

Scully Intellitrol®

Technical Manual



Overfill Prevention Control Unit with Ground Verification & Vehicle Identification Options

scully

MaxSafety®
SYSTEMS

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Introduction

Scully® Signal Company was incorporated in 1936 with the invention of the Ventalarm Signal®, a whistling tank-fill signal designed to replace float devices for high level liquid indication and overfill prevention. It was an immediate success in the United States and Canada and soon replaced unreliable floats in many tank applications.

Scully Signal Company then followed in 1950 with an Automatic and Continuous Self-Checking concept and patents. This brought a new level of fail-safe operations to Automatic Level Control and Overfill Prevention Systems with its "Dynamic Self-Checking®" patents and controls, which are installed worldwide with major oil and chemical companies plus military aviation refueling operations.

Scully's level controls check their own operation around the clock and have been applied to numerous monitoring operations in several industries such as flame safeguard control monitoring systems in refineries for both oil and chemical operations as well as top and bottom loading operations for terminals and tank trucks worldwide.

Summing up an astonishing fail-safe record worldwide in petrochemical operations this past quarter of a century, Dynamic Self-Checking, the electronic heart-beat system that fails safe **"unless incorrectly installed or deliberately bypassed!"**

1.1 Description

The Intellitrol is intended to serve as a secondary overfill protection system for loading operations. It is intended for use in hazardous locations and is packaged in an explosion-proof (flameproof) enclosure and has both International and US approvals and certifications.

The Intellitrol performs a variety of monitoring functions and provides a number of outputs to control valves, pumps and other systems including Terminal Automation Systems (TAS). It has an integrated display to indicate system and monitoring status, a bypass capability, and communications for integration with TAS and other systems.

The Intellitrol contains a pair of microprocessors, each with its own relay that monitors critical functions. Only when both processors detect a safe condition will both relays close and make outputs permissive.

The Intellitrol is designed to be Failsafe® and in the event of a failure (power, sensors, or internal electronics) the unit will enter a non-permissive (safe) state.

This state-of-the-art Dynamic Self-Testing® system controller provides overfill prevention and optional vehicle ground verification and vehicle identification operating in a single enclosure. The Intellitrol also provides the user with comprehensive diagnostic information, both locally on the exterior of the control unit housing and remotely to the terminal automation system via RS-485 communications.

1.2 Monitoring Functions

1.2.1 Overfill

The Intellitrol monitors 5-wire optic sensors, 2-wire optic and 2-wire thermistor sensors that are compliant with EN13922 standards. The Intellitrol does not support 3-wire thermistor sensors such as the SP-BLHK.

The system automatically determines which sensor type is attached. The Intellitrol is compatible with on-vehicle electronics like the Intellicheck® and the Scully Load Anywhere® and interprets their output signals according to the interface used.

1.2.2 Ground

The Intellitrol can be configured via an internal jumper setting to monitor static ground verification based on:

- Ground Bolt/Ground Ball using Scully pioneered Dynamically Self-Testing® ground verification systems or
- Resistive ground verification systems

General

1.2.3 Vehicle Identification Prover

The Intellitrol is capable of monitoring Scully Truck Identification Modules (T.I.M.[®]). The TIM is a small truck-mounted device which gives every vehicle a unique identifier that can be read by the Vehicle Identification Prover (VIP) feature of the Intellitrol. This identification can be compared to a program table list stored in the non-volatile RAM on the CPU of the Intellitrol for a Go/No-Go decision or can be read by a TAS and used for other functions such as billing and automatic compartment size determination for loading using preset meters.

1.2.4 Deadman Switch

The Intellitrol is capable of monitoring a deadman switch which must be held closed by an operator to obtain a permissive state. If the deadman handle is released, the switch will open and the Intellitrol will go non-permissive. (Note: The form C relay use is restricted to only NO and common contacts when using deadman input.)

1.3 Output Capabilities

1.3.1 Form A (Powered) Relay contacts

One set of fuse-protected relay contacts is available for output. These contacts are also used for internal monitoring of relays and must only be used for AC power switching. If a TAS requires voltage-free switching, the Form C contacts should be used. The Main Display on the front panel indicates relay status.

1.3.2 Form C (Volt free) Relay contacts

A set of volt free contacts is available for low voltage switching applications. These contacts are switched together with the Form A contacts and cannot operate separately. (Note: NC contact cannot be used when deadman input used.)

1.3.3 Truck Present

A transistor switch is available to indicate that a truck is connected. Typical use is to control a gate to prevent drive-offs while connected to the Intellitrol. (Alternatively, this switch can be configured to indicate a good ground present instead of truck present. Contact Technical Services for details.)

1.4 Communications

The Intellitrol has an RS-485 interface which can be used to perform maintenance and serves as a communications interface for Terminal Automation Systems. Through this interface, the TAS can obtain Intellitrol status including truck present, sensor, and ground status as well as directly reading TIM information. For more details on the operation of this interface please contact Technical Services.

1.5 Bypass

The Intellitrol has the capability to be bypassed for some fault conditions when connected to a vehicle. The bypass capability is accessed using a bypass key, sold separately. The bypass key is compared to an internal list stored in non-volatile RAM for authorization. If the key is authorized to bypass the unit, the Intellitrol will recognize it and bypass the fault (overflow, ground or vehicle ID). An overflow sensor that becomes wet while loading cannot be bypassed.

1.6 Additional Equipment

1.6.1 Sculcon Junction Box

A Sculcon Junction Box is highly recommended because it is used to interface between the Intellitrol's intrinsically safe connections and a vehicle connection. It comes with a plug and cable assembly for truck connection. The Sculcon Box enables cable replacement without requiring that the Intellitrol door be opened or the seal on the Intellitrol door be broken.

1.6.2 Deadman Control Switch

A Deadman Control Switch is used with the Intellitrol when the operator must be present and actively involved at all times during the loading operation. Thus, the operator must hold the deadman switch closed during the entire loading operation; otherwise the Intellitrol will go non-permissive. The Deadman is optional.

1.7 Display Panel

The Intellitrol Display Panel is designed to be seen at the terminal by an operator located in the lane area of the tanker delivering or receiving a load. The display contains sections with unique functions which are listed in Figure 1.

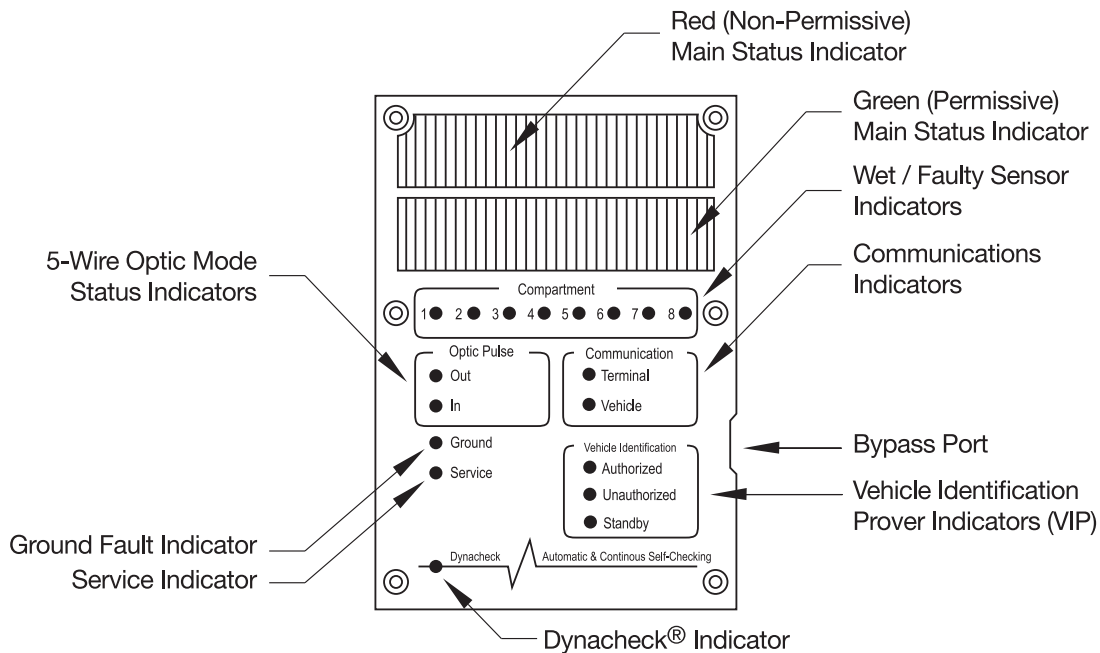


Figure 1: Main Status and Diagnostic Display Panel Indicators

General

1.7.1 Display Panel Indicators

Note: References below to flashing slow and fast are compared to Dynacheck® flashing rate.

Main Status Bars

- **Red Bar On**, (Non-Permissive)
 - Flashing slow, faulty sensor bypassed
 - Flashing fast, main output relay shorted
- **Green Bar On**, (Permissive)
 - Flashing, ground or vehicle identification bypassed

Compartment 8-LED's (Fault Indicators)

- **Off**, No truck/dry sensor
- **Red**, Wet or warming sensor
 - Flashing slow = open 2-wire sensor
 - Flashing fast = shorted 2-wire sensor

Note: When a compartment fault is detected:

A compartment LED on indicates a fault. It may be faulty wiring, thermistor sensors not warmed up, or wet compartments.

- For 2-wire only, 6 or 8 compartments are monitored, depending on jumper settings. LED's on indicate that one or more compartments are faulty and produces a non-permissive condition preventing product transfer.
- For 5-wire only, 1 to 12 compartments are monitored and one compartment at a time is displayed. Up to two compartment LED's are displayed per faulty compartment and produces a non-permissive condition preventing product transfer. 1-12 compartments are monitored. 1-8, and 9-12 are indicated by LED No.8 on plus one additional LED 1-4. Adding the two LED numbers, $(8+1) = 9$, and $(8+1+2+3+4) = 12$, and so on indicates which of 12 compartments is faulty. (Note: The Intellitrol can support up to 15 compartments, however, above writeup is restricted to 12 compartments to support EN13922 maximum.)

Ground, 1 LED

- **Red**, No ground bolt/ground ball detected or no resistive short detected
- **FLASHING Red**, Ground verification function bypassed

Communication, 2 LED's

Requires RS485 com link and VIP/TIM Connection

- **"Terminal" - Yellow**, Communications in progress to TAS
- **"Vehicle" - Yellow**, Communications in progress to TIM

Optic Pulse, 2 LED's

- **"In" - Green**, Receiving pulses from 5-wire sensors
- **"Out" - Green**, Transmitting pulses to 5-wire sensors

Service, 1 LED

- **FLASHING Red**, Operational problem with the Intellitrol

Dynacheck, 1 LED

- **FLASHING Yellow**, Normal operation, once per second
- **OFF**, Operational problem with the Intellitrol

Vehicle Identification Prover, 3 LED's

- **"AUTHORIZED" - Green**, Truck Identification Module (TIM) serial number has been read and found in authorization list.
- **Flashing Green**, VIP function bypassed
- **"UNAUTHORIZED" - Red**, Truck Identification Module (TIM) serial number is not found in authorization list.
- **"STANDBY" - Yellow**, Truck Identification Module (TIM) has not been read.

1.8 Approvals

All Intellitrol units fall under the approvals for:

- ATEX
- Ex d ia IIB T4 Ta -40°C to +50°C Gb



1.9 Constraints

The Intellitrol Control Unit has been designed to be impact-resistant, however, do not subject it to excessive mechanical or thermal stresses. Do not allow the unit to come in contact with aggressive substances.

The Intellitrol may only be repaired by qualified technical personnel by replacing the internal control or display module with equivalent modules. The internal control module and display board modules are not field repairable.

Do not open the Intellitrol door when an explosive gas atmosphere is present. To avoid static discharge buildup, clean only with a damp cloth.

General

1.10 Internal Architecture

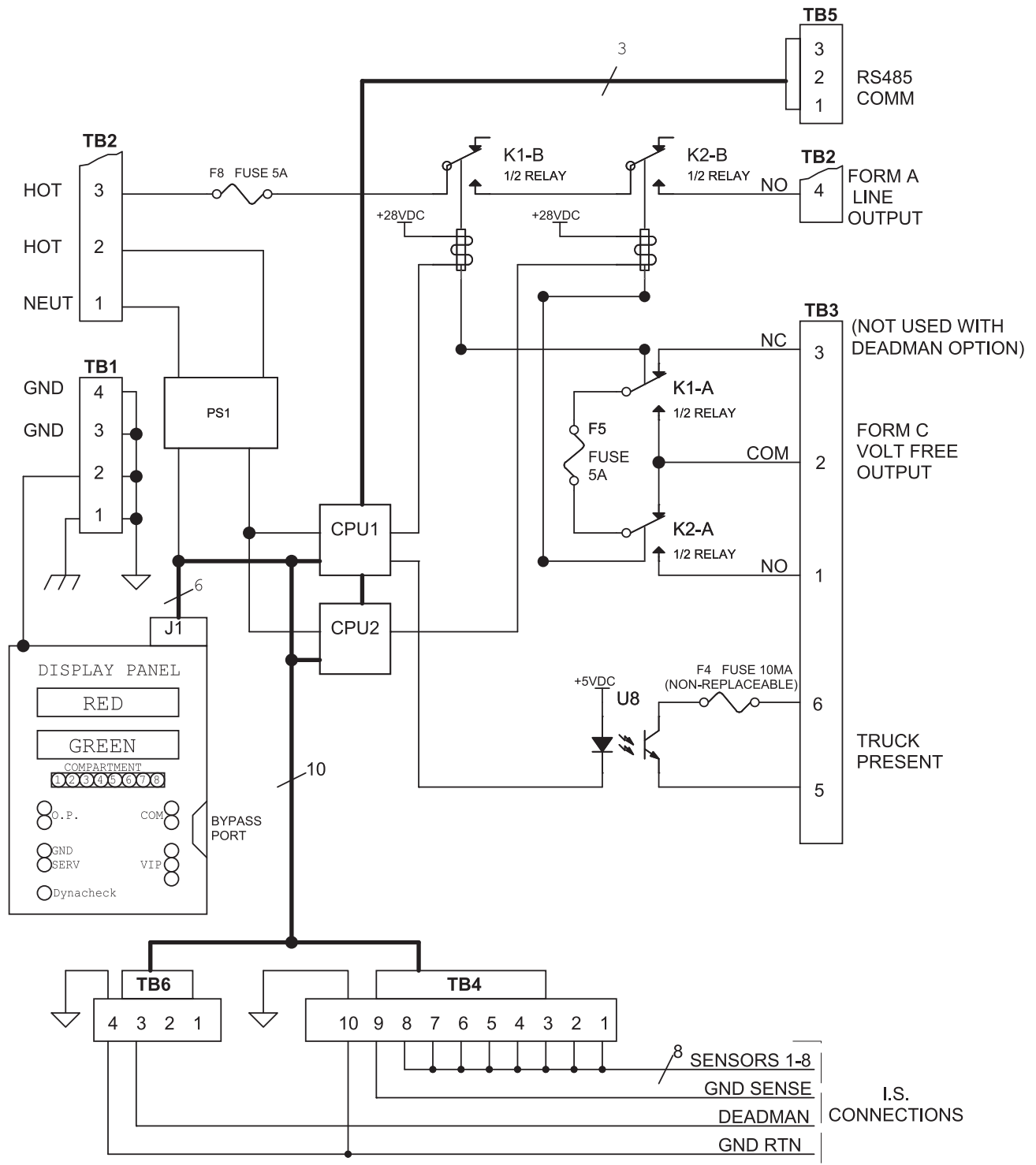


Figure 2: Intellitrol Block Diagram

General

1.11 Technical Specifications

1.11.1 Temperature

Operating: -40 to +60 Degrees C
Storage: -45 to +85 Degrees C

1.11.2 Power Requirements

Voltage: 230 V +/-10% 50Hz
or
120V +/- 5% 60Hz
Consumption: 50 Watts maximum

1.11.3 Outside Dimensions

See Appendix 9.1 & 9.2 for mounting details.

1.11.4 Weight

14.1 kgs

1.12 Configurations

The following models of the Scully Intellitrol are available. All fall under Section 1.8 Approvals and Section 1.11 Technical Specifications.

1.12.1 ATEX Table

ATEX series uses M25 X 1.5 (ISO) METRIC conduit entries.
Default Configuration: (230VAC)

Model	Description	Part Number
ICC-O	Overfill Prevention Only	08912
ICC-OG	Overfill Prevention and Ground Verification	08913
ICC-OGV	Overfill Prevention, Ground Verification and Vehicle Identification Prover	08914

Mechanical Installation

When choosing a location on the loading rack for the Intellitrol, keep in mind that, while it can be exposed to the elements, the main status indicators and diagnostic display panel on the front of the Intellitrol should be readily visible and within easy reach to the user. The control unit should be mounted vertically, at eye level, in a location where the front cover can open 120 degrees for servicing.

Refer to the Intellitrol Enclosure Outline and Sculcon Plug and Cable Assembly Drawings in Appendices 9.1 - 9.3 for physical dimensions, location of mounting bolts, electrical cable gland entry locations, and enclosure bonding stud. The enclosure bonding stud is provided for proper electrical bonding of the enclosure to earth ground. Use only the three conduit entry holes provided for wiring. The left and right side holes are for power and control wiring. The bottom hole is for intrinsically safe sensor wiring only. Do not drill any additional holes in the enclosure, as doing so violates the enclosure's hazardous location approval and voids the warranty.

2.1 Warnings

- The electrical cable entry in the bottom of the enclosure marked “Intrinsically Safe Entry” is for the sensor wiring between the Intellitrol plug and cable assembly and for the optional deadman switch wiring only. To maintain intrinsic safety, this cable entry must not be used for any other wiring.

2.2 Water Proofing

To avoid future maintenance issues regarding water infiltration into the housing via the electrical cable entries, we strongly recommend the following precautions:

- Minimize long vertical cable runs into the sides of the enclosure as they promote water channeling to the cable gland.
- Carefully install the cable gland on the sides of the enclosure, taking extra precaution to make certain that the installation is correct and sealed properly (as required by code).
- To maintain the IP65 rating of the enclosure, the cable gland fittings at all entries to the enclosure should be equipped with a fiber washer between the cable gland and the enclosure to properly seal the threads against water infiltration.

Refer to the Installation Wiring Diagrams for the Intellitrol Control Module and Sculcon Junction Box Plug and Cable Assemblies in Appendices 9.4 - 9.6.

3.1 Non-Intrinsically Safe (IS) Connections

All Non-IS connections are at the top of the control module and must never be intermixed with IS wiring.

3.1.1 Power Selection

The Intellitrol is field selectable for either 120 or 230 VAC by setting red jumper(s) J10 and J11 at the top of the board.

- **120 VAC**, Insert 2 horizontal jumpers, one in J10 and one in J11
- **230 VAC**, Insert a single vertical jumper between J10 and J11

Note: Refer to Appendix 9.8. See J10 and J11 configurations.

3.1.2 Ground

- **TB1-1**, Green wire door ground
- **TB1-2**, Green wire box ground
- **TB1-3**, AC power ground
- **TB1-4**, Extra AC power ground

It is imperative to Intrinsic Safety that the unit be connected to earth ground. A green terminal block is located at the top left of the control module to terminate an incoming ground connection. Do not modify the other connections on this terminal block.

3.1.3 AC Power Connection

- **TB2-1**, Neutral
- **TB2-2**, Hot

3.1.4 Switched Outputs

Powered

- **TB2-3**, Power in
- **TB2-4**, Power out

These connections are used internally to monitor relay status and use a normally open switch for line voltage use.

Caution: Must be the same phase as the power in.

Must not be used for low voltage DC switching.

Unpowered

- **TB3-1**, Normally Open (NO)
- **TB3-3**, Normally Closed (NC)
- **TB3-2**, Common (COM)

This set of dry Single Pole Double Throw (SPDT) relay contacts are available for connection of low voltage devices. In the event of a failure all switched power and the NO connections of the unpowered output will fail safe. The NC contact of the unpowered output will remain closed should power be lost and is not fail safe. The NC contact should NOT be used for safety related functions or for deadmen operation.

Electrical Installation

3.1.5 Status Output/Input

Truck Connected Output

- TB3-5, Transistor Emitter
- TB3-6, Transistor Collector, via a fuse and resistor

This output is a low side transistor switch and will conduct when a truck is detected. Connection is as shown below.

Caution: Must be the same phase as the power in.

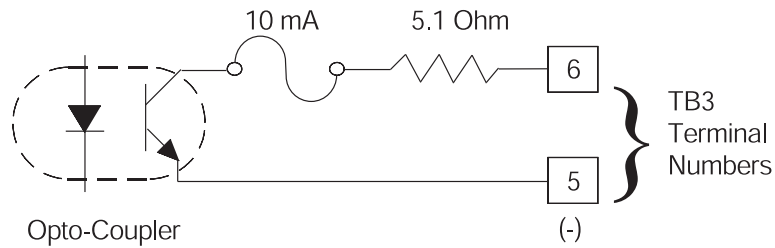


Figure 3: TB3, 5-6 Opto-Coupler

Some typical wiring diagrams to interface this truck connected output to a programmable logic controller's (PLC) input channel or a load amplifying solid state relay are shown in fig.4.

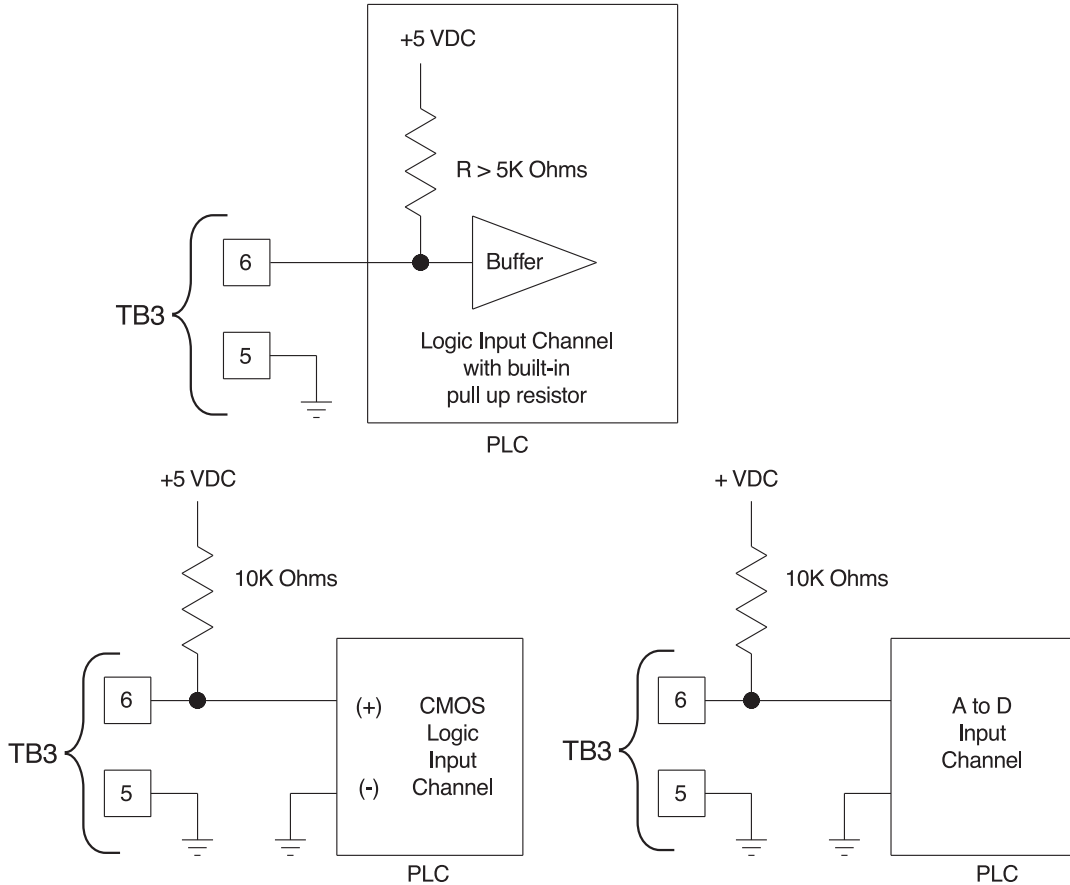


Figure 4: Typical Output Wiring Diagram

3.1.6 RS-485 Communications Terminal

- **TB5-1**, ground terminal
- **TB5-2**, (TD/RD) "B" terminal
- **TB5-3**, (TD/RD) "A" terminal.

Remote communications are available through connector TB5. Appendix 9.7 shows a typical Intellitrol multi drop communications wiring scheme for connection details.

While it is possible for an Intellitrol to share a RS-485 communications line with other equipment, we recommend that each Intellitrol controller have a dedicated RS-485 communications line to simplify troubleshooting.

3.2 Intrinsically Safe (IS) Connections

Caution: DO NOT RUN WIRES connected to Intrinsically Safe connections next to Non Intrinsically Safe wires or connections. Doing so creates risk and an explosion may occur under adverse conditions.

All Intrinsically Safe (IS) connections are made from connectors TB4 and TB6 through the hole at the bottom of the box. Connections from TB4 are typically wired one-to-one from the Intellitrol to the terminal block in the Sculcon box. Different cable configurations are required for connection to 2-wire or 5-wire trucks.

3.2.1 Sculcon Junction Box Plug and Cable Assembly

The Sculcon Junction Box is the preferred way to connect to the IS-Interface. Refer to Appendix 9.2 for the typical Sculcon junction box outline diagram showing physical dimensions, location of mounting bolts and cable gland entry location details. Refer to Appendices 9.4 - 9.6 for wiring diagrams showing the interconnection details for the Sculcon junction box plug and cable assembly to the Intellitrol.

3.2.2 EN13922 Sensor Wiring Connections

- Both 2-wire and 5-wire trucks connect via a 10-pin plug and 10-pin connector with 4J slots (per EN13922)

3.2.3 Standard Sensor Wiring Connections

- 2-wire trucks use an 8- or 10-pin plug on a 10-pin cable.
- 5-wire trucks use a 6-pin plug on a 6-pin cable wired to the same connection. Table 1 below describes the connections and function of TB4, Pins 1-10.

Electrical Installation

Connection	TB4 Pins									
Pin Number	1	2	3	4	5	6	7	8	9	10
2-Wire 8 Compartment	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7	Sensor 8	GND/ TIM Verify	GND
2-Wire 6 Compartment			Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	GND/ TIM Verify	GND
5-Wire 12 Compartment				Pulse to Sensors	Diag.	Pulse from Sensors		Power from Sensors	GND/ TIM Verify	GND
Terminal Number	1	2	3	4	5	6	7	8	9	10
Connection	Sculcon Junction Box & Cable Plug Pin / Socket Receptable									

3.2.4 Deadman Control

- **TB6-3**, NO, Deadman Switch Input
- **TB6-4**, Return

This Normally Open (NO) connection can optionally be used for a Deadman (switch closure) input signal. When this option is enabled, the Intellitrol will permit only when the deadman switch is closed.

3.2.5 J1 Front Display Panel Connection

J1 is located at the bottom left corner of the control board. J1 is a 6-pin ribbon header that provides an IS connection from the controller to the Front Display Panel.

Caution: Make sure to note the orientation of this connector before removing.

3.3 EMI Shield Kit Installation Instructions

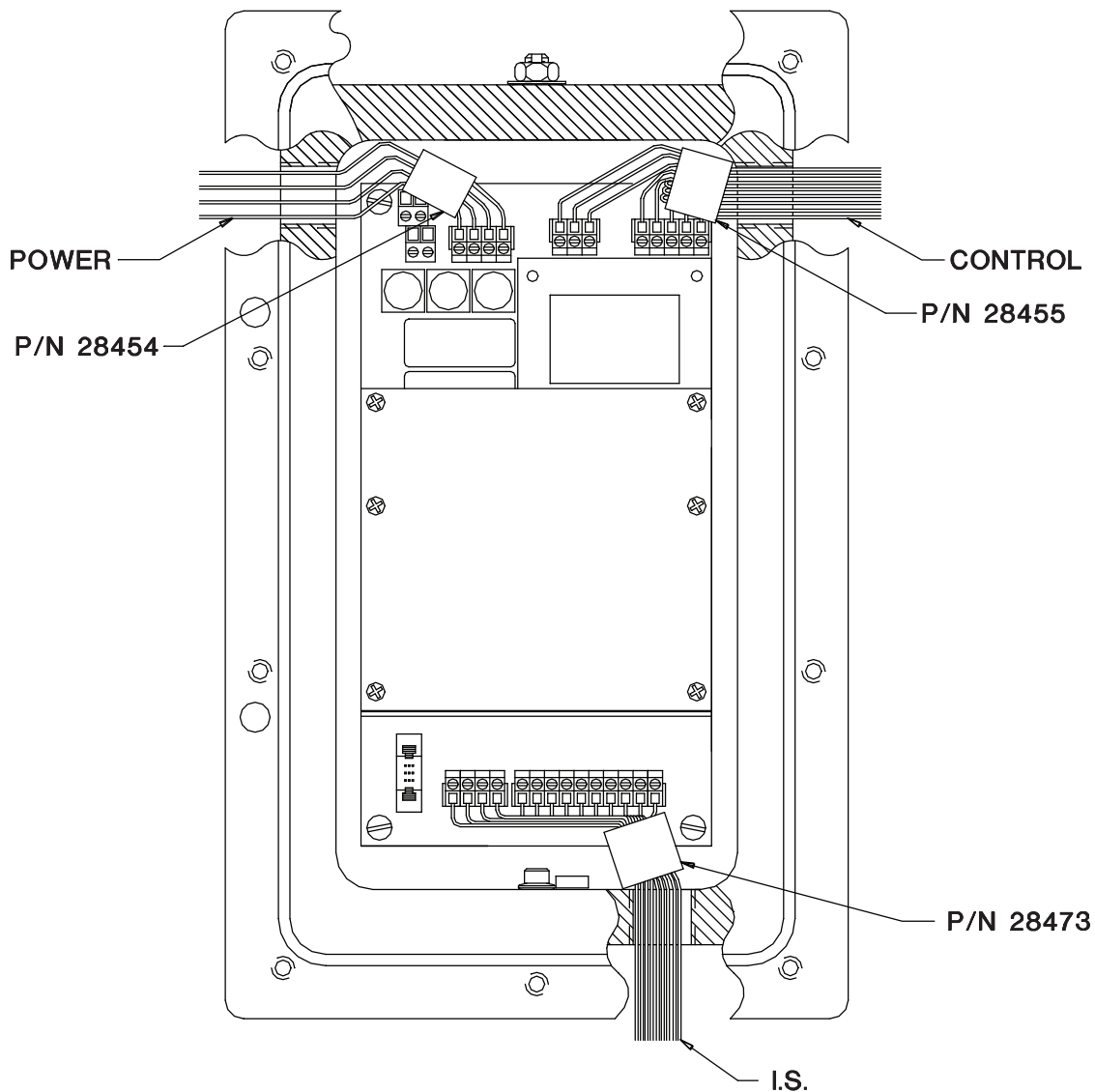
In order to minimize Electro Magnetic Interference (EMI), ferrite filters need to be installed on the three access cables entering the Intellitrol Controller. To reduce susceptibility to external EMI, the snap-on ferrite filters should be installed after the wiring connections are completed inside the Intellitrol. Make sure to leave only enough wire near the connectors to accommodate the snap-on ferrites.

Simply snap one EMI filter over all of the wires exiting the control box located in the three locations shown.

Control Module:

1. Power in on the left side
2. Control out/Modbus in on the right side
3. I.S. outputs at bottom

KEEP ALL LEADS AS SHORT AS POSSIBLE



System Setup

4.1 CPU Jumper Settings

The Intellitrol has a number of features and functions that can be enabled through internal jumper settings. The jumpers on the CPU board are listed below.

4.1.1 Jumper Selectable Options

- **J5** OPERATING MODE SETTINGS (see 4.1.2 below)
- **J8 & J1** COMM MODBUS ADDRESS (see 4.1.3 below)
- **J7** COMM PROTOCOL (see 4.1.4 below)

4.1.2 J5, OPERATING MODE SETTINGS

Enable/Disable (purchased options only).

The Intellitrol options which are purchased can be disabled via jumper plugs on the CPU board. Moving jumpers for non purchased options has no effect.

J5			Function Name	Description
1	-	2	TB3-5/6 CONFIG	Configures External Truck Bypass Indicator on TB3 Pins 5-6
3	-	4	DEADMAN ENABLE	Enable Deadman Switch Input
5	-	6	DEADMAN DISABLE	Disable Deadman Switch Input
7	-	8	VAPOUR ENABLE	Not Used
9	-	10	VAPOUR DISABLE	Not Used
11	-	12	VIP ENABLE	Enable Vehicle Identification Proving
13	-	14	VIP DISABLE	Disable Vehicle Identification Proving
15	-	16	GND ENABLE	Enable Ground Proving
17	-	18	GND DISABLE	Disable Ground Proving
19	-	20	ADD KEY S/N	Add Bypass Key Serial Number
21	-	22	NORMAL OPERATION	Normal Operation
23	-	24	ERASE KEY LIST	Erase Bypass Key Serial Number List

Note: The last three jumpers control Enrolling Bypass Key serial numbers into the Intellitrol's nonvolatile memory. Refer to Section 4.3 for more detail.

4.1.3 J1 & J8, COMM MODBUS ADDRESS

Setting communications speeds and feeds

Two sets of jumpers are used for setting device Modbus. Jumper J8 sets the tens group and jumper J1 sets the ones group. The Modbus address is the sum of the two jumpers.

4.1.4 J7, COMM PROTOCOL

RS485 (J7 Jumper Setup)

- J7, allow the user to select:
 - Parity, (NONE/ODD/EVEN)
 - Baud Rate, (1.2, 2.4, 4.8, 9.6, 19.2 KB/S)
 - Data Pack, (7 or 8 Bits)

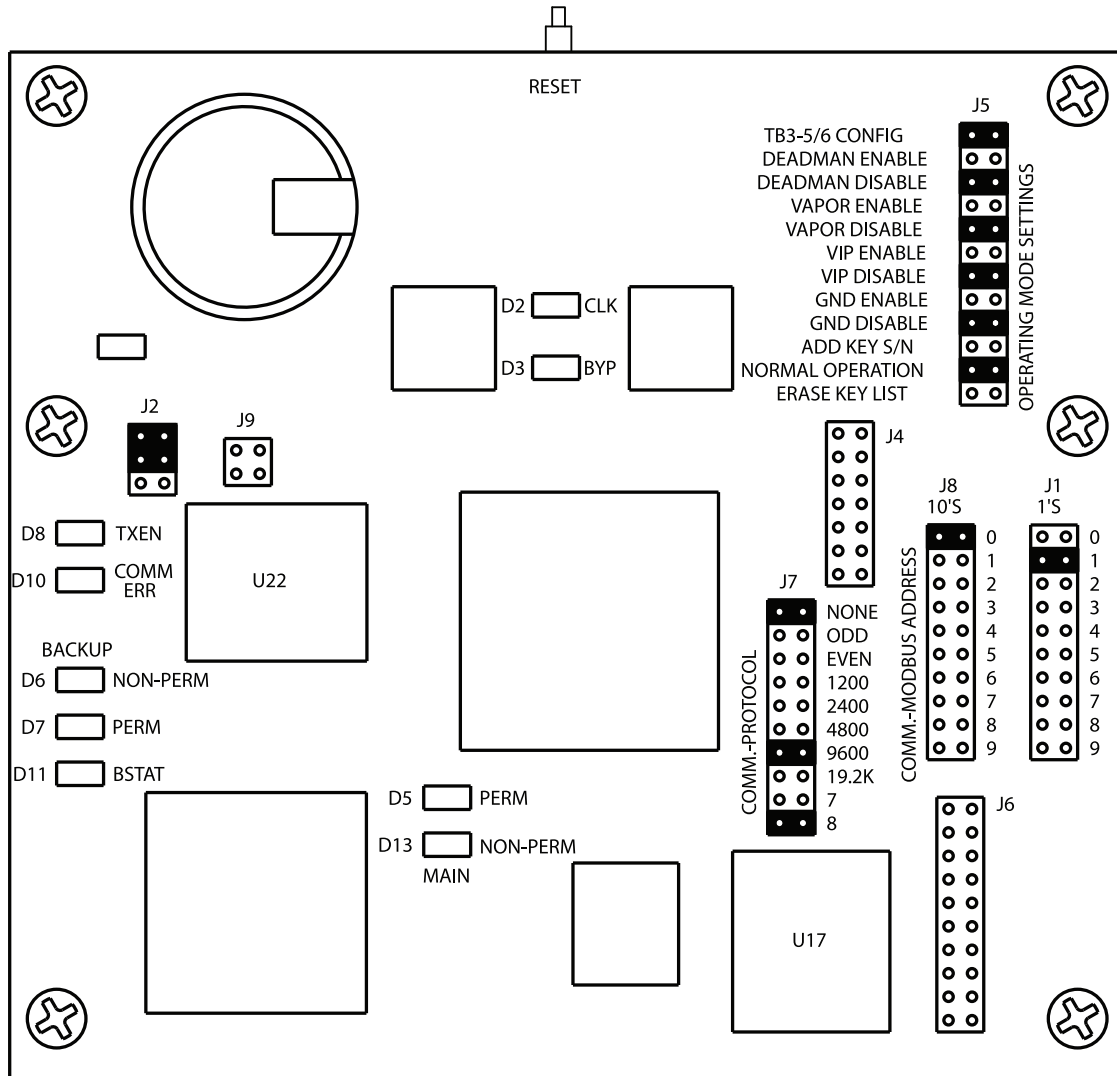


Figure 5: CPU Board Layout

Note: Jumper Terminals: Black denotes default installed jumpers, except J5, operating mode settings are dependent on options purchased.

System Setup

4.1.5 Control Board Jumper Settings

Several modes can be selected using jumpers on the main Control Board.

Note: Refer to Appendix 9.9 for jumper locations on the Intellitrol Control Module.

CHANNEL, (Number of Compartments)

- **J31**, Blue
 - Sets 6 channel mode for 2-wire Sensors
- **J32**, Blue
 - Sets 8 channel mode for 2-wire Sensors

GND BOLT/BALL OR RESISTIVE, (Type of ground system check)

- **J8**, Black
 - Inserted sets resistive ground; otherwise ground bolt/ground ball

THRESHOLD

- **J4**, Black
 - Inserted sets thermistor threshold = 3.8V for SP-BLK & BLUK type sensors.

JUMP START

- **J21, 22 and 23**, Red
 - Inserted disables Jump Start limiting IS output voltage for ATEX applications. All three MUST always be in for ATEX installations. Otherwise remove the three jumpers to enable Jump Start for installations requiring preheating of thermistor sensors.

4.2 VIP List

This feature is optional and must be ordered. Trucks and Tankers can be outfitted with a Truck Identification Module (TIM) that gives the vehicle a unique serial number. These numbers may be stored on the Intellitrol in non-volatile RAM so that the information may be passed to a terminal controller that works in conjunction with the Intellitrol system. The serial numbers must be entered into the Intellitrol via the RS-485 communication port.

4.3 Bypass Key, Add/Erase Procedures

Before use, each Bypass Key must first be programmed into the Intellitrol's permanent memory. Power must be on.

Warning: The following procedure must not be performed in a flammable hazardous environment. The Intellitrol door cannot be open while fuel or a tanker carrying flammable substances is present.

4.3.1 Adding Bypass Key entries:

1. Unbolt and open the Intellitrol door. Store the bolts in a safe place.
2. Move the "Normal Operation" jumper on J5 to the "Add Key S/N" position (refer to Figure 5: CPU Board Layout).
3. Push the "Reset" button (top center of CPU board).
4. Close the door and wait for both Optic Pulse and Communications to blink together continuously at double the Dynacheck rate. The Intellitrol is now ready for entering a bypass key serial number.
5. Position a bypass key up to the bypass port. The Intellitrol will read the bypass key serial number incrementing the "Compartment Number" LED. After all 8 compartment LED's light up, the large green permissive light will flash briefly to indicate that the bypass key serial number has been stored in memory.
6. To add additional bypass keys, repeat Step 5 above. When all bypass key serial numbers have been added, proceed to Step 7.
7. Open the Intellitrol door and return the jumper on J5 to the "Normal Operation" position.
8. Push the "Reset" button.
9. Close and properly secure the Intellitrol door using the original bolts.

4.3.2 Erasing Bypass Key entries:

It may at some point be necessary to delete the list of "authorized" Bypass Key serial numbers store within the Intellitrol's permanent memory (i.e. if a Bypass Key is lost). To delete the list of "authorized" Bypass Keys, do the following:

Warning: The following procedure must not be performed in a flammable hazardous environment. The Intellitrol door cannot be open while fuel or a tanker carrying flammable substances is present.

Caution: All bypass key entries will be erased.

1. *Unbolt and open the Intellitrol door. Store the bolts in a safe place.*
2. *Move the "Normal Operation" jumper J5 to the "ERASE KEY LIST" position (refer to Figure 5: CPU Board Layout).*
3. *Push the "Reset" button (top center of CPU board).*
4. *The large red non-permissive indicator will flash briefly and the Compartment, Optic Pulse, and Communication LED's will blink at double the Dynacheck rate to indicate that all bypass key entries have been deleted from memory.*
5. *Return the jumper on J5 to the "Normal Operation" position.*
6. *Push the "Reset" button.*
7. *Close and properly secure the Intellitrol door using the original bolts.*

4.3.3 External Bypass key entry/deletion

Bypass key serial numbers may be added or deleted one by one from the Intellitrol remotely via external software through the communications port.

Initial Systems Check

Performing an Initial System Check is essential and proves that the Intellitrol installation is performing safely and correctly.

5.1 *Inspect Wiring*

Inspect all field wiring for neat professional installation, and adherence to all wiring instructions above. Verify that all wiring terminals are tightened securely by tugging on each connection. Close the control unit's cover and fasten securely. Tighten the cover bolts in a criss-crossing pattern.

5.2 *Recommended Test Equipment*

Scully Signal Company suggests the use of our Universal Loading Rack Tester Model ST-2-DSWJ for individual compartment checks, cable continuity or float switch detection. While use of Scully test equipment is not required, the test equipment provide all of the proper overfill prevention system signals required to verify the new installation without requiring actual vehicles for the testing.

5.3 Model ST-2-DSWJ Tester

The Model ST-2-DSWJ Tester provides a rotary switch to select the following functional safety checks:

- Cable Continuity
- Float Switch Detection
- Thermistor Sensor Detection
- Optical Sensor Detection

5.3.1 Operational Testing Sequence

1. No vehicle or tester connected to Intellitrol.
2. Power up Intellitrol.
3. Intellitrol will go through a power up sequence, including the testing of all internal functions and operating parameters.
4. Checks and enables display panel LED's in sequence.
5. Red non-permissive indicator will light after 15 seconds.
6. Yellow Dynacheck LED will flash indicating that the Intellitrol is ready to accept a vehicle. If the Intellitrol is connected to a terminal automation system, the yellow terminal LED will also flash each time the Intellitrol is polled by the automation system.

5.3.2 Equipment Attachment

Set the ST-2-DSWJ tester to Thermistor Sensor Detection mode. Attach the black or green 2-wire thermistor or 2-wire optic plug from the Intellitrol to the socket (SJ-8S-4 bayonet pin style) on the right side of the housing.

5.3.3 Two-Wire Thermistor Sensor Operation Testing

The ST-2-DSWJ tester uses one "Channel Test" button/switch per thermistor sensor and each corresponding sensor will be tested when that button is depressed.

When the tester is attached to the thermistor socket, the Intellitrol will detect that it is attached to a "thermistor" equipped vehicle and proceed to warm up the sensors (the tester has traditional thermistor sensors inside). While the sensors are warming up, the 8 red compartment indicator lights at the top of the Intellitrol's diagnostic display panel will light, indicating 8 wet sensors. As each thermistor sensor warms up, the red compartment indicator, corresponding to that sensor, will go out indicating a dry sensor. When all of the thermistor sensors are warmed up (up to 75 seconds required) the Intellitrol will permit, and the green main status indicator will come on. Verify that the Intellitrol's main output relay contact has closed (turned on) and that product can be transferred. This can be done by verifying that this permissive signal is available at the product meter(s) external permissive input terminal(s). Some metering systems also have a visible indicator (LED) to indicate that the external permissive signal is satisfied.

For each thermistor sensor selected, verify that the Intellitrol goes non-permissive and shuts down the gantry. The corresponding compartment indicator light on the Intellitrol diagnostic display panel will light when the test button/switch is pushed. If more than one plug (or two different styles of plugs) is used on this installation for 2-wire thermistor or 2-wire optic operation, repeat the above tests for the other plug.

Initial Systems Check

5.3.4 Five-Wire Optic Sensor Operation Testing

Set the ST-2-DSWJ tester to Optic Sensor Detection mode. If the installation uses a single plug for both 2-wire thermistor or 2-wire optic and 5-wire optic modes, leave the plug connected as per the above. If the installation uses separate plugs for 2-wire thermistor or 2-wire optic and 5-wire optic operating modes, attach the optic plug from the Intellitrol to the optic socket. This will be either the SJ-6W-3 bayonet pin style socket on the left side of the housing for a blue "6W" style optic plug, or the SAE J- 560 style socket on the back of the tester housing for a "6X" style optic plug. When attached to this optic socket, the Intellitrol will detect that it is attached to a 5-wire optic equipped vehicle and proceed immediately to permit. The Intellitrol's diagnostic display panel will light, indicating an "optic out" pulse from the Intellitrol and an "optic in" pulse from the tester. As the Intellitrol permits, the green main status indicator will light up. Verify that the output to the metering system again turns on and that product can be transferred. Verify that when push-button/switch no. 2, no. 4 or no. 6 on the tester is pushed, the Intellitrol goes non-permissive and shuts down product flow. Compartment indicator light no. 1 on the Intellitrol diagnostic display panel will light when one of these tester buttons is pushed.

If more than one plug (or two different styles of plugs) is used on this installation for 5-wire optic operation, repeat the above tests for the other plug.

5.4 Fault Conditions During Initial Testing

If the Intellitrol does not permit the tester in either of the above testing modes, refer to the diagnostic display panel for specific information on identifying the cause of the problem.

If the Intellitrol fails the power up diagnostic test, the Service LED will flash ON-OFF and the Dynacheck light will be off. After making sure that the Intellitrol's plug(s) are not connected to a truck, remove power from the unit for 15 seconds and reapply. See that the Intellitrol goes through the power-up sequence per above. If not, refer to the Troubleshooting Guide in Section 7.3. There can not be a vehicle attached to the Intellitrol during power-up (or during a reset). If there is a vehicle attached during power-up, the Intellitrol will fail its diagnostic tests.

Most of the detailed instructions and cautions for operation of the Intellitrol system and accessories have already been discussed. The basics of loading a vehicle are described below. Refer to Figure 6 for details of the Intellitrol's main status indicators and diagnostic display panel.

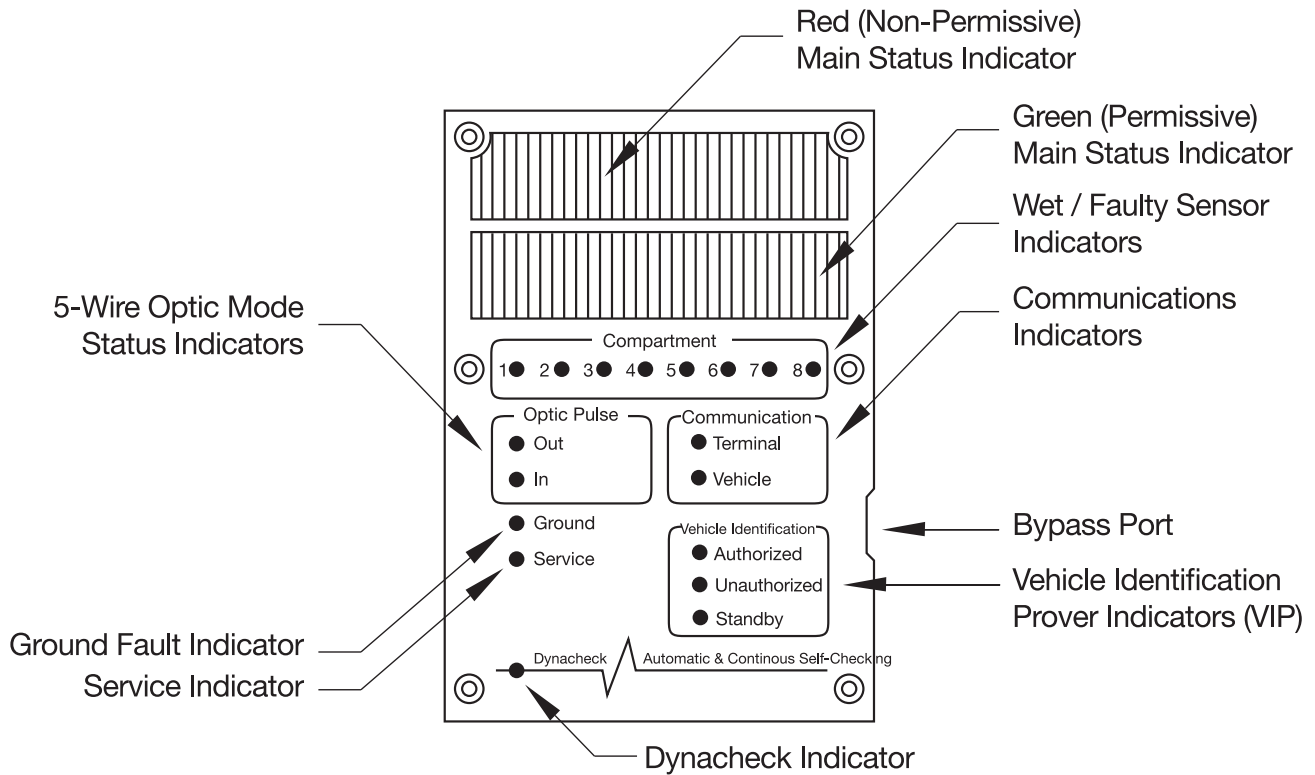


Figure 6: Main Status and Diagnostic Display Panel Indicators

System Operation

6.1 Normal Loading

The Intellitrol is capable of automatically detecting the presence of 2-wire and 5-wire overfill sensors. In operation it constantly monitors the truck plug while running diagnostics. Once a truck is detected the system determines the sensor type and monitors for dry condition.

Optic sensors are detected within a second. Thermistor sensors must heat up before indicating a dry condition. The heat-up time for thermistor sensors can take up to 75 seconds. This is a normal condition.

6.2 After a Normal Load

Disconnect the plug from the vehicle to be loaded. The Intellitrol will return to its non-permissive state and the diagnostic display panel will first flash all of the 8 compartment indicators and then clear (go blank) within a few seconds. This indicates that the Intellitrol's plug is ready to be connected to the next vehicle.

6.3 Intellitrol Not Permitting

If the Intellitrol main display does not go green, the reason for the problem will be indicated in the front panel display (see Section 7.3 Troubleshooting Guide for details).

This condition can be bypassed with the use of a properly registered bypass key.

6.4 Bypassing Normal Operating Modes

6.4.1 Bypassing in General

Before bypassing always verify that it is safe to do so.

To bypass a detected fault condition the bypass key must be held against the side of the Intellitrol front panel at the bypass port for 10-30 seconds.

When in bypass mode the main display will blink. When blinking red, faulty sensors are bypassed.

When blinking green the ground or VIP is bypassed.

- The maximum bypass time is settable via the communications port from 15 to 60 minutes.
- Bypass operation automatically ends when the vehicle is disconnected.
- If more than one fault condition exists preventing loading (e.g. ground and VIP), the bypass key must be pulled away from the bypass port and placed up to the port a second time.
- A faulty sensor can only be bypassed at initial truck hookup.
- A Deadman cannot be bypassed.
- A sensor wet during loading can never be bypassed.

7.1 Preventative Maintenance

The Intellitrol should be inspected annually. The o-ring and corrosion pack should be replaced at this time. It is recommended that maintenance on Scully equipment be carried out by Scully certified technicians.

7.2 Warranty

7.2.1 Intellitrol Control Unit

The Intellitrol Control Unit is warranted by Scully Signal Company ("Scully") to be free from defects in material and workmanship under normal use and service for a period of three years.

Warranty covers manufacturing defects. Damage specifically resulting from improper use or incorrect installation is not covered.

7.2.2 General Terms

All equipment returned to Scully that has a manufacturing date code that exceeds the warranty period should be accompanied by an invoice or work order that states the date of installation. Under these warranties, Scully shall be responsible only for actual loss or damage suffered and then only to the extent of Scully's invoiced price of the product. Scully shall not be liable in any case for labor charges for indirect, special, or consequential damages. Scully shall not be liable in any case for the removal and/or reinstallation of defective Scully equipment.

These warranties shall not apply to any defects or other damages to any Scully equipment caused by misuse or negligence, and this warranty shall not apply to any Scully equipment that has been altered or tampered with by anyone other than Scully factory representatives.

These warranties are the only warranties, expressed or implied, upon which products are sold by Scully, and Scully makes no warranty of suitability for any particular purpose in respect to the products sold.

Scully products or parts thereof assumed to be defective by the purchaser within the stipulated warranty period should be returned to the seller, local distributor, or directly to Scully for evaluation and service. Whenever direct factory evaluation, service, or replacement is necessary, the customer must first, by either email or phone, obtain a Returned Material Authorization Number (RMA) from Scully Company directly. No material may be returned without an RMA number assigned to it or without proper factory authorization.

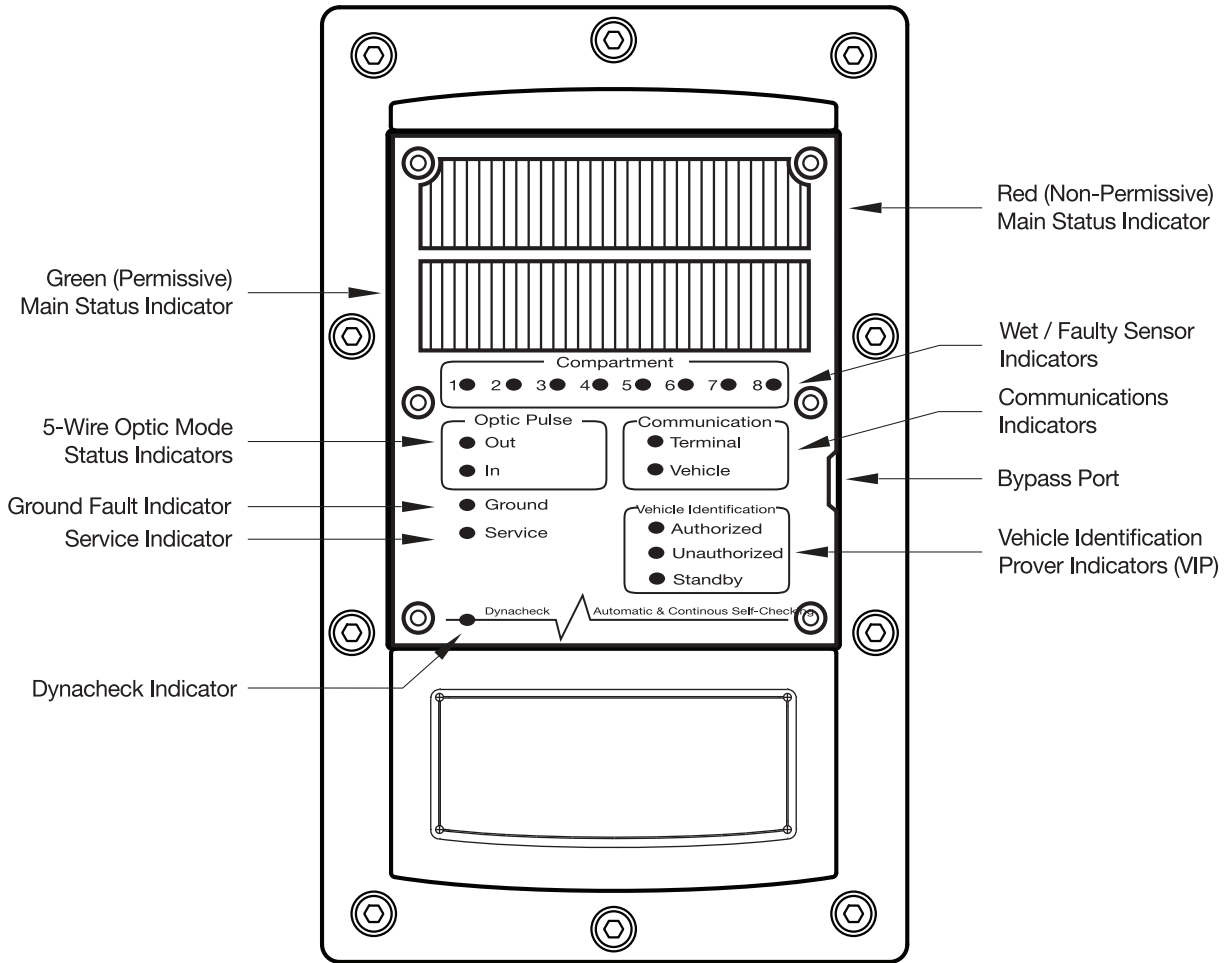
Any returns must be returned freight prepaid to:

Scully Signal Company
70 Industrial Way
Wilmington, MA 01887 U.S.A.
Attention: Service Dept.

Returned warranty items will be repaired or replaced at the discretion of the Scully Service Department according to Scully Product Warranty Policy and the Scully Returned Materials Procedure. Any Scully items under the Scully Warranty Policy that are deemed not repairable by the Scully Service Department will be replaced at no charge or a credit issued for that item subject to the customer's request.

Maintenance

7.3 Troubleshooting Guide



The following table summarizes errors indicated via the front panel and their most likely causes. Problems covered are the:

- Intellitrol Self Check failure
- Unit's plug and cable assembly(s)
- Vehicle trying to get a permissive signal to load at the rack.

This chart and the troubleshooting guide should be consulted prior to requesting technical service help. If after consulting the chart you are unable to resolve the problem contact Scully Technical Services at 1-800 Scully and be prepared to communicate the status of the indicators on the front panel.

Warning: Certain checks may require access to the inside of the control unit to verify or change configuration jumpers. Any activity requiring the opening of the unit should only be performed by qualified personnel. The area must be secured and vapour free before opening the enclosure to avoid explosion.

7.3.1 Table-2: Front Panel Display Trouble Shooting Chart

Table-2a: Front Panel Display Trouble Shooting Chart

Red Non Permit Bar	Green Permit Bar	Compartment LEDs	Optic Out	Optic In	Ground	Service	Comm. Terminal	Comm. Vehicle	Vehicle Id			Dynacheck	<p>OPERATING CONDITION</p> <p><i>Assumes ground proving and VIP enabled, lights for disabled options will always be off</i></p>	
									Authorized	Unauthorized	Standby			
On												*	Rack not permitting or deadman open	
On	Off	On											*	Vehicle connected, and indicated sensor is wet or thermistor sensor still warming
On	Off	**											*	No vehicle connected; an I/O pin (1-8) of the Scully connector is shorted
On	Off	**											*	Vehicle connected; 2-wire sensor is shorted
On	Off	#											*	2-wire sensor open
@	Off					@							*	Shorted output relay
@	Off												*	Vehicle connected and bypassing faulty sensor
Off	On												*	Vehicle connected and rack permitting, all sensors dry
Off	@												*	Vehicle connected and bypassing Ground Proving and/or VIP
			@										*	Vehicle connected; main processor pulsing 5-wire optic sensors
			@	Off									*	Main processor not receiving 5-wire optic pulses back from 5-wire sensors
			@	@									*	Vehicle connected; main processor pulsing 5-wire optic sensors and optic return being sensed
					Off								*	Vehicle not connected or vehicle connected and ground proving successful
					On								*	Vehicle connected and ground proving fault. Either open or Ground Bolt / Ground Ball shorted
	@				*								*	Vehicle connected; Ground proving bypassed
						Off							*	No system error detected
						@							*	System error detected
@	Flashing													
*	Flashing at Dynacheck rate (once per second)													
#	Flashing slow (once every two seconds)													
**	Flashing fast (twice per second)													

Maintenance

Table-2b: Front Panel Display Trouble Shooting Chart

Red Non Permit Bar	Green Permit Bar	Compartment LEDs	Optic Out	Optic In	Ground	Service	Comm. Terminal	Comm. Vehicle	Vehicle Id			Dynacheck	<p>OPERATING CONDITION</p> <p><i>Assumes ground proving and VIP enabled, lights for disabled options will always be off</i></p>
									Authorized	Unauthorized	Standby		
							On					*	Terminal communications line faulty
							Off					*	Intellitrol not communicating with terminal
							*					*	Intellitrol communicating with terminal
							On					*	Vehicle communications error
							Off					*	Vehicle not connected/not communicating
							*					*	Intellitrol communicating with the vehicle
								On	Off	Off		*	Vehicle connected, TIM good, and authorized
								*	Off	Off		*	Vehicle connected, VIP bypassed
								Off	On	Off		*	Vehicle connected, TIM good but not unauthorized, i.e. ID not in VIP list
								Off	*	Off		*	With vehicle connected, unable to see TIMs
											*	*	Intellitrol waiting for TAS command
												*	Intellitrol operational
												Off	Unrecoverable system error occurred
Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	No Power; front panel bad/not connected
													All other displays = bad front panel or unit
@	Flashing												
*	Flashing at Dynacheck rate (once per second)												
#	Flashing slow (once every two seconds)												
**	Flashing fast (twice per second)												

7.4 **Installing Replacement Parts**

Warning: Opening the Intellitrol exposes Non-Intrinsically safe circuits to the atmosphere. Always assure the location is secured and is non-hazardous before opening an explosion proof housing.

The Intellitrol contains only two field replaceable modules. Order a replacement with the correct part number corresponding to the options purchased.

- Control Module
- Front Panel display

7.4.1 **Control Module Replacement Procedure**

- Disconnect the unit from power
- Unbolt and open the Intellitrol door
- Unplug all connectors, noting orientation of J1 ribbon to front panel
- Remove factory grounds from TB1 cable to front panel from green J1 terminal
- Remove the four screws on the corners of the control module which secure it. Lift the control module from the enclosure and remove the blue and black wires from the terminal strips on the back of the module which connect to the IS Barrier Heat sink assembly.
- Make note of jumper settings

7.4.2 **Control Module Reassembly**

- Inspect new module and reset jumpers to match the unit removed. While most will match particular attention should be paid to CHANNEL jumper J31 & J32 which sets 6/8 compartment mode. The jumpers are always shipped in the 8 Compartment mode and must be reset on site if 6 compartment mode is used.
- Re-assemble unit in the reverse order used for removal.

Warning: The blue and black wires from the IS Barrier Heat sink assembly are an integral part to safety and MUST all be reconnected to assure continued Intrinsic Safety!

7.4.3 **Front Panel Replacement**

- Disconnect the unit from power
 - Remove the front cover screws and front panel assembly
 - Note orientation of connector on rear of front panel
 - Re-assemble in reverse direction

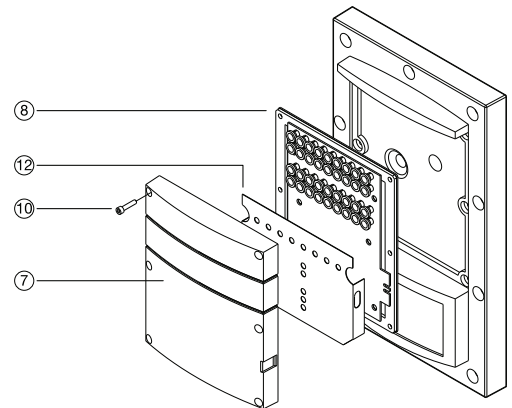
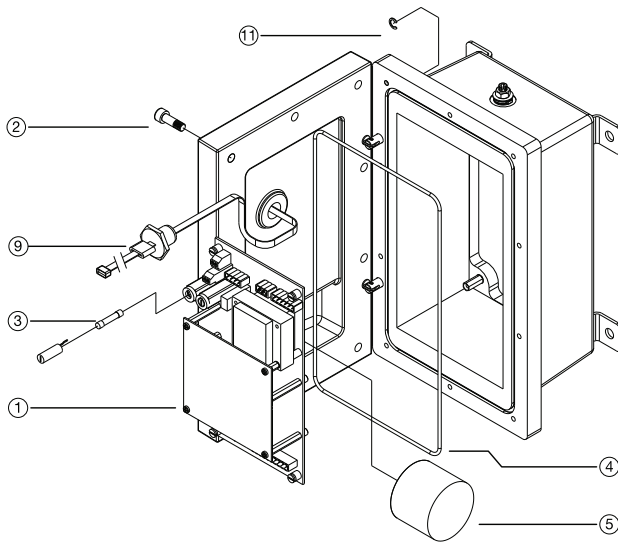
7.5 **Parts Available**

The following lists contain the common spare field replaceable parts available for the Intellitrol control unit and accessory items. Please consult the factory for any parts not mentioned below.

Maintenance

7.5.1 Table-3: List of Replacement Parts

Item	Description	Part Number	Qty.
1	Module Assembly, ICC-O	08983O	1
	Module Assembly, ICC-OG	08983OG	
	Module Assembly, ICC-OGV	08983OGV	
2	Cover Bolt, M8 x 1.25 x 25mm	50005	10
3	Contact Fuse (F5, F8), 5A, Hi-interrupt	26372	2
4	Cover O-ring (gasket)	31340	1
5	Corrosion Inhibitor	40268	1
7	Lens Assembly (with 6 mounting screws)	09181	1
8	Display Module (with backing plate)	08981	1
9	Display Cable Feed-through	08982	1
10	Lens Mounting Screw, 8-32 x 3/4	50080	6
11	Retaining Ring, Cover Hinge	54039	2
12	Text Mask (English), Overfill and Ground	32085*	1
	Text Mask (English), Overfill, Ground and Vehicle ID	32086*	



63103 RevC

*To order lens mask in text other than English, add:

- S for Spanish
- F for French
- G for German
- I for Italian
- D for Danish

Example: 32085S = Lens Mask, Spanish Text, Overfill & Grounding

7.5.2 Table-4: List of Accessories

Part Number	Description
08939	Bypass Key Authorizer
08863	Deadman Control Switch Assembly
08951	Intelliview® 2 Terminal Software
09001	RS-232 to RS-485 Converter Kit (for communications)
08958	SC-8OB Sculcon Junction Box with 8B Style Black Poly Plug and 6 meter (20 ft) Blue Straight Cable (for 2-wire or 5-wire sensors - 4-bayonet pins - 10 contact pins)
08959	SC-8B Sculcon Junction Box with 8B Style Green Poly Plug and 6 meter (20 ft) Blue Straight Cable (for 2-wire or 5-wire sensors - 4 bayonet pins - 10 contact pins)
08729	SC-8A Sculcon Junction Box with 8A Style Green Poly Plug and 9 meter (30 ft) Orange Coiled Cable (for 2-wire sensors - 2 bayonet pins - 10 contact pins)
08156	SC-6A Sculcon Junction Box with 6A Style Green Poly Plug and 9 meter (30 ft) Orange Coiled Cable (for 2-wire sensors - 2 bayonet pins - 8 contact pins)
08159	SC-6W Sculcon Junction Box with 6W Style Blue Poly Plug and 9 meter (30 ft) Blue Coiled Cable (for 5-wire sensors - 3 bayonet pins - 6 contact pins)

Technical Service Hot-Line/Notes

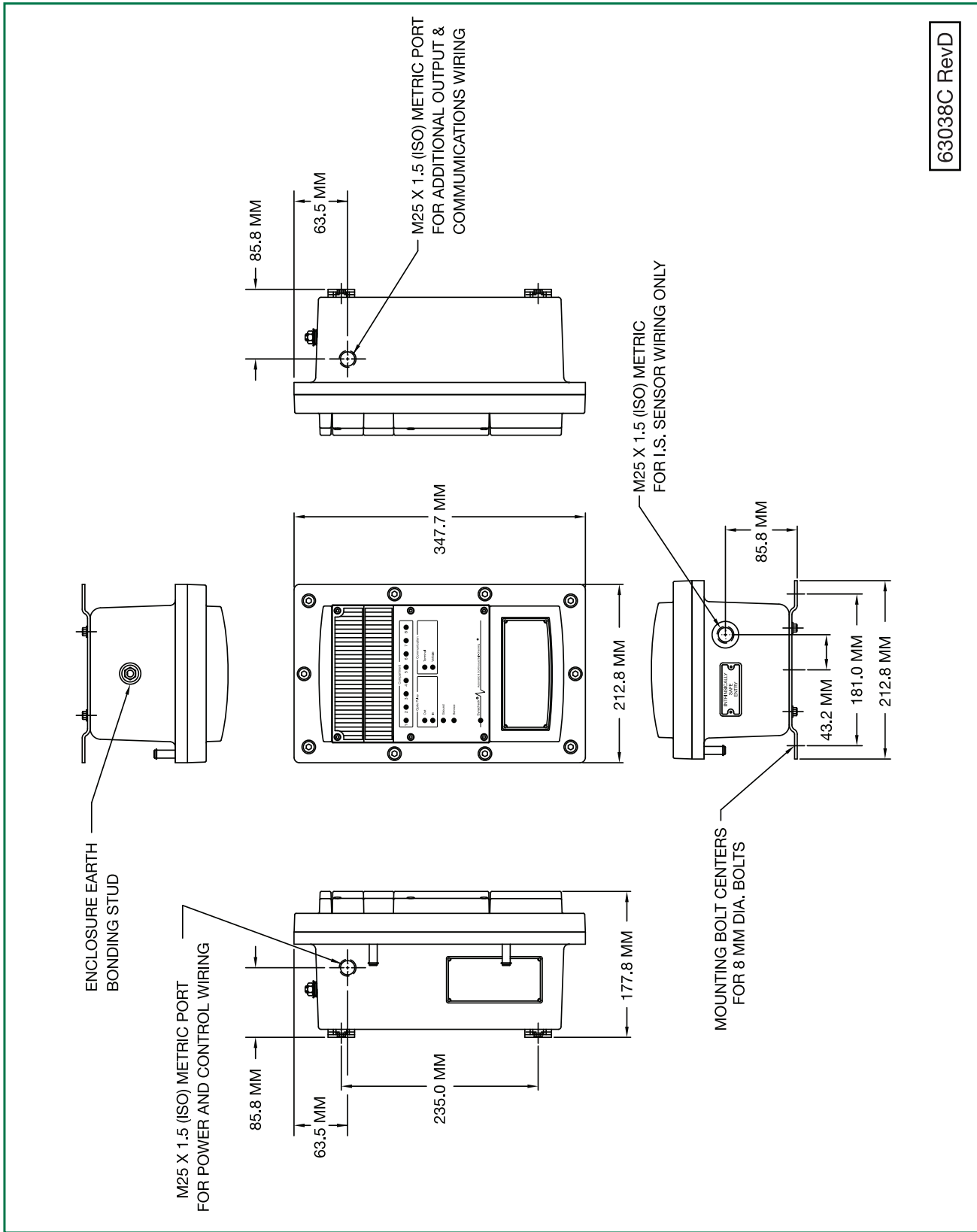
Technical Service Hot-Line

Scully's Technical Service Department can be reached at the corporate headquarters in Wilmington, MA U.S.A. by telephone at (617) 692-8602; by FAX at (617) 692-8620; and by email at Techservice@scully.com. If calling from within the United States, our toll free Technical Service Hot-Line Number is (800) 272-8559.

Our technical service department staff is available from 8 AM to 5 PM Eastern Standard Time to answer any questions which may arise regarding the installation, operation or service of the Scully Intellitrol and accessories.

Notes

9.1 DWG 63038C – Intellitrol Enclosure Outline, Model Series ICC



63038C RevD

9.3 DWG 61337C – Mech. Installation, Intellitrol Model Series ICC

ADDITIONAL OUTPUT CONTROL & COMMUNICATIONS WIRING

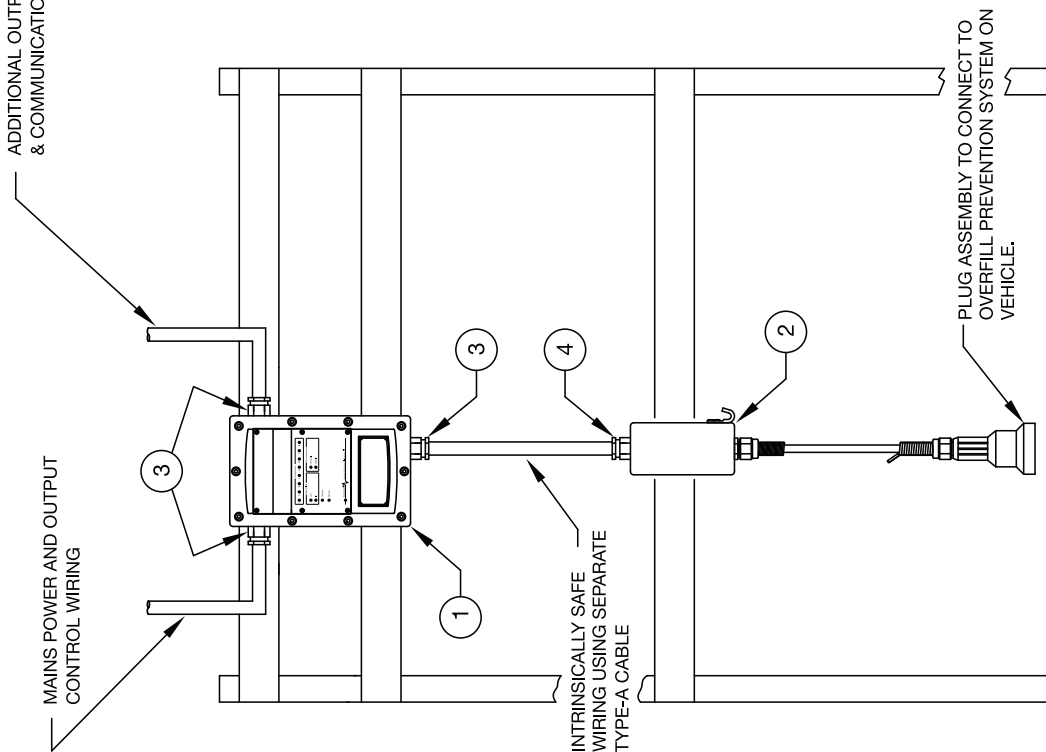
MAINS POWER AND OUTPUT CONTROL WIRING

EQUIPMENT SCHEDULE (TYPICAL)

1. INTELLITROL CONTROL UNIT.
2. SCULCON PLUG AND CABLE UNIT.
3. FLAMEPROOF Exd CABLE GLAND FITTING.
4. INDUSTRIAL CABLE GLAND FITTING.

INSTALLATION NOTES

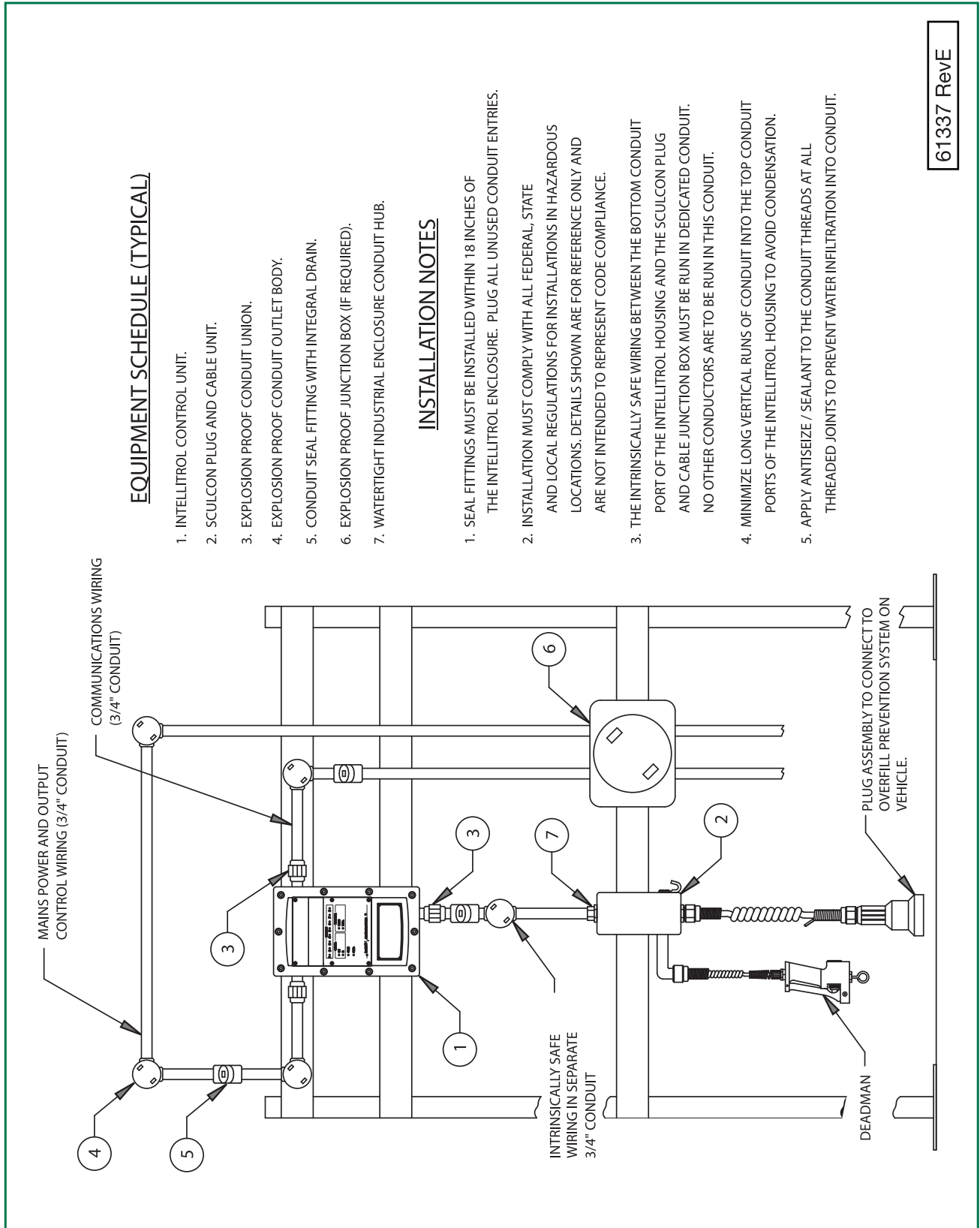
1. INSTALLATION MUST COMPLY WITH NATIONAL AND LOCAL REGULATIONS FOR INSTALLATIONS IN HAZARDOUS LOCATIONS DETAILS SHOWN ARE FOR REFERENCE ONLY AND ARE NOT INTENDED TO REPRESENT CODE COMPLIANCE.
2. THE INTRINSICALLY SAFE WIRING BETWEEN THE BOTTOM PORT OF THE INTELLITROL HOUSING AND THE SCULCON PLUG AND CABLE JUNCTION BOX MUST BE RUN USING DEDICATED TYPE-A CABLE OR IN A CONDUIT. NO OTHER SIGNALS ARE TO BE RUN IN THIS CABLE OR CONDUIT.
3. MINIMIZE LONG VERTICAL RUNS OF CABLE INTO THE TOP PORTS OF THE INTELLITROL HOUSING TO AVOID CONDENSATION CHANNELING.
4. USE FIBER SEALING WASHERS BETWEEN THE CABLE GLAND FITTINGS AND THE INTELLITROL HOUSING AT ALL CABLE PORT ENTRIES.
5. ANY UNUSED HOLES IN THE FLAMEPROOF ENCLOSURE MUST BE PLUGGED USING A CERTIFIED FLAMEPROOF STOPPER PLUG.



61337C RevD

Diagram Appendix

9.4 DWG 61337 – Mech. Installation, Intellitrol Model Series IC



61337 RevE

9.5 DWG 61335C – (2-Wire, Optic or Therm.) Sculcon Field Wiring Diagram

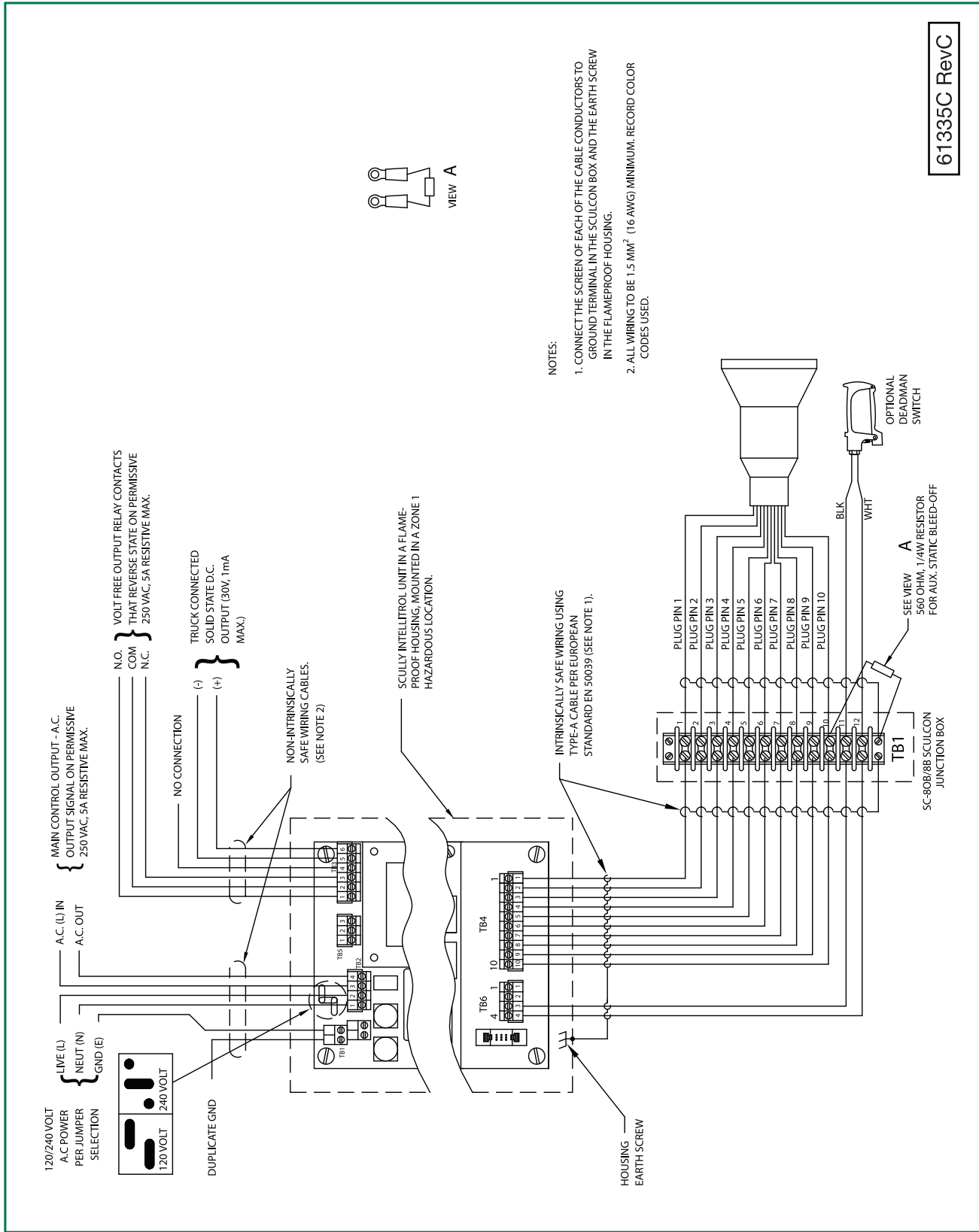
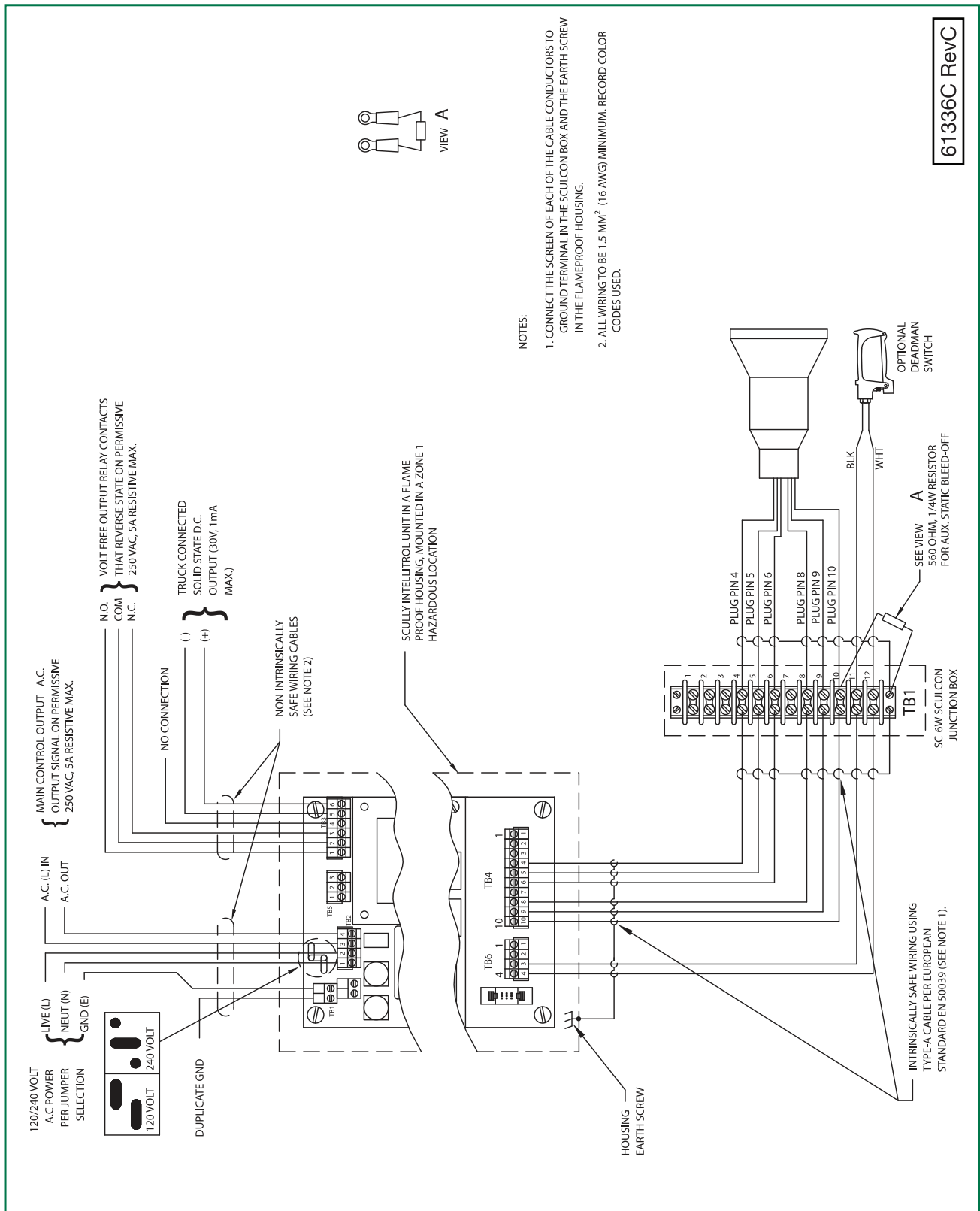


Diagram Appendix

9.6 DWG 61336C – (5-Wire, Optic) Sculcon Field Wiring Diagram



- NOTES:
1. CONNECT THE SCREEN OF EACH OF THE CABLE CONDUCTORS TO GROUND TERMINAL IN THE SCULCON BOX AND THE EARTH SCREW IN THE FLAMEPROOF HOUSING.
 2. ALL WIRING TO BE 1.5 MM² (16 AWG) MINIMUM. RECORD COLOR CODES USED.

61336C RevC

9.7 DWG 61394C – Multiple Sculcon (2-wire and 5-wire) Field Wiring Diagram

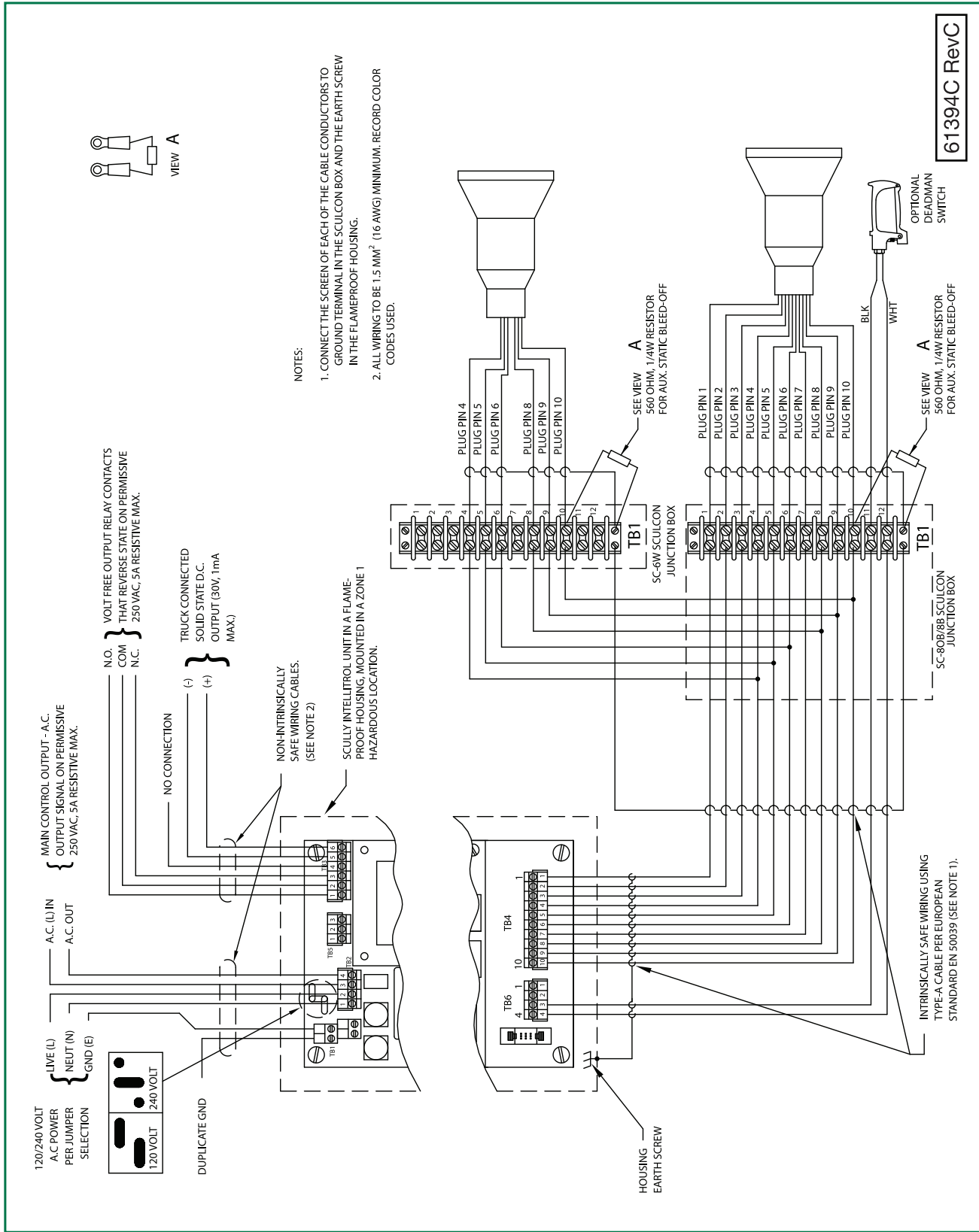
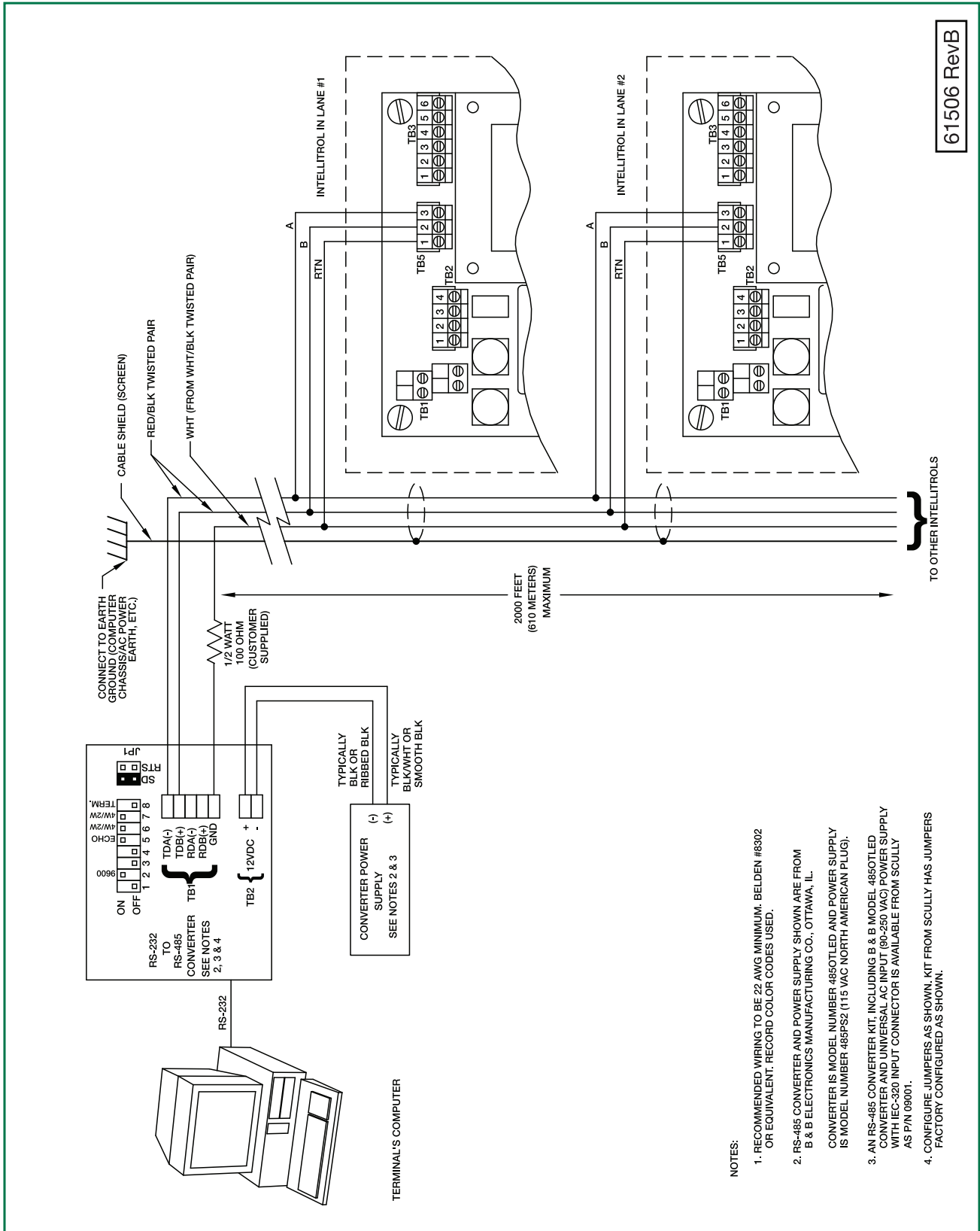


Diagram Appendix

9.8 DWG 61506 - Multi-Drop Communications Field Wiring Diagram



61506 RevB

Notes:

Notes:

Scully - Setting Standards in Safety and Dependability since 1936.

For over seventy-five years Scully has been engineering and building products to the highest safety and reliability standards. We design and manufacture all of our systems under one roof to ensure complete quality control over our manufacturing and testing operations. Scully is ISO certified and all of our products are 100% made in the U.S.A. In addition, we back up our products with the best service in the industry. We have direct sales and service personnel in the U.S.A., The United Kingdom, and Europe and are represented in over 50 countries.

For more information and 24 hour technical assistance, call Scully Signal Company at 1-800-SCULLY (1-800-272-8559).

Scully Headquarters in Wilmington, MA U.S.A.

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MaxSafety®
SYSTEMS

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