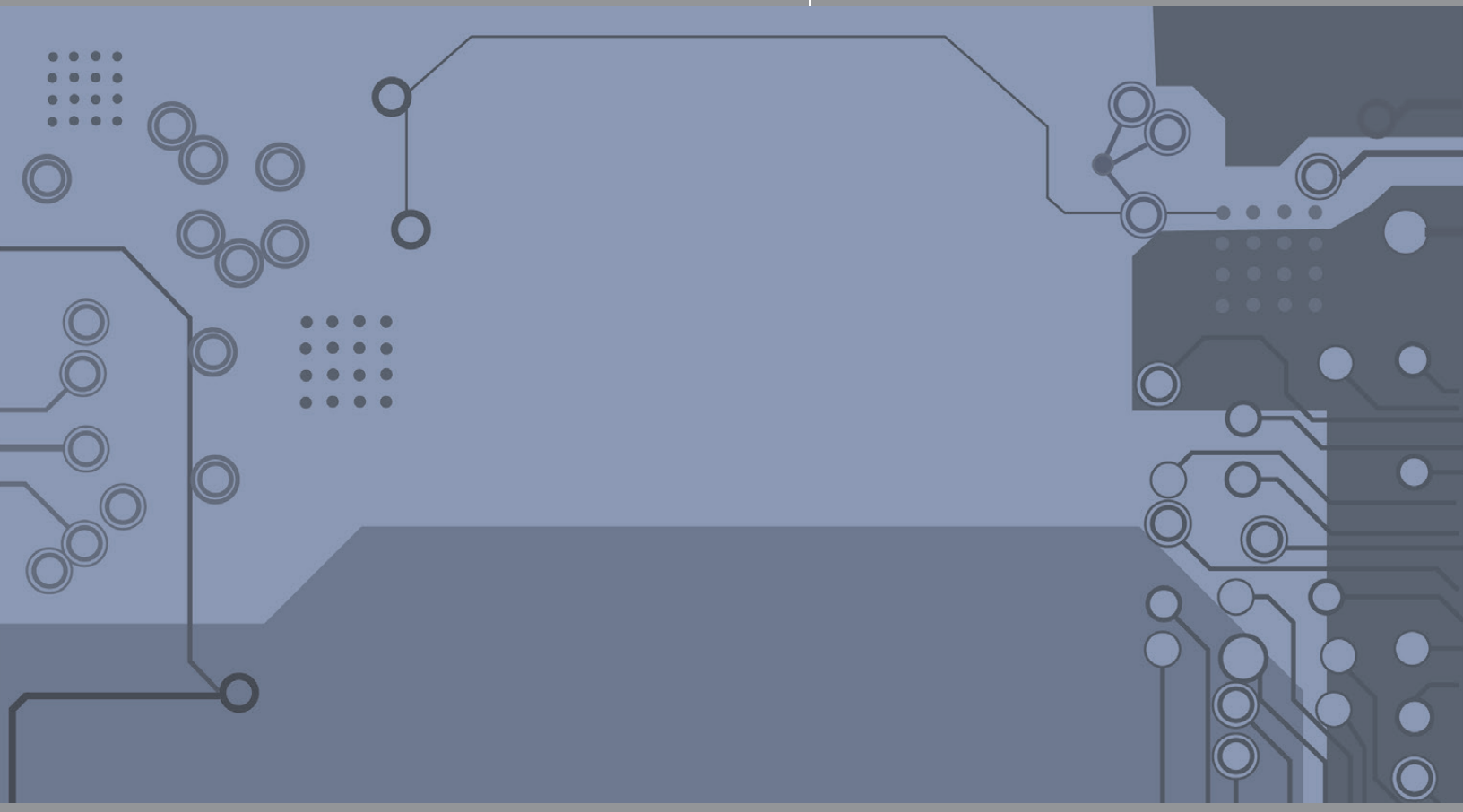
WSI WELD SYSTEMS INTEGRATORS, INC.

RESISTANCE WELDING. SOLVED.

WTC WELDING TECHNOLOGY CORP

Software # T17300

Manual - M032700



Manual Revision: 1.0
Modified: 3/13/19

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REGARDING THIS DOCUMENTATION

This documentation is written to support WTC (Welding Technology Corp) Weld Control with timer software T17300.

It has been designed for planning, programming, start-up personnel, operators, service technicians, plant operators, line builders and maintenance personnel to assist with procedures related to installing the weld control.

This instruction manual contains important information on the safe and appropriate assembly, transportation, commissioning, maintenance and simple trouble shooting of WTC Weld Control.

Some of the screen shots of the software application may appear different and are used for illustrative purpose only.

SOFTWARE UPDATES

WTC reserves the right to make substitutions or changes as required to the hardware or software described in this manual. This manual may be periodically updated to reflect software changes that will affect operation of the equipment described. Request copies of the latest updates by contacting your WTC sales representative or by visiting the website at www.weldtechcorp.com

REVISION HISTORY

REVISION	REL. DATE	COMMENTS
1.0	8/07/15	Initial release of Manual M-032700 with software version T17300.

LANGUAGES AVAILABLE

This documentation was originally published in English.

SYMBOLS USED IN THIS DOCUMENTATION

Danger! and **WARNING!** messages indicate high-voltage hazards in weld controls, SCRs, MFDC inverters and weld monitoring equipment.

THIS SYMBOL WILL BE USED WHEREVER FAILURE TO OBSERVE SAFETY MEASURES MAY RESULT IN DEATH, SEVERE BODILY INJURY OR SERIOUS DAMAGE TO PROPERTY.

THIS SYMBOL WILL BE USED WHEREVER INSUFFICIENT OR LACKING COMPLIANCE WITH INSTRUCTIONS MAY RESULT IN PERSONAL INJURY.

THIS SYMBOL DENOTES WHEN INSUFFICIENT OR LACKING COMPLIANCE WITH INSTRUCTIONS MAY DAMAGE EQUIPMENT OR FILES.

NOTE:

THIS SYMBOL INFORMS THE USER ABOUT SPECIAL FEATURES, OR WHERE TO FIND MORE INFORMATION.

THIS SYMBOL DRAWS ATTENTION TO SPECIFIC INSTRUCTIONS OR PRODUCT FEATURES.

THIS SYMBOL WILL BE USED TO NOTIFY THE OPERATOR WHEN AN OPERATION REQUIRES ESD SAFETY PRECAUTIONS TO BE FOLLOWED. FAILURE TO FOLLOW ESD PRECAUTIONS WHEN PERFORMING CERTAIN PROCEDURES MAY DAMAGE THE EQUIPMENT AND VOID THE WARRANTY.

THIS SYMBOL INDICATES THAT ONLY WTC SERVICE PERSONNEL OR WTC REPAIR PARTNERS SHOULD SERVICE OR OPEN THIS DEVICE. BREAKING A WARRANTY SEAL WILL VOID THE WARRANTY FOR THIS DEVICE.

COMMON TECHNIQUES USED IN THIS MANUAL

The following conventions are used throughout this manual:

- Bulleted lists such as this one provide information, not procedural steps.

1. Numbered lists provide sequential steps or hierarchical information.

Italic type is used for emphasis.

WTC SUPPORT - INDUSTRIAL TECHNICAL SERVICES [ITS]

WTC tests all of our products to ensure that they are fully operational when shipped from the manufacturing facility. If you are experiencing installation or startup problems, please review the troubleshooting information contained in this publication. If you need assistance to get your weld control up and running, please contact Customer Support (see the table below); our trained technical specialists are available to help. When emailing, please provide a photograph of the serial tag and Hardware Status Screen accessed by pressing "Status Mode > F5*>F5*> Hardware Status" on the DEP *100 series* if possible.

If the product is not functioning and needs to be returned, contact your distributor. You must provide a Customer Support case number to your distributor in order to complete the return process.

PHONE	United States/Canada	1.248.477.3900 Ext: 3020
INTERNET	Worldwide	http://www.weldtechcorp.com/service-repairs

SAFETY INSTRUCTIONS

Safety Instructions call your attention specifically to danger potentials or risks. We distinguish among the following places where safety instructions may be required.

SAVE THESE INSTRUCTIONS.

FAILURE TO OBSERVE SAFETY MEASURES MAY RESULT IN DEATH, SEVERE BODILY INJURY OR SERIOUS DAMAGE TO PROPERTY.

LETHAL VOLTAGES ARE PRESENT WHEN APPLYING POWER TO THE WELD CONTROL. EXPOSURE TO HIGH VOLTAGE WILL CAUSE SEVERE ELECTRICAL BURNS, INTERNAL INJURIES AND/OR DEATH.

REFER ALL NECESSARY SERVICE ON THIS MACHINE ONLY TO QUALIFIED MAINTENANCE PERSONNEL.

WHEN LIFTING ANY WEIGHT OVER 20 KG (~45 LB.), USE EITHER A TWO-MAN LIFT OR AN ASSISTED LIFT.

To reduce the risk of fire or electric shock, carefully follow these instructions.

ONLY QUALIFIED PERSONNEL ARE ALLOWED TO SERVICE THE WELD CONTROL AND ASSOCIATED DEVICES!

MAKE CERTAIN THE CIRCUIT BREAKER HANDLE ON THE ENCLOSURE IS IN THE OFF POSITION BEFORE ATTEMPTING TO OPEN THE DOOR.

INSPECT THE ENCLOSURE FOR ANY POTENTIAL SHIPPING DAMAGE, LOOSE CONNECTIONS, OR PACKING MATERIALS INSIDE THE CABINET BEFORE OPERATION!

WTC DOES NOT RECOMMEND DRILLING ANY HOLES IN THE CABINET! IF ADDITIONAL HOLES ARE REQUIRED, MAKE CERTAIN ALL COMPONENTS ARE COVERED TO ADEQUATELY PROTECT FROM METAL DEBRIS.

FAILURE TO FOLLOW THIS REQUIREMENT MAY LEAD TO A POSSIBLE EXPLOSION HAZARD AND VOID THE WARRANTY.

WARNING!

NEVER REMOVE CIRCUIT BOARDS OR ESTABLISH ELECTRICAL CONNECTIONS WITH POWER APPLIED! BE CERTAIN TO REMOVE POWER BEFORE SERVICING, INSTALLING OR REMOVING COMPONENTS.

WARNING!

CIRCUIT BOARDS OVER 24V SHOULD BE HANDLED WITH CARE AS THEY POSE A POTENTIAL SHOCK HAZARD TO THE OPERATOR.

VERIFY THE VOLTAGE TAPS ON THE CONTROL TRANSFORMER ARE SET CORRECTLY FOR YOUR PLANT LINE VOLTAGE PRIOR TO APPLYING POWER TO THE WELD CONTROL CABINET.

WARNING!

ALWAYS ENSURE PROPER FLOW RATE, TEMPERATURE AND CHEMISTRY OF COOLING WATER BEFORE OPERATION. OBSTRUCTED OR INSUFFICIENT FLOW OF COOLING WATER MAY DAMAGE COMPONENTS.

WARNING!

ADJUST THE MAGNETIC TRIP SETTING ON THE CIRCUIT BREAKER TO A VALUE APPROPRIATE FOR WELD OPERATION!

WARNING!

VERIFY ALL TRANSFORMER TAP VOLTAGES BEFORE ATTEMPTING TO APPLY POWER OR WELD. VERIFY THE SETUP PARAMETER “NOMINAL LINE VOLTAGE” TO YOUR FACILITY VOLTAGE IF THE OPERATOR EVER RELOADS SOFTWARE TO DEFAULT SETTINGS.

WARNING!

USE CU 75° RATED CABLE ONLY.

COOLING WATER REQUIREMENTS

COOLING WATER SPECIFICATIONS

The cooling water provided must comply with chemical and physical specifications as stated in the Resistance Welder Manufacturers' Association ***Bulletin 5–005.05***:

- Maximum temperature not to exceed 104° F. (40° C.), or fall below the dew point of ambient air at about 70° F. (21° C.).
- Maximum pressure not to exceed 90 PSIG
- pH maintained between 7.0 and 8.0
- Maximum chloride content 20 parts per million (PPM)
- Maximum nitrate content 10 PPM
- Maximum sulfate content 100 PPM
- Maximum suspended solids content 100 PPM, non-abrasive
- Maximum total (suspended and dissolved) solids content 250 PPM
- Maximum calcium carbonate content 250 PPM
- Resistivity less than 2,000 ohms/cm at 25° C. (500 µSiemens)
- The hose used must be NO LESS THAN 18 in. long across the power voltages.

NOTE:

WATER THAT IS SAFE FOR DRINKING IS GENERALLY SUFFICIENT FOR COOLING WATER, PROVIDED IT IS FILTERED TO ELIMINATE SAND AND RUST PARTICLES. IN ADDITION, WATER TEMPERATURE MUST NOT FALL MORE THAN 2° C. BELOW THE TEMPERATURE OF THE SURROUNDING AIR.

WTC DOES NOT RECOMMEND ADDING ANY ADDITIVES TO THE COOLING WATER.

WATER FLOW RATE

In general, the SCRs require a MINIMUM flow rate of 0.5 gallon (2 liters) per minute. The recommended maximum is 1.0 gal (4 l.) per minute. Larger SCRs (2,100 A. or greater) may require a higher flow rate. Consult WTC for more information.

SCRS WITH HOSE RUNNING BETWEEN TANGS AT 480 VAC

The following warning applies ONLY to SCRs which have the water cooling hose running between tangs at 480 VAC (non-isolated).

REMOVE POWER FROM THE SCR IF THE COOLING WATER IS NOT FLOWING AND THE RESISTIVITY OF THE WATER IS LESS THAN 2,000 OHMS/CM @ 25° C, OR CONDUCTIVITY IS GREATER THAN 500 µSIEMENS @ 25° C.

If water circulation (in hosing between tangs) stops or is interrupted while the power is on, leakage current through the water in the hose between the SCR tangs will cause gas bubbles to form. Current will arc across these voids, weakening or destroying the hose. Putting the water into circulation again develops pressure in the cooling circuit, consequently causing the hose to rupture. ***Therefore, WTC does* NOT *recommend the use of water savers with these SCRs.***

When magnetic contactors are used, they remove power from the SCR module and prevent destruction of the hose. If cooling manifolds are used (rather than hose), leakage current in the water can cause the same destructive action to occur while power is being applied. This can destroy the cement holding the manifold together, resulting in serious water leaks. (WTC's warranty specifically EXCLUDES such failures.)

WORKING WITH STATIC-SENSITIVE DEVICES

ESD COSTS!

Electrostatic discharge (ESD) can ignite flammable materials and damage electronic components. Static electricity can attract contaminants in clean environments or cause products to stick together. Other costs of ESD-damaged electronic devices are in their replacement and production down time. Associated costs of repair and rework, shipping, labor and overhead can be significant. Reducing losses to ESD and static electricity is an ABSOLUTE NECESSITY.

NEVER use the personnel grounding system described below when working with voltages above 220 VAC.

PERSONNEL GROUNDING

Danger!

BEFORE TOUCHING ANY ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES OR CIRCUIT BOARDS, WEAR AN ELECTROSTATIC DISCHARGE (ESD) WRIST STRAP. GROUND THIS STRAP THROUGH A ONE MEGOHM (1MΩ) RESISTOR.

HANDLING OR MOVING ESDS DEVICES

Handle all circuit boards by their edges ONLY. NEVER touch the traces or edge pad connectors.

NOTE:

USE ONLY STATIC-SHIELDING CONTAINERS FOR TRANSPORTING ESDS DEVICES OR CIRCUIT BOARDS.

WORKSTATION REQUIREMENTS

If diagnostics are required, move the circuit board to an approved ESD workstation. A static-safe workstation must include a grounded ESD mat, wrist strap and cord. The measured static voltage at a workstation MUST NOT exceed 50V.

For detailed information about ESD contact:
WTC Industrial Technical Services
Phone: +1 248-477-3900 | Fax: +1 248-477-8897
Email: service@weldtechcorp.com
Website: www.weldtechcorp.com

Chapter 1: OVERVIEW

MEDWELD AC WELD PROCESSOR

The weld processor module, internal to the WT4000 AC weld control, uses free format programming and "Flexible I/O" to create weld parameters and programs to fit any welding application.

- Up to 255 weld schedules.
- Communication via DeviceNet, ProfiBus or Discrete I/O
- 10 available linear current steppers, with 5 steps each.
- Weld firing modes: Percent of Available Current (%I), Constant Current (nnnn0).

The weld processor houses these major components:

- Local I/O Connectors
- An extension connector for optional FieldBus daughter board

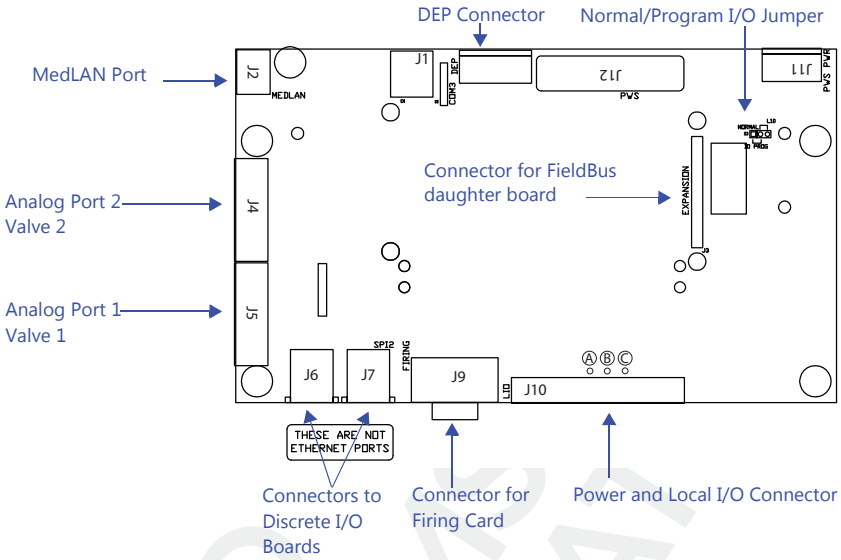


Figure 1.1 Weld Processor Board Connectors

THE PROCESSOR BOARD PROVIDES THE FOLLOWING CONNECTORS FOR SYSTEM COMMUNICATIONS:

- **DEP PORT:** Use this connector to plug a DEP/ Programming device directly into the WTC weld processor card. This is used to program the operating parameters and set the network address.
- **MedLAN PORT:** Use this connector to link the weld control to other controls and a network monitoring system through the WTC Local Area Network (**MedLAN**).
- **FIRING CARD PORT (J9):** This connector links the processor board to the WTC firing card.
- **PORTS (J6, J7):** These connectors link the processor board to communicate with up to two Discrete I/O boards.

The weld processor performs the following weld timing functions required to execute a weld schedule:

- Checks input signals from the I/O modules (either FieldBus or Local I/O) and responds to them accordingly.
- Operates the output signals (FieldBus or DIO) based on the weld schedule.
- Sends firing signals to the firing card as required by the weld schedule.

- Receives sense signals for line voltage, current and power factor from the firing card.
- Adjusts the firing signal, based on the power factor and the line voltage or primary current, based on how the weld schedule is programmed.
- LED indicators on the weld processor module show local input status.
  - ***Status LEDs (behind J10): Normally ON***
    A: Isolation Contactor Status
    B: Thermal Switch
    C: Control Stop

FIELDBUS DAUGHTER BOARD

The optional FieldBus daughter board is part of the weld processor assembly. Depending on its design, this board implements either of the following interfaces:

- ProfiBus
- DeviceNet

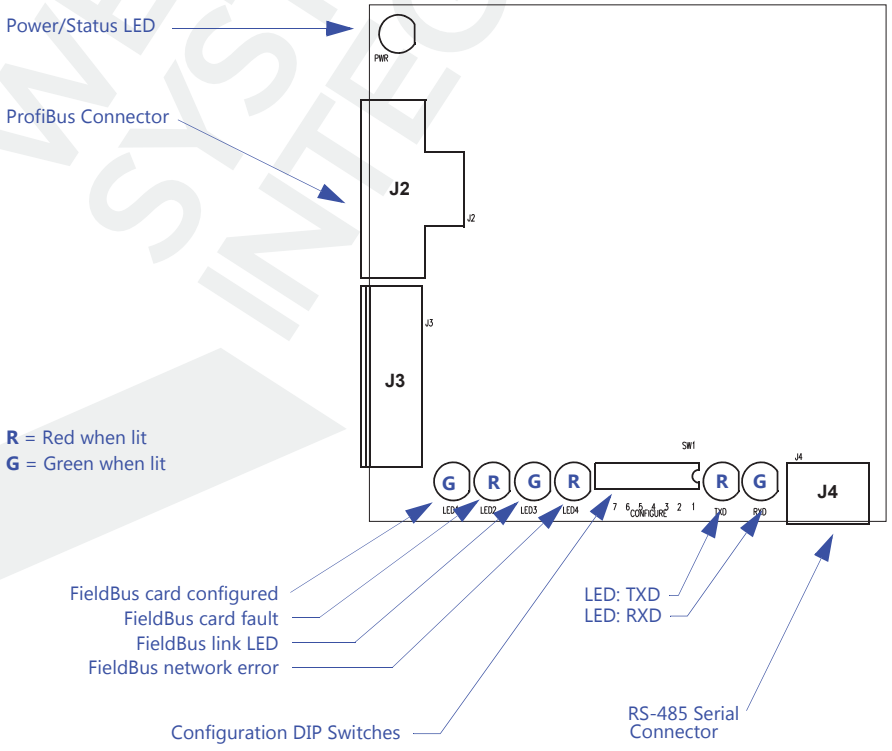


Figure 1.2 FieldBus Daughter Board (ProfiBus)

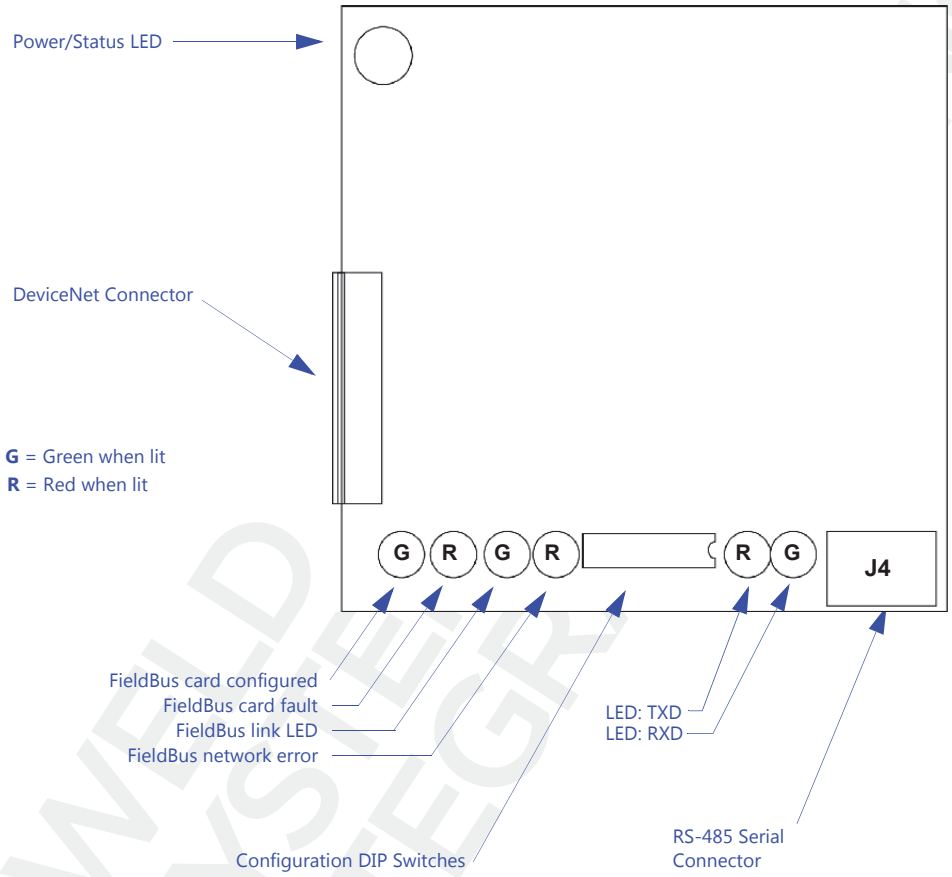


Figure 1.3 FieldBus Daughter Board (DeviceNet)

After installing the control and before putting it into service, it is necessary to correctly set the baud rate and node address for this board. For more details, refer to "Configuring the FieldBus Daughter Board" on page 13.

CONFIGURING THE FIELDBUS DAUGHTER BOARD

LEDs indicate operating status of the FieldBus daughter board, and status of its connection to the network. Refer to the following tables.

MODULE STATUS LEDS

BIT	LED	STATE	FUNCTION
–	●	Off	Device not powered.
LED1	●	Solid	Device is operational.
		Flashing Green	Configuration is missing or incorrect: Device requires commissioning.
LED2	●	Solid	Unrecoverable fault.
		Flashing Red	Minor (recoverable) fault.

NETWORK STATUS LEDS

BIT	LED	STATE	FUNCTION
–	●	Off	Device not powered / not on-line.
LED3	●	Solid	Link is OK; On-line; Connected.
		Blinks	On-line but not connected.
LED4	●	Solid	Critical link failure.
		Blinks Red	Connection timeout.
LED3/ 4	●●	Blinks Green / Red	A specific communication faulted device. The device has detected a Network Access error and is in the Communication Faulted state. The device subsequently received and accepted an identity Communication Faulted Request - Long Protocol message.
TXD LED	●	Blinks red during configuration/ communications.	The control is either communicating to the optional daughter board serial port, or FieldBus configuration is occurring.
RXD LED	●	Blinks green during configuration/ communications.	The control is receiving data from the optional daughter board serial port, or FieldBus configuration is occurring.

FIELDBUS DEFAULTS	
RELOAD FIELDBUS DEFAULTS	OFF
	CLEAR I/O
	DEFAULT 1
	DEFAULT 2
	5 STP GRP
NODE ADDRESS	1 - 63
BAUD RATE	125K
	250K
	500K
BYTE SIZE	0by0
	2by2
	4by4
NETWORK RESPONSE DELAY IN MSEC	1

DISCRETE I/O BOARD

The Discrete I/O board serves to add more I/O capability to the welding control. The board's main features are:

- 16 inputs (grouped in 2 banks of 8 inputs per bank. Each bank can operate at a different voltage). These inputs can operate with any voltage between 16 V and 120 VAC or VDC.
- 10 outputs (grouped in 2 banks of 4 outputs + 2 independent outputs (out 9 and 10) with both Normally Open (NO) and Normally Closed (NC) terminals). Each bank/independent output can operate at a different voltage.

This board operates at either 50 or 60 Hz line frequency.

In the standard configuration, the inputs operate on 24 VDC. Power to activate the inputs is supplied from the Discrete I/O board.

However, with voltage from an external supply, any voltage between 16 VDC and 180 VDC, or 16 VAC and 120 VAC, can activate the inputs. No jumpers or user setup are required. The

Discrete I/O board adjusts itself automatically to the correct operating voltage.

The 10 outputs are electromechanical relay contacts with a current rating of 5 A. at 30 VDC, 120 VAC or 250 VAC. Eight relay outputs are normally-open, closed when activated. The other two outputs are SPDT. Either normally-open or normally-closed contacts can be used.

The connection between the Discrete I/O board and the weld timer is via a standard 8-pin modular connector, similar to a Category 5 Ethernet connector. A standard Category 5 cable can connect the I/O board to the timer. The timer supplies all power for the circuitry on the board. A maximum cable length of 8 m (~25 feet) can be used.

The Discrete I/O board "intelligently" measures the voltages at the input pins and adjusts the load resistances and logic thresholds to accommodate the detected voltages. Any input voltage less than 140 VAC or 180 VDC will not damage he board. A minimum 16 VAC or 15 VDC (either polarity) is required to activate an input. An input will not be activated by any current of less than 2 mA., regardless of nominal input voltage. Recommended nominal input voltages are 24 VAC, 24 VDC or 120 VAC.

A light emitting diode (LED) indicates the status of each input. If an input is ON, the LED lights brightly. If the input is OFF, the LED glows very dimly or it will be OFF. A dim or OFF LED means that some small amount of current is being applied to the input. If driving the inputs by 120 VAC from the solid-state outputs of a programmable controller, some leakage current through the outputs can be expected. If the voltage applied to the Discrete I/O board inputs is below 10 VAC, they will not be activated.

For each group of inputs, a green LED indicates which voltage level the inputs are operating on. If the inputs are in low-voltage mode (24 V AC/DC nominal), this LED will light. If the inputs are in high-voltage mode (120 V AC/DC nominal), this LED will be OFF. On power-up, the green LED will light (24 V mode) until a high-voltage signal is applied to any input.

NOTE: *WHEN USING EXTERNAL POWER, THE INTERNAL 24 VDC INITIATE POWER SOURCE* MUST *BE DISCONNECTED.*

Within each group of 8 inputs, the initiate voltage must be the same for the entire group. It is possible to operate one group of inputs at 120 VAC and the other at 24 VDC.

When operating at 24 VAC, the minimum voltage at which an input is guaranteed to activate is 16 VAC, 50 or 60 Hz. The maximum voltage guaranteed to NOT activate an input is 5 VAC, 50 or 60 Hz. At 24 VAC, the current draw of the input is ~12 mA.

At voltages between 85 and 140 VAC, the minimum voltage at which an input is guaranteed to activate is 80 VAC, 50 or 60 Hz. The maximum voltage guaranteed to NOT activate an input is 20 VAC, 50 or 60 Hz. At 120 VAC, the input draws ~12 mA current. At 20 VAC, an input draws ~1 mA. If an input is driven by a solid-state relay output with a leakage current of 2 mA. OR LESS, the leakage current will not activate the input.

When operating with an AC input signal, the response time of an input to recognize a valid signal is 10 msec.

The inputs are isolated from ground and can be operated from an ungrounded power source. Each group of 8 inputs is isolated from the other group of 8 inputs so it is possible to operate one group of inputs from a grounded 24 VDC power source and the other from an ungrounded 120 VAC power source.

INPUTS

The 16 inputs are divided into two groups of 8. Group 1 inputs are on a 12-pin Phoenix connector labeled **J3**. Group 2 inputs are on a 10-pin Phoenix connector, **J4**. To find the connectors' pin outs and wiring information, refer to the schematics supplied with the control.

To activate an input, either 24 VDC, 24 VAC or 120 VAC is applied between the input and its common. Activating an input sets the corresponding bit as **1**. If an input is not activated, the corresponding bit is **0**.

OUTPUTS

The 10 outputs of the Discrete I/O board are electromechanical relays, rated to switch up to 5 A. at 120 VAC or 2 A. at 250 VAC. A 17-position Phoenix-type pluggable connector labeled **J5** is used for the output signals.

Eight outputs are SPST (normally-open only), arranged in two groups of four. The two SPDT relays are separate. Each group of four relays has a single common connection. The other two

relays have all three poles brought out separately so they can be connected in a normally-open or normally-closed configuration, independent of the other 8 relays. The timer's software determines which output is used for which purpose.

The Discrete I/O board provides no fuses for any of the outputs.

The response time of the relays is 15 msec. maximum to activate or de-activate.

All the relays come out on a 17-pin Phoenix connector. For the pinouts of this connector and wiring information, refer to the schematics supplied with the control.

FIRING CARD

The firing card performs the following tasks:

- Generates the zero crossing, voltage and current signals used by the weld processor to regulate SCR firing
- Provides gate signals to turn on the SCRs

FIRING CARD INPUT SIGNALS

The wires connected to the firing card connector J3 (1L1 and 1L2 *without* an isolation contactor, or 1L1, 1L2 and 2L2 *with* an isolation contactor) originate across the 380/480/600 VAC supply voltage. These wires carry the zero-crossing logic signal. This signal synchronizes the weld processor with the supply.

They also provide the voltage-to-frequency logic signal that the weld processor card uses to measure line voltage.

The current coil generates a voltage signal which is proportional to the measured current. This signal enters the firing card *via* connector J4. The signal is converted to the current-to-frequency logic signal, which the weld processor board uses to measure the welder's current.

The firing card receives a logic-level firing signal through its J2 connector from the weld processor card. This signal is optically coupled to a high-voltage circuit on the firing card, and controls the SCR wired through the firing card connector J1.

FIRING CARD OUTPUT SIGNALS

The firing card also outputs a group of logic level signals from the various connections at the welder's primary circuit. The weld processor uses these signals to:

- Find the zero-degree phase angle point on the supply power as a reference for its phase-angle measurements
- Measure the line voltage, current and power factor
- Adjust the firing phase angle, based on the voltage or current (depending on the firing mode) and the power factor and
- Check for shorted or misfiring SCR(s).

All of these signals are transmitted over firing card connector J2 and weld processor card connector J3.

SCR ASSEMBLY

When the SCR signal is gated in a single-pack configuration, power is passed to the weld transformer through connector H1. (Refer to the drawings supplied with your control for more information.)

Single-pack controls use a pair of inverse/parallel SCRs. The unit has internal water cooling to minimize the external water connections.

Chapter 2: INSTALLATION AND CONNECTIONS

PROVIDING I/O CONNECTIONS

Some inputs/outputs require connection and configuration.

PROVIDING LOCAL I/O

As shipped from the factory, the *MedWeld* has two jumpers installed between J10 pins 10 - 11 and J10 pins 12 - 13 on the timer assembly. You can set up the CONTROL STOP input to use either an internal or external power source, as follows:

- To use the CONTROL STOP input with internal power, remove J10 pins 12 - 13. Place a normally-closed contact between these positions.
- To use the CONTROL STOP input with external power, remove BOTH J10 jumpers pins 10 - 11 and 12 - 13. Place the common on pin 11 and the positive lead after the normally-closed contact on pin 12 (CONTROL STOP input uses 24VDC). Refer to the schematics supplied with the control.

FIELDBUS COMMUNICATIONS

This communication scheme supports a network of DeviceNet or ProfiBus devices, allowing rapid communications between industrial devices.

To install the system using DeviceNet or ProfiBus communication, you must properly configure the FieldBus daughter board. For instructions on installation, refer to "Configuring the FieldBus Daughter Board" on page 11.

Finally, make the connection to the drop line at the terminal block plug provided on the DeviceNet or ProfiBus module.

PROVIDING MEDLAN CONNECTIONS

MedLAN (WTC's Local Area Network) is a proprietary communications protocol. It defines how devices on the network communicate with each other.

NOTE: THE MEDLAN ADDRESS IDENTIFIES EACH WELD CONTROL'S LOCATION ON THE NETWORK. THEREFORE, EACH WELD CONTROL'S ADDRESS MUST BE PROGRAMMED ***BEFORE*** COMMUNICATION OVER THE MEDLAN CHANNEL IS POSSIBLE.

Networking takes place over the MedLAN channel. Use a data entry device (DEP-*100 Series*, *WebVIEW*) for network communications, or to program a single weld control.

However, for the MedLAN network, you MUST use a DEP-*100 Series* Programming Device to program the MedLAN address for each control on the network through the programming port at the top of the card.

NOTE: IN SOME CONFIGURATIONS, A CONNECTOR IS PROVIDED ON THE DOOR OF THE ENCLOSURE FOR CONVENIENCE IN CONNECTING THE DEP *100 SERIES*. THIS PORT IS INTERNALLY WIRED TO THE WELD PROCESSOR CARD.

This must be done before you can use MedLAN. If you do not program a MedLAN address, communication errors may result.

MEDLAN AND DEP *100 SERIES* CONNECTIONS

The network connection requires a Network Power Pack for power to the DEP- *100 Series)* programming device.

A Brad-Harrison, 3-pin bulkhead connector is located at the top right corner of the network power pack. This connector provides external 110/220 VAC power. The DEP-*100 Series* then plugs into the connector on the face of the network power pack.

The MedLAN cable connection originates at the 6-pin connector on the bottom of the network power pack. This cable runs to the 3-pin MedLAN connector (J2) on the weld processor card in the SLC chassis.

For network configurations, the MedLAN cable connection is daisy-chained to the other controls on the network.

MEDLAN WIRING SPECIFICATIONS

The MedLAN interface is an optically-isolated RS–485 connection. The interface is a 3-position, removable Phoenix connector with a pin spacing of 5 mm. The baud rate of this connection is 9,600.

CABLE REQUIREMENTS

WTC recommends using the Belden 9463 cable or equivalent. The following tables list the cable pinouts.

MEDLAN CONNECTOR (ON THE NETWORK POWER PACK):

DESIGNATOR	PIN #	FUNCTION	WIRE COLOR (BELDEN #9463)
MDP2	6	+ 24 V.	
MDPS	5	Com	
MDP1	4	Not used	
MDL2 *	3	MedLAN Line 2	Clear
MDLS *	2	Line Shield	
MDL1 *	1	MedLAN Line 1	Blue

* Some versions of the control use a 6-pin MedLAN connector with all the positions connected as listed here. Other versions use a 3-pin MedLAN connector. It uses only these three pins as noted with an asterisk (*****).

MEDLAN CONNECTOR (ON THE WELD PROCESSOR CARD):

DESIGNATOR	PIN #	FUNCTION	WIRE COLOR (BELDEN #9463)
MDL2	3	MedLan Line 2	Clear
MDLS	2	Line Shield	
MDL1	1	MedLAN Line 1	Blue

WHEN CONNECTING WITH THE DEP-*100 SERIES* PROGRAMMING DEVICE:
REMOVE POWER BEFORE ATTEMPTING TO CONNECT OR DISCONNECT CABLING. EXERCISE CARE WHEN MAKING THE MEDLAN CABLE CONNECTIONS. IF THE MEDLAN CABLE SHOULD BECOME CONNECTED TO THE MDP1 AND MDP2 POWER CONNECTIONS, SERIOUS DAMAGE TO COMMUNICATION COMPONENTS WILL OCCUR.

NEVER CONNECT ANY OF THE COMMUNICATION PORTS TO THE MDP-POWER WIRES. DAMAGE TO THE PORTS OR OTHER INTERNAL COMPONENTS MAY RESULT.

DESIGNATOR	FUNCTION
MDL1 - MedLAN Line 1	This is the TX/RX + line of the RS–485 signal. Attach it to the blue wire of the cable.
MDL2 - MedLAN Line 2	This is the TX/RX – line of the RS–485 signal. Attach it to the clear or white wire of the cable.
Shield	Connect the shield to the drain wire of the cable.

CABLE ROUTING REQUIREMENTS

Wire the MedLAN network ONLY in a “daisy-chain” method. NEVER use “stub” wiring.

The maximum total length of the MedLAN network cable is 3,000 feet. Up to 30 weld controls may be connected to a single MedLAN network.

A maximum of one Network Power Pack (DEP-*100 Series*), OR two Network Power Packs (DEP-100S), OR one computer running MedView or MedCommander may be connected to a single MedLAN network.

The MedLAN cable wire ends terminate into MTSB (Phoenix) connectors. Terminate the cable with this procedure:

1. Strip the cable jacket to 1 inch.
2. Remove foil shield strands outside the foil.
3. Cover the shield with heat shrink.
4. Cover the cable insulation end with one inch of heat-shrink tubing.
5. Strip 1/4 inch of insulation off each wire.
6. Install wires in each connector as shown in Figure 2.1 below.
7. Torque the terminal screws to 5 in.-lb.

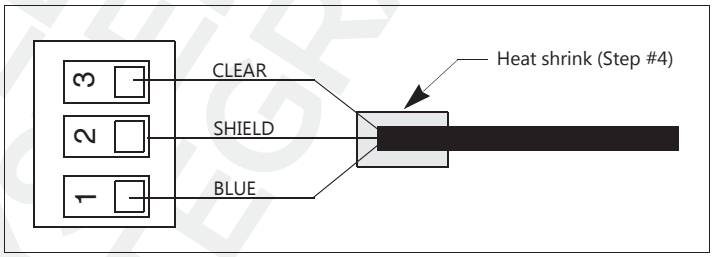


Figure 2.1 Terminating the MedLAN Cable

You must provide strain relief at the MedLAN cable entry and exit points at the weld control enclosure. If the enclosure requires drilling entry/exit holes, exercise caution to assure that no metal shavings are left inside the control.

WARNING!

BE CERTAIN TO COVER ALL COMPONENTS TO PROTECT THEM FROM METAL SHAVINGS. METAL DEBRIS (FROM DRILLING INTO THE CABINET) CAN CAUSE CATASTROPHIC FAILURE. THE WTC WARRANTY DOES NOT COVER DAMAGE CAUSED BY METAL DEBRIS.

Physically separate the MedLAN cable from wiring greater than 50 volts. If the MedLAN cable must cross this wiring, it must do so at a 90° angle.

Figure 2.2 illustrates the recommended wiring configuration. Note that this diagram shows optional equipment.

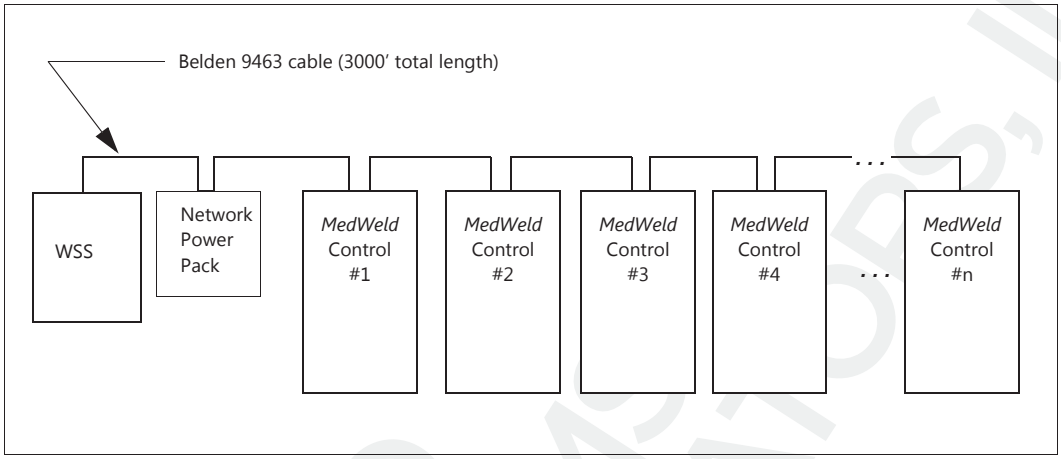


Figure 2.2 Recommended MedLAN Wiring

SETTING THE WELD PROCESSOR MEDLAN ADDRESS

The *MedWeld* uses MedLAN (WTC's proprietary Local Area Network) to create a communications network between devices. After configuring each control, establishing the MedLAN connection and powering it up, you must set the MedLAN address for each device before it can respond to the network.

Use the DEP-*100 Series* to program the MedLAN address for each individual weld control, through the top (DEP) port of the weld processor card.

NOTE: THE STEPS REQUIRED TO SET THE ADDRESS ARE LISTED BELOW. REFER TO THE MANUAL PROVIDED WITH THE DEP-*100 SERIES* PROGRAMMING DEVICE FOR MORE INFORMATION ON OPERATION.

Figure 2.3 illustrates the layout of the DEP-100S keypad and LCD:

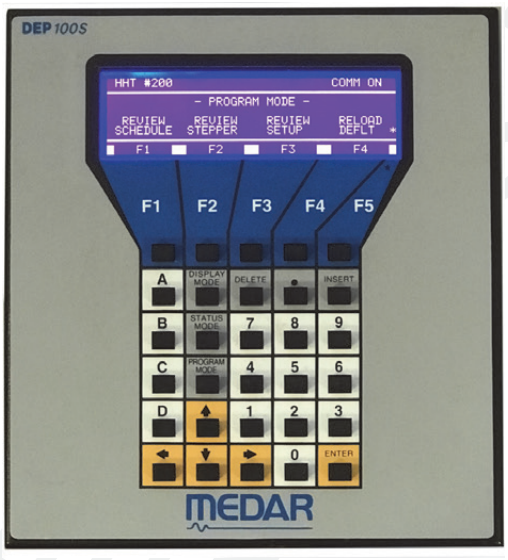


Figure 2.3 WTC DEP-100S Programming Device

TO SET THE ADDRESSES FOR EACH WELD CONTROL, FOLLOW THIS PROCEDURE:

① Plug the DEP-*100 Series* into the DEP (top) port on the weld processor card (or the DEP port on the enclosure door, if provided).

② Press the key labeled PROGRAM MODE on the DEP-*100 Series*. You will see this screen:

```
 HHT #000                      COMM ON
.........................................
           - PROGRAM MODE -

 REVIEW     REVIEW     REVIEW   RELOAD
 SCHEDULE   STEPPER    SETUP    DEFLT  *
.........................................
   F1         F2         F3       F4
```

③ Press F5 on the DEP-*100 Series* (for additional functions). The following screen appears.

```
POWER ON                          COMM ON
.....................................
         - PROGRAM MODE -

 WELDER   TRANSFER   NETWORK       IO
 ID       DATA       ADDR     MAPPING    *
.....................................
 F1       F2         F3            F4
```

④ Press F3 to select NETWORK ADDRESSING (**NETWORK ADDR**). This display will appear.

```
POWER ON                          COMM ON
.....................................
         NETWORK ADDRESS PROGRAMMING


 port #00           download   exit
.....................................
     F1        F2         F3      F4
```

⑤ Press the F1 key to select the port # (MedLAN address).

⑥ With the numeric keys, enter an address ("port") number (00–29). In the example shown, the address is port 02.

⑦ Press Enter to tell the DEP-*100 Series* you have completed your selection.

⑧ Press the F3 (**download**) to send the new MedLAN address to the device. (A message that the download was completed will appear briefly.)

⑨ Unplug the DEP-*100 Series* and move to the next control. Follow this procedure for every control in the network.

MAKE CERTAIN THAT EACH DEVICE HAS A **UNIQUE** ADDRESS. DUPLICATE ADDRESSES MAY CAUSE THE NETWORK TO LOCK UP.

PROGRAMMING THE WELD PROCESSOR

Each weld processor provides multiple functions for defining weld schedules. It also lets you configure the device to meet your application requirements by programming setup parameters. The control also provides a programmable stepper to compensate for lost current density over the life of the electrodes.

All of these features are programmable from several different programming devices:

- Plug the DEP-*100 Series* programming device into the connector on the enclosure door or on the weld processor module or the WTC Network Power Pack.
- Use the WebVIEW communication program to program weld schedules, steppers and setup parameters from a Web Server interface.
- Each programming option is outlined below. For more complete information, refer to the manual provided with each programming device.

DEP-*100 SERIES* PROGRAMMING DEVICE

WTC's DEP-*100 Series* Programming Device is a data entry device. Use it to program one, several or up to 29 weld processors on a MedLAN network.

- When programming locally, the DEP-*100 Series* is plugged directly into the port on the WTC control.
- When using a MedLAN network, a WTC Network Power Pack is required to provide external power for the DEP-*100 Series*.

When communicating through a local port, the DEP-*100 Series* is still required (to set the MedLAN address for each weld processor). The DEP-*100 Series* is shown in Figure 2.3 on page - 25. Its multi-line display and "soft" function keys allow you to see weld data or to program weld settings.

As described in the *DEP-100 Series Programming Guide*, the DEP-*100 Series* displays information based on the software revision contained in both the DEP and the weld processor.

This manual explains how to use displays that are specific to the *MedWeld* processor.

Danger!

PRIOR TO MAKING ANY CONNECTION INSIDE THE WELD CONTROL CABINET:
REFER TO YOUR FACILITIES ELECTRICAL LOCKOUT POLICY AND PROCEDURES.
BEFORE PROCEEDING, VERIFY NO HIGH VOLTAGE IS PRESENT INSIDE THE CABINET WITH A MULTIMETER.

Danger!

THE DOOR OF THE WELD CONTROL CABINET IS INTERLOCKED WITH THE CIRCUIT BREAKER TO PREVENT THE DOOR FROM BEING OPENED WHILE POWER IS ON. NEVER ATTEMPT TO DEFEAT THIS SAFETY MECHANISM.

Danger!

DO NOT DRILL HOLES IN REMOVABLE COVER PLATES WHILE ATTACHED TO WELD CONTROL.

HOW TO PROGRAM I/O MAPPINGS

The *MedWeld* has the capability to assign any Discrete or FieldBus I/O point to any I/O function. This section explains how to program I/O mappings for all types of *MedWeld* controls.

Mappings of I/O numbers to I/O names are not fixed. Instead, you can set any input or output to correspond to any I/O position on the Discrete I/O board or FieldBus I/O transfer.

This assignment is accomplished through either the ***I/O Mapping*** or ***FieldBus Mapping*** screens in the ***Program Mode*** display of the DEP-*100 Series*.

INITIAL PREPARATION FOR I/O ASSIGNMENT

Before entering any programming changes to I/O, follow this procedure:

① Turn OFF power to the control.
② Locate the NORMAL/PROGRAM jumper on the timer board.
③ Set the NORMAL/PROGRAM jumper to PROGRAM mode.

④ Turn ON power to the control.

⑤ Connect the DEP at port **J8** on the timer assembly. Use the Door Port Interface Kit (WTC p/n 830-0654).

⑥ After the DEP powers up, press the PROGRAM MODE key. This screen appears first:

```
HHT #200                          COMM ON
----------------------------------------
            - PROGRAM MODE -


 REVIEW     REVIEW    REVIEW   RELOAD
SCHEDULE   STEPPER    SETUP    DEFLT   *
----------------------------------------
   F1         F2         F3       F4
```

⑦ Perform the appropriate steps as follows:

T17312 (AC CONTROLS)

⑧ Press F5 to pan to these additional options:

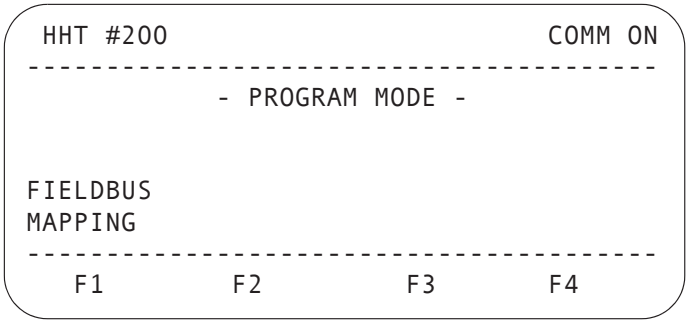
```
HHT #200                          COMM ON
----------------------------------------
            - PROGRAM MODE -


WELDER   TRANSFER    NETWORK    IO
  ID       DATA       ADDR    MAPPING*
----------------------------------------
   F1         F2         F3       F4
```

⑨ Either

- Press F4 from this screen to present the **IO Mapping option. Proceed to "Options for Mapping I/O" on page 30); or:**

⑩ Press F5 again to show the **Fieldbus Mapping** option on the next screen:

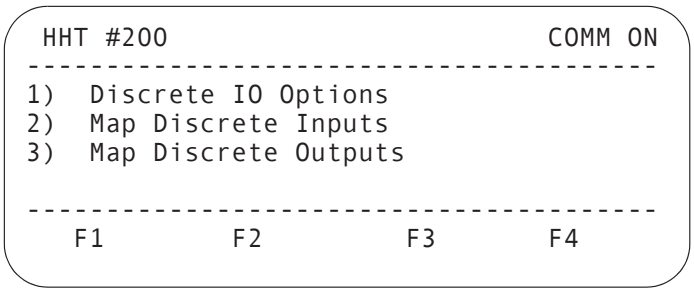


⑪ From this screen, select F1 to access the option for mapping FieldBus I/O. Proceed to **"Options for Mapping I/O" on page 30**).

OPTIONS FOR MAPPING I/O

To set the options for mapping Discrete or FieldBus I/O, follow these steps:

① Press F4 to select the **IO Mapping** option. Either this screen will appear:



In this screen, select one of the three menu options presented:

- **(1) Discrete IO Options**: Proceed to "The I/O Options Screen" on page 31.

- OR this screen appears after selecting the **Fieldbus Mapping** option from the **IO Mapping** screen shown on page 30:

```
 HHT #200                              COMM ON
----------------------------------------
1)  Fieldbus IO Options
2)  Map Fieldbus Inputs
3)  Map Fieldbus Outputs

----------------------------------------
   F1        F2         F3       F4
```

- **(1) Fieldbus IO Options**: Proceed to "The I/O Options Screen (FieldBus)" on page 33.

THE I/O OPTIONS SCREEN

Before proceeding see"Initial Preparation for I/O Assignment" on page 28.

To set the I/O options, press the **1** key while in the **IO Mapping** screen shown above. This screen now appears:

```
 HHT #200                              COMM ON
----------------------------------------
S T A R T   O F   I O   O P T I O N S
RELOAD DIO DEFAULTS: DEFAULT 1
ISOLATION CONTACTOR: DISABLED
E N D   O F   I O   O P T I O N S
wcu #00             download     exit
----------------------------------------
   F1        F2         F3       F4
```

FOLLOW THESE STEPS:

① Use the ↑ or ↓ keys as needed to scroll to the **RELOAD DIO DEFAULTS:** option.

NOTE: IF RESETTING THE DEFAULTS, CYCLE POWER TO THE CONTROL OFF, THEN BACK ON, BEFORE PROGRAMMING ANY ADDITIONAL CHANGES.

② Press [→] to reload from one of the supplied I/O defaults. Selecting **OFF** performs no action. Selecting **Default 1** reloads from the supplied Default 1. Selecting **Default 2** reloads from the supplied Default 2.

③ Press [↓] to scroll down to the **ISOLATION CONTACTOR:** option.

④ If your control has the optional isolation contactor, use [←] or [→] as needed to set this option **ENABLED** for programming.

⑤ If no isolation contactor is included, set the option **DISABLED**.

⑥ To accept these settings for downloading, press [F3]. A message, **DOWNLOAD COMPLETE -- RESTART TIMER**, appears momentarily.

NOTE:

IF THE NORMAL/PROGRAM JUMPER IS NOT IN THE PROPER POSITION, THE DEP WILL INDICATE" CONTROL IS LOCKED -IGNORED" AND RESET OPTIONS TO WHAT IS CURRENTLY PROGRAMMED IN THE CONTROL.
EXIT THE SCREEN BY PRESSING F4, CHANGE THE POSITION OF THE JUMPER TO PROGRAM, THEN RE-DO THE NEEDED CHANGES AND PRESS F3.

⑦ To exit this screen and return to the **IO Mapping** screen, press [F4].

NOTE:

FOR THE CHANGES YOU ENTERED TO TAKE EFFECT, YOU MUST RESET THE WELD PROCESSOR TO RUN MODE. YOU MAY MAKE ALL PROGRAMMING CHANGES BEFORE CYCLING POWER TO THE CONTROL.

⑧ Turn OFF power to the control.

⑨ On the timer board, set the RUN/PROGRAM jumper to RUN mode.

⑩ Turn ON power to the control. The settings you downloaded will now take effect.

THE I/O OPTIONS SCREEN (FIELDBUS)

Before proceeding see"Initial Preparation for I/O Assignment" on page 28.

To set the FieldBus I/O options, press the **1** key while in the **IO Mapping** screen on page 30. This screen now appears:

```
 HHT #200                          COMM ON
-----------------------------------------
S T A R T   O F   I O   O P T I O N S
 RELOAD FIELDBUS DEFAULT: OFF
NODE ADDRESS: (63)

wcu #00             download     exit
-----------------------------------------
   F1        F2          F3        F4
```

FOLLOW THESE STEPS:

① Use the ↑ or ↓ keys as needed to scroll to the **RELOAD FIELDBUS DEFAULTS:** option.

NOTE: IF RESETTING THE DEFAULTS, CYCLE POWER TO THE CONTROL OFF, THEN BACK ON, BEFORE PROGRAMMING ANY ADDITIONAL CHANGES.

② Press → to reload from one of the supplied FieldBus I/O defaults. Selecting **OFF** performs no action. The options are: OFF/ Default 1 / Default 2/ 5 STP GRP. See "FieldBus Default I/O" on page 38.

③ Press ↓ to scroll down to **NODE ADDRESS.** Press → to select from the available options (1-63).

④ Press ↓ to scroll down to **BAUD RATE.** Press → to select from the available options (125k/ 250k/ 500k).

⑤ Press ↓ to scroll down to the **BYTE SIZE.** Press → to select from the available options (0by0/2by2 / 4by4). **0** disables FieldBus communication. **2by2** sets the word size to 16 inputs or outputs. **4by4** sets the word size to 32 inputs or outputs.

⑥ To accept these settings for downloading, press F3. A message, **DOWNLOAD COMPLETE -- RESTART TIMER**, appears momentarily.

- **(2) Map Discrete [FieldBus] Inputs**: Proceed to "Mapping Inputs" on page 34.

MAPPING INPUTS

BEFORE PROCEEDING SEE"INITIAL PREPARATION FOR I/O ASSIGNMENT" ON PAGE 28.

To change the mapping of input points to input names, press the **2** key while in the **IO Mapping** screen. This screen appears:

```
 HHT #200                          COMM ON
---------------------------------------
S T A R T   O F   I O   M A P
▌INPUT 01: BINARY SELECT 1 / PILOT 1
INPUT 02: BINARY SELECT 2 / PILOT 2

wcu #00             download     exit
---------------------------------------
   F1        F2         F3       F4
```

This example is for reference only. What you see will vary, depending on your application and the input mapping currently entered.

Follow these steps:

① Using the ↑ or ↓ keys as needed, scroll to the desired input position number. For example, Input 09 might now have the PRESSURE SWITCH input, but you want to assign the STEPPER RESET GROUP 1 input to this input position number. The screen would look like this:

```
 HHT #200                          COMM ON
---------------------------------------
INPUT 08: FAULT RESET
▌INPUT 09: PRESSURE SWITCH
INPUT 10: NONE

wcu #00             download     exit
---------------------------------------
   F1        F2         F3       F4
```

② With the cursor at Input 09, press ← or → as needed to scroll through the list of available input names. This screen appears:

```
 HHT #200                          COMM ON
----------------------------------------

INPUT 09:PRESSURE SWITCH

wcu #00             download     exit
----------------------------------------
   F1        F2          F3       F4
```

③ In the next example, Input 09 is now assigned to the STEPPER RESET GROUP 1 input. Use the ← and → keys, repeating as needed to display this desired input:

```
 HHT #200                          COMM ON
----------------------------------------

INPUT 09: STEPPER RESET GROUP 1

                        enter    abort
----------------------------------------
   F1        F2          F3       F4
```

④ To assign the input position number to the desired input (Input 09 to the STEPPER RESET GROUP 1 input in this example), press F3 to "enter" and F3 again to "download". A message, **DOWNLOAD COMPLETE -- RESTART TIMER**, appears momentarily.

⑤ To exit this screen and return to the **IO Mapping** screen, press F4.

NOTE:

FOR THE CHANGES YOU ENTERED TO TAKE EFFECT, YOU MUST RESET THE WELD PROCESSOR TO RUN MODE. YOU MAY MAKE ALL PROGRAMMING CHANGES BEFORE CYCLING POWER TO THE CONTROL.

⑥ Turn OFF power to the control.

⑦ On the timer board, set the NORMAL/PROGRAM jumper to RUN mode.

⑧ Turn ON power to the control. The settings you downloaded will now take effect.

MAPPING OUTPUTS

Before proceeding see"Initial Preparation for I/O Assignment" on page 28.

To change the mapping of output points to output names, press the **3** key while in the **IO Mapping** screen. This screen appears first:

```
 HHT #200                          COMM ON
----------------------------------------
S T A R T   O F   I O   M A P
OUTPUT 01: VALVE1 / BINARY VALVE 1
OUTPUT 02: VALVE2 / BINARY VALVE 2

wcu #00             download     exit
----------------------------------------
   F1        F2         F3       F4
```

This example is for reference only. What you see will vary, depending on your application and the output mapping currently entered. Follow these steps:

① Using the ↑ or ↓ keys as needed, scroll to the desired output position number. For example, Output 06 might now have the PRESSURE SELECT 2 output, but you want to assign the PRESSURE SELECT 3 output. The screen would look like this:

```
 HHT #200                          COMM ON
----------------------------------------
OUTPUT 04: VALVE4 / BINARY VALVE 8
OUTPUT 05: PRESSURE SELECT 1
OUTPUT 06: PRESSURE SELECT 2

wcu #00             download     exit
----------------------------------------
   F1        F2         F3       F4
```

② With the cursor at Output 06, press ← or → as needed to scroll through the list of available outputs. This screen appears:

```
 HHT #200                          COMM ON
----------------------------------------

OUTPUT 06: PRESSURE SELECT 3


wcu #00              enter     abort
----------------------------------------
   F1        F2         F3        F4
```

③ In the next example, Output 06 is now assigned to the INITIATION ACKNOWLEDGE output. Use the ← and → keys, repeating as needed to display this screen:

```
 HHT #200                          COMM ON
----------------------------------------

OUTPUT 06: INITIATION ACKNOWLEDGE


wcu #00              enter     abort
----------------------------------------
   F1        F2         F3        F4
```

④ To assign the output position number to the desired output (Output 06 to the INITIATION ACKNOWLEDGE output in this example), press the F3 key to "enter" and F3 again to "download". A message, **DOWNLOAD COMPLETE -- RESTART TIMER**, appears momentarily.

⑤ To exit this screen and return to the **IO Mapping** screen, press F4.

NOTE:

FOR THE CHANGES YOU ENTERED TO TAKE EFFECT, YOU MUST RESET THE WELD PROCESSOR TO RUN MODE. YOU MAY MAKE ALL PROGRAMMING CHANGES BEFORE CYCLING POWER TO THE CONTROL.

⑥ Turn OFF power to the control.

⑦ On the timer board, set the RUN/PROGRAM jumper to RUN mode.

Turn ON power to the control. The settings you downloaded will now take effect.

FIELDBUS DEFAULT I/O

DEFAULT 1

INPUT #	INPUT NAME	TAG
1.	WELD / NO WELD	WLD
2.	FAULT RESET	FR
3.	ISOLATION CONTACTOR SAVER	CSVR
4.	NONE	-
5.	NONE	-
6.	NONE	-
7.	WELD INITIATE	INT
8.	STEPPER RESET	SR
9.	BINARY SELECT 1 / PILOT 1	BS1
10.	BINARY SELECT 2 / PILOT 2	BS2
11.	BINARY SELECT 4 / PILOT 3	BS4
12.	BINARY SELECT 8 / PILOT 4	BS8
13.	BINARY SELECT 16 / PILOT 5	BS16
14.	BINARY SELECT 32 / PILOT 6	BS32
15.	BINARY SELECT 64 / PILOT 7	BS64
16.	TIP DRESS	TIPD

OUTPUT #	OUTPUT NAME	TAG
1.	NO ALERT	NALT
2.	STEPPER APPROCHING MAX	SALT
3.	END OF STEPPER	EOS
4.	PRESSURE SELECT 1	PS1

OUTPUT #	OUTPUT NAME	TAG
5.	PRESSURE SELECT 2	PS2
6.	PRESSURE SELECT 3	PS3
7.	PRESSURE SELECT 4	PS4
8.	NONE	-
9.	NO FAULT	NFLT
10.	WELD MODE ON	WMON
11.	WELD COMPLETE	WCPL
12.	WELD IN PROGRESS	WIP
13.	STEPPERS ARE RESET	SRST
14.	TIP CHANGE REQUIRED	TCR
15.	ISOLATION CONTACTOR IS OPEN	AUX
16.	DUTY CYCLE LIMIT	DUTY

DEFAULT 2

INPUT #	INPUT NAME	TAG
1.	BINARY SELECT 1 / PILOT 1	BS1
2.	BINARY SELECT 2 / PILOT 2	BS2
3.	BINARY SELECT 4 / PILOT 3	BS4
4.	BINARY SELECT 8 / PILOT 4	BS8
5.	BINARY SELECT 16 / PILOT 5	BS16
6.	BINARY SELECT 32 / PILOT 6	BS32
7.	WELD INITIATE	INT
8.	WELD / NO WELD	WLD
9.	FAULT RESET	FR
10.	PRESSURE SWITCH	PS1
11.	STEPPER RESETGROUP 1	SRG1
12.	STEPPER RESETGROUP 2	SRG2
13.	ISOLATION CONTACTOR SAVER	CSVR
14.	TIP DRESS RESET GROUP 1	TDG1
15.	TIP DRESS RESET GROUP 2	TDG2
16.	BINARY SELECT 64 / PILOT 7	BS64

OUTPUT #	OUTPUT NAME	TAG
1.	WELD MODE ON	WMON
2.	FAULT	FLT
3.	ALERT	ALT
4.	READY TO WELD	RTW
5.	WELD COMPLETE	WCPL
6.	STEPPERS ARE RESET GROUP 1	SRG1
7.	STEPPERS ARE RESET GROUP 2	SRG2
8.	END OF STEPPER GROUP 1	ESG1

OUTPUT #	OUTPUT NAME	TAG
9.	END OF STEPPER GROUP 2	ESG2
10.	STEPPER APPROCHING MAX GROUP 1	SAG1
11.	STEPPER APPROCHING MAX GROUP 2	SAG2
12.	WELD IN PROGRESS	WIP
13.	TIP DRESS REQUEST GROUP 1	TDG1
14.	TIP DRESS REQUEST GROUP 2	TDG2
15.	NONE	-
16.	NONE	-

DEFAULT 5 STP GRP

INPUT #	INPUT NAME	TAG
1.	BINARY SELECT 1 / PILOT 1	BS1
2.	BINARY SELECT 2 / PILOT 2	BS2
3.	BINARY SELECT 4 / PILOT 3	BS4
4.	BINARY SELECT 8 / PILOT 4	BS8
5.	BINARY SELECT 16 / PILOT 5	BS16
6.	BINARY SELECT 32 / PILOT 6	BS32
7.	WELD INITIATE	INT
8.	WELD / NO WELD	WLD
9.	FAULT RESET	FR
10.	PRESSURE SWITCH	PS1
11.	STEPPER RESETGROUP 1	SRG1
12.	STEPPER RESETGROUP 2	SRG2
13.	ISOLATION CONTACTOR SAVER	CSVR
14.	TIP DRESS RESET GROUP 1	TDG1
15.	TIP DRESS RESET GROUP 2	TDG2
16.	BINARY SELECT 64 / PILOT 7	BS64
17.	STEPPER RESETGROUP 3	SRG3
18.	STEPPER RESETGROUP 4	SRG4
19.	STEPPER RESETGROUP 5	SRG5
20.	TIP DRESS RESET GROUP 3	TDG3
21.	TIP DRESS RESET GROUP 4	TDG4
22.	TIP DRESS RESET GROUP 5	TDG5
23.	BINARY SELECT 128 / PILOT 8	BS128
24.	NONE	-
25.	NONE	-
26.	NONE	-
27.	NONE	-
28.	NONE	-
29.	NONE	-

INPUT #	INPUT NAME	TAG
30.	NONE	-
31.	NONE	-
32.	NONE	-

OUTPUT #	OUTPUT NAME	TAG
1.	WELD MODE ON	WMON
2.	FAULT	FLT
3.	ALERT	ALT
4.	READY TO WELD	RTW
5.	WELD COMPLETE	WCPL
6.	STEPPERS ARE RESET GROUP 1	SRG1
7.	STEPPERS ARE RESET GROUP 2	SRG2
8.	END OF STEPPER GROUP 1	ESG1
9.	END OF STEPPER GROUP 2	ESG2
10.	STEPPER APPROCHING MAX GROUP 1	SAG1
11.	STEPPER APPROCHING MAX GROUP 2	SAG2
12.	WELD IN PROGRESS	WIP
13.	TIP DRESS REQUEST GROUP 1	TDG1
14.	TIP DRESS REQUEST GROUP 2	TDG2
15.	TIP CHANGE REQUIRED GROUP 1	TCG1
16.	TIP CHANGE REQUIRED GROUP 2	TCG2
17.	STEPPERS ARE RESET GROUP 3	SRG3
18.	TIP DRESS REQUEST GROUP 3	TDG3
19.	STEPPER APPROCHING MAX GROUP 3	SAG3
20.	END OF STEPPER GROUP 3	ESG3
21.	TIP CHANGE REQUIRED GROUP 3	TCG3
22.	STEPPERS ARE RESET GROUP 4	SRG4

OUTPUT #	OUTPUT NAME	TAG
23.	TIP DRESS REQUEST GROUP 4	TDG4
24.	STEPPER APPROCHING MAX GROUP 4	SAG4
25.	END OF STEPPER GROUP 4	ESG4
26.	TIP CHANGE REQUIRED GROUP 4	TCG4
27.	STEPPERS ARE RESET GROUP 5	SRG5
28.	TIP DRESS REQUEST GROUP 5	TDG5
29.	STEPPER APPROCHING MAX GROUP 5	SAG5
30.	END OF STEPPER GROUP 5	ESG5
31.	TIP CHANGE REQUIRED GROUP 5	TCG5
32.	NONE	-

Chapter 3: COMMUNICATIONS AND I/O

The *MedWeld* communicates with automation equipment using one of these integration schemes:

- ***FieldBus***, where I/O is transmitted to a DeviceNet/ProfiBus drop line and sent to a network via the PLC host.
- ***Discrete I/O***. Inputs and outputs are directly wired into the control's enclosure.

This chapter defines the inputs to the *MedWeld*, and the outputs that it provides.

The following sections describe each option and the I/O provided.

LOCAL I/O

When the *MedWeld* is part of a network using any communication scheme, the timer directly provides for local control of certain critical inputs and outputs.

These I/O are the same for both communication scheme. As described in "Providing Local I/O" on page 17, the connections to these I/O should be provided. These tell the processor factors such as the status of the isolation contactor and CONTROL STOP condition.

This I/O is in addition to the I/O mapping provided for discrete I/O and FieldBus operation.

LOCAL INPUTS

The Control Stop input is 24 VDC. It can be either internally- or externally-powered. Refer to "Providing Local I/O" on page 17 for more information.

INPUT BIT NAME	DESCRIPTION
CONTROL STOP CSTP	When this input is de-activated, the control aborts the present schedule and will not initiate another schedule until the input becomes activated. The isolation contactor also drops out (to disable weld current). A CONTROL STOP fault condition is generated. Attempting to initiate a weld when this input is inactive will activate a CONTROL STOP Fault and de-activate the NO FAULT Output.
ISOLATION CONTACTOR IC	This is an input to the weld control showing whether the isolation contactor is open or closed. It is normally closed. If this contact fails to change state when the control attempts to pass current, the control will generate an ISO-CNTR OFF WHEN NEEDED fault. Refer to page 103 for more information about this fault. If this contact fails to return to its original state after the contactor is turned off (including the Isolation Contactor Delay), the control will generate an ISO-CNTR ERR BKR TRIPPED fault condition, and trip the circuit breaker.
THERMAL SWITCH TS2	This input to the weld processor indicates that the SCR module has reached an over-temperature condition. If this input is not active when the control receives the signal to initiate a weld, the weld processor completes the schedule in No Weld and generates a SYSTEM COOLING fault. See page 105 for more details.

LOCAL OUTPUTS

OUTPUT BIT NAME	DESCRIPTION
ISOLATION CONTACTOR ISOC	This output operates the weld transformer isolation contactor. Refer to page 103 for further information.
SHUNT TRIP ST	Activating this output trips the circuit breaker in case of a catastrophic failure.

PROGRAMMABLE INPUTS/OUTPUTS

The *MedWeld* provides for programmable input/output assignments, or mappings. An input mapping lists input numbers 01 - 16 and their respective input names. An output mapping lists output numbers 01 - 10 and their respective output names.
Below are examples of I/O mappings. To learn how to program them using the DEP-*100 Series*, see "How to Program I/O Mappings" on page 26.

EXAMPLE INPUT MAPPING
Any input mapping can have 16 or 32 inputs, to supply the input points of one (or two) Discrete I/O board(s).

NOTE: FieldBus I/O size is 2by2 (16x16), 4by4 (32x32). Discrete I/O size is Inputs: 0/ 16/ 32 and Outputs: 0/ 10/ 20

Example:

01 BINARY SELECT 1 / Pilot 1
02 BINARY SELECT 2 / Pilot 2
03 BINARY SELECT 4 / Pilot 3
04 BINARY SELECT 8 / Pilot 4
05 WELD INITIATE
06 WELD / NO WELD
07 STEPPER RESET
08 FAULT RESET
09 PRESSURE SWITCH
10 NONE
11 RETRACT PILOT 1
12 RETRACT PILOT 2
13 TRANSFORMER OVERTEMP
14 PROGRAM SECURITY
15 HEAT DISPLAY SECURITY
16 NONE

EXAMPLE OUTPUT MAPPING

Any output mapping can have 10 or 20 outputs, to supply the output points of one (or two) Discrete I/O board(s). See note above. For example:

01 VALVE #1
02 VALVE #2
03 VALVE #3
04 VALVE #4
05 PRESSURE SELECT #1
06 PRESSURE SELECT #2
07 RETRACT #1
08 RETRACT #2
09 WELD / NO WELD
10 NO FAULT

THE CONTROL DOES NOT OPERATE WHEN IN PROGRAM MODE. CHANGES TO PROGRAMMED I/O ARE POSSIBLE ONLY WHILE IN THIS MODE.

FOR THE CHANGES YOU PROGRAM TO I/O TO TAKE EFFECT, YOU MUST CYCLE POWER TO THE CONTROL OFF, THEN BACK ON.

IF CHANGING THE FIELDBUS BYTE SIZE, YOU MUST CYCLE POWER TO THE CONTROL OFF, THEN BACK ON.

THE I/O TABLES CONFIGURED ON POWER-UP ARE BASED ON THE MOST RECENTLY- PROGRAMMED I/O MAPPINGS.

INPUT DEFINITIONS

Schedule initiation is ***binary***. Binary initiation sets the desired schedule number as the total of all the weighted values of BINARY SELECT inputs for that schedule number.

For example, BS1 + BS2 will initiate Sequence #03 (because 1 + 2 = 3). BS1 + BS3 + BS4 + BS6 initiates Sequence #45 (because 1 + 4 + 8 + 32 = 45), etc., The BS inputs in these combinations must be HIGH (ON) before the WELD INITIATE input is HIGH (ON).

INPUT DESCRIPTIONS

This section describes the possible input signals that can be provided to the control. The abbreviations below each input label, are tags that appear on the **I/O Status** screen of the DEP-*100 Series* data entry panel.

INPUT BIT NAME	DESCRIPTION
BINARY SELECT 1/PILOT 1 **BINARY SELECT 2/PILOT 2** **BINARY SELECT 4/PILOT 3** **BINARY SELECT 8/PILOT 4** **BINARY SELECT 16/PILOT 5** **BINARY SELECT 32/PILOT 6** BS1/BS2/BS4/BS8/ BS16/BS32	These inputs select the schedule to be initiated (1 – 255). The schedule is selected by a combination of these inputs. Each input has a weighted value (1, 2, 4, 8, 16, 32, 64 or 128). The schedule initiated is the one selected by adding the weighted values of the active inputs. For example, to initiate schedule #4, activate BINARY SELECT Input #4. To initiate schedule #7, activate BINARY SELECT Inputs #1, #2, and #4 (because 1 + 2 + 4 = 7).
WELD INITIATE INT	When this bit goes HIGH, the weld processor will initiate the weld schedule selected through the Binary Select Inputs.
WELD / NO WELD WLD	This is a Weld Input to the control. With this input closed (HIGH), the control is in Weld Mode. If this input is open (LOW), the control is in No Weld Mode. With this input open (No Weld Mode), the control will turn on the NO WELD Output and no weld current will flow and the NO WELD fault is issued.
ISOLATION CONTACTOR SAVER CSVR	This input tells the weld processor to enable the ISOLATION CONTACTOR DELAY timer. The delay timer holds the isolation contactor closed after a weld schedule is completed, to prevent it from dropping out between welds. If this bit is HIGH at the end of a weld schedule, the weld processor will hold the isolation contactor closed for the amount of time programmed into the ISOLATION CONTACTOR DELAY setup parameter. If this bit is LOW at the end of a weld schedule, the isolation contactor will drop out immediately at the end of the weld schedule. However, if this input drops out during the delay time, the remaining time on the delay timer is aborted and the isolation contactor is immediately opened. **NOTE:** WHEN THIS INPUT IS ENABLED AND THE WELD SCHEDULE IS INTERRUPTED BY THE NO WELD INPUT, THE ISOLATION CONTACTOR IGNORES THE DELAY PROGRAMMED IN THE SETUP PARAMETERS AND TURNS OFF AT THE END OF THE SCHEDULE.
FAULT RESET FR	This input allows the operator to reset all faults. When this bit goes HIGH, the weld processor will reset all faults.

INPUT BIT NAME	DESCRIPTION
TRANSFORMER OVERTEMP TROT	This input tells the state of the transformer and external cooling system. It is provided as an external welding transformer over temperature switch. If not using this input and it is programmed, jumper it HIGH. If this input is not active when the control receives a schedule initiate, a SYSTEM COOLING fault will be generated, and the NO FAULT output will be de-energized. A SYSTEM COOLING fault also occurs if a weld schedule contains Function #79 (WAIT nnn CY FOR SYSTEM COOLING), and this input does not become active within the number of cycles specified. Setting this input to **0** means the input defaults to open. Setting to **1** means the input defaults to closed.
NO STROKE/NO WELD NSNW	When this input is active, the control is in No Stroke/No Weld. This tells the weld control to cycle without supplying current and without turning on the valves. This input affects the weld valves only. It does not affect any other outputs. Setting this input to LOW means the input defaults to open. Setting to HIGH means the input defaults to closed.
PROGRAM DISPLAY SECURITY PSEC	HIGH (1 in IO STATUS): All changes to program menu items are allowed. LOW (0 in IO STATUS): Only data under the Stepper Display Mode and Heat Display Mode can be changed. If a change is attempted, the DEP will display "WCU LOCKED - IGNORED".
HEAT DISPLAY SECURITY HSEC	HIGH (1 in IO STATUS): Changes to Heat Display Mode are allowed, i.e. changes to weld functions time and current. LOW (0 in IO STATUS): Changes to Heat Display Mode are not allowed. If a change is attempted, the DEP will display "WCU LOCKED - IGNORED". When this input is used in conjunction with PSEC and both inputs are LOW, only changes to Stepper Display Mode data are allowed.

INPUT BIT NAME	DESCRIPTION
PRESSURE SWITCH PS	This bit is used to force the weld processor to pause the execution of a weld schedule until the bit goes HIGH or until the wait time in function WAIT nnnn CY FOR PRESSURE SWITCH INPUT has elapsed. If this input does not become active in the number of cycles specified, the control generates a PRESSURE SWITCH fault and continues with the schedule. The control aborts the weld schedule and generates a PRESSURE SWITCH fault if the weld initiate is removed while the control is waiting in the function WAIT FOR PRESSURE SWITCH.
WELD PROCEED WP	This bit is used to force the weld processor to pause the execution of a weld schedule until the bit goes HIGH or becomes active. It is used in a weld schedule with function #70 (WAIT FOR WELD PROCEED). (The control will wait for the appropriate input before proceeding with the schedule.) If the initiate is removed before the input becomes active, the control generates a WELD PROCEED fault condition.
STEPPER RESET SR	When this bit goes HIGH the weld processor will reset all steppers to Step 1 and Weld Count 0.
STEPPER RESET GROUP 1-2 SRG1/SRG2	When this bit goes HIGH the weld processor will reset only the stepper programs assigned to the Group (1-5), to Step 1 and Weld Count 0.
RETRACT PILOT 1/2 RT1/RT2	This input changes the state of the RETRACT VALVE #1 (or #2) output. How this output reacts to the RETRACT input depends on the settings established for the Retract Mode and Retract Cylinder setup parameters. • When set to ***UNLATCHED***, the RETRACT VALVE output follows the state of the RETRACT input. The valve output is active while the input is active. • When setting ***LATCHED*** retract mode, the RETRACT input changes the state of the RETRACT VALVE output. The first pulse from the input activates the valve output. The second pulse from the input de-activates the output. • With NONE selected, the control ignores the RETRACT input.
USER INPUT (1-6) UI 1-6	Spare user definable input bits. Used with functions #65 (WAIT nnn CY INP #n TO BE n) and #66 (WAIT FOR INPUT #n TO BE n) in the weld schedule

INPUT BIT NAME	DESCRIPTION
TIP DRESS TIPD	This input will reset the stepper to step #2 and decrement the Tip Dresses Remaining counter. When this input becomes active, the control also resets the TIP DRESS REQUEST output.
TIP DRESS RESET GROUP 1-2 TDG1/TDG2	When this bit is active (HIGH), the stepper associated with the Group (1-2) is reset to step 2 of the stepper program. This normally, occurs after a tip dress operation.

OUTPUT DESCRIPTIONS

This section describes the possible output signals that can be provided to the control. The abbreviations below each output label, are tags that appear on the **I/O Status** screen of the DEP-*100 Series* data entry panel.

Valve outputs may be output in two ways: ***Binary*** or ***Discrete***. The type is set in I/O map Valve Type.

- When set ***binary***, the output is the weighted value of the binary outputs. For example, 1 = BV1; 2 = BV2, 3 = BV1 + BV2 (because 1 + 2 = 3); 5 = BV4 + BV1 (1 + 4 = 5); etc.
- When set ***discrete***, only one of six possible valves will be output for the schedule.

OUTPUT BIT NAME	DESCRIPTION
NONE	When the NONE bit is assigned to an output, the output is disabled and not used by the weld processor.
VALVE 1/BINARY VALVE1 **VALVE 2/BINARY VALVE2** **VALVE 4/BINARY VALVE4** **VALVE 8/BINARY VALVE8** **VALVE 16/BINARY VALVE16** **VALVE 32/BINARY VALVE32** V1/V2/V4/V8/V16/V32	Turning on the discrete initiate for Valve #1, #2, #4, #8, #16 or #32 actuates the binary valve output 1, 2, 4, 8, 16 or 32, respectively.
NO FAULT NFLT	This bit is normally maintained HIGH and indicates a FAULT condition does not exist. When a FAULT occurs, this bit will go LOW.
FAULT FLT	This bit will go HIGH when a FAULT condition exists.
ALERT ALT	This bit will go HIGH when an ALERT condition exists. Alert conditions are usually less serious than faults and are normally used to warn the operator that maintenance is required.
WELD / NO WELD WMON	This bit goes HIGH when the weld control is in WELD MODE.
NO WELD MISMATCH WM	This output is active to indicate that the control is in Weld Mode and the data entry device is in No Weld Mode.

OUTPUT BIT NAME	DESCRIPTION
WELD IN PROGRESS WIP	This bit goes HIGH when function #58 (TURN ON WELD IN PROGRESS) is executed in the weld schedule and goes LOW when function #59 (TURN OFF WELD IN PROGRESS) is executed.
WELD COMPLETE WCPL	This bit goes HIGH when function #50 (TURN ON WELD COMPLETE) is executed in the weld schedule and goes LOW when function #51 (TURN OFF WELD COMPLETE) is executed.
READY TO WELD RTW	This bit goes HIGH when all the following conditions are true: 1. The weld control is in WELD MODE 2. No fault condition exists 3. The Control Stop input bit is HIGH, and 4. The System Cooling input bit is HIGH.
STEPPERS ARE RESET SRST	This bit goes HIGH when all stepper programs are reset, either globally or by group.
STEPPERS ARE RESET GROUP 1-2 SRG1/SRG2	This input will reset all the steppers in Group 1-2 to Step 1 and the weld count to 0.
END OF STEPPER EOS	This output is active when the stepper completes the final weld in Step #5 of the profile. The program now issues the END OF STEPPER fault. Electrode maintenance is required.
END OF STEPPER GROUP 1-2 ESG1/ESG2	This output is active when the stepper completes the final weld in Step #5 of the stepper profile for Group 1-2. The program now issues the END OF STEPPER fault. Electrode maintenance is required.
STEPPER APPROACHING MAX SALT	This output is turned ON when any assigned active stepper assigned to one of these groups has entered Step 5.
STEPPER APPROACHING MAX GROUP 1-2 SAG1/SAG2	This output is turned ON when any assigned active stepper assigned to one of these groups has entered Step 5.
TIP CHANGE REQUIRED TCR	This bit will go HIGH at the end of step 4 when Tip Dresses Remaining = 0.
PRESSURE SELECT 1-4 PS1/PS2/PS3/PS4	These outputs are activated when the MedWeld 4000 executes functions #56 (SET PRESSURE =nn). This function turns on the output corresponding to the number and turns off all the others. The output corresponding to the number will turn off after the schedule is done executing.
INITIATION ACKNOWLEDGE IACK	This output indicates that the control is executing a schedule.

OUTPUT BIT NAME	DESCRIPTION
RETRACT VALVE 1/2 RV1/RV2	These outputs respond to the on/off status of the RETRACT VALVE 1and 2 PILOT Inputs, based on the Retract Mode setup parameter. Refer to page 137 for more details.
CONTACTOR SELECT 1-8 CS1/CS2/CS3/CS4/CS5/CS6/CS7/CS8	This output selects which inverter SCR to switch on, when firing multiple SCRs in the inverter. *Not supported.??*

Chapter 4: PROGRAMMING SCHEDULES

ABOUT WELD SCHEDULES

A weld schedule is a list of commands (or functions), which are used to instruct the weld control to deliver a combination of heat (weld current) and time (weld time) to the weld interface, to create a weld nugget.

The WTC weld control is capable of storing up to 99 unique weld schedules.

This chapter does not describe how to create or modify a weld schedule. (These steps will depend on the programming device.) This chapter only describes all of the weld functions available for use in programming a weld schedule.

THE FOUR BASIC ELEMENTS

	FUNCTION	DESCRIPTION
①	**SQUEEZE**	Apply pressure (electrode force) to the weld interface
②	**WELD**	Deliver weld current to the weld interface
③	**HOLD**	Apply wait time after the weld current stops to allow the nugget time to cool.
④	**WELD COMPLETE**	End of schedule.

WELD SCHEDULE FUNCTIONS

FUNCTION TYPE	DESCRIPTION
DELAY	Delay functions are used to cause a wait time to occur for a specified amount of time.
WELD	Weld functions are used to provide a specified amount of weld current for a specified length of time.
SLOPE	Slope functions are used to provide either a linear increase or decrease in welding current for a specified length of time.
I/O	I/O functions are used to verify, change the status of, or wait for certain I/O points to change.
EXTENDED	Extended functions are used to extend a particular function within a schedule until certain conditions are met.
SPECIAL	Special functions are used to create special conditions within the weld schedule.

SOFTWARE CAPABILITIES

The MedWeld 4000 provides commands for:

- Assigning a schedule to a stepper
- Defining the type of stepper to use
- Turning selected outputs on or off
- Providing weld current.

Other functions enable:

- Overriding the setup parameters
- Controlling the I/O by monitoring inputs and activating outputs
- Regulating weld current to fall within a prescribed range, and repeat the weld if the current is not within that range
- Statistical process control (SPC) functions
- Selecting the firing mode (to assure consistent voltage or to assure constant secondary current)

- Pausing in a schedule to wait for certain operating conditions to become true

You can add functions from this list, or delete functions from it. You may also change any of the numeric values specified in a function. This lets you create a schedule that meets your application requirements.

The following sections describe the functions available for use in a weld schedule, including the two-digit function code and the action each function produces.

The functions are grouped according to their purpose in a weld schedule, and to aid your understanding their overall interaction.

WELD FUNCTIONS LIST

The following is a list of the standard functions available for weld timer software T17300.

NOTE: NUMBERS WITH "*" APPEARING IN THE LINE, INDICATE NO FUNCTION IS ASSIGNED TO THAT NUMBER. UNASSIGNED FUNCTION NUMBERS ARE NOT DISPLAYED.

FUNC. NO.	FUNCTION NAME	CATEGORY
1.	SQUEEZE nn CYCLES	DELAY
2.	COOL nn CYCLES	DELAY
3.	HOLD nn CYCLES	DELAY
4.	OFF nn CYCLES	DELAY
5.	INITIAL SQUEEZE nn CYCLES	DELAY
6.	"*"	
7.	WAIT nn CYCLES	DELAY
8.	"*"	
9.	STEPPER MACH =nn PART =nn (0=OFF)	STEPPER
10.	RESET STEPPER nn	STEPPER
11.	"*"	
12.	"*"	
13.	"*"	

FUNC. NO.	FUNCTION NAME	CATEGORY
14.	"*"	
15.	"*"	
16.	"*"	
17.	"*"	
18.	"*"	
19.	"*"	
20.	WELD nn CY/IMP nn %I	AVC/WELD
21.	TEMPER nn CY/IMP nn %I	AVC/WELD
22.	PREHEAT nn CY/IMP nn %I	AVC/WELD
23.	POSTHEAT nn CY/IMP nn %I	AVC/WELD
24.	PRE-WELD nn CY/IMP nn %I	AVC/WELD
25.	WELD nn CY/IMP nn.n%I	AVC/WELD
26.	WELD nn HALF CYCLES nn.n%I	AVC/WELD
27.	"*"	
28.	"*"	
29.	"*"	
30.	WELD nn CY/IMP nnnn0 AMPS	ACC/WELD
31.	TEMPER nn CY/IMP nnnn0 AMPS	ACC/WELD
32.	PREHEAT nn CY/IMP nnnn0 AMPS	ACC/WELD
33.	POSTHEAT nn CY/IMP nnnn0 AMPS	ACC/WELD
34.	PRE-WELD nn CY/IMP nnnn0 AMPS	ACC/WELD
35.	"*"	
36.	WELD nn HALF CYCLES nnnn0 AMPS	ACC/WELD
37.	"*"	
38.	WELD nnn IMP HI =nnnn0 A LO =nnnn0 A	ACC/WELD
39.	TEST FIRE nn %I	TEST
40.	SLOPE nn CY/IMP nn%I TO nn%I	SLOPE
41.	SET VALVE nn TOUCH DOWN PRESSURE nn PSI	PRESSURE
42.	SET VALVE nn TIP DRESS PRESSURE nn PSI	PRESSURE
43.	SET VALVE nn CYLINDER PRESSURE nn PSI	PRESSURE

FUNC. NO.	FUNCTION NAME	CATEGORY
44.	"*"	
45.	SLOPE nn CY/IMP nnnn0 A TO nnnn0 A	SLOPE
46.	"*"	
47.	WAIT nn CY FOR PRESSURE ACHIEVED	PRESSURE
48.	TURN ON CONTACTOR SELECT nn	I/O
49.	TURN OFF CONTACTOR SELECT nn	I/O
50.	TURN ON WELD COMPLETE	I/O
51.	TURN OFF WELD COMPLETE	I/O
52.	TURN ON ISOLATION CONTACTOR	I/O
53.	TURN OFF ISOLATION CONTACTOR	I/O
54.	TURN ON VALVE n	I/O
55.	TURN OFF VALVE n	I/O
56.	TURN ON PRESSURE SELECT	I/O
57.	TURN OFF PRESSURE SELECT	I/O
58.	TURN ON OUTPUT #nn	I/O
59.	TURN OFF OUTPUT #nn	I/O
60.	IMPULSE= nnnn HEAT CY, nnnn COOL CY	IMPULSE
61.	ABORT IF NO INITIATE FOR nn CYCLES	SPECIAL
62.	REPEAT (AT NEXT FUNCTION)	
63.	TURN ON WELD IN PROGRESS	I/O
64.	TURN OFF WELD IN PROGRESS	I/O
65.	EXTEND WHILE INPUT #nn IS n (0=OFF 1=ON)	EXTEND
66.	WAIT nnn CY INP #n TO BE n (0=OFF 1=ON)	I/O
67.	WAIT FOR INPUT #n TO BE n (0=OFF 1=ON)	I/O
68.	WAIT nnn CY FOR PRESSURE SWITCH INPUT	I/O
69.	WAIT FOR PRESSURE SWITCH INPUT	I/O
70.	WAIT nnn CY FOR WELD PROCEED	I/O
71.	WAIT FOR WELD PROCEED	I/O
72.	WAIT nnn CY FOR LINE > nnn VOLTS	I/O
73.	WAIT FOR LINE > nnn VOLTS	I/O

FUNC. NO.	FUNCTION NAME	CATEGORY
74.	WELD nnn IMP HI =nn %I LO =nn %I	IMPULSE
75.	EXTEND UNTIL NO INITIATE	EXTEND
76.	SEC. CURR LIMITS: HI=nnnn0 LOW=nnnn0	OVERRIDE
77.	ISOLATION CONTACTOR DELAY = nnnn SEC.	OVERRIDE
78.	PROCESS WELD FAULTS	SPECIAL
79.	WAIT nn CY FOR SYSTEM COOLING	I/O
80.	VERIFY TIPS DOWN EVERY nn CY nn TIMES	TEST
81.	SLOW CYLINDER TEST EVERY nn CY nn TIMES	TEST
82.	LINEAR STEPPER #nn ASSIGNED (0 = OFF)	STEPPER
83.	SUREWELD STEPPER #nn ASSIGNED (0 = OFF)	STEPPER
84.	WINDOW: HI =nn% LO =nn% C-FACTOR =nnn	OVERRIDE
85.	WAIT FOR NO INITIATE IF FAULT	I/O
86.	TIP DRESS ADVANCE: GROUP nnnn - STEP nn	STEPPER
87.	SET SPC OFFSET TO nnn	SPECIAL
88.	SEND ALL SAMPLES UNTIL NEXT SPC OFFSET	SPECIAL
89.	VERIFY CYLINDER #n IS OUT OF RETRACT	SPECIAL
90.	TRANSFORMER TURNS RATIO nnn:1	OVERRIDE
91.	FAULT IF TIPS TOUCHING	TEST
92.	FAULT IF TIPS NOT TOUCHING	TEST
93.	INITIAL PF LIMIT: HI=nn LOW=nn	TEST
94.	EXTEND WELD IF LOW CURRENT LIMIT FAULT	EXTEND
95.	EXTEND WELD IF CURRENT LESS THAN nnnn0	EXTEND
96.	POWER FACTOR LIMIT: HI =nn LOW =nn	SPECIAL
97.	C-FACTOR LIMIT: HI =nnnn LO =nnnn	OVERRIDE
98.	GOTO SEQ#nnn IF CURRENT LESS THAN nnnn	SPECIAL
99.	GOTO SEQ#nnn	SPECIAL

NOTE: FOR ALL WELD FUNCTIONS, NN = 20 – 99. (THE PROCESSOR CAN FIRE A RANGE FROM 20% TO 99% I.) FOR HALF-CYCLE FUNCTIONS, THE RANGE IS FROM 20.0% TO 99.9% I. AVC FAULTS MAY OCCUR WHEN THE CONTROL IS FIRING AT OR NEAR THE UPPER AND LOWER LIMITS (20 AND 99%).

DELAY FUNCTIONS

Delay functions cause a delay (or wait) time to occur in the weld schedule for a specified length of time. All delay functions essentially perform the same function, but are assigned different names to describe their purpose in the welding process. During delay functions, weld current does not flow and I/O status does not change.

FUNC. #	FUNCTION NAME	CATEGORY
1.	SQUEEZE nn CYCLES/MS	Squeeze time in Cycles/MSEC
2.	COOL nn CYCLES/MS	Cool time in Cycles/MSEC
3.	HOLD nn CYCLES/MS	Hold time in Cycles/MSEC
4.	OFF nn CYCLES/MS	Off time in Cycles/MSEC
5.	INITIAL SQUEEZE nn CYCLES/MS	Initial Squeeze nnnn Cycles/MSEC
7.	WAIT nn CYCLES/MS	Wait time in Cycles/MSEC

WELD FUNCTIONS

WELD FIRING MODES

Weld functions provide a specified amount of weld current for the number of cycles programmed. The function selected also selects the type of firing mode desired.

The weld function you select also tells the weld processor the type of firing mode to use to control the energy provided to a weld. Specify weld current as either

- A percentage of maximum available current, or
- The amount of secondary current.

This function tells the control how to compensate for changes in the welding environment:

- ***%I*** uses a feature called Automatic Voltage Compensation. AVC monitors primary voltage, using a nominal voltage reference point (programmed in the setup parameters) to determine when compensation is required for voltage swings on the weld bus. This method does NOT compensate for changes in the welder secondary circuit.
- ***Automatic Current Compensation:*** ACC monitors the current during each cycle. It compensates for changes detected during the next cycle, to maintain secondary current at the level programmed.

Functions using the AVC firing mode specify weld current as nn%I (representing the percentage of maximum available current). Functions using the ACC firing mode specify a set amount of secondary current, displayed as nnnn0 AMPS.

THE TRANSFORMER TURNS RATIO SETUP PARAMETER MUST BE ACCURATELY PROGRAMMED FOR THE CONTROL TO SUPPLY THE CORRECT AMOUNT OF SECONDARY CURRENT IN ACC FIRING MODE.

NOTE:

THE WELD DATA GENERATED BY THE CONTROL (AND DISPLAYED AT THE DEP OR A DATA MONITORING DEVICE) DOES NOT INCLUDE EVERY FUNCTION THAT PROVIDES WELD CURRENT. KEEP THIS IN MIND WHEN PROGRAMMING A WELD SCHEDULE. ONLY THE FOLLOWING FUNCTIONS ARE INCLUDED IN THE WELD DATA DISPLAY:

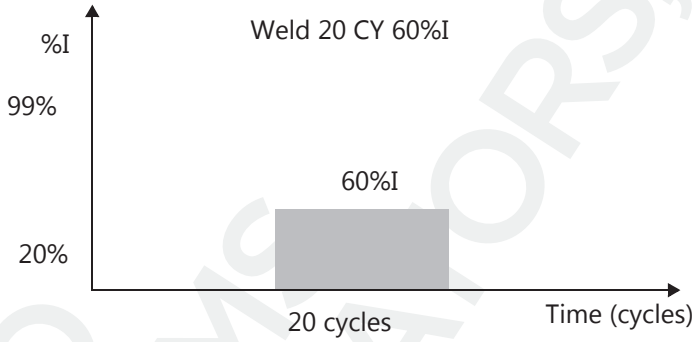
NOTE:

THE WELDING CURRENT DELIVERED IS INFLUENCED BY PREHEAT, PREWELD AND POSTWELD FUNCTIONS. WHEN THE DIFFERENCE BETWEEN THESE FUNCTIONS AND THE MAIN WELD FUNCTIONS IS SUBSTANTIAL, THE AVERAGE CURRENT DISPLAYED FOR THE WELD MAYBE SLIGHTLY HIGHER OR LOWER THAN THE TARGET CURRENT.

% I (AVC FIRING MODE)

FUNC. #	FUNCTION NAME
20	WELD nnnn CY/IMP nn %I
21	TEMPER nnnn CY/IMP nn %I
22	PREHEAT nnnn CY/IMP nn %I
23	POSTHEAT nnnn CY/IMP nn%I
24	PRE-WELD nnnn CY/IMP nn%I
25	WELD nn CY/IMP nn.nn %I
26	WELD nnnn HALF CYCLES nn.nn%I

NOTE: *FOR ALL WELD FUNCTIONS, **NN** = 20 – 99. (THE PROCESSOR CAN FIRE A RANGE FROM 20% TO 99% I.) FOR HALF-CYCLE FUNCTIONS, THE RANGE IS FROM 20.0% TO 99.9% I. AVC FAULTS MAY OCCUR WHEN THE CONTROL IS FIRING AT OR NEAR THE UPPER AND LOWER LIMITS (20 AND 99%).*

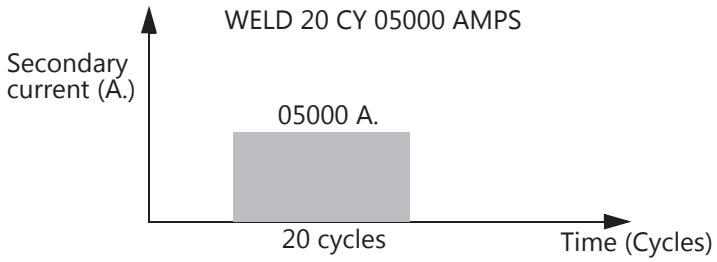


NOTE: WHEN FUNCTION #60 APPEARS BEFORE ANY WELD FUNCTION IN A SCHEDULE, THE CONTROL DISPLAYS IMP (IMPULSES) RATHER THAN CY (CYCLES) TO INDICATE THE WELD CONTROL WILL WELD IN PULSATION MODE. REFER TO FUNCTION #60 ON PAGE 66 FOR MORE INFORMATION.

AUTOMATIC CURRENT COMPENSATION FIRING MODE

The following weld functions will select the Automatic Current Compensation (ACC) firing mode.

FUNC. #	FUNCTION NAME
30	WELD nnnn CY. nnnn0 AMPS
31	TEMPER nnnn CY. nnnn0 AMPS
32	PREHEAT nnnn CY. nnnn0 AMPS
33	POSTHEAT nnnn CY. nnnn0 AMPS
34	PRE-WELD nnnn CY. nnnn0 AMPS
36	WELD nn HALF CYCLES nnnn0 AMPS



ACC FAULTS MAY OCCUR WHEN THE CONTROL IS FIRING AT OR NEAR THE HIGH AND LOW RANGE OF CURRENT. THE CURRENT RANGE FOR EACH CONTROL IS UNIQUE AND DEPENDS ON FACTORS SUCH AS THE SIZE OF THE WELD TRANSFORMER. EXPERIMENT WITH THE CONTROL TO DETERMINE THE UPPER AND LOWER RANGE OF CURRENT EACH CONTROL CAN PROVIDE.

SLOPE FUNCTIONS

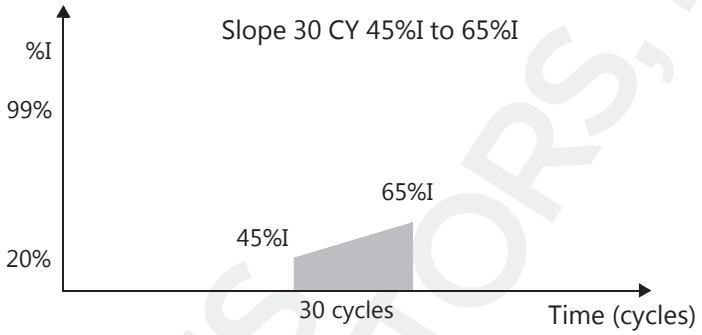
Slope functions provide weld current that starts at the first value and increases or decreases linearly to the second value over the number of cycles specified. Function #40 uses AVC firing mode. Function #45 uses ACC firing.

FUNC. #	FUNCTION NAME
40	SLOPE nn CY nn %I TO nn %I
45	SLOPE nn CY nnnn0 A TO nnnn0 A

Either function will fire for the number of cycles specified. For example, the function -

40 SLOPE 30 CY 45% I TO 65% I

This function tells the weld control to fire one cycle at 45% of the maximum available current. Then, over the next 29 cycles, gradually increase the heat provided to 65%.



NOTE: THE PROCESSOR CAN FIRE A RANGE FROM 20% TO 99% I. AVC FAULTS MAY OCCUR WHEN FIRING AT OR NEAR THESE RANGES

By defining the slope as an impulse (Function #60 appears before this function in the schedule), the weld processor gradually increases the energy provided by each impulse, until it has sloped to the desired energy.

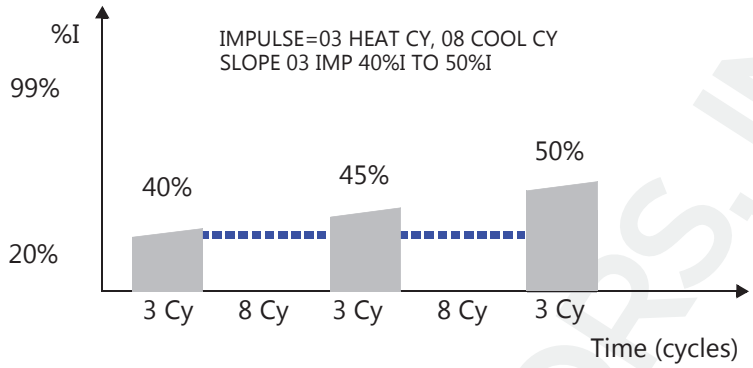
IMPULSE WELDING FUNCTION

This function defines the length of a weld impulse. It tells the weld processor that the next function in the schedule should weld with pulsation (providing heat cycles followed by cool cycles, rather than just heat cycles).

When this function appears before any weld function, the control displays IMP (impulse) rather than CY (cycles) to indicate the weld control will weld multiple impulses.

For example, the following two functions will have the action shown in the diagram below:

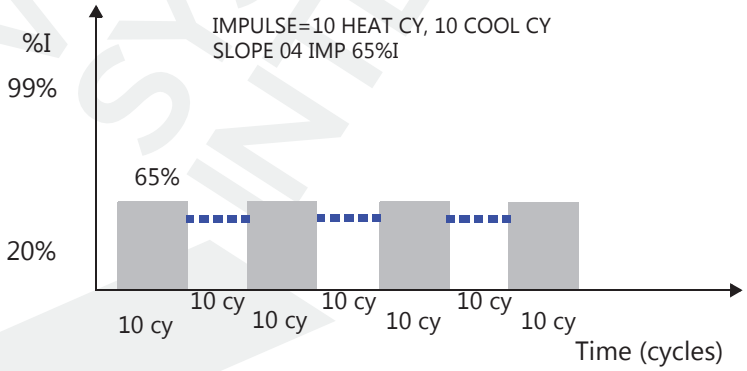
60	IMPULSE = 3 HEAT CY, 8 COOL CY
40	SLOPE 03 IMP 40%I TO 50%



Pulsation welding provides a specified number of impulses. (An impulse is a number of heat cycles — when weld current flows — followed by a number of cycles when current does not flow.) Consider the following schedule:

60	IMPULSE = 10 HEAT CY, 10 COOL CY
20	WELD 04 IMP 65%I

In this example, the weld processor will actually fire for 10 cycles at 65% heat, then wait for 10 cycles with NO heat, and repeat this pattern 4 times.



This function only affects the next function in a weld schedule. It should appear before every weld or slope function you want to weld with pulsation in the schedule.

NOTE: THE LAST COOL TIME OF AN IMPULSE WELD IS NOT EXECUTED. AFTER THE LAST HEAT TIME PERIOD IS EXECUTED, THE WELD PROCESSOR WILL EXECUTE THE NEXT FUNCTION IN THE SCHEDULE.

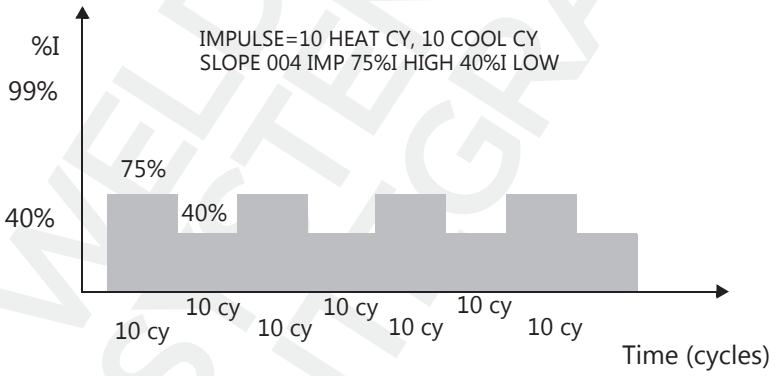
FUNCTION #74 ENABLES WELDING AT TWO DIFFERENT HEAT SETTINGS.

74	WELD nnn IMP HI =nn%I LO =nn%I

The function ***must*** immediately follow Function #60 (which defines the length of the impulse) in the weld schedule.

The control uses the first current setting (nn %I HIGH) for the heat cycles of the impulse. The second heat setting (nn %I LOW) defines the amount of heat to provide during the cool cycles of an impulse.

The cool cycles actually fire at a reduced % heat. For example, the following schedule will have the action illustrated here:



NOTE: HI/LO FUNCTIONS ACT DIFFERENTLY THAN OTHER WELD/HEAT FUNCTIONS IN IMPULSE MODE

TEMPER, PRE HEAT, POST HEAT AND PRE WELD FUNCTIONS

Temper, Pre-Heat, Post-Heat and Pre-Weld are material heating functions and are inserted either before or after main weld functions (#20 or #30). They all essentially perform the same function, but are assigned different names to describe their purpose in the welding process. These functions are not figured into the weld data collection algorithm. For example:

EXAMPLE 1: USING A PRE-HEAT FUNCTION BEFORE THE WELD FUNCTION

32	PREHEAT 20 CY. 5000 AMPS
30	WELD 20 CY. 10000 AMPS

When the weld sequence is complete, the last weld data in the Weld Data Menu will display 10,000 Amps. As mentioned above, the pre-heat function is not figured in the weld data collection algorithm.

EXAMPLE 2: USING TWO WELD FUNCTIONS, WITH THE FIRST AS A PRE-HEAT

30	WELD 20 CY. 5000 AMPS
30	WELD 20 CY. 10000 AMPS

When the weld sequence is complete, the last weld data in the Weld Data Menu will display 7,500 Amps. This is because when two or more weld functions are used in the same weld schedule, the weld data collection algorithm calculates the average current for all the weld functions and displays the results.

I/O FUNCTIONS

I/O functions are used to verify the status of, change status of, or wait for certain I/O points to change states before continuing with the weld schedule. If the input does not become active within the specified delay, the processor generates the appropriate fault. The functions with no programmable delay will abort the schedule and generate the fault if the initiate is removed while the weld processor is waiting.

There are two types of I/O Functions:

- Functions that interact with inputs
- Functions that interact with outputs

NOTE: BEFORE PROGRAMMING THESE FUNCTIONS, CHECK THE PACKET OF DRAWINGS THAT CAME WITH YOUR CONTROL FOR I/O AVAILABILITY.

INPUT FUNCTIONS

Input monitoring functions tell the weld control to check the status of an input. They wait either indefinitely for an input to be active, or wait for only a specified number of cycles for the input to be active.

If the input does not become active within the specified delay, the processor generates the appropriate fault condition. (The wait functions with no programmable delay will abort the schedule and generate the fault if the initiate is removed while the weld processor is waiting.)

FUNC. #	FUNCTION NAME	DESCRIPTION
66	**WAIT NNN CY INP #N TO BE N (0 =OFF 1 =ON)**	This function tells the weld control to wait for the specified amount of time (cycles) for the specified User Input bit (1-6) to go either OFF (0) or ON (1). If the bit does not go either OFF or ON during this time period, a WELD PROCEED FAULT is generated. **NOTE:** IF EITHER FUNCTION #66 OR #67 ARE FALSE AND THE WELD PROCEED FAULT IS SET TO FAULT IN THE SETUP PARAMETERS, THE WELD PROCESSOR WILL EXECUTE THE WELD SCHEDULE IN NOWELD MODE. IF EITHER FUNCTION #66 OR #67 ARE FALSE AND THE WELD PROCEED FAULT IS SET TO ALERT IN THE SETUP PARAMETERS, THE WELD PROCESSOR WILL EXECUTE THE WELD SCHEDULE IN WELD MODE.
67	**WAIT FOR INPUT #N TO BE N (0 =OFF 1= ON)**	This function waits for the specified User Input bit (1-8) to go either OFF (0) or ON (1). If the Weld Initiate input bit goes LOW before this occurs, a WELD PROCEED FAULT is generated.
68	**WAIT NNN CY FOR PRESSURE SWITCH INPUT**	This function waits for the specified amount of time (milliseconds) for the Pressure Switch bit to go HIGH. If the bit does not go HIGH during this time period, a PRESSURE SWITCH FAULT is generated. **NOTE:** IF THE PRESSURE SWITCH BIT IS LOW AND THE PRESSURE SWITCH PARAMETER IS SET TO FAULT, THE WELD PROCESSOR WILL EXECUTE THE WELD SCHEDULE IN NO-WELD MODE. IF THE PRESSURE SWITCH BIT IS LOW AND THE PRESSURE SWITCH PARAMETER IS SET TO ALERT, THE WELD PROCESSOR WILL EXECUTE THE WELD SCHEDULE IN WELD MODE.

FUNC. #	FUNCTION NAME	DESCRIPTION
69	**WAIT FOR PRESSURE SWITCH INPUT**	This function waits indefinitely for the Pressure Switch bit to go HIGH. If WELD INITIATE goes LOW during this wait time, weld timer will generate a PRESSURE SWITCH FAULT.
70	**WAIT NNN CY FOR WELD PROCEED**	This function pauses and waits for up to the specified number of cycles nnnn for the weld proceed input to become active. **NOTE:** FUNCTION #70 CONTINUES THE SCHEDULE IN NO WELD MODE TO INHIBIT WELD CURRENT FROM FLOWING IF THE WELD PROCEED SETUP PARAMETER IS PROGRAMMED AS A ***FAULT***. IF THIS PARAMETER IS PROGRAMMED AS AN ***ALERT***, IT CONTINUES WITH THE SEQUENCE AS NORMAL.
71	**WAIT FOR WELD PROCEED**	This function waits for the Weld Proceed bit to go HIGH. If WELD INITIATE goes LOW during this wait time, weld timer will generate a WELD PROCEED FAULT.
72	**WAIT NNN CY FOR LINE > NNN VOLTS**	This function will wait in the schedule for up to the specified number of cycles, nnn for the line voltage to exceed the number of programmed volts and the WELD PROCEED input to become active. **NOTE:** FUNCTION #72 CONTINUES THE WELD SCHEDULE IN NO WELD MODE TO INHIBIT WELD CURRENT FROM FLOWING IF THE INSUFFICIENT LINE VOLTAGE SETUP PARAMETER IS PROGRAMMED AS A ***FAULT***. IF THIS PARAMETER IS PROGRAMMED AS AN ALERT OR NONE, IT CONTINUES WITH THE WELD SCHEDULE AS NORMAL.
73	**WAIT FOR LINE > NNN VOLTS**	This function waits indefinitely for line voltage to exceed the number of programmed volts. If Weld Initiate is removed during the wait time, an INSUFFICIENT LINE VOLTAGE condition will be posted. default level is Alert.
79	**WAIT NN CY FOR SYSTEM COOLING**	This function waits the specified amount of time (cycles) for the System Cooling bit to go HIGH. If the bit does not go HIGH during this time period, a SYSTEM COOLING FAULT is generated and the schedule is completed in No Weld mode.

FUNC. #	FUNCTION NAME	DESCRIPTION
85	**WAIT FOR NO INITIATE IF FAULT**	If a fault occurs, the fault is posted on the DEP and the execution of the schedule stops at this function until the Weld Initiate bit goes LOW. When Weld Initiate goes LOW, the remainder of the schedule is executed. **NOTE:** THIS FUNCTION MUST BE PLACED AFTER THE WELD FUNCTION, OTHERWISE, ALL ZEROS WILL BE DISPLAYED IN THE WELD DATA SCREEN ON THE DATA ENTRY PANEL.

OUTPUT FUNCTIONS

These functions allow the control to turn outputs on or off within a weld schedule:

FUNC. #	FUNCTION NAME	DESCRIPTION
48	**TURN ON CONTACTOR SELECT NN**	This function will turn ON Contactor Select bit (1-8).
49	**TURN OFF CONTACTOR SELECT NN**	This function will turn OFF Contactor Select bit (1-8).
50	**TURN ON WELD COMPLETE**	Turn on the Weld Complete output **NOTE:** THIS FUNCTION WILL ONLY ACTIVATE THE WELD COMPLETE OUTPUT IF THERE ARE NO ACTIVE FAULT CONDITIONS.
51	**TURN OFF WELD COMPLETE**	This function will deactivate the WELD COMPLETE output.
52	**TURN ON ISOLATION CONTACTOR**	This function will first check to determine if the isolation contactor is already closed, and will pull in the isolation contactor only if it is open. This is designed to improve the process speed, bypassing the delay provided to wait for the isolation contactor to close.
53	**TURN OFF ISOLATION CONTACTOR**	Turn off the Isolation Contactor bit. **NOTE:** ALL NON-WELDING SCHEDULES SUCH AS TIP DRESS SCHEDULES MUST BE EXECUTED IN NO WELD TO KEEP THE ISOLATION CONTACTOR OFF DURING A NON WELD SCHEDULE.
54	**TURN ON VALVE N**	Turn ON Valve Output (1-6).
55	**TURN OFF VALVE N**	Turn OFF Valve Output (1-6).
56	**TURN ON PRESSURE SELECT NNNN**	Turn ON PRESSURE SELECT Output (0-15)
57	**TURN OFF PRESSURE SELECT NNNN**	Turn OFF PRESSURE SELECT Output (0-15)
58	**TURN ON OUTPUT N**	Turn ON User Output (1-6).
59	**TURN OFF OUTPUT N**	Turn OFF User Output (1-6).
63	**TURN ON WELD IN PROGRESS**	Turn ON Weld in Progress Output.
64	**TURN OFF WELD IN PROGRESS**	Turn OFF Weld in Progress Output.

EXTEND/REPEAT FUNCTIONS

Extend functions are used to extend a function under certain conditions.

NOTE: THESE FUNCTIONS MAY REQUIRE CERTAIN INPUTS. BEFORE PROGRAMMING THESE FUNCTIONS, CHECK THE PACKET OF DRAWINGS THAT CAME WITH YOUR CONTROL FOR I/O AVAILABILITY.

FUNC. #	FUNCTION NAME	DESCRIPTION
65	**EXTEND WHILE INPUT #NN IS N (0=OFF 1=ON)**	This function tells the processor to monitor the status of the specified input bit (1-8) and to extend the previous function in the weld schedule while the specified input bit is either OFF (0) or ON (1). **NOTE:** REPEAT AND EXTEND FUNCTIONS ARE MUTUALLY EXCLUSIVE. DO NOT USE THE REPEAT FUNCTION WITH ANY EXTEND FUNCTION IN A WELD SCHEDULE.
75	**EXTEND UNTIL NO INITIATE**	This function tells the processor to monitor the status of the Weld Initiate bit and to repeat the previous function in the weld schedule until the Weld Initiate bit goes LOW. This function is designed to monitor the status of the WELD INITIATE input and will pause the execution of the schedule until the input is removed. In a standard application the weld schedule will be extended until the Weld Complete (process complete) is seen. This then tells the robot or machine that it is okay to remove the initiate signal to the weld control and that the part is complete. If the initiate is dropped before that time, the weld control may issue the fault WELD INITIATE NOT PRESENT.

FUNC. #	FUNCTION NAME	DESCRIPTION
94	**EXTEND WELD IF LOW CURRENT LIMIT FAULT**	This function tells the processor to re-weld if a LOW CURRENT LIMIT FAULT occurs. An EXTENDED WELD ALERT will be generated if the corresponding setup parameter (EXTENDED WELD) is set to its default value. The weld processor re-welds only once. **NOTE:** REPEAT AND EXTEND FUNCTIONS ARE MUTUALLY EXCLUSIVE. DO NOT USE THE REPEAT FUNCTION WITH ANY EXTEND FUNCTION IN A WELD SCHEDULE.
95	**EXTEND WELD IF CURRENT LESS THAN NNNN0**	This function tells the processor to re-weld if a LOW CURRENT LIMIT FAULT occurs. An EXTENDED WELD ALERT will be generated if the corresponding setup parameter (EXTENDED WELD) is set to its default value. The weld function is extended only once. If the desired current is not reached on the re-weld, the LOW CURRENT LIMIT FAULT is generated. **NOTE:** REPEAT AND EXTEND FUNCTIONS ARE MUTUALLY EXCLUSIVE. DO NOT USE THE REPEAT FUNCTION WITH ANY EXTEND FUNCTION IN A WELD SCHEDULE

STEPPER ASSIGNMENT FUNCTIONS

FUNC. #	FUNCTION NAME	DESCRIPTION
9	**STEPPER MACH =NN PART =NN (0=OFF)**	This function allows the user to assign two steppers to a schedule. The stepper additional currents are added together. One stepper is used as a machine stepper to adjust the heat for the machine. The other stepper is a part stepper and used to adjust the heat on an individual part. The part stepper can be reset by inserting Function #10 (below) in a separate schedule and executing the schedule after the part is complete.
10	**RESET STEPPER NN**	Executing this function resets the specified stepper to the first step of the first group number.
82	**LINEAR STEPPER #NN ASSIGNED (0 = OFF)**	This function assigns the linear stepper 1-10 to a weld schedule. This function must be inserted at the start of the weld schedule before the weld function. If the value is programmed as "00", then there are no steppers assigned to the weld schedule.
83	**SUREWELD STEPPER #NN ASSIGNED (0 = OFF)**	This function assigns a SureWeld stepper to a weld schedule. The MedWeld 4000 can have up to 10 independent linear steppers, and up to 10 SureWeld steppers. Linear steppers have 5 programmable levels (called "steps") to provide additional energy. When either function appears in a weld schedule, the appropriate stepper is advanced (incremented) each time you execute the weld schedule. If it is used in a weld schedule, either function MUST be the *first* function in the schedule. Valid stepper numbers are 1 – 10. To disable a stepper for a schedule, assign the stepper as zero (#0). For more details about steppers, refer to Chapter 6: Linear Current Steppers.

FUNC. #	FUNCTION NAME	DESCRIPTION
86	**TIP DRESS ADVANCE: GROUP NN - STEP N**	This function advances all the steppers assigned to the specified GROUP number, to the specified STEP number (1/2). For example, if this function was programmed: TIP DRESS ADVANCE: GROUP 02 - STEP 02, every stepper assigned to Group #2 would advance to Step #2. **NOTE:** THIS FUNCTION CAN ADVANCE SEVERAL STEPPERS SIMULTANEOUSLY. FOR EXAMPLE, YOUR APPLICATION MAY USE SEVERAL DIFFERENT WELD SCHEDULES TO EXECUTE A WELD ON THE SAME TOOL, BUT THOSE SCHEDULES MAY BE ASSIGNED TO DIFFERENT STEPPERS (TO ACCOUNT FOR WELD VARIATIONS). THIS FUNCTION ALLOWS YOU TO ADVANCE EVERY STEPPER ASSIGNED TO A GROUP, EACH TIME ANY SCHEDULE COMPLETES A WELD. (EVERY TIME THE ELECTRODES WELD, EVERY STEPPER INVOLVED IS ALSO ADVANCED.)

FUNCTIONS THAT OVERRIDE SETUP PARAMETERS

The following functions allow setting programming limits that are unique to a given weld schedule. The new limits override the limits programmed in the setup parameters, and apply only to the weld schedule where they appear. They also take priority over any other limits established.

Refer to "Programmable Setup Parameters" on page 107 for detailed descriptions of these limit settings as programmed in the setup parameters.

FUNC. #	FUNCTION NAME	DESCRIPTION
76	**SEC. CURR LIMITS: HI=NNNN0 LOW=NNNN0**	This function assigns a static HI / LOW current limit window in the "local" weld schedule only. This function overrides the "Global" HI / LOW CURRENT LIMIT WINDOW parameters described in "Chapter 5: Faults and Setup Parameters" on page 86.

FUNC. #	FUNCTION NAME	DESCRIPTION
77	**ISOLATION CONTACTOR DELAY = NN SEC.**	This function delays the opening of the isolation contactor for the number of seconds specified, if the Isolation Contactor Saver bit is HIGH.
84	**WINDOW: HI = % LO = % C-FACTOR = NN**	This function defines the C-factor window with high and low limit values. It measures the average current of the weld and verifies it is within a percent HI / LOW tolerance of the target current
90	**TRANSFORMER TURNS RATIO NNN :1**	This function assigns a transformer turns ratio in the "Local" weld schedule only. It overrides the "Global" transformer turns ratio parameters described in "Chapter 5: Faults and Setup Parameters" on page 86.
97	**C-FACTOR LIMITS: HI= NNN LO= NNN**	The function is used to define the high and low C-Factor limits for a weld schedule. It is used to determine when the welding conditions indicate the need for maintenance.

SPECIAL FUNCTIONS

Special functions are used to either create special conditions inside the welding schedule, set local schedule features that over-ride global setup parameters or to chain multiple weld schedules together.

FUNC. #	FUNCTION NAME	DESCRIPTION
61	**ABORT IF NO INITIATE FOR NN CYCLES**	This function tells the control to verify that the weld initiate has remained active. The control waits the number of cycles programmed while checking the WELD INITIATE bit. If WELD INITIATE is not present at any time while it is waiting, the control will abort the sequence and generate the WELD INTIATE NOT PRESENT fault.

FUNC. #	FUNCTION NAME	DESCRIPTION
62	**REPEAT (AT NEXT FUNCTION)**	This function monitors the status of the Weld Initiate input bit. When the last function in the weld schedule is complete, the weld processor checks the status of the Weld Initiate input bit. If the bit is HIGH, the weld processor will repeat the weld schedule, starting at the first line following function #62. When the last function is again complete, the weld processor checks the status of the Weld Initiate input bit. If the bit is still HIGH, the weld processor repeats the weld schedule again, starting at the first line following function #62. This repeat loop will continue until the Weld Initiate input bit goes LOW. **NOTE:** THIS FUNCTION SHOULD BE PLACED IN THE WELD SCHEDULE BEFORE THE SQUEEZE FUNCTION. **NOTE:** : REPEAT AND EXTEND FUNCTIONS ARE MUTUALLY EXCLUSIVE. DO NOT USE THE REPEAT FUNCTION WITH ANY EXTEND FUNCTION IN A WELD SCHEDULE.
78	**PROCESS WELD FAULTS**	This function allows a one-cycle delay in the weld schedule for the weld processor to identify any fault conditions, which may have been generated thus far in the weld schedule. The control normally processes all fault conditions at the end of the weld schedule. This function allows forcing the control to process fault conditions before it completes the weld schedule and before it activates the WELD COMPLETE output. **NOTE:** THIS FUNCTION MUST BE INSERTED AFTER THE MAIN WELD FUNCTION (#20 OR #30) IN THE WELD SCHEDULE. IF IT IS INSERTED PRIOR TO THE WELD FUNCTION, ALL ZEROS WILL BE REPORTED IN THE WELD DATA MENU. **NOTE:** THIS FUNCTION ONLY PROCESSES THE WELD DATA AND SETS THE FAULT BITS. THE FAULT AND ALERT OUTPUTS ARE NOT TURNED ON UNTIL THE END OF THE SCHEDULE. **NOTE:** THE WELD PROCESSOR WILL EXECUTE THIS FUNCTION ONLY ONCE DURING THE WELD SCHEDULE. IF THE FUNCTION APPEARS IN MORE THAN ONE LOCATION IN THE SCHEDULE, THE FIRST OCCURRENCE WILL BE EXECUTED AND ALL OTHERS WILL BE IGNORED.

FUNC. #	FUNCTION NAME	DESCRIPTION
87	**SET SPC OFFSET TO NN**	This function establishes the starting bin number for SPC indexing. Bin #99 is the last usable bin. If the control reaches bin #99 and is still collecting data, data from each weld will be stored in bin #99 until a new offset is assigned. As a result, data accumulated in this bin is unsuitable for analysis. See "SPC Setup Parameters" on page 134 for more information. **NOTE:** THIS FUNCTION DOES NOT TELL THE CONTROL TO COLLECT WELD DATA. IT ONLY ASSIGNS A DATA STORAGE BIN NUMBER. REFER TO THE DATA COLLECTION SAMPLE SIZE AND DATA COLLECTION SAMPLE FREQUENCY SETUP PARAMETERS IN CHAPTER 7 FOR INSTRUCTIONS ON HOW TO SPECIFY DATA COLLECTION.
88	**SEND ALL SAMPLES UNTIL NEXT SPC OFF-SET**	This function tells the processor to begin collecting weld data for all welds. This function should follow the SPC OFFSET function in the weld schedule because it is still necessary to assign a starting bin number. Weld data collection continues until the control executes another schedule containing the SPC OFFSET function (without this function), to reset the global data collection process. This function overrides then global Data Collection Sample Size and Data Collection Sample frequency setup parameters described in Ch. 9: Advanced Topics.
89	**VERIFY CYLINDER #N IS OUT OF RETRACT**	This function is inserted at the beginning of the weld schedule. It checks the status of the mapped Retract Valve output bit. A HIGH bit indicates the gun is out of retraction (closed) and it is OK to proceed with the weld schedule. A LOW bit indicates the gun is in retraction (open). When this occurs, a RETRACT PILOT FAULT is generated and the weld schedule is immediately terminated.
96	**POWER FACTOR LIMIT: HI= NNN LOW= NN**	This function is used to set the Power Factor Range when executing a weld schedule.

FUNC. #	FUNCTION NAME	DESCRIPTION
99	**GOTO SEQ# NN**	This function is an unconditional jump to another weld schedule. It tells the processor to stop the present schedule and continue with the first function in another schedule. This is also known as weld schedule chaining. **NOTE:** THIS FUNCTION CAN BE USED TO SAVE MEMORY IN THE WELD PROCESSOR BY ALLOWING MULTIPLE SCHEDULES TO EXECUTE COMMONLY USED FUNCTIONS. **NOTE:** CAUTION SHOULD BE OBSERVED WHEN USING THIS FUNCTION. AN INFINITE LOOP OF REPEATEDLY INITIATED WELD SCHEDULES CAN BE INADVERTENTLY CREATED IF THE LAST SCHEDULE IN THE CHAIN IS PROGRAMMED TO RETURN TO THE FIRST SCHEDULE IN THE CHAIN. **NOTE:** ONLY THE ORIGINATING WELD SCHEDULE NUMBER IS DISPLAYED IN THE WELD DATA.

WHEN 2 OR MORE WELD SCHEDULES ARE CHAINED TOGETHER USING THE "GO TO SEQ. NN" FUNCTION, AND THE LAST SEQUENCE IN THE CHAIN POINTS TO THE FIRST SEQUENCE IN THE CHAIN, AN INFINITE LOOP IS CREATED. THIS CAN ONLY BE HALTED BY INTERRUPTING THE CONTROL STOP OR BY CYCLING TIMER POWER AFTER ANY SCHEDULE IN THE CHAIN IS INITIATED.

ANALOG PRESSURE CONTROL FUNCTIONS

Program T17300 supports analog I/O through the weld processor integrated ports 1 and 2 (See Figure 1.1 on page -8). For these functions, Valve 1 corresponds to port 1, Valve 2 to port 2.

FUNC. #	FUNCTION NAME	DESCRIPTION
41	**SET VALVE N TOUCH DOWN PRESSURE TO NN**	This function sets a reduced "touch down" pressure for the weld gun to approach and initially touch the work pieces, prior to clamping them and applying the final pressure before welding. This prevents the weld gun from closing too fast and hard on the work pieces. "n" sets the cylinder number: Either #1 or #2. Set the pressure in the range 0 – 99 PSI.
42	**SET VALVE N TIP DRESS PRESSURE TO NN PSI**	This function sets a pressure for the specified weld gun that can be different from the welding or "touch down" pressure settings. This is used when running tip dress schedules. n sets the cylinder number: Either #1 or #2. Set the pressure in the range 0 – 99 PSI.
43	**SET VALVE N CYLINDER PRESSURE NN PSI**	This function sets the final pressure that the cylinder for either weld gun must achieve before welding begins. "n" is the weld gun number, either 1 or 2. Set the final pressure in range 0-99 PSI

FUNC. #	FUNCTION NAME	DESCRIPTION
47	**WAIT NNN CY FOR PRESSURE ACHIEVED**	This function tells the weld control to pause up to the specified number of cycles, until it detects that the valve pressure programmed has been achieved. If more than one valve pressure setting is in the schedule, this function will monitor only the last pressure function it sees. If valve pressure is not achieved after the programmed number of cycles, the control generates a PRESSURE NOT ACHIEVED condition. If the PRESSURE NOT ACHIEVED setup parameter is set to FAULT, the control continues with the schedule in No Weld mode. If set to ALERT, the control continues with the weld sequence in weld mode.

TEST FUNCTIONS

FUNC. #	FUNCTION NAME	DESCRIPTION
39	**TEST FIRE nn% I**	When it executes Function #39, the control will fire one cycle of weld current at the percentage of current programmed. The control monitors and records both the actual current and the power factor during that cycle. The control uses this test fire to determine the initial secondary resistance of the weld, and whether the electrode tips were touching, based on current draw. Other functions (described below) also use the data generated by the test fire.
80	**VERIFY TIPS DOWN EVERY nn CY nn TIMES**	This function lets you verify that the electrode tips are making full contact with the work piece, using the control's dynamic squeeze capabilities. Refer to "Dynamic Squeeze Features" on page 130. During this function, the control fires one cycle of weld current at the percent entered for the Tips Down Test Fire setup parameter, then monitors the weld current provided and the power factor. This is compared to the value programmed in the Tips Down Verified Current setup parameter (described on page 114). If the primary current detected *exceeds* the value programmed, the control proceeds to the next function in the weld schedule. If the primary current is *less* than the value programmed, the control waits for the number of cycles programmed (nn CY), then repeats the test fire. This wait-and-fire process continues up to the programmed number of tries (nn TIMES). If the primary current never reaches the value programmed, the control generates a TIPS NOT TOUCHING fault and schedules in No Weld. (Refer to "Dynamic Squeeze Features" on page 6.)

FUNC. #	FUNCTION NAME	DESCRIPTION
81	**SLOW CYLINDER TEST EVERY nn CY nn TIMES**	This function is similar to the previous function (VERIFY TIPS DOWN), but reports a different fault. It will allow the schedule to execute in Weld mode even when it detects a fault. If the primary current detected by the control *exceeds* the Tips Down Verified Current: nnnn setup parameter, it proceeds to the next function in the weld schedule. If the primary current is *less than* the setup parameter, the control waits the number of cycles programmed (nn CY), then repeats the test fire. If the primary current never reaches the setup parameter limit, the control will continue the schedule in Weld mode, but generates a SLOW CYLINDER fault to indicate the condition.
91	**FAULT IF TIPS TOUCHING**	This function generates a fault condition if the test fire from Function #39 (above) determined that the welding electrodes were touching. These conditions must be true when using this function: • Function #39 (TEST FIRE nn% CURRENT) MUST appear in the weld sequence. • Function #91 must appear after the test fire function (#39) in the weld sequence. • Function #92 (FAULT IF TIPS NOT TOUCHING) cannot appear in the weld sequence. When it executes Function #39, the control monitors the actual weld current. If the control detected *more than* 10 A. primary current, it assumes that the electrode tips *were* touching and generates a TIPS TOUCHING fault. **NOTE:** IF FUNCTION #39 APPEARS MORE THAN ONCE IN A SEQUENCE, THE CONTROL USES THE DATA FROM THE MOST RECENTLY-EXECUTED TEST FIRE.

FUNC. #	FUNCTION NAME	DESCRIPTION
92	**FAULT IF TIPS NOT TOUCHING**	This function can generate a fault condition if the control determines that the welding electrodes are NOT touching. These conditions MUST be true when using this function: • Function #39 (TEST FIRE nn% CURRENT) must appear in the weld sequence. • Function #92 must appear after the test fire function (#39) in the weld sequence. • Function #91 (FAULT IF TIPS TOUCHING) cannot appear in the weld sequence. When Function #39 executes, the actual weld current during that one cycle weld is monitored. If *less than* 10 A. primary current is detected, the control assumes that the electrode tips were NOT touching. It generates a TIPS NOT TOUCHING fault.
93	**INITIAL PF LIMIT: HI=nn% LOW=nn%**	This function is used to generate a fault condition if the initial power factor read during the test fire function (#39) does not fall within the high and low limits programmed in this function. The following conditions must be true when using this function: • Function #39 must appear in the weld schedule. • This must appear after the test fire function (#39) in the weld schedule. If the power factor read during the test fire was not within the range programmed, the control generates an INITIAL P.F. OUT OF RANGE fault.

FUNC. #	FUNCTION NAME	DESCRIPTION
98	**GO TO SEQ SEQ #MM IF CURRENT LESS THAN NNNN**	This function determines if the current provided during the test fire portion of the schedule will be sufficient to make a good weld. These conditions must be true when using this function: • Function #39 must appear in the weld schedule and This function must appear after the test fire function (#39) in the weld schedule. **NOTE:** FUNCTION #98 MAY APPEAR IN A SCHEDULE MORE THAN ONCE, TO ALLOW SETTING-UP FOR DIFFERENT WELDING REQUIREMENTS.

DEFAULT WELD SCHEDULES

ROBOT MODE

SCHEDULE #	FUNC. #	DESCRIPTION
1-15	00	START OF SCHEDULE #N
	82	LINEAR STEPPER #1 ASSIGNED (0 = OFF)
	76	SEC. CURR LIMITS: HI=00000 LOW=99990
	90	TRANSFORMER TURNS RATIO 100:1
	54	TURN ON VALVE #1
	52	TURN ON ISOLATION CONTACTOR
	1	SQUEEZE 30 CYCLES.
	30	WELD 10 CYCLES 50 AMPS
	78	PROCESS WELD FAULTS
	3	HOLD 5 CYCLES
	85	WAIT FOR NO INITIATE IF FAULT
	55	TURN OFF VALVE #1
	53	TURN OFF ISOLATION CONTACTOR
	100	END OF SCHEDULE

NOTE: Schedule # 16-99 (Blank)

MACHINE MODE

SCHEDULE #	FUNC. #	DESCRIPTION
1-15	00	START OF SCHEDULE #N
	82	LINEAR STEPPER #1 ASSIGNED (0 = OFF)
	76	SEC. CURR LIMITS: HI=00000 LOW=99990
	90	TRANSFORMER TURNS RATIO 100:1
	58	TURN ON WELD IN PROGRESS
	52	TURN ON ISOLATION CONTACTOR
	1	SQUEEZE 30 CYCLES.
	30	WELD 10 CYCLES 50 AMPS
	78	PROCESS WELD FAULTS
	3	HOLD 5 CYCLES
	50	TURN ON WELD COMPLETE
	59	TURN OFF WELD IN PROGRESS
	75	EXTEND UNTIL NO INITIATE
	51	TURN OFF WELD COMPLETE
	53	TURN OFF ISOLATION CONTACTOR
	100	END OF SCHEDULE

NOTE: Schedule # 16-99 (Blank)

GUN MODE

SCHEDULE #	FUNC. #	DESCRIPTION
1-15	00	START OF SCHEDULE #N
	76	SEC. CURR LIMITS: HI=00000 LOW=99990
	90	TRANSFORMER TURNS RATIO 100:1
	54	TURN ON VALVE #1
	5	INITIAL SQUEEZE 25 CYCLES
	62	REPEAT (AT NEXT FUNCTION)
	82	LINEAR STEPPER #1 ASSIGNED (0 = OFF)
	54	TURN ON VALVE #1
	1	SQUEEZE 30 CYCLES.
	30	WELD 10 CYCLES 50 AMPS
	78	PROCESS WELD FAULTS
	3	HOLD 5 CYCLES
	55	TURN OFF VALVE #1
	4	OFF 20 CYCLES
	100	END OF SCHEDULE

NOTE: THE TIP DRESS DEFAULT SCHEDULES ARE SPECIFICALLY DESIGNED SO THAT NO WELDING CAN TAKE PLACE WHEN THEY ARE INITIATED. IF A WELD FUNCTION IS INADVERTENTLY INSERTED INTO EITHER SCHEDULE, THEY ARE IGNORED AND NO CURRENT IS PASSED.

Chapter 5: FAULTS AND SETUP PARAMETERS

The MedWeld 4000 provides a number of programmable ***setup parameters***. They allow for customizing the control to meet your application requirements.

These parameters "inform" the control about its operating environment. They also define the hardware (such as the type of transformer used and its turns ratio), and describe acceptable limits on the ranges of weld parameters (such as secondary current, power factor and C-factor).

Some parameters define the severity of fault conditions (as either FAULT or ALERT). They tell the control how to respond when it detects a fault condition:

- ***FAULT*** tells the control to turn OFF the NO FAULT output, or turn ON the FAULT output. This indicates that a fault condition was detected.
- Fault conditions normally inhibit initiation of a weld schedule. (Refer to the Initiation On Fault setup parameter on page 117.)
- ***ALERT*** tells the control to activate the ALERT output. An alert condition generally will not inhibit initiating a weld schedule.
- ***NONE*** tells the control to log that the condition was detected, but neither output is activated. This condition will not inhibit initiation of a weld schedule.

Parameter settings are programmable (with some exceptions). However, the *list* of parameters is fixed. You CANNOT remove a parameter from this list.

You can change the value assigned to a parameter from the DEP-*100 Series* Programming Device, *WSS* (Weld Support System) or *WebVIEW*. (Refer to "Programming the Weld Processor" on page 25 for further information on these programming options.)

TO PROTECT THE OPERATOR OR EQUIPMENT, SOME PARAMETERS ARE NOT PROGRAMMABLE. FOR THESE, YOU CANNOT CHANGE THE SETTING OR VALUE.

The following section shows each setup parameter as displayed at the programming device, along with all of the possible settings. For example, if a parameter is always defined as a fault condition, (FAULT) will appear. If it can be changed to an alert condition, you will see (FAULT) (ALERT).

If a parameter is a numeric value, this manual lists the default setting of that value. The acceptable range of values will also appear in parentheses.

PROGRAMMABLE FAULTS

FAULT	OPTIONS & DEFAULTS	POSSIBLE CAUSES	SOLUTIONS
WELD INITIATE NOT PRESENT	FAULT/ ALERT DEFAULT: ***FAULT***	Occurs: 1. If the weld schedule is using the function TURN ON WELD COMPLETE, the MedWeld 4000 expects the INITIATE WELD input to remain active while executing the weld schedule. If this input is not active when the weld control executes the function TURN ON WELD COMPLETE, the control generates this condition. If the weld schedule does not contain the TURN ON WELD COMPLETE function, the control does not generate this fault/ alert condition. 2. If function #61 (ABORT IF NO INITIATE FOR nnnn CYCLES) is used in the weld schedule and the Weld Initiate bit goes LOW within the amount of time programmed in the function.	1. This is a pre-weld check. Ensure the master controller (i.e. robot, PLC, etc.) is maintaining the Weld Initiate bit HIGH during the time function #61 is monitoring the bit. 2. Ensure the master controller (i.e. robot, PLC, etc.) is maintaining the Weld Initiate bit HIGH until function #50 is executed in the weld schedule.
CONTROL STOP	FAULT/ ALERT DEFAULT: ***FAULT***	Occurs when: 1. The Control Stop input (normally HIGH) goes LOW anytime during the execution of a weld schedule. 2. The CONTROL STOP input from the operator panel was not active when the control tried to initiate a weld. 3. The external wiring feeding the Control Stop (CS) voltage is open, causing a loss of input voltage. 4. Check the robot or PLC ladder to verify that the control stop input is being held HIGH throughout the weld schedule.	1. Ensure any manual control stop push buttons associated with the control are closed or that any light curtains are not broken. The Control Stop input bit should never go LOW unless a legitimate Control Stop event has occurred. 2. Check the robot or PLC ladder to verify that the control stop input is being held HIGH throughout the weld schedule. 3. Check the wiring to verify that 24 VDC is being provided to the CONTROL STOP input.

FAULT	OPTIONS & DEFAULTS	POSSIBLE CAUSES	SOLUTIONS
STEPPER APPROACHING MAX	FAULT/ ALERT/ NONE DEFAULT: ***ALERT***	Occurs when a weld schedule is assigned to a linear stepper, this fault indicates that the stepper has begun the final step of the assigned stepper.	The electrodes will soon need maintenance. Dress or replace the electrodes to avoid the END OF STEPPER fault condition.
END OF STEPPER	FAULT/ ALERT DEFAULT: ***FAULT***	The End of Stepper fault indicates that a stepper has completed the last weld in the final step of the assigned stepper.	Perform a tip dress or change as required and reset the stepper.
SUREWELD TREND LIMIT	FAULT/ ALERT DEFAULT: ***ALERT***		

FAULT	OPTIONS & DEFAULTS	POSSIBLE CAUSES	SOLUTIONS
HIGH CURRENT LIMIT FAULT	FAULT/ ALERT DEFAULT: ***FAULT***	The weld control detects that the current fired during the weld schedule exceeded the value programmed in the HIGH CURRENT LIMIT WINDOW% in the Setup Parameters or function #76 (SEC. CURR LIMITS: HI = nnnn0 LOW = nnnn0) or # 84 (WINDOW: HI= nn% LOW= nn% C-FACTOR =nnn). This can be caused by: 1. The limit is set too low. 2. Welder impedance is lower than it was when the current limit was set. The welder may be drawing more current that the originally calculated maximum. 3. Pressure being maintained to the tips changed during the weld, so less pressure to the welding spot was provided. The weld processor will compensate and possibly generate a HIGH CURRENT LIMIT fault. 4. Incorrect measurement of the primary current. (Since both the weld processor and the firing card are involved in current measurement, certain failures on one of these cards may cause this fault to occur.) 5. Expulsion caused reduction in the weld resistance. (This may cause the current to exceed the calculated maximum.)	1. Ensure the percentage value programmed into HIGH CURRENT LIMIT WINDOW% in the Setup Parameters is correct for the welding application. 2. Check for improper installation of either a kickless cable or shunt cable. 3. With a pressure gauge, verify that constant pressure is being maintained. Check for things affecting pressure (such as hoses binding in the weld gun tooling, faulty or sticky solenoid valves or slow-moving cylinders. 4. Check for loose wiring at the J3 connector on the firing card. 5. Secure the cable that runs between the firing card and the processor. Check for bad connector. Replace as necessary. 6. Ensure the value programmed into TRANSFORMER TURNS RATIO in the Setup Parameters is correct for the welding application. 7. If using %I weld function without function #76 (sec. curr limits: Hi-nnnn0 Low=nnnn0), ensure the nominal C-factor in setup parameters or function #84 is set properly. 8. Adjust the schedule to reduce expulsion while maintaining sufficient current to provide a good weld.

FAULT	OPTIONS & DEFAULTS	POSSIBLE CAUSES	SOLUTIONS
LOW CURRENT LIMIT FAULT	FAULT/ ALERT DEFAULT: ***FAULT***	Occurs when: 1. The weld processor detects that the current fired during the weld schedule was less than the value programmed into the LOW CURRENT LIMIT WINDOW% in the Setup Parameters or function #76 (SEC. CURR LIMITS: HI = nnnn0 LOW = nnnn0) or function #84 (WINDOW: HI= nn% LO= nn% C-FACTOR =nnn). This can be caused by: 1. Limit is set too high. 2. Unusual condition in the secondary. 3. Incorrect measurement of the primary current. (Since both the weld processor and the firing card are involved in current measurement, certain failures on one of these cards may cause this fault to occur.)	1. Ensure the LOW value programmed into either function #76 (SEC. CURR LIMITS: HI = nnnn0 LOW = nnnn0) or function #84 (WINDOW: HI= nn% LOW= nn%) in the weld schedule is correct for the welding application (if used). 2. Ensure the value programmed into TRANSFORMER TURNS RATIO in the Setup Parameters is correct for the welding application. 3. If using %I weld function without function #76 (Sec. Curr limits: Hi-nnnn0 Low=nnnn0), ensure the nominal C-factor in setup parameters or function #84 is set properly. 4. Check the secondary. Look for dirty material, bad kickless cables or shunts, tip alignment, loose connections or reduced weld force due to hoses binding in the weld gun tooling, faulty or sticking solenoid valves or slow moving cylinders. 5. Check for loose wiring at the J3 connector on the firing card. 6. Secure the cable that runs between the firing card and the processor. Check for bad connector. Replace as necessary. 7. Replace the firing card. 8. Replace the processor card.

FAULT	OPTIONS & DEFAULTS	POSSIBLE CAUSES	SOLUTIONS
SCR MISFIRE	FAULT/ ALERT DEFAULT: ***FAULT***	This fault occurs when the weld processor detects conduction on one half-cycle and no conduction on the next half-cycle. This can be caused by: 1. Arcing occurs during the weld functions. 2. Faulty Wiring. (For example the gate and cathode wires are swapped) 3. Insufficient Squeeze time in the weld schedule. (Metal is expelled at the electrode/ material interface.) 4. Poor part fit-up or insufficient pressure. (Metal is being expelled at the faying surface.) 5. Isolation contactor is dropping out early or coming in late. 6. Faulty firing card.	1. Check all wiring connections. Verify that they are secure and correct. 2. Program additional squeeze time in the selected schedule. 3. Try up-sloping or inserting a preheat function (at a low% current) to try to form part fit-ups. Verify sufficient OFF time before the weld function in the weld schedule (typically 20 CY). Also try increasing weld pressure. 4. Correct isolation contactor program or relay logic circuit. 5. Replace firing card.
SLOW CYLINDER FAULT	FAULT/ ALERT DEFAULT: ***ALERT***	The cylinder exceeded the time allowed for closing. When the control executes the function SLOW CYLINDER TEST EVERY nn CYC. nn TIMES, and it detects that primary current has never reached the value programmed in the Tips Down Verified Current: setup parameter. (The control repeats the test fire the number of tries programmed in this function.) Refer to "Dynamic Squeeze Features" on page "Dynamic Squeeze Features" on page 130.	1. Check the values programmed in the Tips Down Verified Current setup parameters are correct for the application. 2. Check for sticking gun cylinder. Remedy as required.

FAULT	OPTIONS & DEFAULTS	POSSIBLE CAUSES	SOLUTIONS
INITIAL P.F. OUT OF RANGE	FAULT/ ALERT DEFAULT: ***ALERT***	This condition is generated when the power factor detected while executing a weld schedule does not fall within the range defined by the High and Low Power Factor Limit setup parameters. 1. The inductance of the welding circuit was changed. 2. Incorrect measurement of power factor. 3. Current coil resistor on firing card or load resistor on SCR assembly is not connected properly. 4. Power factor values programmed incorrectly.	1. Check for any changes in the secondary loop. 2. Make sure the current wires and voltage sense leads are secure, with the correct terminals of the firing card. 3. Confirm that resistor(s) are properly seated and connected. 4. Check the power factor settings.
POWER FACTOR LIMIT	FAULT/ ALERT DEFAULT: ***ALERT***	This condition is generated when the power factor detected while executing a weld schedule does not fall within the range defined by the High and Low Power Factor Limit setup parameters or Function #96 - Power Factor Limit. This can be caused by: 1. Poor part fit-up, arching and problems with factors such as gun timing. 2. Any variation in the welding circuit inductance is reflected in the power factor. 3. Incorrect measurement of power factor. 4. Power factor values are programmed incorrectly. **NOTE:** FUNCTION #96 PERMITS OVERRIDING THE SETUP PARAMETER FOR POWER FACTOR LIMITS.	1. Check for any changes in the secondary loop. 2. Make sure the current wires and voltage sense leads are secure, with the correct terminals of the firing card. 3. Check the power factor settings.

FAULT	OPTIONS & DEFAULTS	POSSIBLE CAUSES	SOLUTIONS
VOLTAGE COMPENSATION LIMIT	FAULT/ ALERT DEFAULT: ***ALERT***	This fault indicates that the weld control could not fully compensate for a drop or surge in supply line voltage. (The processor can provide weld current in a range from 20% to 99%I. However, AVC faults may occur if the programmed range is at or near these limits.) 1. Check the nominal contactor voltage setup parameter. 2. Too much load on the line when attempting the weld. 3. Adjust tap settings on the weld transformer, and/or adjust weld heat away from extreme values. 4. Steppers are pushing the total % current (programmed current + boost) over the threshold.	1. Try recalculating the nominal contactor voltage setting. 2. Check line voltage. 3. Heat may be set at too high or low % current for the control to compensate for line voltage variations. Avoid programming values of 20 %I or secondary current that is too low. 4. Confirm that resistor(s) are properly seated and connected. 5. Adjust the stepper boost.
LOW LINE VOLTAGE	FAULT/ ALERT DEFAULT: ***ALERT***	This fault indicates that the weld initiate was removed or time expired while the control waited for the programmed line voltage (in Function #72 or #73). This can be caused by: 1. Overloading of the weld bus. 2. Brown-outs of the power source.	1. Re-distribute weld bus load. 2. Measure bus voltage with no load. Ensure that it is providing the necessary voltage. (Confirm this by observing the low line voltage on the Weld Data display of the DEP.) 3. Check the power factor settings.

FAULT	OPTIONS & DEFAULTS	POSSIBLE CAUSES	SOLUTIONS
EXTENDED WELD	FAULT/ ALERT DEFAULT: ***ALERT***	This fault indicates that the control had to restart the weld schedule due to insufficient secondary current during the weld. Occurs when: 1. Low current limit is set too high. 2. There is an unusual condition in the secondary. 3. Incorrect measurement of the primary current. (Both the weld processor and the firing card are involved in current measurement) A failure on one of these cards may cause this fault to occur. 4. If function #94 is used and the extend weld (re-weld) is successful, an EXTENDED WELD (ALERT) will occur and the Weld Complete bit will go HIGH. If the extend weld (re-weld) is unsuccessful, both an EXTENDED WELD ALERT and LOW CURRENT LIMIT FAULT will occur and the Weld Complete bit will stay LOW. **NOTE:** This fault must be set to (ALERT) for the Weld Complete bit to go HIGH after a successful extend weld (re-weld). Otherwise, if set to (FAULT), the Weld Complete bit will stay LOW.	1. Re-program the Low Current Limit setup parameter. 2. Check for improper part fit-up, dirty material, worn electrodes, bad kickless cables or shunts, or loose connections in the secondary circuit. 3. Check for loose wiring at the J3 connector on the firing card. 4. Secure the cable that runs between the firing card and the processor. Check for bad connector. Replace as necessary. 5. If using function #94, see corrective action for LOW CURRENT LIMIT FAULT. 6. If using function #95 ensure the programmed current value is correct for the welding application.

FAULT	OPTIONS & DEFAULTS	POSSIBLE CAUSES	SOLUTIONS
CURRENT REGULATION LIMIT	FAULT/ ALERT/ NONE DEFAULT: ***ALERT***	The secondary current provided to a weld is monitored each cycle during an ACC weld function to provide the desired current to a weld. If necessary, the control adjusts the current provided based on the current read during the previous cycle. This fault occurs if the control could not fully compensate for a drop or surge in supply line voltage or for an excessive secondary resistance. In trying to maintain consistent output during the execution of function #30, the control may have required to phase fire above 99% current or below 20% current to achieve the desired target current.	1. Verify the control detects current while firing function #30. Most often this fault is caused by programming a sloping function that starts too low. Current regulation limits are often achieved at the low end (below 20% of maximum current). Also, if the control is programmed with a level of current that is beyond 99% of the maximum available, the current regulation limit fault will also be detected. 2. Ensure that the electrodes and are making contact with pressure and NO insulation material is present on the part between the electrodes. 3. Using a weld meter determine if the secondary current matches the weld control's current reading.
BATTERY FAULT	*Not Supported.*		
HIGH C-FACTOR LIMIT	FAULT/ ALERT DEFAULT: ***FAULT***	This fault indicates that the actual C-Factor read during the weld exceeded the values programmed in the C-Factor function #97 (C-FACTOR LIMIT: HI= nnnn LO= nnnn). This can be caused by: 1. Unusual conditions in the secondary. 2. The High C-Factor Limit was programmed too low.	1. Ensure the "HI" value programmed into function #92 is correct for the welding application. 2. High C-Factor Limit usually indicates current shunting is occurring in the secondary circuit. This can be caused by current shunting paths. See "C-Factor" on page 124 for more information.

FAULT	OPTIONS & DEFAULTS	POSSIBLE CAUSES	SOLUTIONS
LOW C-FACTOR LIMIT	FAULT/ ALERT DEFAULT: ***ALERT***	This fault indicates that the C-Factor read during the weld part of the schedule fell below the value programmed in function #97 (C-FACTOR LIMIT: HI= nnnn LO= nnnn). This can be caused by: 1. Unusual conditions in the secondary. 2. The Low C-Factor limit was programmed too high. 3. Tips closing too slowly, due to dirty or poorly lubricated cylinder.	1. Check for worn cables, loose connections. low air pressure or other causes of decreased secondary current. 2. Lower the C-factor limit. 3. Check for sticking gun cylinder.
LOW C-FACTOR LIMIT	FAULT/ ALERT DEFAULT: ***ALERT***	This fault indicates that the C-Factor read during the weld part of the schedule fell below the value programmed in function #97 (C-FACTOR LIMIT: HI= nnnn LO= nnnn). This can be caused by: 1. Unusual conditions in the secondary. 2. The Low C-Factor limit was programmed too high. 3. Tips closing too slowly, due to dirty or poorly lubricated cylinder.	1. Check for worn cables, loose connections. low air pressure or other causes of decreased secondary current. 2. Lower the C-factor limit. 3. Check for sticking gun cylinder.

FAULT	OPTIONS & DEFAULTS	POSSIBLE CAUSES	SOLUTIONS
WELD INTERRUPTION	FAULT/ ALERT DEFAULT: ***FAULT***	Occurs when: 1. The control entered a No Weld mode while executing a weld schedule. 2. The circuit breaker on the weld control is switched OFF while the weld control is passing current during the execution of a weld schedule. The fault will appear when the circuit breaker is switched back ON and the weld processor re-initializes. 3. If the WTC weld processor loses communication while the control is executing a schedule. 4. Incorrect or loose wiring to the input module. 5. Faulty input module.	1. Check the robot or PLC ladder to verify that the input is being held HIGH throughout the weld schedule. 2. Ensure weld gun is not opening early. Check for intermittent open connection in the weld tooling (primary or secondary). 3. Clear fault and cycle power. 4. Check for proper I/O designations. Verify that all wiring connections are secure. 5. Replace input module.

FAULT	OPTIONS & DEFAULTS	POSSIBLE CAUSES	SOLUTIONS
WELD PROCEED	FAULT/ ALERT DEFAULT: ***FAULT***	This fault is generated if the WELD PROCEED input did not become active when required by the control, or it was removed while the control was executing a schedule. Occurs when: 1. Either function #70 (WAIT nnn CY FOR WELD PROCEED) or function # 71 (WAIT FOR WELD PROCEED) is used in the weld schedule and the originally initiated Schedule Pilot bit goes LOW before the Weld Proceed bit goes HIGH. 2. Faulty robot or PLC ladder logic. 3. Incorrect or loose wiring to the input module. 4. Faulty input module. 5. Faulty weld processor card. **NOTE:** WHEN THE CORRESPONDING SETUP PARAMETER IS SET TO FAULT, THE CONTROL WILL NOT WELD AND GENERATE A FAULT. WHEN THE CORRESPONDING SETUP PARAMETER IS SET AS AN ALERT, THE CONTROL WILL WELD AND GENERATE AN ALERT.	1. Check the ladder logic to verify that the input is being activated. 2. Check for proper I/O designations. Check to make sure all wiring connections are secure. 3. Replace input module.

FAULT	OPTIONS & DEFAULTS	POSSIBLE CAUSES	SOLUTIONS
PRESSURE SWITCH	FAULT/ ALERT DEFAULT: ***ALERT***	Occurs when: 1. function #69 (WAIT FOR PRESSURE SWITCH INPUT) is used in the weld schedule and the Weld Initiate bit goes LOW before the Pressure Switch bit goes HIGH. 2. function #68 (WAIT nnnn MS FOR PRESSURE SWITCH INPUT) is used in the weld schedule and the Pressure Switch bit does not go HIGH within the amount of time programmed in the function. 3. Faulty robot or ladder logic. 4. Loose or incorrect wiring to the input module. 5. Faulty input module. **NOTE:** WHEN THE CORRESPONDING SETUP PARAMETER IS SET TO FAULT, THE CONTROL WILL NOT WELD AND GENERATE A FAULT. WHEN THE CORRESPONDING SETUP PARAMETER IS SET AS AN ALERT, THE CONTROL WILL WELD AND GENERATE AN ALERT.	1. Check analog feedback circuit for problems. 2. Check ladder logic to verify that the input is being activated. 3. Check for proper I/O designations. Check to make sure all wiring connections are secure 4. Check for mechanical problems with the weld gun related to air pressure, e.g. water in air lines, pressure regulator set too low, etc. 5. Check sequence initiated. If the pressure select input is not required, remove the function checking the input. 6. If the function is required, check the switch, contact or device providing the input. 7. If the error was caused by the initiates being removed while waiting for the input, check the initiates. 8. Replace input module if found faulty.

FAULT	OPTIONS & DEFAULTS	POSSIBLE CAUSES	SOLUTIONS
RETRACT PILOT	FAULT / ALERT DEFAULT: ***ALERT***	This fault indicates the weld gun was open (full retract) position when checked by the weld control. When this condition occurs the control will abort the schedule and generate this fault. Occurs during the welding sequence when: 1. Function #89 (VERIFY CYLINDER #n IS OUT OF RETRACT) is inserted in the weld schedule, and the weld gun position is open or full retract (Retract Valve output bit LOW) instead of partial retract (Retract Valve output HIGH) when the weld schedule is initiated. 2. Operator error. 3. Either the Retract Mode or the Cylinder Type setup parameters were changed and the control must be reset. 4. Loose or incorrect wiring to the input module. 5. Faulty input module. 6. Faulty weld processor card.	1. Ensure the input was activated when required by the operator. 2. Cycle power to the control to reset it. (The control ignores changes to these settings until power is cycled.) 3. Check for proper I/O designations. Check to make sure all wiring connection are secure. 4. Replace input module. 5. Replace weld processor. *See "Retract Features" on page 137.*

FAULT	OPTIONS & DEFAULTS	POSSIBLE CAUSES	SOLUTIONS
WELDER CURRENT SHUNTING	FAULT/ ALERT DEFAULT: ***ALERT***	This fault is generated when the control detects that a shorted SCR condition occurred for 3 or more consecutive cycles, but less than the programmed value, in the Shorted SCR Cycle Limit setup parameter. 1. Back-feeding EMF is causing a voltage drop across the transformer, but no measurable current is flowing in the primary. 2. In a multi-gun configuration, guns from two different transformers or controls are touching or conducting through the work piece. 3. Improper grounding of welding tool.	1. Check for touching weld guns. Remedy as necessary. 2. Insure proper grounding of the transformer, fixture and control.
CONTROL IN NO WELD	FAULT/ ALERT DEFAULT: ***ALERT***	Occurs when the weld control moves from weld mode to no weld mode during a weld schedule. This fault is also generated if the weld control receives a weld initiate while in No Weld mode (i.e. the Weld / No Weld bit is LOW). This can be caused by: 1. Robot or PLC ladder logic deactivated the WELD/NO WELD input. 2. Data entry device is programmed in No Weld mode. 3. Loose or incorrect wiring to the input module. 4. Faulty input or output module.	1. Check robot or PLC ladder to verify that the input is being held HIGH throughout the schedule. . 2. Verify the data entry device is in Weld Mode. 3. Check for proper I/O designations. Check to make sure all wiring connections are secure. 4. Faulty input or output module.

FAULT	OPTIONS & DEFAULTS	POSSIBLE CAUSES	SOLUTIONS
HIGH CURRENT LIMIT FAULT	FAULT/ ALERT DEFAULT: ***FAULT***	The weld control detects that the current fired during the weld schedule exceeded the value programmed in the HIGH CURRENT LIMIT WINDOW% in the Setup Parameters or function #76 (SEC. CURR LIMITS: HI = nnnn0 LOW = nnnn0) or # 84 (WINDOW: HI= nn% LOW= nn% C-FACTOR =nnn). This can be caused by: 1. The limit is set too low. 2. Welder impedance is lower than it was when the current limit was set. The welder may be drawing more current that the originally calculated maximum. 3. Pressure being maintained to the tips changed during the weld, so less pressure to the welding spot was provided. The weld processor will compensate and possibly generate a HIGH CURRENT LIMIT fault. 4. Incorrect measurement of the primary current. (Since both the weld processor and the firing card are involved in current measurement, certain failures on one of these cards may cause this fault to occur.) 5. Expulsion caused reduction in the weld resistance. (This may cause the current to exceed the calculated maximum.)	1. Ensure the percentage value programmed into HIGH CURRENT LIMIT WINDOW% in the Setup Parameters is correct for the welding application. 2. Check for improper installation of either a kickless cable or shunt cable. 3. With a pressure gauge, verify that constant pressure is being maintained. Check for things affecting pressure (such as hoses binding in the weld gun tooling, faulty or sticky solenoid valves or slow-moving cylinders. 4. Check for loose wiring at the J3 connector on the firing card. 5. Secure the cable that runs between the firing card and the processor. Check for bad connector. Replace as necessary. 6. Ensure the value programmed into TRANSFORMER TURNS RATIO in the Setup Parameters is correct for the welding application. 7. If using %I weld function without function #76 (sec. curr limits: Hi-nnnn0 Low=nnnn0), ensure the nominal C-factor in setup parameters or function #84 is set properly. 8. Adjust the schedule to reduce expulsion while maintaining sufficient current to provide a good weld.

FAULT	OPTIONS & DEFAULTS	POSSIBLE CAUSES	SOLUTIONS
LOW CURRENT LIMIT FAULT	FAULT/ ALERT DEFAULT: ***FAULT***	Occurs when: 1. The weld processor detects that the current fired during the weld schedule was less than the value programmed into the LOW CURRENT LIMIT WINDOW% in the Setup Parameters or function #76 (SEC. CURR LIMITS: HI = nnnn0 LOW = nnnn0) or function #84 (WINDOW: HI= nn% LO= nn% C-FACTOR =nnn). This can be caused by: 1. Limit is set too high. 2. Unusual condition in the secondary. 3. Incorrect measurement of the primary current. (Since both the weld processor and the firing card are involved in current measurement, certain failures on one of these cards may cause this fault to occur.)	1. Ensure the LOW value programmed into either function #76 (SEC. CURR LIMITS: HI = nnnn0 LOW = nnnn0) or function #84 (WINDOW: HI= nn% LOW= nn%) in the weld schedule is correct for the welding application (if used). 2. Ensure the value programmed into TRANSFORMER TURNS RATIO in the Setup Parameters is correct for the welding application. 3. If using %I weld function without function #76 (Sec. Curr limits: Hi-nnnn0 Low=nnnn0), ensure the nominal C-factor in setup parameters or function #84 is set properly. 4. Check the secondary. Look for dirty material, bad kickless cables or shunts, tip alignment, loose connections or reduced weld force due to hoses binding in the weld gun tooling, faulty or sticking solenoid valves or slow moving cylinders. 5. Check for loose wiring at the J3 connector on the firing card. 6. Secure the cable that runs between the firing card and the processor. Check for bad connector. Replace as necessary. 7. Replace the firing card. 8. Replace the processor card.

FAULT	OPTIONS & DEFAULTS	POSSIBLE CAUSES	SOLUTIONS
SLOW CYLINDER FAULT	FAULT/ ALERT DEFAULT: ***ALERT***	The cylinder exceeded the time allowed for closing. When the control executes the function SLOW CYLINDER TEST EVERY nn CYC. nn TIMES, and it detects that primary current has never reached the value programmed in the Tips Down Verified Current: setup parameter. (The control repeats the test fire the number of tries programmed in this function.) Refer to "Dynamic Squeeze Features" on page "Dynamic Squeeze Features" on page 130.	1. Check the values programmed in the Tips Down Verified Current setup parameters are correct for the application. 2. Check for sticking gun cylinder. Remedy as required.
INITIAL P.F. OUT OF RANGE	FAULT/ ALERT DEFAULT: ***ALERT***	This condition is generated when the power factor detected while executing a weld schedule does not fall within the range defined by the High and Low Power Factor Limit setup parameters. 1. The inductance of the welding circuit was changed. 2. Incorrect measurement of power factor. 3. Current coil resistor on firing card or load resistor on SCR assembly is not connected properly. 4. Power factor values programmed incorrectly.	1. Check for any changes in the secondary loop. 2. Make sure the current wires and voltage sense leads are secure, with the correct terminals of the firing card. 3. Confirm that resistor(s) are properly seated and connected. 4. Check the power factor settings.
BATTERY FAULT	*Not Supported.*		

FAULT	OPTIONS & DEFAULTS	POSSIBLE CAUSES	SOLUTIONS
WELD INTERRUPTION	FAULT/ ALERT DEFAULT: ***FAULT***	Occurs when: 1. The control entered a No Weld mode while executing a weld schedule. 2. The circuit breaker on the weld control is switched OFF while the weld control is passing current during the execution of a weld schedule. The fault will appear when the circuit breaker is switched back ON and the weld processor re-initializes. 3. If the WTC weld processor loses communication while the control is executing a schedule. 4. Incorrect or loose wiring to the input module. 5. Faulty input module.	1. Check the robot or PLC ladder to verify that the input is being held HIGH throughout the weld schedule. 2. Ensure weld gun is not opening early. Check for intermittent open connection in the weld tooling (primary or secondary). 3. Clear fault and cycle power. 4. Check for proper I/O designations. Verify that all wiring connections are secure. 5. Replace input module.

NON-PROGRAMMABLE (HIDDEN) FAULTS

The following is a list of standard non-programmable faults in the *MedWeld* 4000. Their default values are fixed and cannot be changed. Since these faults are non-programmable, they are hidden from view in the DEP-*100 Series* View Setups Menu.

FAULT NAME	POSSIBLE CAUSE	SOLUTION
INVALID SEQUENCE SELECTED	1. The weld initiate was on but no BINARY SELECT inputs were active. 2. Incorrect or loose wiring at the input module.	1. Turn ON the BINARY SELECT input(s) required. 2. Check the wiring diagram for proper I/O designations. Verify that all wiring connections are secure.
TIPS NOT TOUCHING **TIPS TOUCHING**	These two conditions are mutually exclusive. (Both cannot occur within one weld schedule.) Causes that can generate these faults: 1. If the schedule contains the test fire function (#39) and the function FAULT IF TIPS TOUCHING, AND the control detects *more than* 10 A. of primary current during the test fire, the control assumes that the tips were *closed*. It then generates the TIPS TOUCHING fault. 2. If the schedule contains the test fire function and the function FAULT IF TIPS NOT TOUCHING, AND the control detects *less than* 10 A. of primary current during the test fire, the control assumes that the tips were *open*. It generates the TIPS NOT TOUCHING fault. 3. If the weld schedule contains the function VERIFY TIPS DOWN EVERY nn CYC nn TIMES, and the control performs the maximum number of test fires without reaching the desired current value (in the Tips Down Verified Current: nnnn setup parameter), it generates a TIPS NOT TOUCHING fault. (Refer to "Dynamic Squeeze Features" on page 7-6.) 4. Tips closing (or opening) too slowly, due to dirty or poorly lubricated cylinder or stuck tips. 5. Incorrect schedule timing. 6. Improper threshold programming. 7. Faulty cylinder.	1. Check for sticking gun cylinder. Remedy as required. 2. Check robot or ladder logic schedule timing. 3. Adjust threshold in setup parameters or functions. 4. Replace or repair cylinder.

FAULT NAME	POSSIBLE CAUSE	SOLUTION
ISO CNTR OFF WHEN NEEDED	This fault is generated when the control detects that the isolation contactor is open when it is trying to execute a weld function. (The contactor must be closed to provide weld current.) On detecting this condition, the control finishes the schedule in No Weld and generates this fault condition. If the control is in No Weld mode, it does not generate a fault.	1. Ensure function #52(TURN ON ISOLATION CONTACTOR) is in the weld schedule and inserted before the squeeze function. 2. Verify that the isolation contactor coil is receiving 120 VAC. Replace the isolation contactor if the coil is receiving 120 VAC but not closing. Troubleshoot the coil control signal if 120 VAC not present. 3. Use the I/O Status display on the DEP *100 Series* to verify that the inputs are High (1) when required. 4. Verify that the Ready to Weld signal was High (1) when required. 5. Check fuses, replace as necessary.
ISO CNTR ERR-BRKR TRIPPED	This fault is generated when the MedWeld 4000 trips the Circuit Breaker because the Isolation Contactor is CLOSED without a valid command signal. An example is a contactor stuck closed at the end of a weld schedule, after the TURN OFF ISOLATION CONTACTOR function is executed. When this fault occurs, the weld processor trips the CIRCUIT BREAKER and powers down the weld control. Following attempts to restore power without correcting the cause of the problem will result in the same CIRCUIT BREAKER trip. The fault will be retained and displayed on the next normal power-up of the weld control. It can also occur if the isolation contactor is pulled in when a weld initiate is not present.	1. Replace isolation contactor if the contacts are frozen shut. 2. Replace isolation contactor auxiliary contacts. Check for defective isolation contactor aux contact module (contacts possible stuck open). 3. Check for defective weld timer.

FAULT NAME	POSSIBLE CAUSE	SOLUTION
NO ZERO CROSSING SYNC	This condition is generated when the control is unable to synchronize with the line voltage. This fault is observed when the circuit breaker is turned off or tripped. 1. No incoming voltage to the control cabinet. 2. Failure of the incoming power signal to reach the firing card, (through its J3 connector) due to loose or faulty wiring. 3. Zero-crossing signal is not reaching the weld processor card, due to loose cable or bad connector between the firing card and the weld processor card. 4. Faulty firing card. 5. Faulty weld processor card. 6. Overloading weld bus. 7. Brown-out of power source.	1. Verify incoming power to the control's circuit breaker with a volt meter. If no power, check for circuit break shunt trip or other errors. 2. Check for loose wiring at the J3 connector on the firing card. Repair as necessary. 3. Secure the cable between the firing card and processor card. Check for bad connector, and replace as necessary. 4. Replace firing card. 5. Replace weld processor card. 6. Re-distribute the weld bus load. 7. Correct power delivery problem.
SYSTEM COOLING	This fault is generated if the control receives a valid weld initiate and the SYSTEM COOLING input is not active. This fault is also generated if the SCR thermal switch is tripped. This can be caused by: 1. Defective SCR thermistor. 2. Loose/ incorrect connections to input module or within the circuit. 3. No or insufficient water/air flow. 4. Faulty weld processor module.	1. Check wiring and continuity at the J10 connector of the MedWeld 4000 processor board, pins 8-9. This is where the SCR thermal switch is connected. 2. Replace thermal switch if necessary. 3. Check AUXILLARY COOLING (TROT) input, if mapped. Ensure it is HIGH. 4. In the case the SCR overheats, check the water flow, access holes, hoses and filters (if used). 5. Replace weld processor.
HEAT CYCLE LIMIT	This fault is generated when the control detects that the number of consecutive weld cycles where conduction occurred exceeded the limit programmed in the Heat Cycle Limit (0=SEAM) setup parameter. When the limit is exceeded, the weld schedule is finished in No Weld Mode. The control generates a HEAT CYCLE LIMIT fault. This can be caused by: 1. Incorrect weld schedule programming. 2. Faulty weld processor card.	1. Secure the cable between the firing card and processor card. Check for bad connector, and replace as necessary. 2. Lower the number of cycles when the weld control is firing. 3. Your application does not need the Heat Cycle Limit setup parameter. To disable this parameter, set it to 0. 4. Replace weld processor card.
IO	This fault is issued when there has been a loss of communication over a set amount of time and no I/O is being received at the weld processor due to bad connectors or improper seating of the cables	Power down the weld control, re-seat cable and restore power.

FAULT NAME	POSSIBLE CAUSE	SOLUTION
ISO CONTACTOR NOT ENABLED	This fault is generated if the isolation contactor is de-activated (opens) while the control was executing a weld schedule. Can be caused by: 1. Faulty robot or ladder logic. 2. Loose or incorrect wiring to the input module. 3. Faulty input module.	1. Check robot or ladder to verify that the input is being activated and held HIGH throughout the schedule. 2. Check for proper I/O designations. Check to make sure all wiring connections are secure. 3. Replace module.
INITIATION ON POWER-UP	FieldBus I/O: Occurs when the weld control establishes a link with the I/O master (PLC/ Robot) after the control is powered-up. It may indicate a drop of the I/O connection during operation (not desired). Discrete I/O: The WELD INITIATE input is HIGH (1) when power is applied to the weld control.	FieldBus I/O: Ensure the I/O connection is stable and established before power-up of the weld control. Discrete I/O: Ensure the Weld Initiate input is set LOW by the operator at the time power is applied to the weld control.
PRESSURE NOT ACHIEVED	This fault occurs when the proportional valve pressure was not achieved within the number of cycles programmed in Function #13 (WAIT nn CY FOR PRESSURE ACHIEVED). If the schedule contains more than one valve pressure setting, the processor will only monitor the last pressure function contained in the schedule.	1. Check analog feedback circuit for problems. 2. Check for mechanical problems with the weld gun related to air pressure, e.g. water in air lines, pressure regulator set too low, etc. Increase the time programmed in the function if incorrect to allow for pressure to achieve the set limit.
SECONDARY CURRENT COIL/ BOARD	This fault will occur under the following conditions: 1. If an error occurred while attempting to initialize or configure the SCIB due to a malfunction on the SCIB board or an improper connection to the weld timer. 2. If an error occurred during the secondary current calibration process due to an improper connection to the secondary current coil. 3. If an error occurred during the secondary calibration process due to a loss of primary power (no zero-crossing synchronization). 4. If an error occurred during the secondary calibration process due to a missing current range jumper on the SCIB board.	1.

FAULT NAME	POSSIBLE CAUSE	SOLUTION
DATA NOT PROGRAMMED	This fault is generated when a weld schedule is initiated and either the weld schedule, setup data or the assigned stepper program data is invalid. This fault will occur after a RAM DATA failure or when a newly commissioned board has not been properly initialized.	To initialize a board: 1. Reload from defaults or 2. Restore the schedule, setup and stepper data files from a backup.

PROGRAMMABLE SETUP PARAMETERS

SETUP	DESCRIPTION	PROGRAMMABLE OPTIONS	DEFAULT VALUE
CURRENT MONITOR MODE	Select either primary or secondary current monitoring. If selecting secondary current monitoring, a Secondary Current Interface board (SCIB) and secondary sensing coil must be attached.	**PRIMARY/SECONDARY**	PRIMARY
TRANSFORMER	This parameter has four selections. AC regulates on the current that is actually read. DC uses a special algorithm to compensate for the delay in current changes. WOUND/ STACKED refers to the transformer core type.	**AC WOUND / DC WOUND** By selecting AC WOUND or DC WOUND, the control uses delayed firing to prevent damage caused by firing at too great a phase angle on the first cycle of a weld or impulse. **AC STACKED / DC STACKED** By selecting AC STACKED or DC STACKED, the first half-cycle of each pulse is fired completely, as required by the weld schedule.	AC WOUND

SETUP	DESCRIPTION	PROGRAMMABLE OPTIONS	DEFAULT VALUE
CURRENT LIMIT MODE	This parameter specifies which method the control will use during current limit processing.	**AVERAGE:** If set to *AVERAGE*, the control adds the current read during each cycle and divides by the number of cycles to determine average current. The fault is generated only if the average current exceeds the limit **PEAK:** If this parameter is set to PEAK, the fault is generated if the current limit is exceeded during any one cycle.	AVERAGE
INITIATION ON FAULT	This parameter tells the control how to react if it receives a weld initiate when a fault condition is present.	**INHIBIT:** Tells the control to ignore the initiate and stay faulted. **ALLOW:** Tells the control to ignore the fault condition and initiate the schedule.	INHIBIT

SETUP	DESCRIPTION	PROGRAMMABLE OPTIONS	DEFAULT VALUE
SHORT DETECTION	The weld control provides two parameters to aid in detecting either shunting current or a shorted SCR. By setting the SHORT DETECTION setup parameter to ENABLE, the processor continuously monitors the primary voltage across the SCRs when the control is not executing a weld function. When the processor detects no voltage across the SCRs during four out of seven half-cycles, it examines the primary current to determine whether the drop was due to a shorted SCR: • Primary current exceeding a preset amperage indicates a shorted SCR. The weld processor immediately generates a SHORTED SCR fault. • If the primary current is less than a preset amperage, the processor checks the SCR Cycle Limit parameter to determine whether the voltage drop was due to a shorted SCR or shunting current. • The SCR Cycle Limit parameter sets the maximum number of consecutive cycles where a shorted SCR condition (without current) can occur before the breaker is tripped. The control then generates the appropriate fault (SHORTED SCR or CURRENT SHUNTING fault). • If the control detects no primary current for 3 or more consecutive cycles, it generates the WELDER CURRENT SHUNTING fault. (If the SCR is shorted or current is shunting, primary current will not be detected.) This fault conditions indicates that shunting was detected for more than 3 cycles but less than the number of cycles programmed in the Shorted SCR Cycle Limit setup parameter.	**ENABLED:** Tells the control to check for shorted SCRs. **DISABLED:** No shorted SCR conditions of any kind will be detected. No faults will be generated. **USE THIS PARAMETER FOR TEST PURPOSES ONLY! DISABLING THE SHORT DETECTION FEATURES CAN CAUSE CATASTROPHIC FAILURE AND DANGEROUS OPERATING CONDITIONS. ALWAYS SET THIS PARAMETER TO ENABLED UNDER NORMAL OPERATING CONDITIONS.** **IF THE CONTROL DETECTS A SHORTED SCR CONDITION WITH CURRENT FOR FOUR OUT OF SEVEN HALF-CYCLES, THE CONTROL WILL TRIP THE BREAKER, REGARDLESS OF THE PROGRAMMED VALUE OF THIS SETUP PARAMETER.**	ENABLED

SETUP	DESCRIPTION	PROGRAMMABLE OPTIONS	DEFAULT VALUE
RETRACT MODE	The Retract Mode setup parameter determines how the mapped Retract Valve output bit will react when the control receives the mapped Retract Pilot input bit:	**LATCHED:** In Latched mode, a LOW to HIGH transition on the Retract Pilot input bit causes the state of the Retract Valve output bit to latch ON or OFF. **UNLATCHED:** In Unlatched mode, the Retract Valve output bit follows the state of the Retract Pilot input bit. (See "Retract Features" on page 147) **NOTE:** FOR SAFETY, THE MEDWELD 4000 IGNORES ANY CHANGES MADE TO THIS PARAMETER UNTIL YOU RESET THE CONTROL (BY CYCLING POWER).	LATCHED
CYL	The Cylinder setup parameter defines the type of weld gun air cylinder being used:	**AIR-NORMAL:** In Air-Normal mode, the weld tooling uses an air-only cylinder that requires a HIGH Retract Valve output bit to close the gun to the retracted position. **AIR-INVERTED:** In Air-Inverted mode, the weld tooling uses an air-only cylinder that requires a LOW Retract Valve output bit to close the gun to the retracted position. (See "Retract Features" on page 137)	AIR-NORMAL
ANALOG INPUTS	This parameter tells the weld processor what type of analog signal will be sent to the Analog Valve. Either a Voltage (0-10V) signal or a Current Loop (4-20ma) signal.	**VOLTAGE / CURRENT LOOP VOLTAGE**	VOLTAGE

SETUP	DESCRIPTION	PROGRAMMABLE OPTIONS	DEFAULT VALUE
HIGH POWER FACTOR LIMIT%	This parameter tells the weld control the range of acceptable values for high power factor. If the power factor exceeds these limits, a HIGH POWER FACTOR LIMIT fault is generated. The HIGH POWER FACTOR LIMIT fault can help warn of a deteriorating secondary.	10 - 99	99
LOW POWER FACTOR LIMIT%	This parameter tell the weld control the range of acceptable values for low power factor. If the power factor falls below these limits, a LOW POWER FACTOR LIMIT fault is generated. A LOW POWER FACTOR LIMIT fault can indicate an increase in inductive reactance.	10 -99	10
TIPS DOWN TEST FIRE	The welding schedule uses this value of heat when the control executes the functions VERIFY TIPS DOWN EVERY nn CYC. nn TIMES or SLOW CYLINDER TEST EVERY nn CYC. nn TIMES. Program the lowest value possible to reduce the open secondary voltage, while keeping this value high enough so that the current detected when tips are down exceeds the Tips Down Verified Current setup parameter. For more information, refer to the description of this parameter in ""Dynamic Squeeze Functions" on page 131	20-99	20
VALVE 1 INITIAL PRESSURE	This parameter sets the initial pressure of the Valve 1 output bit. This value can represent any unit of measure (PSI).	0-99	50
VALVE 2 INITIAL PRESSURE	This parameter sets the initial pressure of the Valve 2 output bit. This value can represent any unit of measure (PSI).	0-99	50

SETUP	DESCRIPTION	PROGRAMMABLE OPTIONS	DEFAULT VALUE
HEAT CYCLE LIMIT (0=SEAM)	This parameter defines the maximum number of consecutive cycles of heat conduction. (After nine consecutive cycles without conduction, the heat cycle counter is reset to zero.) For seam welding applications, disable this function by setting the cycle limit to zero.	0-99	60
ISOLATION CONTACTOR DELAY (SEC)	When function #53 (TURN OFF ISOLATION CONTACTOR) is used in the weld schedule and CSVR (Isolation Contactor Saver) input is high, this parameter delays the opening of the isolation contactor for the number of seconds programmed. Typically used in robot applications, this parameter reduces wear on the isolation contactor by preventing it from unnecessarily opening and closing during runs of multiple welds. **NOTE:** FUNCTION #77 (ISOLATION CONTACTOR DELAY = NN SEC.) OVERRIDES THIS GLOBAL SETUP PARAMETER, WHEN USED LOCALLY IN A WELD SCHEDULE. **NOTE:** THIS PARAMETER AND FUNCTION #77 (ISOLATION CONTACTOR DELAY = NN SEC.) ARE BOTH DISABLED WHEN THE ISOLATION CONTACTOR SAVER INPUT BIT IS SET LOW OR NOT MAPPED.	0 to 99	5
HIGH CURRENT LIMIT WINDOW (%)	The High Current Limit Window is calculated as a percentage above the target secondary current (base current + stepper boost). This is a dynamic window, which contours with the linear current stepper program in use.	1% to 20%	20%

SETUP	DESCRIPTION	PROGRAMMABLE OPTIONS	DEFAULT VALUE
LOW CURRENT LIMIT WINDOW (%)	The Low Current Limit Window is calculated as a percentage below the target secondary current (base current + stepper boost). This is a dynamic window, which contours with the linear current stepper program in use. For ACC, the base is the actual secondary current value programmed. %I is derived by determining the maximum current deliverable, and the percentage of that current programmed in the weld schedule.	1% to 20%	20%
SHORTED SCR CYCLE LIMIT	This parameter sets the maximum number of consecutive cycles where a shorted SCR condition (without current) can occur before the breaker is tripped. **IF THE CONTROL DETECTS A SHORTED SCR CONDITION WITH CURRENT FOR FOUR OUT OF SEVEN HALF-CYCLES, THE CONTROL WILL TRIP THE BREAKER REGARDLESS OF THE PROGRAMMED VALUE OF THIS SETUP PARAMETER. REFER TO THE DESCRIPTION OF THESE FEATURES IN "SHORT DETECTION" ON PAGE 118.**	3-99	60
DATA COLLECTION SAMPLE SIZE	This parameter sets a global command, which allows the weld processor (WCU) to sample data for analysis at controlled intervals. The sample size is the number of consecutive welds collected for analysis (per bin). For more information, see "SPC Indexing Capabilities" on page 132.	0 to 99	5
DATA COLLECTION SAMPLE FREQUENCY	This parameter sets a global command, which allows the weld processor (WCU) to sample data for analysis at controlled intervals. The sample frequency is the total number of welds, from which the samples are taken from (per bin). For more information, see "SPC Indexing Capabilities" on page 132.	1 to 9999	100

SETUP	DESCRIPTION	PROGRAMMABLE OPTIONS	DEFAULT VALUE
TIPS DOWN VERIFIED CURRENT	This is the value of ***primary*** current that is used as the threshold when the control executes the functions VERIFY TIPS DOWN nn CY. nn TIMES or SLOW CYLINDER TEST EVERY nn CYC. nn TIMES. Determine this value by experimenting to distinguish open and closed secondary currents for various heat settings. For more information, refer to the description of this parameter in "Dynamic Squeeze Features" on page 130.	0-9999	10
TRANSFORMER TURNS RATIO	This parameter is the turns ratio for the welding transformer being used. The weld processor uses this value to calculate secondary current during a weld (Secondary Current = Primary Current x Turns Ratio). **NOTE:** FUNCTION #90 (TRANSFORMER TURNS RATIO NNN:1) OVERRIDES THIS GLOBAL SETUP PARAMETER, WHEN USED LOCALLY IN A WELD SCHEDULE. Caution:  **THE CONTROL USES THIS VALUE TO DETERMINE THE SECONDARY CURRENT PROVIDED. BE CERTAIN TO CORRECTLY PROGRAM THIS PARAMETER FOR THE OPERATING ENVIRONMENT BEFORE ATTEMPTING TO USE THE WELD FUNCTIONS USING AUTOMATIC CURRENT COMPENSATION (ACC).** **WHEN PROGRAMMING THE CONTROL FOR ACC FIRING (FUNCTIONS #30–34), IF YOU CHANGE THE TURNS RATIO, THE CONTROL WILL REQUIRE THE FIRST TWO CYCLES OF THE NEXT WELD TO ADJUST THE CURRENT.**	1 to 256	1:100
NOMINAL LINE VOLTAGE	The control uses this parameter to establish a reference point for determining the compensation required for line voltage fluctuations when welding in the %I firing mode. Nominal Line voltage is obtained from the transformer name plate.	200 to 600	468

SETUP	DESCRIPTION	PROGRAMMABLE OPTIONS	DEFAULT VALUE
NOMINAL C FACTOR	The C-factor represents the value of current obtained or expected for each percentage of maximum current deliverable. The programming device displays the actual C-Factor detected during the last weld. You can program the acceptable range of C-factor in a weld schedule. To determine the nominal C-Factor, first perform a series of welds. Record the actual C-factor displayed at the programming device. Calculate the average, and enter that as the nominal C-factor value. This parameter is used when using %I weld functions and Dynamic current limits (no function #76 in schedule) to determine the expected secondary current.	0 to 999	999
SEC. CURR COIL FACTOR (X1000): nnnn	This setup parameter is used to monitor secondary current as an adjustment to accommodate for secondary current sensing coils of different sensitivities. Setting this parameter to 1000 will result in accurate secondary current readings for coils of 0.477 µHy mutual inductance (150 mV/kA @ 50 Hz, or 180 mV/kA @ 60 Hz). Setting this parameter ***above*** 1,000 will increase the reading. Setting ***below*** 1,000 will decrease the reading. **NOTE:** SEC. CURR COIL FACTOR IS ONLY SUPPORTED WHEN A SECONDARY CURRENT INTERFACE BOARD (SCIB) IS INSTALLED TO MEASURE THE SECONDARY CURRENT FROM THE WELD TRANSFORMER.	0 to 9999	1000

Chapter 6: LINEAR CURRENT STEPPERS

THE PURPOSE OF LINEAR CURRENT STEPPERS

During the welding process, the face of the welding cap gradually deforms or "mushrooms." As it does, the contact surface area with the work piece increases, which causes the current density at the weld interface to decrease. As a result, the weld nugget gradually becomes colder.

The purpose of a Linear Current Stepper is to gradually increase the welding current, in incremental steps, to compensate for the gradual decrease in current density at the weld interface, caused by the "mushrooming" of the welding caps. This gradual increase in welding current ensures the appropriate amount of heat is continuously present at the weld interface to continually make good weld nuggets.

HOW LINEAR CURRENT STEPPERS WORK

The *MedWeld* weld control with timer software T17300 has 10 available linear current stepper programs. Each stepper program has 5 programmable steps.

Within each of the 5 steps, the user can program the current boost (rise) over a number of welds (run). The current boost for each step can be expressed as either a percentage value or an

absolute Amps value. The current boost (rise) is delivered in equal, incremental steps, over the total number of welds (run) in each step.

To use a linear current stepper, function #82 (LINEAR STEPPER #nn ASSIGNED) must be inserted into the first line of the weld schedule.

Stepper programs are only active during the execution of a weld function and will increment when the following functions are used in the weld schedule:

FUNCTION #	PERCENTAGE OF AVAILABLE CURRENT WELD FUNCTION
20	WELD nnnn CY/IMP nn %I
21	TEMPER nnnn CY nn %I
22	PREHEAT nnnn CY nn %I
23	POSTHEAT nnnn CY nn %I
24	PRE-WELD nnnn CY nn %I
25	WELD nnnn CY nn.nn %I
26	WELD nn HALF CYCLES nn.n %I
40	SLOPE nnnn CY nn%I TO nn%I
74	WELD nn IMP HI =nn%I LO = nn%I

FUNCTION #	CONSTANT CURRENT WELD FUNCTION
30	WELD nnnn CY nnnn0 AMPS
31	TEMPER nnnn CY nnnn0 AMPS
32	PREHEAT nnnn CY nnnn0 AMPS
33	POSTHEAT nnnn CY nnnn0 AMPS
34	PRE-WELD nnnn CY nnnn0 AMPS
36	WELD nn HALF CYCLES nnnn0 AMPS
45	SLOPE nnnn CY nnnn0 A TO nnnn0 AMPS

STEPPER PROFILES

Each stepper program has a stepper profile. In the example below, each step has two current values. The first value **(blue)** is a percentage value and the second value **(red)** is an absolute Amps value. If a Percentage of available current weld function is used, the current boost (rise) must be expressed in a percentage value (%I). If a Constant Current weld function is used, the current boost (rise) must be expressed in absolute Amps.

NOTE: *If a percentage of available current weld function is used in the weld schedule and both a percentage and absolute Amps value is entered in the step, the absolute Amps value is ignored by the weld processor. Conversely, if a Constant Current weld function is used, the percentage value is ignored.*

EXAMPLE OF A STEPPER PROFILE

STEP	% VALUE	AMPS. VALUE	WELD FUNCTION
①	3%	100 AMPS	60 WELDS
②	6%	110 AMPS	180 WELDS
③	9%	120 AMPS	300 WELDS
④	12%	130 AMPS	600 WELDS
⑤	15%	140 AMPS	800 WELDS

Stepper Group 1

STEPPER GROUPS

In a typical welding application, multiple weld schedules can be assigned to a single stepper program. Also, if desired, the user may assign a single weld schedule to an individual stepper program.

In the case of a specific weld gun, it is advantageous that all the stepper programs used on that gun increment their weld counters, each time the gun makes a weld. Assigning these stepper programs to a common "Group" causes all the stepper programs within that group to increment together each time a weld is made by that gun, regardless of what weld schedule stepper combination was initiated with. In addition, stepper grouping allows the user to advance or reset several stepper programs at one time. The stepper group range is 0-99.

HOW STEPPER PROFILING WORKS

The following is an example of a linear stepper program without tip dressing. This example would typically be used in either a hard-tool welding application or any other application where dressing of the weld caps is not required.

1. Function #82 (LINEAR STEPPER #nn ASSIGNED) is inserted into the first line of Weld Schedule #1 and is assigned to Linear Stepper Program #1.
2. Current weld function #30 (WELD nnnn CY. nnnn0 AMPS) is used and is programmed to deliver 10000A of base current for 160 milliseconds.

EXAMPLE SCHEDULE #1 (NO TIP DRESS)	
00	START OF SCHEDULE # 1
82	LINEAR STEPPER # 1 ASSIGNED (0=OFF)
58	TURN ON WELD IN PROGRESS
76	SEC. CURR LIMITS: HI =00 LOW = 99990
90	TRANSFORMER TURNS RATIO 73:1
52	TURN ON ISOLATION CONTACTOR
1	SQUEEZE 30 CYCLES

EXAMPLE SCHEDULE #1 (NO TIP DRESS)	
30	WELD 10 CYCLES 10000 AMPS
3	HOLD 5 CYCLES
50	TURN ON WELD COMPLETE
59	TURN OFF WELD IN PROGRESS
75	EXTEND UNTIL NO INITIATE
51	TURN OFF WELD COMPLETE
53	TURN OFF ISOLATION CONTACTOR
100	END OF SCHEDULE # 1

BELOW IS THE STEPPER PROFILE AS VIEWED FROM THE DEP-*100 Series* DATA ENTRY PANEL

```
POWER ON                          COMM ON
.........................................
LINEAR STEPPER STATUS:
Boost: +00%              Total Welds=00000
Step #01 Count=0000      Tips Dresses=050
stpr #01          advance      wcu#00*
.........................................
   F1        F2        F3        F4
```

This screen shows the amount of energy being added to each weld function (Boost), the current step (Step) and the selected stepper (stpr), as well as the total weld count and the step count (the number of welds completed during the current step).

FROM THE STEPPER STATUS DISPLAY:

Press F1 to see a different stepper

- Press F3 to advance the stepper
- Press F4 to see the stepper settings for a different weld processor (***wcu***#)
- Press F5 to see additional stepper options. The asterisk (*) indicates that additional displays or information are available. When you press F5, you see the stepper reset option at F3 ; or

- Press F5 a second time, and you will see a display showing the status of every linear stepper:

```
POWER ON                          COMM ON
.........................................
         Stpr   1-8    . . . . . . . .
STEPPER  Stpr  9-16    . . . . . . . .
STATUS   Stpr 17-24    . . . . . . . .
STATUS   Stpr 25-32 . . . . . . . . . *
.........................................
    F1        F2        F3        F4
```

- Press F5 a third time to return to the initial stepper display.

SUREWELD STEPPERS

The SureWeld stepper accurately measures the power factor during each cycle of weld. The power factor indicates changes in the electrical resistance of the weld, which in turn indicates the magnitude of weld expulsion.
The SureWeld stepper compensates for tip wear by identifying the current level where expulsion occurs, then backing off the current to a point just below the level of expulsion. (The SureWeld stepper automatically increases or decreases the current as required.)
To assign a SureWeld stepper to a weld sequence, you must include Function #83 as the first function in the weld sequence.

SUREWELD PARAMETERS:

The following is a list of parameters controlling the SureWeld steppers:

▶ **INC HT/I ON 99 WELDS W/O EXPULSION**
This parameter programs the "no-expulsion" counter. The control keeps track of the number of welds where expulsion did not occur since the stepper last changed the current provided. When the counter reaches the programmed limit, the stepper increases the heat by 1 %.

▶ **DEC HT/I ON 09 WELDS WITH EXPULSION**
This counter tracks the number of welds where expulsion did occur. When this counter reaches the programmed limit, the control decreases the heat by 1 %.

- **BLANKING CYCLES: (01)**
  At the start of a weld, there is a short drop in power factor associated with part fit-up and breaking through surface coating. This parameter tells the control how many cycles at the start of a weld to ignore to prevent misinterpreting these events as expulsion.
  A good starting value for this parameter is 1 /2 to 1 /3 the number of weld cycles.

- **1-CYCLE EXPULSION LIMIT (PFD): (00.75%)**
  A drop in power factor that is greater than this programmable set point is assumed to be due to expulsion. This value is programmable in increments of 0.01%.

  A good method to determine this value is to determine the power factor drop for welds where expulsion did not occur, then compare it to the power factor seen when welds with expulsion occur.

  If this parameter is set too low, the control may misinterpret normal cycle-by-cycle variations. If set too high, expulsion may not be detected.

- **STEPPER GROUP: (00)**
  This parameter enables you to group SureWeld steppers together. Steppers will be programmed into weld sequences and be associated with a group of steppers.

  At the completion of a weld sequence, the weld control will verify the stepper that was activated to see which group it belongs to, then will bump up the weld count on all steppers that are associated to the group.

- **POSITIVE TREND LIMIT: (99)**
  NEGATIVE TREND LIMIT: (99)
  These two parameters are provided to prevent runaway stepper conditions which can be caused by problems such as improper electrode cooling, incorrect base heat, or arcing secondary current-carrying cables causing problems with the monitoring of power factor drop (PFD).
  They limit how much (in either direction) the stepper can modify the current provided to a weld. Starting from zero, the control increments the appropriate trend (positive or negative) every time it adds or subtracts current. When these limits are exceeded, the control generates the SURE WELD STEPPER TREND condition, as programmed in the setup parameters.

- **MAXIMUM(-) ADD'L % (-10)**
  This parameter sets the limit on how far to decrement the total %1 when using the %1 firing mode.

- **MAXIMUM (-) ADD'L CURRENT: (00000 AMPS)**
  This parameter sets the limit on how far to decrement the total heat supplied during a weld function when the SCR firing mode is ACC. Total heat is the base heat defined in the last weld function in the sequence plus the heat added by the stepper.

- **MAXIMUM %1: (99%)**
  This parameter sets the maximum amount of total heat to supply during a weld function when the SCR firing mode is %1.
  Total heat is the base heat defined in the last weld function in the sequence plus the heat added by the stepper.

- **MAXIMUM CURRENT: (99999 AMPS)**
  When the control is using constant current compensation, this parameter defines the total current (in secondary amps) to supply during a weld function.
  Total current is the base current defined in the last weld function in the sequence, plus the current added by the stepper.

IF THE CONTROL DETECTS THAT THE TOTAL HEAT OR CURRENT REACHED OR EXCEEDED THE MAXIMUM DEFINED ABOVE, THE SCR GENERATES THE END OF STEPPER CONDITION.

- **END OF STEPPER WELDS: (99999)**
  This parameter sets the maximum weld count for a SureWeld stepper. When the stepper has completed the number of welds specified by the parameter, the control resets the count to zero and generates an End of Stepper Fault.

- **ALERT POINT: (99%)**
  This parameter defines the point where the SCR alerts you when the stepper is approaching maximum heat, if the SCR firing mode is %1.

- **ALERT POINT AMPS: (99999)**
  This parameter defines the point where the SCR alerts you when the stepper is approaching the maximum current, if the SCR firing mode is ACC.

WHEN THE CONTROL DETECTS THAT THE HEAT (OR SECONDARY CURRENT) HAS REACHED THE ALERT POINT PROGRAMMED, IT GENERATES THE STEPPER APPROACHING MAX. CONDITION.

- **STEPPER APPROACHING MAX. WELDS: (99999)**
  When the weld count reaches this limit, the *MedWeld* generates the STEPPER APPROACHING MAX WELDS condition, to indicate that the electrodes require maintenance.

EXAMPLE TIP DRESS SCHEDULE

The tip dress schedule provides the required signals to the robot to perform a dressing operation on the electrodes within a stepper program. When TDG1-2 turns High, the robot energizes the tip dresser (air or electric) and closes the gun on the tip dresser for a programmed amount of time to cut the electrodes.

Tip Dress Request (TDG1-2) output turns High after the stepper has completed all welds of step 4.

EXAMPLE TIP DRESS SCHEDULE:

TIP DRESS SCHEDULE	
00	START OF SCHEDULE #
10	SET VALE 2 TOUCH DOWN PRESSURE 20 PSI
51	TURN OFF WELD COMPLETE
58	TURN ON WELD IN PROGRESS
01	SQUEEZE 60 CYCLES
86	TIP DRESS ADVANCE: GROUP 02 - STEP 2
59	TURN OFF WELD IN PROGRESS
50	TURN ON WELD COMPLETE
75	EXTEND UNTIL NO INITIATE
100	END OF SCHEDULE #

Example Shows The Schedule Is Programmed To Return All Steppers Associated with Group 2 to the start of Step 2.

At the start of this schedule, the Weld in Progress (WIP) output comes on to inform the robot it has accepted the schedule and is in process.

Depending on the plant process, the squeeze time is either the actual time for the dresser to perform the tip dress operation or a buffer that allows time for this output to be scanned by the robot. Following the squeeze termination all steppers associated with Group 1 are reset to the beginning of Step 2 in the stepper program and the Remaining Tip Dress counter is decremented by 1.

The Weld in Progress (WIP) output is turned OFF and the Weld Complete (WCPL) output is turned ON and remains on as long as the Weld Initiate (INT) input is maintained by the robot. The time between the turn ON and turn OFF of a Weld Complete is determined by the robot scan time needed to see transition of the Weld Complete (WCPL) signal. Once the initiate is removed, the Weld Complete is turned OFF and the sequence is terminated.

Chapter 7: ADVANCED TOPICS

This chapter describes some of the advanced features of the *MedWeld* control.

C-FACTOR

C-Factor (or Capacity Factor) is a parameter used to track changes in the weld tooling. C-Factor is calculated by determining the amount of total capacity utilized to create the target current and dividing this value by the actual current created.

The C-Factor feature can be used as a maintenance tool to monitor the following:

- Weld tooling degradation
- Current shunting paths (primary or secondary)
-

C-Factor is calculated by the weld processor after each weld and is displayed in the Weld Data Display of the DEP-*100 Series*.

The processor calculates C-Factor is by dividing the average secondary current during the weld by the %I fired. The following formula shows this:

$$\text{C-Factor} = I_{pri} \times \frac{n}{\%I} \times \frac{V_{nominal}}{V_{line}} = \frac{I_{sec}}{\%I} \times \frac{V_{nominal}}{V_{line}}$$

Where n = transformer turns ratio.

The C-Factor varies with changing conditions in the secondary. Decreasing C-Factor indicates that the total capacity of the system is decreasing. This is evident when the tool current pathways become more resistive. This, in turn, results in deterioration in the secondary circuit. (Two examples of this are cable wear and deterioration of connections.).

DECREASING C-FACTOR

As the weld tooling degrades over time, its resistance (either primary or secondary) increases. As the resistance increases, the weld control must compensate for this change, otherwise the welds will gradually grow colder. Weld tooling degradation can be caused by the following conditions:

- Frayed or undersized (MCM) welding cables.
- Welding cables too long for application.
- Broken or undersized leaf shunts.
- Loose hardware connections.
- Incorrect hardware (mild steel vs. stainless steel).
- Incorrect weld caps for application.
- Lower tip pressure.

As the resistance of the weld tooling gradually increases, the weld control gradually increase its "on-time" (or use more of its available capacity) to deliver the requested target current. This gradual decrease in available capacity of the weld control is reflected by a gradually decreasing C-Factor parameter.

INCREASING C-FACTOR

Current shunting (either primary or secondary) is essentially an unintended, alternate path of current flow occurring in the weld tooling. Current shunting causes the overall resistance of the weld tooling to decrease. As current is shunted across the alternate path, less current passes through the work piece, resulting in colder welds. Secondary current shunting paths can be caused by the following conditions:

- Cable shorts to weld tooling or part.
- Weld expulsion (slag) build-up around the hinge of the weld gun

- Higher tip pressure
- Cooling water conductivity issues

As the resistance of the gun insulator breakdown due to wear the weld control gradually decreases its "on-time" (or uses less of its available capacity) to deliver the requested target current. This gradual increase in available capacity of the weld control is reflected by a gradual increase in the C-Factor parameter.

C-FACTOR SETUP

Prior to using the C-Factor feature, it is important to establish a reference C-Factor parameter for a known good weld tool. After completing several test welds, record the C-Factor parameter displayed in the Weld Data Menu of the DEP-*100 Series* for future reference. These values will require adjustment as the user becomes more familiar with the weld tooling and what the C-Factor parameters are when weld quality issues occur (caused by either weld tooling degradation or current shunting).

Insert function #97 (C-FACTOR LIMIT: HI= nnnn LOW= nnnn) near the beginning of the weld schedule. See example schedule below:

NOTE: Function #97 must be inserted in the weld schedule before functions #30 (WELD nn CY. nnnn0 AMPS) and #50 (TURN ON WELD COMPLETE).

FUNCTION #	FUNCTION NAME
00	START OF SCHEDULE # 1
82	LINEAR STEPPER #1 ASSIGNED (0=0FF)
97	C-FACTOR LIMIT: HI= 220 LOW= 150
76	SET CURRENT LIMITS: HI =00 LOW =99990
90	TRANSFORMER TURNS RATIO 73:1
52	TURN ON ISOLATION CONTACTOR
58	TURN ON WELD IN PROGRESS
1	SQUEEZE 30 CYCLES
30	WELD 10 CYCLES 10000 AMPS
3	HOLD 5 CYCLES
50	TURN ON WELD COMPLETE

FUNCTION #	FUNCTION NAME
59	TURN OFF WELD IN PROGRESS
75	EXTEND UNTIL NO INITIATE
51	TURN OFF WELD COMPLETE
53	TURN OFF ISOLATION CONTACTOR
100	END OF SCHEDULE # 1

SET THE HI AND LOW C-FACTOR LIMIT FAULTS IN THE SETUP PARAMETERS AS FOLLOWS:

FAULT NAME	VALUE
LOW C-FACTOR LIMIT	ALERT
HIGH C-FACTOR LIMIT	FAULT

- Gradual weld tool degradation is an expected process. Therefore, Low C-Factor is set as an ALERT.
- Secondary current shunting is not an expected process and requires immediate attention. Therefore, High C-Factor is set as a FAULT.

DYNAMIC CURRENT WINDOWS

You can define a window of acceptable values for current. To define this window, use the setup parameters: High Current Limit and Low Current Limit.

These parameters, along with the Nominal C-Factor parameter, define the acceptable range of current to expect. You can also override the values in the setup parameters by inserting into the weld schedule Function #84 (WINDOW: HI=+00% LO=00% C-FACTOR=000).

Function #84 defines a current limit window with high and low limit values and a new nominal C-Factor. (Refer to the discussion of C-Factor on page 134.)

The target current is determined by the firing mode used by the weld function: %I or automatic current compensation. This calculation is shown below:

AVC:

***TARGET CURRENT* =**
(%I programmed in Function #20 + stepper boost) x C-Factor

ACC:
***TARGET CURRENT* =**
A. programmed in Function #30 + stepper boost

Calculate the high and low current limits using this equation:

$$\text{Limit} = \text{Target current} \pm \left(\text{Target current} \times \frac{\text{HI or LO Limit percentage}}{100\ \%} \right)$$

AVC EXAMPLE

In this mode, the target value is determined by the following calculation:

***TARGET CURRENT* =**
%I in Function #20 + Stepper boost x C-factor

An example of how these calculations are used is shown below:

- Function #20 is WELD 10 CY 50%I
- Stepper Boost is 2%
- C-Factor is 170
- High Current Limit = 10%
- Low Current Limit = 20%.

To determine the target current:

***TARGET CURRENT* =**
(%I programmed in Function #20 + Stepper boost) x C-Factor

= (50 + 2) x 170 = 8,840 A.

TO DETERMINE THE HIGH CURRENT LIMIT:

***HIGH CURRENT LIMIT* =** Target + (Target x %High Limit/100)
= 8,840 + (8,840 x 10/100)
= 8,840 + (884) = 9,724 A.

TO DETERMINE THE LOW CURRENT LIMIT:

***LOW CURRENT LIMIT* =** Target – (Target x %Low Limit/100)
= 8,840 – (8,840 x 20/100)
= 8,840 – (1,768) = 7,072 A.

ACC FIRING MODE

In this firing mode, the target value is established by the following calculation:

Target current = A. in Function #30 + Stepper boost

An example of how these calculations are used is shown below.

- Function #30 is WELD 08 CY 11000 A. SEC
- Stepper Boost is 700 A. SEC
- High Current Limit = 10%
- Low Current Limit = 20%

TO DETERMINE THE TARGET CURRENT:

Target current = A. in Function #30 + stepper boost
= 11,000 + 700 = 11,700 A.

TO DETERMINE THE HIGH CURRENT LIMIT:

High Current Limit = Target + (Target x %High limit/100)
= 11,700 + (11,700 x 10/100)
= 11,700 + (1170) = 12,870 A.

TO DETERMINE THE LOW CURRENT LIMIT:

Low Current Limit = Target – (Target x %Low limit/100)
= 11,700 – (11,700 x 20/100)
= 11,700 – 2,340 = 9,360 A.

DYNAMIC SQUEEZE FEATURES

The *MedWeld* provides a test fire function. Use it to determine the initial secondary resistance of a test fire, and whether the electrode tips were touching, (based on current draw).

The data generated by the test fire can be used by the control in several ways.

SPECIFYING THE TEST FIRE CURRENT

First, use the setup parameter Tips Down Test Fire %I to tell the processor the amount of heat to use in the welding schedule when the control executes Function #80 (VERIFY TIPS DOWN EVERY nn CYC. nn TIMES) or Function #81 (SLOW CYLINDER TEST EVERY nn CYC. nn TIMES).

Set this parameter value to be low enough to reduce the open secondary voltage, but high enough so that the current detected when tips are down exceeds the Tips Down Verified Current setup parameter.

DO NOT CONFUSE THE TIPS DOWN TEST FIRE %I SETUP PARAMETER WITH FUNCTION #39 (TEST FIRE NN%). THIS SETUP PARAMETER IS USED ONLY BY THE VERIFY TIPS DOWN AND SLOW CYLINDER TEST FUNCTIONS.

FUNCTION #39 PERFORMS A 1-CYCLE TEST FIRE AT THE PERCENT HEAT PROGRAMMED. THE TEST FUNCTIONS USE THE RESULTS OF THIS TEST FIRE TO CHECK CONDITIONS SUCH AS INITIAL POWER FACTOR AND THE AMOUNT OF CURRENT PROVIDED BY THE WELD.

DEFINING THE CURRENT THRESHOLD

You must also define the setup parameter Tips Down Verified Current to define the current threshold to use when executing the dynamic squeeze functions: Function #80 (VERIFY TIPS DOWN nn CY. nn TIMES) or Function #81 (SLOW CYLINDER TEST EVERY nn CYC. nn TIMES).

The best way to determine this value is by experimenting to distinguish open and closed secondary currents for various heat settings. Once the secondary current value is established, divide it by the Turns Ratio of the transformer. The result of this

division is what you must program as the TIPS DOWN VERIFIED CURRENT.

DYNAMIC SQUEEZE FUNCTIONS

Once you define the dynamic current setup parameters, use the following functions with the test fire function in a weld schedule, as described below:

80	VERIFY TIPS DOWN EVERY nn CY nn TIMES

This function uses the dynamic squeeze capabilities to verify that the electrode tips are making full contact with the workpiece. The control fires one cycle of weld current at the percentage programmed in setup parameter TIPS DOWN TEST FIRE (default value 20%). It then monitors the weld current provided and determines the power factor.

This is compared to the value programmed in the Tips Down Verified Current setup parameter, (described on page 114). If the primary current detected *exceeds* the programmed value, the control proceeds to the next function in the weld schedule.

If the current is *less* than the value programmed, the control waits for the number of cycles programmed (nn CY), then repeats the test fire. This wait-and-fire process continues up to the programmed number of tries (nn TIMES).

If the current never reaches the value programmed, the control generates a TIPS NOT TOUCHING fault and goes through the weld schedule in No Weld mode.

81	SLOW CYLINDER TEST EVERY nn CY nn TIMES

This function is nearly identical to Function #80, but reports a different fault and will schedule in Weld mode even when it detects a fault.

If the primary current detected by the control *exceeds* that set in the Tips Down Verified Current: nnnn setup parameter, it proceeds to the next function in the weld schedule.

If the current is *less than* the setup parameter, the control waits the number of cycles programmed (nn CY), then repeats the test fire. If the current never reaches the setup parameter limit, the control continues the schedule in Weld Mode, but generates a SLOW CYLINDER fault to indicate the condition.

SPC INDEXING CAPABILITIES

With ***SPC*** (Statistical Process Control) ***Indexing***, the control collects weld data in temporary storage bins. This data can be collected either in controlled intervals or continuously (in special situations such as tear-down).

Analyzing the collected weld data can help recognize certain welding trends such as changes in resistance of the work piece, primary current and line voltage.

To perform SPC indexing, use the following functions in a weld schedule, along with the SPC setup parameters described below.

SPC (STATISTICAL PROCESS CONTROL) FUNCTIONS

87	SET SPC OFFSET TO nn

For the purpose of statistical data collection, each weld is assigned a data storage bin number (00-99). This function establishes the starting bin number for SPC Indexing.

Consider the following example:

CAR TYPE #1	
Weld Schedule #20	SET SPC OFFSET TO 01
Weld Schedule #01	15 Welds Made (Bins 1-15)
Weld Schedule #02	15 Welds Made (Bins 16-30)
Weld Schedule #03	15 Welds Made (Bins 31-48)

CAR TYPE #2	
Weld Schedule #21	SET SPC OFFSET TO 51
Weld Schedule #04	12 Welds Made (Bins 51-62)
Weld Schedule #05	12 Welds Made (Bins 63-74)
Weld Schedule #06	15 Welds Made (Bins 75-88)

After establishing a bin number, the processor stores the data for each weld made in its own individual bin. The bin numbers increase by one each time a weld is made. This will continue until another schedule containing function #87 (SET SPC OFFSET) is executed.

Bin #99 is the last usable bin. If the weld processor reaches bin #99 and is still collecting data, the data for each weld will be stored in bin #99 until a new offset is assigned, therefore making the data unsuitable for analysis.

NOTE:

THIS FUNCTION DOES NOT TELL THE WELD PROCESSOR TO COLLECT WELD DATA. IT ONLY ASSIGNS A DATA STORAGE BIN NUMBER. TO SETUP SPC DATA COLLECTION PARAMETERS, SEE SPC SETUP PARAMETERS.

88	SEND ALL SAMPLES UNTIL NEXT SPC OFFSET

This function is useful to verify tool conditions after a tip-dress operation.

This function tells the weld processor to collect and sample 100% of the weld data within the schedule. It overrides the "global" Data Collection Sample Size and Data Collection Sample Frequency setup parameters, described in SPC Setup Parameters below.

Function #87 (SET SPC OFFSET) should be inserted before #88 in the weld schedule, to ensure the data is sent to the appropriate bin. Otherwise, it will be sent to default bin #0.

The processor will continue collecting and sampling 100% of the weld data within the schedule until the weld processor executes another weld schedule containing function #87 (SET SPC OFFSET). At which point, the "global" Data Collection Sample Size and Data Collection Sample Frequency setup parameters regain their hierarchical priority.

SPC SETUP PARAMETERS

PARAMETER	RANGE
Data Collection Sample Size: 5	0-99
Data Collection Sample Frequency: 100	1-9999

These two parameters set a global command, which allows the weld processor (WCU) to sample data for analysis at controlled intervals.

- The ***sample size*** is the number of consecutive welds collected for analysis (per bin).
- The ***sample frequency*** is the total number of welds, from which the samples are taken from (per bin).

For example:
Let's assume function #87 (SET SPC OFFSET) is inserted in the weld schedule and set to bin #1:

87	SET SPC OFFSET TO 01

Let's also assume in the Setup Parameters, the Data Collection Sample Size is set to (2) and the Data Collection Sample Frequency is set to (8):

DATA COLLECTION SAMPLE SIZE: 2
DATA COLLECTION SAMPLE FREQUENCY: 8

By setting the Data Collection Sample Size to (2) and the Data Collection Sample Frequency to (8), the WCU will collect data for the first two consecutive welds (in bin #1) and flag the WebView to retrieve the data. It will then collect data for the six remaining welds (without flagging the WebView) before repeating the process.

The following table illustrates the example above:

BIN # 1		
SAMPLE / FREQUENCY	**WCU PROCESS**	**WEBVIEW PROCESS**
1/8	Data Flagged for Retrieval	Data Uploaded
2/8	Data Flagged for Retrieval	Data Uploaded

BIN # 1		
SAMPLE / FREQUENCY	**WCU PROCESS**	**WEBVIEW PROCESS**
3/8	Data Collected	Data Ignored
4/8	Data Collected	Data Ignored
5/8	Data Collected	Data Ignored
6/8	Data Collected	Data Ignored
7/8	Data Collected	Data Ignored
8/8	Data Collected	Data Ignored
1/8	Data Flagged for Retrieval	Data Uploaded
2/8	Data Flagged for Retrieval	Data Uploaded
3/8	Data Collected	Data Ignored
4/8	Data Collected	Data Ignored
5/8	Data Collected	Data Ignored
6/8	Data Collected	Data Ignored
7/8	Data Collected	Data Ignored
8/8	Data Collected	Data Ignored

NOTE: WELD DATA COLLECTION IS BIN DEPENDENT. EACH BIN HAS ITS OWN INDEPENDENT COUNTER AND IS UPLOADED TO THE WEB VIEW SEPARATELY.

SCR SHORT DETECTION

The *MedWeld* provides two parameters to aid in detecting either shunting current or a shorted SCR.

By setting the Short Detection setup parameter to ENABLE, the processor continuously monitors the primary voltage across the SCRs when the control is not executing a weld function.

Danger!

DO NOT DISABLE SHORT DETECTION (BY SETTING THIS PARAMETER TO DISABLE) FOR NORMAL OPERATING CONDITIONS.
WHEN DISABLING SHORT DETECTION, THE CONTROL WILL NOT SHUNT TRIP THE CIRCUIT BREAKER IN CASE OF AN SCR SHORT. THE CONTROL WILL NOT DETECT SITUATIONS SUCH AS A CATASTROPHIC SCR FAILURE. THIS CAN CAUSE TOOL DAMAGE, AND CREATE THE POTENTIAL FOR SERIOUS INJURY OR DEATH.

When the processor detects no voltage drop across the SCRs during four out of seven half-cycles, it examines the primary current to determine whether the drop was due to a shorted SCR:

- Primary current *exceeding* a preset amperage indicates a shorted SCR. The weld processor *immediately* generates a SHORTED WCU #00 - BREAKER TRIPPED fault.
- If the primary current is *less than* a preset amperage, the processor checks the SCR Cycle Limit parameter to determine whether the voltage drop was due to a shorted SCR or shunting current.
- The SCR Cycle Limit parameter sets the maximum number of consecutive cycles where a shorted SCR condition (without current) can occur before the breaker is tripped. The control then generates the appropriate fault (either SHORTED WCU or WELDER CURRENT SHUNTING).

Danger!

IF THE CONTROL DETECTS A SHORTED SCR CONDITION WITH CURRENT FOR FOUR OUT OF SEVEN HALF-CYCLES, THE CONTROL WILL TRIP THE BREAKER, REGARDLESS OF THE PROGRAMMED VALUE OF THIS SETUP PARAMETER.

- If the control detects no primary current for 3 or more consecutive cycles, it generates the WELDER CURRENT SHUNTING fault. (If the SCR is shorted or current is shunting, primary current will not be detected.) This fault conditions indicates that shunting was detected for more than 3 cycles

but less than the number of cycles programmed in the Shorted SCR Cycle Limit setup parameter.

NOTE:

THESE PARAMETERS CHECK DIFFERENT CONDITIONS. SHORTED CYCLE LIMIT CHECKS FOR SHORTED CONDITIONS WHEN CURRENT IS APPLIED. WELD CURRENT SHUNTING CHECKS FOR PROBLEMS WHEN PRIMARY CURRENT IS NOT DETECTED.

RETRACT FEATURES

This section details the retract operation and how certain programmable functions and setup parameters affect the operation:

- Retract Mode
- Initiate from Retract and
- Cylinder Type.

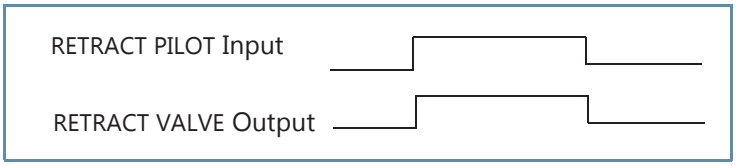
WARNING!

FOR SAFETY, THE WELD CONTROL IGNORES ANY CHANGES TO THESE PARAMETER SETTINGS UNTIL POWER IS REMOVED FROM THE CONTROL. (THE CONTROL CHECKS THE STATUS OF THESE PARAMETERS ONLY AT POWER-UP.)

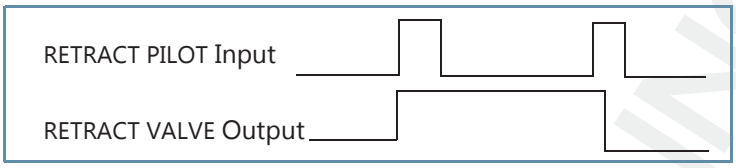
RETRACT MODE SETUP PARAMETER

The Retract Mode setup parameter determines how the control will react to the presence of an active RETRACT PILOT input.

- **UNLATCHED** tells the control to let the output for the Retract valve follow the state of the RETRACT PILOT input. This is for applications which use a toggle or selector switch. (The output will be active while the input is active.)



- **LATCHED** tells the control to change the state of the output each time it receives a pulse from the RETRACT PILOT input. (The control expects a brief pulse from the input, such as from a push button.)



NOTE: SELECTING LATCHED RETRACT MAY REQUIRE TOGGLING THE STATE OF THE RETRACT PILOT INPUT AT POWER-UP (TO CHANGE THE STATE OF THE RETRACT VALVE OUTPUT). THIS WILL BE REQUIRED IF THE CONTROL POWERS UP IN THE INCORRECT RETRACT STATE, OR IF THE OF THE RETRACT PILOT INPUT STATUS CHANGES WHILE THE CONTROL IS IN A C-STOP CONDITION (THE CONTROL STOP INPUT IS LOW).

CYLINDER TYPE

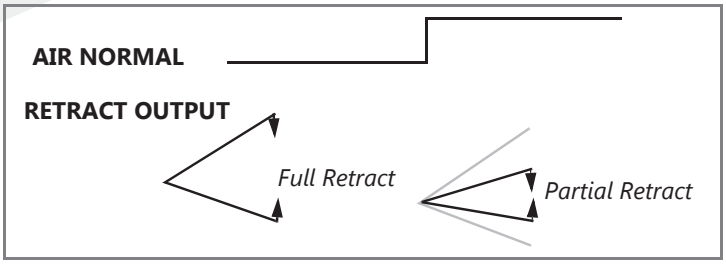
This parameter defines the type of gun cylinder being used in the control application. This parameter enables defining the retract operation, as shown below:

Air-Only Cylinders:
With air-only cylinders, two valves control the weld gun: The Weld valve and the Retract valve.

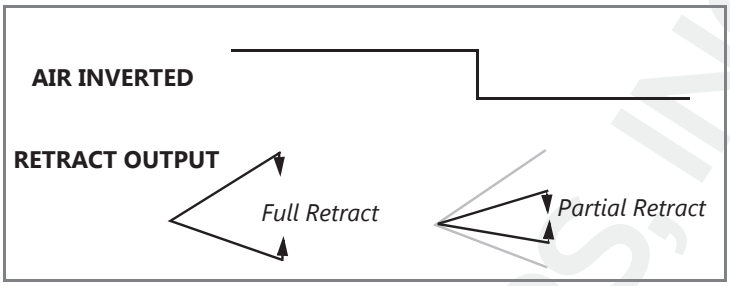
- The ***Retract*** valve allows the gun to close to a set gap position. Usually, a spring or a second return valve returns the gun to the full open position.
- The Weld valve closes the gun under the welding air pressure.

The air-only cylinders are identified as shown below in the CYLINDER TYPE setup parameter:

- ***AIR-NORMAL*** tells the control the gun is an air-only cylinder using "normal" retract. (The output is turned ON to close the gun.)



- ***AIR-INVERTED*** indicates an air-only cylinder, but the output is turned OFF to close the gun.



NOTE:

SELECTING AIR-ONLY IN THE CYLINDER TYPE SETUP PARAMETERS DISABLES THE OUTPUTS ASSOCIATED WITH THE AIR-OVER-OIL CYLINDER. THESE OUTPUTS, CONTROL THE ADVANCE, INTENSIFY AND BLOCKING VALVES. THEY DO NOT TURN ON WHEN THE AIR-ONLY CYLINDERS ARE SELECTED.

WELD/NO WELD STATUS

The DEP's Display Mode provides an option called W/NW STATUS. (Refer to Chapter 3 of the DEP Programming Guide.) It allows changing the software setting at the weld processor from Weld to No Weld. If the weld control is set to Weld mode and DEP is set to No-Weld mode at the time when a schedule is initiated, the schedule will be executed in No-Weld mode and the NO WELD MISMATCH (WM) will turn HIGH (if mapped).

VIEWING WELD DATA

This section describes the **Weld Data** screen on the DEP *100 Series*:

```
HHT#200                              COMM ON
.....................................
     PriV SecI   pf              cf 000
max  000  00000  00  00%         lV 121
avg  000  00000  00  00 cyc       sch 00
low  000  00000  00 scr #00       WCU #00*
.....................................
F1          F2          F3      F4
```

max
avg
low These three rows indicate the maximum, average and minimum values read during the last weld.

PriV This column shows the primary line voltage detected by the WCU during the weld.

SecI This column shows the secondary current (I) read during the last weld.

pf The third column is the maximum, average, and minimum power factor during the last weld.

cf C-Factor is 1% of the total available current. The C-Factor is re-calculated for each weld. It is the amount of the actual secondary current that will be added to the total weld energy for each 1% of current:

$$\frac{\text{Isec}}{\%\text{I}} = \text{C-Factor}$$

This value is used to alert the maintenance staff of a welder's deteriorating secondary or shunting conditions.

00% I
00
CYC These two values show the percent current (00 % I) and number of cycles (00 CYC) of weld current provided during the last weld.

lv 000 The line voltage at the WCU. This is updated each time the DEP polls the WCU.

sch #nn The last schedule initiated by the selected WCU (schedule **nn**).

WCU #nn The selected weld control (address **nn**).

The DEP-100 Series always displays data for the selected WCU. To see a different device, press F4 *Press* F5 *to see a different device.*

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844-WSI-WELD

www.WSIWeld.com · salesteam@wsiweld.com

4943 Driscoll Road · Warrensville Heights, OH 44146 USA

Main: 844-974-9353 · International: 216-475-5629

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