Scully Load Anywhere® Overfill Prevention System

Featuring Dynacheck®

Installation And Troubleshooting Manual

scully

Important Notice

It is the intention of Scully Signal Company that the Load Anywhere On-Board System be installed as shown in this manual. Any modifications or other deviations will violate the conditions of the Factory Mutual Research (FM) approval that is based upon a correctly installed system that is properly connected to a truck terminal loading rack equipped with Scully equipment. This system is designed for use as secondary level detection to provide protection against overfilling a tank truck compartment and causing a product spill.

It is implied by this manual that each system installed should have the proper battery power from the vehicle's electrical system, be properly installed as shown in the manual and be properly maintained. It is the end user's responsibility to insure that a system is properly installed and maintained and in good operating condition.

Other manufacturers provide terminal loading rack equipment, truck mounted equipment or systems they claim are compatible with Scully equipment. Connecting or using other manufacturers' equipment with Scully tank truck equipment is not condoned by Scully. It can greatly reduce the safety and reliability of the system and will violate the conditions of the FM approvals.

An optimum safety system, taking full advantage of the exclusive Scully Dynamic Self-Checking features of this equipment and in compliance with the FM approval, should be the Load Anywhere System connected to any truck terminal loading rack equipped with a Scully Loading Rack Control Monitor.

Toll-Free Assistance
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scully

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Table Of Contents

Chapter 1 System Overview

1.1 Introduction

The Scully Load Anywhere® On-Board Tank Vehicle Overfill Prevention System is designed for complete compatibility with Scully Loading Rack Overfill Prevention Systems. Over 90% of all bottom loading terminals in the United States use Scully equipment. The Load Anywhere System provides unmatched compatibility.

The Load Anywhere System incorporates Scully's exclusive Dynacheck® automatic and continuous self-testing. The system's control unit, wiring, connections and optic probes are checked for safe operation automatically and continuously 30 times per second. No manual checks are needed. The ultimate in Faylsafe® protection, the Load Anywhere System signals the shutdown of the loading rack when an overfill condition exists or if an unlikely system fault occurs. The Scully Load Anywhere System provides unbeatable protection against hazardous spills.

State-of-the-art optic sensing technology is used to detect the presence of liquid product within the vehicle compartment. The Load Anywhere System's optic probes "see" the liquid product high-level, require no warm-up time and are extremely resistant to fogging and frosting . The Scully Load Anywhere System provides unequalled dependability backed by over 60 years of petrochemical handling experience.

1.2 Description

This manual contains detailed information on the installation and troubleshooting of the Load Anywhere System. This system is designed for complete loading rack compatibility. We suggest that you read this entire manual before beginning an installation or a troubleshooting session. This system is comprised of the following parts:

1. The On-Board Control Unit.
2. The Probe(s).
3. The Socket(s).

The On-Board Control Unit

The Scully Load Anywhere System On-Board Control Unit is set up for the number of vehicle compartments as required by the user. See Figure 1.1. This unit is included in the complete system package.

The Probes

Scully Five-Wire Optic Probes for the Load Anywhere System are provided for each vehicle compartment as required by the user. See Figure 1.1. The probes are included in the complete system package.

The Sockets

Scully Sockets are used for connecting the vehicle's Load Anywhere System to the Scully Terminal Loading Rack Control Monitor via the rack's plug and cable. See Figure 1.1. An independently sold Scully socket is needed to complete system installation.

scully
Load Anywhere
On-Board Overfill Prevention System

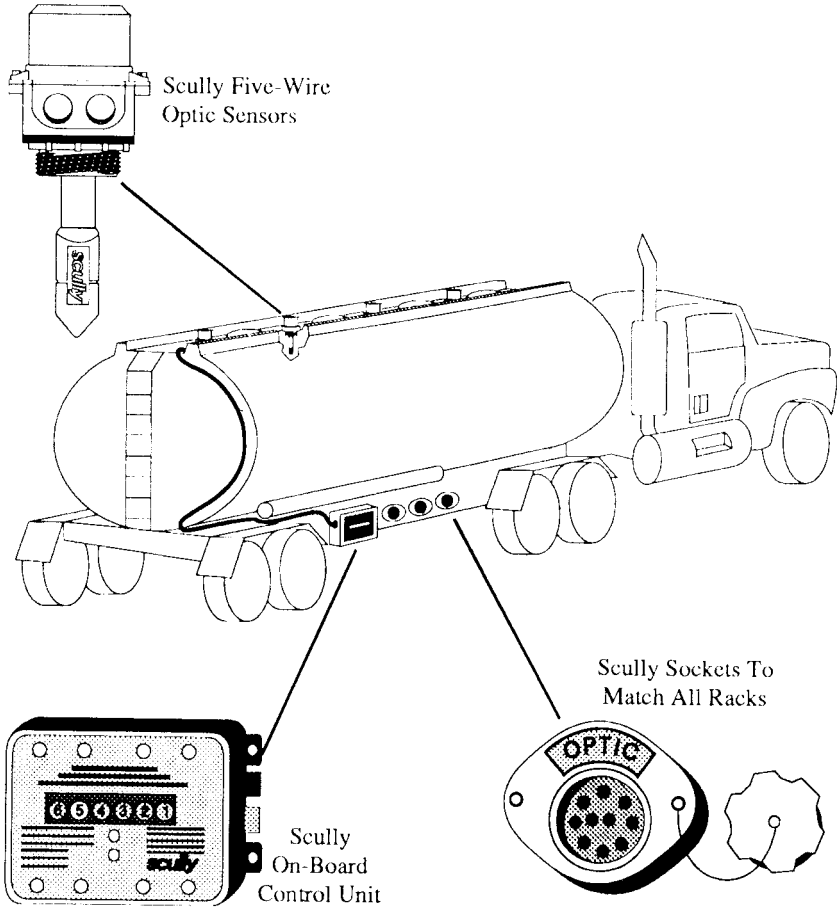


Figure 1.1 Scully Load Anywhere System Components

1.3 Selecting The Proper Socket

The Scully Sockets called for by the American Petroleum Institute (API) are:

1. Optic Socket, SJ-6W ..... P/N 07974.
2. Thermistor Socket, SJ-6S ..... P/N 07720.

The terminals in your region may require different style sockets. They should be checked with before selecting the appropriate socket(s). Scully manufactures these alternative sockets:

1. Optic Socket, SJ-6SO ..... P/N 07973.
2. Optic Socket, SJ-6X(J-560 Style) ..... P/N 08199.
3. Thermistor Socket, SJ-6(J-560 Style) ..... P/N 07681.
4. Float Socket, SJ-F ..... P/N 07788.
5. Float Socket, SJ-6F(J-560 Style) ..... P/N 08116.

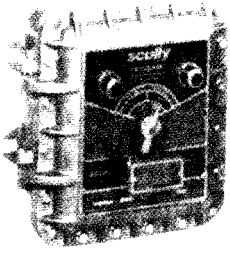
See Technical Data Sheet #60674 for further information.

Call our Applications Engineering Department for further assistance in selecting the proper socket.

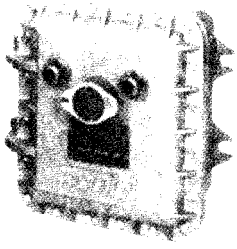
1-800-272-8559
or
(617)692-8600

Section 1.4 Compatible Rack Control Monitors

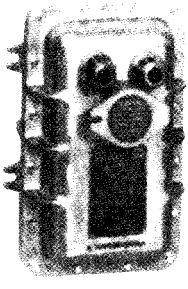
The components of the Scully Load Anywhere System are designed for use with Scully Rack Overfill Prevention Control Monitors. Compatible Rack Control Monitors are shown in Figure 1.2.



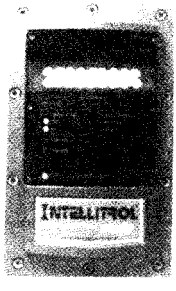
Scully Biclops
Optic and Thermistor System
and Scully Biclops
Thermistor Only System



Scully ST-6 Series
Thermistor System



Scully ST-35 Series
Optic System



Scully Intellitrol™

Figure 1.2 Compatible Rack Control Monitors

** Intrinsically safe float systems are not manufactured by Scully and are not recognized as fail-safe. They do not incorporate Scully's exclusive Dynacheck® automatic and continuous self-testing.*

Chapter 2 Theory Of Operation

2.1 Introduction

This chapter explains the operational theory of the Load Anywhere System. It is strongly suggested that this chapter be read thoroughly before beginning an installation or troubleshooting session. The Scully Load Anywhere System is designed to be used with Scully five-wire optic probes. The Load Anywhere System has individual output connections for optic, thermistor and float controlled racks. If any of the optic probes detect product liquid, all three output circuits are shut off and the loading process is stopped. By allowing for connection to any one of three styles of sockets, the Load Anywhere System provides complete compatibility at the rack.

2.2 Optic Probe Overview

The Scully optic probe, as shown in Figure 2.1, contains an input and output section and an optical transmit and receive section. A pulsed electrical signal from the On-Board Control Unit module, or, from another probe in multiple compartment installations, is received on the yellow wire. This electrical input pulse is converted to a pulsed infrared light signal that is transmitted optically, through a prism, to the light receiving section of the probe. The light signal is converted back to a pulsed electrical signal, larger in amplitude than the initial input pulse received at probe #1 and sent out on the orange wire. The orange wire is connected back to the control unit or to the yellow wire of the next probe in multiple compartment installations.

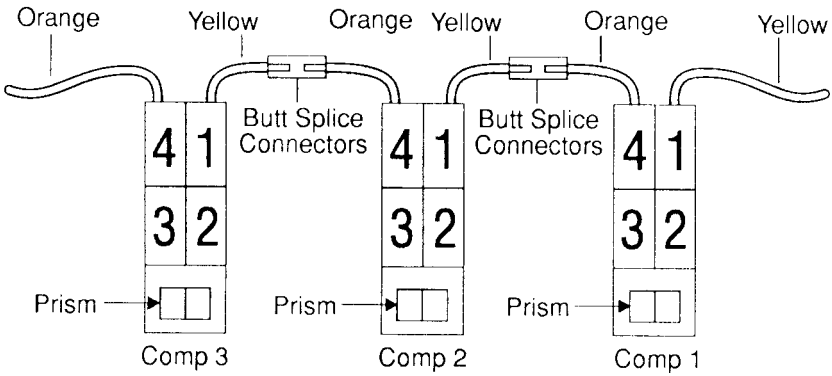


Figure 2.1 Signal Transmission

Section 1: Receives input pulse signal - looks for a recognizable waveform, comparable to Dynacheck.

Section 2: Converts pulse to light - this section takes the input pulse after it has been received as an appropriate signal and transforms it into a light signal which can be transmitted by an LED (Light Emitting Diode).

Section 3: Receives light signal (yes/no) - this section either receives a light signal or does not. This section determines whether or not an output signal should be generated or not.

Section 4: Converts light signal to pulse - transforms received light signal into a comparable input pulse that will be recognized as a Dynacheck pulse by either the next optic Probe input, a rack controller receive signal section, or a Scully Load Anywhere receive sensor signal section (TB-2) orange).

If a probe's prism is wetted with liquid product, the optic signal passes into the liquid and is lost. When no optic signal is received, no electrical pulsed signal will be sent out on the orange wire. The other three wires in the probe are for power input and a diagnostic function. The red wire is the positive (+) dc voltage supply wire and the black wire is the negative (-) dc supply ground reference. A diagnostic signal output is provided on the green wire. Refer to Figure 2.1.

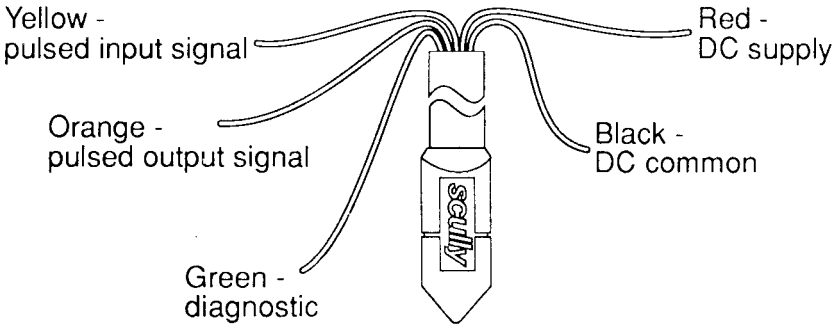


Figure 2.2 The Five Wires Of The Optic Probe

2.3 On-Board Control Unit Power At TB1

Power for the On-Board Control Unit is provided by the vehicle's 12 volt dc, electrical system. The 12 volts are typically available from the blue wire auxiliary connection in the nose box of the trailer. The On-Board Control Unit module provides a yellow power light for a quick check of power from the trailer's electrical system.

2.4 Optic Probe Power At TB2

Optic probe regulated dc power is sent to the probes from TB2 of the On-Board Control Unit module on the red and black terminals. During normal operation, the voltage level is an 8 - 12 volt dc intrinsically safe signal.*

The On-Board Control Unit sends out a signal on the yellow connection of TB2 to the optic probes. This signal, when measured with an ac voltmeter, will be approximately 0.2 - 0.5 volts ac. Please note that this signal level will only be measured at TB2 yellow and on the yellow wire of the first probe.

If the first compartment probe is dry or in air and operating properly, it will output a signal on its orange wire. This signal, when measured with an ac voltmeter, will be approximately 0.5 - 2.0 volts ac. You should be able to measure this larger signal throughout the optic probe chain on the yellow and orange wires of each probe. The last probe in the chain sends the signal back on its orange wire to the orange connection on TB2. The loop is now complete and will light the green permit light on the On-Board Control Unit.

This loop of signals known as Dynacheck® , check the probe's operation 30 times per second. Should the Dynacheck signals be interrupted in any way, whether due to a wet probe or faulty wire for example, the control unit will shut off its output control circuitry, signaling the shutdown of the loading operation at the loading rack.

*Definition: *An intrinsically safe signal is a combination of electrical voltage and current that cannot produce a spark with enough energy to ignite an explosive gas/air mixture.*

2.5 On-Board Control Unit Indicator Lights

Under normal operating conditions, the On-Board Control Unit's red indicator lights are used to display which optic probe is wet, recognizing an overfill condition within the compartment.

Another function of the On-Board Control Unit's red indicator lights is to provide probe diagnostics. These lights correspond to the number of tank compartments on the vehicle. They are numbered so that the #1 indicator light corresponds to the compartment closest to the front of the trailer or vehicle cab. The green wire on each of the optic probes is tied in parallel and finally connects to the green terminal of TB2 on the On-Board Control Unit. The On-Board Control Unit looks at the number of green diagnostic wires that are connected together.

Note: Newer On-Board Control Units have compartment indicator lights that read 1 - 6 from right to left (6-5-4-3-2-1). Earlier units have compartment indicator lights that read 1-6 from left to right (1-2-3-4-5-6). The numbering direction has no bearing on the correct use of this manual.

After the unit electronically adds the number of connected probes, it determines which red indicator light to turn on. In a normal condition, when all probes are dry and operating properly, the red indicator light beyond the last vehicle compartment will be on. For example, if you have a four compartment vehicle, the number five light would be on. A black cap is provided to cover the number five light in this example. Therefore, a six compartment vehicle would have no indicator lights on and the black cap is not required.
When diagnosing a problem on the vehicle by using the indicator lights, it is important to remember that an illuminated indicator light does not necessarily indicate a bad probe. Should an overfill condition or a fault appear, the red compartment indicator light will go on, showing where the Dynacheck signal has stopped.

For example, if you have a four compartment trailer and the number two light goes on, it means that either the number two probe is wet or there is a fault in the system between the output of probe one and the input of probe two. The fault could be in the wiring or with the probe. Section 6.6 contains further information about the compartment indicators in regards to troubleshooting.

Figure 2.3 below shows normal compartment indications for an operational system with one to six compartments. The indicator light that is lit is also the one to be capped.

# Of Vehicle Compartments	Compartment Light Lit
1	2
2	3
3	4
4	5
5	6
6	NONE

Figure 2.3 Lighted Compartment Indicators

2.6 Socket Output Signals At TB3

Output signals are available for any one of the following types of sockets:

1. Optic, blue label socket.
2. Thermistor, green label socket.
3. Float, red label socket.

Connections are made from TB3 of the On-Board Control Unit to the three possible socket types. The sockets provide the transfer path for the signals to the terminal loading rack. Refer to Figure 2.4 below.

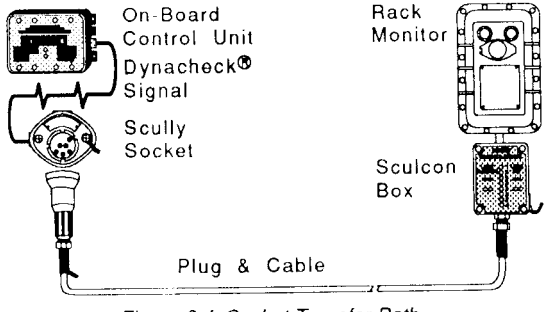


Figure 2.4 Socket Transfer Path

Chapter 3 Mechanical Installation

3.1 Introduction

When choosing a location to install components of the Scully Load Anywhere System, these two guidelines must be followed:

1. The National Fire Protection Agency (NFPA) code which is listed in Figure 3.1.
2. Practical considerations within the jurisdiction of this code.

FLAMMABLE AND COMBUSTIBLE LIQUIDS CODE

Location	NEC Class I, Group D Division	Extent of Classified Area
TANK VEHICLE AND TANK CAR*		
Loading Through Open Dome	1	Within 5 feet of edge of dome, extending in all directions
	2	Area between 5 feet and 15 feet from edge of dome, extending in all directions
Loading Through Bottom Connections With Atmospheric Venting	1	Within 5 feet of point of venting to atmosphere extending in all directions
	2	Area between 5 feet and 15 feet from point of venting to atmosphere, extending in all directions. Also up to 18 inches above grade within a horizontal radius of 10 feet from point of loading connection
Loading Through Closed Dome With Atmospheric Venting	1	Within 5 feet of open end of vent, extending in all directions
	2	Area between 5 feet and 15 feet from open end of vent, extending in all directions. Also within 5 feet of edge of dome, extending in all directions
Loading Through Closed Dome With Vapor Control	2	Within 5 feet of point of connection of both fill and vapor lines extending in all directions
Bottom Loading With Vapor Control Any Bottom Unloading	2	Within 5 feet of point of connections extending in all directions. Also up to 18 inches above grade within a horizontal radius of 10 feet from point of connection

* When classifying extent of area, consideration shall be given to fact that tank cars or tank vehicles may be spotted at varying points. Therefore, the extremities of the loading or unloading positions shall be used.

Figure 3.1 NFPA Code

The On-Board Control Unit is approved as non-incendive for Class I, Division 2, Group D locations by FM*.

Scully SP-FU Optic Probes are approved as intrinsically safe for Class I, Division 1, Group D locations by FM. These are the only probes to be used with the Load Anywhere System. ***The use of other probes violates these approvals and jeopardizes the fail-safe operation of the automatic and continuous self-checking feature of Scully Systems.***

Note: When referencing the ANSI/NFPA30 table as shown in Figure 3.1, Division 1 is a more hazardous location than Division 2. Therefore, equipment approved for Division 1 is also approved for Division 2.

WARNING

Before beginning an installation, the tank compartments must be completely drained of liquid and vapor free.

* Factory Mutual Research Corporation

3.2 Mounting The On-Board Control Unit & Sockets

When choosing a location for the On-Board Control Unit and sockets, choose a central point on the vehicle. Centrally located sockets will best accommodate most loading racks. Mount them forward to or behind the loading valves. The On-Board Control Unit housing and socket housing(s) should be mounted to a clean, bare metal surface on a bracket mounted to the vehicle frame. Good electrical connections between the housing(s) and the vehicle frame are important.

CAUTION

No drilling or welding to the tank's frame should take place without first consulting the tank manufacturer.

A mounting bracket as shown in Figure 3.2 is preferred. The On-Board Control Unit housing is completely sealed and is waterproof when properly assembled. To prevent damaging the seal, do not over tighten the cover bolts.

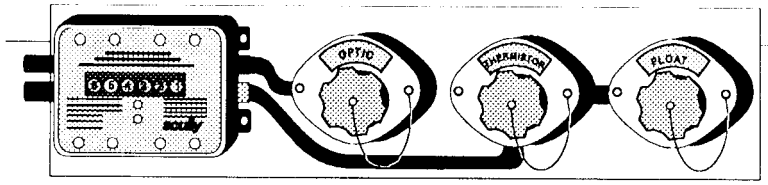


Figure 3.2 Preferred Mounting Bracket

The sockets are provided with drain holes located on the top and bottom of the housing. One blocking screw for the top drain hole is provided. This allows for the drainage of moisture that may accumulate and cause socket corrosion.

3.3 Mounting The Probes With MHC & MHCF Holders

When mounting the Scully Optic Probe in the manhole cover or directly in the tank, the probe mounting hole should be located away from the vapor recovery hood. See Figure 3.3. The hole must be free of any burrs or sharp edges.

The overall height of the probe and holder must not extend above the roll-over rails. Various height probe holder covers are available to simplify unusual installations. Scully manufactures the following probe holder covers in the following heights:

1. Standard, 2 1/8" ..... P/N 20888.
2. Short, 1 3/8" ..... P/N 21583.
3. Tall, 2 7/8" ..... P/N 21513.

When mounting the probe holder directly in the tank, be sure the hole is within an arms reach of the manhole cover to aid in future maintenance if required.

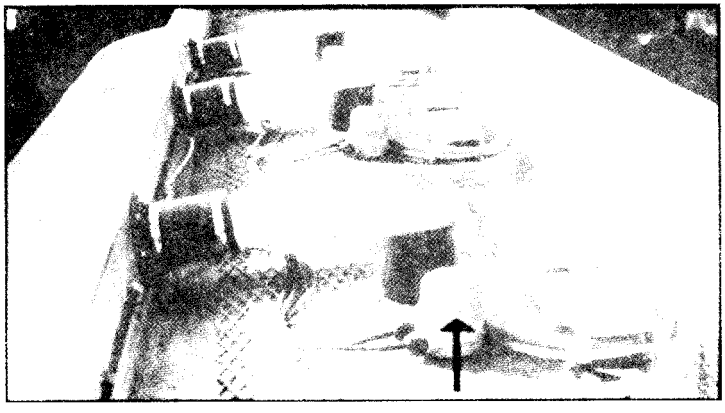


Figure 3.3 Typical Probe Holder Mounting Location

The MHC Type Probe Holder

This holder is made to be mounted in two (2) ways:

1. Through-hole mounting technique. The hole into which the MHC type probe holder is mounted must be 2 3/8" in diameter. Install the gasket between the body of the probe holder base and the outside surface around the hole. The locknut is installed, concave side toward the holder, on the threads of the probe holder base and firmly tightened against the inside surface around the hole as shown in Figure 3.4.

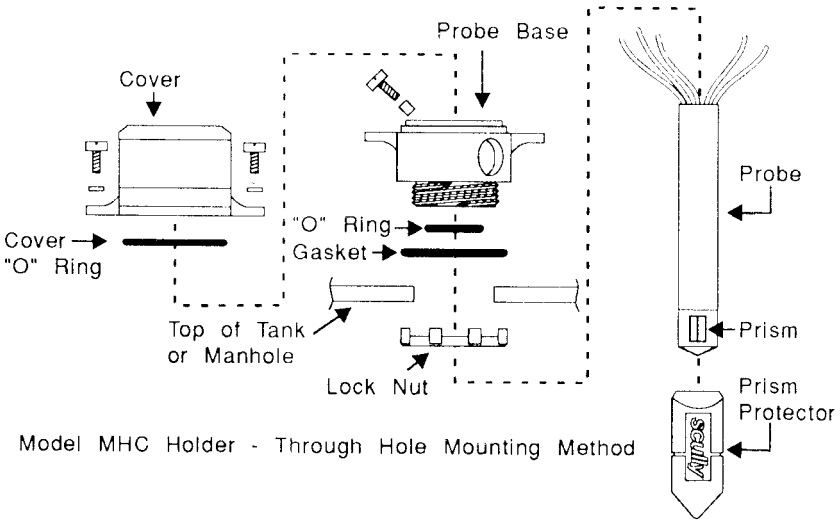
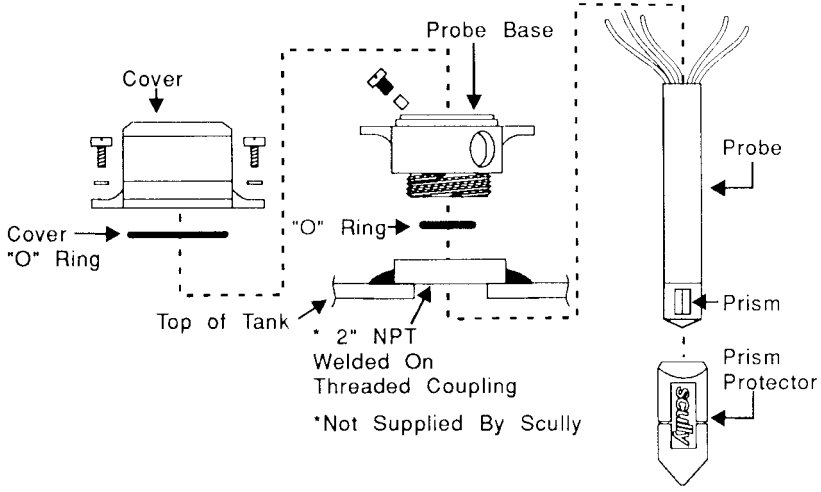


Figure 3.4 Through-Hole Mounting Technique

2. 2" NPT thread mounting technique. The locknut and mounting gasket are not used for mounting in this manner. We strongly recommend applying a suitable anti-seize compound to the threads before the installation. This is beneficial should future maintenance be required. Refer to Figure 3.5.



Model MHC Holder - Threaded Hole Mounting Method

Figure 3.5 2" NPT Mounting Technique

The MHCF Type Holder

This holder has a flanged base. It has a four (4) bolt hole pattern established to mate with old float style sensor mounting flanges. This flanged base also has the standard TTMA* six (6) hole pattern spotted for drilling if required. Here is how the MHCF is mounted:

1. Install the gasket between the flange on the probe holder base and the outside of the mounting surface. Use ¼-20 bolts, nuts and lock washers as required for either the four (4) mounting holes on the flange or for the six (6) mounting holes, depending on the pattern used. Tighten the bolts evenly so that the gasket is uniformly compressed. To prevent damage to the gasket, don't over tighten the mounting bolts. See Figure 3.6.

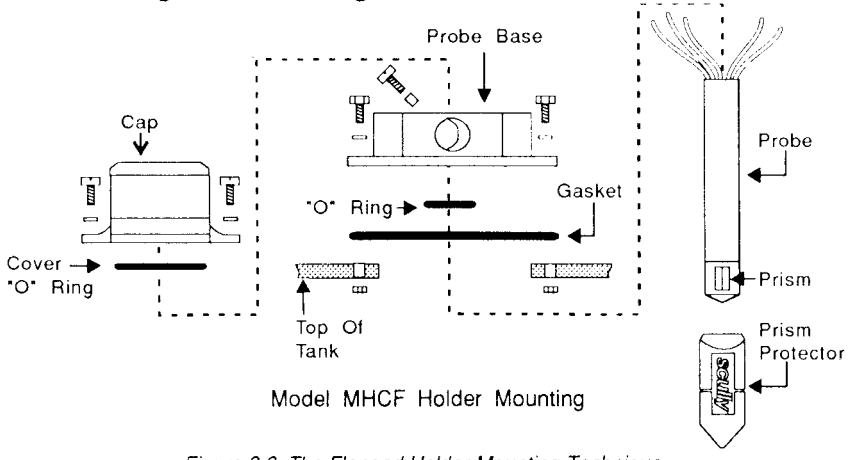


Figure 3.6 The Flanged Holder Mounting Technique

* Truck Trailer Manufacturers Association

3.4 Optic Probe Sensing Level Adjustment

If the probe was removed from the holder to ease installation, proper care must be taken when re-installing the optic tip into the probe holder. If you damage the prism or misadjust the probe, its proper operation cannot be insured. The optic tip should be installed into the probe holder from the bottom. It aids installation to apply some white lubricant or petroleum jelly around the top of the optic probe. Refer to Figure 3.7

CAUTION

The liquid level sensing point for overfill protection should be set slightly above each compartment's maximum capacity level weights and measures marker. If no marker rods are present, set the liquid level sensing point slightly above the maximum capacity of a properly filled compartment. Take into account the minimum ullage requirements for each compartment and the emergency shut down times. These times vary according to the rack, but they may allow from 25 to 75 gallons of product to flow during the time it takes the loading valves to fully close.

The sensing level is the point at which the probe detects the presence of liquid product in the compartment and stops the Dynacheck pulsed signal. This point is found midway on the optic probe prism. The prism is the triangular shaped glass piece within the green head of the Scully optic probe tip. The notch on the prism protector shows the shut-off level. Refer to Figure 3.7.

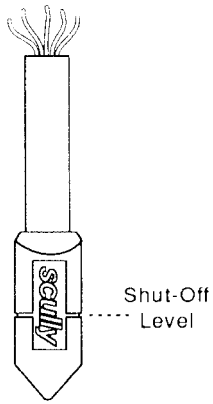


Figure 3.7 Optic Probe Tip & Sensing Level

Adjust the sensing level in the following fashion:

1. The sensing level of the probe is adjusted by loosening the locking screw located inside the probe holder. See Figure 3.8 below.

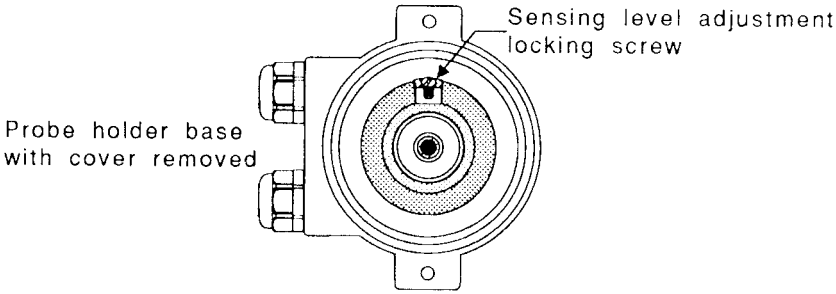


Figure 3.8 Optic Probe Locking Screw

2. Adjust the probe position so that the mid-point of the prism or the notch in the prism protector is at the desired shut-off level. Use an upward, twisting motion as shown in figure 3.9 to prevent the "O" ring from being dislodged. We recommend that the shut-off point be set at a point just above the maximum tank capacity. This point is generally indicated by the uppermost marker button. In all cases, the point must be below the vapor exit port with the prism facing away from it and the manhole cover.

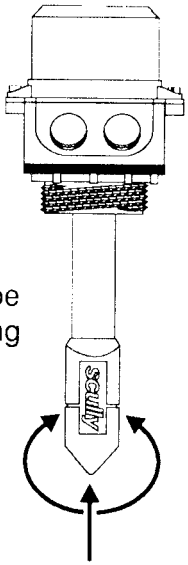


Figure 3.9 Adjusting The Optic Probe Position

3. Make sure no obstacles or shields are within 4" of the prism if the prism protector is not used on the probe. Obstacles within this zone may cause the probe to send false readings to the On-Board Control Unit.

4. Tighten the locking screw securely after adjustment.

5. The probe holder caps should be left off until wiring has been completed and the complete system operation has been verified.

Chapter 4 Electrical Installation

4.1 Introduction

In this chapter, you will be wiring the components of the Load Anywhere System. The tasks will include stripping the outer jacket off the multi-conductor cable, splicing wires and making connections to the terminal strips. A skillful hand is required in performing these wiring basics. If one of the cable conductors is nicked, the inner copper can be exposed and can cause electrical shorts.

The majority of installation problems can be traced to a poorly spliced cable or a bad connection. All connections should be checked carefully. Using the installation kit, the proper tools, and installation tips will greatly reduce installation time and problems.

This chapter provides descriptions of wiring procedures and diagrams. The color fold-out diagrams in the rear of this manual should be used in conjunction with the sections of this chapter.

4.2 Installation Kit Components

Throughout this manual we refer to elements of the Scully Installation Kit. We strongly recommend the use of these elements in kit form to make installations quicker and easier. As shown in Figure 4.1, the installation kit; part number 08309, includes:

1. 100' of Scully Cable ..... P/N 22056. This cable is for wiring probes and sockets to the On-Board Control Unit. It has five wires that are color coded to match the colors on the terminal strips of the control unit and the wires on the probe.

2. 16 liquid tight cable compression fittings ..... P/N 27555.

3. 30 crimp-on connectors ..... P/N 22255.

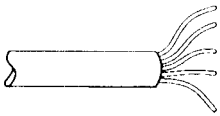
4. An in-line fuse holder with ¼ ampere fuse ... P/N 31486.

5. One socket cleaner ..... P/N 07811.

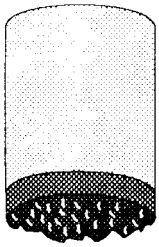
6. This installation manual ..... P/N 61007.

Contact Our Sales Department To Order Your Load Anywhere Installation And Service Video*.
1-800-272-8559
or
(617)729-7510

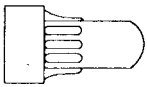
*. Installation and service video ..... P/N 08679.



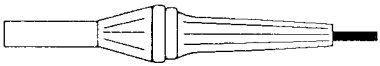
5 Wire Optic Cable



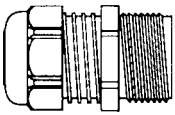
Socket Cleaner



Crimp-On Connector



1/4 Amp Fuse and Holder

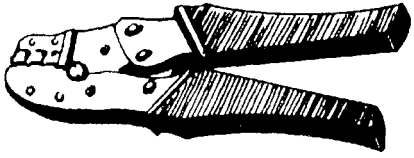


Cable Compression Fitting (Strain Relief)

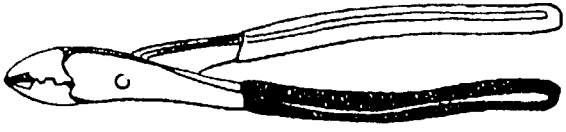
Figure 4.1 Installation Kit Components

4.3 Recommended Installation Tools

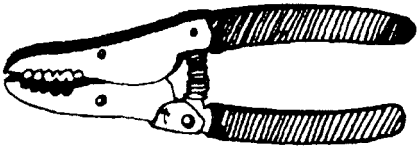
A well equipped electrician's tool set including the items shown in Figure 4.2 is recommended for installing this system.



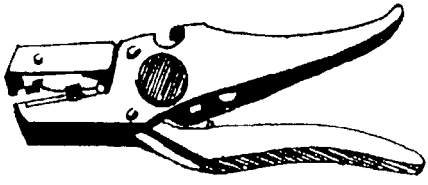
Ratchet Crimper



Manual Crimper



Wire Stripper



Self-Adjusting Wire Stripper

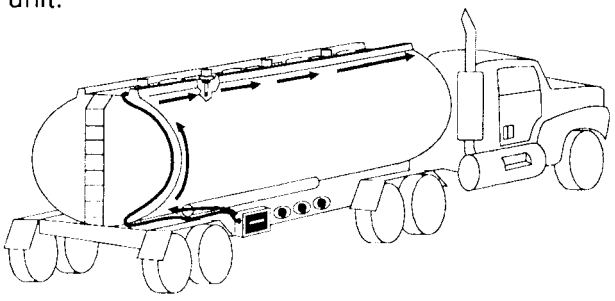
Figure 4.2 Recommended Installation Tools

4.4 Wiring The On-Board Control Unit To The Probes

With references to the color coded fold-out at the back of this manual, please note that the cable run is from the On-Board Control Unit to the ***rear*** compartment at the back end of the vehicle, and then to each additional compartment as required.

If you are not using Scully cable for your installation, use a good quality, tinned, multi-conductor 18 gauge cable. The outer covering should be oil and gasoline resistant. Carefully document the color coding in your cable for ease of service if required at a later date.

Measure out a length of cable from the On-Board Control Unit to the probe in the ***rear*** compartment. The cable is generally run along the frame up the back of the tank and along the inside of the roll-over rail as shown in Figure 4.3. It is important to install the cable approximately 2" up the side of the roll over rail to prevent cable immersion in product. From there it proceeds at a right angle to the rear compartment probe. This is usually the longest length of cable in the run. Be sure to leave approximately 10" of excess cable at the probe holder and 5" at the control unit.



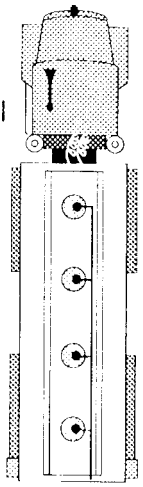


Figure 4.3 General Path For Running The Cable

Remove the cover of the On-Board Control Unit. Strip off the cable outer jacket to expose the color coded wires within as shown in Figure 4.4. After stripping away the outer jacket, carefully inspect the insulation of each inner wire to make sure that none have been accidentally cut or nicked. Using cable Entry B, as shown on the fold out diagram on back cover, install a compression fitting into this hole to accept the cable. Insert the cable through the compression fitting so the desired length is inside the module housing. Pull the cable back about 1/2" and apply a silicone bead around the jacket. Push the cable into the compression fitting and tighten. This will insure a good water seal at the cable entry point. Connect the wires to TB2 in the On-Board Control Unit as shown in the fold-out diagram. Leave the cover off until you have verified complete system operation.

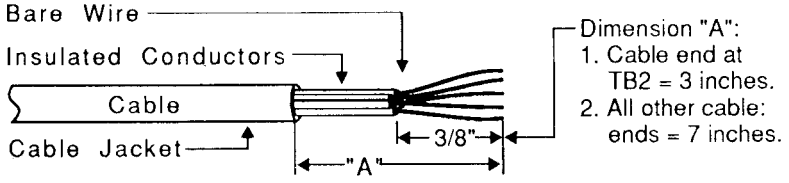


Figure 4.4 Exposing The Color Coded Wires Within The Cable

Note: A cable compression fitting, supplied in the Scully Installation Kit, should be used wherever the cable run enters or leaves the On-Board Control Unit or a probe holder. See Figure 4.5. If you do not use the supplied fittings, you must use a quality 1/2" NPT, water tight strain relief, properly sized for the cable O.D.

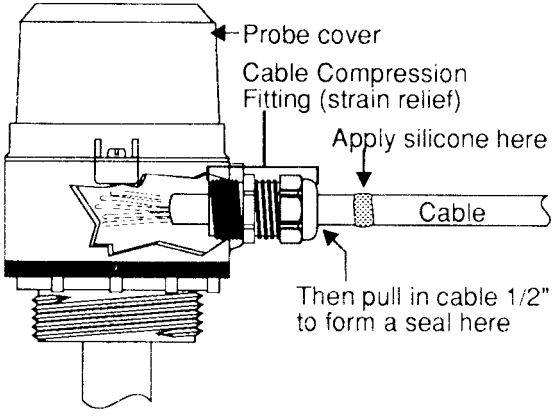


Figure 4.5 Installing A Cable Compression Fitting

Single Compartment Installations.

The probe cover cap should be removed. For single compartment installations, the wires are stripped and connected color for color at the probe. The probe holder cover should be left off until you have verified complete system operation. When the installation is complete, the excess cable is folded inside the probe holder as shown in Figure 4.6. If you are doing a single compartment installation, proceed to Section 4.5.

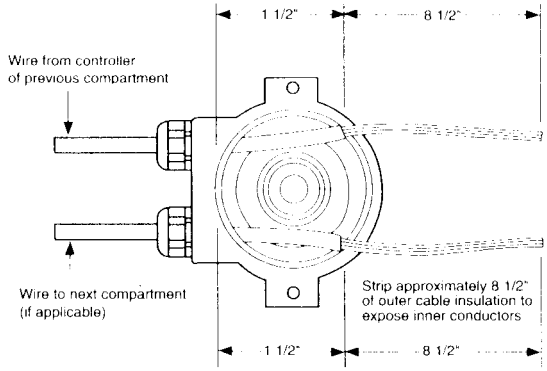


Figure 4.6 Cable Dressing

Multiple Compartment Installations.

The probe holder covers should be removed. For each additional compartment, cut and install a length of cable from one probe to the next and so forth until you have reached the front compartment. The cable should run from the probe to the roll-over rail, along the rail and then at a right angle to the next probe. Be sure to leave approximately 10" of excess cable at each probe. Strip 7" of the cable jacket at each end to expose the color coded wires. When you have prepared the cable for each compartment, cut the wires on each probe to 10" in length as shown in Figure 4.4.

Refer to the fold-out diagram. At compartment #1, the compartment closest to the front of the trailer or vehicle, connect the five probe wires to the five cable wires by matching the colors.

At compartment #2, connect the orange cable wire coming from compartment #1 to the yellow probe wire. The orange probe wire is connected to the orange cable wire leaving compartment #2. The yellow cable wire coming from compartment #1 is connected to the yellow cable wire leaving compartment #2. Connect the three other cable wires coming from compartment #1 to the same color probe wires and to the cable wires leaving compartment #2.

Continue this process for each remaining compartment until you have connected all the wires of the last compartment probe on the vehicle. ***The key to wiring this system is that the orange wire leaving one probe always connects to the yellow wire of the next probe.***

Note: The yellow wire feeding through the cabling and the probe holders does not directly connect to a probe except at compartment #1. This wire carries the input pulse signal from the On-Board Control Unit directly to probe #1.

After the hook-up is complete on each probe, fold the excess wire into the probe holder base of each probe. Refer to Figure 4.6. This will leave a service loop at each probe should future maintenance be required. Leave the probe holder caps off until you have verified complete system operation. When the installation is complete, be very careful that the wires do not get pinched against a probe holder base when putting the probe holder covers back on.

4.5 Wiring The On-Board Control Unit To The Sockets

Refer to the fold-out diagram. Measure out a length of cable from the On-Board Control Unit to a socket. Be sure to leave approximately 10" of excess cable inside the socket and 5" inside the control unit. Strip the cable jacket to expose the color coded wires as shown in Figure 4.4.

Using the cable Entry C or D on the right side of the module housing, install a compression fitting into this hole to accept the cable. Insert the cable as previously described and tighten the fitting. Remember, a small amount of silicone helps prevent moisture from seeping in. Connect the wires to TB3 in the On-Board Control Unit as shown in the fold-out diagram at the end of this manual.

Remove the socket face plate. Using either of the two cable entry holes in the socket box, install a compression fitting and route the cable into the socket box and tighten the fitting. Connect the wires to the socket pins as shown in the fold-out diagram for your style socket. Leave the socket face plate off until you have verified complete system operation. When the installation is complete, fold the excess wiring inside the socket face plate. Be sure the wires do not get pinched against the socket housing when bolting the face plate back on.

Repeat this procedure for wiring additional sockets, using Entries C and D as required. Remember, different socket styles with the same function, optic or thermistor for example, can be wired in parallel using the second cable hole in the socket box.

4.6 Wiring The On-Board Control Unit To The Battery

Measure out a length of cable from the On-Board Control Unit to the nose box of the trailer. Be sure to leave 3" of excess wiring at the control unit and 10" at the nose box. Strip the cable jacket to expose the color coded wires. Cut off the other three colored wires, leaving the red and black wires. Use cable Entry A with a compression fitting for this purpose. Pass the cable through the fitting and tighten. Connect the red and black wires to their corresponding colors at the TB1 terminal.

Note: The red lead that supplies battery power from the tractor to the On-Board Control Unit should be fitted with the provided ¼ ampere in-line fuse. This fuse protects the non-replaceable control module fuse. This in-line fuse should be mounted in a weather-proof area. A typical location is in the nose box of the trailer or in the vehicle's cab.

WARNING

If the power wiring to the On-Board Control Unit passes through a Class I, Division 2 hazardous location, it must be suited for and installed in accordance with all applicable requirements. Read this manual carefully before applying power to the unit. Do not connect the On-Board Control Unit to anything but a 12 volt dc source that has a negative ground. The Load Anywhere System is designed to be powered from a vehicle battery system that can vary between 10 and 16 volts dc. Do not substitute this source with anything but a well designed and well filtered electronic power supply. Do not use battery chargers or other unusual power sources as a substitute for a 12 volt dc vehicle battery system. Disconnect the On-Board Control Unit during routine battery charging.

At the nose box, or some other convenient location, leave some excess cable length and splice in the ¼ ampere in-line fuse. Refer to Figure 4.7. Connect the black wire to the large white connection and the red wire to the center blue connection. The center blue connection is typically the source of auxiliary power.

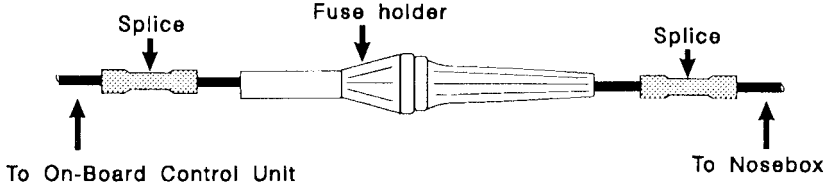


Figure 4.7 Splicing In The ¼ Ampere In-Line Fuse

If the vehicle is not equipped with a nosebox, connect the black wire to the vehicle ground and the red wire to the vehicle's 12 volt dc auxiliary source. Be sure to splice in the ¼ ampere in-line fuse. When wiring, every connection should be in a weather protected area.

4.7 Parking Brake Interlock

A customer requirement sometimes calls for the Load Anywhere System to not produce a permissive loading signal unless the parking brakes are set. If this type of option is required, an air/electric switch can be installed. Suggested switches are:

1. Bendix/Westinghouse TE ..... P/N 228477.
2. Hobbs ..... P/N M-4014-60.

WARNING

When installing an air pressure switch onto the vehicle's brake system, you are working on a safety related vehicle system. All materials and workmanship must be of good quality. Do not perform this type of installation unsupervised if you are not a trained and experienced air brake system technician.

1. Install the air/electric switch into the parking brake air system. Typical switch models like the above are set at 60 psi. These should be wired to close the switch when pressure is applied and exceeds this value.

2. The switch can be used to disconnect battery power to the On-Board Control Unit unless the parking brakes are set. It can also be used to interrupt the orange return signal wire before it reaches TB2 on the On-Board Control Unit.

Note: If the air pressure switch and/or the battery power wiring to the air pressure switch passes through a Class I, Division 2, hazardous location, it must be suited for and installed in accordance with all applicable requirements.

Chapter 5 Powering Up The System

5.1 Introduction

Scully suggests you perform the preliminary troubleshooting tests, sections 6.1 through 6.4, before supplying power to the system. These tests will verify that your system is receiving proper power and there are no shorts or opens. Proceed with this chapter after performing these quick tests.

Once the wiring installation in Chapter 4 is complete, and you have completed the quick tests in Chapter 6, the system is ready for operation. Carefully check all wiring connections made in the previous chapter. Turn on the power to the On-Board Control Unit.

The yellow power lamp will light. The green permit lamp will light. The red indicator lamp that corresponds to the compartment number that is one higher than the number of compartments on the vehicle will also light. For example, on a four compartment vehicle the number five compartment lamp will light. In a six compartment vehicle, no compartment lights will be on. Refer to Figure 2.3.

If you are not receiving the green permit light, please proceed to Chapter 6 in preparation for troubleshooting procedures.

5.2 Preventive Maintenance Tips

Now that you have installed your Scully Load Anywhere System, all that remains is to secure all the covers in place. Coat all connections with a moisture inhibiting spray or paste to prevent wiring corrosion.

On-Board Control Unit Module

To help prevent corrosion on terminal blocks TB1, TB2 and TB3, apply a small amount of white lube on each block and where the wires are bare. This coating will keep air and condensation away from the connections. Put the black rubber indicator cap over the unused compartment light as shown on page 10. Place the cover back onto the On-Board Control Unit.

Probes

To help prevent corrosion of the probe wiring connections, coat all crimped connections with a small amount of white lube. Carefully fold the service loops of wire into the probe holder base. Secure the covers, being careful not to pinch any wires.

Sockets

To help prevent corrosion at the socket pin connections, apply a small amount of white lube at each electrical pin connection at the rear of the socket where the wires attach. Install all socket faceplates making sure the gasket is correctly positioned. Don't forget the face plate covers. Make sure the cable bushing is properly installed so that the cover's cable swings freely.

Additional securing points for the cable run, if desired, should also be done at this time. Once the system components have been properly secured, you are ready to Load Anywhere!

5.3 Maintenance Tips

To avoid downtime and maintain the system in top working order, it is advised that you perform periodic, routine service checks.

Make sure that the socket cover(s) is always placed back onto the socket(s) after each use. Periodically clean the socket electrical contacts with a socket cleaner to insure a proper rack to truck connection. Additional socket cleaners, part number 07811, can be ordered by contacting the Scully Sales Department. Occasionally apply a small amount of white lube to the socket "J" slots to reduce wear.

Visually inspect all connections to make sure they are liquid tight. Fittings should be tightened as needed. All damaged parts should be replaced immediately.

Performing these routine service checks will increase the life of your Load Anywhere System and save you needless downtime.

Chapter 6 Preliminary Troubleshooting

6.1 Introduction

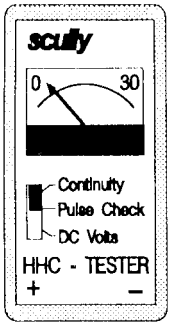
This chapter explains how to do a quick system check once you have installed the Load Anywhere System and are completing a new installation. This chapter also covers preliminary checks for system installations that are not receiving the green permit light. You will check voltage, the probe and socket wiring and probe operation. Most installation and operating problems are traceable by performing these tests. Detailed diagnostic troubleshooting will be covered in Chapter 7.

WARNING

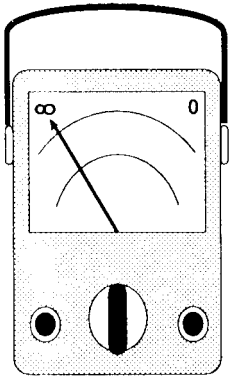
Before doing any troubleshooting of the Load Anywhere System the tank compartments must be completely drained of liquid and vapor free.

6.2 Testing With Multimeters

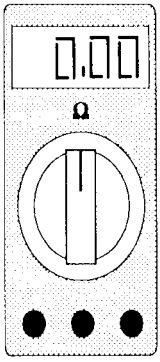
To insure trouble-free operation of your Load Anywhere System, it is important to use good wiring practices. Many wiring problems can be traced to insufficient voltage, shorts, opens or poor connections. These types of problems can be found by using a Scully HHC Tester or a good quality multimeter; either digital or analog style. The three different types of testers described are shown in Figure 6.1.



A. HHC Tester



B. Analog Multimeter



C. Digital Multimeter

Figure 6.1 Testers

6.3 System Voltage Quick Test

Perform this quick test to insure the system is operating at a proper voltage level. Set either one of the meters shown in Figure 6.1 to the dc volt mode. The tester should be set to a scale which is capable of measuring up to 20 volts. For this test, power should be supplied to the On-Board Control Unit.

To measure the voltage at TB1, place the red lead on the positive (+) terminal and the black lead on the negative (-) terminal. ***The voltage reading should be between 10 and 16 volts dc.*** If you receive a reading between 10 and 16 volts, this part of your system is operating properly. Proceed to section 6.4.

If you are not receiving this voltage level, check your wiring from the nose box to TB1 and the output voltage from the blue auxiliary connection on the nose box. If this is unsuccessful, continue with this chapter.

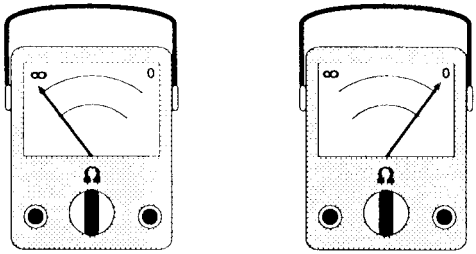
6.4 Troubleshooting Continuity Tests

For the following tests, power to the Load Anywhere System must remain off until the tests have been completed or, in troubleshooting, a test has provided a successful remedy.

The Scully HHC Tester can find open and shorted connections when used in the continuity mode. Figure 6.2-C shows these conditions as they appear on this tester.

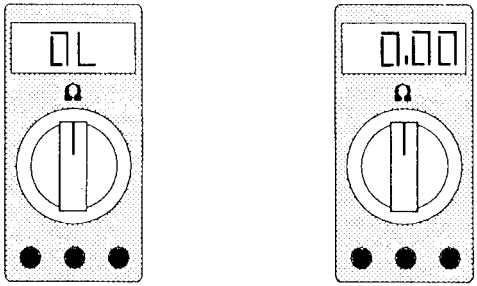
The analog style multimeter will also find open, shorted and high resistance connections when used in the Ohms mode and set at the RX1 scale. Figure 6.2-A shows these conditions as they appear on this tester.

The digital style multimeter varies in indicating open and shorted connections, but should always be set to the lowest Ohms scale; typically 200 Ohms. Figure 6.2-B shows these conditions as they appear on this tester.



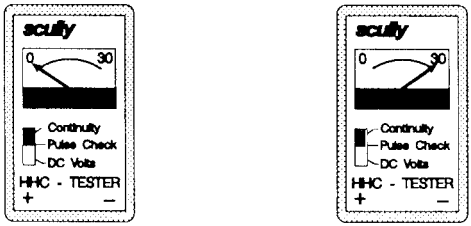
Open Circuit Short Circuit

Figure 6.2-A Analog Style Meter



Open Circuit Short Circuit

Figure 6.2-B Digital Style Meter



Open Circuit Short Circuit

Figure 6.2-C H.H.C. Tester

Continuity Test At TB1

No power should be on to the on-board unit. Remove the wires from TB1 of the On-Board Control Unit Module. Connect the black or common lead of any of the previously described testers to the vehicle chassis. With the red lead, touch one wire and then the other. The negative (-) power supply wire should indicate continuity (short circuit) since it is grounded to the vehicle chassis. The positive (+) supply wire should indicate an open circuit. The needle will not deflect for the HHC Tester or the analog style multimeter. A digital meter will indicate an open. Refer to figure 6.2 for typical meter indications.

If you received an incorrect meter reading from any of these checks, there is a problem in the power supply wiring. Fix the problem before proceeding to the next step. After the problem is fixed, re-connect the wires to TB1.

Continuity Test At TB2

At TB2, test for short circuits again. Remove all five wires from TB2 of the On-Board Control Unit Module. Connect the black lead of any of the testers to the vehicle chassis. With the red lead, touch all five wires one at a time. The meter should indicate an open circuit for all five wires.

If you receive a short circuit indication on any wire, repair the problem before continuing. For example, if the red wire indicates a short, you need to check all places where the wire may be touching the metal of the vehicle chassis. This includes inside and outside of the probe holders. When everything is correct, re-connect the wires to TB2.

Continuity Test At TB3

At TB3 we will test for short circuits and proper grounding. Disconnect all wires from TB3 of the On-Board Control Unit. Connect the black lead of any of the testers to the vehicle chassis. With the red lead, touch each of the wires one at a time. Each one should indicate an open circuit except for the normally grounded black wire. If no short circuits are found, the HHC Tester and the analog style multimeter needles will not deflect.

If a short circuit is detected, repair the problem before continuing to the next step. When everything is correct, re-connect the wires to TB3.

Continuity Test At The Socket

At the socket, we will test for proper wiring between the socket pins and TB3. Starting at the top of TB3, connect the black lead to the terminal and the red lead to the socket pin which corresponds to this terminal. Refer to the appropriate socket wiring diagram on the fold-out diagram. If the wiring is okay, the HHC Tester and analog style multi-meter needles will fully deflect. The digital style multimeter will give a zero Ohms reading. The HHC Tester and analog style multi-meter should not deflect when touched to any other pins of that socket. The digital style multimeter will read an open circuit.

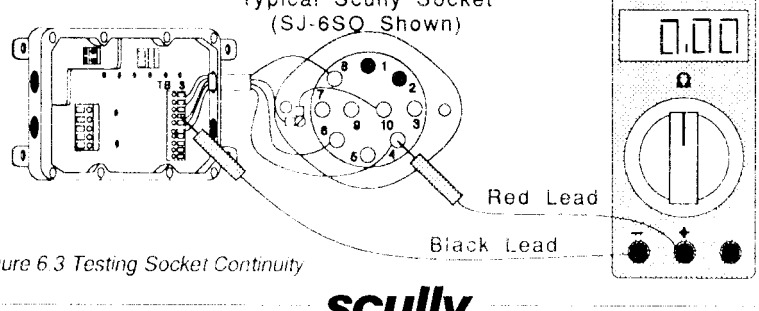
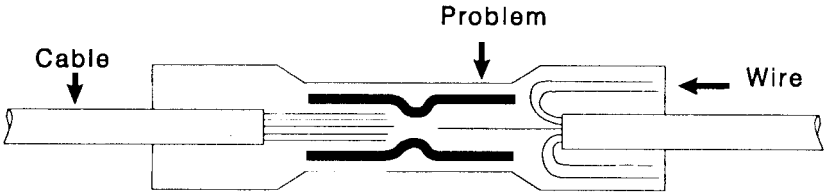


Figure 6.3 Testing Socket Continuity

Proceed to the next terminal on TB3. Repeat the above test procedure. Continue testing all terminals on TB3 which are wired to socket pins. Where no connection exists, skip that terminal.

High Resistance Readings

It is possible to have a tester indicate an Ohms reading that is neither an open nor a direct short. This indicates another type of wiring problem. The most common of these is an incomplete connection in one of the crimp-on connectors as shown in Figure 6.4. If you encounter this type of reading, check and repair the poor connection.



Problem: only one strand of wire is actually connected within the butt splice.

Figure 6.4 Incomplete Connection Within The Crimp-On Connector

Note: If you have been performing these tests prior to starting up the system, return to Chapter 5, to complete the installation.

6.5 Troubleshooting Scully Optic Probes

A stable testing environment is necessary for wet testing Scully Optic Probes. We recommend the use of a non-reflective cup containing black coffee. Black coffee is better than fuel oil and gas since these liquids are relatively translucent in small quantities. Black coffee is generally dark enough to absorb the infrared light beam that emits from the prism. A light colored cup, white Styrofoam for example, can cause the beam to refract back into the prism especially when water is used. Therefore, always use black coffee in a dark colored cup to avoid faulty readings.

To test the proper function of the optic probe, submerge the tip into the cup as shown in Figure 6.5, and verify that the red compartment indicator for that probe is lit and the green permit light is off. If you encounter flickering red and green indicator lights, the testing environment is unstable or there is a loose connection. Adjust the testing environment or repair the loose connection. If there is still no response, proceed to Chapter 7.

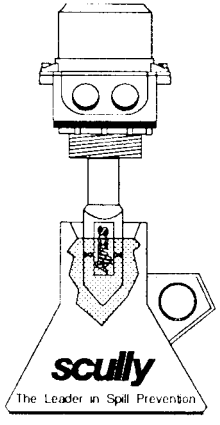


Figure 6.5 Testing The Optic Probe

6.6 Red Compartment Indicator Lights

The red compartment indicator lights on the On-Board Control Unit serve two primary purposes. One purpose is to locate where an overfill or fault condition exists. Another purpose is to identify the number of compartments in a vehicle. In each case, the red lights indicate where the Dynacheck signal has stopped.

For example, if we are troubleshooting a four compartment vehicle, the number 5 indicator light will be on for a properly operating system as shown in Figure 6.6. The number 5 indicator lamp is on because the Dynacheck signal has not been received by the fifth probe. This is a normal condition for a four compartment vehicle since the vehicle has only four probes installed. The green permit light will also come on. On a four compartment vehicle, the constantly on number 5 light should be capped with the black cap provided in the Scully installation kit before completing the installation.

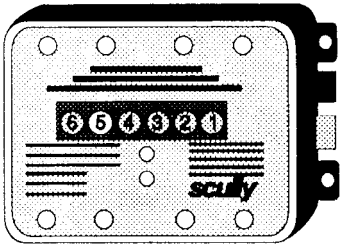


Figure 6.6 Indicator Light #5 Lit On A Four Compartment Vehicle

If the number four light of a four compartment vehicle is lit, the green permit light should not be on. This indicates there is a fault in the system. The Dynacheck signal has stopped at probe number four. In this situation, the following problems are possible:

1. Probe number four is wet or defective, there is stray outside light on the prism, or there is some defect with the prism.
2. The number three orange to number 4 yellow wiring between compartments 3 and 4 is shorted, open or poorly connected.
3. Probe number three is defective, there is no output pulse.

In summary, red indicator lights for the compartment do not necessarily show that the probe is defective. The indicator lights are designed to show where the Dynacheck signal has stopped.

Chapter 7 Diagnostic Troubleshooting

7.1 Introduction

If you did not get the permit light to go on after performing the preliminary troubleshooting procedures, this chapter will assist you in pinpointing the problem. It is strongly recommended that you read Chapter 2 before continuing with this chapter. Figure 6.2 will continue to be of assistance in verifying the proper tester response signals generated by the Load Anywhere System. In all cases, voltages measured throughout the system will be referenced to the black terminal wire or the black wire at the probes. Always put the black lead on this common line when checking voltage measurements.

WARNING

Before doing any troubleshooting of the Load Anywhere System, the tank compartments must be completely drained of liquid and vapor free.

Additional tools required for these troubleshooting procedures are shown in Figure 7.1 below.

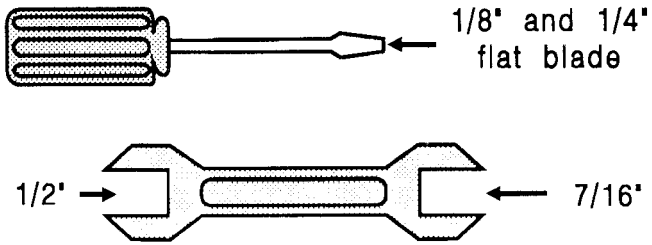


Figure 7.1 Additional Tools For Troubleshooting

7.2 Troubleshooting Procedures

Follow each step and answer each question with either YES or NO. Questions asked when using a HHC tester are in normal type. Questions asked when using a voltmeter are in *italicized* type.

Procedure 1

Problem: Green Permit and Yellow Power lights are on, but the wrong Red Indicator light is on.

Causes: Defective Diagnostic Output from one of the probes. Broken wire or connection to one of the Green Diagnostic Leads. Defective Control Module.

Disconnect the Green wire from TB-2 on the Control Module.

Is the #1 Red Indicator Light on?

YES	NO
Reconnect the Green wire to TB-2.	The Control Module must be replaced.

On top of the vehicle, disconnect all the Green Probe Leads.

Is the #1 Red Indicator Light on?

YES	NO
Starting at the #1 compartment, reconnect the Green Probe Leads one compartment at a time. As each Green Probe Lead is *(Cont'd on following page.)*	A short exists between the Control Module to the top of the vehicle. Repair or replace wiring as necessary.

(Cont'd from previous page.) connected, the Red Indicator Light will move up one position. (i.e. When the #1 Green Probe Lead is reconnected, the Red Indicator Light will move from #1 to #2. When the #2 Green Probe Lead is reconnected, the Red Indicator Light will move from #2 to #3, and so on).	

When each Green Probe Lead is connected, do the appropriate Red Indicator Lights go on?

YES	NO
Secure all electrical connections and secure probe covers onto the probe holder bases. Wet test all probes for proper response by the Control Module. (The Green Permit Light goes out and the Red Indicator Light for that probe goes on.)	The Probe that does not light the proper Red Indicator when its Green Lead is connected must be replaced.

Procedure 2

Problem: Yellow Power Light is on, no Red Indicator Lights are on and no Green Permit Light is on.

Cause: Last compartment probe is defective.
Control Module is defective.
Wiring from the last compartment probe to the Control Module is defective.

Using a Scully HHC Tester in its Pulse Check Mode, check across the ORG and BLK terminals of TB-2 for full scale deflection.

Using a voltmeter in its Volts AC scale, check across the ORG and BLK terminals of TB-2 for a reading of .5 - 2.0 Volts AC.

Does the HHC Tester fully deflect?

Does the voltmeter read between .5 - 2.0 AC Volts?

NO	YES
Disconnect the Orange wire from TB-2 and test across the Orange wire and the BLK terminal of TB-2. *Disconnect the Orange wire from TB-2 and test across the Orange wire and the BLK terminal of TB-2.*	The Control Module must be replaced

Does the HHC Tester fully deflect?

Does the voltmeter read between .5 - 2.0 Volts AC?

NO	YES
On top of the vehicle at the last compartment, using the HHC Tester, test across the Orange and Black Probe Leads, while connected, for full deflection. *On top of the vehicle at the last compartment, using the voltmeter test across the Orange and Black Probe Leads, while connected, for a reading of .5 - 2.0 Volts AC.*	The Control Module must be replaced.

Does the HHC Tester fully deflect?

Does the voltmeter read between .5 - 2.0 Volts AC?

NO	YES
Disconnect the Orange wire from the Orange Probe Lead. Using the HHC in Pulse Mode test across the Orange Probe Lead and the Black Probe Lead connection for full deflection. *Disconnect the Orange wire from the Orange Probe Lead. Using the voltmeter, test across the Orange Probe Lead and the Black Probe Lead connection for a reading of .5 - 2.0 Volts AC.*	An open orange probe wire connection exists between the last probe and the control module. Repair or replace as necessary.

Does the HHC Tester fully deflect?

Does the voltmeter read between .5 - 2.0 Volts AC?

NO	YES
The probe in the last compartment is defective and must be replaced.	A short exists between the Control Module and the last compartment probe. Repair or replace as necessary.

Procedure 3

Problem: Yellow Power light is on, Green Permit light is on, no Red Indicator lights are on and the vehicle will not permit a load at the rack.

Cause: Wiring from TB-3 of the Control Module to the Socket is defective.
Output from the Control Module is defective.
Socket is defective.

Is the Socket faceplate excessively dirty or are the J-Slots in the side of the faceplate excessively worn?

NO	YES
Using an HHC Tester in Continuity Mode, check from the appropriate TB-3 connections to its appropriate Socket pin designation, as depicted in the fold out at the end of this manual, for full deflection. *(Cont'd on next page.)*	Replace the Socket faceplate or contact assembly and test with a Scully SCT-3 Tester or connect to a Scully loading rack monitor for proper vehicle response.

(Cont'd from previous page.) *Using a voltmeter set to its ohm (resistance) scale, check from the appropriate TB-3 connections to its appropriate Socket pin designation, as depicted in the fold out at the end of this manual, for a short circuit.*	

Does the HHC Tester fully deflect at the proper connections?

Does the voltmeter read a short across the proper connections?

YES	NO
Using a Scully SCT-3 Tester or a Scully loading rack monitor, connect to the Socket and check for proper vehicle response.	A faulty connection exists between TB-3 and the Socket. Repair or replace as necessary and re-test.

Does the SCT-3 Tester or Scully loading rack monitor indicate proper operation?

YES	NO
Take the vehicle back to the loading facility where the problem was noted and connect for loading. If load permission is still not attainable, contact Scully Technical Services at 1-800-272-8559.	The Control Module must be replaced

Procedure 4

Problem: No Yellow Power Light, Green Permit Light or Red Indicator Lights are on.

Cause: Blown in-line fuse for TB-1.
Blown internal fuse in the Control Module.
Faulty wiring between the tractor and the trailer.
Faulty wiring between the nose box of the trailer and the Control Module.
Faulty connection at the vehicle power source.

Is there an in-line fuse between the vehicle power source and the Control Module?

YES	NO
Validate the fuse is intact.	Proceed to the voltage tests, procedure 4a.

Is the fuse intact?

NO	YES
Replace.	Proceed to the voltage tests, procedure 4a.

Does the fuse blow after it is replaced?

YES	NO
Proceed to the voltage tests.	Secure electrical connections. Attach covers and insulators as necessary.

Disconnect the wires at TB-1 of the Control Module.

Connect a new fuse within the in-line fuse holder.

Does the fuse blow when it is connected?

NO	YES
Disconnect the Red wire from the RED terminal at TB-2.	A short exists between the in-line fuse holder and the vehicle power source. Repair or replace as necessary.

Procedure 4a

Using the Scully HHC Tester in DC Volts Mode, test across the vehicle chassis and the hot side of the fuse holder for an approximate reading of 10 - 16 Volts.

Using a voltmeter set to DC Volts scale, test across the vehicle chassis and the hot side of the fuse holder for a reading of 10 - 16 Volts DC.

Does the HHC Tester read between 10 - 16 Volts?

Does the voltmeter read between 10 -16 DC Volts?

YES	NO
Using the Scully HHC Tester in its DC Volts Mode, test across the two wires that were connected to TB-1 for an approximate reading of 10 - 16 Volts. *Using a voltmeter set to its DC Volts scale, test across the two wires that were connected to TB-1 for a reading of 10 - 16 Volts DC.*	An open wire connection exists between the in-line fuse holder and the vehicle power source. Repair or replace as necessary.

Does the HHC Tester read between 10 - 16 Volts DC?

Does the voltmeter read between 10 - 16 Volts DC?

YES	NO
Remove power from the vehicle and connect the two power leads to TB-1 taking care to connect the hot wire to the (+) terminal and the ground wire to the (-) terminal.	An opening exists between the in-line fuse holder or vehicle power wiring and TB-1 of the Control Module. Repair or replace as necessary.

Measure the voltage across TB-1.

Does the HHC Tester read between 10 - 16 Volts DC?

Does the voltmeter read between 10 - 16 Volts DC?

YES	NO
Check the Red wire that was connected to the TB-2 RED terminal for shorts. Repair or replace the faulty wire as necessary and reconnect the Red wire to TB-2 RED.	An internal short exists within the Control Module. The Control Module must be replaced.

Do the lights come on once the unit is checked for shorts?

NO	YES
On top of the vehicle, disconnect all Red probe leads.	Secure covers, wires and insulators as necessary. Wet test all probes for proper response by the module.

Does the Yellow Power Light and the #1 Red Indicator Light come on?

YES	NO
Reconnect the Red Probe Leads one at a time until the Control Module indicators go off. The Probe whose Red Lead connection shut down the lights is defective and must be replaced.	The internal fuse is blown. The Control Module must be replaced.

Procedure 5

Problem: The #1 Red Indicator Light is on, the Yellow Power Light is on and the Green permit Light is off.

Cause: The #1 compartment probe is in product.
The #1 compartment probe is defective.
The output signal from TB-2 YEL terminal is faulty.
The wiring between the Control Module and the probes is faulty. The power signal from TB-2 RED is faulty.

Is there product in the #1 compartment?

NO	YES
(OUTPUT POWER TEST) Using the Scully HHC Tester in its DC Volts Mode, measure the voltage across TB-2 RED and BLK terminals. *Using a voltmeter in its DC Volt scale, measure the voltage across TB-2 RED and BLK terminals.*	System is operating properly.

Does the HHC Tester read between 8 - 16 volts DC?

Does the voltmeter read between 8 - 16 Volts DC?

NO	YES
Disconnect the Red wire from the TB-2 RED terminal.	Proceed to 5a, the output pulse tests.

Using the Scully HHC Tester in DC Volts Mode, measure the voltage across TB-2 RED and BLK terminals.

Using a voltmeter in its DC Volt scale, measure the voltage across TB-2 RED and BLK terminals.

Does the HHC Tester read between 8 - 16 Volts DC?

Does the voltmeter read between 8 - 16 Volts DC?

YES	NO
On top of the vehicle, disconnect all the Red Probe Leads.	The Control Module must be replaced.

Connect the Red wire to the TB-2 RED terminal. Using the Scully HHC Tester in DC Volts Mode, measure the voltage across TB-2 RED and BLK terminals.

Using a voltmeter in DC Volt scale, measure the voltage across TB-2 RED and BLK terminals.

Does the HHC Tester read between 8 - 16 Volts DC?

Does the voltmeter read between 8 - 16 Volts DC?

YES	NO
One of the probes is defective.	A short exists in the wiring between the Control Module and the probes. Repair or replace as necessary.

On top of the vehicle, connect the Red Probe Leads one at a time. Each time a Red Probe Lead is connected, test across the Red and Black Probe Lead connections with the HHC Tester in DC Volts Mode for a reading of between 8 - 16 volts.

On top of the vehicle, connect the Red Probe Leads one at a time. Each time a Red Probe Lead is connected, test across the Red and Black Probe Lead connections with the voltmeter on its DC Volts scale for a reading of between 8 - 16 Volts DC.

When a Red Probe Lead connection is made, does the HHC Tester read between 8 - 16 Volts DC?

When a Red Probe Lead connection is made, does the voltmeter read between 8 - 16 Volts DC?

YES	NO
Remake the connections and secure as necessary.	The probe that causes the incorrect reading when the Red Lead is connected must be replaced.

Procedure 5a
(Output Pulse Check)

#1 Red Indicator Light is on, Yellow Power Light is on and the Green Permit Light is off. Output power section checks, OK.

Using the Scully HHC Tester in Pulse Check Mode, test across the YEL and BLK terminals of TB-2 for full scale deflection.

Using a voltmeter set on its AC Volts scale, test across the YEL and BLK terminals of TB-2 for a reading of .2 - .5 Volts AC.

Does the HHC Tester fully deflect?

Does the voltmeter read between .2 - .5 Volts AC?

NO	YES
Disconnect the Yellow wire from the YEL TB-2 terminal.	Proceed to 5b, the yellow probe lead test.

Re-test across the YEL and BLK terminals of TB-2.

Does the HHC Tester fully deflect?

Does the voltmeter read between .2 - .5 Volts AC?

YES	NO
Connect the Yellow wire to the TB-2 YEL terminal.	The Control Module must be replaced.

Procedure 5b
(Yellow Probe Lead Test)

On top of the vehicle, at compartment #1, disconnect the Yellow wire from the Yellow Probe Lead. Using the Scully HHC Tester in its Pulse Check Mode, test across the Yellow wire and the Black Probe Lead for full scale deflection.

On top of the vehicle, at compartment #1, disconnect the Yellow wire from the Yellow Probe Lead. Using a voltmeter set on its AC Volts scale, test across the Yellow wire and the Black Probe Lead for a reading of .2 - .5 Volts AC.

Does the HHC Tester fully deflect?

Does the voltmeter read between .2 - .5 AC Volts?

YES	NO
Connect the Yellow wire to the #1compartment Yellow Probe Lead.	A fault exists between TB-2 of the Control Module and the first compartment probe. Repair or replace the wiring as needed.

Using the Scully HHC Tester in its Pulse Check Mode, test across the Yellow and the Black Probe Leads for full scale deflection.

Using a voltmeter set on its AC Volts scale, test across the Yellow and the Black Probe Leads for a reading of .2 - .5 Volts AC.

Does the HHC Tester fully deflect?

Does the voltmeter read between .2 - .5 AC Volts?

YES	NO
Check the status of the Red Indicator Lights. Re-test system against status of Control Module Indicators.	The first compartment probe must be replaced.

Procedure 6

Problem: Power Light is on, Permit Light is off and a Red Indicator Light, other than #1, showing a faulty probe is on.

Causes: Power (Red wire) to probe is faulty.
Signal from previous probe is faulty.
Wiring from previous probe is faulty.
Probe is immersed in product.

Does the vehicle have product in the indicated compartment?

NO	YES
Using the Scully HHC Tester in DC Volt Mode, check across the indicated compartment's Red and Black Probe Leads for a reading between 8 - 16 Volts DC. *Using the voltmeter in its DC Volt scale and read across the indicated compartment's Red and Black Probe Leads for a reading between 8 - 16 Volts DC.*	System is indicating properly.

Does the HHC Tester read between 8 - 16 Volts DC?

Does the voltmeter read between 8 - 16 Volts DC?

YES	NO
Using the Scully HHC Tester in Pulse Check Mode, test across the Yellow and the Black Probe Leads of the indicated probe for full scale deflection. *Using a voltmeter set on its AC Volts scale, test across the Yellow and the Black Probe Leads of the indicated probe for a reading of .5 - 2.0 AC Volts.*	A fault exists in the Red wire. Repair or replace as necessary and re-test.

Does the HHC Tester fully deflect?

Does the voltmeter read between .5 - 2.0 AC Volts?

YES	NO
Using the Scully HHC Tester in Pulse Check Mode, test across the Orange and Black Probe Leads of the indicated compartment probe for full scale deflection. *Using a voltmeter set on its AC Volt test across the Orange and the Black Probe Leads of the indicated compartment probe for a reading of between .5 - 2.0 Volts AC.*	Using the Scully HHC Tester in Pulse Check Mode, test across the Orange and the Black Probe Leads of the previous compartment probe full scale deflection. *Using a voltmeter set on its AC Volts scale, test across the Orange and the scale, Black Probe Leads of the previous compartment probe for a reading of between .5 - 2.0 AC Volts.*

If YES, Does the HHC Tester fully deflect?

Does the voltmeter read between .5 - 2.0 Volts AC?

YES	NO
The Red Indicator Lights are not registering properly and the fault exists at another probe Test the remaining probes using Trouble shooting Procedure #6.	The indicated probe must be replaced.

If YES, Does the HHC Tester fully deflect?

Does the voltmeter read between .5 - 2.0 Volts AC?

NO	YES
A fault in the wiring connection exists between the indicated probe and the previous probe. Repair or replace as necessary.	Disconnect the Orange wire from the Orange Probe Lead. And re-test using the above procedure.

Does the HHC Tester fully deflect?

Does the voltmeter read between .5 - 2.0 Volts AC?

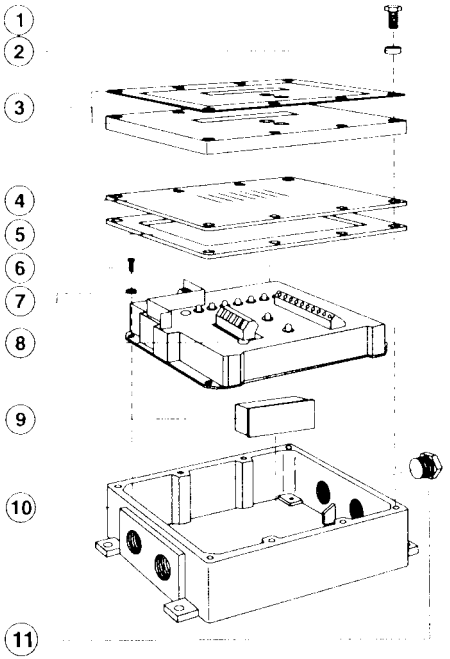
YES	NO
A fault in the wiring connection exists between the indicated probe and the previous probe. Repair or replace as necessary.	The previous probe must be replaced.

Call the Technical Service Department at 1-800-272-8559 for questions concerning further troubleshooting of the system.

8.1 Load Anywhere Control Monitor

Load Anywhere Control Monitor Part # 08687

	Part #	Description	Qty
	08712	Complete Cover Assembly, Includes (1)(2)(3)(4)(5)	1
(1)	50132	Cover Bolts, Stainless	8
(2)	51229	Nylon Washers	8
(3)	N/A	Cover and label assembly	1
(4)	31350	Indicator Cover, Plastic	1
(5)	22027	Cover Gasket	1
(6)	50545	Mounting Screw, Stainless	1
(7)	51101	Lock Washer, Stainless	4
(8)	08563	Load Anywhere Control Module Includes (5)(6)(7)(9)	4
(9)	21733	Corrosion Capsule	1
(10)	31439	Housing Only	1
(11)	50740	1/2"NPT Pipe Plug	1

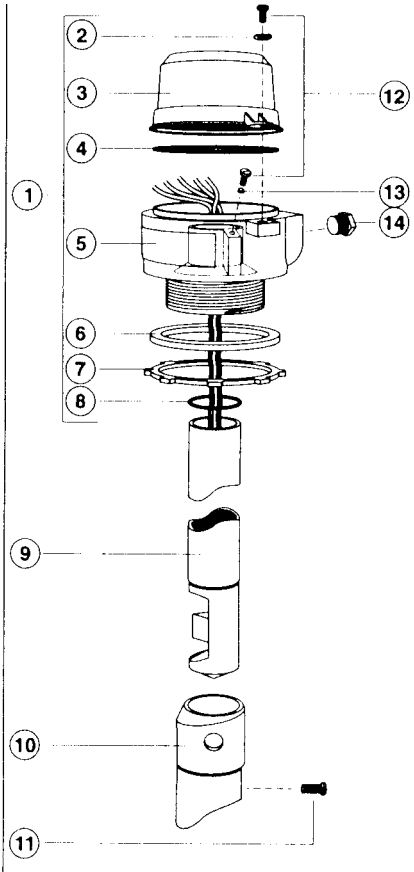


61183, REV B

8.2 SP-FU/MHC Optic Probe

SP-FU/MHC Optic Probe
Part # 07894, 08698

	Part #	Description	Qty
(1)	21715	Holder Assembly, Includes (2) (3) (4) (5) (6) (7) (8) (12) (13) (14)	1
(2)	51122	Lock Washer, Stainless	2
(3)	20888	Standard Height Cap	1
(4)	20766	Cover O-Ring	1
(5)	20889	Probe Holder Housing	1
(6)	20893	Gasket for Holder	1
(7)	57044	2" Nut for Holder	1
(8)	08577	Shaft O-Ring	1
(9)	21500 08758	Optic Probe Only (7" length) Optic Probe Only (12" length)	1
(10)	08334	Prism Protector Kit, Includes (11)	1
(11)	57052	Bonding Screw	1
(12)	50571	Screw, Stainless	3
(13)	N/A	Nylon Slug	1
(14)	50740	Base 1/2" NPT Pipe Plug	1



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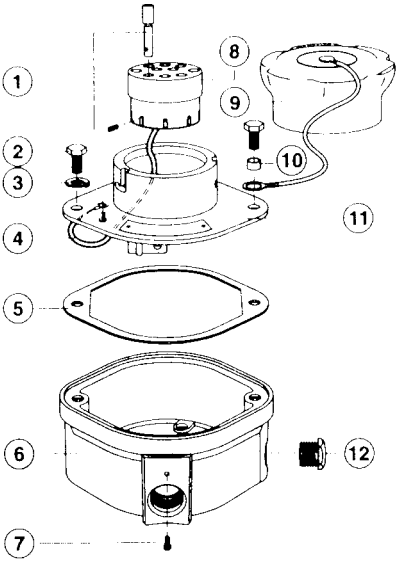
8.3 SJ-6SO Optic Socket

SJ-6SO Optic Socket
Part # 07973

	Part #	Description	Qty
	21576	Complete Faceplate Assembly, Includes (4) (8) (11)	1
(1)	07783	Single Pin and Screw	1
(2)	50141	Faceplate Bolt	2
(3)	51116	Lock Washer	1
(4)	N/A	Ground Wire	1
(5)	20628	Housing Gasket	1
(6)	21810	Housing Only	1
(7)	50513	Drain Hole Screw	1
(8)	21771	Contact Assembly (w/ 6 pins and screws)	1
(9)	08575	Blue Vinyl Cap	1
	08571	Blue Metal Cap (not shown)	1
(10)	N/A	Cap Cable Bushing (Included with (9))	1
(11)	08515	Faceplate and Label, Less Contact Assembly	1
(12)	50740	1/2" NPT Pipe Plug	1



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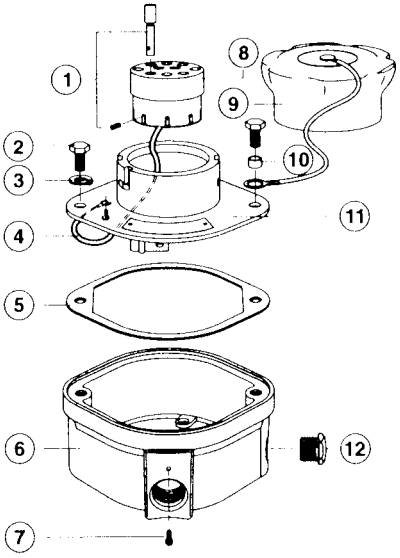
8.4 SJ-6W Optic Socket

SJ-6W Optic Socket
Part # 07974

	Part #	Description	Qty
	21790	Complete Faceplate Assembly, Includes (4) (8) (11)	1
(1)	07783	Single Pin and Screw	1
(2)	50141	Faceplate Bolt	2
(3)	51116	Lock Washer	1
(4)	N/A	Ground Wire	1
(5)	20628	Housing Gasket	1
(6)	21810	Housing Only	1
(7)	50513	Drain Hole Screw	1
(8)	21771	Contact Assembly (w/6 pins), Includes (1)	1
(9)	08575	Blue Vinyl Cap	1
	08572	Blue Metal Cap (not shown)	1
(10)	N/A	Cap Cable Bushing (Included with (9))	1
(11)	08510	Faceplate and Label, Less Contact Assembly	1
(12)	50740	1/2" NPT Pipe Plug	1



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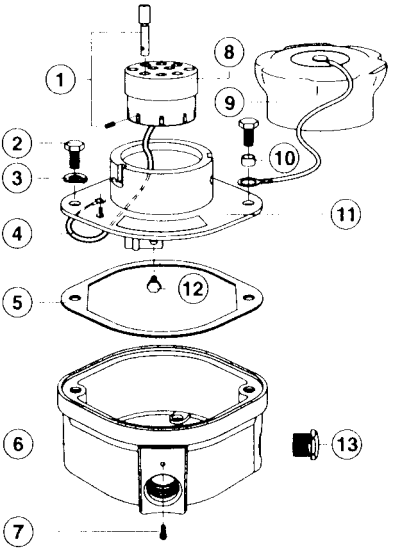
8.5 SJ-6S Thermistor Socket

SJ-6S Thermistor Socket Part # 07720

	Part #	Description	Qty
	20770	Complete Faceplate Assembly, Includes (4) (8) (11)	1
(1)	07783	Single Pin and Screw	1
(2)	50141	Faceplate Bolt	2
(3)	51116	Lock Washer	1
(4)	N/A	Ground Wire	1
(5)	20628	Housing Gasket	1
(6)	21810	Housing Only	1
(7)	50513	Drain Hole Screw	1
(8)	20757	Contact Assembly w/ 8 pins and screws)	1
(9)	08574	Green Vinyl Cap	1
	08570	Green Metal Cap (not shown)	1
(10)	N/A	Cap Cable Bushing (Included with (9))	1
(11)	08516	Faceplate and Label, Less Contact Assembly	1
(12)	50130	Dummy Element Mounting Bolt	1
(13)	50740	1/2" NPT Pipe Plug	1



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Chapter 9 Return Policy & Warranty

9.1 Return Policy

No material may be returned to Scully without a Returned Material Authorization (RMA) number which is issued by the Customer Service. This authorization can be obtained by written or verbal request and is subject to restocking charges. Return freight must be prepaid by the shipper. Unauthorized returns will be held at the customer's expense. **All returns must have the Scully issued RMA number on or near the shipping label.**

9.2 Warranty Coverage

Scully warrants electronic controls, electronic truck equipment including On-Board modules, optic probes and thermistor probes manufactured by Scully to be free from defects in material or workmanship under normal use and service for a period of two years from the date of installation. All peripheral equipment; such as plugs, cables and sockets, manufactured by Scully is warranted under normal use for 90 days after installation but no longer than 120 days from date of shipment by Scully. Purchaser's sole remedy for Scully products which are defective in material or workmanship shall be repair or replacement at Scully's discretion.

9.3 Warranty Limitation

This warranty is the only warranty, expressed or implied, upon which products are sold by Scully, and Scully makes no warranty of merchantability or of fitness for any particular purpose in respect to the products sold by it. This warranty shall not apply to any defects or other damages to any products caused by or resulting from misuse or negligence, and this warranty shall not apply if any alteration to any product is made by anyone other than Scully - or if it has been re-used or re-installed without consultation with Scully. Scully shall not in any case be liable for labor charges for indirect, special or consequential damages. Warranty repair or replacement shall be at the sole discretion of Scully.

Scully Signal Company, 70 Industrial Way, Wilmington, MA 01887
Tel (617)692-8600, Fax (617)692-8620