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FMS-E10
Facility Monitoring System

Installation and Wiring Guide
Version 1.4
August 26, 2009

Facility Monitoring System
Version 1.4
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Important Safety Instructions

The following general safety precautions must be observed during all phases of operation and service of this instrument. Failure to comply with these precautions or with specific warnings elsewhere violates safety standards of design, manufacture, and intended use of the instrument. Protel Inc.® assumes no responsibility for the customer's failure to comply with these requirements.

WARNING: All installation work should be performed by a qualified technician. Installation methods and materials must comply with all local rules and regulations that may apply.

WARNING: The equipment referenced in this manual connects to potentially lethal power sources and should be handled with that in mind.

WARNING: Do not operate the instrument in the direct presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

WARNING: Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to Protel Inc.® for service and repair to ensure that safety features are maintained.

WARNING: This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

WARNING: This equipment has been approved for mobile applications where the equipment should be used at distances greater than 20cm from the human body (with the exception of hands, wrists, feet and ankles). Operation at distances less than 20cm is strictly prohibited. This warning applies only if the optional 900MHz radio is installed.

This product has been certified to UL 60950-1 Issue: 2007/03/27 Ed:2. The product is electrically rated at 120Vac, 60 Hz, 30 watts. A permanently attached label is provided on the bottom side of the product with the information shown in the example below.

Protel Inc.
Model: FMS-E10
S/N: ROE45876

Certified to UL 609501 Issue: 2007/03/27 2nd Edition
Rated: 120Vac 60Hz 30W

Remote Monitoring/Control Overview

IVS Server

Broadband Connection

Internet Browser

Broadband Connection

Local Router

Ethernet

**Facility
Management
System
(FMS)**

Wired Peripherals

Modbus

Thermostats

Modbus

FMS

kW Meters

RS232

Fuel Monitor

RS485

Direct Connection

Direct Connection

Current Sensors

Remote APs

Temperature Sensors

Air/Vac Machines

Wireless Peripherals

Remote APs

900MHz

FMS

900MHz

Freevend

900MHz
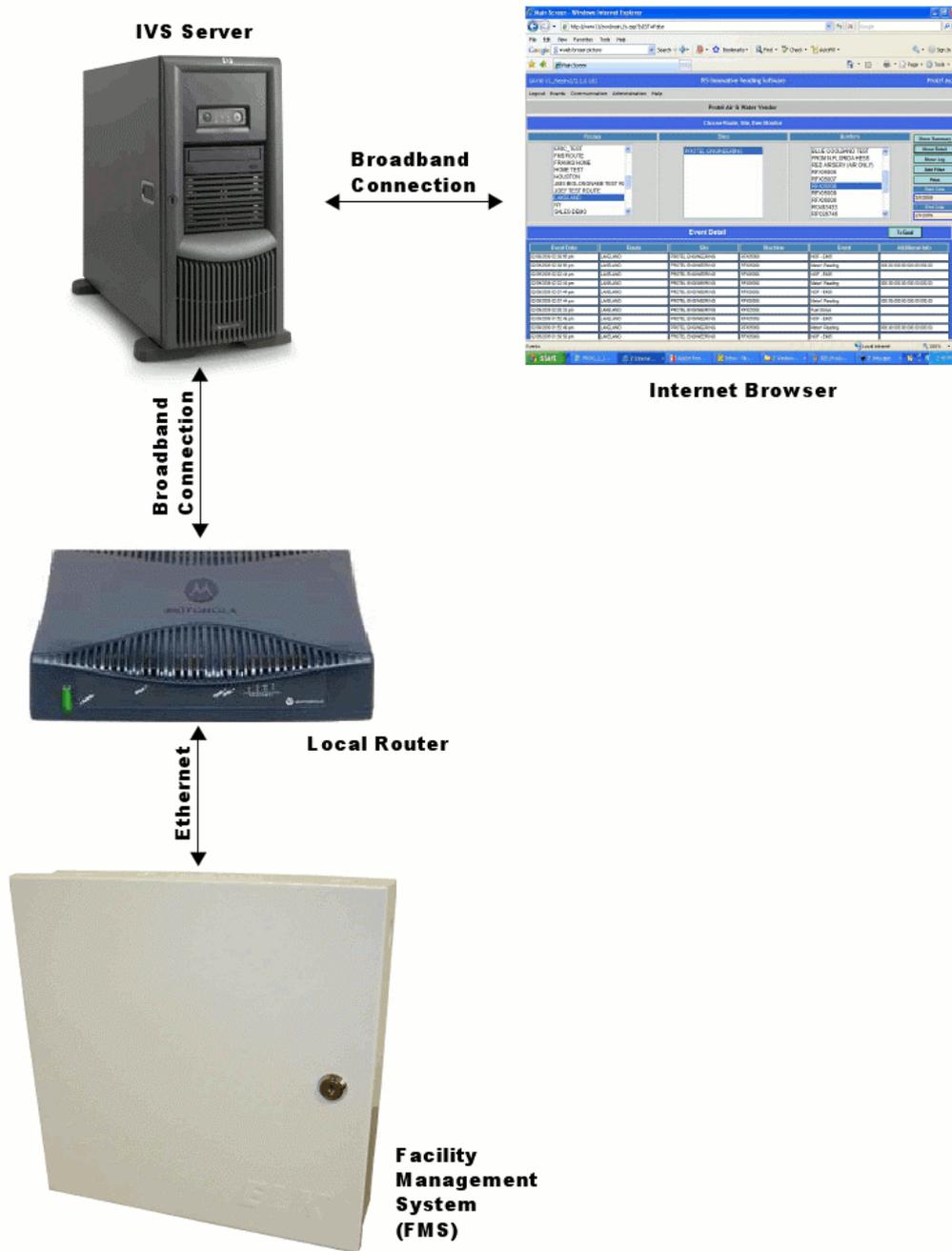
Air/Vac Machines
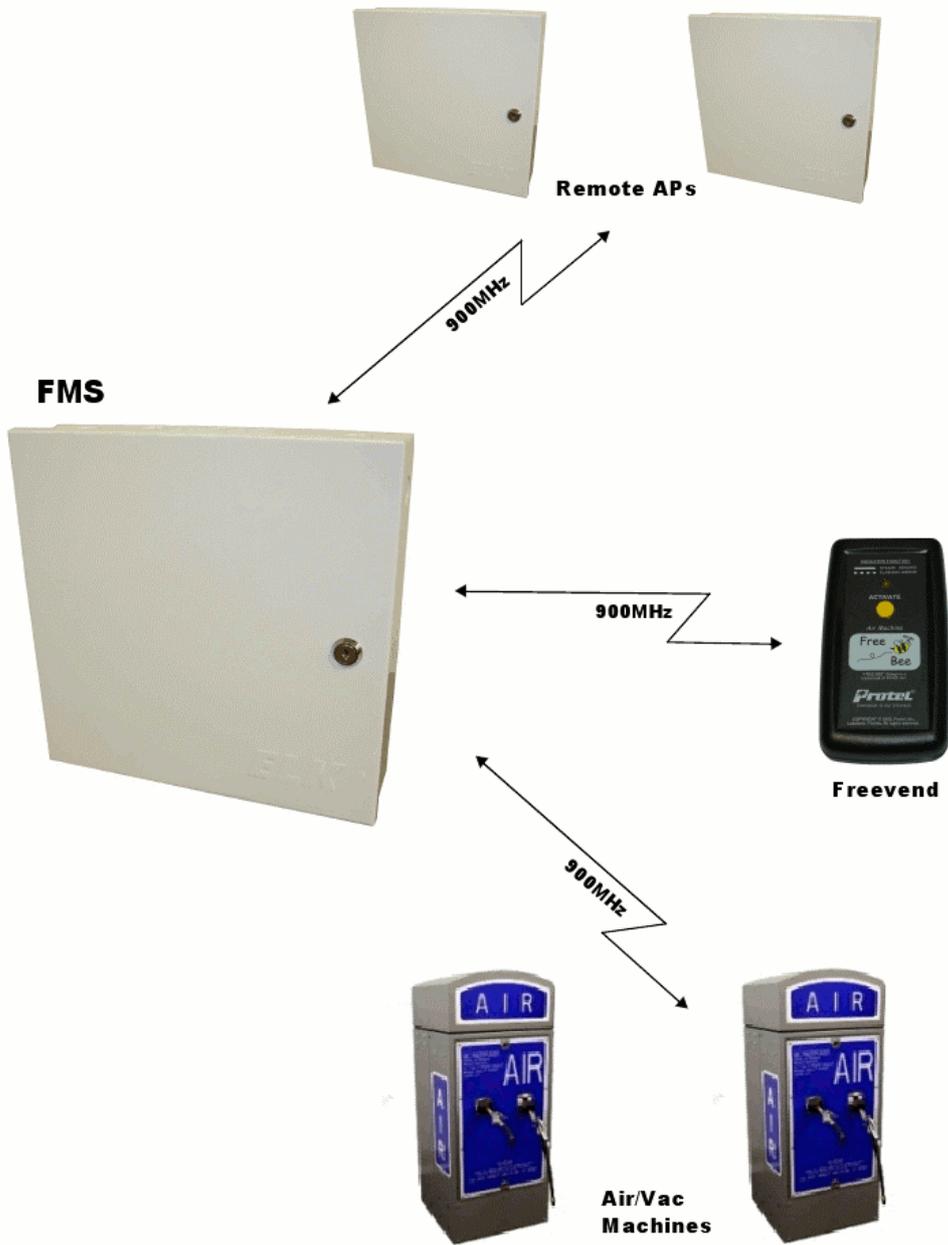
1.0 Introduction

The Facility Monitoring System (FMS) is a communication bridge that connects devices and sensors located at remote sites to a central management system. The FMS uses an Ethernet connection to a local broadband router to send data to and from the management system. The remote current and temperature sensors connect directly to the FMS. The remote devices interface to the FMS through an RS232 or RS485 communication port.

Basic Features:
1. (4) current sensor inputs
2. (4) temperature/ dry circuit sensor inputs
3. RS232 port [normally connected to the Fuel tank monitor]
4. Ethernet connection
5. NiCAD battery
6. (2) RS485 buses [Protel proprietary & Modbus (RTU)]
7. Protel expansion bus
8. 1-wire expansion bus
9. Flash micro-controller w/ Flash co-processor
10. Audio alarm
11. 12W AC to DC power adapter

Optional Features:
1. 900MHz frequency hopping, spread-spectrum radio
2. Modbus kW meters (single & multiphase)
3. Modbus Thermostats (single & multistage)
4. Current Sensors
5. Thermistor Probes

2.0   Installation

Pre-Installation

Before installing the FMS on location, read all instructions and cautionary markings in this manual.

Prior to installation, the FMS's Ethernet adapter should be programmed to match the local router's IP settings. The FMS's default setting is DHCP. This operation can be performed "on-site" using a laptop, a cross-connect cable and the "Device Discovery" program. The program is free and available at www.digi.com. Go to the support tab and click on diagnostics/utilities. Select "Digi Connect ME" in the product list. Select your operating system and download the "Device Discovery Utility" program to your desktop.

After installing the device discovery program on your computer you should have a desktop icon like the one seen below:

Apply power to FMS and connect it to your computer using a cross connect cable (use a standard Ethernet cable if your computer is a server). There will be a short delay while each device recognizes that a peer to peer connection can be established. Start the device discovery program and it should automatically start looking for attached devices.
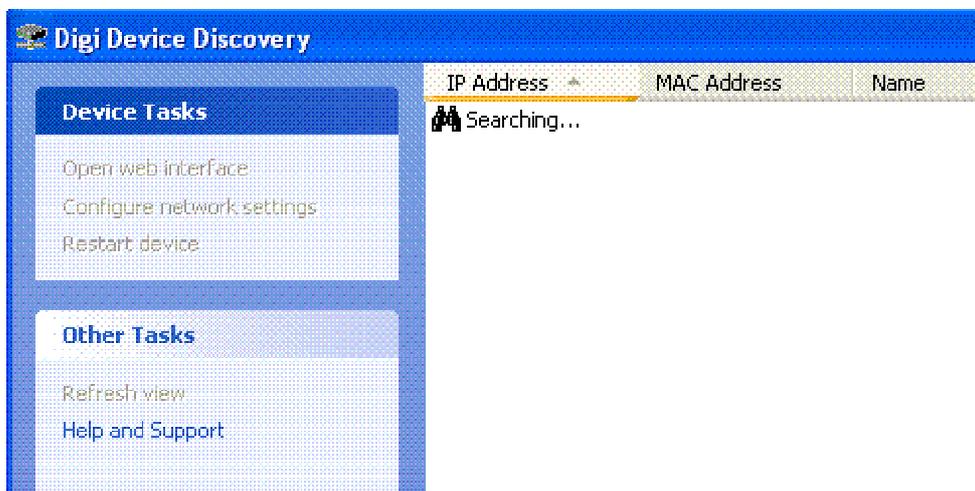
If the program times-out before locating the FMS, click "Refresh view" and try again.

When the device has been located, highlight the item and click "Configure network settings". Set the IP settings to match the router's and save.

Ethernet Cables

Since the distance between the router and the FMS varies considerably, it is typical to build a custom length Ethernet cable "on-site". Appendix A contains a guide to assist in fabricating a quality cable.

Hardware / Materials Required

Tools Required:
Drill, high-speed bits, masonry bits
Wire strippers, cutters
#2 Phillips screwdriver
#2 Slotted screwdriver
Hammer
Pencil
Stepladder

Materials Required:
Ethernet cable, connectors
Tie-wraps
Conduit, conduit Fittings
Electrical tape
Wall Anchors, screws
Wire-nuts (if allowed by code)

Mounting

The FMS should be mounted to a non-metallic wall at an approximate height of five (5) feet from the floor.

a) This ensures service access to the FMS user interface.
b) Provides a good working height for the optional local area network 900MHz antenna that screws onto the top of the FMS enclosure.
c) Positions the FMS enclosure to allow an optional 3' coax extension cable with antenna and mounting bracket to reach to the top of an 8' ceiling.
d) If the 900MHz radio is not used, the wall can be metallic.

The FMS should be mounted no further than 25' away from equipment connected to its RS232 serial port. The distance from the FMS to the Ethernet router is not critical, but should be less than 200'.

Hold the FMS in the desired location and mark the hole pattern (8"W x 8.5"H) with a pencil. Secure the FMS in place using the appropriate hardware for the type of wall construction.

Wiring

All wiring and installation methods should conform to applicable electrical and building codes. Pre-plan the wire and conduit runs.

WIRING DIAGRAM

FMS

Air/Vac — A B G

Remote AP — A B G

Fuel Monitor

P5 — G B A G B A

P6

Temperature Sensors — T1 T1 T2 T2 T3 T3 T4 T4

P12

Thermostat — A B G

kW Meter — A B G

kW Meter — A B G

P15 — A B G A B G

ETHERNET

P10 — C1 C1 C2 C2 C3 C3 C4 C4

POWER ADAPTER

P14

P13

TERMINAL BLOCK

HOT

NEUTRAL

GROUND

ROUTER

Current Sensors

Diagram 10 - Connector Identification
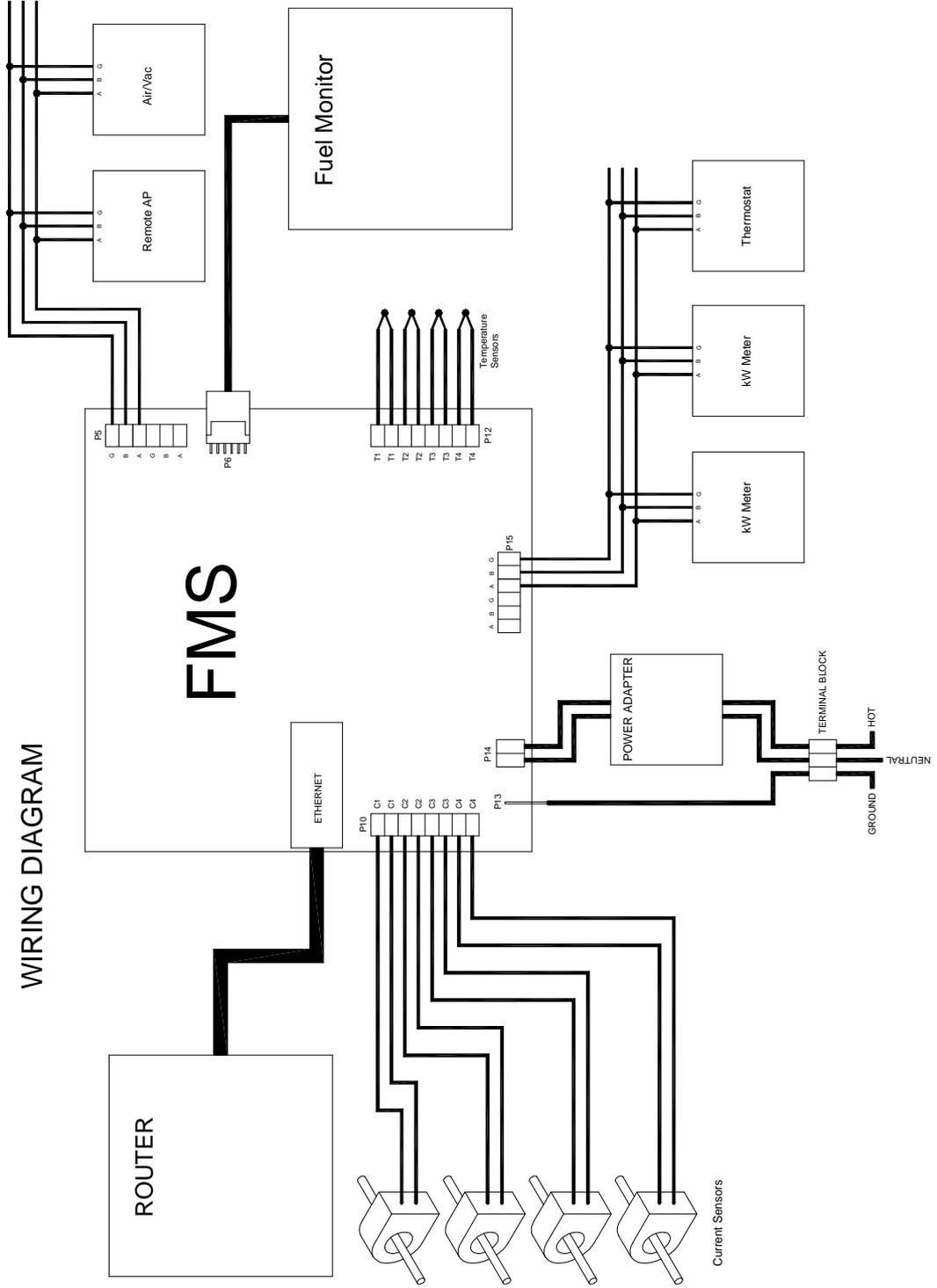
Diagram 10 - Connector Identification
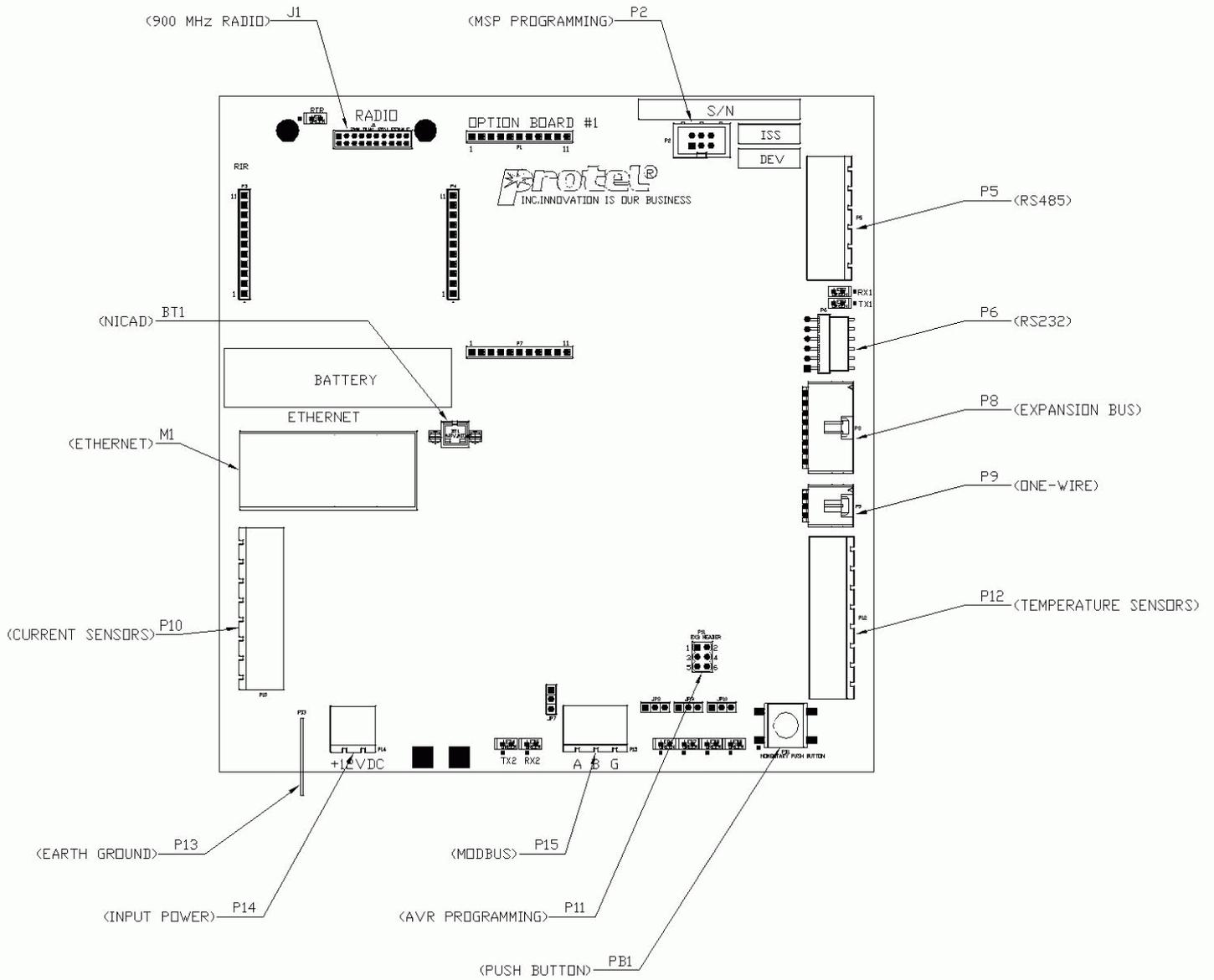
Current Sensors

If the current sensor feature is being utilized, refer to Diagram Y for an overview of a typical installation. These are low voltage AC signals so there is no polarity to the connections. The current sensor wires should be housed in conduit between the load sense point and the FMS enclosure. The sides of each 2 position connector have a dovetail feature that allows each connector to be ganged together to form a single multi-position connector. Adjacent connectors must be joined together before inserting them into FMS connector (P10).
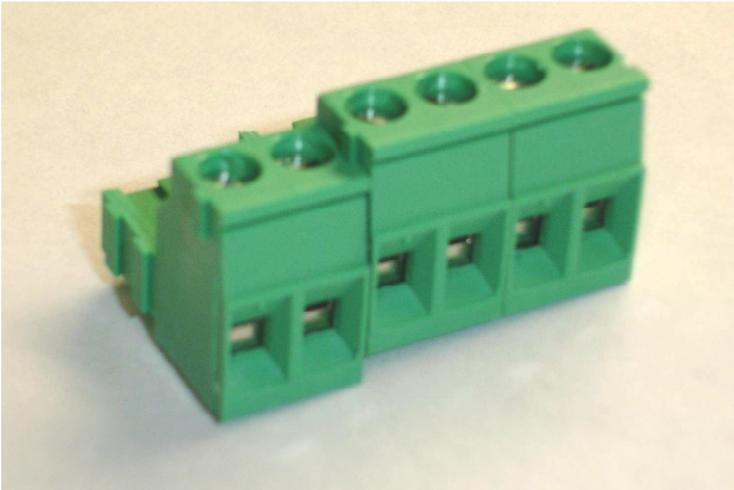
(Detail of interlocking dovetail)
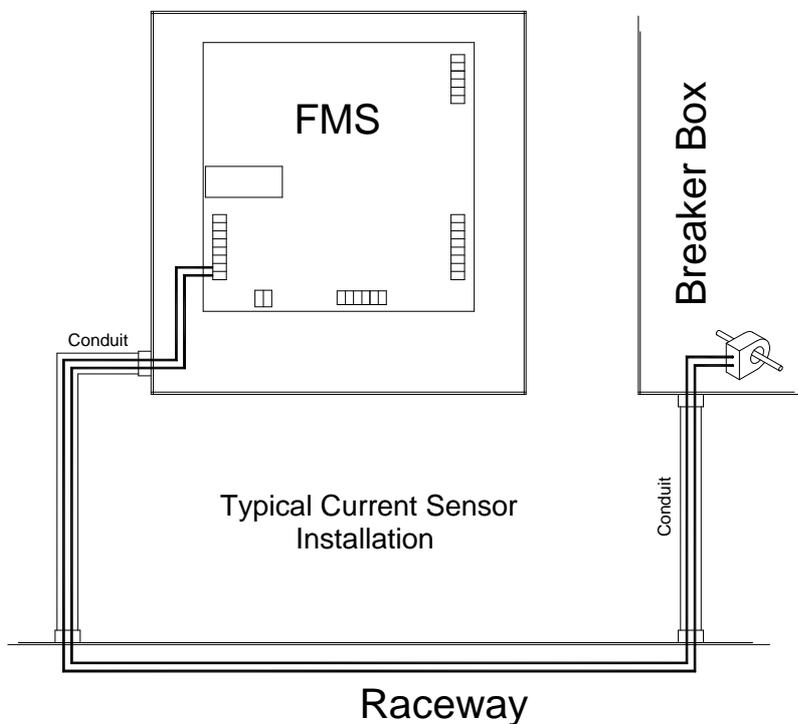
(Diagram Y)

Temperature Sensors

If the temperature sensor feature is being utilized, refer to Diagram K for an overview of a typical installation. These are low voltage resistive sensors that do not have polarity. It is not necessary to house these wires in conduit, but they should be protected by a fitting when passed through a bulkhead.

(Detail of bulkhead protection)

The temperature sensor connectors have the same dovetail feature as previously described (see current sensor wiring). FMS connector P12 can accept up to 4 temperature sensors.
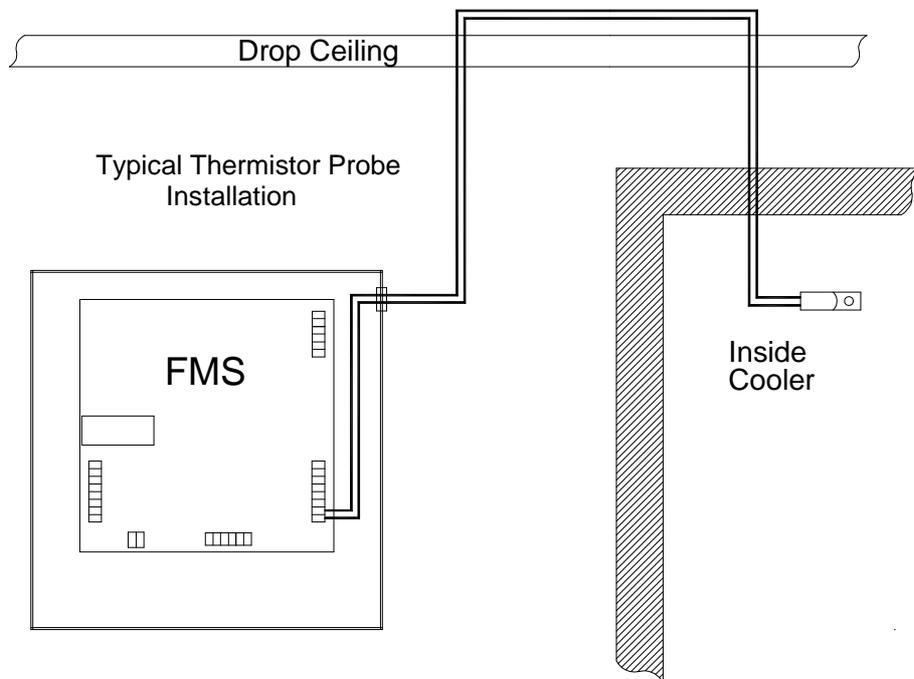
(Diagram K)

Ethernet Connection

Insert the Ethernet cable into RJ45 jack located in the middle of the left side of the FMS board. It is not necessary to house this cable in conduit, but it should be protected by a fitting when passed through a bulkhead.

RS232 Connection

If the Fuel Monitor feature is being utilized, Attach cable PN: WICA000305-72 between the serial port of the fuel monitor and FMS connector P6. It is not necessary to house this cable in conduit, but it should be protected by a fitting when passed through a bulkhead. The cable should be securely fastened to the fuel monitor serial port connector so it can't be accidentally removed.
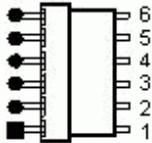
P6 Pin-out Detail (1=TX output, 2=RCV input, 3=GND)

RS485 Connection

Connector P5 provides an RS485 communication port to other Protel devices such as remote Access Points and Air/Vac machines. Two connections for each pin function are provided to facilitate daisy chaining of devices. "A" is the idle high or "Net(+)" connection. "B" is the idle low or "Net(-)" connection. "G" is the ground connection. The communication parameters for this connection is 9600 baud, 8 data bits, no parity and 1 stop bit. At 9600 baud, no impedance matching termination is necessary. Not all devices will require the ground connection.

Modbus Connection

Connector P15 provides an RS485 communication port to Modbus devices such as kW Meters and Thermostats. Two connections for each pin function are provided to facilitate daisy chaining of devices. "A" is the idle high or "Net(+)" connection. "B" is the idle low or "Net(-)" connection. "G" is the ground connection. The communication parameters for this connection is 9600 baud, 8 data bits, no parity and 1 stop bit. At 9600 baud, no impedance matching termination is necessary. Not all devices will require the ground connection.

RF Connection (optional)

If the EAP has a 900MHz Radio installed, it will have a standard SMA bulkhead connector on the top left exterior surface. If the wall is non-metallic and the RF environment is not challenging, antenna PN: ANT0000049 can be fastened directly onto this bulkhead connector. If either of these conditions are not met, it will be necessary to install a remote antenna using bracket PN: HDM0157200 and extension cable PN: WICA000273.

Grounding

Connect earth ground to the three position terminal block shown in the wiring diagram (pg. 10) using a 18 to 14 AWG green wire.

AC Wiring

Warning: Ensure that power is disconnected and tagged at the main utility breaker box before proceeding.

There are two methods of supplying AC power to the FMS, using permanent wiring or using a pluggable type power cord.

Permanent Wiring: The AC supply wires should be protected by conduit and have a readily accessible service disconnect. Use 14AWG THHN wires when using this method of installation.

Power Cord Wiring: The outlet should be located near the FMS and remain readily accessible for disconnect during servicing. Only use Protel power cord PN: WICA000317-72 for this method of installation.

Refer to page 11 for an illustration of the AC wiring. Connect the three position terminal block to 120VAC power source as shown. Before energizing the circuit, perform an inspection of all connections to and from the FMS.

DC power connector

Connect the 12VDC output from the power adapter to P14. Polarity is automatically corrected by the on board diode bridge.

Battery

A 4-cell 1/3AA battery pack is supplied with the FMS (PN: CTRBATAY08). It should be connected to "BT1" after the FMS has been installed and tested. This will prevent loss of data in the event of a brown out or power loss.

Radio (optional)

The 900MHz radio plugs into a 20 position dual row connector "J1" in the upper left hand corner of the FMS. It is secured in place by two #4-40 ¼" long machine screws. Its output connector feeds through a short RF cable (PN: WICA000304-05) that provides a bulkhead connection to the exterior of the enclosure. The radio has internal parameters that need to be programmed correctly in order to function properly. If the radio was ordered as an option for the FMS, it will have these settings preset to default values. These default settings will work fine as long as there are no other competing networks in the immediate vicinity. Programming the radio can be performed using PN: ASY0000319. The Network Programmer enables the user to alter the function and manage the network assignments of each radio. The radio can function as a Server or a Client. There can only be one server radio per network assignment at a given location.

3.0   Operation

Diagram 11 - LED Identification
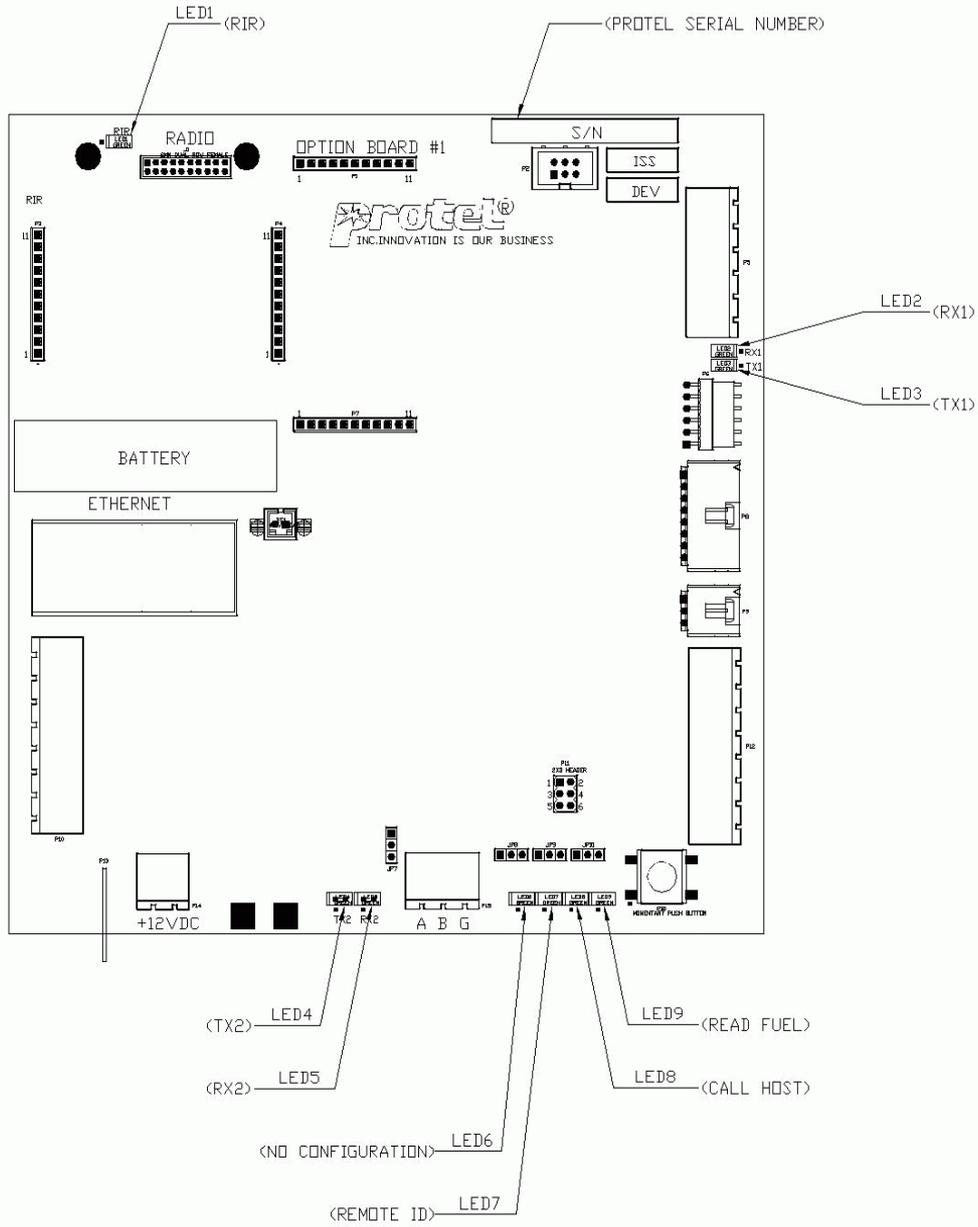
Serial Number

The location of the FMS serial number is detailed in Diagram 11. Record this number along with the site information so it can be entered into the management system at a later date.

Initial Power Up

Inspect all connections prior to energizing circuit. Apply AC power to the circuit and remove tag from breaker. Upon initial power up, LEDs 6 through 9 will flash twice indicating that a reset has occurred. After reset the main processor will begin a search for installed devices on the RS485 bus. During RS485 communications, the transmit (TX1) and receive (RX1) LEDs flash to indicate any activity. After locating any installed devices, the TX1 LED should settle into a 1 second "heart-beat" pattern that continuously polls for the devices on the RS485 bus. The Ethernet adapter will require up to 30 seconds to establish itself on the local network. Do not attempt any push button operations for at least 30 seconds. The Ethernet adapter has 2 LEDs to indicate connectivity status as depicted in the picture below.

When power is first applied and the Ethernet module is connected to a local router, the link light will illuminate for a moment. After the module obtains an initial connection with the local host it will restart. This will be indicated by the link LED momentarily extinguishing. This will be followed by the link LED illuminating again and sporadic flashes from the Activity LED.

Push Button Operation

The push button enables the user to step through several functions indicated by LEDs 6 through 9. To activate one of these functions, press and hold the pushbutton until the desired LED has illuminated and then release. While the push button is depressed, the LEDs will step though a predefined sequence. The sequence is as follows:

*Read Fuel – LED9 ON – This will initiate communication with the fuel monitor followed by a communication to the IVS server.

*Call Host – LED8 ON – This will initiate a call to the IVS server. Initially LED8 will come on solid. Once communication has been established it will begin to flash.

*Test Mode – LED6, 7 & 8 ON – While in test mode, all three LEDs will flash in unison. Depressing and releasing PB1 a second time will exit test mode.

*Soft Reset – All LEDs ON – This operation will restart the FMS without having to remove power.

*No Operation – All LEDs OFF – Exit without performing any operation.

*While the pushbutton is depressed it continually cycles through the five modes.

LED Indicators

LED1 (RIR) – Radio in Range. This will illuminate when the radio is configured as a Server or when it's configured as a Client radio and within range of the Server radio.
LED2 (RX1) – RS485 Receive. This will illuminate whenever the FMS detects incoming data on the RS485 bus.
LED3 (TX1) – RS485 Transmit. This will illuminate whenever the FMS transmits on the RS485 bus.
LED4 (TX2) – Modbus Transmit. This will illuminate whenever the FMS transmits on the Modbus.
LED5 (RX2) – Modbus Receive. This will illuminate whenever the FMS detects incoming data on the Modbus.
LED6 (No Configuration) – This will illuminate if the FMS does not have a valid configuration file from the IVS management system.
LED7 (Remote ID) – This will illuminate if the FMS is configured as a remote and has not been assigned an ID on the RS485 bus.
LED8 (Call Host) – This will illuminate whenever a call is in process to the IVS management system.
LED9 (Read Fuel) – This will illuminate whenever a fuel read is active.

RS485

LED 3 will continually flash a rate of once per second. This is the FMS's polling rate to all the devices attached to the RS485 bus. If a device is attached, the TX activity should be followed by some RX activity.

Modbus

LED4 will only indicate activity prior to a scheduled call to the IVS server. If Modbus devices are attached to the bus connection P15, The TX activity should be followed by RX activity.

Jumper Selections

Presently, there are no user configurable jumper selections. The jumpers should be left in their factory default positions of:
JP1 - right 2 connections shorted
JP3 - shorted
JP7 - lower 2 connections shorted

Program Updates

The FMS is capable of receiving a program update through the IVS system. Please refer to the IVS manual for more information. The FMS is equipped with programming connector P2. This provides a port for a programmer that allows a field technician to immediately update the FMS program without having to go through IVS. The field programmer, pictured below, is PN: ASY0000304 also know as an "FP20 flash programmer".

4.0 Troubleshooting

General
Troubleshooting time will be greatly reduced if each technician has a complete set of "known good" parts on hand at all times. Any suspect component can then be tested by replacing it with a "known good" component.

Ethernet
If an FMS fails to connect to IVS, the Ethernet module's LEDs can provide some insight into the problem.

Link LED off – Check the router, cable and verify that the FMS has power.

Activity LED – If the LED flashes in a distinct repetitive pattern (i.e. 2 flashes, pause, 2 flashes, pause, 6 flashes, long pause, repeat), The module has encountered a problem. Remove power to the FMS and retry. If problem persists, replace the FMS.

Radio
Observe the TX & RX LEDs (LED2 & 3) of the EAP. These LEDs are indicators for wired and wireless LAN communication. The FMS should poll for remotes once every second. If this is not occurring, check to make sure the FMS has power applied. Observe the TX & RX LEDs of the remote device. You should see the RX LED of the remote flash once per second. The TX of the remote should flash at least once every minute when the FMS polls that particular device. Verify that the antenna is not close to any metal objects other than the ground plane. Verify the settings of all radios in the network with the Network Programmer. If problems persist, raising the FMS or remote antenna to a higher location will usually help in problematic situations.

Fuel Monitor
The serial settings of the FMS are hard-coded to 9600,8,N,1. Verify that the serial port settings of the fuel monitor match these settings.

Thermostat
Refer to the thermostat manual provided to manipulate settings within the device. The serial settings of the FMS are hard-coded to 9600,8,N,1. Verify that the serial port settings of the Thermostat match these settings. Verify that the Modbus ID does not conflict with any other device.

KW Meter
Refer to the kW Meter manual provided to manipulate settings within the device. The serial settings of the FMS are hard-coded to 9600,8,N,1. Verify that the serial port settings of the kW Meter match these settings. Verify that the Modbus ID does not conflict with any other device.

Current Sensor
Verify that the sensor is snapped securely around a single conductor of the AC load. When the current sensor is not installed or "loose" it should have a DC resistance of approximately 500 ohms. When the sensor is installed, and no current is flowing through the circuit under test, the AC voltage should be zero. The AC voltage will vary linearly up to 3VAC when clamped onto a 40A load.

Temperature Sensor
The temperature sensors are negative temperature coefficient resistive elements. The sensor will be approximately 10k ohms at room temperature. When exposed to colder than room temperature, the resistance will increase. When exposed to hotter than room temperature, the resistance will decrease.

5.0 Specifications

Electrical

AC to DC Power Adapter
>Input: 120VAC, 60Hz, 30W
>Output: 12VDC at 1000mA

Ethernet
>Data rate: 10/100 Mbit
>Encryption: 256-bit AES encryption (SSL)

Current Sensor
>Measurement range: 0 to 40A (AC)
>Accuracy: +/- 0.1A or +/- 10% (whichever is greater)
>Sensor: CR Magnetics #3110

Temperature Sensor
>Range: -40'F to +254'F
>Accuracy: +/- 2'F or +/- 4% (whichever is greater)
>Type: NTC thermistor 10k ohms @ +25'C +/- 1%

RS485, Modbus, RS232
>Baud rate: 9600bps
>Data bits: 8
>Parity: none
>Stop bits: 1

Radio
>Technology: 900MHz, spread-spectrum, frequency-hopping
>RF connector: MMCX
>Output power: 200mW (typical with +3dBi antenna)
>Sensitivity: -99dBm (typical)

Mechanical

Enclosure
>Height: 12-3/8"
>Width: 12-1/4"
>Depth: 3-3/8"
>Recommended Clearance
>>Above & Below: 6"
>>Sides: 6"
>>In front of door: 16" (min)
>Construction: 20 gauge steel
>Coating: powder coat
>Color: appliance white
>Features: ½" conduit knock-outs (top, bottom & sides)

Environmental

For indoor use only
>Operational temperature range: -20'C to +60'C
>Humidity: 0 to 95% (non-condensing)

6.0 Parts List
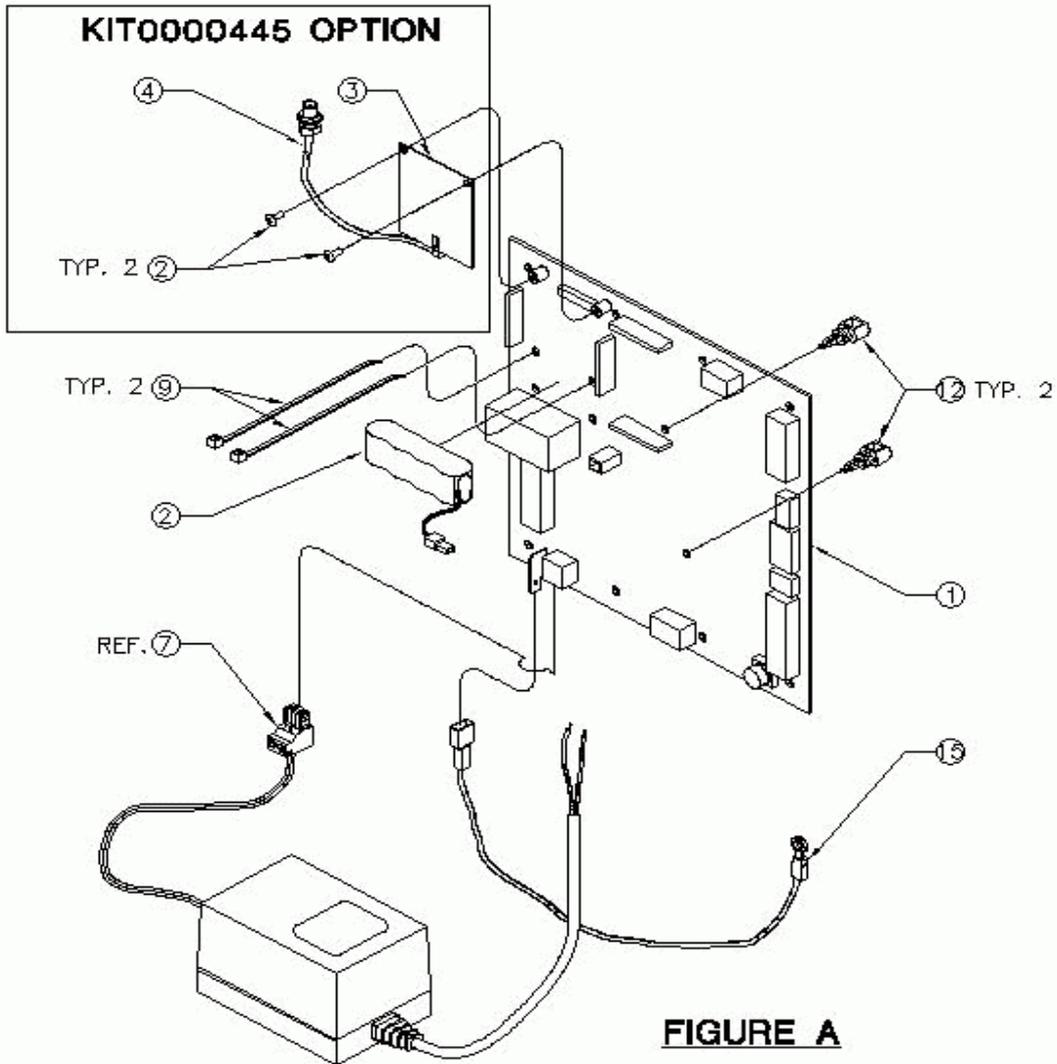
FIGURE A

Item #	Part Number	Description	Qty
	KIT0000445	**KIT C-STORE A/P LAN RADIO CH0**	**1**
2	HDF0180400	SCREW, 4-40 X 1/4 PH PN HD	2
3	HDM0142100	RADIO RS485 900MHZ MMCX PROGRAMED	1
4	WICA000304-05	ASSY CABLE COAX SMA BH TO MMCX	1
		FIGURE A	
1	ASYPWA0356	ASSY PCB 0356A STORE MONITOR	1
2	CTRBATAY08	ASSY BATTERY 4 PACK 1/3AA	1
7	HDM0152300-10	PWR SUPPLY 12V DC/1A MOD 10IN	1
9	HDS0000234	CABLE TIE NYLON 3.9 IN	2
12	HDS0000556	STANDOFF 1/2 IN LOCKING	2
15	WICA000308	ASSY CABLE GROUND	1
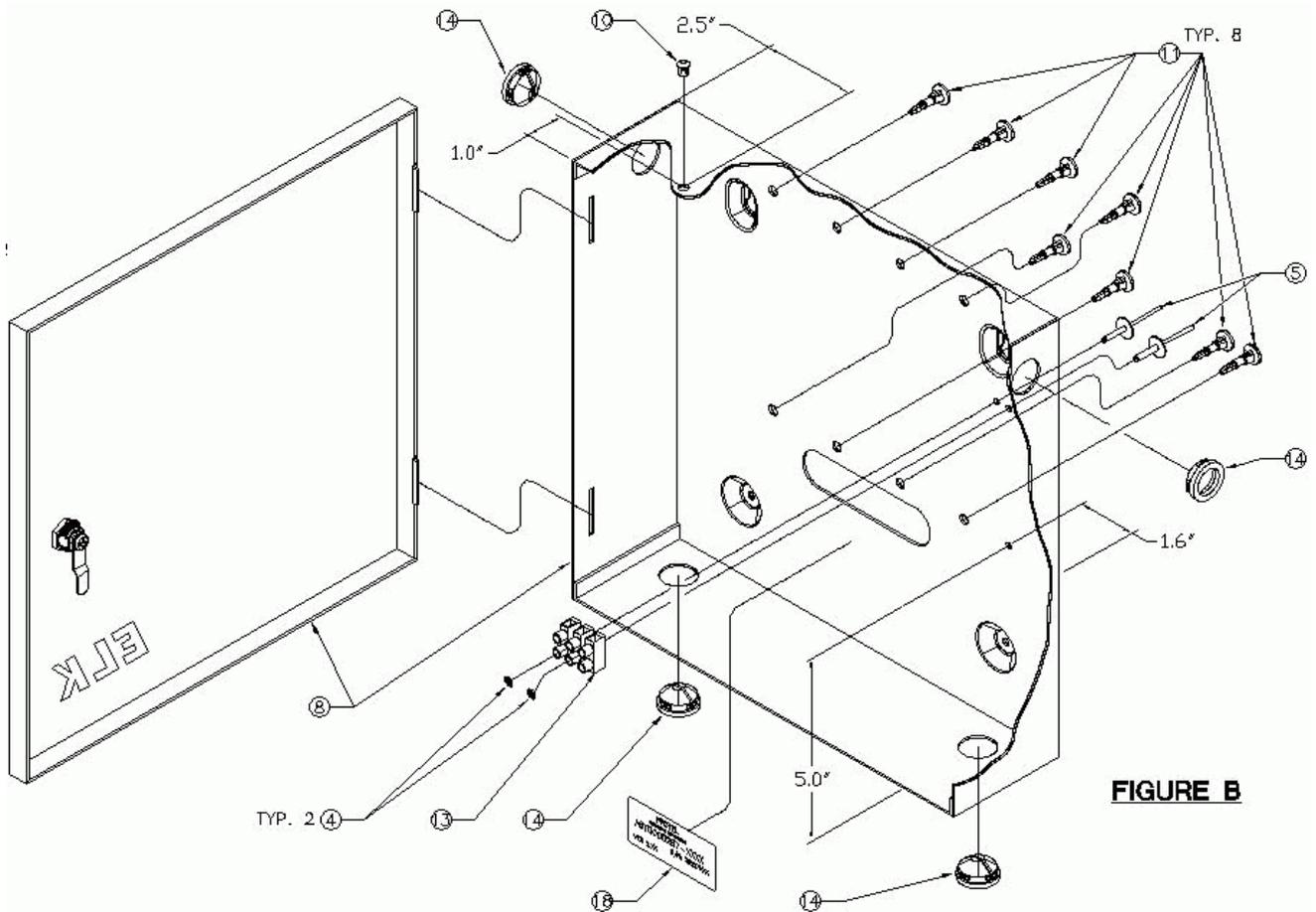
FIGURE B

Item #	Part Number	Description	Qty
4	HDF0000291	WASHER FLAT #4 TYPE B NAR	2
5	HDF0000307	RIVET POP SOFT SET 1/8 X 0.640 IN	2
8	HDM0156500	ENCLOSURE UTILITY BOX STEEL W/LOCK & KEY	1
10	HDS0000518	HOLE PLUG NYLON .250	1
11	HDS0000551	STANDOFF 1/2 IN LOCKING NYLON	8
13	HDS0000566	TERMINAL BLOCK 3 POS EURO	1
14	HDS0000567	NM PLASTIC PUSH-IN STRAIN RELIEF 3/8 INCH	4
18	LB00000484	LABEL MONITOR ASSEMBLY	1

FIGURE C

DETAIL 'Z'
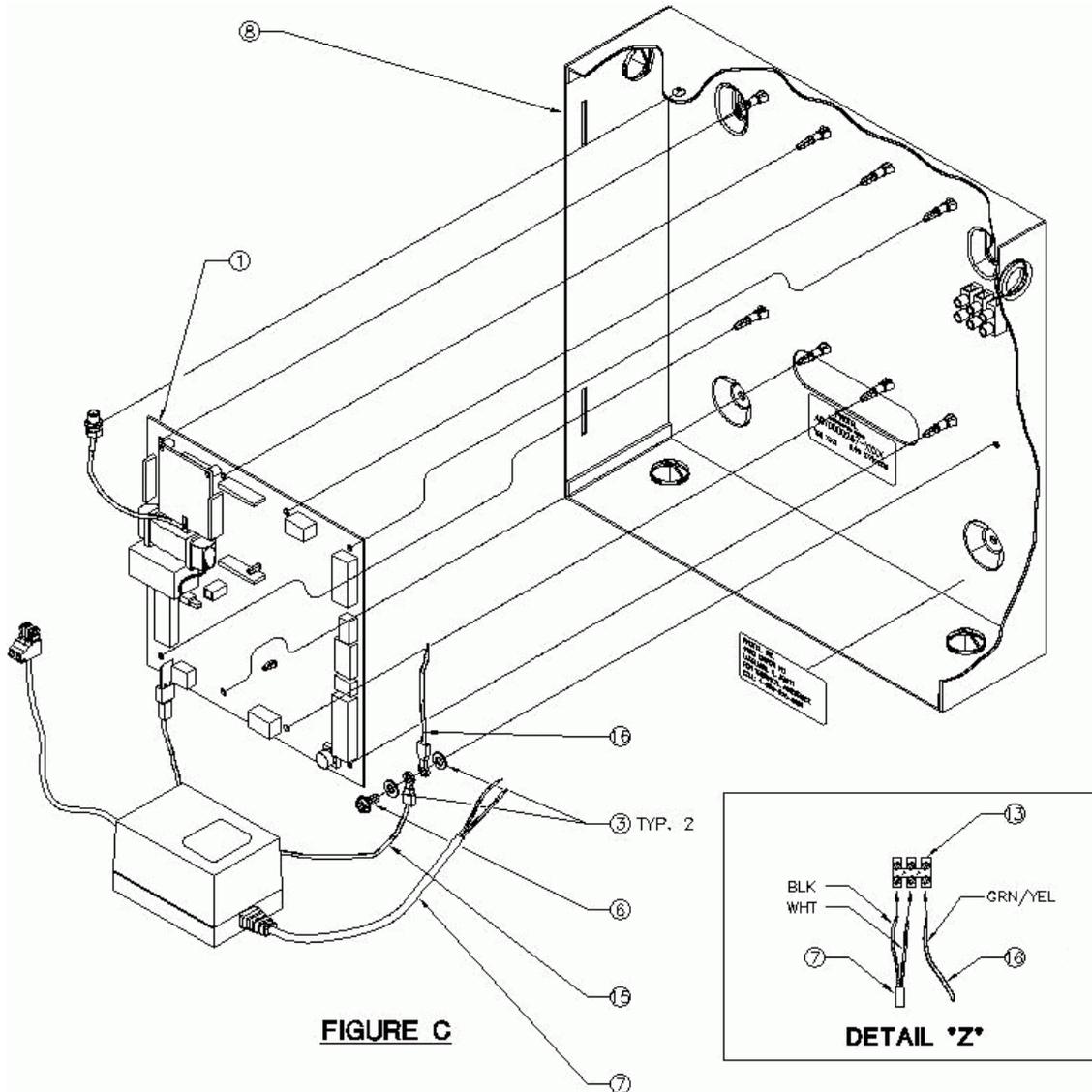
Item #	Part Number	Description	Qty
1	ASYPWA0356	ASSY PCB 0356A STORE MONITOR	1
3	HDF0000206	WASHER FLAT #10 .406 OD SS	2
6	HDF0000310	SCREW 10-32 X 3/8 HX WASHER HD SLFTHD	1
7	HDM0152300-10	PWR SUPPLY 12V DC/1A MOD 10IN	1
8	HDM0156500	ENCLOSURE UTILITY BOX STEEL W/LOCK & KEY	1
13	HDS0000566	TERMINAL BLOCK 3 POS EURO	1
15	WICA000308	ASSY CABLE GROUND	1
16	WICA000309	ASSY CABLE GROUND RING	1

7.0 Service Information

Protel, Inc. will repair or replace any product of its manufacture. All requests for such repair should be directed to the Protel customer service department. In-warranty repair is free of charge. Out-of-warranty repair is handled on a labor plus parts basis.

Return Address:

Protel, Inc.
4150 Kidron Road
Lakeland, Florida 33811

Return Process:

Call customer service at 863-644-5558 for an RMA number. Include this number with all CRN returns. Please indicate the problem encountered on each device.

8.0 Warranty

Protel, Inc. (Protel) warrants that the FMS component parts shall be free from defects in materials and workmanship and that this product will conform to and perform in accordance with its respective specifications for a period of 24 months from the date that Protel ships the product to its customer.

The limited warranty expressed herein is the sole and exclusive warranty provided by Protel. Protel makes no other warranty, either expressed or implied, of any kind including without limitation or merchantability, fitness for a particular purpose, title or lack of infringement.

The warranty provided herein shall be void and unenforceable if the product has been: 1. Subject to misuse, abuse/neglect, vandalism, improper repackaging or damage by accident, fire, flood, wind or earthquake. 2. The product has been improperly installed, wired or altered. 3. The product has been used in violation of the written instructions furnished by Protel or provided with the product.

The correction of any defects by repair or replacement within the warranty period shall constitute the sole and exclusive remedy of purchaser and shall constitute the fulfillment of all of the obligations of Protel with respect to any warranty given herein. Protel shall not be liable to purchaser or any third party for loss of profits direct, indirect, incidental, special or consequential, or other damages from any cause whatsoever. However, for any warranty or replacement to take place, Protel must receive written notice prior to expiration of warranty specifying the nature of said defect. All warranty and repairs are to be performed at Protel's factory only and all items sent must be "freight prepaid". All repaired or replaced parts installed during the warranty period carry a warranty for the unexpired period of the original warranty or for a period of ninety (90) days, whichever is longer.

9.0 Appendix

About the Cable:

You can find bulk supplies of the cable at many computer stores or most electrical or home centers. You want UTP (Unshielded Twisted Pair) Category 5 cable for basic 10/100 functionality. You want CAT 5e for gigabit (1000BaseT) operation and CAT 6 or 7 gives you a measure of future proofing. Bulk cable comes in many types, there are 2 basic categories, solid and braided cable. Braided cable tends to work better in patch applications for desktop use. It is more flexible and resilient than solid cable and easier to work with, but really meant for shorter lengths. Solid cable is meant for longer runs in a fixed position. Plenum rated cable must be used whenever the cable travels through an air circulation space. For example, above a false ceiling or below a raised floor. It may be difficult or impossible to tell from the package what type of cable it is, so peal out an end and investigate.
Here is what the internals of the cable look like:
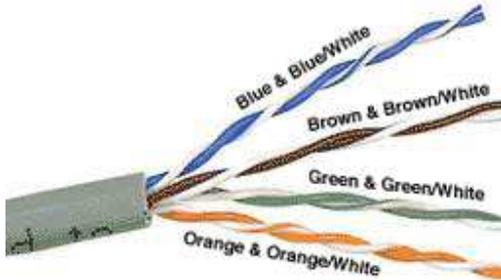
Internal Cable Structure and Color Coding
Inside the cable, there are 8 color coded wires. These wires are twisted into 4 pairs of wires, each pair has a common color theme. One wire in the pair being a solid or primarily solid colored wire and the other being a primarily white wire with a colored stripe (Sometimes cables won't have any color on the striped wire, the only way to tell which is which is to check which wire it is twisted around). Examples of the naming schemes used are: Orange (alternatively Orange/White) for the solid colored wire and White/Orange for the striped cable. The twists are extremely important. They are there to counteract noise and interference. It is important to wire according to a standard to get proper performance from the cable. The TIA/EIA-568-A specifies two wiring standards for an 8-position modular connector such as RJ45. The two wiring standards, T568A and T568B vary only in the arrangement of the colored pairs.

The RJ45 plug is an 8-position modular connector that looks like a large phone plug. There are a couple variations available. The primary variation you need to pay attention to is whether the connector is intended for braided or solid wire. For braided/stranded wires, the connector has sharp pointed contacts that actually pierce the wire. For solid wires, the connector has fingers which cut through the insulation and make contact with the wire by grasping it from both sides. The connector is the weak point in an ethernet cable, choosing the wrong one will often cause grief later. If you just walk into a computer store, it's nearly impossible to tell what type of plug it is. You may be able to determine what type it is by crimping one without a cable.
RJ45 jacks come in a variety styles intended for several different mounting options. The choice is one of requirements and preference. RJ45 jacks are designed to work only with solid cable. Most jacks come labeled with color codes for either T568A, T568B or both. Make sure you end up with the correct one.
Here is a diagram and pin out:
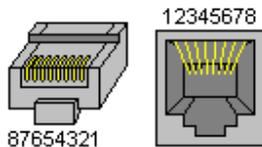
RJ45 Plug and Jack Pin Out

Ethernet Cable Pin Outs:

There are two basic cable pin outs. A straight through cable, which is used to connect to a hub or switch, and a cross over cable used to operate in a peer-to-peer fashion without a hub/switch. Generally all fixed wiring should be run as straight through.

Standard, Straight-Through Wiring (both ends are the same):

RJ45 Pin #	Wire Color (T568A)	Wire Diagram (T568A)	10Base-T Signal 100Base-TX Signal	1000Base-T Signal
1	White/Green		Transmit+	BI_DA+
2	Green		Transmit-	BI_DA-
3	White/Orange		Receive+	BI_DB+
4	Blue		Unused	BI_DC+
5	White/Blue		Unused	BI_DC-
6	Orange		Receive-	BI_DB-
7	White/Brown		Unused	BI_DD+
8	Brown		Unused	BI_DD-
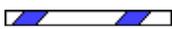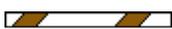
Straight-Through Cable Pin Out for T568A

RJ45 Pin #	Wire Color (T568B)	Wire Diagram (T568B)	10Base-T Signal 100Base-TX Signal	1000Base-T Signal
1	White/Orange		Transmit+	BI_DA+
2	Orange		Transmit-	BI_DA-
3	White/Green		Receive+	BI_DB+
4	Blue		Unused	BI_DC+
5	White/Blue		Unused	BI_DC-
6	Green		Receive-	BI_DB-
7	White/Brown		Unused	BI_DD+
8	Brown		Unused	BI_DD-
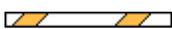
Straight-Through Cable Pin Out for T568B

Cross Over Cable (T568B):

RJ45 Pin # (END 1)	Wire Color	Diagram End #1	RJ45 Pin # (END 2)	Wire Color	Diagram End #2
1	White/Orange		1	White/Green	
2	Orange		2	Green	
3	White/Green		3	White/Orange	
4	Blue		4	White/Brown	
5	White/Blue		5	Brown	
6	Green		6	Orange	
7	White/Brown		7	Blue	
8	Brown		8	White/Blue	
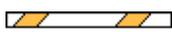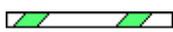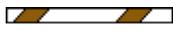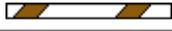
Cross Over Cable Pin Outs

How to wire Ethernet Patch Cables:

1. Strip off about 2 inches of the cable sheath.
2. Untwist the pairs - don't untwist them beyond what you have exposed, the more untwisted cable you have the worse the problems you can run into.
3. Align the colored wires according to the diagrams above.
4. Trim all the wires to the same length, about 1/2" to 3/4" left exposed from the sheath.
5. Insert the wires into the RJ45 plug - make sure each wire is fully inserted to the front of the RJ45 plug and in the correct order. The sheath of the cable should extend into the RJ45 plug by about 1/2" and will be held in place by the crimp.
6. Crimp the RJ45 plug with the crimper tool.
7. Verify the wires ended up the right order and that the wires extend to the front of the RJ45 plug and make good contact with the metal contacts in the RJ45 plug
8. Cut the cable to length - make sure it is more than long enough for your needs.
9. Repeat the above steps for the second RJ45 plug.

How to wire fixed Ethernet Cables:

1. Run the full length of cable in place, from endpoint to endpoint, making sure to leave excess.
2. At one end, cut the wire to length leaving enough length to work, but not too much excess.
3. Strip off about 2 inches of the cable sheath.
4. Align each of the colored wires according to the layout of the jack.
5. Use the punch down tool to insert each wire into the jack.
6. Repeat the above steps for the second RJ45 jack.

If a cable tester is available, use it to verify the proper connectivity of the cable. That should be it, if your cable doesn't turn out, look closely at each end and see if you can find the problem. Often a wire ended up in the wrong place or one of the wires is making no contact or poor contact. Also double check the color-coding to verify it is correct. If you see a mistake or problem, cut the end off and start again. A cable tester is invaluable at identifying and highlighting these issues.

When sizing cables remember that an end-to-end connection should not extend more than 100m (~328ft). Try to minimize the cable length, the longer the cable becomes, the more it may affect performance. This is usually noticeable as a gradual decrease in speed and increase in latency.

Cable Category Details:

Cable Category	Rated Frequency Bandwidth (MHz)	Common Uses
1	None	Common Use
2	1	Telephone Wiring
3	16	Telephone Wiring, 10Base-T
4	20	Token-Ring, 10Base-T
5	100	100Base-TX, 10Base-T
5e	100	1000Base-T, 100Base-TX
6	250	1000Base-T, 100Base-TX
6a*	500	10GBase-T
7	600	

Increasing category levels are backward compatible.