Details</b>	<b>A6-57</b>
<b>Cabinet Equipment Mounting Details sheet 3 of 3</b>	<b>A6-58</b>

# CABINET HOUSING 1B



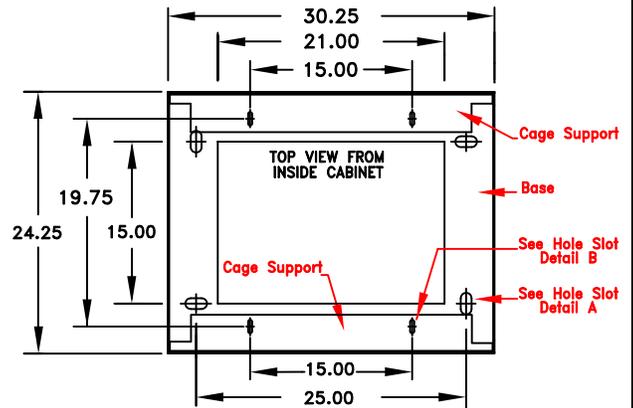
## DETAIL A CABINET HOUSING 1B & 2 VENTILATION EXHAUST DETAIL

### SECTION A-A CABINET HOUSING 1B & 2 FLANGE AROUND DOOR OPENING

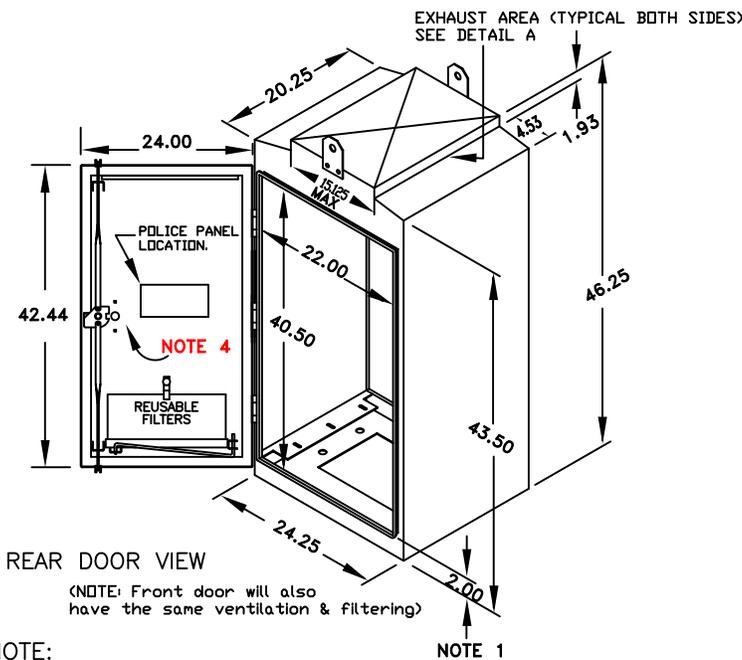


\* TOLERANCE +0.0625, -0

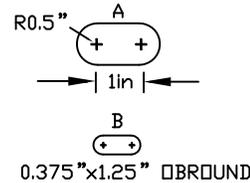
## CABINET HOUSING 1B BOTTOM DETAIL



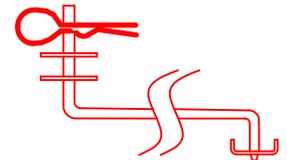
# CABINET HOUSING 2



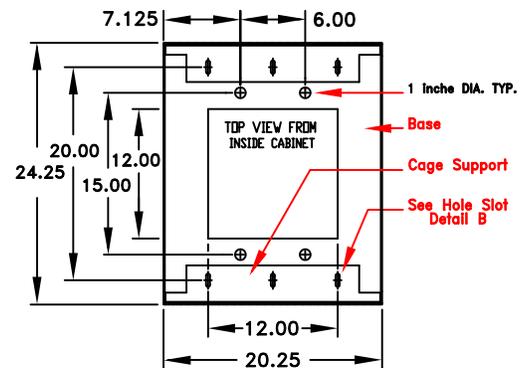
## HOLE SLOT DETAIL



## DETAIL C



## CABINET HOUSING 2 BOTTOM DETAIL



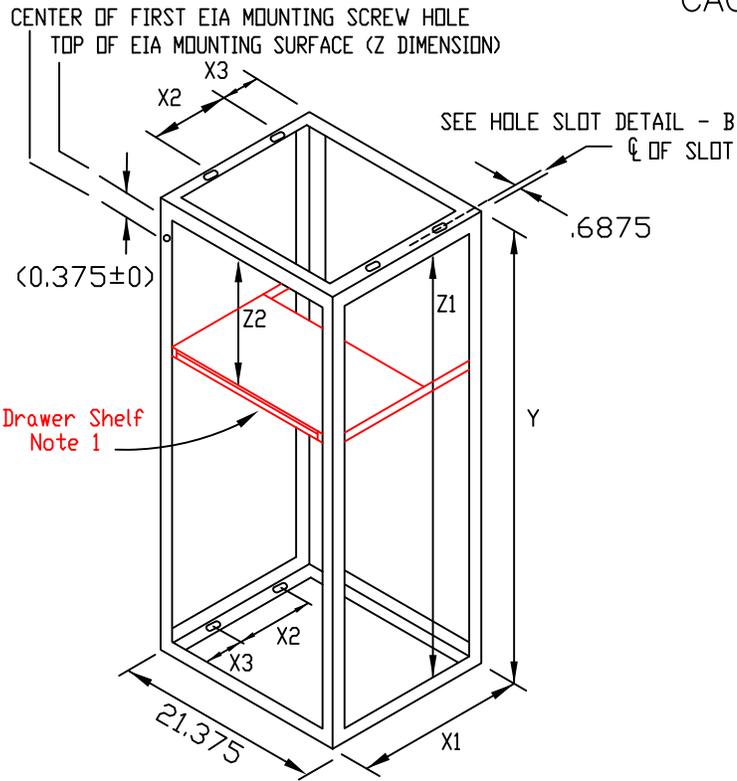
NOTE: ALL HOLE PATTERNS CENTERED ON CABINET BOTTOMS.

NOTE:

1. Cabinet base to door opening.
2. The locks & handles shall be on right side of the front door & the left side of the rear door (viewed externally)
3. All dimensions shown are in inches.
4. The locks & handles shall be on left side of the front door & the right side of the rear door (viewed externally)
5. Upper and lower catches must hold the door open at multiple positions.

TITLE: CABINET HOUSING DETAILS SHEET 1 OF 4	
ERRATA 2	NO SCALE
TEES 2009	A6-1

# CAGE SUPPORT DETAIL

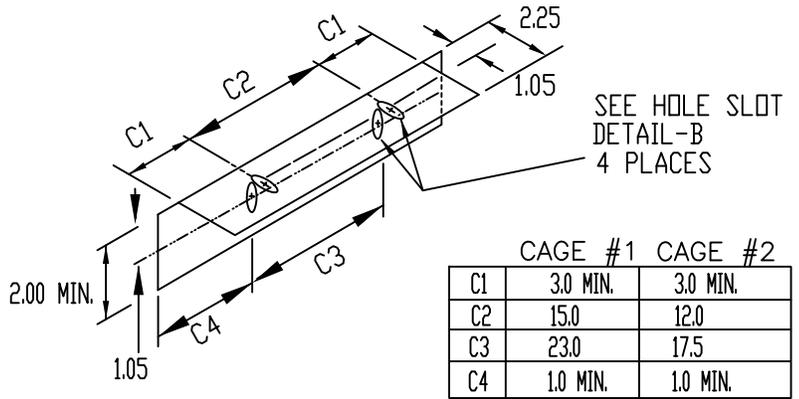


FRONT VIEW

## CABINET CAGE DIMENSIONS

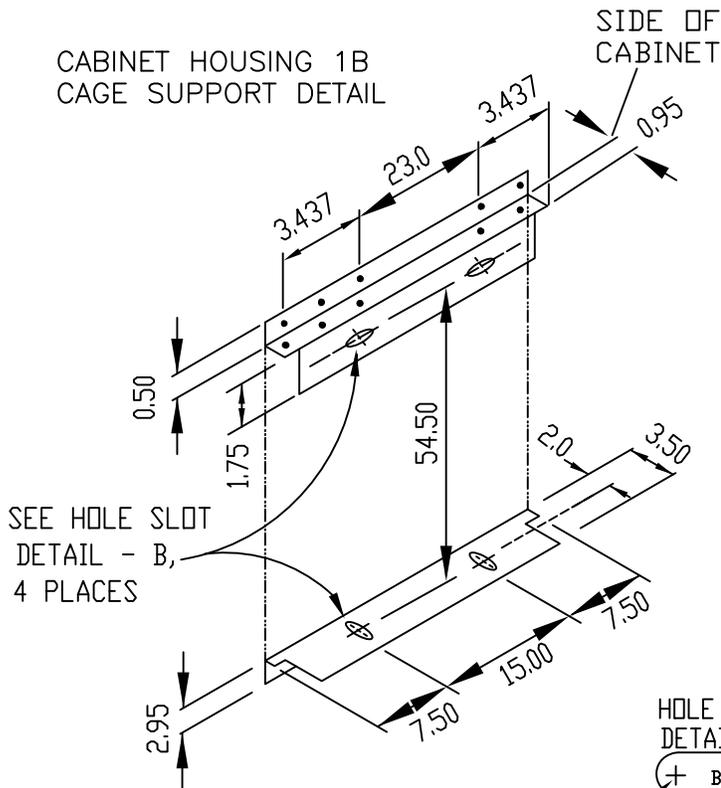
	CAGE #1	CAGE #2
X1	21.375	16.00
X2	15.00	12.00
X3	3.188	2.00
Y	55.50	40.00
Z1	53.00 MIN.	38.75 MIN.
Z2	15.75	7.25

## SPACER BRACKET DETAIL

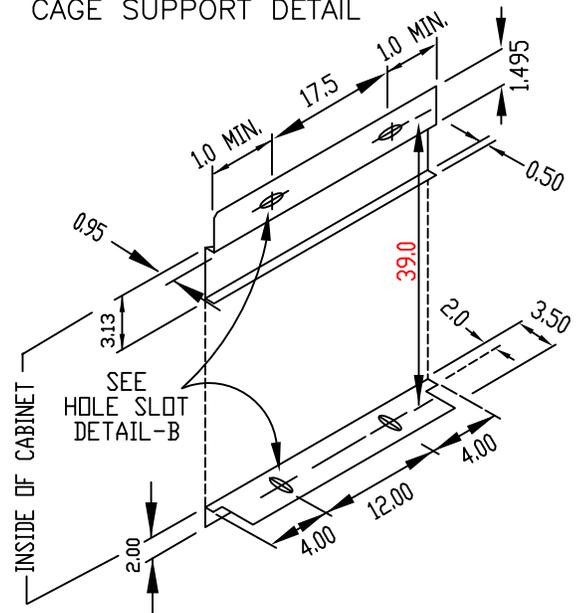


	CAGE #1	CAGE #2
C1	3.0 MIN.	3.0 MIN.
C2	15.0	12.0
C3	23.0	17.5
C4	1.0 MIN.	1.0 MIN.

## CABINET HOUSING 1B CAGE SUPPORT DETAIL

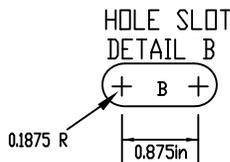


## CABINET HOUSING 2 CAGE SUPPORT DETAIL

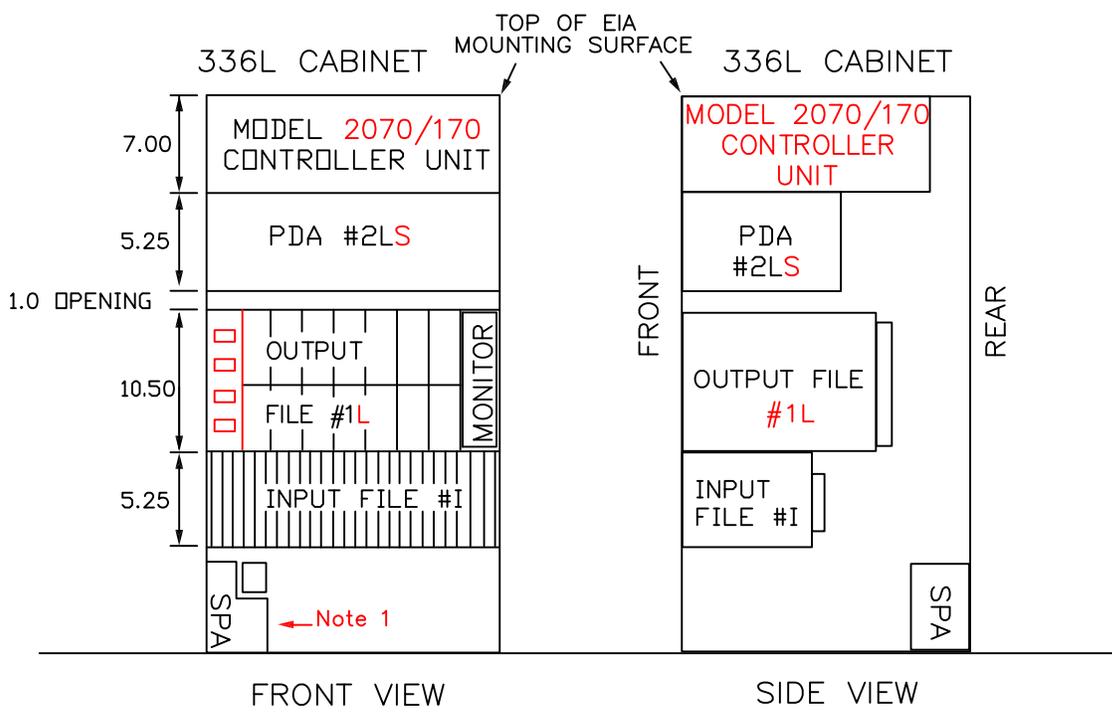
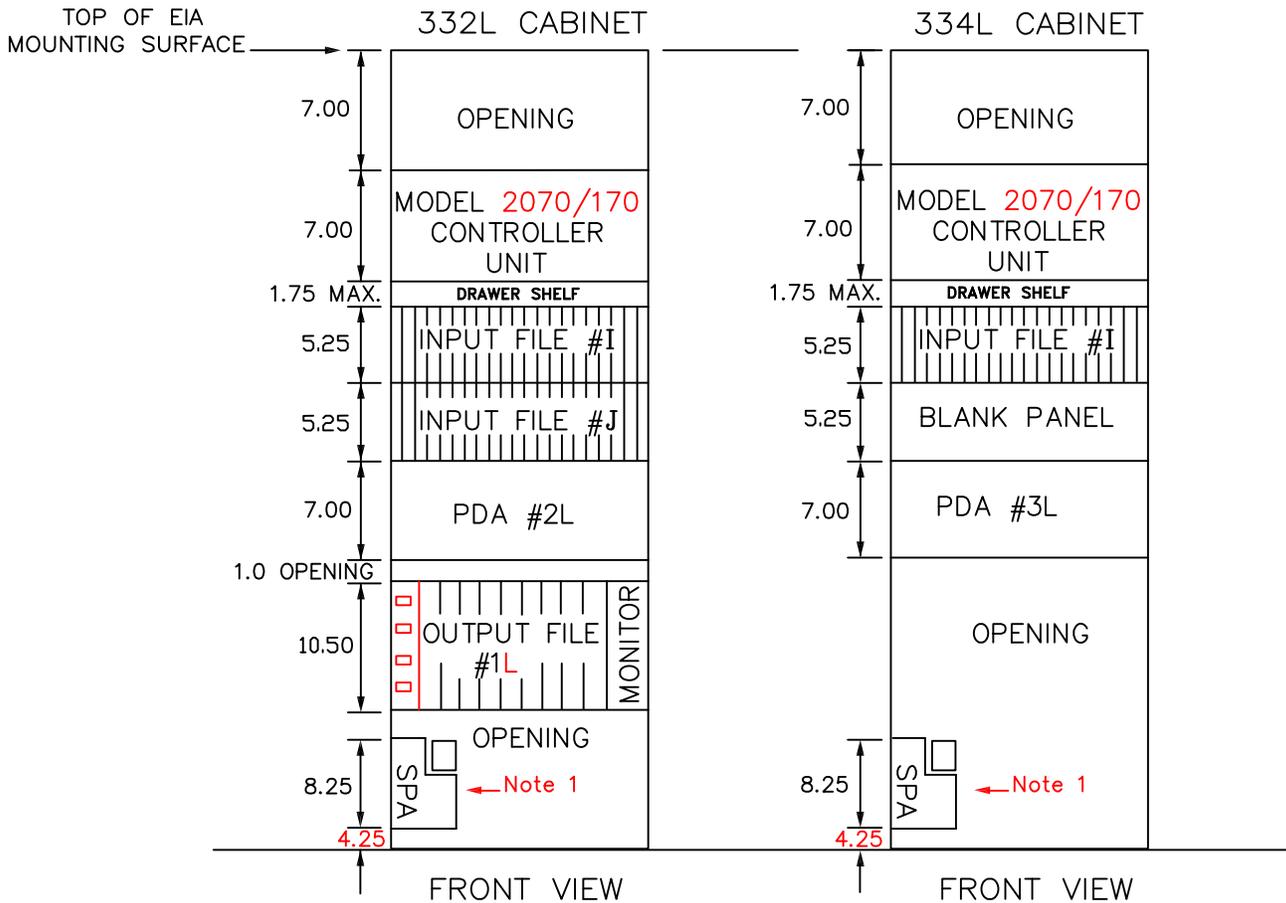


NOTE:

1. Drawer Shelf details, A6-6
2. All dimensions shown are in inches



TITLE: CABINET HOUSING DETAILS SHEET 2 OF 4	
ERRATA 2	NO SCALE
TEES 2009	A6-2

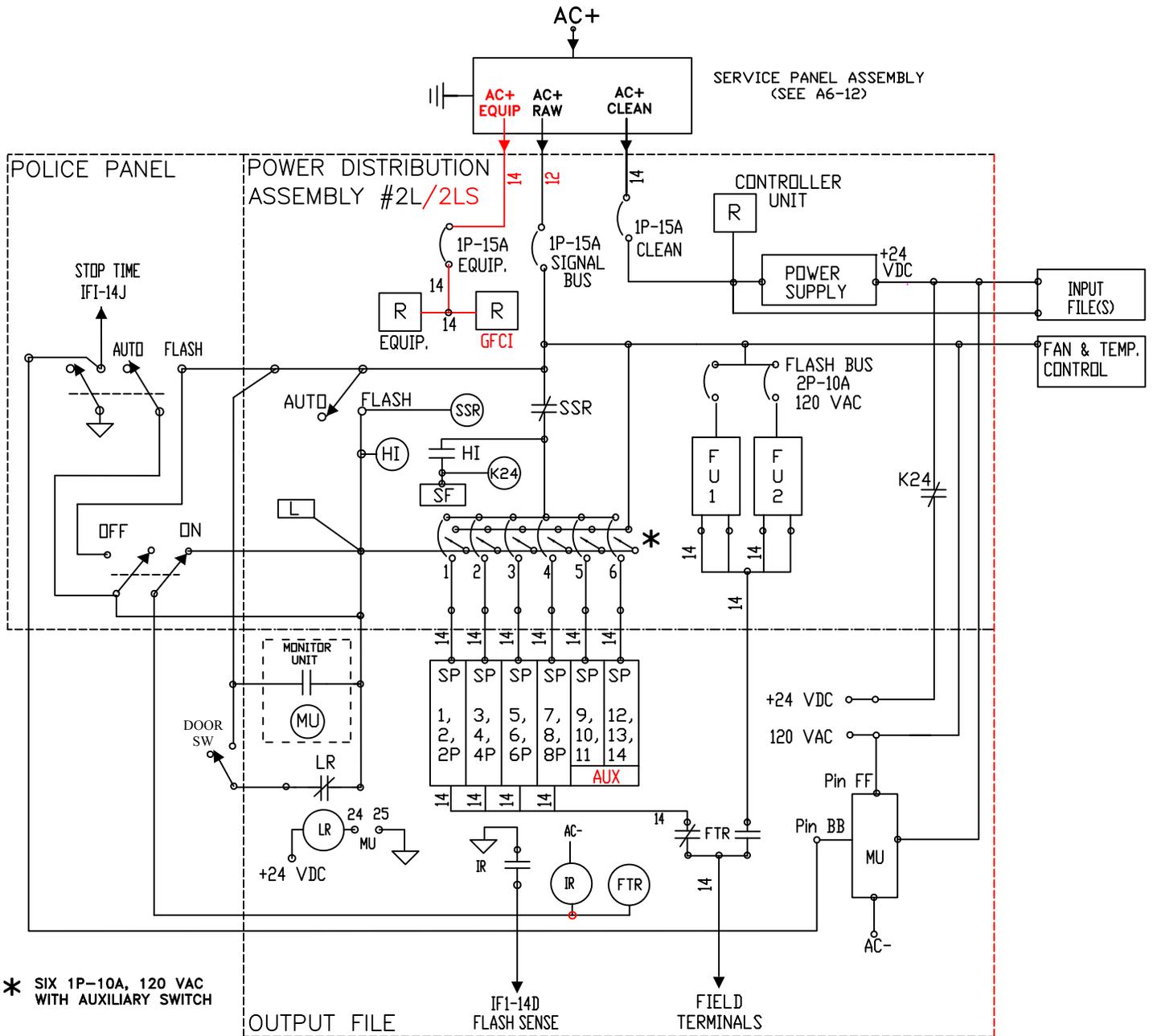


NOTE:

1. SPA shall be bolted on the rail and firmly attached to the Service Panel.
2. All dimensions shown are in inches.

TITLE: <b>CABINET EQUIPMENT MOUNTING DETAILS</b>	
<b>SHEET 1 OF 3</b>	
ERRATA 2	NO SCALE
TEES 2009	A6-5

# 332L & 336L CABINET ONE LINE DIAGRAM



\* SIX 1P-10A, 120 VAC WITH AUXILIARY SWITCH

## SHEET DEFINITIONS

TBS	TERMINAL BLOCK - SERVICE	(*)	RELAY COIL - * RELAY NAME	TR	TRANSFER RELAY
⏏	EQUIPMENT GROUND	(FU1)	FLASHER UNIT ONE	IR	ISOLATION RELAY
8	WIRE SIZE, IF NOT INDICATED SHALL BE #16 AWG OR LARGER	⏏	DC GROUND	⏏	SWITCH CONTACT
⏏	CIRCUIT BREAKER	WDT	WATCHDOG TIMER	LR	LOGIC RELAY
(R)	DUPLEX RECEPTACLE	FTR	FLASH TRANSFER RELAY	CB-1	SIGNAL CIRCUIT BREAKER 1 (SECONDARY)
GFCI	GROUND FAULT CIRCUIT INTERRUPTER	(L)	PDA FLASH ON DISPLAY LAMP	IFI-14J	INPUT FILE 1, TERMINAL BLOCK 14, POSITION J (CHANNEL 2 INPUT)
⏏	RELAY CONTACT, NORMALLY CLOSED	SPA	SERVICE PANEL ASSEMBLY	IFI-14D	INPUT FILE 1, TERMINAL BLOCK 14, POSITION D
⏏	RELAY CONTACT, NORMALLY OPEN	MU	MONITOR UNIT	CI-65	C1 CONNECTOR, PIN 65
SSR	SOLID STATE RELAY	(SF)	SSR Fault Indicator	(HI)	Health Indicator Relay
PDA	POWER DISTRIBUTION ASSEMBLY	T2-6	TERMINAL BLOCK 2, POSITION 6	(K24)	Disconnect 24VDC Relay
AUX	AUXILIARY				
SP	SWITCH PACK				

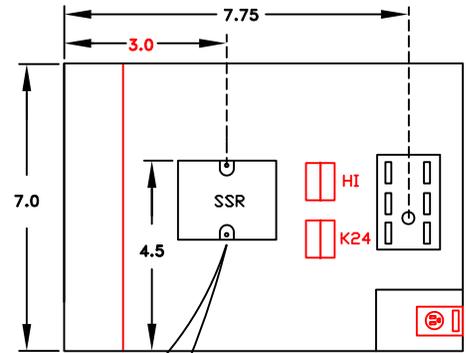
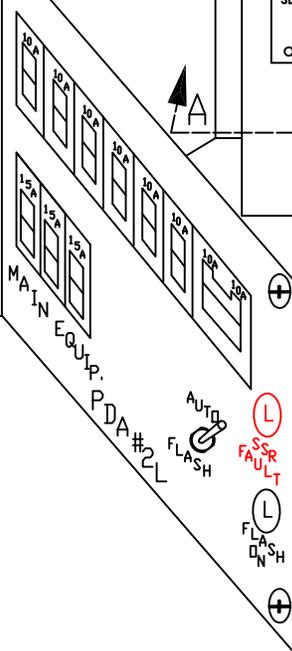
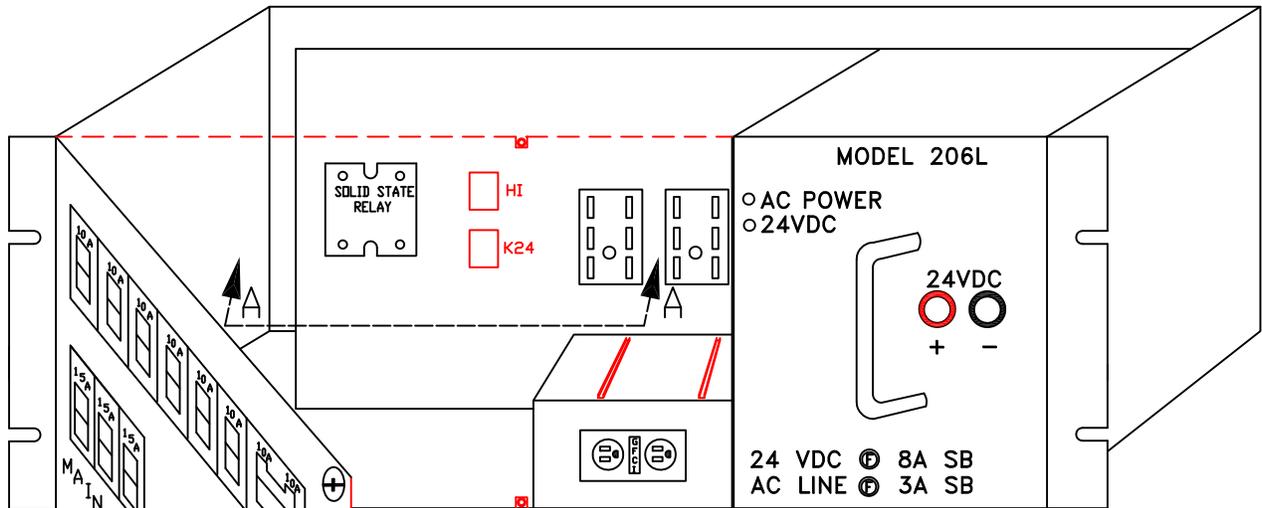
TITLE: MODEL 332L AND 336L ONE LINE DIAGRAM

ERRATA 2

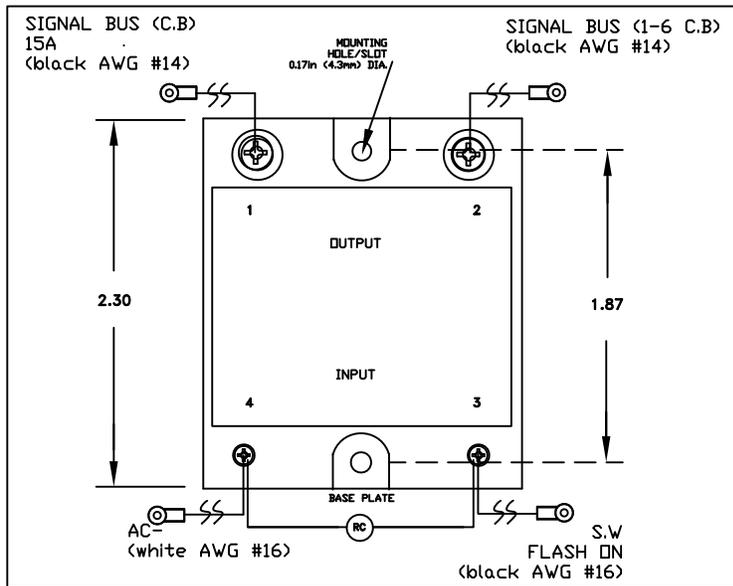
NO SCALE

TEES 2009

A6-7



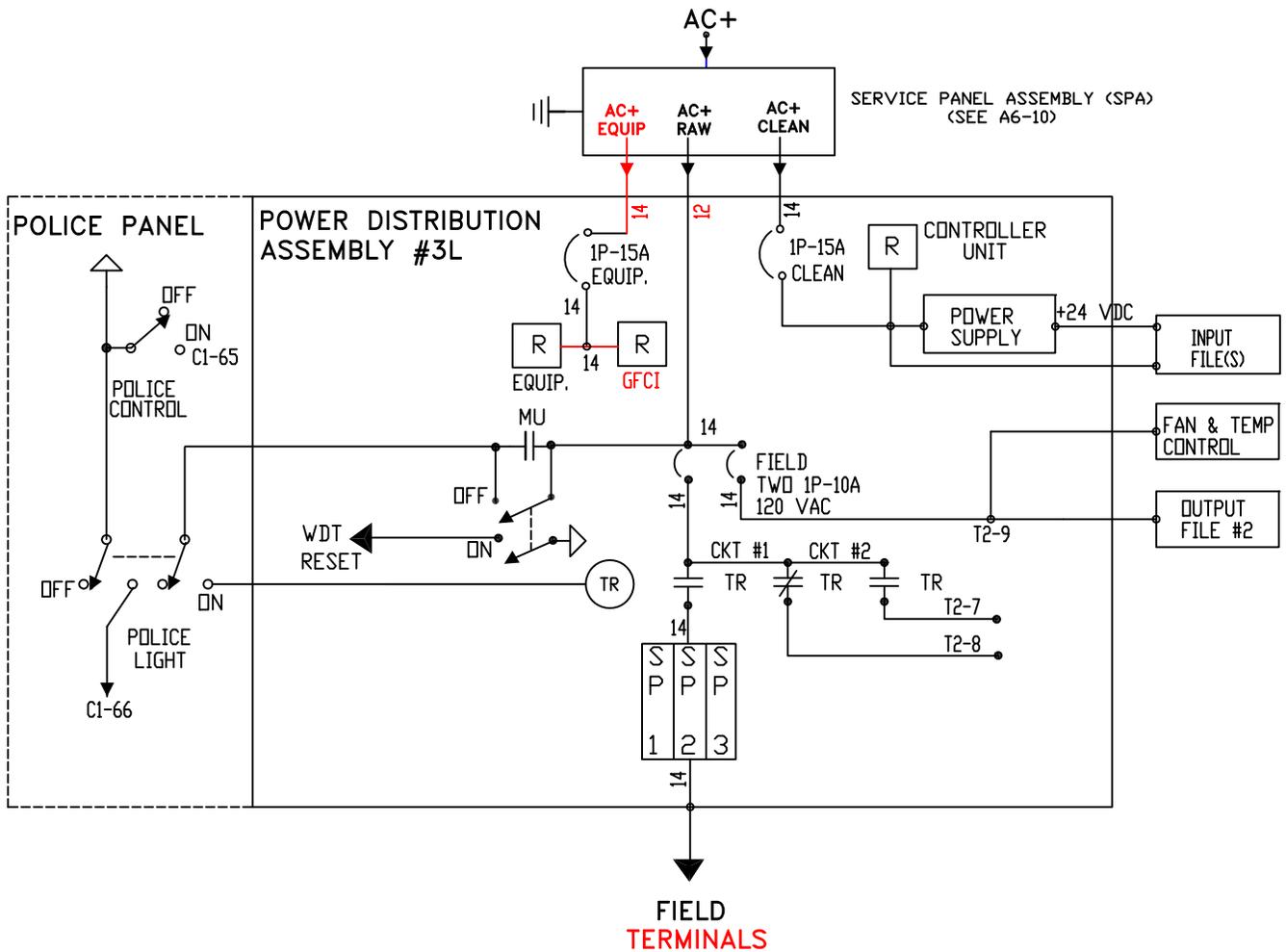
Section A-A



NOTE:  
All dimensions shown are in inches.

TITLE:	
<b>PDA #2L</b> <b>SSR INSTALLATION DETAILS</b>	
ERRATA 2	NO SCALE
TEES 2009	A6-8

# 334L CABINET ONE LINE DIAGRAM



## SHEET DEFINITIONS

TBS    TERMINAL BLOCK - SERVICE	WDT    WATCHDOG TIMER
EQUIPMENT GROUND	MU    MONITOR UNIT
WIRE SIZE, IF NOT INDICATED SHALL BE #16 AWG OR LARGER	CB-1    SIGNAL CIRCUIT BREAKER 1 (SECONDARY)
CIRCUIT BREAKER	TR    TRANSFER RELAY
DUPLEX RECEPTACLE	T2-6    TERMINAL BLOCK 2, POSITION 6
<b>GFCI</b> <b>GROUND FAULT CIRCUIT INTERRUPTER</b>	CI-65    C1 CONNECTOR, PIN 65
RELAY CONTACT, NORMALLY CLOSED	SPA    SERVICE PANEL ASSEMBLY
RELAY CONTACT, NORMALLY OPEN	<b>SP</b> <b>SWITCH PACK</b>
IFI-14J <b>INPUT FILE 1, TERM. BLOCK 14, POSITION J</b> (CHANNEL 2 INPUT)	DC GROUND
FLASHER UNIT ONE	SWITCH CONTACT
<b>PDA</b> <b>POWER DISTRIBUTION ASSEMBLY</b>	

TITLE:

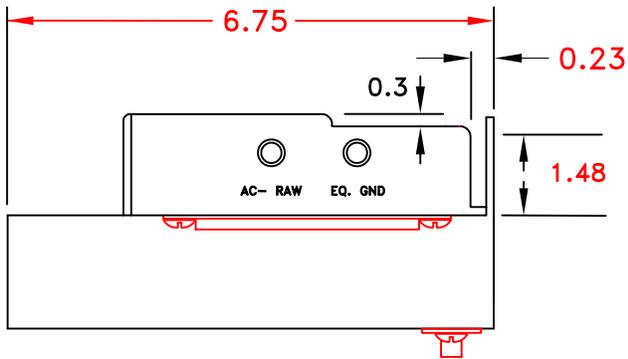
**MODEL 334L ONE LINE DIAGRAM**

**ERRATA 2**

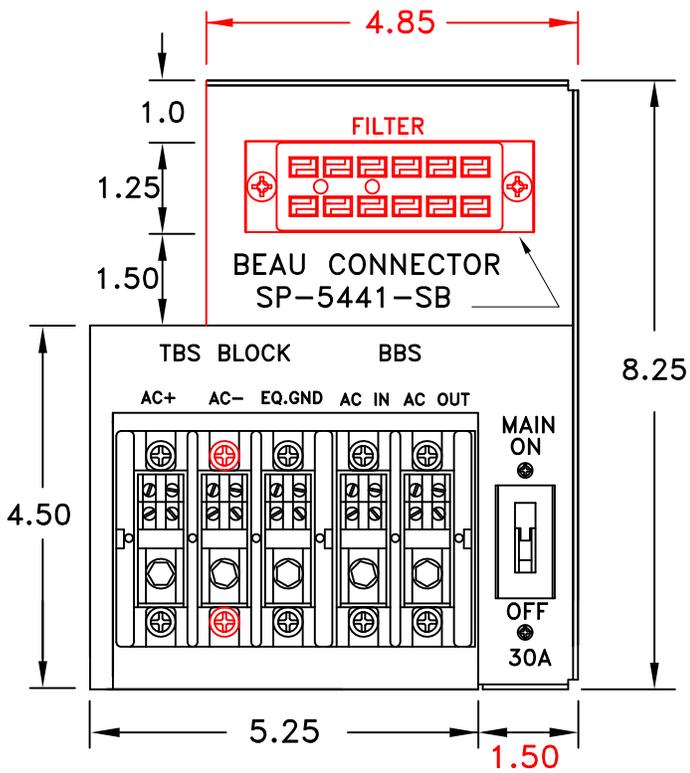
NO SCALE

TEES 2009

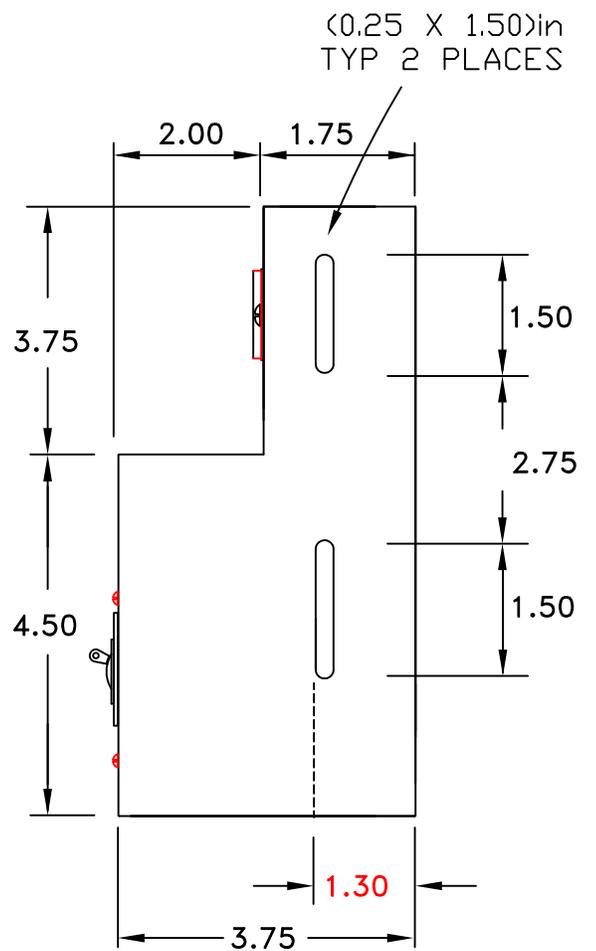
A6-9



TOP VIEW



FRONT VIEW

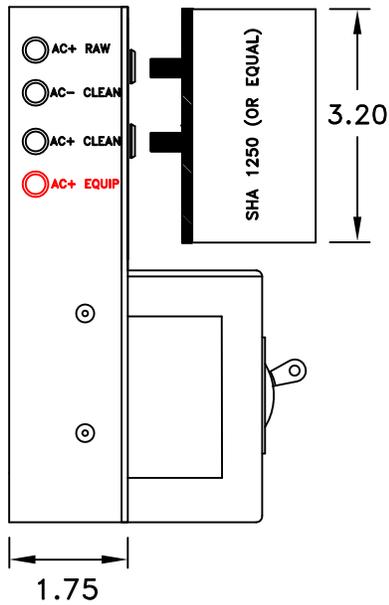


SIDE VIEW

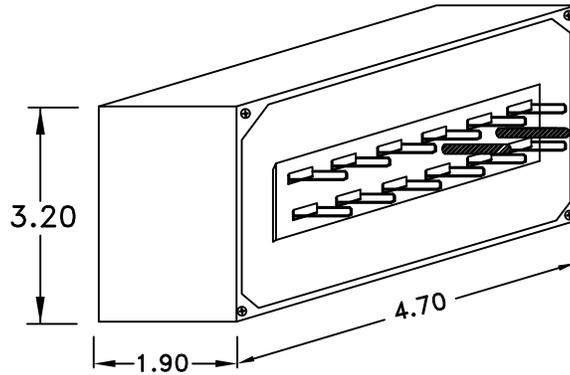
NOTE:

All dimensions shown are in inches.

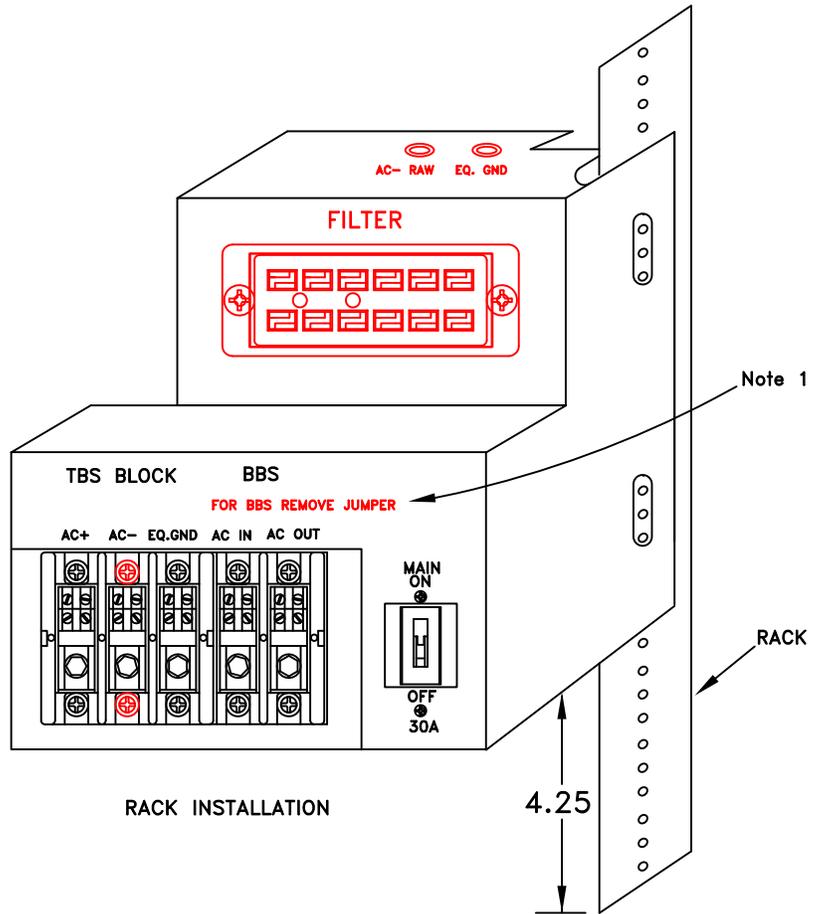
TITLE: SERVICE PANEL ASSEMBLY (SPA) DETAILS SHEET 1 OF 3	
ERRATA 2	NO SCALE
TEES 2009	A6-10



SIDE VIEW



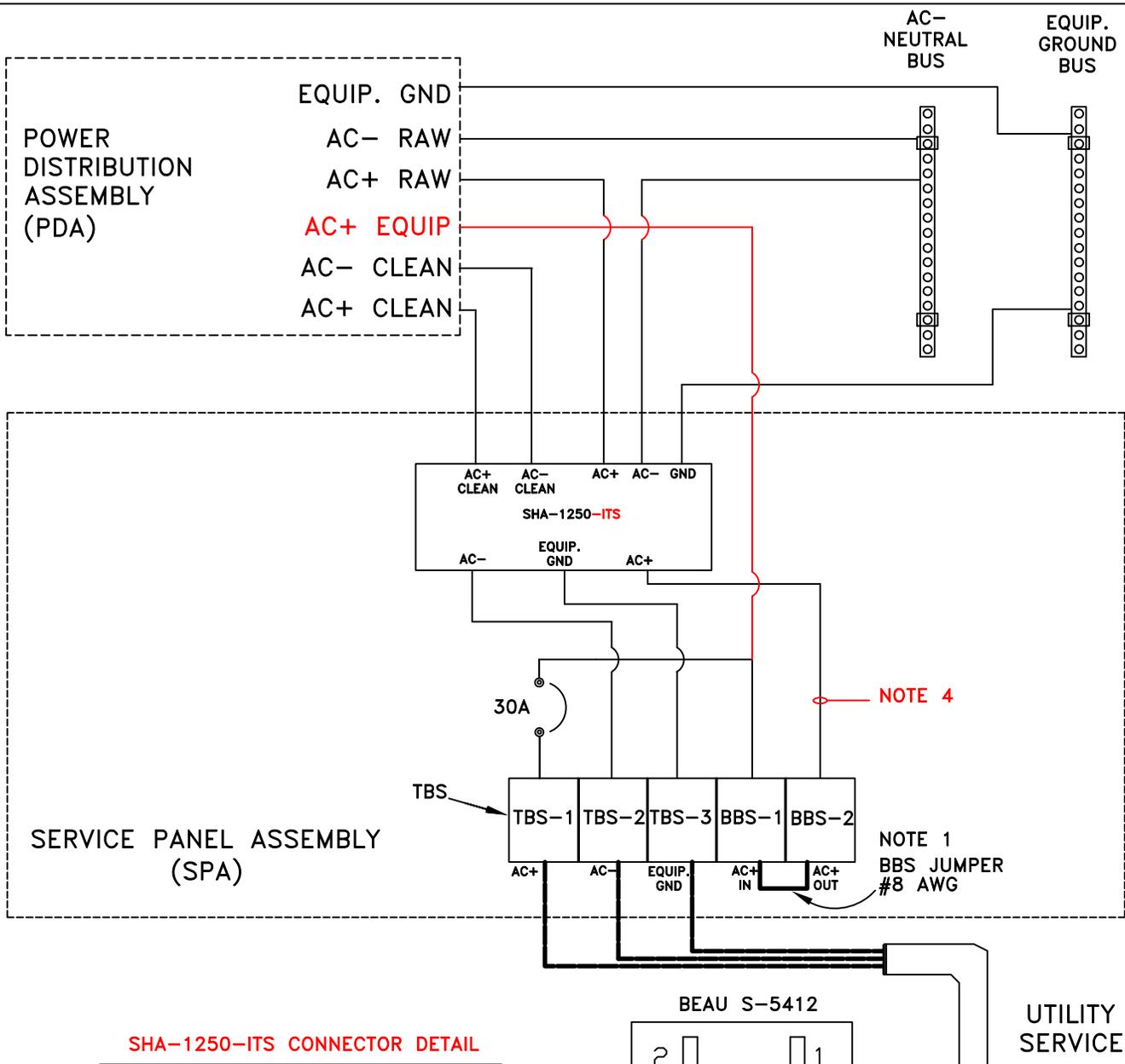
FILTER  
(MODEL SHA-1250-ITS OR EQUAL)



NOTES: (FOR THIS DETAIL)

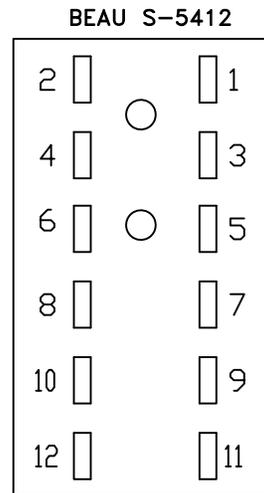
1. Place label "FOR BBS REMOVE JUMPER"
2. The SPA shall be mounted at least 4.25in above the bottom of the cabinet shelf, **except the 336L.**
3. All dimensions shown are in inches.

TITLE:	
SERVICE PANEL ASSEMBLY (SPA) DETAILS SHEET 2 OF 3	
ERRATA 2	NO SCALE
TEES 2009	A6-11



**SHA-1250-ITS CONNECTOR DETAIL**

PIN	FUNCTION	PIN	FUNCTION
1	AC+ RAW	2	AC+ RAW
3	EQ. GND	4	EQ. GND
5	AC+ CLEAN	6	AC+ RAW
7	AC- CLEAN	8	NA
9	EQ. GND	10	EQ. GND
11	AC- RAW	12	AC- RAW



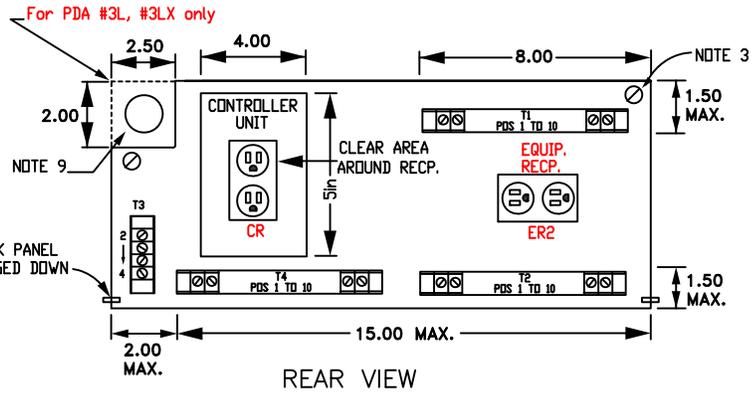
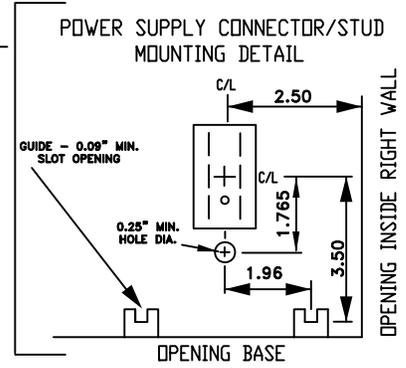
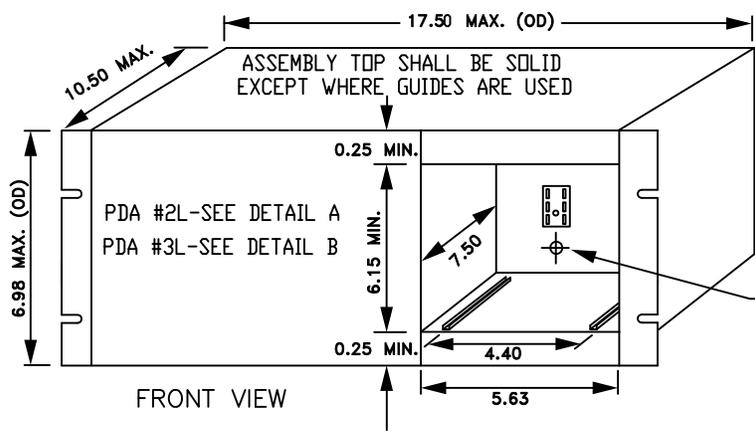
FRONT VIEW

NOTE:

BBS = Battery Back-up System  
TBS = Terminal Block Service

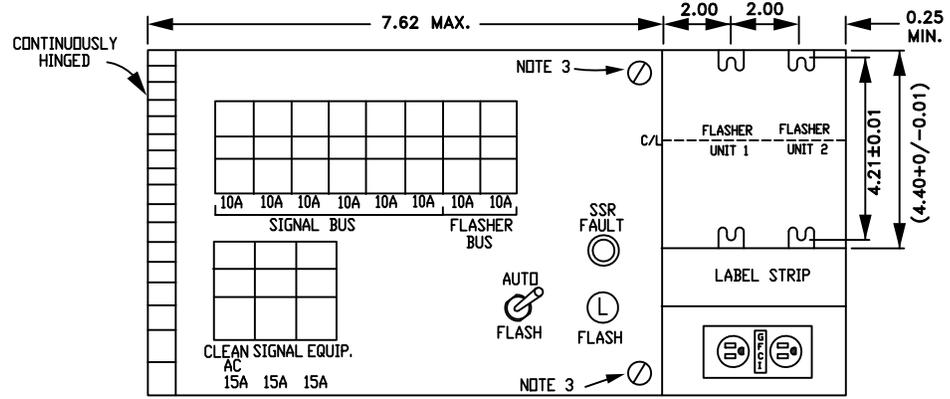
1. Remove jumper when connecting BBS.
2. SHA-1250-ITS connector BEAU S-5412 or equivalent
3. Surge protection shall be provided of indicators  
GREEN LED Indicator ON= ok, OFF= error.  
YELLOW LED ON= error, Off= ok.
4. Red insulation for both conductors

TITLE: SERVICE PANEL ASSEMBLY (SPA) DETAILS SHEET 3 OF 3	
ERRATA 2	NO SCALE
TEES 2009	A6-12

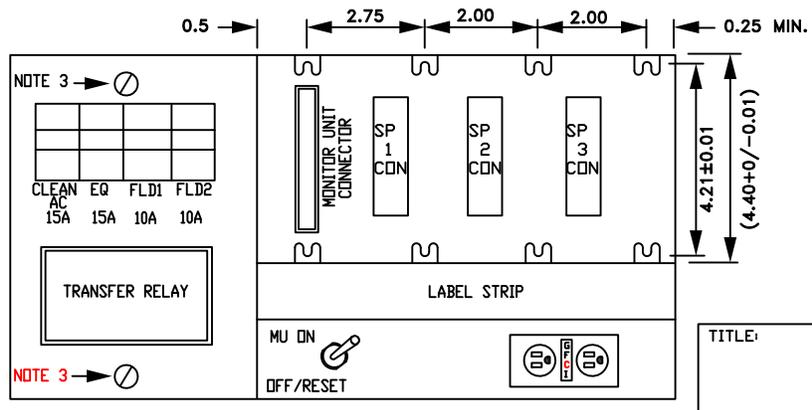


FRONT VIEW

REAR VIEW



DETAIL A

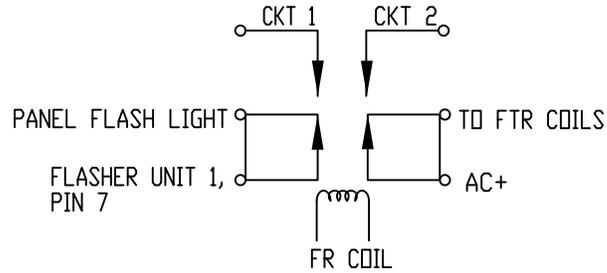


DETAIL B

NOTE:  
All dimensions shown are in inches.

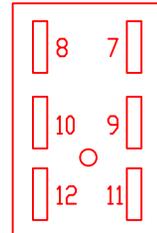
TITLE:	
PDA #2L & #3L DETAILS SHEET 1 OF 8	
ERRATA 2	NO SCALE
TEES 2009	A6-13

## FLASH RELAY CONNECTOR SOCKET WIRING DETAIL



## FLASHER UNIT CONNECTOR SOCKET WIRING DETAIL

PIN NO.	FUNCTION
7	LD Ckt #1
8	LD Ckt #2
9	EG
10	AC- CLEAN
11	AC+ CLEAN
12	NA



REAR VIEW

TITLE:	
PDA #2L & #3L DETAILS SHEET 2 OF 8	
ERRATA 2	NO SCALE
TEES 2009	A6-14

POWER DISTRIBUTION ASSEMBLY TERMINAL BLOCK ASSIGNMENT DETAIL

PDA's	2L(X,S)	2L(X,S)	3L(X)	2L(X,S) & 3L(X)	2L(X,S)	3L(X)		
TERMINAL BLOCK	T1		T2		T3		T4	
SIDE POS	A	B	A	B	A	B	A	B
1.	EG BUS / EG	* / ER AC-	EG BUS / EQ GND	24VDC BUS / PS-7	NA / NA	FL1 / SP 3-3		
2.	AC- BUS / AC-	01-5 / FU1-7	AC- BUS / AC-	24VDC (CONTROLLED) / PS-7	NA / NA	FL2 / SP 3-5		
3.	CR AC- / AC-CLEAN	01-6 / FU1-8	* / AC+ CLEAN	DC GND BUS / PS 8	NA / NA	FL3 / SP 3-7		
4.	* / SCB CKT 5	01-7 / FU2-7	* / AC+ RAW	DC GND BUS / PS-8	NA / NA	FL4 / SP 2-3		
5.	* / AC+ RAW	01-8 / FU2-8	* / MU		NA / NA	FL5 / SP 2-5		
6.	CR AC+ / AC+ CLEAN	* / FTR DRIVE	* / TR COIL		NA / NA	FL6 / SP 2-7		
7.	* / SSR	01-1 / SCB CKT 1	NA / TRC2ND		NA / NA	FL7 / SP 1-3		
8.	* / SCB CKT 6	01-2 / SCB CKT 2	NA / TRC2NC		NA / NA	FL8 / SP 1-5		
9.	* / FCB1 (SEC)	01-3 / SCB CKT 3	03-5 / FLD2		NA / NA	FL9 / SP 1-7		
10.	* / ER AC+	01-4 / SCB CKT 4	SPA AC- / AC-CLEAN		NA / NA	NA / NA		

A = EXTERNAL SIDE    B = INTERNAL SIDE    \* = WIRE PER ONE LINE DIAGRAM

NOTES: (FOR DETAILS A6-13 TO A6-15)

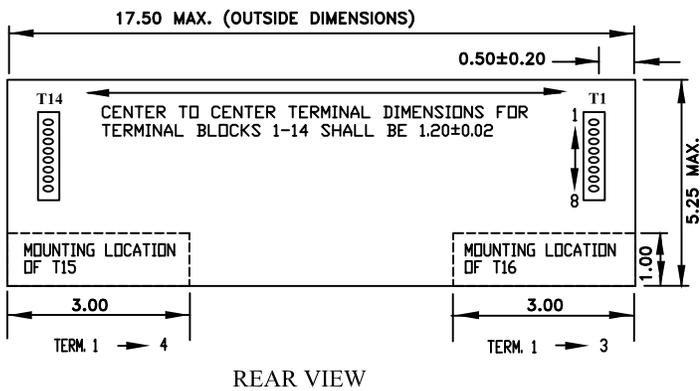
- All dimensions shown are in inches.
- SHEET DEFINITIONS:

CKT = CIRCUIT	EG = EQUIPMENT GROUND
FLD1 = FIELD 1 CIRCUIT BREAKER	FL1 = FIELD LOAD 1
FU1-7 = FLASHER UNIT #1, PIN 7	ER = EQUIPMENT RECEPTACLE
L = LAMP	LD CKT#1 = LOAD CIRCUIT 1
SSR = SOLID STATE RELAY	CR = CONTROLLER RECEPTACLE
MN = MAIN	MU-22 = MONITOR UNIT - PIN 22
OD = OUTSIDE DIMENSION	POS = POSITION
PS-7 = POWER SUPPLY PIN 7	SCB = SIGNAL CIRCUIT BREAKER
SP 3-3 = SWITCH PACK 3, PIN 3	TR = TRANSFER RELAY
01-8 = OUTPUT FILE TB 01, POSITION 8	FCB1 = FIELD CIRCUIT BREAKER 1

- Thumb screw device.
- Transfer relay in PDA #2L(X,S) & #3L(X) shall extend no more than 1.0 inch out from the assembly front face.
- Slack shall be provided in the wiring for the circuit breakers and GFCI receptacle to allow for the removal and repair. Excess bends and stress on the wiring shall be minimized.
- See Output File plan sheet for heavy duty relay and switch pack wiring assignments and connector mounting location.
- Wiring shall be routed (with extra length) to minimize movement when front panel door is opened. The wiring going to the front panel shall be routed such that it does not cause undue twisting or bending of the wires.
- No ventilation hole shall be large enough to place a 0.375 inch diameter object through.
- If PDA #2L, #2LX or #2LS is installed, park the C1 harness #1 - C5S connector at the Input Panel's C5P.  
If PDA #3L or #3LX is installed, the C1 harness #2 - C5S connector shall be connected to the PDA's C6P connector, support bracket and wiring shall be installed.

TITLE:	
PDA #2L(X,S) & #3L(X) DETAILS	
SHEET 3 OF 8	
ERRATA 2	NO SCALE
TEES 2009	A6-15

### INPUT FILE DETAIL



### INPUT FILE TERMINAL ASSIGNMENT DETAIL

#### T1 - 14

TERM	PIN - FUNCTION
1	SP - SPARE
2	F - CHANNEL 1 OUTPUT
3	W - CHANNEL 2 OUTPUT
4	D - CHANNEL 1 INPUT
5	E - CHANNEL 1 INPUT
6	J - CHANNEL 2 INPUT
7	K - CHANNEL 2 INPUT
8	L - EQUIP. GROUND

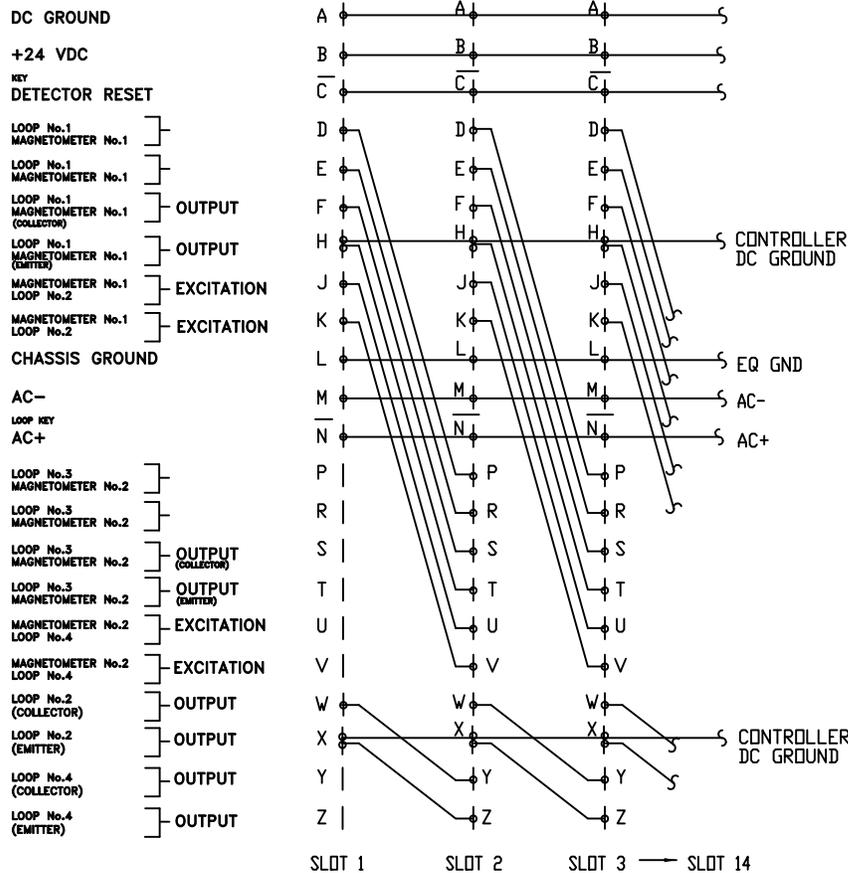
#### T15

TERM	FUNCTION
1	+24 VDC
2	DC GROUND
3	DETECTOR RESET
4	C1 HARNESS DC GROUND

#### T16

TERM	FUNCTION
1	AC+ CLEAN
2	AC- CLEAN
3	EQUIP. GROUND

### INPUT FILE WIRING DIAGRAM



NOTE:  
All dimensions shown are in inches.

TITLE:

INPUT/OUTPUT FILE DETAIL  
SHEET 1 OF 9

ERRATA 2

NO SCALE

TEES 2009

A6-16



OUTPUT FILE #1L TERMINAL ASSIGNMENT DETAIL

01 TERM	FUNCTION
1	PDA CKT1/SWPKS 1,2,2P-1
2	PDA CKT2/SWPKS 3,4,4P-1
3	PDA CKT3/SWPKS 5,6,6P-1
4	PDA CKT4/SWPKS 7,8,8P-1
5	PDA FU1 CKT1/FTR1
6	PDA FU1 CKT2/FTR2
7	PDA FU2 CKT1/FTR3
8	PDA FU2 CKT2/FTR4
9	EQUIP. GROUND
10	AC-
11	AC+ (FROM PDA)
12	SSR (TO PDA)
13	DOOR SW. (FROM POL PAN)
14	FTR COILS (TO)

02 TERM	FUNCTION
1	+24VDC TO LOGIC RELAY (LR) COIL
2	DC GROUND
3	IFI-14J, STOP TIME (FROM M.U)
4	IFI-14D, FLASH SENSE (FROM I.R)
5	EXTERNAL (M.U) RESET
6	NA
7	+24VDC (CONTROLLED) TO SWITCHPACKS (1-12) POSITION 9

FT1 TERM	FUNCTION	FT2 TERM	FUNCTION	FT3 TERM	FUNCTION
101	SWPK 4-RED	113	SWPK 2P-RED	125	SWPK 1-RED
102	SWPK 4-YEL	114	SWPK 2P-YEL	126	SWPK 1-YEL
103	SWPK 4-GRN	115	SWPK 2P-GRN	127	SWPK 1-GRN
104	SWPK 4P-RED	116	SWPK 3-RED	128	SWPK 2-RED
105	SWPK 4P-YEL	117	SWPK 3-YEL	129	SWPK 2-YEL
106	SWPK 4P-GRN	118	SWPK 3-GRN	130	SWPK 2-GRN
107	SWPK 8-RED	119	SWPK 6P-RED	131	SWPK 5-RED
108	SWPK 8-YEL	120	SWPK 6P-YEL	132	SWPK 5-YEL
109	SWPK 8-GRN	121	SWPK 6P-GRN	133	SWPK 5-GRN
110	SWPK 8P-RED	122	SWPK 7-RED	134	SWPK 6-RED
111	SWPK 8P-YEL	123	SWPK 7-YEL	135	SWPK 6-YEL
112	SWPK 8P-GRN	124	SWPK 7-GRN	136	SWPK 6-GRN

OUTPUT FILE #2L TERMINAL ASSIGNMENT DETAIL

O3 TERM	FUNCTION
1	PDA FU1 CKT1/FTR5
2	PDA FU2 CKT2/FTR6
3	FTR COILS (TO)
4	AC-
5	PDA CKT5/SWPKS 9,10,11-1
6	PDA CKT6/SWPKS 12,13,14-1
7	EQUIP. GROUND
8	AC+ (FROM PDA)

O4 TERM	FUNCTION
1	+24VDC
2	DC GROUND
3	IFI-14J, STOP TIME (FROM M.U)
4	IFI-14D, FLASH SENSE (FROM I.R)
5	EXTERNAL (M.U) RESET
6	WDT INPUT
7	LR COIL (UNIT IN)
8	SSR (PDA)

FT4 TERM	FUNCTION	FT5 TERM	FUNCTION	FT6 TERM	FUNCTION
A101	SWPK 13-RED	A111	SWPK 11-RED	A121	SWPK 9-RED
A102	SWPK 13-YEL	A112	SWPK 11-YEL	A122	SWPK 9-YEL
A103	SWPK 13-GRN	A113	SWPK 11-GRN	A123	SWPK 9-GRN
A104	SWPK 14-RED	A114	SWPK 12-RED	A124	SWPK 10-RED
A105	SWPK 14-YEL	A115	SWPK 12-YEL	A125	SWPK 10-YEL
A106	SWPK 14-GRN	A116	SWPK 12-GRN	A126	SWPK 10-GRN

NOTE:

1. Thumb screws device.
2. All dimensions shown are in inches.

TITLE:

INPUT/OUTPUT FILE DETAILS  
SHEET 3 OF 9

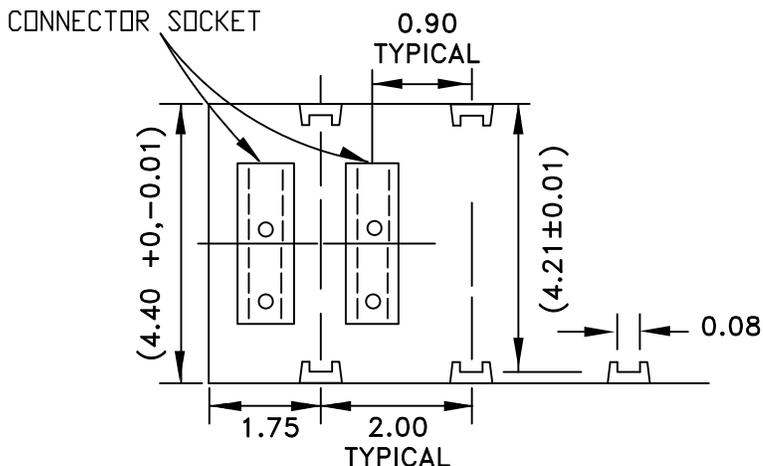
ERRATA 2

NO SCALE

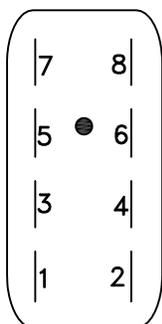
TEES 2009

A6-18

### SWITCH PACK MOUNTING DETAIL



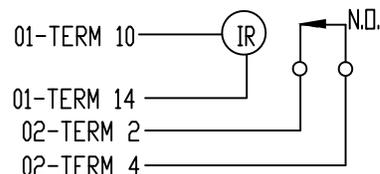
### HEAVY DUTY RELAY SOCKET DETAIL



REAR VIEW

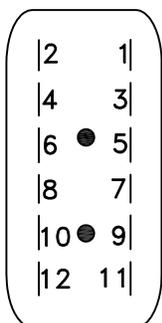
PIN	FUNCTION
1	COIL
2	COIL
3	N.C. CIRCUIT #1
4	N.C. CIRCUIT #2
5	COMMON CIRCUIT #1
6	COMMON CIRCUIT #2
7	N.O. CIRCUIT #1
8	N.O. CIRCUIT #2

### ISOLATION RELAY (IR) DETAIL



(Refer to detail A6-16)

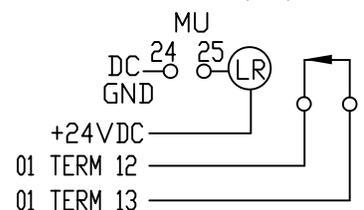
### SWITCH PACK SOCKET DETAIL



REAR VIEW

PIN	FUNCTION
1	AC+
2	EQUIP. GROUND
3	RED OUTPUT
4	NA
5	YELLOW OUTPUT
6	RED INPUT
7	GREEN OUTPUT
8	YELLOW INPUT
9	+24 VDC
10	GREEN INPUT
11	NA
12	NA

### LOGIC RELAY (LR) DETAIL



(Refer to detail A6-16)

**NOTE:**

All dimensions shown are in inches

TITLE: <b>INPUT/OUTPUT FILE DETAIL</b> <b>SHEET 4 OF 9</b>	
<b>ERRATA 2</b>	NO SCALE
TEES 2009	A6-19

MODEL 210 MONITOR UNIT PIN ASSIGNMENT

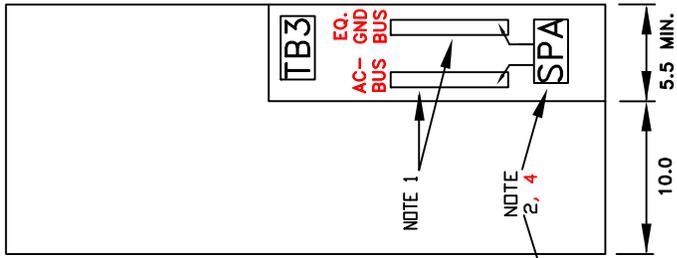
CONNECTOR PIN No.	MONITOR FUNCTION	TERMINATION	CONNECTOR PIN No.	MONITOR FUNCTION	TERMINATION
1	SWPKS 2 GRN		A	SWPKS 2 YEL	
2	SWPKS 2P GRN		B	SWPKS 6 GRN	
3	SWPKS 6 YEL		C	SWPKS 6P GRN	
4	SWPKS 4 GRN		D	SWPKS 4 YEL	
5	SWPKS 4P GRN		E	SWPKS 8 GRN	
6	SWPKS 8 YEL		F	SWPKS 8P GRN	
7	SWPKS 5 GRN		H	SWPKS 5 YEL	
8	T&B		J	SWPKS 1 GRN	
9	SWPKS 1 YEL		K	T&B	
10	SWPKS 7 GRN		L	SWPKS 7 YEL	
11	T&B		M	SWPKS 3 GRN	
12	SWPKS 3 YEL		N	T&B	
13	T&B		P	NA	
14	NA		R	T&B	
15	T&B		S	T&B	
16	T&B		T	NA	
17	NA		U	T&B	
18	T&B		V	T&B	
19	NA		W	NA	
20	EQUIP. GROUND	01-TERM 9	X	NA	
21	AC-	01-TERM 10	Y	DC GROUND	02-TERM 2
22	WATCHDOG TIMER	C4-37	Z	EXTERNAL RESET	02-TERM 5
23	+24 VDC	02-TERM 1	AA	T&B	
24	B.D. OUT CKT	LOGIC RELAY COIL	BB	STOPTIME	02-TERM 3
25	B.D. OUT CKT	DC GROUND	CC	NA	
26	NA		DD	NA	
27	NA		EE	OUTPUT SW-SIDE 2	01-TERM 12
28	OUTPUT-SW SIDE 1	AC+	FF	AC+	01-TERM 11

NOTES: (FOR DETAILS A6-20)

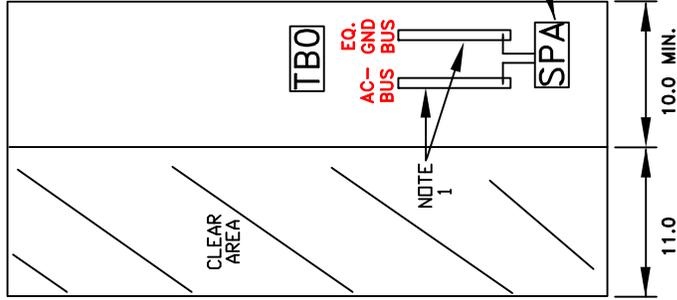
- Top of relays shall be flush with face of file.
- The isolation relay shall be Potter & Brumfield R10-E1-X2-115 (or equal). The logic relay (LR) shall be Potter & Brumfield KUP11(D11 or 15) or equal.
- See connectors C4 & C5 wiring lists for connector/file interface.
- Sheet definitions:  
 CKT = CIRCUIT  
 FU = FLASHER UNIT  
 FTR = FLASH TRANSFER RELAY  
 IFI-14D = INPUT FILE "I", TB 14, POSITION D  
 SSR = SOLID STATE RELAY  
 MU = MONITOR UNIT  
 N.C. = NORMALLY CLOSED RELAY CIRCUIT  
 N.O = NORMALLY OPEN RELAY CIRCUIT  
 PDA FU1 CKT1 = PDA FLASHER UNIT 1, OUTPUT CIRCUIT 1  
 POL PAN = POLICE PANEL  
 SW = SWITCH  
 SWPK(S) = SWITCH PACK(S)  
 T&B = CONDUCTORS CONNECTED TO PIN, TWO FEET IN LENGTH WITH RING LUG ON UNCONNECTED END, TIED & BUNDLED SEPARATELY.  
 2P-2 = PHASE 2 PED. PIN 2
- For details, see A3-3 & A3-4.
- All dimensions shown are in inches.

TITLE: <b>INPUT/OUTPUT FILE DETAILS</b> <b>SHEET 5 OF 9</b>	
<b>ERRATA 2</b>	NO SCALE
TEES 2009	A6-20

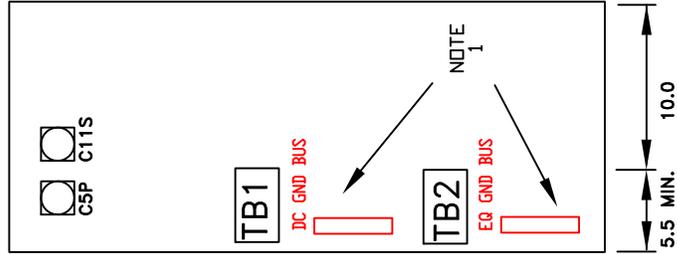
INPUT PANEL #1  
(332L CABINET)



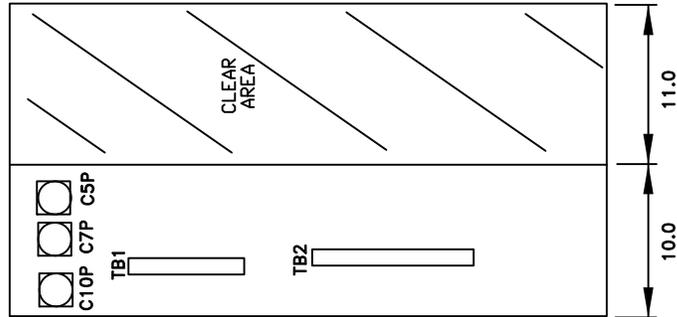
INPUT PANEL #2  
(334L CABINET)



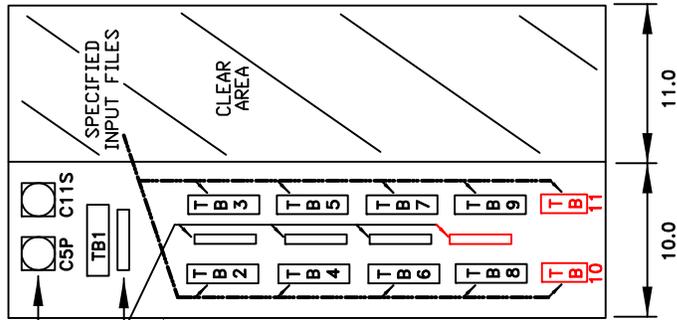
INPUT PANEL #3  
(336L CABINET)



INPUT PANEL #4  
(336L CABINET)



INPUT PANEL #1  
(332L CABINET)



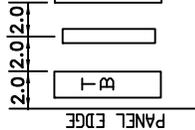
TOP OF EIA MOUNTING SURFACE

CI HARNESS

NOTE 1

TB'S MOUNTED BELOW CONTROLLER SUPPORT ANGLES

\*TB DETAIL



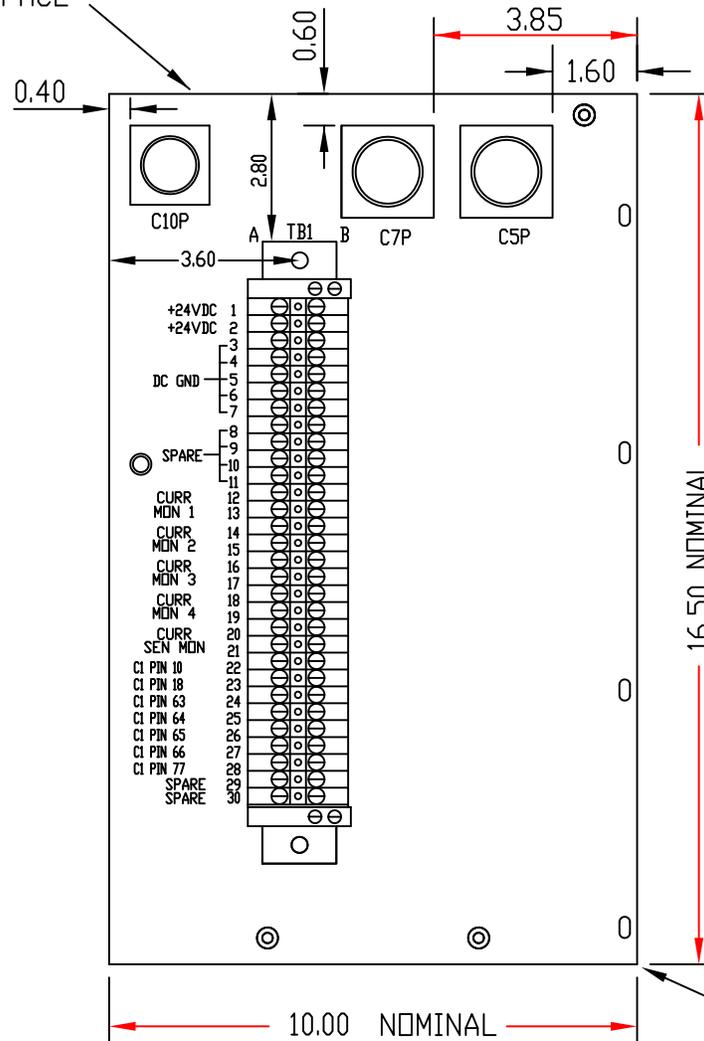
BOTTOM OF EIA MOUNTING SURFACE

TITLE: SIDE PANEL DETAILS SHEET 1 OF 4	
ERRATA 2	NO SCALE
TEES 2009	A6-21

NOTES:

1. 10 terminal (#8 wire) minimum copper bus.
2. See service panel assembly details A6-10, A6-11 & A6-12.
3. The terminal block shall have terminal positions necessary to match position assignments. Terminal position screws shall be 8-32 except for TB5, TB6, TB3, which shall be 10-32
4. SPA shall be bolted on the Rail and firmly attached to the Service Panel.
5. All dimensions shown are in inches.

TOP OF EIA  
MOUNTING SURFACE

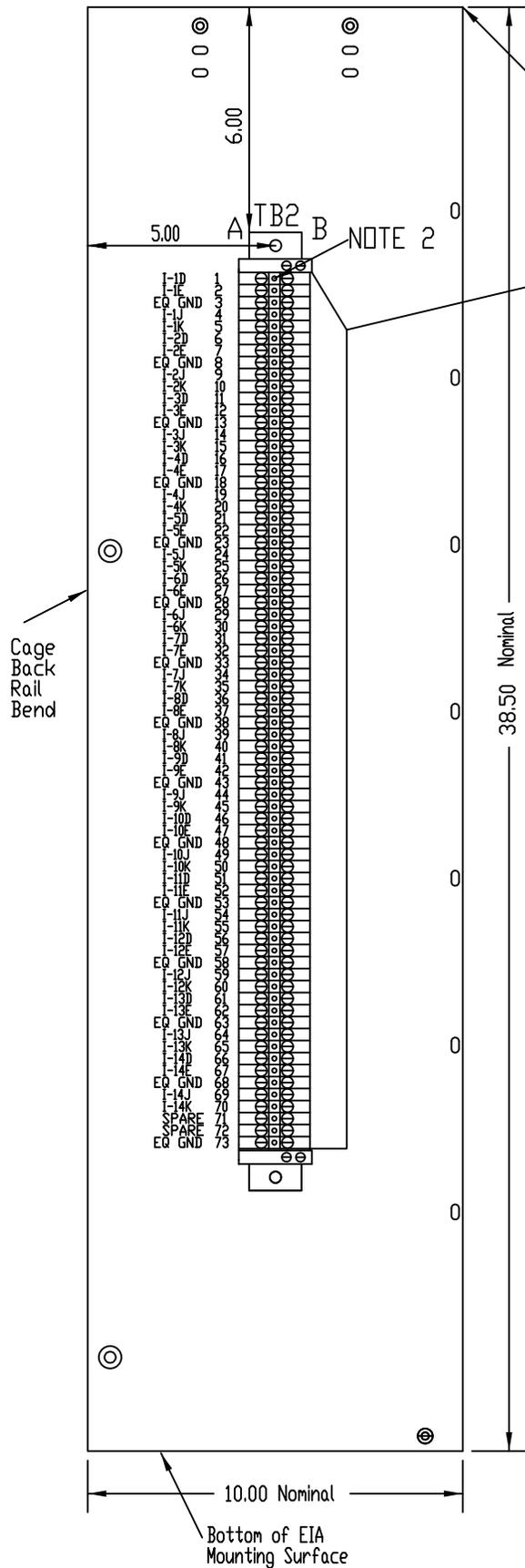


Panel continuous  
or two sections  
(upper and lower)

NOTES:

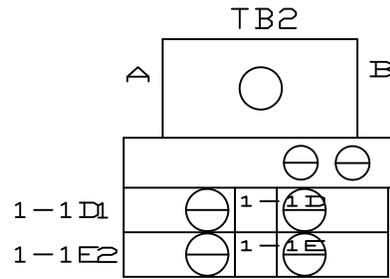
1. Provide and install a 30 position TB1 Terminal Block & three circular connectors, C5P, C7P & C10P (no contacts), TB1 shall be Open Construct Phoenix Contact Terminal Block **UT 6, Weidmuller Terminal Block WDU 10** or equal, mounted on DIN Railing (supported every 6 inches with position function label tabs and positions commoned and end locks.
2. A 4 foot length "CMS" Harness of 14 #20 (or larger) Conductors shall be furnished and installed in the cabinet. One end of the harness shall be the C10S Connector resting in C10P (mounted on the Input Panel #3) when not in used. The other end shall be stripped (according to manufacturers requirements) and connected to the "B Side" of TB1. The conductor bundle shall have external protection.
3. All dimensions shown are in inches.

TITLE:	
SIDE PANEL DETAILS SHEET 2 OF 4	
ERRATA 2	No Scale
TEES 2009	A6-22



Panel Continuous or Two Sections (upper and lower)

Specified Input File I Terminals.



LABELING ON PANEL AND TERMINAL BLOCK.

NOTES:

1. Provide and install a 73 position TB2 Terminal Block. TB2 shall be Open Construction Phoenix Contact **Terminal Block UT 6**, **Weidmuller Terminal Block WDU 10** or equal, mounted on DIN Railing (supported every 6 inches) with position function label tabs and positions commoned and end locks.
2. All terminals to be labeled using manufacturer recommended plastic labels as shown above.
3. All dimensions shown are in inches.

TITLE:

SIDE PANEL DETAIL  
SHEET 3 OF 4

Errata 2

No Scale

TEES 2009

A6-23

## TERMINAL BLOCK ASSIGNMENT

### 332L, 342LX INPUT PANEL #1

POS	A	B	POS	A	B
TB2-1	DET 1	I-1D	TB3-1	DET 21	J-1D
TB2-2		I-1E	TB3-2		J-1E
TB2-3		I-1J	TB3-3	DET 22	J-1J
TB2-4	DET 2	I-1K	TB3-4		J-1K
TB2-5		I-2D	TB3-5	DET 23	J-2D
TB2-6	DET 3	I-2E	TB3-6		J-2E
TB2-7		I-2J	TB3-7	DET 24	J-2J
TB2-8	DET 4	I-2K	TB3-8		J-2K
TB2-9		I-3D	TB3-9	DET 25	J-3D
TB2-10	DET 5	I-3E	TB3-10		J-3E
TB2-11		I-3J	TB3-11	DET 26	J-3J
TB2-12	DET 6	I-3K	TB3-12		J-3K
TB4-1		I-4D	TB5-1	DET 27	J-4D
TB4-2	DET 7	I-4E	TB5-2		J-4E
TB4-3		I-4J	TB5-3	DET 28	J-4J
TB4-4	DET 8	I-4K	TB5-4		J-4K
TB4-5		I-5D	TB5-5	DET 29	J-5D
TB4-6	DET 9	I-5E	TB5-6		J-5E
TB4-7		I-5J	TB5-7	DET 30	J-5J
TB4-8	DET 10	I-5K	TB5-8		J-5K
TB4-9		I-6D	TB5-9	DET 31	J-6D
TB4-10	DET 11	I-6E	TB5-10		J-6E
TB4-11		I-6J	TB5-11	DET 32	J-6J
TB4-12	DET 12	I-6K	TB5-12		J-6K
TB6-1		I-7D	TB7-1	DET 33	J-7D
TB6-2	DET 13	I-7E	TB7-2		J-7E
TB6-3		I-7J	TB7-3	DET 34	J-7J
TB6-4	DET 14	I-7K	TB7-4		J-7K
TB6-5		I-8D	TB7-5	DET 35	J-8D
TB6-6	DET 15	I-8E	TB7-6		J-8E
TB6-7		I-8J	TB7-7	DET 36	J-8J
TB6-8	DET 16	I-8K	TB7-8		J-8K
TB6-9		I-9D	TB7-9	DET 37	J-9D
TB6-10	DET 17	I-9E	TB7-10		J-9E
TB6-11		I-9J	TB7-11	DET 38	J-9J
TB6-12	DET 18	I-9K	TB7-12		J-9K
TB8-1	MANUAL	I-11D	TB9-1	SPARE 2	J-11D
TB8-2	SPARE	I-11J	TB9-2	SPARE 3	J-11J
TB8-3	11 COM	I-11K	TB9-3	11 COM	J-11K
TB8-4	PED Ø2	I-12D	TB9-4	EVA	J-12D
TB8-5	PED Ø4	I-12J	TB9-5	EVC	J-12J
TB8-6	12 COM	I-12K	TB9-6	12 COM	J-12K
TB8-7	PED Ø6	I-13D	TB9-7	EVB	J-13D
TB8-8	PED Ø8	I-13J	TB9-8	EVD	J-13J
TB8-9	13 COM	I-13K	TB9-9	13 COM	J-13K
TB8-10	FLH SENSE	I-14D	TB9-10	RR1	J-14D
TB8-11	STOP TIME	I-14J	TB9-11	RR2	J-14J
TB8-12	14 COM	I-14K	TB9-12	14 COM	J-14K
TB10-1	DET 19	I-10D	TB11-1	DET 39	J-10D
TB10-2		I-10E	TB11-2		J-10E
TB10-3	DET 20	I-10J	TB11-3	DET 40	J-10J
TB10-4		I-10K	TB11-4		J-10K

TB1- SEE INPUT PANEL #4 TB1 ASSIGNMENTS

### 334L, 344LX INPUT PANEL #3, TB #1

POS	A	B
TB1-1	+24 VDC	I/O FILES
TB1-2	+24 VDC	CAB. HARNESS #5
TB1-3	DC GND	C1 PINS 1 & 104
TB1-4	DC GND	I/O FILES & CAB. HARNESS #5
TB1-5	DC GND	
TB1-6	DC GND	
TB1-7	DC GND	
TB1-8	SPARE	NA
TB1-9	SPARE	NA
TB1-10	SPARE	NA
TB1-11	SPARE	NA
TB1-12	CURR. MONITOR 1	CAB. HARNESS #5
TB1-13	CURR. MONITOR 1	CAB. HARNESS #5
TB1-14	CURR. MONITOR 2	CAB. HARNESS #5
TB1-15	CURR. MONITOR 2	CAB. HARNESS #5
TB1-16	CURR. MONITOR 3	CAB. HARNESS #5
TB1-17	CURR. MONITOR 3	CAB. HARNESS #5
TB1-18	CURR. MONITOR 4	CAB. HARNESS #5
TB1-19	CURR. MONITOR 4	CAB. HARNESS #5
TB1-20	CURR. SEN. MON.	CAB. HARNESS #5
TB1-21	CURR. SEN. MON.	CAB. HARNESS #5
TB1-22	C1 PIN 10	CIA CONTROL 4
TB1-23	C1 PIN 18	NA
TB1-24	C1 PIN 63	NA
TB1-25	C1 PIN 64	NA
TB1-26	C1 PIN 65	POL. CONTROL SW.
TB1-27	C1 PIN 66	POL. LIGHTS SW.
TB1-28	C1 PIN 77	NA
TB1-29	SPARE	CAB. HARNESS #5
TB1-30	SPARE	CAB. HARNESS #5

### 336L, 346LX INPUT PANEL #4

TERM	A	B
TB1-1	(+24 VDC) O2-1/T3-1	I15-1, J15-1
TB1-2	M RESET	O2-5
TB1-3	O2-7/T3-2	C5-24
TB1-4	RESERVED	RESERVED (COMM IN)
TB1-5	RESERVED	RESERVED (COMM IN)
TB1-6	RESERVED	RESERVED (COMM OUT)
TB1-7	RESERVED	RESERVED (COMM OUT)
TB1-8	RESERVED	RESERVED
TB2-1 TO 6	NA	NA

### 334L, 344LX INPUT PANEL #3, TB #2

POS	A	B	POS	A	B
TB2-1	I-1D		TB2-38	EQ. GND	
TB2-2	I-1E		TB2-39	I-8J	
TB2-3	EQ. GND		TB2-40	I-8K	
TB2-4	I-1J		TB2-41	I-9D	
TB2-5	I-1K		TB2-42	I-9E	
TB2-6	I-2D		TB2-43	EQ. GND	
TB2-7	I-2E		TB2-44	I-9J	
TB2-8	EQ. GND		TB2-45	I-9K	
TB2-9	I-2J		TB2-46	I-10D	
TB2-10	I-2K		TB2-47	I-10E	
TB2-11	I-3D		TB2-48	EQ. GND	
TB2-12	I-3E		TB2-49	I-10J	
TB2-13	EQ. GND		TB2-50	I-10K	
TB2-14	I-3J		TB2-51	I-11D	
TB2-15	I-3K		TB2-52	I-11E	
TB2-16	I-4D		TB2-53	EQ. GND	
TB2-17	I-4E		TB2-54	I-11J	
TB2-18	EQ. GND		TB2-55	I-11K	
TB2-19	I-4J		TB2-56	I-12D	
TB2-20	I-4K		TB2-57	I-12E	
TB2-21	I-5D		TB2-58	EQ. GND	
TB2-22	I-5E		TB2-59	I-12J	
TB2-23	EQ. GND		TB2-60	I-12K	
TB2-24	I-5J		TB2-61	I-13D	
TB2-25	I-5K		TB2-62	I-13E	
TB2-26	I-6D		TB2-63	EQ. GND	
TB2-27	I-6E		TB2-64	I-13J	
TB2-28	EQ. GND		TB2-65	I-13K	
TB2-29	I-6J		TB2-66	I-14D	
TB2-30	I-6K		TB2-67	I-14E	
TB2-31	I-7D		TB2-68	EQ. GND	
TB2-32	I-7E		TB2-69	I-14J	
TB2-33	EQ. GND		TB2-70	I-14K	
TB2-34	I-7J		TB2-71	SPARE	
TB2-35	I-7K		TB2-72	SPARE	
TB2-36	I-8D		TB2-73	EQ. GND	
TB2-37	I-8E				

### 33xL, 34xLX SERVICE PANEL 1, 336L, 346LX SERVICE PANEL 2

TERM	A	B
TBS-1	AC+	TO PDA (without BBS) TO BBS-1 (with BBS)
TBS-2	AC-	AC- BUS
TBS-3	GND	TO EQ.GND BUS
BBS-1	AC+ IN	MBPS AC+ IN
BBS-2	MBPS AC+ OUT	TO PDA
TB0-1 TO 12	NA	NA
TB3-1 TO 6	NA	NA

See Service Panel Assembly (SPA) details A6-10, A6-11 & A6-40

**NOTES:**

- Sheet Definitions:
  - 11 COM = DC COMMON
  - COMM = COMMUNICATION
  - DET1 = DETECTOR #1
  - EVA = EMERGENCY VEHICLE PREEMPTION A
  - IFI-1D = INPUT FILE 1, SLOT 1, CONNECTOR PIN D
  - OF = OUTPUT FILE
  - M = MONITOR MODULE
  - NA = NOT ASSIGNED
  - RR1 = RAILROAD PREEMPTION 1
  - MBPS = MANUAL BYPASS SWITCH
  - BBS = BATTERY BACK-UP SYSTEM
  - PDA = POWER DISTRIBUTION ASSEMBLY
  - x = 2, 4
- All dimensions shown are in inches.

TITLE:	
SIDE PANEL DETAILS SHEET 4 OF 4	
ERRATA 2	NO SCALE
TEES 2009	A6-24

C1 HARNESS WIRING LIST #1

PIN	SOURCE	DESTINATION	FUNCTION	PIN	SOURCE	DESTINATION	FUNCTION
1	DC GND	DC GND BUS	-	53	I2-7	IFI-11W	SPARE #1
2	O1-1	C4-1	SWPK 4P-RED	54	I2-8	IFJ-11F	SPARE #2
3	O1-2	C4-2	SWPK 4P-GRN	55	I3-1	IFJ-1F&W	5 CE
4	O1-3	C4-3	SWPK 4-RED	56	I3-2	IFI-1F&W	1 CE
5	O1-4	C4-4	SWPK 4-YEL	57	I3-3	IFJ-5F&W	7 CE
6	O1-5	C4-5	SWPK 4-GRN	58	I3-4	IFI-5F&W	3 CE
7	O1-6	C4-6	SWPK 3-RED	59	I3-5	IFJ-9F	5 CE
8	O1-7	C4-7	SWPK 3-YEL	60	I3-6	IFI-9F	1 CE
9	O1-8	C4-8	SWPK 3-GRN	61	I3-7	IFJ-9W	7 CE
10	O2-1	C4-9	SWPK 2P-RED	62	I3-8	IFI-9W	3 CE
11	O2-2	C4-10	SWPK 2P-GRN	63	I4-5	IFI-3F	2 CE
12	O2-3	C4-11	SWPK 2-RED	64	I4-6	IFJ-3F	6 CE
13	O2-4	C4-12	SWPK 2-YEL	65	I4-7	IFI-7F	4 CE
14	DC GND	IFI-15-4	INPUT DC GND	66	I4-8	IFJ-7F	8 CE
15	O2-5	C4-13	SWPK 2-GRN	67	I5-1	IFI-12F	2 PED
16	O2-6	C4-14	SWPK 1-RED	68	I5-2	IFI-13F	6 PED
17	O2-7	C4-15	SWPK 1-YEL	69	I5-3	IFI-12W	4 PED
18	O2-8	C4-16	SWPK 1-GRN	70	I5-4	IFI-13W	8 PED
19	O3-1	C4-17	SWPK 8P-RED	71	I5-5	IFJ-12F	EVA PREEMPT
20	O3-2	C4-18	SWPK 8P-GRN	72	I5-6	IFJ-13F	EVB PREEMPT
21	O3-3	C4-19	SWPK 8-RED	73	I5-7	IFJ-12W	EVC PREEMPT
22	O3-4	C4-20	SWPK 8-YEL	74	I5-8	IFJ-13W	EVD PREEMPT
23	O3-5	C4-21	SWPK 8-GRN	75	I6-1	IFJ-11W	SPARE #3
24	O3-6	C4-22	SWPK 7-RED	76	I6-2	IFI-3W	2 CE
25	O3-7	C4-23	SWPK 7-YEL	77	I6-3	IFJ-3W	6 CE
26	O3-8	C4-24	SWPK 7-GRN	78	I6-4	IFI-7W	4 CE
27	O4-1	C4-25	SWPK 6P-RED	79	I6-5	IFJ-7W	8 CE
28	O4-2	C4-26	SWPK 6P-GRN	80	I6-6	IFI-11F	ADVANCE
29	O4-3	C4-27	SWPK 6-RED	81	I6-7	IFI-14F	FLASH SENSE
30	O4-4	C4-28	SWPK 6-YEL	82	I6-8	IFI-14W	STOP TIME
31	O4-5	C4-29	SWPK 6-GRN	83	O6-1	C5-1	SWPK 14-RED
32	O4-6	C4-30	SWPK 5-RED	84	O6-2	C5-2	SWPK 14-GRN
33	O4-7	C4-31	SWPK 5-YEL	85	O6-3	C5-3	SWPK 13-RED
34	O4-8	C4-32	SWPK 5-GRN	86	O6-4	C5-4	SWPK 13-YEL
35	O5-1	C4-33	SWPK 2P-YEL	87	O6-5	C5-5	SWPK 13-GRN
36	O5-2	C4-34	SWPK 6P-YEL	88	O6-6	C5-6	SWPK 12-RED
37	O5-3	C4-35	SWPK 4P-YEL	89	O6-7	C5-7	SWPK 12-YEL
38	O5-4	C4-36	SWPK 8P-YEL	90	O6-8	C5-8	SWPK 12-GRN
39	I1-1	IFI-2F	2 CE	91	O7-1	C5-9	SWPK 11-RED
40	I1-2	IFJ-2F	6 CE	92	DC GND	DC GND BUS	-
41	I1-3	IFI-6F	4 CE	93	O7-2	C5-10	SWPK 11-GRN
42	I1-4	IFJ-6F	8 CE	94	O7-3	C5-11	SWPK 10-RED
43	I1-5	IFI-2W	2 CE	95	O7-4	C5-12	SWPK 10-YEL
44	I1-6	IFJ-2W	6 CE	96	O7-5	C5-13	SWPK 10-GRN
45	I1-7	IFI-6W	4 CE	97	O7-6	C5-14	SWPK 9-RED
46	I1-8	IFJ-6W	8 CE	98	O7-7	C5-15	SWPK 9-YEL
47	I2-1	IFI-4F&W	2 CALL	99	O7-8	C5-16	SWPK 9-GRN
48	I2-2	IFJ-4F&W	6 CALL	100	O5-5	C5-17	SWPK 14-YEL
49	I2-3	IFI-8F&W	4 CALL	101	O5-6	C5-18	SWPK 11-YEL
50	I2-4	IFJ-8F&W	8 CALL	102	O5-7	IFI&J-15-3	DETECTOR RESET
51	I2-5	IFJ-14F	RR1 PREEMPT	103	O5-8	C4-37	WDT-MU
52	I2-6	IFJ-14W	RR2 PREEMPT	104	DC GND	IFJ-15-4	INPUT DC GND

TITLE:		HARNESS WIRING DETAILS SHEET 1 OF 5
ERRATA 2	NO SCALE	
TEES 2009	A6-25	

## C1 HARNESS WIRING LIST #2

PIN	SOURCE	DESTINATION	FUNCTION	PIN	SOURCE	DESTINATION	FUNCTION
1	DC GND	TB1/3-7	DC GND BUS	53	I2-7	IFI-11F	RATE CODE 2
2	O1-1	C6-1	SWPK 1-RED	54	I2-8	IFI-11W	RATE CODE 1
3	O1-2	C6-2	SWPK 1-GRN	55	I3-1	IFI-4F	MAIN 9
4	O1-3	C6-3	SWPK 2-RED	56	I3-2	IFI-4W	MAIN 10
5	O1-4	C6-4	SWPK 2-YEL	57	I3-3	IFI-6F	MAIN 3
6	O1-5	C6-5	SWPK 2-GRN	58	I3-4	IFI-6W	MAIN 4
7	O1-6	C6-6	SWPK 3-RED	59	I3-5	IFI-7F	MAIN 5
8	O1-7	C6-7	SWPK 3-YEL	60	I3-6	IFI-7W	MAIN 6
9	O1-8	C6-8	SWPK 3-GRN	61	I3-7	IFI-8F	MAIN 11
10	O2-1	TB1/22	CIA CONTROL 4	62	I3-8	IFI-8W	MAIN 12
11	O2-2	C7-25	CMS CLOCK	63	I4-5	TB1/24	MAIN 17
12	O2-3	C7-26	CMS ENABLE	64	I4-6	TB1/25	MAIN 18
13	O2-4	C7-27	CMS CLEAR	65	I4-7	TB1/26	POL. CONTR'L SW.
14	DC GND	IFI-15-4	INPUT DC GND	66	I4-8	TB1/27	POL. LIGHTS SW.
15	O2-5	C7-28	CMS DIM LEVEL 1	67	I5-1	C7-16	CIA SENSE 1
16	O2-6	C7-29	CMS DIM LEVEL 2	68	I5-2	C7-31	CIA SENSE 2
17	O2-7	C7-30	CMS DIM LEVEL 3	69	I5-3	C7-32	CIA SENSE 3
18	O2-8	TB1/23	-	70	I5-4	C7-33	CIA SENSE 4
19	O3-1	C7-9	CMS ADDRESS 1	71	I5-5	C7-34	CIA SENSE 5
20	O3-2	C7-10	CMS ADDRESS 2	72	I5-6	C7-35	CIA SENSE 6
21	O3-3	C7-11	CMS ADDRESS 3	73	I5-7	C7-36	CIA SENSE 7
22	O3-4	C7-12	CMS ADDRESS 4	74	I5-8	C7-37	CIA SENSE 8
23	O3-5	C7-13	CMS ADDRESS 5	75	I6-1	C7-5	CMS LATCH
24	O3-6	C7-14	CMS ADDRESS 6	76	I6-2	C7-6	PHASE FIRE
25	O3-7	C7-15	CMS ADDRESS 7	77	I6-3	TB1/29	MAIN 19
26	O3-8	C7-4	CIA CONTROL 5	78	I6-4	C7-8	CMS TEST REQ.
27	O4-1	C7-17	CMS DATA 1	79	I6-5	IFI-10F	MAIN 15
28	O4-2	C7-18	CMS DATA 2	80	I6-6	IFI-9W	MAIN 14
29	O4-3	C7-19	CMS DATA 3	81	I6-7	IFI-9F	MAIN 13
30	O4-4	C7-20	CMS DATA 4	82	I6-8	IFI-10W	MAIN 16
31	O4-5	C7-21	CMS DATA 5	83	O6-1	C5-1	SWPK 14-RED
32	O4-6	C7-22	CMS DATA 6	84	O6-2	C5-2	SWPK 14-GRN
33	O4-7	C7-23	CMS DATA 7	85	O6-3	C5-3	SWPK 13-RED
34	O4-8	C7-24	CMS DATA 8	86	O6-4	C5-4	SWPK 13-YEL
35	O5-1	C7-1	CIA CONTROL 1	87	O6-5	C5-5	SWPK 13-GRN
36	O5-2	C7-2	CIA CONTROL 2	88	O6-6	C5-6	SWPK 12-RED
37	O5-3	C6-9	SWPK 1-YEL	89	O6-7	C5-7	SWPK 12-YEL
38	O5-4	C7-3	CIA CONTROL 3	90	O6-8	C5-8	SWPK 12-GRN
39	I1-1	IFI-1W	PASSAGE 1	91	O7-1	C5-9	SWPK 11-RED
40	I1-2	IFI-12W	PASSAGE 2	92	DC GND	TB1/3-7	-
41	I1-3	IFI-12F	DEMAND 2	93	O7-2	C5-10	SWPK 11-GRN
42	I1-4	IFI-13W	OFF RAMP 2	94	O7-3	C5-11	SWPK 10-RED
43	I1-5	IFI-13F	QUE 2	95	O7-4	C5-12	SWPK 10-YEL
44	I1-6	IFI-14W	PASSAGE 3	96	O7-5	C5-13	SWPK 10-GRN
45	I1-7	IFI-14F	DEMAND 3	97	O7-6	C5-14	SWPK 9-RED
46	I1-8	IFI-1F	DEMAND 1	98	O7-7	C5-15	SWPK 9-YEL
47	I2-1	IFI-2W	OFF RAMP 1	99	O7-8	C5-16	SWPK 9-GRN
48	I2-2	IFI-3W	MAIN 7	100	O5-5	C5-17	SWPK 14-YEL
49	I2-3	IFI-3F	MAIN 8	101	O5-6	C5-18	SWPK 11-YEL
50	I2-4	IFI-2F	QUE 1	102	O5-7	IFI-15-3	DETECTOR RESET
51	I2-5	IFI-5F	MAIN 1	103	O5-8	C6-10	WDT
52	I2-6	IFI-5W	MAIN 2	104	DC GND	TB1/3-7	DC GND BUS

TITLE:

HARNESS WIRING DETAILS  
SHEET 2 OF 5

ERRATA 2

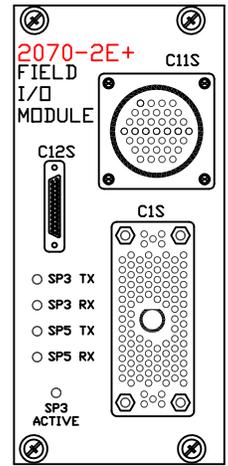
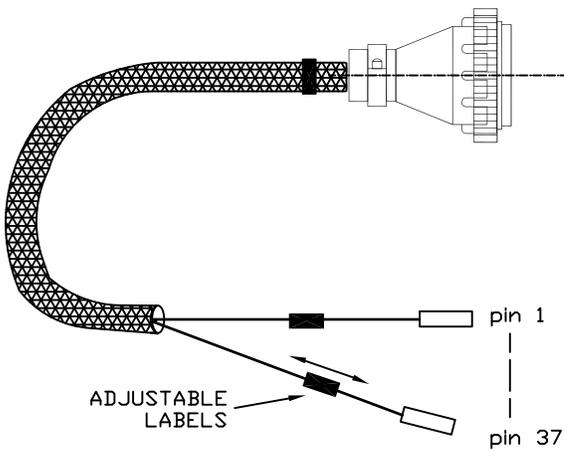
NO SCALE

TEES 2009

A6-26

# C11P HARNESS

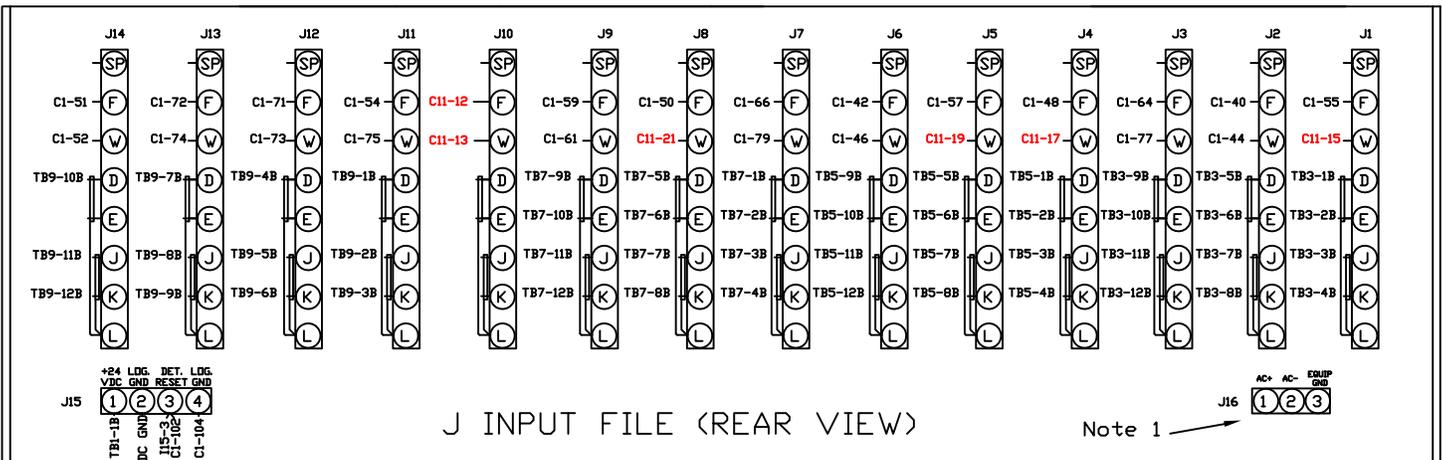
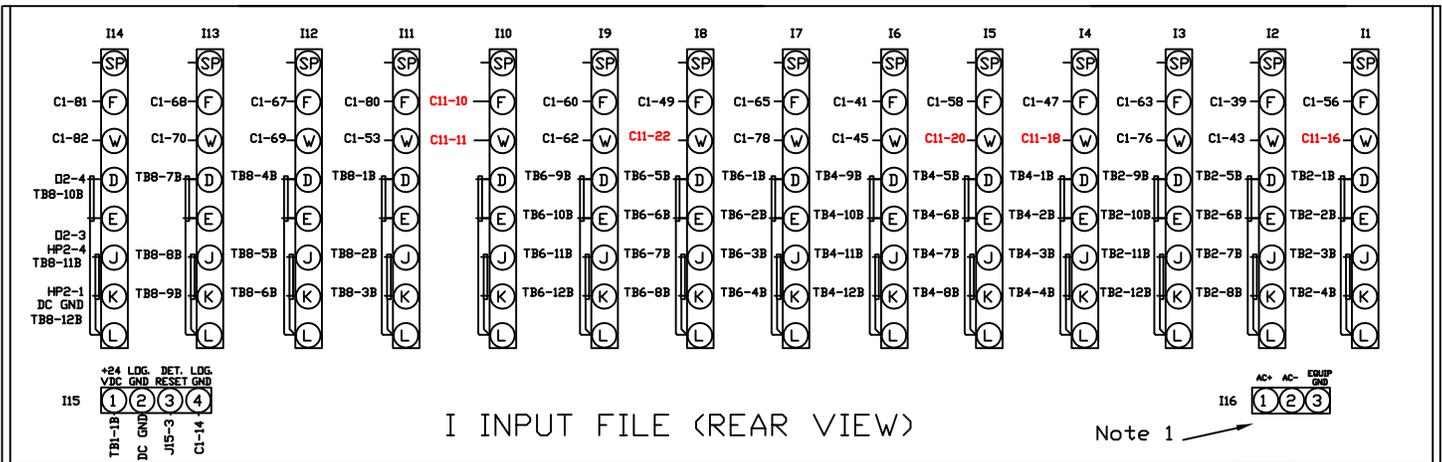
TYCO/AMP - Circular Plastic Connector (CPC)				
Shell Size	No. of Position	Key	Receptacle	Plug
23	37	A	206151-1	206150-1



C11	CONN TO						
1	NA	11	IFI-10W	21	IFJ-8W	31	DCG#2
2	NA	12	IFJ-10F	22	IFI-8W	32	NA
3	NA	13	IFJ-10W	23	NA	33	NA
4	NA	14	DCG#2	24	NA	34	NA
5	NA	15	IFJ-1W	25	NA	35	NA
6	NA	16	IFI-1W	26	NA	36	NA
7	NA	17	IFJ-4W	27	NA	37	DCG#2
8	NA	18	IFI-4W	28	NA		
9	DCG#2	19	IFJ-5W	29	NA		
10	IFI-10F	20	IFI-5W	30	NA		

IFI-10F = INPUT FILE I, TERMINAL BLOCK 10, TERMINAL DESIGNATION F (CHANNEL 1 OUTPUT)  
IFJ-10W = INPUT FILE J, TERMINAL BLOCK 10, TERMINAL DESIGNATION W (CHANNEL 2 OUTPUT)

2070-2E+  
FI/O MODULE  
REAR VIEW



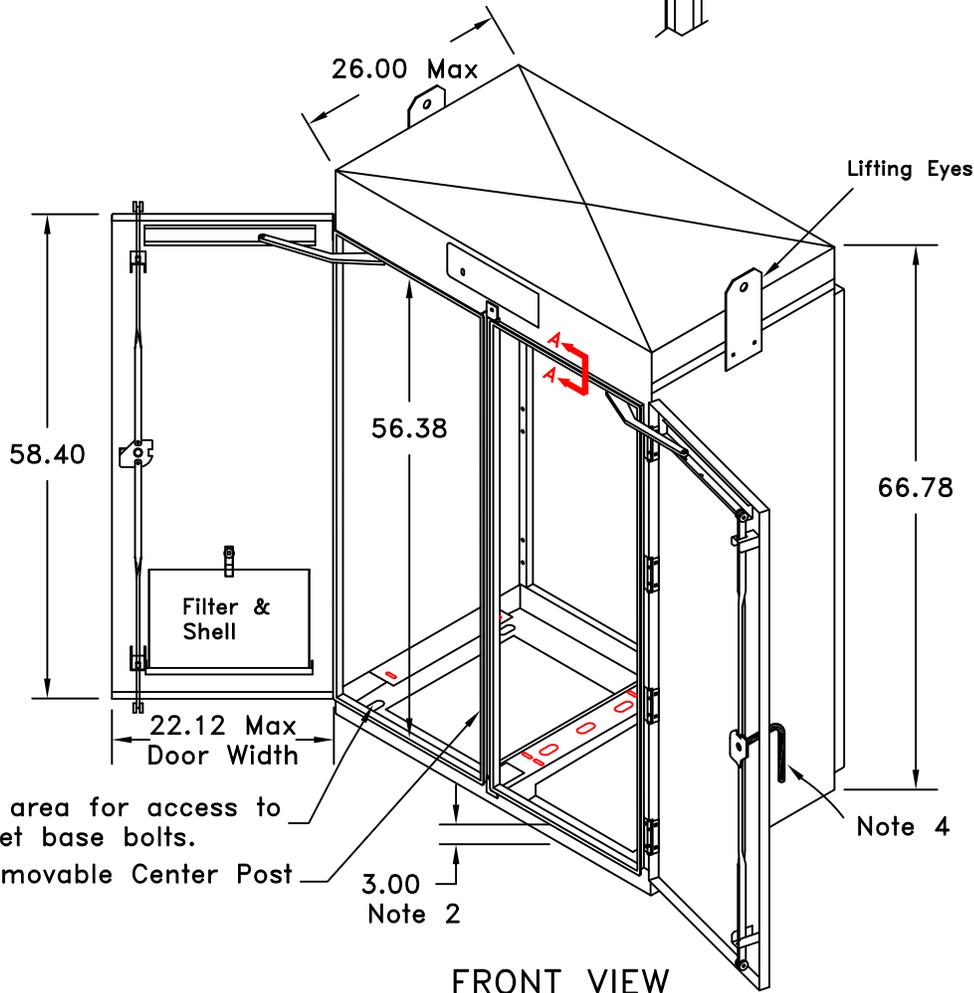
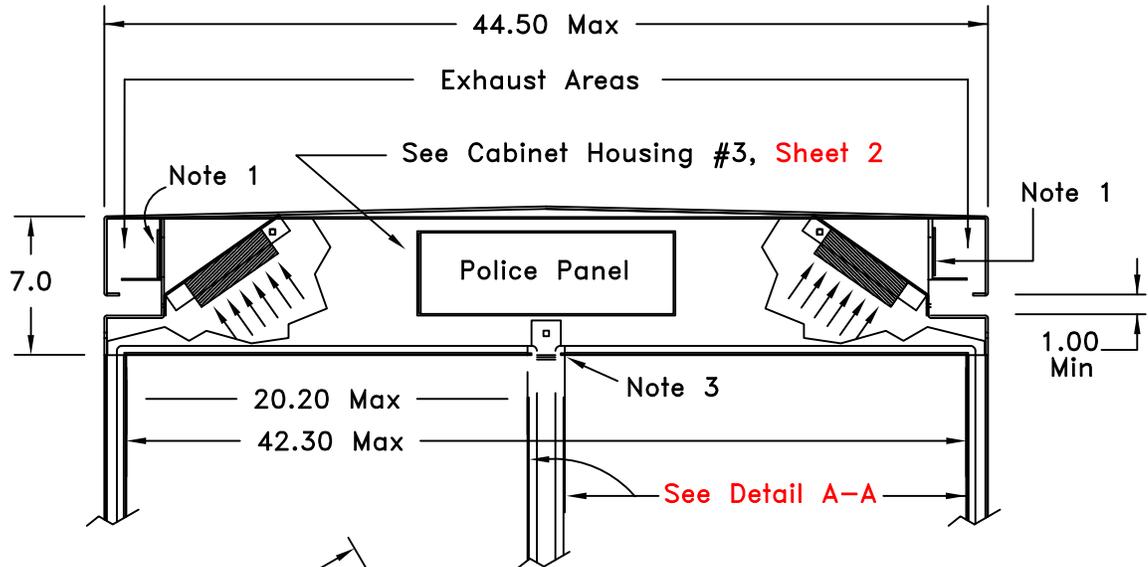
## CALTRANS MODEL 33xL, 34xLX CABINETS I & J INPUT FILE

**NOTE:**

1. No AC power at the Input File for the LX cabinet, see A6-50.
2. For C1S and C11S Pin Assignment, see A9-9.

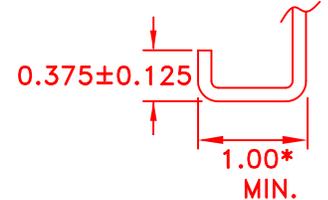
TITLE: C11 HARNESS TERMINATION DETAIL	
ERRATA 2	NO SCALE
TEES 2009	A6-31

# EXHAUST DETAIL



## SECTION A-A DETAIL

Flange Around  
Door Opening



\* TOLERANCE  $+0.0625$   
 $-0$

### NOTES:

1. Perferated Screen
2. From Cabinet base to door lip
3. After center post is installed a sealant shall be applied to prevent leakage.
4. The locks & handles shall be centered vertically on the door opposite from the hinges on both, the rear & front.

TITLE:

CABINET HOUSING #3 DETAILS  
SHEET 1 OF 7

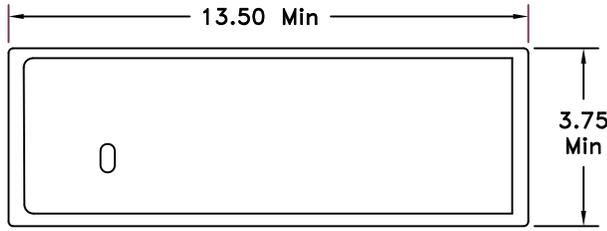
ERRATA 2

NO SCALE

TEES 2009

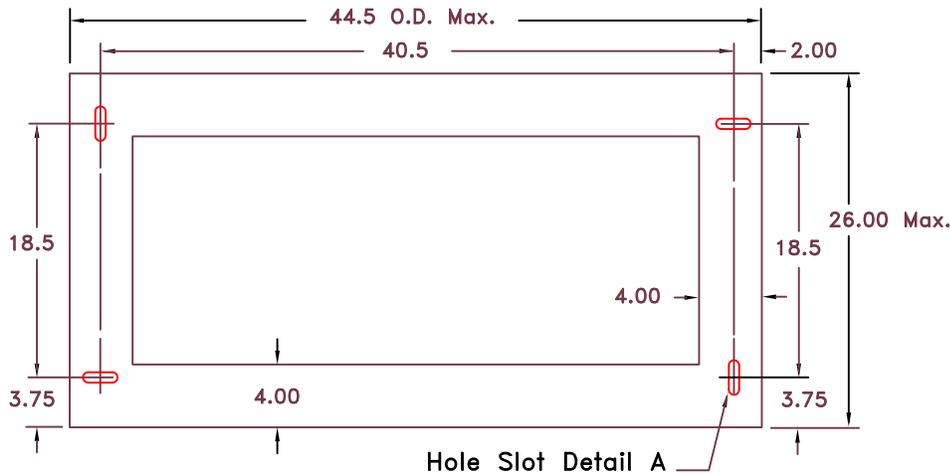
A6-32

CABINET HOUSING #3 & #4  
POLICE PANEL DETAIL

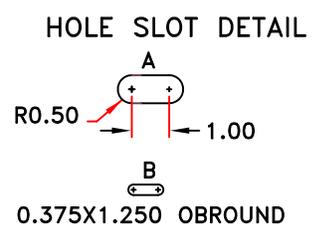


Police Panel Shall Be 3.00" Deep

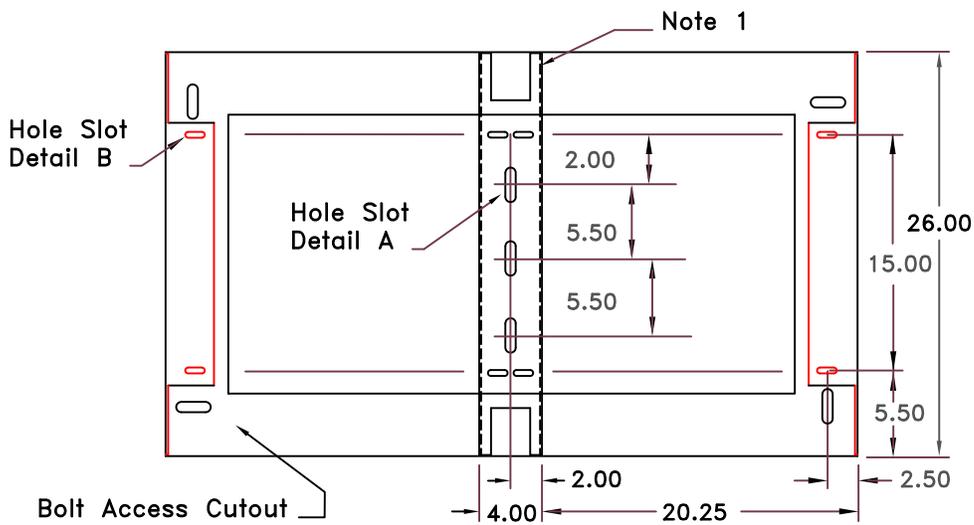
CABINET HOUSING #3 & #4 BOTTOM DETAIL



Hole Slot Detail A



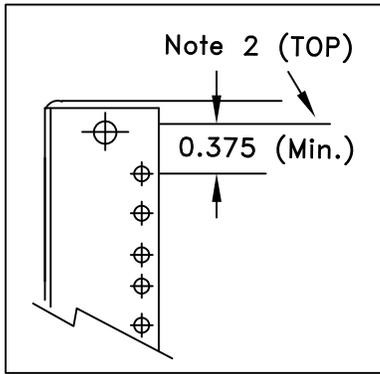
CAGE SUPPORT DETAIL



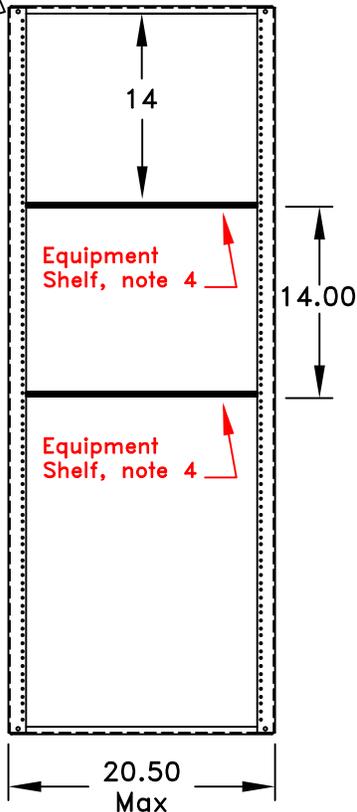
TOP VIEW

- NOTES:
1. Tac Weld Cage Support to bottom assembly front and rear. See Cage Support Assembly Detail.
  2. Uses LX Foundation.

TITLE: CABINET HOUSING #3 & #4 DETAILS SHEET 2 OF 7	
ERRATA 2	NO SCALE
TEES 2009	A6-33

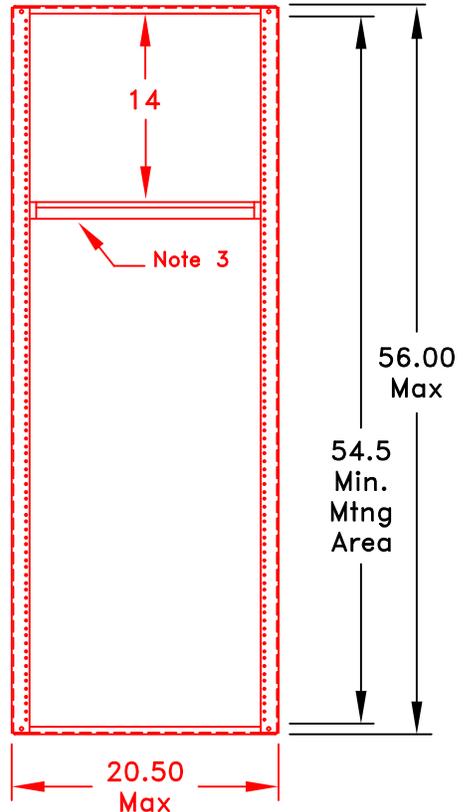


(Front & Rear Typical)  
FRONT VIEW



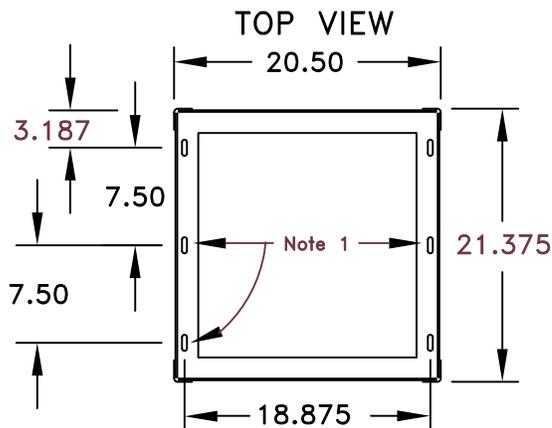
(Rack 2)

(Front & Rear Typical)  
FRONT VIEW



(Rack 1)

Note 2 (BOTTOM)



(Rack 1 & 2)

HOLE SLOT DETAIL

B



0.375X1.250 OBOUND

NOTES

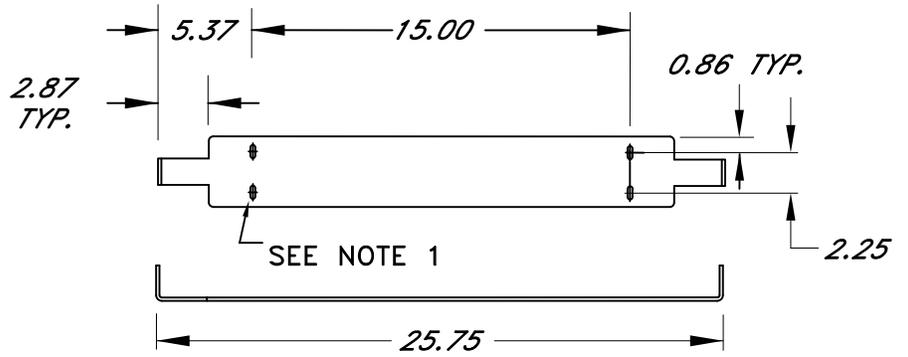
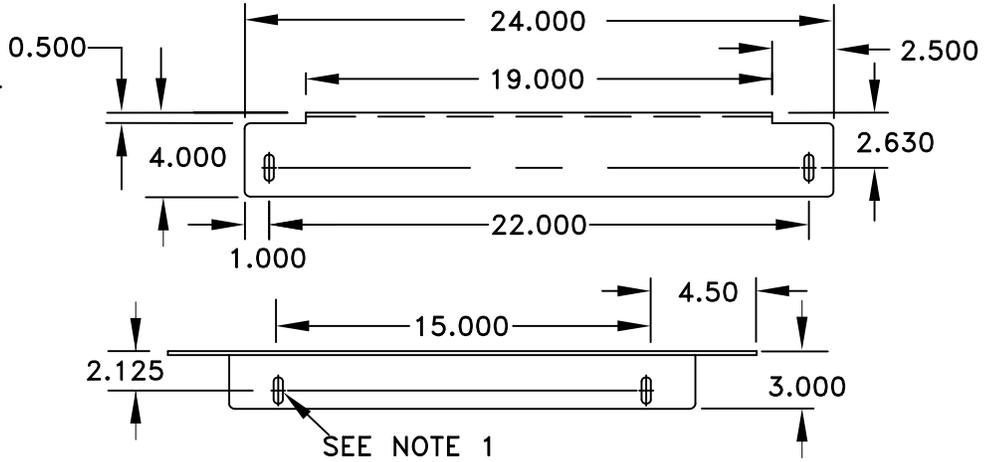
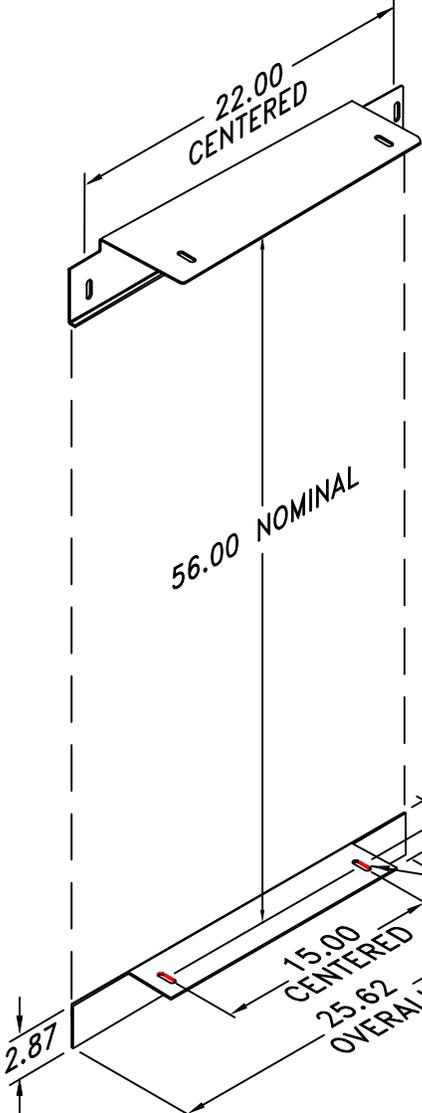
1. Hole Slot Detail B, Cage #1 details A6-2.
2. TOP, Refers to the bottom lip of the top hat.  
BOTTOM, Refers to the top lip of the bottom hat.
3. Controller unit support drawer shelf assembly, A6-6.
4. Equipment shelf, A6-41.

TITLE: CABINET HOUSING #3 DETAILS SHEET 3 OF 7	
ERRATA 2	NO SCALE
TEES 2009	A6-34

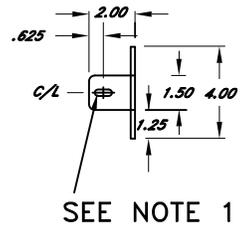
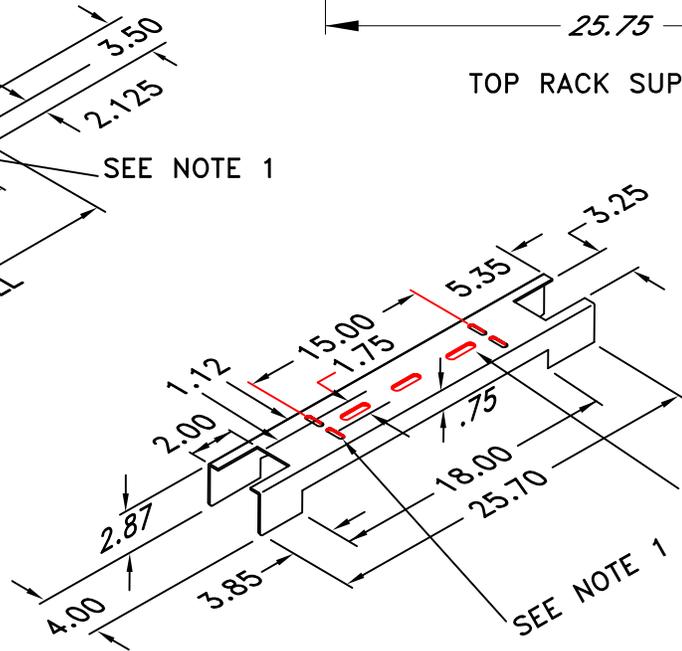
# HOUSINGS 3 TO CAGE 1 SUPPORT DETAILS

## SPANNER BRACKET DETAIL

SPANNER BRACKET ATTACHED TO SIDE OF CABINET



## TOP RACK SUPPORT



### NOTES:

1. Hole Slot Detail B see Cabinet Housings 3 Detail 2
2. Hole Slot Detail A see Cabinet Housings 3 Detail 2
3. All dimensions shown are in inches.

CENTER CHANNEL PART IS WELDED TO BOTTOM PLATE

TITLE:

CABINET HOUSING #3 DETAILS  
SHEET 4 OF 7

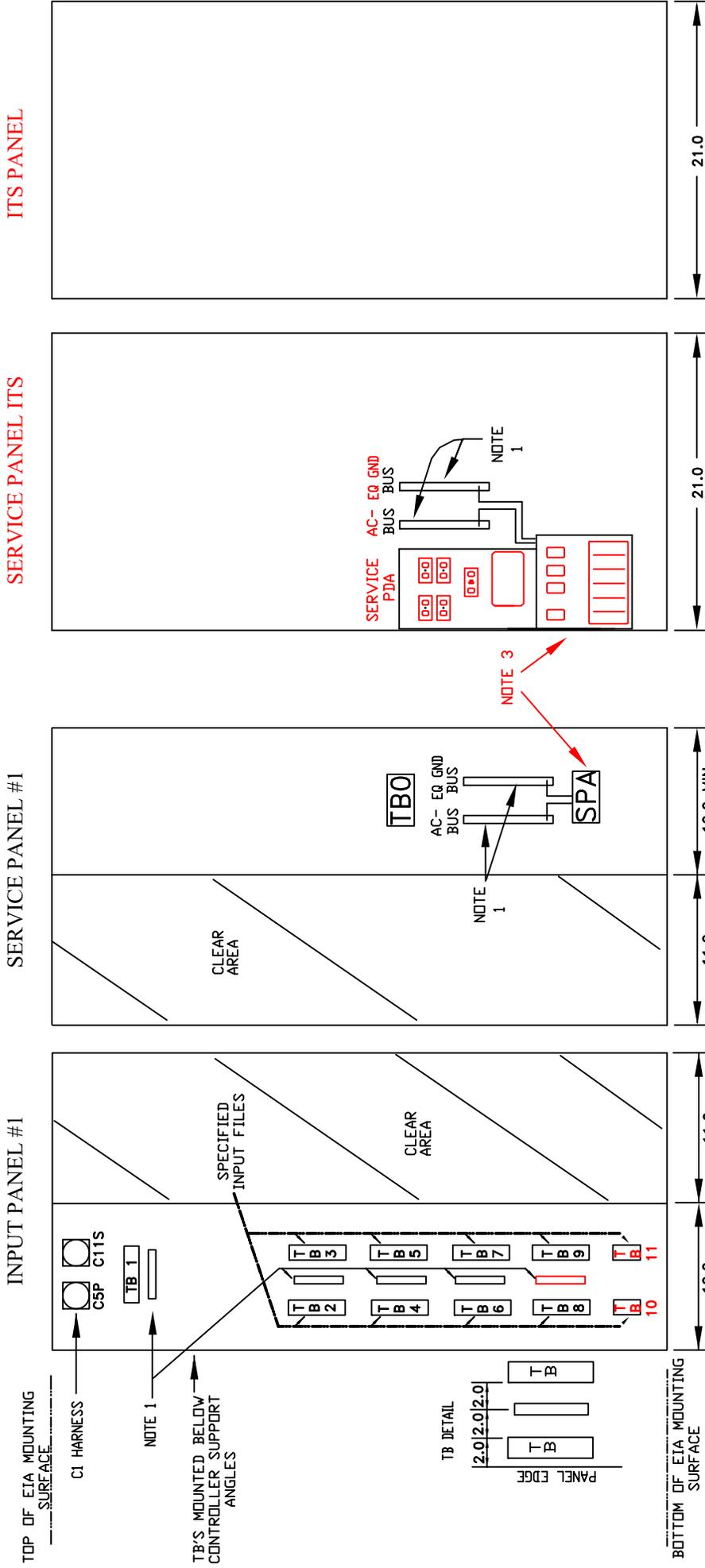
ERRATA 2

NO SCALE

TEES 2009

A6-35

**MODEL 342LX SIDE PANEL**



REAR VIEW (LEFT SIDE)

REAR VIEW (RIGHT SIDE)

REAR VIEW (LEFT SIDE)

REAR VIEW (RIGHT SIDE)

NOTES:

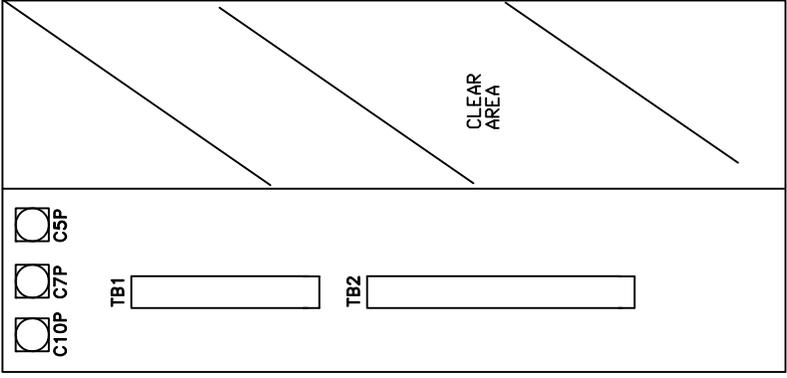
1. 10 terminal (#8 wire) minimum copper bus.
2. The terminal block shall have terminal positions necessary to match position assignments.
3. Terminal position screws shall be 8-32 except for TBS, TBO, TB3, which shall be 10-32
4. SPA and the Service PDA shall be bolted on the Rail and firmly attached to the Service Panel.
5. All dimensions shown are in inches.

TITLE:	<b>MODEL 342LX SIDE PANEL DETAIL</b>
	ERRATA 2
	TEES 2009
	NO SCALE
	A6-36

**MODEL 344LX SIDE PANEL**

TOP OF EIA MOUNTING SURFACE

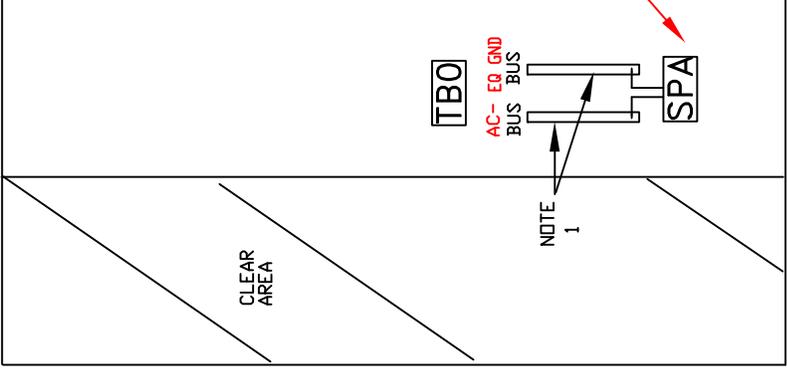
INPUT PANEL #3



10.0 11.0

REAR VIEW (LEFT SIDE)

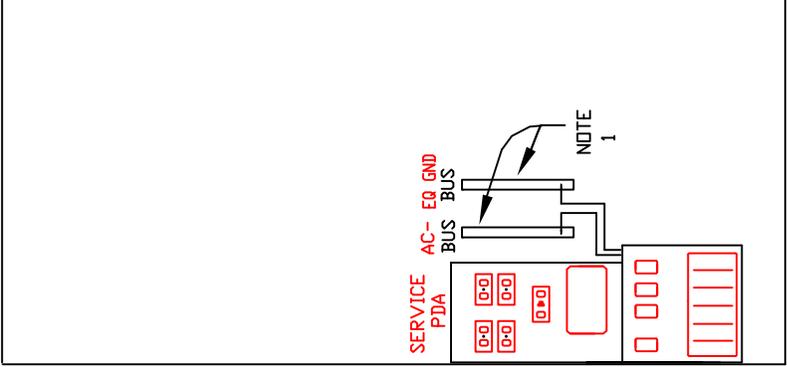
SERVICE PANEL #1



11.0 10.0 MIN.

REAR VIEW (RIGHT SIDE)

SERVICE PANEL ITS



21.0 21.0

REAR VIEW (LEFT SIDE)

ITS PANEL



21.0

REAR VIEW (RIGHT SIDE)

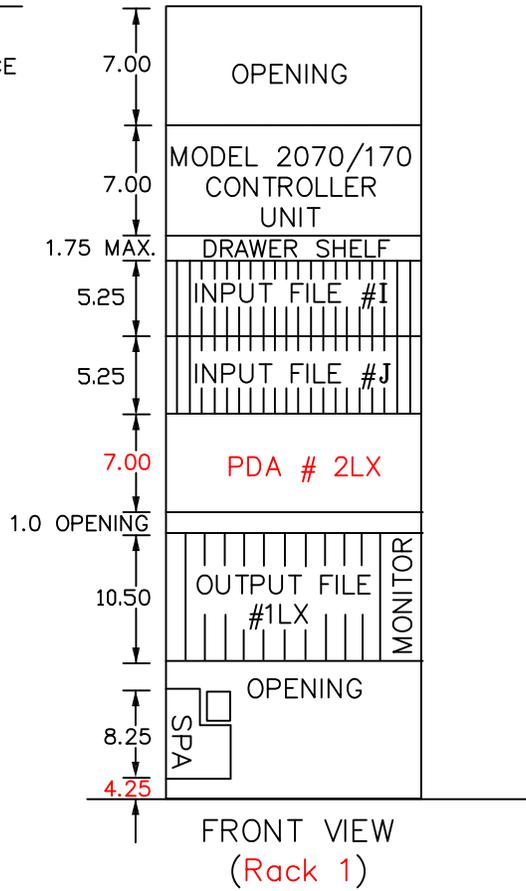
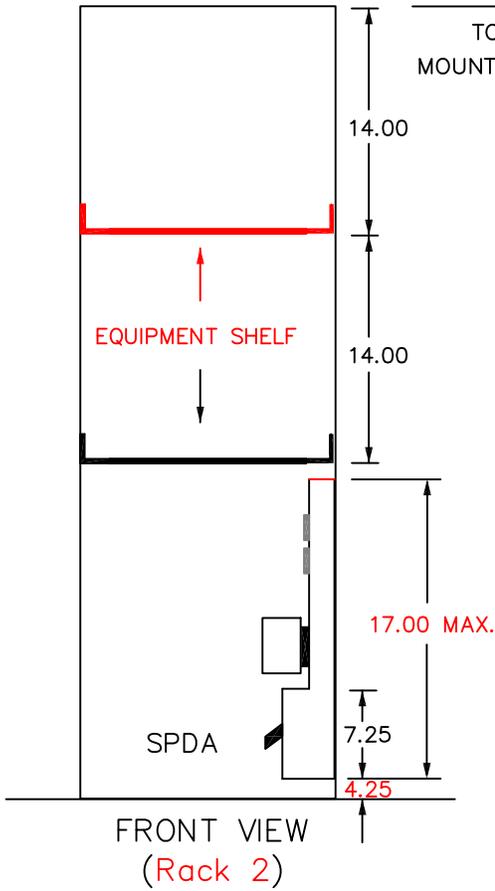
BOTTOM OF EIA MOUNTING SURFACE

NOTES:

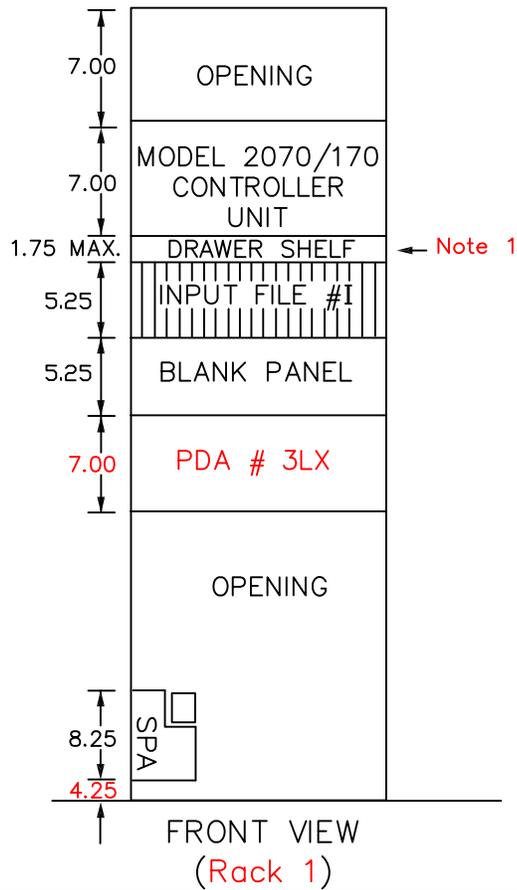
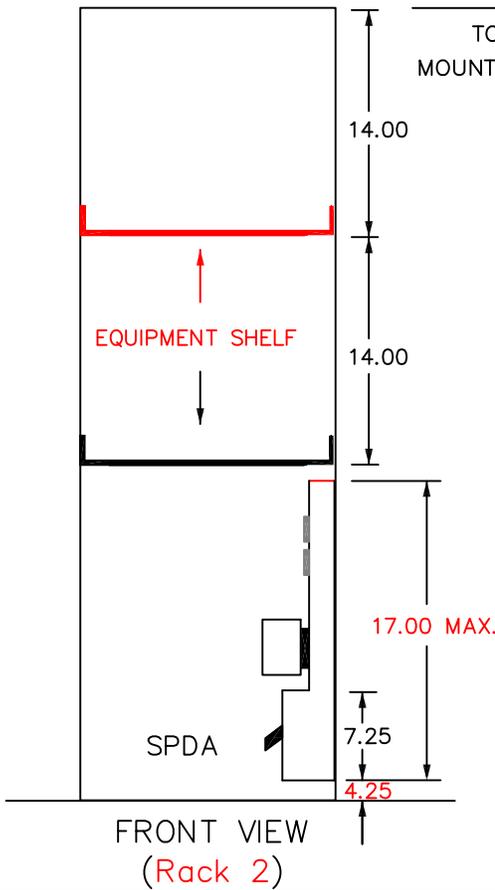
1. 10 terminal (#8 wire) minimum copper bus.
2. The terminal block shall have terminal positions necessary to match position assignments. Terminal position screws shall be 8-32 except for TBS, TBO, TB3, which shall be 10-32
3. SPA and the Service PDA shall be bolted on the Rail and firmly attached to the Service Panel.
4. All dimensions shown are in inches.

TITLE: <b>MODEL 344LX SIDE PANEL DETAIL</b>	
ERRATA 2	NO SCALE
TEES 2009	A6-37

MODEL 342LX



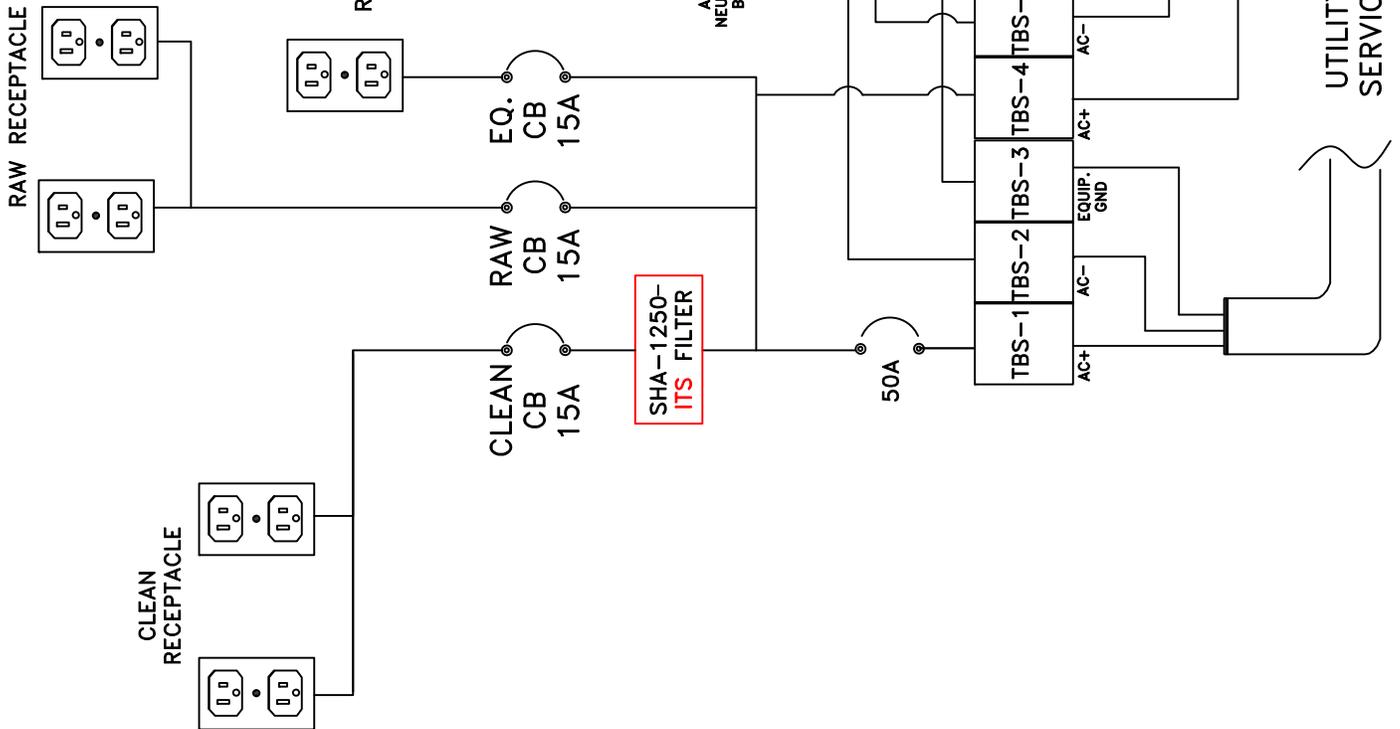
MODEL 344LX



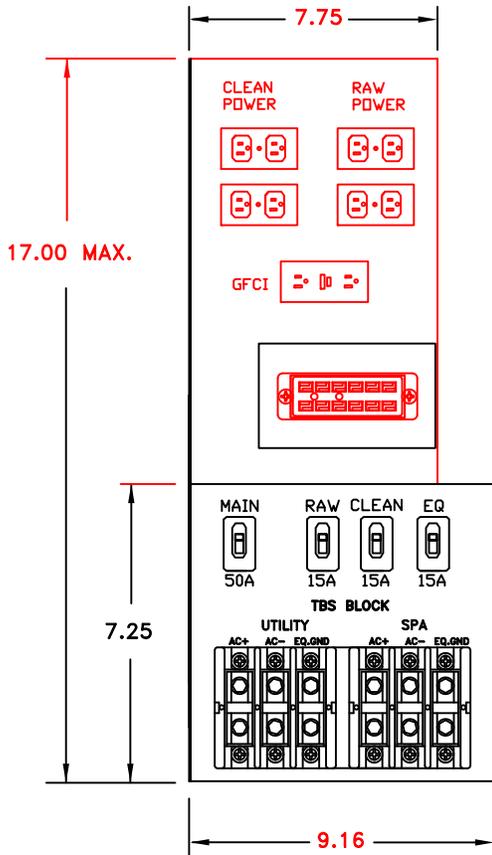
TITLE:	CABINET EQUIPMENT MOUNTING DETAILS	
	SHEET 2 OF 3	
	ERRATA 2	NO SCALE
	TEES 2009	A6-38

- NOTE:
1. Controller unit support drawer shelf assembly.
  2. All dimensions shown are in inches.

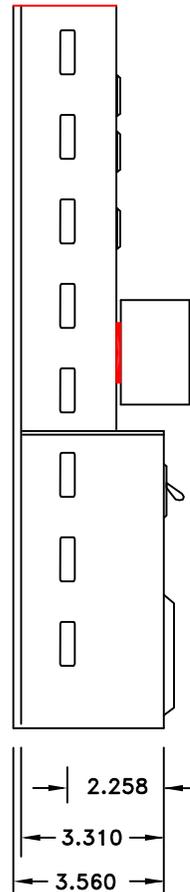
MODEL 342LX, 344LX & 346LX



TITLE:	
SERVICE PDA DETAILS SHEET 1 OF 2	
ERRATA 2	NO SCALE
TEES 2009	A6-39



REAR VIEW  
(LEFT SIDE)



REAR VIEW

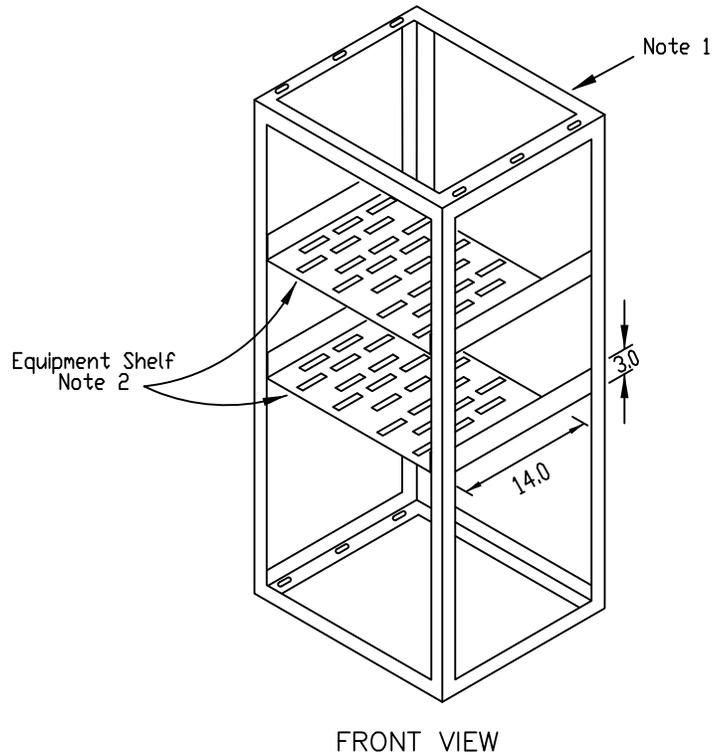
MODEL 342LX, 344LX & 346LX

NOTES:

1. The Service PDA shall be mounted at least 4.25in above the bottom of the LX cabinet.
2. All dimensions shown are in inches.

TITLE:		SERVICE PDA DETAILS SHEET 2 OF 2	
ERRATA 2		NO SCALE	
TEES 2009		A6-40	

Rack #1 EQUIPMENT SHELF INSTALLATION DETAILS  
(FOR CABINET HOUSING #3)

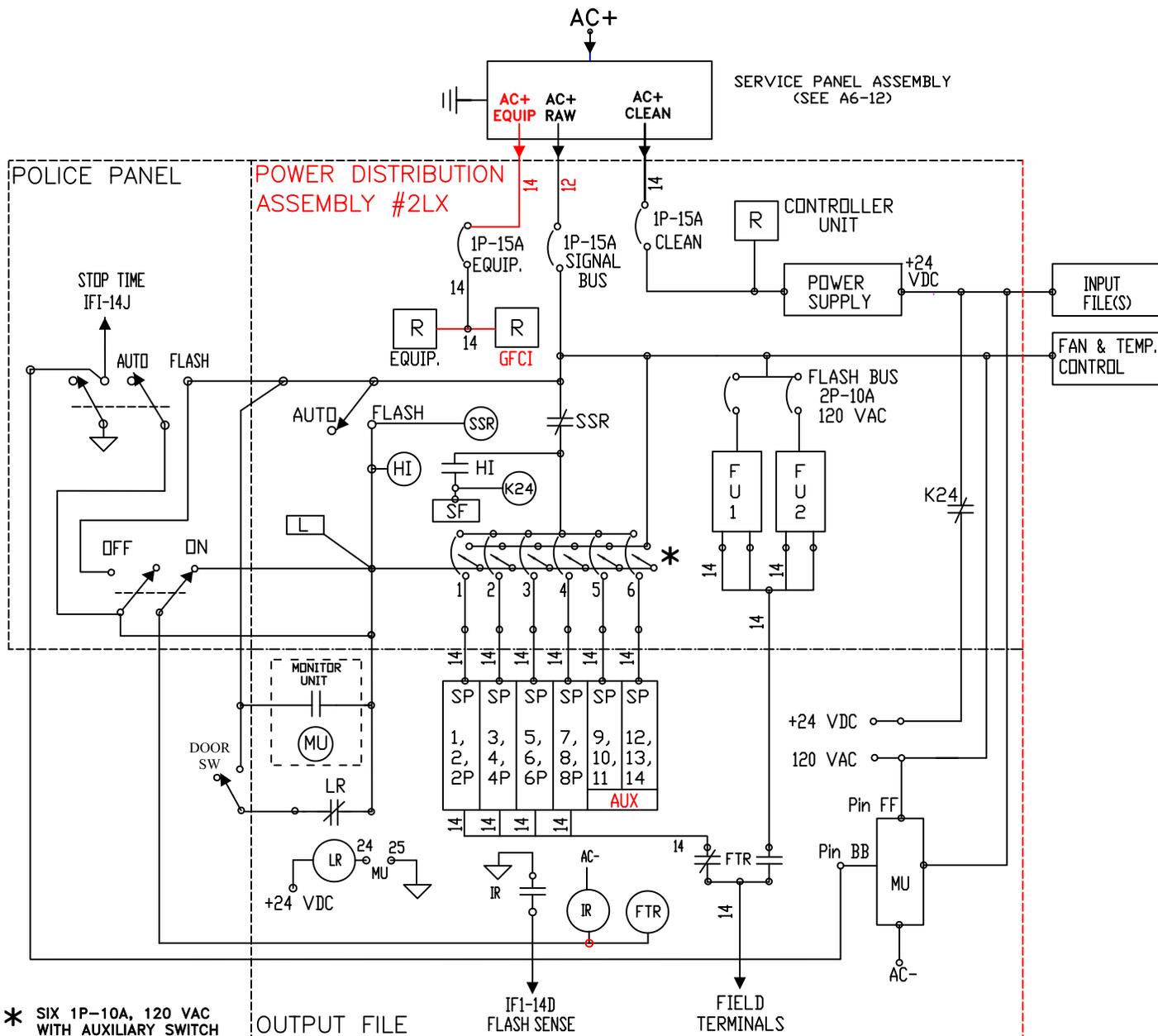


NOTE:

1. Cabinet Housing #3 details, A6-32 & A6-34.
2. Equipment Shelf with Air Vents
3. All dimensions shown are in inches

TITLE: RACK #1 DRAWER AND SHELF INSTALLATION DETAILS	
ERRATA 2	NO SCALE
TEES 2009	A6-41

# 342LX & 346LX CABINET ONE LINE DIAGRAM



## SHEET DEFINITIONS

TBS	TERMINAL BLOCK - SERVICE	(*)	RELAY COIL - * RELAY NAME	TR	TRANSFER RELAY
	EQUIPMENT GROUND		FLASHER UNIT ONE	IR	ISOLATION RELAY
8	WIRE SIZE, IF NOT INDICATED SHALL BE #16 AWG OR LARGER		DC GROUND		SWITCH CONTACT
	CIRCUIT BREAKER	WDT	WATCHDOG TIMER	LR	LOGIC RELAY
	DUPLEX RECEPTACLE	FTR	FLASH TRANSFER RELAY	CB-1	SIGNAL CIRCUIT BREAKER 1 (SECONDARY)
GFCI	GROUND FAULT CIRCUIT INTERRUPTER		PDA FLASH ON DISPLAY LAMP	IFI-14J	INPUT FILE 1, TERMINAL BLOCK 14, POSITION J (CHANNEL 2 INPUT)
	RELAY CONTACT, NORMALLY CLOSED	MU	MONITOR UNIT	IFI-14D	INPUT FILE 1, TERMINAL BLOCK 14, POSITION D
	RELAY CONTACT, NORMALLY OPEN	SF	SSR Fault Indicator	CI-65	CI CONNECTOR, PIN 65
SSR	SOLID STATE RELAY		Health Indicator Relay	(HI)	Health Indicator Relay
PDA	POWER DISTRIBUTION ASSEMBLY	T2-6	TERMINAL BLOCK 2, POSITION 6	(K24)	Disconnect 24VDC Relay
AUX	AUXILIARY				
SP	SWITCH PACK				

TITLE: MODEL 342LX AND 346LX ONE LINE DIAGRAM

ERRATA 2

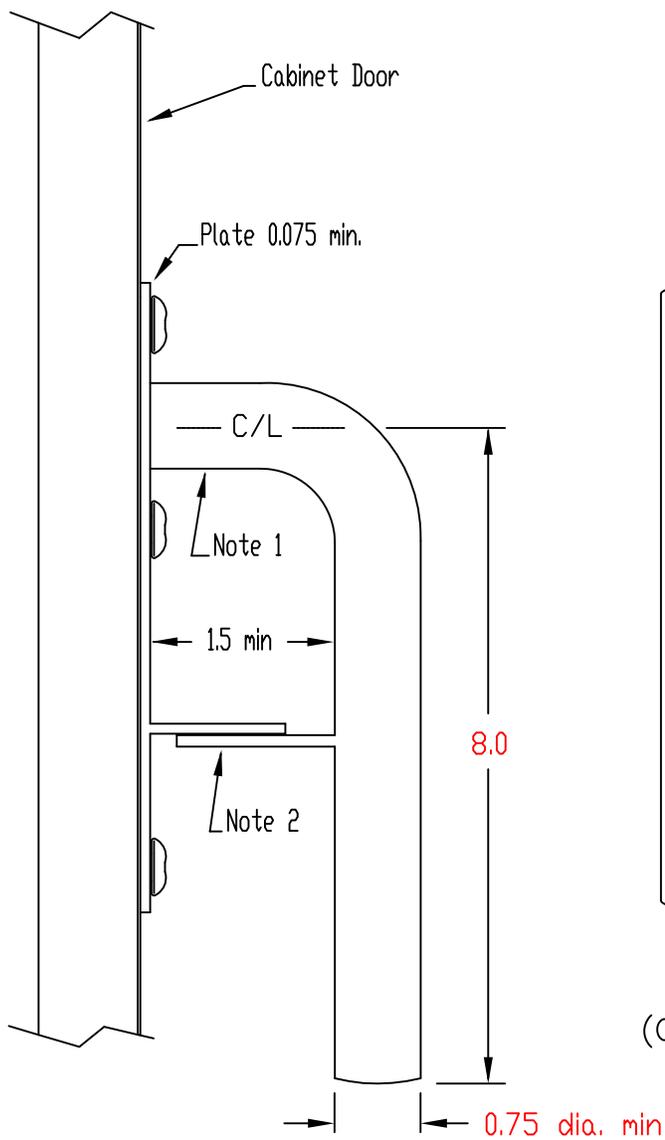
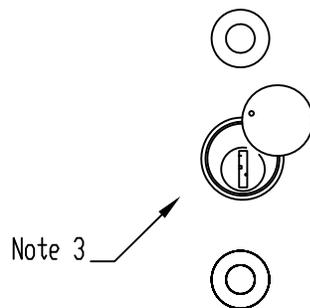
NO SCALE

TEES 2009

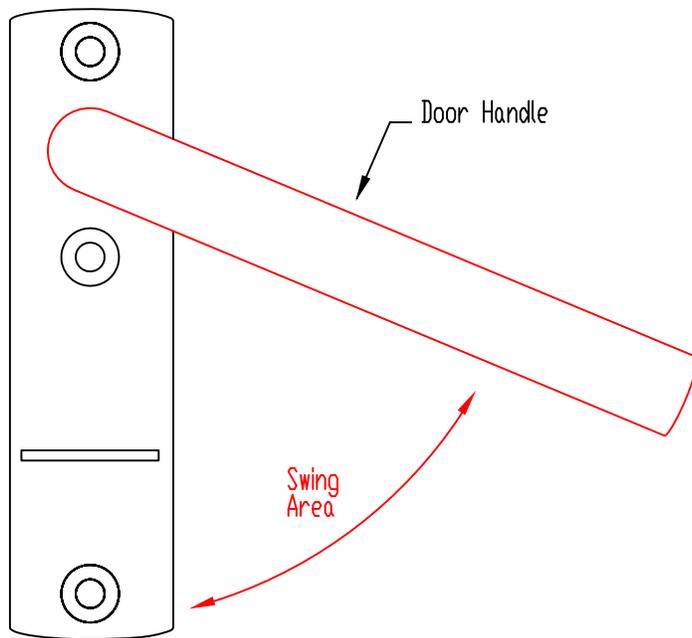
A6-42

HOUSING 1B, 2, 3 & 4 HANDLE DETAILS

LOCK DETAILS



**SIDE VIEW**  
(Locked position)



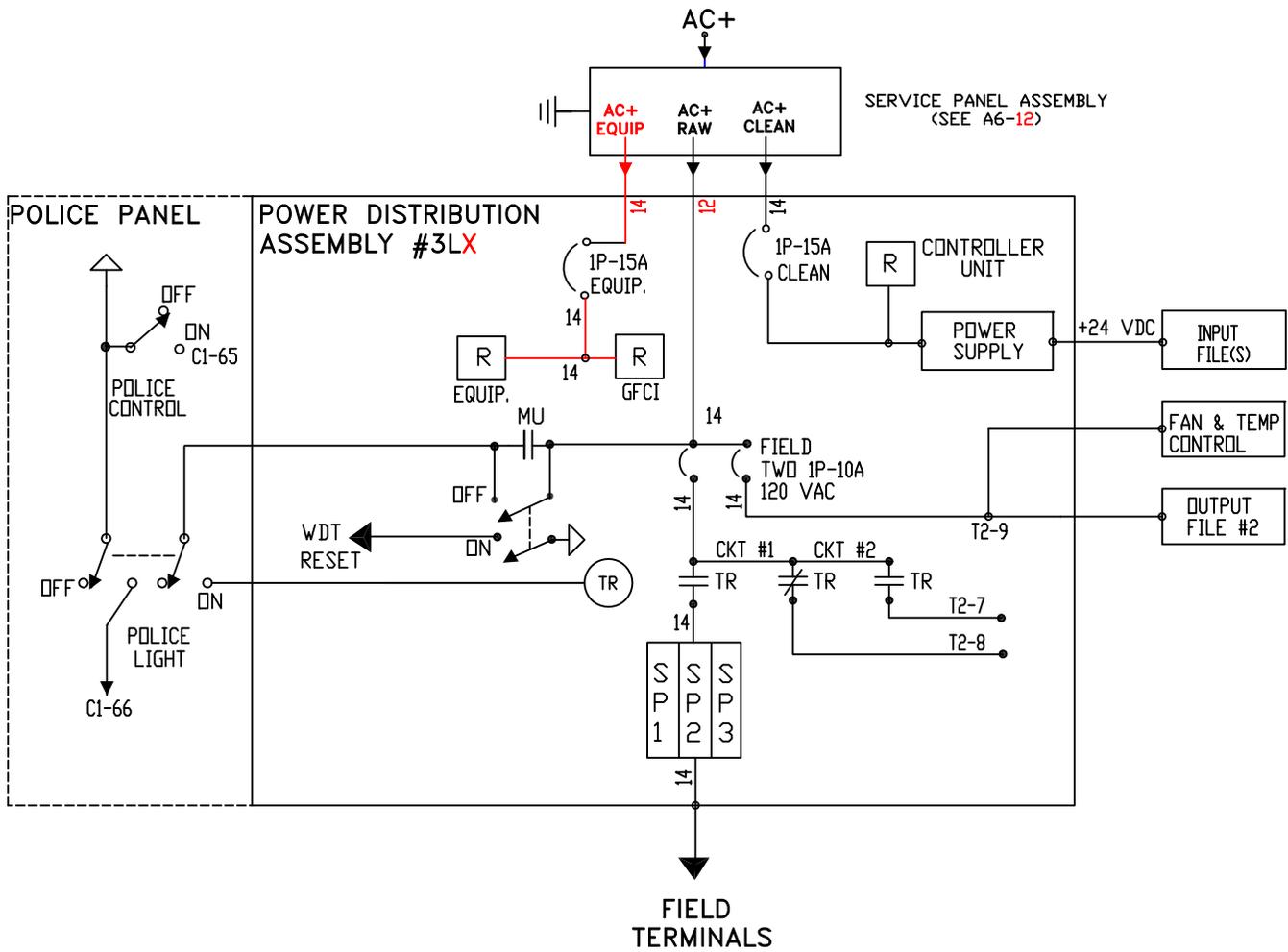
**FRONT VIEW**  
(Open position)

NOTES:

1. Handle shank, 0.5 inch minimum
2. Provision for padlock, horizontal or verticle position.
3. Door lock, Corbin 2 Type or equal.
4. All dimensions shown are in inches.

TITLE: <b>CABINET DOOR HANDLE DETAILS SHEET 1 OF 1</b>	
ERRATA 2	No Scale
TEES 2009	A6-43

## 344LX CABINET ONE LINE DIAGRAM



### SHEET DEFINITIONS

TBS	TERMINAL BLOCK - SERVICE	WDT	WATCHDOG TIMER
	EQUIPMENT GROUND	MU	MONITOR UNIT
	WIRE SIZE, IF NOT INDICATED SHALL BE #16 AWG OR LARGER	CB-1	SIGNAL CIRCUIT BREAKER 1 (SECONDARY)
	CIRCUIT BREAKER	TR	TRANSFER RELAY
	DUPLEX RECEPTACLE	T2-6	TERMINAL BLOCK 2, POSITION 6
GFCI	GROUND FAULT CIRCUIT INTERRUPTER	CI-65	CI CONNECTOR, PIN 65
	RELAY CONTACT, NORMALLY CLOSED	SPA	SERVICE PANEL ASSEMBLY
	RELAY CONTACT, NORMALLY OPEN	SP	SWITCH PACK
IFI-14J	INPUT FILE I, TERM. BLOCK 14, POSITION J (CHANNEL 2 INPUT)		DC GROUND
	FLASHER UNIT ONE		SWITCH CONTACT
PDA	POWER DISTRIBUTION ASSEMBLY		

TITLE:

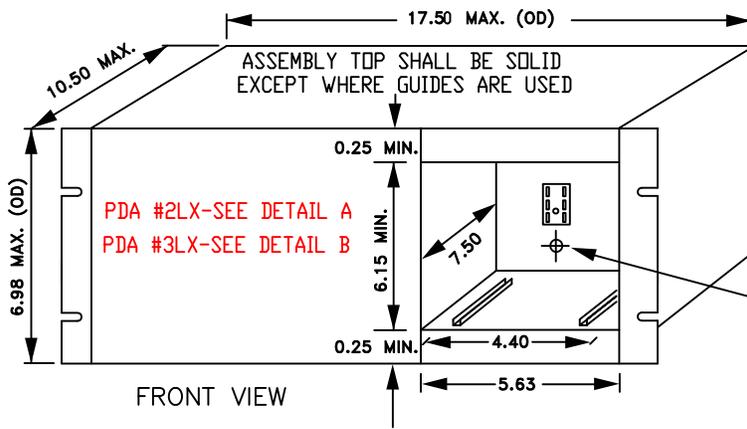
MODEL 344LX ONE LINE DIAGRAM

ERRATA 2

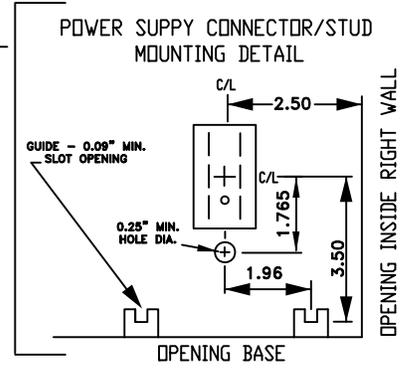
NO SCALE

TEES 2009

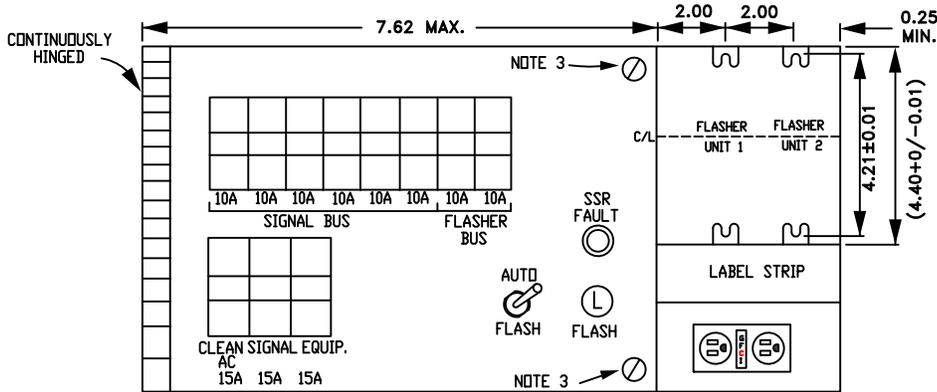
A6-44



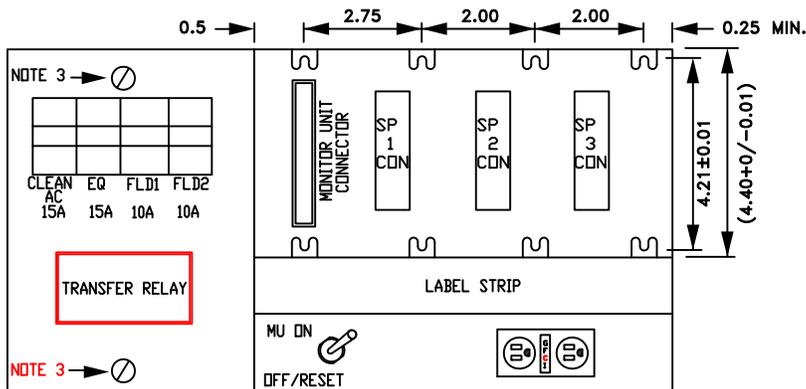
FRONT VIEW



FRONT VIEW



DETAIL A

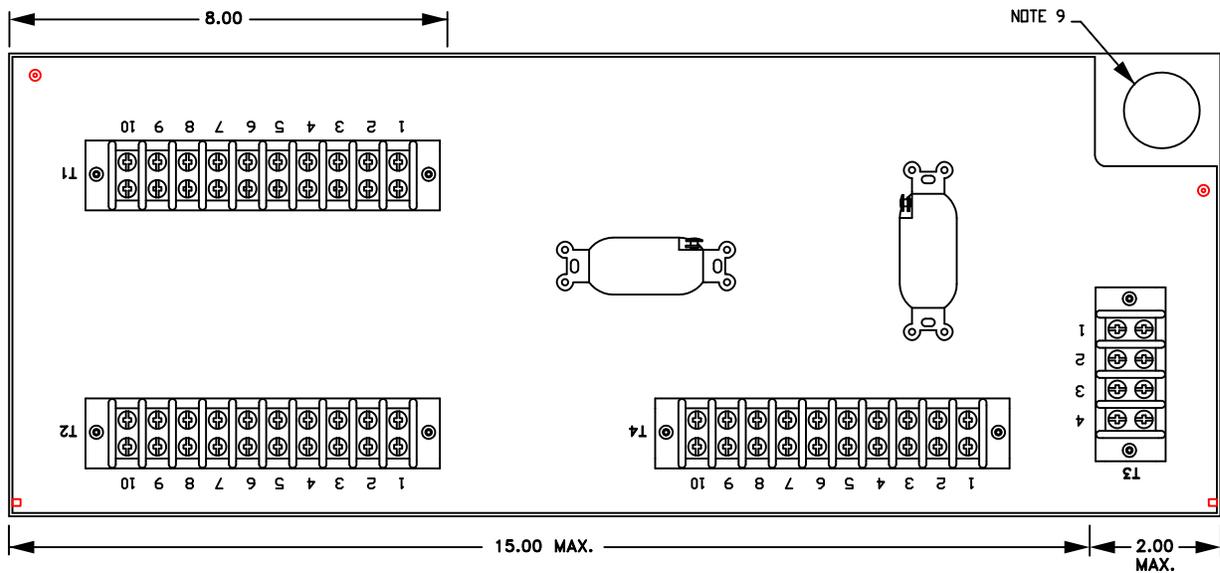
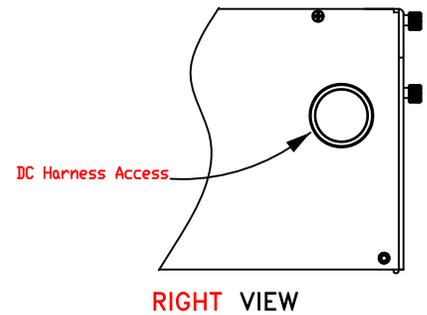
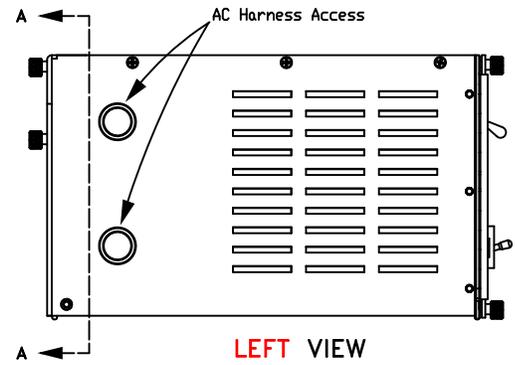
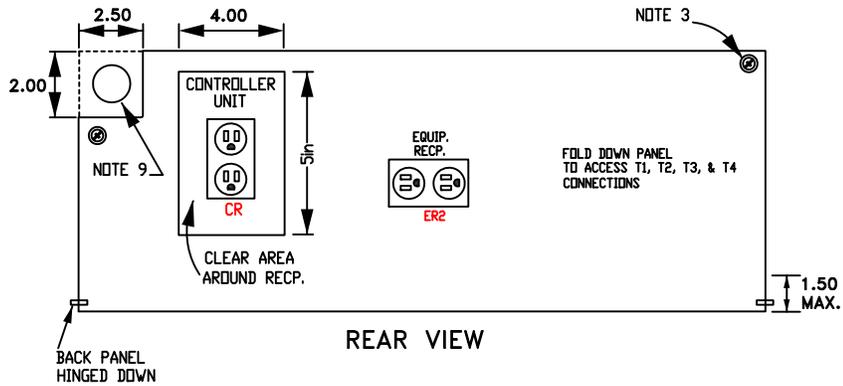


DETAIL B

NOTE:

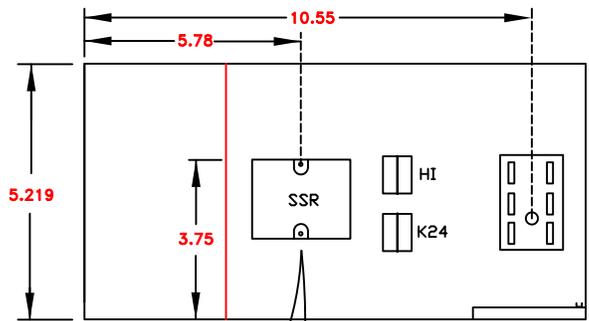
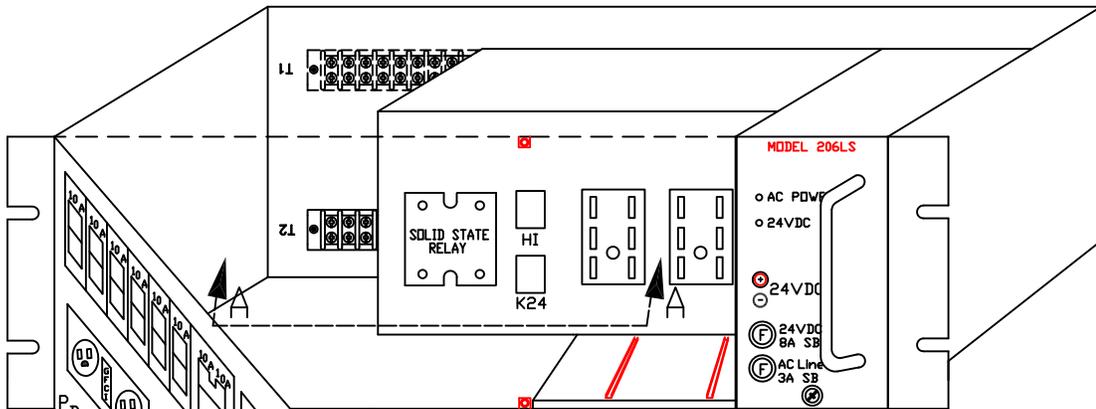
See A6-14 and A6-15 for sheets 3 & 4.

TITLE:	
PDA #2LX & #3LX DETAILS SHEET 4 OF 8	
ERRATA 2	NO SCALE
TEES 2009	A6-45

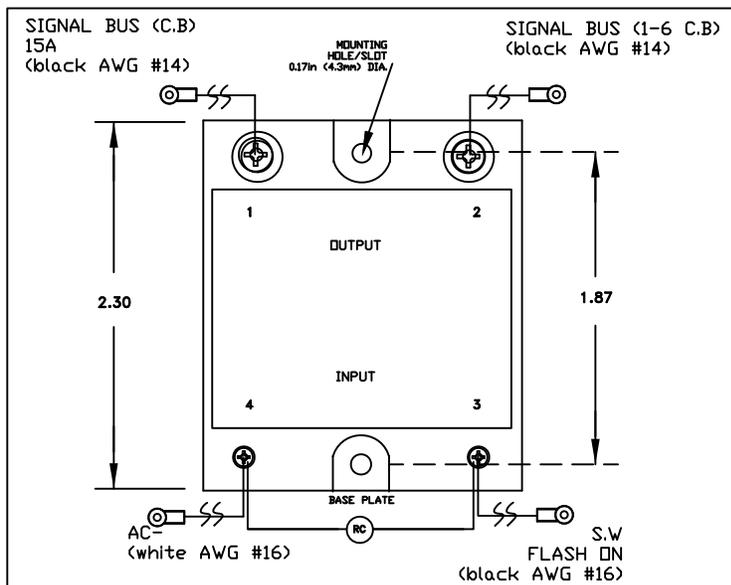


NOTE:  
See A6-14 and A6-15 for sheets 3 & 4.

TITLE:	
PDA #2LX & 3LX DETAILS SHEET 5 OF 8	
ERRATA 2	NO SCALE
TEES 2009	A6-46



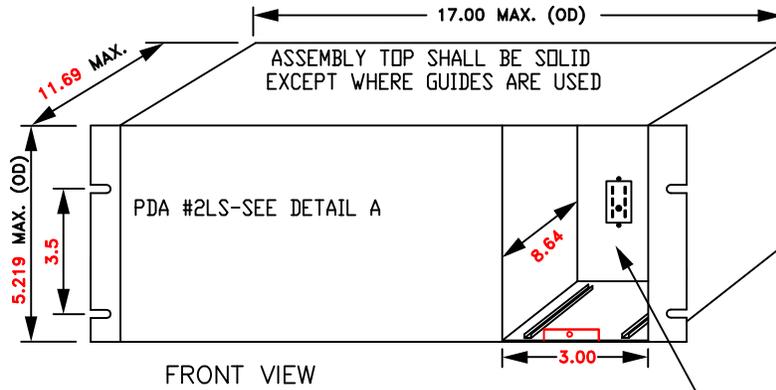
Section A-A



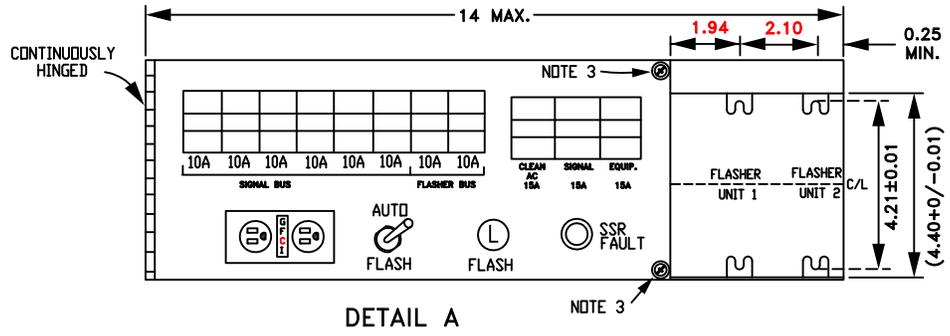
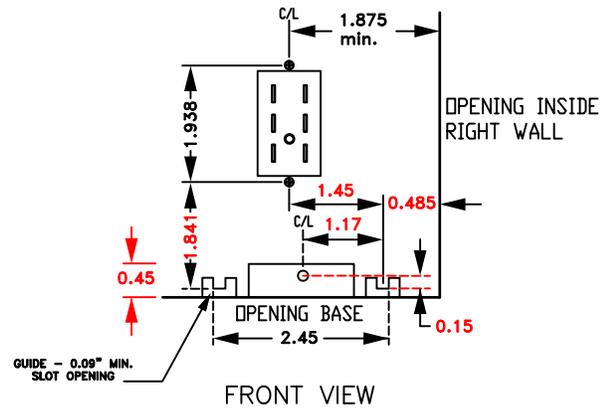
NOTE:

1. PDA top and bottom vented.
2. All dimensions shown are in inches.

TITLE:	
<b>PDA #2LS SSR INSTALLATION DETAILS SHEET 6 OF 8</b>	
ERRATA 2	NO SCALE
TEES 2009	<b>A6-47</b>

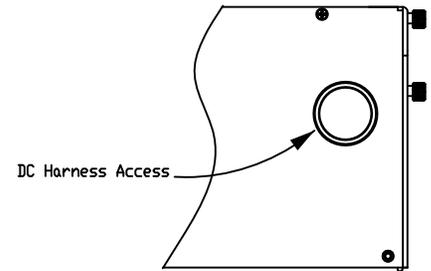
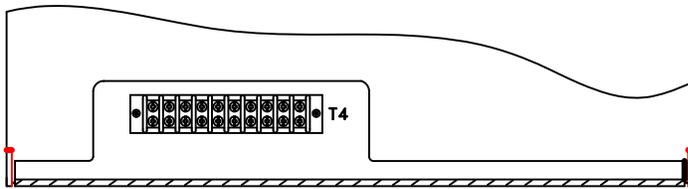
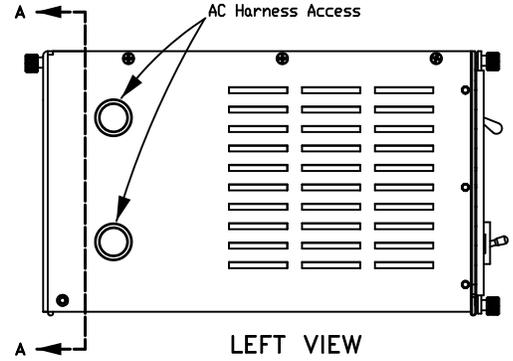
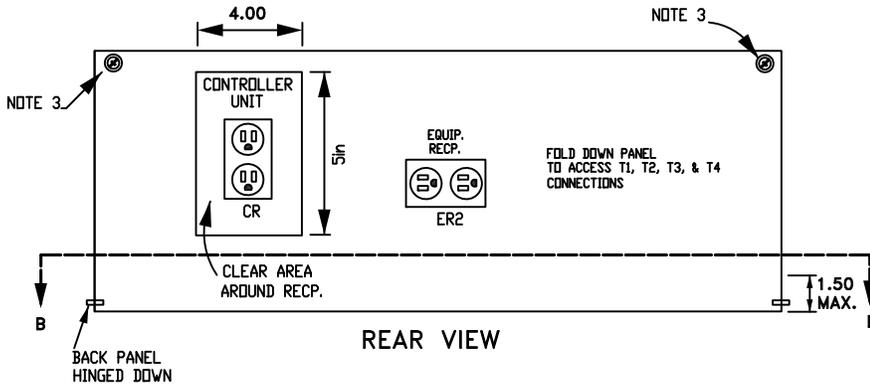


POWER SUPPLY CONNECTOR/STUD MOUNTING DETAIL



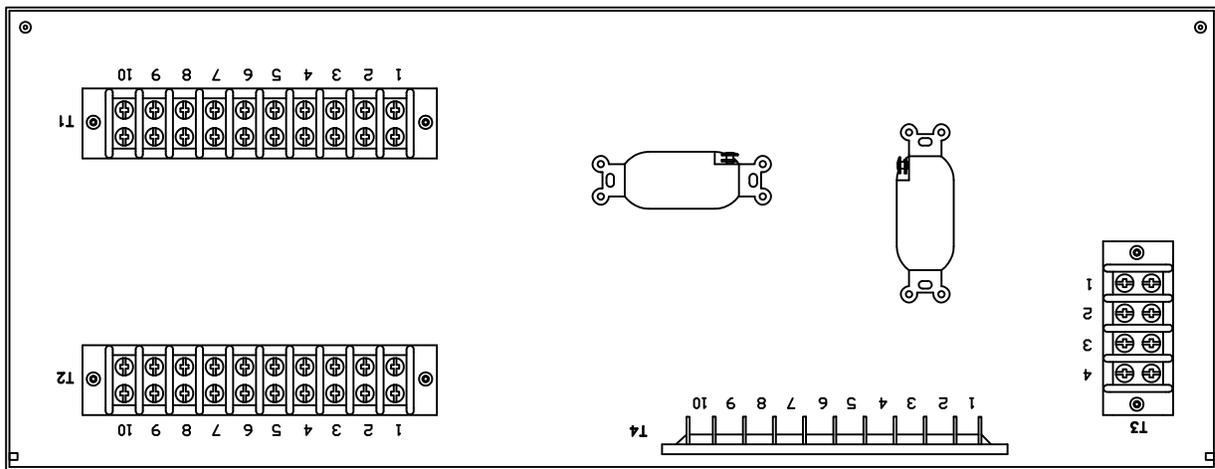
- NOTE:
1. See A6-14 and A6-15 for sheets 4 & 5.
  2. All dimensions shown are in inches.

TITLE:	
<b>PDA #2LS DETAILS SHEET 7 OF 8</b>	
ERRATA 2	NO SCALE
TEES 2009	A6-48



VIEW B-B

RIGHT VIEW

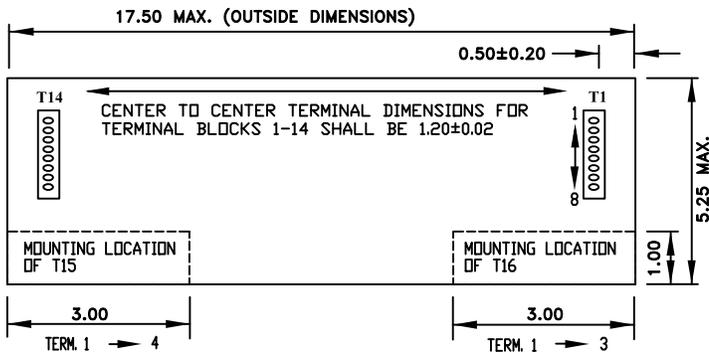


VIEW A-A  
(INSIDE REAR PANEL)

NOTE:  
See A6-14 and A6-15 for sheets 4 & 5.

TITLE:	
PDA #2LS DETAILS SHEET 8 OF 8	
ERRATA 2	NO SCALE
TEES 2009	A6-49

### INPUT FILE DETAIL



REAR VIEW

### INPUT FILE TERMINAL ASSIGNMENT DETAIL

#### T1 - 14

TERM	PIN - FUNCTION
1	SP - SPARE
2	F - CHANNEL 1 OUTPUT
3	W - CHANNEL 2 OUTPUT
4	D - CHANNEL 1 INPUT
5	E - CHANNEL 1 INPUT
6	J - CHANNEL 2 INPUT
7	K - CHANNEL 2 INPUT
8	L - EQUIP. GROUND

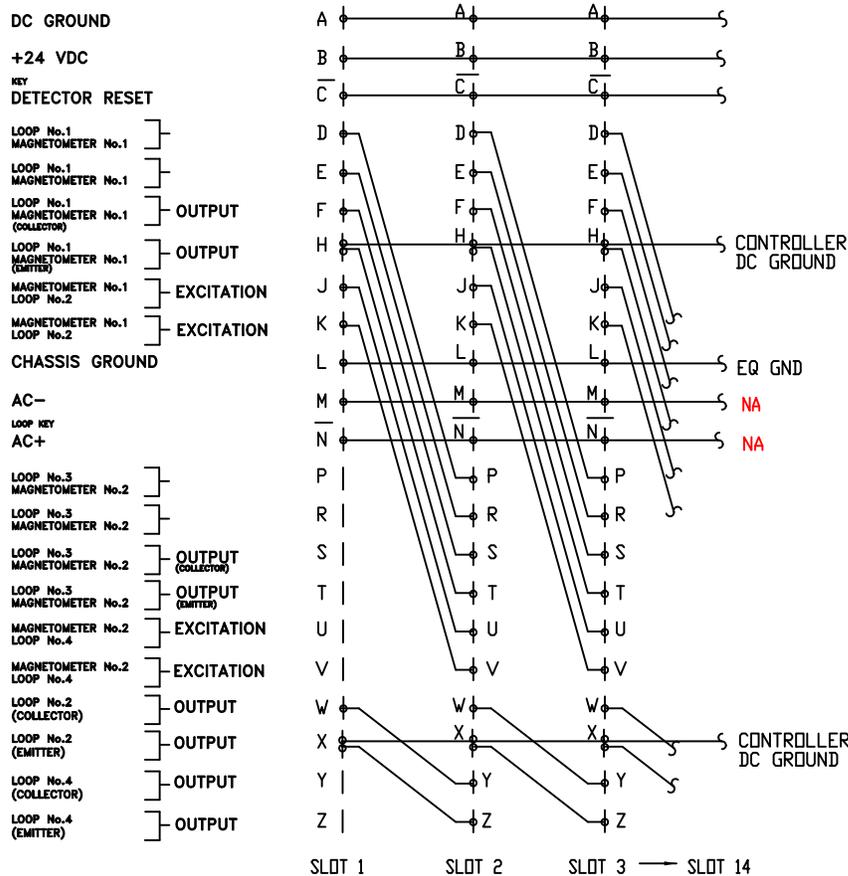
#### T15

TERM	FUNCTION
1	+24 VDC
2	DC GROUND
3	DETECTOR RESET
4	C1 HARNESS DC GROUND

#### T16

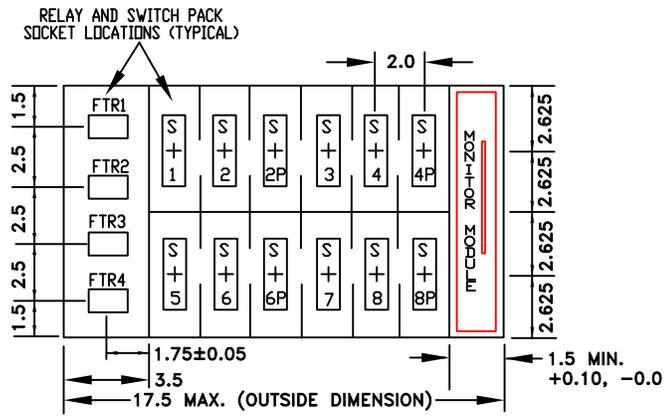
TERM	FUNCTION
1	NA
2	NA
3	EQUIP. GROUND

### INPUT FILE WIRING DIAGRAM



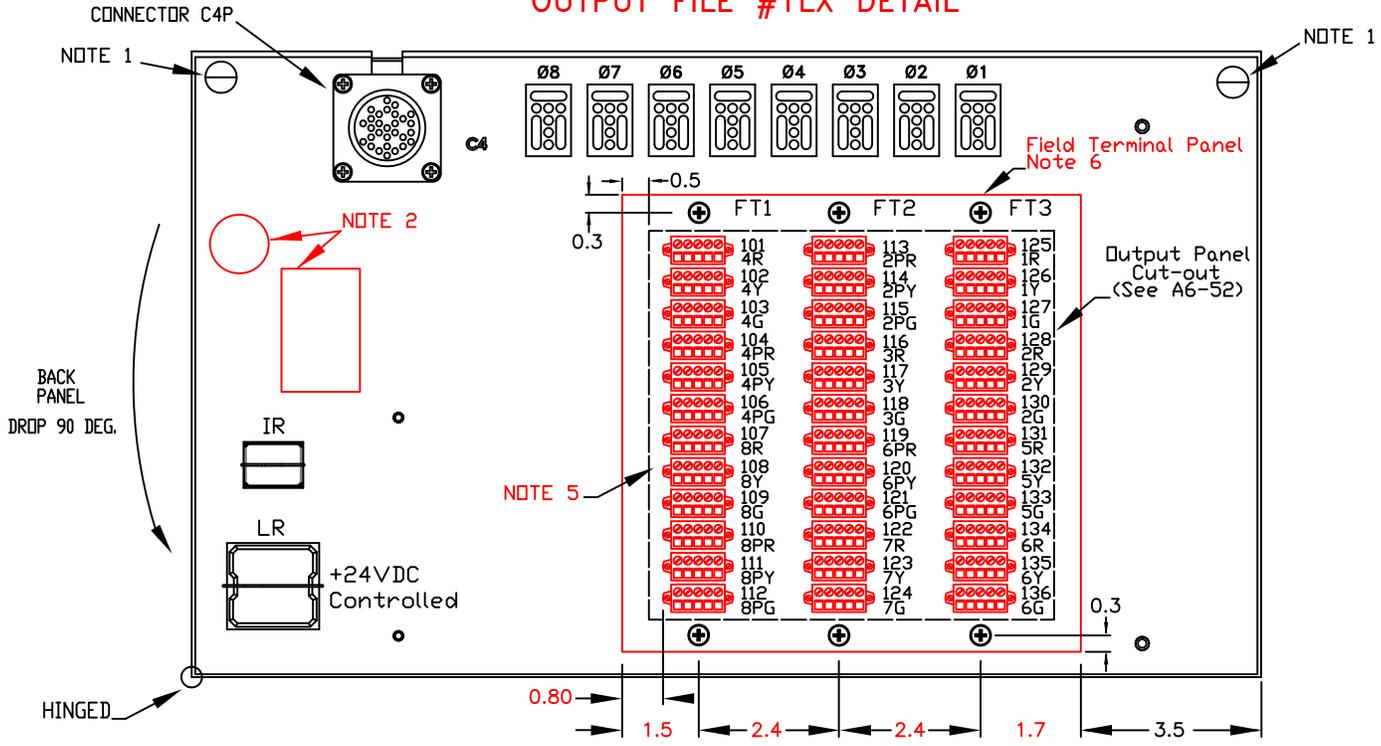
NOTE:  
All dimensions shown are in inches.

TITLE:	
<b>INPUT/OUTPUT FILE LX DETAILS SHEET 6 OF 9</b>	
ERRATA 2	ND SCALE
TEES 2009	<b>A6-50</b>



FRONT VIEW

OUTPUT FILE #1LX DETAIL



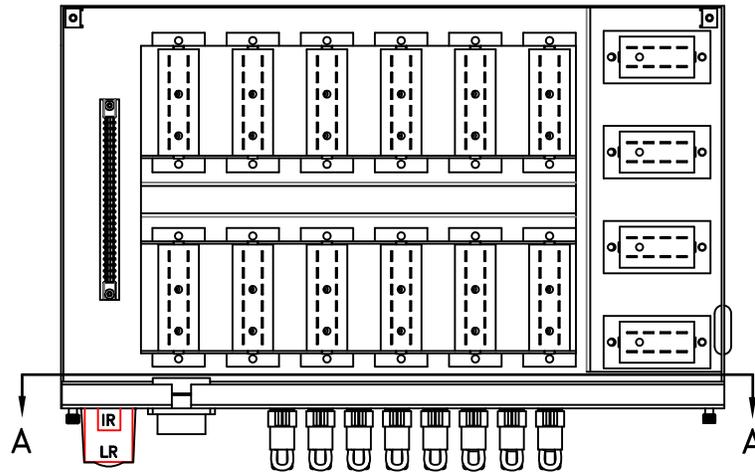
REAR VIEW

NOTE:

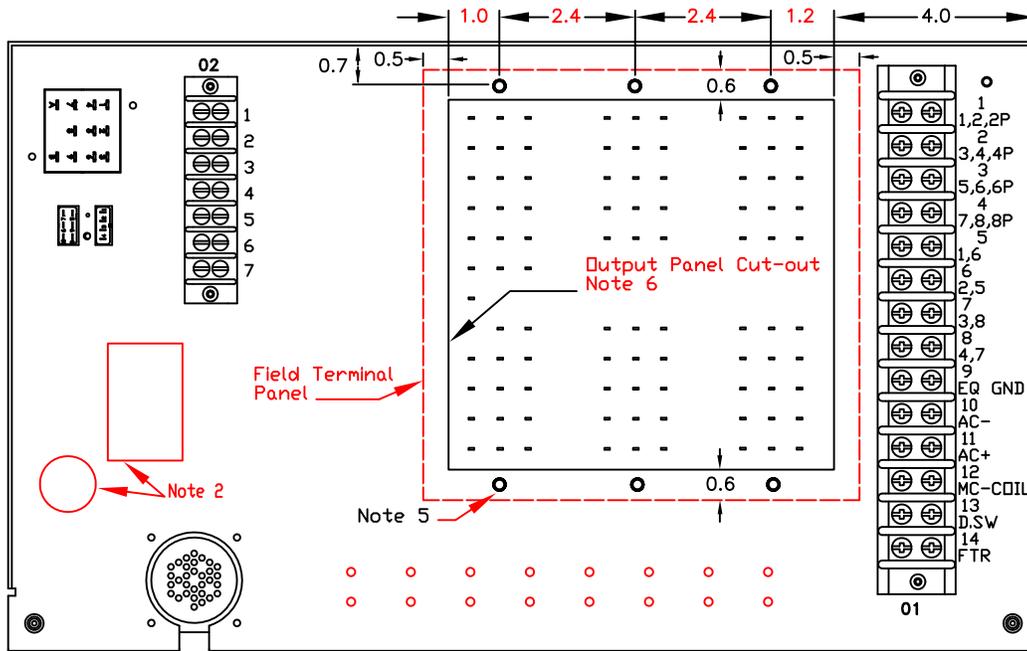
1. Thumb screws device
2. Panel stamped for OL Monitor Input Cable and Red Monitor Program Board, but Board not installed.
3. For Terminal Assignment, see Output File #1L detail.
4. See A6-18, A6-19 & A6-20 for sheets 5, 6 & 7.
5. Field Terminal contacts shall be 5-pin screw type Weidmuller BLT-C36, Phoenix Contact, or equivalent.
6. Height = 8.2 - 8.5, Width = 8
7. All dimensions shown are in inches

TITLE:	
INPUT/OUTPUT FILE #1LX DETAILS SHEET 7 OF 9	
ERRATA 2	NO SCALE
TEES 2009	A6-51

OUTPUT FILE #1LX DETAIL



REAR VIEW  
(BACK PANEL - OPEN)



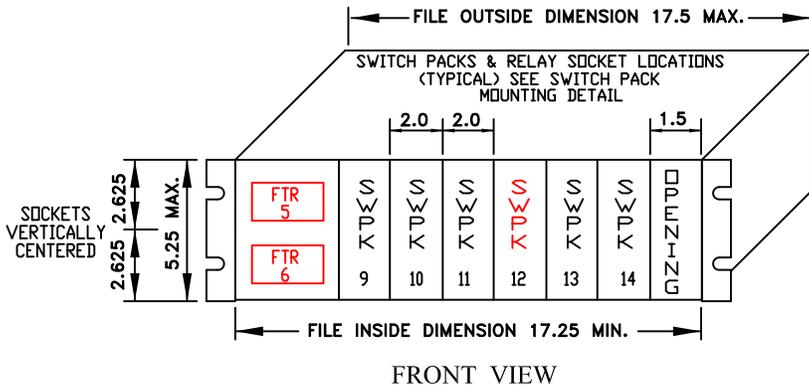
NOTE:

VIEW A-A

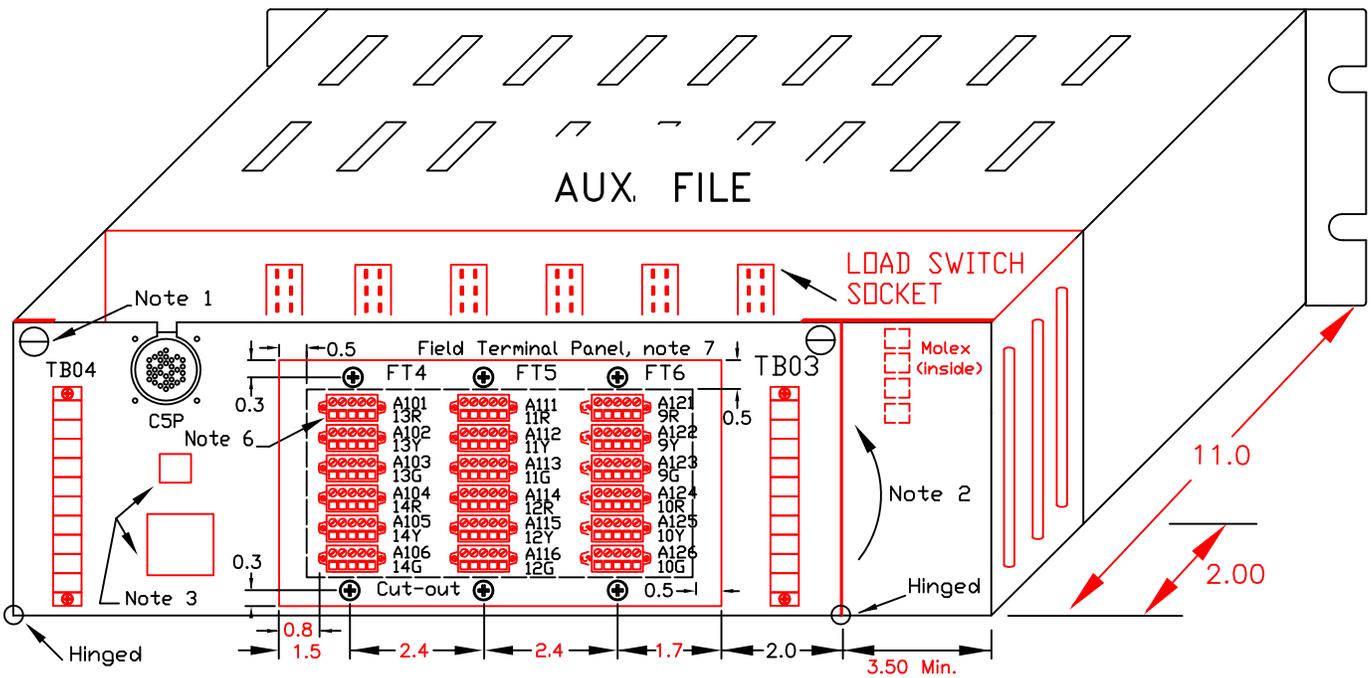
1. Thumb screws device
2. Panel stamped for OL Monitor Input Cable and Red Monitor Program Board, but board not installed.
3. For Terminal Assignment, see Output File #1 detail.
4. See A6-18, A6-19 & A6-20 for sheets 5, 6 & 7.
5. Holes 0.2 Dia. for Field Terminal Panel & Output Panels.
6. Cut-out Height = 7 - 7.3, Width = 7
7. All dimensions shown are in inches

TITLE: INPUT/OUTPUT FILE #1LX DETAILS SHEET 8 OF 9	
ERRATA 2	NO SCALE
TEES 2009	A6-52

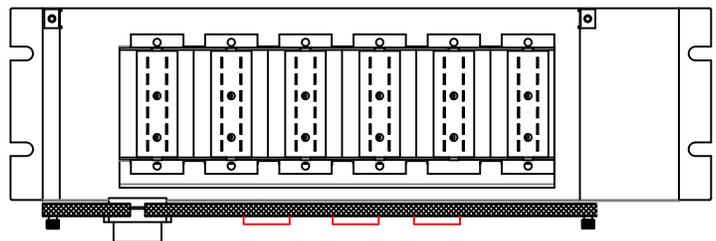
OUTPUT FILE #2LX DETAIL



FRONT VIEW



REAR VIEW  
(BACK PANEL - CLOSED)



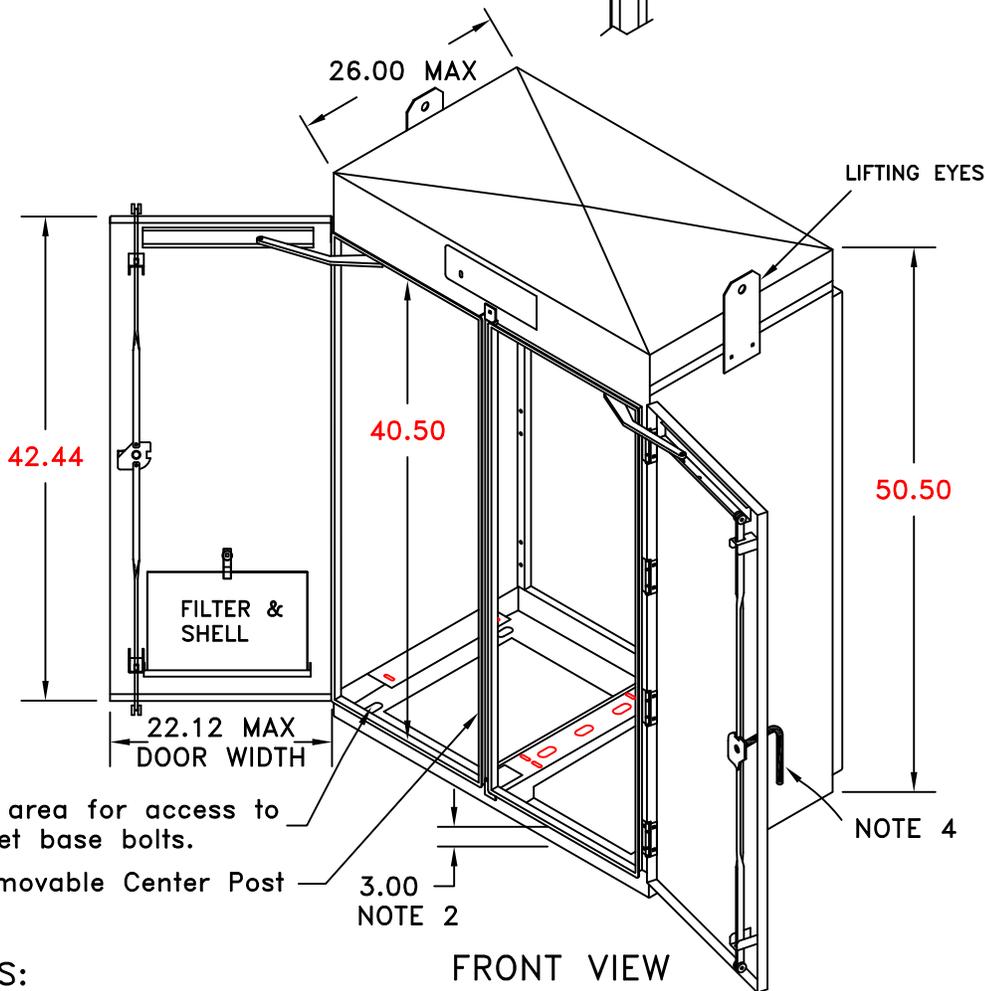
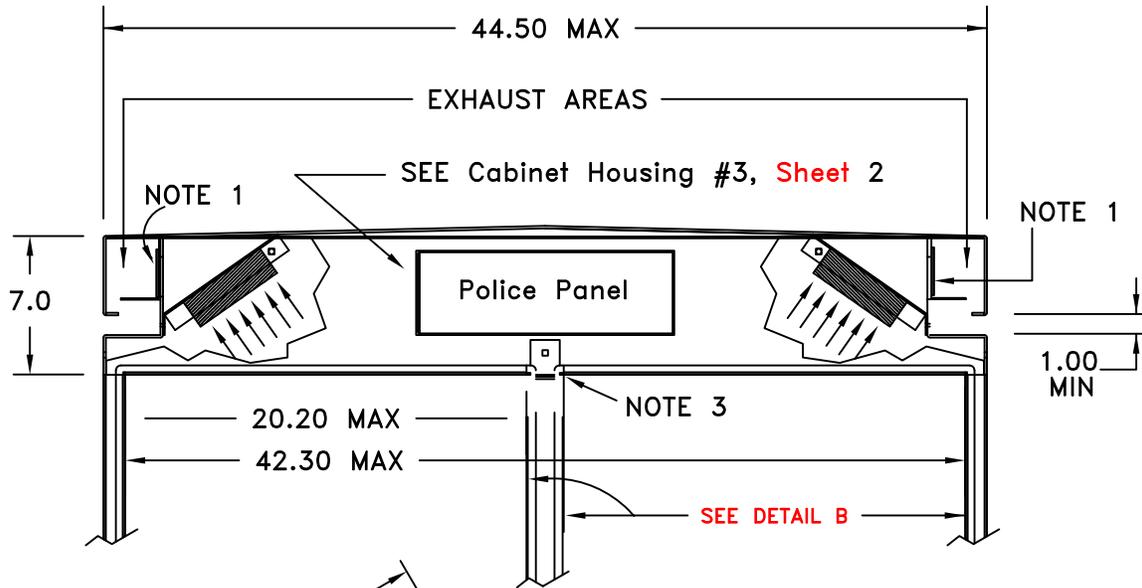
REAR VIEW  
(BACK PANEL - OPEN)

NOTE:

1. Thumb screws device
2. Back Panel Drop 90 Deg.
3. Panel stamped for IR & LR relay sockets, but relays not installed
4. For Terminal Assignment, see Output File #2L detail.
5. See A6-18, A6-19 & A6-20 for sheets 5, 6 & 7.
6. Field Terminal contacts shall be 5-pin screw type, Weidmuller BLT-C18, Phoenix or equivalent.
7. Height = 4.6 - 4.8, Width = 8
8. All dimensions shown are in inches

TITLE: INPUT/OUTPUT FILE #2LX DETAILS SHEET 9 OF 9	
ERRATA 2	NO SCALE
TEES 2009	A6-53

# EXHAUST DETAIL



Clear area for access to Cabinet base bolts.

Removable Center Post

## NOTES:

1. Perforated Screen
2. From Cabinet base to door lip
3. After center post is installed a sealant shall be applied to prevent leakage.
4. The locks & handles shall be centered vertically on the door opposite from the hinges on both, the rear & front.

TITLE:

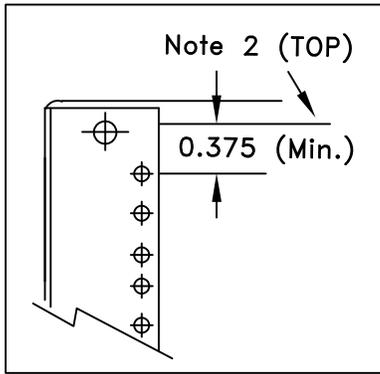
CABINET HOUSING #4 DETAILS  
SHEET 5 OF 7

ERRATA 2

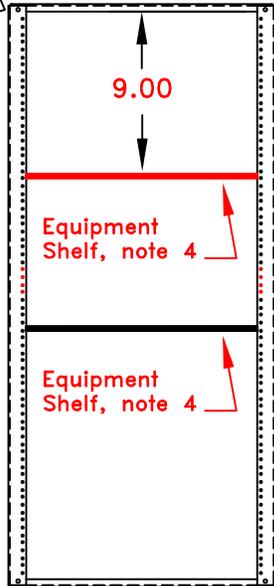
NO SCALE

TEES 2009

A6-54

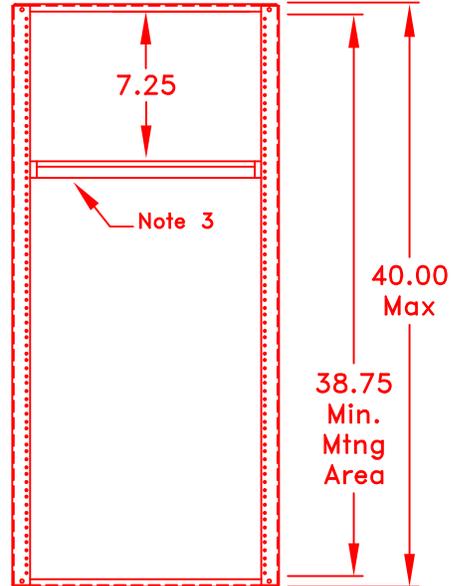


(Front & Rear Typical)  
FRONT VIEW



(Rack 2)

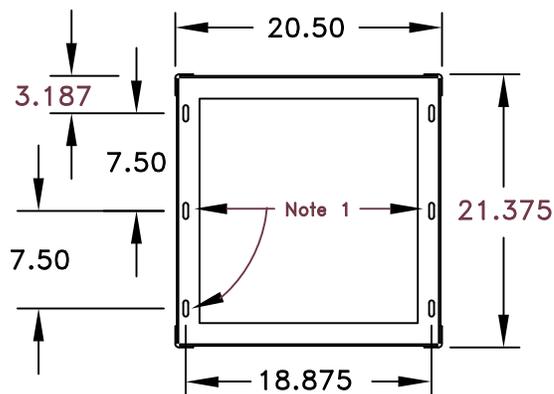
(Front & Rear Typical)  
FRONT VIEW



(Rack 1)

Note 2 (BOTTOM)

TOP VIEW



(Rack 1 & 2)

HOLE SLOT DETAIL  
B

0.375X1.250 OBOUND

NOTES

1. Hole Slot Detail B, Cage #2 details A6-2.
2. TOP, Refers to the bottom lip of the top hat.  
BOTTOM, Refers to the top lip of the bottom hat.
3. Controller unit support drawer shelf assembly, A6-6.
4. Equipment shelf, A6-41.

TITLE:

CABINET HOUSING #4 DETAILS  
SHEET 6 OF 7

ERRATA 2

NO SCALE

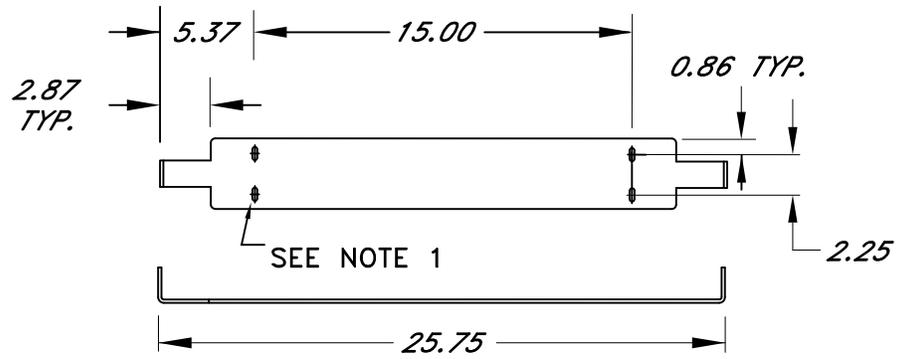
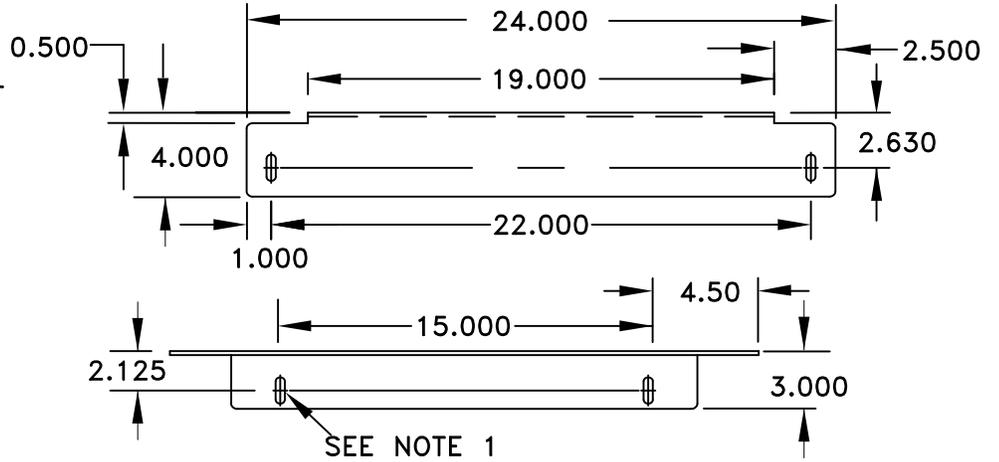
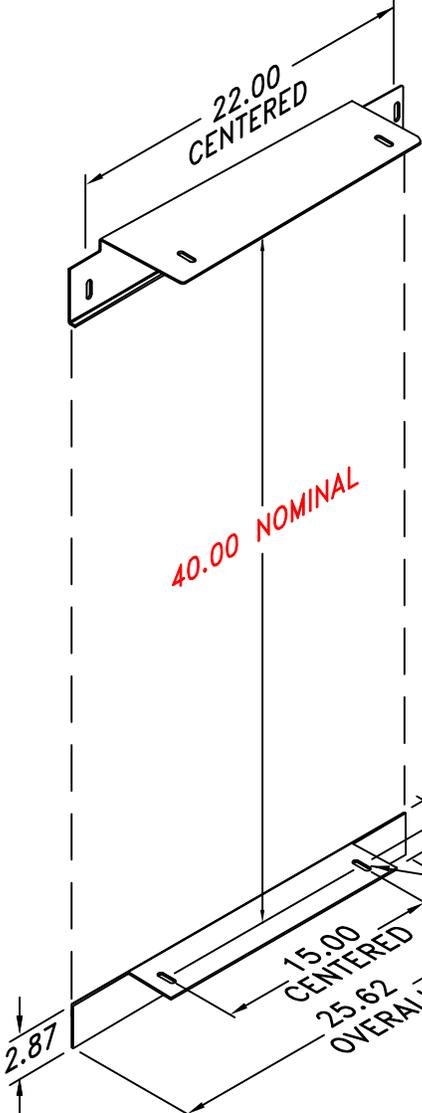
TEES 2009

A6-55

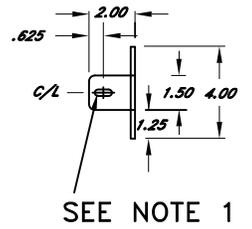
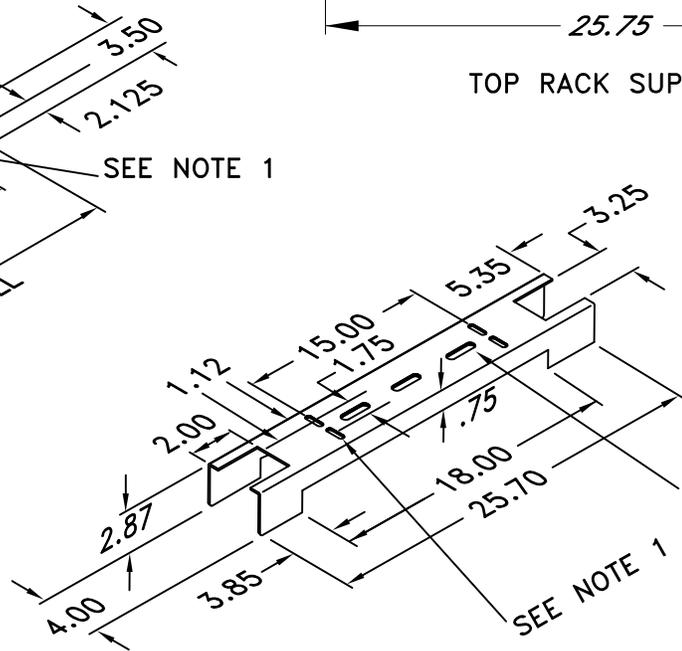
# HOUSINGS 4 TO CAGE 1 SUPPORT DETAILS

## SPANNER BRACKET BRACKET DETAIL

SPANNER BRACKET  
ATTACHED TO SIDE OF CABINET



## TOP RACK SUPPORT



**NOTES:**

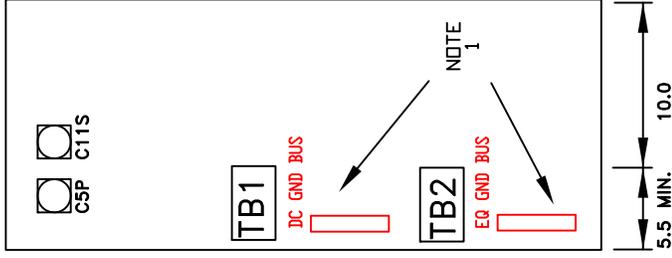
1. Hole Slot Detail B see Cabinet Housings 3 Detail 2
2. Hole Slot Detail A see Cabinet Housings 3 Detail 2
3. All dimensions shown are in inches.

CENTER CHANNEL  
PART IS WELDED TO BOTTOM PLATE

TITLE: <b>CABINET HOUSING #4 DETAILS</b> <b>SHEET 7 OF 7</b>	
ERRATA 2	NO SCALE
TEES 2009	A6-56

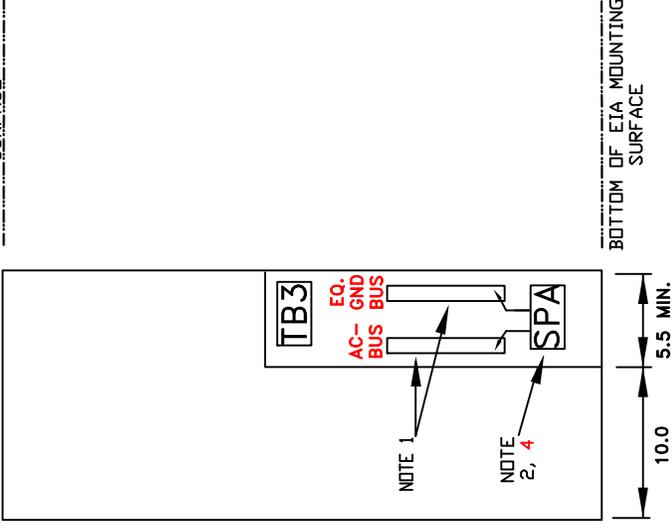
**MODEL 346LX SIDE PANEL**

INPUT PANEL #4



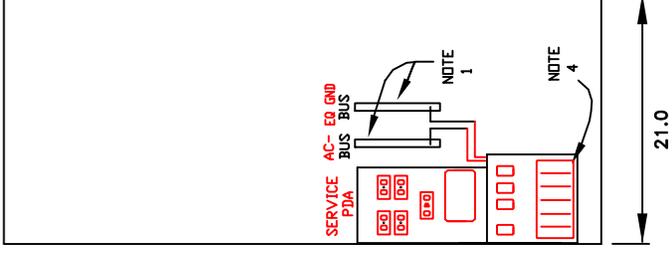
REAR VIEW  
(LEFT SIDE)

SERVICE PANEL #2



REAR VIEW  
(RIGHT SIDE)

SERVICE PANEL ITS



REAR VIEW  
(LEFT SIDE)

ITS PANEL



REAR VIEW  
(RIGHT SIDE)

NOTES:

1. 10 terminal (#8 wire) minimum copper bus.
2. The terminal block shall have terminal positions necessary to match position assignments.
3. Terminal position screws shall be 8-32 except for TBS, TBO, TB3, which shall be 10-32
4. SPA and the Service PDA shall be bolted on the Rail and firmly attached to the Service Panel.
5. All dimensions shown are in inches.

TITLE:

**MODEL 346LX SIDE PANEL DETAILS**

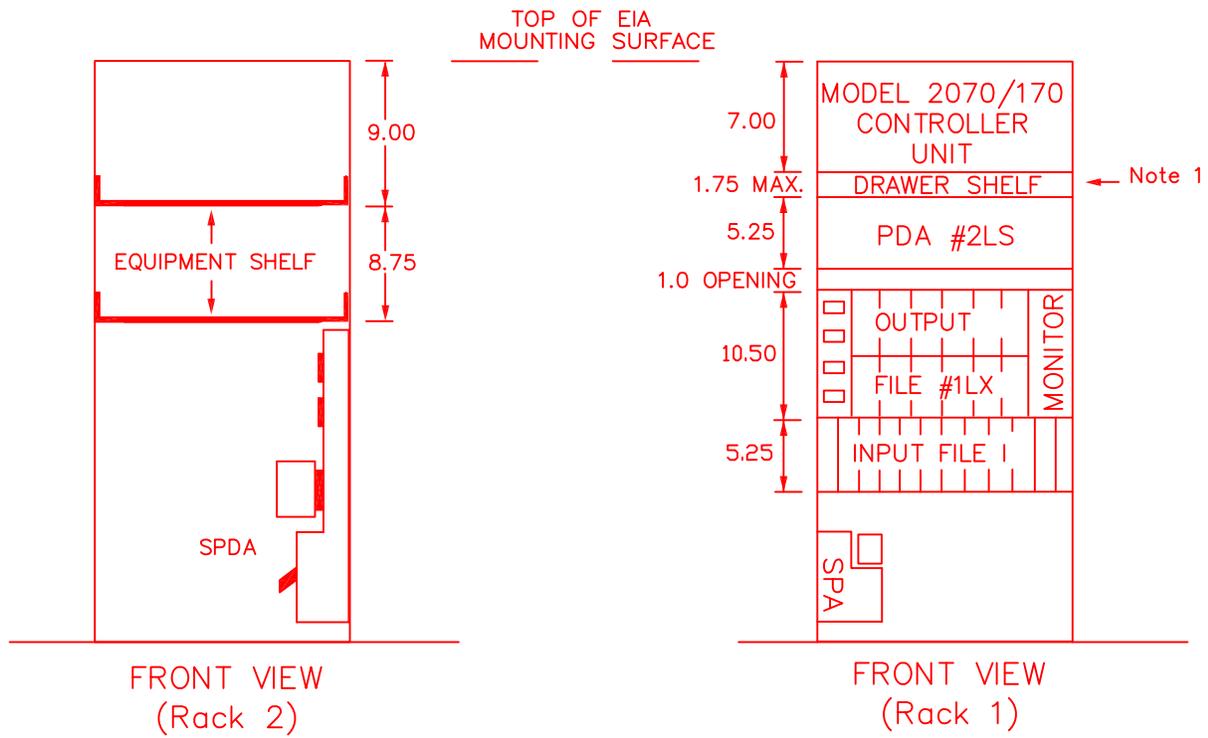
ERRATA 2

NO SCALE

TEES 2009

A6-57

MODEL 346LX



NOTE:

1. Controller unit support drawer shelf assembly.
2. All dimensions shown are in inches.

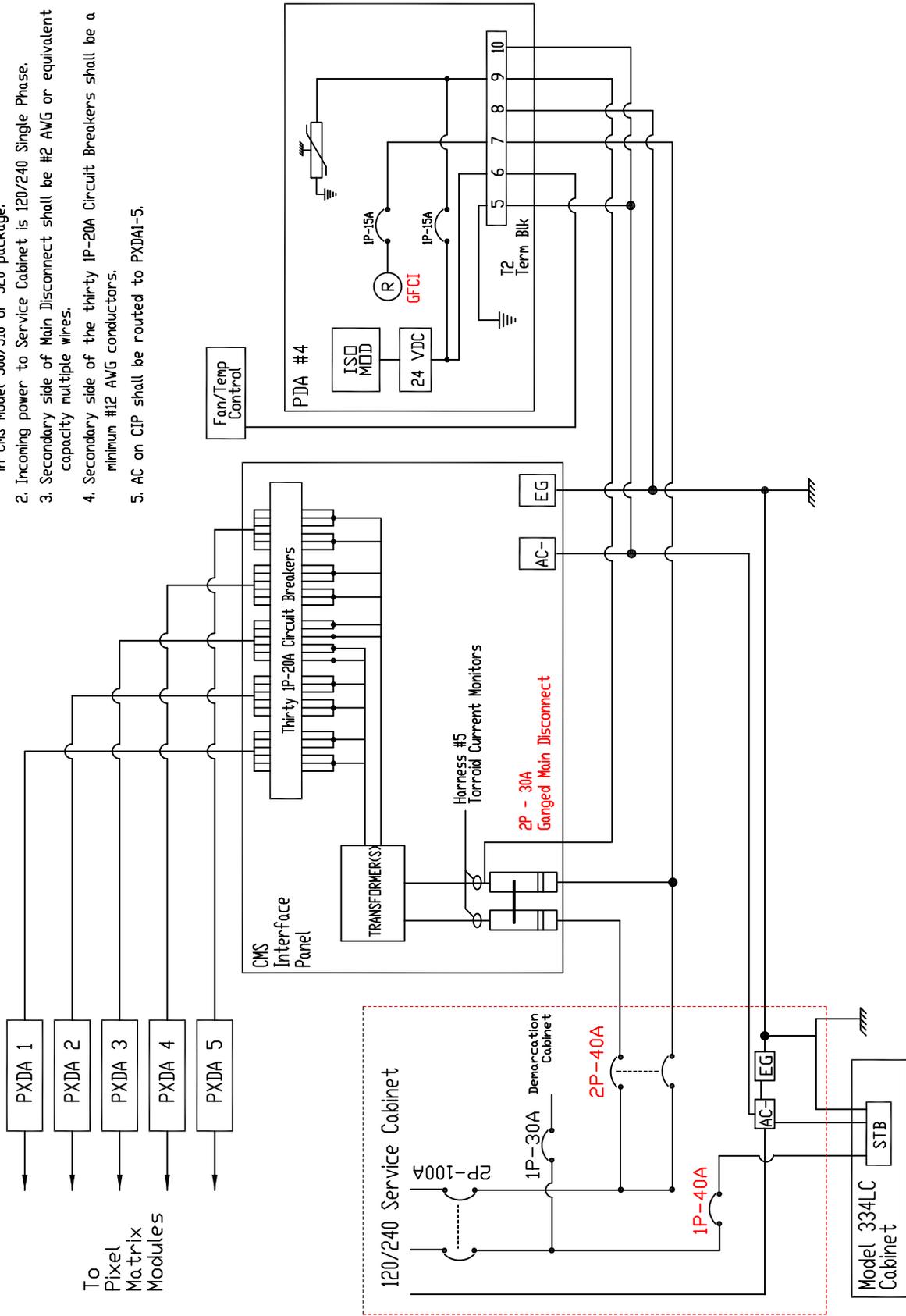
TITLE: <b>CABINET EQUIPMENT MOUNTING DETAILS</b> <b>SHEET 3 OF 3</b>	
ERRATA 2	NO SCALE
TEES 2009	<b>A6-58</b>

**APPENDIX A8**  
**CHAPTER 8 DETAILS**

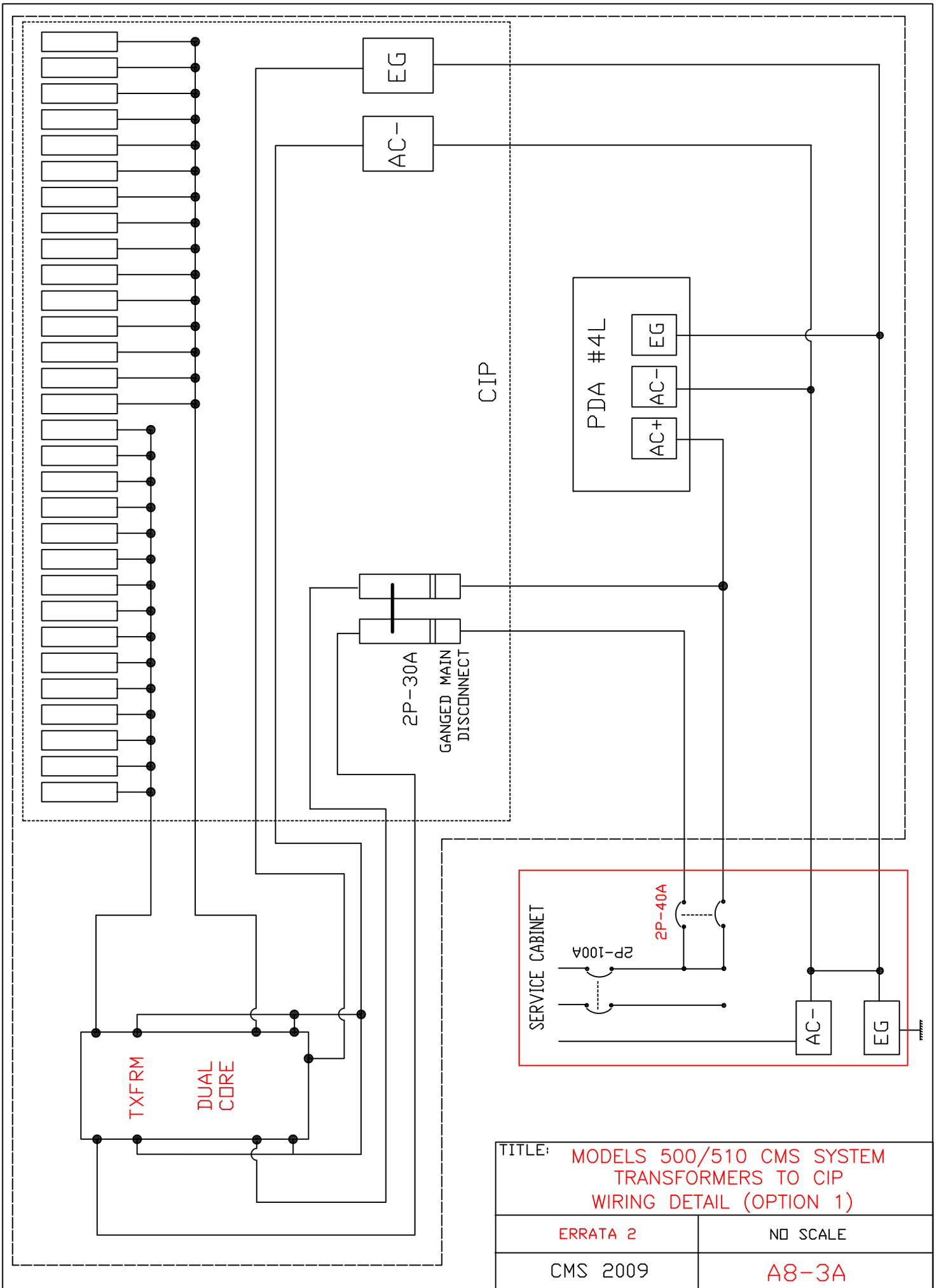
<b>Model 500, 510 &amp; 520 CMS System Wiring Diagram</b>	<b>A7-2</b>
<b>Model 500/510 CMS System TxFrm to CIP Wiring Detail , Option 1</b>	<b>A8-3A</b>
<b>Model 500/510 CMS System TxFrm to CIP Wiring Detail , Option 2</b>	<b>A8-3B</b>

NOTES:

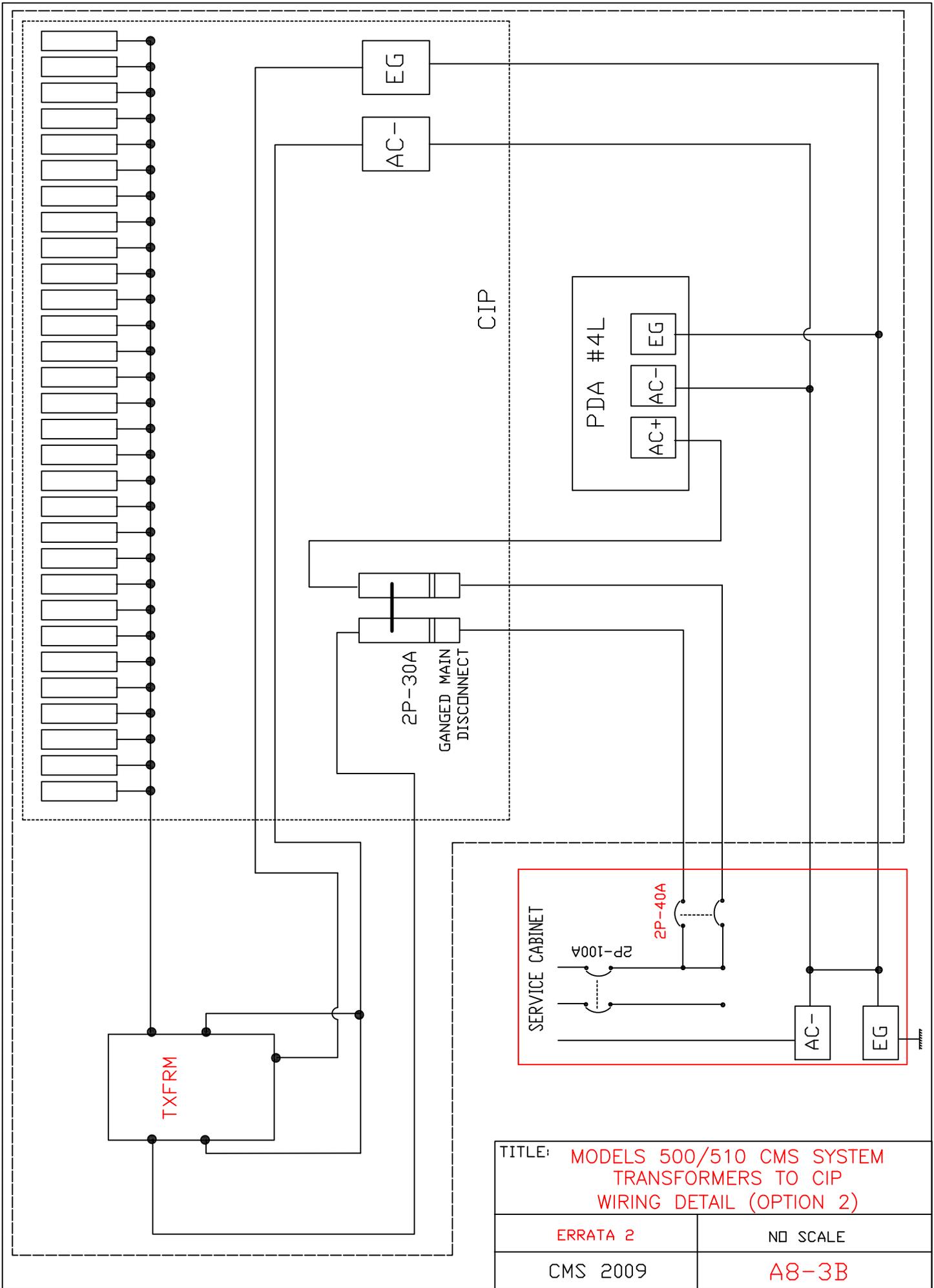
1. AC Service is shown only to complete diagram and is not provided in CMS Model 500/510 or 520 package.
2. Incoming power to Service Cabinet is 120/240 Single Phase.
3. Secondary side of Main Disconnect shall be #2 AWG or equivalent capacity multiple wires.
4. Secondary side of the thirty IP-20A Circuit Breakers shall be a minimum #12 AWG conductors.
5. AC on C/P shall be routed to PXDA1-5.



TITLE:	
MODELS 500, 510 & 520 CMS SYSTEM WIRING DIAGRAM	
ERRATA 2	NO SCALE
CMS 2009	A7-2



TITLE: MODELS 500/510 CMS SYSTEM TRANSFORMERS TO CIP WIRING DETAIL (OPTION 1)	
ERRATA 2	NO SCALE
CMS 2009	A8-3A



TITLE: MODELS 500/510 CMS SYSTEM  
TRANSFORMERS TO CIP  
WIRING DETAIL (OPTION 2)

ERRATA 2

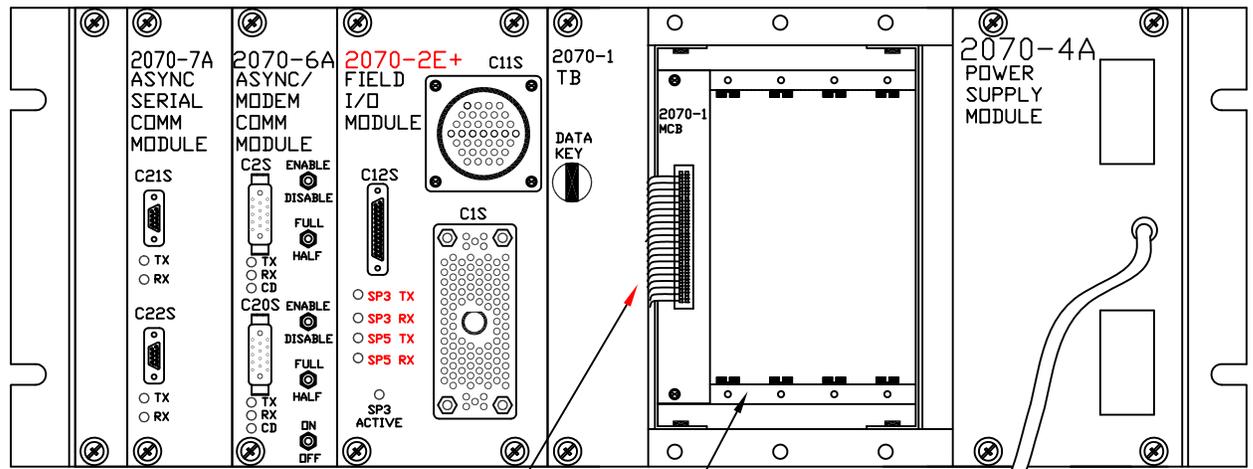
NO SCALE

CMS 2009

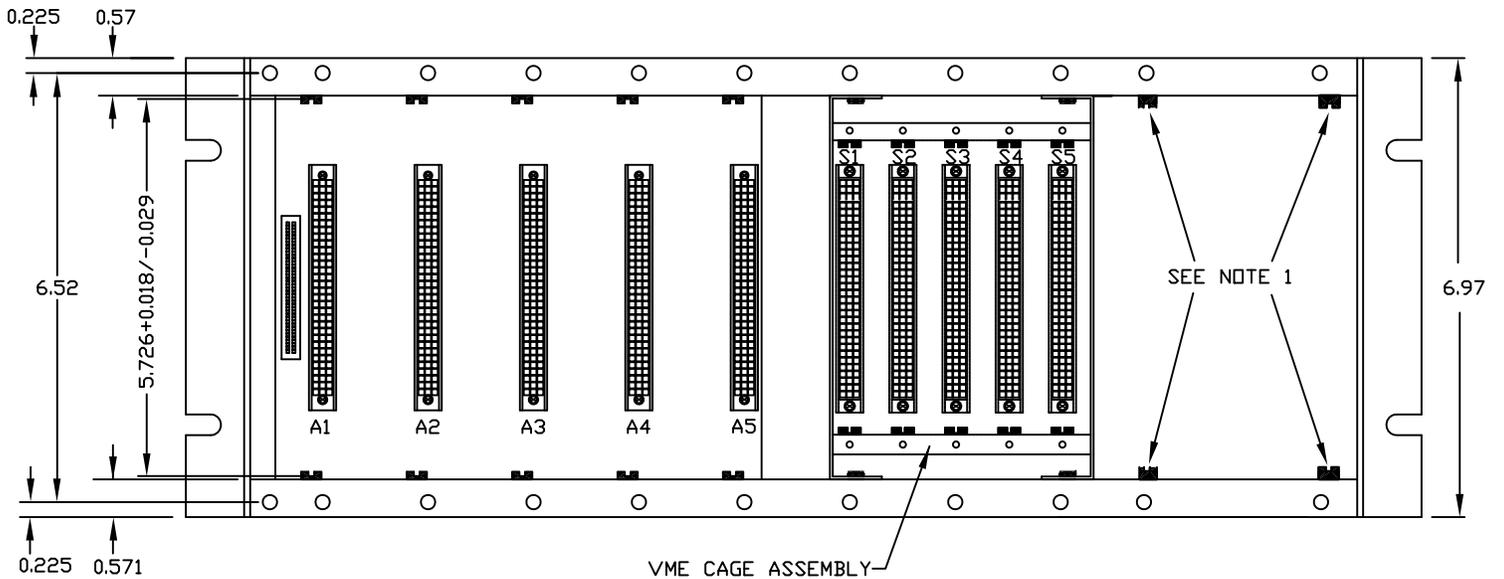
A8-3B

**APPENDIX A9**  
**CHAPTER 9 DETAILS**

<b>Model 2070 - Chassis Rear View</b>	<b>A9-2</b>
<b>Model 2070 - Chassis Motherboard</b>	<b>A9-4</b>
<b>Model 2070 – 2, Field I/O Module</b>	<b>A9-8</b>
<b>Model 2070 – 2E+ Field I/O Module, C1 &amp; C11 Connectors</b>	<b>A9-9</b>
<b>Model 2070 – 4 Power Supply Module</b>	<b>A9-13</b>
<b>Model 2070 – Power Failure Reaction</b>	<b>A9-17</b>



SEE NOTE 3  
 VME CAGE ASSEMBLY (EXPOSED)  
 REAR VIEW, LOADED

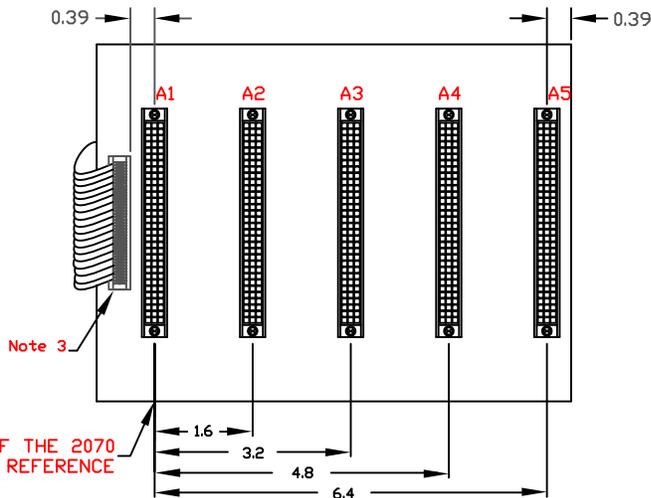


VME CAGE ASSEMBLY  
 REAR VIEW, UNLOADED

NOTES: (FOR THIS DETAIL)

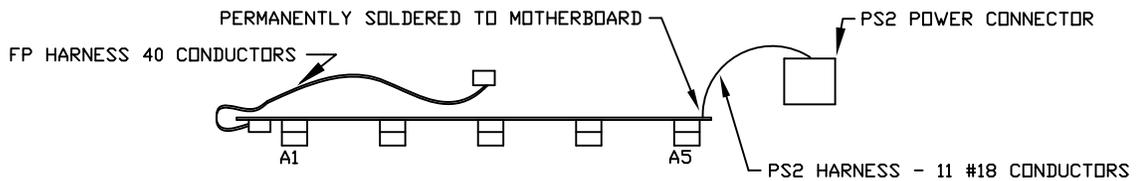
1. Four permanently attached 8in long Card Guides SAE 1800F (OR EQUAL) beginning 0.51in from the backplane mounting surface.
2. TB – TRANSITION BOARD  
 MCB – MAIN CONTROLLER BOARD
3. Maximum length of harness shall be 4in, and shall not protrude beyond the back of the 2070 unit.
4. The VME Cage Assembly Opening shall be delivered covered by a blank panel. Matching M3 PEM fasteners shall be provided on the back plane surface for panel mounting.
5. Blank plates shall cover all unused module openings.
6. All Module Front Plates thickness shall be (0.08+0.005)
7. All dimensions shown are in inches.

TITLE: MODEL 2070-CHASSIS REAR VIEW	
ERRATA 2	NO SCALE
TEES 2009	A9-2



SEE SLOT DIMENSION 1.1in OF THE 2070 TOP VIEW DIAGRAM FOR REFERENCE

CONNECTOR VIEW



TOP VIEW

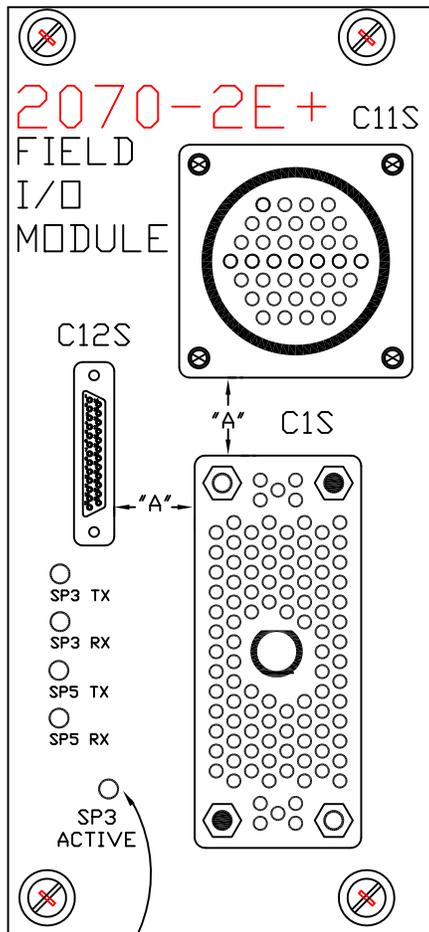
FP HARNESS PIN/WIRING ASSIGNMENT			
PIN	CONNECTOR ROW A	PIN	CONNECTOR ROW B
1	SP4TXD+	2	SP4TXD-
3	SP4RXD+	4	SP4RXD-
5	SP6TXD+	6	SP6TXD-
7	SP6RXD+	8	SP6RXD-
9	NA	10	NA
11	NA	12	NA
13	NA	14	NA
15	NA	16	NA
17	NA	18	NA
19	NA	20	NA
21	DCG #1	22	DCG #1
23	+12 VDC SER	24	-12 VDC SER
25	DCG #1	26	DCG #1
27	CPU LED	28	DCG #1
29	CPURESET	30	DCG #1
31	DCG #1	32	C50 ENABLE
33	DCG #1	34	+5 VDC
35	+5 VDC	36	+5 VDC
37	+5 VDC	38	+5 VDC
39	NA	40	NA

PS2 HARNESS PIN/WIRING ASSIGNMENT	
PIN	FUNCTION
1	+5 VDC
2	+12 VDC SER
3	-12 VDC SER
4	DCG #1 (+5 VDC & 12 SER)
5	+5 VDC Standby
6	ISO +12 VDC
7	DCG #2 (ISO +12 VDC ONLY)
8	POWERDOWN
9	POWERUP
10	EG (EQUIPMENT GROUND)
11	LINESYNC
12	NA

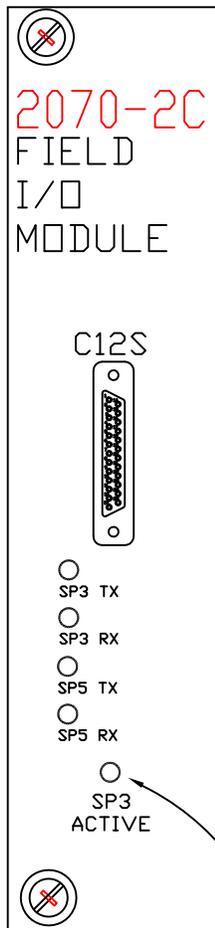
NOTES: (FOR THIS DETAIL)

1. The Motherboard shall be a 0.125 inch minimum thickness pcb mechanically mounted in a vertical position.
2. A1 to A5 receptacle connectors shall be 96 socket contact DIN 41612 connectors (ROBINSON NUGENT #DIN 96RSC or ELCO Series 8477 Three Row Inverted Socket OR EQUAL).
3. The FP Harness shall be connected to the Motherboard via a header connector. Pin 1 shall be in the lower right hand corner.
4. Front Panel Harness Connector shall intermate with AMP 102-160-9 or equal located on Front Panel PCB.
5. Angle Brackets shall support the Motherboard to the Model 2070 chassis.
6. All dimensions shown are in inches.

TITLE: MODEL 2070 CHASSIS MOTHERBOARD	
ERRATA 2	NO SCALE
TEES 2009	A9-4



FRONT VIEW



FRONT VIEW

C12S PIN ASSIGNMENT			
PIN	FUNCTION	PIN	FUNCTION
1	SP5TXD+	14	SP5TXD-
2	SP5RXD+	15	SP5RXD-
3	SP5TXC+	16	SP5TXC-
4	SP5RXC+	17	SP5RXC-
5	SP3TXD+	18	SP3TXD-
6	SP3RXD+	19	SP3RXD-
7	SP3TXC+	20	SP3TXC-
8	SP3RXC+	21	SP3RXC-
9	LINE SYNC+	22	LINE SYNC-
10	NRESET+	23	NRESET-
11	POWERDOWN+	24	POWERDOWN-
12	BIAS +5 VDC	25	EG
13	DCG #2		

LED

LED

### FIELD I/O FACE PANELS

#### NOTES: (FOR THIS DETAIL)

1. **2070-2E+** Faceplate shall be 4X wide. **2070-2C** Faceplate shall be 2X wide. (SEE SYSTEM PCB MODULE, GENERAL DETAILS.)
2. Dark Circles in the C1S Connector denote guide pin locations and opencircles denote guide socket locations.
3. Dimension "A" shall be a minimum of 0.5in.
4. C1S - M104 Type. C11S - 37-Pin Circular Plastic Type. C12S - 25-Pin DB Socket Type
5. C12S pin 12 (BIAS +5VDC) at 50mA maximum is derived from the ISO +12 VDC Power Supply. BIAS +5VDC refers to voltage required for a Line Terminator device.
6. EG (Equipment Ground) pin is electrically connected to the faceplate.
7. LED indicators Tx & Rx for SP3 (field site) and SP5 shall be provided.
8. C1 connector shall be bolted to the Faceplate.
9. Angle Brackets shall support main board to the Faceplate.

TITLE: MODEL 2070-2 FIELD I/O MODULES	
ERRATA 2	NO SCALE
TEES 2009	A9-8

## C1S PIN ASSIGNMENT

PIN	FUNCTION NAME	PIN	FUNCTION NAME	PIN	FUNCTION NAME	PIN	FUNCTION NAME
1	DCG #2	27	I24	53	I14	79	I44
2	I0	28	I25	54	I15	80	I45
3	I1	29	I26	55	I16	81	I46
4	I2	30	I27	56	I17	82	I47
5	I3	31	I28	57	I18	83	I40
6	I4	32	I29	58	I19	84	I41
7	I5	33	I30	59	I20	85	I42
8	I6	34	I31	60	I21	86	I43
9	I7	35	I32	61	I22	87	I44
10	I8	36	I33	62	I23	88	I45
11	I9	37	I34	63	I28	89	I46
12	I10	38	I35	64	I29	90	I47
13	I11	39	I0	65	I30	91	I48
14	DCG #2	40	I1	66	I31	92	DCG #2
15	I12	41	I2	67	I32	93	I49
16	I13	42	I3	68	I33	94	I50
17	I14	43	I4	69	I34	95	I51
18	I15	44	I5	70	I35	96	I52
19	I16	45	I6	71	I36	97	I53
20	I17	46	I7	72	I37	98	I54
21	I18	47	I8	73	I38	99	I55
22	I19	48	I9	74	I39	100	I36
23	I20	49	I10	75	I40	101	I37
24	I21	50	I11	76	I41	102	I38 DET RES
25	I22	51	I12	77	I42	103	I39 WDT
26	I23	52	I13	78	I43	104	DCG #2

## C11S PIN ASSIGNMENT

PIN	FUNCTION NAME	PIN	FUNCTION NAME	PIN	FUNCTION NAME	PIN	FUNCTION NAME
1	I56	11	I25	21	I54	31	DCG #2
2	I57	12	I26	22	I55	32	NA
3	I58	13	I27	23	I56	33	NA
4	I59	14	DCG #2	24	I57	34	NA
5	I60	15	I48	25	I58	35	NA
6	I61	16	I49	26	I59	36	NA
7	I62	17	I50	27	I60	37	DCG #2
8	I63	18	I51	28	I61		
9	DCG #2	19	I52	29	I62		
10	I24	20	I53	30	I63		

TITLE:

MODEL 2070-2E+  
FIELD I/O MODULE  
C1S & C11S CONNECTORS

ERRATA 2

NO SCALE

TEES 2009

A9-9



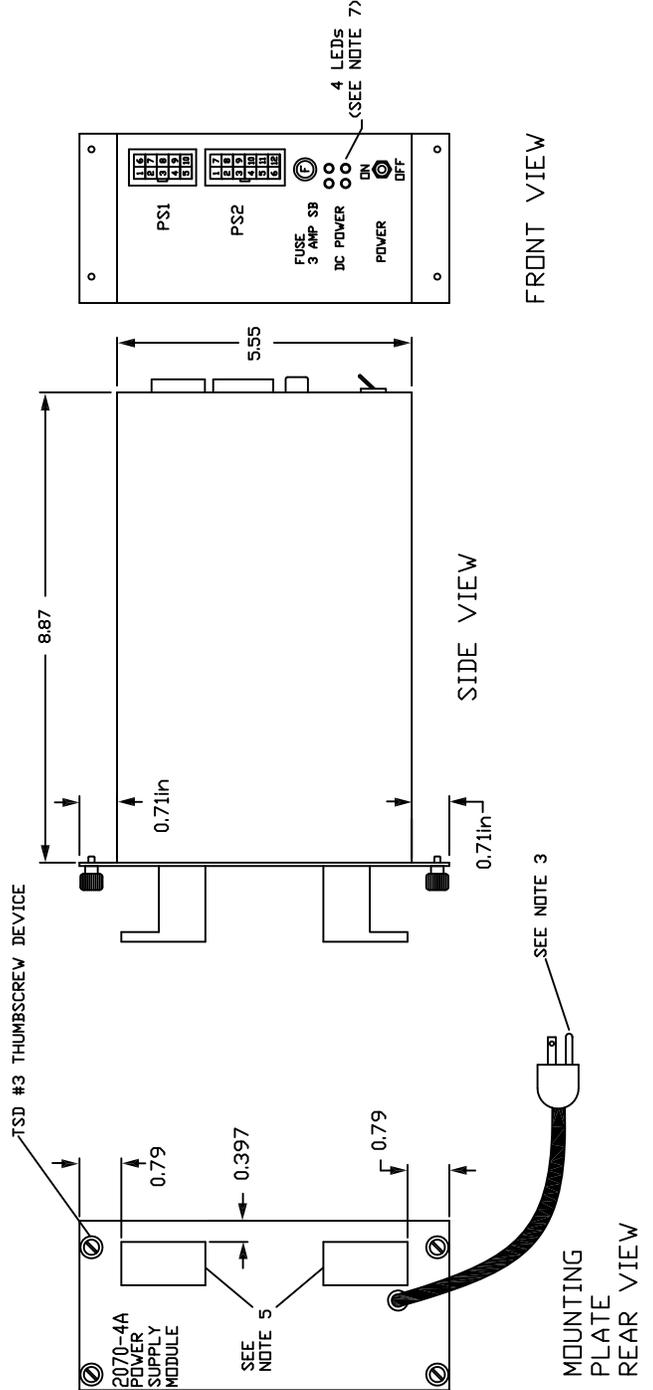
TOP VIEW

PS1 CONNECTOR PINOUT	
PIN	FUNCTION
1	+5 VDC
2	+12 VDC SER
3	-12 VDC SER
4	DCG #1 (+5 VDC & 12 SER)
5	+5 VDC Standby
6	+5 VDC SENSE
7	DCG #1 SENSE
8	AC FAIL
9	SYSRESET
10	NA

PS2 CONNECTOR PINOUT	
PIN	FUNCTION
1	+5 VDC
2	+12 VDC SER
3	-12 VDC SER
4	DCG #1 (+5 VDC & 12 SER)
5	+5 VDC Standby
6	ISO +12 VDC
7	DCG #2 (ISO +12 VDC ONLY)
8	POWERDOWN
9	POWERUP
10	EG (EQUIPMENT GROUND)
11	LINESYNC
12	NA

NOTES: (FOR THIS DETAIL)

1. Power switch shall be mounted vertically. Power On shall be in the up position.
2. Fuse shall be a replaceable 3AG Slow Blow type resident in a fuse holder. Fuse label shall indicate rating.
3. Three conductor #16 power cable, **4 feet (48 inch) minimum length** and permanency attached to the Module with strain relief. The end plug connector shall be a three blade NEMA 5-15P grounding plug type.
4. PS1 and PS2 Receptacle Connectors shall be AMP Mini-Universal Double row MATE-N-LOK 2 CAP Connectors with locking latch devices (OR EQUAL).
5. PS1 connector shall be a 10 position PLUG connector. PS2 connector shall be a 12 position PLUG connector.
6. Buckeye Cord-Wrap PP-40055 device with PP-40058 Extension (OR EQUAL).
7. Mounting Plate shall conform to the 4X Wide Module dimensions.
8. A LED indicator shall be provided for each DC power source (+5, ISO +12, +12 SER, -12 SER).
9. Power Supply shall be marked as 2070-4A.
10. All dimensions shown are in inches.

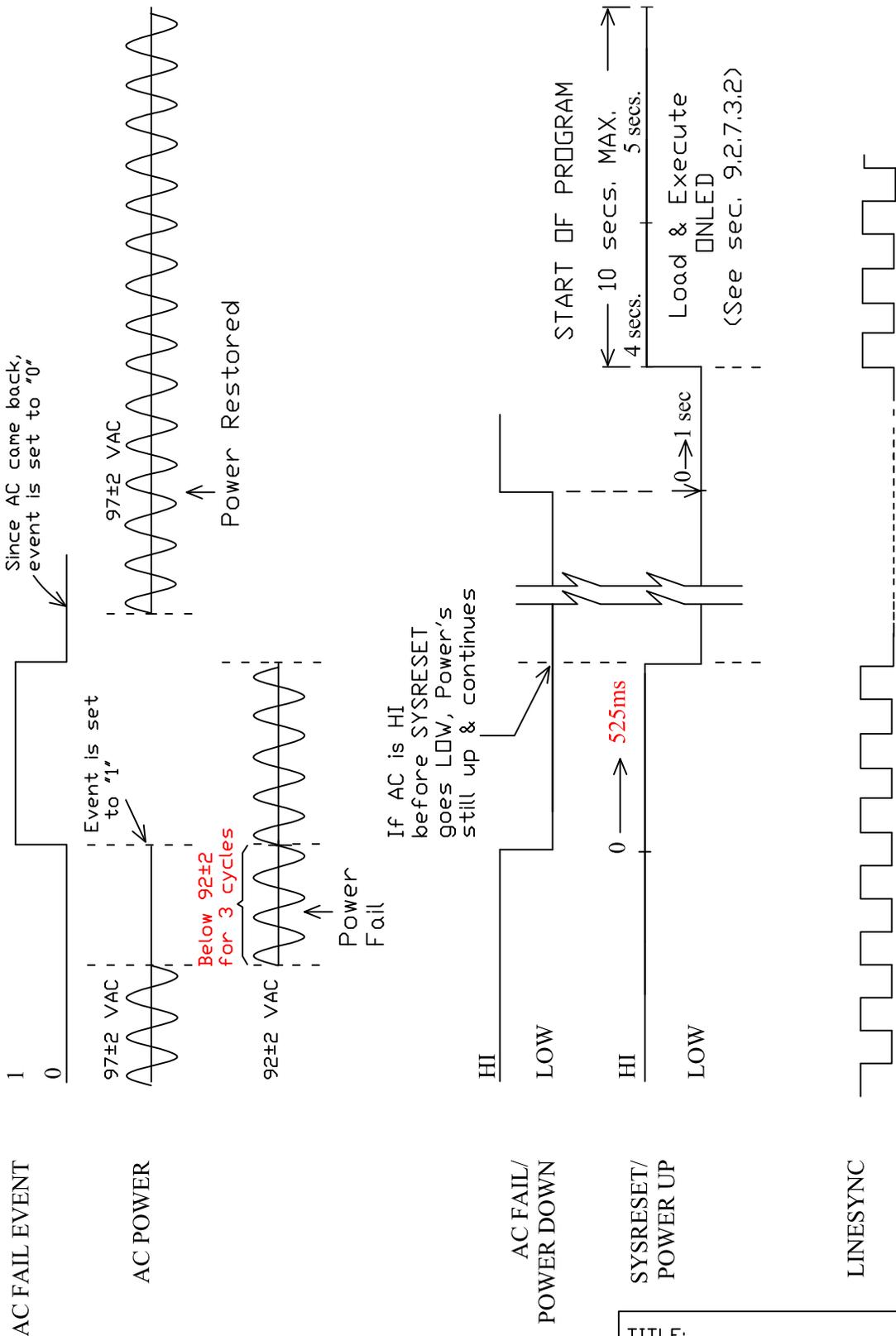


FRONT VIEW

SIDE VIEW

REAR VIEW

TITLE: MODEL 2070-4 POWER SUPPLY MODULE	
ERRATA 2	NO SCALE
TEES 2009	A9-13



**NOTES:**

Power Failure: A Power Failure is said to have occurred when the incoming line voltage falls below  $92 \pm 2$  VAC for 50ms. See Power Conditions.

Power Restoration: Power is said to be restored when the incoming line voltage equals or exceeds  $97 \pm 2$  VAC for 50ms. See Power Conditions.

Power Conditions: A 16.7 ms (one 60 Hz cycle) reaction period is allowed to be included in the 50 ms timing or added to (67 ms duration). The hysteresis between power failure and power restoration voltage settings shall be a min. of 5 VAC with a threshold drift of no more than 0.2 VAC.

TITLE: MODEL 2070 POWER FAILURE REACTION	
ERRATA 2	NO SCALE
TEES 2009	A9-17

**APPENDIX A10**  
**CHAPTER DETAILS**





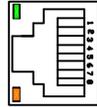
2070-Ex

CPU PORT

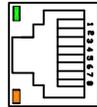
10/100

Activity

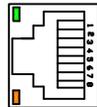
SW PORT A



SW PORT B



SW PORT C



PORT 2, 3, 4 RJ45 PIN ASSIGNMENTS			
PIN	FUNCTION	PIN	FUNCTION
1	TX +	5	NA
2	TX -	6	RX -
3	RX +	7	NA
4	NA	8	NA

TITLE:	
MODEL 2070-Ex NETWORK SWITCH MODULE	
ERRATA 2	NO SCALE
TEES 2009	A10-10