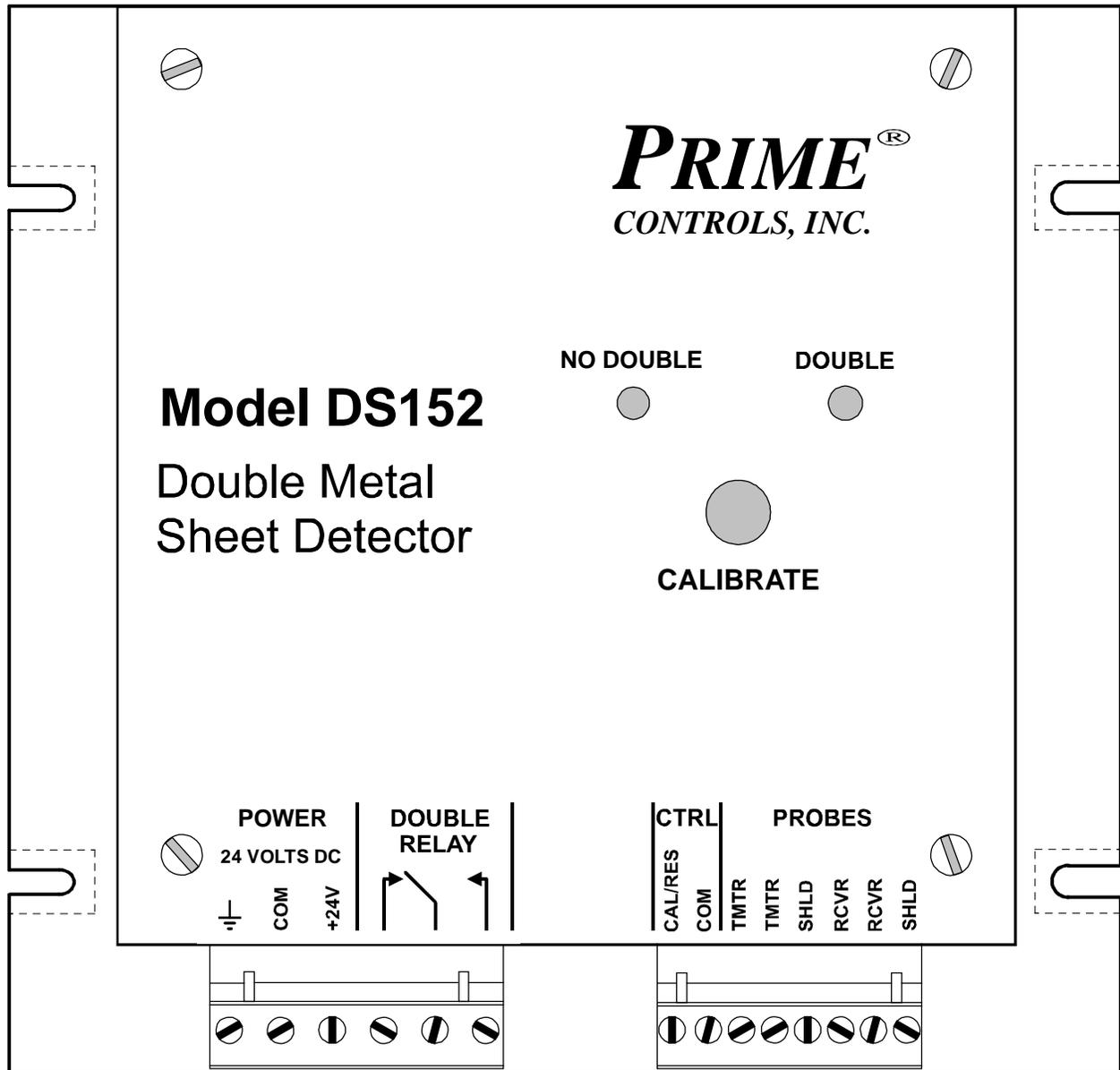


# OPERATING INSTRUCTIONS

## Model **DS152** DOUBLE SHEET DETECTOR



### DESCRIPTION

The Model DS152 Double Metal Sheet Detector comprises a control module in a sheet metal housing with two probes to form a system that detects the thickness of metals passing between the probes. 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 the type of probe attached. If the probes are not recognized, the flash pattern changes for three seconds with the DOUBLE indicator on solidly and the NO DOUBLE indicator flashing. When probe assessment is completed successfully, the indicators stop flashing

Other features of the control module include:

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.

Switch selectable delay of relay response.

Probe fault detection and reporting via the two front panel indicators.

## Probes

The DS152 accommodates a number of Prime probes including but not limited to the Type A, CA, CB, P1000B, P70 series, and P15 series. All of these probes are potted and completely sealed. Most are available in connector or fixed cable models except the P1000B which has a permanently attached cable.

The same probe type is used for transmitter and receiver and is not polarized. The probes have no magnetic attraction and they do not respond to small amounts of fine metal filings, oil or dirt.

## INSTALLATION

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

### DS152 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.

### P1000B Probes

The probes must be mounted so that they face each other with typically a 20 mm (0.75 inch) gap between the sensing faces for steel and 32 mm (1.25 inch) gap for magnesium. The sheet material should not pass closer than 2 mm (1/16 inch) from the sensing faces. The body of each probe has four threaded inserts on the back and four on one end for flexible and easy mounting.

The cables from the probes to the DS152 should be run in conduit with no other conductors.

### P70CS Probes

P70CS probes are designed to be used where a wide gap is required between the probes. However, in order to be effective with a large gap, the probes must be mounted with nonmagnetic materials such as 303 stainless steel, phenolic, or nylon. If the probes are surrounded by iron or steel, their range and effectiveness is diminished. The gap can be as large as 100 mm (4 inches) but varies with material and the application. If the gap is too large the unit will not calibrate properly.

### “B”, “CA” and Other Legacy Probes

Where older controls such as the DS10 are being replaced, the existing probes can most probably be used with the DS152. The older controls use three wire probes where the DS152 uses two wire probes. When using a three wire probe with the DS152, one of the leads must be cut off and abandoned. To determine which two leads to use, measure the resistance between the three leads of the old probe and mark and connect to the DS152, the leads across which the highest resistance is measured. Cut off the third wire, insuring that it does not short to any conductive surface. For most older probes, the wire to be abandoned is white in color. If questions arise, call the factory. The newer probes utilize twisted pair wiring which offers greater electrical noise immunity.

## Electrical Wiring

All wiring for the DS152 connects to removable terminal blocks at the bottom of the control enclosure as described in the following paragraphs.

1. Connect 24V DC power (5watts) and system common to the terminals labeled +24V and COM respectively on the left terminal block. Optionally connect earth ground to the terminal labeled with the ground symbol.
2. Connections to the control circuit of the machine are made through the form C relay. This relay is powered in the NO DOUBLE condition and the diagram on the DS152 front panel reflects the NO DOUBLE state.
3. The shielded cables from the probes to the board should be run in conduit. The receiver probe is connected to terminals labeled RCVR on the rightmost terminal block and the transmitter probe to the terminals labeled TMTR on the same terminal block. Since the probes are non-polarized, the order of lead connection is not important and since the probes are identical, it matters not which is the transmitter and which is the receiver. Connect the shield leads (drain wires) from the probe cables to the terminals labeled SHLD.
4. If SW2 (right) is OFF (up), the output relay may be operated in a "follower" mode or "latch" mode depending upon the wiring of the RESET input. If SW2 is ON, the relay is always in follower mode and the CAL/RES input is available for connection to a remote calibration switch. Operational modes and required connections for the SW2 OFF condition are described below.
  - a) For "follower" mode, jumper RESET and COM together on the center terminal block. In this mode, when a DOUBLE condition occurs, the relay drops out and the DOUBLE indicator comes on. When the double condition is corrected, the relay returns to the normally energized condition, the DOUBLE indicator goes out and the NO DOUBLE indicator comes on. Automatic reset is normally selected to control the operation when the fault condition is automatically removed or the DS152 is wired into the stop circuit of the machine.
  - b) For "latch" mode, wire the RESET and its associated COM terminal to the normally open contacts 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.
5. If SW2 (right) is ON (down), a remotely located switch or dry contact may be connected across the CAL/RES terminals. Closing a contact across the terminals invokes the calibration process as if the front panel pushbutton had been pressed.

## INDICATORS

The function of the indicators and controls on the DS152 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 is closer to the calibrated single thickness value than to the calibrated double thickness value.

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

## CONFIGURATION SWITCHES AND JUMPERS

### Switches

Two small switches are located on the main control circuit board in the opening between the two connectors at the front of the board. These switches affect the outputs response time of the unit as follows (switches are ON in the down position):

Left Switch OFF:	No relay delay
Left Switch ON:	½ second relay delay
Right Switch OFF:	CAL/RES input is relay latch reset input.
Right Switch ON:	CAL/RES input is remote calibration switch input.

### Jumpers

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

For proper operation, the double sheet detector must be calibrated on both a single and a double thickness of the material to be fed any time prior to running. Calibration values are retained even when power is removed from the DS152.

1. Place a single sheet of metal of the thickness to be gauged in the probe gap and press the CALIBRATE push button (or optional remote calibration switch). During calibration on the single thickness, the NO DOUBLE indicator flashes and the DOUBLE is off. If the

calibration on single is successful, the NO DOUBLE indicator turns off and the DOUBLE indicator flashes. Calibration on the double thickness must occur within 3 minutes or calibration is aborted and the system reinstates the calibration parameters that were in effect prior to the latest calibration attempt.

If the calibration is not successful, both indicators flash simultaneously. Calibration on a single may be attempted again immediately. If the CALIBRATE push button (or remote calibration switch) is not pressed within 30 seconds after the error is reported, the system reinstates the calibration parameters that were in effect prior to the latest calibration attempt.

2. With the NO DOUBLE indicator off and the DOUBLE indicator flashing, place a double thickness of material to be gauged in the probe gap and press the CALIBRATE push button (or remote calibration switch). If the calibration is successful, the unit resumes gauging and turns on the DOUBLE indicator. If the calibration is not successful both indicators flash simultaneously. When this occurs, reinsert the single thickness and retry the calibration.
3. Proceed with normal operation.

## **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 1.5 and are incremented either by tenths (1.6, 1.7, 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 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 five flashes of the DOUBLE LED indicates version 1.5 of the firmware.

## **ELECTRICAL SPECIFICATIONS**

Power Requirement: 24 Volts DC @ 150mA Continuous. Startup surge current of 0.5 A.

### **CAL/RES Input**

Maximum Input Voltage: 30 Volts  
Switching Thresholds: Upper - 6.9 volts, Lower - 3.3 volts

When the internal jumper is installed for pull up to accommodate sinking drivers (toward board center), 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 Relay**

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

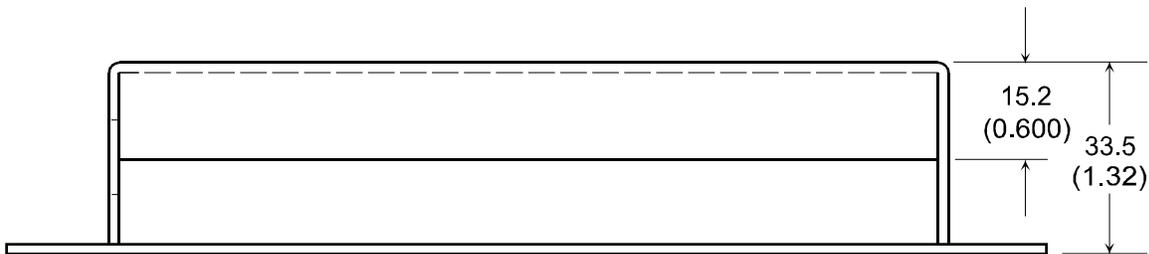
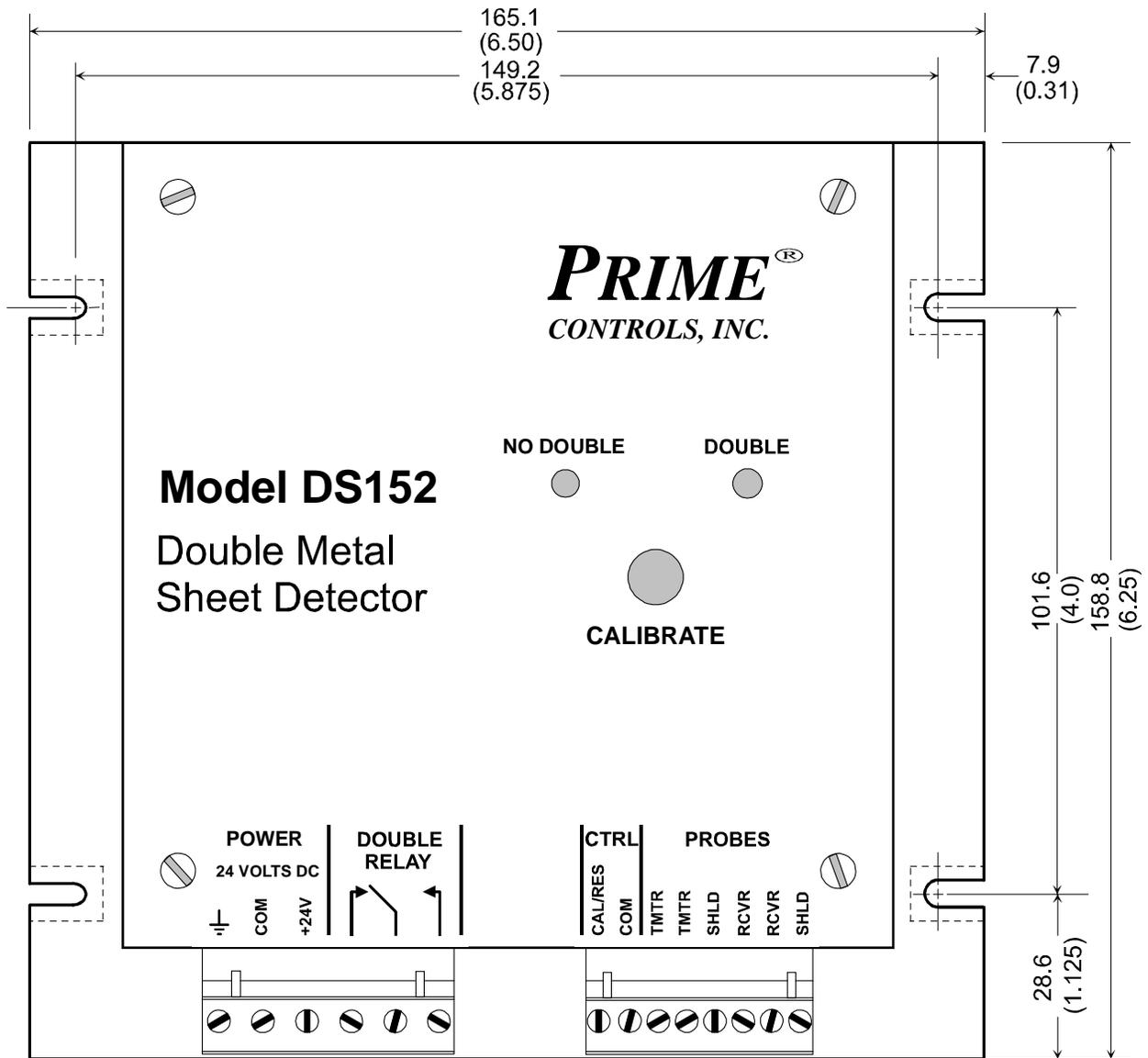
Expected mechanical life: 20 million operations  
Expected electrical life: 100,000 operations at 8 amps, 240VAC  
50,000 operations at 14 amps N.O., 5 amps N.C.,  
120VAC resistive  
30,000 operations at 7.2FLA, 45LRA, 120VAC  
10,000 operations at 5FLA, 30 LRA, 240VAC

## TROUBLESHOOTING

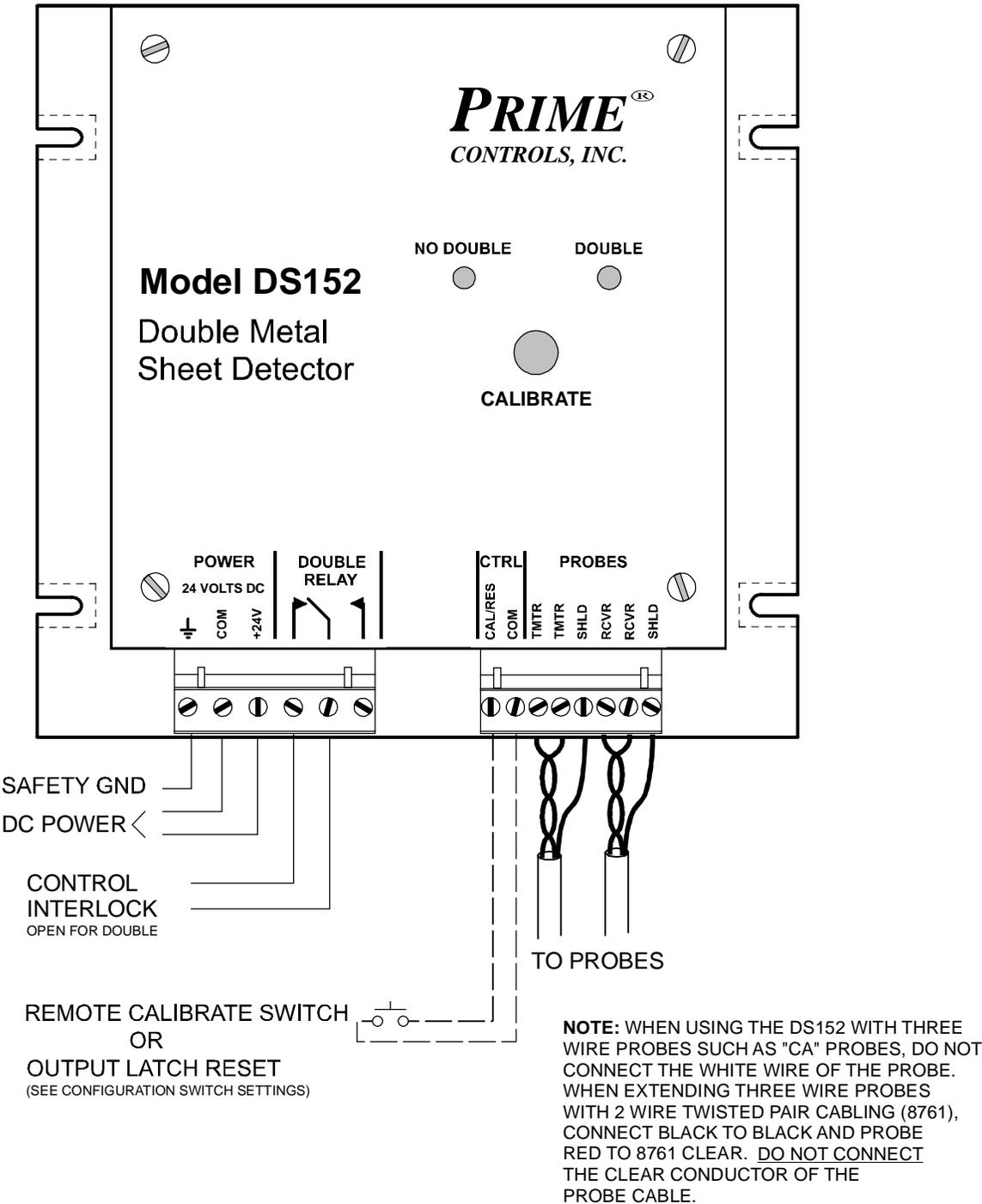
Should trouble develop, proceed as follows:

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 relays are set to follow and not to latch (activate the RESET input to unlatch). For most installations, simply install jumpers between RESET and COM.
3. If the DOUBLE indicator is on solidly while the NO DOUBLE indicator is flashing, check for a missing, disconnected, open, or shorted transmitter probe.
4. If the NO DOUBLE indicator is on solidly while the DOUBLE indicator is flashing, check for a missing, disconnected, or open receiver probe.
5. If at power-up the NO DOUBLE indicator flashes constantly while the DOUBLE indicator flashes for 5 seconds followed by solid on for 3 seconds, check for a missing disconnected, open or shorted transmitter 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 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. Phone: (937) 435-8659. Mention model number and serial number.



# DS152 WIRING EXAMPLE



## **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. 9/25/97