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TLS-HLD

Site Prep Manual

VEEDER-ROOT

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Introduction

This manual describes the site preparation and console installation procedures for the TLS-HLD Console.

This manual assumes that you installing the TLS-HLD in a new site (before pavement is put down and with no wiring runs in place). Among the topics covered are:

- Site layout considerations.
- Installing the console and connecting wiring from the 120 or 240 Vac power panel.
- Probe assembly and installation procedures.
- Installing wiring conduit between the console and its probes.
- Probe-to-console field junction box wiring diagram.
- Attaching probe wiring to the console.
- RS-232 serial communication connection requirements and serial commands.
- Troubleshooting information that contains diagnostic and maintenance information.
- System specifications.

After the console is wired to its power source and probes, you should program the console following the setup instructions contained in the TLS-HLD Setup manual.

Regulatory Agency Console Documentation

The UL Console Form Numbers are listed by Underwriters Labs, in File Number: MH11766.

Related Manuals

577013-785	TLS-HLD Setup manual
576013-635	RS-232 Serial Interface manual
576013-859	Direct Burial Cable Installation manual

Safety Symbols

The following safety symbols may be used throughout this manual to alert you to important safety hazards and precautions

	EXPLOSIVE Fuels and their vapors are extremely explosive if ignited.		**FLAMMABLE** Fuels and their vapors are extremely flammable.
	ELECTRICITY High voltage exists in, and is supplied to, the device. A potential shock hazard exists.		**TURN POWER OFF** Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.
	NO SMOKING Sparks and embers from burning cigarettes or pipes can ignite fuels and their vapors.		**NO OPEN FLAMES** Open flames from matches, lighters, welding torches, etc. can ignite fuels and their vapors.
	NO POWER TOOLS Sparks from power tools (such as drills) can ignite fuels and their vapors.		**USE SAFETY BARRICADES** Unauthorized people or vehicles in the work area are dangerous. Always use safety cones or barricades, safety tape, and your vehicle to block the work area.
	WEAR EYE PROTECTION Fuel spray from residual pressure in the lines can cause serious eye injuries. Always wear eye protection.		**INJURY** Careless or improper handling of materials can result in bodily injury.
	GLOVES Wear gloves to protect hands from irritation or injury.		**READ ALL RELATED MANUALS** Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.

Site Considerations

Control Drawing

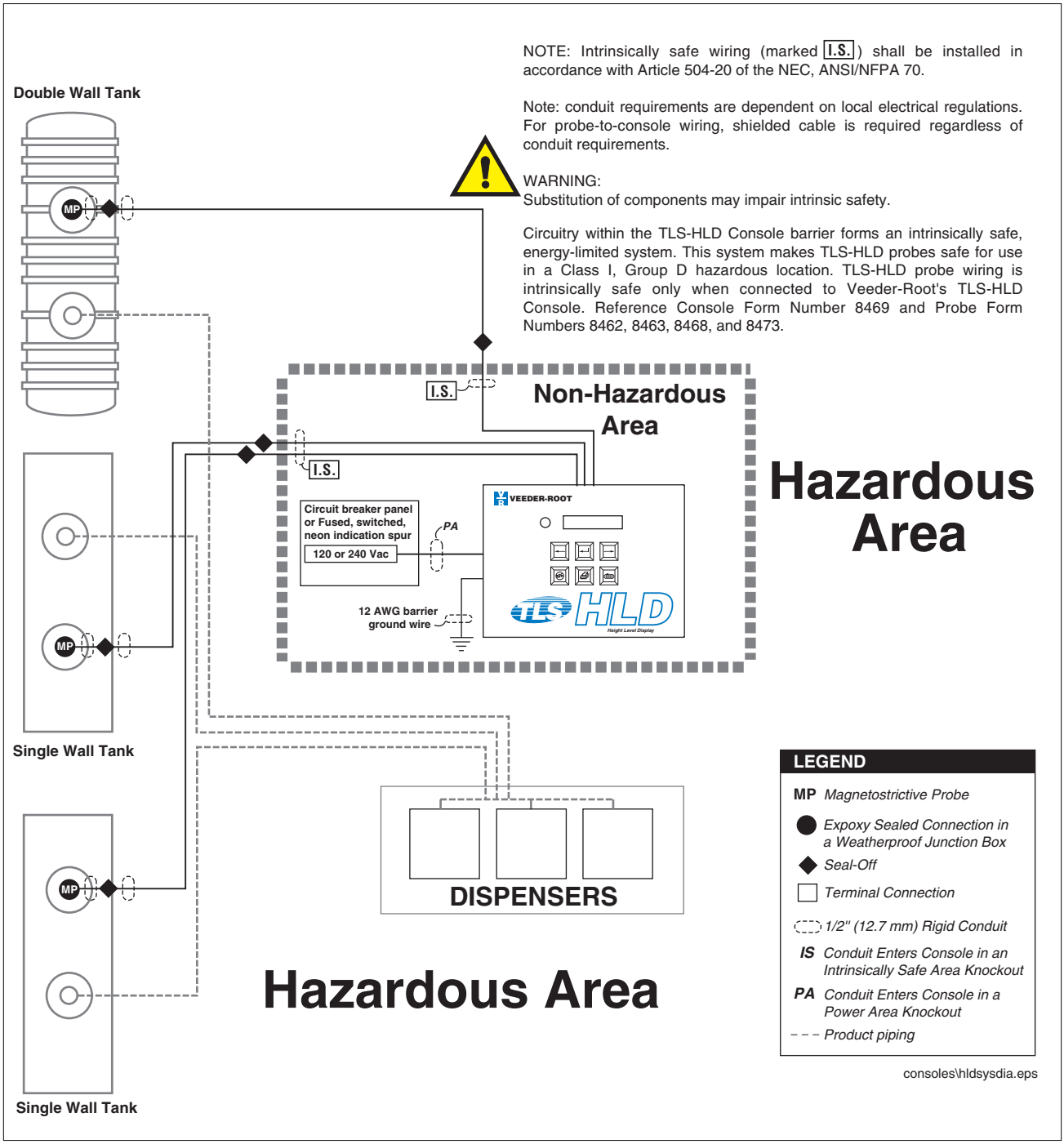


Figure 1. Control Drawing - Example TLS-HLD System Site Layout

National Electrical Code Compliance

The following information is for general reference and is not intended to replace recommended National Electric Code (NEC) procedures. It is important for the installer to understand that electrical equipment and wiring located in Class I, Division 1 and 2 installations shall comply with the latest appropriate articles found in the National Electric Code (NFPA 70) and the Automotive and Marine Service Station Code (NFPA 30A), or other local code such as the CEC, Canadian Electrical Code..

PROBE- TO-CONSOLE WIRING

Shielded Cable or Veeder-Root Direct Burial Cable Required

To ensure the best operating systems available, Veeder-Root **REQUIRES** the use of shielded cable for all probes regardless of conduit material or application. In these installations, shielded cable must be rated less than 100 picofarad per foot and be manufactured with a material suitable for the environment, such as Carol™ C2534 or Belden™ 88760, 8760.

Note: Throughout this manual, when mentioning any cable being used for probe-to-console wiring, it will be referring to shielded cable.

Wire Length

Improper system operation could result in undetected potential environmental and health hazards if the probe-to-console wire runs exceed 1000 feet. Wire runs must be less than 1000 feet to meet intrinsic safety requirements.

Splices

Veeder-Root recommends that no splices be made in the wire run between a probe junction box and the console. Each splice degrades signal strength and could result in poor system performance.

Wire Gauges - Color coded

- Shielded cable must be used in all installations. Probe-to-console wires should be #14 - #18 AWG stranded copper wire and installed as a Class 1 circuit. As an alternate method when approved by the local authority having jurisdiction, #22 AWG wires such as Belden 88761 may be suitable in installations with the following provisions:

  - Wire run is less than 750 feet

  - Capacitance does not exceed 100 pF/foot

  - Inductance does not exceed 0.5 µH/foot

- Wires carrying 120 or 240 Vac from the power panel to the console should be #14 AWG copper wire for line, neutral and chassis ground (3); and #12 AWG copper wire for barrier ground (1).

PROBE JUNCTION BOXES

Weatherproof electrical junction boxes with a gasketed cover are required on the end of each probe conduit run at the manhole location. Gasketing or sealing compound must be used at each entry to the junction box to ensure a waterproof junction. The interior volume of each junction box must be a minimum of 16 cubic inches.

Veeder-Root recommends the following junction box or equivalent:

- Appleton Electric Co. - JBDX junction box, JBK-B cover, and JB-GK-V gasket.
- Crouse-Hinds Co. - GRFX-139 junction box, GRF-10 cover, and GASK-643 gasket.

Probe Wiring Safety Issues

⚠ WARNING

Probes operate in areas where flammable liquids and explosive vapors may be present.

Improper installation may result in fire or explosion causing serious injury or death.

Practice the following:

1. **Read thoroughly and follow the instructions shipped with each probe.**
2. **Probe wiring must enter the console only through their designated areas.**
3. **Power wires and conduit must not enter the intrinsically safe compartment of the console.**
4. **Substitution of components may impair intrinsic safety.**

Wiring between the console and the probes is of limited electrical power so that there is insufficient energy to ignite fuel. In the console, the low power probe wiring is considered intrinsically safe because it is physically isolated from all high power wiring. To maintain the integrity of this safety feature probe wiring can not share the same conduit with power wiring. In addition, probe cables can only enter the console through the designated intrinsically safe area knockouts.

If the TLS-HLD System is being retrofitted into a paved site, you can cut grooves in the pavement, run direct burial cable to the probes, and then seal over the cable grooves, subject to approval of the local authority having jurisdiction.

Before trenching, you should diagram all conduit runs between the console's intended location and its deployed probes. Your site diagram will help you calculate conduit and wiring lengths, and necessary quantities of junction boxes, sealing boxes, clamps, brackets, etc.

Throughout this planning process and in the actual installation, you must follow all latest National Electric Codes, and applicable federal, state, and local codes as regards conduit type, depth below grade, sealing, grounding, wire capacities, direct burial (if permitted), etc.

Selecting a Console Location

⚠ WARNING

Explosive vapors or flammable liquids could be present near locations where fuels are stored or being dispensed. The TLS-HLD Console is not explosion proof.

An explosion or fire resulting in serious injury or death, property loss and equipment damage could occur if the console is installed in a volatile, combustible or explosive atmosphere (Class I, Division 1 or 2).

Do not install this console in a volatile, combustible, or explosive atmosphere.

Select a mounting location on the inside of any building. The console must be protected from severe vibration, extremes in temperature and humidity, rain, and other conditions that could harm computerized electronic equipment.

The equipment is designed to operate safely under the following range of conditions:

- Temperature range 0 to 40°C - (storage temperature range of -40 to +74°C).

- A maximum relative humidity of 95% RH (non-condensing) at temperatures up to 40°C.
- Console may be powered by either 120 or 240 Vac. A switch-mode power supply automatically detects the input voltage (no jumpers required).
- Main supply voltage fluctuations not exceeding ±10%.
- Pollution Degree Category 2.
- Installation Category II.

Consoles must be installed within the interior of buildings. They are not suitable for any external location.

Ensure that the console is located where neither the console nor its associated cabling will be damaged by doors, furniture, barrows, etc. Consider the ease of routing wiring, ducting, and probe cables to the console. Check that the mounting surface material is strong enough to support the console's weight of about 4 pounds.

If the unit requires cleaning, do not use any liquids, wipe only with a clean, dry cloth.

Console Installation

Mounting the Console

Figure 2 illustrates recommended console mounting. Install the console fastening devices to the mounting surface using the hole pattern (6.7” x 5.7”) shown in Figure 3. Mounting screws up to 3/16” diameter may be used.

Install metal conduit (1/2” I.P.S.) between the console and the power panel. Figure 3 shows the three designated knockouts (one each on top, left side, and bottom) through which power wiring can safely enter the console.

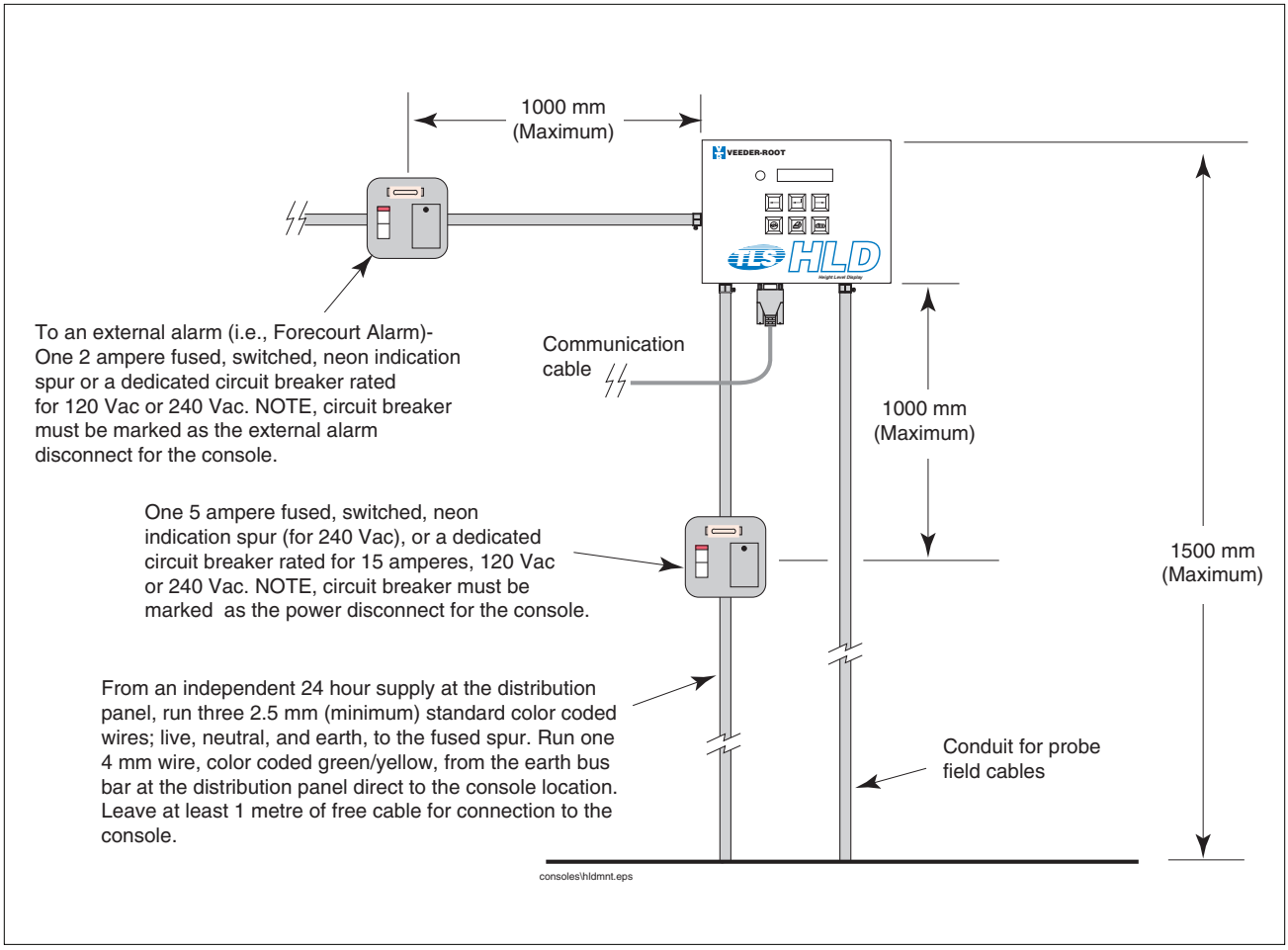


Figure 2. Recommended Mounting of Console

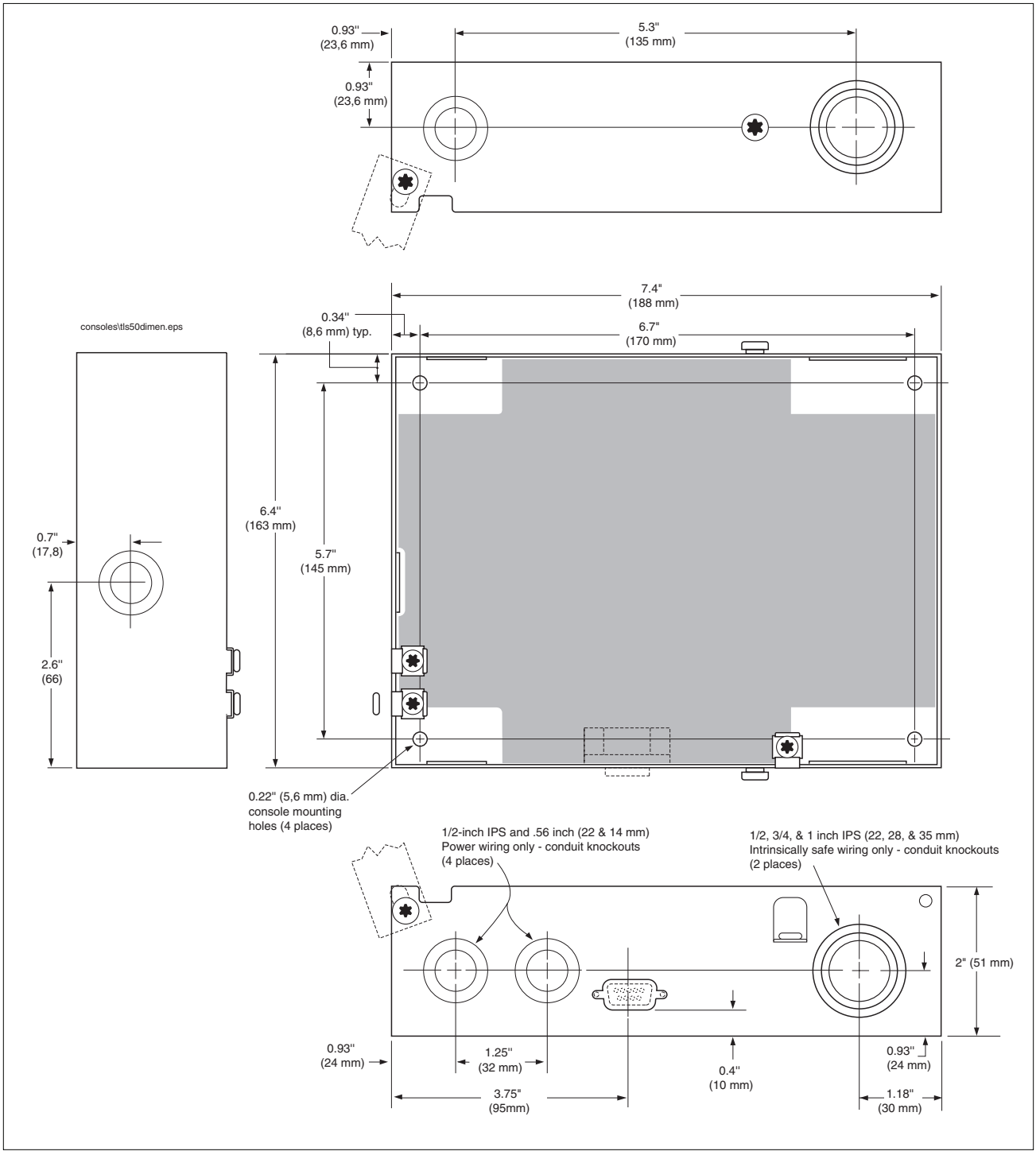


Figure 3. Console Dimensions and Designated Conduit Knockouts

Wiring the Console

⚠ WARNING

The console contains voltages which can be lethal. It is connected to devices that must be intrinsically safe.

Connecting power wires to a live circuit can cause electrical shock that may result in serious injury or death.

1. **Turn power off at the circuit breaker connecting the power supply wires.**
2. **Attach conduit from the power panel to the console's Power Area knockouts only (1 on top and bottom, ref. Figure 3).**

1. Pull four wires between the power panel and the console; three #14 AWG (2.5 mm^2) color-coded wires for AC line (L), AC neutral (N) and chassis ground; and one #12 AWG (4 mm^2) green and yellow wire for barrier ground.

   For international applications using 240 Vac, pull four wires between the power panel and a 5 A fused, switched, neon indication spur; three #14 AWG color-coded wires for AC line (L), AC neutral (N) and chassis ground; and one #12 AWG green and yellow wire for barrier ground. Pull four identical wires between the spur and the console.

2. Open the right door of the console and connect the four power/ground wires as shown in [Figure 4]. Do not connect the power wires to breaker panel at this time.

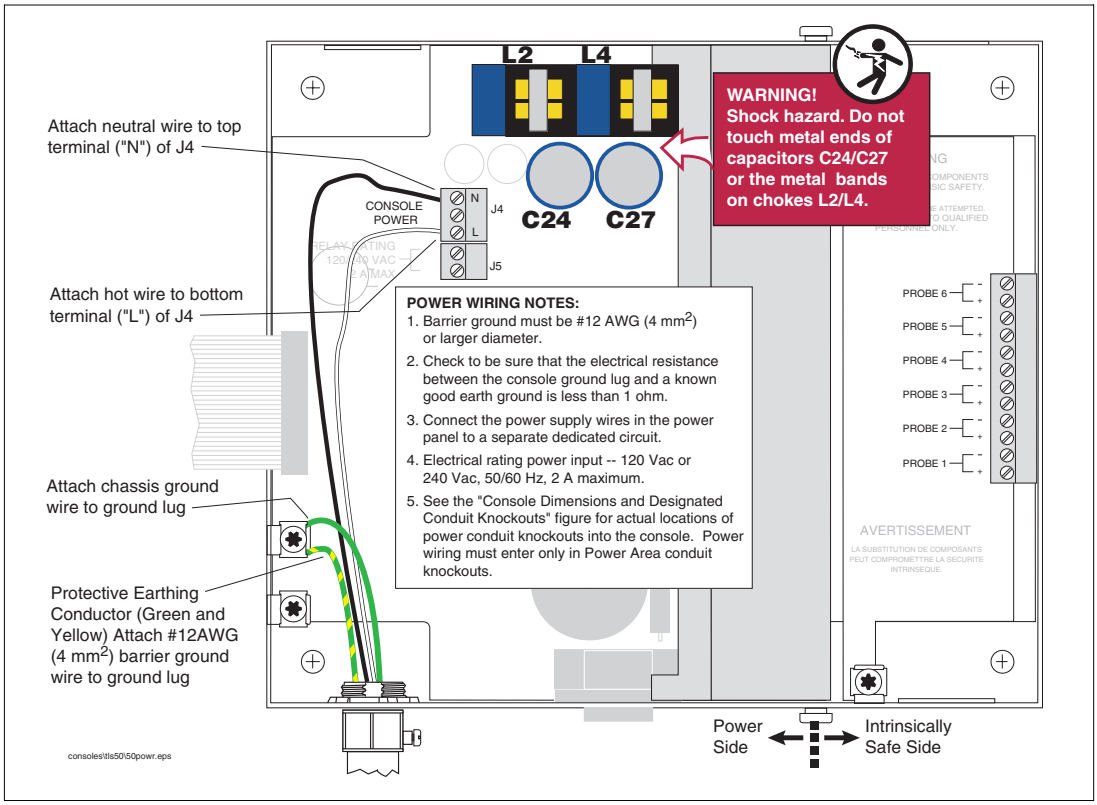


Figure 4. Wiring AC Power to the Console

Mag Probe Assembly

The following assembly instructions are for Global Mag Plus an Mag Plus probes. For other probe types follow assembly instructions included with probe.

Attaching Probe Canister Spacer Rings

1. Open the probe shipping carton so that you have access to the probe. Also open the installation kit.
2. After setting the spacer vanes for a 3- or 4-inch riser (see Figure 5), install the two spacer rings as shown. Note: you must slide the bottom spacer over the probe and onto the lower end of the canister. NOTE: spacers are not required for a 2-inch riser.

Assembling Floats onto Probe Shaft

The Product floats, Water Floats (if ordered), and Boots from Probe Installation Kits are assembled on the probe shafts in the exact sequence and orientation shown in Figure 6.

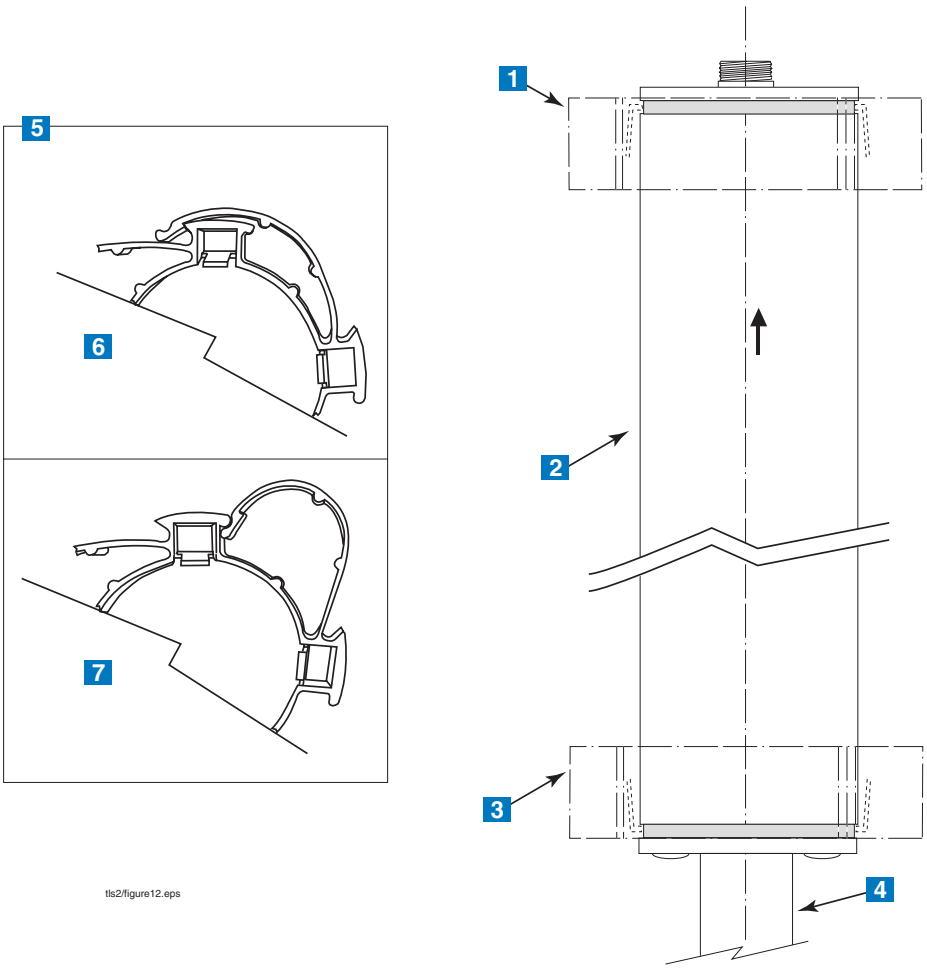
IMPORTANT! Failure to push the boot as far as possible onto the probe shaft could cause the boot and float(s) to fall into the tank. The boot must be pushed on until it “locks” on the probe shaft. Also, water floats must be installed, if ordered, for the probe to operate correctly.

Handle the probe carefully. Striking or dropping the probe will result in loss of calibration and could cause permanent damage.

Attaching Cable Connector to Probe Canister

Attach the connector end of the probe cable to the threaded connector on top of the probe canister and tighten down the integral nut.

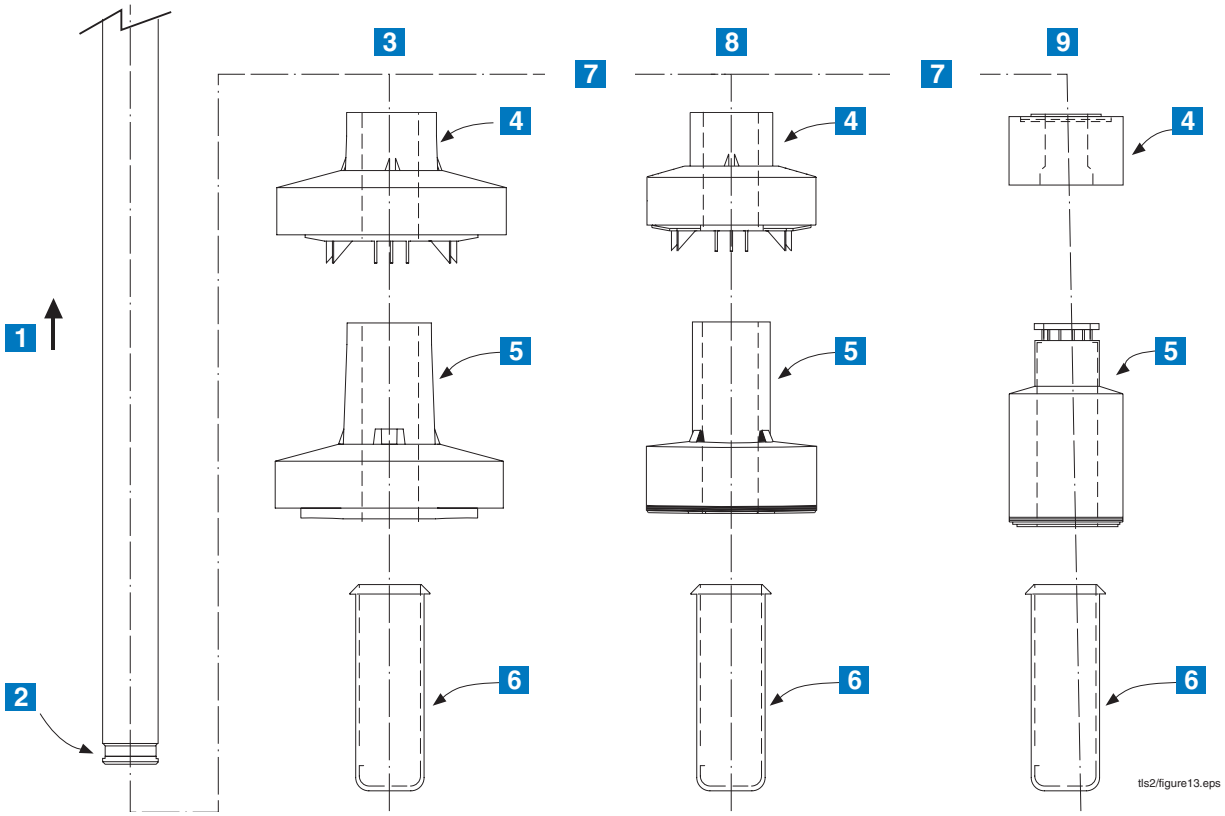
This completes the probe assembly. Save the remaining kit components. They will be needed to install the probe into the tank.



Legend for numbered boxes

1 After setting vanes (see insert) install top spacer ring. Orient locking tabs as shown, and then slide ring over top of canister until tabs snap into groove in canister.
2 Probe canister
3 After setting vanes (see insert) install bottom spacer ring. Orient locking tabs as shown, and then slide ring over probe and onto canister, until tabs snap in groove.
4 Probe shaft
5 Spacer Ring Riser Adjustment
6 For 3"riser - set 4 spacer ring vanes as shown.
7 For 4"riser - set 4 spacer ring vanes as shown.

Figure 5. Installing Probe Canister Spacer Rings



Legend for numbered boxes

1 Up
2 Bottom of probe shaft
3 4-Inch Floats
4 Product float - slide on probe shaft first
5 Water float - (Optional) slide on probe shaft second.
6 Boot - slide on probe shaft last
7 Or (different float size)
8 3-Inch Floats
9 2-Inch Floats

Figure 6. Probe Float/Boot Installation

Probe Installation

Probe Manhole Installation

At each underground probe location, install a 14-inch (355 mm) minimum diameter approved manhole according to the manufacturer's instructions (Note: probes should be located at least 24 inches (610 mm) from the submersible pump to avoid erroneous probe readings when the pump is running).

Position the manhole so that there is necessary clearance for junction box installation and wiring.

Probe Installation

Each probe supplied by Veeder-Root is accompanied by an assembly manual which details the assembly of the probe. Figure 7 and Figure 8 illustrate how to install the assembled probe either in an underground tank, and in an above ground tank.

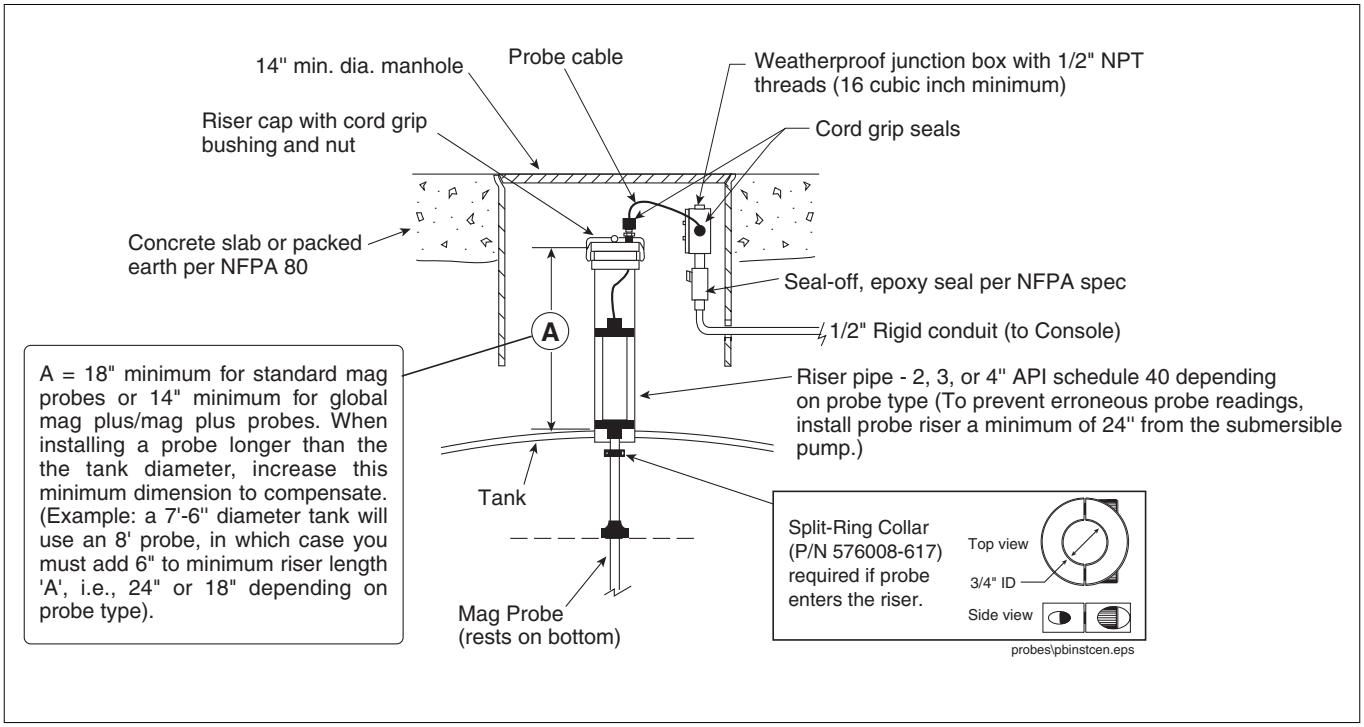


Figure 7. TLS-HLD Probe Installation Example - Underground Storage Tank

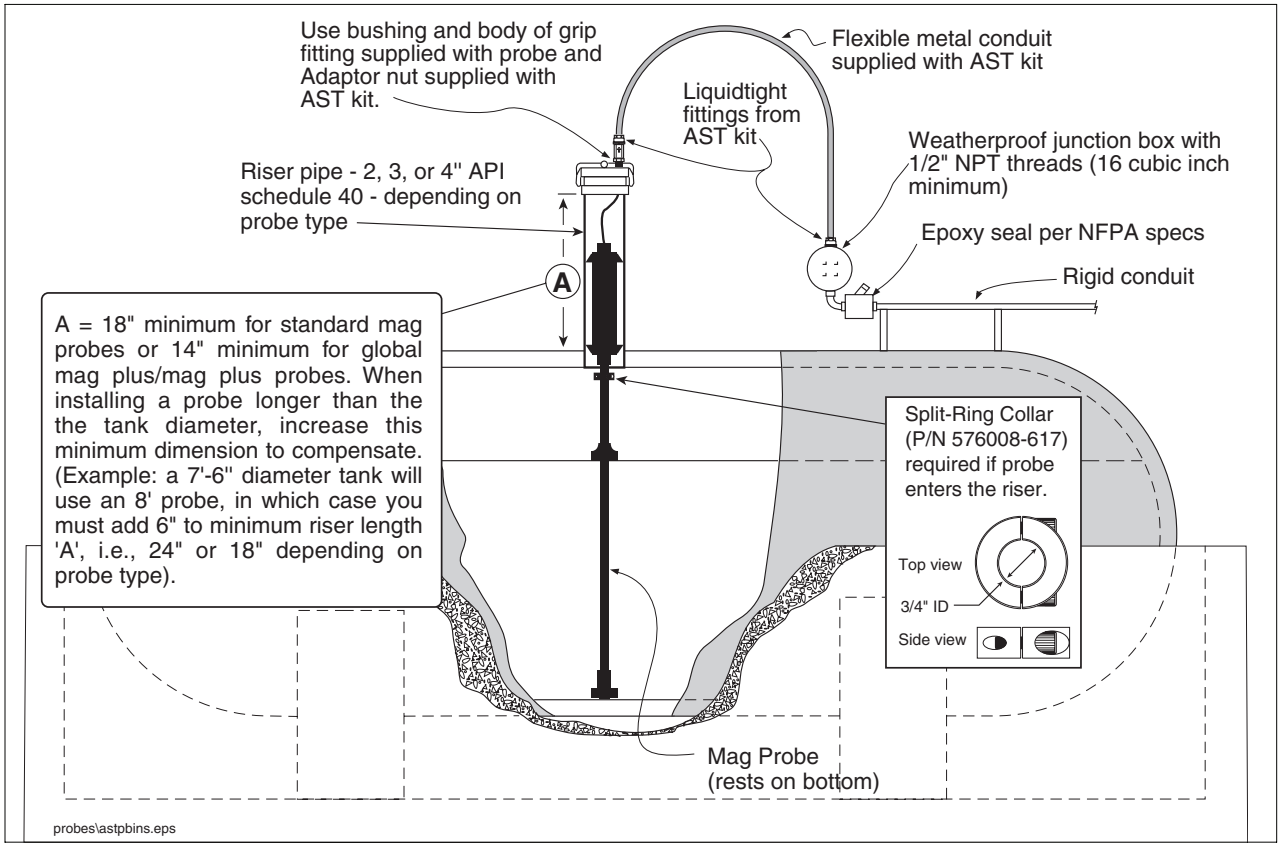


Figure 8. TLS-HLD Probe Installation Example - Above ground Storage Tank

Probe Conduit Installation

⚠ WARNING

Probes operate in areas where flammable liquids and explosive vapors may be present.

Improper installation may result in fire or explosion causing serious injury or death.

Practice the following:

1. **Read thoroughly and follow the instructions shipped with each probe.**
2. **Probe wiring conduit must not contain any other wires.**
3. **Probe wiring and conduits must enter the console only through their designated areas (see Figure 3).**
4. **Power and communication wires and conduit must not enter the intrinsically safe compartment of the console. (see Figure 3).**

Wiring Run Methods

Two wiring run methods are commonly used for probes - Shielded wiring pulled through buried, sealed 1/2" rigid conduit; or direct burial cable.

BURIED RIGID CONDUIT

The preferred method, especially in new sites before driveway surfaces are paved, is to pull probe wiring through buried 1/2" rigid conduit [Figure 9].

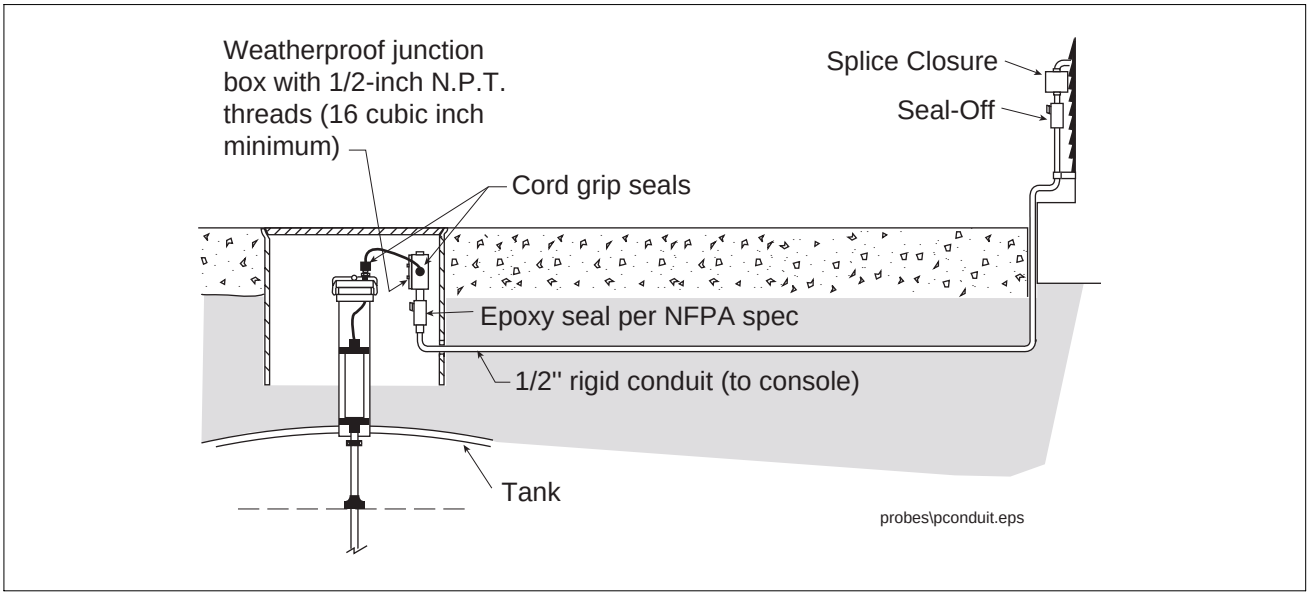


Figure 9. Example Probe Wiring Run in Buried Rigid Conduit

Pulling Wires for Probes

Pull shielded cable consisting of two conductors, color-coded #14-18 AWG (2.5 - 0.8 mm^2) stranded copper wire, between the console and the junction box at each probe location (do not gang wires together). Use single lengths of wire with no splices to ensure optimum signal strength.

IMPORTANT! Maximum probe-to-console cable length is 1000 feet (305m).

Since wires for multiple probes may enter the console through a single conduit, it is recommended that you use a different color-code for each wire or individually mark each wire to identify probe inputs. Also, if the intrinsically safe wires enter the building in a wiring trough, only intrinsically safe wires (from TLS-HLD probes) can be in the trough. Keep all low power (intrinsically safe) wiring physically isolated from high power wires in all wiring troughs per the NEC.

DIRECT BURIAL CABLE

An alternative to trenching through existing pavement is to use direct burial cable.

Prior to installing direct burial cable with epoxy splices, consult with the local authority having jurisdiction. Use of direct burial cable is only allowed in locations where local codes permit the use of buried cable.

⚠ WARNING

Direct burial cable can be installed in hazardous locations where fuel and vapor may be present. It is specifically designed for certain uses only. It must be installed in the correct manner.

Installing the cable incorrectly or without proper precautions can result in fire, explosion, electrical shock, hazardous conditions as well as equipment damage or inaccurate inventory control.

Perform the following:

1. **Use direct burial cable for intrinsically-safe wiring only. Do not use for power wiring.**
2. **Do not share conduit for intrinsically-safe probes with wiring of any other type or from any other system.**
3. **Maintain a physical separation of at least 2 inches between probe wiring to all other wiring.**
4. **When cutting trenches for direct burial cable ensure that you do not cut through existing fuel or wiring systems. Obtain as much site information as possible before cutting the trench.**
5. **When grinding trenches in existing pavement for direct burial cables, wear approved breathing and hearing protection, goggles, and gloves.**

The direct burial method requires grinding a 1/4" to 3/8" wide by 1-1/4" deep groove (adding 1/4" of depth for each additional cable) in the pavement surface, laying Veeder-Root supplied direct burial cable down in the bottom of the groove, laying an expanded polyethylene foam backer rod over the cable(s), and then a placing a 1/4" to 1/2" bead of Veeder-Root recommended silicone sealant over the backer rod to within a minimum of 3/8" below the pavement surface [see Figure 10]. If you decide to use the direct burial method, you should order the Veeder-Root Direct Burial Cable Preparation Kit, P/N 848100-500.

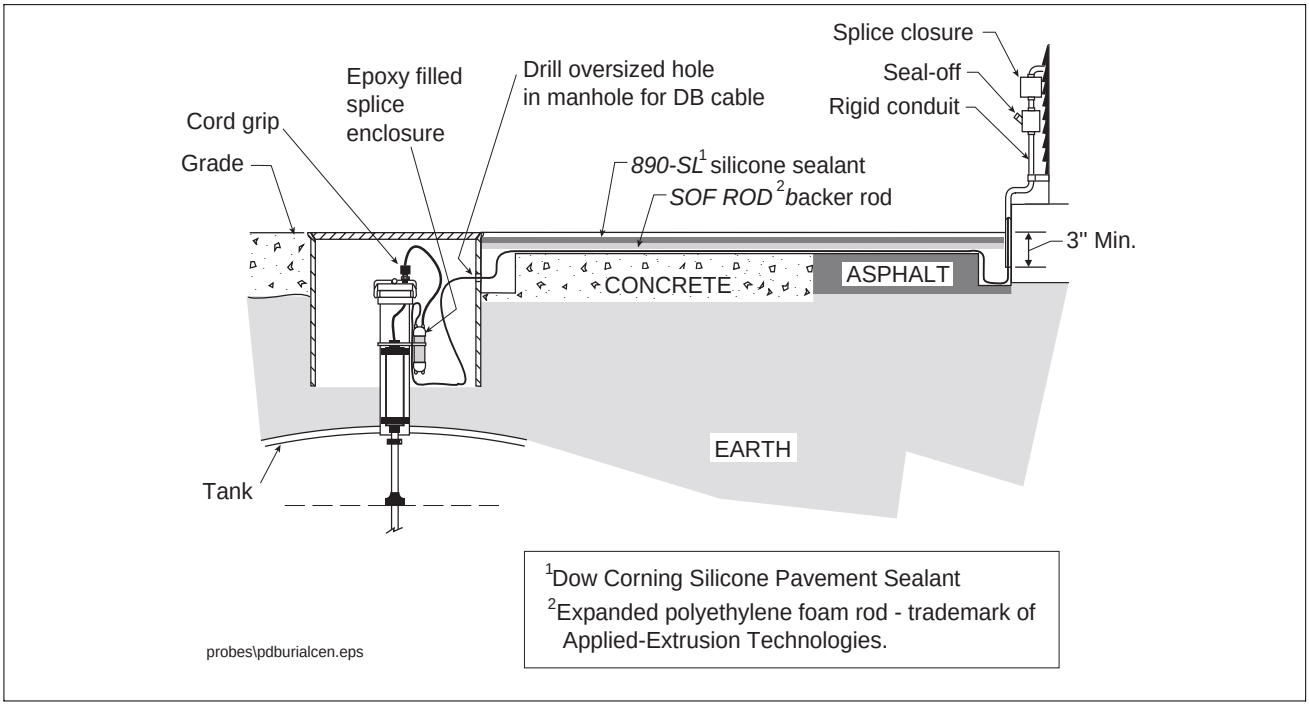


Figure 10. Example Probe Wiring Run Via Direct Burial Cable

Figure 11 diagrams a typical probe field wiring connection in the junction box.

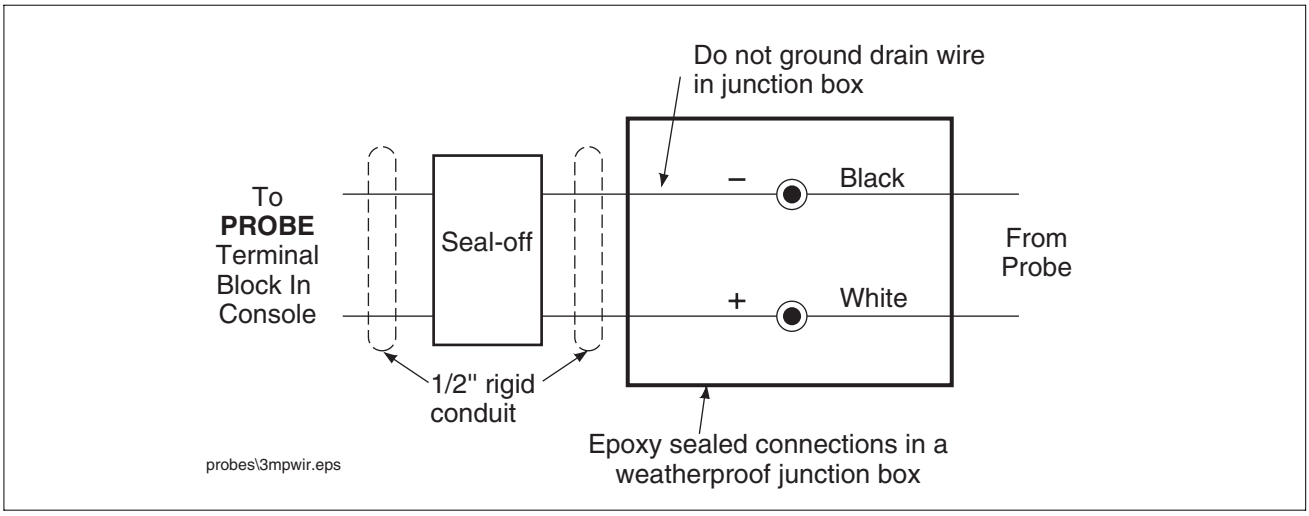


Figure 11. Probe Field Wiring Connection

Sealing Field Connections

WIRING RUN THROUGH RIGID CONDUIT

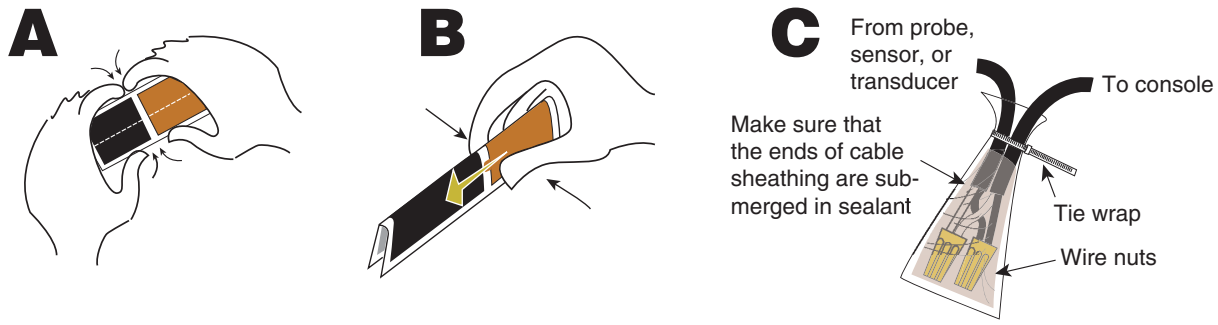
1. Pull the wires from the probe canister into the junction box. Pull two wires from the console through the seal-off box and into the junction box.
2. Using wire nuts, connect the two wires from the probe to the two wires coming from the console. Be sure to observe color codes or tags when making these connections.
3. Do NOT terminate drain wire at this location, ground drain wire at console only.
4. Seal wire nuts with epoxy sealant using one bag for two-wire nut connections (Figure 12).

CAUTION: Epoxy sealant is irritating to eyes, respiratory system, and skin. Can cause allergic skin reaction. Contains: epoxy resin and cycloaliphatic epoxycarboxylate. Precautions: Wear suitable protective clothing, gloves, eye, and face protection. Use only in well ventilated areas. Wash thoroughly before eating, drinking, or smoking.

5. Push the tie-wrapped, epoxy sealed bag into the junction box. Replace and tighten the junction box cover.

DIRECT BURIAL CABLE

When using direct burial cable for probe- or sensor-to-console wiring runs, the sealing materials and procedure are completely different. If you are using Direct Burial Cable you must follow the sealing instructions in the Direct Burial Cable Installation Manual.



Instructions:

NOTE: When temperature is below 50˚F (10˚C), keep resin in a warm place prior to mixing (e.g., in an inside pocket next to body).

1. Open epoxy sealant package, and remove resin pak.
2. Holding resin pak as shown in A, bend pak along long length.
3. As shown in B, firmly squeeze the RED SIDE of the resin, forcing it through the center seal and into BLACK SIDE.
4. Mix thoroughly to a uniform color by squeezing contents back and forth 25-30 times.
5. Squeeze mixed, warm resin into one end of bag and cutoff other end.
6. Slowly insert wiring connections into sealing pack until they fit snugly against the opposite end as shown in C.
7. Twist open end of bag and use tie wrap to close it off and position the tie wrapped end up until the resin jells.

consoles\epxy2w.eps

Figure 12. Epoxy Sealing Connections

Connecting Probes to the Console

⚠ WARNING

The equipment is used in location where lethal voltages and explosive vapors or flammable fuels may be present.

Care must be taken when installing, servicing or replacing parts in the system or serious injury or death from explosion, fire or shock may occur.

For this system:

1. **Comply with the latest National Electric Code, federal, state, and local codes, and any other applicable safety codes. In addition, take necessary precautions during installation, service, and repair to prevent personal injury, property loss and equipment damage.**
2. **Refer servicing to trained and qualified personnel only.**
3. **Substitution of components may impair intrinsic safety.**
4. **Be sure AC power is "OFF" before opening the console panel cover and connecting probe wires. Do not short any voltage across any barrier terminal including probes.**

Probe Wiring Precautions

To The Installer! You Must Read And Understand This Information.

INPUT/OUTPUT WIRING POSITIONS AND LABELING

In all cases, the devices wired to the console's input/output terminal blocks must be recorded to prevent improper replacement during installation or service. A circuit directory is listed below for this purpose.

During programming, the probes wired to each position are identified and stored in memory. If a probe is removed and reconnected to a different set of input terminals after programming, the system will not properly recognize the data being received.

Wiring Assignments

1. Identify all probe wires according to their terminal block location using the self-adhesive numbering labels furnished. Accurately record on the circuit directory in Figure 13 the location of each probe **as you attach wires** to the probe input terminal block.
2. IMPORTANT! Once a device has been wired to certain terminals and the system has been programmed, the wires from that device may not be relocated to other terminals without reprogramming the system

Probe Number	TANK Number & Product
PROBE 1 IN TANK	
PROBE 2 IN TANK	
PROBE 3 IN TANK	
PROBE 4 IN TANK	
PROBE 5 IN TANK	
PROBE 6 IN TANK	

consoles\tls50\prbtnk.eps

Figure 13. Probe Installation Directory

Grounding Probe Shields and Drain Wires

Connect probe cable shields and drain wires to ground in the console only, not at the field junction boxes. Do not ground both ends of the shield.

CONNECTING PROBES TO THE CONSOLE - OBSERVE POLARITY

Connect the two color-coded/marked wires from the each probe to the appropriate terminals of the Probe Terminal Block as shown in Figure 14.

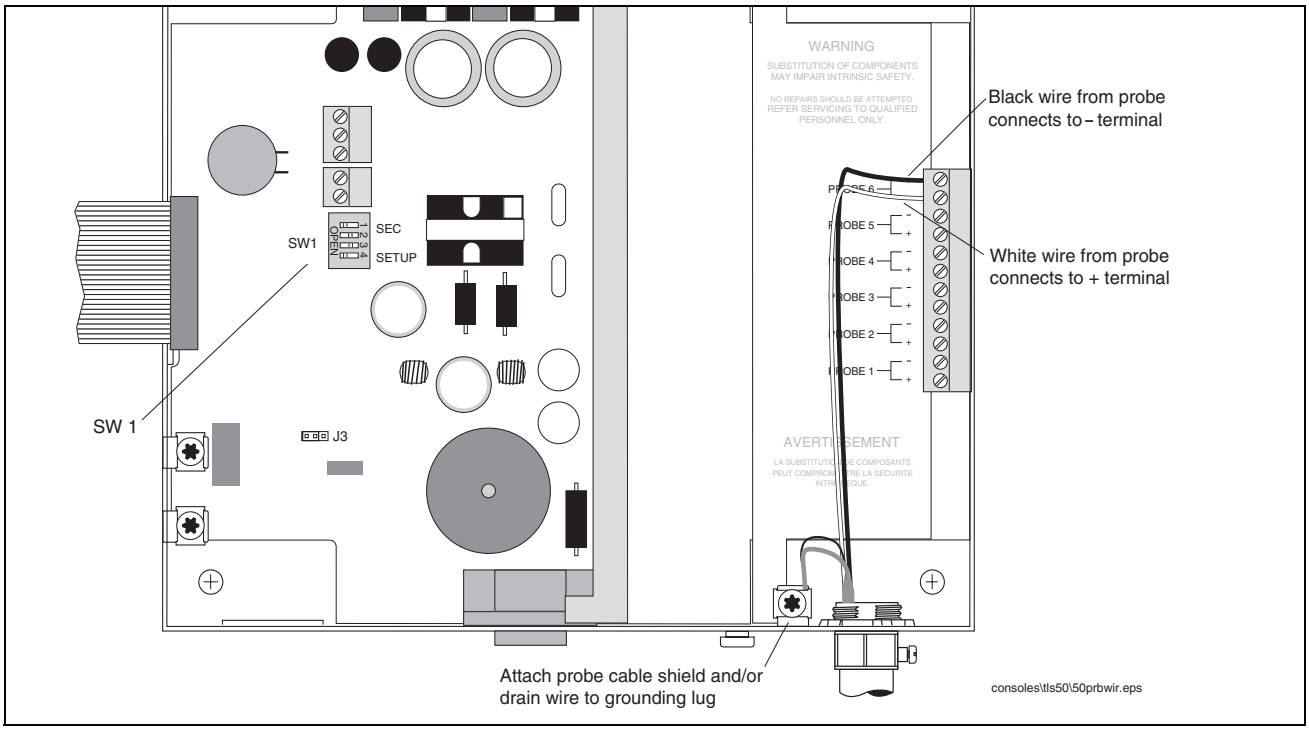


Figure 14. Connecting Probe Wiring to Console

Applying Power to System

TLS-HLD Cold Boot - Initial Power Up

Once all devices are connected to the TLS-HLD Console attach the console power wires to the appropriate power panel connections. Close the front panel of the console. Switch on the AC power breaker. The system will automatically run a cold boot self-diagnostic program when you power up the TLS-HLD for the first time:

Test Passed	Test Failed	Action (If Failed)
RAM TEST - OK	RAM FAIL	Replace CPU board
ROM TEST - OK	ROM FAIL	" " "
COLD BOOT		
EEPROM TEST - OK	EEPROM FAIL	" " "
STARTUP COMPLETE		

Following a cold boot, if the probes and console are configured correctly, the display will read:

ALL FUNCTIONS NORMAL

Following a cold boot, if the probes and console are not configured correctly, the display will read:

NO TANKS CONFIGURED

Follow the Setup instructions in the TLS-HLD Setup manual to program the system.

TLS-HLD Cold Boot - RAM Clear

If the system has previously been setup, a cold boot can be initiated and the system reset (such as for a software upgrade) as follows:

Move the RAM clear jumper (J3 in Figure 4) off of pins 1 and 2 and onto pins 2 and 3. The display will acknowledge the RAM clear request with the message: **RAM CLEAR**, then turn the power Off. Move the jumper back onto pins 1 and 2.

TLS-HLD Warm Boot

Once the system is setup, every time power to the TLS-HLD is switched Off and On, the software will run a self-diagnostic warm boot program and display the test results:

Test Passed	Test Failed	Action (If Failed)
RAM TEST - OK	RAM FAIL	Replace CPU board
ROM TEST - OK	ROM FAIL	" " "
WARM BOOT		
STARTUP COMPLETE		

If a fault is detected an error message will be displayed and the system will halt. When the warm boot completes the display returns to the top level status message. Once the Boot Up successfully completes, go to the Setup manual to program the console.

RS-232 Communications

RS-232 Peripheral Equipment Requirements

Any peripheral equipment connected to an RS-232 serial port must meet the following criteria:

1. Peripheral equipment must be UL listed.
2. The equipment must have an EIA standard RS-232C or RS-232D communications protocol.
3. The equipment must NOT be installed over or in a hazardous location.

RS-232 Connections

TO A DEVICE LESS THAN 50 FEET FROM THE CONSOLE

Veeder-Root recommends that you use a null-modem cable no longer than 50 feet (15 m) for direct connections between the console and a remote device. Cable runs longer than 50 feet can result in data errors, component damage, or both.

TO A DEVICE MORE THAN 50 FEET FROM THE CONSOLE

If cable runs longer than 50 feet are needed, two short-haul modems should be used, one at the console and one at the remote device. We recommend an asynchronous short-haul modem, Black Box model ME800A, or equivalent at the console and at the remote device. For more information, you can contact Black Box at - phone: 1-724-746-5500, fax: 1-724-746-0746, or at their Internet address *http://www.blackbox.com*

Figure 15 illustrates how to connect two short-haul modems between the console RS-232 Interface Module's or Auxiliary RS-232 Interface Module's DB-25 connector and the remote device.

Connections to telephone lines must meet the following criteria:

- Connection to telephone equipment is subject to local regulations.
- Maximum short circuit current: 0 amperes.
- Maximum open circuit voltage: 0 volts.

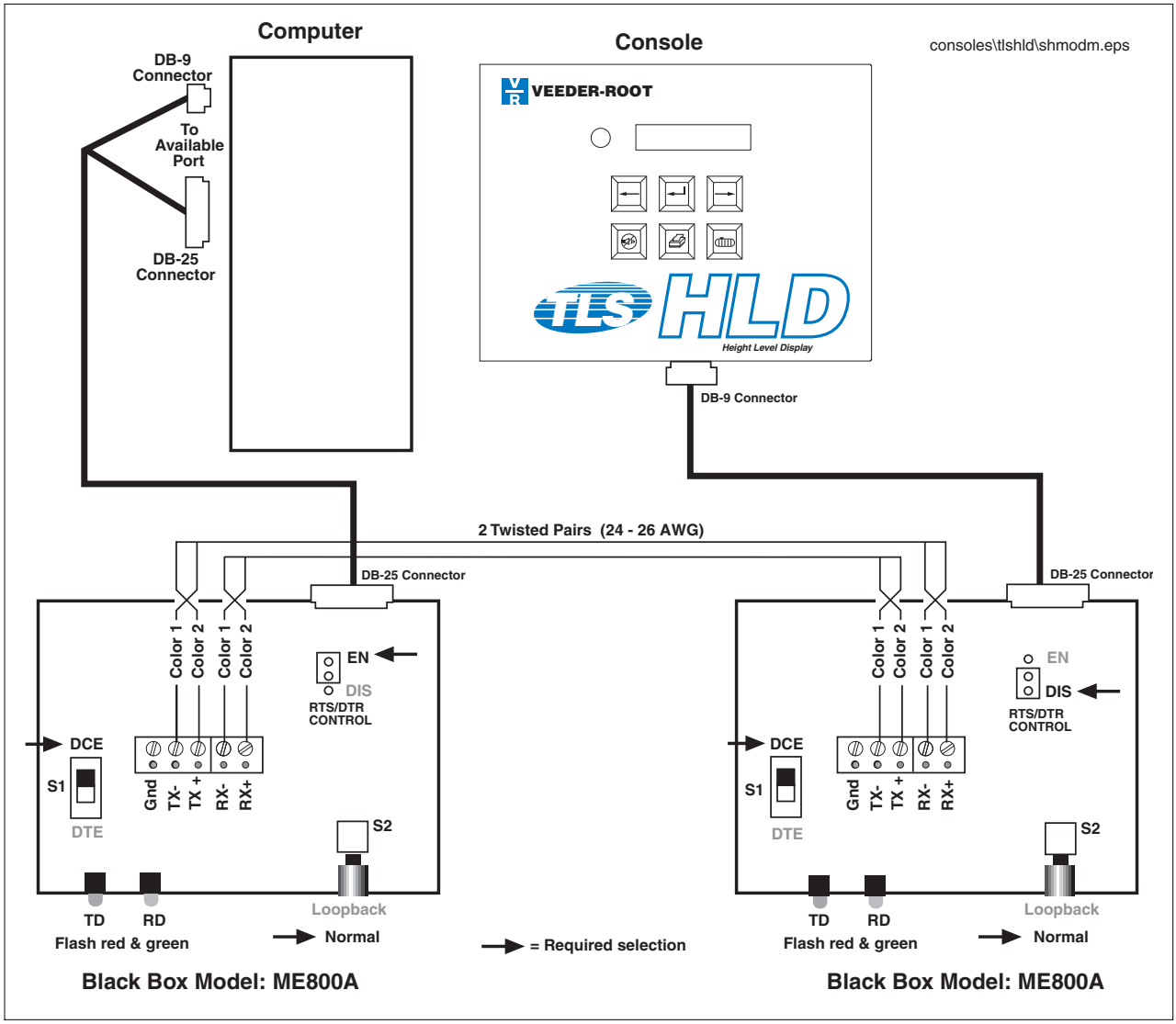


Figure 15. Console Connected to a Remote Device Via Short-Haul Modem

Surge Protection for Communication Devices

In locations that are subject to high levels of noise and power surges, the use of a surge protector is recommended. The following models are available from B&B Electronics, telephone 1-815- 433-5100, or at their Internet address *http:// www.bb-elec.com:*

- Telephone Line Surge Protector, model TLSP
- RS-232 Surge Protector, model 232DSP

Restricting System Programming Access

To protect against unauthorized access to system operation, two security features can be enabled. These switches are located on the Power Supply Board next to the power wiring terminals (see Figure 16 below). Consoles are shipped from the factory with all switches in the open position.

SERIAL SECURITY

Enabling Switch position 1 allows the operator to enter a 6-digit security code before the system will respond to a serial command. The default serial security code is 000000. The security code itself can be changed with a serial command. However, the serial security code switch must be reset to the **Open** position to **inhibit** the security code requirement.

SETUP SECURITY

A switch in the console can be set to prevent access to the setup and diagnostic menus after initial programming. Closing or turning on Switch position 4 inhibits use of the setup and diagnostic menus.

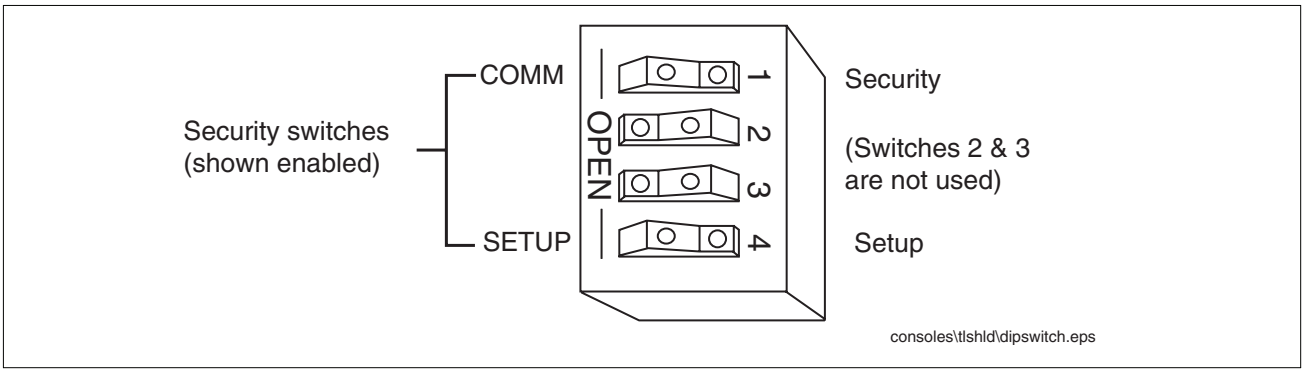


Figure 16. Console Dip Switch Settings

DIP SWITCH SETTINGS

In Figure 16 above, rocker switches 1 and 4 are shown in the closed (enabled) position. Switch 1 is Communications; Switch 4 is Setup and Diagnostics. To inhibit a function, press the left side of the switch down to the Open position. Switch 2 and Switch 3 are not used and can be in any position.

RS-232 Serial Communication Setup

- Interface mode type: printer, modem, serial; default serial
- Baud rate options: 300, 600, 1200, 2400, 4800, 9600; default 9600
- Parity options: None, Odd, or Even; default None
- Data length options: 8 or 7; default 8
- Number of stop bits options: 1 or 2; default 1
- Handshaking options: None, XON/XOFF, or Hardware; default XON/XOFF
- Printer page eject options: Yes or No; default No
- Answer On options: 0 to 9; default 1

- Serial Language options: English; default English
- Veeder-Root RS-232 command protocol format. For more information on the command format, consult the Veeder-Root Serial Interface Manual.

DB-9 Connector Pin-Outs

Communicating with the Console from a remote computer is done through a RS-232 serial port (DB-9 connector) on the bottom of the console.

Pin layout to connect the Console's Serial Interface DB-9 connector to a 25-pin computer terminal connector are shown in Figure 17. These connections are standard for "AT" style modem cables.

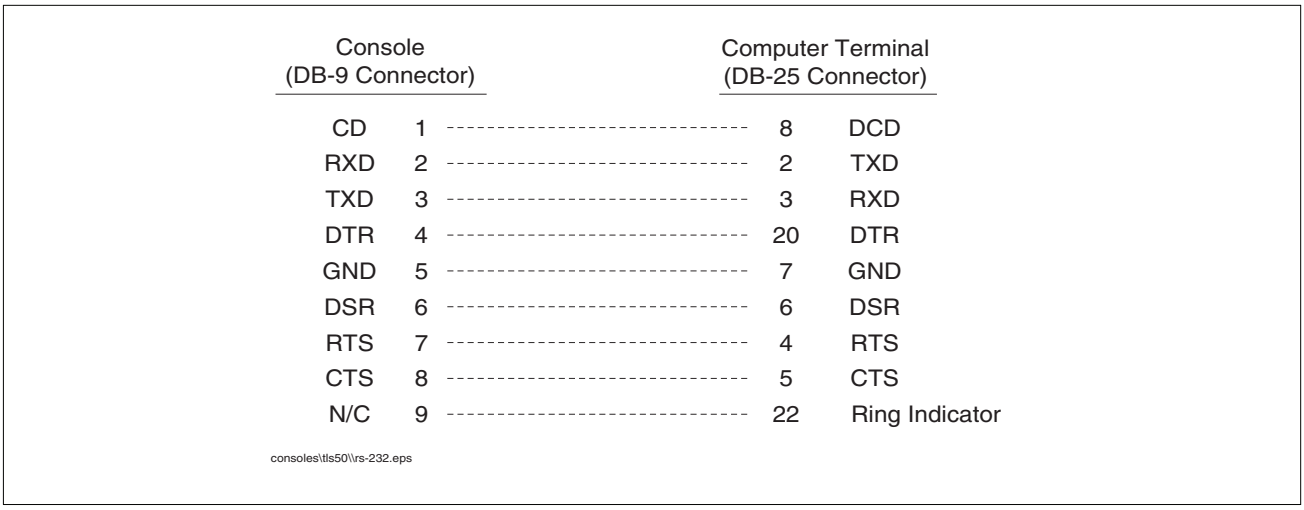


Figure 17. DB9, RS-232 Pin-Outs

RS-232 Commands

TLS-HLD RS-232 Serial Commands

001	System Reset	page 27
003	Remote Alarm Reset	page 28
201	In-Tank Inventory Report	page 29
205	In-Tank Status Report	page 30
504	Set RS-232 Security Code	page 31
50C	Set Printer Page Eject Enable	page 32
517	Set Units of Measurement and Language (ext. lang. set)	page 33
601	Set Tank Configuration	page 34
608	Set Tank Tilt	page 35
881	Set Communication Port Data	page 36
882	Initialize Communication Port Data	page 37
883	Set Communication Port Language	page 38
884	Set Serial Port Handshaking	page 39
902	System Revision Level Report	page 40
A01	Probe Type and Serial Number	page 41
A02	Probe Calibration Values	page 42
A10	Probe Last Sample Buffers	page 43
A11	Probe Fast Average Buffers	page 44
A12	Probe Standard Average Buffers	page 45

Function Code: 001

Function Type: System Reset *Version 1*

Command Format:

Display: `<SOH>S00100`

Computer: `<SOH>s00100`

Typical Response Message, Display Format:

```
<SOH>
S00100
<ETX>
```

Typical Response Message, Computer Format:

```
<SOH>s001000000000000&&CCCC<ETX>
```

Notes:

1. 0000000000 - Not Used.
2. && - Data Termination Flag
3. CCCC - Message Checksum

Function Code: 003

Function Type: Remote Alarm Reset *Version 1*

Command Format:

Display: `<SOH>S00300`

Computer: `<SOH>s00300`

Typical Response Message, Display Format:

```
<SOH>
S00300
<ETX>
```

Typical Response Message, Computer Format:

```
<SOH>s0030000000000&&CCCC<ETX>
```

Notes:

1. 0000000000 - Not Used
2. && - Data Termination Flag
3. CCCC - Message Checksum

Function Code: 201

Function Type: In-Tank Inventory Report *Version 1*

Command Format:

Display: `<SOH>I201TT`

Computer: `<SOH>i201TT`

Typical Response Message, Display Format:

```
<SOH>
I201TT
TANK     HEIGHT     WATER      TEMP
1          48.9       0.0      37.3
<ETX>
```

Typical Response Message, Computer Format:

```
<SOH>i201TT0000000000TT0ssssNNFFFFFFFF...
                        TTpssssNNFFFFFFFF...&&CCCC<ETX>
```

Notes:

1. 0000000000 - Unused
2. TT - Tank Number (Decimal, 00 = all)
3. 0 - Unused
4. ssss - Tank Status Bits:
   - Bit 1 - (LSB) Unused
   - Bit 2 - Unused
   - Bit 3 - Invalid Fuel Height Alarm (MAG Probes Only)
   - Bit 4-16 - Unused
5. NN - Number of eight character Data Fields to follow (Hex)
6. FFFFFFFF - ASCII Hex IEEE float:
   1. Unused
   2. Unused
   3. Unused
   4. Height
   5. Water
   6. Temperature
   7. Unused
7. && - Data Termination Flag
8. CCCC - Message Checksum

Function Code: 205

Function Type: In-Tank Status Report *Version 1*

Command Format:

Display: `<SOH>I205TT`

Computer: `<SOH>i205TT`

Typical Response Message, Display Format:

```
<SOH>
I205TT
TANK   STATUS
1      ALL FUNCTIONS NORMAL
<ETX>
```

Typical Response Message, Computer Format:

```
<SOH>i205TT0000000000TTnnAA...
                        TTnnAA&&CCCC<ETX>
```

Notes:

1. 0000000000 - Unused
2. TT - Tank Number (Decimal, 00 = all)
3. nn - Number of alarms active for tank (Hex, 00 = none)
4. AA - Active tank alarm type:
   - 01 = Unused
   - 02 = Unused
   - 03 = Unused
   - 04 = Unused
   - 05 = Tank Low Product Alarm
   - 06 = Unused
   - 07 = Unused
   - 08 = Unused
   - 09 = Tank Probe Out Alarm
   - 10 = Unused
   - 11 = Unused
   - 12 = Unused
   - 13 through 26 = Unused
   - 27 = Tank Low Temperature Warning
5. && - Data Termination Flag
6. CCCC - Message Checksum

Function Code: 504

Function Type: Set System (RS-232) Security Code *Version 1*

Command Format:

Set:		Inquire:	
Display:	`<SOH>S50400aaaaaa`	Display:	`<SOH>I50400`
Computer:	`<SOH>s50400aaaaaa`	Computer:	`<SOH>i50400`

Typical Response Message, Display Format:

```
<SOH>
I50400
aaaaaa
<ETX>
```

Typical Response Message, Computer Format:

```
<SOH>i504000000000000aaaaaa&&CCCC<ETX>
```

Notes:

1. 0000000000 - Not Used.
2. aaaaaa - Current Security Code (6 ASCII characters from 20 Hex - 7E Hex)
3. && - Data Termination Flag
4. CCCC - Message Checksum

Function Code: 50C

Function Type: Set Remote Printer Page Eject Flag *Version 1*

Command Format:

Set:

Display: `<SOH>S50C00f`

Computer: `<SOH>s50C00f`

Inquire:

Display: `<SOH>I50C00`

Computer: `<SOH>i50C00`

Typical Response Message, Display Format:

```
<SOH>
I50C00
f
<ETX>
```

Typical Response Message, Computer Format:

```
<SOH>i50C000000000000f&&CCCC<ETX>
```

Notes:

1. 0000000000 - Not Used
2. f - Page Eject Flag:
   0 = Disabled
   1 = Enabled
3. && - Data Termination Flag
4. CCCC - Message Checksum

Function Code: 517

Function Type: Set System Type & Language Flags *Version 1*

Command Format:

Set:

Display: <SOH>S51700ULL

Computer: <SOH>s51700ULL

Inquire:

Display: <SOH>I51700

Computer: <SOH>i51700

Typical Response Message, Display Format:

```
<SOH>
I51700
U
LL
<ETX>
```

Typical Response Message, Computer Format:

<SOH>i5170000000000000ULL&&CCCC<ETX>

Notes:

1. 0000000000 - Not Used.
2. U - System Units:
   1 = U.S
   2 = Metric
3. LL - System Language:
   1 = English
   2 = French
   3 = Spanish
   4 = Not Used
   5 = Portuguese
   6 = Not Used
   7 = Not Used
   8 = Not Used
   9 = Not Used
   10 = Not Used
   11 = Not Used
   12 = Not Used
   13 = Not Used
   14 = Not Used
   15 = Chinese
4. && - Data Termination Flag
5. CCCC - Message Checksum

Function Code: 601

Function Type: Set Tank Configuration *Version 1*

Command Format:

Set:

Display: `<SOH>S601TTf`

Computer: `<SOH>s601TTf`

Inquire:

Display: `<SOH>I601TT`

Computer: `<SOH>i601TT`

Typical Response Message, Display Format:

```
<SOH>
I601TT
f
<ETX>
```

Typical Response Message, Computer Format:

```
<SOH>i601TT0000000000TTf...
                        TTf&&CCCC<ETX>
```

Notes:

1. 0000000000 - Not Used
2. TT - Tank Number (Decimal, 00 = all)
3. f - Tank Configuration Flag:
   0 = Off
   1 = On
4. && - Data Termination Flag
5. CCCC - Message Checksum

Function Code: 608

Function Type: Set Tank Tilt *Version 1*

Command Format:

Set:		Inquire:	
Display:	<SOH>S608TTHHH.HH	Display:	<SOH>I608TT
Computer:	<SOH>s608TTFFFFFFFF	Computer:	<SOH>i608TT

Notes:

1. TT - Tank Number (Decimal, 00 = all)
2. HHH.HH - Tank Tilt, (Decimal)
3. FFFFFFFF - Tank Tilt, (ASCII Hex IEEE float)

Typical Response Message, Display Format:

```
<SOH>
I608TT
TT HHH.HH
<ETX>
```

Typical Response Message, Computer Format:

```
<SOH>i608TT0000000000TTFFFFFFFF...
                        TTFFFFFFFF&&CCCC<ETX>
```

Notes:

1. 0000000000 - Not Used.
2. TT - Tank Number (Decimal, 00 = all)
3. FFFFFFFF - Tank Tilt, (ASCII Hex IEEE float)
4. && - Data Termination Flag
5. CCCC - Message Checksum

Function Code: 881

Function Type: Set Communication Port Data *Version 1*

Command Format:

Set:		Inquire:	
Display:	<SOH>S881CCBBBBBPSDTAA	Display:	<SOH>I881CC
Computer:	<SOH>s881CCBBBBBPSDTAA	Computer:	<SOH>i881CC

Typical Response Message, Display Format:

```
<SOH>
I881CC
CC BBBBB P S D T AA
<ETX>
```

Typical Response Message, Computer Format:

```
<SOH>i881CC0000000000CCBBBBBPSD0AA&&CCCC<ETX>
```

Notes:

1. 0000000000 - Not Used
2. CC - Communication Port Number (1)
3. BBBBB - Baud Rate (Decimal)
4. P - Parity (Decimal; 0=None, 1 or 2)
5. S - Stop Bit (Decimal; 1 or 2)
6. D - Data Bit (Decimal; 7 or 8)
7. 0 - Not Used
8. AA - Number of Rings before Answer (Decimal, 0 - 9)
9. && - Data Termination Flag
10. CCCC - Message Checksum

Function Code: 882

Function Type: Initialize Communication Port Data *Version 1*

Command Format:

Set:		Inquire:	
Display:	`<SOH>S882CC149`	Display:	`<SOH>I882CC`
Computer:	`<SOH>s882CC149`	Computer:	`<SOH>i882CC`

Notes:

1. 149 - This verification code must be sent to confirm the command

Typical Response Message, Display Format:

```
<SOH>
I882CC
CC BBBBB P S D T AA
<ETX>
```

Typical Response Message, Computer Format:

```
<SOH>i882CC0000000000CCBBBBBPSD0AA&&CCCC<ETX>
```

Notes:

1. 0000000000 - Not Used.
2. CC - Communication Port Number (1)
3. BBBBB - Baud Rate (Decimal)
4. P - Parity (Decimal; 0= None, 1 or 2)
5. S - Stop Bit (Decimal; 1 or 2)
6. D - Data Bit (Decimal; 7 or 8)
7. 0 - Not Used
8. AA - Number of Rings before Answer (Decimal)
9. && - Data Termination Flag
10. CCCC - Message Checksum

Function Code: 883

Function Type: Set Serial Communication Language *Version 1*

Command Format:

Set:

Display: <SOH>S88300LL

Computer: <SOH>s88300LL

Inquire:

Display: <SOH>I88300

Computer: <SOH>i88300

Typical Response Message, Display Format:

```
<SOH>
I88300
LL
<ETX>
```

Typical Response Message, Computer Format:

<SOH>i8830000000000000LL&&CCCC<ETX>

Notes:

1. 0000000000 - Not Used
2. LL - System Language:
   - 1 = English
   - 2 = French
   - 3 = Spanish
   - 4 = Not Used
   - 5 = Portuguese
   - 6 = Not Used
   - 7 = Not Used
   - 8 = Not Used
   - 9 = Not Used
   - 10 = Not Used
   - 11 = Not Used
   - 12 = Not Used
4. && - Data Termination Flag
5. CCCC - Message Checksum

Function Code: 884

Function Type: Set Serial Handshaking *Version 1*

Command Format:

Set:

Display: <SOH>S88400f

Computer: <SOH>s88400f

Inquire:

Display: <SOH>I88400

Computer: <SOH>i88400

Typical Response Message, Display Format:

```
<SOH>
I88400
f
<ETX>
```

Typical Response Message, Computer Format:

<SOH>i8840000000000000f&&CCCC<ETX>

Notes:

1. 0000000000 - Not Used
2. f - Handshaking method:
   0 = Disabled
   1 = Hardware
   2 = XON/XOFF
3. && - Data Termination Flag
4. CCCC - Message Checksum

Function Code: 902

Function Type: System Revision Level Report *Version 1*

Command Format:

Display: `<SOH>I90200`

Computer: `<SOH>i90200`

Typical Response Message, Display Format:

```
<SOH>
I90200
SOFTWARE# 349787-vvv-rrr B
CREATED - YY.MM.DD.HH.mm
<ETX>
```

Typical Response Message, Computer Format:

```
<SOH>i902000000000000SOFTWARE# 347871-vvv-rrrCREATED -
YY.MM.DD.HH.mm&&CCCC<ETX>
```

Notes:

1. 0000000000 - Not Used
2. vvv - Software version number (ASCII text string)
3. rrr - Software revision level (ASCII text string)
4. YY.MM.DD.HH.mm - Date and time of software creation
5. && - Data Termination Flag
6. CCCC - Message Checksum
7. Unused
8. B = 2 (Serial Package installed)

Function Code: A01

Function Type: Probe Type and Serial Number *Version 1*

Command Format:

Display: `<SOH>IA01TT`

Computer: `<SOH>iA01TT`

Typical Response Message, Display Format:

```
<SOH>
IA01TT
TT  PP KKKK LLLL.LL  SSSSSS cccc
<ETX>
```

Notes:

1. TT - Tank Number (Decimal, 00 = all)
2. PP - Probe Type: - MAG1
3. LLLL.LL - Probe Length (Decimal)
4. SSSSSS - Probe Serial Number (Decimal)
5. cccc - Probe Date Code (Hex)

Typical Response Message, Computer Format:

```
<SOH>iA01TT0000000000TT0PPKKKKFFFFFFFFSSSSSScccc...
                      TT0PPKKKKFFFFFFFFSSSSSScccc&&CCCC<ETX>
```

Notes:

1. 0000000000 - Not Used.
2. TT - Tank Number (Decimal, 00 = all)
3. 0 - Not used
4. PP - Probe Type: 03 = MAG1
5. KKKK - Circuit Code (Hex)
6. FFFFFFFF - Probe Length (ASCII Hex IEEE float)
7. SSSSSS - Probe Serial Number (Decimal)
8. cccc - Probe Date Code (Hex)
9. && - Data Termination Flag
10. CCCC - Message Checksum

Function Code: A02

Function Type: Probe Factory Dry Calibration Values *Version 1*

Command Format:

Display: `<SOH>IA02TT`

Computer: `<SOH>iA02TT`

Typical Response Message, Display Format:

```
<SOH>
IA02TT
TT PP CCC.CCCC
<ETX>
```

Notes:

1. TT - Tank Number (Decimal, 00 = all)
2. PP - Probe Type: 03 = MAG1
3. CCC.CCCC - Probe Data (Decimal)

Typical Response Message, Computer Format:

```
<SOH>iA02TT0000000000TT0PPNNFFFFFFFF...
                      TT0PPNNFFFFFFFF...&&CCCC<ETX>
```

Notes:

1. 0000000000 - Not Used.
2. TT - Tank Number (Decimal, 00 = all)
3. 0 - Not used
4. PP - Probe Type: 03 = MAG1
5. NN - Number of eight character Data Fields to follow (Hex)
6. FFFFFFFF - Calibration Value (ASCII Hex IEEE float)
7. && - Data Termination Flag
8. CCCC - Message Checksum

Function Code: A10

Function Type: Probe Last Sample Buffers *Version 1*

Command Format:

Display: <SOH>IA10TT

Computer: <SOH>iA10TT

Typical Response Message, Display Format:

```
<SOH>
IA10TT
TT PP nnnnn
ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss
ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss
ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss
ssss.sss  ssss.sss
<ETX>
```

Notes:

1. TT - Tank Number (Decimal, 00 = all)
2. PP - Probe Type:03 - MAG1
3. nnnnn - Sample Number (Decimal)
4. ssss.sss - Probe Data (Decimal)

Typical Response Message, Computer Format:

```
<SOH>iA10TT0000000000TT0PPSSSSNNFFFFFFFF...
                      TT0PPSSSSNNFFFFFFFF...&&CCCC<ETX>
```

Notes:

1. 0000000000 - Not Used
2. TT - Tank Number (Decimal, 00 = all)
3. 0 - Not used
4. PP - Probe Type: 03 - MAG1
5. SSSS - Sample Number (Hex)
6. NN - Number of eight character Data Fields to follow (Hex)
7. FFFFFFFF - Probe Data (ASCII Hex IEEE float)
8. && - Data Termination Flag
9. CCCC - Message Checksum

Function Code: A11

Function Type: Probe Fast Average Buffers *Version 1*

Command Format:

Display: <SOH>IA11TT

Computer: <SOH>iA11TT

Typical Response Message, Display Format:

```
<SOH>
IA11TT
TT PP nnnnn
ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss
ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss
ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss
ssss.sss  ssss.sss
<ETX>
```

Notes:

1. TT - Tank Number (Decimal, 00 = all)
2. PP -Probe Type:03 - MAG1
3. nnnnn - Sample Number (Decimal)
4. ssss.sss - Probe Data (Decimal)

Typical Response Message, Computer Format:

```
<SOH>iA11TT0000000000TT0PPSSSSNNFFFFFFFF...
                      TT0PPSSSSNNFFFFFFFF...&&CCCC<ETX>
```

Notes:

1. 0000000000 - Not Used
2. TT - Tank Number (Decimal, 00 = all)
3. 0 - Not used
4. PP - Probe Type: 03 - MAG1
5. SSSS - Number of Samples (Hex)
6. NN - Number of eight character Data Fields to follow (Hex)
7. FFFFFFFF - Probe Data (ASCII Hex IEEE float)
8. && - Data Termination Flag
9. CCCC - Message Checksum

Function Code: A12

Function Type: Probe Standard Average Buffers*Version 1*

Command Format:

Display: <SOH>IA12TT

Computer: <SOH>iA12TT

Typical Response Message, Display Format:

```
<SOH>
IA12TT
TT PP nnnnn
ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss
ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss
ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss  ssss.sss
ssss.sss  ssss.sss
<ETX>
```

Notes:

1. TT - Tank Number (Decimal, 00 = all)
2. PP - Probe Type:03 - MAG1
3. nnnnn - Sample Number (Decimal)
4. ssss.sss - Probe Data (Decimal)

Typical Response Message, Computer Format:

```
<SOH>iA12TT0000000000TT0PPSSSSNNFFFFFFFF...
                      TT0PPSSSSNNFFFFFFFF...&&CCCC<ETX>
```

Notes:

1. 0000000000 - Not Used
2. TT - Tank Number (Decimal, 00 = all)
3. 0 - Not used
4. PP - Probe Type: 03 - MAG1
5. SSSS - Number of Samples (Hex)
6. NN - Number of eight character Data Fields to follow (Hex)
7. FFFFFFFF - Probe Data (ASCII Hex IEEE float)
8. && - Data Termination Flag
9. CCCC - Message Checksum

Troubleshooting

This section contains information to help diagnose system problems. The Diagnostic Menu and Report can help determine if a probe is functioning correctly. The sections describing system boots help determine if the console hardware is functioning correctly.

A brief section is included that describes how install a software upgrade. Other sections detail CPU and Power Supply board replacement should the self-diagnostic programs indicate a hardware failure.

At the end of the Troubleshooting section you will find a list of specifications and a chart showing the probes that can be used with the TLS-HLD Console.

Dual-Function Front Panel Keys

Two of the six front panel keys have dual functions [Figure 18].

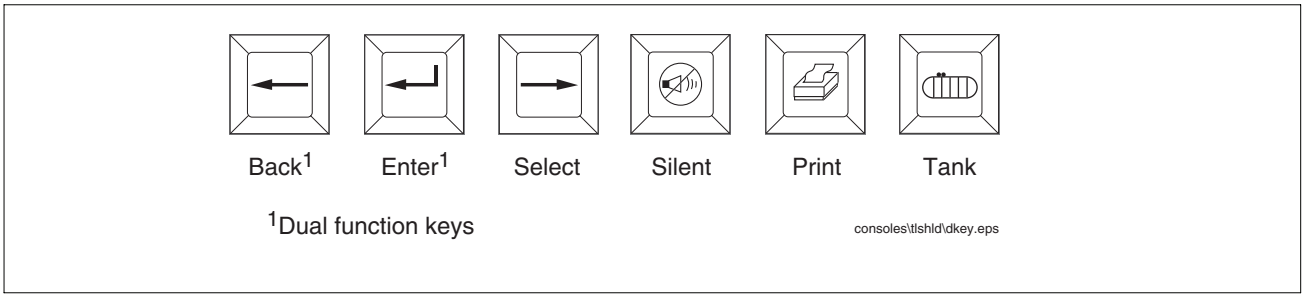


Figure 18. Dual-Function Keys

Pressing the Enter key down for an extended period (longer than 2 seconds) will change the system language to the next available language queued in software. Repeat this procedure until the desired language is displayed.

Pressing the Back key down for at least 2 seconds will change the system setup units. Repeat this procedure until the desired units are displayed.

A short beep from the console beeper will inform the operator that these keys have been held in long enough to select the alternate function. When the operator is ready to return to the originally programmed language and/or units, switch the console power Off and then back On. The system will perform a warm boot and return to the originally programmed language and units.

Probe Diagnostic Menu

The Diagnostic Menu is accessed from the front panel of the console. Press the Select key until the display reads **DIAGNOSTICS**. Table 1 below discusses all of the display messages in the Diagnostic Menu.

.

Table 1.- Diagnostics Menu

Menu	Display Sequence	Display Notes and/or Instructions
Diagnostics	Diagnostics Press ↵	Press ↵ key to enter Diagnostics. You can also press the Print key to print out the Diagnostic Report if you have made the correct comm setup selections and you have a serial printer connected.
	Software Version XXXXXX-XXX Y	Console's current software version. Note: from this display on, you press → key to move from one display to the next.
	T1: Probe Type: GLB01	Probe type installed in tank (in this example, T1). At any 'T' display below, press the Tank key to view equivalent data for other tanks.
	T1: Serial Number XXXXX	Serial number of the probe.
	T1: Probe ID XXXXX	Manufacturing code of the probe.
	T1: Probe Length XXX	Length of the probe.
	T1: Gradient XXX.XXXX	Probe calibration factor used to calculate water height and product height.
	T1: Number Samples 20	Number of probe measurement sets made before posting water height, product height, and product temperature. (A measurement set consists of probe counts 00 - 18 discussed below.)
	T1: Samples Read XXXXXX	Historical total of probe measurements read.
	T1: Samples Used XXXXXX	Historical total of probe measurements used.
	T1: Counts 00 XXXXX 01 XXXXX	Probe counts used to calculate water height, product height, and product temperature. Counts 00 - 18 constitute one probe measure set.
	(Continue to press the → key to move through all of the count pairs until you reach the last count below)	
	T18: Counts 18 XXXXX	

Probe Diagnostic Report

The Diagnostic Report example below is a printout of probe information, for all tanks. The probe functions are discussed in Table 1.

DIAGNOSTICS

```
SOFTWARE VERSION 349

TANK           :    1          2          3
PROBE TYPE     :    GLB8       GLB8       GLB8
SERIAL NUMBER  :    123001     123002     123003
PROBE ID       :    D021       D021       D021
PROBE LENGTH   :    96.0       96.0       96.0
GRADIENT       :    350.00     350.00     350.00
NUMBER SAMPLES :    20         20         20
SAMPLES READ   :    xxxxxx     xxxxxx     xxxxxx
SAMPLES USED   :    xxxxxx     xxxxxx     xxxxxx
COUNTS   00    :    xxxxx      xxxxx      xxxxx
         01    :    xxxxx      xxxxx      xxxxx
         02    :    xxxxx      xxxxx      xxxxx
         03    :    xxxxx      xxxxx      xxxxx
         04    :    xxxxx      xxxxx      xxxxx
         05    :    xxxxx      xxxxx      xxxxx
         06    :    xxxxx      xxxxx      xxxxx
         07    :    xxxxx      xxxxx      xxxxx
         08    :    xxxxx      xxxxx      xxxxx
         09    :    xxxxx      xxxxx      xxxxx
         10    :    xxxxx      xxxxx      xxxxx
         11    :    xxxxx      xxxxx      xxxxx
         12    :    xxxxx      xxxxx      xxxxx
         13    :    xxxxx      xxxxx      xxxxx
         14    :    xxxxx      xxxxx      xxxxx
         15    :    xxxxx      xxxxx      xxxxx
         16    :    xxxxx      xxxxx      xxxxx
         17    :    xxxxx      xxxxx      xxxxx
         18    :    xxxxx      xxxxx      xxxxx
         19    :    0xhhhh     0xhhhh     0xhhhh
```

Replacing the CPU Board

The CPU board in the TLS-HLD must be replaced when:

- A system self-test failure occurs during a warm or cold boot, or
- The display contains garbled messages and/or the voltage between the GND and 8V test points on the back of the CPU board is within 7 - 9 Vdc; or,
- The voltage between the GND and 5V test points [Figure 19] on the back of the CPU board is not within 4.75 - 5.25 Vdc.

1. Turn Off power to the system.

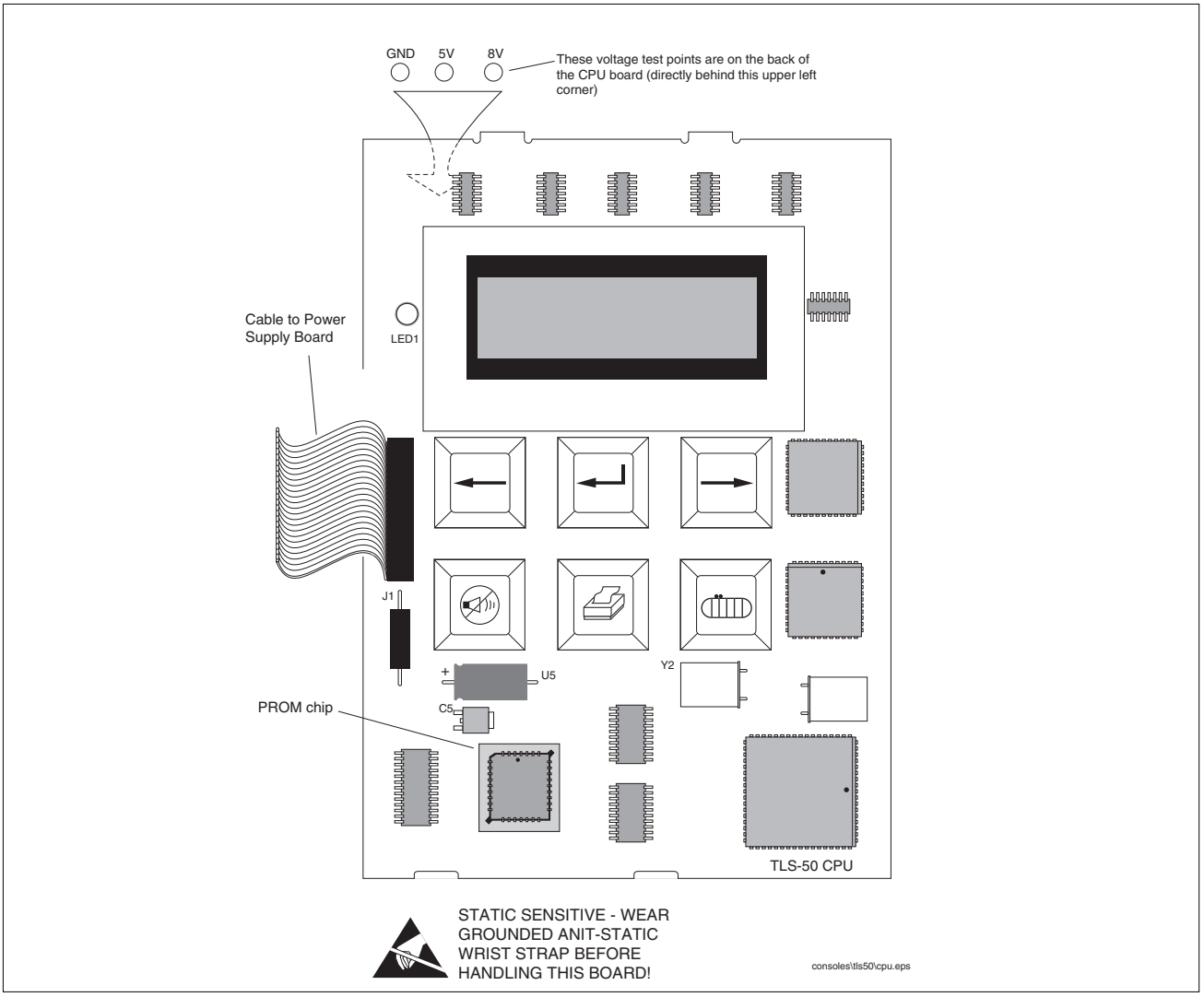


Figure 19. CPU Board Voltage Test Points

2. Attach the anti-static strap to your wrist and to a good ground.
3. Disconnect the CPU cable from the Power Supply board.
4. The CPU board snaps securely into place in the door of the console without the use of screws. There are two tabs on the top of the board that fit into two slots in the top edge of the door. The bottom of the CPU board snaps in place between two pairs of detents protruding from the bottom edge of the door. The CPU board is removed by inserting a straight-slot screwdriver into one of the two indents on the bottom of the board and then gently prying against the door until the board clears the upper detents, then rotating the board up slightly and toward you to clear the top tabs from the slots in the door.
5. Replace the CPU board reversing the above steps.
6. Follow the instructions in “TLS-HLD Cold Boot - Initial Power Up” on page 21.

PROM Chip Replacement (Software Upgrade)

The PROM chip is replaced when a software upgrade is installed. This procedure requires that you perform a RAM clear.

1. If possible, record the current setup information. Turn Off power to the system.
2. Open the front door of the console. The CPU board is installed in the door.

3. Attach anti-static strap to your wrist and to a good ground.
4. Disconnect the CPU board cable from the Power Supply board. Remove the CPU board following the instructions in “Replacing the CPU Board” on page 48.
5. Locate the PROM chip on the board [Figure 19].
6. Remove the PROM chip following instructions in Figure 20.
7. Replace the PROM chip following instructions in Figure 21.
8. Replace the CPU board in the front door of the TLS-HLD. Connect the CPU board cable to J1 on the Power Supply board.
9. Follow the instructions in “TLS-HLD Cold Boot - Initial Power Up” on page 21.

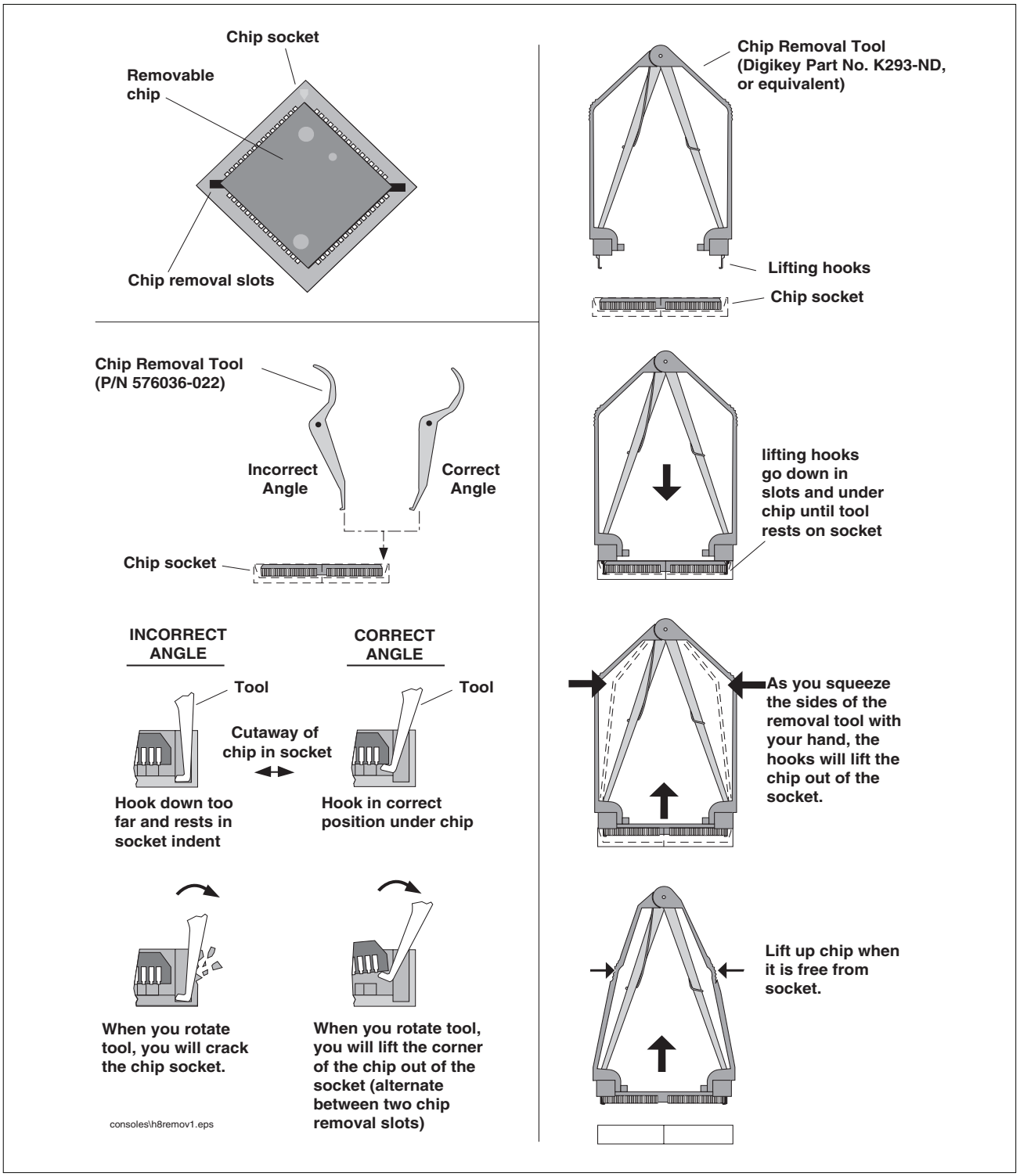


Figure 20. Removing PROM Chip

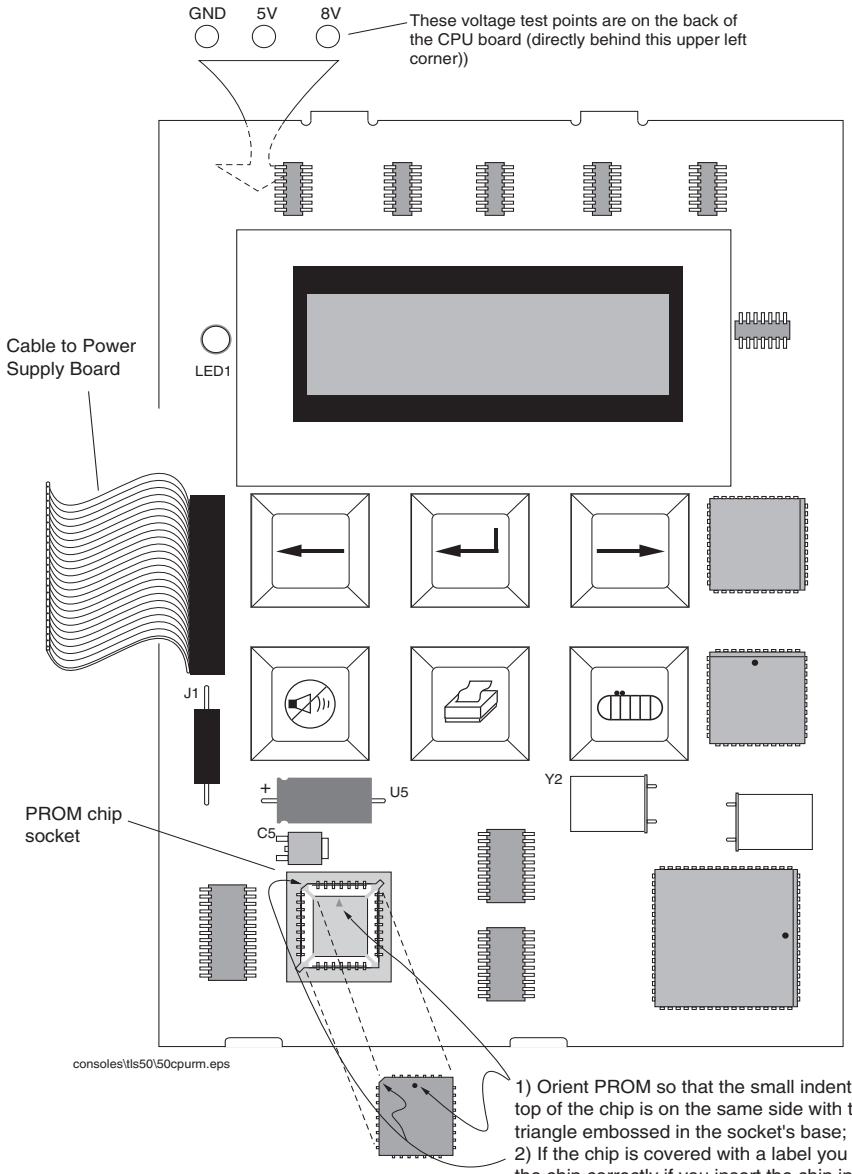


Figure 21. Replacing PROM Chip

Replacing the Power Supply Board

The Power Supply board must be replaced when:

- Probe data is not being processed, or
- The voltage between the GND and 8V test points [Figure 19] on the back of the CPU board is less than 7 Vdc.

1. Turn Off power to the system.
2. Disconnect the CPU cable from the Power Supply board.
3. Tag and disconnect probe and power.
4. The Power Supply board is secured by two T-15 Torx screws in the top of the board. You must also remove the two screw locks which go through the bottom of the console into the DB-9 connector before you can lift out the board.

   After removing the Torx screws (and screw locks), slowly lift up on the board until the lower tabs on the board clear the slots in the bottom of the console, then continue to lift the board out.
5. Replace the board by reversing the above steps.
6. Turn on power to the system. The system will perform a warm boot procedure [page 21] and the display will return to the top level status screen. You do not have to reprogram the console after replacing the Power Supply board.

Display Messages

TANK PARAMETERS

The following tank parameters are displayed one at a time as the operator scrolls through the Top Level Menu.

- Product Height,
- Product Temperature (requires probes that have temperature measurement capability),
- Water Height (requires probes that have water measurement capability).

Pressing the Tank key allows the user to select which tank's data is displayed. If a parameter is not available for any tank in the system, that display will not appear as you scroll through the menus. When viewing a display that is available in one of the tanks, but is not available for the current tank, a "**NO DATA**" message will be displayed for that parameter.

Alarms

When an alarm occurs, the console's internal beeper will activate (if enabled), the front panel LED will flash red, and the top line of the display will contain the alarm message. In the case of multiple alarms, the main display screen will automatically scroll through the active alarms. Press the Silent key to switch Off the internal beeper and acknowledge the alarm. The red LED will continue to flash until the alarm condition is remedied.

When an alarm condition returns to the normal state the alarm will be removed from the list of alarms. If no alarms are active, the LED will return to the Normal state (continuous green), the beeper will be switched Off, and the top line of the display status line will read ALL FUNCTIONS NORMAL.

Displayed Alarm Messages

- PROBE OUT (all probes) - If the console is not reliably communicating with the probe, the Probe Out alarm will activate.

- INVALID HEIGHT (only probes that use two floats) - If the water float and the product float are too close together to provide reliable height data, the Invalid Height alarm will activate.
- LOW TEMPERATURE (only probes with temperature option) - If the Probe is reporting a temperature lower than -4° F (-19.8° C), the Low Temperature alarm will activate.
- NO TANKS CONFIGURED - This message displays in the top line of the display until at least one tank has been configured in the Tank Setup menu. The front panel red LED will be flashing, but the console's internal beeper will not be switched On.

Alarm Cause/Action Table

Table 2 lists each of the displayed alarms, a possible cause, and a suggested corrective action.

Table 2.- Alarm Index, Cause, and Corrective Action

Alarm	Cause	Action
PROBE OUT	If the console is not reliably communicating with the probe, the Probe Out alarm will activate.	Call for service following the procedures established for your site.
INVALID HEIGHT	(Only probes that use two floats) - If the water float and the product float are too close together to provide reliable height data, the Invalid Height alarm will activate.	Call for delivery.
LOW TEMPERATURE	(Only probes with temperature option) - If the Probe is reporting a temperature lower than -4° F (-19.8° C), the Low Temperature alarm will activate.	Probe returns to normal operation after probe temperature rises above -4°F (-19.8°C).
NO TANKS CONFIGURED	This message displays in the top line of the display until at least one tank has been configured in the Tank Setup menu. The front panel red LED will be flashing, but the console's internal beeper will not be switched On.	Configure at least one tank in Tank Setup.

Console Specifications

PHYSICAL SPECIFICATIONS

- Width (door closed): 7.6”, open 9.6”) Depth (door closed 2.6”, open 9”))
- Height: 6.7” Weight: 3.5 lbs.
- Two PC boards in console: CPU (in door) and Power Supply (in unit)

ENVIRONMENTAL SPECIFICATIONS

- Console storage and operation: indoor, climate controlled.

ELECTRICAL SPECIFICATIONS

- Console operating voltage: 120/240 Vac, 2 A max.
- The Power Supply board fuses F1 and F2 are NOT field replaceable The rating for both fuses is 2 A, Type T [Time Lag].

SIGNAL INPUT SPECIFICATIONS

- Up to 6 probes monitored with TLS-HLD
- Probe data: 0.15 A at 12 volts

SIGNAL OUTPUT SPECIFICATIONS

- One dry contact relay output: 120 Vac, 2 A

FRONT PANEL USER INTERFACE

- Two line, graphic LCD display
- Visible annunciator (bi-color LED)

  Green - all functions normal

  Flashing red - alarm active
- Push keys

  Select

  Enter

  Print

  Back

  Silence

  Tank
- Audible annunciator: internal beeper

TLS-HLD Probe Circuit Codes

Table 3 lists the probes that can be used with the console.

Table 3.- Mag Probe Minimum Detected Fluid Levels

Circuit Code	Mag Probe Type	Name Plate Color	Water Detect	2" Floats	
				Min. Fuel Level	Min. Water Level
Mag Probes - Form Number 8473					
C000	Std., 2 float	Black	Yes	9.5"	0.75"
C001	Std., 2 float	Red	Yes	9.5"	0.75"
D000	Std., Inv. only, 2 flt	Green	Yes	9.5"	0.75"
D001	Alt., 1 float	Black	No	7"	—
D002	Alt., 1 float	Red	No	7"	—
D003	Alt., Inv. only	Green	No	7"	—
Mag Probes - Form Numbers 8463 & 8493					
D004	2 float	Black	Yes	3.23"	.867"
D005	2 float	Red	Yes	3.23"	.867"
D006	Inv. only, 2 flt	Green	Yes	3.23"	.867"
D007	1 float	Black	No	3"	—
D008	1 float	Red	No	3"	—
D009	Inv. only, 1 flt	Green	No	3"	—
Mag Probes - Form Number 8468					
D021	Inv. only 2 flt	Blue	Yes	3.23"	0.867"
D022	Inv. only, 2 flt	Blue	Yes	3.23"	0.867"
D023	Inv. only, 1 flt	Blue	No	3"	—
D024	Inv. only, 1 flt	Blue	No	3"	—

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