

SOLUTION CONTROL TECHNICAL DATA SHEET #1 SOLID STATE DIFFERENTIAL PRESSURE TRANSDUCER OPTION #9181-05C

THEORY: A major variable in the resistance welding process is **TIP (electrode) FORCE**. Since the electrical resistance between parts being joined **decreases** as force between the welding electrodes **increases**, the heat generated during the weld changes accordingly.

Since the tip force also acts as a **forge** in the nugget development process, process variations will greatly affect weld strength and ductility.

Lastly, if current starts to flow before proper **TIP FORCE** has been reached, metal expulsion (flash) will occur causing part indentation, tip pick-up of metal, and potential danger to the operator and others in the area of the welder.

*Welding before proper tip force has been reached **DRASTICALLY** reduces the quantity of welds possible between tip dressing, and **REDUCES** overall weld strength, consistency, and appearance.*

CALCULATING ELECTRODE TIP FORCE: The SOLUTION uses the **differential** pressure measurement to calculate electrode force as follows:

ELECTRODE TIP FORCE (lbs.) = AIR PRESSURE (psi) X CYLINDER PISTON AREA

- For *PRESS* or *PROJECTION* welders, this is the exact electrode force used by the SOLUTION.
- For *ROCKER ARM* welders, this value has to be modified by the welder's mechanical leverage as shown in the direction book. Once this value has been entered when the control is first installed, all calculations are automatically done by the SOLUTION control each time a weld is made.
- For two and three stack welding cylinders as well as Intensifier style cylinders, the manufacturer's marking of cylinder piston area is used for this calculation.

The **TIP FORCE**, as shown in FIGURE A on the next page, remains at zero (0) until the electrode touches the work piece at point #2. **Then the tip force increases in direct proportion to the change in air pressure.**

INSTALLATION: The #9181-05C **DIFFERENTIAL PRESSURE TRANSDUCER** option connects to the weld cylinders shown in FIGURE B on the next page using two 1/4" polyflow tubes supplied with the control. The transducer, mounted **inside** the SOLUTION control, subtracts the air pressure on the underside of the cylinder piston from that of the top. The resultant is the **exact** air pressure acting on the cylinder rod.

HI-LOW FEATURE: An **additional** check is made at the **end** of the weld to be sure that the electrode force has not gone **above or below** the customer entered maximum VARIATION.

If this number has been **exceeded**, higher electrode force will **reduce** electrical resistance between the parts to **reduce** weld heat and **reduce** nugget strength, penetration, and ductility.

If force has dropped **below** this number, excessive electrode heating and material surface marking will occur.

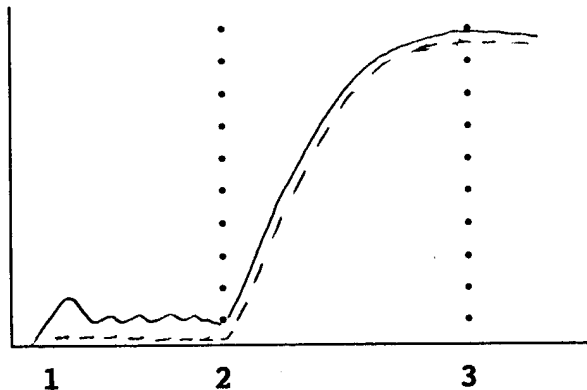
In either case, with this **HI/LOW** feature a fault will be generated by the control to keep the electrodes closed and require operator reset, or close a FAULT RELAY to signal a fault to a remote system..

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APPLICATION: This **SOLUTION** option is designed to start current flow in the welder at the **EXACT** tip force desired. As shown in the graph below, air pressure in the welding cylinder, as measured by the **DOUBLE SIDED** (differential) **PRESSURE TRANSDUCER** supplied with this option, changes in three steps:

1. **WELDER IS INITIATED:** The welder head starts to move at point #1. Before the electrodes touch (point #2), volume in the upper half of the cylinder starts to **INCREASE**. Therefore, during this same time, air pressure in the **VARIABLE** volume cylinder builds only slightly as required to overcome friction and inertia. This varies depending on air temperature, viscosity, oil content in the compressed air, temperature of welder bearings, etc.
2. **ELECTRODE TOUCHES WORK PIECE:** At point #2, the cylinder stops moving, and the now **FIXED** volume of the cylinder causes each additional amount of air to increase pressure. At the same time air exhausts out of the lower side of the cylinder
3. This continues until at point #3 the pressure inside the cylinder has reached that of the welder's pressure regulator, and the pressure on the underside of the piston has reached zero.

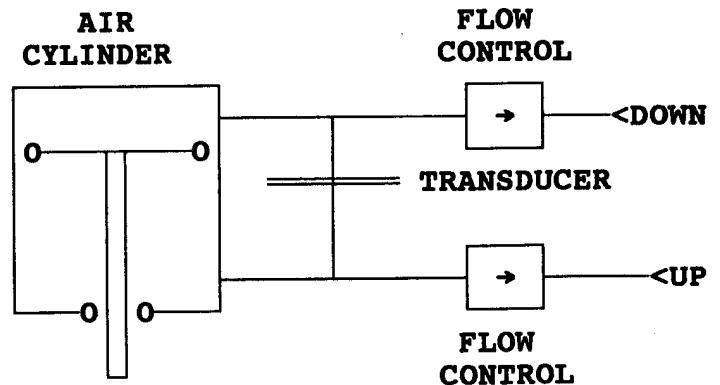
FIGURE A



LEGAND

Air Cylinder Differential Pressure —————
Electrode Tip Force - - - - -

FIGURE B



ELIMINATES NEED FOR SQUEEZE TIME: Because use of a **DIFFERENTIAL** type transducer eliminates error and false signals caused by changes in **welder head advance speed** as set by flow controls in the air system, no artificial **SQUEEZE TIME** is needed. Also, unlike mechanical pressure switches, this device is accurate to better than $\frac{1}{2}$ psi. and will not change even under large temperature swings and changes in air density and composition.

*Use of this option will present the **SAME EXACT ELECTRODE FORCE CONDITIONS** every time that the weld has started. Because of this, resistance in the nugget zone of the parts being joined will be constant and, therefore, reproduce weld strength and ductility throughout the production run.*

SOLUTION CONTROL TECHNICAL DATA SHEET #2 WELDING HEAT STEPPER

AVAILABILITY:

SOLUTION: Single HEAT STEPPER function is **standard**.

SOLUTION-2: 15 HEAT STEPPER package is available as **option #9281-15**

PURPOSE: The SOLUTION WELDING HEAT STEPPER is designed to allow a greatly extended number of welds in galvanized steel to be made between tip dressings. Using this function, the SOLUTION control can produce **3,000 or more quality welds between tip dressings** in coated materials such as galvanized steel.

UNIQUE UNITROL FEATURE: Unlike heat steppers in other brand controls, the Unitrol Heat Stepper does **not** require the user to enter individual step points (weld number and weld heat). The Unitrol heat stepper uses a **computer generated curve** that requires entry of only two numbers:

1. Total number of welds to be made before dressing the electrodes
2. Heat percent increase over the original setting to be reached during the last weld

Everything else is done automatically.

THEORY: As welding starts on a clean set of electrodes, the surface resistance is relatively low. As welding continues two things happen:

1. **ELECTRODE SURFACES BECOME CONTAMINATED** with material pick-up and surface resistance is increased. For example, in welding galvanized steel, the zinc in the coating alloys with the copper of the electrode to form a layer of brass on the electrodes (typical gold color on the tip face). Brass has a poorer conductivity than copper and therefore causes lower current through the work piece resulting in weaker welds.

Since the welding transformer is supplying a fixed voltage output, the current between the electrodes (through the work pieces) decreases as this resistance increases. Thus, the weld becomes weaker as production continues.

1. **ELECTRODES MUSHROOM** increases the contact area. While the proper use of chilled water, water flow rates, and water cooled electrode holders can hold this to a minimum, the effect cannot be fully eliminated in long runs.

When the area increases, the fixed available voltage from the welding transformer is spread over a larger surface. This **DECREASES** the weld current density (amps per square inch) in the nugget area and, therefore, **DECREASES** the amount of heat generated in the nugget area.

The weld heat in the nugget area **DECREASES** at a rate proportional to the **SQUARE** of the change in electrode contact diameter. As an example, on a #5RW (#2MT) electrode a change from an original contact diameter of 3/8" to a 1/2" will **DECREASE** the welding heat by **43%** to produce welds with poor strength and little penetration.

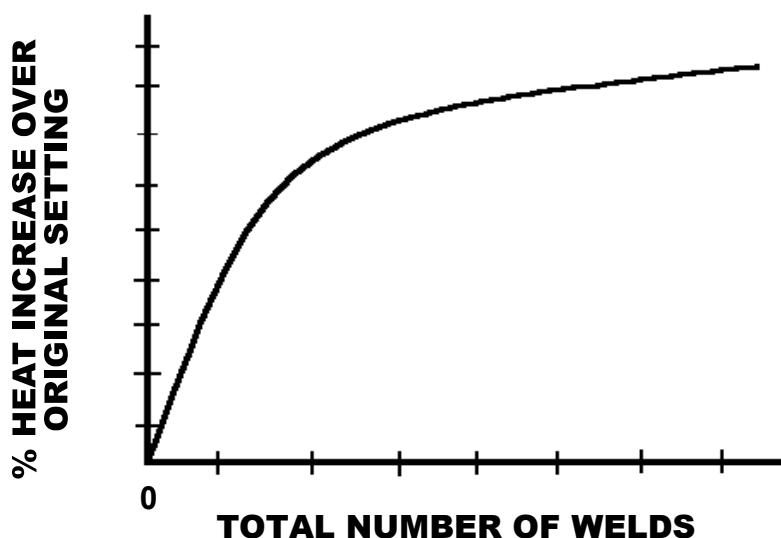
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FUNCTION: The Unitrol HEAT STEPPER uses a **COMPUTER GENERATED CHART** to continuously increase the welding heat % as welding continues to compensate for the conditions stated on the previous page.

This eliminates the time consuming process of setting a large group of data points necessary in heat stepper systems produced by other manufacturers.

The graph below illustrates how this HEAT STEPPER operates:

- 1 For the first weld, heat will be the value (percent or amps) of the SOLUTION program being used.
- 2 As the number of welds increases, the HEAT STEPPER starts continuously increasing the heat by an amount shown on the graph. The curve on this electronic graph is set in the SOLUTION computer from industrial experience, and makes most of the increase in the first 30% of welds, then only increases slightly for the balance. Note that the increases are stepless forming a continuously changing weld heat to counterbalance the effects of tip build-up and tip diameter change.
- 3 At the time the last weld has been made (as set by the user) heats in each weld schedule have been increased by the user entered value.
- 4 When the next weld is attempted, the controls will not close the weld tips, and will display "PLEASE DRESS TIPS". The pressing of any button on the keypad will reset the stepper to the starting point, and the process begins again.



SOLUTION CONTROL TECHNICAL DATA SHEET #3 CONSTANT CURRENT AND PROGRAMMED CURRENT MONITOR/WINDOW OPTION #9181-22A AND #9181-22B

For SOLUTION controls (available for SOLUTION-2 controls on request *)

This option provides an easy to use and very accurate closed loop CONSTANT CURRENT function to SOLUTION controls. You can now set the required welding heat in **direct AMPS from a welding chart** and start production. The unique features of this system include:

- Works with up to **9 TRANSFORMER TAP POSITIONS** without the need to go through the setup procedure each time.
- Uses **AVC** (Automatic Voltage Compensation) even when in CONSTANT CURRENT mode to reach selected welding current within 2 line cycles.
- Value of current is entered **DIRECTLY** in actual AMPS on the 32 character display
- Can be switched from **CONSTANT CURRENT** mode to **CONSTANT VOLTAGE** mode (set in percent heat) with a few keystrokes on the keypad.
- **COMPARES** RMS current during entire weld against customer set windows for continuous quality control check of the weld, and displays the results for every weld. If the weld current is outside the customer set window, the SOLUTION tells you why, and in plain English - not codes.
- **SETUP** of system when first installed can be done in a few minutes using simple English language display prompts.
- **HOLDS** RMS current value to +/-1% of system range or better.
- Can be supplied with **PRIMARY** or **SECONDARY** current coils.

With UNITROL, all instructions on the display are in plain English. You can navigate through most set-ups and commands without looking at the direction book. It even tells you when to go to a higher or lower transformer tap switch position.

For SOLUTION and SOLUTION-2 controls:

This option allows the setting of upper and lower limits for current measurement on each weld. If the average RMS current measured during any weld is either **ABOVE** or **BELOW** the customer set window, the SOLUTION control will keep the electrodes closed, and the display will show the average RMS current measured during the weld. Measurements can be made on either weld transformer primary or secondary (order desired current pick-up coil). On SOLUTION-2 the fault can be assigned to one of three fault relays to signal an outside system of the problem.

*The HEAT STEPPER option #9281-15 is not available on SOLUTION-2 controls when this function is included.

SOLUTION CONTROL

TECHNICAL DATA SHEET #4

INITIATION METHODS

Unitrol provides a large choice of initiation methods that can be selected by the user without the need to purchase extra cost options. Therefore, the same control system can operate a variety of welders, and the user can choose the best method for each particular job.

The Unitrol **SOLUTION** and **SOLUTION-2** controls come **STANDARD** with the ability to be initiated in three ways:

1. **SINGLE LEVEL FOOT OR HAND SWITCH.** This will cause the welder to operate with the closure of one switch contact. It should be used with a completely guarded welding station, or with automatic welding equipment.
2. **DOUBLE LEVEL FOOT SWITCH.** This arrangement closes the welding tips after the first level switch has been closed, and then goes into the welding cycle on closure of the second level switch. A double level foot switch initiation is typically used on commercial spot welding machines. Proper guarding is required for welders where the opening between the electrodes is greater than 1/4", especially on welding of small parts where the operator's fingers are close to the welding zone.
3. **DUAL HAND BUTTON/ANTI-TIEDOWN.** With this initiation, two separate (double pole) switches must be closed within 1/2 second of each other to close the welding electrodes and start the weld sequence. As the name implies, if one of the buttons is "tied down", the welder will not respond to any attempt at initiation. This is the recommended method for welders using hand part insertion into a welding fixture since both hands must be free from the welding area and touching the initiation buttons before any movement will occur.

Note: If you are using hand buttons that contain only one normally-open contact, order an anti-tiedown interface board #9181-56 (for SOLUTION), or #9281-56 (for SOLUTION-2).

INITIATION MODES: A keypad selection allows two types of initiation:

- a. **MOMENTARY MODE** that will close the welding electrodes and complete the weld sequence with just a short closing of both switches. **THIS MODE SHOULD ONLY BE USED ON WELDERS HAVING COMPLETE GUARDING AT THE ELECTRODE AREA, OR WITH ELECTRODES THAT ARE LESS THAN 1/4" CLEAR OPENING.**
- b. **HOLDING MODE** that will stop closure of the welding electrodes if either button is released prior to the start of the actual weld heat sequence. **THIS MODE SHOULD BE USED ON ALL WELDERS WHERE THE WELDING AREA IS NOT COMPLETELY GUARDED, OR WHERE THE ELECTRODES ARE OPEN MORE THAN 1/4" PRIOR TO WELDING.**

SOLUTION CONTROL TECHNICAL DATA SHEET #5 WELD SCHEDULE SELECTION

The SOLUTION and SOLUTION-2 welding controls have great flexibility contained within their microcomputer “brains.” Unitrol has designed a system that does not require the addition of “black boxes” or special circuit boards to accomplish even the most complex of tasks.

Weld schedules can be entered and accessed in many ways:

1. **KEYPAD INPUT.** The STANDARD Unitrol SOLUTION control is programmed by use of a simple keypad mounted in the control pendant. The welding schedule for each program, up to 75, is entered without the need for special codes or instructions. The operator merely enters the desired value of Squeeze Time, Weld Time, etc., in response to the plain English requests on the 32 alpha/numeric display. Once programmed, each of the 75 possible complete schedules will remain in the ELECTRONIC MEMORY (no battery) for use at any future time.
2. **DUAL HEAT OPERATION.** This function is **STANDARD** on all SOLUTION controls. By using two foot pedals, two sets of palm buttons, or a combination, any two of the 75 stored welding schedules can be used as required for each weld location. This usually eliminates the need to handle a weldment more than once since different metal combinations and/or thicknesses can be accurately welded without touching the control settings.
3. **BINARY DATA INPUT.** This function is **STANDARD** on all SOLUTION-2 controls. Any of the 75 stored PROGRAMS in the SOLUTION-2 memory can be instantaneously recalled by use of a series of solid state or mechanical switches external to the control. While a lesser number can be used, seven switches, are required to access all 75 stored schedules. These are typically found in a PLC CONTROLLER, on AUTOMATIC MACHINES, or ROBOTS, but can also be used with individual switches on a welder.

In addition, some users have applied “zone” switching to automatically choose a different complete welding schedule by limit or proximity switches on a welding fixture. There is no time delay in this selection operation, and if desired, a different welding schedule can be used for each location without any restriction. If no new BINARY code is entered, the last schedule entered is used.

4. **RS232 COMPUTER DATA INPUT OPTION #9181-21 OR #9181-21/4 FOR RS-485.** This option is available only in SOLUTION controls. On automatic machines that are operated from a central computer, it is often desired to load new schedules into the control for use at a particular weld location. This option accepts a simple 9600 BAUD serial stream of data through an external serial communication cable. The remote central computer can control up to 99 SOLUTION local welding control systems. The SOLUTION will continue to weld with the last loaded welding schedule until a new one is sent (between welds). .

SOLUTION CONTROL TECHNICAL DATA SHEET #6 MULTI-SCR CASCADE SEQUENCE SYSTEMS

THEORY:

This function can be programmed on any SOLUTION-2 as a **STANDARD** function without the need to purchase a separate option. The SOLUTION-2 must be ordered with the desired number of SCR contactors to allow cascade sequencing.

FUNCTION:

The SOLUTION-2 control allows any sequence of SCR firing and valve sequencing desired. A **typical** CASCADE SEQUENCE operates on systems having ONE air solenoid and MANY SCR contactors but can be a mixture as desired. A **typical** CASCADE sequence is as follows:

- a. Initiation signal is sent to SOLUTION-2 control.
- b. Solenoid signal is turned on causing all weld heads to advance.
- c. SQUEEZE TIME or PRESSURE TRANSDUCER setting is satisfied. (see TECHNICAL DATA SHEET #1)
- d. First chosen SCR contactor is fired causing electrodes connected to that transformer to weld. The weld schedule is customer selected from the 75 in the SOLUTION-2 memory.
- e. After the last heat cycle of this first SCR is completed (no hold time), the next SCR contactor is fired causing the electrodes connected to that transformer to weld. The weld schedule is that chosen by the customer and can be the same or different from the first without any restrictions.
- f. This process continues until the last weld of the sequence is completed.
- g. HOLD TIME is completed.
- h. The solenoid valve is released causing all welding heads to retract.

OPERATION NOTES:

Unitrol's unique programming system allows simple keypad selection of the SCR welding sequence. This is quite useful in balancing heat distortion on components.

One individual SCR can be fired using either keypad selection or by closing a switch to another CHAIN input. This is useful for setup and adjustment.

SOLUTION CONTROL TECHNICAL DATA SHEET #7 SEQUENTIAL VALVE SYSTEMS

THEORY:

All SOLUTION-2 controls are supplied **STANDARD** to operate many solenoid valve outputs in any desired order. Any order of valve operations and SCR firing can be achieved with the SOLUTION-2 group of controls.

A **typical** sequential valve sequence utilizes **ONE** SCR contactor with **SEVERAL** solenoid valves. While sequence time for a multi-head system will be slightly longer than that of an SCR CASCADE, cost is much lower since only one welding transformer and one SCR contactor is required.

The **SOLUTION-2** control line operates from 4 to 16 solenoid valve driver outputs in any order desired. Up to 675 operational steps can be performed by the **SOLUTION-2** control.

The same control, if properly configured, can operate up to 15 SCR contactors to control multiple transformers.

FUNCTION:

The following is a typical sequence of events for a SEQUENTIAL VALVE control:

- a. The initiation signal is sent to the SOLUTION-2 control.
- b. The first keypad chosen solenoid is energized causing the weld cylinder(s) to advance.
- c. SQUEEZE TIME or PRESSURE TRANSDUCER setting is satisfied. (see TECHNICAL DATA SHEET #1)
- d. SCR contactor fires transformer to make first weld using the customer selected welding schedule from 75 in the SOLUTION-2 memory.
- e. After HOLD TIME has been completed, the first solenoid valve is released, and the next chosen solenoid valve is energized advancing the next cylinder(s).
- f. This sequence continues until the last chosen weld is made.

OPERATION NOTES:

A SOLUTION-2 used this way can replace separate controls at great cost savings.

An individual solenoid valve can be selected for welding from the keypad or through operation of other CHAINS in the SOLUTION-2. This is useful during set-up and adjustment.

A group of optional DIFFERENTIAL PRESSURE TRANSDUCERS can be added to this system to individually monitor each cylinder. Thus, the absolute fastest gun sequence can be attained without any SQUEEZE TIME, and each weld will be started at the correct tip force to improve welds and greatly increase the number of welds possible between tip dressing.

SOLUTION CONTROL TECHNICAL DATA SHEET #8 PRINTER PORT OPTIONS #9181-21A and #9181-21A/4

THE #9181-21A PRINTER PORT option allows connection of the SOLUTION control to any 9600 baud RS-232 **SERIAL** printer. Cable length can be up to 50' long..

THE #9181-21A/4 PRINTER PORT option is designed for connection to any 9600 BAUD RS-485 line up to 3,000 feet long).

As shown in the TYPICAL PRINTOUT below, as each weld is made the output will send the WELD NUMBER, TIP FORCE (if option 9181-05C is installed) as measured at the END OF HOLD, and the AVERAGE SECONDARY WELDING CURRENT (if option series #9181-22 is installed). With the control set to PRINT FAULTS ONLY, the printer will only print when one or more fault has been detected

The AVERAGE WELDING CURRENT will be measured ONLY during the WELD portion of the schedule. Since this does not record UPSLOPE, DOWNSLOPE, etc., data transmitted can be directly compared to published welding schedule charts for set-up purposes. If this welding current is out of the customer-set window, **I-FAULT** will appear at the end of that line.

The print output will also show the TIP FORCE at the **end** of the weld, and **F-FAULT** if this value is out of the customer-selected window.

When the control is powered up, or when any welding schedule change is made, an output will be sent to the printer to show WELDING PROGRAM NUMBER, as well as all data in the program.

TYPICAL PRINTOUT

*** PROGRAM #3 ***

SQUEEZE TIME 12
WELD TIME 05
WELD HEAT 50%
HOLD TIME 05
UPSLOPE INIT. 50%
UPSLOPE TIME 04
HIGH I = 18,300 A
LOW I = 17,400 A
WELDFORCE 0520 LB
TRANSF. TAP #03

HEAT STEPPER ON
AVC IS ON
PRESS. TRANSD. ON
I-READ AND REACT

WELD #00345 TIP FORCE = 0532 LB CURRENT = 18,162 A
WELD #00346 TIP FORCE = 0525 LB CURRENT = 18,156 A
WELD #00347 TIP FORCE = 0528 LB CURRENT = 17,375 A ****FAULT:CURRENT****
WELD #00348 TIP FORCE = 0518 LB CURRENT = 18,148 A ****FAULT:TIP FORCE****
WELD #00349 TIP FORCE = 0530 LB CURRENT = 17,900 A
WELD #00350 TIP FORCE = 0518 LB CURRENT = 17,380 A ****FAULT: FORCE+CURRENT**
WELD #00351 TIP FORCE = 0532 LB CURRENT = 18,164 A

SOLUTION CONTROL TECHNICAL DATA SHEET #9 BUILT-IN PRINTER OPTION #9181-21B

THE 9181-21B BUILT-IN PRINTER OPTION incorporates a dot matrix print mechanism to print on a 2¼" wide roll of standard adding machine paper.

The system prints a single 40 column line for each weld with the data as shown in the TYPICAL PRINTOUT below.. The printer uses a standard ribbon, and is factory mounted into the welding control's cabinet.

As shown in the TYPICAL PRINTOUT below, as each weld is made the printer will show the WELD NUMBER, TIP FORCE (if option 9181-05C is installed) as measured at the END OF HOLD, and the AVERAGE SECONDARY WELDING CURRENT (if option series #9181-22 is installed).

With the control set to PRINT FAULTS ONLY, the printer will only print when one or more fault has been detected. Because of the relatively short ribbon life in this printer, **this PRINT FAULTS ONLY mode is recommended for production welding to capture faults.**

The AVERAGE WELDING CURRENT will be measured ONLY during the WELD portion of the schedule. Since this does not record UPSLOPE, DOWNSLOPE, etc., data printed can be directly compared to published welding schedule charts for set-up purposes. If this welding current is out of the customer-set window, **I-FAULT** will appear at the end of that line.

The print output will also show the TIP FORCE at the **end** of the weld, and **F-FAULT** if this value is out of the customer-selected window.

When the control is powered up, or when any welding schedule change is made, the weld program being used along with system settings will be printed as shown below to form a complete document.

TYPICAL PRINTOUT

```
*** PROGRAM #07 ***  
—  
SQUEEZE TIME    16  
WELD TIME       13  
WELD HEAT       75%  
HOLD TIME       07  
HIGH I   =    07,500 A  
LOW I    =    06,800 A  
FORCE    =    0350 LB  
DOWNSLOPE FINAL 45%  
DOWNSLOPE TIME 05  
***  
  AVC IS ON  
  PRESS. TRANSD. ON  
  I-READ & REACT  
  ***  
#00032,FORCE=0382LB,CUR.=07,252A  
#00033,FORCE=0370LB,CUR.=06,780A, I-FAULT  
#00034,FORCE=0348LB,CUR.=06,950A,F-FAULT  
#00035,FORCE=0378LB,CUR.=06,950A  
#00036,FORCE=0382LB,CUR.=07,420A  
#00037,FIRCE = 0348LB, CUR.=06,780A,I+F FLT.
```

SOLUTION CONTROL TECHNICAL DATA SHEET #10 LOAD CELL OPTION #9181-05D

THEORY: **TIP FORCE** (in pounds) is measured directly by using a **BEAM STYLE** four bridge load cell mechanically mounted in line with the welding cylinder. A beam style load cell is designed for maximum life with the highest accuracy possible. Because the device measures actual conditions, this option will work with welders activated by air cylinders, cams, or hand/foot mechanical mechanisms.

USE: Use of this **LOAD CELL** eliminates error and false signals caused by changes in **welder head advance speed** as set by flow controls in the air system. Accuracy is +/- 0.5% full scale, and the system is repetitive to better than +/- 0.2% full scale. The tip force reading does not respond to changes in air temperature as the device is temperature compensated.

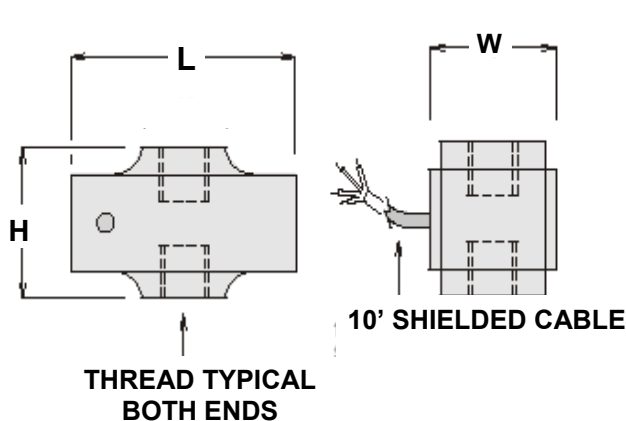
Use of this option will present the **SAME EXACT FORCE CONDITIONS** every time that the weld has started. Because of this, the inter resistance of the parts being joined will be constant therefore, reproducing weld strength and ductility throughout the production run.

Load cells are available in various ranges to match your welder's maximum force. The most common value is 300 pounds. Other values are available up to 10,000 pounds.

Load cells can withstand up to a 50% overload before permanent damage is done to the unit. Also, if the tip force is set to high in the control the system will warn you that you have requested tip force greater than the load cell rating.

Installation consists of cutting a component in direct line with the force, tapping both ends, and installing the threaded ends of the load cell. A typical load cell requires the removal of 5/8" on the connecting component. The load cell is then connected by plug to the SOLUTION welding control. No field calibration is required.

STANDARD STYLES: Standard load cells are provided with a female thread on both ends and include short threaded rods to allow male to male installation.



CAPACITY (lbs.)	THREAD	H X W X L (in.)
50	1/4-28	.75 X .66 X 1.57
100	1/4-28	.75 X .66 X 1.60
200	3/8-24	1.00 X .75 X 1.67
300	3/8-24	1.00 X .93 X 1.72
500	3/8-24	1.00 X .93 X 1.64
750	3/8-24	1.00 X .93 X 1.69
1,000	3/8-24	1.00 X .93 X 1.75

OPTIONAL STYLES: Other cell styles, including **stud** and **washer** types, are available on request in ranges of up to 10,000 lbs.

SOLUTION CONTROL TECHNICAL DATA SHEET #11 ELECTRONIC PRESSURE REGULATOR SYSTEM OPTION #9181-16 (SINGLE), #9381-16 (DOUBLE)

THEORY:

This option allows the user to set a desired TIP FORCE into each welding program. When a particular welding program (of the 75 available) has been chosen, the SOLUTION will calculate the required air psi. for the given size welding cylinder and then set this psi. on the remote air regulator provided with this option.

Where a double regulator system is being used (#9381-16) for bucking pressure applications, this option will calculate the required TOP and BACK-UP psi. from the given WELD FORCE and FORGE FORCE of the chosen program.

The change of air pressure is accomplished in less than one second from the time the signal reaches the control module. Program selection can be done from the initiation inputs (2 can be selected), or through BCD or RS-232 optional inputs. Up to 75 can be selected.

TYPICAL APPLICATIONS:

ROBOTIC WELDERS: Each welding location can have a separate welding program with the exact TIP FORCE required. This eliminates compromise TIP FORCE settings on components with various thickness combinations being welded. TIP FORCE can be changed "on the fly" at the beginning of each weld as the electrodes are closing.

MULTI-HEAD WELDERS: Each group of weld heads can have a correct TIP FORCE to match the metal combination being welded at a particular location on a large weldment.

TRANSGUN WELDERS: Using two or more weld schedule initiation buttons on the transgun, the correct weld program and TIP FORCE can be used at each location on a weldment.

PRESS/ROCKER ARM WELDERS: Utilizing multiple foot pedals, the correct weld program and TIP FORCE can be chosen for each location on a weldment.

EQUIPMENT:

This option is supplied with two components; A ½" NPT. remote air regulator and electronic pneumatic control module. Other size regulators are available on special order. The regulator will operate between 0-99 psi. as directed by the selected TIP FORCE of the program being used. This replaces the normal manual air regulator and gauge on the welder. Since control of this remote regulator is done from an air hose, distance of the regulator from the SOLUTION control is unlimited.

At installation, a water trap/filter must be installed upstream of the new remote regulator. An air line oiler can be installed downstream of this regulator. All other fittings and tubing unique to this option are supplied with the control.

SOLUTION CONTROL

TECHNICAL DATA SHEET #12

TRANSGUN PROTECTION OPTION #9181-26A

The basic welding control for a transgun (portable combination transformer/weld gun) is identical to that used on a floor mounted pedestal welder. That is, the control must be able to control both the time, heat, and valve functions.

However, transguns have one unique feature: They provide line voltage (208V to 575V) on a rubber cord to the hand held transgun. If the transgun's transformer shorts between the primary and secondary windings, line voltage potential will be on the welder's case and arms. If the operator's body has a path to ground, voltage will be conducted through the operator's body **which can result in serious injury, or death.**

The RWMA (Resistance Welder Manufacturers' Association) has published industry safety standards for transguns in Bulletin 5, section 5-015.68.04. This section requires two systems for protection of the operator and reads as follows:

1. Grounding Integrity — The welding gun transformer case and secondary shall be grounded and protected by fail safe circuitry designed to immediately disconnect line voltage from the transgun via a circuit breaker with under voltage trip. The combined clearing time shall not exceed 60mS. A sensed value of grounding conductor resistance in excess of 1Ω by the ground integrity monitor would be considered an inadequate ground [referred to in paragraph 5-015.68.04(a)(2)]. A push to test circuit providing a 1Ω resistance between the sense lead and ground will be included to verify the operation of the ground integrity circuit.

NOTE — The ground integrity monitor will not depend on a programmable device.

2. Ground Fault Current Relay — A sensitive, fail safe, ground fault relay with a maximum trip point of 15mA must be used to provide protection against differential ground fault leakage currents. The ground fault relay must immediately disconnect line voltage from the Portable Transgun via a circuit breaker with shunt trip or a circuit breaker with under voltage trip. The combined clearing time shall not exceed 60mS. A push to test circuit supplying a test fault current, through the sense coil of 20mA maximum will be included to verify the operation of the ground fault relay.

A transgun welder should never be operated unless both of the above systems are operational in the welding control. Unitrol will not knowingly sell a welding control for use on a transgun welder without these systems factory installed.

Unitrol offers option #9181-26A that incorporates both Ground Continuity and Ground Fault protections systems to fully match the above RWMA specifications. This option can be ordered on any Unitrol control (SOLUTION, SOLUTION-2, SIMPLICITY, or FIRE'N MODULE) that contains a circuit breaker. Option #9181-26A includes an "under voltage trip" mechanism factory added to the existing circuit breaker to turn power off of the control and transgun should a fault be detected. Because this system uses the "under voltage trip" rather than a "shunt trip" operator in the circuit breaker, the system will not allow the circuit breaker to turn on even if the detection system becomes non-operational (fail safe operation).

NOTE: The welding control **must** include a circuit breaker. The circuit breaker itself is not included in this option.

This option is factory installed and only requires customer installation of the supplied "End of Load" resistor in the transgun. All connections to the welding control are factory wired ready for operation. Full directions are included with this option that cover both operation as well as wiring schematics.