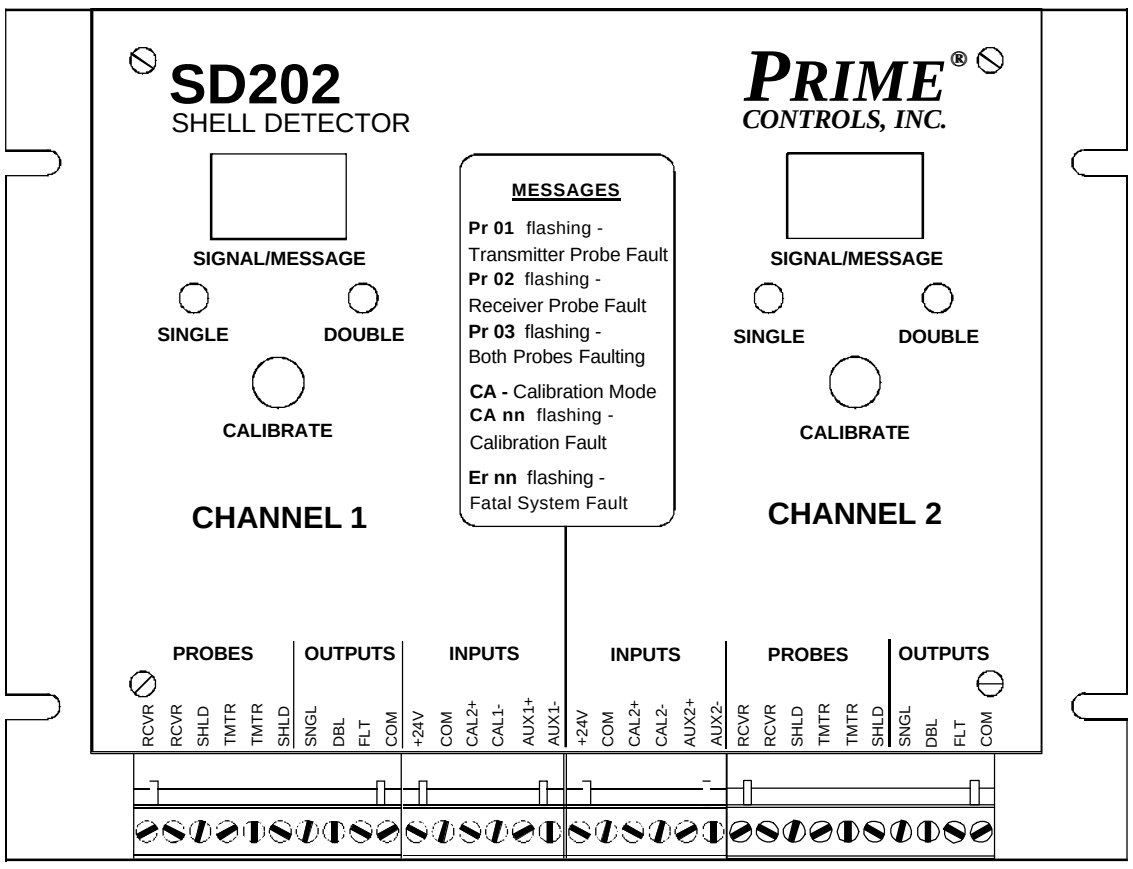
OPERATING INSTRUCTIONS

MODEL **SD202** SHELL DETECTOR



DESCRIPTION

The Model SD202 Shell Detector for conversion press applications is a rugged but sensitive dual channel instrument designed specifically to detect and report missing blanks or double blanks at the infeed of a conversion press.

A complete system for two press lanes comprises one control module housed in an aluminum enclosure and four probes. Each transmitting and receiving probe pair senses missing blanks or double blanks at one lane of the press.

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Control Module

The control module allows for fast and easy setup and for quick diagnosis of system errors or problems. Setup is achieved through the simple press of a push-button switch or an external contact closure. Faults are reported on two digit displays on the control module and through FAULT outputs that may be connected to a PLC or system controller.

The DOUBLE, SINGLE, and FLT outputs may be jumper selected as sinking or sourcing drivers. A four position DIP switch behind the front panel allows the installer to select a number of operational options as described in the installation section of this document.

The AUX inputs provide a means to switch between sensing steel blanks and sensing aluminum blanks without removing the front panel and changing the DIP switch settings.

When the unit first powers up, the two digit displays indicate the material sensing mode of the unit, i.e. whether set up for sensing **Al**uminum or **St**eel by displaying the characters "Al" or "St" for a period of approximately four seconds. Which mode comes up is a function of an internal DIP switch setting and the state of the AUX inputs as described later in this document.

SD202s with ROM Version 1.13 or higher offer two sensing modes that differ in timing characteristics. These modes are selectable through a DIP switch setting. On-press operation incorporates delays in the output signals that insure sufficient OFF time between ends to allow PLC detection of the gap between ends during belt indexing. The alternate high speed mode provides for fast detection of continuously moving ends and provides a minimum output pulse width of 25 mS on the double output when a double is detected. The 25 mS is intended to provide a signal duration that can be detected by a slow PLC or that is of sufficient duration to latch a relay.

Probes

The SD202 may be used with any of the new two wire probes or with older model three wire probes including AV, AY, AZ, AZA, and CB probes. When used with older 3 wire probes, the white wire in the probe cable is not used and must remain disconnected.

OPERATION

Operation of the SD202 Shell Detector involves only two processes, calibration and fault interpretation. These processes are described below.

Calibration

Calibration requires the following steps:

1. Stop the press in the dwell portion of the cycle with a single end between the infeed probes.

2. Observe that no error conditions are being reported on either display of the SD202 control module.

3. Press the CALIBRATE push button on the Channel 1 side of the SD202 control module and observe the SINGLE and DOUBLE LEDs flashing alternately and "CA" flashing on the numeric display. If the calibration is successful, the display flashing stops in less than three seconds and a number between 48 and 52 is displayed.

   If the display continues to flash "CA", retry the calibration by pressing the CALIBRATE push button a second time. If after the second calibration attempt the flashing continues beyond 5 seconds, check for proper gap setting, proper material selection (steel vs. aluminum), and/or for appropriate sample between the probes.

   If the calibration problem is not resolved and the calibration switch pressed again within 30 seconds, calibration mode is aborted and the previous calibration values are reinstated.

4. Repeat step 3 on Channel 2 of the SD202.

If both channels calibrate successfully, calibration is complete. The calibration process may also be initiated through an external switch or signal controlling the CAL+ and CAL- inputs to the SD202. Activation of this input performs the same function as pressing the CALIBRATE push-button switch for the corresponding channel.

Fault Interpretation

The SD202 monitors the probe connections on a continuous basis and reports what it detects to be disconnected or malfunctioning probes. The probe faults are reported as follows:

Alternately flashing "PR" and "01" - transmitter probe disconnected or failing.

Alternately flashing "PR" and "02" - receiver probe disconnected or failing.

Alternately flashing "PR" and "03" - both probes disconnected or failing

The SD202 performs extensive self diagnostics at power up and more limited diagnostics while running. Most fatal faults, if not involving the display subsystem, are reported on the numeric displays through the alternate flashing of "Er" and "nn" where "nn" is a two digit number indicating the source of the fault. These faults are not field repairable and require the change out of the control module.

Any detected fault causes the FLT outputs to be turned OFF until the fault is cleared.

INSTALLATION

Installation comprises four basic steps: 1) installing the probes, 2) mounting the control module, 3) wiring the unit, and 4) setting system options. Each of these steps is further expanded below.

Installing the Probes

1. Mount the probes, one above and one below the centerline of the track carrying the ends into the press. The probes must be positioned such that they are *centered on the can end during the dwell* portion of the press cycle. In the vertical, the track should run midway through a gap of approximately 5/8 inch (16 mm) between the probes.

2. Run the probe cabling through conduit back to the cabinet housing the control module. *Do not run the sensor cables through conduit carrying high level or noisy signals.*

Mounting the Control Module

Mount the control module on the back panel of an industrial enclosure. The footprint is 8.25 inches (210 mm) by 6.25 inches (159 mm) with mounting slot locations on a rectangle 7.625 inches (194 mm) in the horizontal and 4.0 inches (102 mm) in the vertical. Insure that the mounting screws make good electrical contact between the module housing and the control enclosure back panel. See drawing at the end of this document.

Wiring the Control Module

1. Connect 24 volt dc power between one set of the +24V and COM terminals of the control module. Two +24V terminals and two COM terminals are supplied for convenience of connecting jumpers to the CAL and AUX inputs. The two +24V terminals are internally connected. The supply must be capable of delivering 0.2 amps continuous and a startup surge of 0.3 amps.

2. Connect the channel 1 transmitter probe wires to the two TMTR terminals on the left side of the control module and the channel 1 receiving probe wires to the two RCVR terminals on the left side of the control module. The probe connections are not polarized. Connect the shield wires to the terminal labeled SHLD.

   Though both the transmitting and receiving probes are identical, it is preferred practice to choose the transmitting probe as the one that will remain farthest from the track as it moves and stretches.

   On retrofit installations where older three wire probes are installed, cut back and do not connect the third (usually white) wire. If in doubt about which wires to use, measure the resistance between the wires in pairs, and then use the pair that produces the highest resistance reading (typically 23 ohms).

3. Repeat step 2 for channel 2 of the unit.

4. Connect the SNGL, DBL, and FLT outputs to the system controller and/or interlocking circuitry as required. These outputs may be sinking or sourcing as determined by the placement of jumpers on the SD202 circuit board. See the figure at the end of this document.

   The FLT outputs are always ON for no fault and are slaved together. Thus a fault on either channel will turn OFF both FLT outputs. The active states of the other outputs may be affected by the setting of the compatibility DIP switch as described later in this document.

5. If calibration is to be activated remotely, connect the CAL+ and CAL- inputs appropriately. Connect *sinking* drivers or contacts to the CAL- terminal and connect CAL+ to the 24 volt power source. Connect *sourcing* drivers to the CAL+ terminal and connect CAL- to COM.

6. If the application may involve switching between steel and aluminum blanks, either AUX input may be wired to provide external control of the sensing mode of the SD202. Connect *sinking* drivers or contacts to the AUX- terminal and connect the AUX+ terminal to the 24 volt supply. Connect s*ourcing* drivers to the AUX+ terminal and connect the AUX- terminal to COM.

Setting System Options

To set any of these options, disconnect power and remove the front panel of the control module by removing the four screws at the corners of the module. Removing the panel allows access to a four position DIP switch and a set of six jumpers.

The DIP switch, located at the upper left hand corner of the circuit board, may be set as follows:

Switch	OFF	ON
DIP 1	Sense aluminum ends	Sense steel ends
DIP 2	Display signal strength	Display relative metal thickness
DIP 3	Select fail-safe mode	Select compatibility mode
DIP 4	On-press sensing	High speed sensing

NOTE: The DIP switches are read only upon power-up of the unit. After changing a switch setting, power the unit down and back up again to activate the change.

Sinking or Sourcing Outputs

Output driver sinking or sourcing modes are selected through the jumper settings as shown on the INTERNAL SETTINGS illustration at the end of this document. Sourcing output is selected when the jumpers are installed on the two pins closest to the connector edge of the circuit board.

Sensing Aluminum or Steel

When no signal is applied to either of the AUX inputs, DIP switch 1 determines the material sensing mode as aluminum when OFF and steel when ON. However, if either AUX input is active, DIP switch 1 has the reverse effect.

Display Direction

The numeric displays may be set to readout in proportion to received signal (high for empty gap, low for doubles and tabs) or in proportion to metal thickness (low for gap and high for doubles and tabs) between the probes. See the chart above.

Compatibility with Earlier Double Sensing Units

When DIP switch 3 is ON, the sourcing outputs of the SD202 provide the same logic levels as the outputs of older double sheet units such as the DS33 and DS35, allowing for quick and easy retrofit installations. When DIP switch 3 is OFF, the output states are defined to provide maximum protection against loss of connection between the shell detector and the controlling PLC. The loss of connection is sensed as the fault condition.

The table below defines the output states for all combinations of DIP switch 3 and the possible sensing states.

		Ch 1 OUTPUT STATES		Ch 2	
Switch	In Gap	SNGL	DBL	SNGL	DBL
OFF	missing	OFF	ON	OFF	ON
OFF	single	ON	ON	ON	ON
OFF	double	ON	OFF	ON	OFF
ON	missing	ON	OFF	ON	OFF
ON	single	OFF	OFF	OFF	OFF
ON	double	OFF	ON	OFF	ON

High Speed Sensing Mode

This option is available on units with ROM Version 1.13 or higher.

SD202s with ROM Version 1.13 or higher offer two sensing modes that differ in timing characteristics. These modes are selectable through a DIP switch setting. DIP switch 4 OFF selects on-press operation which incorporates delays in the output signals that insure sufficient OFF time between ends to allow PLC detection of the gap between ends during belt indexing. DIP switch 4 ON selects the alternate high speed mode which provides for fast detection of continuously moving ends and provides a minimum output pulse width of 25 mS on the double output when a double is detected. The 25 mS is intended to provide a signal duration that can be detected by a slow PLC or that is of sufficient duration to latch a relay.

In the high speed sensing mode, minimum sensing time is approximately 3 milliseconds. This means that the end must completely block the sensor gap for a minimum of 3.5 mS.

Special Functions

The SD202 offers two sets of optically isolated inputs that provide added control over the unit. These are the remote calibration input terminals labeled CAL1+, CAL1-, CAL2+, and CAL2- and the sensing mode inputs labeled AUX1+, AUX1-, AUX2+ and AUX2-.

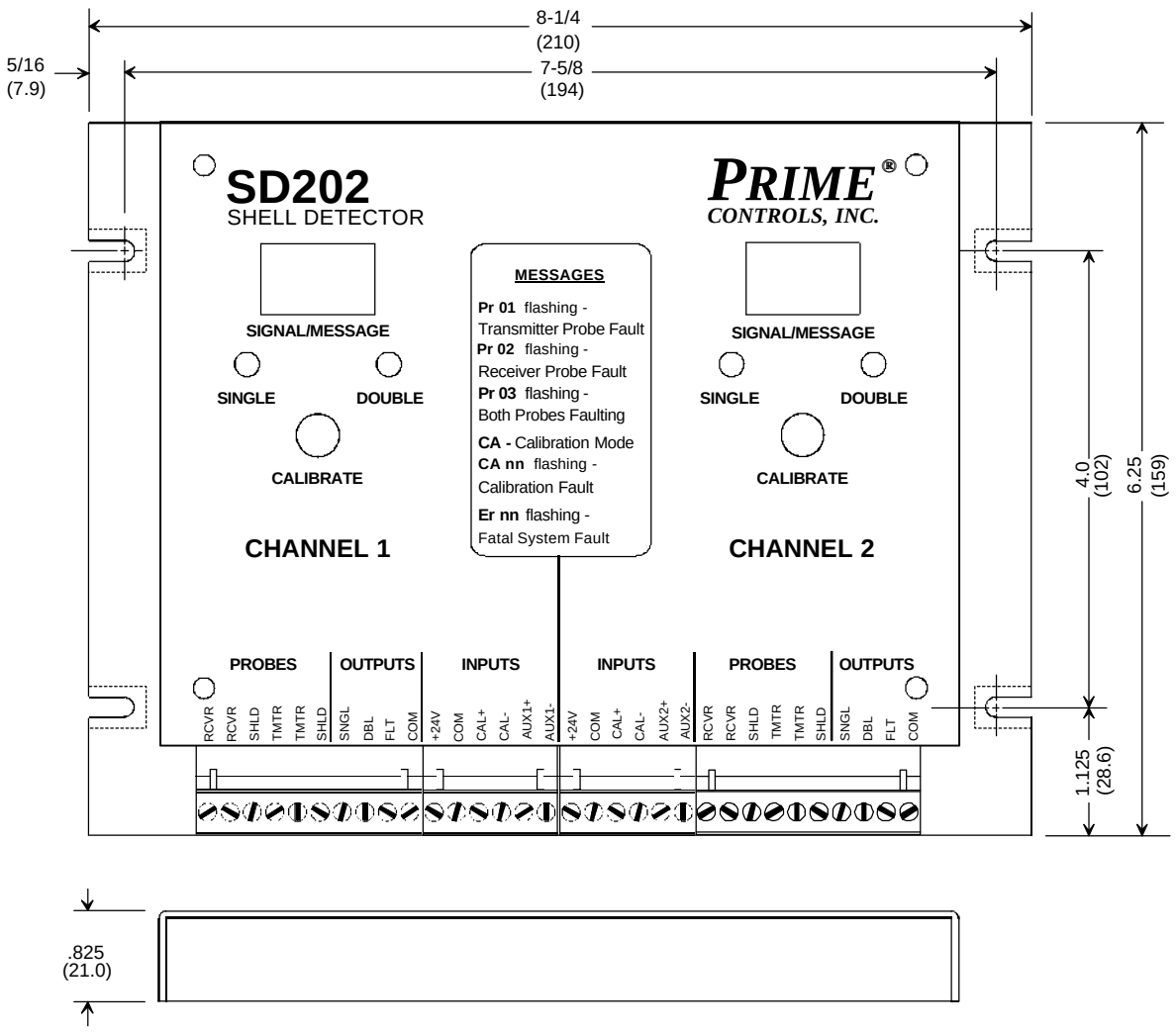
Remote Calibration

The remote calibration inputs, when activated, perform the same function as the CALIBRATE push-button switches on the front panel of the control module.

Material Selection

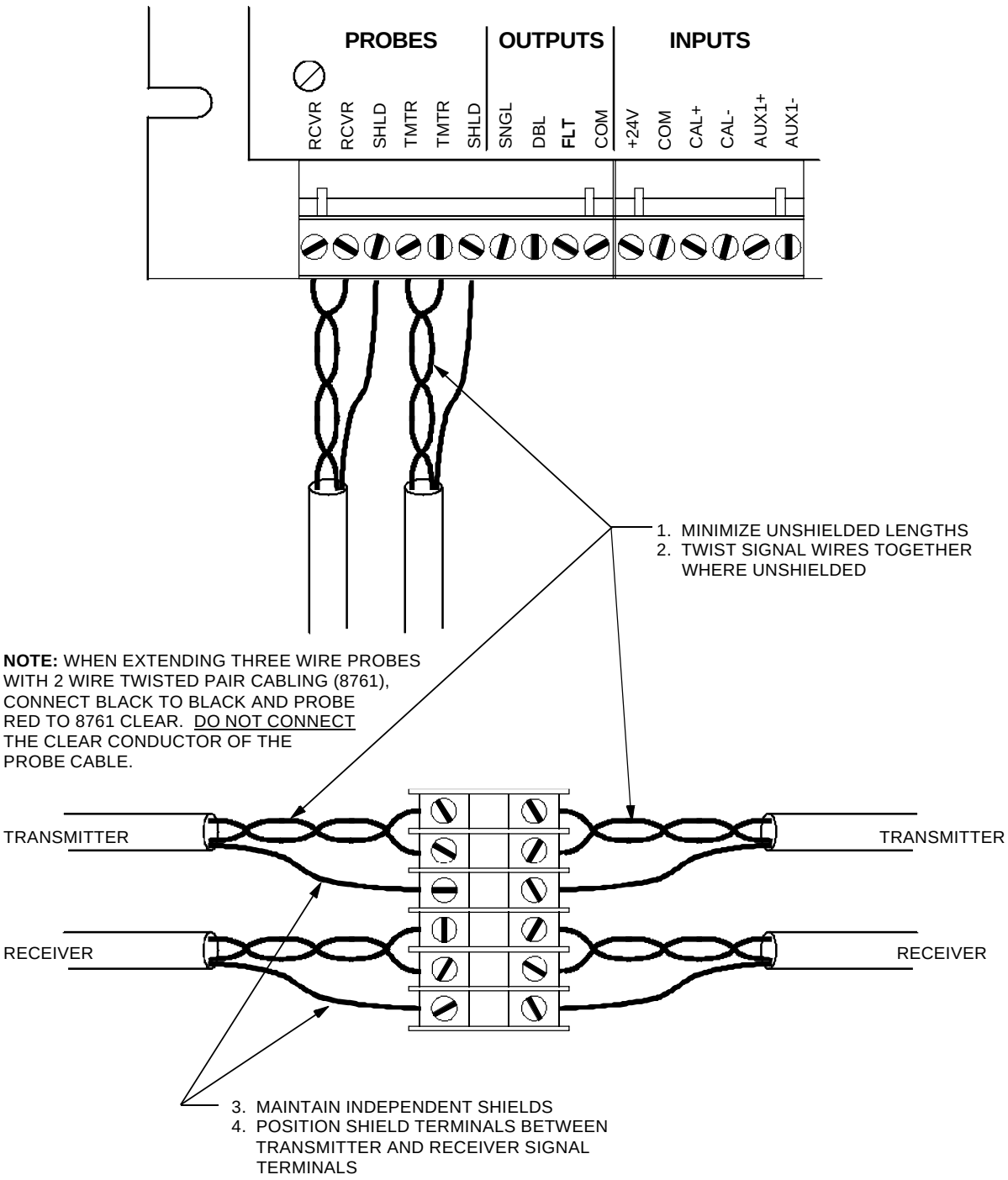
The AUX inputs work in conjunction with DIP switch 1 to determine the selection of material to be sensed (sensing steel or aluminum). Activating either the AUX1 or the AUX2 input reverses the effect of DIP switch 1. If DIP switch 1 is OFF and neither AUX input is active, aluminum sensing is selected. With DIP switch 1 OFF and either AUX input active, steel sensing is selected. If DIP switch 1 is ON and neither AUX input is active, steel sensing is selected. When DIP switch 1 is ON and either AUX input is active, aluminum sensing is selected.

As the SD202 changes from sensing aluminum to sensing steel, the characters "St" appear on the two digit displays for a period of approximately 4 seconds indicating the switch to **St**eel sensing mode. Likewise, when switching from sensing steel to sensing aluminum, the characters "Al" appear on the two digit displays indicating the switch to **Al**uminum.

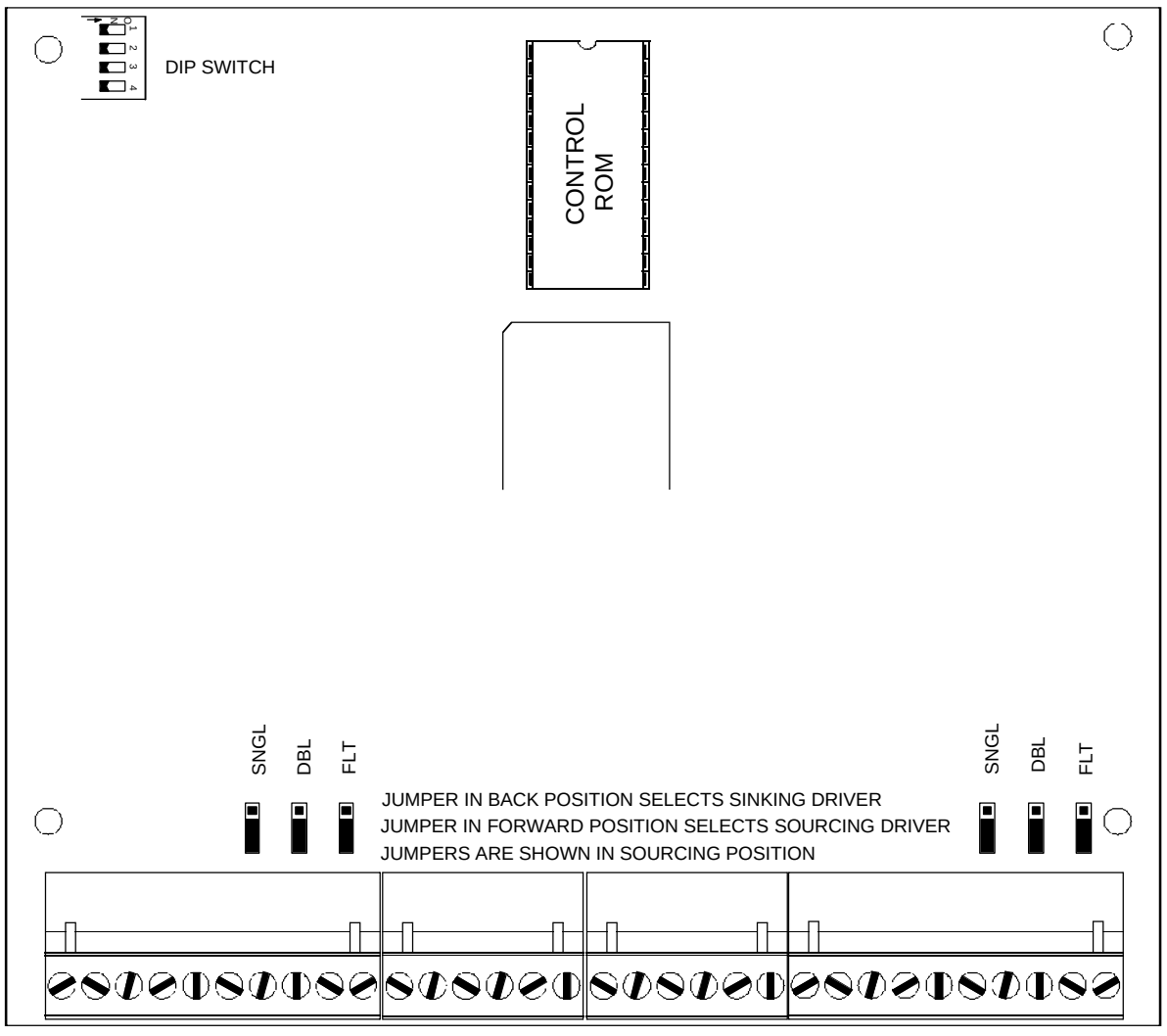

8-1/4
(210)
5/16
(7.9)
7-5/8
(194)
SD202
SHELL DETECTOR
PRIME®
CONTROLS, INC.
SIGNAL/MESSAGE
SINGLE
DOUBLE
CALIBRATE
CHANNEL 1
MESSAGES
Pr 01 flashing -
Transmitter Probe Fault
Pr 02 flashing -
Receiver Probe Fault
Pr 03 flashing -
Both Probes Faulting
CA - Calibration Mode
CA nn flashing -
Calibration Fault
Er nn flashing -
Fatal System Fault
SIGNAL/MESSAGE
SINGLE
DOUBLE
CALIBRATE
CHANNEL 2
PROBES
OUTPUTS
INPUTS
INPUTS
PROBES
OUTPUTS
RCVR
RCVR
SHLD
TMTR
TMTR
SHLD
SNGL
DBL
FLT
COM
+24V
COM
CAL+
CAL-
AUX1+
AUX1-
+24V
COM
CAL+
CAL-
AUX2+
AUX2-
RCVR
RCVR
SHLD
TMTR
TMTR
SHLD
SNGL
DBL
FLT
COM
4.0
(102)
6.25
(159)
1.125
(28.6)
.825
(21.0)

SD200 AND SD202 WIRING RECOMMENDATIONS

FOR MAXIMUM NOISE IMMUNITY, SPLICE OR TERMINATE CABLES ONLY WHEN ABSOLUTELY NECESSARY. WHERE EXTENSION IS NECESSARY, USE BELDEN 8761 OR EQUIVALENT SHIELDED TWISTED PAIR CABLE. THE SD200 AND SD202 ARE DESIGNED TO PROVIDE HIGH COMMON MODE NOISE REJECTION. COMMON MODE REJECTION IS REALIZED MOST EFFECTIVELY WITH TWISTED PAIR CABLING.



	OFF	ON
SW 1	SENSE ALUMINUM ENDS	SENSE STEEL ENDS
SW 2	DISPLAY SIGNAL STRENGTH	DISPLAY RELATIVE THICKNESS
SW 3	SELECT FAIL SAFE MODE	SELECT COMPATIBILITY MODE
SW 4	CONVERSION PRESS SPEED	HIGH SPEED WITH ONE SHOT OUTPUT



INTERNAL SETTINGS

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