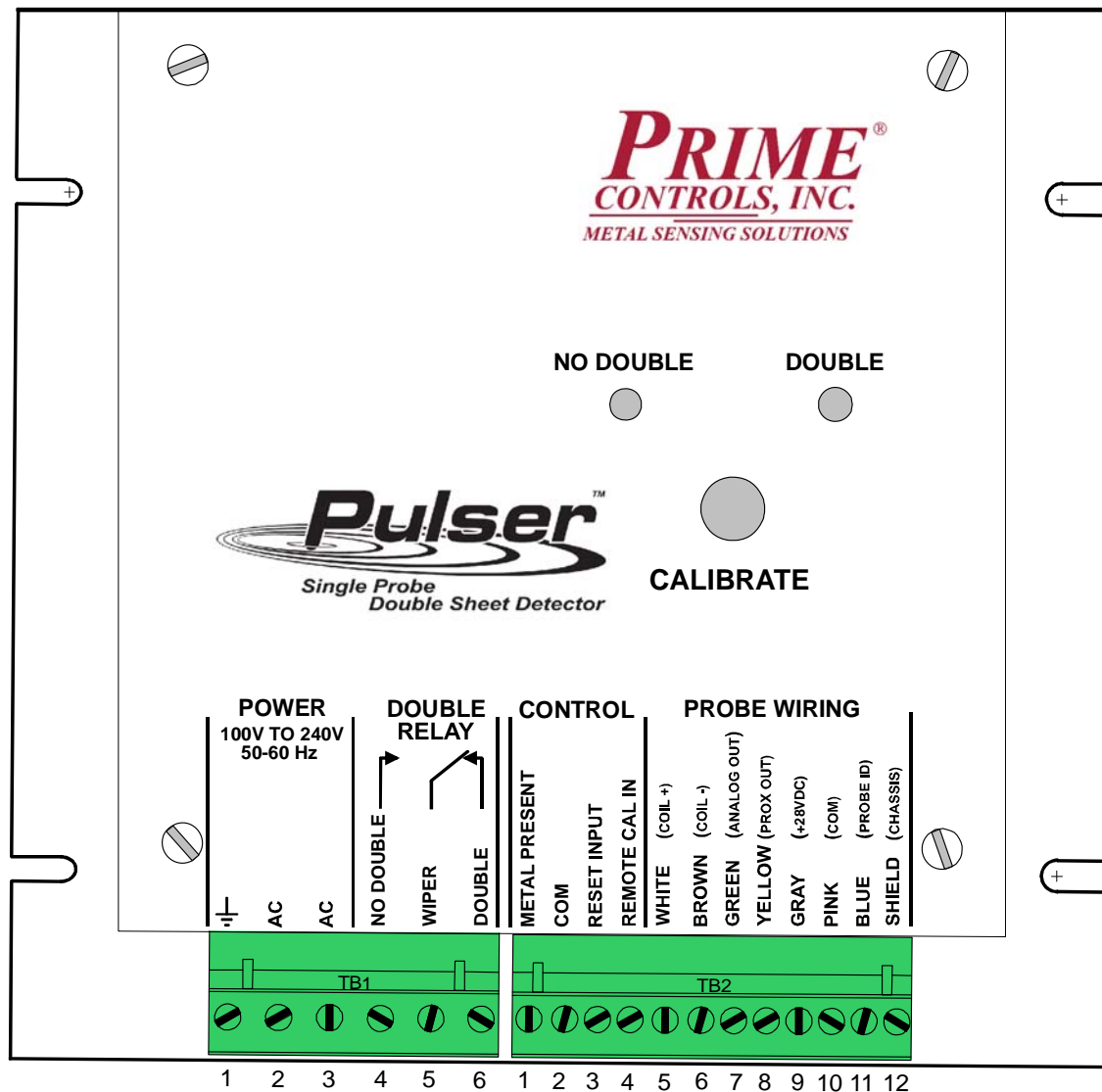


OPERATING INSTRUCTIONS

PULSER SINGLE PROBE DOUBLE SHEET DETECTOR



DESCRIPTION & OPERATION

The Model DS200 Double Metal Sheet Detector comprises a control module in a sheet metal housing with a single probe to form a system that detects the thickness of ferrous metals on the face of the probe using pulsed electromagnetic detection. The technology permits double metal detection with minimal magnetic attraction of the sheet or a blank, up to a single thickness 6.4mm (0.25"). The detector system may be used on automatic sheet feeders where double or overlapped sheet material may jam or damage the receiving machine. The presence of a double sheet produces an output to stop the machine or to signal the operator.

TABLE OF CONTENTS

CONTROL MODULE	3
PROBES.....	4
INSTALLATION.....	5
INPUTS AND CONTROLS.....	6
OPTION SWITCHES	7
OUTPUTS.....	7
INDICATORS.....	8
CALIBRATION.....	8
FIRMWARE VERSION	10
POWER REQUIREMENTS.....	10
LOGIC INPUT ELECTRICAL SPECIFICATIONS	10
OUTPUT RELAY SPECIFICATIONS	10
METAL PRESENT OUTPUT SPECIFICATION	11
TROUBLESHOOTING	11
LIMITATION AND EXCLUSION OF WARRANTIES.....	14
Table 1. Probe Characteristics	4
Figure 1. Probe Characteristics (Graphic Depiction of Table 1 above).....	4
Figure 2. Location of Option Switches.....	7
Figure 3. Physical Dimensions.....	12

CONTROL MODULE

The DS200 control module allows fast and easy setup and for diagnosis of system errors or problems. Calibration is achieved through the simple press of a push-button switch. Faults are reported through different flash patterns on the green NO DOUBLE and yellow DOUBLE indicators.

When the unit first powers up, the two indicators flash alternately as the unit determines which model of the *Pulser™* probe is attached. The Probe assessment routine causes the detector to automatically set parameters unique to each *Pulser™* probe model. When changing probes, even the same model, always interrupt power and have the probe in air (no metal on the face of the probe) when you re-apply power, to run the routine again. When probe assessment has completed, the indicators stop flashing

Other features of the control module include:

- 100 to 240 VAC operation without internal jumpers.
- Removable terminal blocks for quick change out of the control module.
- Form C relay output providing normally open and normally closed contacts.
- Latching “DOUBLE” relay that is cleared by a high signal on the RESET input.
- LED indicators report the gage states of NO DOUBLE and DOUBLE.
- Automatic setup of system gain and operating parameters.
- Simple push-button calibration.
- Non-volatile memory that retains all calibration parameters even when power is removed.
- Probe fault detection and reporting via the two front panel indicators.
- External CAL terminal for use by a remotely-located Calibrate switch
- Metal present output to verify the sheet has fed properly

PROBES

The DS200 operates with a several different *Pulser™* probes including Models PE36, PE42, PE54, and PE75. All probes are potted and completely sealed. The probes do not respond to small amounts of fine metal filings, oil or dirt.

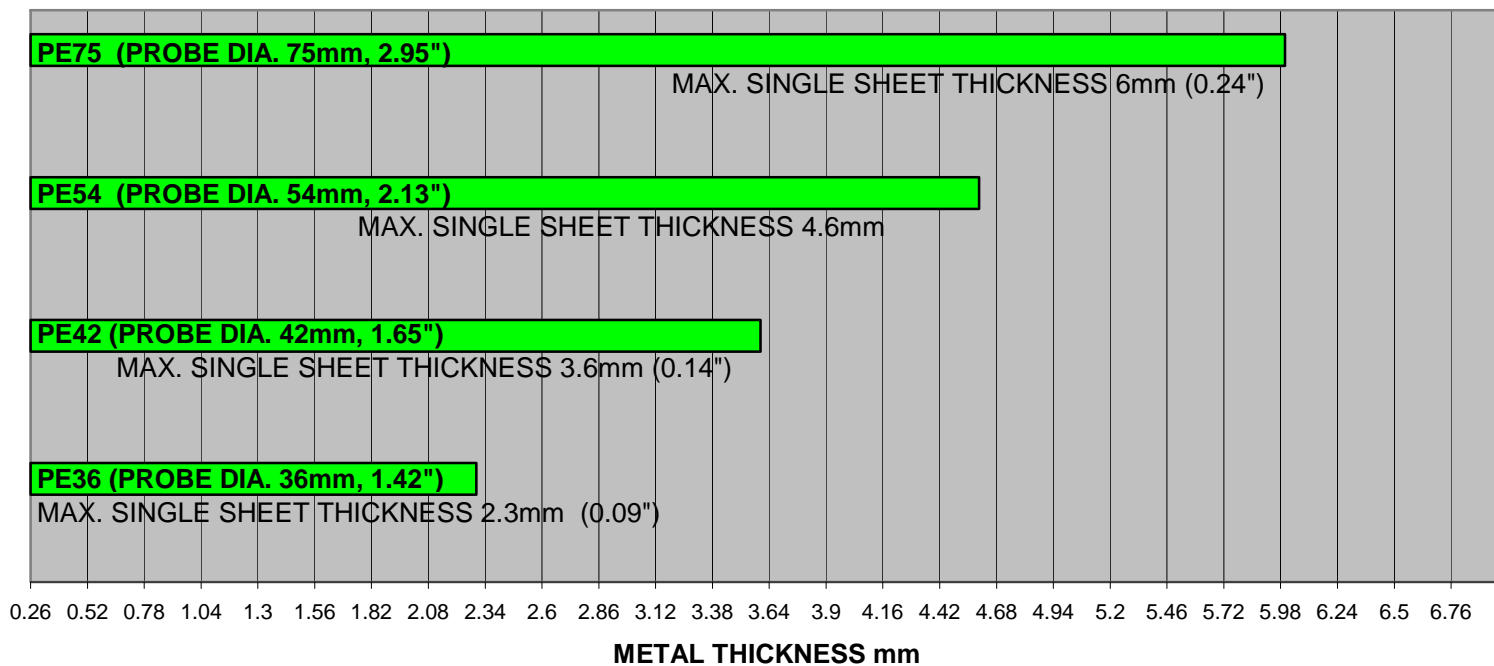
Each probe has a proximity detector that is activated when metal is within 2mm (0.08”) of the probe face. Therefore, the probe must be kept at least 2mm from the surface of the metal if a thickness reading is not desired.

Probe Model	Min Single Thickness	Max Single Thickness	Probe Diameter
PE36	0.25mm (0.01”)	2.3mm (0.09”)	36mm (1.42”)
PE42	0.25mm (0.01”)	3.6mm (0.14”)	42mm (1.65”)
PE54	0.25mm (0.01”)	4.6mm (0.18”)	54mm (2.13”)
PE75	0.25mm (0.02”)	6.0mm (0.24”)	75mm (2.95”)

Table 1. Probe Characteristics

Figure 1. Graph of Probe Characteristics. (Graphic Depiction of Table 1 above.)

PROBE CHARACTERISTICS



INSTALLATION

Installation of the individual components of the Double Metal Sheet Detector system is covered in the following paragraphs:

DS200 Control Module Installation

The controller is designed to mount on the back panel of an electrical enclosure using the four mounting slots at the edges of the enclosure. The footprint is 6.5 inches (165 mm) by 6.25 inches (159 mm) with mounting slot locations on a rectangle 5.875 inches (149 mm) in the horizontal and 4.0 inches (102 mm) in the vertical (see Figure 3 at the end of this document). Insure that the mounting screws make good electrical contact between the module housing and a well-grounded control enclosure back panel.

Avoid mounting locations with excessive heat and vibration.

Probe Installation

To take a thickness reading, the probe must be mounted so that the sheet is in contact with the probe face. Each probe has a proximity detector that detects when metal is within 2mm (0.08") of the probe face. Therefore, if a thickness reading is not desired, the probe must be kept at least 2mm from the surface of the metal. The face of the probe is made of steel and will last for many years of operation.

Electrical Wiring (See Figure 3 at the end of this document)

All wiring for the DS200 connects to removable terminal blocks at the bottom of the control enclosure as described in the following paragraphs. See the Wiring Diagram, Figure 3, at the end of this document for a visual interpretation of the following procedures.

1. Connect 100 to 240 VAC (50-60 Hz. @15watts) to the terminals labeled AC on the left of terminal block TB1. Connect earth ground to the leftmost terminal.
3. For optimum noise immunity run the shielded cable from the probe to the board in conduit without AC or high current wiring. The probe is connected to terminals on the rightmost terminal block TB2, labeled with the colors of the wires in the cable. Connect the shield lead (drain wire) from the probe cable to the terminal labeled SHIELD. If a splice is made between the controller and the probe, do not leave the probe unshielded for more than 20 to 30 mm.
4. Connections to the control circuit of the machine are made through the form C output relay on TB1. This relay is energized in the NO DOUBLE condition as a fail-safe feature and is shown on the cover of the controller in the de-energized, NO DOUBLE, position. If power is lost to the controller, or if there is a DOUBLE metal condition, the relay de-energizes, opening the NO DOUBLE contact across TB1-4 and TB1-5 and closing the DOUBLE contacts across TB1- 5 and TB1-6.
5. The output relay may be operated in a Follower Mode or in a Latched Mode, depending upon the voltage applied to the RESET terminal on TB1. In the Follower Mode, the relay de-energizes when a DOUBLE is detected and re-energizes when the DOUBLE is removed. In the Latched Mode, the relay de-energizes when a DOUBLE is detected and will remain de-energized until the RESET terminal is momentarily taken to a high logic level greater than +12V and no more than +30VDC.
 - a) To operate the output in the Follower Mode, connect the RESET terminal on TB1 to a voltage between +12VDC and +30VDC. When a DOUBLE condition occurs, the relay drops out, closing contacts 5 and 6 on TB1, and the DOUBLE indicator comes on. When the DOUBLE metal condition is removed, the relay returns to the normally energized condition, the amber DOUBLE indicator goes out and the green NO DOUBLE indicator turns on. The Follower Mode is normally selected to control the operation when the DOUBLE condition is automatically removed or when the DS200 is wired into the stop circuit of a machine with a manual restart circuit.
 - b) To operate the output in a Latched Mode, leave the RESET terminal on TB1 open. In this mode, when a DOUBLE condition occurs, the relay drops out and the DOUBLE indicator comes on. After the DOUBLE condition is corrected, the RESET contact must be momentarily connected to a high logic level to bring the relay back to the NO DOUBLE state.

INPUTS AND CONTROLS

The primary control of the DS200 is the CALIBRATE push-button switch on the front panel. Use of this switch is described below under CALIBRATION.

The DS200 has two logic inputs labeled CAL and RESET. The CAL input parallels the function of the CALIBRATE push-button on the front panel, allowing the calibration function to be performed through high logic level, greater than +12VDC and less than +30VDC, from a remotely-located switch wired to this input. The RESET input controls the latching of the relays as described in item 5b of the Electrical Wiring section above.

Both the CAL and RESET inputs are activated when a high logic level, greater than +12VDC, is present.

OPTION SWITCHES

The DS200 has two internal option switch modules, SW1 and SW2, for configuring special features. See Figure 2 below. The switch module located to the right, SW1, is used to select the Continuous Sampling Mode. The rightmost switch on SW1 selects this mode when it is in the down position. The unused switches are for future options and are not used at the time of printing this manual. These switches are read only at power up. If it is desired to change the switch setting, power down the DS200 and change the switch setting and then power up again.

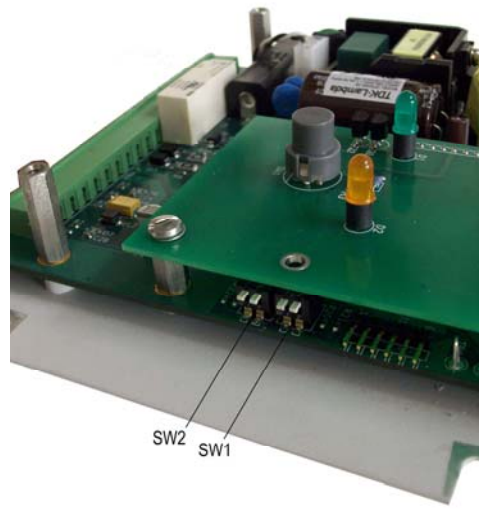


Figure 2. Location of Option Switches

OUTPUTS

The DS200 outputs include a form C relay for reporting DOUBLE conditions and a dc logic output for reporting no material in front of the probe.

The logic output is labeled the NOTHING output since it provides an indication that nothing is present in front of the probe. The intent of this output is to signal that a sheet did not feed. This output provides a dc sourcing signal that switches between zero volts and 24 volts, delivering up to 50 mA.

The NOTHING output is near zero volts when there is nothing in front of the probe and is High, sourcing near 24 volts, when material is present in front of the probe.

INDICATORS

The function of the indicators and controls on the DS200 are described in the following paragraphs:

1. The amber DOUBLE indicator is ON whenever the metal thickness is closer to the calibrated value for double thickness than to the calibrated value for single thickness.
2. The green NO DOUBLE indicator is ON whenever the metal thickness is closer to the calibrated single thickness value than to the calibrated double thickness value.

Through various flashing patterns, these indicators also provide information regarding system mode (calibrate vs. operate), firmware version number, probe identification, and error conditions. Reading firmware version is described later in this document. All other flash patterns can be interpreted as follows:

Alternate flashing of amber and green indicates busy such as during initialization after power-up.

Simultaneous flashing of amber and green indicates an error condition. The reasons are various such as calibration sample too thick, sample too thin, too little difference between double and single when performing a two point calibration.

Green flashing, amber off - awaiting single sample for calibration. Note: during power up, the Green Flashing, Amber Off indicates the first digit of the probe identification.

Amber flashing, green off - awaiting push-button press for calibration on double. Note: during power up, the Amber Flashing, Green Off indicates the second digit of the probe identification.

Green flashing, amber on - probe error. Probe may not be connected, probe wire broken, or probe may be defective.

CALIBRATION

The detector may be calibrated via the CALIBRATE push-button switch on the front cover or remotely through a switch supplying a positive voltage greater than +12V and less than +30V to the CAL terminal on the right terminal block, TB2-4. If you do not have external power for the Active High input, +28VDC is available from TB2-9 (see Figure 4 at the end of this manual).

The DS200 offers two modes of calibration:

1. Calibrate on single nominal thickness (single sample teach), and
2. Calibrate on single and double thickness (two sample teach).

Normally, where double thickness discrimination is required, the DS200 can be calibrated on a single thickness of the material to be monitored (one press of the CALIBRATE push button). If changes in the metal thickness need to be monitored (for example a 10% increase in the normal metal thickness), the DS200 may be calibrated on two different thickness samples of the same material (two presses of the CALIBRATE pushbutton within one second), which allows the threshold to be set between the two calibration points.

Calibration on Single Thickness Only

Calibration on single thickness is selected when the CALIBRATE pushbutton is pressed once during any one-second period. If the probe is not on metal when the CALIBRATE pushbutton is pressed, the green NO DOUBLE LED will begin flashing indicating that the DS200 is waiting to be calibrated on the single thickness.

Then, when a single sheet of metal to be gauged is pressed against the probe face, the proximity detector will cause the DS200 to automatically take a reading of the metal and perform a calibration. During calibration on the single thickness, the green NO DOUBLE indicator flashes and the amber DOUBLE indicator is off.

If the probe is on metal when the CALIBRATE pushbutton is pressed, the calibration is immediately made.

If the calibration on the single is successful, the green indicator stops flashing and remains solidly on.

If the calibration is not successful, both indicators flash simultaneously to indicate an error condition. To recover from an error condition, after fixing the problem that caused the error, press the CAL pushbutton again to initiate another calibration cycle.

If there is an error, make sure that the sheet is solidly against the probe when calibrating and that the sheet thickness does not exceed the probe specification. (See Table 1. Probe Characteristics on page 4). If these concerns seem to check out, re-try the calibration. Alternatively, retry the calibration by calibrating on single and double thickness as described below. If difficulties persist, call Prime Controls for technical assistance.

Calibration on Both Single thickness and Double thickness

Calibration on both single and double thickness is selected by pressing the CALIBRATE pushbutton twice within any one-second period. If the probe has no metal on the face of the probe the green NO DOUBLE LED will begin to flash indicating that the DS200 is waiting to calibrate on the single thickness.

Then, place a single thickness of material against the probe face and the DS200 will automatically take a reading of the metal thickness and will perform a calibration. During calibration on the single thickness, the green, NO DOUBLE, indicator flashes and the amber, DOUBLE, indicator is off.

Expected mechanical life:	20 million operations
Expected electrical life:	100,000 operations at 8 amps, 240VAC 50,000 operations at 14 amps N.O., 5 amps N.C., 120VAC resistive 30,000 operations at 7.2 FLA, 45 LRA, 120VAC 10,000 operations at 5 FLA, 30 LRA, 240VAC

“METAL PRESENT” OUTPUT SPECIFICATION

Output Type:	Sourcing
OFF Voltage (No Metal):	0 volts
ON Voltage (Metal Present):	24 volts DC
Max Current:	50 mA
Short Circuit Protection:	Self-Resetting thermal fuse.

TROUBLESHOOTING

Should trouble develop, proceed as follows:

1. When power is applied, always have the probe in air (no metal on the face of the probe). This allows the Controller to normalize the probe to zero thickness during the startup sequence. If at any time power is interrupted, remove the probe from metal and then re-apply the power.
2. Check AC input power to the control module
3. Check the fuse, accessible at the lower left side of the DS200 housing.
4. When power is applied, if the green and amber indicators show a response to the metal condition in front of the probe and the output relay does not switch, check that the RESET input on TB1 has +24VDC applied (if you want the relay to follow the sheet condition). If the unit is to be reset by an external button, check voltage on the RESET terminal when the external button is pressed. The voltage must be greater than +12V when the button is pressed, and less than +9 volts when the button is released.
5. When power is applied, if the DOUBLE indicator is on solidly while the NO DOUBLE indicator is flashing, check for a missing, disconnected, open, or shorted probe.
6. If both indicators flash in unison, the system is indicating an invalid calibration. The causes can be many. Among them, an attempt to calibrate both double and single on the same thickness material, a shorted probe, probe gap too large, incorrect probes for the material being gauged. To recover from an error condition, after fixing the problem that caused the error, initiate another calibration cycle. If the problem cannot be resolved, call the factory for assistance.

For further information or service assistance, contact Prime Controls, Inc., 4551 Gateway

Circle, Dayton, Ohio 45440-1711. Phone: (937) 435-8659, Fax: (937) 435-2091. Mention model number and serial number.

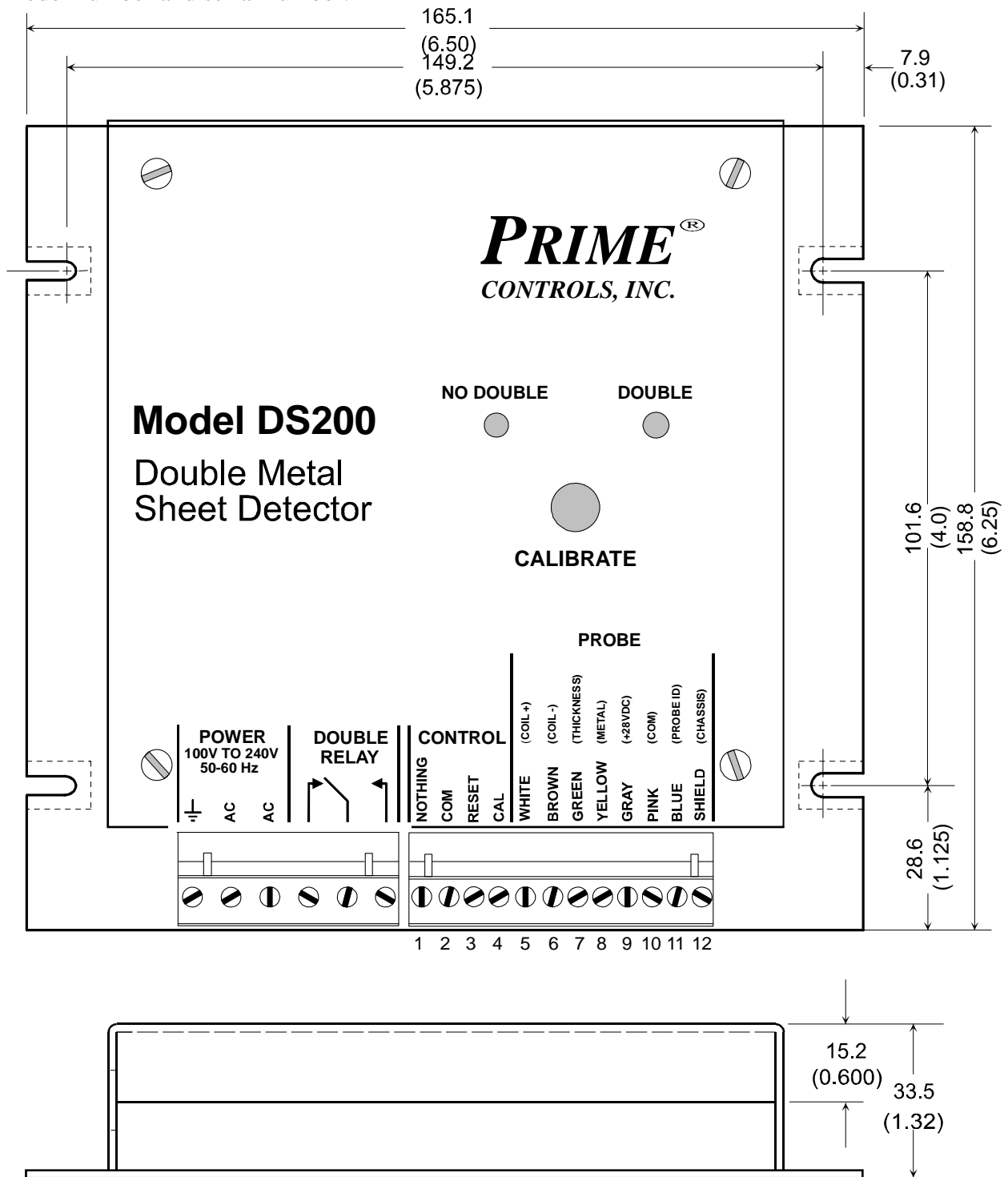


Figure 3. Physical dimensions

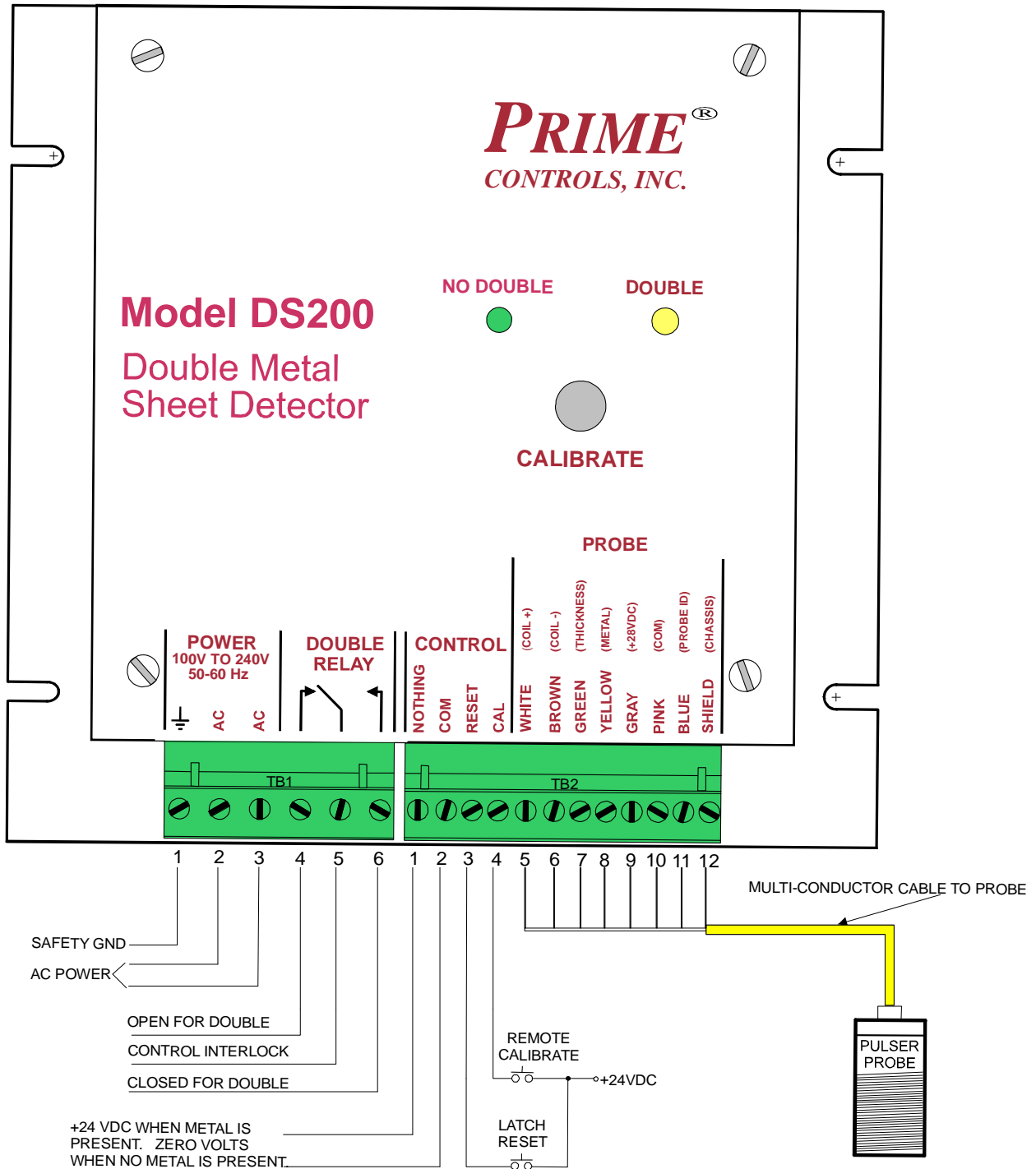


Figure 4. Wiring Diagram

LIMITATION AND EXCLUSION OF WARRANTIES

All goods purchased from Prime Controls, Inc. shall be free from defects in materials, design and workmanship under normal conditions of use for one year from the date of shipment. THIS WARRANTY IS THE SOLE WARRANTY AND IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OF FITNESS FOR A PARTICULAR PURPOSE. THE LIABILITY OF PRIME CONTROLS TO ANY PURCHASER SHALL BE LIMITED EXCLUSIVELY TO THE COST OF REPLACEMENT OR REPAIR OF DEFECTIVE PARTS, AND SHALL NOT INCLUDE LIABILITY FOR ANY DIRECT, CONSEQUENTIAL OR INCIDENTAL DAMAGES WHATSOEVER, WHETHER FORESEEN OR UNFORESEEN, INCLUDING BUT NOT LIMITED TO LOST PROFITS, LOST SALES, OR INJURY TO PERSONS OR PROPERTY.

8/30/10