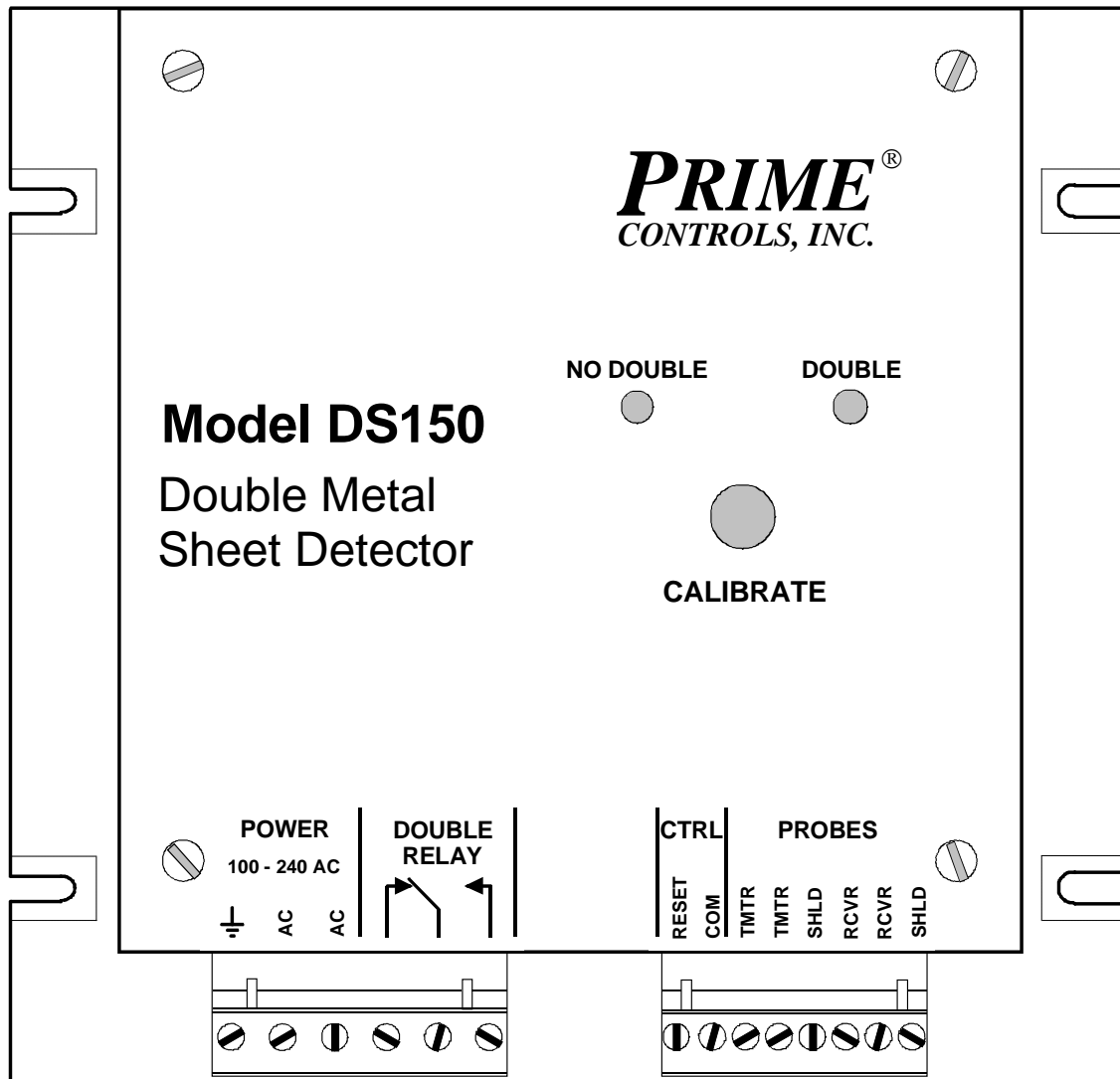


OPERATING INSTRUCTIONS

Model **DS150** DOUBLE SHEET DETECTOR



DESCRIPTION

The Model DS150 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:

Select 95 to 130 or 200 to 250 volt operation 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.

Switch selectable delay of relay response.

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

Probes

The DS150 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:

DS150 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 DS150 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 DS150. The older controls use three wire probes where the DS150 uses two wire probes. When using a three wire probe with the DS150, 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 DS150, 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 DS150 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. 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 DS150 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 form C relay. This relay is powered in the NO DOUBLE condition and the diagram on the DS150 front panel reflects the NO DOUBLE state.
4. 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.
5. The output relay may be operated in a "follower" mode or "memory" mode depending upon the wiring of the RESET input. The operational modes and required connections 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 DS150 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.

INDICATORS

The function of the indicators and controls on the DS150 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 Sw	Right Sw	Probes In Use	Effect
OFF	OFF	Any	None
ON	OFF	Any	Relay Delay-ON = 250 mS
OFF	ON	P1000B	Minimum Operating Freq = 400 Hz
ON	ON	Any	Relay Delay-ON = 600 mS

When only the right switch is ON and the attached probes are P1000Bs, the operating frequency of the unit is not allowed to go below 400 Hz insuring fast response times. However, for heavier steel, e.g. 12 gauge or thicker, this switch should be kept in the OFF (up) position. Enabling the ON-delay with the left switch overrides the frequency control feature.

These features may or may not apply to your unit depending upon its date of manufacture and whether it has been back to the factory for upgrade. The features apply according to the version of the installed firmware as follows:

Firmware Version	Applicable Switch Features
1.0	None - switches are not used
1.1	Right switch only limits lower frequency with P1000B
1.2	Features as indicated in the above table

To determine the version of firmware in your system, see the section later in this document on FIRMWARE VERSION.

Jumpers

The RESET 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 DS150.

1. Place a single sheet of metal of the thickness to be gauged in the probe gap and press the CALIBRATE push button. 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 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. 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 1.0 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 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.

ELECTICAL SPECIFICATIONS

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

Reset 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

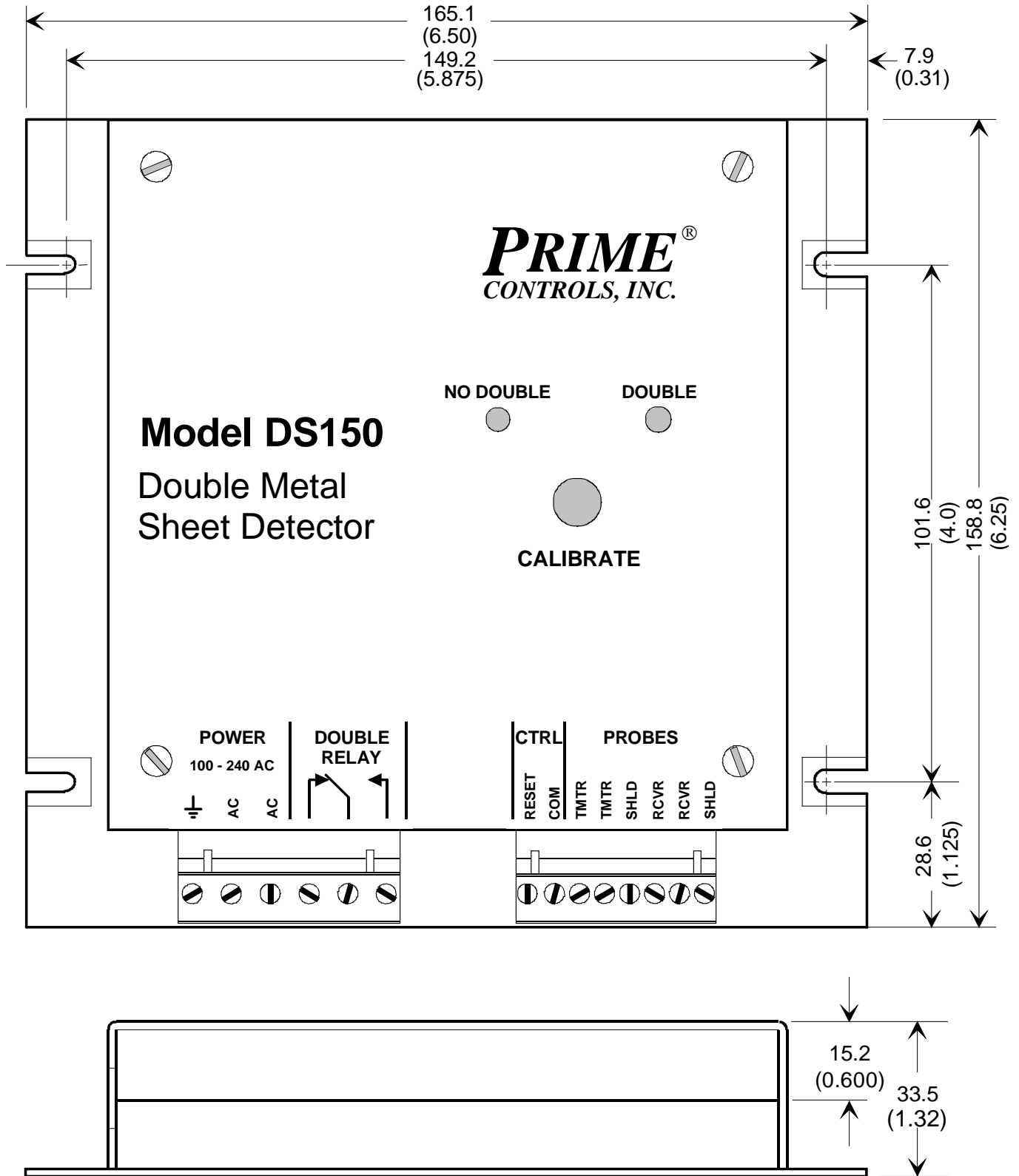
Expected mechanical life: 20 million operations
Expected electrical life: 100,000 operations at 8 amps, 240VAC
50,000 operations at 14 amps N.O., 5 amps N.C.,
120VAC resistive
30,000 operations at 7.2FLA, 45LRA, 120VAC
10,000 operations at 5FLA, 30 LRA, 240VAC

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.



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