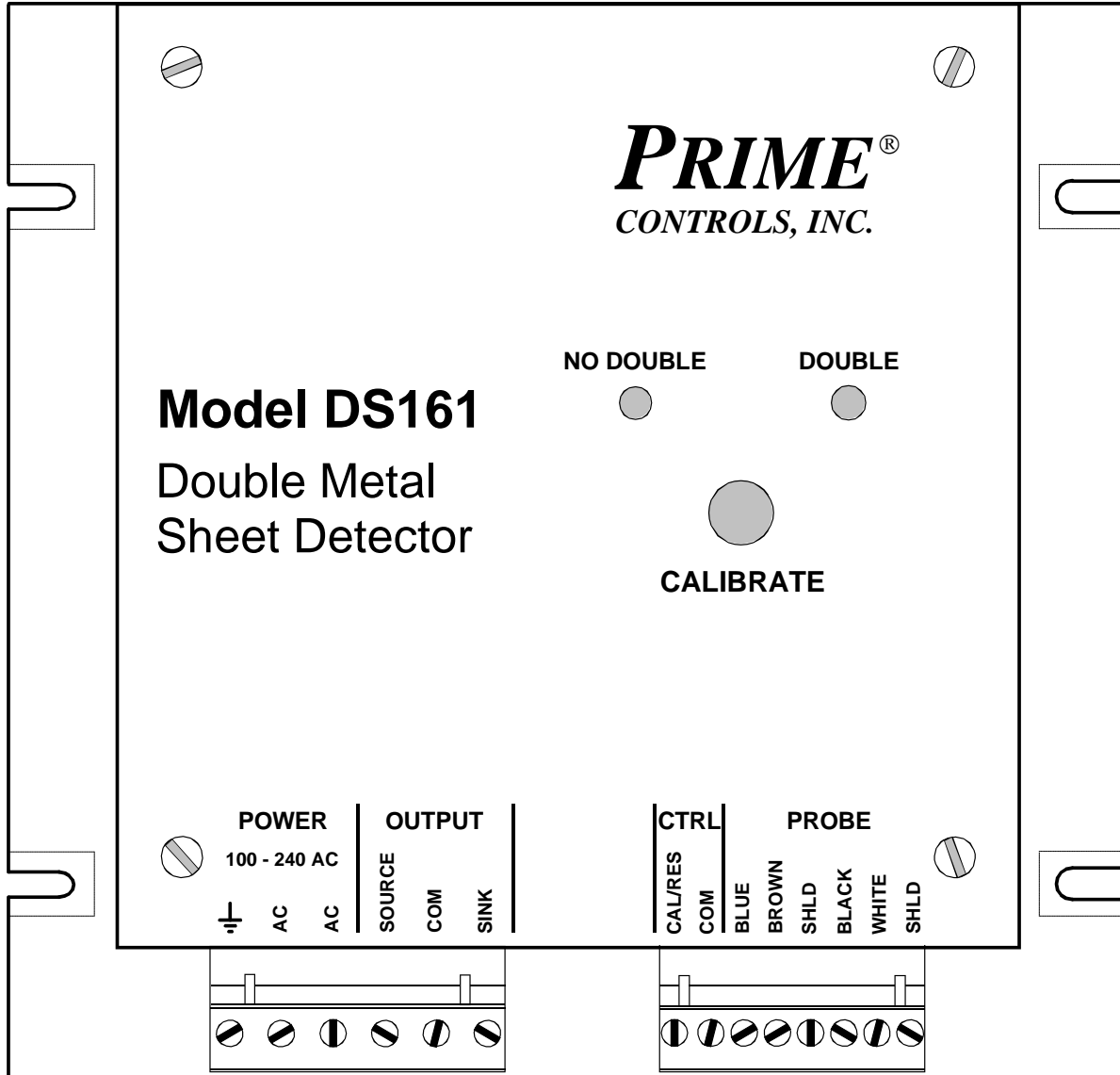


# OPERATING INSTRUCTIONS

## Model **DS161** DOUBLE SHEET DETECTOR



### DESCRIPTION

The Model DS161 Double Metal Sheet Detector comprises a control module in a sheet metal housing with one probe to form a system that detects the thickness of non-ferrous metals in front of the probe. The detector system may be used on automatic sheet feeders where double or overlapping 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 features of the control module include:

Fast and easy pushbutton calibration

Select 95 to 130 or 200 to 250 volt operation through internal jumpers.

Removable terminal blocks for quick change out of the control module.

Sinking and sourcing solid state outputs on for single only.

LED indicators report the gage states of NO DOUBLE and DOUBLE.

Automatic setup of system gain and operating parameters.

Non-volatile memory that retains all calibration parameters even when power is removed.

Optional latching outputs that are cleared by asserting the CAL/RES input or remote calibration input.

## **Probe**

The DS161 requires one P10T30P probe. The probe is potted and completely sealed. The probe connects to the control module through a four conductor shielded cable, Prime Model CBL104-3.

## **INSTALLATION**

Installation of the components of the DS161 system is covered in the following paragraphs:

### **DS161 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 165 mm (6.5 inches) by 159 mm (6.25 inches) with mounting slot locations on a rectangle 149 mm (5.875 inches) in the horizontal and 102 mm (4.0 inches) 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.

### **P10T30P Probe**

The P10T30P probe is very sensitive to surrounding metals and must be mounted in non-metallic brackets such as Nylatron. For greatest sensitivity, no metal should be within one inch (25mm) of the threaded probe body. Where multiple probes are used in close proximity, the probes must be aligned in the same orientation and the faces must lie in the same plane. If these requirements are met, the probes may be mounted as near to each other as 1.5 inches (40 mm) center to center. Otherwise the probes can be no closer than 1.5 inches edge to edge.

### **Relay Latch/Remote Calibration**

The DS161 control module has one logic input labeled CAL/RES that may be used for remote calibration control or as a reset input for the latching relay function. The position of the rightmost configuration switch (located beneath the cover between the two green terminal blocks) determines the function of the CAL/RES logic input. The UP position enables remote calibration, the DOWN position enables the reset relay function.

A jumper plug beneath the control cover and immediately behind the CAL/RES terminal determines the default state of the CAL/RES input. Normally, the jumper plug is positioned toward board center, pulling the CAL/RES terminal up to +15 volts through 4700 ohms. Activation of the input then requires a contact closure across CAL/RES and COM. Placing the jumper plug in the position toward board edge pulls the CAL/RES input to COM through 4700 ohms. The input then requires a sourcing driver at the controlling device. However, the low level remains the active level.

### **Electrical Wiring**

All wiring for the DS161 connects to removable terminal blocks at the bottom of the control enclosure as described in the following paragraphs.

1. Connect I00 to I30 VAC, 50-60 Hz. power (15watts) to the terminals labeled AC on the left terminal block. Connect earth ground to the terminal labeled with the ground symbol.

2. For 200 to 260 volt operation, remove the DS161 cover and remove suitcase jumpers A and C immediately in front of the gray transformer. Place one of the suitcase jumpers in position B. Discard the second jumper. Replace the cover.
3. Connections to the control circuit of the machine are made through the sinking or sourcing solid state outputs. The outputs are ON only when a single thickness of metal is being detected. No metal in front of the probe or double thickness metal cause the outputs to turn OFF.
4. The shielded cable from the probe to the control unit should be kept clear of AC power cables or electrically noisy conductors of any type. The probe wires connect according to their colors to the terminals labeled BLUE, BROWN, BLACK, and SHLD. These connection designations assume the use of Prime cable CBL104-3 or exact equivalent. Connect the shield lead (drain wire) from the probe cable to one of the terminals labeled SHLD. The second SHLD connection is unused.
5. Optionally connect the CAL/RES input to a remote switch, relay or controller output for remote calibration or output latch control. See **Remote Calibration/Output Latch** earlier in this document. The rightmost configuration switch determines the function of this input.
6. The outputs may be operated in a "follower" mode or "memory" mode depending upon setting of the rightmost configuration switch and the wiring of the CAL/RES input. The operational modes and required connections are described below.
  - a) For "follower" mode, either set the rightmost configuration switch to the UP position and do not jumper between CAL/RES and COM or set the rightmost configuration switch to the DOWN position and connect a jumper between CAL/RES and COM on the center terminal block. In this mode, when a SINGLE condition occurs, the output turns on and the NO DOUBLE indicator comes on. When a double condition occurs, the NO DOUBLE output turns off, the DOUBLE indicator comes on, and the outputs turn off. When there is no metal in front of the probe, both indicators turn off and the outputs turn off. Follower mode is normally selected to control the operation when the fault condition is automatically removed or the DS161 is wired into the stop circuit of the machine.
  - b) For "latch" mode, set the rightmost configuration switch in the DOWN position and wire the CAL/RES and its associated COM terminal to the normally open contacts of a switch, relay, or controller output. In this mode, when a single is detected, the outputs turn on and remain on until the single condition is removed and a contact is closed across the CAL/RES and COM terminals to reset the latch condition. This mode is used when the single condition occurs too quickly for the receiving controller or circuitry to respond.

## INDICATORS

The function of the indicators and controls on the DS161 are described in the following paragraphs:

1. 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. NO DOUBLE indicator is ON whenever the received signal indicates a single thickness sample is in front of the probe.
3. Both indicators are off if no metal is detected in front of the probe.
4. The NO DOUBLE indicator flashes for two seconds after “one sample” calibration has been invoked successfully.
5. The DOUBLE indicator flashes in “two sample” calibration mode while awaiting the second press of the calibration pushbutton.
6. Both indicators flashing in unison indicates an invalid calibration.

See TROUBLESHOOTING for interpretation of other flash patterns on these indicators.

## CONFIGURATION SWITCHES AND JUMPERS

Two small switches are located at the front of the main circuit board in the opening between the two connectors.

Switch	State	Effect
LEFT	UP	Select 25 kHz Operating Frequency
LEFT	DOWN	Select 6 kHz Operating Frequency
RIGHT	UP	External Input is CAL Input
RIGHT	DOWN	External Input is Output Latch Reset

The CAL/RES input has associated with it a two position jumper plug located under the front cover and immediately behind the connector. This jumper allows the input 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. The input is active low.

## **CALIBRATION**

The DS161 controller offers two modes of calibration or “teach”, a one-sample calibration and a two-sample calibration. Both are invoked through the CALIBRATE pushbutton on the face of the unit or through a contact closure across the CAL/RES and COM logic inputs if the rightmost switch is in the UP position. Throughout the calibration procedure described below, any operation from the CALIBRATE pushbutton may be duplicated through the CAL/RES input if the rightmost configuration switch is in the UP position.

The latest calibration information is always stored in non-volatile memory and is restored at power-up.

### **One-sample Calibration**

The one-sample calibration simply sets the gauge threshold at 125% of the signal present at the time the pushbutton switch is pressed.

1. Position the sensor and the object to be sensed in relation to each other to produce an “acceptable” condition.
2. Tap the calibration pushbutton.

If the calibration is successful, the green indicator flashes several times at a 5 Hz rate and then reverts to following the output. The new calibration value is stored in non-volatile memory. If the sensor signal is out of calibration range, both indicators flash simultaneously for 30 seconds or until the calibrate pushbutton is pressed again.

### **Two-sample Calibration**

Two-sample calibration may be used for looser or tighter control of the positioning of the gauge threshold. Two-sample calibration places the gauge threshold at the midpoint between the two recorded samples. Whereas the one-sample calibration always discriminates on a 25% change in signal relative to the sample point, the separation of sample points in the two-sample mode may vary according to the user’s needs.

1. Position the sensor and the object to be sensed in relation to each other to produce an “acceptable” condition.
2. Tap the calibration pushbutton twice within one second. The double indicator begins to flash.
3. Position the sensor and an out-of-tolerance object in relation to each other to produce an “unacceptable” condition.
4. Tap the calibration pushbutton once more. The double indicator stops flashing.

## **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 pushbutton in as power is applied to the unit. The revision number will be 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

CAL/RES: 30 Volts maximum  
Upper switch threshold - 6.9 volts  
Lower switch threshold - 3.3 volts

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

## OUTPUT SPECIFICATIONS

### Sinking Output

#### Open Drain

Connection: Screw terminal block  
Max. applied voltage: 30 Volts, TVS limited  
Max. current, momentary: 40 Amps  
Max. current, sustained: 50 mA, fuse limited  
Max. off state leakage @ 30 V: 25 uA  
Overcurrent protection: 50 mA self resetting fuse.  
ESD protection: Transient Voltage Suppressor @ 30 Volts

### Sourcing Output

Connection: Screw terminal block  
Max. source current: 50 mA, fuse limited  
Output Voltage High: 24 volts  
Overcurrent protection: Self resetting fuse  
ESD protection: Transient Voltage Suppressor @ 30 Volts



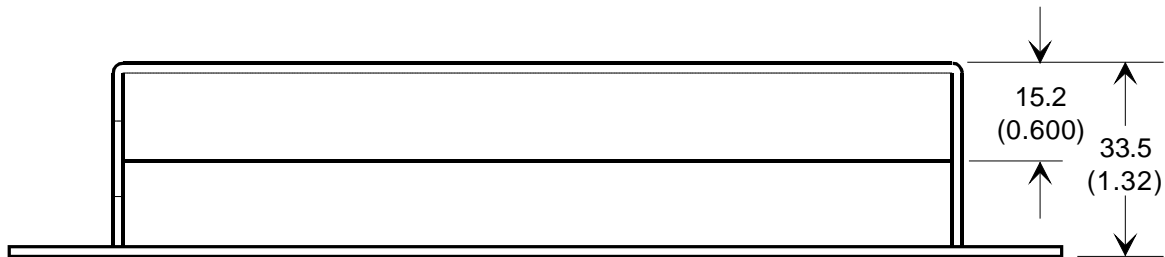
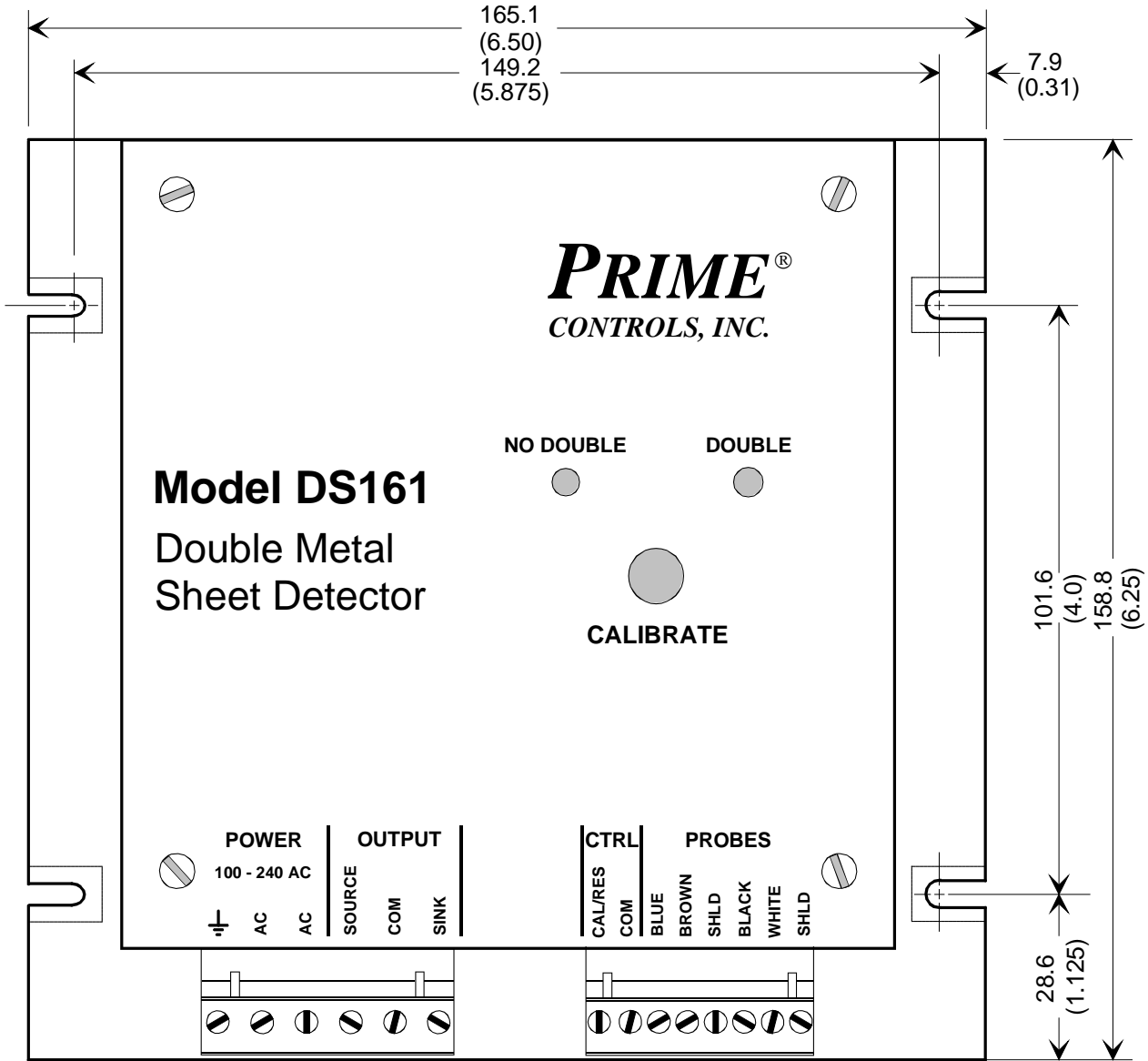
## **TROUBLESHOOTING**

Should trouble develop, proceed as follows:

1. Check AC input power to the control module
2. If the unit powers up, initializes and the indicators show a response to the materials in the gap but the relays do not switch, check that the outputs are set to follow and not to latch (set the rightmost switch to the UP position or activate the CAL/RES input to unlatch). For most installations, simply install jumpers between CAL/RES and COM.
3. 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
  - shorted receiver probe
  - incorrect probes for the material being gauged

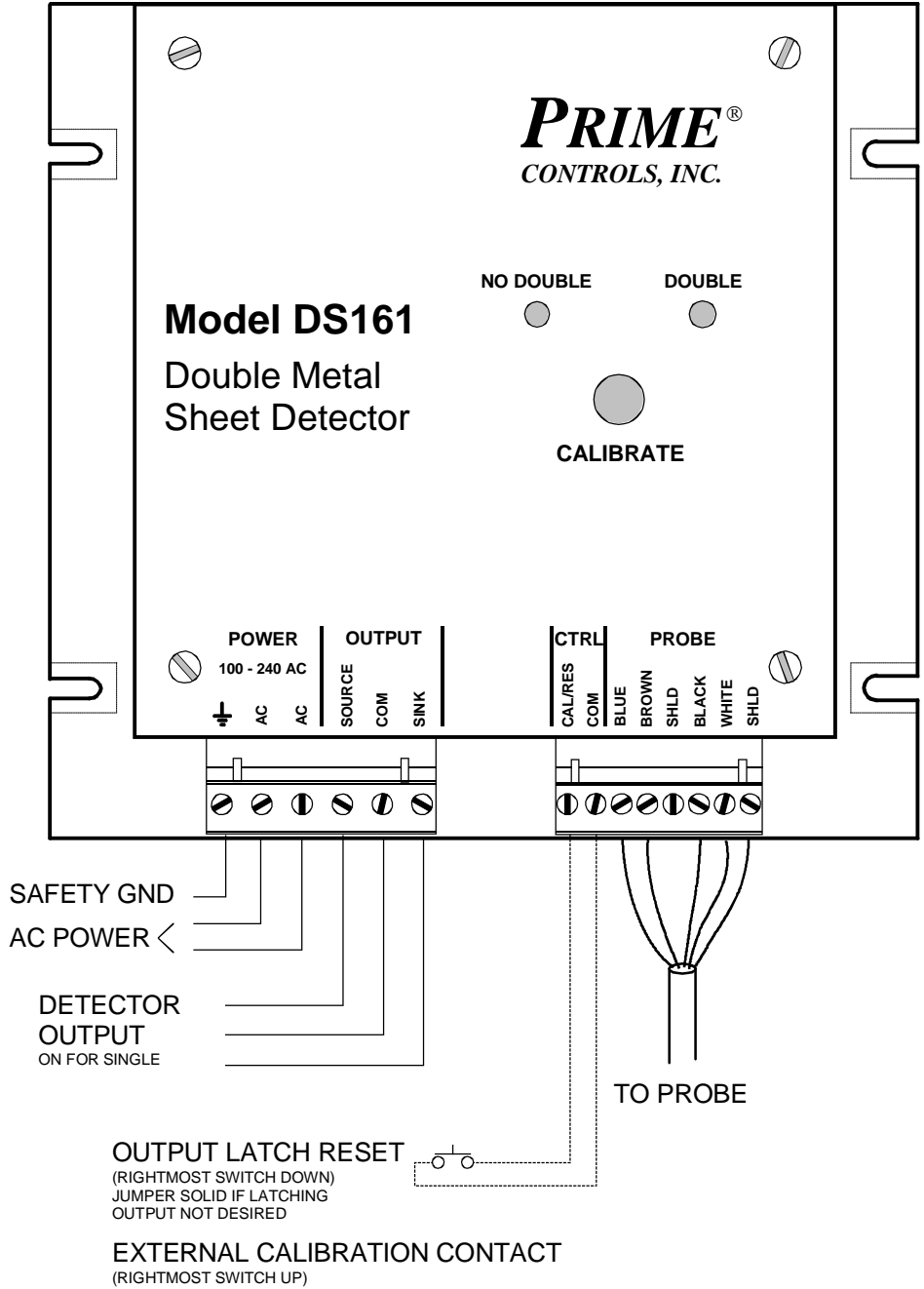
If the problem cannot be resolved, call the factory for assistance.

For further information or service assistance, contact Prime Controls, Inc., 4551 Gateway Circle, Dayton, Ohio. Phone: (937) 435-8659. Mention model number and serial number.



**CONTROL MODULE DIMENSIONS**

# DS161 WIRING



## **LIMITATION AND EXCLUSION OF WARRANTIES**

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