SOFT TOUCH FOR 9380, 9480

OPTIONS 9381-34WDR/115 and 9381-34WDR/24DC

WITH TS8 SENSOR BOARD AND TRANSFORMER SIGNAL INJECTION

LOW PRESSURE APPROACH WITH SENDING ABILITY

PURPOSE: To prevent fingers (or other body parts) from sustaining permanent injury between moving resistance welder electrodes. This is especially important with welder operations that require small part to be hand loaded between electrodes that have a clearance of more than ¼".

SENSOR BOARD: The **9180-TS8** sensor board detects if metal is between electrodes before allowing high welding force to be applied. This is done using a voltage injected into one coil of the welding transformer that puts a low voltage across the welding electrodes. If continuity is detected, this voltage drops to near zero and the output relay on the 9180-TS8 board will close to tell the microprocessor that it is safe to apply welding force and go through the welding sequence.

PNEUMATIC SYSTEM, DRAWING 1963D3F3:

This option is used on PMCO style frequency converter welders with **DIAPHRAGM** or **CYLINDER** heads. The option puts a pressure on the bottom of the diaphragm or cylinder piston that partially counterbalances the head weight of the welder ram. This low force is applied between the electrodes until continuity has been detected between the electrodes.

PNEUMATIC INSTALLATION: Connect hoses from the SOLUTION enclosure bulkhead fittings to the diaphragm or welding cylinder as shown on page 10. The solenoid valve that is presently connected to the top port will not be used. the solenoid valve (FORGE) that is presently installed will stay in place and be connected as shown on page 10.

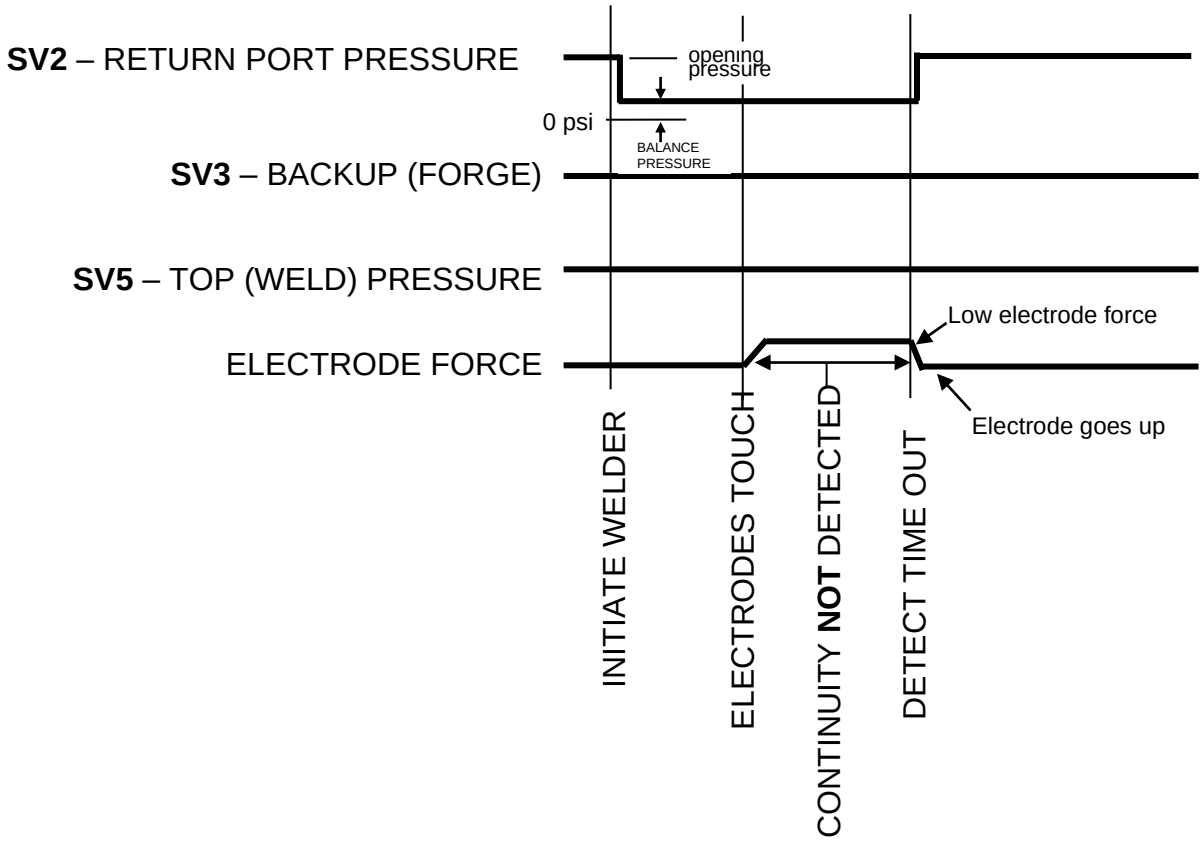
SYSTEM OPERATION:

The typical frequency converter welder incorporates a cylinder or diaphragm head along with a forge valve. The dead weight of the ram supported by the small surface of an electrode can be damaging to an operator's finger. This scheme can counterbalance most of the ram weight.

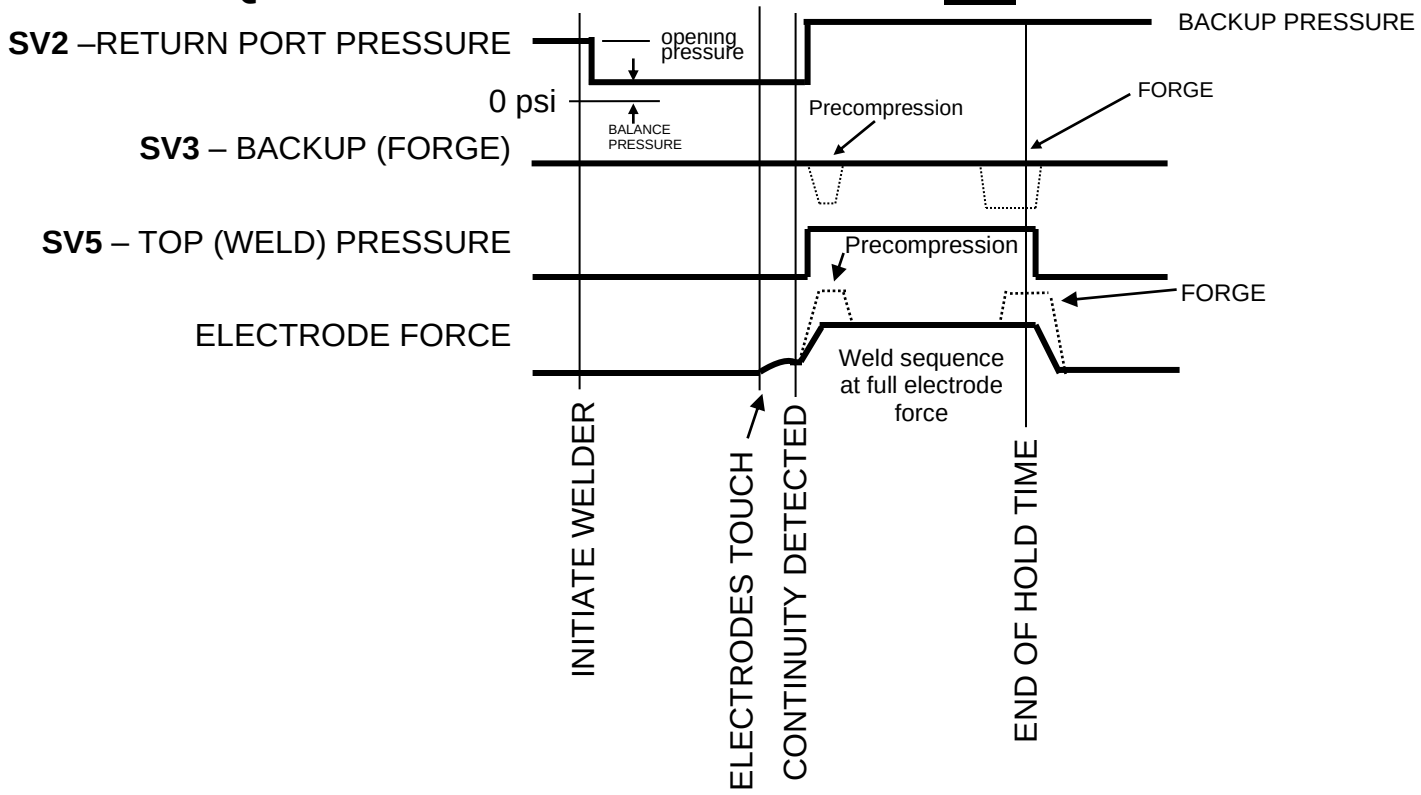
When the welding control is initiated, A 3-way solenoid valve, SV2, is energized. This places lower pressure set by the volume booster regulator (adjusted by the BALANCE pressure precision regulator) on the underside of the diaphragm or cylinder piston. This will let the ram drop but will maintain some upward force to counterbalance some of the moving ram weight and keep the electrode force at or below 70 pounds.

1. If continuity is **not** detected (both electrodes do **not** touch the same metal within the selected DETECT TIME), SV2 will be deenergized to put pressure on OPENING PRESSURE on the bottom side of the diaphragm or cylinder piston to raise the welder ram.
2. If continuity **is** detected (both electrodes touch the same metal within the selected DETECT TIME):
    a. The output of a relay on the TS8 sensor board will put 24VDC to input PS5. This will turn on the yellow LD15 on the left side of the power supply/IO board.
    b. Solenoid valve SV5 will be energized to put air on top of the diaphragm.
    c. Solenoid valve SVF will be deenergized to put the backup pressure as set by the welder's back pressure (FORGE) regulator.
    d. The letter **T** (for "trace") will be shown on the control display.
    e. If continuity is not detected before the end of the customer-entered MAX. DETECT TIME, SV5 will be deenergized to put pressure on the bottom side of the diaphragm or cylinder piston to raise the welder ram.

SEQUENCE WHEN ELECTRODES DO NOT TOUCH METAL



SEQUENCE WHEN ELECTRODES DO TOUCH METAL



SETTING THE SOLUTION CONTROL FOR USE WITH THE SOFT TOUCH FUNCTION

1. Press: PROGRAM, 87, ENTER, 80.

FOR 9380 CONTROLS: The display will show:

SOFT TOUCH ON **CHANGE1=YES,0=NO**	**OR**	**SOFT TOUCH OFF** **CHANGE1=YES,0=NO**

a. If **SOFT TOUCH ON** is shown, press **0** to not change the mode

b. If **SOFT TOUCH OFF** is shown, press **1** to turn this function ON.

FOR 9480 CONTROLS: The display will show:

SOFT TOUCH ON **CHANGE1=YES,0=NO**	**OR**	**LIGHT CURTAIN** **CHANGE1=YES,0=NO**

a. If **SOFT TOUCH ON** is shown, press **0** to not change the mode

b. If **SOFT TOUCH OFF** is shown, press **1** to turn this function ON.

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2. The display will now show:

MAX.DETECT 000CY
CHANGE1=YES,0=NO

This is the maximum time from the start of initiation for the system to detect continuity before opening the electrodes. This time is in cycles, and 060cy = 1 second. The time selected should be at least 50% longer in time that it takes for the electrodes to close. A typical number is 45 cycles. If continuity is detected before the end of the MAX. DETECT time selected, the control will skip the balance off this time and start the weld sequence. After time entry press **ENTER.**

3. The display will now show:

DETECT BLANK 000
CHANGE1=YES,0=NO

4. This is the time starting at initiation that the system will **not** be looking for continuity. For normal applications leave this number at 015.

   This blanking time is used on welders where it is possible for the electrodes to see continuity before they are fully closed. Continuity is only checked **after** blanking time. Early false continuity can happen part of the material being welded can touch top and bottom electrodes as the electrodes are still closing. This can occur where welds are being made close to the vertical wall of a flange or angle.

5. Press **ENTER** to exit out of this program.

USING SOFT TOUCH IN PRODUCTION

1. When ready for welding, the control is initiated (close foot switch or hand buttons).
2. **FAIL-SAFE <u>STARTING</u> SEQUENCE:**

If the SOFT TOUCH SENSOR detects continuity before the electrodes close (when the foot switch is not pushed), the display will show:

SENSOR IS CLOSED

and the electrodes will not even **start** to close. No action in the welder can take place until the output from the SOFT TOUCH sensor board is open. This indicates that the output relay on the SOFT TOUCH sensor board is closed.

3. **SEQUENCE AFTER ELECTRODES START TO MOVE:**
   a. Solenoid valve SV2 will be energized to lower the electrode under low force and will display:

WAIT: SOFT TOUCH

   b. The SOLUTION waits until the SOFT TOUCH board detects continuity between the electrodes.
   c. If this input closes **before** the **MAX DETECT time** has been reached, input PS5 on the SOLUTION control will be turned on, yellow LD15 will glow, and solenoid valve SV5 will turn ON to bring the electrodes to full welding force.
   d. If this input does **not** close before **MAX DETECT** time has been reached, the display will show:

DETECT TIME OUT

   and release solenoid valve SV2 to open the electrodes. Note that under this condition, the electrodes will not get to weld force. The initiation switch will have to be released and then closed again to try to make another welding sequence.

WHAT TO DO IF "DETECT TIME OUT" IS SHOWN EVERY TIME

1. **CLEAN ELECTRODES:** Check to be sure that there is nothing on the electrodes that would prevent electricity from being conducted. This can be as simple as a piece of emery cloth left behind after dressing the electrodes. Clean the electrodes and try again.
2. **DETECT TIME SETTING TOO LOW:** If it takes more time for the electrodes to touch the metal, go to PROGRAM, 87, ENTER, 80, and push **STEP** until the display shows:

MAX. DETECT ###CY
CHANGE1=YES,0=NO

   Press **1** to change, and then increase the time shown. Since this is in line cycles, 060 = 1 second. Note that if this control is being operated on 50Hz power, 050 = 1 second.

   If that does not correct the problem, **contact the Unitrol service department at 847-480-0114.**

TROUBLE SHOOTING CHART

PROBLEM	SOLUTION
When TIP DRESS switch is closed, electrodes do not close, or they start to close but to not travel all the way	1. BUCKING PRESSURE setting is too HIGH. This puts too much lifting pressure on the underside of the piston or diaphragm. DECREASE this pressure. Be sure that the force between electrodes under the TIP DRESS closure is less than 70 pounds. 2. Ram bearings or slides are not adjusted or lubricated to allow ram to fall easily by gravity when air is removed from cylinder 3. Welder cylinder piston cups or shaft seals are not flexible (replace) or need lubrication.
When the foot switch is closed, the electrodes do not fully close, then go back up, and the display shows: **DETECT TIME OUT** without going through the welding sequence.	The time set in PROGRAM 87/80 for DETECT TIME is too short for the time it takes for the electrodes to close and see continuity through the metal. Increase the DETECT TIME.
When the foot switch is closed, the electrodes **touch**, but the display shows: **DETECT TIME OUT** and the electrodes open up without going through the welding sequence	1. Check to see if there is some insulating material on either electrode. Clean electrodes. 2. The welding machine has run out of stroke. Typical strokes on these machines are ½". Adjust the electrode holders if needed. 3. If a LIMIT SWITCH or PROXIMITY SWITCH is being used as a second sensor, be sure that this switch is closing when the electrodes are touching.
RT1 SWITCH OPEN is on display	Install a jumper between terminals #13 and #14
Display shows: **DEPTH SW. CLOSED** and will not respond to keypad or foot switch.	Control is in the DUAL SENSOR mode. 1. If this mode is correct, check the limit switch or proximity switch that is wired to terminal #13. It should be OPEN. 2. If this mode is not correct, temporarily remove the jumper in terminal #13, reset mode in PROGRAM 87/80 to SINGLE mode, and then reinstall the jumper.

PROBLEM	SOLUTION
Display shows: **SENSOR CLOSED** and will not respond to keypad or foot switch.	Check to be sure that the two blue wires connected to the welding transformer secondary are securely installed.
Display shows: **SEN+DEPTH CLOSED** and will not respond to keypad or foot switch.	Both the SOFT TOUCH board output and the limit switch are closed before the foot switch has been closed. Check both of the faults shown in the two boxes above.
There is a noticeable delay from when the foot switch is closed and when the welder ram starts to move.	1. The ram is mechanically sticking. Adjust ram bearings or cylinder cup seals and shaft seals. Check lubrication. 2. The OPENING air pressure on the bottom (lifting side) of the welder cylinder is too high. This requires that a lot of time is needed to exhaust this air before the ram starts to move. Lower the OPEN PRESSURE regulator until it is just able to pick up the ram smoothly. 3. Be sure that all flow control valves have been removed from the diaphragm or welding cylinder ports.

HOW THE SENSOR WORKS

The SOFT TOUCH sensor board is designed to sense **continuity** between the welding electrodes. This is done by having a small voltage present between the open electrodes. This small voltage is injected into one of the welding transformer primary coils by a circuit inside the control box. When the electrodes close on metal, the impedance of the welder secondary drops to a very low value. This will “short out” the small voltage between the electrodes. The SOFT TOUCH sensor board conditions and amplifies this voltage and knows when metal is in contact between the electrodes.

This whole effect depends on the welder secondary being properly insulted not and finding a conductive path from the upper electrode to the lower electrode until the electrodes are closed.

PROBLEMS WITH LOW ELECTRODE FORCE

Because operation of the SOFT TOUCH sensor board depends on detection of continuity between the electrodes, a reasonable force must exist where the electrodes touch the metal on both sides for good continuity to be measured. If the electrodes touch and dwell before opening with the DETECT TIME OUT display, try decreasing the electrode force during the SOFT TOUCH sequence. This is done by slightly LOWERING the balance pressure regulator.

PROBLEMS WITH COATED METAL

If metal between the electrodes is coated with an insulating material, the electrodes will not see continuity and the SOFT TOUCH system will not operate. This is just reality of continuity testing. Some materials that have had problem with this system have included metal with various oxide coatings (titanium oxide, silicon oxide, etc.) as well as polished material that has a thick wax finish. Problems are also found trying to use hot rolled steel that has not had the scale properly removed.

During normal spot welding, the high force of the electrodes is usually enough to break the oxide surface coating and make contact through the electrodes. These materials typically have a lot of expulsion when welded confirming that the surface must be “blown away” at the early part of each weld.

But the low voltage and low force of the SOFT TOUCH process will not always be able to establish a continuity path between the electrodes to let this function work.

ALTERNATIVE SENSOR INSTALLATION: Where these partially insulated materials are welded on this machine, the only way the system will operate is with the use of a LIMIT SWITCH or PROXIMITY SWITCH as the main sensor. The limit or prox switch will be mounted and adjusted in such a way that it will close when the electrodes are less than ¼” apart. While this is not as elegant as the continuity sensing of the SOFT TOUCH board, it will still provide protection in the pinch point area between the electrodes if set up correctly. Note that if the limit or prox switch is closed before the welding electrodes start to close, the system will not allow any movement and will display the fault.

A SOFT TOUCH BYPASS kit is available with a keylock selector switch and indicator LED for this purpose. can be installed to switch between the SOFT TOUCH sensor board on conductive material, and limit switch operation on poor conductive material. Contact the Unitrol service department for more information on these two choices.

TROUBLE SHOOTING INSULATION FAULTS IN WELDER

On all resistance welders, either the top or bottom electrode arm or holder is insulated from the welder frame. This is done using fiber sheets between plates, and fiber tubes and washers on bolts that connect the insulated components. If one of these insulators is missing, the secondary of the welder will be shorted, and the SOFT TOUCH system will **not** see the required change in voltage when the electrodes close on metal.

If these voltage changes are not seen by the SOFT TOUCH sensor board, **the SOFT TOUCH system will not be able to be used.**

Because the welder transformer secondary is essentially one copper strip, putting a meter from electrode to electrode will not tell if the insulators are not properly installed. To do this, you will have to unbolt the flexible shunts or linkages that connect to the moving part of the welder secondary to the top welding transformer pads. On a press welder this is usually a stack of copper laminations. On some welders, this flexible connection consists of one or more flexible copper cables.

Remove the flexible connection from either side, insulate to keep from touching anything, and check from top to bottom electrode for continuity. If the welder is properly insulated, the resistance measured should be zero (totally open). If continuity is measured, check and repair insulation as needed so that this reading shows fully open (no resistance).

Once this has been accomplished, reconnect the flexible components. Check the DC voltage between TP4(+) and TP1 on the TS8 sensor board. The voltage should drop at least ¾ volt when you turn on the TIP DRESS switch and the electrodes touch.

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