

Series 1500 SELECTRONIC® Micro-Controller Installation and Operation Manual

S15-95102N
Revised 2-97
Section 50
00-02-0229



Please read the following information before installing. This installation information is intended for all Series 1500 systems. A visual inspection of this product before mounting for any damage during shipping is recommended.

GENERAL INFORMATION

WARNING

BEFORE BEGINNING INSTALLATION OF THIS MURPHY PRODUCT

- ✓ Disconnect all electrical power to the machine.
- ✓ Make sure the machine cannot operate during installation.
- ✓ Follow all safety warnings of the machine manufacturer.
- ✓ Read and follow all installation instructions.



Description

The S1500 is a microprocessor based alarm and shutdown system. It tells in alphanumeric characters which protective device has signaled an alarm or caused equipment shutdown. Basic configuration for each application is completed at Murphy and can be changed in the field.

The basic system consists of (1) the module, (2) a 32 position, rail mount type terminal block, (3) a 36 inch (914 mm) flat ribbon cable for connection of the terminal block to the monitor, and (4) a power supply which includes the control Inputs/Outputs and an intrinsically safe barrier with cable assembly.

The S1500 system is powered from 120 VAC or 24 VDC. A rechargeable battery pack, within the power supply, is included as backup power.

S1500 Module

The module is the brain of the micro-controller system. It contains a microcomputer, an alphanumeric display, and a keypad for operator access to field adjustable functions.

Alphanumeric Display

The S1500 module displays each mode of operation. The display is a dot matrix alphanumeric 32-character display arranged in two lines (each line with 16 characters). By observing the monitor the operator can determine the operating status of the control system.

Power Supply

An explosion-proof enclosure designed for Class I, Division 1, Group D hazardous locations (CSA NRTL/C approved.) contains the supply voltage conditioning circuits, battery charger, module power supply, backup batteries and the intrinsically safe barriers for isolation between the power supply and the low energy module circuits. Power supply accepts 120 VAC, 50-60 Hz and/or 24 VDC input power. 24 VDC power can be used as primary power or as a backup source of power when 120 VAC is used.

Suitable for Class I, Division 1,
Groups C and D, Hazardous Locations.

Control Relays

The power supply has four control relays to provide form "C" SPDT outputs. The output relay functions are determined by the user's configuration. Relays can be configured as: Motor, Fuel, Ignition, Lube, Alarm, Load, and Crank.

Sensor Input Terminal Block

Sensor input terminal block consists of a 64-position, 32 pair input rail-mount terminal block for interface of panel or field-mounted end devices. End devices can be mechanical switches or energy storing devices (such as dry relay contacts) but only when used with intrinsically safe approved barriers. The terminal block can be used for Normally Open sensors (one wire), and/or Normally Closed sensors (two wires).

Ribbon Cable

A 36 in. (914 mm) flat ribbon cable is supplied for connection of the S1500 module and the sensor input terminal block. A connector (37 PIN D-sub type) is included at each end of the cable.

Power and Control Cable

The S1500 module is connected to the power supply via a 15-conductor shielded cable (Power and Control cable). The cable is factory-sealed on the power supply end, and has a 15-pin D-sub miniature connector on the monitor end. Outputs from the module are transmitted to control relay drivers in the power supply.

Backup Power (Battery Pack)

The backup power is provided by a 12 VDC, 600 MAh rechargeable Ni-cad battery pack. A temperature compensated, constant current battery charger maintains full charge on the battery pack when primary power is on. If the battery is fully discharged when primary power is turned on, it will take approximately 24 hours to bring batteries up to full charge. At full charge the battery pack will maintain operation of the S1500 system for approximately 5 hours after primary power failure. The battery output is regulated to 6 VDC for the monitor supply voltage.

Sensor Inputs

User-selectable Sensor Input types (Shutdown or Alarm Only) are available for each sensor. The sensor inputs are identified as follows:

- Class A:** Inputs are operative (armed) all the time.
- Class B1:** Inputs are enabled after the first preset Start-Run time period.
- Class B2:** Inputs are enabled after the second preset Start-Run time period.
- Class C:** Inputs are armed after a fault has been cleared for 0.5 seconds.
- Class P:** Armed after compressor is loaded and process timer has expired.
- Class ESD:** Emergency shutdown overrides the Test lockout timer.

Permissive Function

(Only available when Logic Mode is configured for Pre/Postlube)

This function was designed to monitor prelube pressure input. Terminal 32 of the sensor terminal block is reserved for a permissive prelube input. The pressure signal can be obtained from a pressure switch with normally open or normally closed contacts that indicates when sufficient oil pressure has been reached during prelube. If permissive pressure has not been reached, the system will not allow start-up.

NOTE: To bypass this feature, install jumper at sensor input terminal 32.

Opto-Isolated Input

The Opto-isolated input is a special input in the explosion-proof power supply which can be preprogrammed as Ignition or Motor Auxiliary.

Built in Barrier (within the Power Supply)

The S1500 power supply circuit is isolated from the module by an intrinsically safe barrier located between the output and the Power and Control Cable terminal block.

The power output to the module is isolated by a FB (fuse barrier) mounted inside the power supply. The four (4) control outputs from the S1500 module are isolated by zener diode shunt barriers.

Tachometer

This optional feature of the S1500 system keeps record of engine RPM and also monitor engine Ovespeed, Underspeed and Crank Disconnect.

Hourmeter

An hourmeter feature is available for the S1500 system to record the engine or motor elapsed running time.

NOTE: To make a selection for channel configuration, output relay options, opto-isolator option, and to assist you with your selection, just give us a call (for phone and fax numbers see page 12). Also refer to our sales bulletin no. S15-95063B.

SPECIFICATIONS

Power Consumption: 120 VAC (8 watts); 24 VDC (7.2 watts).

Sensor Inputs: 32 N.O. and/or N.C., such as Murphy SWICHGAGE® instruments. Inputs are user-selectable as Class A, B, C, P or ESD for shutdown, alarm, control function, and emergency shutdown.

Opto-Isolated Input: 120 VDC or 24-120 VAC, the opto-isolated input is used as a run input or ignition.

Outputs: 4-SPDT relays, 4 A, 1/20 HP, 125/250 VAC/3A, 30 VDC.

NOTE: An isolation barrier (such as Murphy's LCDT-ISB for Normally Open sensors or other approved barrier) must be used between the sensor switch and input terminals if the sensor output comes from any energy storing device such as a relay or transistor.

Timers: 12 adjustable timers for:

- Start-up lockouts (2)
- Test
- Prelube
- Postlube
- Load delay
- Idle
- Crank
- Rest
- Run delay
- Process delay
- Ignition ground

Sensor Input Terminal Block: 32 positions; Rail mount DIN type.

Backup Power Battery Pack: Rechargeable during normal operation.

Provides up to 5 hours backup power.

Tachometer Sensing: From either Ignition or Magnetic Pickup.

Operating Temperatures: 32 to 122°F (0 to 50°C).

Storage Temperatures: -4 to 158°F (-20 to 70°C).

Case: ABS plastic, 1/4 DIN (90 x 90 mm).

Interface Output: RS232 communication port.

Alphanumeric Display: 2 lines, each line with 16 characters (32 total).

Laboratory Approvals: The S1500 system is CSA and NRTL/C approved for Class I, Division 1, Groups C and D, hazardous locations.

Power Supply Enclosure: Explosion-proof, Class I, Division 1. Intrinsically safe barrier built into power supply, 120 VAC and 24 VDC power supply barrier with dry contact relay functions such as:

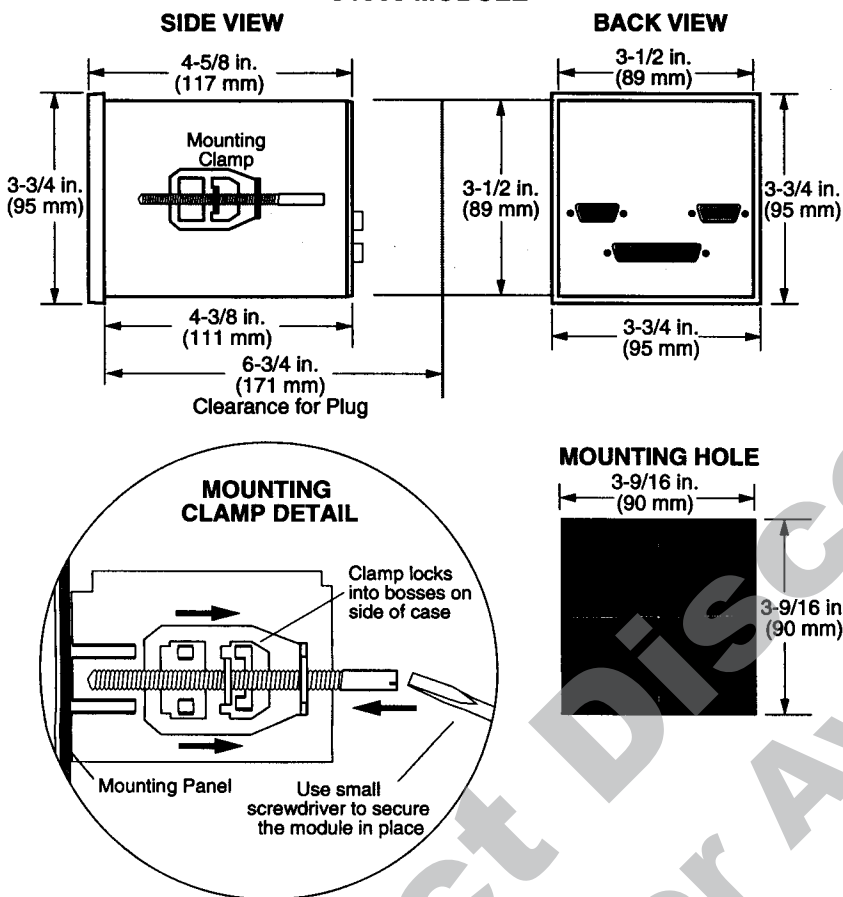
- Fuel valve
- Alarm
- Shutdown
- Ignition
- Control (Pre/Postlube)
- Compressor Loading
- Engine Cranking

MOUNTING SCHEMATIC

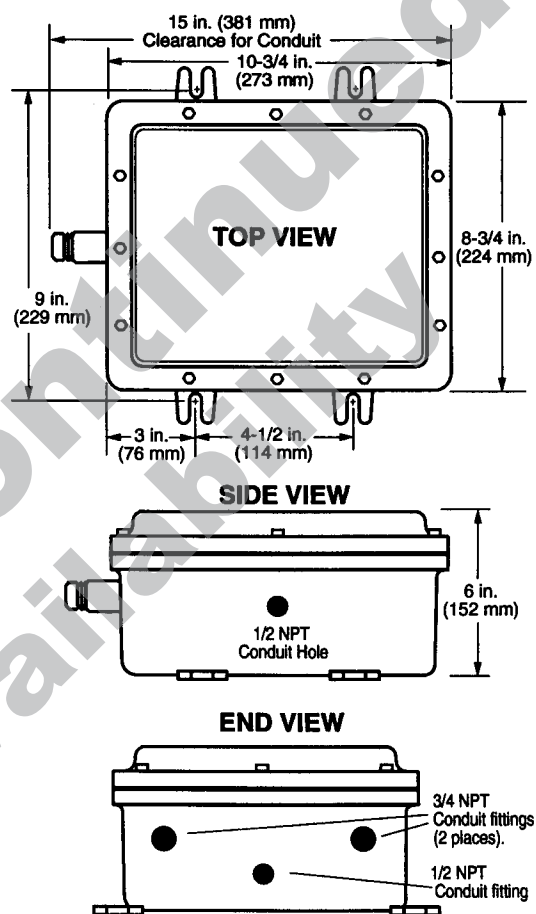


WARNING: BEFORE MOUNTING YOUR \$1500 SYSTEM TURN THE POWER SOURCE OFF AND STOP YOUR ENGINE OR MOTOR. THE \$1500 MODULE MUST BE MOUNTED IN A FLAT PANEL WITHIN A WEATHERPROOF ENCLOSURE.

\$1500 MODULE

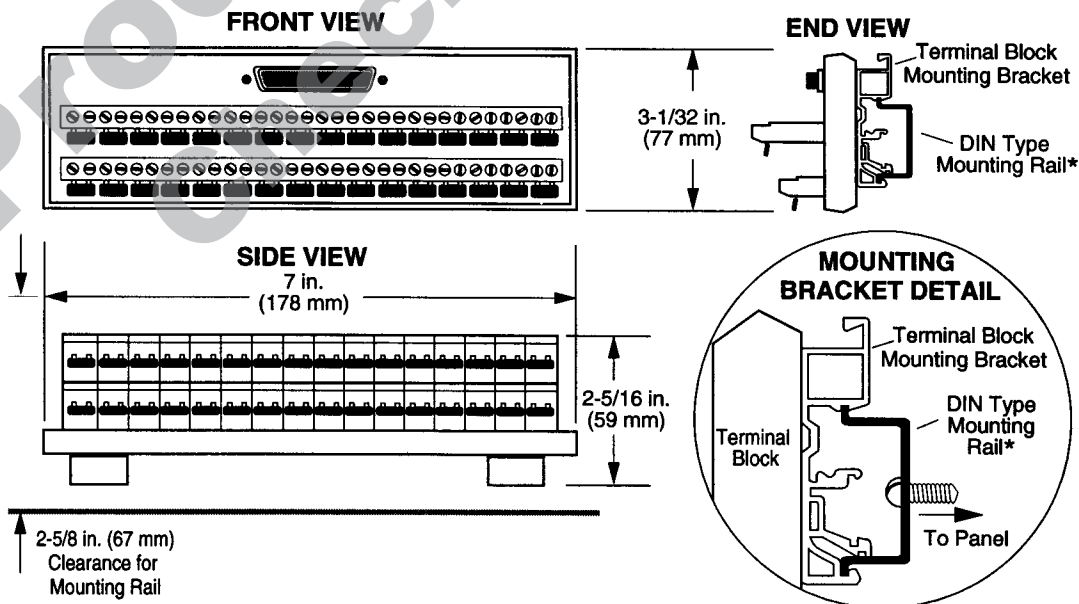


POWER SUPPLY BOX



TERMINAL BLOCK (rail mount)

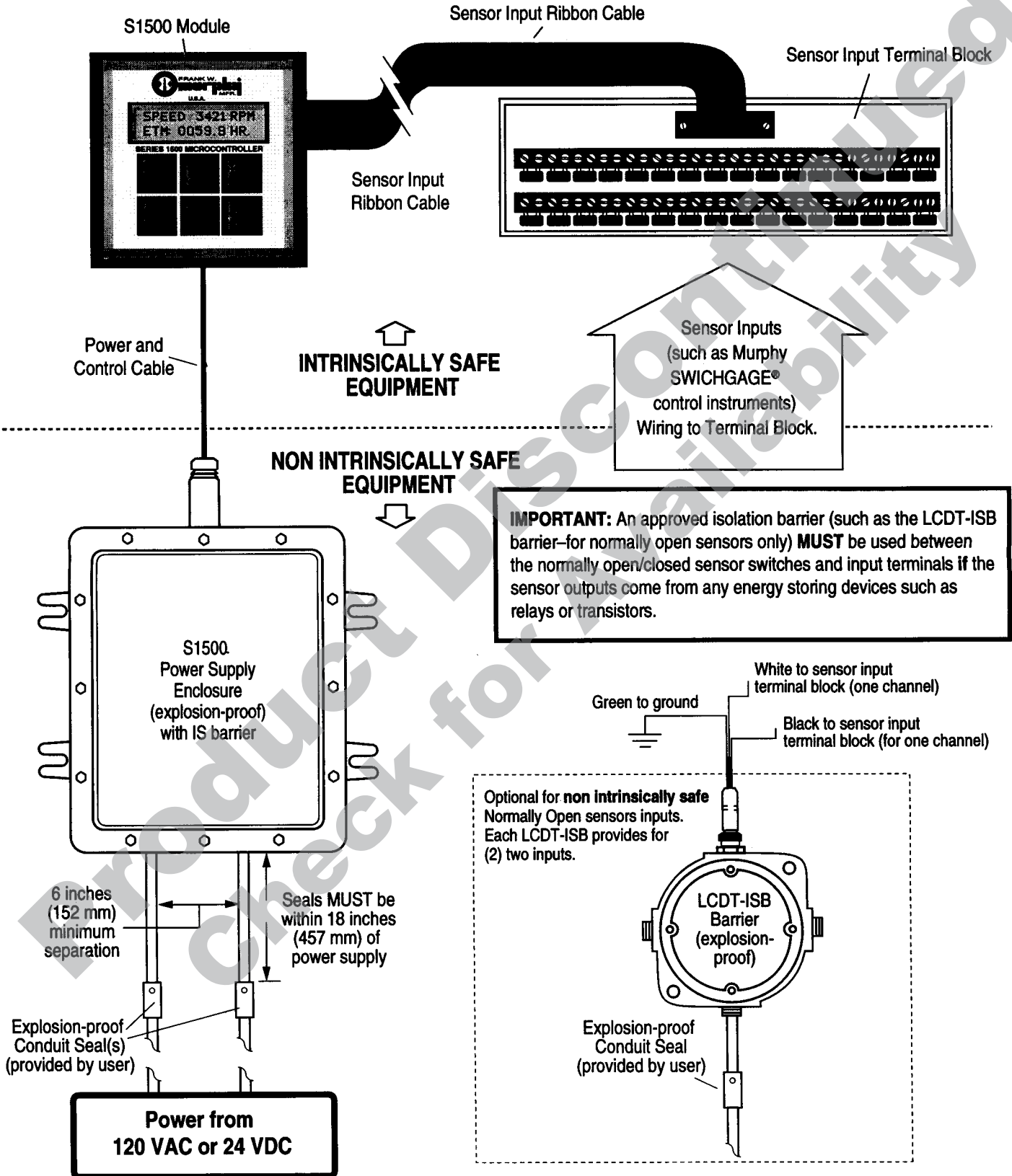
* The terminal block has (2) two rail mount clamps for easy panel mounting. Mounting rail is customer supplied.
 Standard DIN mounting rail models: DIN 46277, EN50035, and EN50022 zinc-plated steel are recommended.
 The recommended length for the mounting rail is 7 inches (178 mm) minimum.



HAZARDOUS AREAS INSTALLATION



WARNING: FOR HAZARDOUS APPLICATION REQUIREMENTS, S1500 COMPLETE SYSTEM MUST BE INSTALLED IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE (NEC) CLASS I, DIV 1, GRPS. C & D (ARTICLE 504) SPECIFICATIONS.



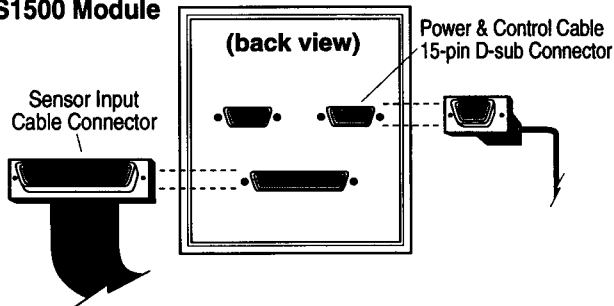


WARNING: PERFORM THE WIRING OPERATION WITH THE POWER SOURCE "OFF" AND THE AREA MADE NON-HAZARDOUS. MAKE SURE THE VOLTAGE AND CURRENT REQUIREMENTS ARE WITHIN THE S1500 SYSTEM RATINGS. CONDUIT IS REQUIRED TO PROTECT WIRES FROM DAMAGE. REFER TO THE SPECIFIC SYSTEM APPLICATION WIRING DIAGRAM SUPPLIED WITH YOUR UNIT.

1. Module Connections

- a. Interconnect the S1500 module and the power supply with the power and control cable and secure the connector in place by tightening the screws on each side of the connector.
- b. Repeat step (a.) for the interface output port (if applicable).
- c. The sensor connector from the terminal block simply plugs into the back of the S1500 module—tighten connector screws.

S1500 Module



2. Typical Power Supply Connections



WARNING: DO NOT ROUTE THE POWER SUPPLY WIRING AND THE SENSOR INPUT LEAD WIRING IN THE SAME CONDUIT.

a. Conduit installation:

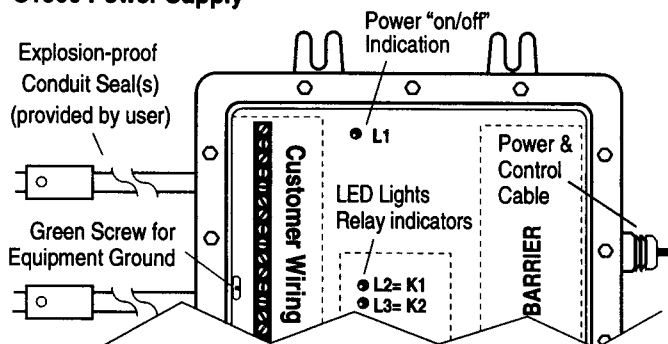
- 1) Remove power before opening power supply cover.
 - 2) Install one 1/2 in. NPT or two 3/4 in. NPT conduits, from customer end of the Power Supply.
- Note: Follow NEC guidelines for maximum number of wires in conduit.*
- 3) Install an approved explosion-proof seal in the conduit within 18 in. (457 mm) of Power Supply enclosure (seal unused conduit holes).

Important: Green screw above conduit hole (power supply) is to attach equipment ground per NEC.

b. Customer Wiring: Install non-intrinsically safe wiring to power supply through conduit installed in "step 2-a".

- 1) Run wiring from the power source to the S1500 power supply.
- 2) Connect the 120 VAC "H" lead to terminal 1 in power supply.
- 3) Connect the 120 VAC "N" lead to terminal 2 in power supply and connect ground to terminal 4, and to equipment ground.
- 4) For 24 VDC systems, connect the "DC(+)" lead to power supply terminal 3. Connect the "DC(-)" lead to power supply terminal 4. (Refer to Power Supply Typical Wiring Diagram, page 6.)

S1500 Power Supply



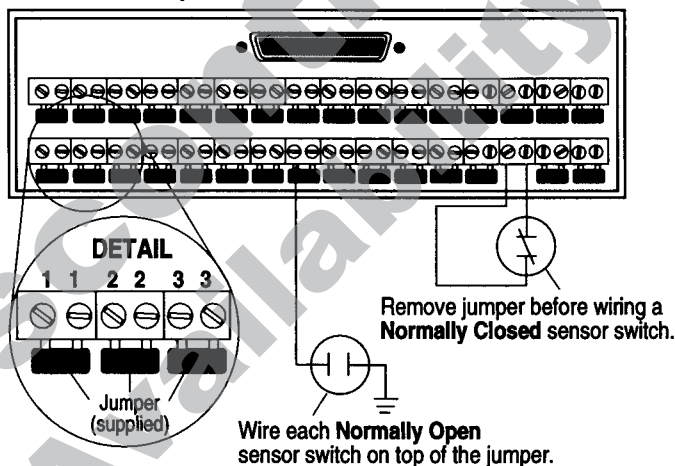
3. Normally Open Sensor Input Wiring

Wire each normally open sensor on top of the factory supplied jumper. Loosen the screw and slide the wire lead into the terminal without removing the jumper (either side of jumper).

4. Normally CLOSED Sensor Input Wiring

Remove the factory-supplied jumper completely. Connect the two wires of the normally closed sensor to the two terminals of the terminal block.

S1500 Sensor Input Terminal Block



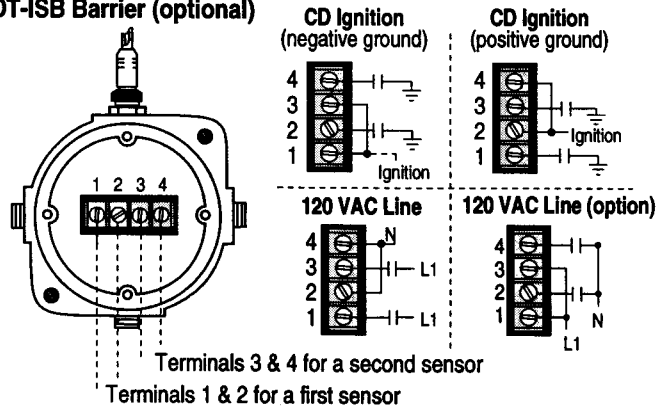
NOTE: All switches connected to terminal block must be dry contact mechanical switches.

5. Intrinsically Safe Barrier Wiring (normally open sensor only)

Important: Secure area of hazardous conditions before opening barrier cover or operating sensor contacts.

- a. Run Sensor switches wiring through conduit and isolate from the S1500 terminal block with an explosion-proof barrier.
- b. For wiring refer to the following typical wiring diagrams.

Normally Open System Barrier LCDT-ISB Barrier (optional)



NOTE: Terminals #1 & #3 must be (+) positive with respect to #2 and #4.

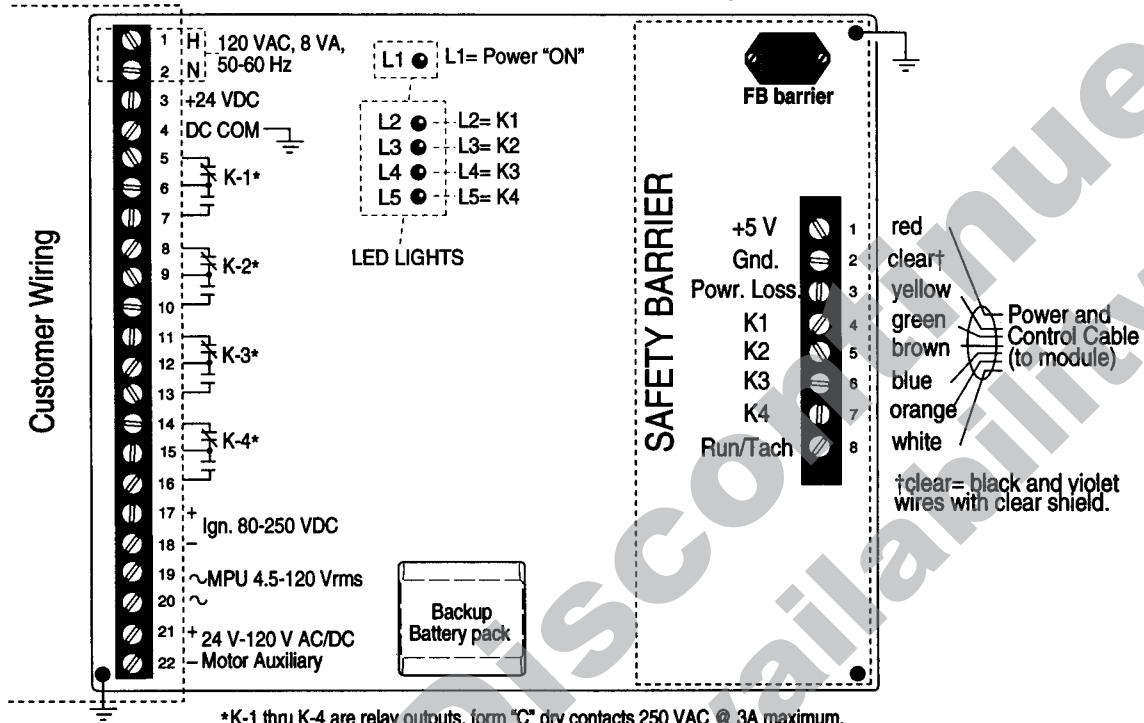
Normally Closed System Barrier

For normally closed non-intrinsically safe sensors, use an approved intrinsically safe barrier, and wire according to manufacturer's instructions.

POWER SUPPLY TYPICAL WIRING DIAGRAM

WARNING: PERFORM THE WIRING OPERATION WITH THE POWER SOURCE "OFF" AND THE AREA MADE NON-HAZARDOUS. MAKE SURE THE VOLTAGE AND CURRENT REQUIREMENTS ARE WITHIN THE S1500 SYSTEM RATINGS. CONDUIT IS REQUIRED TO PROTECT WIRES FROM DAMAGE.

S1500PS (120 VAC, 24 VDC Power Supply)



*K-1 thru K-4 are relay outputs, form "C" dry contacts 250 VAC @ 3A maximum.
 **Optically-isolated input (for run indication) 24-120 VAC maximum.

INTERFACE OPERATION AND SET UP

Operating The S1500 Interface

By using the six membrane keys and the liquid crystal display, you can make changes to the System Set up, Mode, Elapsed Time, Start/Stop, Tach., Crank, Lube, and Timer Set up. You can also scroll throughout the menus. The graphic below shows the display and keys.

- ▲ **YES** key is used for scrolling up (increment)
- ▼ **NO** key is used for scrolling down (decrement)
- **RESET** key is used to reset alarms or shutdowns
- **MODE** key is used for mode and test timer functions
- **START/STOP** key is used for automatic start and stop
- **ENTER** key is for entering and confirming set points and exiting menus

System Set Up Screens

While the S1500 waits on Valid Start, you may enter the SYSTEM SET UP screens:

Timer Set Up

This Set up Screen allows you to preset all available timers. The timers available are determined by the Logic Mode selected in the Logic Mode Set up.

Crank Set Up

This Set up allows you to set Crank Attempts, Crank Period, and Rest Period.

Tach Set Up

This Set up Screen allows you to calibrate the optional internal tachometer with pulses per revolution and set the Overspeed, Underspeed and Crank Disconnect set points.

Sensor Set Up

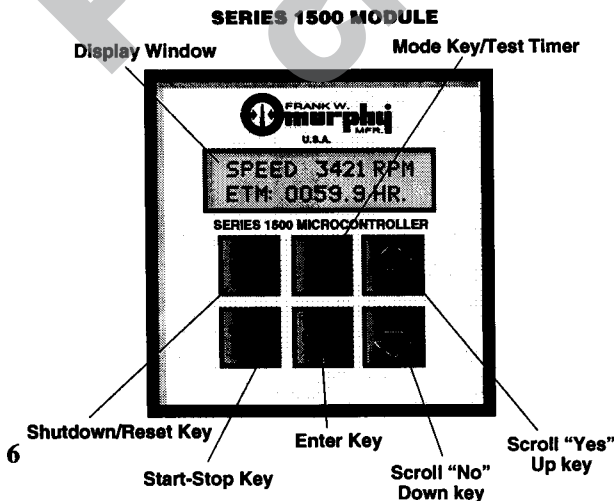
This Set up Screen allows you to acknowledge shutdown messages and to edit the input Sensor Class (A,B1, B2, C, P or ESD) and Action (Alarm Only or Shutdown).

Advanced Set Ups (password protected screens)

The following Set Ups are available only under the ADVANCED SETUP mode.

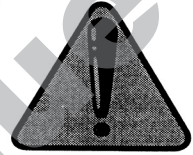
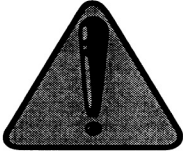
ETM Set Up

This Set up Screen allows you to preset the Elapsed Time Meter (ETM).



CONFIDENTIAL

SECURITY PASSWORD INFORMATION



MURPHY has made efforts to ensure the reliability of the S1500 Systems. Please note that the S1500 Advanced Set Ups are critical operating parameters. These Set ups contain information that only qualified personnel should be allowed to access. Items set improperly within these parameters can cause serious damage to the S1500 and to your equipment. Access to the Set ups is password protected. Please keep this password code away from unauthorized personnel.

Password code = WHAT

Read all instructions before attempting to edit the S1500 Advanced Set ups, and make sure that the whole system is correctly installed. Please contact Murphy if you have any questions.

Modifying Current Timer Set Up

There are a number of Timers the S1500 uses to carry out its functionality. Most of these can be preset to the user's desired time. While in System Set up, press

■ **MODE** until the following screen appears:

TIMER SETUP
ENTER TO MODIFY

To modify the current Timer Setup, press the ENTER key. The S1500 will prompt the user for the desired Class-B Time. This timer locks out Sensor Inputs configured as Class-B. The minutes of the current setting will be blinking, i.e.

TIMER SETUP
CLASS-B 5:00

Press ▲ **YES** or ▼ **NO** keys to increase or decrease the time. Press ■ **ENTER** to accept and save.

Repeat this procedure to preset all available timers. Timers availability is determined by the Mode selected. Timers are listed as follows:

Class-B1 Timer

Available in ALL Modes. This timer locks out Sensor Inputs configured as Class-B1.

Class-B2 Timer

Available in ALL Modes. This timer locks out Sensor Inputs configured as Class-B2.

Run Delay

This delay locks out the "Failure to Start" shutdown in both, the Engine Mode and the Motor Mode.

Warmup Timer

Available only in Engine Modes. The Underspeed Setpoint is not monitored until after this delay.

Ignition Ground Delay Timer

Available only in Engine Modes. This is the delay between tripping the Fuel Valve and grounding the ignition upon shutdown.

Load Delay Timer

Available only in Modes with Compressor Loading as an option. This is the delay on startup before loading the compressor.

Process Delay Timer

Available only in Modes with Compressor Loading as an option. This is the delay after loading the compressor that lock out Sensor Inputs configured as Class-P. (i.e. Low Interstage Pressures).

Idle/Run Unload Timer (with Compressor Loading mode only).

This is the time a unit is allowed to run unloaded without seeing a Start Pressure before shutting down.

Prelube Timer

During a Prelube cycle—this is the time for which the Lube relay will be picked up (regardless of the Prelube Permissive input). For example, if the Prelube timer is set for 1 minute, the Lube relay will be picked up for one minute even if the Prelube Permissive input is satisfied. This timer occurs before the Permissive Timer.

Permissive Timer

During the Prelube cycle, this is the preset time by which the Prelube Permissive input must be satisfied. Example, if the Prelube Permissive input is not satisfied when this timer expires, a Prelube Permissive failure shuts down. This timer occurs after Prelube Timer.

NOTE: If a Logic Mode with Pre/Postlube Logic Mode is chosen, terminal 32 is dedicated for the Permissive Pressure Input. To bypass this function, install a jumper at terminal 32.

Postlube Timer

This is the time at which the Lube relay will be de-energized. For example, if the Postlube timer is set for 5 minute, the Lube relay de-energizes after this period of time.

Test Timer

The TEST TIMER allows you to test sensor inputs without operating the shutdown device. Also allows you to test timer input wiring to the S1500 terminal block.

NOTE: Sensor Inputs configured as ESD inputs will override the Test Timer function and cause a shutdown.

While in the Run Mode, press ■ **MODE**, the display will read:

TEST TIMER

Press ■ **ENTER** to Modify.

Press ■ **ENTER** to initiate the Test Timer or press ■ **MODE** to exit.

If ■ **ENTER** is pressed, the Test Time remaining will be displayed:

TEST TIMER
TEST TIMER 5:00

To test an input, simulate a fault at the device, and the corresponding Shutdown Message will appear on the display, i.e.

LOW OIL
PRESSURE (01)

Press ■ **RESET** to clear the display and reset the Test Time to 5:00.

To exit Test Timer mode press ■ **MODE** or allow the Test Timer to expire.

Modifying Current Crank Set Up

If an Engine Mode with Cranking was chosen in the Mode Set up, the Crank Set up screen will be available. The Crank Set up screen allows the user to set up the S1500's Engine Cranking function. While in System Set up, press ■ **MODE** until following screen appears:

Crank Disconnect -Crank Attempts -Purge Period -Crank Period -Rest Period

CRANK SETUP
ENTER TO MODIFY

To modify the current Tach Setup, press ■ **ENTER**. The S1500 will prompt you for the number of Crank Attempts before Overcrank.

CRANK SETUP
ATTEMPTS 6

Use the ▲ **YES** or ▼ **NO** keys to set the Crank Attempts to the desired value.

Press ■ **ENTER** to save. Next, enter the desired Purge Period. This is the period for which the engine will be cranked with Ignition Grounded and Fuel Valve shut off.

CRANK SETUP
PURGE :6

Use the ▲ **YES** or ▼ **NO** keys to set the Purge Period to the desired value. Press to save. Next the user is now prompted to enter the desired Crank Period.

CRANK SETUP
PERIOD :30

Use the ▲ **YES** or ▼ **NO** keys to set the Crank Period to the desired value.

Press ■ **ENTER** to save. Now set the desired value for the Rest Period.

CRANK SETUP
REST :30

Use the ▲ **YES** or ▼ **NO** keys to set the Rest Period to the desired value. Press ■ **ENTER** to save.

Modifying The Current Sensor Set Up (Optional)

This screen allows you to edit the Class Type and Function for each Sensor Input. Class Type designates when Sensor Input is to be monitored, while Action describes whether the input is to sound an alarm only or shut down the unit. The Class and Types are listed as follows:

Class-A: Armed at all times for alarm or shutdown

Class-B1: Locked out by first lockout timer (first Start/Run timer)

Class-B2: Locked out by second lockout timer (second Start/Run timer)

Class-C: Armed after fault condition has been cleared for 2 seconds

Class-P: Locked out by the Compressor Load timer—after the compressor is loaded, and the Process Timer has expired.

ESD: Overrides the Test lockout timer (for Remote/Emergency stop input)

SD: Upon reaching a fault condition, the unit is shutdown, and alarm is sounded.

AL: Sensor input is an Alarm only, it is not a shutdown. Upon receiving a fault condition, the corresponding shutdown message is annunciated. Additionally, if a Logic Mode with an Alarm Relay Output is chosen, the Alarm Relay will drop out sounding the alarm. The alarm can be silenced pressing by **RESET**.

To modify the current sensor set up, proceed as follows: While in System Setup, press **MODE** until the following screen appears:

SENSOR SET UP ENTER TO MODIFY

Both the Shutdown Message, as well as the Sensor Class Type, corresponding to each sensor input may be edited. To modify the current Sensor Setup, press the **ENTER** key, for example:

SENSOR SET UP MODIFY INPUT # 0

Use the **YES** or **NO** keys to select the desired input. When the desired message number is selected, press **ENTER** to modify the message, for example:

LOW OIL PRESSURE

With the first character blinking, you may change the character by pressing the **YES** or **NO** keys to scroll through available characters. Press **MODE** to move forward on character, or **RESET** to move backward. Once the Shutdown Message modification is completed, press **ENTER** to save the new message. The Sensor Class Type and Function will now be displayed, for example:

SHUTDOWN TYPE... CLASS A SHUTDOWN

To change the Class Type and Function, use the **YES** or **NO** keys until the desired combination of Class and Function is reached. Press the **ENTER** key to save and return to the "Sensor Setup" screen.

Repeat as above for all Sensor Inputs and Messages to be edited.

The Advanced Set ups

Entering the Password

The first screen seen under the Advanced Set ups will be the following:

ADVANCED SETUP PASSWORD: XXXX

The first "X" will be blinking, to enter the password, use the **YES** or **NO** keys to scroll through the characters. Press **RESET** and **MODE** to scroll between characters. When the correct password is entered, press **ENTER** to acknowledge. The following screen will be briefly displayed:

ADVANCED SETUP PASSWORD OK!

User will be allowed to modify the Advanced Set ups. If Password is incorrect the screen displayed will be the following:

ADVANCED SETUP PASSWORD ERROR!

User will again be prompted to enter correct password. After 3 unsuccessful entries, the Advanced Set up is aborted and screen will return to Waiting on Start.

Modifying Current Tachometer Set Up

If an Engine Mode is chosen in the Mode Setup, the Tachometer Setup screen is available. This screen allows you to setup the S1500's Internal Tach function.

While in System Setup, press **MODE** until the following screen appears:

-Underspeed Shutdown -Overspeed Shutdown

TACH SETUP ENTER TO MODIFY

To modify the current Tach Setup, press the **MODE** key. The S1500 will prompt the user for Pulses per Revolution:

TACH SETUP PULSES/REV 99

To calibrate the internal tachometer enter the pulses per revolution of the engine. When using a magnetic pick up input, the pulses per revolution are the number of gear teeth. When using the ignition signal input, pulses per revolution are determined by the following chart:

Cylinder	Cycles	Pulses/rev.	Cylinder	Cycles	Pulses/rev.
1	2	1	6	4	3
2	2	2	8	2	8
2	4	1	8	4	4
3	2	3	10	4	5
4	2	4	12	4	6
4	4	2	16	4	8
6	2	6			

Use the **YES** or **NO** keys to set the Pulses per Revolution to the appropriate value. Press **ENTER** to save. Next, the user is now prompted to enter the desired Overspeed Set point, with the current setting (in rpm) blinking, i.e.

TACH SETUP OVERSPEED 9999

Use the **YES** or **NO** keys to set the Overspeed Setpoint to the desired value. Press **ENTER** to save.

The user is now prompted to enter the desired Underspeed Set point:

TACH SETUP UNDESPEED 0000

Use the **YES** or **NO** keys to set the Underspeed Setpoint to the desired value. Press **ENTER** to save. The user is now prompted to enter the desired Disconnect Set point:

TACH SETUP DISCONNECT 0000

Use the **YES** or **NO** keys to set the Disconnect Setpoint to the desired value. Press **ENTER** to save. The Tach Function Setup is now complete.

Modifying Current ETM (Elapsed Time Meter)

This set up allows you to preset the S1500 internal Elapsed Time Meter. While in SYSTEM SETUP, press **MODE** until the following screen appears:-

User Presettable -1 (one) Hour resolution, up to 9999.9 hrs

ETM SETUP ETM: 1234.5 hr

To zero the Elapse Time, press **RESET**. Press the **ENTER** key to save.

Available Modes with Listed Relay Configurations

The Mode Set up you choose determines which Set up Screens are available in the System Setup, and which timers are available in the TIMER SETUP screen. For example, if a Mode is chosen with no Lubing function, the LUBE SETUP is not available. The functions assigned are as follows:

- Mode 1 K1=Crank, K2=Load, K3=Cooler, K4=Ignition
- Mode 2 K1=Crank, K2=Lube, K3>Loading, K4=Ignition
- Mode 3 K1=Crank, K2=Lube, K3=Cooler, K4=Ignition
- Mode 4 K1=Load, K2=Lube, K3=Cooler, K4=Ignition
- Mode 5 K1=Crank, K2=Load, K3=Shutdown, K4=Ignition
- Mode 6 K1=Crank, K2=Cooler, K3=Shutdown, K4=Ignition
- Mode 7 K1=Load, K2=Cooler, K3=Shutdown, K4=Ignition
- Mode 8 K1=Crank, K2=Lube, K3=Shutdown, K4=Ignition
- Mode 9 K1=Load, K2=Lube, K3=Shutdown, K4=Ignition
- Mode 10 K1=Cooler, K2=Lube, K3=Shutdown, K4=Ignition
- Mode 11 K1=Alarm, K2=Crank, K3=Load, K4=Ignition
- Mode 12 K1=Alarm, K2=Crank, K3=Cooler, K4=Ignition
- Mode 13 K1=Alarm, K2=Load, K3=Cooler, K4=Ignition
- Mode 14 K1=Alarm, K2=Lube, K3=Crank, K4=Ignition
- Mode 15 K1=Alarm, K2=Lube, K3=Load, K4=Ignition
- Mode 16 K1=Alarm, K2=Lube, K3=Cooler, K4=Ignition
- Mode 17 K1=Alarm, K2=Crank, K3=Shutdown, K4=Ignition
- Mode 18 K1=Alarm, K2=Load, K3=Shutdown, K4=Ignition
- Mode 19 K1=Alarm, K2=Cooler, K3=Shutdown, K4=Ignition
- Mode 20 K1=Alarm, K2=Lube, K3=Shutdown, K4=Ignition
- Mode 21 K1=Crank, K2=Load, K3=Fuel, K4=Ignition
- Mode 22 K1=Crank, K2=Cooler, K3=Fuel, K4=Ignition
- Mode 23 K1=Load, K2=Cooler, K3=Fuel, K4=Ignition
- Mode 24 K1=Crank, K2=Lube, K3=Fuel, K4=Ignition
- Mode 25 K1=Load, K2=Lube, K3=Fuel, K4=Ignition
- Mode 26 K1=Cooler, K2=Lube, K3=Fuel, K4=Ignition
- Mode 27 K1=Crank, K2=Shutdown, K3=Fuel, K4=Ignition
- Mode 28 K1=Load, K2=Shutdown, K3=Fuel, K4=Ignition
- Mode 29 K1=Cooler, K2=Shutdown, K3=Fuel, K4=Ignition
- Mode 30 K1=Shutdown, K2=Lube, K3=Fuel, K4=Ignition
- Mode 31 K1=Alarm, K2=Crank, K3=Fuel, K4=Ignition
- Mode 32 K1=Alarm, K2=Load, K3=Fuel, K4=Ignition
- Mode 33 K1=Alarm, K2=Cooler, K3=Fuel, K4=Ignition
- Mode 34 K1=Alarm, K2=Lube, K3=Fuel, K4=Ignition
- Mode 35 K1=Alarm, K2=Shutdown, K3=Fuel, K4=Ignition
- Mode 36 K1=Load, K2=Lube, K3=Cooler, K4=Motor

- Mode 37 K1=Load, K2=Cooler, K3=Shutdown, K4=Motor
- Mode 38 K1=Load, K2=Lube, K3=Shutdown, K4=Motor
- Mode 39 K1=Cooler, K2=Lube, K3=Shutdown, K4=Motor
- Mode 40 K1=Alarm, K2=Load, K3=Cooler, K4=Motor
- Mode 41 K1=Alarm, K2=Lube, K3=Load, K4=Motor
- Mode 42 K1=Alarm, K2=Lube, K3=Cooler, K4=Motor
- Mode 43 K1=Alarm, K2=Load, K3=Shutdown, K4=Motor
- Mode 44 K1=Alarm, K2=Cooler, K3=Shutdown, K4=Motor
- Mode 45 K1=Alarm, K2=Lube, K3=Shutdown, K4=Motor

Available Start / Stop Options

Four different Start/Stop Modes are available for the S1500:

Via Start/Stop Key Mode

A valid start sequence occurs when the **START/STOP** key is pressed.

Via Remote Start/Stop Mode

A valid start sequence occurs when a Remote Start input is seen.

Via H-O-A Switch Mode

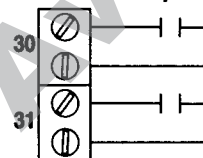
A valid start sequence occurs when either the H-O-A switch is placed in "Hand" or switch to "Auto" and a Auto Start input is seen.

Maintain Start Mode

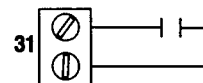
A valid start sequence occurs when the Maintain signal is seen.

Typical Start/Stop Set up Wiring

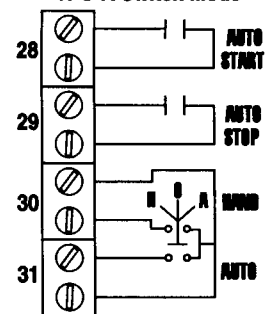
Remote Start Stop Mode



Maintain Start Mode



H-O-A Switch Mode



Sequence of Operations – Engine Mode

Upon powering the S1500 module/head, the unit will immediately begin looking for a valid start sequence. What constitutes a valid start sequence depends on the Start/Stop option chosen by the user. Refer to “Available Start / Stop Options” (on page 9), for information. The S1500 display will show:

WAITING ON START
ETM: 0000.0 hrs

At this point, the user may enter the SETUP MODE by pressing **MODE**, and select the desired preset timers, etc. Once a valid Start Sequence is active, the S1500 will initiate a Run Sequence as follows:

NOTE: If a Mode without the Pre/Postlube function was chosen, go to Starting.

PRELUBE

If a Logic Mode with the Lubing function was chosen, the S1500 will perform the Prelube function. Prelube function consists of a preset Prelube Period and Permissive Period. First the Lube relay is energized, displaying:

LUBE CYCLE
PRELUBE: 1:00

for the duration of the Prelube Period. Once this period expires, it will display:

LUBE CYCLE
PERMISSIVE: 1:00

At this point the unit is monitoring the Prelube Permissive input into TB32. Permissive Period will last until Permissive Pressure is seen. If the Permissive Period expires before Permissive Pressure is activated, a Fault Shutdown occurs, displaying:

PERMISSIVE
FAILURE

If Permissive Pressure is seen, a Start Sequence will occur.

START SEQUENCE

If a Logic Mode without Engine Cranking was chosen, go to Run Mode.

ENGINE CRANKING

This cycle is as follows: First, a System Purge will occur. The Crank Relay will energize and Engine is cranked with the ignition grounded. The display will read:

ENGINE SYSTEM
PURGE : 15

The Ignition Relay is energized (as well as the Fuel Valve Relay, if a Logic Mode with Fuel Valve was chosen). Current crank attempt and time are displayed, i.e.:

CRANK ATTEMPT: 1
CRANK : 15

If at the end of the cranking attempt the engine fails to start, a rest period will follow. The display will show the current crank attempt and rest period, i.e.:

CRANK ATTEMPT: 1
REST : 15

Once the rest period expires, another crank period will initiate. When crank attempts are exhausted a Fault Shutdown will be initiated. The display will show:

OVERCRANK
SHUTDOWN

Engine cranking routine is exited once Crank Disconnect is reached.

RUN MODE

Upon reaching the Run Mode, the S1500 will initiate the Run Delay, and monitor the Tach input for Disconnect Speed, and display:

WAITING ON RUN
RUN DELAY : 15

If the engine does not reach disconnect speed by the time the run delay expires, the S1500 will initiate a Fault Shutdown and display:

FAILURE TO START *Note: If Crank routing was performed, Crank Disconnect will already have been reached*

Once Crank Disconnect is reached the S1500 will initiate the Class-B timer, Engine Warmup timer and if a Mode with Compressor Loading function was chosen, Load Delay Timer. Engine Speed and Class-B1 time remaining are displayed:

SPEED 2343 rpm
CLASS-B 5:00

When Class-B timer expires, Engine Speed and Elapsed time are displayed:

SPEED 3333 rpm
ETM 1234.5hrs

COMPRESSOR LOADING

If an Engine Mode with the Compressor Loading function was chosen, the corresponding Relay is energized after the Load Delay expires. The Process Delay timer locking out the Class-P sensors will also be initiated. If a Stop Pressure is seen the Compressor Load relay will be de-energized, and the Idle/Run Unloaded timer initiated. The S1500 will then display the remaining Idle time:

SPEED 3333rpm
IDLE 10:00

If a Start Pressure is seen before the Idle Time expires, the Compressor Load relay will again be energized. The Idle Time reset, and the Elapsed Time will again be displayed. If no Start Pressure is seen by the time the idle Time expires, the S1500 will perform a Normal Stop and return to Waiting On Start.

FAULT SHUTDOWN

Upon reaching a fault condition, the S1500 will de-energize the Alarm (and/or Shutdown) and Fuel Valve relays and initiate the Ignition Ground Delay. When Ignition Ground Delay expires, the Ignition relay is de-energized, and (after a Postlube, if enabled) the cause of the shutdown announced, i.e.

LOW OIL
PRESSURE (01)

The user must press **RESET** to energize the Alarm and Shutdown relays, then clear the fault message and return to the Waiting On Start Screen.

NORMAL STOP

If a Normal Stop is called for via the **STOP** key, a Remote Stop Signal or Stop Pressure, the same sequence occurs as a Fault Shutdown except the Alarm (and/or shutdown) relay is not de-energized, and (after a Postlube, if enabled) the Waiting On Start Screen is seen immediately.

POSTLUBE

If a Mode with the Lube function is chosen, a POSTLUBE will be performed after either a Fault Shutdown or Normal Stop. The Lube Relay will be energized, and the display will read:

LUBE CYCLE
Postlube 5:00

Once the Postlube timer expires, the S1500 will either announce the cause of the Fault Shutdown or return to the Waiting On Start screen.

ALARM ONLY CONDITION

If a Mode with the Alarm function is chosen, Sensor Inputs may be configured as Alarm Only. See Sensor Setup. If a Sensor Input configured as Alarm Only reaches a fault condition. The Alarm relay will de-energize and the cause of the alarm will be announced, i.e.

LOW JACKET WATER
LEVEL (12)

The user may silence the Alarm and clear the display by pressing the **RESET** key. When the Alarm Condition clears and faults again the Alarm relay will de-energize, and the cause will be announced.

ENGINE OVERSPEED/UNDERSPEED

When Engine Speed rises above Overspeed Set point, falls below Underspeed Set point, or Loss of Tach. Signal is detected, a Fault Shutdown occurs and is displayed:

ENGINE
OVERSPEED

The Tach Function may be disabled in the Tach. Setup.

LOSS OF PRIMARY POWER

This is an Alarm Only Condition, the S1500 will display:

LOSS OF PRIMARY POWER

The S1500 will continue to monitor the engine, running off its backup batteries. Fully charged battery life is approximately 4 hours.

*** IMPORTANT: Test Timer Mode Can Be Accessed While The Engine is Running.**

Sequence of Operations (Motor Mode)

Upon powering the S1500 module/head, the unit will immediately begin looking for a valid start sequence. What constitutes a valid start sequence depends on the Start/Stop option chosen by the user. Refer to "Available Start / Stop Options" (on page 9), for information.

The S1500 display will show:

WAITING ON START
ETM: 0000.0 hrs

At this point, the user may enter the SETUP MODE by pressing **MODE**, and select the desired configuration, preset timers, etc. Once a valid Start Sequence is seen, the S1500 will initiate a RUN SEQUENCE as follows:

NOTE: If a Mode without the Lube function was chosen, go to STARTING.

PRELUBE

If a Logic Mode with the Lubing function was chosen, the S1500 will perform the Prelube function. The Prelube function consists of a preset Prelube Period and a Permissive Period. First the Lube relay will be energized, and the display will read:

LUBE CYCLE
PRELUBE: 1:00

for the duration of the preset Prelube Period. Once the Prelube Period expires, the display will read the following:

LUBE CYCLE
PERMISSIVE 1:00

At this point the S1500 is monitoring the Prelube Permissive input into TB32. The Permissive Period will last until the Permissive Pressure is seen. If the Permissive Period expires before the Permissive Pressure is seen, the S1500 will perform a Fault Shutdown, and the display will read:

PERMISSIVE
FAILURE

If Permissive Pressure is activated, a Start Sequence will occur.

RUN MODE

Upon reaching the Run Mode, the S1500 will initiate the Run Delay, and monitor the Run Input for the Motor Starter Auxiliary Input. The display will show:

WAITING ON RUN
RUN DELAY : 15

If the Motor Starter Auxiliary Input is activated by the time the Run Delay expires, the S1500 will initiate a Fault Shutdown and display:

FAILURE TO
START

Once the Motor Starter Auxiliary Input is active, the S1500 will initiate the Class-B and the Motor Warmup and the Load Delay timers (if a Mode with the Compressor Loading function was chosen). The S1500 will display Motor Running and the Class-B remaining:

MOTOR RUNNING
CLASS-B 5:00

When Class-B timer expires, Motor Speed and Elapsed time are displayed:

MOTOR RUNNING
ETM 1234.5 HRS

COMPRESSOR LOADING

If a Motor Mode with the Compressor Loading function was chosen, the corresponding Relay is energized after the Load Delay expires. The Process Delay timer locking out the Class-P sensors will also be initiated. If a Stop Pressure is seen the Compressor Load relay will be de-energized, and the Idle/Run Unloaded timer initiated. The S1500 will then display the remaining Idle time:

MOTOR RUNNING
IDLE 10:00

If a Start Pressure is seen before the Idle Time expires, the Compressor Load relay will again be energized. The Idle Time reset, and the Elapsed Time will again be dis-

played. If no Start Pressure is seen by the time the idle Time expires, the S1500 will perform a Normal Stop and return to Waiting On Start.

FAULT SHUTDOWN

Upon reaching a fault condition, the S1500 will de-energize the Alarm or Shutdown relay displaying the cause of alarm/shutdown, for example:

LOW OIL
PRESSURE (01)

The user must press **RESET** to energize the Alarm and Shutdown relays, then clear the fault message and return to the Waiting On Start Screen.

NORMAL STOP

If a Normal Stop is called for via the **STOP** key, a Remote Stop Signal or Stop Pressure, the same sequence occurs as a Fault Shutdown except the Alarm (and/or shutdown) relay is not de-energized, and (after a Postlube, if enabled) the Waiting On Start Screen is seen immediately.

POSTLUBE

If a Mode with the Lube function is chosen, a Postlube will be performed after either a Fault Shutdown or Normal Stop. The Lube Relay will be energized, and the display will read:

LUBE CYCLE
Postlube 5:00

Once the Postlube timer expires, the S1500 will either announce the cause of the Fault Shutdown or return to the Waiting On Start screen.

ALARM ONLY CONDITION

If a Mode with the Alarm function is chosen, Sensor Inputs may be configured as Alarm Only. See Sensor Setup. If a Sensor Input configured as Alarm Only reaches a fault condition. The Alarm relay will de-energize and the cause of the alarm will be announced, i.e.

LOW JACKET WATER
LEVEL (12)

The user may silence the Alarm and clear the display by pressing the **RESET** key. When the Alarm Condition clears and faults again the Alarm relay will de-energize, and the cause will be announced.

LOSS OF MOTOR INPUT

The Loss of Motor Auxiliary Input is a Shutdown condition. When this condition arises, a Fault Shutdown occurs and it is displayed:

LOSS OF MOTOR
AUXILIARY INPUT

LOSS OF PRIMARY POWER

This is an Alarm Only Condition, the S1500 will display:

LOSS OF PRIMARY
POWER

The S1500 will continue to monitor the motor, running off its backup batteries. Fully charged battery life is approximately 4 hours.

*** IMPORTANT: Test Timer Mode Can Be Accessed While The Motor is Running.**

TROUBLESHOOTING INSTRUCTIONS



WARNING: Do NOT open power supply until operations have been shut down and area has been rendered non-hazardous. Do NOT run sensor wires in conduit with any other wire. Do NOT apply voltage to any annunciator input terminals. Do NOT bundle sensor wires with any other wiring. Make sure the voltage and current requirements are within the S1500 system ratings.

Troubleshooting Instructions

Before going through the check list below, refer to the connections and operation procedures and be sure all connections are tight. Also check your system wiring schematic for proper wiring.

If any problems persist after you have made these checks, consult your nearest Murphy facility.

1. Symptom: No display

- a. Check that the miniature D-sub 15-pin connector (power and control cable) is firmly connected to the back of the S1500 module. Check the power and control cable for cracks or broken wire.
- b. Check for power failure or power input shutdown.

NOTE: If after all of the above has been done, and there is still no display, return the S1500 module to us.

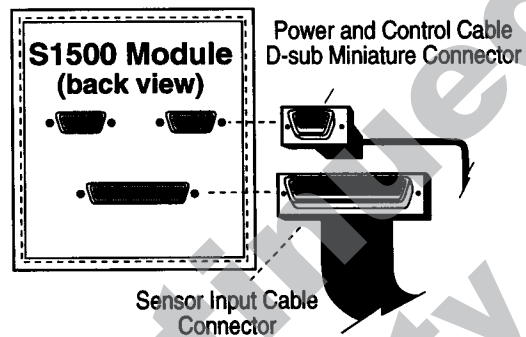
2. Symptom: Engine fails to start (Sensor switch fault display cannot be cleared.)

- a. Check that the miniature D-sub 15-pin connector (power and control cable) is properly connected to the back of the S1500 module.
- b. Check that the sensor input cable connector (ribbon cable) is properly connected to the back of the S1500 module.
- c. Check the display window for low battery voltage. A fading display will indicate loss of primary and backup power. To fully charge the battery pack allow 24 hours with primary power ON.

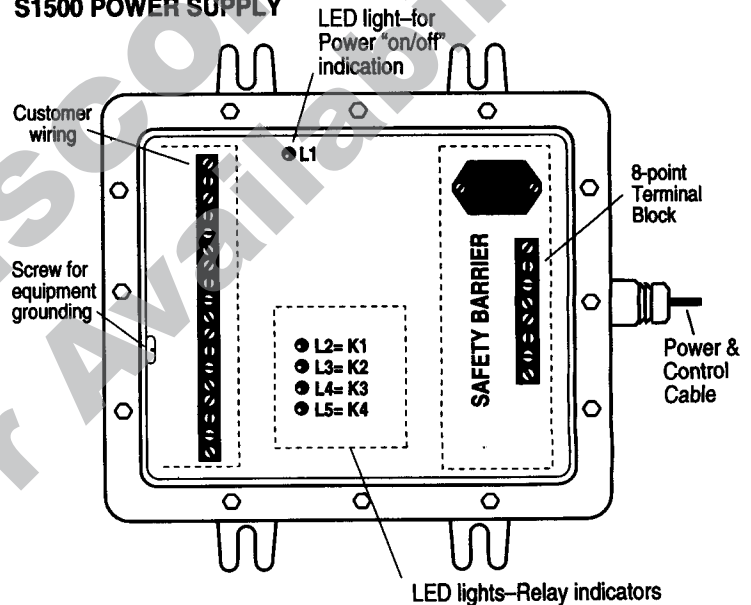
NOTE: Backup battery package can only be replaced at the factory.

- d. Check to see that LED lights are lit indicating relays coils are energized and in normal operation.
- e. Check that the 8 leads on the 8-point terminal block under the Safety Barrier cover are connected and tight. (See drawing.)
- f. Measure the voltage between terminals #1 and #2 on the 8-point terminal block, (voltage should read between 5 VDC and 6 VDC). Do this with the power input connected to power supply, and with it disconnected. There should not be more than a 0.5 V difference between the readings with the panel connected, and not connected.

NOTE: If shutdowns still result, send the complete system back to us.



S1500 POWER SUPPLY



WARRANTY

A two year limited warranty on materials and workmanship is provided with this Murphy product. Details are available on request and are packed with each unit.

In order to consistently bring you the highest quality, full featured products, we reserve the right to change our specifications and designs at any time.



■ **Frank W. Murphy Manufacturer**
P.O. Box 470248; Tulsa, Oklahoma 74147; USA
tel. (918) 627-3550 fax (918) 664-6146
e-mail fwmurphy@ionet.net

■ **Frank W. Murphy Southern Division**
P.O. Box 1819; Rosenberg, Texas 77471; USA
tel. (281) 342-0297 fax (281) 341-6006
e-mail murphysd@intertex.net

■ **Frank W. Murphy, Ltd.**
Church Rd.; Laverstock, Salisbury SP1 1QZ; U.K.
tel. +44 1722 410055 fax +44 1722 410088 tlx 477088
e-mail sales@fwmurphy.co.uk

■ **Frank W. Murphy Pte., Ltd.**
26 Siglap Drive; Republic of Singapore 456153
tel. +65 241-3166 fax +65 241-8382
e-mail fwmsales@fwmurphy.com.sg

■ **Murphok Pty., Ltd.**
1620 Hume Highway; Campbellfield, Vic 3061; Australia
tel. +61 3 9358-5555 fax +61 3 9358-5558

■ **Murphy de México, S.A. de C.V.**
Blvd. Antonio Rocha Cordero 300, Fracción del Aguaje
San Luis Potosí, S.L.P.; México 78384
tel. +52-48-206264 fax +52-48-206336
e-mail murmexsl@infosel.net.mx

■ **Murphy Switch of California**
P.O. Box 900788; Palmdale, California 93590; USA
tel. (805) 272-4700 fax (805) 947-7570
e-mail sales@murphyswitch.com

■ **Frank W. Murphy France**
tel. +33 1 30 762626 fax +33 1 30 763989