RLM 9000

INSTALLATION, OPERATION, SERVICE & REPAIR PARTS

REDJACKET

RJE-260-071 Rev. F 9/98

It is imperative that time is taken in reading and understanding this manual thoroughly before installing and using the RLM 9000 LINE AND SENSOR MONITORING AND TANK GAUGING SYSTEM.

WARNING **Before beginning any installation, programming or operating procedures, carefully read the instructions below.**

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important information concerning the life of the product.

DANGER indicates presence of a hazard which *will* cause *severe* personal injury, death or substantial property damage if ignored.

WARNING indicates presence of a hazard which *can* cause *severe* personal injury, death or substantial property damage if ignored.

CAUTION indicates presence of a hazard which *will* or *can* cause *minor* personal injury or property damage if ignored.

NOTICE indicates special instructions on installations, operation, or maintenance which are important but not related to personal injury hazards.

For Technical Assistance Call:

1-800-777-2480

NOTICE **Specifications and/or installation instructions are subject to change per manufacturer's recommendations.**

RED JACKET PETROLEUM LIMITED WARRANTY

OUR PROMISE OF QUALITY:
The Marley Pump Company, a United Dominion Company, guarantees Red Jacket products as to workmanship, material, and performance when they are properly installed, used and cared for.

OUR COMMITMENT WITHIN THE CONTINENTAL UNITED STATES:
Should any part(s) fail within the parts period specified below, it will be repaired or replaced and returned, free of charge, provided the part(s) is returned to Red Jacket's point of manufacture transportation prepaid.

Should any part(s) fail within the labor period specified below, Red Jacket will also pay for the reasonable services of an authorized service representative for on-site repair or replacement of the defective part(s).

SCHEDULE OF WARRANTY PERIODS:

Product	Parts From Date of Manufacture	Labor From Date of Installation*
Submersibles	18 Months	12 Months
Except: Solvent Pumps	6 Months	3 Months
Leak Detectors	18 Months	12 Months
Except: Solvent Leak Detectors	6 Months	3 Months
Retractors	6 Months	None
Electronic Systems	18 Months	12 Months
Except: Vapor Probes	6 Months	None

* Installation date will revert to the Date of Manufacture without a previously submitted Installation Report #WAF01 which was received within 15 days after the installation. Regardless of installation date, under no condition can labor warranty extend beyond the parts warranty.

EXCLUSIONS:

Normal (Routine) Maintenance:
Normal or routine maintenance such as cleaning, lubricating or adjusting components and assemblies or for replacing consumable items such as paper, ribbons, filters, bulbs, etc., are excluded from this warranty.

Transportation Damage to Equipment:
Should equipment be damaged in transit or handling, it is the responsibility of the distributor or customer to file a damage claim with the responsible carrier. Latent damage must be reported to the carrier within 14 days of the date of delivery and an inspection by the carrier must be requested. Damage caused in transit or by handling is not the responsibility of Red Jacket and is not covered.

WARRANTY DISCLAIMER AND LIMITATION OF LIABILITY:
THE ABOVE WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WHICH EXCEED THE AFORESAID EXPRESSED WARRANTIES ARE HEREBY DISCLAIMED AND EXCLUDED FROM THIS AGREEMENT.

MANUFACTURER EXPRESSLY DISCLAIMS AND EXCLUDES ANY LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY ARISING IN CONNECTION WITH THIS PRODUCT, INCLUDING WITHOUT LIMITATION PURCHASER'S LOSS OF STORED LIQUIDS OR DAMAGE TO THE GROUND, UNDER-GROUND OR ENVIRONMENT, WHETHER ARISING UNDER THEORIES OF TORT, NEGLIGENCE, STRICT LIABILITY, CONTRACT OR OTHERWISE.

Some states do not allow the exclusion or limitation of incidental or consequential damages or limitation on the duration of implied warranties so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

The RLM 9000 manual #260071 is divided into three sections.

SECTION A: INSTALLATION — Provides system description, specifications and parts list along with installation and troubleshooting for the automatic tank gauge/leak detection portion of the unit. For installation information regarding the line pressure monitoring portion, see pages 36-45.

SECTION B: PROGRAMMING — Provides instructions for programming the system to your own specifications. The instructions for programming the line pressure monitoring portion are found in the PPM 4000 manual #260010, pages 47-51.

SECTION C: OPERATION — Provides instructions to the actual user, including a basic system description, features, how to view information, report descriptions, loading paper and printing reports. The instructions for operation, testing and alarms are found in the enclosed PPM 4000 manual #260010, pages 53-75.

NOTICE **Instructions for installation, operation, programming and troubleshooting of the line pressure monitoring portion of the RLM 9000 system are provided in the PPM 4000 manual #260010. Refer to the pages mentioned above.**

SECTION A:
INSTALLATION INSTRUCTIONS AND TROUBLESHOOTING

continued on page iv

SECTION A: CONTINUED

SECTION B:
PROGRAMMING INSTRUCTIONS

SECTION C:
OPERATION

SECTION A

INSTALLATION AND TROUBLESHOOTING

This section provides a system description and parts list followed by the installation instructions and a troubleshooting guide. These instructions cover the automatic tank gauging and leak detection portion only. For instructions regarding the line pressure monitoring portion, refer to the PPM 4000 manual #260010.

WARNING **All installation and programming of the RLM 9000 system should be performed by personnel who are trained and qualified to do so.**

WARNING **All installation and programming of the RLM 5000/ 9000 system must be performed by trained and qualified personnel only.**

Before beginning any installation or troubleshooting procedures, carefully read and understand all instructions.

Failure to follow these guidelines could result in severe personal injury, death or substantial property damage.

NOTICE **Retain a copy of this manual on site with the RLM 9000 system as required by the EPA regulations in paragraph 40 CFR 280.45.**

The RLM 9000 operates as the central processing unit and data collection center for complete tank and line leak detection and inventory management. It collects level and temperature data from up to eight magnetostrictive level probes, and computes various volumetric quantities, correcting all volumes for temperature. The operator may choose from among various inventory, alarm and miscellaneous displays as well as generate a complete set of inventory, operation and leak detection reports.

SITE NUMBER: 12345

9/09/88 6:45 PM

INVENTORY REPORT

TANK NO. 2	**10000 GAL UNLEADED**
GROSS	**8612.2 GAL**
NET	**8595.6 GAL**
PROD LEVEL	**85.456 IN**
ULLAGE	**1388.8 GAL**
TEMPERATURE	**70.1 F**
WATER LEVEL	**1.202 IN**
WATER VOLUME	**23.1 GAL**

SITE NUMBER: 12345

9/09/88 6:45 PM

RECONCILIATION REPORT

TANK NO. 2	**10000 GAL UNLEADED**
BEGIN GROSS	**6543.1 GAL**
BEGIN NET	**6521.3 GAL**
BEGIN LEVEL	**63.612 IN**
GROSS DEL	**24246.7 GAL**
NET DEL	**24312.3 GAL**
END GROSS	**7563.8 GAL**
END NET	**7544.3 GAL**
END LEVEL	**74.374 IN**
GROSS USAGE	**23226.0 GAL**
NET USAGE	**23289.3 GAL**

All reports—Inventory, Reconciliation, Delivery, etc.—include time, date, location, name, site number and tank number. The printing of these reports may be ordered from the front panel or through the RLM 9000's serial ports. With the built-in printer, these reports may be printed on demand or pre-scheduled. Security features include automatic detection and recording of deliveries, high level overfill alarm, high water and low fuel protection, sudden (theft) and gradual (leaks) inventory changes. All alarms generate reports immediately and may be programmed to activate one of the two relay outputs. Ten different reports are available.

High performance leak detection rate criteria may be selected by the user. Tests of 0.05, 0.1 and 0.2 gallons per hour may be performed on demand or scheduled to occur at periodic intervals. The RLM 9000 also estimates the probability of error and when the programmed confidence level is reached, the test is completed.

INVENTORY MANAGEMENT

Power Requirements: 120 VAC.

Cable: Maximum cable capacitance of 13000pF cannot be exceeded. Maximum length: 1500' from control unit to sensor.

Applicable Products with Standard Sensor and Standard Floats: 100% Gasoline, 100% Diesel, up to 15% MTBE with Gasoline, up to 15% MTBE with Diesel, Gasoline/Methanol Mixtures, Gasoline/Ethanol Mixtures, M-85, E-85 and Jet Fuel.*

Applicable Products with Standard Sensor and Stainless Steel Floats: 100% Methanol and 100% Ethanol.

Number of Tanks Monitored: 1 to 8.

Liquid Level Accuracy: ±0.04% of full scale.

Liquid Level Resolution: 0.001" or better.

Temperature Accuracy: ±0.01° F.

Temperature Resolution: for unit 0.001° F,

Number of Temperature Sensors: 5 per inventory sensor. Automatic rejection of temperature sensors above the liquid level.

Number of Strapping Points: 144 maximum.

Tank Type and Size: Selectable from menu of stored tables or user programmable.

Leak Detection Algorithm: Advanced digital signal processing and statistical methods, including digital filtering of data, temperature compensation to API tables, density compensation for floats, curve fitting and automatic estimation of error and confidence level.

Leak Test Time: Depends on leak rate criterion, confidence level and conditions in the tank. Test time under "best" conditions will be one hour.

Enclosure Dimensions: 15.0"W x 14-1/2" H x 6.0"D.

Display Size: 32 characters (2 lines of 16 characters each).

Operating Temperature: 32° to 104° F (Computer enclosure only).
32° to 110° F (Inventory Sensor Style 17).
-30° to 160° F (Inventory Sensor Style 18).

Safety: Inventory Sensor: Intrinsically safe for Class I, Group D

Reports Available: Inventory, Reconciliation, Delivery, Delivery History, Leak Test, Leak Estimate, Alarm, Alarm History, Alarm Status and Configuration, Tank Configuration, Sensor Configuration.

NOTICE **Specifications and/or installation instructions are subject to change per manufacturer's recommendations.**

* All tank cap seals (refer to figure 24) have not been evaluated for exposure to these fluids. Also, it is unknown if any of the probes/sensors have been additionally evaluated for this list of fluids.

Units/Sensors

Part Number	Description
RE400-062-5	RLM 9000 System
RE400-094-5	Inventory Sensor - 4' (53") Model
RE400-154-5	Inventory Sensor - 5'4" (69") Model
RE400-096-5	Inventory Sensor - 6' (77") Model
RE400-151-5	Inventory Sensor - 7' (89") Model
RE400-098-5	Inventory Sensor - 8' (101") Model
RE400-157-5	Inventory Sensor - 9' (113") Model
RE400-110-5	Inventory Sensor - 10' (125") Model
RE400-156-5	Inventory Sensor - 10'6" (131") Model
RE400-112-5	Inventory Sensor - 12' (149") Model
RE400-095-5	Inventory Sensor - Other

Peripheral Sensors

RE400-147-5	High Level Sensor — 2"
RE400-148-5	High Level Sensor — 4"
RE400-108-5	Hydrostatic Sensor — Xerxes model
RE400-109-5	Hydrostatic Sensor — Xerxes model
RE400-111-5	Liquid Sump Sensor
RE400-180-5	Liquid Refraction Sensor
RE400-204-5	Dispenser Pan/Sump Sensor
RE400-219-5	Vapor/Conductivity — 2" Floating Sensor
RE400-220-5	Vapor/Conductivity — 4" Floating Sensor
RE400-377-5	Groundwater Monitor 10'
RE400-378-5	Groundwater Monitor 15'
RE400-381-5	Groundwater Monitor 20'
Various	High/Low Level Sensor 2" & 4" for lengths 4', 6', 8', 10', and 12'

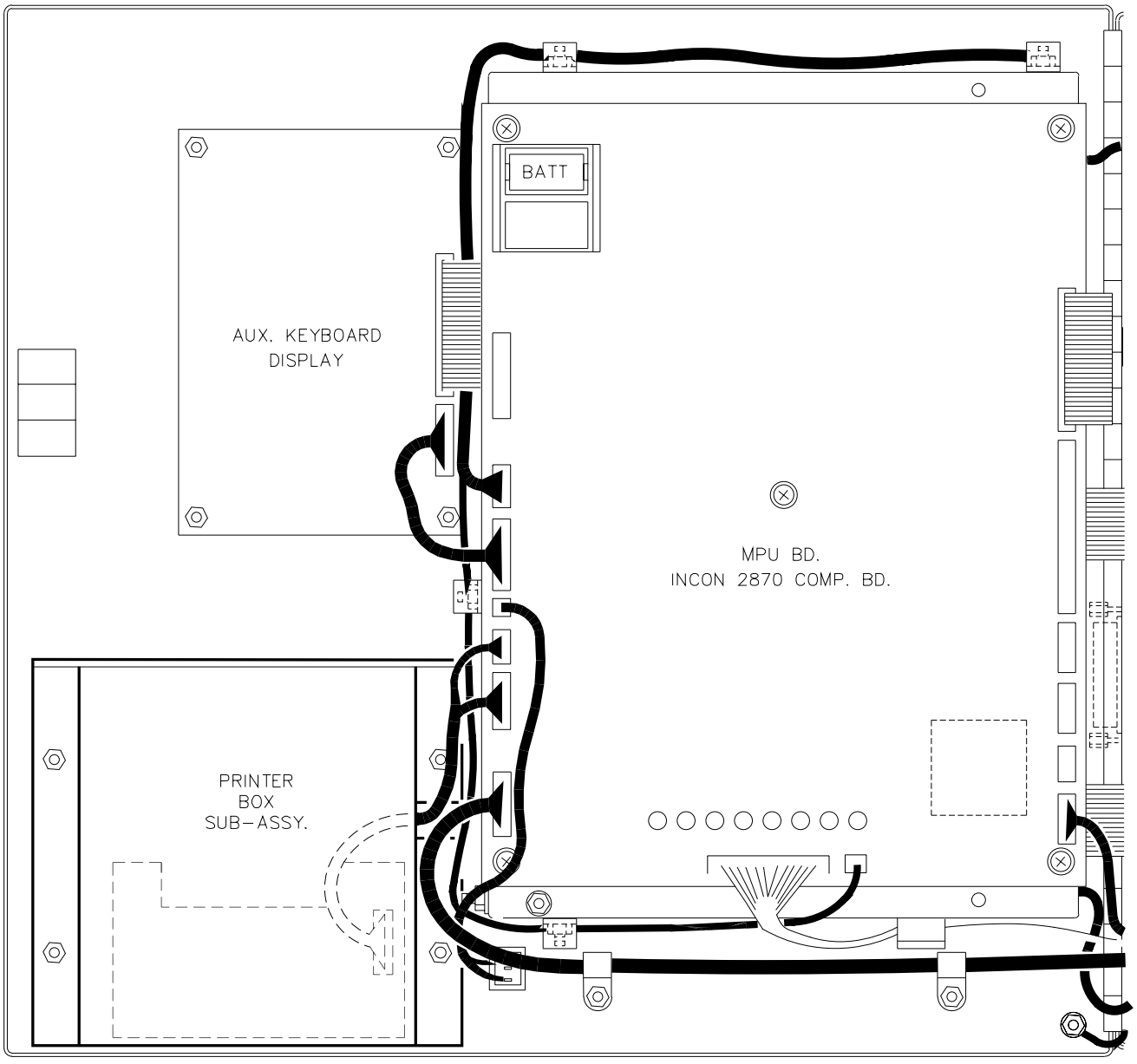
Part Number	Description
	Boards
RE125-007-5	Analog Module
RE126-080-5	Relay Output Assembly.
RE330-031-5	MPU Board — Tank Gauge
RE330-032-5	MPU Board — Line Pressure
RE330-033-5	Power Supply — Tank Gauge
RE330-034-5	Power Supply — Line Pressure
RE330-035-5	Interface Board — Tank Gauge
RE330-036-5	Interface Board — Line Pressure
RE330-040-5	Display/Keyboard Board
RE330-045-5	Board - AC On/Off Board
RE330-013-5	Relay Board — 4100
	Cables
RE330-047-5	Cable Communication
RE330-048-5	Cable External Relay
RE350-043-5	Cable - Keyboard
RE350-046-5	Cable - Display Ribbon — Barrier Interface
RE350-053-5	Cable 5VDC Interface
RE350-078-5	L1 to AC Switch
RE350-079-5	Neutral to AC Switch
RE350-106-5	Printer Driver Cable
	Inventory Sensor Parts
RE400-047-5	Compression fitting
RE400-101-5	Float Kit 4" Gasoline (product float, water/interface float and well cap)
RE400-102-5	Float Kit 4" Diesel (product float, water/interface float and well cap)
RE400-105-5	2" Diesel float Kit (product float, water/interface float and well cap)
RE400-106-5	Float Kit 2" Gasoline (product float, water/interface float and well cap)

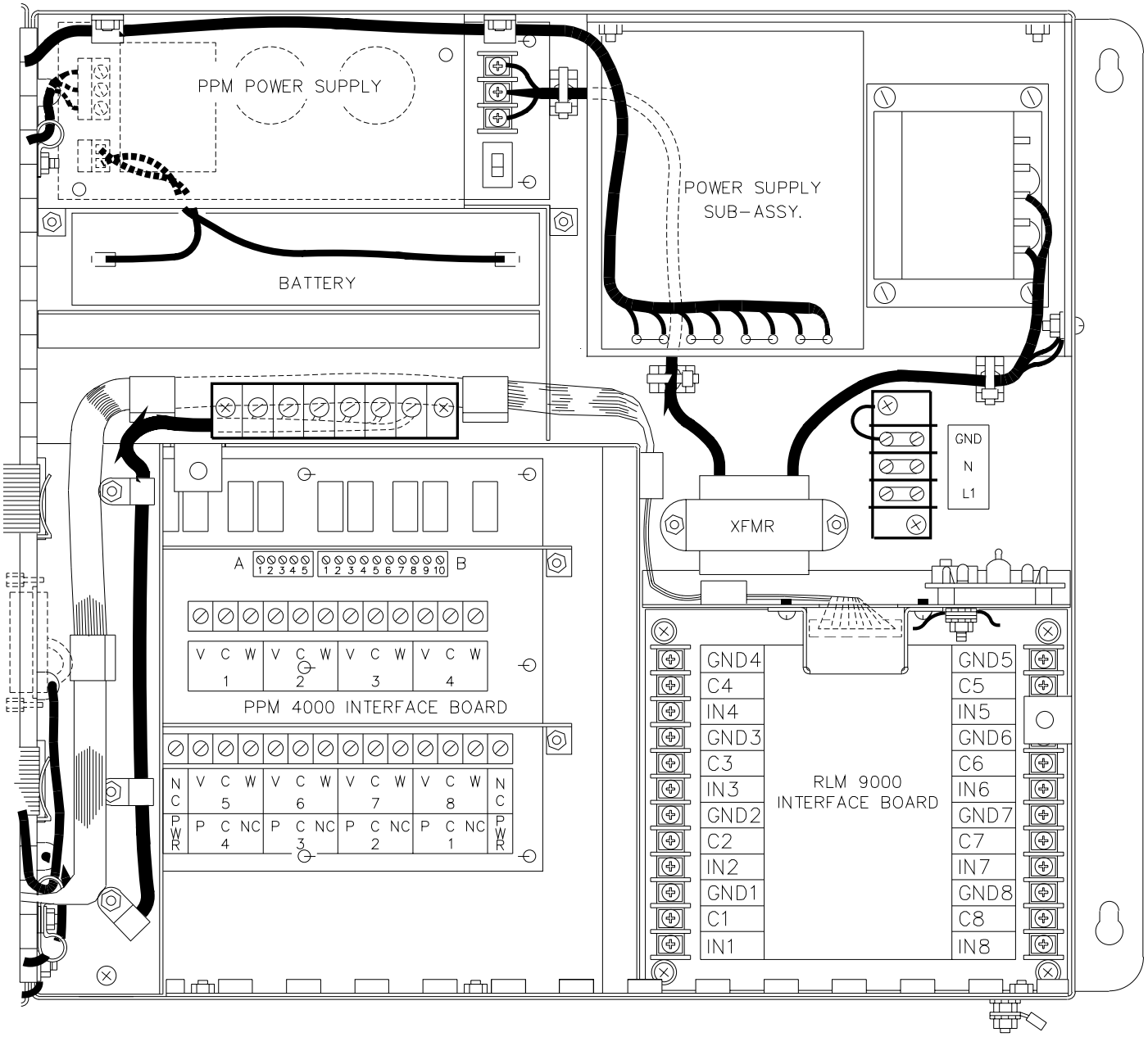
Part Number	Description
	Line Pressure Parts
RE076-370-5	Packer-Manifold Seal
RE101-054-5	Accumulator
RE223-025-5	Functional Element
RE144-148-5	Check Valve Kit
RE400-012-5	Standard Line Pressure Kit
RE400-100-5	Special Line Pressure Kit
RE400-117-5	Transducer
	Misc.
RE090-002-5	Battery — ATG Backup
RE090-008-5	Battery LP Backup
RE220-030-5	Fuse (1/2A)
RE220-031-5	Fuse (3A)
RE230-003-5	Lock
RE266-017-5	Keys
RE350-051-5	Transformer (signal)
RE400-046-5	* Scotchlok Waterproof Wire Connectors (20 per pack)
RE400-093-5	* Scotchcast Connector Kit (12 per pack)
RE400-095-5	Printer Paper (12 rolls)
RE400-120-5	Printer Assembly (before 992)
RE400-107-5	Printer Assembly (after 9/92)
RE400-121-5	Printer Paper (1 roll)

* Scotchlok connectors are shipped with the following sensors: Refraction, Optical Liquid Discrimination, Vapor/Conductivity, High Level/Low Level, Hydrostatic and Sump. Scotchcast connectors are shipped with the Inventory Sensor and Transducer. The Scotchcast connectors, however can be used with any Red Jacket peripheral device.

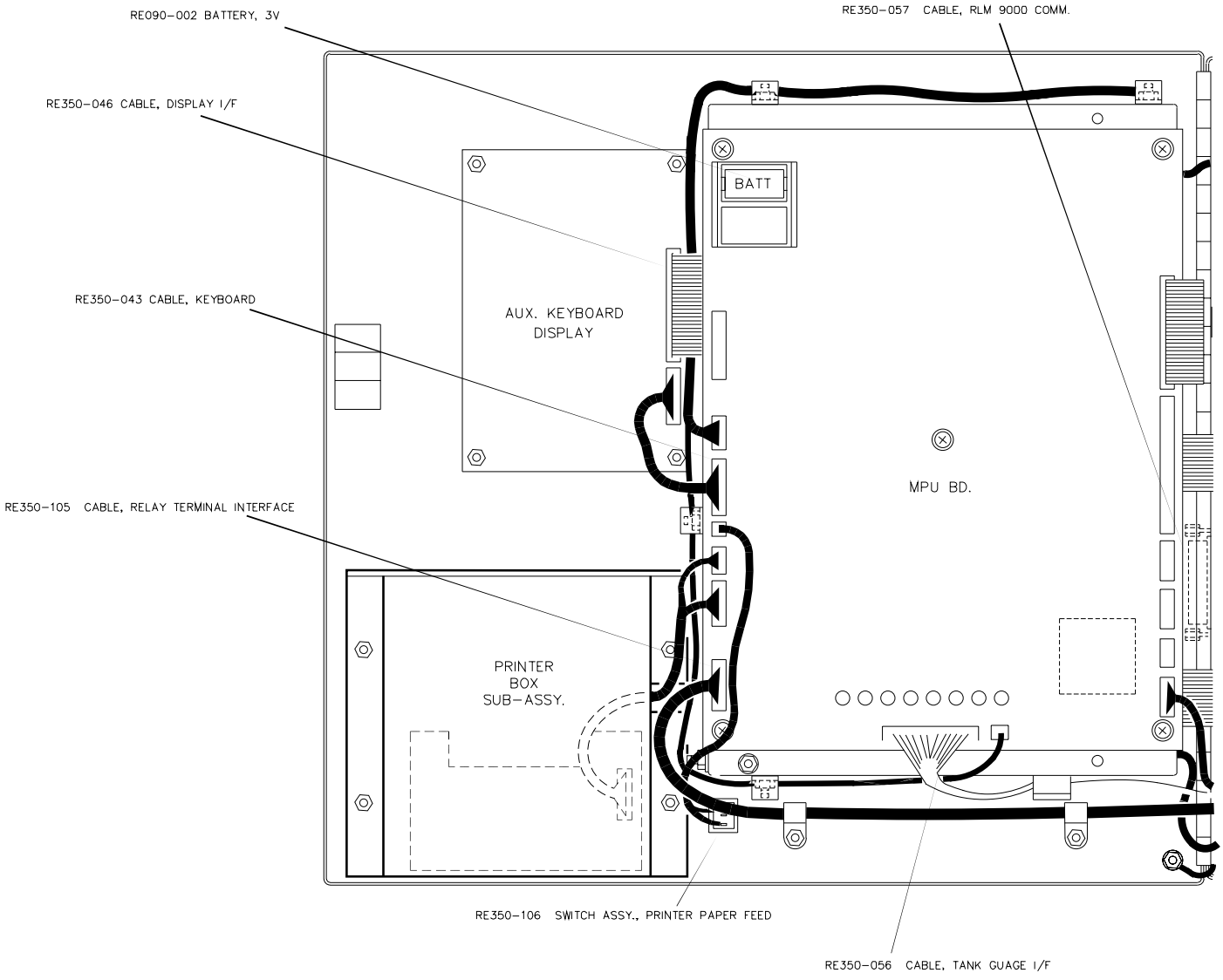
RLM 9000 MPU BOARD

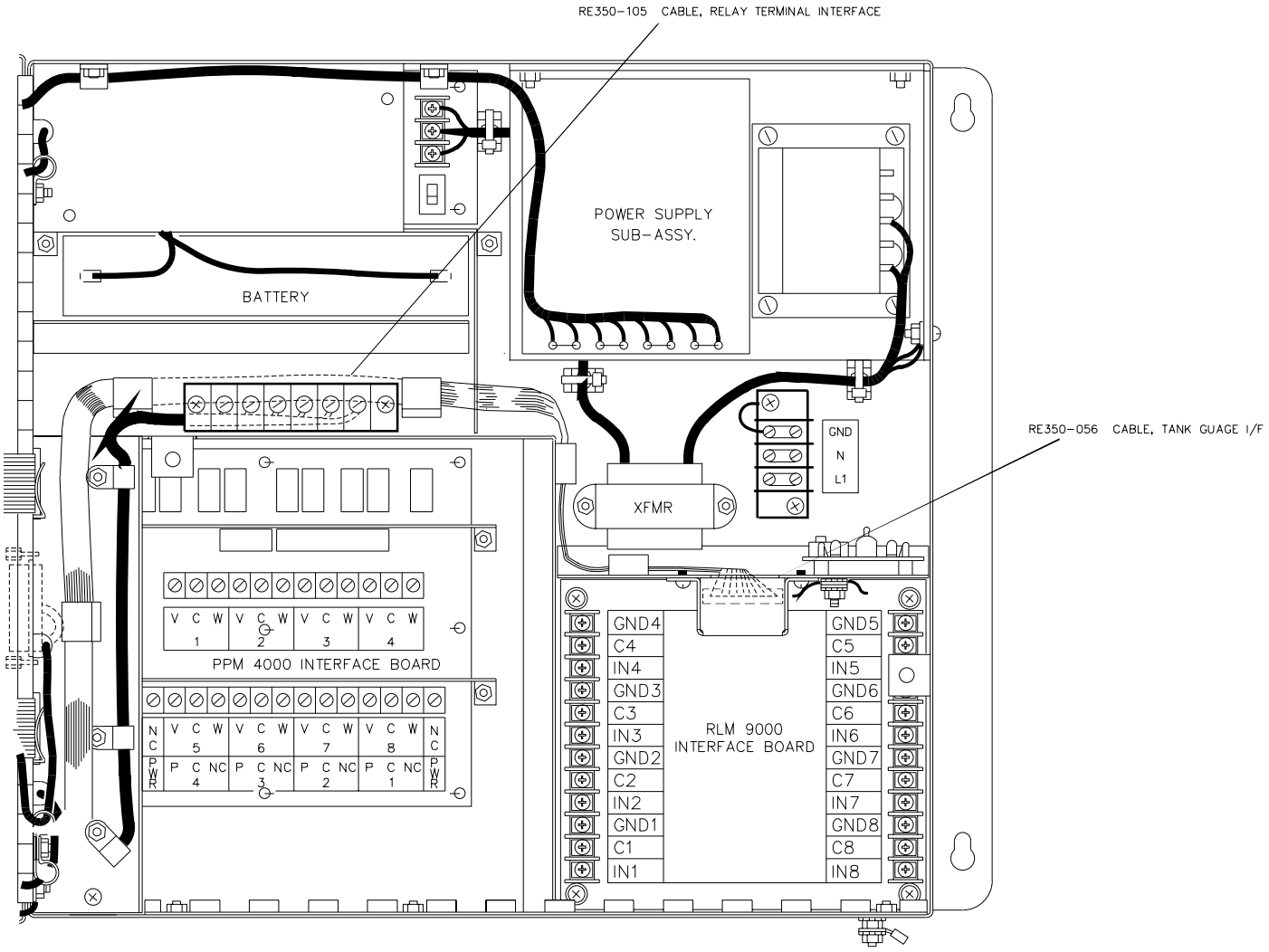
RLM 9000 ENCLOSURE DOOR




PPM POWER SUPPLY
BATTERY
POWER SUPPLY
SUB-ASSY.
GND
N
L1
XFMR
A
1 2 3 4 5
1 2 3 4 5 6 7 8 9 10
B
V C W
1
2
3
4
PPM 4000 INTERFACE BOARD
NC
PWR
5
6
7
8
P C NC
GND4
C4
IN4
GND3
C3
IN3
GND2
C2
IN2
GND1
C1
IN1
RLM 9000
INTERFACE BOARD
GND5
C5
IN5
GND6
C6
IN6
GND7
C7
IN7
GND8
C8
IN8

RLM 9000 CABLE LOCATION




RE350-105 CABLE, RELAY TERMINAL INTERFACE
POWER SUPPLY SUB-ASSY.
BATTERY
RE350-056 CABLE, TANK GUAGE I/F
GND
N
L1
XFMR
V C W 1
V C W 2
V C W 3
V C W 4
PPM 4000 INTERFACE BOARD
NC V C W 5 V C W 6 V C W 7 V C W 8 NC
PWR P C NC 4 P C NC 3 P C NC 2 P C NC 1 PWR
GND4 C4 IN4 GND3 C3 IN3 GND2 C2 IN2 GND1 C1 IN1
RLM 9000 INTERFACE BOARD
GND5 C5 IN5 GND6 C6 IN6 GND7 C7 IN7 GND8 C8 IN8

INSTALLATION DO'S AND DON'TS

WARNING **Failure to follow these guidelines could result in severe personal injury, death or substantial property damage.**

DO Plan all conduit runs and junction box installations before mounting the RLM computer and auxiliary control unit.

DO Install the system to meet the **National Electric Code, Federal, State and Local codes, and any applicable safety codes.**

DO **Disconnect all power** before making any connections.

DO **Maintain intrinsic safety**. All wiring must be installed within sealed conduit. **Inventory Sensor wires must be separated from all other wiring.**

DO Observe proper conduit access into the **RLM 9000** Computer and auxiliary control unit.

DO Submit properly completed war-ranty form. Warranty is void if form is not submitted.

DO Mount the **RLM 9000** and auxiliary control unit in a dry, climate controlled environment.

DO Install ground wire minimum 16 gauge from safety ground terminal on the bottom of the RLM 9000 and 4100 enclosures to proper earth ground (ex. water pipe).

DON'T Short circuit power supply.

DON'T Handle the **MPU** of the Computer without grounding strap. Elec-tronics are very sensitive to static electricity.

DON'T Mount the **RLM** Computer or auxiliary control unit or power transformers in a hazardous area or a volatile, combustible or explosive environment.

DON'T Allow unauthorized field service work on the internal circuits of the control unit. **Unauthorized work** will adversely affect the intrinsic safety of the system and void product warranty.

DON'T Run any other lines or power devices through the Computer. The Computer is a low voltage device.

DON'T Operate the system without the protective covers installed over barrier terminals.

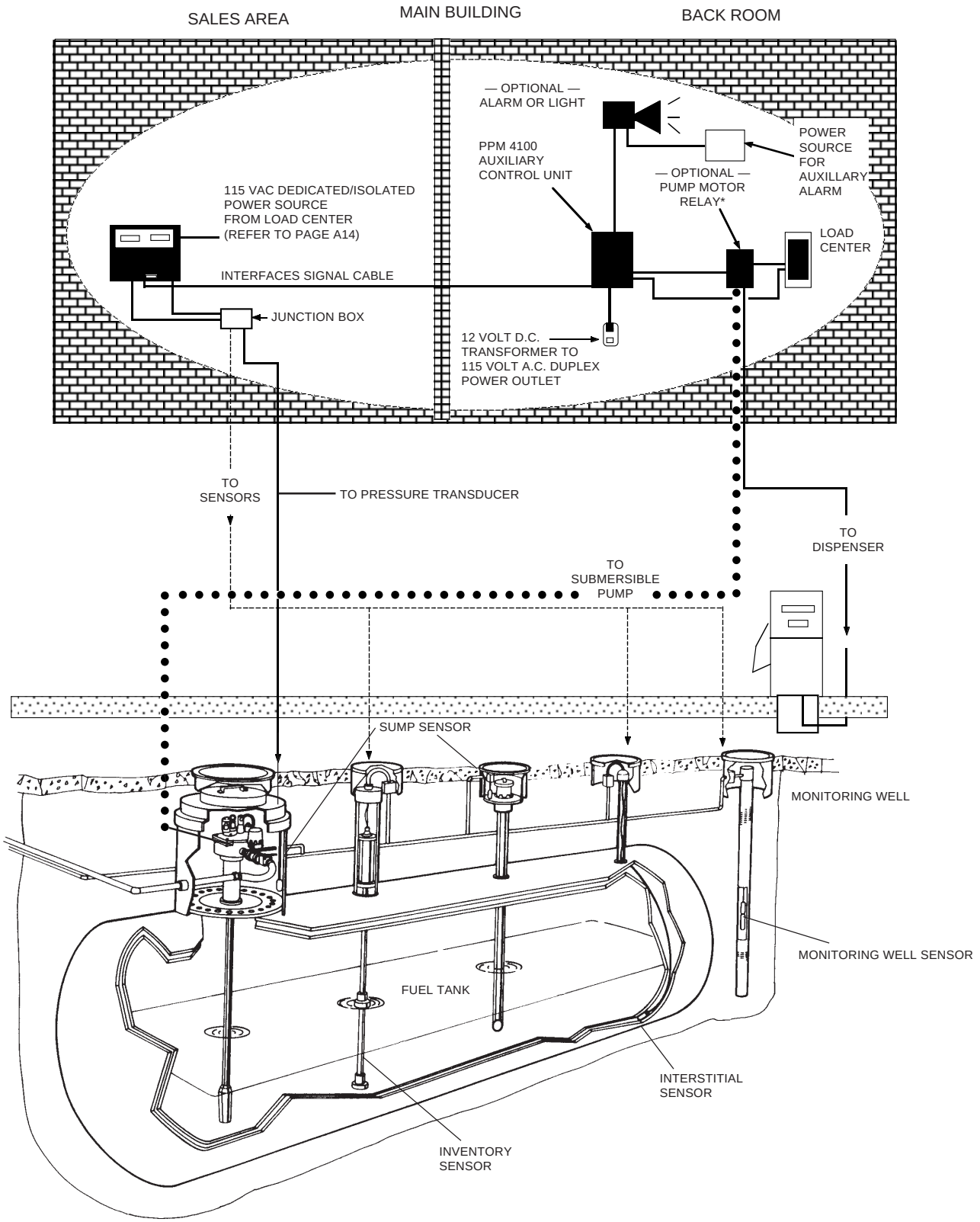
DON'T Drill any holes in the Computer cabinet.

DON'T Pull peripheral sensor wires more than 2000 feet maximum from the computer.

DON'T Pull inventory sensor cable more than 1500 feet maximum from the computer.

DON'T Run any other wires in the conduit between the auxiliary control unit and the computer. This conduit must contain only factory supplied 15 conductor cable.

DON'T Install a junction box in the conduit run between the RLM 9000 and 4100 enclosures.



NOTICE **All junction boxes, fittings, connections, wiring (except between RLM 9000 and PPM 4100), conduits, monitoring well, load center, etc., are to be provided by the installer.**

ATTENTION INSTALLER

READ THIS IMPORTANT SAFETY INFORMATION BEFORE BEGINNING WORK

Portions of this product are to be installed and operated in the highly combustible environment of a petroleum product storage tank. It is essential that you carefully read and follow the warnings and instructions in this manual to protect yourself and others from serious injury, explosion, electrical shock or death.

For safety reasons, we have taken particular care in the design of this product to limit the power in the wiring to the fuel tanks and to keep that wiring physically separated from any other wiring (Intrinsically safe). It is your responsibility to maintain the effectiveness of these safety features by installing this product in accordance with the instructions and warnings which follow. Your failure to do so could create danger to life and property and will result in a voiding of all warranties connected with this product.

DANGER

Conduits or wiring troughs from sensors to computer must not contain any other wires.

All conduits must enter the computer and auxiliary control unit through preformed knockouts.

Do not install the computer and auxiliary control unit in a volatile, combustible, or explosive environment.

Installation and use of this product must comply with the National Electrical Code: NFPA 70, Automotive and Marine Service Stations Code NFPA 30A; Federal, State, Local Codes; and other applicable safety codes.

Shut off all power before installation of the system.

The auxiliary control unit and computer must have proper earth ground (ex. water pipe).

Conduit from auxiliary control unit to computer must contain only factory supplied 15 conductor cable.

Failure to comply with these requirements will result in serious personal injury, property loss, and equipment damage.

INSTALLATION STEPS

NOTICE **Plan all conduit runs and junction box installations before mounting the RLM 9000 Computer and Auxiliary Control Unit.**

STEP 1. Install the RLM 9000 computer in a visible and accessible location, inside and away from hazardous areas. A mounting template is provided for this purpose. Do not drill any holes in the RLM 9000 enclosure. See page A16.

STEP 2. Run 3 (three) conductor, 14 gauge min. from dedicated power source to L1, neutral and GND on RLM 9000. Do not apply power to unit until all connections have had a final inspection by qualified personnel. Use appropriate knock-outs. See page A14.

STEP 3. Run proper twisted shielded pair cable from tank sensor to barrier board observing proper polarity. DO NOT drill any holes, use appropriate knock-outs to access this compartment. See page A26-A27.

STEP 4. Install the Auxiliary Control Unit inside the building close to the main load center and pump motor relays. A mounting template is provided for this purpose. Do not drill any holes in the Auxiliary Control Unit enclosure. See page A15.

STEP 5. Run a three (3) conductor, 16 gauge cable **(in conduit)** for the supplied D.C. Power Transformer.

WARNING **OBSERVE POLARITY! Install auxiliary pump control (115 VAC) power. See page A18.**

STEP 6. Install 16 gauge wire (minimum) from safety ground terminal of RLM 9000 and 4100 enclosures to a suitable earth ground (ex. water pipe). See page A26.

STEP 7. Remove load wire from product relay coil and connect that wire to "IN" terminal of Auxiliary Control Unit. Run a new wire from the corresponding "OUT" terminal of the Auxiliary Control Unit's Terminal strip back to the product relay coil. See page A21.

NOTICE **This wiring configuration will not affect any self service console or POS terminal operation.**

STEP 8. Install Line Pressure kit, the functional element, check valve, Packer-Manifold seal-ring, accumulator, transducer and housing. See pages 36-42 in PPM 4000 manual #260010.

STEP 9. Run three (3) conductors, 18 gauge, gasoline and oil resistant wires **(in conduit)** from the product line transducer to the 9000 computer terminal strip.

WARNING **OBSERVE PROPER POLARITY.**

STEP 10. Run the factory supplied (15) conductor, 22 gauge minimum, signal cable **(in conduit),** between the 9000 computer and the Auxiliary Control Unit.

STEP 11. Run three (3) conductors, 18 gauge, gasoline and oil resistant wires from probes to the 9000 line pressure interface board.

WARNING **OBSERVE PROPER POLARITY. BLACK to VAPOR, UNINSULATED to COMMON, WHITE to LIQUID.**

STEP 12. Install pressure transducer on product piping.

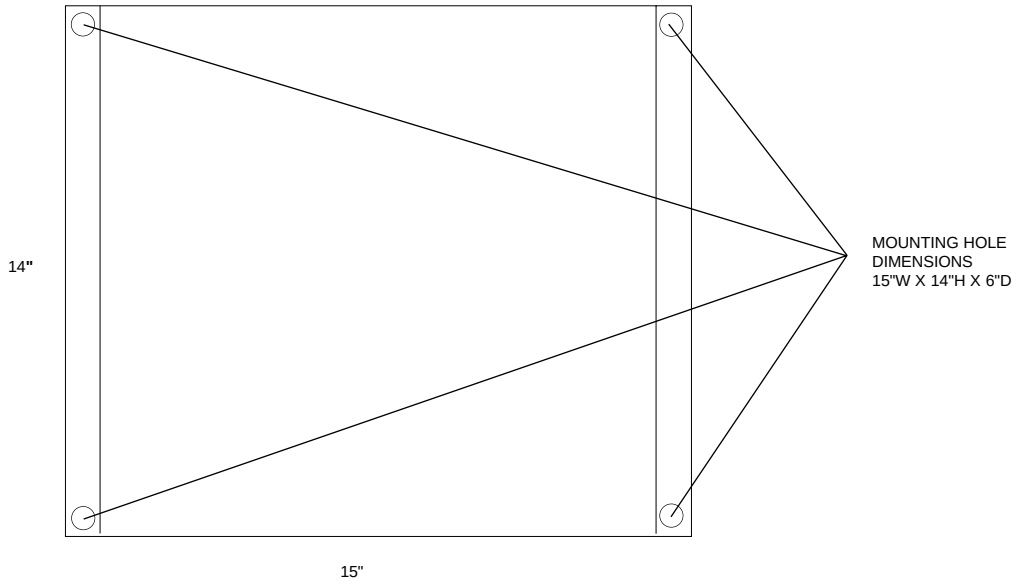
NOTICE **See page 36 in the PPM 4000 manual (260-010) for installation instructions and procedure to allow temporary operation of system with monitoring capability disabled.**

DANGER **Failure to ground the RLM 9000 terminal and 4100 enclosure may result in a shock hazard.**

RLM 9000 COMPUTER ENCLOSURE INSTALLATION

WARNING **Handle the electronics with care. This device is sensitive to static electricity. Touching or improper handling of the M.P.U. Boards may cause severe damage to the unit.**

Install the RLM 9000 at eye level in an accessible, dry, climate controlled location. Using the mounting holes in the back of the enclosure, mount the control panel on a permanent surface. **Do not drill any holes in the enclosure, to do so will void system warranty.**

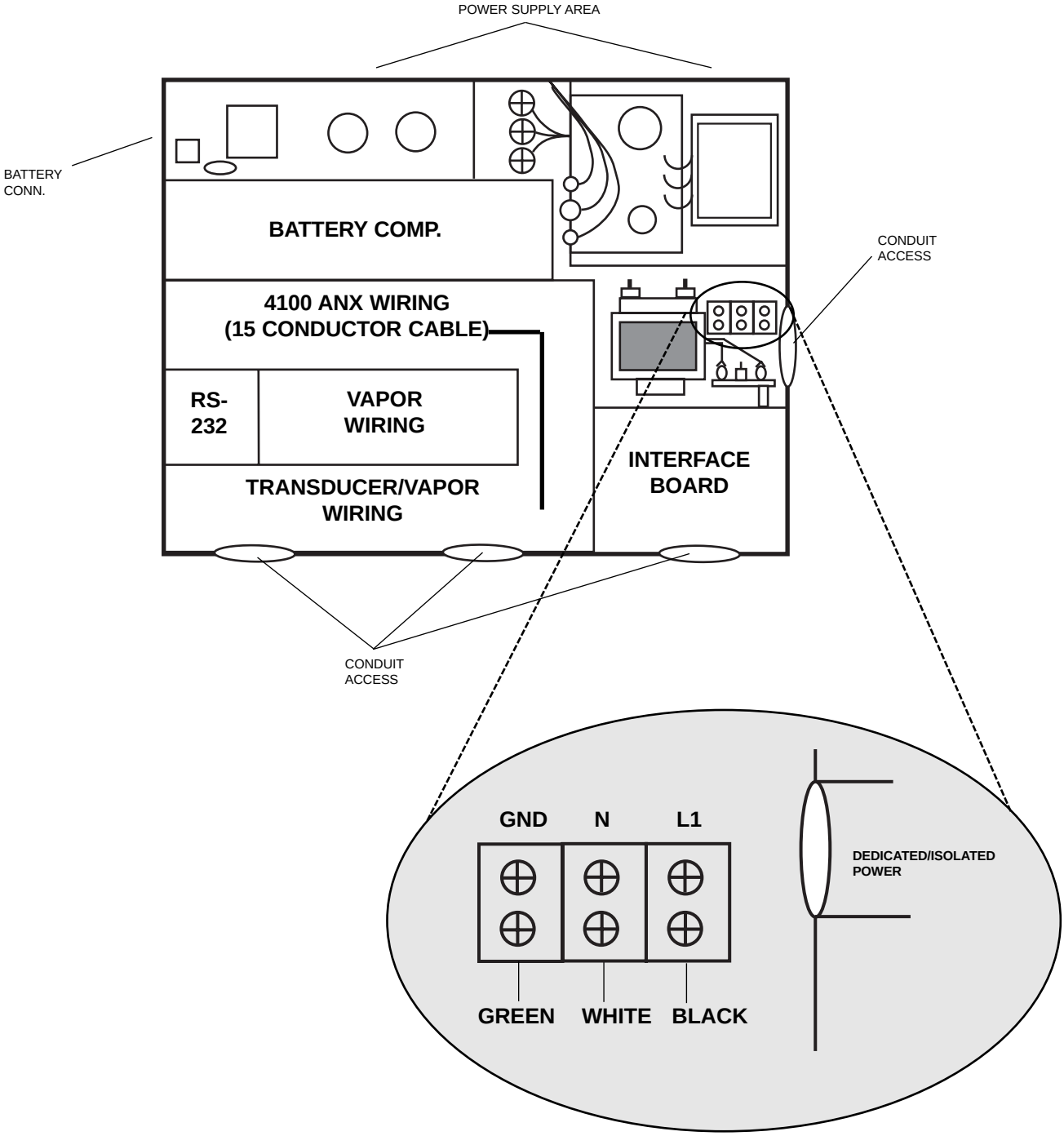


NOTICE **TEMPLATE PROVIDED IN SHIPPING CONTAINER.**

DANGER **Do not mount the RLM 9000 Computer in a hazardous area or in a volatile, combustible or explosive environment. Failure to comply with these requirements will result in serious personal injury, property loss and equipment damage through explosions, fire or electrical shock.**

RLM 9000 COMPUTER POWER INSTALLATION

WARNING **Take care to install battery cable in cable divider groove. Failure to do so may result in damage to battery and system.**



WARNING **Do not connect battery until total system installation and final inspections have been completed. Failure to comply can result in serious personal injury, death or substantial property damage.**

PPM 4100 AUXILIARY CONTROL UNIT ENCLOSURE INSTALLATION

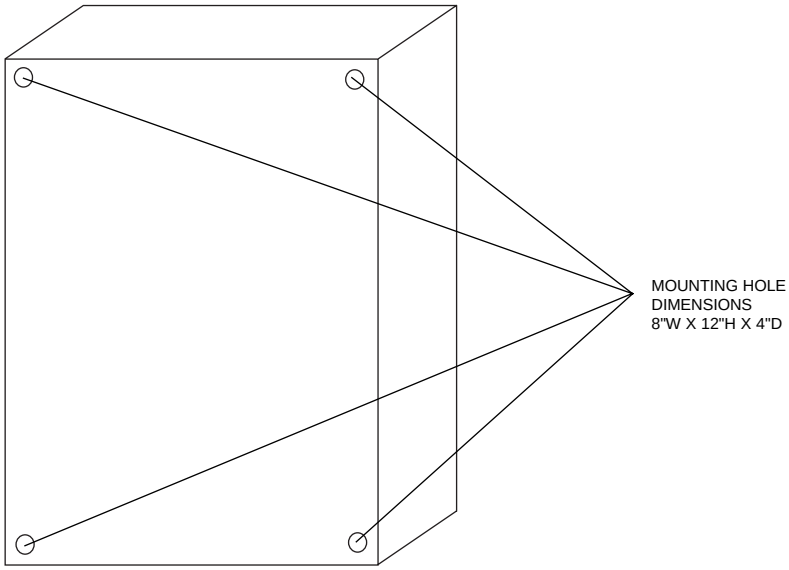
For ease of installation the PPM 4100 auxiliary control unit should be installed close to the main load or power center and pump motor relays.

(SEE ILLUSTRATION PAGE A9)

Use mounting holes on back of enclosure and mount on permanent surface.

Plan all conduit runs and junction box placement before permanently mounting control unit.

NOTE: Template provided. (See shipping container)



WARNING **Proper conduit access into enclosure must be observed to maintain intrinsic safety. Do not mount the PPM 4100 Computer in a hazardous area or in a volatile, combustible or explosive environment. Failure to comply with these requirements will result in serious personal injury, property loss and equipment damage through explosions, fire or electrical shock.**

D.C. POWER TRANSFORMER INSTALLATION

Wire the supplied D.C. Power Transformer **IN CONDUIT** to the 12 VDC terminal in the Auxiliary Control Unit. This plug in device requires continuous 115VAC power and must not be installed on a switched outlet. **DO NOT PLUG IN THE TRANSFORMER AT THIS TIME.**

WARNING **Install 115 VAC. This power source automatically runs the submersible pumps and must be in the SAME PHASE as all the product relays. Improper phasing will damage the 4100 board.**

Auxiliary Control Unit In/Out terminals 1, 2, 3, and 4 are wired in series between the dispenser switch and the product relay.

Remove **LOAD WIRE** from terminal "S2" of product relay contactor coil. Run that wire to **"IN"** terminal screw of Auxiliary Control Unit. Run a new wire from the **"OUT"** terminal screw of the Auxiliary Control Unit back to terminal "S2" of the product relay contactor coil.

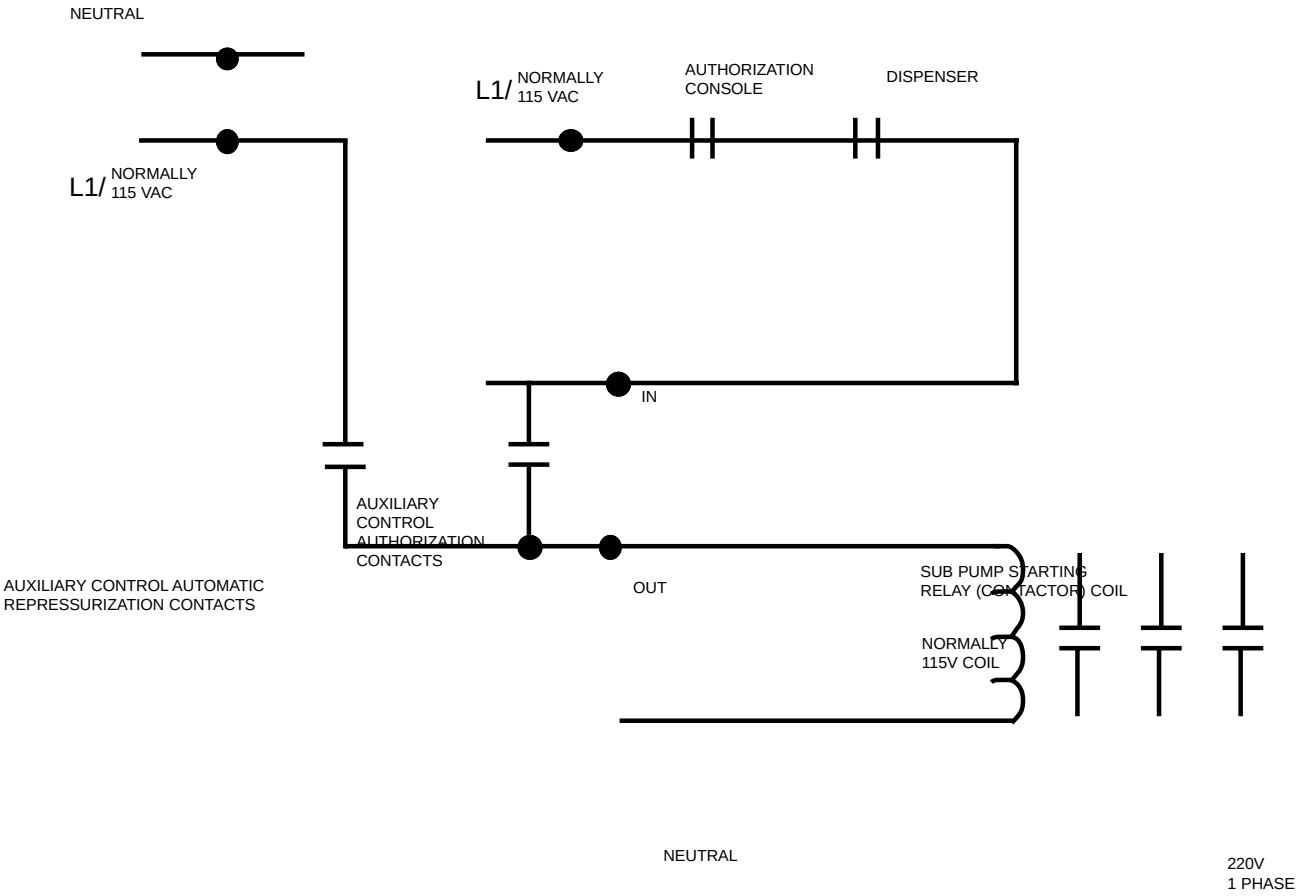
WARNING **Use only the U.L. Listed DC Power Transformer furnished with the RLM 9000 system. Any substi-tution will void warran-ty and intrinsic safety codes and could cause severe personal injury, death or substantial property damage.**

WARNING **Do not connect the DC Power Transformer or 115VAC power until all connections have been made and final inspections have been completed by qualified personnel. Failure to follow these instructions could result in damage or system failure not covered by warranty and could cause severe personal injury, death or substantial property damage.**

PUMP CONTROL
WIRING SCHEMATIC

PPM 4100 AUXILIARY CONTROL UNIT

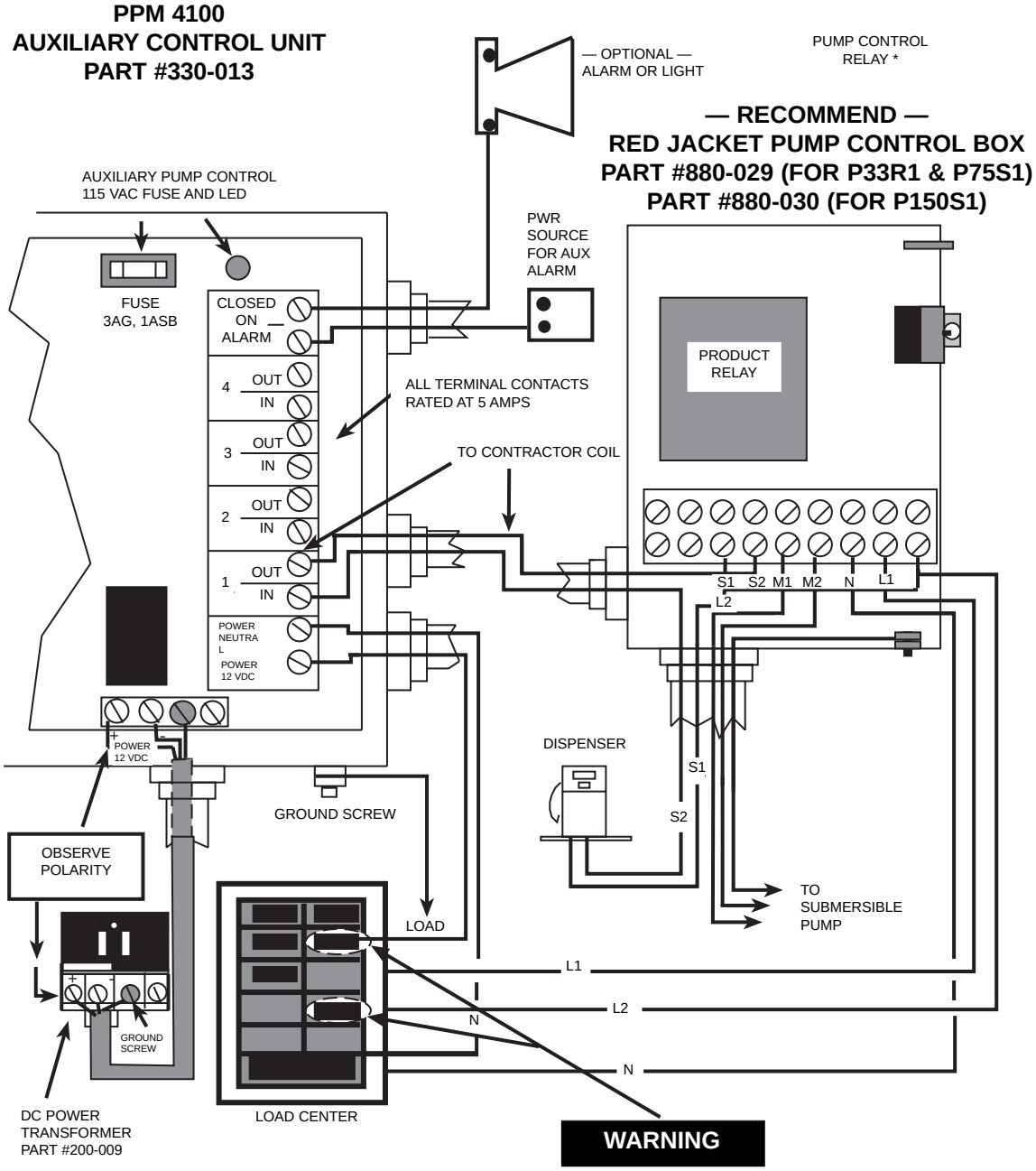
WARNING **The pressure transducer connections on the RLM 9000 and the pump connections on the 4100 auxiliary control must correspond by number.**



WARNING **Suggested schematic if pump motor relay used is other than Red Jacket product relay.**

Voltage for coil operation must match L1 voltage.

AUXILIARY CONTROL UNIT
WIRING INSTALLATION OVERVIEW



WARNING

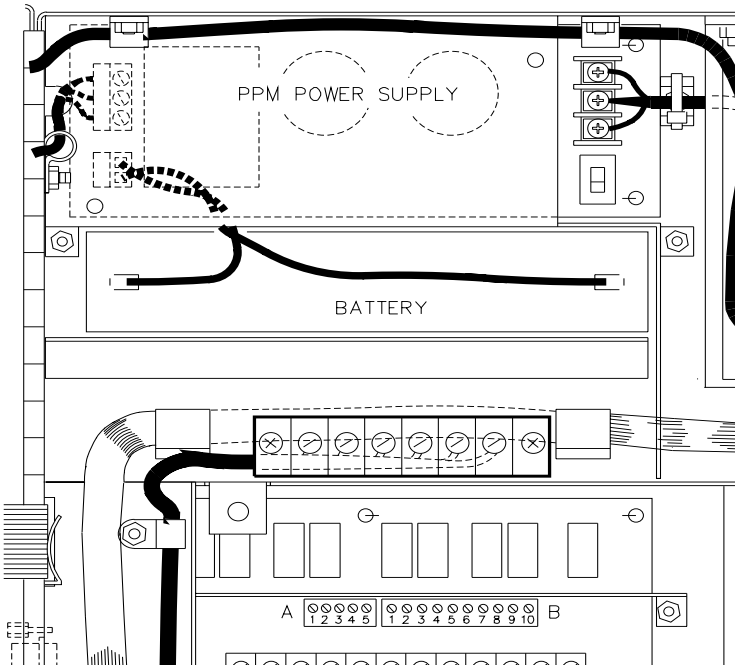
Constant 115 VAC power source must be in same phase as all product relay coils. Improper phasing will damage the 4100 board.

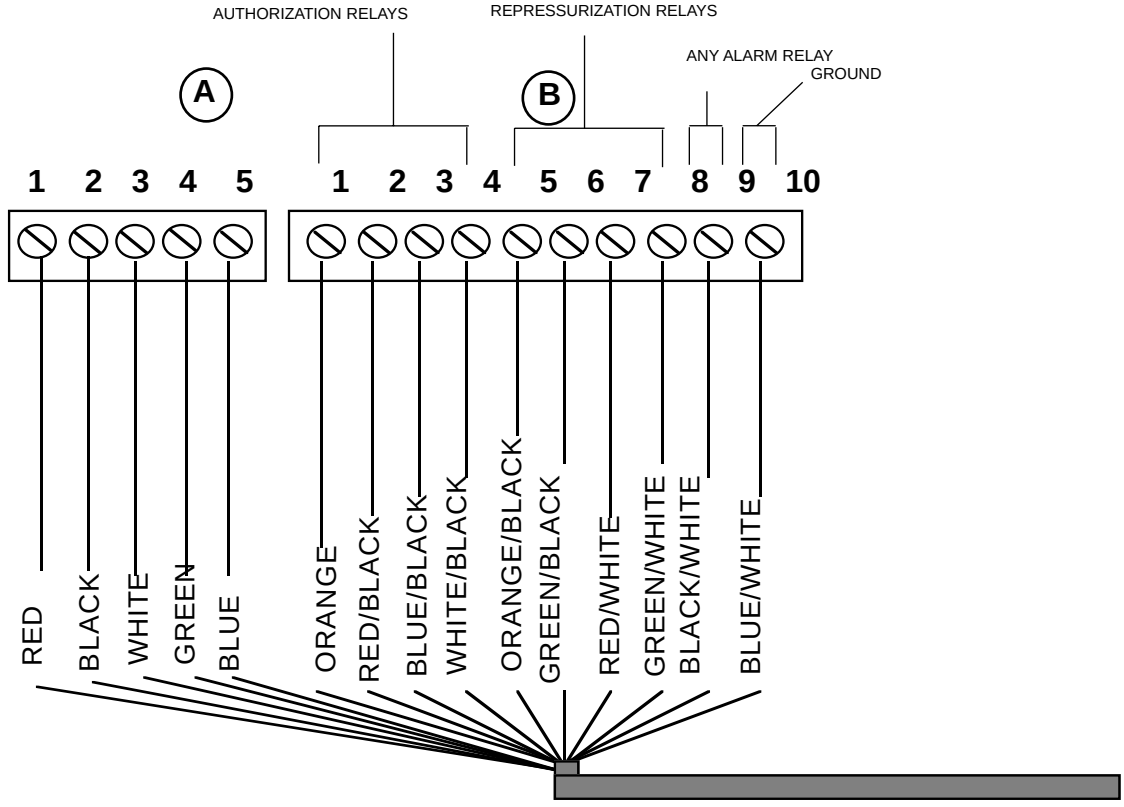
WARNING

1. **If less than four (4) products are used, no connections are made at remaining "IN" and "OUT" terminals.**
2. **Pumps will not operate until the RLM 9000 is programmed.**
3. **This wiring configuration will not affect any self service console installation or operation.**
4. **Out terminal must be wired to coil side of product relay.**

*** If dispenser system has built-in pump relay switch, Red Jacket Control Box (880-029, 880-030) is optional. If not, a control box is required.**

RLM 9000 COMPUTER AND AUXILIARY CONTROL UNIT SIGNAL CABLE INSTALLATION

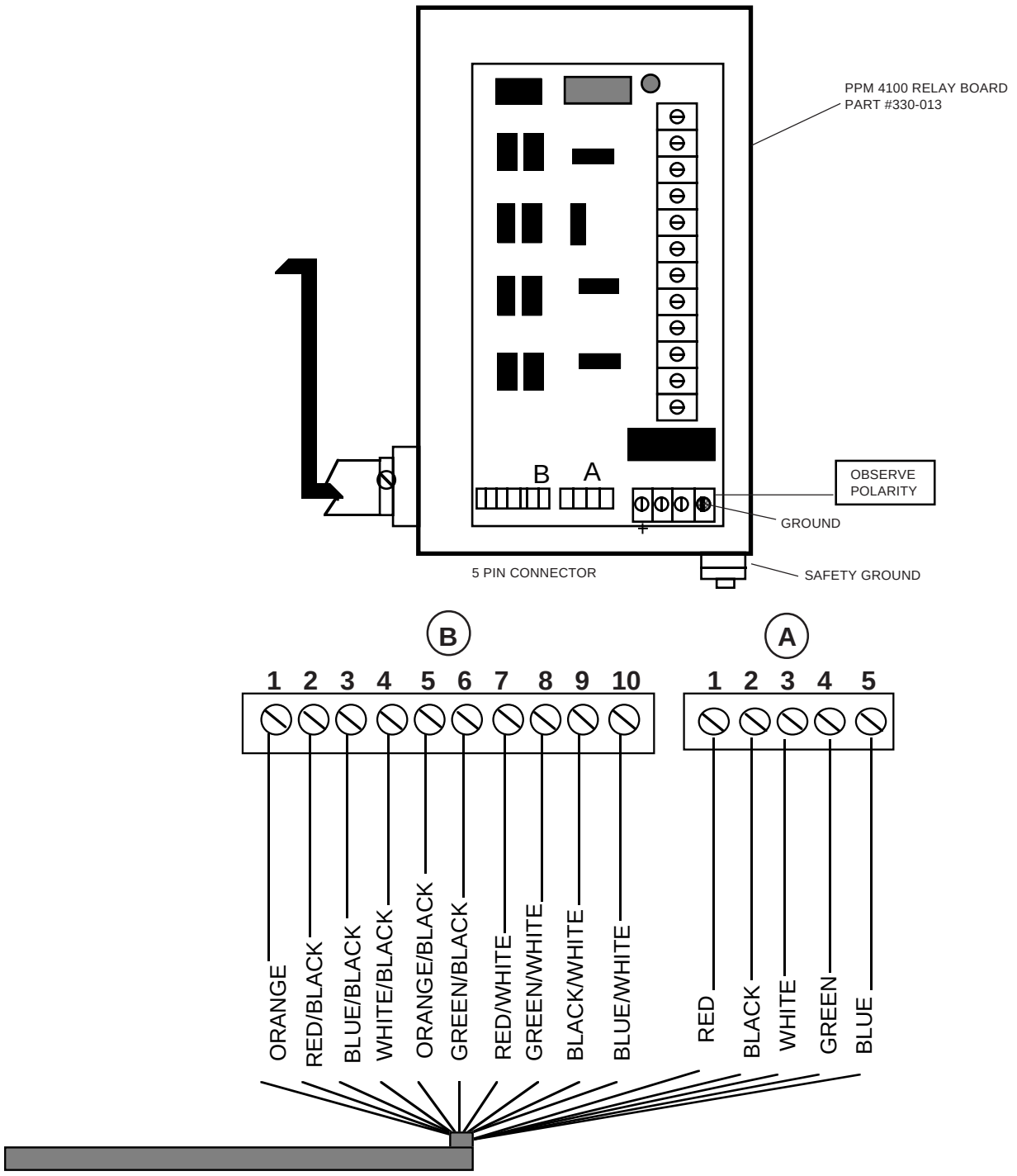




NOTICE

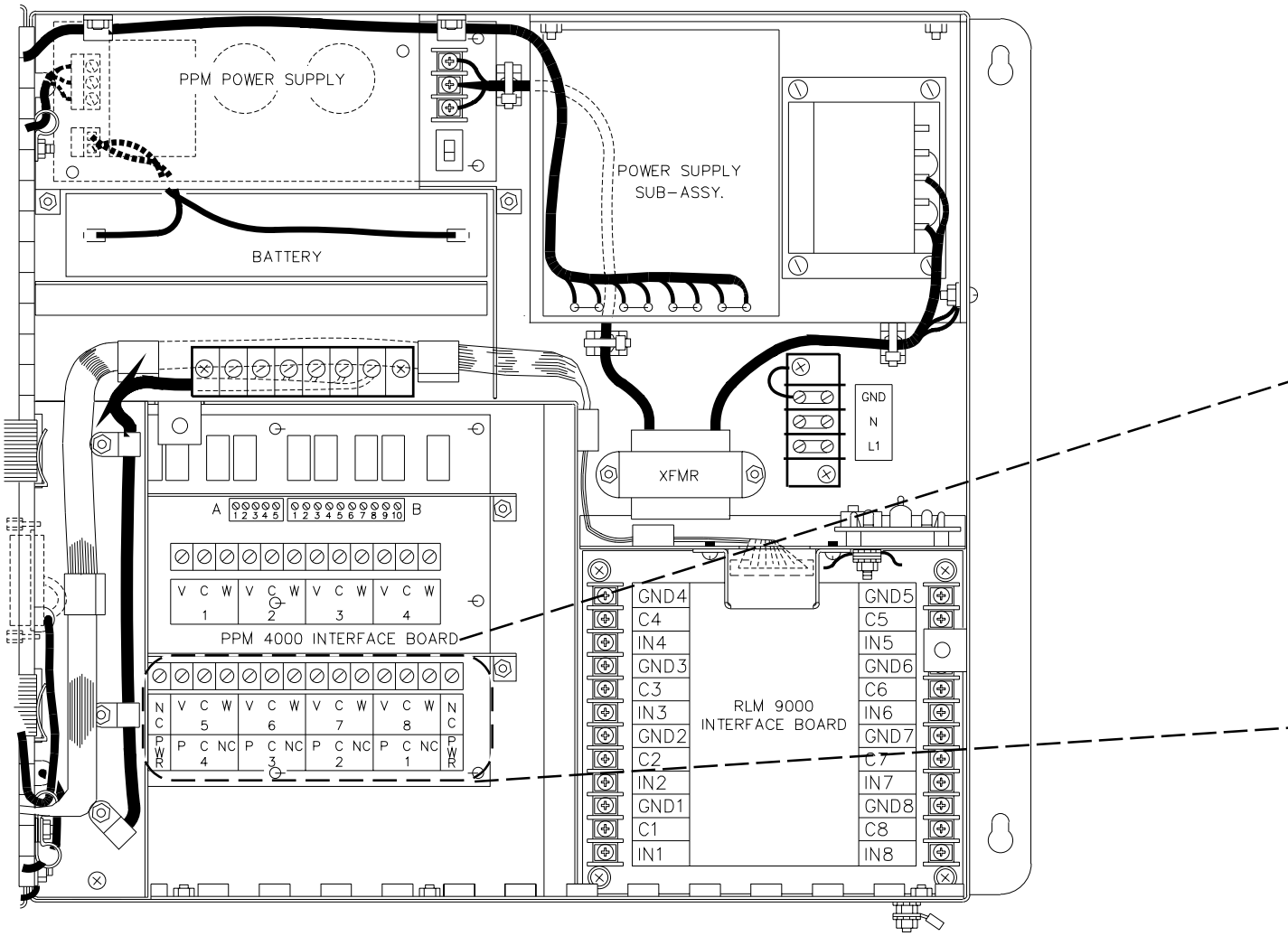
Run 15 conductor signal cable, minimum 22 gauge between RLM 9000 computer and auxiliary control unit. Connect cable to connectors provided. Use factory supplied 15 conductor cable only. Pin 1 through 5 on pin connectors "A" must correspond. Pin 1 through 10 on pin connectors "B" must correspond.

PPM 4100 AUXILIARY CONTROL UNIT



WARNING **To maintain intrinsic safety, all wires must be installed in conduit. Do not install a junction box on the conduit run between RLM 9000 and 4100 enclosures. Use factory supplied 15 conductor cable only. Length of run 250 feet maximum. This conduit must contain no other wiring. Failure to comply can result in severe personal injury, death or substantial property damage.**

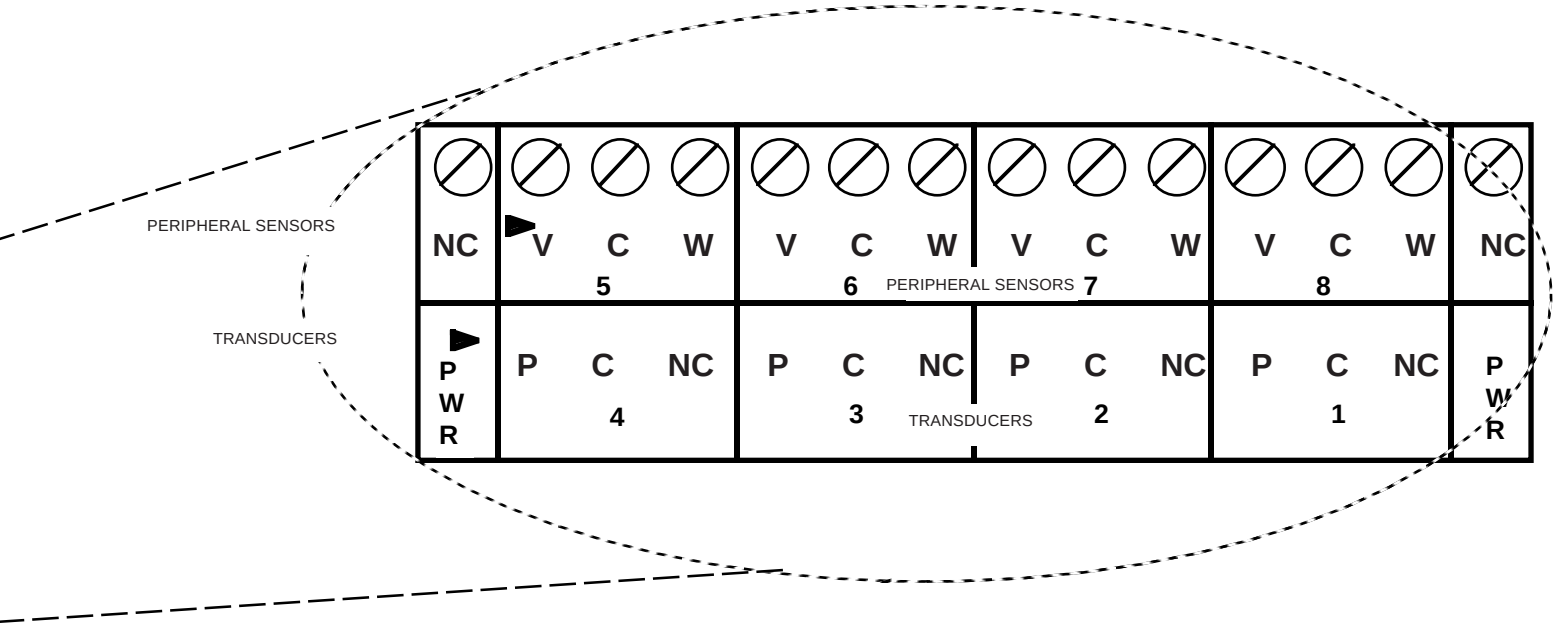
EXPLANATION OF RLM 9000 COMPUTER PROBE/TRANSDUCER TERMINAL BOARD



WARNING

For ease of wiring, power for the line pressure transducers (red wire) can be attached at each end of the terminal strip.

If less than four (4) pressure sensors are installed, the remaining terminals become probe terminals and resistors must be in place if not used for probe monitoring.



NOTICE **This is a dual purpose label. When making peripheral sensor connections, read the top of label. When making pressure transducer connections, read the bottom part of the label.**

SEALING & PRESSURE REGULATING KIT INSTALLATION INSTRUCTIONS

Included in the Part #RE400-012-5 Red Jacket Line Pressure Kit (to be used with the PPM 4000 line and probe monitoring system and the RLM 9000 system) is a specially designed functional element (223-025-5), check valve (144-183-5), packer-manifold seal (076-382-1), product line transducer assembly (RE400-117-5), and an accumulator (RE101-054-5) to be installed in Red Jacket submersible pumps manufactured after 1963.

NOTICE **We recommend installing this equipment BEFORE installing the PPM 4000 control unit to avoid possible pump shutdown due to loss of line pressure.**

WARNING ***ALL AIR MUST BE OUT OF THE SYSTEM FOR THE ELECTRONIC LEAK DETECTION SYSTEM TO WORK PROPERLY.*** **Before installing components in the pump, fill the system with product by running the pump and delivering product from each dispenser (starting with the farthest from the pump and working to the pump) until air is removed from the system.**

1. Disconnect power to pump at the load center.
2. Remove syphon system, if present.
3. Remove pumping unit. See Figure 1, page A28.
4. Remove old O-ring underneath the leak detector port from packer. See Figure 2B.
5. Examine O-ring gland for corrosion roughness. Clean with a wire brush, if necessary.
6. Install new packer-manifold seal provided in kit with the retaining lip (wider edge) facing up against the packer.
7. Examine packer-manifold seat. See Figure 2A for corrosion roughness, nicks, scratches, etc. If found to be rough, smooth with fine emery paper.

WARNING **Seat must be smooth and nick-free to provide proper sealing between packer and manifold. If not, manifold may have to be replaced.**

8. Replace packer (extractable portion) to original position reversing order of Figure 1, page A28.
9. Remove functional element by removing two cap screws. Take out old O-rings.
10. Remove existing check valve and spring.
11. Replace with silver/gray check valve and spring. Smaller end of spring should rest on check valve hub.
12. Place new O-rings (3) on new functional element and mating surface of packer.
13. Carefully replace new functional element by tightening two cap screws (removed earlier).

CAUTION **MAKE SURE BOTH FITTINGS ARE TIGHT TO PREVENT POSSIBLE LEAK INTO THE GROUND AND/ OR WATER SEE PAGE INSIDE THE TANK.**

14. Reconnect power to pump at load center.

15. Clear remaining air from system as follows:

    A. Turn on dispenser that is farthest from submersible pump but do not open nozzle. Wait four or five minutes or more. Look for leaks on parts worked on.

    B. Shut off pump and allow to stand four or five minutes. Then start pump again and open nozzle farthest from submersible pump.

    C. Continue to flow enough gasoline (about 20 to 30 gallons) to pump ALL air from the system.

16. Observe any fluid seepage from functional element area to insure tightness.

CAUTION **Make sure that a syphon check valve, Part No. 188-079, (not included in this kit) is used when installing a syphon system.**

17. Replace new or existing syphon tube, if necessary.

18. In testing the new components, we recommend utilizing a sample test fixture installed in the dispenser shear valve as shown in Figure 3, Page A28.

The pump should be started and a few gallons of product dispensed to remove any air which may have entered the system while installing the test fixture. The pump should then be restarted to pressurize the system. Full line pressure (approximately 26 psi) will register on the gauge. Turn the pump off and the pressure should drop

CAUTION **If pressure does NOT hold, do not install the PPM 4000/ RLM 9000 line and probe monitoring system. The PPM 4000/RLM 9000 would sense the loss of pressure and shut down the system, restricting total flow of product through the submersible pump. First, locate the area of pressure loss and correct problem.* Then, install PPM 4000/RLM 9000 to avoid this potential problem.**

to 11 to 15 psi and hold utilizing the new precision functional element. This indicates that everything is working properly.

* If a slow pressure drop exists in the underground piping, it can be caused by thermal contraction, or by a leak in the system. To determine if the pressure drop is caused by thermal contraction, with a pressure gauge installed in the dispenser shear valve, start the submersible pump and dispense 20 to 30 gallons from the system.

a. Turn off the pump and after the pressure relief action has occurred per normal operation of the pump, record the pressure reading as indicated on the gauge. It should be noted that the built-in pressure relief valve in the newly designed functional element (223-025-5) will allow the pressure to drop 11 to 15 psi and hold.

b. With the pump off, wait approximately 3 minutes and record the discharge line pressure again as indicated on the pressure gauge. (Figures A and B constitute the first set of readings.)

Start the pump and allow it to run for approximately 2 minutes. Repeat A and B above to acquire the second set of readings. Repeat this procedure until you have recorded approximately 6 or 7 sets of readings (approx. 30 minutes) being sure that you do not dispense product at any time during this exercise. If the pressure drop experience was due to thermal contraction, B reading will become closer to A reading each time until at the end of approximately 30 minutes there will be no drop in line pressure from A reading to B reading about 3 minutes later.

However, with a leak in the system readings, A and B will probably not become any closer regardless of the amount of readings taken.

1. ALWAYS DISCONNECT the power.
2. Backout bayonet electrical disconnect bolt.
3. Swing electrical connector aside.
4. IF SYPHON SYSTEM: disconnect syphon.
5. Remove the two lockdown bolts.
6. Lift unit. Replace unit by reversing these steps. Caution: Do not damage surface above discharge port. "O" ring below leak detector port seals on this surface.

FIGURE 1

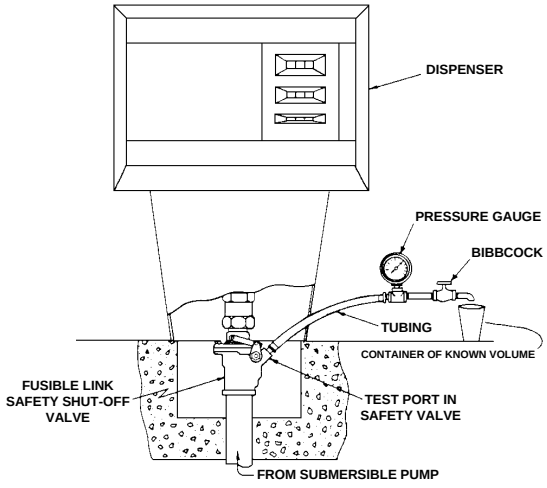


FIGURE 2A ***FIGURE 2B*** ***FIGURE 3***

ACCUMULATOR ASSEMBLY KIT INSTALLATION INSTRUCTIONS

The Red Jacket Accumulator is to be installed only in the two-inch threaded port located in the top of Red Jacket 4" submersible pumps manufactured after 1963.

IMPORTANT: ALL AIR MUST BE OUT OF THE SYSTEM FOR ELECTRONIC LEAK DETECTION SYSTEM TO WORK PROPERLY. Before installing Accumulator in pump, fill the system with product by running the pump and delivering product from each dispenser (starting with the farthest from the pump and working to the pump) until all air is removed from system.

WARNING **We recommend installation of the Accumulator before placing the PPM 4000 monitoring equipment in control of the pumping system.**

1. Disconnect power to pump at the load center.
2. Remove the two-inch plug from the top of the Red Jacket pump. If the two-inch plug is found to be so tight that it cannot be removed, the submersible should be removed from the tank and placed in a vise. Remove the functional element assembly next to the pipe plug. The plug should then come out readily if a large pipe wrench is used. Replace functional element assembly securely and replace the pump in the tank.
3. Apply UL Classified pipe thread sealant to the two-inch threads on the Accumulator.
4. Screw the Accumulator into the pump. Tighten with wrench. (Top hex is 2-1/2")
5. Remove 3/8" plug from the tank test port on top of pump. (See Figure 1 below.)
   a. Apply UL Classified pipe thread sealant on the straight vent tube fitting and install in the “Tank Test” port on the pump manifold.
   b. Align Accumulator so that vent opening at the top of Accumulator is as close to tank test port as possible.
   c. Remove plastic thread protector plug from vent port on Accumulator. Apply UL Classified pipe thread sealant to vent tube elbow fitting and install Accumulator vent port. Elbow should be pointed downward for best protection of tubing. (See Figure 1 below.)
6. Install tubing vent line into both fittings as shown in Figure 1 below.

CAUTION **Make sure both fittings are tight to prevent possible leak into the ground and/or water seepage inside accumulator and tank.**

7. Connect power to pump at load center.
8. Clear remaining air from system as follows:

NOTICE **This procedure should be accomplished before placing the PPM 4000/RLM 9000 monitoring equipment in control of the pumping unit.**

a. Turn on dispenser that is farthest from Accumulator but do not open nozzle. Wait four or five minutes or more. Look for leaks on parts worked on.

b. Shut off pump and allow to stand four or five minutes. Then start pump again and dispense product from nozzle farthest from Accumulator (repeat with each nozzle working to the pump).

c. Turn pump on, then off. Bleed pressure to zero from shear valve of farthest dispenser. (Repeat twice). This will eliminate any trapped air in the Accumulator.

DANGER **If excessive air is trapped in the line, the ability to sense a leak is seriously hampered. Therefore, the above procedure is extremely important.**

9. Observe for any fluid seepage from Accumulator or fittings to insure tightness.

10. The pump should now be restarted to pressurize the system. Full line pressure (approximately 26 psi) will register on the gauge. Turn the pump off and the pressure should drop to 11 to 15 psi and hold utilizing the new precision functional element.

NOTICE **Considering that the PPM 4000/RLM 9000 monitoring equipment will stop the operations of the submersible pump if it senses loss of line pressure, make sure all fittings in the system are tight and that pressure holds.**

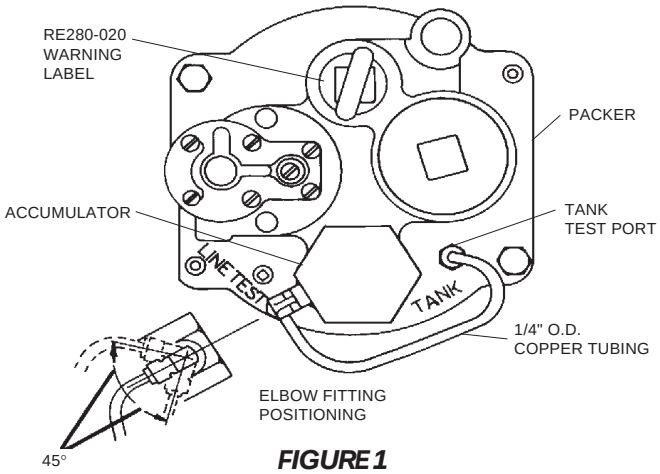


FIGURE 1

1. Install reducing tee in product line at discharge of submersible pump as shown on page 41 & 42.
2. **All air must be removed** from total piping system for accurate operation. Refer to Step #8 on page 36 on Accumulator Installation.

DANGER

To maintain intrinsic safety, the transducer wiring must be sealed in conduit with no other non intrinsic-safe wiring. Proper conduit access must be used at the PPM 4000 Computer. Failure to follow these instructions will result in severe personal injury, death or substantial property damage.

NOTICE

As an option to assist in troubleshooting, install a ball valve down stream from the transducer pipe assembly. Refer to pages 41 & 42.

3. Run a gasoline and oil resistant three (3) conductor, min. 18 gauge cable or 3 individual wires from transducer housing to the PPM 4000 Computer. **OBSERVE POLARITY - RED WIRE POWER (PWR) TERMINAL, BLACK WIRE TO COMMON (C) TERMINAL, GREEN WIRE TO PRESSURE (P) TERMINAL.**

Waterproof connectors are supplied with each line pressure kit.

WATER-RESISTANT CONNECTION INSTRUCTIONS
PART NO. 190027

Water-resistant connectors are supplied with each vapor probe, pressure kit and/or sensor to be used for splicing our probe wires in all below ground locations (i.e. manhole junction boxes). The gel-like material contained inside the connector body protects wires from corrosion and provides a waterproof seal. **DO NOT REMOVE GEL-LIKE MATERIAL FROM CONNECTOR BODY.**

WIRE RANGE: 22 - 14 AWG solid or stranded copper conductors.

WARNING **Turn power off before installing connector. All electrical work should be done in accordance with appropriate local codes. Use with insulated copper wire only.**

In Use With Liquid Refraction Sensor

To form a water-resistant connection, all Red Jacket Electronics equipment is shipped with 3M Scotchlok connectors. One connector per connection.

Step 1. Leave the insulation on each wire from sensor.

Step 2. At the sensor junction box, leave the insulation on the end of the three (3) conductor wires that run from the computer terminal strip to the sensor junction box.

Step 3. Match the proper wires together. Check the installation and wiring instructions for specific probe or sensor being used. (See figure 1).

Step 4. Insert one wire into opening on connector and insert other wire into another opening on cennector. Using the appropriate pliers, press blue section of connector firmly into the clear housing. One connector per connection is used. (See figure2).

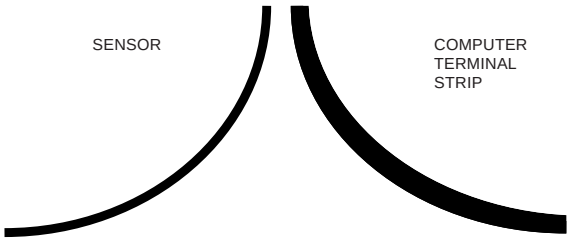


FIGURE 1

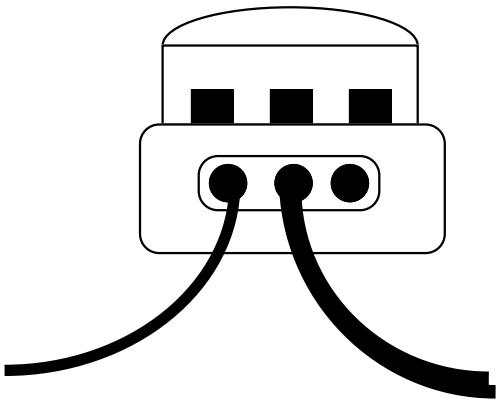


FIGURE 2

In Use with Well Vapor Probe

The coil cords used in the well probes utilize small gauge wires. These wires must be stripped and joined to the 18 gauge wires that run from the computer terminal strip before inserting into the water-resistant connector. This action will increase size of the wires enough to ensure a good connection at the waterproof connectors.

STEP 1. Strip the insulation from each coil cord wire approximately 1/2". Omit the green wire. (See figure 3).

STEP 2. At the probe junction box, strip 1/2" from the ends of the three (3) 18 conductor wires that run from the computer terminal strip to the probe junction box.

STEP 3. Twist the proper wires together:

RED PROBE WIRE TO TERMINAL V OF THE PPM COMPUTER.

BLACK PROBE WIRE TO TERMINAL C OF THE PPM COMPUTER.

WHITE PROBE WIRE TO TERMINAL W OF THE PPM COMPUTER (See figure 4).

STEP 4. Insert the 3 sets of wires into separate water-resistant connectors. Using the appropriate pliers, press the blue section of the connectors firmly into the clear plastic housing. (See figure 5). One connector per connection is used.

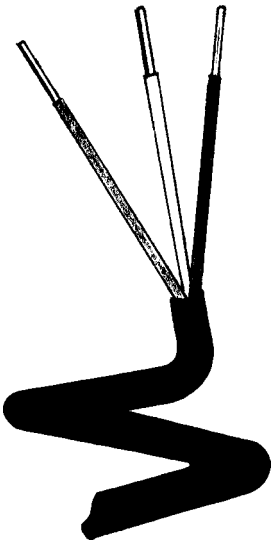


FIGURE 3

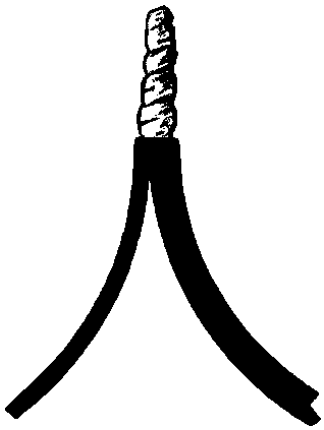


FIGURE 4

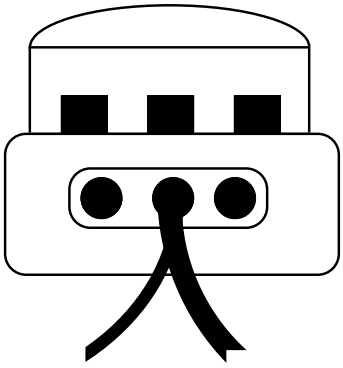


FIGURE 5

SCOTCHCAST INSULATING RESIN INSTRUCTIONS

Insulating resin pouches, part no. RE196-108, are supplied with each **Red Jacket inventory sensor** and/or **line pressure kit** to be used for splicing the sensor/kit wires in all locations (i.e., manholes, junction boxes). The insulating resin protects wires from corrosion and provides a water-resistant seal.

CAUTION

Disconnect all power before installing the insulating resin.

All electrical work should be done in accordance with appropriate local codes.

Use with insulated copper wire only.

STEP 1. Match the proper wires together that run from the computer terminal strip and the sensor/or line pressure kit at the junction box. Follow appropriate wiring/installation instructions for the specific equipment to be installed.

STEP 2. Make sensor wire connections using the wire nuts provided.

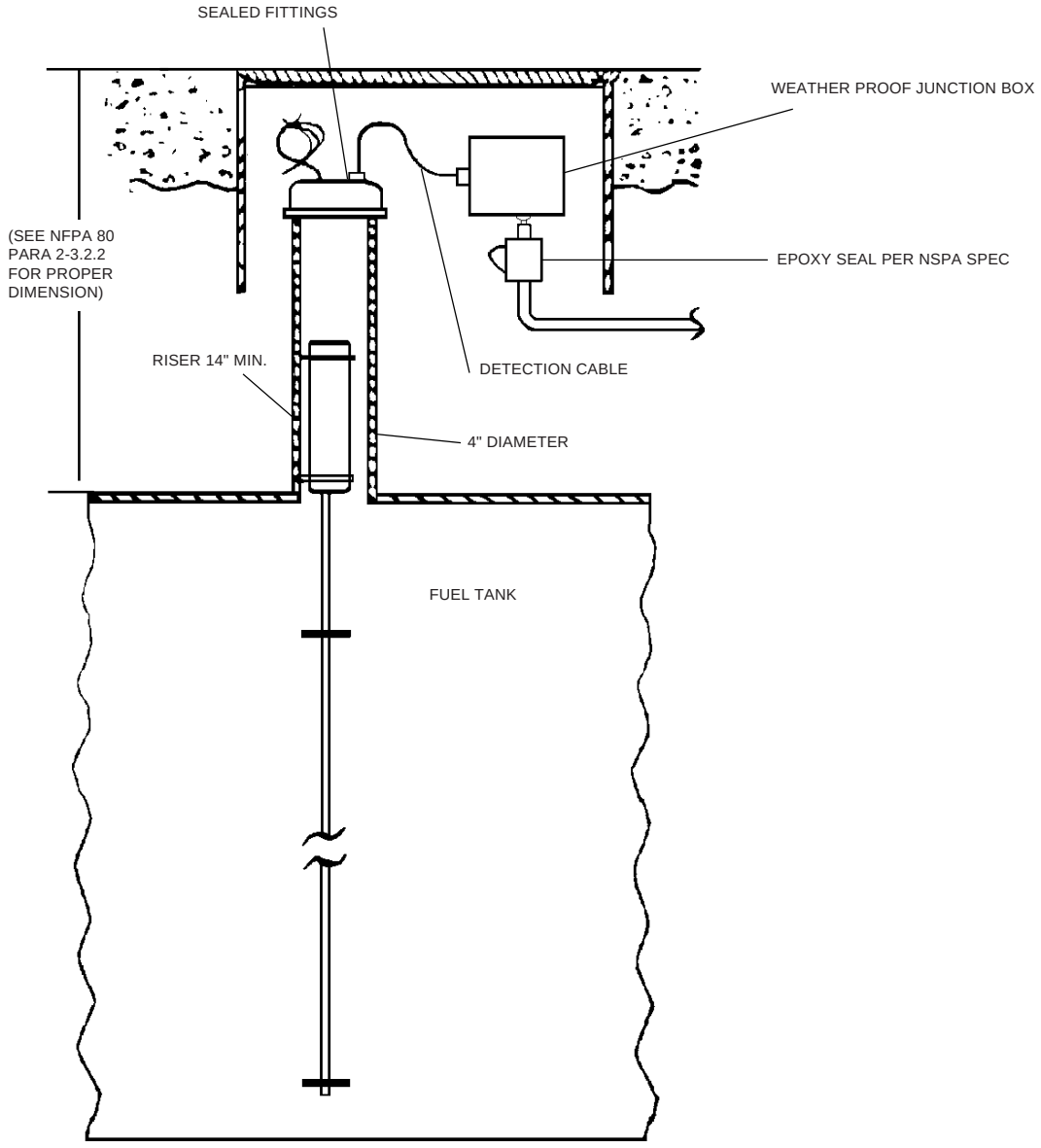
STEP 3. Remove the resin pouch from its package.

STEP 4. Squeeze the two resins together bursting the barrier between them. Mix the two parts together thoroughly.

STEP 5. Cut open one end of the resin pouch and insert all three wire nuts. Make sure they are completely coated with resin.

CAUTION

DO NOT TURN THE RESIN POUCH UPSIDE DOWN UNTIL IT HAS HARDENED.



NOTICE If the tank sensor exceeds the tank diameter (example: at 7' 6" tank can use an 8' sensor), the extra sensor height will extend into the riser pipe.

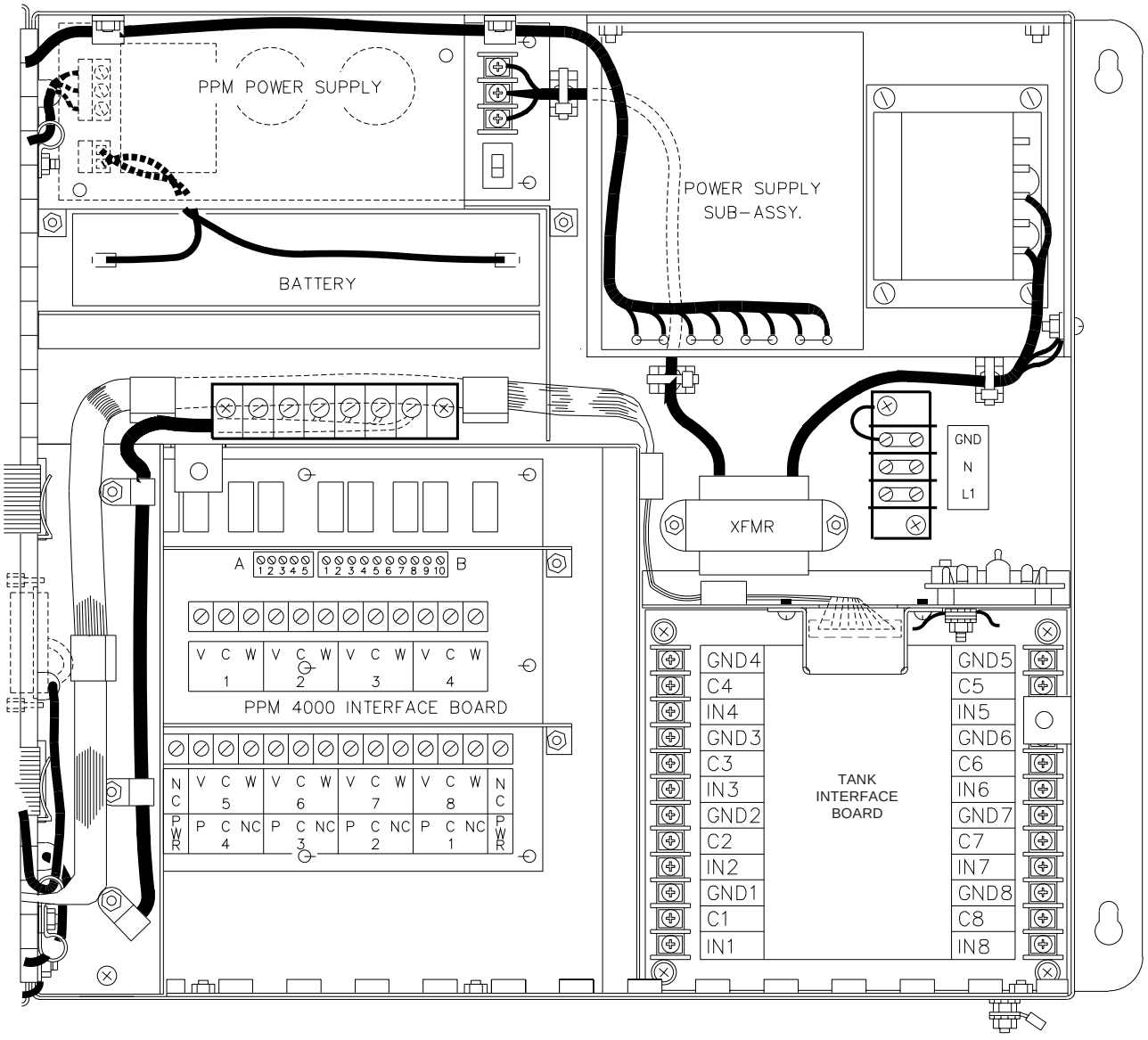
Step 1 Install sensor signal cable compression seal in 4" well cap provided with the float and cap kit.

Step 2 Install sensor signal cable through signal cable compression seal.

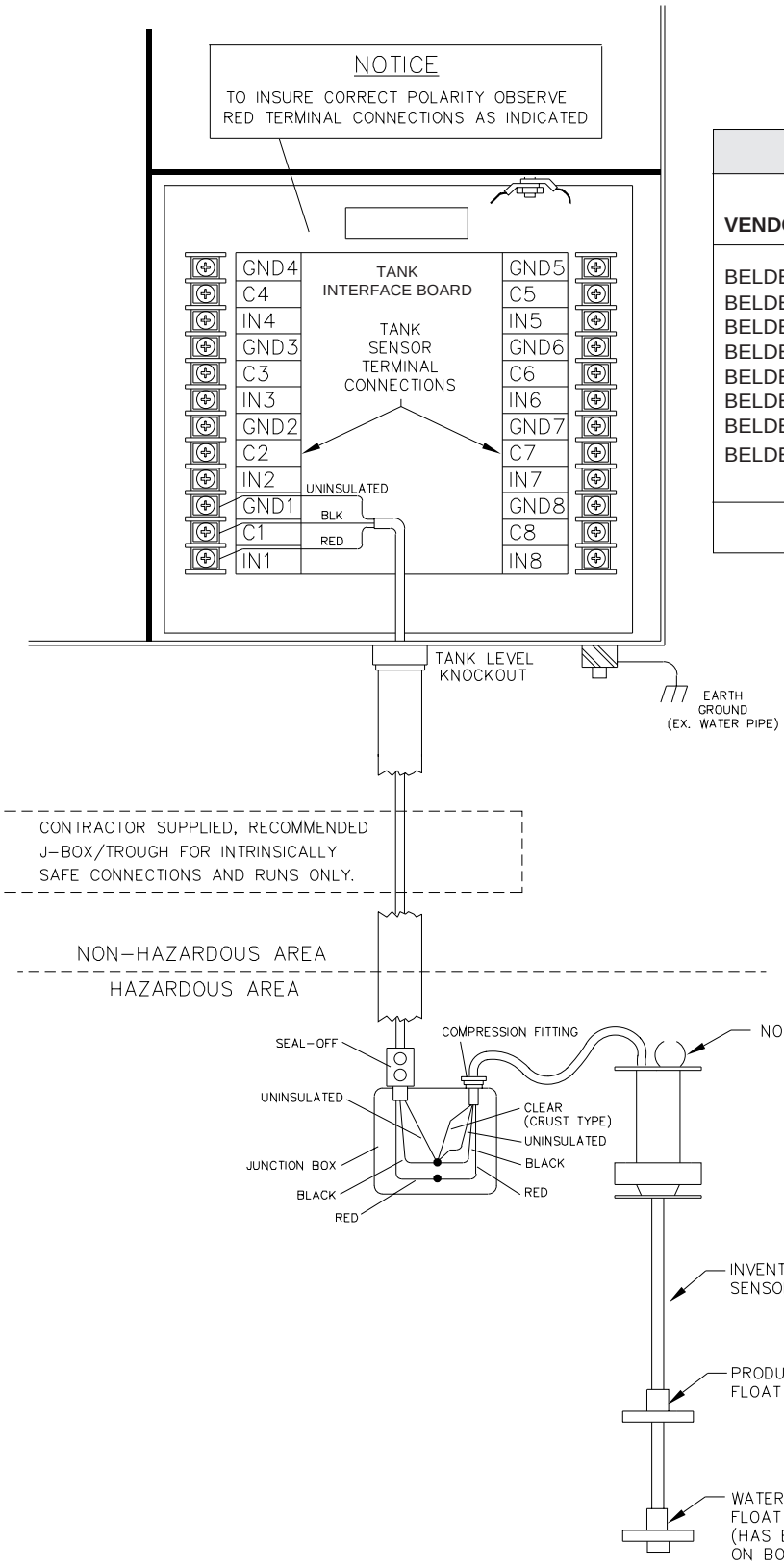
Step 3 Using sensor signal cable carefully lower sensor into tank until it rests on the bottom of the tank. Screw 4" cap onto riser pipe. Lubricate riser threads to allow easier cap removal.

Step 4 Pull sensor signal cable until light tension occurs on cable and tighten compression fitting.

RLM 9000
TANK SENSOR WIRING DIAGRAM

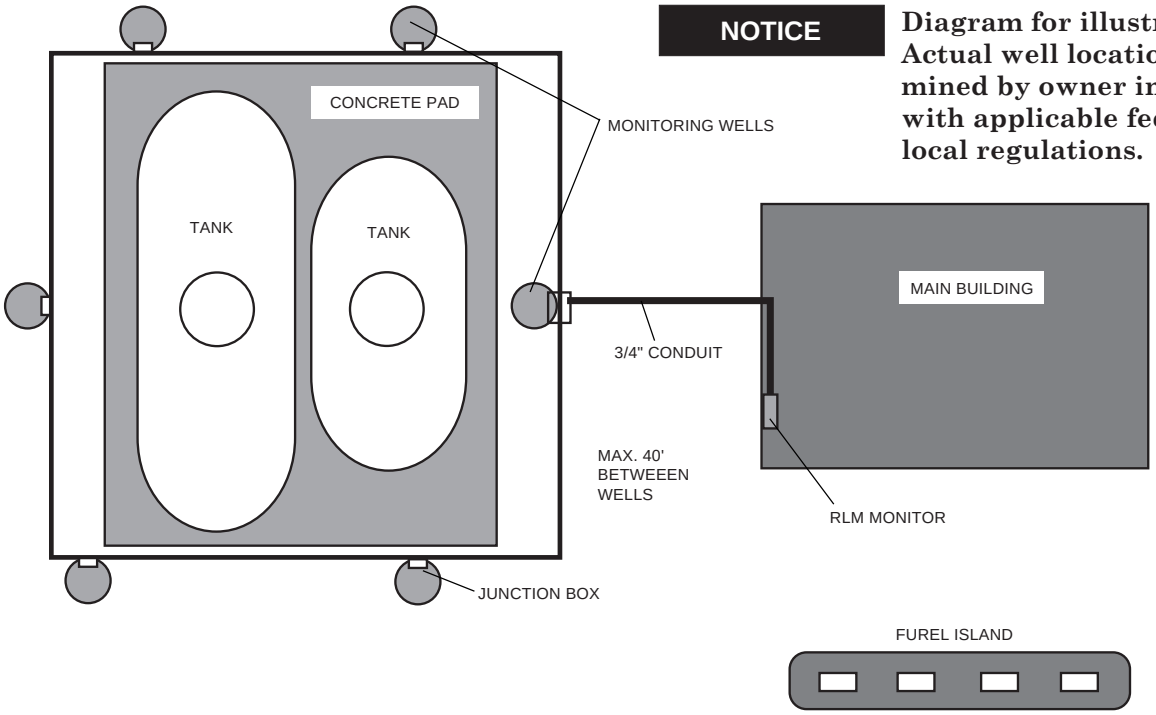


RLM 9000
TANK SENSOR WIRING DIAGRAM



RECOMMENDED CABLES		
VENDOR / MODEL #	**MAXIMUM DISTANCE**	**DIAMETER (INCHES)**
BELDEN #87760 (Teflon)	130 Ft.	.157
BELDEN #87761 (Teflon)	200 Ft.	.122
BELDEN #8762	265 Ft.	.204
BELDEN #8761	275 Ft.	.175
BELDEN #8760	295 Ft.	.222
BELDEN #9841	550 Ft.	.252
BELDEN #89182 (Teflon)	775 Ft.	.312
BELDEN #9182	1550 Ft.	.350
FOR ADDITIONAL CABLE SELECTIONS CONSULT FACTORY		

RLM 9000 VAPOR / CONDUCTIVITY SENSOR INSTALLATION (WELL APPLICATION)



NOTICE

Diagram for illustration only. Actual well location to be determined by owner in accordance with applicable federal, state and local regulations.

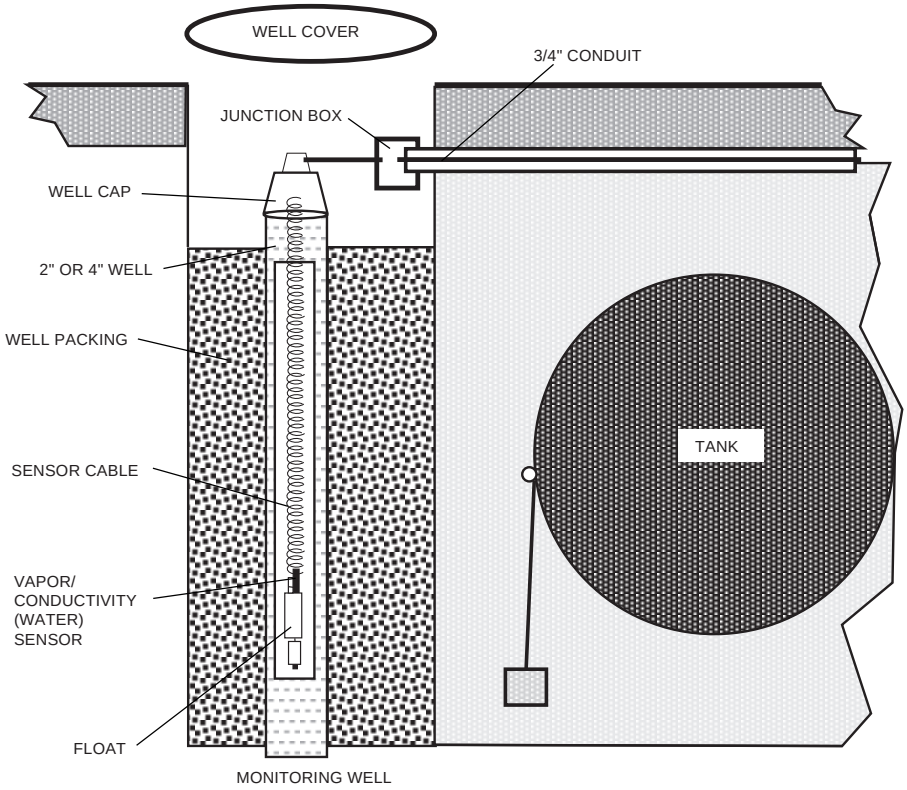
WELL SENSOR INSTALLATION

Install Sensor in 2" or 4" diameter schedule 40 PVC slotted well casing.

Maximum distance between sensors and RLM 5000/5001 Computer is 2000'.

NOTICE

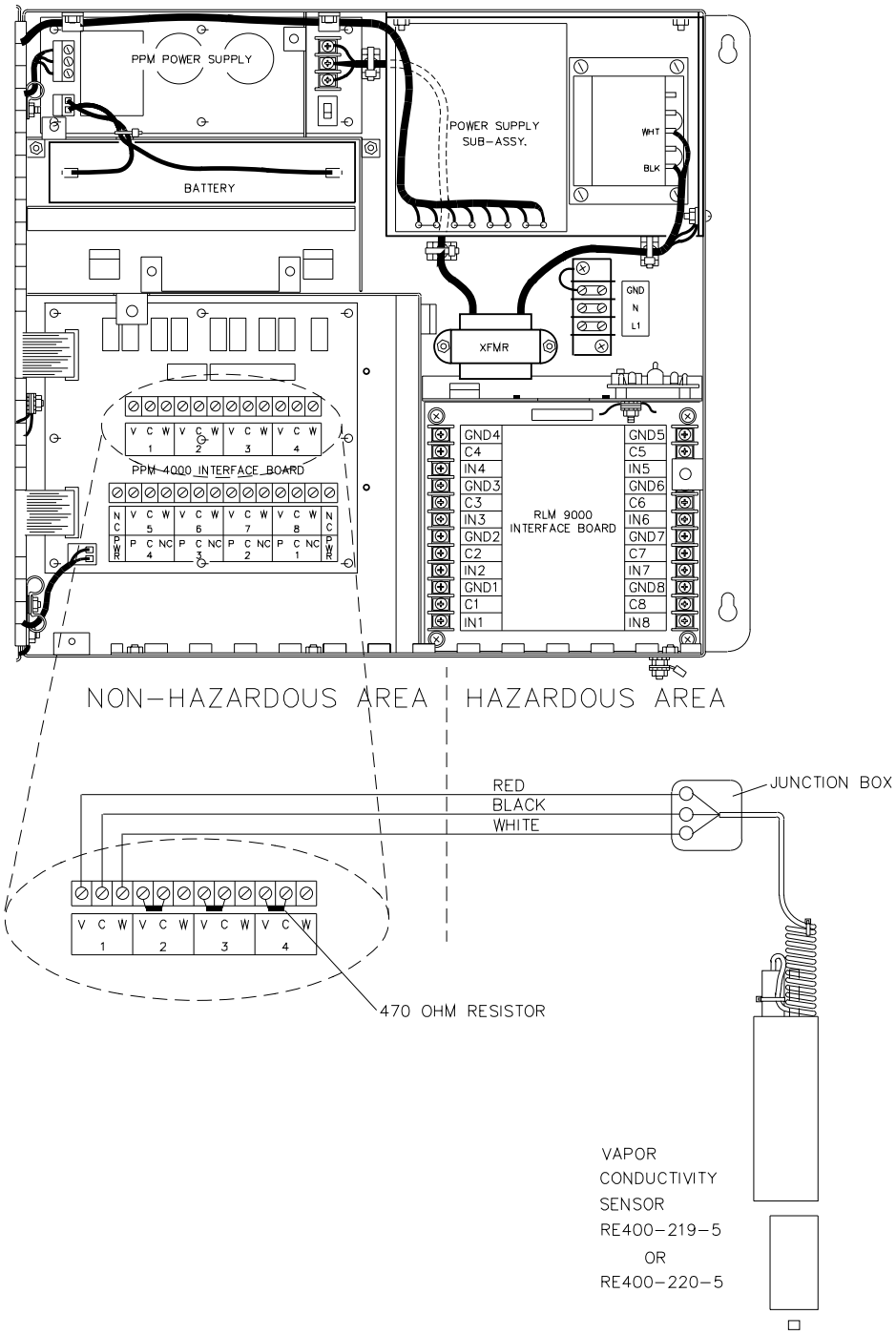
Use the water-resistant connectors (provided in packaging) to make wiring splices at the junction boxes.

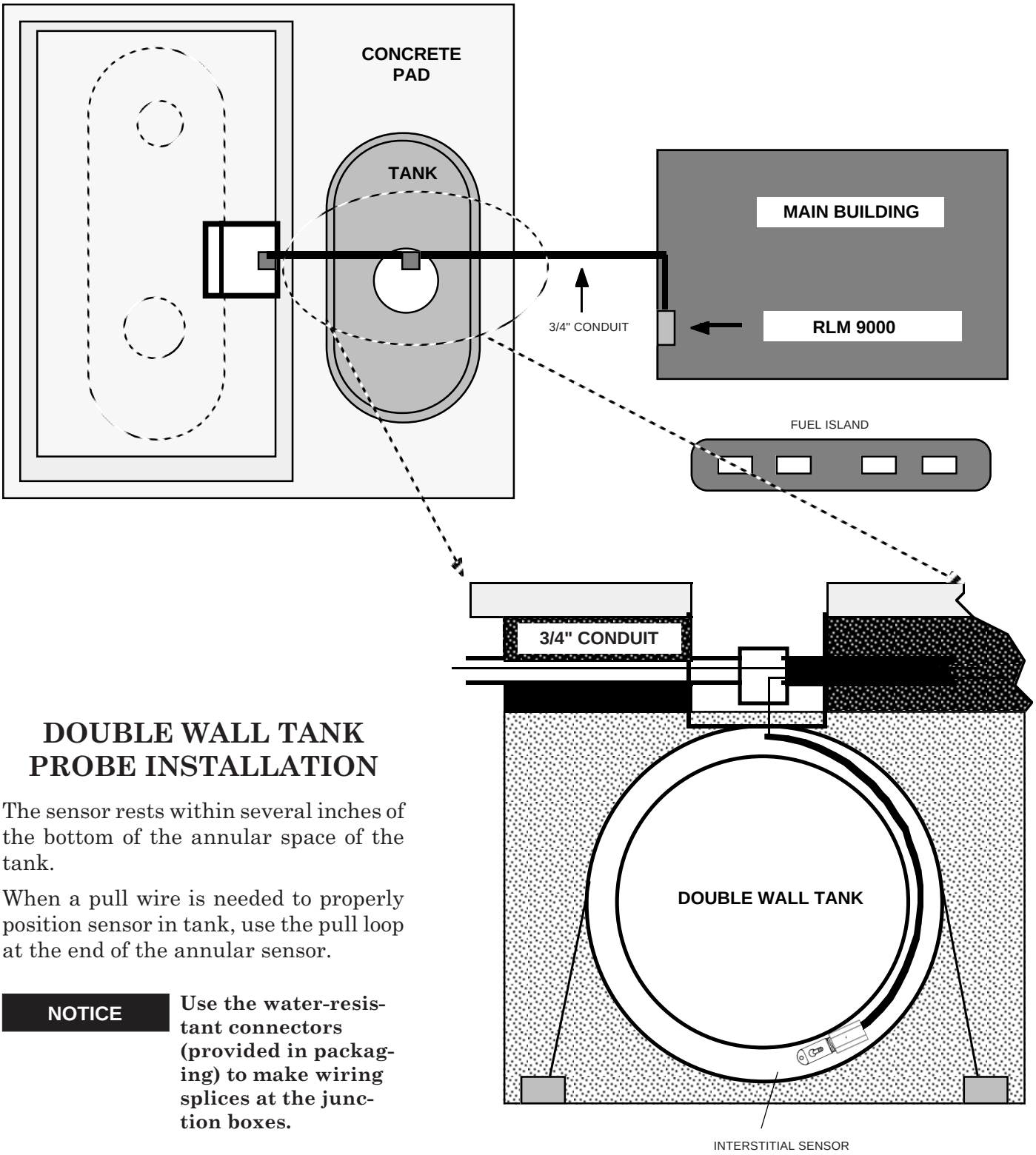


Run an 18 gauge, gasoline and oil resistant, 3 conductor cable from probes to RLM 9000 computer. Observe polarity. Red to vapor, black to common, white to water.

NOTICE **Watertight connectors must be used at all outdoor junction boxes.**

NOTICE **470 OHM resistors must be left in place if no probe is to be connected to terminal.**





DOUBLE WALL TANK PROBE INSTALLATION

The sensor rests within several inches of the bottom of the annular space of the tank.

When a pull wire is needed to properly position sensor in tank, use the pull loop at the end of the annular sensor.

NOTICE

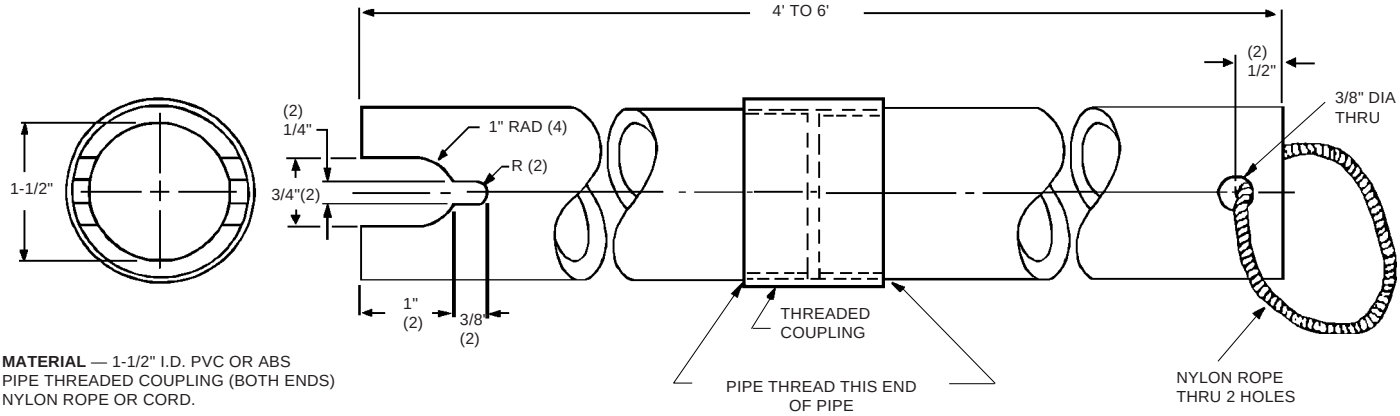
Use the water-resistant connectors (provided in packaging) to make wiring splices at the junction boxes.

1. Before installing annular space sensor, make sure a pull wire is already installed in the double-wall tank before the riser pipe is installed. If pull wire is not installed, use 1/8" fish tape to install pull wire if a riser pipe is NOT installed. Use a 1/4" fish tape when a riser pipe is already installed prior to the pull wire installation.
2. Tie one end of the pull wire to the pull cap on the annular space sensor.
3. Insert sensor gently into the tank fitting or riser pipe (whichever is applicable) and pull the opposite end of the pull wire simultaneously until sensor rests at bottom of the riser fitting.
4. **Reverse** Steps A through D below, utilizing the sensor tool to help sensor clear bottom of tank fitting and to establish proper position into the annular space of the tank. (See back of this page for instructions on how to make sensor tool.)
5. Mark pull wire with tape at top of the tank fitting or riser pipe (whichever is applicable) to serve as a reference point. Measure how far to pull sensor around the annular space of tank. Follow this formula:

   1.38 x *(dia. of tank in feet)* = *Total Length of Pull Wire Exposed*
6. After computing the total length in feet, measure from the tape mark that number of feet calculated to the top edge of the tank fitting or riser pipe, whichever is applicable. This will place the sensor in the appropriate area of the tank.
7. Secure end of pull wire for easy future access.
8. If riser pipe has not been installed at this point, do so. Be sure to cap the opening to keep moisture and/or foreign matter from entering into annular space of double-wall tank.

Doublewall Tank Sensor Tool

This drawing was designed to enable you to construct a tool to help in installing and removing an annular space sensor. This sensor tool can be made to any length. The optional threaded coupling makes it easy to break down for storage. Red Jacket does not manufacture this item.

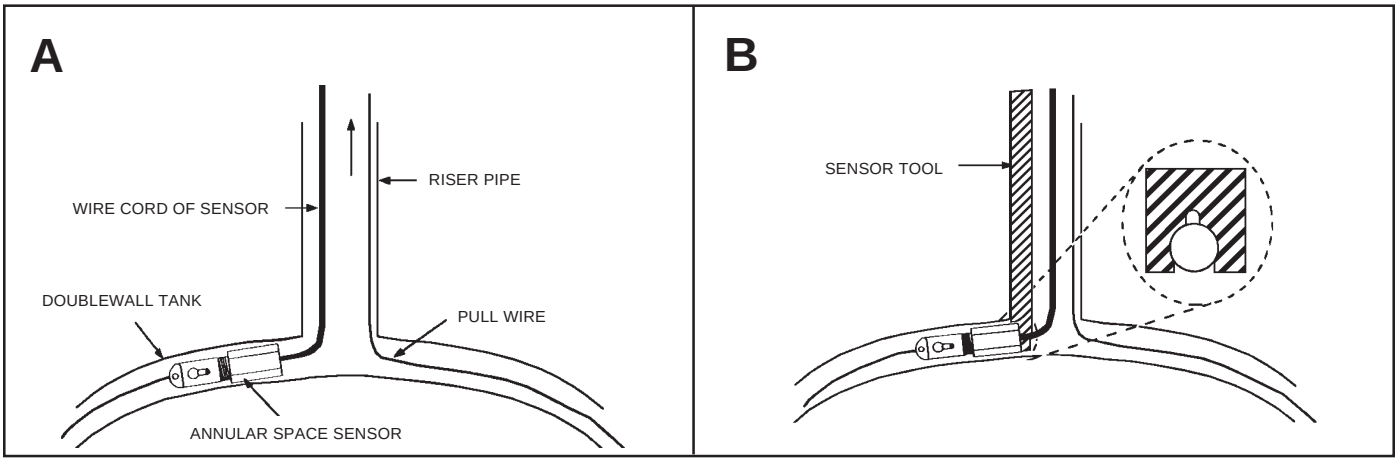


MATERIAL — 1-1/2" I.D. PVC OR ABS
PIPE THREADED COUPLING (BOTH ENDS)
NYLON ROPE OR CORD.

Instructions to Extract
Annular Space LRS/OLDS Sensor

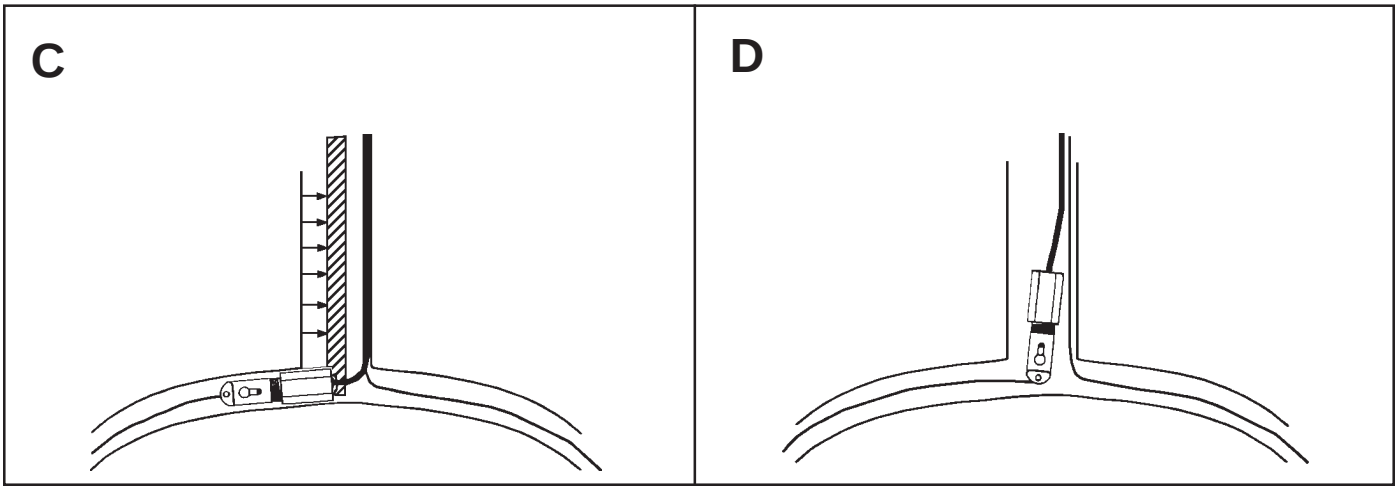
A. Loosen pull wire and pull wire cord of sensor gently until resistance is felt and top of sensor is showing at bottom of riser pipe.

B. Insert cut out end of sensor tool into riser and position over exposed end of sensor as illustrated. (See below for instructions on how to make sensor tool.)



C. Move sensor tool to clear sensor from bottom edge of riser fitting.

D. Remove sensor tool while at the same time gently pulling wire cord of sensor to lift sensor out of riser pipe.

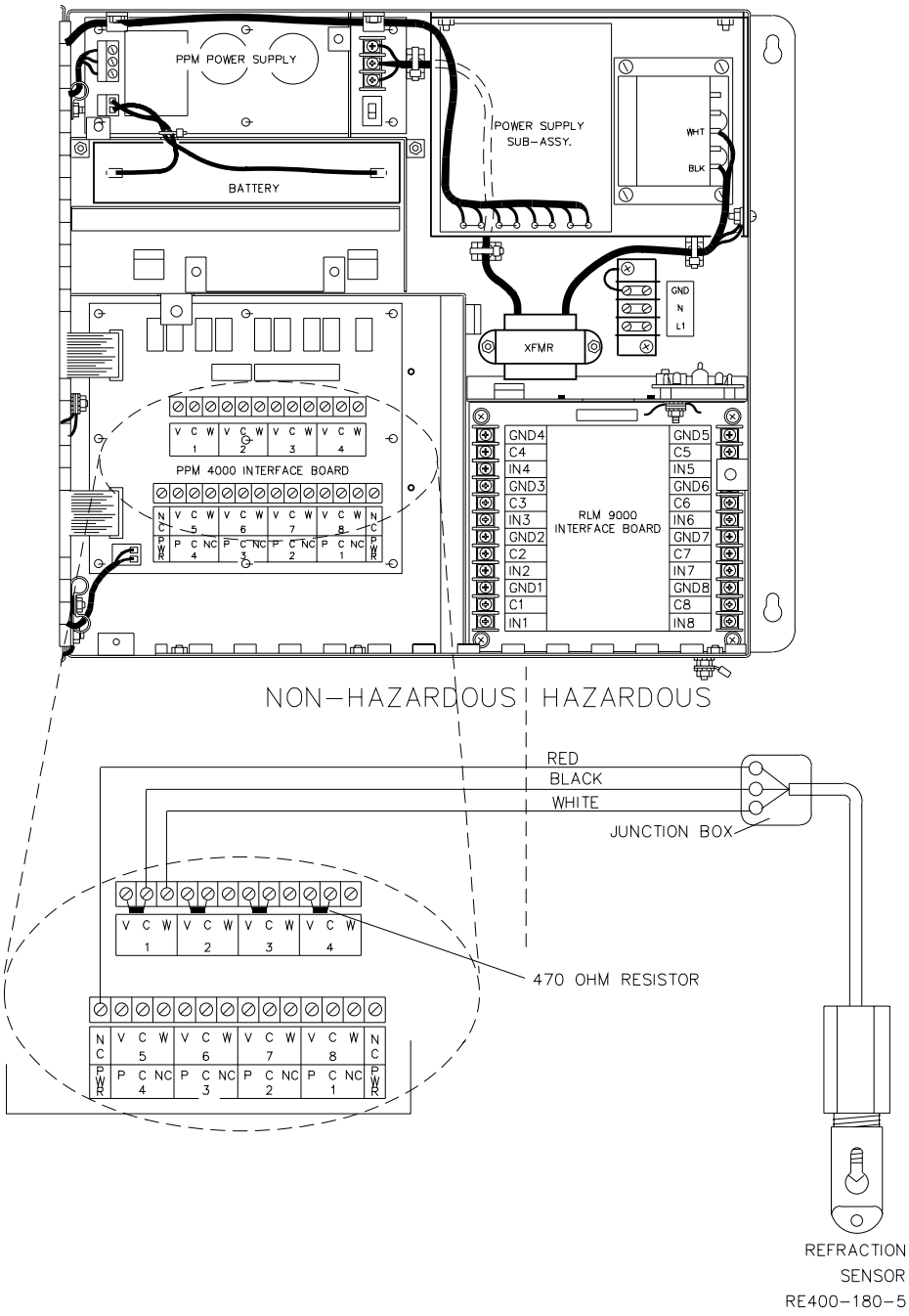


RLM 9000 LIQUID REFRACTION SENSOR (LRS) CONNECTION

Run an 18 gauge, gasoline and oil resistant, 3 conductor cable from probes to RLM 9000 computer. Observe polarity. Red to vapor, black to common, white to water.

NOTICE **Watertight connectors must be used at all outdoor junction boxes.**

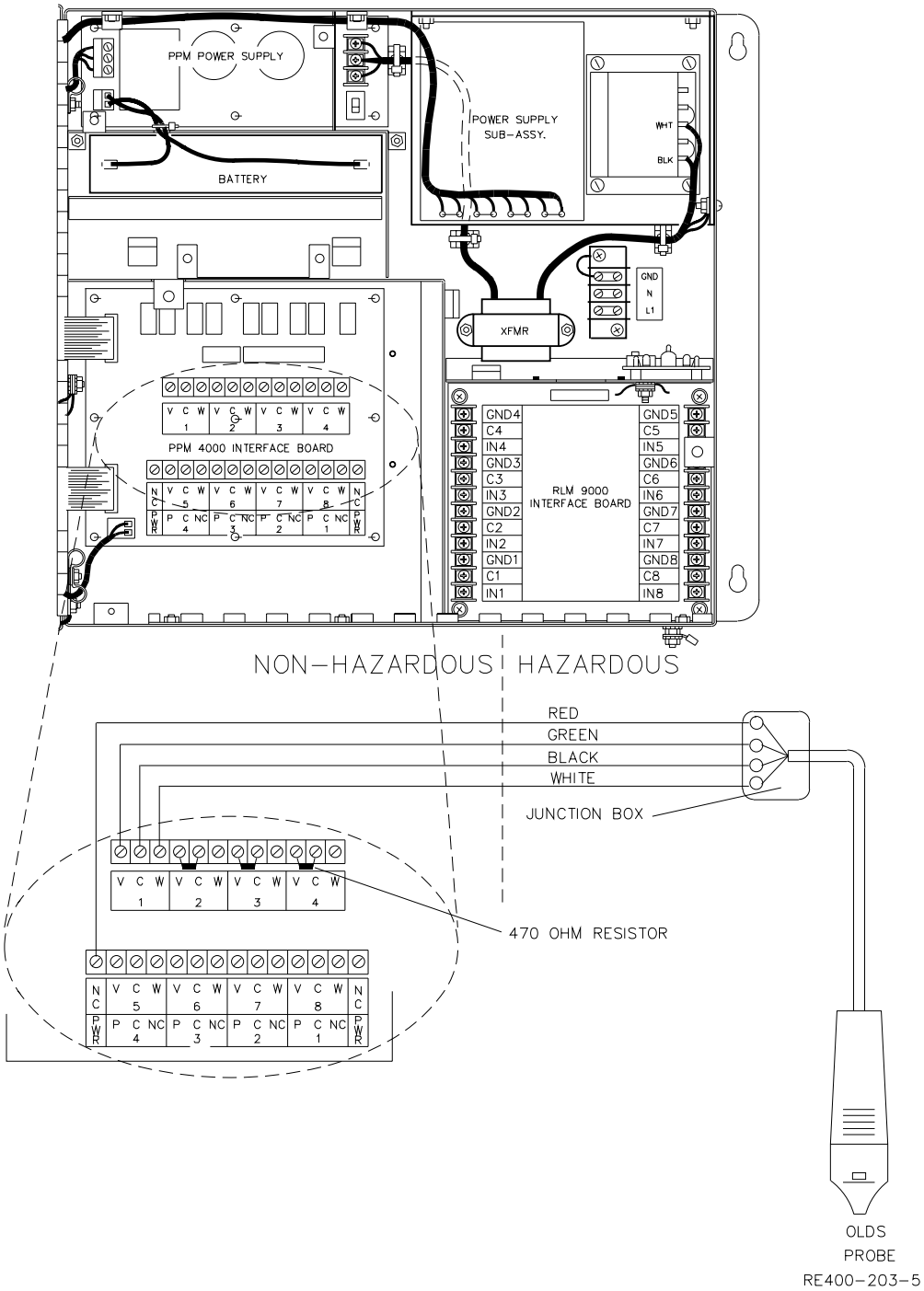
NOTICE **470 OHM resistors must be left in place if no probe is to be connected to terminal.**



RLM 9000 OPTICAL LIQUID DISCRIMINATION SENSOR CONNECTION

Pull an 18 gauge, gasoline and oil resistant, four conductor cable or four individual wires from each refraction sensor to the PPM unit. White to water, Black to common, Red to Power, and Green to vapor.

NOTICE **470 OHM resistors must be left in place if no sensor is to be connected to terminal.**

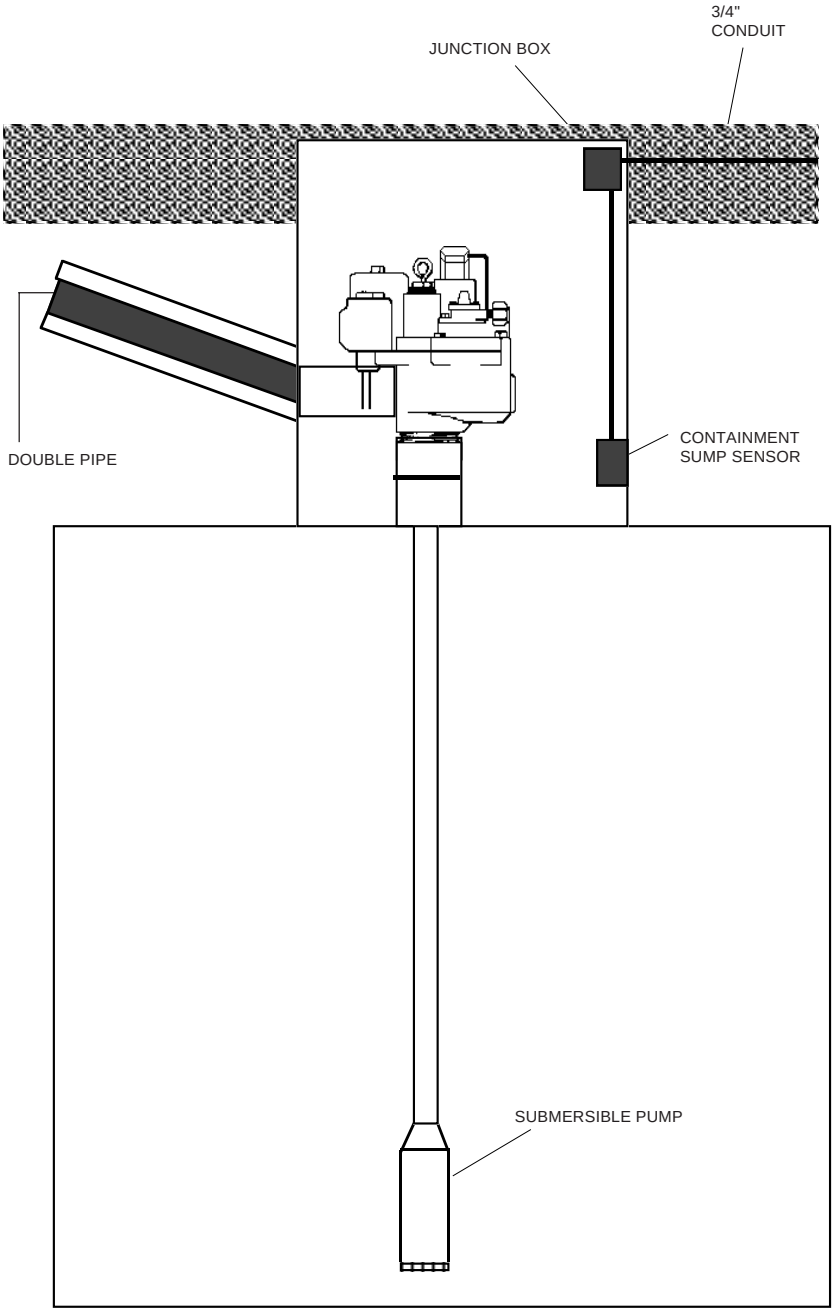


Containment Sump Sensor Installation

The sump sensor mounts to the wall of the containment sump using the bracket that the sensor comes encased in. Position the height of sensor in the sump to the level that activation is required.

NOTICE

Use the waterproof connectors (provided in packaging) to make wiring connections at the junction boxes. Maximum distance between sensor and RLM 5001 is 2000 feet.

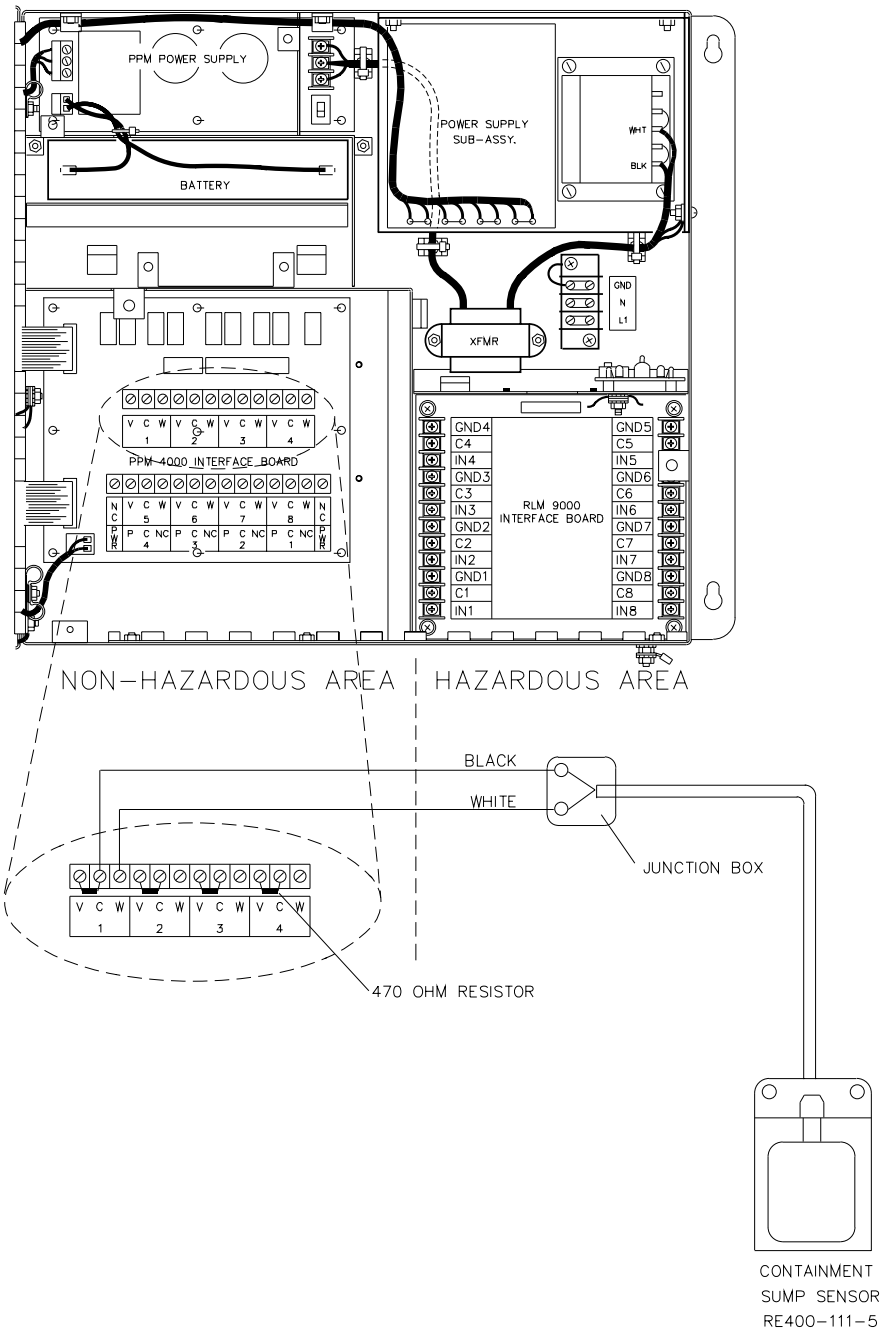


RLM 9000
SUMP SENSOR CONNECTION

Run an 18 gauge, gasoline and oil resistant, 2 conductor cable from sensors to RLM 9000 computer.

NOTICE **Watertight connectors must be used at all outdoor junction boxes.**

NOTICE **470 OHM resistors must be left in place if no probe is to be connected to terminal.**



1. Mount the monitor in a dispenser pan, sump or vault using existing mounting hardware, or attach it to a vertical pipe or riser by sue of a hose clamp or plastic wire tie.

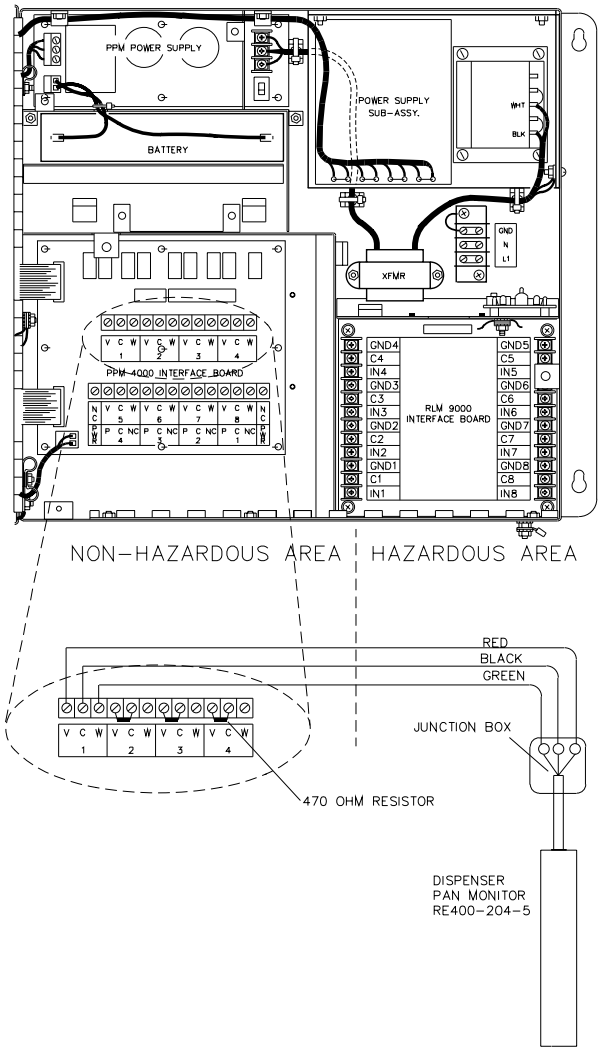
CAUTION **The installation of the sensor must not interfere with dispenser servicing or operation of the emergency shut off valve.**

2. Run 18 gauge, 3 conductor, gasoline and oil resistant cable from sensors to the control box. Maximum cable length is 2000.'

WARNING **Cable my be run only in dedicated conduit or conduit containing other gas and oil resistant intrinsically safe wires having minimum insulation thickness of 0.010 inches.**

3. To adjust the water alarm level, loosen the thumbscrew and slide it to the desired level at which the water alarm will sound. Tighten the thumbscrew after adjusting.

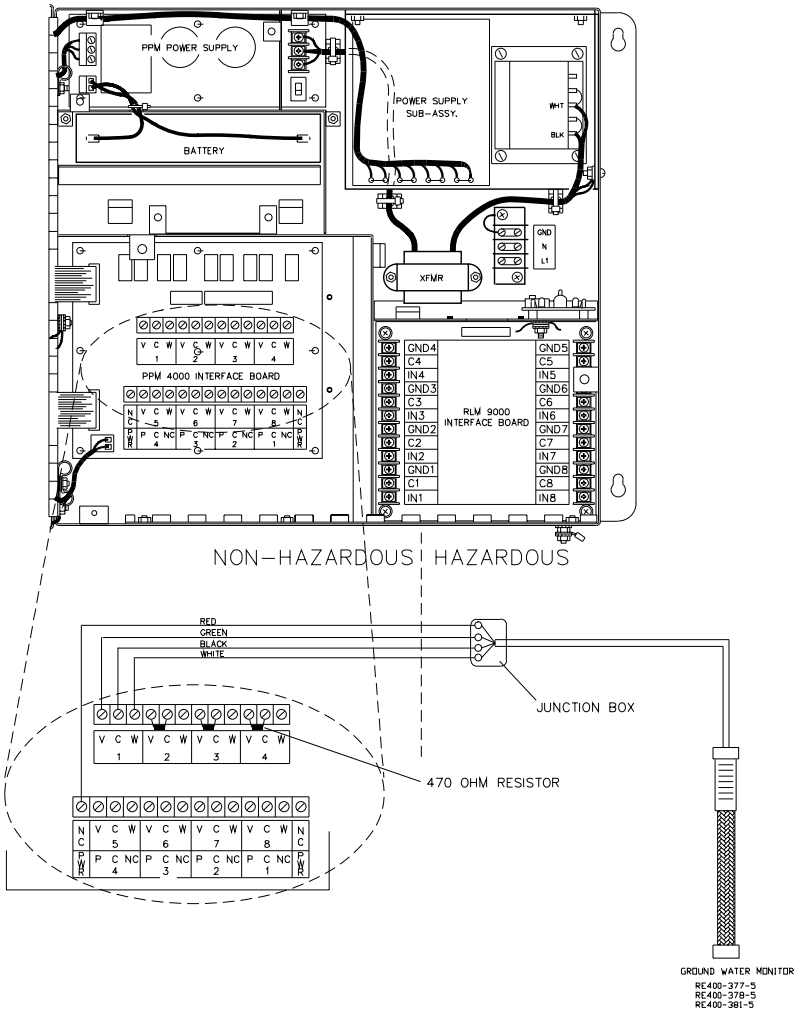
4. Remove the 470 ohm resistor for each channel used and connect the wires as follows: Red to "V," Black to "C." and Green to "W."



Groundwater Monitor (GWM)

RE400-377-5 (10'), RE400-378-5 (15'),
RE400-381-5 (20')

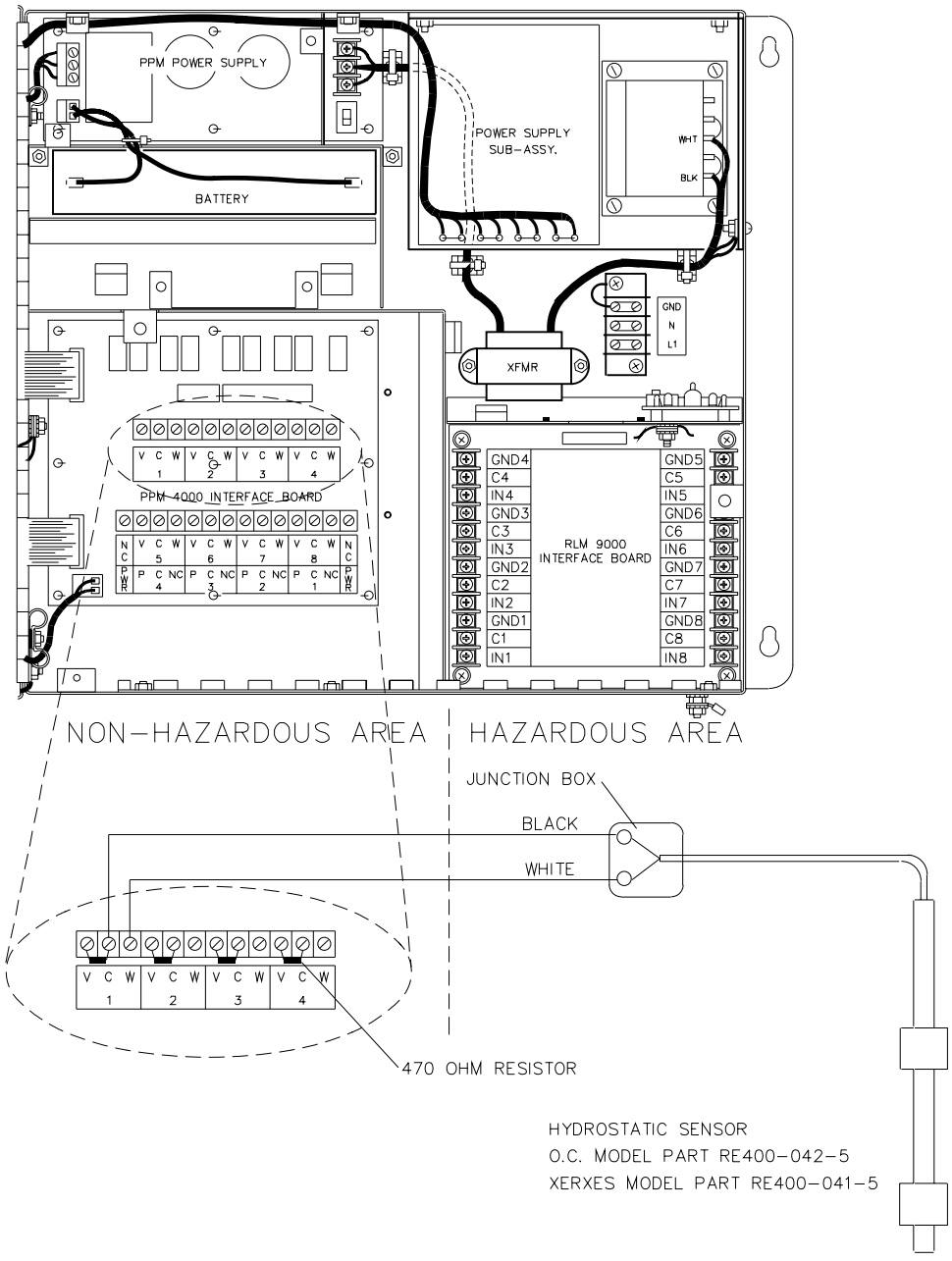
1. Drill a 1/2' hole into the top center of the monitoring well cap (installer supplied). Attach the supplied compression fitting through this hole.
2. Pull the GWM four conductor cable through the compression fitting as far as it will go. Tighten the compression fitting.
3. Measure the depth of the well from riser top to well bottom.
4. Lay out the GWM and measure from the bottom of the anchor, the length recorded in the above step.,
5. Loop any excess sensor cable between this point and the well cap and secure it to itself with the supplied wire tie. The object is to have the sensor cable hanging taut from the well cap to the well bottom without any slack.
6. Lower the sensor into the well and secure the sell cap.
7. Remove the 470 ohm resistor on each channel to be used, and with an 18 gauge gas and oil resistant cable, connect the signal wires as follows: Red to NC, Green to V, Black to C, White to W.



Run an 18 gauge, 2 conductor gas and oil resistant cable from the control unit through conduit to a junction box in the manway. Connect the two wires to the control units using the supplied Scotchlok connectors follows: Black to "C" terminal, White to "W" terminal.

NOTICE **The 470 ohm resistors must be left in place if no sensor is to be connected to the terminal.**

NOTICE **Water-resistant connectors must be used at all outdoor junction boxes.**

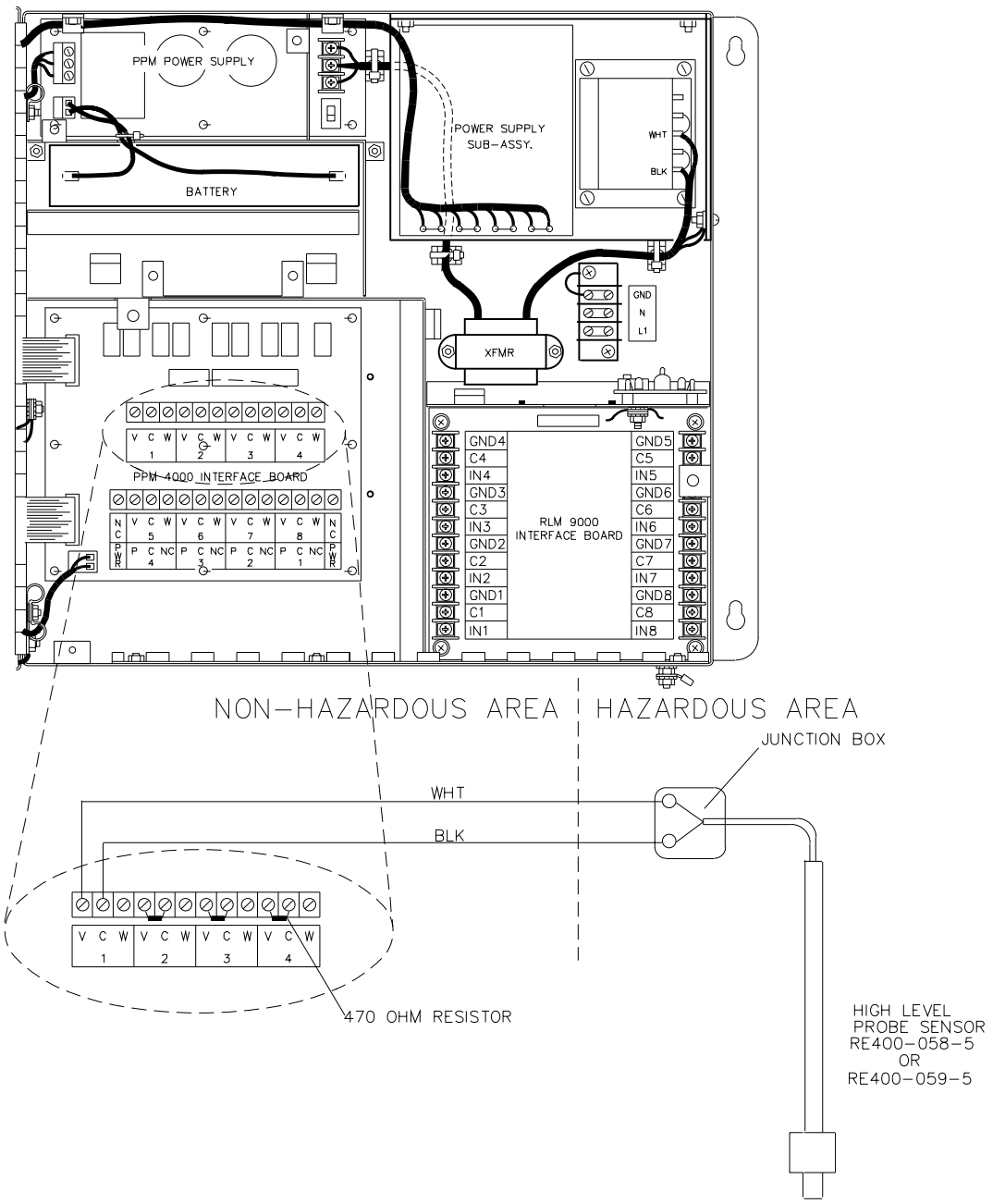


RLM 9000
HIGH LEVEL SENSOR

Run an 18 gauge, gasoline and oil resistant 2 conductor cable from the high level sensor to the RLM unit as follows: Black to "C" Terminal, Red to "V" terminal.

NOTICE **The 470 ohm resistors must be left in place if no sensor is to be connected to the terminal.**

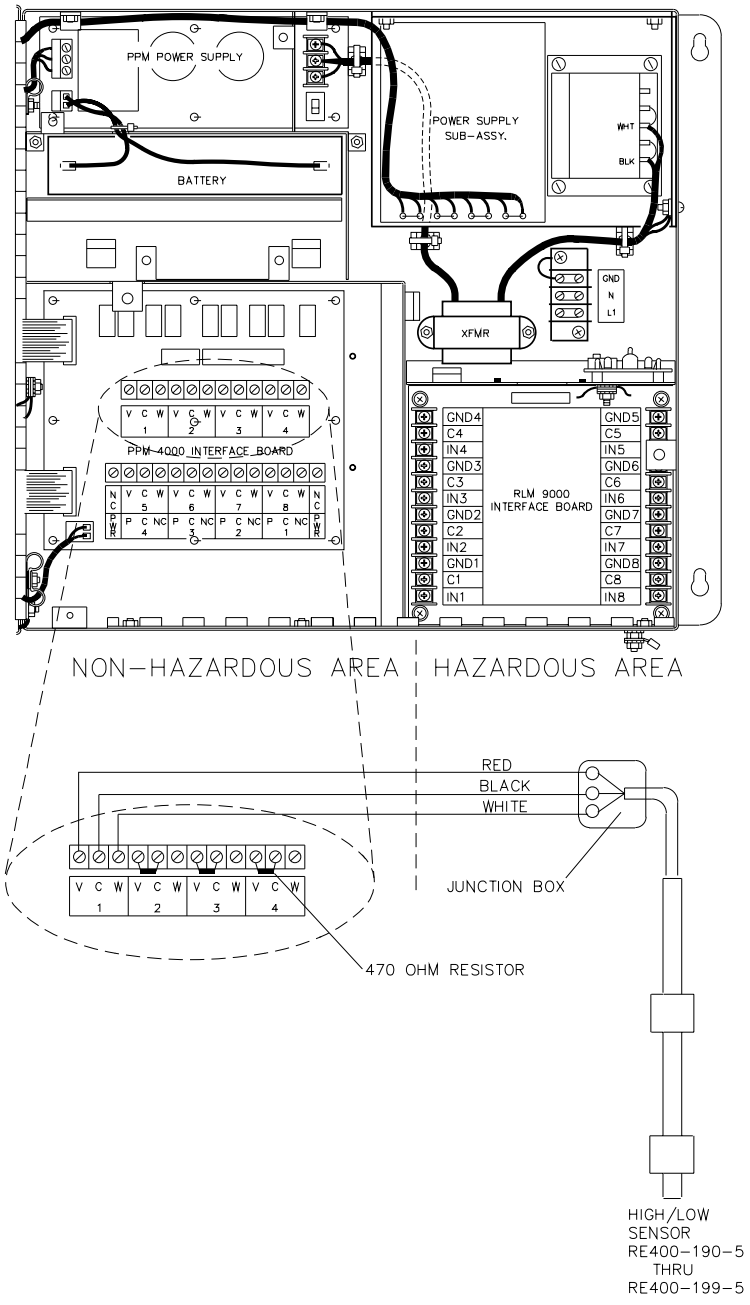
NOTICE **Water-resistant connectors must be used at all outdoor junction boxes.**



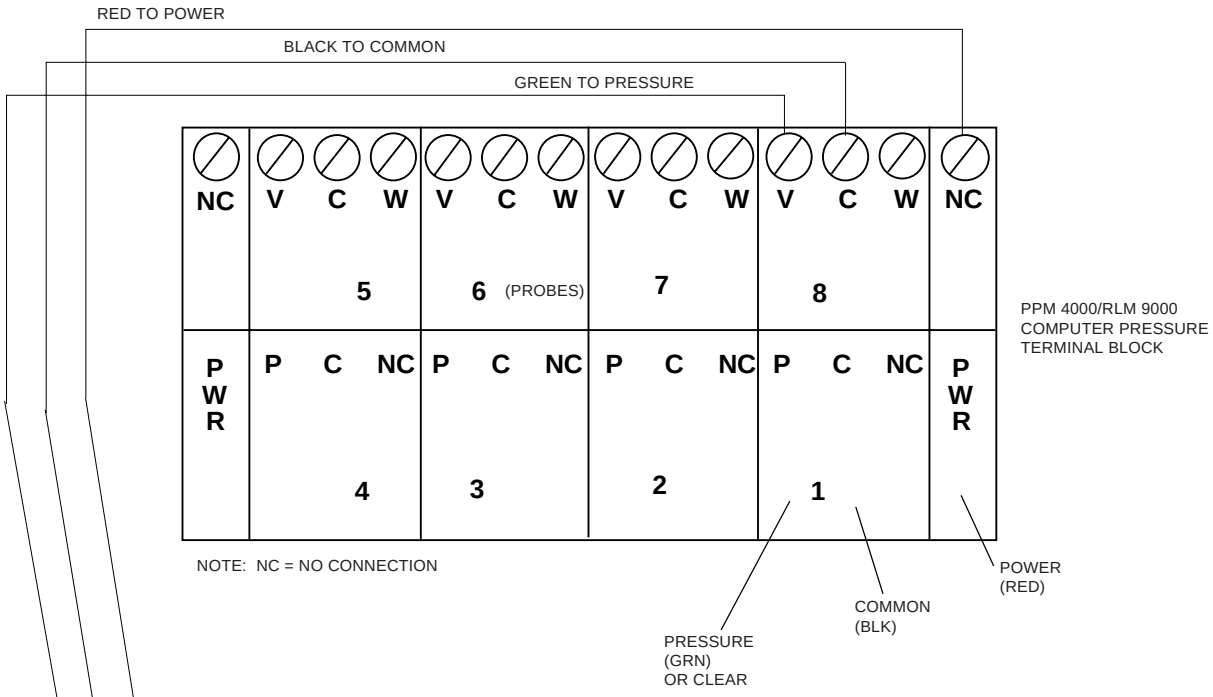
Run an 18 gauge, gasoline and oil resistant three (3) conductor cable or three individual wires from each sensor to the RLM 9000. Observe polarity: Red to "V" Terminal, Black to "C" Terminal, White to "W" Terminal.

NOTICE **The 470 ohm resistors must be left in place if no sensor is to be connected to the terminal.**

NOTICE **Water-resistant connectors must be used at all outdoor junction boxes.**

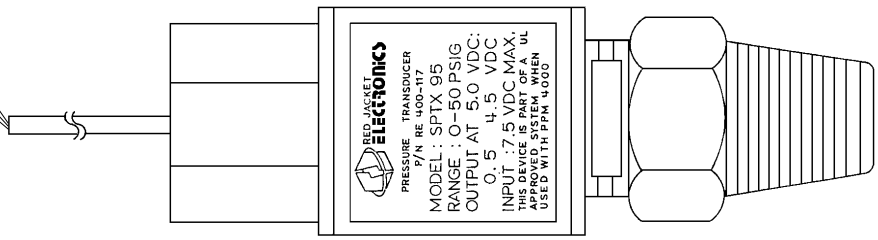


LINE PRESSURE KIT
TRANSDUCER INSTALLATION



Run a three (3) conductor 18 gauge, gas and oil resistant cable from product transducer to computer. **Observe polarity.** Red wire to power terminal - black wire to common terminal - green wire to pressure terminal.

Up to four (4) product line transducers may be installed. If less than four (4) product lines are to be monitored, the remaining terminals may be used for probe monitoring.



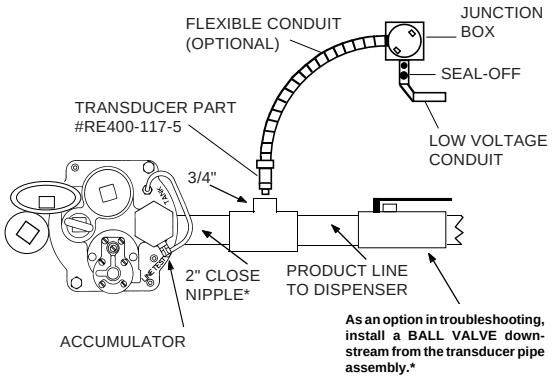
TRANSDUCER PART NO. RE400-117-5

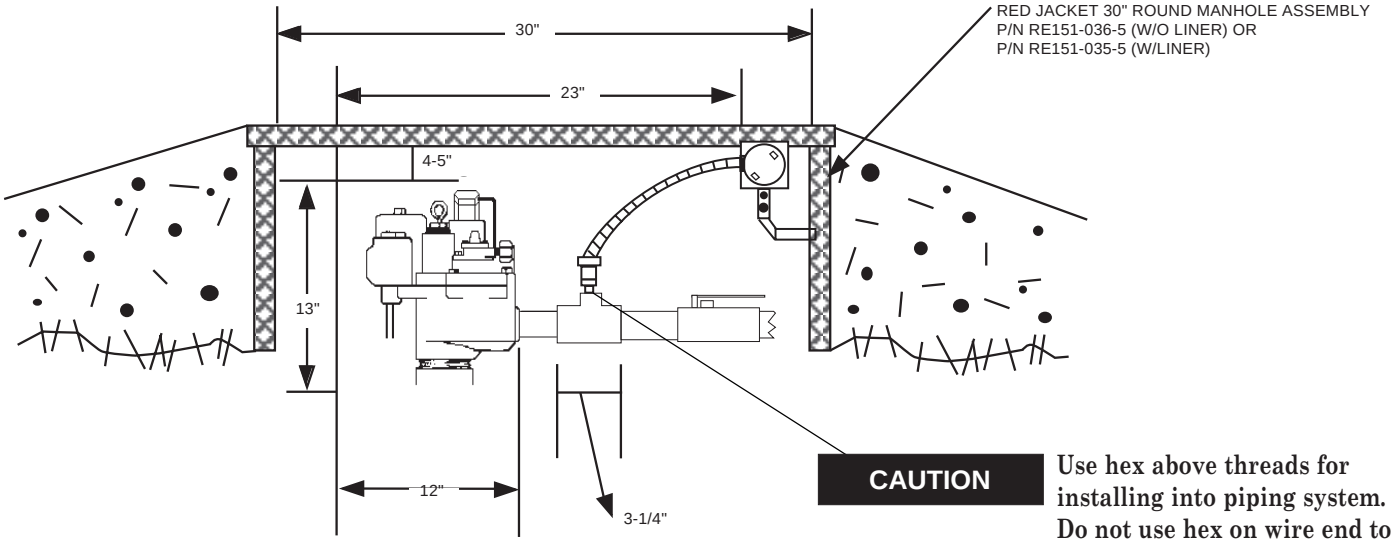
DANGER

To maintain intrinsic safety, all probe and transducer wiring must be installed within sealed conduit, separate from all other wires. Failure to follow these directions will result in severe personal injury, death or substantial property damage.

NOTICE

Use of conduit may vary depending on local codes — flexible conduit recommended.



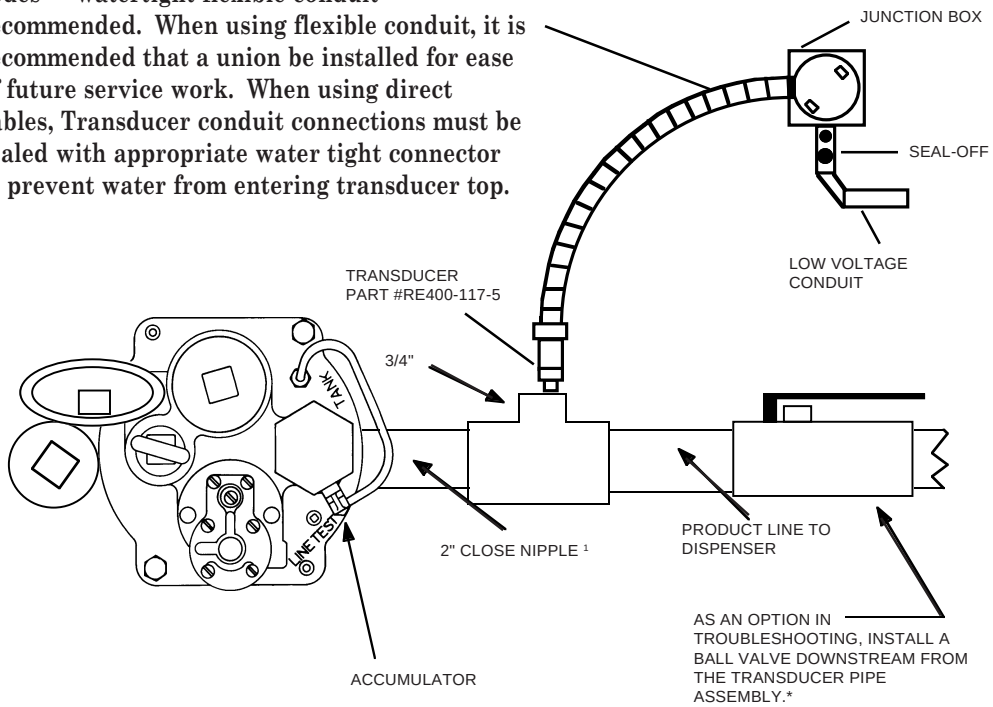


CAUTION

Use hex above threads for installing into piping system. Do not use hex on wire end to fasten into piping system. When attaching conduit fitting, use wire side hex to steady transducer.

NOTICE

Use of conduit may vary depending on local codes — watertight flexible conduit recommended. When using flexible conduit, it is recommended that a union be installed for ease of future service work. When using direct cables, Transducer conduit connections must be sealed with appropriate water tight connector to prevent water from entering transducer top.



Recommended* Direct Bury Cable [2]		
* If approved by State/Local Regulations		
Manufacturer / Model Number		No.of Conductors
Belden	88489	4
Belden	85102	2
Belden	85103	3
Belden	85105	5
Belden	85107	7
Belden	85109	9
Carol	02769	2
Carol	02769	3
Carol	02770	4

NOTICE

Only installation of cable hook up is necessary. Mount transducer as close to pump discharge as possible. Never mount transducer on a plane that differs from pump discharge more than 1.' The position of the transducer, in relation to the line, does not affect the operation of the system.

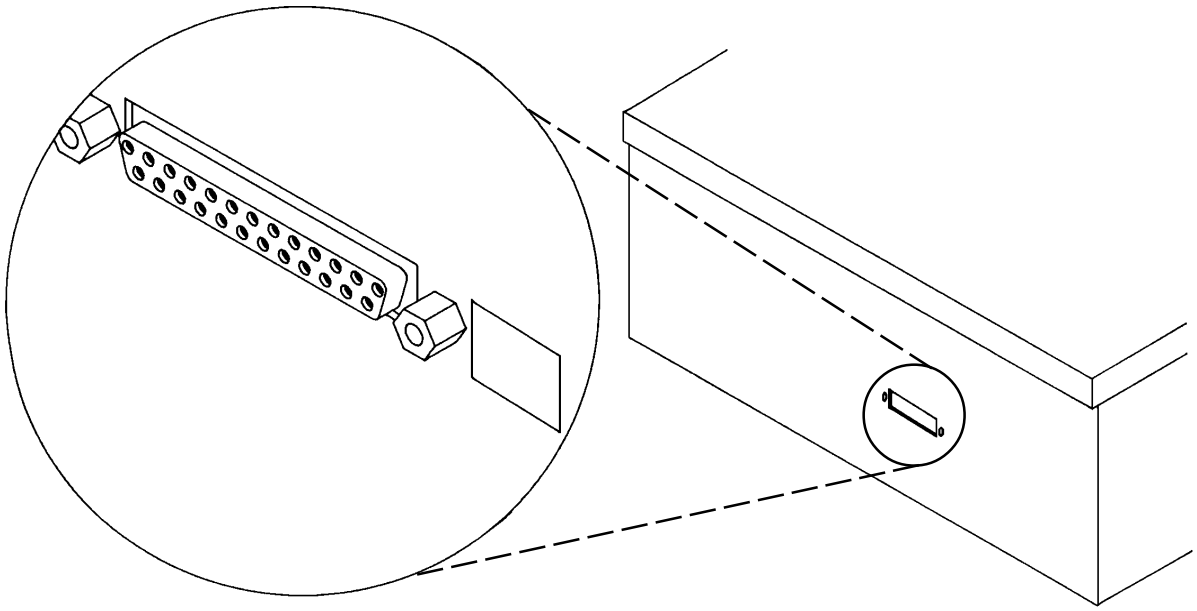
[1] Installer supplied.

[2] When using Direct Bury cable, conduit is not required once the cable leaves the building.

A connector is provided on the RLM 9000 for RS-232C interface as shown in the illustration below.

The connector is provided for local connection to other RS-232C compatible devices. Equipment connected to either RS-232C Port should have an RS-232C communication protocol, be UL Listed and should not be installed in or over a hazardous location.

It also provides a connection from the monitor to a locally obtained AT Command Set compatible modem for auto-dialing operation. Connection to this port requires Five (5) conductor communication cable (locally obtained).



Pin Designations			
7 Pin J-9 MPU Board	**25 Pin "D" Connector, Female, DTE**		
	Term. No.	**Function**	**Input/Output**
GRN	2	TXD	0
RED	3	RXD	1
BLK	7	CKT Common	
BROWN	8	DCD	1
WHITE	20	DTR	0

The following are error codes and their explanations. These will appear on the LCD display under the conditions listed.

Alpha Error	Error encountered in API temperature compensation routine, calculating alpha. Probable cause: special temperature compensation not programmed correctly.
API Error	Error encountered in API temperature compensation routine. Probable cause: special temperature compensation not programmed correctly.
FLT Missing	System not receiving pulse from second float. Probable cause: water float missing or system setup for two floats when only one is present.
Level Error	Error encountered while calculating level.
Net Error	Error encountered while calculating net volume.
RTD TBL Error	Error encountered in RTD table. Probable cause: Number of RTD's programmed does not match number of table entries.
Sync Error	System cannot synchronize on sensor data. Probable cause: sensor length programmed wrong, defective sensor, or faulty wiring.
Table Error	Error encountered in special tank or special compensation. Probable cause: input data out of range of values programmed in table.
Temp Error	Error encountered while calculating temperature.
Time Out or No Probe	System is getting no response from sensor. Probable cause: defective sensor, defective barrier, faulty wiring, hardware failure.
Ullage Error	Error encountered while calculating ullage.
Volume Error	Error encountered while calculating volume.
WD Timeout	Self diagnostic reset has occurred.
WTR Volume Error	Error encountered while calculating water volume.

CONDITION	POSSIBLE CAUSE
1. No L.E.D. Power Indicator on right or left side of power control board.	A. Right L.E.D. indicates power from source. If no L.E.D. inspect wiring to breaker panel. B. Left L.E.D. is power on opposite side of switch and fuse. Change switch position or check fuse.
2. No LCD Readout.	A. No power on system. B. Loose connector from MPU board to display.
3. Keypad Not Responding to Commands.	A. No power to MPU board. B. Loose connection from MPU to keypad board. C. Faulty MPU board or keypad board.
4. Unit Loses Programming Upon A/C Power Loss.	A. Test battery for proper 3VDC. B. Inspect battery to insure good connection in socket. C. Check solder joint of socket to MPU board.
5. Printer Inoperative.	A. Paper improperly fed. B. Loose connector from MPU board. C. No power to MPU board. D. Head bound, attempt to move to one side and cycle unit power. E. Faulty printer or MPU board.

CONDITION	POSSIBLE CAUSE
6. Inaccurate Product Levels	A. Insure dimensions of tank are properly programmed. B. Gradient improperly programmed. C. Sensor length improperly programmed. D. Tank tilted. E. Sensor not fully seated in tank. F. Insure that there is less than 1 OHM resistance between ground lug of tank sensor interface board and chassis ground.
7. Unit Displays GROSS 1 * * TIME OUT **(No Communications)**	A. Unit cannot communicate with sensor, inspect all wire connections and OHM test wires to sensor. B. Test positive and negative lugs of tank sensor interface board for 24 VDC without sensor inline or 20 VDC with sensor online, if 0 VDC is present, interface board is possibly faulty. C. Faulty sensor. D. Loose connections between interface board and MPU board.
8. Unit Displays GROSS 1 * * SYNC ERROR **(Faulty Communications)**	A. Inspect wires, perform OHM test. B. Loose connection between interface and MPU board. C. Faulty sensor.
9. Continuous Theft Alarms	A. Unit is in sleep mode. Inspect time for correct A.M. or P.M. B. Check programming for sleep mode.

SECTION B

PROGRAMMING

This section provides instructions for programming the RLM 9000 system, tank gauging / leak detection portion. A menu tree serves as a table of contents for locating specific programming areas. The key board and locating LCD display are explained followed by directions for entering the Set Up Mode which allows programming of the unit. Programming instructions are formatted with a side heading to advise the current position within the menu system at each step. Headings across the top of each page designate the current main menu.

*** Programming of the line pressure portion of the RLM 9000 begins on page B51.**

A programming worksheet is included at the end of this section pp. B49-B50. This worksheet should be used to keep a record of the specific data programmed into each RLM 9000 unit.

WARNING All installation and programming of the RLM 9000 system should be performed by personnel who are trained and qualified to do so.

MENU TREE

NOTE: Parenthesis designate how display will indicate headings if different. Headings to far left indicate Main Menu. Headings that are second indention from left indicate Sub-Menu. Headings that are third indention from left indicate Sub-Menu features.

NOTICE **CALL NO. 2-4 SAME AS CALL NO. 1.**

NOTICE **TANKS 2 - 8 SAME AS TANK 1**

NOTICE **SCHEDULED TESTING FOR TANKS 2 - 8 SAME AS TANK 1**

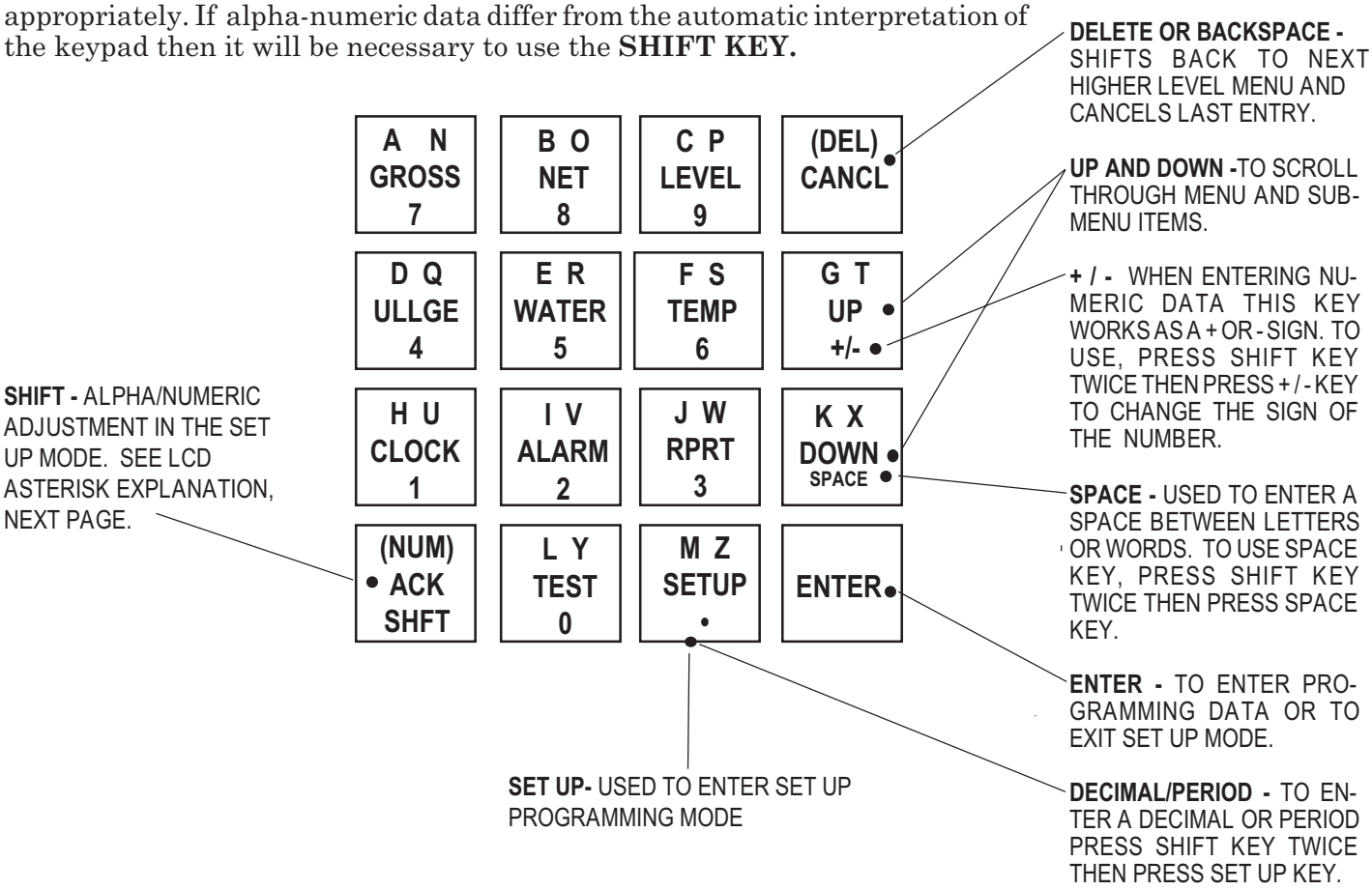
The RLM 9000 has two keypads. For programming or inquiry of the tank gauging/leak detection portion, use the keypad on your right when facing the box. (See illustration below.) NOTE: The keypad on the left is for use in programming the line pressure monitoring system.

The keypad for tank gauging has two modes:

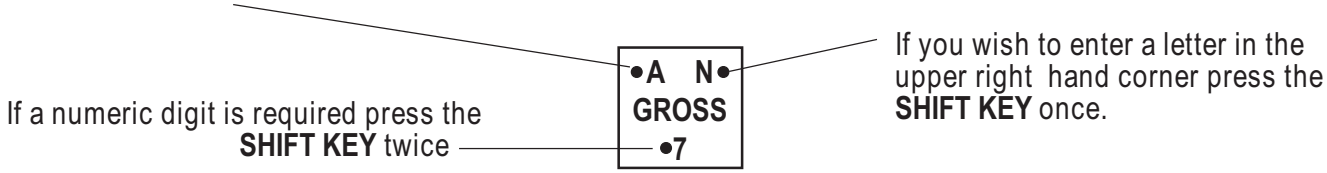
One mode is for the **basic operation of features**. This includes viewing tank levels, fluid temperature, volumes, water level, printing reports and initiating tests. Refer to Section C of this manual for complete instructions regarding this mode.

The second mode is the **Set-Up Mode, (programming)** which allows the input of site specifications including type of tanks, product, generation of automatic reports and leak tests. In the Set up Mode (Programming) the keypad is used to scroll through the Menu System and enter alpha-numeric data.

The RLM 9000 interprets the keypad in a context sensitive manner. For example, in those places where a numeric answer is required, the keypad will automatically interpret the keypad as numeric. **UP, DOWN, ENTER, OR CANCEL** are required to scroll through the menus, the keys will be interpreted appropriately. If alpha-numeric data differ from the automatic interpretation of the keypad then it will be necessary to use the **SHIFT KEY.**

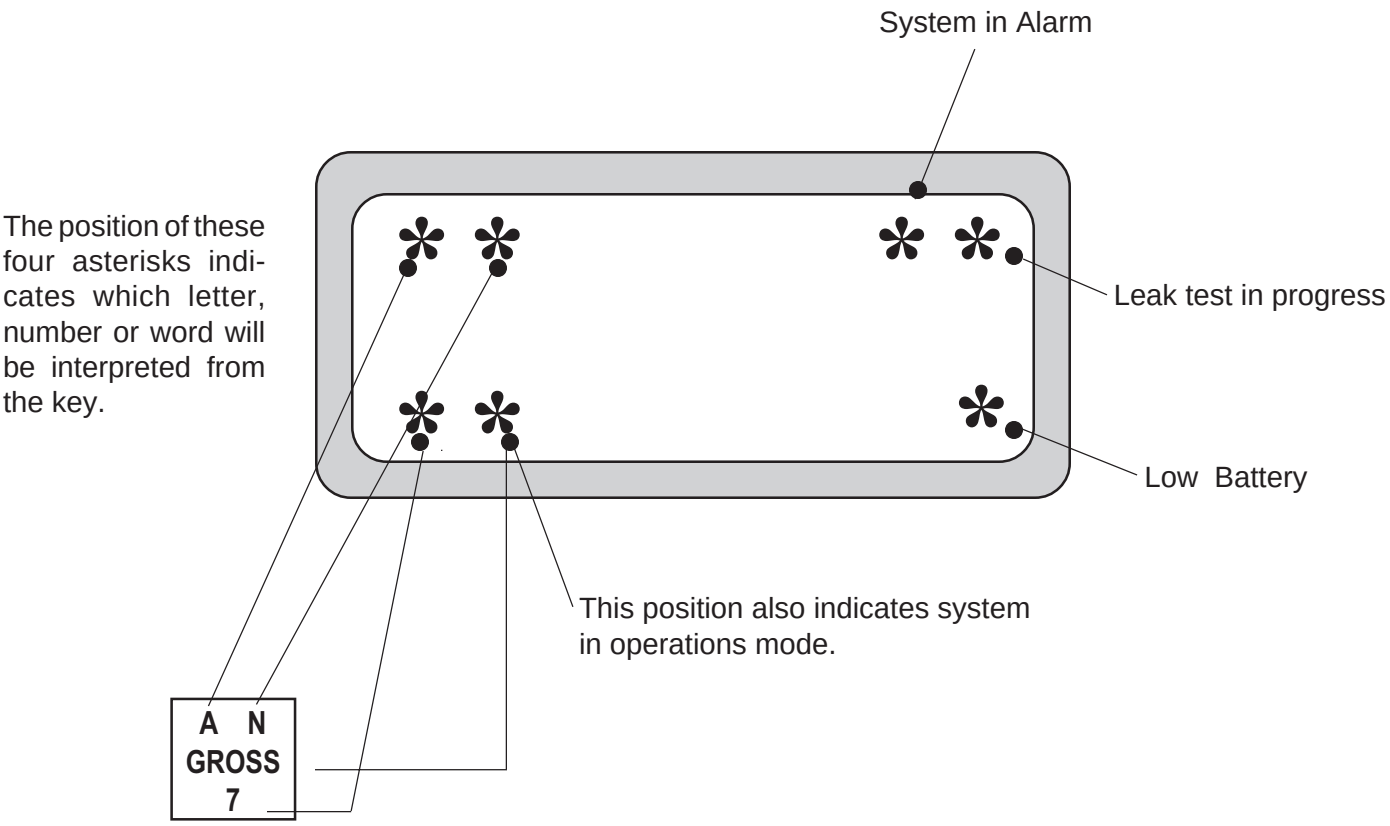


In the set up mode the RLM 9000 will default to the letter in the upper left hand corner



NOTICE **The program will return to normal operation automatically 3 minutes after the last key is pressed.**

LCD ASTERISK EXPLANATION



The SET UP MODE offers a "menu" with 3 programming fields.
Field 1 is the Main Menu
Field 2 is the Sub Menu
Field 3 is the Sub Menu Feature

• To enter the set up mode, press the **SET-UP** key 

• The display will show 

To display main menu selection, press **UP** or **DOWN** key.

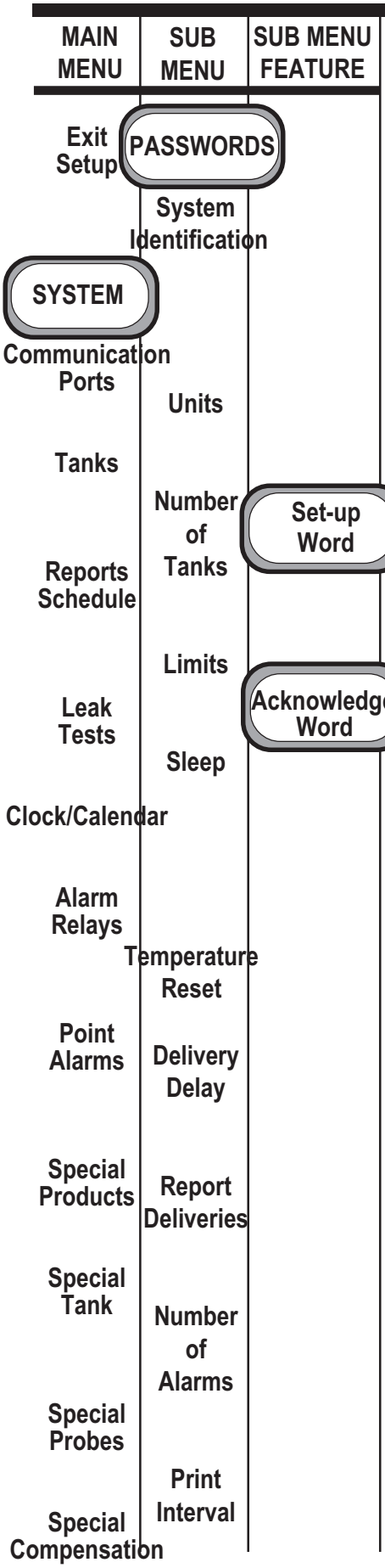
Ex. Pressing the UP key will scroll you to the first main menu which is passwords.

• The display will scroll through the main menu. At the end of the main menu EXIT SET-UP will return.

- To exit main menu, press **ENTER** key. (This exits operator from set up (programming) mode and enters operator into the operation mode.)
- To continue in set up (programming) mode and enter the sub-menu mode, press the **UP** or **DOWN** key to the desired main menu item that contains the desired sub-menu item; Press **ENTER**.
- To scroll through the sub-menu, press the **UP** or **DOWN** key.
- To return to main menu, press the **CANCEL** key. 

NOTICE **There are no program (set up) parameters which may be set from the main menu. All program entries are entered in the sub-menu mode.**

MAIN MENU - SYSTEM



The PASSWORD PROGRAM sub-menu allows the operator to program a password for access to the set-up menu and/or a separate password required to acknowledge alarms, (REMOTE AUDIBLE AND VISUAL ALARMS).

NOTICE **If a security password is not required, press the UP or DOWN key and scroll to the next desired sub-menu feature.**

Step 1. The display should read **PASSWORDS.** Press **ENTER**. The display now will read **SET-UP WORD.** Press **ENTER**. An asterisk (*) will indicate set-up ready for password entry. Password may be any combination of up to 12 letters or digits. Press **ENTER** key. The password will disappear and the display asterisk will shift to the down position indicating programming is complete.

Step 2. Press the **UP** key. The display should read **ACKWORD**. Repeat Step 1 to program a security password to acknowledge alarms.

Step 3. Press **CANCEL** key to return to **PASSWORDS.** Press the **UP** key to scroll to next sub-menu, **System I.D.**

Step 4. To return to main menu, press **CANCEL** key. The display will show **SYSTEM.** Press the **UP** or **DOWN** key to scroll through main menu or press **CANCEL** key to exit set-up, then **ENTER**.

NOTICE **Once a Set Up Password is entered, the password will be requested by computer on every entry during SET-UP.**

The SYSTEM Identification Program sub-menu allows the operator to program a site name and location. The site name and location programmed here will be used in the heading of all report printouts.

Step 1. The display should read **SYSTEM ID**. Press the **ENTER** key. The display will read **LOCATION 1**. Press **ENTER** key again and the asterisk will indicate set-up ready for location name.
* If nothing is entered here, the RLM 9000 will default to "RED JACKET".

NOTICE **Location 1 and Location 2 will combine to form the full location name.**

Step 2. Enter location name (up to 12 letters). Press **ENTER**. Location name and asterisk will disappear, indicating program is complete.

Step 3. Press the **UP** key. The display will show **LOCATION 2**. Press **ENTER** key and the asterisk will indicate set-up ready for location name. Repeat Step 2.
* If nothing is entered here, the RLM 9000 will default to "TECH LINE".

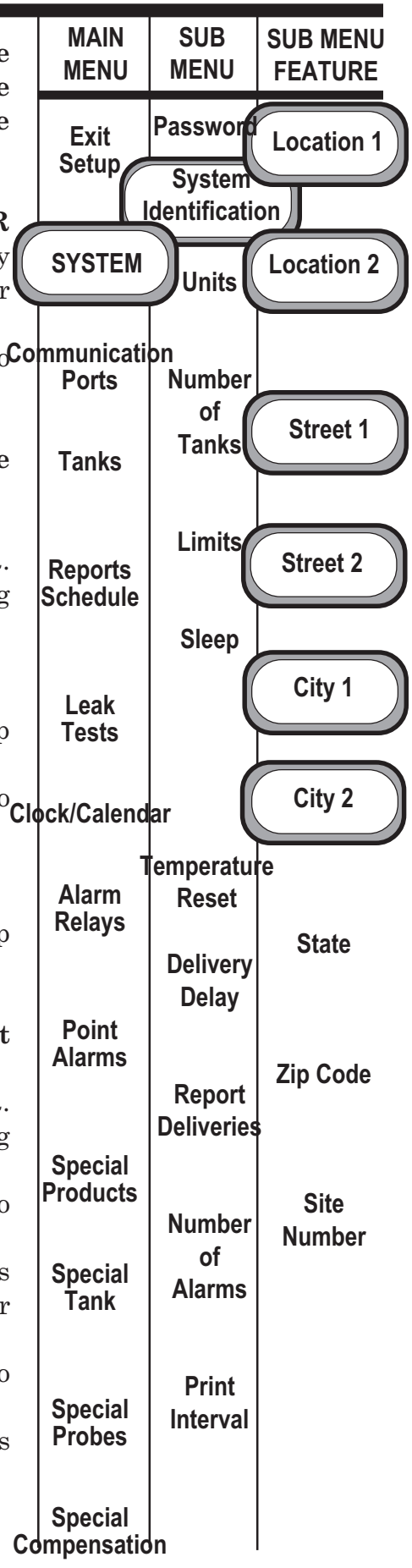
Step 4. Press the **UP** key. The display should read **STREET 1**. Press **ENTER** and the asterisk will indicate set-up ready for street address.

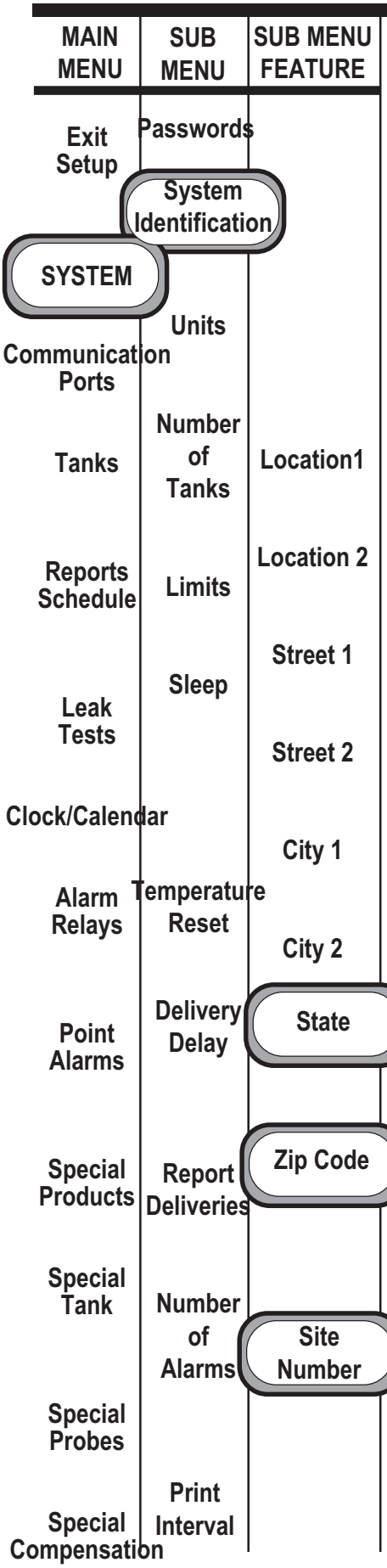
NOTICE **Street 1 and 2 will combine to form full street address.**

Step 5. Enter street address up to 12 characters. Press **ENTER**. Street address and asterisk will disappear indicating program is complete.
* If nothing is entered here, the RLM 9000 will default to "1-800".

Step 6. Press the **UP** key. The display will read **STREET 2**. Press **ENTER** and the asterisk will indicate set up ready for street address. Repeat Step 5.
* If nothing is entered here, the RLM 9000 will default to "468-7867".

Step 7. Press the **UP** key. The display will read **CITY 1**. Press





ENTER key. The asterisk will indicate set-up ready for city name (up to 12 characters).

NOTICE **City 1 and City 2 will combine to form full city location.**

Step 8. Enter city, up to 12 characters. Press **ENTER**. City name and asterisk will disappear indicating program is complete.
* If nothing is entered here, the RLM 9000 will default to "Mission".

Step 9. Press **UP** key. The display will read **CITY 2**. Press **ENTER,** asterisk will indicate set up ready for city name. Repeat Step 8.

Step10. Press **UP** key. The display will read **STATE**. Press **ENTER** key. The asterisk will indicate set-up ready for state name (up to 13 characters). Press **ENTER** and state name and asterisk will disappear indicating program is complete.
*If nothing is entered here, the RLM 9000 will default to "KS".

Step 11. Press **UP**. The display will read **ZIP CODE**. Press **ENTER**. The asterisk will indicate set-up ready for zip code (up to 12 characters). Enter zip code. Press **ENTER**. Zip code and asterisk will disappear indicating program is complete.

Step 12. Press **UP** key. The display will read **SITE NUMBER**. Press **ENTER**. The asterisk will indicate set-up ready for site number (up to 12 digits). Enter site number. Press **ENTER**. Site number and asterisk will disappear indicating program is complete.

Step 13. Press **CANCEL** key to return to System ID sub-menu.

Step 14. Press **UP** key. The display will scroll to the next sub-menu, UNITS.
To return to main menu, press **CANCEL** key, display will read **SYSTEM.**

To EXIT SET-UP, press **CANCEL** key again. Display will read **EXIT SET-UP.** Press **ENTER.**

The UNITS sub-menu allows the operator to program the units for volumetric, level and temperature quantities.

Step 1. The display should read **UNITS**. Press **ENTER**. The display will show **VOLUME UNITS**. Press **ENTER** key, then use the **UP** or **DOWN** key to scroll between gallons or liters. Press **ENTER** when the desired unit is displayed. Gallons or liters will disappear indicating program is complete.
* If nothing is entered here, the RLM 9000 will default to "gallons".

Step 2. Press the **UP** key. The display will read **LEVEL UNITS**. Press **ENTER** key, then press **UP** or **DOWN** key to scroll between inches and centimeters. Press **ENTER** when desired unit is displayed. Inches or centimeters will disappear indicating programming is complete.
* If nothing is entered here, the RLM 9000 will default to "inches".

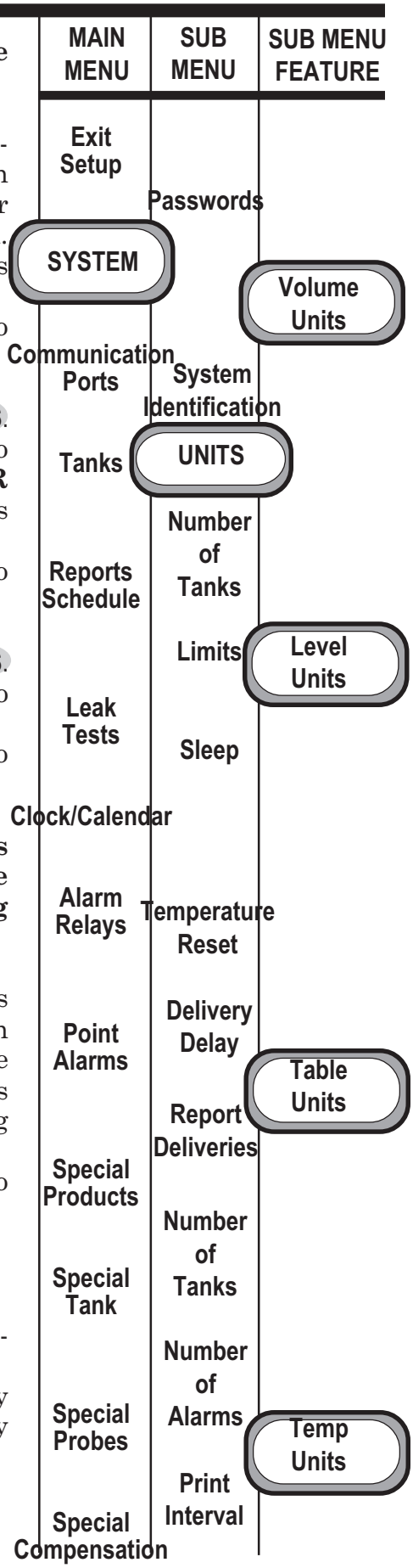
Step 3. Press the **UP** key. The display will read **TABLE UNITS**. Press **ENTER** key, then press **UP** or **DOWN** key to scroll between in/gal and cm/ltrs.
* If nothing is entered here, the RLM 9000 will default to "In/Gal".

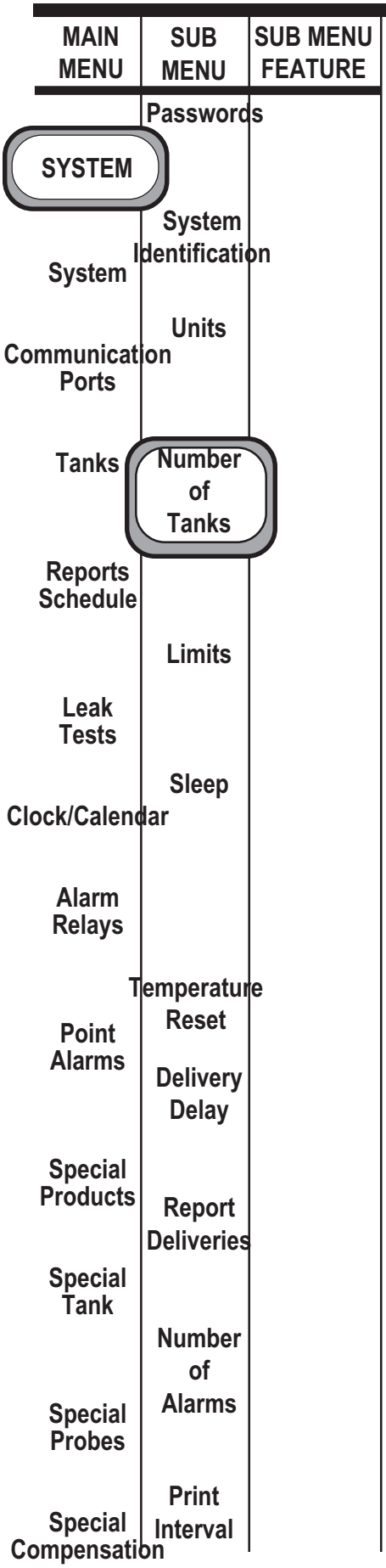
NOTICE **This unit selection is for special tanks only. Press ENTER key when desired unit is displayed. The selection will disappear indicating programming is complete.**

Step 4. Press **UP** key. The display will read **TEMP UNITS**. Press **ENTER** key, then press **UP** or **DOWN** to scroll between Fahrenheit and Celsius. Press **ENTER** key when the display shows the correct unit desired. The unit (Celsius or Fahrenheit) will disappear indicating programming is complete.
* If nothing is entered here, the RLM 9000 will default to "Fahrenheit".

Step 5. Press **CANCEL** key to return to **UNITS** sub-menu.

Step 6. Press **UP** key. The display will scroll to the next sub-menu.
To return to main menu, press **CANCEL** key. Display will read **SYSTEM**. To exit SET-UP, press **CANCEL** key again. Display will read **EXIT SET-UP**. Press **ENTER.**





The NUMBER-OF-TANKS sub-menu allows the operator to program in the number of tanks monitored, hence the number of sensors. The RLM 5000 or 9000 can monitor a maximum of eight tanks.

Step 1. The display should show **NO. OF TANKS**. Press **ENTER**. key. Asterisk will indicate set-up ready for number of tanks. Enter the number of tanks being monitored, between one and eight. Press **ENTER**. The asterisk and desired number of tanks will disappear indicating programming is complete.
* If nothing is entered here, the RLM 9000 will default to "1".

NOTICE **If an incorrect number is entered, press CANCEL key, then ENTER key and repeat Step 1. Press CANCEL key. Display will read NO. OF TANKS.**

Step 2. Press **UP** key. The display will scroll to the next sub-menu, LIMITS. To return to main menu, press **CANCEL** key. The display will read **SYSTEM**.

To Exit SET UP, press **CANCEL** key again. Display will read **EXIT SET-UP**. Press **ENTER.**

The LIMITS sub-menu allows the operator to set system wide thresholds for leak, theft and delivery limits.

Step 1. The display should read **LIMITS**.

NOTICE **This feature operates only if the sleep mode is activated. A maximum of 10 volume units can be entered in this feature. A loss greater than the amount entered will activate a leak alarm.**

Step 2. Press **ENTER**. The display will read **LEAK LIMIT**, and number of volume units entered. Enter desired number. Press **ENTER**. The asterisk and number of gallons will disappear indicating program complete.
* If nothing is entered here, the RLM 9000 will default to "2.0000".

Step 3. Press the **UP** key. The display will scroll to the next sub-menu feature. The display should read **THEFT LIMIT**.

NOTICE **This feature operates only if the sleep mode is activated. A maximum of 999 volume units can be entered. In this feature, a loss greater than the amount entered will activate the theft alarm.**

Step 4. Press **ENTER**. The display will read **THEFT LIMIT** and number of volume units. Enter desired number. Press **ENTER**. The asterisk and number of gallons will disappear indicating program complete.
* If nothing is entered her, the RLM 9000 will default to "+10.0000".

Step 5. Press the **UP** key. The display will scroll to the next sub-menu feature. The display should read **DELV. LIMIT**.

NOTICE **Increases larger than amount entered will be interpreted as a delivery.**

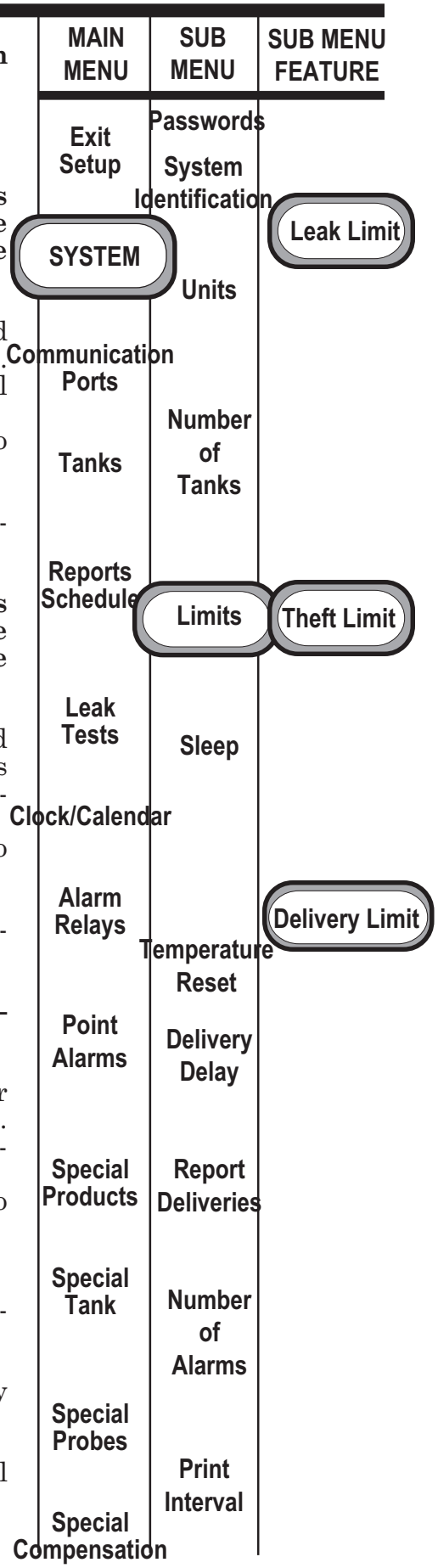
Press **ENTER**. The display will read **DELV LIMIT**. Enter the desired number of gallons. Press the **ENTER** key. The asterisk and number will disappear indicating programming complete.
* If nothing is entered here, the RLM 9000 will default to "+200.000".

Step 6. Press CANCEL key to return to **LIMITS** sub-menu.

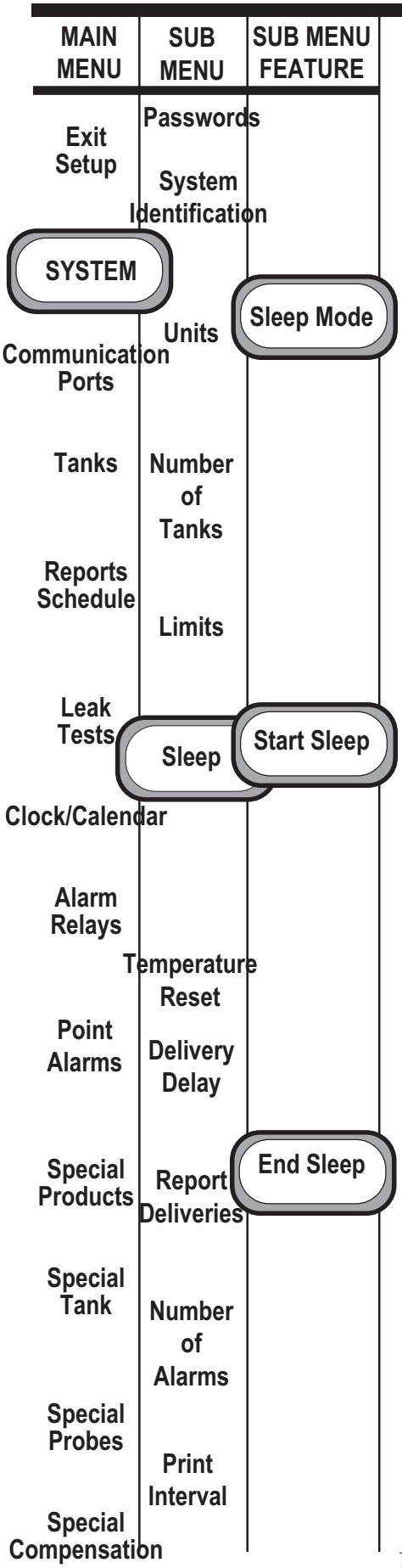
Step 7. Press **UP** key. The display will scroll to the next sub-menu, **SLEEP.**

To return to main menu, press **CANCEL** key. Display will read **SYSTEM.**

To exit SET UP, press **CANCEL** key again. Display will read **EXIT SET UP**. Press **ENTER.**



MAIN MENU - SYSTEM



The SLEEP sub-menu feature allows the operator to program in the period (sleep mode) during which the system monitors for leak alarms and theft alarm.

This feature is designed for systems that do not operate 24 hours a day.

Step 1. The display should show **SLEEP**. Press **ENTER** key. The display will read **SLEEP MODE**. Use the **UP** or **DOWN** key to scroll between **off** (cancel sleep mode) **scheduled** (automatic start and stop). When the display shows the desired choice, press the **ENTER** key. The entry will disappear indicating programming is complete (sleep mode).

* If nothing is entered here, the RLM 9000 will default to "off".

Step 2. Press the **UP** key. The display will show **START SLEEP**. Press **ENTER**. Enter time desired. Example: 04:39:22=4:39 am. Press **ENTER** key. The time entered will disappear indicating programming complete.

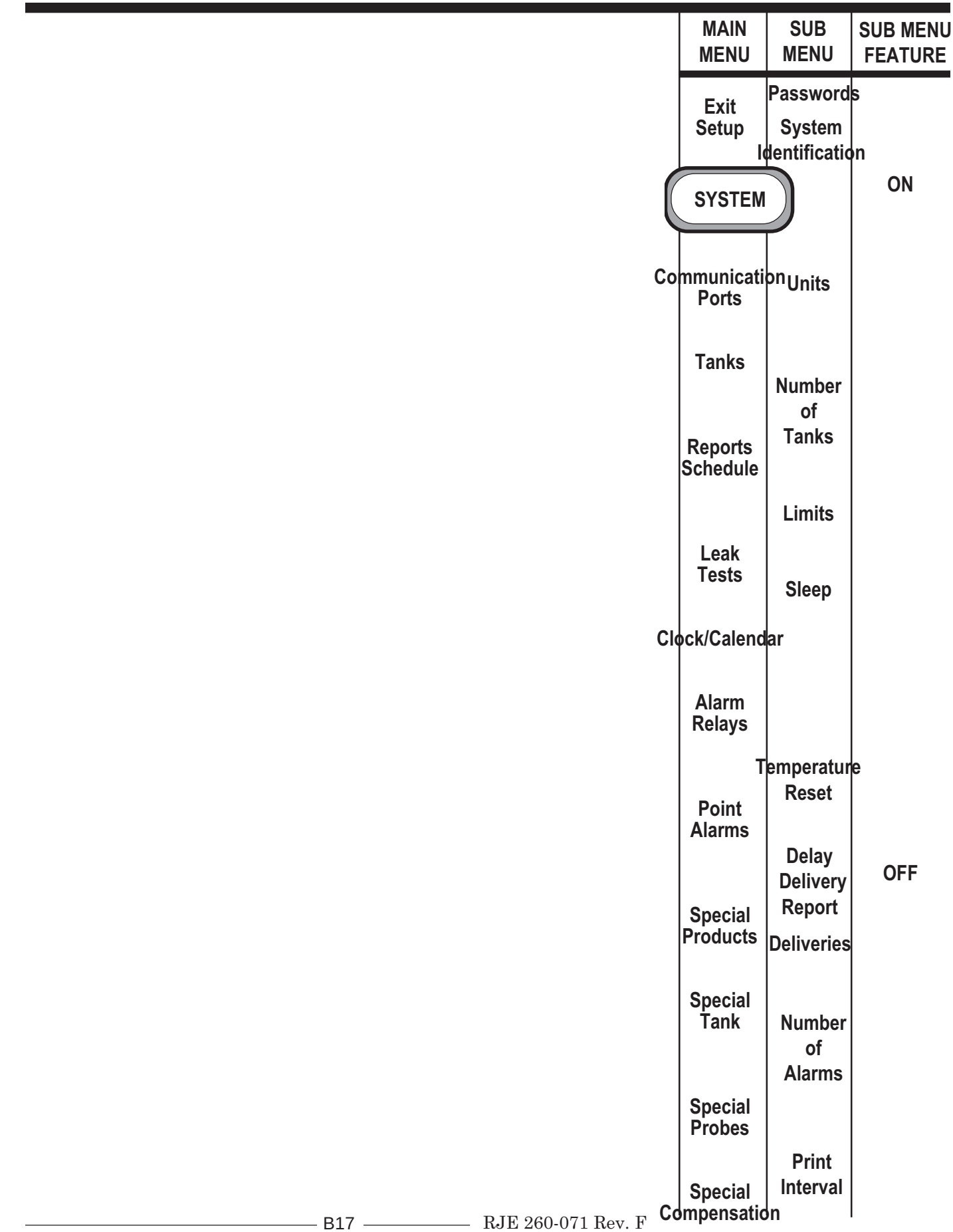
Step 3. Press the **UP** key. The display will show **END SLEEP**. Press **ENTER**. Enter time desired. Press **ENTER**. The time entered will disappear indicating programming complete.

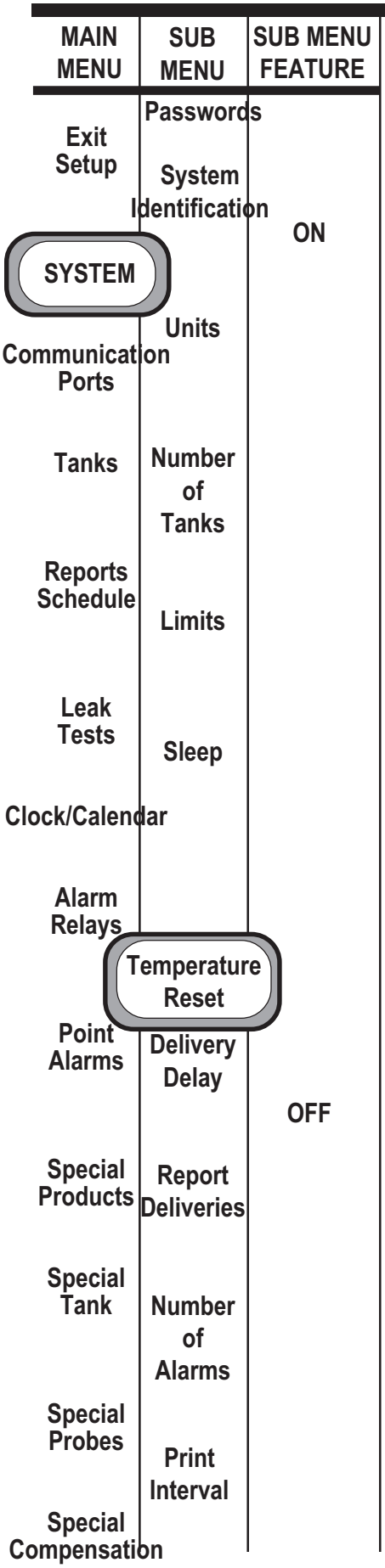
NOTICE **All time entries while in Set Up Mode must be entered in 24 hour format.**

Step 4. Press **CANCEL** key to return to sub menu, **SLEEP**.

Step 5. Press **UP** key. The display will scroll to the next sub-menu, **BLANK**.

To return to main menu, press **CANCEL** key. Display will read **SYSTEM**. To exit SET UP, press **CANCEL** key again. Display will read **EXIT SET UP.** Press **ENTER.**


MAIN MENU
SUB MENU
SUB MENU FEATURE
Exit Setup
Passwords
System Identification
SYSTEM
ON
Communication Ports
Units
Tanks
Number of Tanks
Reports Schedule
Limits
Leak Tests
Sleep
Clock/Calendar
Alarm Relays
Temperature Reset
Point Alarms
Delay Delivery Report
OFF
Special Products
Deliveries
Special Tank
Number of Alarms
Special Probes
Print Interval
Special Compensation



The TEMPERATURE RESET sub-menu allows the operator to enter a variable used to control one of the proprietary temperature tracking algorithms in the RLM 9000. It defaults to one degree and should be left at this setting unless difficulties are encountered.

Step 1. The display should show **TEMP RESET.** Press **ENTER** then enter the variable number. Press ENTER key. The number will disappear indicating programming is complete.

Step 2. Press the **UP** key. The display will scroll to the next sub-menu, **DELIVERY DELAY**.

To return to main menu, press **CANCEL** key. The display will read **SYSTEM.** To exit SET UP, press **CANCEL** key again. Display will read **EXIT SET UP.** Press **ENTER.**

NOTICE **Variable should not be adjusted without consulting the factory.**

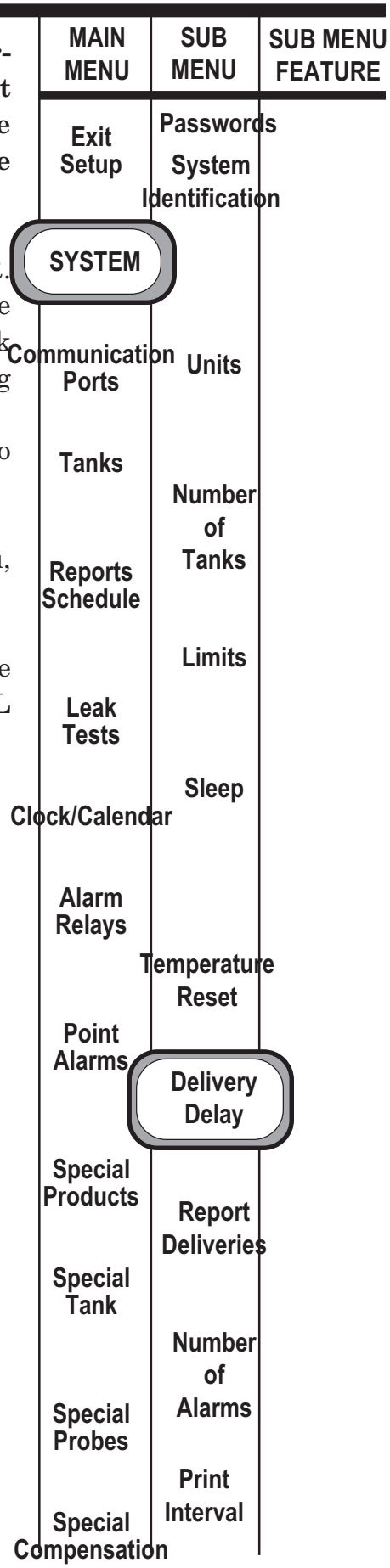
The DELIVERY DELAY sub-menu provides for uninterrupted delivery reports from multiple tank compartment drops. When the RLM 9000 sees a tank's volume increase stop, it will wait this amount of time before closing out the delivery.

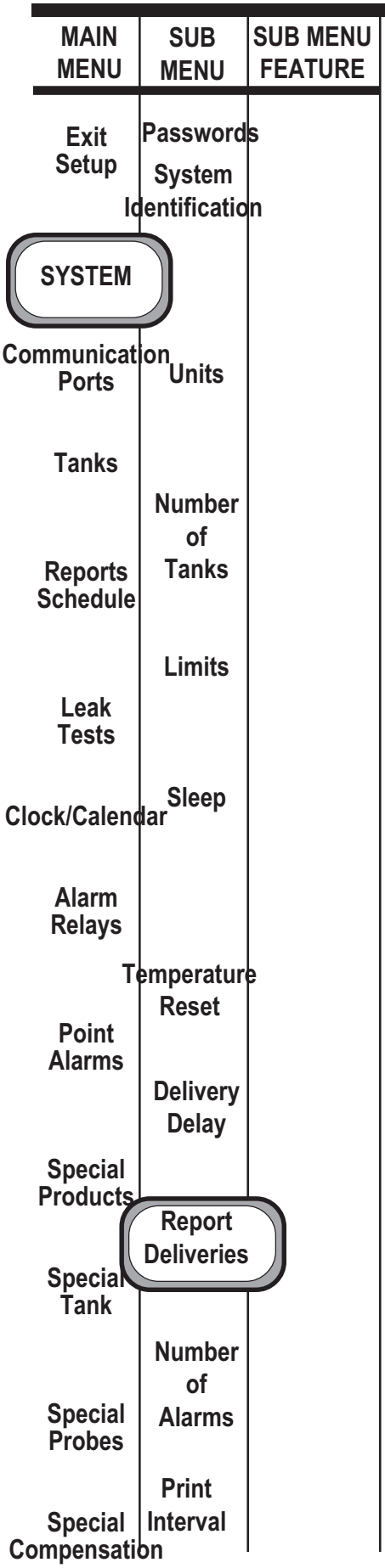
Step 1. The display should show **DELIVERY DELAY**. Press **ENTER**. The asterisk will indicate set-up ready for delay time (minutes). Enter time desired. Press **ENTER**. Asterisk and time entered will disappear indicating programming complete. Display will read **DELIVERY DELAY.**

* If nothing is entered here, the RLM 9000 will default to "5".

Step 2. Press the **UP** key. Display will scroll to the next sub-menu, **REPORT DELIV.**

To return to the main menu, press **CANCEL** key. The display will read **SYSTEM.** To exit SET UP, press **CANCEL** key again. Display will read **EXIT SET UP.** Press **ENTER.**





The REPORT DELIVERIES sub-menu allows the operator to select whether delivery reports are automatically printed for each delivery. The last ten deliveries for each tank are retained in memory.

Step 1. This display should show **REPORT DELIV.** Press **ENTER**. The asterisk will indicate set-up ready for programming. Press the **UP/DOWN** key to scroll between choices.

ENABLE - automatic printing of delivery reports.
DISABLE - manual activation of delivery reports.

Step 2. Press the **ENTER** key when the display shows the desired choice, the asterisk and entry will disappear indicating programming complete. Display will read **REPORT DELIV.**
* If nothing is entered here, the RLM 9000 will default to "Enabled".

Step 3. Press the **UP** key, the display will scroll to the next sub-menu, **NO. OF ALARMS.**

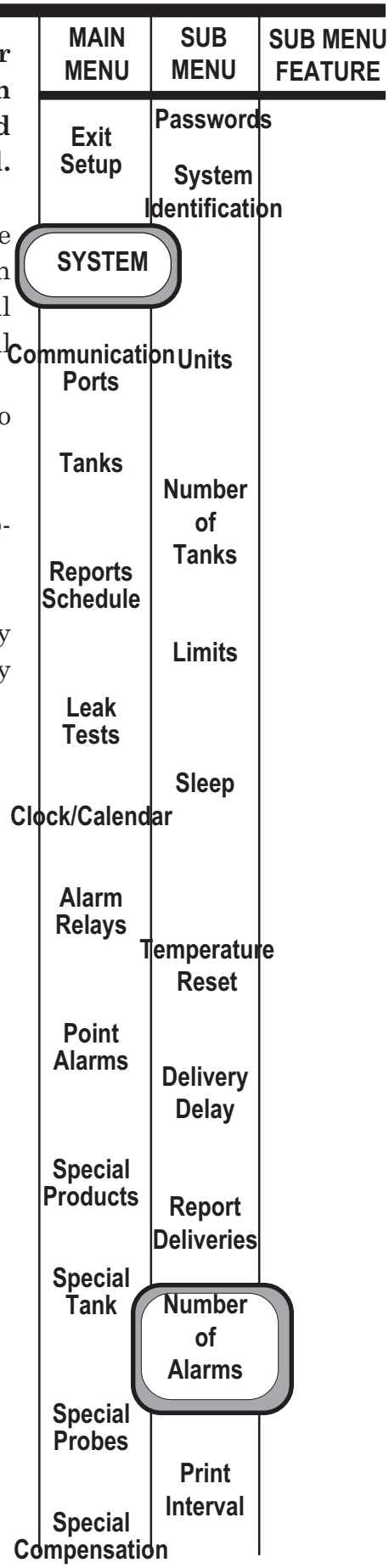
To return to the main menu, press **CANCEL** key. The display will read **SYSTEM.** To exit SET UP, press **CANCEL** key again. Display will read **EXIT SET UP.** Press **ENTER.**

The NUMBER-OF-ALARMS sub-menu allows the operator to enter the number of alarm events that will be printed in the Alarm History Report. The last 50 alarms are retained in memory regardless of how this sub-menu is programmed.

Step 1. The display should show **NO. ALARMS.** Press **ENTER**. The asterisk indicates set-up ready. Enter a number between 1 and 50. Press **ENTER**. The asterisk and number will disappear indicating programming complete. Display will read **NO. ALARMS.**
* If nothing is entered here, the RLM 9000 will default to "50".

Step 2. Press the **UP** key, the display will scroll to the next sub-menu, **PRT INTERVAL.**

To return to main menu, press **CANCEL** key. The display will read **SYSTEM.** To exit SET UP, press **CANCEL** key again. Display will read **EXIT SET UP.** Press ENTER.



MAIN MENU	SUB MENU	SUB MENU FEATURE
Exit Setup	Passwords	
	System Identification	
SYSTEM		
	Units	
Communication Ports		
Tanks	Number of Tanks	
Reports Schedule	Limits	
Leak Tests	Sleep	
Clock/Calendar		
Alarm Relays		
	Temperature Reset	
Point Alarms	Delivery Delay	
Special Products	Report Deliveries	
Special Tank	Number of Alarms	
Special Probes	Print Interval	
Special Compensation		

The PRINT INTERVAL sub-menu allows the operator to enter a variable to control the interval between strapping table points which will be printed on tank set up reports. This does not affect operation of the unit in any other way.

Step 1. The display should show **PRT INTERVAL**. Press **ENTER.** The asterisk indicates SET UP READY. Enter the number of printed points desired. Press **ENTER.** The asterisk and number will disappear indicating that programming is complete. (Ex. If the number "2" is entered here, the strapping table printout will display tank volume at 2 (two) inch intervals.)
* If nothing is entered here, the RLM 9000 will default to "=+1.00000".

Step 2. This completes SYSTEM programming. Press **CANCEL** to return to Main Menu System.

Step 3. Press the **UP** key. The display will scroll to the next main menu, **COMM PORTS.**

The COMM PORTS MENU allows the operator to configure the two communication ports, auto dial feature and select which alarms will be transmitted to remote sites.

Step 1. The display should show **COMM PORTS**. Press **ENTER**. The display will read **CHANNEL 1**. Press **ENTER**.

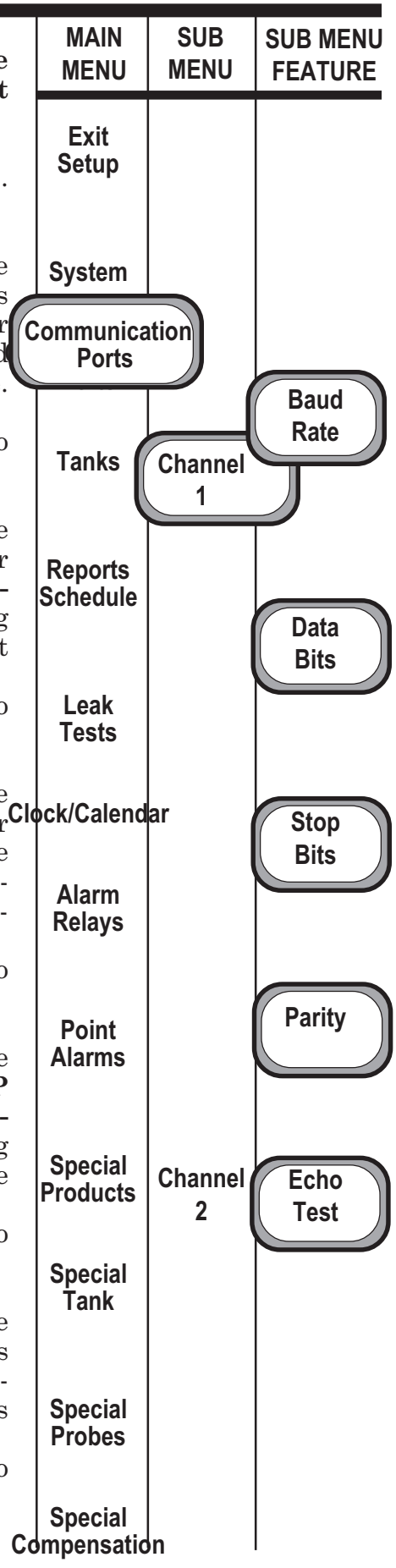
Step 2. The display should show **BAUD CHAN 1**. Press **ENTER**. The display will read between 50 and 384,000 baud rate. Press the **UP** or **DOWN** key to scroll to the desired baud rate for comm channel 1. Press **ENTER**. The desired selection and asterisk will disappear indicating programming complete. Press the **UP** key to scroll to the next sub-menu feature.
* If nothing is entered here, the RLM 9000 will default to "1200".

Step 3. The display should show **DATA BITS 1**. Press **ENTER**. The lower line of the display will read 7 or 8. Use the **UP** or **DOWN** key to scroll to the desired selection. Press **ENTER**. The selection and asterisk will disappear indicating programming complete. Press **UP** key to scroll to the next sub-menu feature.
* If nothing is entered here, the RLM 9000 will default to "8".

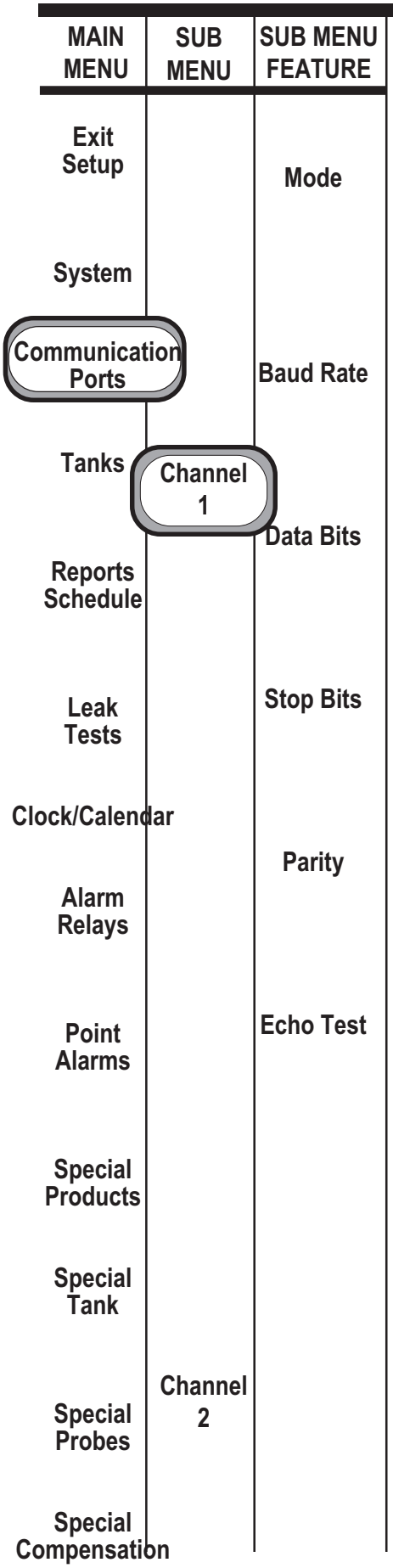
Step 4. The display should show **STOP BITS 1**. Press **ENTER**. The lower line of the display will read 1 or 2. Use the **UP** or **DOWN** key to scroll to desired entry. Press **ENTER**. The selection and asterisk will disappear indicating programming complete. Press the **UP** key to scroll to the next sub-menu feature.
* If nothing is entered here, the RLM 9000 will default to "1".

Step 5. The display should read **PARITY 1**. Press **ENTER**. The display will read **ODD - EVEN - MARK OR SPACE**. Press the **UP** or **DOWN** key to scroll to the desired entry. Press **ENTER**. The selection and asterisk will disappear indicating programming complete. Press the **UP** key to scroll to the next sub-menu feature.
* If nothing is entered here, the RLM 9000 will default to "none".

Step 6. The display should show **ECHO TEST 1**. Press **ENTER**. The display will read **ACTIVE**. Notice this is a communications test. All characters received will be echoed back to the remote terminal. Press **CANCEL** key to end test then press **UP** to scroll to the next sub-menu feature, **CHANNEL 2.**
* If nothing is entered here, the RLM 9000 will default to "Active...".



MAIN MENU - COMM PORTS



To return to Main Menu, press **CANCEL** key. Display will read **COMM PORTS.** To exit SET UP, press **CANCEL** again. Display will read **EXIT SET UP**. Press ENTER.

Step 1. The display will read **CHANNEL 2**. Press **ENTER**.

Step 2. The display should show **Mode Channel 2**. Press **ENTER**. The display will read **Native.** Press up or down to toggle between Native and Veeder Root. This selects the communication protocol for external telecommunications. Press **ENTER.** The desired selection and asterisk will disappear indicating programming complete. Press the **UP** key to scroll to the next sub-menu feature.

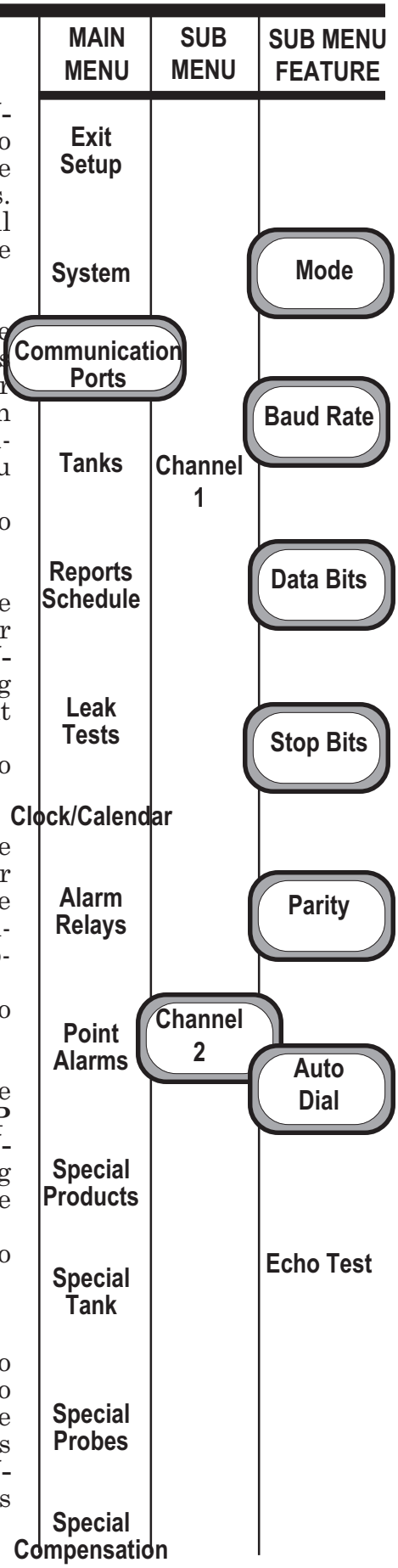
Step 3. The display should show **BAUD CHAN 2**. Press **ENTER**. The display will read between 50 and 384,000 baud rate. Press the **UP** or **DOWN** key to scroll to the desired baud rate for Comm Channel 2. Press **ENTER**. The desired selection and asterisk will disappear indicating programming complete. Press the **UP** key to scroll to the next sub-menu feature.
* If nothing is entered here, the RLM 9000 will default to "1200".

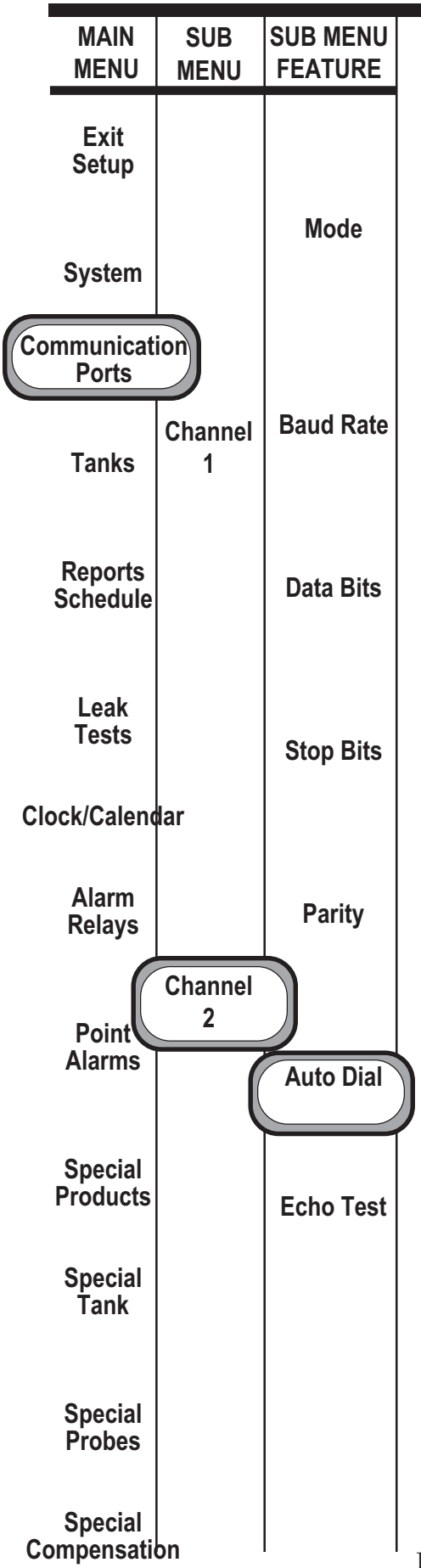
Step 4. The display should show **DATA BITS 2**. Press **ENTER**. The lower line of the display will read **7 or 8**. Use the **UP** or **DOWN** key to scroll to the desired selection. Press **ENTER**. The selection and asterisk will disappear indicating programming complete. Press **UP** key to scroll to the next sub-menu feature.
* If nothing is entered here, the RLM 9000 will default to "8".

Step 5. The display should show **STOP BITS 2**. Press **ENTER**. The lower line of the display will read **or 2.** Use the **UP** or **DOWN** key to scroll to desired entry. Press **ENTER**. The selection and asterisk will disappear indicating programming complete. Press the **UP** key to scroll to the next sub-menu feature.
* If nothing is entered here, the RLM 9000 will default to "1".

Step 6. The display should show **PARITY 2.** Press **ENTER**. The display will read **ODD - EVEN - MARK - SPACE**. Press the **UP** or **DOWN** key to scroll to the desired entry. Press **ENTER**. The selection and asterisk will disappear indicating programming complete. Press the **UP** key to scroll to the next sub-menu feature.
* If nothing is entered here, the RLM 9000 will default to "none".

Step 7. The display should show **AUTO DIAL 2**. Press **ENTER**. This program feature allows the operator to program auto dial parameters for **COMM PORTS** channel 2 only. Up to four different phone numbers may be programmed to be called upon alarm. The display will read **CALL NO. 1**. Press **ENTER**. The display will read **ACCESS NO.1**. Press **ENTER**. (Note asterisk in lower left corner.) Enter access code for **CALL NO. 1** (12 digits maximum). Press **ENTER.**





NOTICE **The access will combine with phone number (Step 7) to complete the dialing sequence. The access number is used to access to an outside line or long distance company. Press ENTER. The access number will disappear indicating programming is complete.**

If auto dialing is not required, enter blanks.

Step 8. The display should show **PHONE NO. 1**. Press **ENTER**. Enter the complete phone number including area code. (12 digits maximum). Press **ENTER** when the desired phone number has been entered. The phone number and asterisk will disappear indicating programming is complete. Press **UP** to scroll to the next sub-menu feature.

Step 9. The display should show **REDIAL NO. 1**. Press **ENTER**. Press the **UP** or **DOWN** key to scroll between-

ENABLED - automatic redial if call is not completed.
DISABLED - disables automatic redial.

* If nothing is entered here, the RLM 9000 will default to "Enable".

Press **ENTER**. When display shows desired selection, the entry will disappear indicating program is complete. Press **CANCEL** to return to sub-menu.

Step 10. The display will show **CALL NO. 1**. Press the **UP** key to scroll to Call No. 2. Repeat Steps 6 through 8 for Call No. 2, Call No. 3 and Call No. 4.

Step 11. The display should show **DIAL DELIVER**. Press **ENTER**. Enter the numbers which should be dialed automatically when a delivery occurs. If you wish to dial all phone numbers, enter **1-2-3-4**. Press **ENTER.** The desired numbers will disappear indicating programming complete. Press **UP** and scroll to next sub-menu feature.

Step 12. The display should show **DIAL ALARM**. Press **ENTER**. Enter the numbers which should be dialed automatically when an alarm occurs. If you wish to dial all 4 phone numbers, enter **1-2-3-4**. Press **ENTER**. The desired phone numbers will disappear indicating programming complete. Press the **UP** key to scroll to the next sub-menu feature.

Step 13. The display should show **DIAL LEAK**. Press **ENTER**. Enter the phone numbers which should be dialed automatically when a leak test fails. If you wish to dial all 4 numbers, enter **1-2-3-4**. Press **ENTER**. The desired phone numbers will disappear indicating programming complete. Press **CANCEL**. The display will return to **AUTO DIAL**. Press **UP** to scroll to the next sub-menu feature.

Step 14. The display should show **ECHO TEST 2**. Press **ENTER**. The display will read **ACTIVE**. Notice this is a communications test. All characters received will be echoed back to the remote terminal. Press **CANCEL** key to end test then press **UP** to scroll to the next sub-menu feature.

Step 15. The display will show **SECURITY 2**. Press **ENTER**. Notice this code is used both as security code in the communications format and also as an address in multi drop applications. Enter six digit code desired.

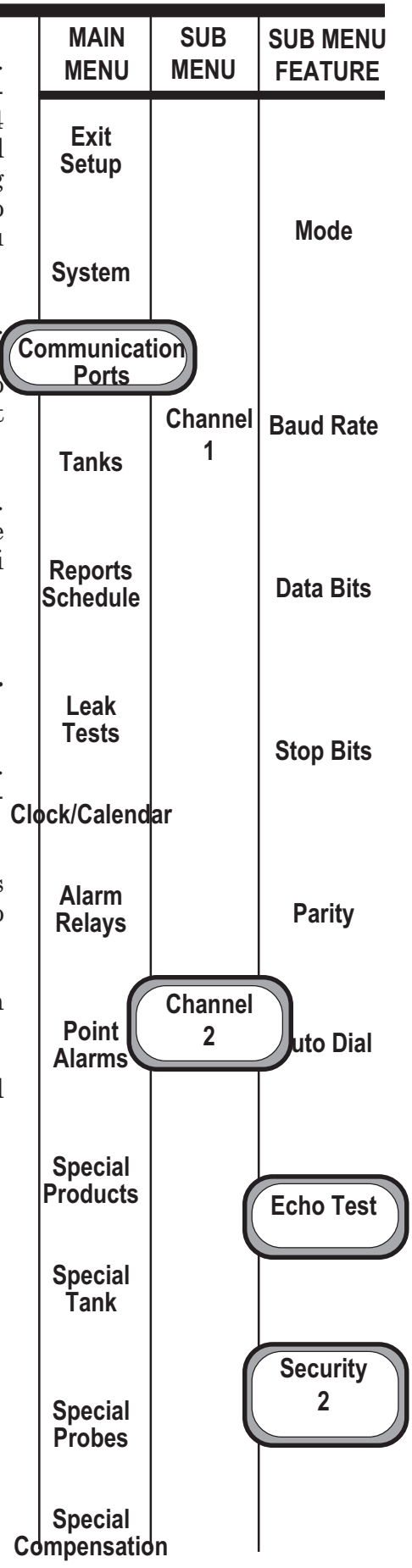
NOTICE **To enter blanks, use SHIFT key, then DOWN key. This must be done to enter each blank.**

Press **ENTER** when the desired code has been entered. The code will disappear indicating programming is complete.

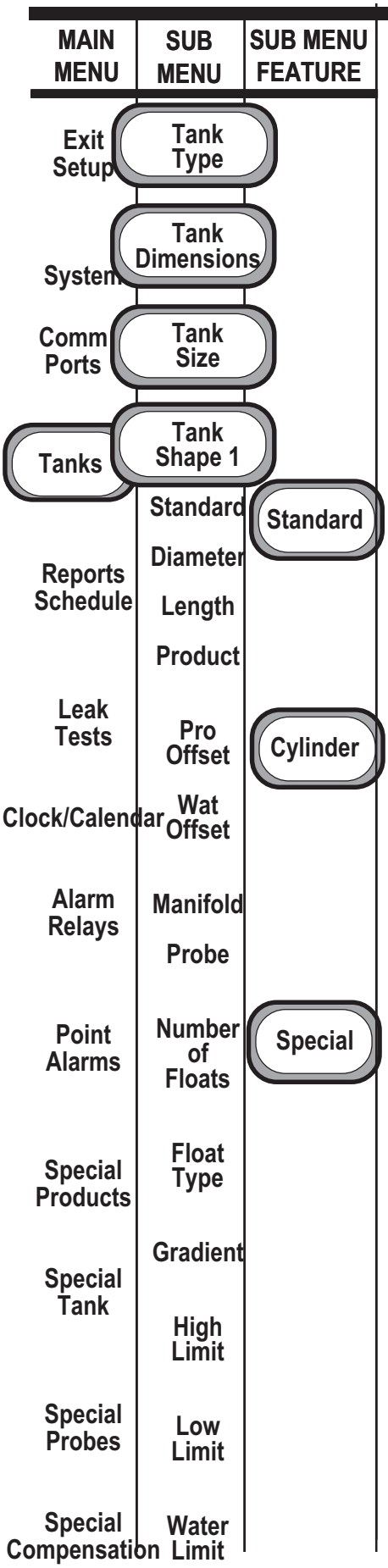
This completes programming for the communications port portion of the main menu. Press **CANCEL** twice to return to main menu, **COMM PORTS.**

Step 16. Press **UP** key. The display will scroll to the next main menu, **TANKS.**

To exit SET UP, press **CANCEL** key. Display will read **EXIT SET UP.** Press **ENTER.**



MAIN MENU - TANKS



The TANKS MENU allows the operator to enter data about each tank and sensor monitored by the RLM 9000. A maximum of 8 tanks may be programmed into the system.

Step 1. The display should show **TANKS**. Press **ENTER**. The display will read **TANK 1**. Press **ENTER**. The display will read **TANK TYPE 1**. Enter a 12-character description of the tank. Example: Unleaded, best gas, etc.
* If nothing is entered here, the RLM 9000 will default to "none".

NOTICE **This is a memo field and is used for report printouts.**

Press **ENTER**. The description will disappear indicating programming is complete. Press **UP** to scroll to the next sub-menu.

Step 2. The display should show **TANK DIMS 1**. Press **ENTER**. Enter a 12-character description of the tank dimensions. Example: 10,000 gal, 8x20, standard 3.
* If nothing is entered her, the RLM 9000 will default to "none".

NOTICE **This is a memo field and is used for report printouts only.**

Press **ENTER**. Desired description will disappear indicating programming complete. Press **UP** key and scroll to the next sub-menu.

Step 3. The display should show **TANK SIZE 1**. Press **ENTER**. Enter a 12-character description of the tank size. Example: 20,000 or 10,000. Do not program in the word gallons as it is automatically appended to this entry on report printouts.
* If nothing is entered here, the RLM 9000 will default to "none".

NOTICE **This is a memo field and is used for report printouts only.**

Press **ENTER**. The desired description will disappear indicating programming is complete. Press **UP** to scroll to the next sub-menu.

Step 4. The display should show **TANK SHAPE 1**. Press **ENTER**. Use the **UP** or **DOWN** key to scroll between standard, cylinder or special 1 through 8.
* If nothing is entered here, the RLM 9000 will default to "standard".

NOTICE **This program sub-menu determines what strapping table method will be used for Tank 1.**

A. **STANDARD** - Enter strapping information under sub-menu **STANDARD**. (Fiberglass tanks listed in standard list.)

B. **CYLINDER** - Enter strapping dimensions under sub-menu Diameter and Length. (Steel tanks).

C. **SPECIAL** 1 through 8 - This strapping information is entered under main menu Special Tanks. A special tank strapping table entered at this point may be used by other identical tanks. Example: Tank Shape 1 - 2 - 3 are identical to special tank 3. Enter Special 3 in each tank sub-menu.

Step 5. When Standard tank shape is selected, press the **UP** key. The display will show **STANDARD 1**. Press **ENTER**.
* If nothing is entered here, the RLM 9000 will default to "1".

NOTICE **For Cylinder, go to Step 7. For Special, go to Special Tanks Main Menu. If cylinder or special 1 through 8 has been entered in sub-menu Tank Shape (Step 4), then this sub-menu does not apply. If standard has been entered in Step 4 then refer to standard tank chart for entry number to automatically enter strapping table. Strapping tables for the listed manufacturer's models are pre-programmed in computer memory.**

Step 6. Enter tank number to correspond with manufacturer's model number. Press **ENTER** when desired number has been entered. The number will disappear indicating program is complete. Press **UP** key and scroll to next sub-menu.

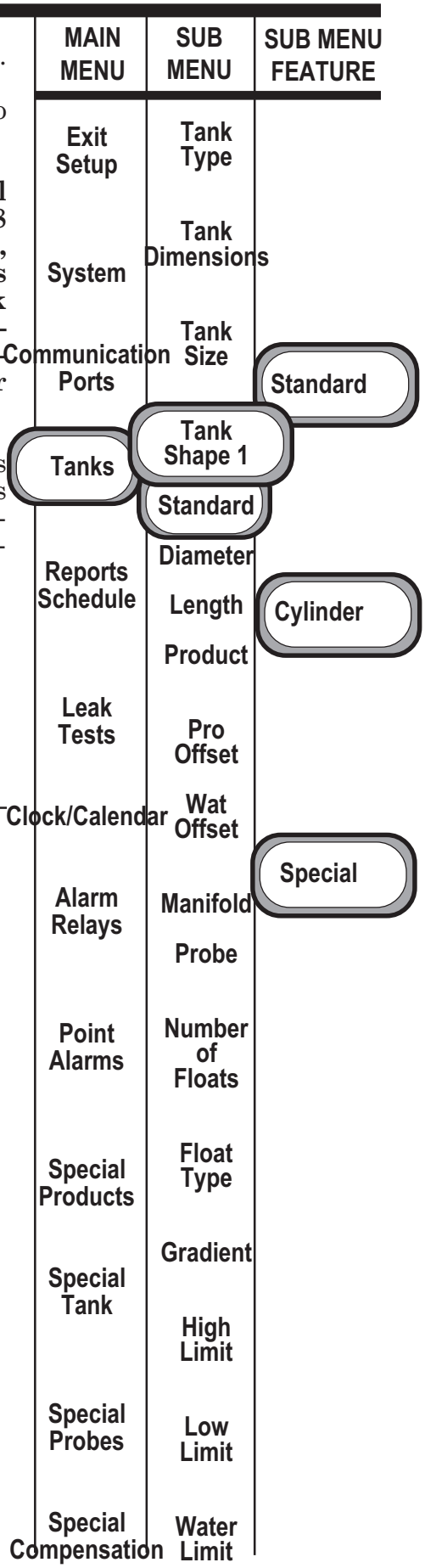
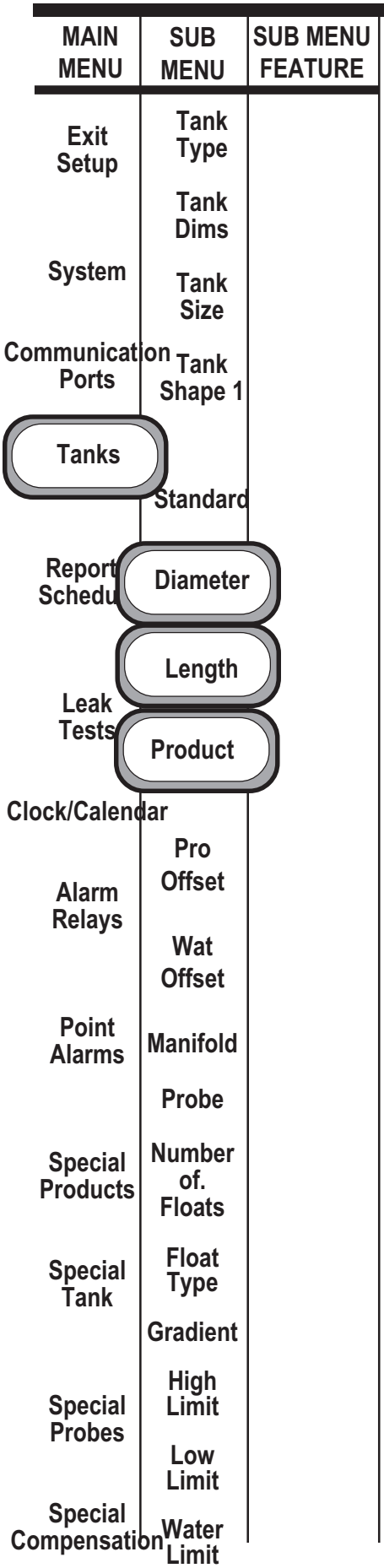


TABLE OF STANDARD TANKS

Tanks 1-7 manufactured by Xerxes
Tanks 8-22 manufactured by Owens Corning
Tanks 23-29 manufactured by Corespan

TANK	DIAMETER	CAPACITY	MODEL #
1	8 ft.	6,000	DWT-II
2	8	8,000	NO NUMBER
3	8	8,000	DWT-II
4	8	10,000	DWT-II
5	8	12,000	NO NUMBER
6	10	15,000	DWT-II
7	10	20,000	DWT-II
8	10	10,000	D-6
9	10	15,000	D-3 AND D-6
10	10	15,000	DWT-2(10)
11	10	20,000	D-3 AND D-6
12	8	20,000	DWT-2 (10)
13	8	4,000	G-3
14	8	4,000	G-5 AND G-6
15	8	6,000	G-5,G-6 AND DWT-2 (8)
16	8	6,000	G-3
17	8	8,000	G-3
18	8	8,000	G-5,G-6 AND DWT-2 (8)
19	8	10,000	G-5,G-6 AND DWT-2 (8)
20	8	10,000	G-3
21	8	12,000	G-5,G-6 AND DWT-2(8)
22	8	12,000	G-3
23	8	4,000	NO NUMBER
24	8	5,000	NO NUMBER
25	8	6,000	NO NUMBER
26	8	8,000	NO NUMBER
27	8	10,000	NO NUMBER
28	8	12,000	NO NUMBER
29	8	15,000	NO NUMBER

MAIN MENU - TANKS



Step 7. The display should show **DIAMETER 1**. Press **ENTER**.
* If nothing is entered here, the RLM 9000, will default to "+0.0000".

NOTICE **If special 1 through 8 or standard has been entered in sub-menu Tank Shape (Step 4), then this sub-menu does not apply.**

Step 8. If cylinder has been entered in Step 4, then enter the diameter of the tank being monitored in inches or centimeters.

NOTICE **The RLM 9000 will automatically strap a cylinder tank upon entry of diameter and length (sub-menu Step 9).**

Press **ENTER**. The diameter entered will disappear indicating programming complete. Press the **UP** key to scroll to the next sub-menu.

Step 9. The display should show **LENGTH 1**. Press **ENTER**.
* If nothing is entered here, the RLM 9000 will default to "0.0000".

NOTICE **If special 1 through 8 or standard has been entered in submenu Tank Shape (Step 4), then this sub-menu does not apply. If cylinder has been entered in Step 4, then enter the length of the tank being monitored in inches or centimeters.**

Press **ENTER**. When the desired length has been entered the length will disappear indicating that programming is complete. Press the **UP** key and scroll to the next sub-menu.

Step 10. The display should show **PRODUCT 1**. Press **ENTER**. Use the **UP** or **DOWN** key to scroll through the preselected products or the special products 1 through 8.

Leaded regular - Unleaded regular - Unleaded plus - Unleaded extra - Unleaded super - Diesel - Kerosene - #2 Fuel oil - Special 1 through 8

NOTICE **If a special product is needed, this information is entered in the main menu under Special Products. Enter a standard product or special product.**
* If nothing is entered here, the RLM 9000 will default to "Leaded Reg.".

Press **ENTER** and the desired product will disappear indicating programming is complete. Press **UP** key to scroll to the next sub-menu, **PRO OFFSET**. Press **ENTER.**

The PRO OFFSET sub-menu provides the capability to match product float levels with actual stick level readings. To use, record stick readings and electronic gauge readings.

Step 11. Determine the difference and enter this value in the **PRO OFFSET** menu function. Example: If the stick reading is 72-1/2 inches, and the product level displayed by the RLM 9000 is 72.25, then the difference is +.25 inches. Enter this value. Press **ENTER** and the desired value will disappear indicating programming is complete. Press **UP** key to scroll to next sub-menu, **WAT OFFSET W.** Press **ENTER**.
* If nothing is entered here, the RLM 9000 will default to "0.0".

The WAT OFFSET sub-menu provides the capability to match the water float level with the actual stick level readings. To use, record the actual water level and electronic gauge readings.

Step 12. Determine the difference and enter this value in the **WAT OFFSET** menu function. Example: If the stick reading shows 0 inches of water, and the water level displayed by the RLM 9000 is 0.4 inches, then the difference is -0.4 inches. Enter this value. Press **ENTER** and the desired value will disappear indicating programming is complete. Press **UP** key to scroll to the next sub-menu, **MANIFOLD 1.**
* If nothing is entered here, the RLM 9000 will default to "0.0".

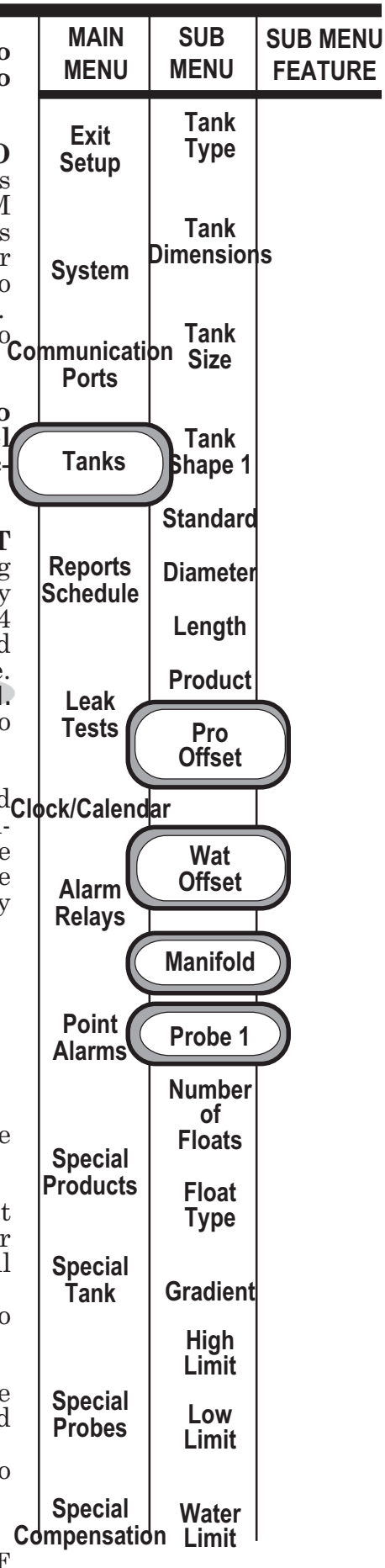
Step 13. The display should show **MANIFOLD 1.** This feature is used when individual tanks are manifolded together for syphoning. The RLM 9000 will use this feature to consider the manifolded tanks as one. Example: If tanks 1 and 2 are manifolded, press **ENTER** and use the **UP** or **DOWN** key to scroll between the five manifold categories.

1	Manifold	A
2	Manifold	B
3	Manifold	C
4	Manifold	D
5	NONE	

Manifold A, B, C, or D may be selected as long as the same is selected for Tank 2 Manifold menu feature.

Press the **ENTER** key when the display shows the correct manifold for this tank. The desired choice will disappear indicating programming complete. Press the **UP** key scroll to the next sub-menu.
* If nothing is entered here, the RLM 9000 will default to "none".

Step 14. The display should read **PROBE 1.** Press **ENTER**. Use the **UP** or **DOWN** key to scroll between the nine standard probes and the special 1 through 8 selections.
* If nothing is entered here, the RLM 9000 will default to "STD 10".



MAIN MENU	SUB MENU	SUB MENU FEATURE
Exit Setup	Tank Type	
System	Tank Dimensions	
Communication Ports	Tank Size	
Tanks	Tank Shape 1	
	Standard	
Reports Schedule	Diameter	
	Length	
Leak Tests	Product	
Clock/Calendar	Offset Product	
	Offset Water	
Alarm Relays	Manifold	
	Probe 1	
Point Alarms	Number of. Floats	
Special Product	Float Type	
Special Tank	Gradient	
	High Limit	
Special Probes	Low Limit	
Special Compensation	Water Limit	

NOTICE **The nine standard entries and tank sensor lengths are used for most standard tanks. The standard number for each probe is stamped on the probe housing.**

If an unusual size tank and tank sensor are used, then the sensor size may be entered under special probe 1 through 8.

Press the **ENTER** key when the display shows the correct sensor size. The desired entry will disappear indicating programming complete. Press **UP** key to scroll to the next sub-menu.

Step 15. The display should show **NO. FLTS 1**. Press **ENTER**. Use the **UP** or **DOWN** key to scroll between 1 and 2 floats. Press the **ENTER** key when the display shows the correct number of floats. The desired entry will disappear indicating programming complete. Press **UP** key to scroll to the next sub-menu.
* If nothing is entered here, the RLM 9000 defaults to "2 Floats".

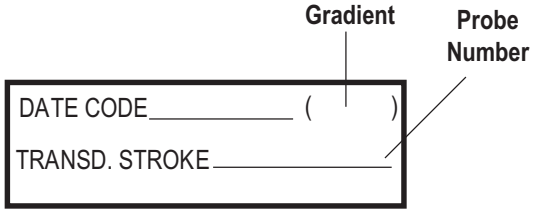
Step 16. The display should show **FLOAT TYPES**. Press **ENTER**. Press **UP** or **DOWN** key to scroll between gasoline and oil. NOTICE: Diesel requires an "oil" entry.
* If nothing is entered here, the RLM 9000 defaults to "Gasoline".

NOTICE **The float type selection is guided by the product used in this tank. See sub-menu PRODUCT, Page 24 Step 9. Press ENTER when the display shows the correct float type. The desired entry will disappear indicating programming complete. Press the UP key and scroll to the next sub-menu.**

Step 17. The display should show **GRADIENT 1**. Press **ENTER**.

NOTICE **The gradient number is stamped on the probe housing. Note label. The gradient number for each probe will vary and must match tank program number to probe gradient.**

Label on Sensor Head with Probe Number and Gradient Number:



The RLM 9000 will not allow you to enter a gradient of less than 8.5 or greater than 9.99. Enter gradient number. Press **ENTER**. The desired entry will disappear indicating programming is complete. Press **UP** key and scroll to the next sub-menu.
* If nothing is entered here, the RLM 9000 defaults to "9.03000".

Step 18. The display should show **HIGH LIMIT 1**. Press **ENTER**.

This is an overfill alarm and will print out as overfill alarm.

Enter the high limit in inches or centimenters, corresponding with sub-menu (level units), Page 9. If you do not want the high-level alarms to be active, enter blanks. Enter high limit desired. Press **ENTER**. The entry will disappear indicating programming complete. Press **UP** key and scroll to the next sub-menu.
* If nothing is entered here, the RLM 9000 defaults to "0.0".

Step 19. The display should show **LOW LIMIT 1**. Press **ENTER**.

NOTICE **This is low-inventory limit (reorder point) and will print out low limit alarm. Enter the low limit in volume units. If you do not want low-level alarms to be active, enter zero.**

Press **ENTER**. The entry will disappear indicating programming complete. Press **UP** key and scroll to the next sub-menu.
* If nothing is entered here, the RLM 9000 defaults to "0.0".

Step 20. The display should show **WATER LIMIT 1**. Press **ENTER**.

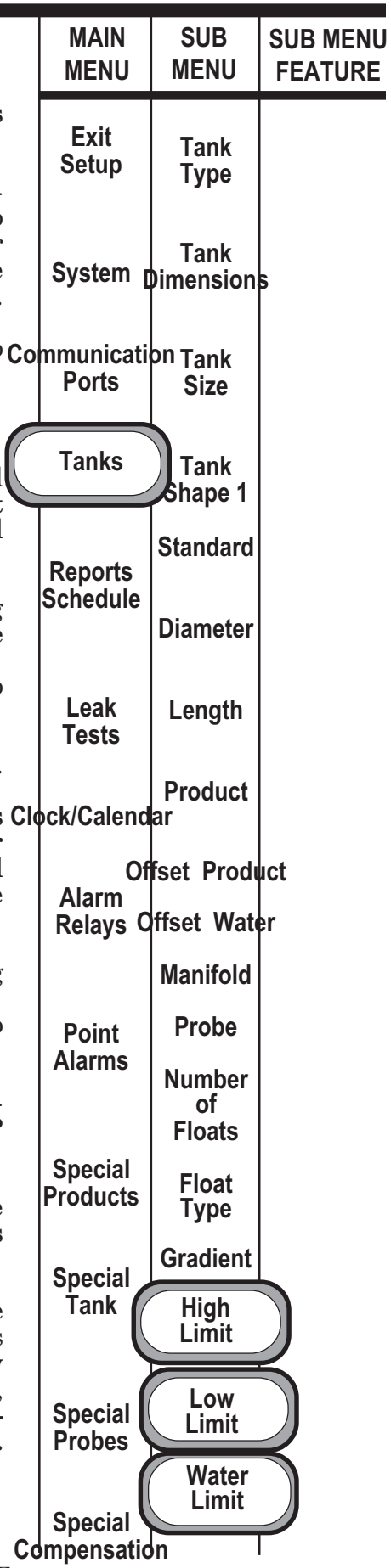
NOTICE **This is a high-water alarm and will print out as water alarm. Enter the water limit in inches or centimeters corresponding with sub-menu (level units). If you do not want the water alarm to be active, enter zero. Enter water limit desired.**

Press **ENTER.** The entry will disappear indicating programming complete.
* If nothing is entered here, the RLM 9000 defaults to "0.0".

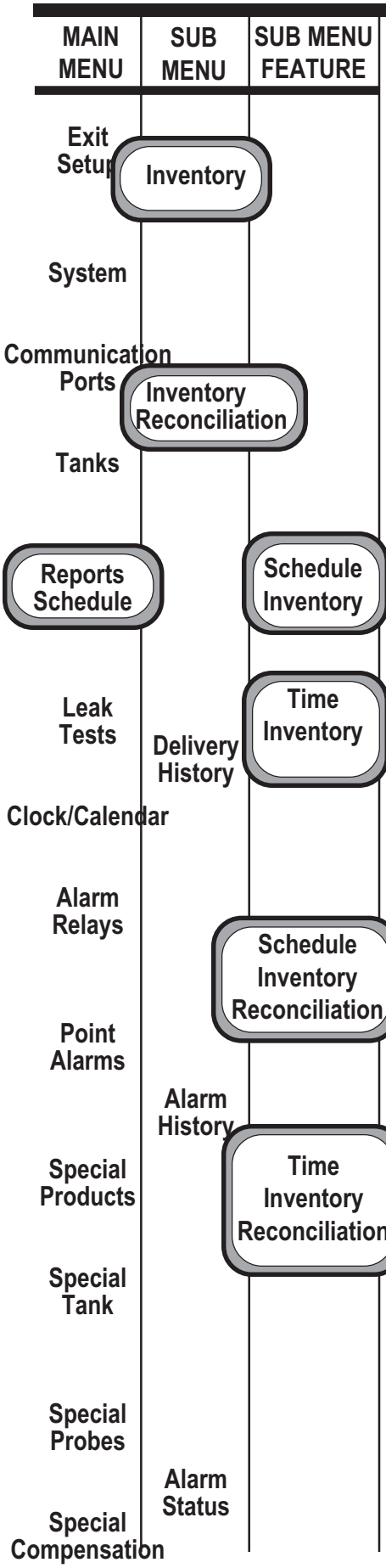
Programming for Tank One is now complete. To program additional tanks press **CANCEL**, then press **UP** key to scroll to the next sub-menu Tank 2.

IMPORTANT: Follow Steps 1 through 20, starting on Page 27, to program Tank Two and all remaining tanks (2 through 8).

When you have finished programming all applicable tanks (if a tank channel is not used, no programming is necessary), press cancel twice. The display will show **TANKS**. Press the **UP** key to scroll to the next main menu, **REPORTS SCHEDULE.** To exit SET UP, press **CANCEL** key. Display will show **EXIT SET UP**. Press **ENTER.**



MAIN MENU - REPORTS SCHEDULE



The REPORTS SCHEDULE MENU allows the operator to schedule routine reports for printing on an established time basis.

Step 1. The display should show **REPORT SCHED**. Press **ENTER**. The display will read **INVENTORY**. Press **ENTER**. The display will read **SCHED INVTRY**. Press **ENTER**. Use the **UP** or **DOWN** key to scroll between None - Shift - Daily - Monday - Tuesday - Wednesday - Thursday - Friday - Saturday - Sunday - 1st Day through 30 Days - Last Day.

NOTICE **The RLM 9000 defaults to none if no entry is made in Sched Inventory sub program.**

Step 2. Scroll to desired entry. Press **ENTER**. The entry will disappear indicating programming is complete. Press **UP** key and scroll to the next sub-menu.

Step 3. The display should show **TIME1 INV**. Press **ENTER**.

Time 1 Inv is used only for the Daily Reports. If shift is entered in Step 1 then Time 1, Time 2 and Time 3 require programming. * (If reports are wanted after each shift). All time entries are entered in 24-hour (military) time. Enter time desired. Example: 07.00.00 (7 a.m.)

NOTICE **Range error occurs if an incorrect time value has been entered.**

Step 4. Press **ENTER**. The time entered will disappear indicating programming complete.
Press **UP** key and scroll to the next sub-menu.

Step 5. The display should show **TIME 2 INV**.

NOTICE **Time 2 and 3 are used only if shift has been entered in Step 1 Sched Invtry sub-menu. If an entry is required, follow Step 3.**

Step 6. Press **CANCEL.** Display will show **INVENTORY.**

Step 7. Press **UP** key. The display should show **INVEN RECON**. Press **ENTER**. The display will show **SCHED INVREC.**

NOTICE **This sub-menu is for INVENTORY RECONCILIATION reports and operates the same as SCHED INVTRY sub-menu. (Steps 1 through 5).**

Step 8. If an automatic report is not required enter **NONE**. If an automatic report is required repeat steps 2-3-4. The programming process is identical except that the display will show **TIME 1 REC** instead of **TIME 1 INV.** When the display shows the desired entry, press **ENTER**. The desired entry will disappear indicating programming complete.

Step 9. When programming for **SCHED INV REC** is complete, press **CANCEL**. Display will show **INVEN RECON.**

Step 10. Press UP key. The display should show **DELIV HIST**. Press **ENTER**. The display should show **SCHED DHSTRY**. Press **ENTER**.

NOTICE

This sub-menu is for a DELIVERY HISTORY REPORT for each tank.
This report will include up to the last 10 deliveries. If an automatic report is not required enter **NONE.** If an automatic report is required, repeat steps 3-4-5. The programming process is identical except that the display will show **TIME 1 DHST.** When the display shows the desired entry press **ENTER** and the desired entry will disappear indicating programming complete. Use **UP** key and scroll to next sub-menu.

Step 11. Press CANCEL key. Display will show **DELIV HIST**.

Step 12. Press **UP** key. The display should show **ALARM HIST**. Press **ENTER**. The display should show **SCHED ALHIST**. Press **ENTER**.

NOTICE

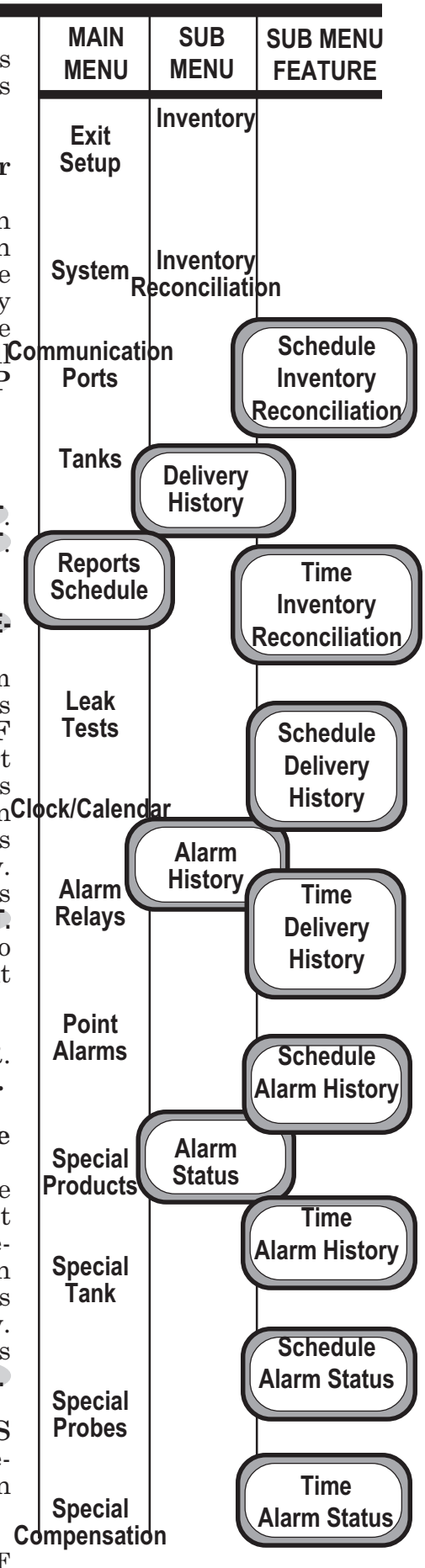
This sub-menu feature is for ALARM HISTORY REPORTS.
The RLM 9000 can store and report up to 50 alarm events. The number of alarm history events reported is controlled by programming. (See - **NUMBER OF ALARMS,** sub-menu Page B20). If an automatic report is not required, enter **NONE**. If an automatic report is required, press the **UP or DOWN** key to scroll between NONE-SHIFT-DAILY-MONDAY-TUESDAY etc. Press **ENTER** when the display shows the desired entry. Repeat steps 3-4-5. The process for setting the time is identical except that the display will show **TIME 1 AHST.** Once the times are entered, press **CANCEL** once to return to the sub-menu. Press **UP** key to scroll to next sub-menu item.

Step 13. The display should show **ALARM HIST.** Press **ENTER**. The display should show **SCHED ALSTAT.** Press **ENTER.**

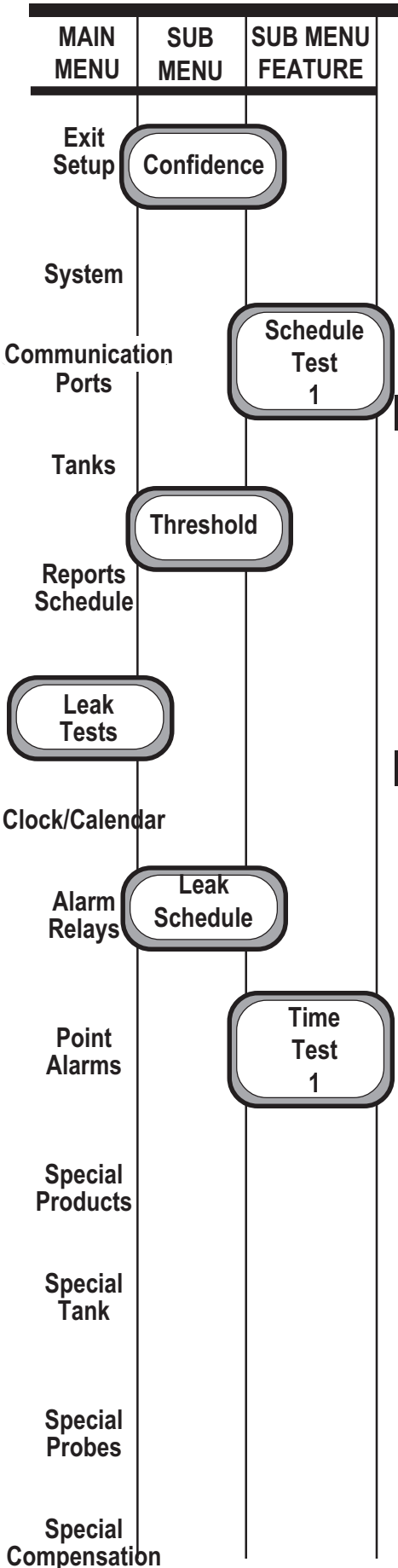
NOTICE

This sub-menu is for scheduling printouts of the ALARM STATUS.
Alarm Status will print out a list of all currently active alarms at a scheduled time. If an automatic report is not required, enter **NONE**. If an automatic report is required, press the **UP** or **DOWN** key to scroll between NONE-SHIFT-DAILY-MONDAY-TUESDAY etc. Press **ENTER** when the display shows the desired entry. Repeat steps 3-4-5. The process for setting the time is identical except that the display will show **TIME 1 ASTAT.**

Step 14. Once the times are entered, programming for **REPORTS SCHEDULE** is complete. Press **CANCEL** twice to return to main menu. Use **UP** key to scroll to the next main menu, **LEAK TEST.**



MAIN MENU - LEAK TESTS



The LEAK TESTS MENU allows the operator to set leak test parameters and schedule automatic leak tests.

Step 1. The display should show **LEAK TESTS**. Press **ENTER**. The display will read **CONFIDENCE**. Press **ENTER**. Press the **UP/ DOWN** key to scroll between 90.0 - 95.0 - 97.5 - 99.0. When the desired confidence level is displayed, press enter. The confidence level will disappear indicating that programming is complete. Press the **UP** key to scroll to next sub-menu.

Step 2. The display should show **THRESHOLD**. Press **ENTER**.

NOTICE **Enter a threshold in volume units per hour. For example, .1 tests for leaks of .1 gph. Press ENTER. The desired entry will disappear indicating programming is complete. Press the UP key and scroll to the next sub-menu.**

Step 3. The display should show **LEAK SCHED**. Press **ENTER**.

Step 4. The display will read **SCHED TEST 1**. Press **ENTER**. Use the **UP**or **DOWN** key to scroll between None - Daily - Monday - Tuesday - Wednesday - Thursday - Friday - Saturday - Sunday - 1 through 30 Days - Last Day.

NOTICE **The RLM 9000 defaults to NONE if no entry is used here.**

Scroll to the desired entry. Press **ENTER**. The entry will disappear indicating programming is complete. Press **UP** key and scroll to the next sub-menu.

Step 5. The display will show **TIME TEST 1**. This is the time the test will be performed on Tank 1. Press **ENTER**. The display will read 00.00.00. Enter time desired in 24-hour time (military). Press **ENTER**. If range **ERROR** occurs, an incorrect time has been entered. Enter correct time. Press **ENTER.** The desired entry will disappear indicating programming is complete. Press the **UP** key and scroll to the next sub-menu.

Step 6. The display should show **SCHED TEST 2**. This is for scheduling tests on Tank 2. Press **ENTER**. Follow Steps 1 through 5, to program Schedule Test for tanks 2 through 8. If a tank monitor is not used, no programming for that channel is required.

Programming for **LEAK TESTS** is complete. Press **CANCEL** twice. The display will show **LEAK TESTS**. Press the **UP** key and scroll to the next main menu. The display should show **CLOCK/CAL**.

The CLOCK/CALENDAR MENU is used to set and configure the clock and calendar in the RLM 9000.

NOTICE **The unit will automatically adjust for leap year.**

Step 1. Press **ENTER**. The display will read **DAYLITE SAVE**. Press **ENTER**. Use the **UP** or **DOWN** key to scroll between enable and disable. Press **ENTER** when desired entry is on screen.

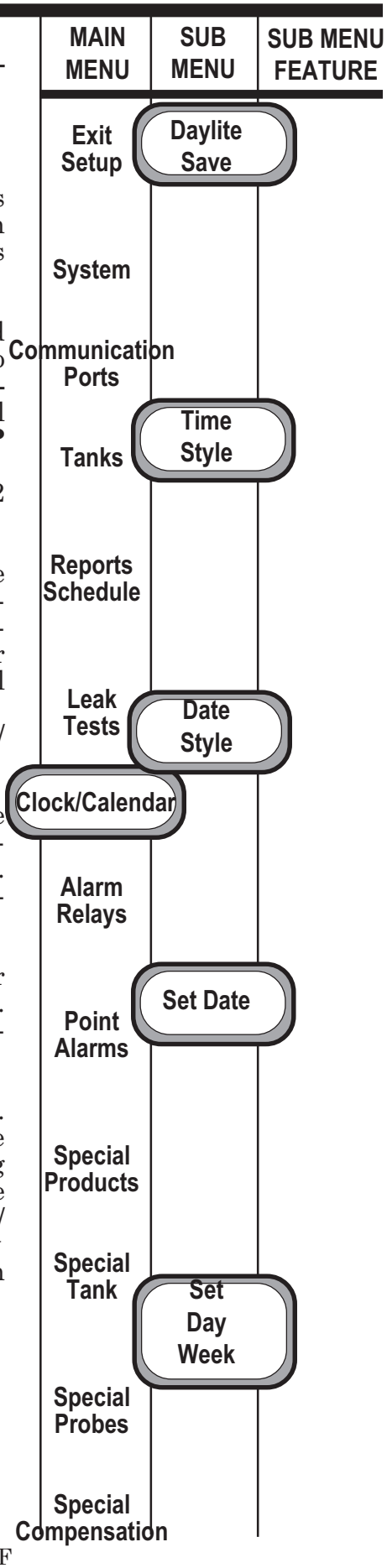
Step 2 . Press **UP** to scroll to next sub-menu. The display will read **TIME STYLE**. Press **ENTER**. Use the **UP** or **DOWN** key to scroll between 12-hour or 24-hour time style. Press **ENTER** when desired time style is displayed. The entry will disappear indicating programming complete. Press **UP** key to scroll to the next sub-menu.
* If no entry is made here, the RLM 9000 defaults to "12 hour".

Step 3 . The display should show **DATE STYLE**. Press **ENTER**. Use the **UP** or **DOWN** key to scroll between MM/DD/YY - DD/MM/YY - YY/MM/DD. Press **ENTER** when the display shows desired date style. The entry will disappear indicating programming complete. Use **UP** key to scroll to the next sub-menu.
* If no entry is made here, the RLM 9000 defaults to "MM/DD/YY".

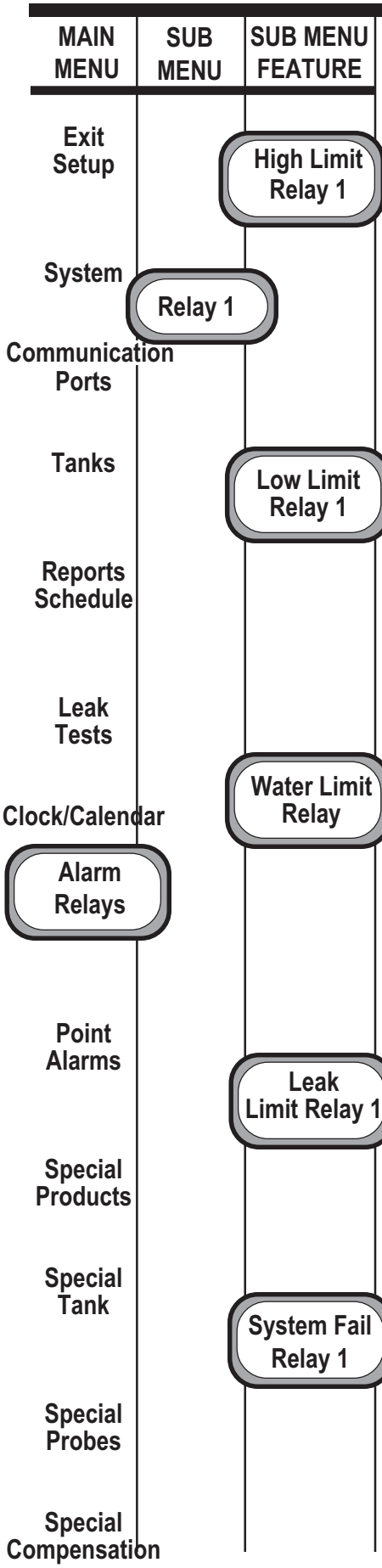
Step 4 . The display will show **SET TIME**. Press **ENTER**. The display will read **00.00.00.** Enter time in 24-hour (military) time. Example: 04:39:22 = 4:39 a.m. Press **ENTER**. The entry will disappear indicating programming is complete. Use the **UP** key to scroll to the next sub-menu.

Step 5 . The display should show **SET DATE**. Press **ENTER**. Enter correct year, month, day, in that order. Press **ENTER**. The entry will disappear indicating programming complete. Use the **UP** key to scroll to the next sub-menu.

Step 6 . The display should show **SET DAY WEEK**. Press **ENTER**. Use the **UP/DOWN** key to scroll to the current day of the week. Press **ENTER**. The entry will disappear indicating programming complete. If no entry is made here, the RLM defaults to "Monday". Programming for CLOCK/CAL is complete. Press **CANCEL.** The display will show **CLOCK/CAL**. Press **UP** key and scroll to the next main menu, **ALARM RELAYS.**



MAIN MENU - ALARM RELAYS



The ALARM RELAYS main menu allows you to assign the various alarms to the two relay output channels. Each relay, RELAY 1 and RELAY 2, has a common which connects a normally open and normally closed contact upon programmable alarm. The relays will change states upon occurrence of any alarm assigned to it. Each relay contact is rated for 5A at 30VDC, 125VAC, 250VAC.

Step 1. The display will read **ALARM RELAYS**. Press **ENTER** and the display will read **RELAY 1**. Press **ENTER** to assign alarms which will activate Relay 1. Relay 1 will change states upon occurrence of any alarm assigned to it. Use the **UP** and **DOWN** key to scroll through the available alarm selections.

Step 2. The first alarm selection is **HIGH LIM RY1**. Press **ENTER** to assign or unassign the overfill alarm to relay 1. The display will show **"NO"** or **"YES"**. Use the **UP** or **DOWN** key to toggle between **"NO"** and **"YES"**. Press **ENTER** when the correct state is displayed. Press the **UP** key to scroll to the next sub-menu item.

* If no entry is made here, the RLM 9000 defaults to "No".

Step 3. The next alarm selection is **LOW LIM RY1**. Press **ENTER** to assign or unassign the low limit alarm to relay 1. The display will show **"NO"** or **"YES".** Use the **UP** or **DOWN** key to toggle between **"NO"** and **"YES"**. Press **ENTER** when the correct state is displayed. Press the **UP** key to scroll to the next sub-menu item.

* If no entry is made here, the RLM 9000 defaults to "No".

Step 4. The next alarm selection is **WTR LIM RY1.** Press **ENTER** to assign or unassign the water limit alarm to relay 1. The display will show **"NO"** or **"YES"**. Use the **UP** or **DOWN** key to toggle between **"NO"** and **"YES"**. Press **ENTER** when the correct state is displayed. Press the **UP** key to scroll to the next sub-menu item.

* If no entry is made here, the RLM 9000 defaults to "No".

Step 5. The next alarm selection is **LEAK LIM RY1**. Press **ENTER** to assign or unassign the leak limit alarm to relay 1. The display will show **"NO"** or **"YES".** Use the **UP** or **DOWN** key to toggle between **"NO"** and **"YES"**. Press **ENTER** when the correct state is displayed. Press the **UP** key to scroll to the next sub-menu item.

* If no entry is made here, the RLM 9000 defaults to "No".

Step 6. The next alarm selection is **SYS FAIL RY1**. Press **ENTER** to assign or unassign the system failure alarm to relay 1. The display will show **"NO"** or **"YES".** Use the **UP** or **DOWN** key to toggle between **"NO"** and **"YES"**. Press **ENTER** when the correct state is displayed. Press the **UP** key to scroll to the next sub-menu item.

* If no entry is made here, the RLM 9000 defaults to "No".

Step 7. The next alarm selection is **THEFT RY1**. Press **ENTER** to assign or unassign the theft alarm to relay 1. The display will show **"NO"** or **"YES"**. Use the **UP** or **DOWN** key to toggle between **"NO"** and **"YES"**. Press **ENTER** when the correct state is displayed. Press the **UP** key to scroll to the next sub-menu item.

* If no entry is made here, the RLM 9000 defaults to "No".

Step 8. The next selection is **POINT 1 RY.** Press **ENTER** to assign or unassign the 16 individual point alarms to relay 1. The Point Alarms which are discussed in the next programming section are for future system growth and special application. **This feature is not functional at the time of this publication.**

* If no entry is made here, the RLM 9000 defaults to "Open".

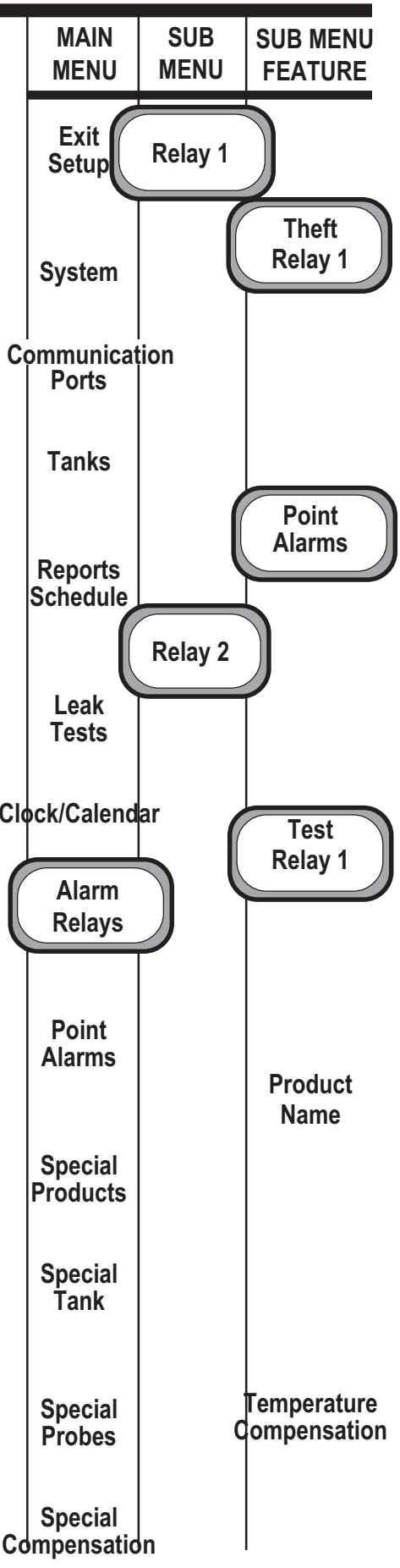
Step 9. The next selection is **TEST RY 1**. Press **ENTER.** Open will appear on the screen. Press the **DOWN** key. The relay will be energized. Press the **CANCEL** key to end the test.

This ends programming for relay 1. Press the **CANCEL** key to get back to the **RELAY 1** sub-menu level. Press the **UP** key to scroll to the next sub-menu, **RELAY 2.**

RELAY 2

The instructions for assigning alarms to relay 2 are identical to the instructions regarding relay 1.

This ends the programming alarm relays section. Press the **CANCEL** key. The display will read **ALARM RELAYS.** Press the **UP** key to scroll to the next main menu, **POINT ALARMS.**



MAIN MENU - POINT ALARMS

MAIN MENU	SUB MENU	SUB MENU FEATURE
Exit Setup		
System		
Communication Ports		
Tanks		
Reports Schedule		
Leak Tests		
Clock/Calendar		
Alarm Relays		
Point Alarms		
Special Products		
Special Tank		
Special Probes		
Special Compensation		

The POINT ALARM MAIN MENU allows you to assign names to the alarms associated with the 16 external alarm inputs. This programming feature is planned for future system growth and special applications. <u>This feature is not functional at the time of this publication</u>.

Press the **UP** key again to scroll to next main menu, **SPECIAL PROD.**

The SPECIAL PRODUCTS main menu item allows you to enter custom data for liquid products not in the standard list. The data entered here is for specifying the temperature compensations and API gravity values. These values are available from the product supplier. Up to eight special products can be defined.

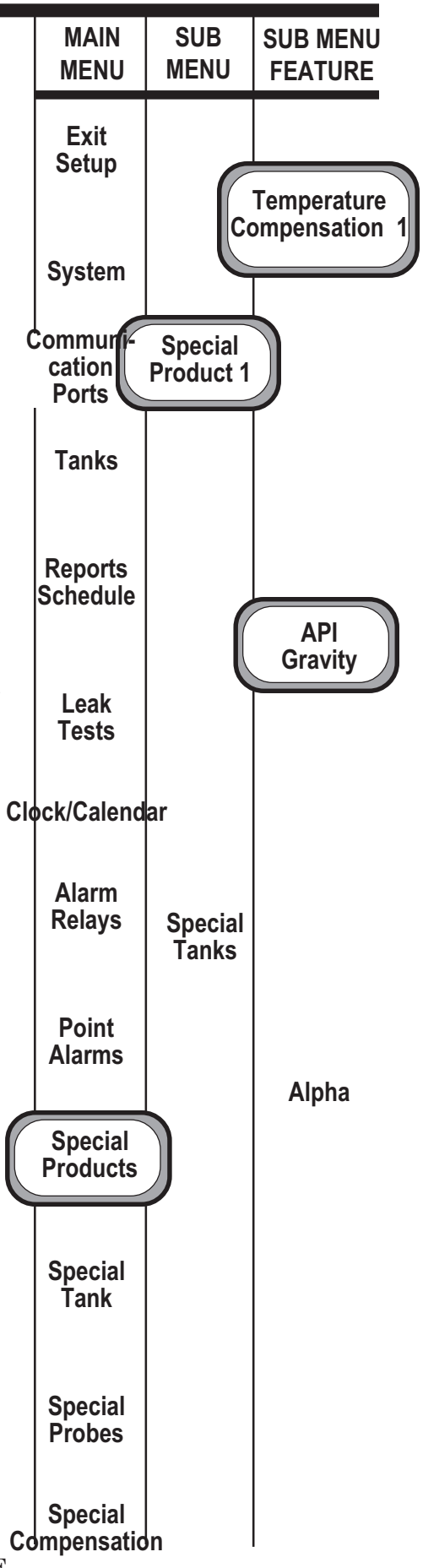
Step 1. The display should show **SPECIAL PROD.** Press **ENTER**. The display will show **SPEC PROD 1**. To define special product 1, press **ENTER.**

Step 2. The display will show **PROD NAME 1**. Press **ENTER**, and key in the name you wish to assign to this special product. Twelve characters maximum. Press **ENTER** when name is complete.

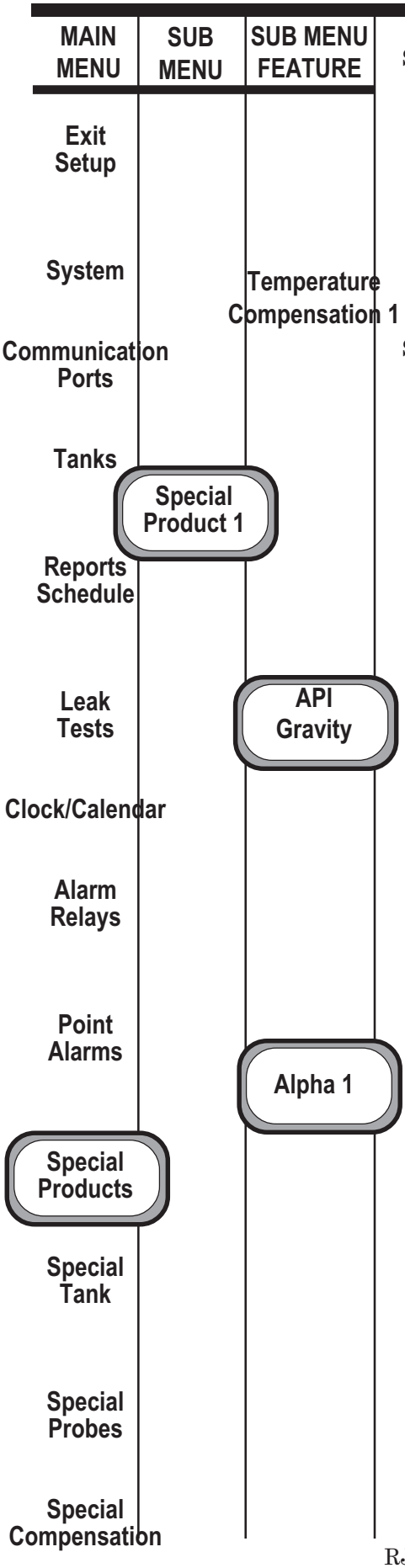
Step 3. Press the **UP** key to scroll to the next sub-menu item, **TEMP COMP 1.**

Press **ENTER** and use the **UP** key to scroll through the temperature compensation methods. They are: API 6A/54A, API 6B/54B, API 6C/54C, and SPEC COMP 1 to SPEC COMP 4. This allows configuration for three standard compensation tables plus the ability to create up to four customized temperature compensation tables. Programming instructions for building a special compensation table are found under the main menu feature **SPECIAL COMP**. Press **ENTER** when the correct compensation table is displayed.

NOTICE **Use Table 6A/54A for crude oil and JP4. Use 6B/54B for most other refined products including gasoline, fuel oil, jet fuel, kerosene and diesel. Use 6C/54C for compensation for special petroleum products such as lube oils. Table 6A or 6B requires you enter API gravity. This is a number between 20 and 80 for common products. Table 6C requires you enter the temperature coefficient of expansion. This value is multiplied by 1,000,000 before entering it. Typical values are 0.000500=(500 x 10^{-6}) so enter 500 in sub-menu Alpha. Special compensation is used for non-petroleum fluids or fluids which don't work with any of the above tables. See main menu Spec Comp, Page 41.**



MAIN MENU - SPECIAL PRODUCTS



Step 4. Press the **UP** key to scroll to the next sub-menu item, **API GRAV 1**. This is required only when temperature compensation API 6A/54A or API 6B/54B was selected in the previous step. Press **ENTER** and key in the actual API gravity associated with the product. This number is available from the product supplier. This number is between 20 and 80 for common products. Press **ENTER** after entering the correct number.

Step 5. Press the **UP** key to scroll to the next sub-menu item, **ALPHA1**. Press **ENTER** and key in the correct temperature coefficient of expansion. This is required only when temperature compensation API 6C/54C was selected in Step 3 TEMP COMP sub-menu item. This value is multiplied by 1,000,000 before entering. Ex. (.000500) $10^6 = 500$. Press **ENTER** after entering the correct number.

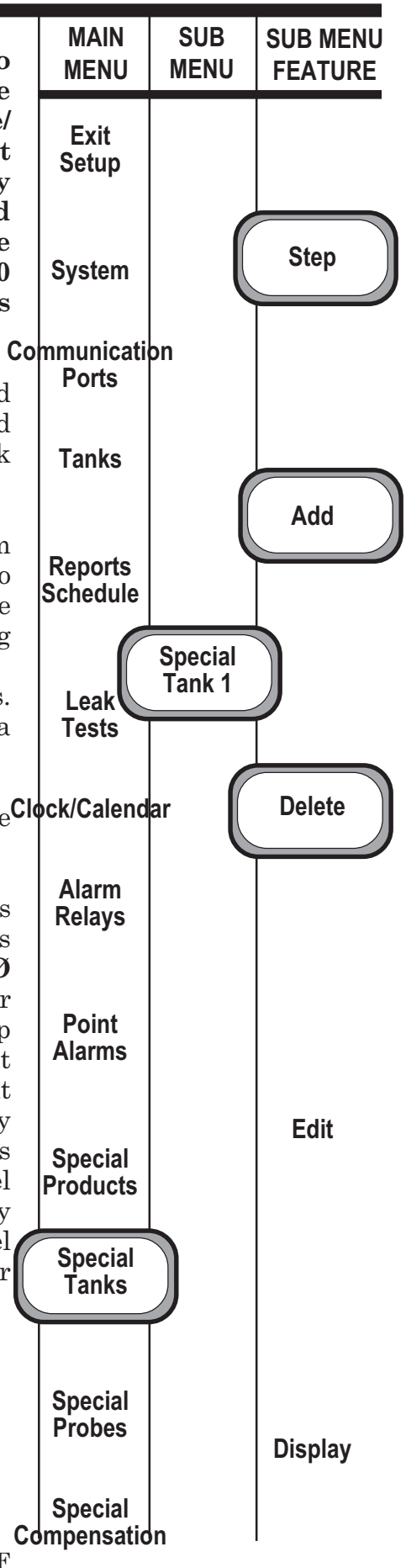
This ends programming instructions for Special Product 1. To program in the other seven special products, press **CANCEL** then the **UP** key to access Special Products 2 - 8. Follow the same sequence of programming instructions as in Special Product 1. If finished programming the Special Products, press the **CANCEL** key twice. The display will show **SPECIAL PROD.** Press the **UP** key to scroll to next main menu, **SPECIAL TANK.**

The SPECIAL TANK main menu allows you to create up to eight custom strapping tables. These may be used when one of the standard tables is not appropriate. Up to 144 volume/ level data points per tank may be entered, but you do not have to enter this many. Fewer points will less accurately describe the tank shape and conversion between level and volume, but will work as long as the data includes the entire height of the tank. When determining volumes, the RLM 9000 will automatically interpolate between the data point pairs that are entered.

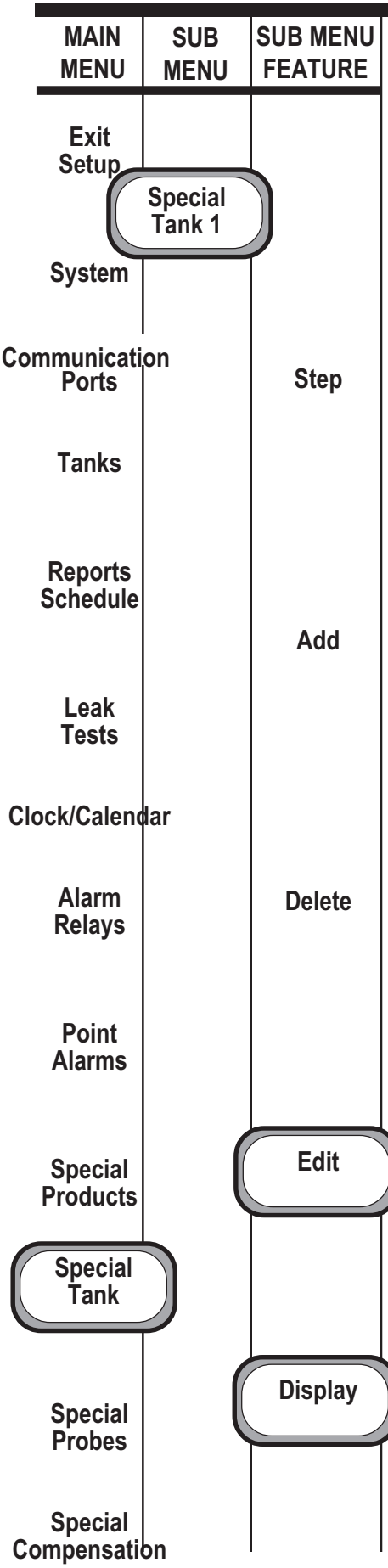
Step 1. The display should show **SPECIAL TANK**. Press **ENTER** and the display will show **SPEC TANK 1**. Press **ENTER** again and you will be able to scroll through five sub-options in the tank table mode using the **UP** or **DOWN** key:

a) **STEP** - Enter the intervals at which you wish to program in volume data. For example, if you enter '1' you will have to program in volume at one inch increments. The volume verses level data should be entered from the exact strapping table supplied by the tank manufacturer.
b) **ADD** - Allows you to directly enter the volume data points.
c) **DELETE** - Allows you to delete the last volume data point.
d) **EDIT** - Allows you to change a particular data point.
e) **DISPLAY** - Allows you to scroll through the entire strapping table.

Step 2. After entering the Step increments, press **ENTER** then press the **UP** key to scroll to the **ADD** sub-option and press **ENTER.** The display will show **LEVEL** on the top line, and **Ø** on the bottom line, indicating that this is the next height for which volume data may be entered. Press **ENTER**. The top line of the display will read **VOLUME.** Enter the volume that corresponds with the previous level display. In this case, at level Ø the volume will be Ø. Press **ENTER** and the display will again read **ADD.** To continue adding data points press **ENTER**. The display will automatically step to the next level entered in the **STEP** sub-option. Press **ENTER** and then key in the volume that corresponds with the previous level display. Continue adding volume data points in this manner until finished.



MAIN MENU - SPECIAL TANK



Use the **CANCEL** key for correcting errors or the **DELETE** sub-option for deleting an entire entry. The **DELETE** option allows you to delete the last point in the table. To use it scroll with the **UP** key until the displays reads **DELETE** then press **ENTER**. The top line of the display will read **LEVEL** and the lower line will show the level corresponding to the last volume data point in the table. Press **ENTER** to delete this point. The top line of the display will prompt **'SURE?'**. Press **ENTER** to delete the value or **CANCEL** to abort.

If you want to **EDIT** a level/volume pair, scroll to the **EDIT** option and press **ENTER**. The upper line of the display will show **LEVEL** and the lower line will show the lowest level data point in the table. You can scroll to the level which corresponds to the volume data point that you would like to edit by pressing the **UP** or **DOWN** key. When you are displaying the correct level point, press **ENTER**. The display will show **VOLUME** on top and the current volume value on the lower line. You may re-enter the correct volume data. To back out of the **EDIT** option, press **ENTER** until the displays read **EDIT**.

To use the **DISPLAY** option scroll to it with the **UP** or **DOWN** key and press **ENTER**. If the table is not empty, the upper line on the display will read **LEVEL** and the lower line will show a value. Use the **UP** or **DOWN** key to scroll through the levels in the table. If you wish to examine a value at a particular level, press **ENTER** when the display is showing that level data point. The display will now show volumes and you may scroll through volumes now by using the **UP** or **DOWN** key. This ends programming for Special Tank 1. To program other SPECIAL TANKS, press **CANCEL** and press the **UP** key to access SPECIAL TANKS 2-8. Follow the same sequence of programming instructions as in SPECIAL TANK 1.

WARNING **Be extremely careful not to put in any incorrect volumes as it will cause the RLM 9000 to make inaccurate volume calculations. It is recommended that, upon completion of entering a special strapping table, it be printed out and examined for error. When finished programming the special tanks, press the CANCEL key twice. The display will show SPECIAL TANK. Press the UP key to scroll to the next main menu, SPECIAL PROBE.**

The SPECIAL PROBES main menu will allow you to enter data for up to eight level probes not in the standard list. Scroll to the SPECIAL PROBES main menu item and press ENTER. The display will read SPEC PROBE 1. Press ENTER and use the UP and DOWN keys to scroll through the probe parameters. Press the CANCEL key at any time to return to the Special Probes menu.

Step 1. The display should read **SPECIAL PROBE**. Press **ENTER.** Display will read **SPEC PROBE 1**.

Step 2. Press **ENTER**. Display will read **LENGTH 1.** Press **ENTER** to enter the length of the custom probe. Key in the new probe length in inches and press **ENTER**.

Step 3. Press the **UP** key. Display will read **NO. RTDS 1.** Press **ENTER** to enter the number of RTD's in the custom probe. **ENTER** to the correct number and press **ENTER**.

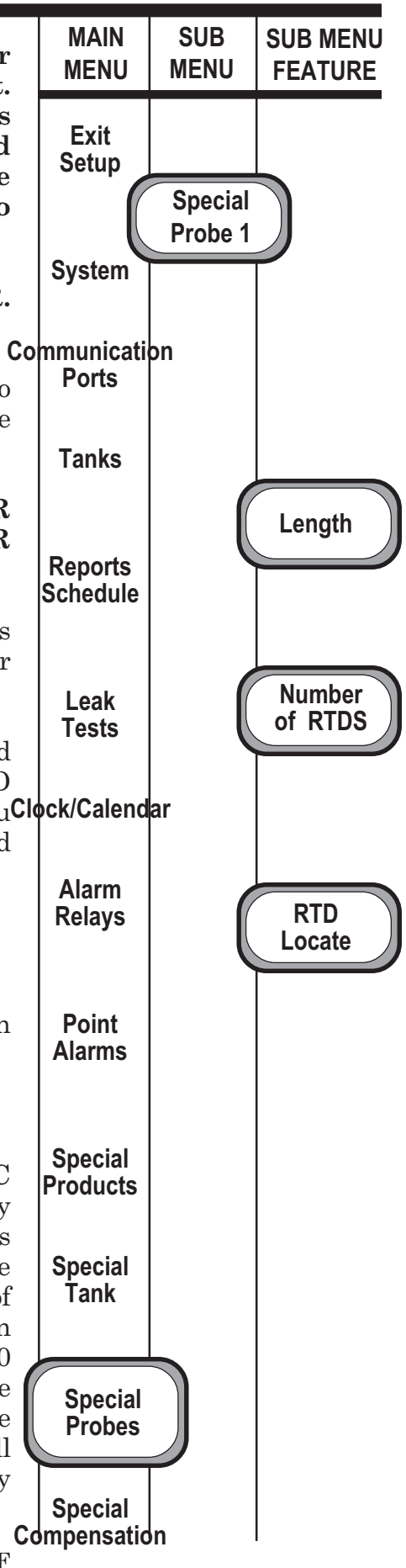
Step 4. Press the **UP** key. Display will read **RTD LOCATE 1**. Press **ENTER** to create or modify the table of RTD locations for custom probe 1.

Data for all special probes is entered, edited, and displayed using a special table entry mode. You may enter up to 6 RTD locations per probe, but do not have to enter this many. You must program only as many RTD's as are in the probe, and only as many as you have entered under NO. OF RTDS 1.

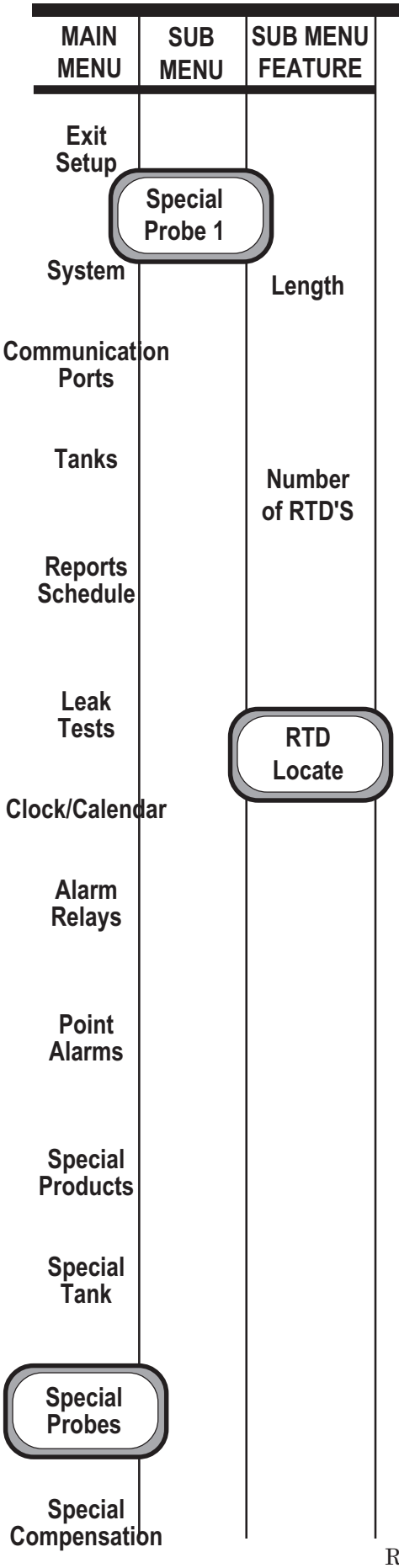
There are four sub-options in the RTD location table mode:

a) **ADD** - Allows you to directly enter the RTD locations
b) **DELETE** - Allows you to delete a particular RTD location
c) **EDIT** - Allows you to edit a particular RTD location
d) **DISPLAY** - Allows you to advance through the RTD location table

Step 5. When you enter the **RTD LOCATE** sub-menu under the **SPEC PROBE** menu the upper line of the display will display **RTD LOCATE.** To enter a data point into the table, press **ENTER**, scroll to the **ADD** option and press **ENTER**. The decimal number represents the distance from the bottom of the probe to the RTD in inches or centimeters, depending on the unit of measure previously chosen. The number 0.0000 will appear on the lower line of the display and the upper line will read **ADD.** Enter a decimal number for the location of the RTD and then press **ENTER**. The top line of the display will read **ADD**. Note that the display will show **DUPLICATE** if you try to enter duplicate values for the same point.



MAIN MENU - SPECIAL PROBES



Step 6. After you have entered a number of points, you can examine the table by scrolling the display using the **UP** key until it indicates **DISPLAY**. Press the **ENTER** button to enter this option. If the table is not empty, the lower line of the display will show a value, and the upper line will read **DISPLAY**. This decimal number indicates the lowest RTD location point in the table. Use the **UP** or **DOWN** button to scroll through the RTD location values in the table. Note that the values are arranged in the order in which they were entered (even if this is not ascending numerical order). To leave this data table, press the **CANCEL** button. If the table is empty, the display will show **TABLE EMPTY**.

Step 7. If you want to delete a point, scroll to the **DELETE** option and press **ENTER**. You will now see a decimal number that represents the lowest RTD location value in the table. Use the **UP** or **DOWN** key to scroll through the RTD location values until you come to the data that you would like to delete. Press the **ENTER** key to delete this data point. You will then return to the sub-option sub-menu and the display will read **DELETE**. To re-enter the **DELETE** option, press the **ENTER** key. To leave the **DELETE** option without deleting any more data point-pairs, press the **CANCEL** key.

Step 8. If you want to edit a point, scroll to the **EDIT** Option and press **ENTER**. The upper line of the display will read **EDIT**, and the lower line of the display will show the lowest RTD location data in the table. You can scroll to the data that you would like to edit by pressing the **UP** or **DOWN** key. When you are displaying the RTD location data that you would like to edit, press the **ENTER** key. The display will then go into a data entry mode and allow you to change the value. If you do not want to edit the data press **CANCEL**. The display will return to the sub-option menu and the display will read **EDIT**. Note that the display will show **DUPLICATE** if you try to enter duplicate values for the same point. This ends programming for SPECIAL PROBE 1. To program other special probes, press the **CANCEL** key then the **UP** key to access Special Probes 2-8. Follow the same sequence of programming instructions as for Special Probe 1. If finished programming the special probes, press the **CANCEL** key twice. The display will show **SPECIAL PROB.** Press the **UP** key to scroll to the next main menu, **SPECIAL COMP.**

MAIN MENU - SPECIAL TEMPERATURE COMPENSATION

The SPECIAL TEMPERATURE COMPENSATION main menu allows you to create up to four custom temperature compensation tables. These may be used when one of the standard tables is not appropriate. One of the purposes of the special compensation table is to allow compensation to other reference temperatures. The reference temperature is the temperature to which the special volume values will be compensated. With the other compensation methods, this is 60 degrees Fahrenheit or 15 degrees Celsius. Data for all custom temperature compensation tables is entered, edited and displayed using a special table entry mode. You may enter up to 32 temperature compensation data points per tank. Fewer points will less accurately describe the temperature compensation function and conversion between gross volume and net volume, but will work as long as data includes the entire temperature range of 0 to 40 degrees Celsius (32° to 104° F). When determining net volume, the RLM 9000 will automatically interpolate between the data point pairs entered.

Step 1. The display should read **SPECIAL COMP**. Press **ENTER**. The display reads **SPEC COMP 1**.

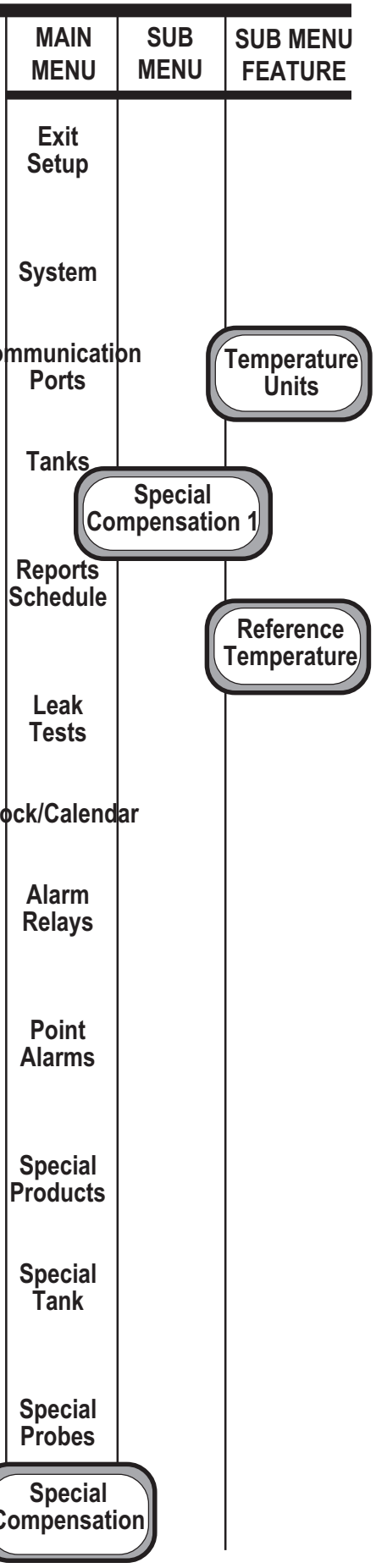
Step 2. Press the **UP** key. Display should show **TEMP UNITS.** Press **ENTER**. Use the **UP** and **DOWN** key to select either Fahrenheit or Celsius. Press **ENTER** when desired units are displayed.

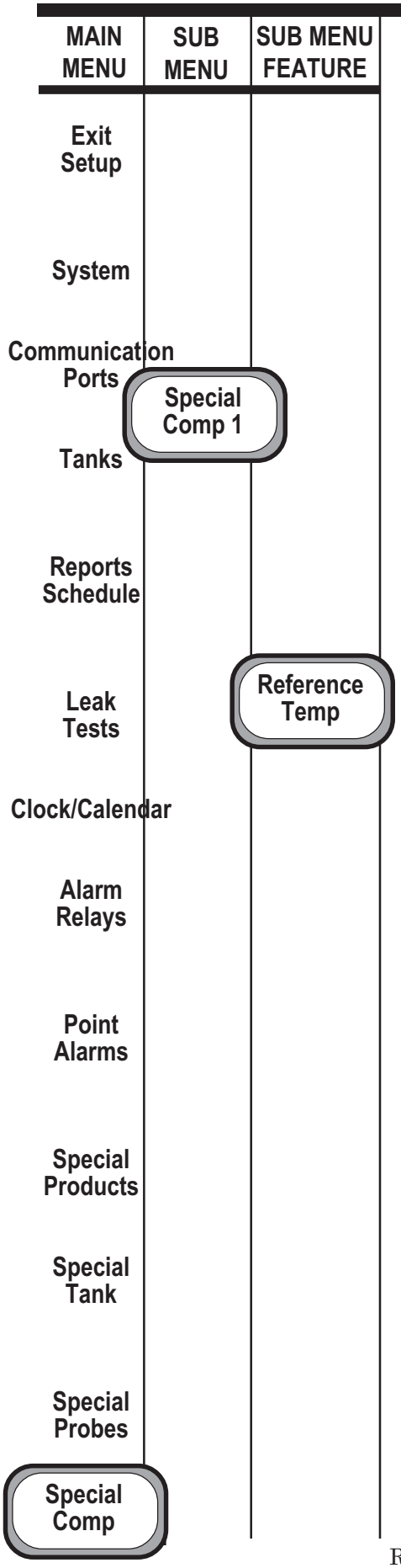
Step 3. Press **ENTER.** Display should show **REF TEMP.** Press **ENTER**. Enter the reference temperature table.

Step4. When creating this table you will be prompted for temperature and density values for the product in the tank. For a given temperature you will be required to enter a density value. There are four sub-options available for creating the special table.

a) **ADD** - Allows you to directly enter the temp/density values
b) **DELETE** - Allows you to delete values in the table
c) **EDIT** - Allows editing of the data table
d) **DISPLAY** - Allows display of all values in the table

Step 5. To enter values into the table, scroll to **ADD** and press **ENTER**. The display will read **TEMP** on the top line and display a number on the bottom line. Enter the first temperature of the table. Note: If using Fahrenheit the first number must be 32 degrees and the last number in the table must be 104 degrees. For Celsius, the first number must be 0 degrees and the last must be 40 degrees. Press **ENTER** when the correct temperature is displayed. The display will now read **DENSITY**. Enter the corresponding density value for the previous temperature entry. Press **ENTER** when the correct value has been keyed in and the display will read **ADD**,





which means it's ready for the next temp/density entry. Note that the display will show **DUPLICATE** if you try to enter duplicate values for the same point.

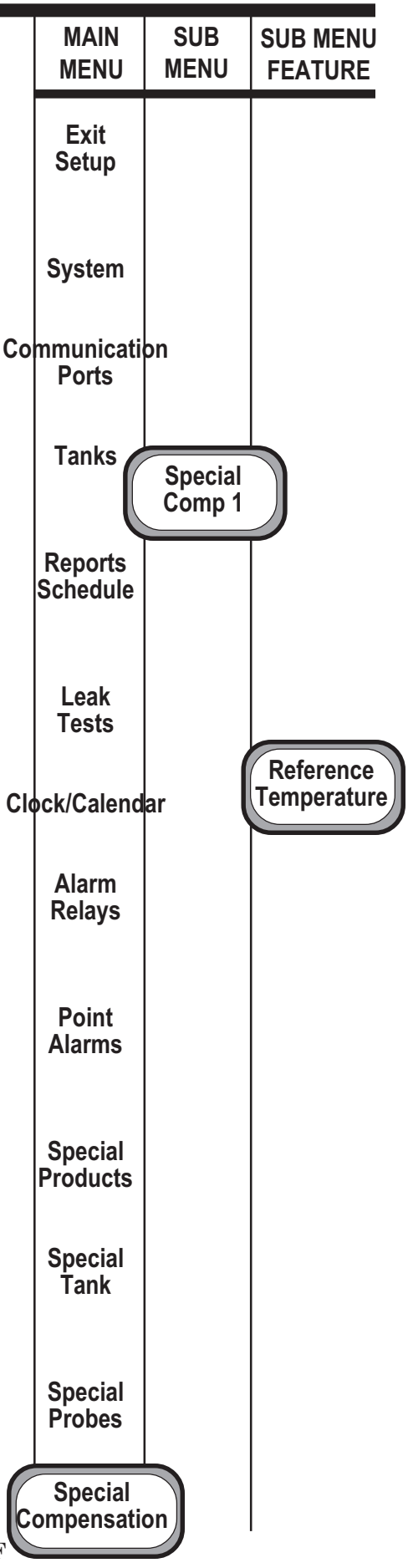
Step 6. After you have entered a number of point-pairs, you can examine the table by scrolling the display until it indicates **DISPLAY**. Press the **ENTER** key to enter this option. If the table is not empty, the lower line of the display will show a value, and the upper line will read **TEMP**. This decimal number indicates the lowest temperature point in the table. Use the **UP** or **DOWN** key to scroll through the temperature values in the table. Note that the values are arranged in numerical order (even if they were not entered in numerical order). If you want to examine the corresponding density data point for a particular temperature point, then press the **ENTER** key when the display will show that temperature. If you now use the **UP** or **DOWN** key you can scroll through the density data points. You can return to the temperature data points by pressing the **ENTER** key again. The upper line for the display shows the appropriate label at all times. To leave this data table, press the **CANCEL** key. If the table is empty, the lower line for the display will show **EMPTY**.

Step 7. If you want to delete a point-pair, scroll to the **DELETE** option and press **ENTER**. You will now see a decimal number that represents the lowest temperature value in the table. Use the **UP** or **DOWN** key to scroll through the temperature data until you come to the data that you would like to delete. Press the **ENTER** key to delete this data point. You will then return to the sub-option menu and the display will read **DELETE**. To re-enter the **DELETE** option, press the **ENTER** button. To exit the **DELETE** option without deleting any more data point-pairs, press the **CANCEL** key and return to the Table sub-menu option.

Step 8. If you want to edit a point-pair, scroll to the **EDIT** option and press **ENTER**. The upper line of the display will read **TEMP**, and the lower line of the display will show the lowest temperature data in the table. You can scroll to the data that you would like to edit by pressing the **UP** or **DOWN** key. When you are displaying the temperature data that you would like to edit, press the **ENTER** key. The display will then go into a data entry mode that you can use to first change the temperature data and then it will automatically display the corresponding

density data point for editing. If you do not want to change one of the point-pairs, then simply keep pressing the **ENTER** key without pressing either the **UP** or **DOWN** key. The display will return to the sub-menu and the display will read **EDIT**. Note that the display will show **DUPLICATE** if you try to enter duplicate values for the same point.

This ends programming for SPECIAL COMP 1. To program other special temperature compensation, press **CANCEL** key then press the **UP** key to access special comp 2-8. Follow the same sequence of programming instructions as in SPECIAL COMP 1. If finished programming SPECIAL COMP, press the **CANCEL** key three times. When the display reads **EXIT SET UP**, press **ENTER.**



NOTES

MAIN MENU	SUB MENU	SUB MENU FEATURE
Exit Setup		
System		
Communication Ports		
Tanks		
Reports Schedule		
Leak Tests		
Clock/Calendar		
Alarm Relays		
Point Alarms		
Special Products		
Special Tank		
Special Probes		
Special Compensation		

WARNING **These instructions apply to the RLM 9000 unit also. The keypad illustrated below will be the keypad on your left when facing the RLM 9000 unit.**

NUMERIC PAD FOR DATA ENTRY

SCAN To review each function on LCD Display

TEST Systems and Communications test

RESET Clears programming errors

ENTER Loads Data

RESET Push RESET + ENTER simultaneously to clear ENTER (used with programming switch ON)

NEXT Advances display to next programming function (used with programming switch ON)

QUIET Silences PPM 4000/RLM 9000 Audible Alarm

BEFORE YOU BEGIN PROGRAMMING, FIRST READ ALL OF THE INSTRUCTIONS

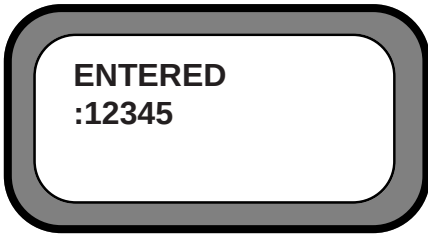
THE PROGRAMMING INSTRUCTIONS FOR THE PPM 4000 ALSO APPLY TO THE LINE PRESSING PROGRAMMING OF THE RLM 9000. IF ANY ERRORS ARE MADE WHILE PROGRAMMING - PRESS THE "RESET" KEY TO CORRECT THE MISTAKE AND REENTER THE DATA FOR THAT STEP.

NOTICE PPM 4000 units with version 3.11 software or later have a maximum calling pace of once every four minutes if no connection is established with a computer and three hours on an 'acknowledged' fault. A fault is considered 'acknowledged' when a PPM 4000 establishes contact with a remote computer modem.

LOCAL PRINT FEATURE: *The RLM 9000 and PPM 4000 do not automatically provide printouts of line pressure reports. Software version 2.71 and later provide an option for obtaining these reports.. It allows a serial printer to be attached directly to the communications port on the RLM 9000. Simply attach the printer and program the phone number to '0.' This will cause a status report to print at the programmed call time, and upon any alarm that would normally cause the unit to call out. Compatibility will be with serial (RS232 connection) ASCII printers that are at least 80 columns wide.

STEP 1 Slide the Program Switch **UP** to the **"PROGRAM"** position. (See page 4 for location of Program Switch.)

STEP 2 **Press "NEXT"**. Using the numeric key pad, enter a location or I.D. number up to 10 digits. When the desired number has been entered, **press "ENTER"**. The L.C.D. Display will show **"ENTERED"** and the program number. Check for accuracy.

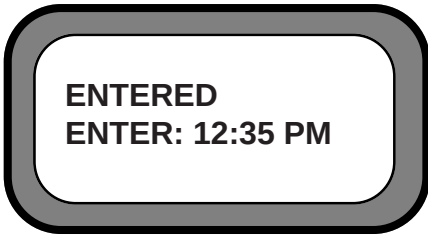


STEP 3 **Press "NEXT"**. If remote communications is desired and a MODEM has been installed, enter the phone number to be dialed, up to eleven (11) digits. **Press "ENTER".** The display will show **"ENTERED"** and the phone number.

NOTICE **LOCAL PRINT FEATURE** available with versions 2.71 and later software, see above notice.

STEP 4 **Press "NEXT".** Enter Month, Day and Year. If it is a single digit month or day a zero (0) must precede the month or day number. **Press "ENTER".** The display will show **"ENTERED"** and the date.

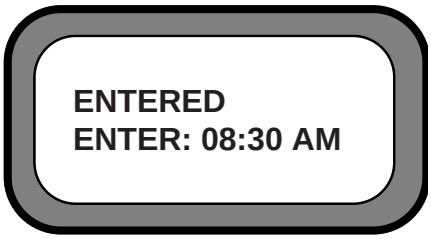
STEP 5 **Press "NEXT".** Enter the correct time. If it is a single digit hour, a zero (0) must precede the hour number. If the present time is a PM **press zero "0"** after the correct time has been entered. **Press "ENTER".** The display will show **"ENTERED"** and the correct time AM or PM.



STEP 6 Press "NEXT". **STM** represents Standard Time and **DSM** represents Daylight Savings Time. **Press zero "0"** on the key pad. The display will switch back and forth between **"STM"** and **"DSM"**. If programmed in the "DSM" mode the system will automatically adjust for Daylight Savings Time. **Press "ENTER".** The display will show "ENTERED". **If Daylight Savings Time is used at any time during the year, enter DSM; if not, enter STM.**

STEP 7 **Press "NEXT". If communications is desired and a MODEM has been installed, follow STEP 7A. If communications is not being used, follow STEP 7B.**

A. The PPM 4000 will automatically send a Status Report every 24 hours. **Enter the correct time.** If it is a single digit hour, a zero (0) must precede hour number. If the present time is PM **press zero "0"** after the correct time has been entered. **Press "ENTER".** The display will show "ENTERED" and the desired time.

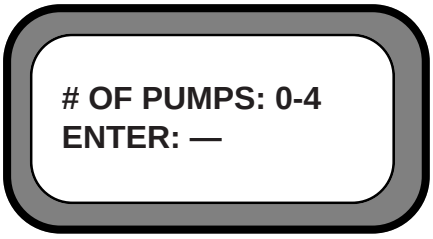


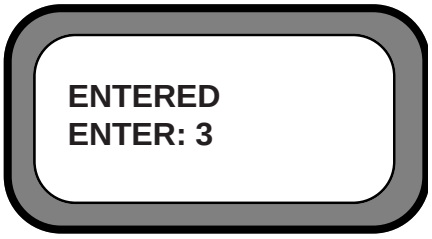
B. If the automatic reporting function is not used **press zero "0" two "2" times** and the display will immediately show **"DISABLED". Press "ENTER".** The display will show **"ENTERED" and "DISABLED".**

STEP 8 **Press "NEXT".** The PPM 4000 can monitor up to four (4) pressure piping systems. The number entered here will activate the appropriate hardware and software to allow the respective number of pumps to operate**.**

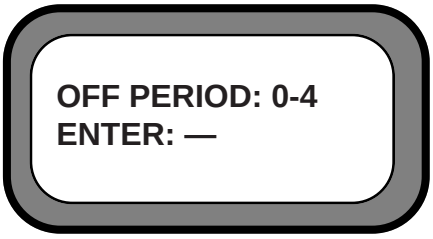
Since the PPM 4000 is an 8 channel monitoring system, entering 2 pumps would program two (2) pressure systems and six (6) hydrocarbon probes. Entering three (3) pumps would program 3 pressure systems and five (5) hydrocarbon probes etc. A maximum of four (4) pressure systems can be entered.

Press zero "0" to four "4" depending on the number of pressure systems desired. **Press "ENTER".** The display will show "NUMBER OF PUMPS": and the number programmed.

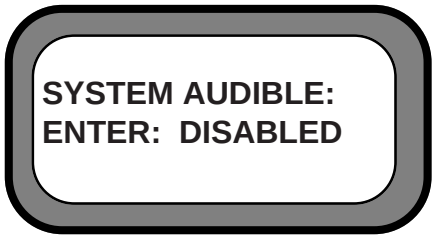




STEP 9 **Press "NEXT".** This entry, 1, 2, 3 or 4, determines the number of minutes a pump will be locked out of operation. If zero "0" is entered, the respective pump in the alarm will be locked out of operation until the PPM 4000 RESET FUNCTION is performed by a qualified technician.



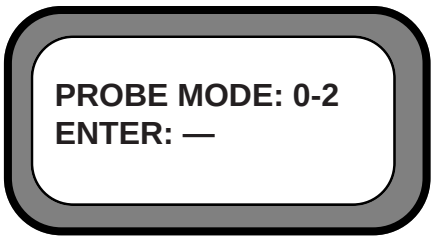
STEP 10 **Press "NEXT".** The PPM 4000 can be programmed to provide an audible alarm when a System alarm occurs. Press zero "0" on the keypad. The display will switch back and forth between "DISABLED" and "ENABLED." When the desired choice is displayed, press "ENTER." The display will show "ENTERED."

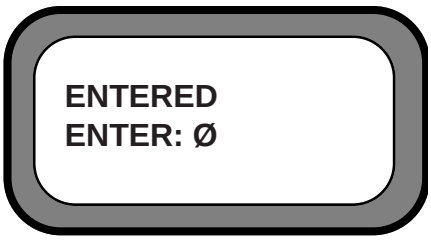


STEP 11 **Press "NEXT".** The PPM 4000 can be programmed to provide an audible alarm when an Air alarm occurs. Press zero "0" on the keypad. The display will switch back and forth between "DISABLED" and ENABLED." When the desired choice is displayed, **press "ENTER."** The display will show "ENTERED."

STEP 12 **Press "NEXT".** This entry determines the pump lock out action taken upon a probe alarm. If zero "0" is entered, no action will be taken upon probe alarm. Only the audible and visual display will indicate an alarm condition. If a one (1) is entered, the respective pump channel will be locked out of operation upon a probe alarm. If a two (2) is entered, ALL pump channels will be locked out of operation upon probe alarm. If individual pump lock out is programmed, lock out of pump #1 will occur upon alarm on probe #1. Lock out of pump #2 will occur upon alarm of probe #2 etc.

Press Zero (0), One (1) or Two (2) depending on the response desired to a hydrocarbon probe alarm. **Press "ENTER",** and the display will show **"PROBE MODE"** and the number entered will be displayed.





NOTICE **The liquid alarm jumper, located on the MPU Interface Board, allows the selection of two (2) modes of operation.**

JUMPER "IN" - NO SHUT DOWN OF PUMPS ON LIQUID ALARM
JUMPER "OUT" - LIQUID ALARMS CORRESPOND TO PROBE ALARM PROGRAMMING. Refer to illustration on page 4.

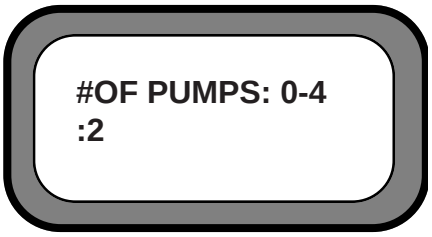
The manifolded pumps feature allows the user to shut down any combination of pumps. If any pump in a manifold installation is shut down due to any reason, all pumps contained in the manifold will automatically shut down.

Manifold entry is performed through the keyboard right after entering the probe mode. The screen will show :

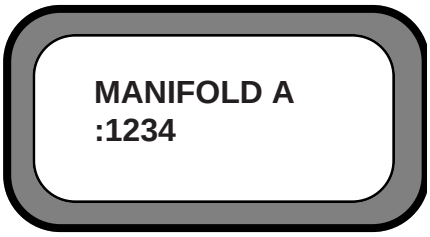
Any combination of available pumps may be entered. If no pumps are programmed then the screen is not shown to the user. If, for example, two pumps are programmed and the user enters pumps 1234, the entry is automatically changed to reflect the actual number of pumps (two). Pumps cannot be programmed into manifold if they have not been already programmed in Step 8.

Example:

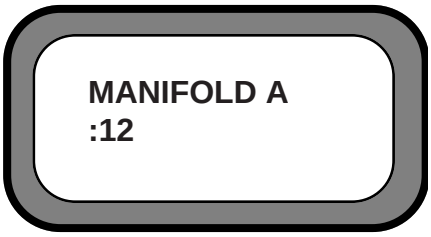
User enters



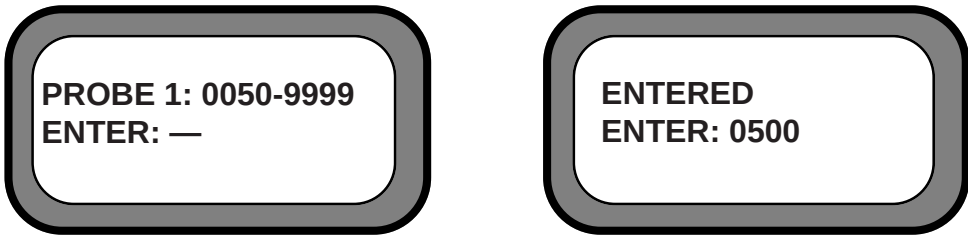
User then enters



Unit returns

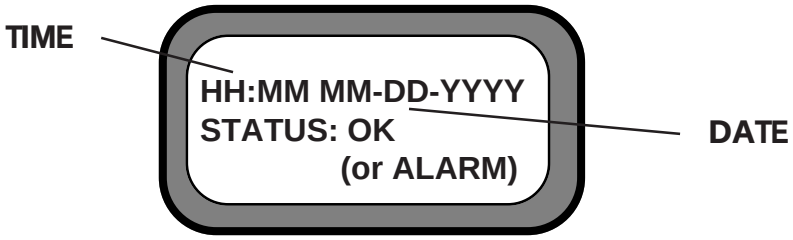


STEP 13 **PRESS "NEXT".** The display will show **"PROBE 0050-9999".** Use the numeric key pad to enter the alarm threshold (50 relative resistance units to 9999). If the threshold level is lower than 1000 PRU a preceeding zero (0) must be entered, then the remaining digits. **EXAMPLE: 0375.**



STEP 14 **PRESS "NEXT".** Repeat STEP 11 for all remaining probes. Individual probe programming makes it possible to set different alarm thresholds for each individual probe location. It is not necessary to program any unused probe channel. If a probe terminal is not used, a terminating resistor must be bridged across the V and C terminals of the unused channel.

STEP 15 **PRESS "NEXT".** The display should now show the correct Time, Date and Status (Alarm). The programming menu of the PPM 4000 has traveled full circle and is now back at the starting position.



STEP 16 **PRESS "RESET and ENTER"** simultaneously to clear the alarm condition. The display should now show the correct **Time, Date and Status "OK".**

STEP 17 Programming is now complete. Return the programming switch to the "RUN" position.

Now review your program information by pressing the **"SCAN"** key. This will allow you to scroll through each position. If any programmed information needs to be changed, i.e. AM vs. PM or a threshold level, **slide the program switch to the "PROGRAM"** position and press **"NEXT"** until the desired function is reached. Enter the new or corrected information repeating the appropriate programming step. Then, **return the programming switch to the "RUN" position. "Time, Date and Status OK"** will appear.

NOTES

REDJACKET

RLM 9000 PROGRAMMING WORKSHEET

This Worksheet is provided for recordkeeping of the specific data programmed into each RLM 9000 unit. Copies of this worksheet may be made as required.

SYSTEM

PASSWORDS _____ *(Default value)
Set up word_____ _____ (None) Ackword _____(None)
SYSTEM ID _____
Location 1 _____ (Red Jacket)
Location 2 _____ (Tech line)
Street 1 _____ (1800-)
Street 2 _____ (468-7867)
City 1 _____ (MISSION)
City 2 _____ (None)
State _____ (KS)
Zip Code _____ (None)
Site Number _____ (None)
UNITS
Volume Units _____ (Gallons)
Level Units _____ (Inches)
Table Units _____ (In/Gal)
Temp Units _____ (Fahrenheit)
NO. OF TANKS_____ (1)
LIMITS
Leak Limit _____ (+2.0)
Theft Limit_____ (+10.0)
Deliv Limit _____ (+200.0)
SLEEP
Sleep Mode _____ (off)
Start Sleep _____ (00.00.0)
End Sleep _____ (900.00.0)
DELIV DELAY_____ (1)
REPORT DELIV _____ (Enabled)
NO. OF ALARMS _____ (50)
PRT INTERVAL _____ (+1.0)

COMM PORTS

CHANNEL 1
Baud chan 1 _____ (1200)
Data Bits 1 _____ (8)
Stop Bits 1 _____ (1)
Parity 1 _____ (None)
Echo Test 1 _____ (Active . . .)

CHANNEL 2
Baud chan 2 _____ (1200)
Data Bits 2 _____ (8)
Stop Bits 2 _____ (1)
Parity 2 _____ (None)
Auto Dial 2 _____
Access No.1____ No.2 ____ No.3 ____ No.4 ____
Phone No.1 ____ No.2 ____ No.3 ___ _No.4 ____
Redial No.1 ____ No.2 ____ No.3 ____ No.4 ____
Dial Delivery No.1 ____ No.2 ____ No.3 ____ No.4 ____
Dial Alarm No.1 ____ No.2 ____ No.3 ____ No.4 ____
Dial Leak No.1 ____ No.2 ____ No.3 ____ No.4 ____
Echo Test 2 _____ (Active . . .)
Security 2 _____

TANKS	Tank 1	Tank 2	Tank 3	Tank 4
Tank Type 1 (None)				
Tank Dims 1 (None)				
Tank Size 1 (None)				
Tank Shape 1 (Standard)				
Standard 1 (1)				
Diameter 1 (+0.0)				
Length 1 (0.0)				
Product (Leaded Reg.)				
Pro Offset (0.0)				
Wat Offset (0.0)				
Manifold 1 (None)				
Probe 1 (STD 101)				
No. Flts 1 (2 Floats)				
Float Type 1 (Gasoline)				
Gradient 1 (9.03)				
High Limit 1 (0.0)				
Low Limit (0.0)				
Water LImit 1 (0.0)				

	Tank 5	Tank 6	Tank 7	Tank 8
Tank Type 1 (None)				
Tank Dims 1 (None)				
Tank Size 1 (None)				
Tank Shape 1 (Standard)				
Standard 1 (1)				
Diameter 1 (+0.0)				
Length 1 (0.0)				
Product (Leaded Reg.)				
Pro Offset (0.0)				
Wat Offset (0.0)				
Manifold 1 (None)				
Probe 1 (STD 101)				
No. Flts 1 (2 Floats)				
Float Type 1 (Gasoline)				
Gradient 1 (9.03)				
High Limit 1 (0.0)				
Low Limit (0.0)				
Water LImit 1 (0.0)				

REPORT SCHEDULE

Sched Invtry _____ (None)
Time 2 Inv _____ (00.00.0)
Sched Invrec _____ (None)
Time 2 Invrec _____ (00.00.0)
Sched Dhstry _____ (None)
Time 2 Dhstry _____ (00.00.0)
Sched Alhist _____ (None)
Time Alstat _____ (00.00.0)
Sched Alstat _____ (None)
Time 2 Alstat _____ (00.00.0)

Time 1 Inv _____ (00.00.0)
Time 3 Inv _____ (00.00.0)
Time 1 Inrec _____ (00.00.0)
Time 3 Invrec _____ (00.00.0)
Time 1 Dhstry _____ (00.00.0)
Time 3 Dhstry _____ (00.00.0)
Time 1 Ahst _____ (00.00.0)
Time 3 Ahst _____ (00.00.0)
Time 1 Astat _____ (00.00.0)
Time 3 Astat _____ (00.00.0)

LEAK TESTS

Confidence _____ (98.0)
Threshold _____ (0.1)

Leak Sched

Sched Test 1 _____ (None)
Sched Test 2 _____ (None)
Sched Test 3 _____ (None)
Sched Test 4 _____ (None)
Sched Test 5 _____ (None)
Sched Test 6 _____ (None)
Sched Test 7 _____ (None)
Sched Test 8 _____ (None)

Time Test 1 _____ (00.00.0)
Time Test 2 _____ (00.00.0)
Time Test 3 _____ (00.00.0)
Time Test 4 _____ (00.00.0)
Time Test 5 _____ (00.00.0)
Time Test 6 _____ (00.00.0)
Time Test 7 _____ (00.00.0)
Time Test 8 _____ (00.00.0)

CLOCK/CAL

Daylight Savings _____ (Enabled)
Time Style _____ (12 Hour)
Date Style _____ (MM/DD/YY)
Set Time _____ (N/A)
Set Date _____ (1990.01.05)
Set Day Week _____ (Monday)
Test _____ N/A

ALARMS RELAYS

Relay 1

High Lim RY1 _____ (No)
Watr Lim RY1 _____ (No)
Sys Fail RY1 _____ (No)
Point 1 RY1 _____ (No)
Test Relay 1 _____ (Open)

Low Lim RY1 _____ (No)
Leak Lim RY1 _____ (No)
Theft RY1 _____ (No)
Thru Point 16 RY1 _____ (No)

POINT ALARMS

Point 1thru Point 16 _____ (Same)

SPECIAL PROD

Spec Prod 1

Prod Name 1 _____ (None)
Temp Comp 1 _____ (API 6A/54A)
API GRAV 1 _____ (0.0)
Alpha 1 _____ (0.0)

SPECIAL TANK

Spec Tank 1

Step _____ (1.0)
Add, Delete, Edit, Display

Spec Tank 2 thru 8 programmed the same

SPEC PROBE

Spec. Probe 1

Length 1 _____ (60)
No. RTD'S 1 _____ (0)
RTD Locate 1 (Add, Delete, Edit, Display)

Spec Probe 2 thru 8 programmed the same

SPECIAL COMP

Spec Comp 1

Temp Units _____ (Fahrenheit)
Ref Temp_____ (60.0)
Add, Delete, Edit, Display Table

Spec Comp 2 thru 8 programmed the same

SECTION C

OPERATION

This section provides a basic system description and users guide to the display of information and reports.

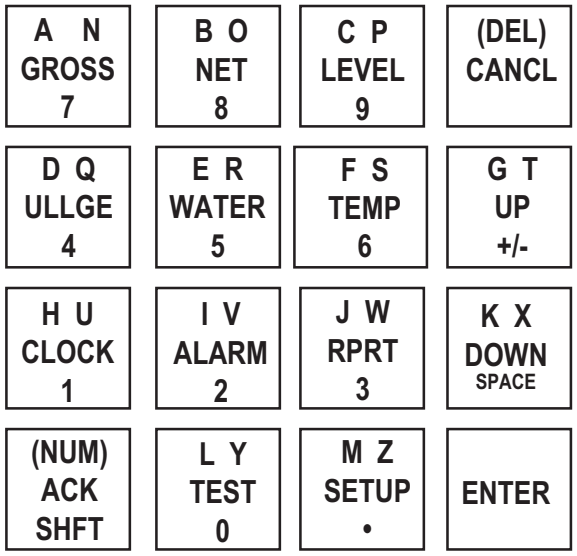
BASIC SYSTEM DESCRIPTION

The RLM 9000 is a powerful tank monitoring and leak detection system. It has features which allow you to measure the contents of underground tanks, print reports on its internal printer, sound alarms, communicate with remote systems, and perform leak tests. Despite the system's numerous and sophisticated features, it is easy to operate. It has been designed so the user need not concern himself with advanced features he is not using. In summary, the RLM 9000 offers the best of both worlds. For the user with a straight-forward application, it is simple to operate. In situations where its advanced features are required, they can be used to provide functions not available on competitive systems.

BASIC FEATURES ACCESSIBLE FROM THE FRONT PANEL

Once the RLM 9000 system is installed and programmed, the operator need not concern himself with the advanced capabilities and features available through the setup menu. Ordinarily, his only interaction with the system will be through its keypad display and printer. All of the basic functions of the system are available through these input and output devices.

Many kinds of information may be ordered from the keypad. This information is displayed on the system's LCD display or may be printed out on system reports. Listed below are the basic types of information that the system can provide along with a description of each of these. The parenthesis indicate the feature designation on the keypad.



LEVEL: (LEVEL)
Level is the physical height of the liquid in the underground storage tank. It is reported in inches or centimeters. Level is the total height of the product including any water that may be at the bottom of the tank in petroleum and similar applications. It is the same as the level which would be read off a dipstick immersed in the tank.

GROSS: (GROSS)
Gross is the gross volume in the tank. This is the physical volume of the liquid in gallons or liters. Where two floats are used on the sensor to detect water at the bottom of a tank, the volume of that water is not included in the gross volume. That is to say, the gross volume includes only the volume of the product. The system must be programmed with information describing the shape of the tank so that gross volume may be calculated from level. The RLM 9000 permits the user to model the tank in three different manners. You may use one of its 29 standard tank models, you may model the tank as a simple cylinder, or you may load a tank chart for the specific tank you are working with.

TEMPERATURE: (TEMP)
Temp is the product temperature and is reported in degrees fahrenheit or degrees celsius. The primary purpose for measuring the product temperature is so that the system may temperature correct the volume and report net volume. This temperature correction is very important for leak detection.

WATER: (WATER)
Water is the level of the second float on the sensor when two floats are used. This float is designed to float on the water at the interface between the water and the product in petroleum applications. It may therefore be used to report the water level in the tank. Water level is reported in inches or centimeters on the system display.

NET: (NET)
Net is the temperature compensated product volume. It is reported in gallons or liters. The net volume is the volume that the product would occupy if its temperature was 60 degrees fahrenheit, or, in systems programmed for metric temperature, 15 degrees celsius. Many products expand and contract substantially as temperature is varied. Therefore, the gross volume of these products changes significantly with temperature variation. By correcting the volume back to a known temperature, a constant volume of product is reported independent of temperature variations. This calculation is done in accordance with the American Petroleum Institute's practices for petroleum products, or you may enter a custom compensation table which may be used for other types of liquids. The calculation of net volume does not include any water in systems equipped with two floats. It is important to understand that the calculation of net volume is the basis for the leak detection capability in the system.

ULLAGE: (ULLGE)
Ullage is the remaining capacity in the tank. It is reported in gallons or liters on the system display. Ullage is the amount of liquid which can be added to the tank without overfilling it.

ALARMS: (ALARM)
The system can generate a number of different kinds of alarms. Included among these are high level alarms (overfill), low level alarms (reorder or run out), high water alarms, theft alarms, leak alarms, and system failure alarms associated with problems and errors. When an alarm condition is detected, a variety of actions may be taken depending on how the system is configured. A report may be automatically generated on the system printer, a relay may be programmed to close automatically in response to an alarm, the system may sound an alarm annunciator when an alarm is detected.

The RLM 9000 can also be programmed to autodial up to four different telephone numbers and report the data to remote computers in response to an alarm. Alarm conditions may be viewed from the front panel on the systems' LCD display. In all cases alarms are recorded in a history buffer which may be subsequently examined by means of a report. Where alarms close relays for remote enunciation and where they sound the internal alarm enunciator, an alarm acknowledge button is provided to silence the alarm or open the relay. Acknowledging an alarm does not affect the system in any other way. The alarm remains active in the system until the alarm condition is removed.

REPORTS: (RPRT)
The RLM 9000 system can generate many different reports. The list of available reports includes Inventory, Reconciliation, Delivery, Delivery History, Leak Test, Leak Estimate, Alarm, Alarm History, Alarm Status and Configuration, and Tank Configuration. All reports include a heading section which is fully programmable. This information is provided to identify what system generated the report. Many reports may be ordered from the front panel or may be scheduled in the system to be printed automatically at pre-determined times. Some reports (alarm, delivery and leak test), are printed automatically when events occur.

TESTS: (TEST)
The RLM 9000 system can perform accurate leak tests as required by various federal, state and local regulations. These tests may be ordered from the front panel or may be scheduled to occur automatically. Tests may also be cancelled from the front panel. The RLM 9000 system allows the user to program the parameters which must be met for the leak test. The system then performs a test which satisfies the programmed parameters.

SETUP MODE: (SETUP)
The RLM 9000 has a powerful setup mode which can be used to program or configure the system. Setup mode is accessible through the front panel display or through remote communications.

AUTOMATION FEATURES AND COMMUNICATIONS

The RLM 9000 has many features which allow it to operate automatically without user intervention. It also has powerful communications features which allow it to report data to remote sites and to be operated remotely.

REPORT SCHEDULING:
Many reports may be scheduled to be printed at pre-determined times. Among these are the inventory report, reconciliation report, delivery report, delivery history report, alarm history report. These reports may be scheduled to be printed any day of the month or any day of the week, or every day, or at the close of every business shift. The time that the report is printed is also programmable.

LEAK TEST SCHEDULING:
Leak tests may be scheduled to occur at pre-determined times in a manner similar to reports. Leak tests may be pre-programmed to occur on any day of the month, any day of the week, or every day. The time that the leak test will begin is also programmable.

COMMUNICATIONS:
The RLM 9000 includes one communications channel. It may be used for RS-232 communication only and is configured for use with any Hayes compatible modem. The 9000's communication protocol is powerful and complete. Any data available in the system which may be displayed on its display or reported on its printer may be accessed through the communication channel. Likewise, the system may be operated remotely by means of a communication channel. Leak tests may be started, alarms may be acknowledged, etc. Finally, the system may be completely configured through the serial communications channels.

AUTODIALING:
The RLM 9000 system has the ability to initiate phone calls when particular events occur. A call can be initiated when an alarm occurs, or when a delivery is detected, or when a leak test result is available. In fact, the system may autodial up to four different phone numbers in response to any of these events, and report the data to remote computer equipment at these numbers.

RLM 9000 ADVANCED FEATURES

The RLM 9000 system has a number of advanced features which may be utilized to enhance its functions.

DELIVERY DETECTION AND REPORTING:
The system automatically detects delivery of product into the tank and generates delivery reports. In addition, a delivery record is stored in a history buffer which may be viewed by means of a delivery history report. This capability allows the system to both monitor deliveries for its owner and to reconcile throughput through the tank. A reconciliation report may be generated at programmable intervals which will indicate deliveries into the tank along with starting and ending inventory and a calculated volume which was delivered out of the tank.

SPECIAL PRODUCTS:
The RLM 9000 system can be used with virtually any liquid product which is chemically compatible with its sensor and which is not viscous or sticky. The system is pre-programmed with eight standard petroleum products which may be selected from a menu. However, in applications where other products are used, the RLM 9000 provides a special products capability which can be used to characterize these liquids.

SPECIAL COMPENSATION:
The RLM 9000 system provides four different temperature compensation models for the liquid products. The first three of these are American Petroleum Institute models and can be used with virtually any petroleum product. They provide temperature compensation in accordance with the API tables 6A/54A, 6B/54B,and 6C/64C. In addition a special compensation capability is included which allows the user to define a temperature compensation table for any product.

SPECIAL PROBES:
Although the RLM 9000 system is normally used with one of five standard probes, it may be configured to operate with virtually any standard magnetostrictive liquid level sensor. This capability is provided to allow for special applications. It is also useful in retrofit applications where the sensors may have been purchased previously and used with other obsolete equipment.

VIEWING INSTRUCTIONS

To view information on the LCD display, see the following instructions.

A. View Gross Gallons

Key Stroke	Display response
Press (GROSS) Key	"Tank No. ?"
Enter 1 - 8 for tank #__	"Gross tank #__ gallons"

B. View Net Gallons

Key Stroke	Display response
Press (NET) Key	"Tank No. ?"
Enter 1 - 8 for tank #__	"Net tank #__gallons"

C. View Level in inches

Key Stroke	Display response
Press (LEVEL) Key	"Tank No. ?"
Enter 1 - 8 for tank #__	"Net tank #__gallons"

D. View Ullage gallons

Key Stroke	Display response
Press (ULLGE) Key	"Tank No. ?"
Enter 1 - 8 for tank #__	"Ullage tank #__gallons"

E. View Water level

Key Stroke	Display response
Press (WATER) Key	"Tank No. ?"
Enter 1 - 8 for tank #__	"Water level, tank #__"

F. View Temperature

Key Stroke	Display response
Press (TEMP) Key	"Tank No. ?"
Enter 1 - 8 for tank #__	"Temperature tank #__ F"

G. View Clock and Date

Key Stroke	Display response
Press (CLOCK) key	"Time"
Press (UP) key	"Date"

H. View alarm

Key Stroke	Display response
Press (ALARM) key	"Alarm List"
Press (UP) key	"Prior Alarms"

RLM 9000
REPORT MODE INSTRUCTIONS

The RLM 9000 can generate a variety of reports. All reports include time, date, location, name, site number and tank number. The printing of these reports may be generated from the keypad on the front panel or through the RLM 9000's serial ports. With the built in printer, the reports may be printed on demand. All alarms generate reports immediately and may be programmed to activate one of the two relay outputs. Ten different reports are available. To print reports, follow the instructions below. Instructions for installing/changing the printer paper are found on page C13.

```
     SITE NUMBER: 12345

9/09/88                6:45 PM

     INVENTORY  REPORT

TANK NO. 2        10000 GAL
         UNLEADED

GROSS            8612.2 GAL
NET              8595.6 GAL
PROD  LEVEL        85.456 IN
ULLAGE           1388.8 GAL
TEMPERATURE         70.1 F
WATER  LEVEL       1.202 IN
WATER  VOLUME     23.1 GAL
```

```
     SITE NUMBER: 12345

9/09/88                6:45 PM

   RECONCILIATION  REPORT

TANK NO. 2        10000 GAL
         UNLEADED

BEGIN  GROSS      6543.1 GAL
BEGIN NET         6521.3 GAL
BEGIN LEVEL         63.612 IN
GROSS  DEL       24246.7 GAL
NET DEL          24312.3 GAL
END  GROSS        7563.8 GAL
END NET           7544.3 GAL
END LEVEL           74.374 IN
GROSS  USAGE     23226.0 GAL
NET  USAGE       23289.3 GAL
```

ENTERING THE REPORT MODE:
Enter into the report mode by pressing the (RPRT) Key. The display will now show "Inventory". Pressing the (UP) and (DOWN) key will enable you to scroll through the different report options.

NOTICE **After printing a report, the RLM 9000 will exit out of the report mode. To print additional reports, reenter the report mode as indicated above.**

Below is a description of all available reports followed by instructions for printing each individual report.

A. INVENTORY REPORT:
This report states the total amount of non-temperature compensated product. Once in the report mode, scroll through using the (UP) or (DOWN) key until "Inventory" is shown on the display. Press the (ENTER) key. The display will now ask for the "tank number" to be entered. If one tank reporting is desired, press the corresponding tank number. For an inventory report on all tanks, enter 0. Now press the (ENTER) key. The report will print out.

B. RECONCILIATION REPORT:
This report states an inventory report that is temperature compensated. Once in the report mode, scroll through using the (UP) or (DOWN) key until "Reconcile" is shown on the display. Press the (ENTER) key. The display will now ask for a "tank number" to be entered. If one tank is desired, press the specific "tank number" to be entered. For a reconciliation report on all tanks, enter 0. Press (ENTER) key to print this report.

C. DELIVERY REPORT:
This report states the last product delivery. Once in the report mode, scroll through using the (UP) or (DOWN) keys until "Delivery" is shown on the display. Press the (ENTER) key. The display will now ask for a "tank number" to be entered. For a delivery report on a particular tank, press desired tank number. If a report for all tanks is desired, enter 0. Now press the (ENTER) key to print this report.

D. DELIVERY HISTORY REPORT:
If programmed, Delivery History will give a past history of deliveries. Once in the report mode, scroll through using the (UP) or (DOWN) keys until "Delivery Hist" is shown on the display. Press the (ENTER) key. The display will now ask for a "tank number" to be entered. If a report for one tank is desired, press desired tank number. If a report for all tanks is desired, enter 0. Press the (ENTER) key to print this report.

NOTICE **The RLM 9000 retains in memory the last ten deliveries made at each tank. The unit will print these out on a delivery history.**

E. LEAK TEST REPORT:
This report states the data on the last leak test performed. Once in the report mode, scroll through using the (UP) or (DOWN) key until "Leak" is shown on the display. Press the (ENTER) key. The display will now ask for a "tank number" to be entered. If a report for one tank is desired, press tank number. If a report for all tanks is desired, enter 0. Press the (ENTER) key to print this report.

F. LEAK ESTIMATE REPORT:
This report states the length of time it will take the RLM 9000 to perform a leak test. This time coincides with the present time. Once in the report mode, scroll through using the (UP) or (DOWN) keys until "Leak Est" is shown on the display. Press the (ENTER) key. The display will now ask for a "tank number" to be entered. If a report for one tank is desired, press the tank number. If reporting for all tanks, enter 0. Press the (ENTER) key to print this report.

G. ALARM HISTORY REPORT
This report lists the past alarm history. Once in the report mode, scroll through using the (UP) or (DOWN) keys until "Alarm Hist" is shown on the display. Press the (ENTER) key. The display will now ask for a "tank number" to be entered. If a report for one tank is desired, press the tank number. If reporting for all tanks, enter 0. Now press the (ENTER) key to print this report.

NOTICE **The RLM 9000 will print out the number of alarms selected in programming (see page B21 for "Number of Alarms").**

H. ALARM STATUS REPORT
This report lists current alarm conditions. Once in the report mode, scroll through using the (UP) or (DOWN) keys until "Alarm Stat" is shown on the display. Press the (ENTER) key. The display will now ask for a "tank number" to be entered. If a report for one tank is desired, press that tank number. If reporting for all tanks, enter 0. Now press the (ENTER) key to print this report.

I. SYSTEM SETUP REPORT:
Describes how the system is configured. Once in the report mode, scroll through using the (UP) or (DOWN) keys until "Setup" is shown on the display. Press the (ENTER) key to print this report.

J. TANK SETUP REPORT:
This report sets up the programming of each tank. Once in the report mode, scroll through using the (UP) or (DOWN) keys until "Tank Setup" is shown on the display. Press the (ENTER) key. The display will now ask for a "tank number" to be entered. If a report for one tank is desired, press the tank number. If reporting for all tanks, enter 0. Now press the (ENTER) key to print this report.

A. Inventory Report

Key Stroke	Display Response
Press (RPRT) key	"Inventory"
Press (ENTER) key	"Tank No. ?"
Press 1 - 8 for tank #	"Tank No. __"

NOTICE **Enter 0 if a report for all tanks is needed**

Press (ENTER) key ..... Report will print

B. Reconciliation Report

Key Stroke	Display Response
Press (RPRT) key	"Inventory"
Press (UP) key	"Reconcil"
Press (ENTER) key	"Tank No. ?"
Press 1 - 8 for tank #	"Tank No. __"

NOTICE **Enter 0 if a report for all tanks is needed**

Press (ENTER) key ..... Report will print

C. Delivery Report

Key Stroke	Display Response
Press (RPRT) key	"Inventory"
Press (UP) key 2 times	"Delivery"
Press (Enter) key	"Tank No. ?"
Press 1 - 8 for tank #	"Tank No. __"

NOTICE **Enter 0 if a delivery report for all tanks is needed**

Press (ENTER) key ..... Report will print

D. Delivery History Report

Key Stroke	Display Response
Press (RPRT) key	"Inventory"
Press (UP) key 3 times	"Del Hist"
Press (Enter) key	"Tank No. ?"
Press 1 - 8 for tank #	"Tank No. __"

NOTICE **Enter 0 if a delivery history report for all tanks is needed**

Press (ENTER) key ..... Report will print

E. Leak Test Report

Key Stroke	Display Response
Press (RPRT) key	"Inventory"
Press (UP) key 4 times	"Leak"
Press (Enter) key	"Tank No. ?"
Press 1 - 8 for tank #	"Tank No. __"

NOTICE **Enter 0 if a report for all tanks is needed**

Press (ENTER) key ..... Report will print

F. Leak Estimate Report

Key Stroke	Display Response
(RPRT) key	"Inventory"
Press (UP) key 5 times	"Leak Est"
Press (Enter) key	"Tank No. ?"
Press 1 - 8 for tank #	"Tank No. __"

NOTICE **Enter 0 if a report for all tanks is needed**

Press (ENTER) key ..... Report will print

G. Alarm History Report

Key Stroke	Display Response
Press (RPRT) key	"Inventory"
Press (UP) key 6 times	"Alarm Hist"
Press (ENTER) key	"Tank No. ?"
Press 1 - 8 for tank #	"Tank No. __"

NOTICE **Enter 0 if report for all tanks is needed**

Press (ENTER) key ..... Report will print

H. Alarm Status Report

Key Stroke	Display Response
Press (RPRT) key	"Inventory"
Press (UP) key 7 times	"Alarm Stat"
Press (ENTER) key	"Tank No. ?"
Press 1 - 8 for tank #	"Tank No. __"

NOTICE **Enter 0 if a report for all tanks is needed**

Press (ENTER) key ..... Report will print

I. System Setup Report

Key Stroke	Display Response
Press (RPRT) key	"Inventory"
Press (UP) key 8 times	"Setup"
Press (ENTER) key	Report will print

J. Tank Setup Report

Key Stroke	Display Response
Press (RPRT) key	"Inventory"
Press (UP) key 9 times	"Tank set up"
Press (ENTER) key	"Tank No. ?"
Press 1 - 8 for tank #	"Tank No. __"

NOTICE **Enter 0 if a report for all tanks is needed**

Press (ENTER) key ..... Report will print

The following steps explain how to install the thermal paper (Part No. 400121-5) into the RLM 9000 printer (Part No. 400-120-5).

Step 1: Open door of RLM 9000 control unit so that the printer is facing forward.

Step 2: To remove the aluminum rod, hold the left end cap of rod tightly with left hand. With right hand turn right end cap forward to unthread it from the rod. Remove end cap, taking care to not lose the plastic washer. At this point, pull the rod out through the roll of paper from the left side.

Step 3: Scratch both sides of the paper. The side with visible scratch marks is the thermal side of the paper.

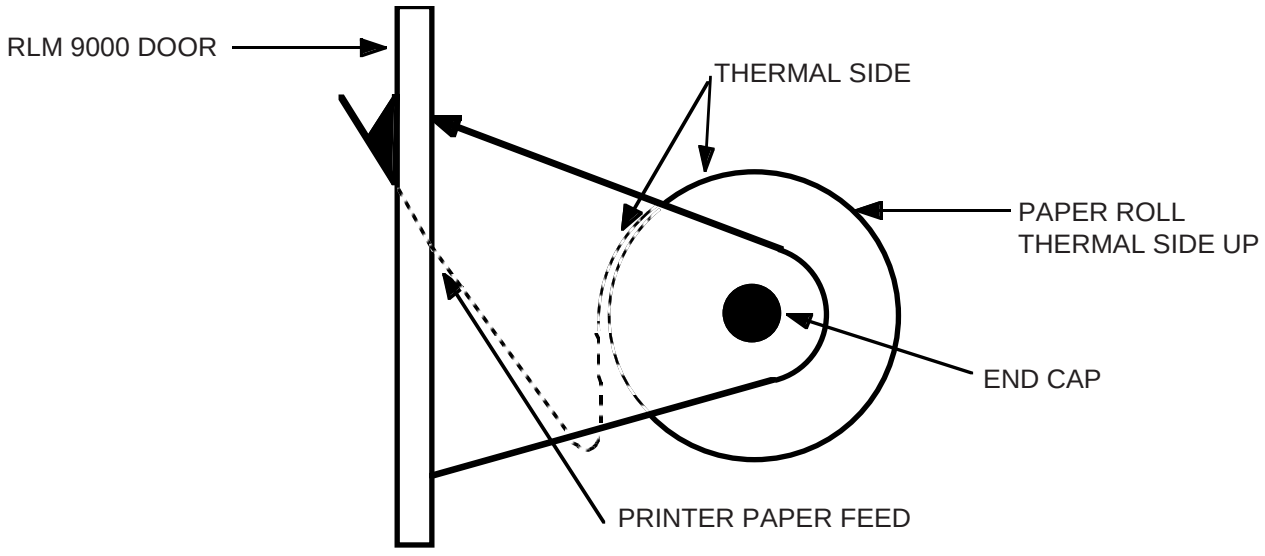
Step 4: Have thermal side of paper facing up. Insert paper into the opening at the bottom of the printer. While inserting the thermal paper, press the red feed button on the front side of the door. Keep pressing the button until the paper advances out of the front of the unit.

Step 5: Reinstall the aluminum rod from the left side. Be sure to place the washer back on the rod before threading the end cap on.

Step 6: The printer is now ready to print a report.

NOTICE **When printing a report, if the paper is feeding and nothing is being printed, the thermal paper is upside down and needs to be reinstalled.**

SIDE VIEW
PAPER INSTALLATION



LEAK TESTS — TANK

The RLM 9000 system includes the capability of performing high accuracy leak tests. These tests can be used to meet federal, state and local underground storage regulations. When correctly used, the RLM 9000 can be an effective means of verifying that your underground storage tanks are not leaking.

WARNING **Consult federal, state and local regulations that apply in your area. These may require specific leak detection methods or capabilities. It is the tank owner's responsibility to make certain that he is complying with all applicable regulations.**

WARNING **You must conduct leak tests in accordance with the recommendations of this manual and any relevant technical bulletins issued by Red Jacket. Failure to do so could invalidate test results. False alarms or undetected leaks may result if you do not conduct leak tests in accordance with Red Jacket's recommendations.**

LEAK ESTIMATE REPORT:
Because of the variable test time in the RLM 9000, a special leak estimate report has been included. This report provides the user with an estimate of how long the leak test will take under the current conditions in the tank. It is recommended that the user run a leak estimate report before starting a leak test to make certain that there is sufficient time to complete the test.

Certain statistical algorithms used in the RLM 9000 software require extended periods of time to initialize. As a result, if the system has been turned off and must reinitialize these algorithms, the leak estimate report will indicate extended test times to allow for this initialization. Similarly, if you have entered the setup mode, these algorithms must be re-initialized. Leak tests started immediately after exiting setup mode will also be extended as indicated on a leak estimate report.

HOW TO CONDUCT A TANK LEAK TEST:
Leak tests may be conducted during any idle period when no product is being withdrawn or added to the tank. If product is withdrawn or added to the tank during a leak test, the test will be disturbed and the results invalidated. It is therefore important that you plan to do your leak tests during periods of time when the tank can be effectively taken out of service.

The user should program the RLM 9000 system in accordance with Section 4 in the leak test sub-menu. You must set the system's leak threshold equal to that required by the relevant local, state or federal regulations. Similarly, you should adjust the confidence level to the appropriate value. You may choose to set up a schedule for automatic leak tests. In this case, the system will automatically conduct a leak test on a daily, weekly or monthly basis. Alternatively, if you do not set up a leak test schedule, you may manually order leak tests at any time by pressing the (TEST) Key on the front panel.

It is important that leak tests be conducted when conditions in the tank are stable. Therefore, do not attempt a leak test for at least six hours after product has been delivered into the tank. Similarly, it is recommended that you wait at least two hours after you stop withdrawing product from the tank to start a leak test.

WARNING **Failure to wait the recommended delay periods after deliveries and withdrawals from the tank can result in false alarms or failure to detect leaks.**

Because of the variable test time employed by the RLM 9000 it is recommended that you run a leak estimate report before starting a leak test. This report will show you the expected time required to complete the test. At the end of the leak test, the system will automatically print a leak test report if this feature is enabled. In any case, you may order a leak test report for the last leak test conducted on any tank by following the procedure for ordering a report. The leak test report summarizes the conditions in the tank during the test, records test data and indicates the test result.

INTERFERENCE:
Because volumetric tank tests are highly sensitive there are a number of sources of possible interference. These interference sources can affect leak test results. If you have difficulty with leak tests, it is important that you determine if one of these sources of interference is causing the problems. Temperature instability is the most important source of interference in volumetric leak tests. When the temperature in the tank is severely disturbed by a product delivery, for example, it is not possible to calculate net volume to sufficient accuracy for leak tests. As a result, false alarms or failure to detect leaks may be seen. If you fail a leak test it is a good idea to examine temperature variation that was recorded during the test. If it is more than a few tenths of a degree, you may suspect interference from temperature instability and should retest the tank after the temperature has stabilized.

A second source of interference in volumetric tank tests is in leaks from leaking check valves and similar sources. Product may leak into the tank from the dispensing lines if the check valves leak or in some cases due to thermal expansion in the product dispensing lines. The leak into the tank will be recorded as a positive slope on leak test reports but will not be declared a leak. It is important to note, however, that a small incoming leak can hide the effect of a small leak in the tank. Therefore, if you routinely see positive slopes of a magnitude similar to the programmed leak threshold, you should attempt to identify the source of the incoming leak and remedy the condition.

WARNING **Incoming leaks, due to leaking check valves or thermal expansion in product dispensing lines, can mask real tank leaks. Corrective action should be taken if these in leaks are detected.**

Tank cross-talk is another source of error in volumetric tank testing. Under certain installation conditions, it is possible for changes in the level in one tank to cause small changes in level in an adjacent tank. This results from a change in the force being applied on the second tank from the first tank. While this phenomenon is uncommon, it can be a source of interference in volumetric tank testing.

Another source of interference is tidal action. In coastal communities where there is some tidal effect on the groundwater levels the changing pressure due to rising and falling groundwater can cause tank deformation. This will be seen as changes in level and could result in an erroneous leak test.

Another source of interference in volumetric tank testing is tank deformation. After the level in a tank has been changed dramatically, the tank will change shape. This is called tank deformation. For example, a large change in level results when product is delivered into the tank. For some period of time after the delivery, the tank will deform. This could result in false leak test results.

INTERPRETING THE RESULTS OF A LEAK TEST:
The RLM 9000 produces a very complete leak test report at the end of each test. It contains a variety of kinds of information allowing the user to determine if the tank is leaking and also make judgments about the validity of a particular test.

The most important piece of information on the leak test report is the test result line at the bottom of the test. It is here that the system reports whether the test has passed or failed. Ordinarily, this is the only line of the report that the operator may be concerned with.

It is important to understand the meaning of pass and fail on the leak test report. The RLM 9000 is unique in that it allows you to tailor its operation to meet the local regulatory requirements. The confidence and threshold values which are programmed in the setup mode determine how long the test will go and how the results will be interpreted. A passed test indicates that the system is confident that you do not have a leak greater than the threshold value. For example, in a system programmed with confidence level of 95% and threshold of .2 gallons per hour, a passed test indicates that the system is 95% certain that a leak equal to or greater than .2 gallons per hour does not exist in the tank. There is a 5% chance that a leak equal to or greater than .2 gallons per hour exist in the tank. A failed leak test indicates that the system is confident that the tank is leaking but makes no statement about how much. For example, in a system programmed for 95% confidence and .2 gallons per hour threshold, a failed test result indicates that the system is 95% confident that the tank is leaking. There is a 5% chance that the tank is actually tight.

Another important piece of data on the leak test report is the slope. The slope is the rate of change of volume in the tank. Positive slopes indicate that the volume in the tank is increasing. Negative slopes indicate that the volume in the tank is decreasing, as a result, most probably, of a leak.

Slope high and slope low indicate the degree to which the test was disturbed by wave action or other noise. The RLM 9000 computes the two values to indicate the range over which the slope could vary due to wave action or noise. Thus, if slope high and slope low are very close together, these sources of interference have not been a significant factor in the test.

You will note that the body of the leak test report includes many pieces of information about the conditions at the beginning and the end of the test. These are provided to help you identify potential sources of interference which may have invalidated the test. Pay particular note to the last delivery information. A product delivery into the tank causes severe instability in the tank for a period of time. It is important that leak tests not be run for a period of approximately six hours after a delivery. If you find that a leak test has started within that period, it should be considered invalid.

You should also pay particular attention to the starting and ending temperature in the tank. Large changes in temperature (more than a half degree or so), indicate that the tank is thermally unstable which may cause leak tests to be failed. Similarly, note the starting and ending water levels. In normal tests these should be approximately the same. Changes in water level, particularly increases, may be indicative of problem tests.

WHAT TO DO WHEN YOU FAIL A TANK LEAK TEST:

You will occasionally fail leak tests. This is a normal condition and a single failed leak test should not be cause for great alarm. Remember if the confidence level of the test is 95%, there is a 5% chance that the system will give you the wrong answer.

WARNING **Under no circumstances should a tank be excavated and a repair attempted solely on the basis of a single failed leak test.**

If you fail a leak test, do not panic. First review the leak test report to determine if there is an obvious source of interference with the test. For example, if the test started only a few minutes after a delivery, the temperature instability in the tank will interfere with that test. If such a source of interference is identified, retest the tank as soon as that problem no longer exists. If no source of interference can be identified retest the tank to validate or invalidate the first test result. If necessary, several tests may be run. If repeated tests indicate a leak and there is no obvious source of interference, you should immediately have the tank precision tested. If the precision test confirms the presence of a leak, the tank owner must take corrective action in accordance with federal, state and local regulations.

WARNING **It is the tank owner's obligation to comply with the reporting requirements of federal, state and local regulations. These requirements should be followed explicitly and where they conflict with this manual, they should supercede.**

INVENTORY RECONCILIATION:

Inventory reconciliation can be an important help in detecting leaks. It is highly recommended that you use the RLM 9000's automatic reconciliation feature to help you reconcile your inventory. To do this, you must establish an inventory reconciliation period by programming the system to produce an automatic reconciliation report. This report will show starting and ending inventory, deliveries into the tank, and calculated withdrawals from the tank during the period between the current report and the last report. This should be checked against dispensing or metering equipment if possible. Example: in a fleet fueling application the RLM 9000 is configured to produce a daily reconciliation report. The report shows the amount of product that was dispensed in two vehicles. This figure is compared with the meter reading on the product dispenser daily to determine if there are significant inventory losses.

DANGER

Before entering any part of the dispensing system for repairs or maintenance of any kind (i.e. to change dispenser filters, service submersible pump, etc.) you must:

1) **Turn OFF power to the submersible pump, AND**

2) **Engage the monitor disable feature. (See pages 54 & 55 for Temporary Monitor Disable)**

Failure to follow these instructions will lead to property damage from product leakage, an explosion, and/or serious personal injury or death.

NOTICE

THE MONITOR DISABLE FEATURE MUST BE DISENGAGED AFTER SERVICE OR REPAIR IS COMPLETE TO MAKE THIS SYSTEM OPERATIVE. IF THE MONITOR DISABLE IS LEFT ENGAGED, IT WILL AUTOMATICALLY DISENGAGE AFTER ONE (1) HOUR. (SEE PAGE 54).

TEMPORARY MONITOR DISABLE

This feature allows the submersible pump to be operated for up to 1 hour without alarming.

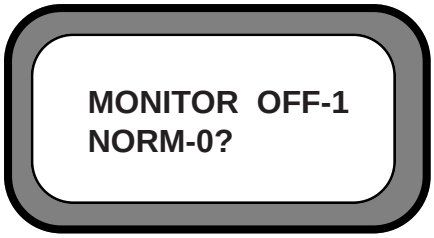
WARNING **This is a temporary disable mode which allows a qualified service technician to temporarily disable the line leak detection capabilities of the computer. This feature can be used during start up, and/or service to disable the pressure monitoring functions for 1 hour. If one hour elapses or the feature is reset, normal monitoring will resume, possibly allowing a pump to start unless the POWER TO THE PUMP IS TURNED OFF.**

Failure to follow these instructions can lead to severe personal injury, death or substantial property damage.

TO DISABLE THE PRESSURE MONITORING SYSTEM:

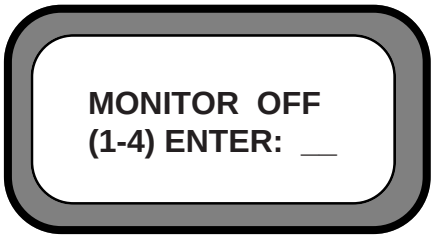
Press **"TEST", "6", "ENTER".**

The LCD display will read, **"MONITOR"**, and offer two choices: **"1"** to disable the monitor, or **"0"** to return monitor to normal operation.

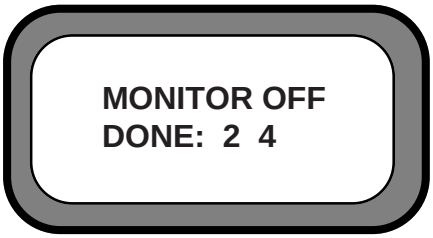


TO DISABLE THE MONITOR:

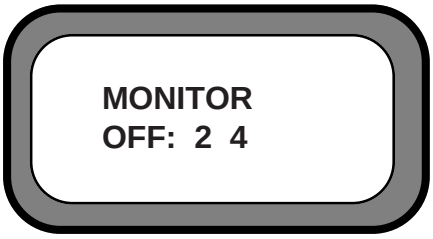
Press **"1"**. The display will read:



Select the desired pump(s) and enter their corresponding location number. To disable monitoring on pump #2 and #4, press **"2", "4", "ENTER".** The display will read:



To confirm that the command has been accepted, scan to **"MONITOR OFF"** display. The display should read:



The computer has now ceased monitoring submersible pumps #2 and #4.

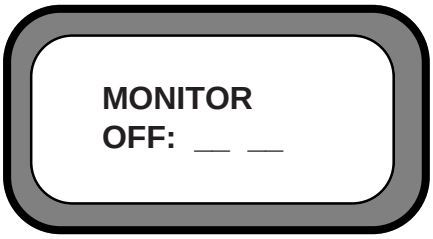
NOTICE **The submersible pump is still fully functional at this point. Care must be taken to prevent the submersible pump from starting unexpectedly.**

TO RETURN MONITOR TO NORMAL OPERATION:

Press **"TEST", "6", "ENTER".**

Press **"0", "THE LOCATION NUMBERS OF THE PUMP(S)", "ENTER".**

The selected pump(s) should now be back to normal monitoring function. **"SCAN"** to **"MONITOR OFF"** display to verify that the pump(s) location numbers have disappeared from the screen.



OPERATIONAL CHARACTERISTICS & SCOPE — LINE PRESSURE TEST

A test begins after each operation of the submersible pump and every time the line pressure falls to 10 psi or upon demand.

Guided by timing available and current system characteristics, the PPM 4000 progressively pursues three levels of tests in the following sequence:

The first level is the **Catastrophic Level Test;**

The second level is the **Standard Level Test;**

The third level is the **Precision Level Test.**

OPERATIONAL CHARACTERISTICS & SCOPE

Catastrophic Level Test:

1. Approximate time required for test — 8 seconds.

2. Scope — leaks of approximately 10 gph.

3. Action resulting from alarm —
   a. Pump operation is affected as programmed (pump cut-off or interruption in operation).
   b. Message displayed on control LCD including system identification.
   c. Audible alarm sounds.
   d. Record of leak is placed in system memory.

Standard Level Test:

1. Approximate time required for test — minimum 17 minutes; maximum 70 minutes.

2. Scope — Meets or exceeds EPA monthly line lightness testing requirements. Leaks of approximately .2 gph or greater at pump pressure.

3. Action resulting from an alarm —
   a. Pump operation is affected as programmed (pump cut-off or interruption in operation).
   b. Message displayed on control LCD including system identification.
   c. Audible alarm sounds.
   d. Record of leak is placed in system memory.

With appropriate equipment in use, an auxiliary device is activated, alarm signal and associated information are transmitted to remote monitoring location and a permanent record is created via hard copy from printer. (See page 43 for communications hookup.) In addition to the above, the time and date of the most recent test that passed is displayed and transmitted.

Precision Level Test:

1. Approximate time required for test — 75 minutes of dormant time is required to stabilize the system previous to performance of this test.

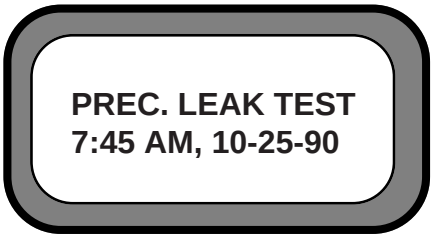
   Additional time required — minimum 60 minutes; maximum 135 minutes.

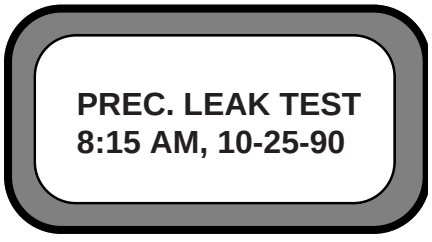
2. Scope — Meets or exceeds EPA annual line tightness testing requirements. Tests for .1 gph at 1-1/2 times pump pressure.

3. Action resulting from test —
   a. The results of this test do not affect pump operation. Our experience indicates that the myriad of everchanging characteristics in submersible pumping systems makes it impractical to affect the pump's operation based on this extremely sensitive and critical level of observation.
   b. Message is displayed on control LCD including time, date and status indicating the most recent opportunity that occurred for this level of test and the results. (See LCD below).
   c. Information as in (b) above is entered into monitoring equipment record. Subsequent status report will include the information covering last precision level test performance.

Please note the following concerning line leak detection:

The hydraulic characteristics of each submersible pumping system are unique and constantly subject to change. These hydraulic characteristics affect line leak detection methods and, therefore, the above scope of leak rates.





PPM 4000/RLM 9000
LINE LEAK ALARM RESPONSE

1. After programming, the L.C.D. Display continuously reads:
   "TIME, DATE and STATUS OK".
   (PRESS "SCAN" to review programmed information)

2. In alarm condition, the audible alarm will sound and the LCD will display:
   "ALARM TYPE AND LOCATION". PRESS "QUIET" on the key pad to silence the audible alarm.

   Once the alarm status has been identified, notify the proper authority and/or response technician.

NOTICE **If communications has been installed, the alarm status will be immediately transmitted to the designated monitoring location. If, at any time you wish to review the alarm memory, PRESS "SCAN" and scroll the display to "PRIOR ALARMS".**

3. **After an alarm condition has been corrected,** the following procedures should be used by the response technician or authorized personnel to reset (clear) the alarm memory.

   A. Unlock the PPM 4000 enclosure. Then **slide the programming switch to the program position.**

   B. **PRESS "ENTER and RESET"**, on the keypad, simultaneously for one (1) second.

   C. **PRESS "SCAN"** to scroll the display and verify that the alarm memory has been cleared. If alarm memory has not cleared, repeat the process. Once verified, **slide the programming switch to the run position** and lock the PPM 4000 enclosure.

   D. **PRESS "SCAN"** until **"TIME, DATE and STATUS OK"** appears on the display.

4. When A.C. power is removed from the PPM 4000, the display will read **"AC POWER LOST".**

5. **Press "SCAN"** on the keypad and the display will return to the "Time, Date, Status".

NOTICE **The operator should notify a qualified response technician UNLESS a total area power failure has occurred.**

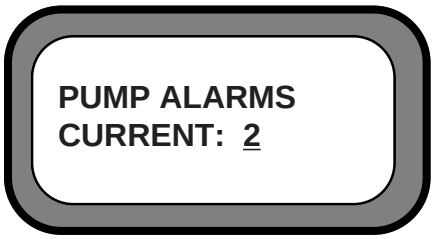
6. The PPM 4000, upon an A.C. power loss, will shut down all monitoring operations to conserve program memory (approx. 36 hours).

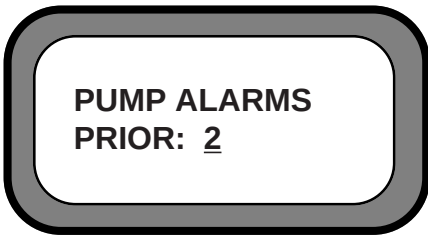
NOTICE **If power failure to Auxiliary Control Unit occurs, the product pumps WILL NOT OPERATE.**

7. In alarm condition, if a leak is indicated, action should be taken according to local regulations.

ALARM CONDITIONS

If a loss of pressure in the piping system, which upon analysis by the PPM 4000 Computer is determined to be a leak, **PUMP SHUT DOWN** and **ALARM** will occur. Pump in alarm will be identified on display. EXAMPLE: Pump No. 2 is currently in alarm and will remain in prior alarm status after correction of leak.

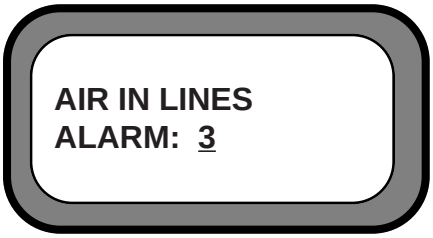




NOTICE **If a catastrophic or standard level test fails, an ALARM and PUMP SHUTDOWN will occur. This is a safety feature and is not programmable. A precision test successfully completed will be posted into the computer memory by date and time the test was passed. This will be visible on the screen when scanned to that channel.**

AIR IN LINES

If air is trapped in piping system, the display will indicate which piping system. (No pump shut down will occur.) EXAMPLE: Piping system No. 3 contains air in the line.



DANGER **If excessive air is trapped in the line, the ability to sense a leak is seriously hampered. See page A29 "Accumulator Installation Instructions", Number 8.**

Failure to follow these instructions will lead to severe personal injury, death or substantial property damage.

SYSTEM ALARMS

The five primary factors that can cause a system alarm to occur:

A. The computer allows itself one unsuccessful attempt to run the submersible pump in a 12 hour period. If it attempts to run the pump again and fails, the system will alarm. This will occur if both attempts take place in the same 12 hour period.

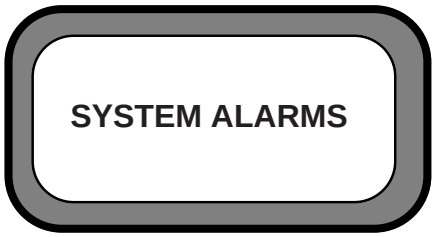
B. If the computer restarts the pump 25 times without satisfying system pressure requirements.

C. If the pressure transducer connections in the PPM 4000 and the pump connections in the PPM 4100 do not correspond by number.

D. Out of product in tank.

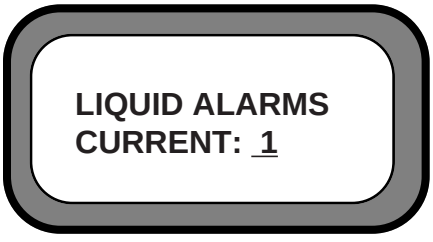
E. Transducer failure or wired incorrectly.

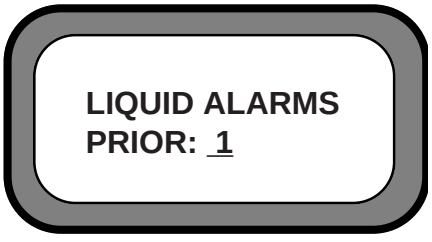
F. Submersible runs for more than 4 hours.



LIQUID ALARMS

If an annular space probe is installed and a liquid alarm occurs, this is an indication that water has entered the monitored space. **PUMP SHUT DOWN** will respond to programming and jumper location (see illustration on page 4). EXAMPLE: Probe No. 1 is currently in alarm and will remain in prior alarm status after correction of problem.

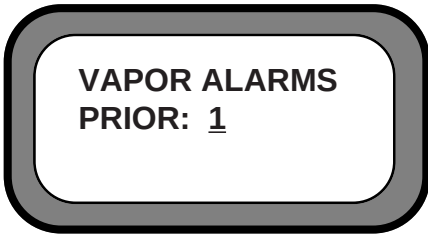




If a floating probe is installed and a liquid alarm occurs, this is an indication that the probe has sunk below water surface.

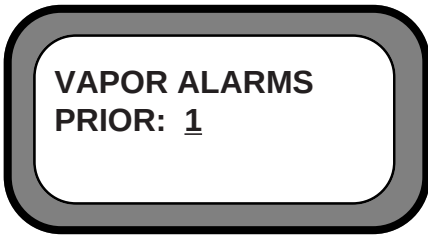
VAPOR ALARMS

When vapor concentration exceeds programmed threshold level, an alarm condition will occur. The display will indicate location and pump shut down will occur if programmed. EXAMPLE: Probe No. 1 is currently in alarm and will remain in a prior alarm status after correction of problem.

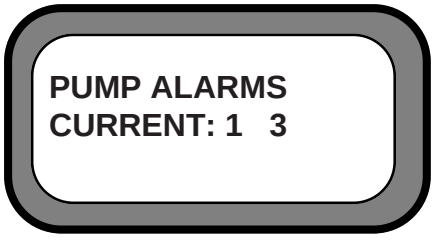


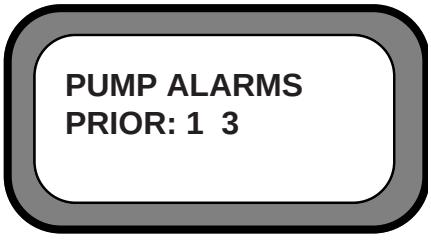
If alarm condition is in the prior display only, and/or if multiple alarm numbers occur in display, see below.

If alarm condition is in the **PRIOR DISPLAY** only, this is an indication that the alarm condition has cleared, but the alarm had occurred at the prior location number.

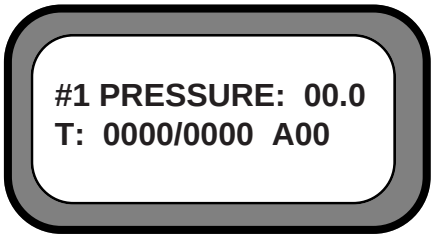


If multiple alarm number occurred in display, this is an indication that more than one alarm has occurred. EXAMPLE: Pumps No. 1 and 3 are currently in alarm and will remain in prior alarm status after correction of leak.



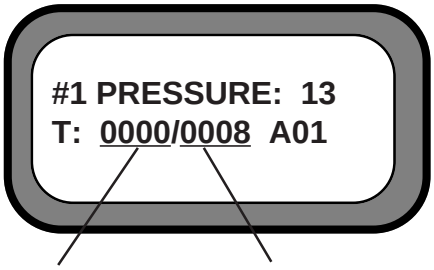


To view current pressure for subject piping system, press scan and scroll to the desired piping system number.

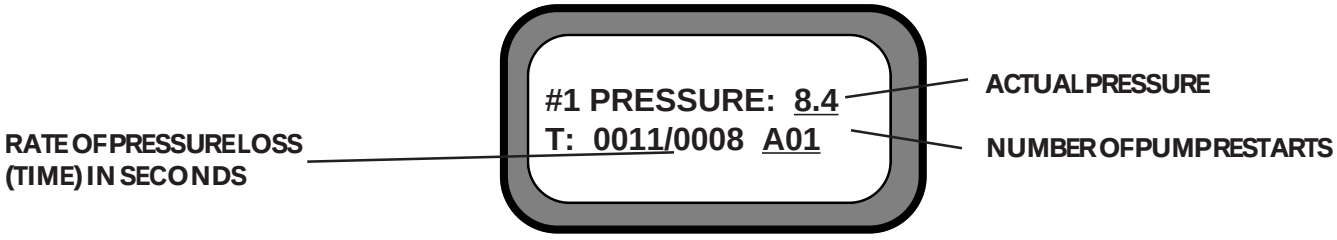


As the submersible pump runs, the display will show actual operating pressure.

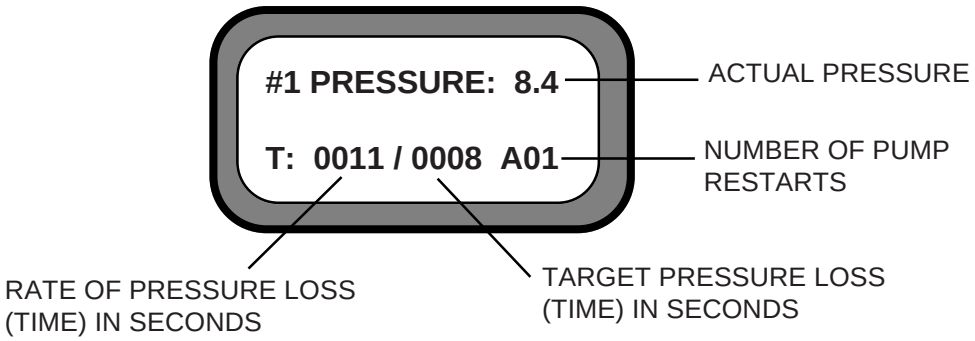
Upon pump shut off, the display will show the functional element seating pressure.



In the event a pressure loss occurs below the **FUNCTIONAL ELEMENT SEATING PRESSURE (11-15 psi),** the display will show pressure loss below functional element seating and begins its leak detection and thermal contraction test cycle.



NOTICE **To run a pump to view pressure, refer to "SYSTEM TEST", Test Mode B, page number 66. Due to the design of the pressure transducer, 35.2 psi is the maximum pressure that will register on the display of the PPM 4000, regardless of actual line pressure above 35.2 psi.**



1. The PPM 4000 evaluates the rate of pressure loss over time to detect leaks. The pressure screen (see above) can be used to observe the Catastrophic and Standard level tests.

2. Pressure screen components (refer to above example):

    A. "#1 Pressure" displays the channel (1 of 4) that is currently being displayed.

    B. "8.4" displays the current pressure, in PSI, in the product line.

    C. "T: 0011/0008" displays the timer and target values.

        1) The timer (left side of slash) indicates how much time (in seconds) it is taking to drop from 10 to 5 PSI line pressure.

        2) The target (right side of slash) is the time (in seconds) set by the computer. The first target is 8 seconds (catastrophic target) and all remaining targets are the previous timer value plus a percentage for thermal contraction.

    D. "AO1" displays the number of times the PPM 4000 has run the submersible during line testing and is called the number of "accumulators." When a customer runs the pump, this number is automatically returned to AO1, the timer is cleared and the 8 second catastrophic target is set. This will NOT count the number of customer pump runs.

3. Pump operating pressure is normally 25-30 PSI dead-head (submersible is on, no fuel being dispensed).

4. After the pump shuts off, line pressure must be relieved to, or "seat" at 11-15 PSI. A precision functional element must be used with the PPM 4000.

5. There are three line leak tests performed by the PPM 4000; Catastrophic, Standard, and Precision level tests.

    A. The Catastrophic test detects leaks of approximately 10 GPH or greater. The catastrophic test meets or exceeds EPA hourly line tightness test requirements.

    B. The Standard test detects leaks of .2 GPH at pumping pressure. The

Standard test meets or exceeds EPA monthly line tightness test requirements.

C. The Precision test tests for leaks of approximately .1 GPH at 1-1/2 times pumping pressure. The Precision test meets or exceeds EPA annual line tightness test requirements.

D. Once the system passes the Standard test, Precision test, or both, the PPM 4000 monitors the product line until pressure drops below 5 PSI; at this point the tests are started again.

6. An "Air In Lines" condition will cause completed tests not to be updated to the Standard and Precision test displays (see page for description of "Air In Lines"). This is because excessive resilience can mask leaks.

NOTICE **An air In Lines alarm requires seven consecutive occurrences to produce and alarm; only one occurrence is necessary to prevent tests from being declared a "pass."**

7. The PPM 4000 system must sense that the submersible is running (sensed at the 4100 cabinet) or leak detection will not occur.

8. If line pressure stays above 10 PSI, only the Precision Level test is performed.

9. The PPM 4000 will abort all tests underway when a customer runs the submersible pump. No action is taken during a customer operation, which is to say that the PPM 4000 system is only monitoring until the customer transaction is complete. Once the submersible is shut of, the PPM 4000 will begin active testing.

TESTING THE PPM 4000

WARNING **Though the PPM 4000 monitoring system provides a self test feature and supervised circuitry for fail-safe operation, it is mandatory that operation of the system be verified upon start up and that periodic testing of this equipment be routinely performed. Failure to follow these instructions can lead to severe personal injury, death or substantial property damage.**

There are two tests outlined below that Red Jacket recommends be performed to test the operation of the PPM 4000. The System Test and The Artificial Leak Test are the two tests outline.

I. The System Test Procedure

This procedure has three modes of testing. All three should be performed at the initial start up of the system and at appropriate intervals determined by the end user, guided by applicable regulations.

Test Mode A — is a verification that the basic electronic components, communication functions, and auxiliary alarm devices are operative.

Test Mode B — assures that the individual pumps are properly wired and operative.

Test Mode C — initiates a leak test of all line leak detection channels connected to the unit.

II. The Artificial Leak Test

This test verifies the leak testing performance of the PPM 4000 as it resets to a simulated leak. Performance of this test should be determined by the end user, guided by applicable regulations.

DANGER **All tests described here should be performed by qualified personnel only. Failure to follow the appropriate procedures will result in severe personal injury, death or substantial property damage if ignored.**

I. The System Test

STEP 1: RESET

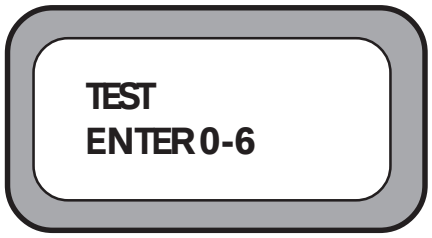
Push **RESET** and **ENTER** simultaneously to clear **ENTER** (used with programming switch on - up position).

The PPM 4000 has three test modes:

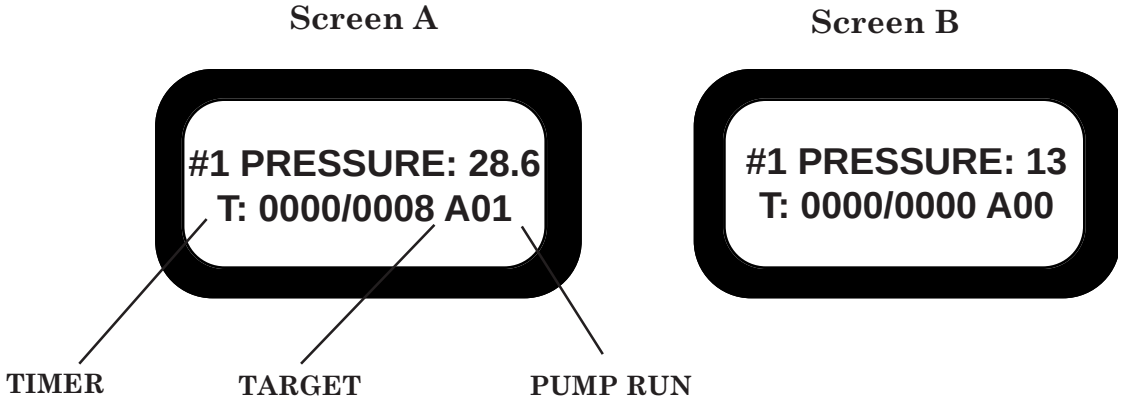
Mode A: Electronics - Communication, Auxiliary Alarm Devices and Relay Test (No pump run will take place).
Mode B: Individual line leak and pump run test.
Mode C: All piping systems - leak and pump run test

STEP 2: To activate Test Mode, press **TEST** on Digital Keypad

THE DISPLAY WILL SHOW:



The PPM Display will show target and pump run when the pump starts. When this occurs, as in screen A, repeat step 4 for each pump connected to the PPM 4000 unit.



WARNING

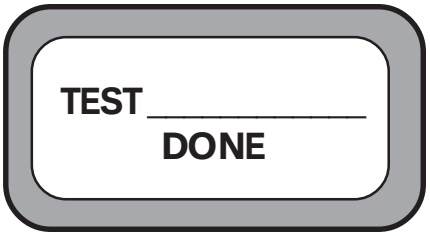
When conducting these tests, watch for the following conditions:
1) On the second line of the displayed pressure screen, the target should show 0008 and the pump run counter should read A01. See screen A above.

2) Displayed pressure should rise and fall in conjunction with 0pump run and pump shut off. See Screen A above.

Failure to follow these instructions can lead to severe personal injury, death or substantial property damage.

If "TEST DONE" appears on the screen, the PPM 4000 thinks that the submersible pump is running. In this case, check for the following:

1) Someone dispensing product from that particular pump.
2) Relay(s) controlling the pump are energized. (Continuous pump run.)
3) Excessive voltage may exist.



TEST MODE B

LEAK DETECTION ACTIVATION TROUBLESHOOTING

A) The PPM 4000 performs a leak test each time the submersible pump shuts off. In order to do the test, the **8 second time target** and the **Accumulator counter target** must be set. If these two targets have not been set, the leak detection capabilities are not being utilized.

To determine that the submersible pump is running, current from the contactor coil is measured by the 4100 Auxiliary Control Unit at the OUT terminal. If targets have not been set, see below for list of possible causes to check in order to locate the problem:

1. Coil side of the pump motor contactor is wired onto the IN terminal instead of the OUT terminal. In this case, the PPM 4000 cannot see the current draw from the coil on the IN terminal when the pump runs.
2. Some dispensers can have a bleed voltage when not activated onto the IN terminal. If this voltage exceeds 50 volts, a continuous pump run state is perceived by the PPM 4000. To check this, place a voltmeter on the OUT terminal of the suspected channel and the Power Neutral terminal. Voltage should not exceed 50 volts with the dispenser OFF. If voltage does exceed 50 volts with the dispenser OFF, call technical services at 1-800-2-MARLEY.
3. If the current drawn from the contactor coil on the OUT terminal is less than 30 milliamps when the contactor is engaged, the PPM 4000 will not sense pump run and targets will not be set.

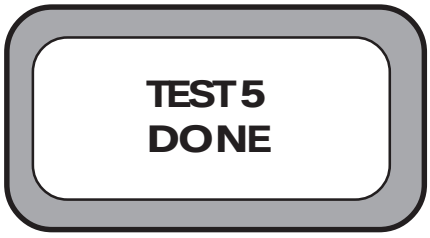
   To check this, remove the wire from the OUT terminal, place a meter set to read milliamps in series with the OUT terminal and the wire that was removed. Engage the contactor if 30 milliamps or greater is not read. The contactor coil is not drawing enough current to allow the PPM 4000 to sense the pump running. Call technical services if this is encountered (1-800-2-MARLEY).

B) If pressure display remains at 0 psi or approximately 10-14 psi at all times, 5 volt DC supply to the transducer may not be working. Check the DC voltage level between the red and black wires at the transducer. If no 5 VDC is seen, call technical services at 1-800-2-MARLEY.

TEST MODE C - To activate Test Mode C-

Step 5: Press **TEST**,
Press **5**,
Press **ENTER**

- At this time, the PPM 4000 will sequentially activate all pumps for five (5) seconds.
- A leak test of all piping systems will be performed.
- Display will show:



NOTICE

When all the targets are known to be setting and verified in Test Mode B, this indicates that the PPM 4000 computer is seeing the pumps run and that the leak detection capabilities are active.

Whenever the system is 'Reset' from an alarm condition, the targets are zeroed out.

Test Mode C is useful since it runs all the pumps, and sets all the targets eliminating the running of each individual pump (Test Mode B). Test Mode C is useful as long as it is known that the targets are being set on each pump.

It is a good idea to SCAN through to the pressure screens of each pump to check to see that targets are set before leaving the site.

II. The Artificial Leak Test - to verify the leak testing performance of the PPM 4000 as it reacts to a simulated leak.

WARNING **If the system is opened (as in the following steps) with the power connected to the pump, the monitoring equipment will start the pump as part of the verification process.**

Failure to follow these directions can result in severe personal injury, death or substantial property damage.

Step 1: Disconnect power to the submersible pump. (Note the warning above.)

Step 2: Install a test fixture in the dispenser shear valve as shown in Fig. 1.

Step 3: Reconnect power.

Step 4: Start the submersible pump and dispense several gallons of product into a metering can to remove any air which may have entered the system when the test fixture was installed.

Step 5: Turn off the pump and disconnect power to the pump. (Note above warning.)

Step 6: Open the bibcock and drop the line pressure to zero by bleeding fluid from the system and measuring it. When the pressure has dropped to zero, no more than about 1-1/2 cups (11-14 oz.) of fluid should have been drained from the system. A volume greater than this may indicate the presence of air in the system.

Step 7: Close the bibcock and reconnect the power to the pump.

Step 8: Run the submersible pump with the test feature (Section I, Mode B) of the PPM 4000 computer. Note the LCD readout, pump pressure and holding pressure.

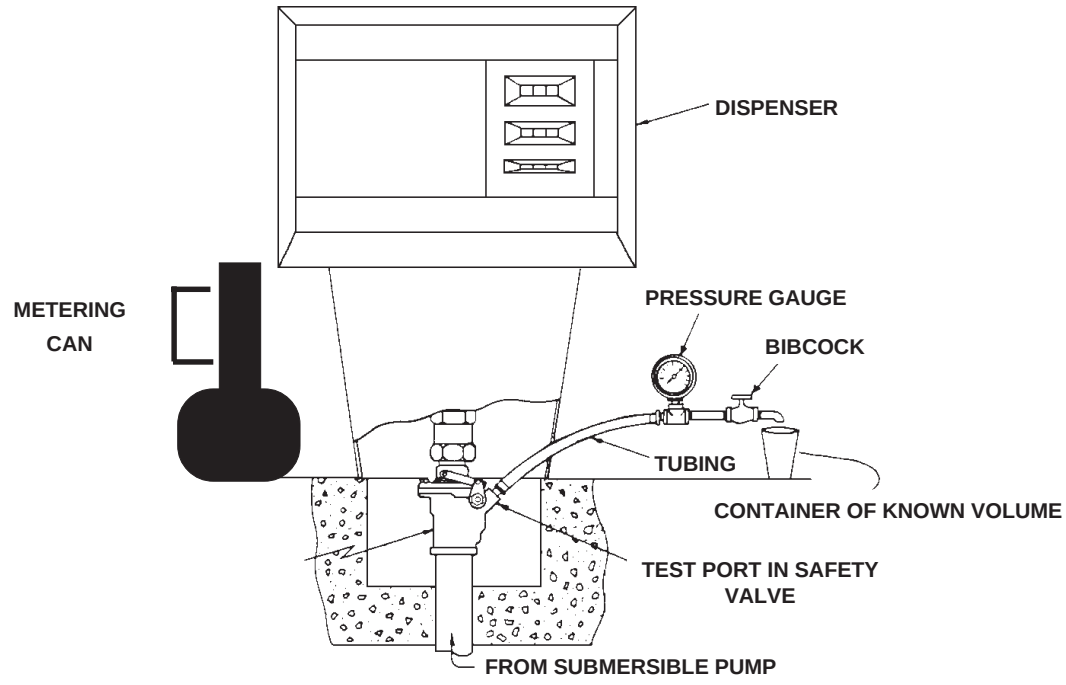
Step 9: Open the bibcock to create a small artificial leak into an appropriate container. The leak should be approximately 64 oz. per minute or less to be equivalent to the EPA standard.

- With the leak in place, notice the LCD readout.
- The computer will time from 10 psi to 5 psi, reset the target time, toggle the pump and time from 10 psi to 5 psi to 5 psi again.
- The audible leak alarm should sound.
- "Pump Alarm" should appear on the LCD readout with the appropriate channel number inserted.

If no alarm occurs, verify that:

1. Targets are being set.
2. The timer is counting when pressure drops below 10 psi.
3. Timer continues to count as pressure drops to 5 psi.
4. Repeat test.

Log the test results on the PPM series manual status report provided for your convenience on page 75.



SAMPLE ARTIFICIAL LEAK TEST AT STANDARD LEVEL TEST

This sample explains how the test works and what the PPM computer will do.

1. Normal pump running pressure 27-29 psi. At this point the computer sets a target of 8 seconds and the timer is started. **See LCD display #1.**

2. After delivery is complete and pump shuts off, the functional element relieves pressure to between 11-14 psi. **See LCD display #2.**

3. If pressure remains above 10 psi and the submersible pump is not activated for 45 minutes, a precision leak test will begin (see conditions in "Precision Leak" section, page 50 of Technical & Applications Guide RJE 260-045). The lines are considered not to be leaking within the design criteria of the PPM 4000.

4. The graph, however, depicts that the pressure did drop below 10 psi. The timer has started counting. **See LCD display #3.**

5. If the pressure dropped below 5 psi within the 8 second target a catastrophic leak would be indicated and positive shut down would occur. (See page 47 of Technical & Applications Guide RJE 260-045.)

6. SOLID LINE (A) - In this example, it took 20 seconds for the pressure to drop from 10 psi to below 5 psi. The computer acknowledges that the catastrophic leak test passed but that a problem may still exist because the pressure did drop below 5 psi. The graph shows it taking 20 seconds. **See LCD display #4.**

7. The computer picks the time it took for the pressure to drop from 10 psi to below 5 psi, 20 seconds, adds a 5% allowance for thermal contraction **(See LCD display #5)** and establishes it as a new target.

8. COMPUTER PUMP RUN #1 ON GRAPH - At this point, the computer restarts the pump for 3 to 5 seconds to repressurize the line so it can take another look at the pressure rate of fall. **See LCD display #5.**

9. THE SECOND PRESSURE DROP ON GRAPH LINE (B) - If the pressure rate of fall continues on the next run and is equal to or less than the new target, 21 seconds on the graph, the computer will consider it a leak and shut the pump down. Positive shut down. **See LCD display #7, 8, 9.**

10. EXPLANATION - The pressure in a line can drop for many reasons: Thermal contraction, malfunctioning check valve, leaking filter, etc., or a leak in the line. Leaks are consistent. A leak will not get smaller, only larger. The computer is programmed to look for these consistencies.

STANDARD LEVEL TEST

1 **#1 PRESSURE: 28.5**
T: 0000/0008 A01

* CUSTOMER DISPENSE

2 **#1 PRESSURE: 13.0**
T: 0000/0008 A01

* CUSTOMER FINISHED

* SEATING PRESSURE

3 **#1 PRESSURE: 9.8**
T: 0001/0008 A01

* PRESSURE DROPS BELOW 10 PSI

* START TIMER

4 **#1 PRESSURE: 4.9**
T: 0020/0008 A01

* PRESSURE DROPS BELOW 5 PSI

* TIMER > TARGET

* JOG PUMP

5 **#1 PRESSURE: 28.5**
T: 0020/0021 A02

* JOG PUMP (PPM 4000)

6 **#1 PRESSURE: 13.0**
T: 0020/0021 A02

* SEATING PRESSURE

7 **#1 PRESSURE: 9.8**
T: 0001/0021 A02

* DROPS BELOW 10 PSI

* START TIMER

8 **#1 PRESSURE: 4.9**
T: 0020/0021 A02

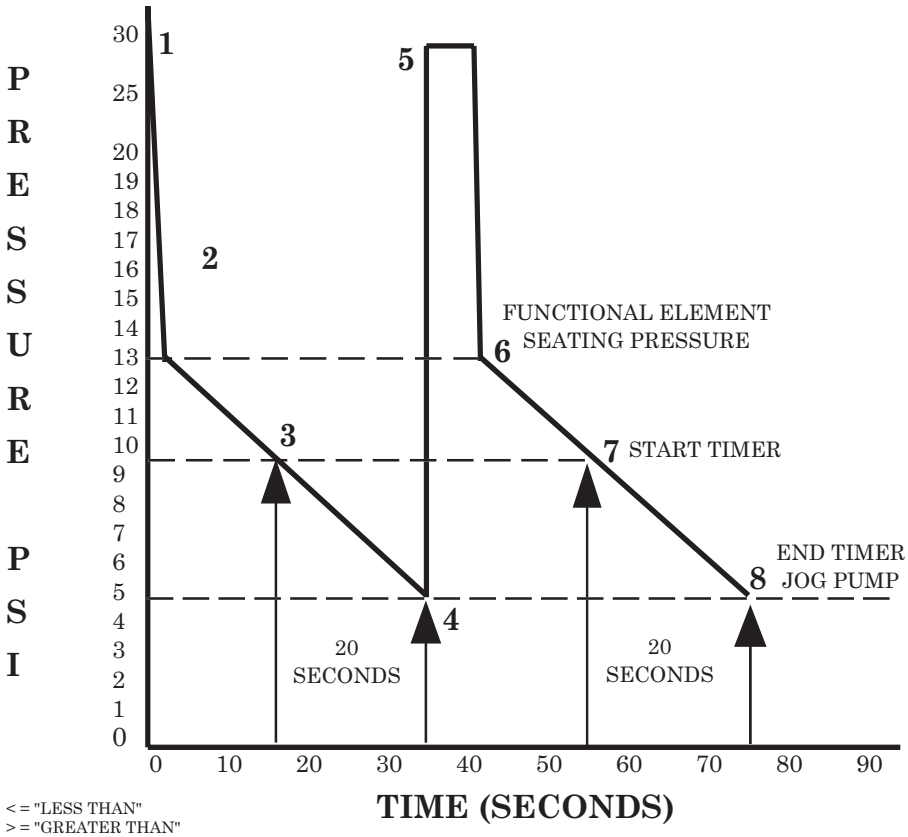
* DROPS BELOW 5 PSI

* STOP TIMER

* TIMER < TARGET

9 **PUMP ALARM**
CURRENT:1

* TEST FAILS



< = "LESS THAN"
> = "GREATER THAN"

PPM SERIES MANUAL STATUS REPORT

WARNING **To retain the protection provided by any safety equipment, periodic examination and testing is mandatory. Monthly testing is highly recommended. The form below is a sample which may be used to satisfy the record keeping requirements for testing and will provide verification of system operation. Failure to follow these directions can lead to severe personal injury, death or substantial property damage.**

LOCATION NUMBER _____

DATE _____ TIME _____

PUMP ALARMS CURRENT _____ PRIOR _____

VAPOR ALARMS CURRENT _____ PRIOR _____

LIQUID ALARMS CURRENT _____ PRIOR _____

SYSTEM ALARMS _____ PRIOR _____

STD, LEAK TEST #1 _____ #2 _____ #3 _____ #4 _____

(DAY, DATE, TIME)

PREC. LEAK TEST #1 _____ #2 _____ #3 _____ #4 _____

(DAY, DATE, TIME)

#1 PRESSURE _____ #2 PRESSURE _____ #3 PRESSURE _____ #4 PRESSURE _____

TIME _____ TIME _____ TIME _____ TIME _____

#1 TARGET _____ #2 TARGET _____

CURRENT PPM _____ CURRENT PPM _____

#3 TARGET _____ #4 TARGET _____

CURRENT PPM _____ CURRENT PPM _____

#5 TARGET _____ #6 TARGET _____

CURRENT PPM _____ CURRENT PPM _____

#7 TARGET _____ #8 TARGET _____

CURRENT PPM _____ CURRENT PPM _____

ARTIFICIAL LEAK TEST RESULTS DATE _____

#1 PRESSURE _____ #2 PRESSURE _____ #3 PRESSURE _____ #4 PRESSURE _____

TIME _____ TIME _____ TIME _____ TIME _____

ALARM _____ ALARM _____ ALARM _____ ALARM _____

OPERATOR _____

(SAMPLE)