



#9580, #9581, #9582 ACCUSTART

**DIFFERENTIAL PRESSURE TRANSDUCER
CONTROL SYSTEMS**

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Thank you for purchasing this Unitrol ACCUSTART. It is designed using the latest in microcomputer technology and should provide years of dependable service. The ACCUSTART was designed and produced with **pride** by the Unitrol team:

CONCEPT DESIGN: Roger Hirsch
SOFTWARE DESIGN: Leonard Arman
HARDWARE DESIGN: Grig Ioffe
MFG. SUPERVISOR: David Hirsch

FINAL INSPECTION AND CALIBRATION BY: _____

MODEL NUMBER:

SERIAL NUMBER:

DATE OF MANUFACTURE:

SOFTWARE VERSION: PR4SBRD

LINE VOLTAGE: 115 , 60Hz

RELAY CONTACT RATING: 120VAC - .3A, 30VDC = 1A

WARRANTY

Unitrol will repair, replace, or calibrate any component that fails to perform to factory specifications for a period of one (1) year from the date of shipment. This warranty excludes service on any component that was mechanically damaged, or where the system was not used per Unitrol directions and specifications.

No other warranty, written or implied, covers this product unless in writing and signed by an officer of Unitrol Electronics Inc. prior to shipment of this product.

Components shipped with this device:

- ACCUSTART complete with 3' power and signal cable**
- 1 = Cord grip for connecting control cable to customer cabinet**
- 2 = Keys for keylock switch**
- 2 = 1/4" polyflow 1/4" NPT fittings**
- 1 = 36" red polyflow tubing**
- 1 = 36" green polyflow tubing**
- 1 = Direction book**
- FOR model #9582 ONLY:**
- 1 = 1/2" Air regulator**
- 1 = 36" blue polyflow tubing**
- 1 = 36" white (clear) polyflow tubing**

ACCUSTART

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FUNCTION:

This device contains a solid state DIFFERENTIAL pressure transducer. Because it subtracts back pressure from working pressure on the welder's air cylinder, the effects of flow controls or internal air cylinder leakage will be detected and prevent welding until the proper TIP FORCE HAS BEEN REACHED. The ACCUSTART does the following:

- A. FOR ALL MODELS: An internal relay contact will close when the DIFFERENTIAL pressure being measured equals or exceeds the user set **PRESSURE** value. At the same time, the **W** light will turn on, and the internal sounding device will beep momentarily.
- B. FOR MODELS #9581 and 9582 only: A second internal relay contact closes for **1 second** if the DIFFERENTIAL pressure being measured reaches or exceeds the user set **HIGH LIMIT** value. At the same time, the **H** light will glow and will remain on until the pressure has dropped to zero and then up past 3psi during the next weld. This HIGH LIMIT contact can be used to operate a warning device or possibly lock out the welder.
- C. FOR MODEL #9182: The remote air pressure regulator supplied with this control will automatically set the output air pressure to the operator selected **PRESSURE** value set on the large display.

INSTALLATION:

- 1. Locate the ACCUSTART box on top of your control or at a convenient location that will allow the displays to be read easily. If desired, the four rubber feet can be removed, and #6-32 screws inserted through the main cabinet into the ACCUSTART. Note that threaded inserts have been provided in the bottom of the ACCUSTART cabinet for this purpose.
- 2. Install pipe tees at the ADVANCE and RETRACT ports of the air cylinder being monitored as shown in the diagram on the back of the ACCUSTART box. Use the drawing that matches your welding cylinder.
- 3. Install one of the provided ¼"NPT to ¼" polyflow fittings in each of these tees.

FOR THE SYSTEM TO WORK PROPERLY, IT IS IMPORTANT THAT THESE TEES ARE INSTALLED DIRECTLY AT THE ENTRANCE TO THE AIR CYLINDERS SO THAT PRESSURE IN THE CYLINDER IS READ BEFORE THE AIR REACHES ANY FLOW CONTROLS.

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4. Run the RED polyflow tube provided in the kit from the FORWARD port (furthest away from the rod end of the cylinder) to the FORWARD input at the back of the ACCUSTART. Cut this red polyflow tube as necessary.
5. Run the GREEN polyflow tube provided in the kit from the RETURN port to the RETURN input at the back of the ACCUSTART. Cut this green polyflow tube as necessary.
6. On model #9582, connect the blue and clear (white) tubing per the pneumatic drawing included with the pressure regulator kit.
7. Run the multi-conductor cable into your control box using the fitting provided. Cut the cable as necessary. Strip the end of the cable to expose wires.

CRITICAL: Be sure that this control cable does NOT run near any of the high voltage wires or the SCR contactor in the welding control. Inductive “cross talk” between high current carrying conductors and the ACCUSTART cable can cause permanent damage to the ACCUSTART, and can lock up the unit during production.

8. Connect the control wires as shown on back of the cabinet and also at the bottom of the next page.
 - a. Connect the Black and White wires to 115V (or 230V if ordered special with this voltage setting and marked on the control's name plate).
 - b. Connect the Green wire to the cabinet ground. **DO NOT OPERATE THIS DEVICE WITHOUT THIS GREEN GROUND WIRE PROPERLY CONNECTED.**
 - c. Remove any existing wire jumper on the welding control's PRESSURE SWITCH input and connect the RED wire to one of these points, and the BLUE wire to the other. Note that if wires are already connected to this input, trace where these wires are connected and then contact the Unitrol service department for assistance.
 - d. FOR MODELS #9581 and #9582 only: The Brown and Orange wires are connected to a relay contact that will close for 1 second when the pressure has exceeded the HIGH LIMIT setting on the ACCUSTART. These can be connected to any alarm or lighting device within the contact rating of 0.3A 120VAC or 1A 30VDC. You can use a light bar, sounding

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device, relay interlock (to prevent further welding), or connect to a PLC on automatic welders.

WIRING

115V-----BLACK

NEUTRAL-----WHITE

GROUND-----GREEN

FOR 230V WHERE MARKED ON NAMEPLATE:

230V-----BLACK

230V-----WHITE

GROUND-----GREEN

CONTACTS

Close when PRESSURE is reached:

RED —|— BLUE

On models #9581 and #9582, close when pressure reaches HIGH LIMIT:

BROWN —|— ORANGE

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DIRECTIONS FOR USE

1. Turn air and power on at the welder.
2. Push the rear switch on the ACCUSTART to the **BYPASS** position. No lights will be on in this position.
3. Cycle the welder. With the ACCUSTART in the **BYPASS** position the welder should operate exactly as it did before installation of this unit. If not, check the wiring of the RED and BLUE wires.
4. Now push the rear switch on the ACCUSTART to the **USE** position. The yellow **ON** light should glow, and the display windows should show numbers.
5. The **PRESSURE** window should now be at **00**. If a number is displayed in this window, disconnect the RED tubing going into the back of the ACCUSTART. There should be no air coming out of this tube. If air **is** flowing from this tube, check connection of the RED and GREEN tubing.
6. With the keylock in the **SET** position, install the desired welding pressure on the **SET PRESSURE** window. Each push of the + or – button will increase or decrease this setting by 1 psi. If either button is pushed and held, the number will change continuously until the button has been released. See **SELECTING CORRECT AIR PRESSURES** at the end of this direction book.
7. On models #9581 and #9582, set the desired **HIGH LIMIT** in the same manner as shown above. The value of the **HIGH LIMIT** will reflect the maximum pressure desired that would maintain desired weld quality.

TIP (ELECTRODE) FORCE is a very important in the formation of a resistance welding nugget.

LOW: If the electrode force is too **LOW**, excess heat will be created between the electrode and the part being welded. This will cause high expulsion (sparks) and large poor looking welds. Also, **LOW** electrode force will drastically reduce electrode life.

HIGH: If the electrode force is too **HIGH**, heat created between the parts in the nugget area will be very low. This creates weak brittle welds with very poor penetration into each piece of metal that is being joined. Typically, the **HIGH LIMIT** should be set 3-4 psi **ABOVE** the **SET PRESSURE**.

Therefore, it is important that the proper electrode force be reached **before** the first half-cycle of weld heat flows, and that this force **does not rise too much** over the proper level during the weld.

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8. Set the air regulator on the welder to about 1 psi above the value set in the **SET PRESSURE** window. If you close and maintain the first stage of the welder's foot switch, you can use the **PRESSURE** window of the ACCUSTART to read this pressure as it is being adjusted.
9. Set the welder control to NO WELD.
10. Close the foot pedal or hand switches on the welder. If the air gauge on the welder is accurate, the electrodes should touch, the air pressure on the **PRESSURE** window will glow, the green **W** ("WELD") light should glow, and welder should go through the balance of the sequence. If the value displayed in the **PRESSURE** window is lower than the **SET PRESSURE** display, the ACCUSTART will not close the internal relay and will keep the welder from operating.
11. On models #9581 and #9582: If the pressure being measured reaches or exceeds that shown in the **SET HIGH LIMIT** window, the red **H** ("HIGH") will glow, a tone will be heard for 1 second, and the **HIGH LIMIT** fault relay will close for 1 second.

Once the red **H** light is on, it will stay on until the start of the next weld. In this way, the operator can confirm that the last weld had a **HIGH LIMIT** force fault.

SQUEEZE TIME: With the ACCUSTART system operating correctly, set the **SQUEEZE TIME** on your welder to **00** cycles. In this way, as soon as the selected pressure is present on the welder's cylinder, the first heat cycle can flow.

Leaving time on SQUEEZE in the welding control will just **lower production output**.

12. **KEYLOCK:** To prevent change on settings, turn the keylock to the **LOCK** position and remove the key.

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SELECTING CORRECT AIR PRESSURES

Proper **TIP FORCE** for a large variety of metals and thicknesses can be found on the Unitrol WEB site: www.unitrol-electronics.com. These are located in the DOWNLOAD area and are free. These values are in POUNDS.

CALCULATING REQUIRED AIR PRESSURE:

For a given TIP FORCE, you will need a certain air pressure (psi). This is the setting that will be made on the ACCUSTART. It is calculated as follows:

$$\text{AIR PRESSURE SETTING} = \frac{\text{TIP FORCE}}{\text{WELD FORCE RATIO}}$$

The **WELD FORCE RATIO** is calculated using one of the following that fits your welder type:

A. WELDERS THAT HAVE FORCE CHART PLATES:

Locate the TIP FORCE for 50 psi. Then divide this TIP FORCE by 50 to yield the WELD FORCE RATIO.

$$\text{WELD FORCE RATIO} = \frac{\text{TIP FORCE AT 50 PSI}}{50}$$

B. WELDERS WITH MULTI-SECTION GUN CYLINDERS:

These air cylinders are used on fixture-type welders as well as press welders without rams. The effective area of the cylinder marked on the body. If in doubt, check with the cylinder manufacturer or contact the Unitrol service department for assistance. This effective area value is the WELD FORCE RATIO.

C. PRESS WELDERS:

These welders have a single-piston cylinder that operates a guided ram. The area of the cylinder is the WELD FORCE RATIO that is calculated as:

$$\text{CYLINDER AREA} = \text{WELD FORCE RATIO} = \text{DIAMETER} \times \text{DIAMETER} \times .785$$

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If the cylinder diameter is unknown, measure the outside diameter of the welder cylinder and subtract 1/8". Then move to the nearest full inch or half-inch size.

The following are areas of common cylinder sizes for U.S. manufactured welders:

INSIDE CYLINDER DIAMETER	CYLINDER AREA
3"	7.1 in ²
3-1/2"	9.6 in ²
4"	12.6 in ²
4-1/2"	15.9 in ²
5"	19.6 in ²
6"	28.3 in ²
8"	50.2 in ²
10"	78.5 in ²
12"	113 in ²

For example, to have 756 lbs electrode force on a PRESS WELDER with a 4" diameter cylinder (12.6 in²):

$$\text{AIR PRESSURE SETTING} = \frac{756}{12.6} = \underline{60 \text{ psi.}}$$

D. ROCKER ARM WELDERS:

If you are operating a **ROCKER ARM** welder, you must first calculate the machine **ARM LEVERAGE** as follows:

$$\text{ARM LEVERAGE} = \frac{A}{B}$$

A = distance from the center of cylinder rod to the rocker arm pivot point.

B = distance from rocker arm pivot point to center of electrode

Then calculate the WELD FORCE RATIO as follows:

$$\text{WELD FORCE RATIO} = \text{CYLINDER AREA} \times \text{ARM LEVERAGE}$$

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As an example, on a ROCKER ARM WELDER that has a 5" diameter cylinder (19.6 in²), measures 18" from the cylinder rod to the rocker arm pivot ("A"), and 24" from the rocker arm pivot to the center of the electrode ("B"):

$$\text{ARM LEVERAGE} = 18/24 = .75$$

$$\text{WELD FORCE RATIO} = .75 \times 19.6 = 14.7$$

This means that for every psi of air in the weld cylinder, the electrode will have 14.7 lbs of force.

To reach a 735lb force on this ROCKER ARM welder, the calculation is:

$$\text{AIR PRESSURE SETTING} = \frac{735}{13.7} = \underline{50 \text{ psi.}}$$

TO BYPASS THE ACCUSTART SYSTEM, push the switch on the back to the BYPASS position. Then don't forget to add SQUEEZE TIME to your welding control program.

A WORD ABOUT SYSTEM SPEED

The transducer in this ACCUSTART has a response time of 10ms. This means that changes in air pressure have a **virtually instant reaction**.

However remember that this system measures both the air pressure going into the cylinder as well as the air pressure on the backup (return) side. If the flow control on the return side is closed too far, air will be metered out of this side, and the transducer will wait until the **DIFFERENTIAL** pressure matches the selected value. This is the point that the TIP FORCE will be at the desired level.

Welding at any time before this point will yield expulsion and variable weld strength values.

In other words, the ACCUSTART shows reality!

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TROUBLE SHOOTING CHART

PROBLEM	PROBABLE SOLUTION
No lights or displays on face of unit	<ol style="list-style-type: none">1. Line voltage not present into white and black wires2. Switch on back set at BYPASS
System locks up when welder is operated	Cable from ACCUSTART has been run too close to high voltage lines in welder. Change cable routing to correct this problem
PRESSURE window shows a value above 01 when welder is not operated	<ol style="list-style-type: none">1. Air should not be in the RED tube. If it is, reverse GREEN and RED polyflow tubes at the welder cylinder side.2. Have transducer calibrated at factory
PRESSURE window shows FF when welder is not in operation	<ol style="list-style-type: none">1. Replace shorted transducer in system2. Replace amplifier chip in socket U-103. Replace microcomputer in socket U-7
PRESSURE window shows FF when welder <i>is</i> being cycled	Lower air pressure to a value below 99 psi
HIGH LIMIT light remains On even though pressure is below HIGH LIMIT setting	Be sure that the air pressure drops below 3 psi when welder is not being operated

If you have any problem in the use of this product, contact the Unitrol service department at 847-480-0115.
Thank you for selecting this ACCUSTART for your production system.

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NOTES

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