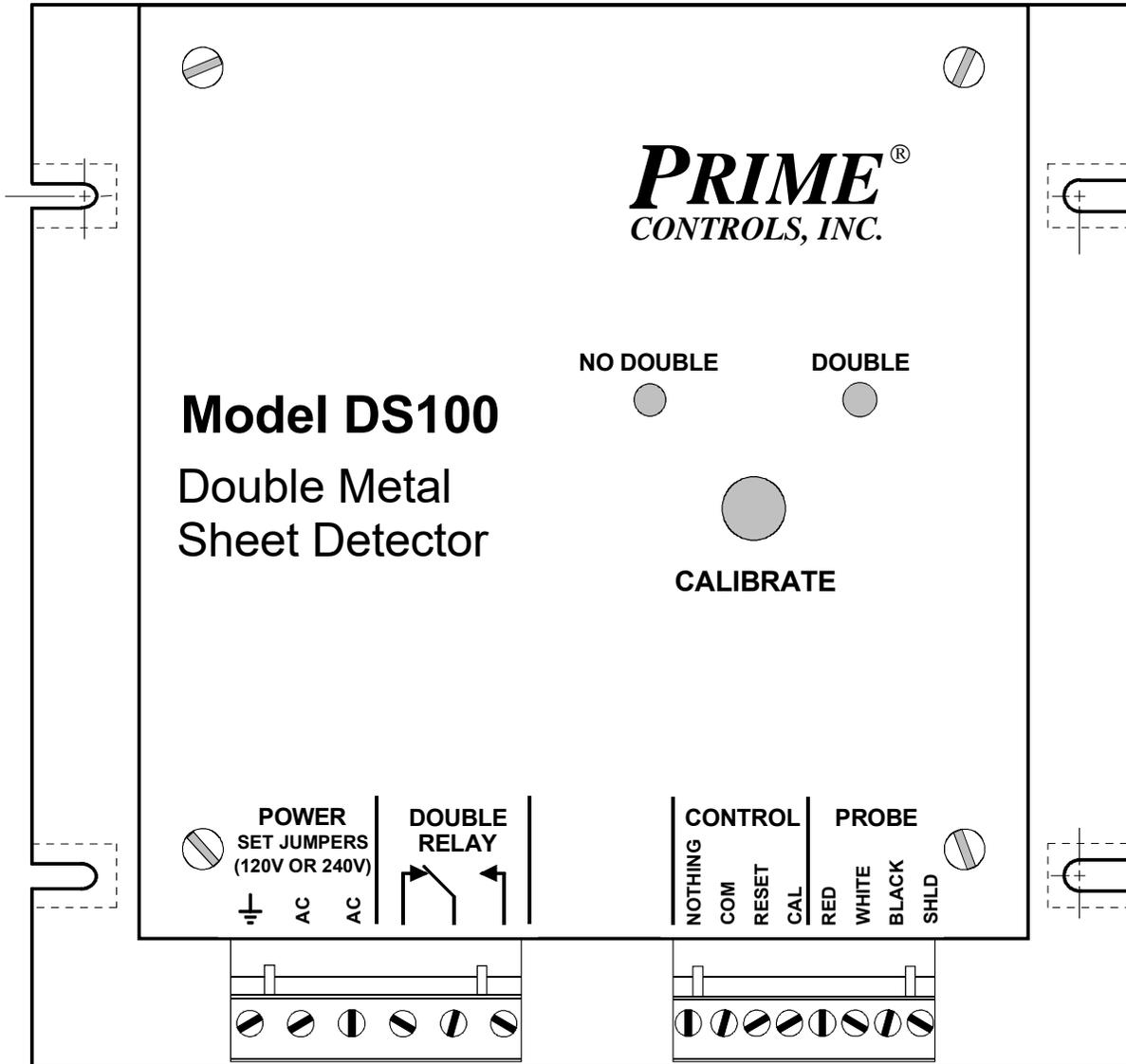


OPERATING INSTRUCTIONS

Model DS100 DOUBLE SHEET DETECTOR



DESCRIPTION

The Model DS100 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 metals passing the face of the probe. The detector system may be used on automatic sheet feeders where double or overlapped sheet material may jam or damage the receiving machine. A double feed produces an output to stop the machine or signal the operator.

Control Module

The 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 and yellow "no double" and "double" indicators.

When the unit first powers up, the two indicators flash alternately as the unit determines which model of probe is attached. If the probe is not recognized, the flash pattern changes with the DOUBLE indicator on solid and the NO DOUBLE indicator flashing. When probe assessment has completed successfully, the indicators stop flashing

Other features of the control module include:

- 95 to 130 or 200 to 250 volt operation selected through internal jumpers.
- Removable terminal blocks for quick change out of the control module.
- Form C relay output providing normally open or normally closed contacts.
- 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.
- Latching relay output that is cleared by asserting the RESET input.
- Probe fault detection and reporting via the two front panel indicators.
- External Calibrate terminals for convenient placement of the calibrate switch
- Metal present output to verify the sheet has fed properly

Probes

The DS100 operates with a several different Prime magnetic probes including Models PM4, PM10, and PM15. All probes are potted and completely sealed. The probes do not respond to small amounts of fine metal filings, oil or dirt.

Probe Model	Min thickness	Max thickness	Probe Diameter
PM4	.04 mm (.0015")	.40 mm (.015")	18 mm (0.70")
PM10	.10 mm (.004")	1.0 mm (.040")	30 mm (1.18")
PM15	.15 mm (.006")	1.5 mm (.060")	36 mm (1.42")

CAUTION: Protect the probes from exposure to magnetic fields. Probes should not be allowed to contact other probes, magnets, or other sources of magnetic fields. Failure to prevent exposure may result in permanent damage to the probe.

INSTALLATION

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

DS100 Control Module

The control board 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 drawing at 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.

Probes

The probe must be mounted so that the sheet is in contact with the probe face as it passes. The face of the probe is made of magnetic material and will last for many years of operation.

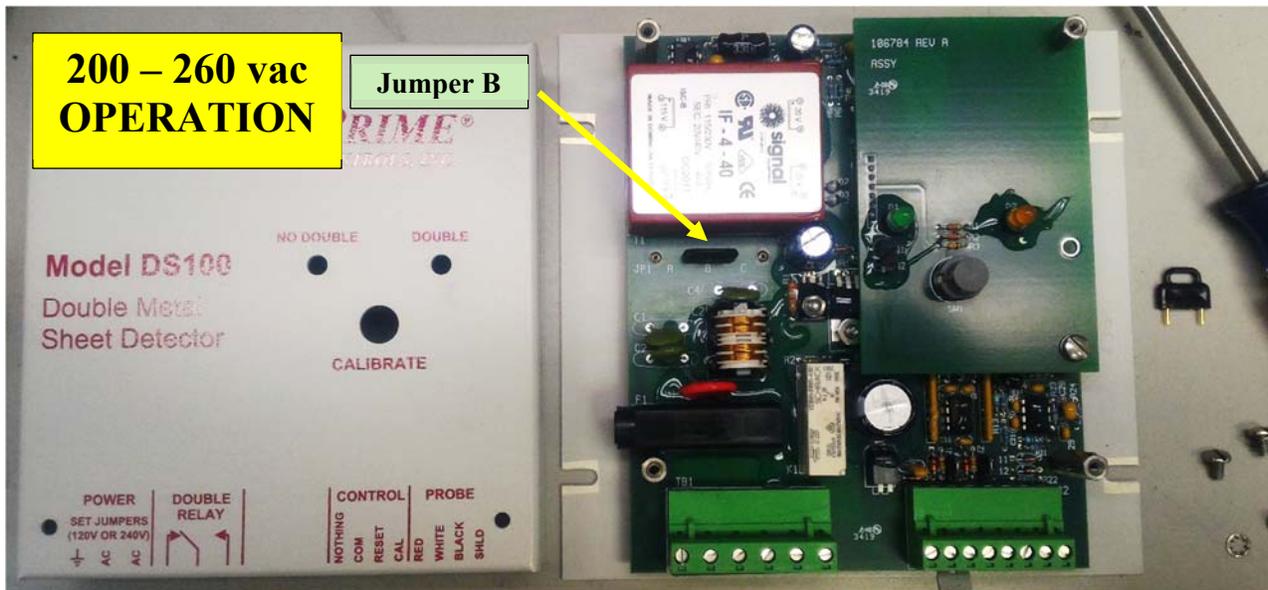
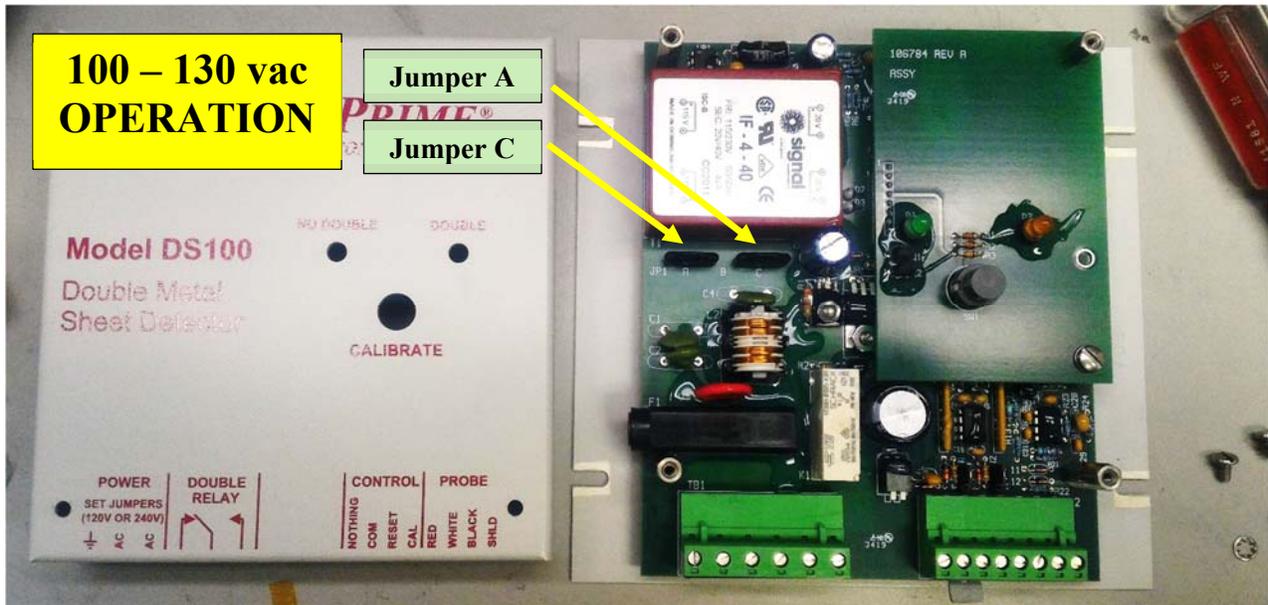
The Model DS100 Double Sheet Detector can be made to operate with no contact between the sheet material and the probe if the gap is kept very small and is held constant. A constant gap is very important since a small change in gap causes significant change in the sensor signal. If the system is to be operated with a gap between the probe and the sheet material, the unit must be calibrated after the gap is established. If the gap is too large, the unit may fail to calibrate.

Electrical Wiring

All wiring for the DS100 connects to removable terminal blocks at the bottom of the control enclosure as described in the following paragraphs.

1. Connect 100 to 130 VAC (50-60 Hz. @15watts) to the terminals labeled AC on the left of terminal block. Connect earth ground to the leftmost terminal.
2. For 200 to 260 volt operation remove the DS100 cover and remove suitcase jumpers **A** and **C** immediately in front of the gray transformer block. Place one of the suitcase jumpers in position **B**. Discard the second jumper. Replace the cover. The factory setting for these jumpers is for 100 to 130 volt operation. *Do not power the Model DS100 with 200 to 260 VAC until jumpers have been changed.*

Refer to pictures below:



3. Connections to the control circuit of the machine are made through the form C output relay. This relay is powered in the NO DOUBLE condition. If power is lost to the control the relay is not energized and the DOUBLE contact is closed.
4. Shielded cable from the probe to the board should be run in conduit. The probe is connected to terminals on the rightmost terminal block labeled Red, White, Black & Shield. Connect the shield leads (drain wires) from the probe cables to the terminals labeled SHLD. If a splice is made between the control and probe leave the probe unshielded no more than 20 to 30 mm.

5. The output relay may be operated in a "follower" mode or "memory" mode depending upon the wiring of the RESET input. The mode connections and definitions are described below.
 - a) To operate the output in the "follower" mode, jumper RESET and COM. together on the terminal block. When a DOUBLE condition occurs, the relay drops out 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. Automatic reset is normally selected to control the operation when the fault condition is automatically removed or the DS100 is wired into the stop circuit of a machine with a manual restart circuit.
 - b) To operate the output in a "latch" mode, wire the RESET and its associated COM terminal to the normally open contact of a switch, relay, or controller output. In this mode, when a fault condition occurs, the relay drops out and the DOUBLE indicator comes on. After the fault condition is corrected, the RESET contact must be momentarily activated to bring the relay back to the NO DOUBLE state.

INPUTS AND CONTROLS

The primary control input to the DS100 is the calibration push-button switch on the front panel. Use of this switch is described below under CALIBRATION.

The DS100 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 a remotely located switch wired to this input. The RESET input controls the latching of the relays as described in item 5 of the Electrical Wiring section above.

The two logic inputs have associated with them two jumper plugs located under the front cover and immediately behind its associated terminal. The function of these jumpers is described below under CONFIGURATION SWITCHES AND JUMPERS.

Both the CAL and RESET inputs are ON when low (zero volts) independent of the jumper settings.

A two position DIP switch between the two main connectors, is visible from the connector edge of the unit. These switches control the selection of the calibration mode and the system response time as described below under CONFIGURATION SWITCHES AND JUMPERS.

OUTPUTS

The DS100 outputs include a form C relay for reporting OVER 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 22 volts, delivering up to 100 mA.

The NOTHING output is ON (sourcing at 22 V) when material is present in front of the probe.

INDICATORS

The function of the indicators and controls on the DS100 are described in the following paragraphs:

1. The amber DOUBLE indicator is ON whenever the received signal 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 received signal 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, 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 failed calibration. The reasons are various such as calibration sample too thick, sample too thin, too little difference between double and single, or too much air gap between metal and probe.

Green flashing, amber off - awaiting single sample for calibration.

Amber flashing, green off - awaiting push-button press for calibration on double.

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

If the probe is replaced without powering the unit down and back up again, a condition can occur where both LEDs remain off. Though no damage will occur to the unit if a probe is changed with power applied, the unit must be power-cycled to register the new probe.

CONFIGURATION SWITCHES AND JUMPERS

A two position switch is located on the main control circuit board in the opening between the two connectors. In units with version 1.3 or later firmware, the right switch determines the response time of the system as detailed below. The right switch is not used on units with version 1.2 or earlier firmware. The switch on the left selects one or two “hit” calibration as described below in the CALIBRATION section of this document.

Left Switch:	UP	selects calibrate on single.
	DOWN	selects calibrate on single and double
Right Switch:	UP	selects standard (12 millisecond) response time.
	DOWN	selects high speed (2 millisecond) response time.

NOTE: These switches are read only at power up. If a switch setting is changed, be sure to power the unit down and back up again.

Each of the logic inputs (CAL and RESET) has associated with it a two position jumper plug located under the front cover and immediately behind its associated connector. These jumpers allow the inputs to be driven by a sinking (NPN) or sourcing (PNP) device. When the jumper plug is installed on the pins closest to the connector, the input is set up for a sourcing driver. When installed on the two pins farthest from the connector (factory setting), the input is set up for a sinking driver, or dry contact between the input and COM. Both inputs are active low.

CALIBRATION

The detector may be calibrated via the push-button switch on the front cover or remotely through a switch connected between the CAL and COM terminals of the right terminal block.

The DS100 offers two modes of calibration: 1) calibrate on single nominal thickness, and 2) calibrate on single and double thickness. Normally where double thickness discrimination is required, the DS100 can be calibrated on a single thickness of the material to be monitored (one press of the push button). If finer changes in thickness are to be discriminated, the DS100 may be calibrated on two different thicknesses of the same material. The discrimination threshold is set halfway between the two calibration points.

Calibration on Single Only

Calibration on single is selected when the left configuration switch is UP. See section on CONFIGURATION SWITCHES AND JUMPERS above.

Place a single sheet of metal to be gauged against the probe face and press the CALIBRATE push-button. During calibration on the single thickness, the green (NO DOUBLE) indicator flashes and the amber (DOUBLE) indicator is off. If the calibration on the single is successful,

the green indicator stops flashing and remains solidly on until the material thickness at the probe face changes.

If the calibration is not successful, both indicators flash simultaneously. Make sure that the sheet is solidly against the probe when calibrating or that the sheet thickness does not exceed the probe specification. (See probe specifications on page 2). If everything seems to check out, re-try the calibration. Alternatively try calibrating on single and double as described below. If difficulties persist, call Prime Controls for technical assistance.

Calibration on Single and Double

Calibration on single AND double is selected when the left configuration switch is DOWN.

Place a single thickness of material against the probe face and press the CALIBRATE push-button. During calibration on the single thickness, the green (NO DOUBLE) indicator flashes and the amber (DOUBLE) indicator is off. When calibration on the single thickness is complete and the unit is ready for the double thickness, the green indicator turns off and the amber indicator flashes. Place a sample of thicker material or two samples of the single material against the probe face and press the CALIBRATE push-button again. If calibration is successful, the amber indicator stops flashing and remains solidly on and the green indicator is off.

If the calibration is not successful, both indicators flash simultaneously. The causes for unsuccessful calibration can be many including too little difference in thickness between the thin and thick material, poor probe contact, wrong probe model for the material, etc.

FIRMWARE VERSION

From time to time, as improvements are made to Prime products, the firmware controlling the units is revised. When setting a unit up or troubleshooting it may be necessary to determine the version number for the firmware installed in your unit. The version numbers begin with 1.0 and are incremented either by tenths (1.1, 1.2, etc.) for small revisions or by the integer digit (1.0, 2.0, etc.) for more significant revisions.

To determine the version of the firmware running in your unit, simply hold the calibration push button in as power is applied to the unit. The revision number is displayed as one second flashes of the NO DOUBLE LED for the integer digit followed by one second flashes of the DOUBLE LED for the fractional digit. Count the number of flashes on each LED to determine the revision number. Thus one flash of the NO DOUBLE LED followed by two flashes of the DOUBLE LED indicates version 1.2 of the firmware.

POWER REQUIREMENTS

95 to 130 volts, 50/60 Hz at 50 mA.

LOGIC INPUT ELECTRICAL SPECIFICATIONS

RESET, CAL : 30 Volts maximum
Upper switch threshold - 6.9 volts
Lower switch threshold - 3.3 volts

When the internal jumper is installed for pull up (U position) to accommodate sinking drivers, the input is pulled to +15 volts through 4700 ohms. When the jumper is installed for pull down (D position) to accommodate sourcing drivers, the input is pulled to common through 4700 ohms.

OUTPUT RELAY SPECIFICATIONS

Maximum switched voltage: 380VAC
Maximum switched current: 14 amps N.O., 5 amps N.C, AC resistive,
8 amps DC
Maximum switched power: 200W DC, 2,000VA AC.
Minimum required contact load: 12V, 100 mA

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 7.2FLA, 45LRA, 120VAC
10,000 operations at 5FLA, 30 LRA, 240VAC

NOTHING OUTPUT SPECIFICATION

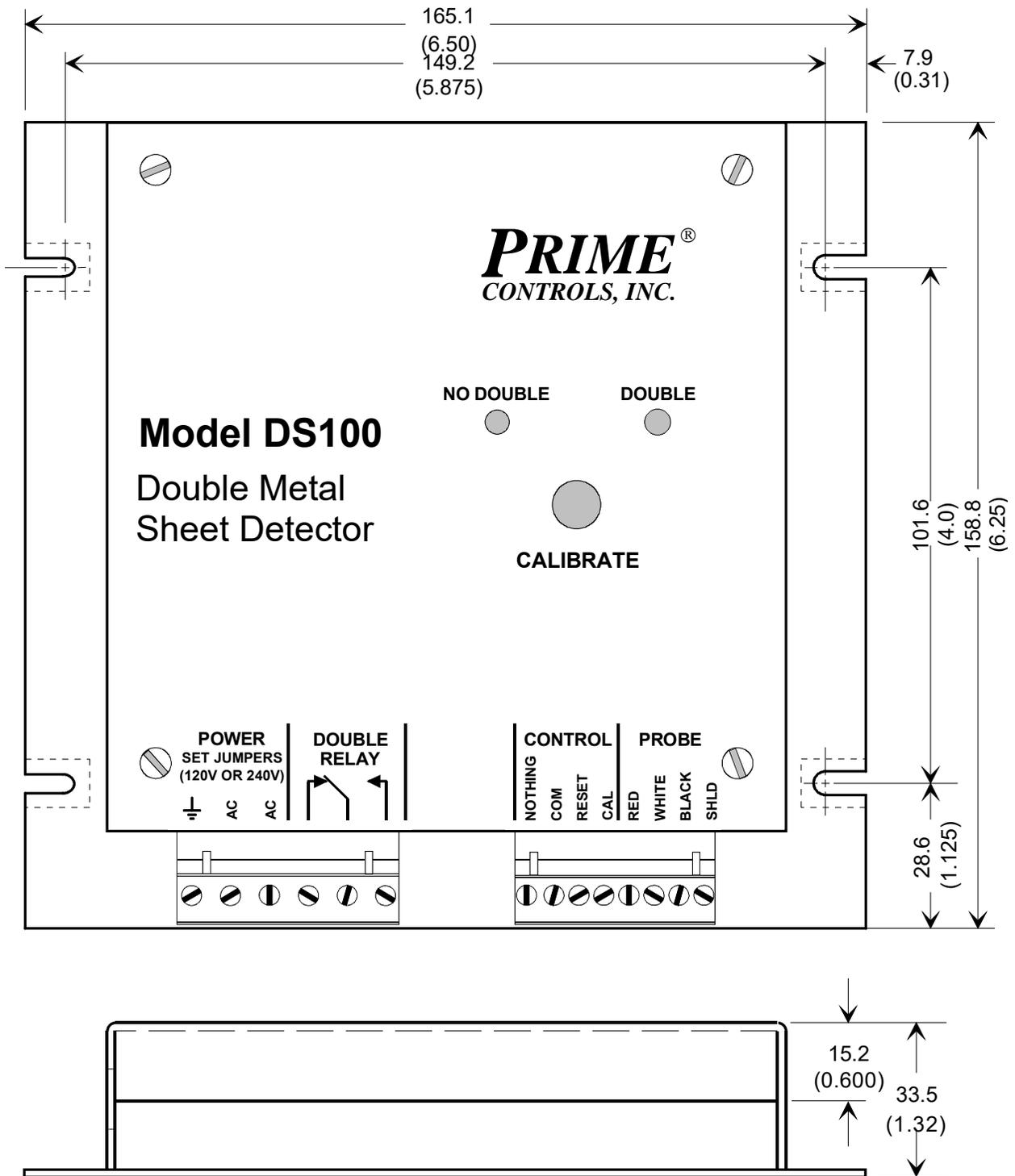
Output Type: Sourcing
OFF Voltage: 0 volts
ON Voltage: 22 volts DC
Max Current: 50 mA
Short Circuit Protection: Self resetting thermal fuse.

TROUBLESHOOTING

Should trouble develop, proceed as follows:

1. Check AC input power to the control module
2. Check the fuse, accessible at the lower left side of the DS100 housing.
3. 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 jumper is installed (if you want the relay to follow the sheet condition). The jumper is installed between RESET and COM. on the terminal strip. If the unit is reset by an external machine START button, check wiring across the Reset and COM terminals or the START button contacts.
4. 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.
5. 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 receiver probe, probe gap too large, incorrect probes for the material being gauged. 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.



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