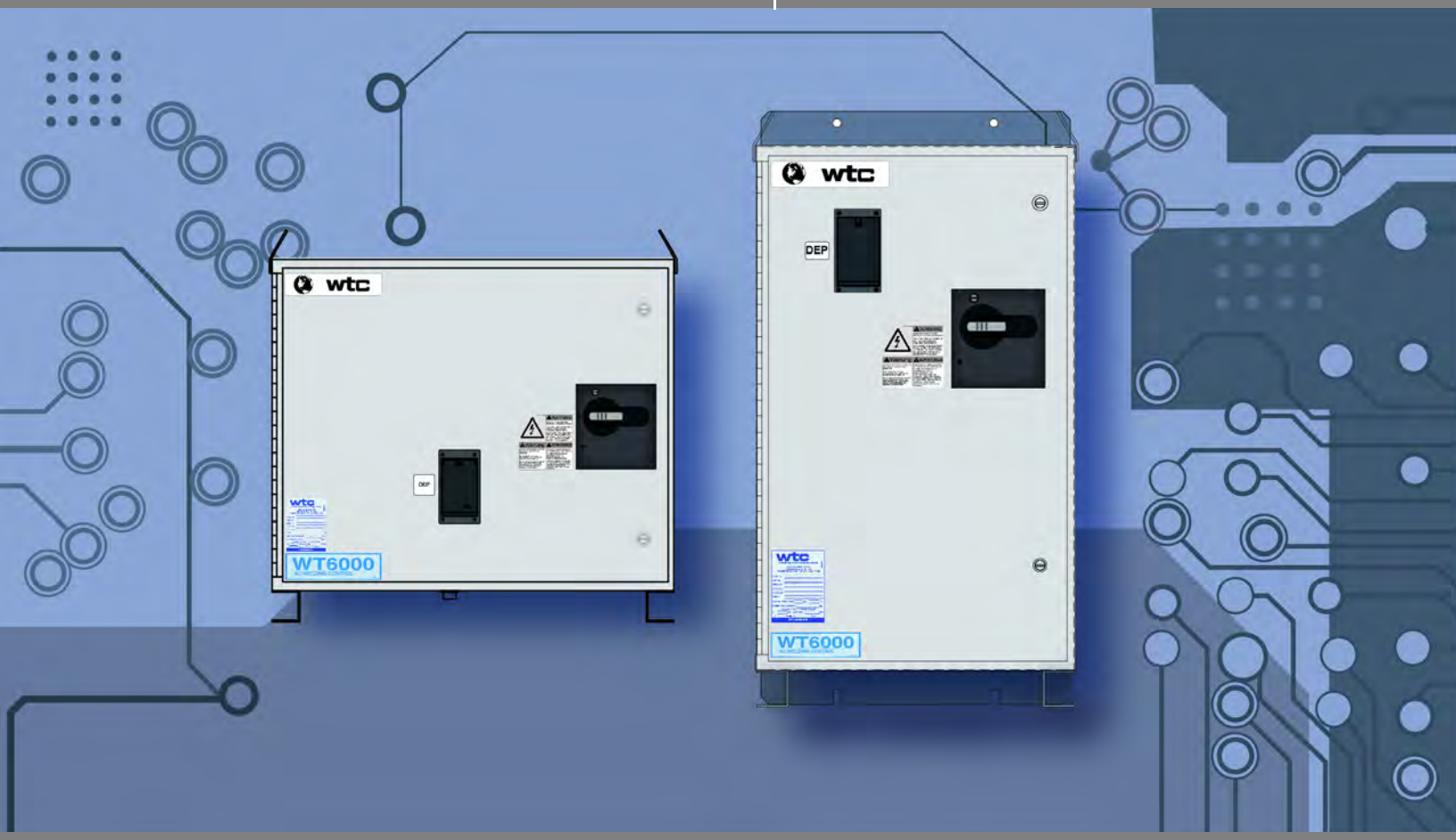
WELDING TECHNOLOGY CORP

WT6000 -G13300

USER MANUAL



6000AC Weld Control

TABLE OF CONTENTS

REGARDING THIS DOCUMENTATION

This documentation is written to support WT6000 Weld Control with timer software G13300

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 WTC6000 Weld Control

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

REVISION HISTORY

REVISION	REL. DATE	COMMENTS
1.0	03/2015	Initial release of manual for G13300-00-01
1.1	03/2016	Updated Logo, Installation instructions and Faults troubleshooting.

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, MFDC inverters and weld monitoring equipment.

Danger!	This symbol will be used wherever failure to observe safety measures may result in death, severe bodily injury o serious damage to property.
WARNING!	This symbol will be used wherever insufficient or lacking compliance with instructions may result in personal injury.
Caution:	This symbol denotes when insufficient or lacking compliance with instructions may damage equipment or files.
NOTE:	This convention 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 of 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 module 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 on the DEP 300s 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
	Outside United States/ Canada	
Internet	Worldwide	Go to http://support.wtc.com

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.

Danger!

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

Danger!

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.

Caution:

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.

Danger!

ONLY qualified personnel are allowed to service the weld cabinet and associated devices!

Danger!

Make certain the circuit breaker handle on the enclosure is in the OFF position before attempting to open the door.

Danger!

Inspect the enclosure for any potential shipping damage, loose connections, or packing materials inside the cabinet before operation!

WARNING!

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.

Danger!

NEVER remove circuit boards or establish electrical connections with power applied! Be certain to REMOVE POWER BEFORE servicing, installing or removing components.

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.

WARNING!

Verify the setup parameter “Nominal Line Voltage” to your facility voltage if the operator ever reloads software to default settings.

WARNING!

Never use a personal grounding strap when working with voltages above 220V.

WARNING!

Cu 75° ONLY

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.

Danger!

PERSONNEL GROUNDING

Before touching any Electrostatic Discharge Sensitive (ESDS) devices or circuit boards, put on and wear an Electrostatic Discharge (ESD) wrist strap. Ground this strap through a one megohm (1 MΩ) 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 50 volts.

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

NOTES:

Chapter 1: UNPACKING THE CONTROL

WARNING!

It is extremely important to examine the crate/packaging immediately upon delivery to your freight dock. If there is evidence of any damage, note it on the bill of lading before signing. If there is severe damage to the crate/packaging, do not sign the bill of lading and refuse the shipment.

WARNING!

WTC's freight terms are FOB: Shipping Point. This means once the weld control is picked-up by the freight carrier at WTC's shipping dock, it becomes the customers' ownership and responsibility (the company who issued the purchase order). Therefore, if any damage occurs to the weld control by the freight carrier during transit, it is the customer's responsibility to identify it upon receipt and file the appropriate claim paperwork with the freight carrier to have it resolved.

WARNING!

Typically, domestic welding control shipments are either skidded standing upright, with multiple cabinet bolted together (back-to-back), or skidded laying flat (for taller enclosures). If the shipment is via ocean, welding controls are typically placed inside a special coated bag to prevent any potential salt water induced corrosive damage to the weld control.

WTC uses recycled shipping materials whenever possible (wood skids, packaging materials, etc.)

If you have any concerns or questions regarding this practice, please contact WTC at +1 248-477-3900.

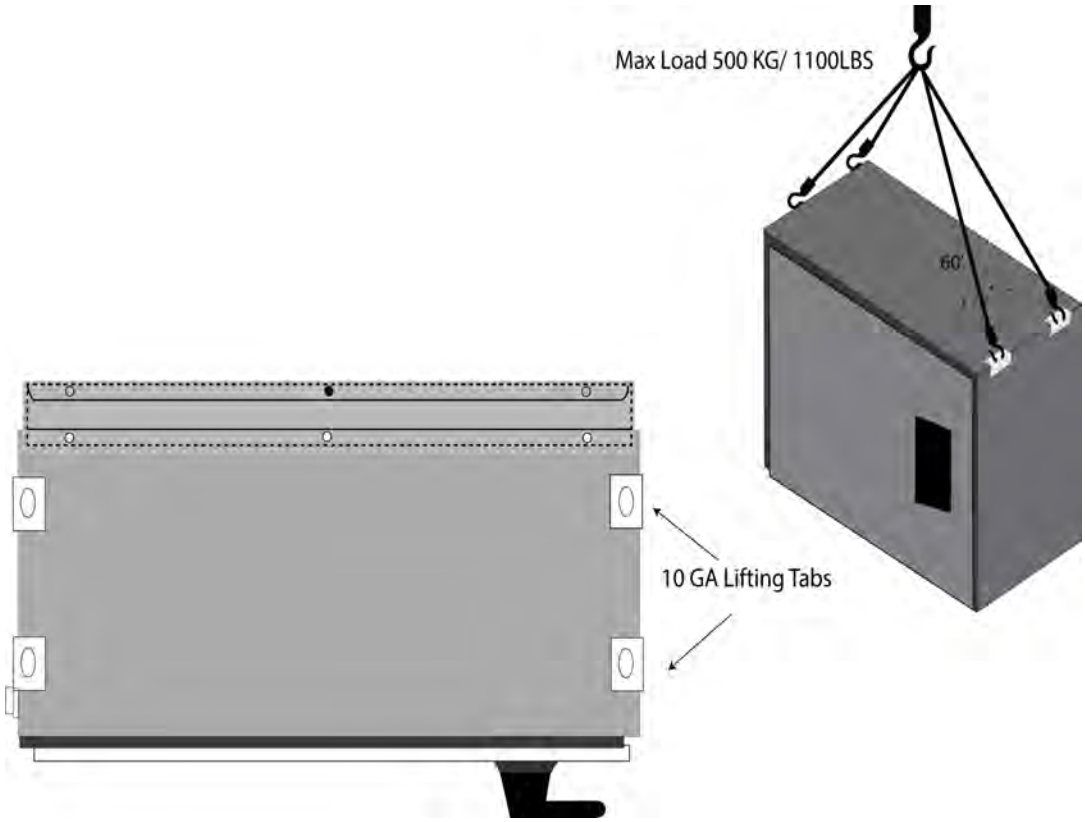
LIFTING AND MOVING THE WELD CONTROL CABINET

WARNING!

CRATED WELD CONTROLS ARE NOT INTENDED TO BE STACKED. MOVE ONLY BY EITHER FORKLIFT OR ASSISTED LIFT.

LIFTING BRACKETS / EYE BOLTS

WTC assembles most weld controls with a provision for lifting and moving the cabinet. Never attempt to lift any size weld control cabinet without using the lifting brackets or eye bolts. Dropping the welding control from even a short distance can cause severe damage and will void the warranty. **NEVER** put power on a welding control that has been dropped. If the weld control has been dropped, contact WTC as soon as possible.



IDENTIFYING DAMAGED OR MISSING ITEMS

WARNING!

THOROUGHLY INSPECT THE WELD CONTROL CABINET (INTERNALLY AND EXTERNALLY) FOR ANY SHIPPING DAMAGE (DAMAGED CABLES/ WIRING, BENT METAL, DAMAGED CIRCUIT BOARDS, ETC.) BEFORE OPERATION.

PROBLEM	SOLUTION
The welding control / parts order arrived, with items missing from bill of lading.	Obtain the shipping documentation that came with the weld control / parts order. Contact WTC's Customer Service Department to determine if the missing items are either on backorder or if they are actually missing from the shipment.

When contacting WTC for assistance, please have the following information ready:

1. Sales order number (example: 122435-00)
2. Company Name
3. Part number from the shipper or bill of lading for the missing/ damaged part.

WTC Industrial Technical Services:
Phone: +1 248-477-3900 | Fax: +1 248-477-8897
Email: service@weldtechcorp.com
Website: www.weldtechcorp.com

NOTE: When emailing WTC for support with a shipment issue, please include pictures of the problem (if possible), as they can be very helpful in quickly understanding and resolving your problem.

NOTE: WTC's firewall will not accept compressed (.zip) files as email attachments. If you need to email a .zip file to WTC, change the file extension to .piz prior to attaching it to the email message. This will allow both the email and the attachment to pass through the WTC firewall. Thank you for your understanding.

Chapter 2: SAFETY AND WARNINGS

WT6000 CABINET SAFETY CONCERNS

BEFORE YOU APPLY POWER!

Danger!

LETHAL VOLTAGES ARE PRESENT WHEN APPLYING POWER TO THE WELD CONTROL. EXPOSURE TO HIGH VOLTAGE WILL CAUSE SEVERE ELECTRICAL BURNS AND POSSIBLY DEATH.

ONLY QUALIFIED MAINTENANCE PERSONNEL SHOULD PERFORM SERVICE ON THIS MACHINE!

Danger!

NEVER DRILL INTO A WELD CONTROL CABINET WITHOUT FIRST REMOVING POWER FROM THE CABINET AND PROPERLY PROTECTING INTERNAL COMPONENTS FROM METAL DEBRIS / SHAVINGS.

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

Danger!

ENSURE PROPER FLOW RATE, TEMPERATURE AND CHEMISTRY OF COOLING WATER BEFORE RUNNING PART PRODUCTION

OBSTRUCTED WATER PATHS OR LOW WATER FLOW MAY DAMAGE THE WELDING EQUIPMENT.

Danger!

PRINTED CIRCUIT BOARDS MUST BE COMPLETELY POWERED DOWN PRIOR TO PERFORMING ANY MAINTENANCE, TROUBLESHOOTING OR REPLACEMENT.

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.

NEVER USE A PERSONAL GROUND STRAP WHEN WORKING WITH VOLTAGES ABOVE 220V.

OTHER INSTRUCTIONS:

Use CU 75° rated cable only.

Adjust the magnetic trip setting of the circuit breaker to a proper value based on your weld application.

NOTE: If you are unsure of either a safety or maintenance procedure, please contact WTC's service department for assistance.

Chapter 3: SYSTEM OVERVIEW

6000AC WELD PROCESSOR

From a single phase power supply, the low frequency welding control utilizes an inversed parallel pair of Silicon Controlled Rectifiers (SCR) to control the output of the welding power transformer. SCRs are turned on by pulsing a gate with a voltage signal. The welding control uses predictive algorithms to determine the best point to pulse the gate of the SCRs during the half cycle of the alternating current supply. The SCRs are turned off only when the alternating current supply is below the threshold point. This occurs near the zero crossing point of the AC power supply.

Weld Control pictured for illustrative purpose only actual customer configuration may vary.

FEATURES

The weld timer module, internal to the 6000AC, uses free format programming and “Flexible I/O” to create weld parameters and programs to fit any welding application.

- Up to 255 weld schedules.
- Built in Ethernet/IP.
- DeviceNet/ ProfiBus/ ProfiNet add-on available.
- 10 available linear current steppers, with 5 steps each.
- Internal web server allows the user to view and edit timer data from web browser, robot teach pendant or touch panel (HMI) device.
- Weld firing mode: Percent of Available Current (%I), Constant Current.
- Non-battery backed up memory.

INSIDE THE WELD CONTROL

The WT6000 **SINGLE-PHASE AC** Weld Control contains the following sub-assemblies:

- **SCR ASSEMBLY:** 1650 AMPS/1800 PIV. 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 SCRs. The unit can be air or water cooled.

- **CIRCUIT BREAKER:** A circuit breaker provides the means to safely disconnect power from the control in case of a failure, and permits troubleshooting the control safely. Incoming power enters the control enclosure through the access plates at the top right of the cabinet.

  The standard control configuration uses a 400A circuit breaker. The supply voltage (380, 480 or 575 VAC) is connected to the single-phase breaker at terminals located at the top of the breaker.

A rotary handle operates the circuit breaker, and visually indicates its condition. The handle must be UP/vertical to turn ON the breaker. The handle must be horizontal to turn the breaker OFF. The middle position indicates that the breaker has tripped.

An operator mechanism interlocks the door with the circuit breaker's status. This mechanism permits turning on the circuit breaker ONLY when the door is closed. Turning the breaker OFF permits opening the door, as a safety feature while servicing the control.

The circuit breaker has a magnetic trip coil. The level of current at which the breaker trips is set via a dial or dip switches located on the face of the breaker. The magnetic trip coil trips the breaker if instantaneous current reaches or exceeds a pre-set current threshold level.

- **ISOLATION CONTACTOR:** Acts to isolate voltage from the weld transformer. It removes power from the transformer's primary circuit. This allows safely servicing the weld electrode tips or weld control unit while the control is idle (or when a fault occurs). The weld processor monitors the state of the isolation contactor via the auxiliary contacts.

- **CONTROL TRANSFORMER:** Supply voltage (380, 480 or 575 VAC) from below the circuit breaker goes to a control transformer. It reduces the supply voltage to 120 VAC control voltage.

  The 120 VAC is used to pull in the isolation contactor, and to activate the circuit breaker shunt trip. This transformer supplies 120 VAC to power the timer assembly. The timer assembly, in turn, powers a 24 VDC power supply that powers the timer and local timer inputs and outputs.

- **CURRENT COILS:** The standard Weld control has a coil to measure primary current.

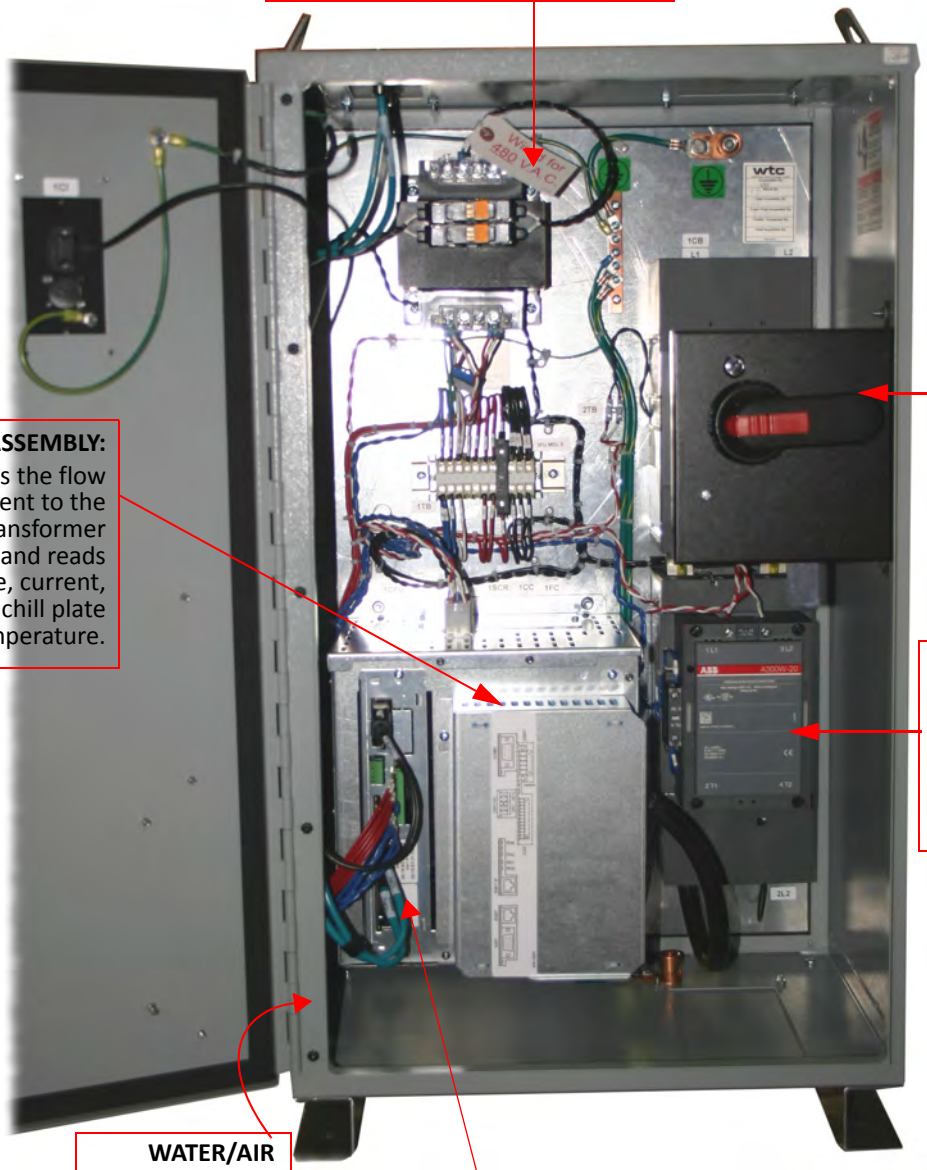
  The primary current coil is the doughnut-shaped device located in the SCR module in the control enclosure.

The control uses this device to measure the welder's primary current. The weld control measures this current and reports the actual current that is being passed during the weld.

- **WELD TIMER ASSEMBLY (PROCESSOR):** Brains of the weld control and controls all Ethernet/DeviceNet communications.

- **WATER/AIR MANIFOLD:** Water standard, optional air cooling available.

INTERIOR OF THE CABINET



CONTROL TRANSFORMER: Steps down line voltage to 120 VAC for the cabinet power.

CIRCUIT BREAKER: Supplies or interrupts line voltage to the entire weld control cabinet.

SCR ASSEMBLY: Controls the flow of current to the weld transformer and reads voltage, current, and chill plate temperature.

ISOLATION CONTACTOR: Isolates voltage from the welding transformer's primary coil.

WATER/AIR MANIFOLD: Water standard, optional air cooling available.

WELD TIMER ASSEMBLY (PROCESSOR): Brains of the weld control and controls all Ethernet/ DeviceNet/ProfiNet communications.

WELD CONTROL SPECIFICATIONS

POWER SOURCE	
STANDARD LINE VOLTAGE CONFIGURATION	1-Phase AC 380V-575V (± 10%)
LINE FREQUENCY	50/60Hz (Automatic Selection)
OUTPUT FREQUENCY	50 / 60 Hz
OUTPUT CURRENT OPTIONS AT 10% DUTY CYCLE	2500 AMPS
OUTPUT VOLTAGE OPTIONS	380 - 575 VAC Line
MAXIMUM POWER	192KVA @ 480 VAC AC Line Power with 400A Circuit Breaker.
DEVICE TYPE	SCR Water Cooled - 1650A-50% duty cycle
POWER CONSUMPTION	70VA (Idling condition)

MONITORING AND CONTROL FUNCTIONS	
FIRING CONTROL	SCR Phase control with Auto Power Factor
CURRENT CONTROL	Primary Constant Current Voltage Compensation
PRIMARY CURRENT RANGE	16A to Rated Current Level
PRIMARY CURRENT ACCURACY	± 2% Setting, ± 1% Repeatability
AC MAINS MEASUREMENT ACCURACY	± 2% Setting

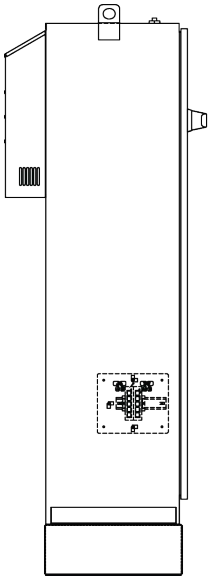
PROCESSOR & FUNCTIONS	
WELD PROCESSOR	Series 6000
STANDARD COMMUNICATIONS	Ethernet IP 10/100 BaseT; RS485
OPTIONAL COMMUNICATIONS	DeviceNet, Profinet, ProfiBus
NUMBER OF WELD SCHEDULES	255
NUMBER OF STEPPERS	10
PROCESSOR STORAGE TYPE	F-RAM (No Battery Required)
WELD PROCESSOR LANGUAGES	English, German, French, Spanish, Portuguese, Chinese Korean, Russian, Polish.

ENVIRONMENTAL CONDITIONS	
OPERATING TEMPERATURE	+5° C to +45° C
HUMIDITY	0 - 90% (Relative, without Condensation)
ESD	EN 61000-4-2 Level 3
NOISE IMMUNITY	EN 61000-4-4 Level 3
SURGE IMMUNITY	EN 61000-4-5 Level 3

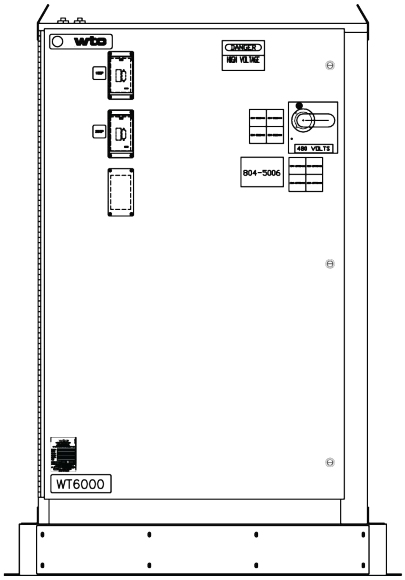
WATER COOLING REQUIREMENTS	
• Maximum temperature not to exceed 104° F. (40° C.), or fall below the dew point of ambient air • pH maintained between 7.0 and 8.0 • Maximum chloride content 20 PPM (parts per million) • Maximum nitrate content 10 PPM • Maximum sulfate content 100 PPM • Maximum suspended solids content 100 PPM (non-abrasive) • Maximum total solids content 250 PPM (suspended and dissolved) • Maximum calcium carbonate content 250 PPM	
MINIMUM WATER FLOW RATE	Greater than 5 liters/min (1.32 gal/min)
MAX PRESSURE DROP @ 5 LITERS/MIN FLOW	Less than 70 kPa / .7 bar / 10 PSI
PRESSURE RATING	Less than 620 kPa / 6.2 bar / 90 PSI
ELECTRICAL RESISTIVITY OF WATER	Greater than 5000 ohms/cm
WATER INLET TEMPERATURE	Less than 95° F (35° C)

AIR COOLING REQUIREMENTS	
AMBIENT AIR TEMPERATURE	Less than 45° C
AIR MOUNTING LOCATION	Minimum 200mm (3 inches) from wall or object

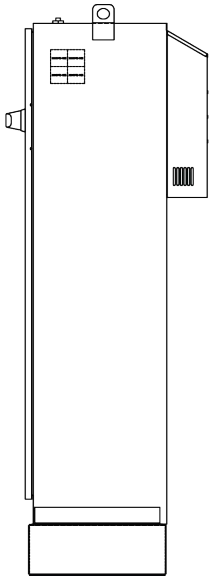
Chapter 4: INSTALLING THE CONTROL



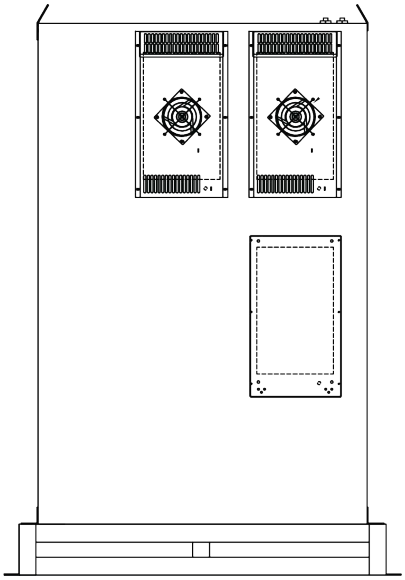
SIDE VIEW



FRONT VIEW DOOR CLOSED



SIDE VIEW



REAR VIEW

INSTALLATION CHECKLIST

USE THE FOLLOWING CHECKLIST AS A GUIDE DURING THE INSTALLATION PROCESS. IF YOU ARE UNSURE HOW TO PROPERLY INSTALL AND HOOKUP THE WELD CONTROL CABINET, CONTACT WTC FOR ASSISTANCE.

1. Ensure electricity is locked out at welding bus, power distribution panel, or other applicable power source.

2. Verify weld control cabinet circuit breaker is in the OFF position.

3. Inspect interior of weld control cabinet for loose and/or missing parts. Inspect for any shipping damage.

4. Check and ensure all water drain holes are open and unblocked. Remove any tape affixed over these holes for shipping.

5. Mount weld control at desired location using appropriate mounting hardware. The weld control unit is designed to be mounted using all four mounting tabs.

6. Remove access plates and drill / punch holes for:
   - Single-phase AC line power and ground.
   - Output power to welding transformer and ground.
   - I/ O connections (if applicable).

7. Plumb cooling water to supply and return fittings.

8. With the welding bus power off and properly locked out, connect the power cables from the welding bus to the top of the circuit breaker. Connect ground wire to weld control cabinet.

9. Verify proper sizing of cabling from the bus to the circuit breaker, and from the control to the weld transformer's primary circuit.

10. Provide the connection to the weld transformer. (Refer to the electrical schematics supplied with the control for assistance in connecting the welding transformer.)

    NOTE: When connecting the welding transformer to the Isolation Contactor, verify that the 2L2 sense wire is also attached.

11. Provide the I/O connections based on the control's communication scheme.

12. Connect ground cable from copper grounding post inside cabinet to welding transformer.

13. Connect data entry panel, Control Stop (CSTOP) and EtherNet (ENET1) cables.

14. Verify magnetic and thermal trip settings on circuit breaker, per manufacturer specifications (if applicable).

15. Inspect cabinet and verify all wiring connections (high voltage, terminals, crimp connections, etc.) are secure.

16. Close weld control cabinet door and lock with 1/4-turn fasteners.

17. Remove electrical lock out devices.

18. Turn weld control cabinet circuit breaker ON.

19. Ensure cooling water is flowing at specified flow rate.

20. Use data entry panel or network software application to program I/O parameters for Device Net, Ethernet/IP or specialty communication modules.

21. Use data entry panel or network software application to program setup parameters, weld schedules and current steppers as required for customer application.

CABINET MOUNTING AND FASTENING

The weld control units dimensions vary, based on its size. Refer to the installation drawings provided with your control for the exact dimensions and mounting tolerances.

WTC recommends leaving a clearance of AT LEAST 2 inches (about 50mm) from the wall. This clearance is necessary to allow access for the cooling water hoses and power line outputs.

The control enclosure has four mounting tabs: Two at the top of the cabinet and two at the bottom. Because it is heavy, the cabinet must be mounted to a strong structure such as a machine frame.

Ensure that the cabinet mounted using *all four* mounting tabs.

Caution:

IT IS IMPORTANT THAT THE WELD CONTROL IS MOUNTED ON A LEVEL SURFACE. IF THE WELD CONTROL IS MOUNTED ON AN UNEVEN SURFACE, THE CABINET DOORS MAY BE DIFFICULT TO OPEN. FAILURE TO USE APPROVED MOUNTING HARDWARE MAY VOID YOUR WARRANTY.

Caution:

THE ENCLOSURE SHOULD BE SECURELY MOUNTED ONTO A FIXED STRUCTURE, FOR EXAMPLE: FLOOR, STAND OR ROBOT.

Caution:

THE ELECTRICAL INSTALLATION FOR THE WELD CONTROL SHOULD MEET ALL NATIONAL AND LOCAL ELECTRICAL CODES AS DETERMINED BY THE AUTHORITY HAVING JURISDICTION.

ELECTRICAL INSTALLATION

WIRING DIAGRAM INDEX

STEP	COLOR	DESCRIPTION
①		Verify the primary of 1T control transformer is correctly tapped for the plant line voltage.
②		Connect plant line voltage to circuit breaker.
③		Connect ground cable from plant ground to weld enclosure copper ground lug. Connect ground cable welding transformer to weld enclosure copper ground lug.
④		Connect weld transformer cables to 1L1 and 1L2 terminals on 1IC isolation contactor.

NOTES:

1.) (XX) WIRE NUMBER
2.) SNUBBER
3.) TWISTED WIRE PAIR
4.) BONDING/NOISE GROUND
5.) CUSTOMER RESPONSIBILITY
6.) MOV
7.) WIRE NUMBER/GAUGE CHART

WIRE NUMBERS	COLOR/GAUGE
1 THRU 99	— BLUE, 16AWG
100 THRU 169	— RED, 16AWG
170 THRU 179	— WHT/RED, 16AWG
180 THRU 199	— YELLOW, 16AWG
1L1, 1L2, 1L1A, 1L2A, 2L1, 2L2, H1	— BLACK, 16AWG

WIRE GAUGES AS SHOWN ABOVE EXCEPT WHERE NOTED

8.) WIRE (1L1A) IS CONNECTED TO THE XFMR LEAD NEAREST THE CUSTOMER LINE VOLTAGE.

9.) DUE TO TRANSFORMER AVAILABILITY, '1T' MAY NOT BE WIRED AS SHOWN. IN THIS INSTANCE, REFER TO THE HOOK–UP DIAGRAM FOUND ON EACH INDIVIDUAL XFMR.

10.) THIS DWG IS INTENDED TO SHOW POINT TO POINT WIRE DESTINATIONS. WHILE THE TERMINAL DESIGNATORS ARE CORRECT, THE PHYSICAL REPRESENTATION MAY NOT BE. REFER TO THE COMPONENTS IN THE ENCLOSURE TO FIND THE ACTUAL TERMINAL ORIENTATIONS.

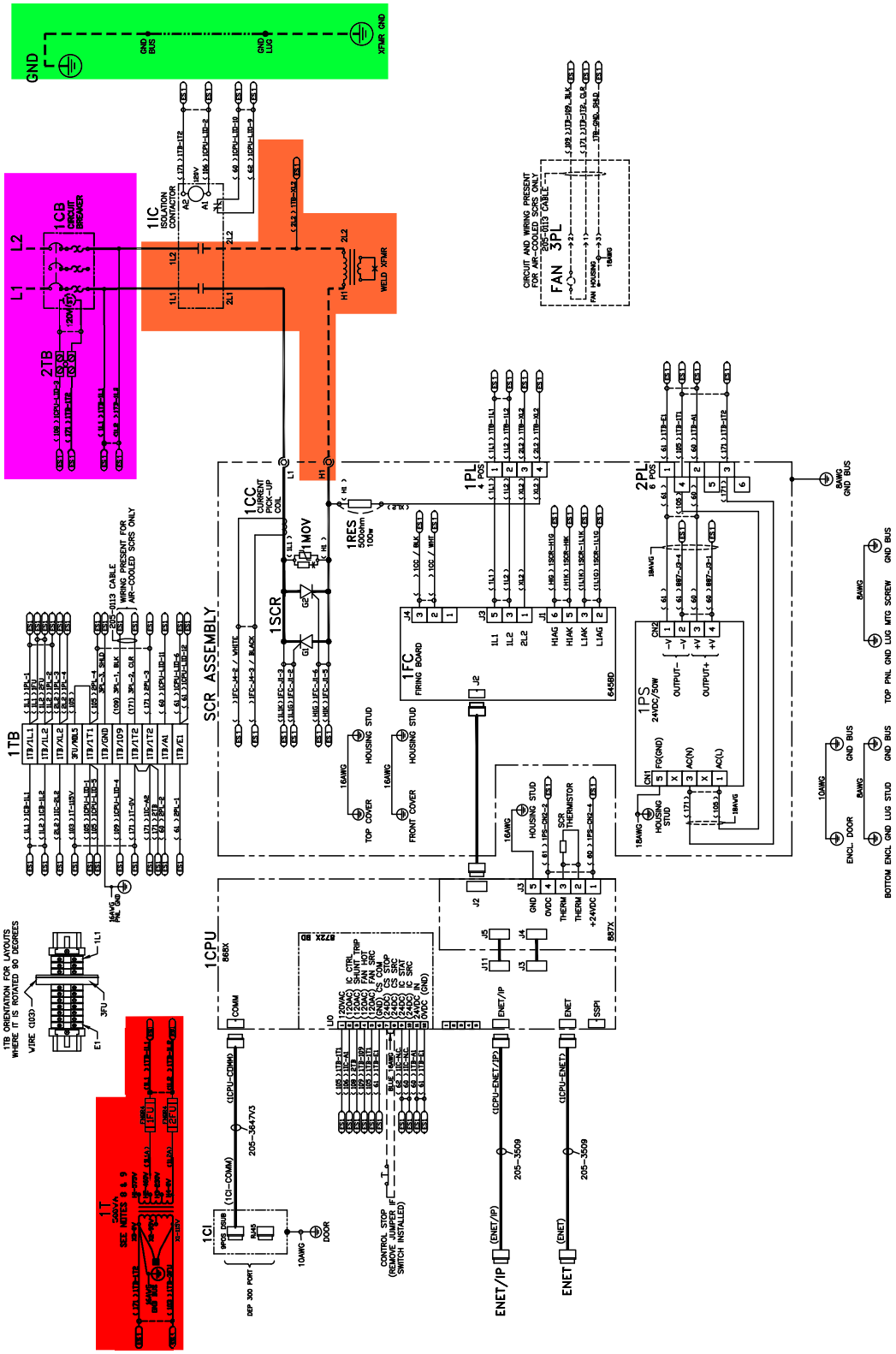
Danger!

PRIOR TO MAKING ANY CONNECTION INSIDE THE WELD CONTROL CABINET:

1. REFER TO YOUR FACILITIES ELECTRICAL LOCKOUT POLICY AND PROCEDURES.
2. 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.

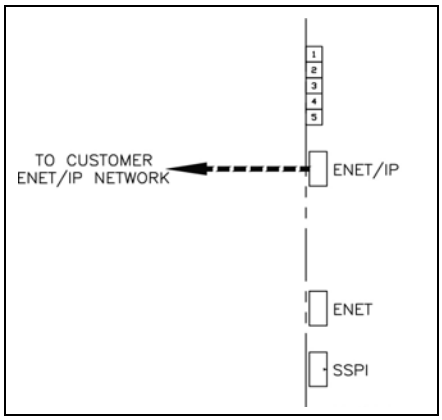


Basic electrical connections highlighted with color. Refer to Processor Communications Connections for additional details.

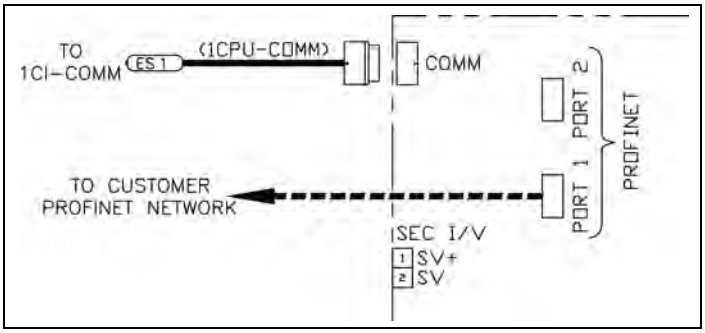
NOTE: For illustration purpose only. Your cabinet configuration may differ depending on your specific application. Refer to electrical drawings that came with your control. For application specific electrical drawings, contact WTC.

Processor connections with EtherNet, DeviceNet, ProfiNet and ProfiBus.

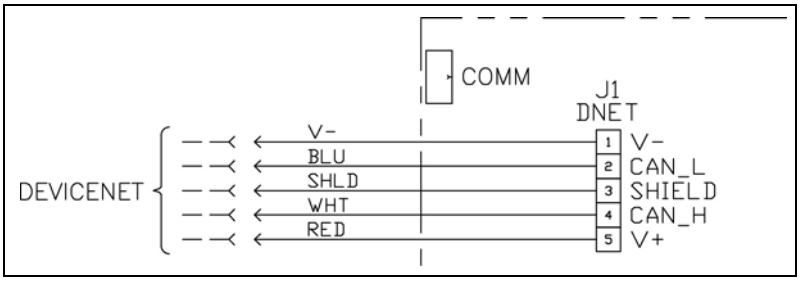
ETHERNET IP:



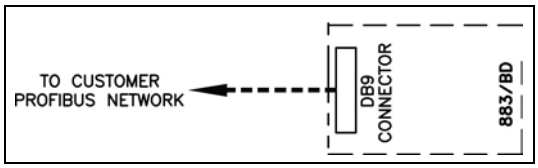
PROFINET:



DEVICENET:



PROFIBUS:



WATER COOLING REQUIREMENTS

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

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 - condensation may occur and damage components.

FAILURE TO MAINTAIN PROPER WATER COOLING TO THE WELD CONTROL CABINET MAY CAUSE DAMAGE TO THE WELD CONTROL AND VOID THE WARRANTY. CONTACT WTC IF YOU HAVE ANY QUESTIONS REGARDING THE WATER COOLING REQUIREMENTS LISTED ABOVE.

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

WELD CONTROL PROGRAMMING AND SETUP

Before welding can begin, the following parameters need to be programmed into the weld timer.

PROGRAM SETUP PARAMETERS

Review and program the Setup Parameters as required for the welding application.

The Review Setups Menu is found in the DEP-300s by pressing: Program Mode (F2) -> Review Setups (F4).

NOTE: Refer to Chapter 7: Faults and Setup Parameters for detailed information regarding the description and programming of setup parameters.

PROGRAM WELD SCHEDULES

Review and program the Weld Schedules as required for the welding application.

The Review Schedule Menu is found in the DEP-300s by pressing: Program Mode (F2) -> Review Schedule (F2).

NOTE: Refer to Chapter 6: Programming Schedules or Glossary of Schedule Functions for detailed information regarding function descriptions and the programming of weld schedules.

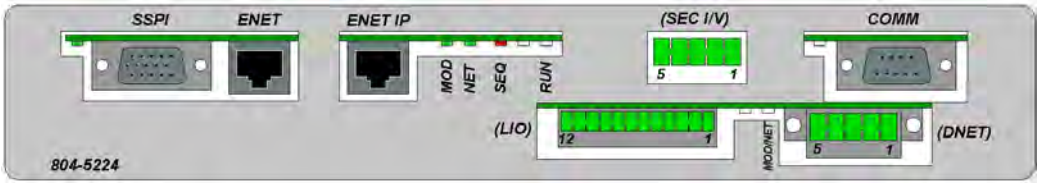
SETUP LINEAR CURRENT STEPPER FUNCTIONS

Review and program the Linear Current Stepper Functions as required for the welding application.

The Review Stepper screen is found in the DEP-300s by pressing: Program Mode (F2) -> Review Stepper (F3).

NOTE: Refer to Chapter 8: Linear Current Steppers for detailed information regarding the description and programming of linear current steppers.

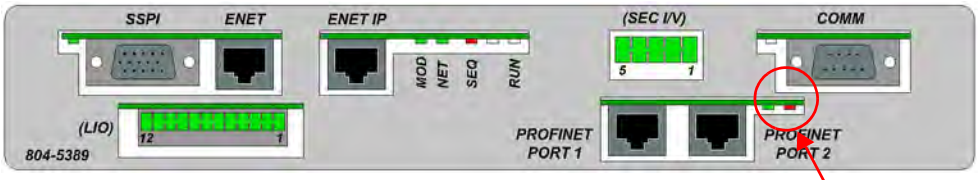
Chapter 5: COMMUNICATIONS SETUP



Timer Face with DeviceNet option.

The following describes the communication ports located on the WT6000 weld timer assembly.

PORT NAME	COMMUNICATION TYPE	DESCRIPTION
ENET IP	Ethernet/IP (EIP)	ENET IP is used for I/O communication between the weld timer and other Ethernet enabled devices (e.g. a Robot or PLC). Also used to communicate with Weld Gateway and ***RAFT***™ Gateway networking software.
ENET	Ethernet	ENET is used for Standard Ethernet communications.
SSPI	WTC Proprietary I/O Communication Protocol	Not used.
COMM	RS485 Serial Interface	COMM is used for DEP-300s or DEP-105 data entry panel communications.
DNET	Device Net (Optional)	DNET is used with optional FieldBus connections.
SEC I / V	Secondary Current or Voltage Monitoring Input (Optional)	Location for input wires for Secondary Current or Secondary Voltage Monitoring.
LIO	Local I/O Connections	Used for Isolation Contactor, Circuit breaker shunt trip, Fan, and Control Stop.



Timer Face with ProfiNet Option

ProfiNet Status LEDs

LED	STATUS	DESCRIPTION
	ON	The ProfiNet interface board is functioning properly and ready to connect to the master ProfiNet device.
	OFF	The ProfiNet interface board has either not completed initializing or is not functioning properly.
	ON	The ProfiNet interface is not connected to the master ProfiNet device (no application relationships).
	OFF	The ProfiNet interface is connected to the master ProfiNet device.

ETHERNET SETUP

The WT6000 weld timer has two Ethernet communication ports:

PORT NAME	COMMUNICATION TYPE	DESCRIPTION
ENET IP	Ethernet/IP (EIP)	ENET IP is used for I/O communication between the weld timer and other Ethernet enabled devices (e.g. a Robot or PLC). It also can be used for updating timer software and maintenance functions. ENET IP includes a web page interface for robot pendants or browser enabled devices.
ENET	Standard Ethernet	ENET is used for standard Ethernet communications. It also can be used for updating software and maintenance functions. ENET includes a web page interface for robot pendants or browser enabled devices.

ENET IP (EIP) FACTORY DEFAULT SETTINGS

How to navigate through the DEP-300s to the EIP Options menu:

① Press Program Mode (F2)

② Press More (F5)

③ Press EIP Options (F2)

The EIP factory default settings are as follows:

NAME	ADDRESS
IP Address	192.168.0.250
Sub Net Mask	DHCP
Gateway	0.0.0.0
Name Server	0.0.0.0
Input Instance 150	Type: 8bit Size: 2
Output Instance 100	Type: 8bit Size: 2
DHCP	ON
DHCP MODE	Retry disabled
PORT MODE	Auto

SETTING THE NUMBER OF AVAILABLE EIP INPUTS AND OUTPUTS

In timer software G13300, there are a maximum of 64 inputs and outputs that can be mapped. The number of mapped inputs and outputs is determined by selecting a Type and Size, whose product is less than or equal to 64.

In the default settings chart on previous page, the Type is 8 and the Size is 2 for both the inputs and outputs. Since the product of 8 and 2 is 16, the total mappable I/O is 32 for both the inputs and the outputs.

The chart below shows all the possible combinations in which the Type and Size can be configured and not exceed the maximum of 64

NOTE: If the Size is set to 0, the entire map is disabled and no I/O can be mapped.

TYPE	SIZE	PRODUCT
8	0	0
8	1	8
8	2	16
8	3	24
8	4	32
8	5	40
8	6	48
8	7	56
8	8	64
16	0	0
16	1	16
16	2	32
16	3	48
16	4	64
32	0	0
32	1	32
32	2	64

ENET (STANDARD ETHERNET) FACTORY DEFAULT SETTINGS

How to navigate through the DEP-300s to the Local Ethernet menu:

① Press Program Mode (F2)

② Press More (F5)

③ Press More (F5)

④ Press Local Ethernet (F1)

The ENET factory default settings are as follows:

NAME	ADDRESS
IP Address	89.89.200.250
Sub Net Mask	255.0.0.0
Gateway	0.0.0.0

DEVICENET SETUP

The WT6000 weld timer is capable of DeviceNet I/O communications. This requires the installation of an optional DeviceNet peripheral board.

How to navigate through the DEP-300s to the FieldBus Mapping menu:

① Press Program Mode (F2)

② Press More (F5)

③ Press More (F5)

④ Press FieldBus Mapping (F2)

The DeviceNet factory default settings are as follows:

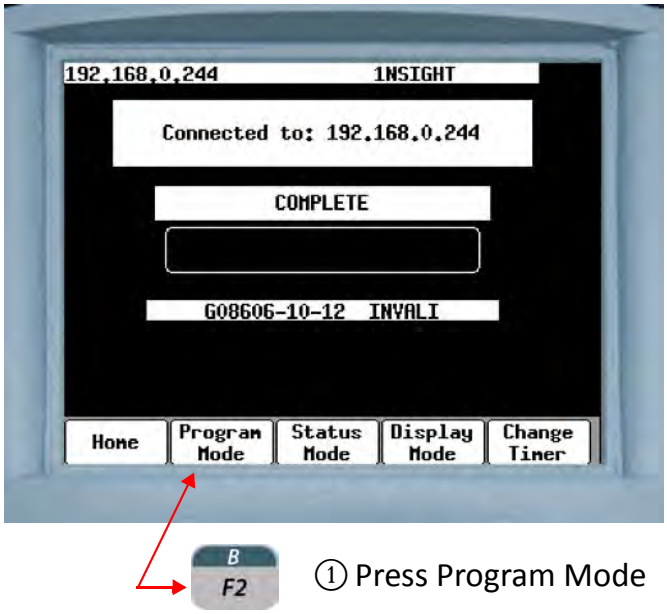
NAME	ADDRESS
RELOAD DEFAULT	OFF
NODE ADDRESS	11
BAUD RATE	500K
POWER UP	RETAIN
BYTE SIZE	4 BY 4
NETWORK RESPONSE DELAY IN MSEC.	1

PROFINET (PNET) SETUP

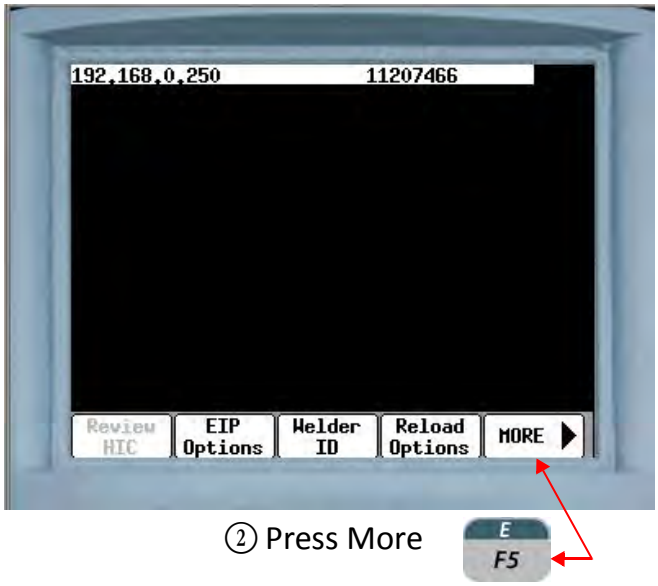
he WT6000 weld timer is capable of ProfiNet I/O communications. This requires the installation of an optional ProfiNet interface board.

PROFINET FACTORY DEFAULT SETTINGS

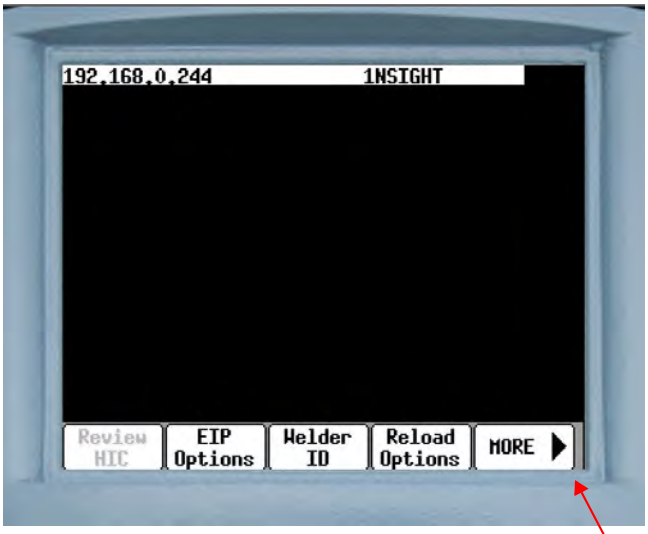
The following describes how to navigate through the DEP-300s to the FieldBus Mapping menu:



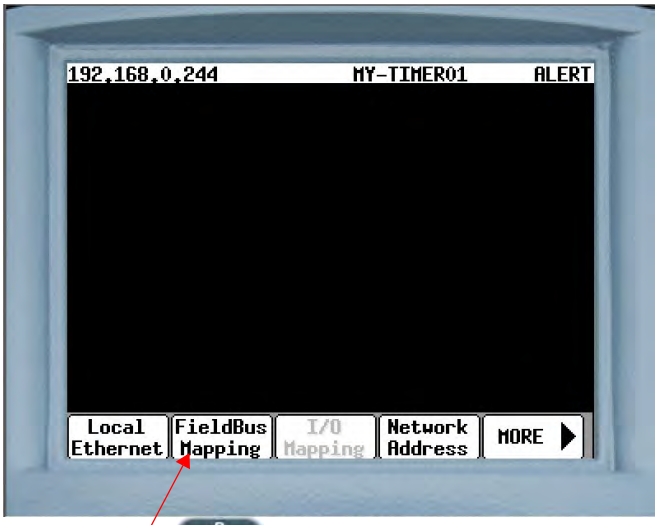
① Press Program Mode

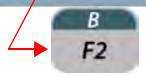


② Press More



③ Press More





④ Press FieldBus Mapping

PROFINET FACTORY DEFAULT SETTINGS:

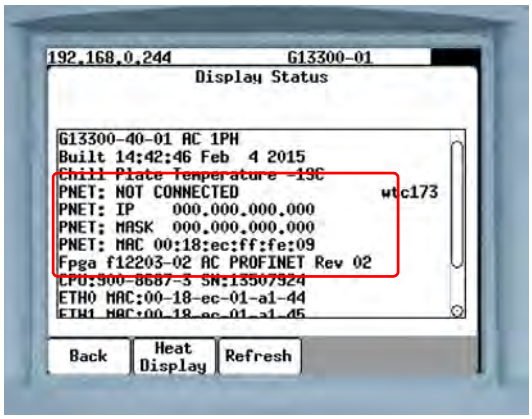
NOTE: A ProfiNet configuration tool is required for the first configuration of these parameters.

NAME	DEFAULT	OPTIONS	DESCRIPTION
RELOAD DEFAULT	OFF	OFF CLEAR IO DEFAULT 1 DEFAULT 2	**CLEAR IO:** Sets all mappable FieldBus Inputs and Outputs to NONE. (Unmapped) **DEFAULT 1:** Reloads Default 1 FieldBus I/O for the application. **DEFAULT 2:** Reloads Default 2 FieldBus I/O for the application.
NODE ADDRESS	1	NONE	
POWER UP	(RETAIN)	(RETAIN) (FACTORY DEFAULT)	**(RETAIN):** Controls how the ProfiNet Name, IP Address, Subnet Mask and Router Address are initiated at power-up. The weld timer follows the settings made by the ProfiNet Configuration Tool. This is the standard setting for ProfiNet. **FACTORY DEFAULT:** The weld timer overrides the ProfiNet Configuration Tool settings and blanks the ProfiNet Name, IP Address, Subnet Mask and Router Address. This is the non-standard setting for ProfiNet.
BYTE SIZE	8 by 8	2 by 2 4 by 4 6 by 6 8 by 8	ProfiNet always transfers 8 bytes in and out. The Byte Size determines how many of the 8 bytes are to be used. **2 by 2:** 16 bits x 16 bits **4 by 4:** 32 bits x 32 bits **6 by 6:** 48 bits x 48 bits **8 by 8:** 64 bits x 64 bits
NETWORK RESPONSE DELAY IN MSEC	1	1	Used for communicating, typically with a DEP that requires a 1ms delay.

PROFINET HARDWARE STATUS

To view the ProfiNet hardware status through the DEP-300s navigate to the Display Mode screen F4.

In the example below, the Display Status menu provides the user with information regarding the ProfiNet hardware status (circled in red) of the weld timer the DEP is connected to.



As long as the ProfiNet interface board is connected to the weld timer, the following statuses are always displayed:

STATUS	DESCRIPTION
PNET: CONNECTED / NOT CONNECTED	When connected, the ProfiNet name will appear on the same line.
PNET: IP	ProfiNet IP Address
PNET: MASK	ProfiNet SubNet Mask
PNET: MAC	ProfiNet Mac Address

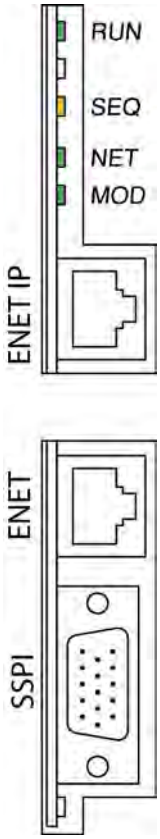
Additional ProfiNet status information may also be displayed. The following only appear if there is an issue and are self clearing:

STATUS	DESCRIPTION
PNET: LINKDOWN	Cable Disconnected
PNET: SESSION LOST / IO FAULT	Lost connection to master PNET controller (i.e SLC rack etc>0
PNET: GOT RELEASE INDICATION	Clean disconnection with master PNET controller

WT6000 PROCESSOR LED DESCRIPTION

The WT6000 processor (weld timer) has four status LED's. Through a combination of changing colors and flashing/solid states, the LED's indicate the status of the EtherNet/IP Module, the EtherNet/IP Status, Weld Sequence Status and the Weld Control Status.

Below is an illustration and description of the LED's located on the WT6000 weld timer:



	MOD (ETHERNET/IP MODULE STATUS)	NET (ETHERNET/IP NETWORK STATUS)	SEQ (WELD SEQUENCE STATUS)	NOT USED	RUN (WELD CONTROL STATUS)
GREEN	EIP functioning properly	EIP Connection established	Processing functions prior to weld		Control stop input high
FLASHING GREEN	EIP initializing	Waiting on EIP connection	Weld control in NO WELD mode		Control stop input low
RED	Error Non-Recoverable	EIP connection lost Waiting to re-establish connection	Processing WELD/ HEAT functions		Mains Sync Error
FLASHING RED					Fault
AMBER			Processing functions after weld		
FLASHING AMBER					Alert
OFF			In weld mode- not in a sequence		

Chapter 6: PROGRAMMING SCHEDULES

ABOUT WELD SCHEDULES

What is a weld schedule?

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.

Essentially, the weld schedule is a “recipe” and the functions within it are the “ingredients”. Just as it is important to use the right ingredients in the correct measure to make a good culinary dish, it is likewise important to use the right functions (properly programmed and in the correct order) to make a good weld nugget.

THE FOUR BASIC ELEMENTS

FUNCTION	DESCRIPTION
SQUEEZE	Apply pressure (electrode force) to the weld interface
WELD	Deliver weld current to the weld interface
HOLD	Apply wait time after the weld current stops to allow the nugget time to cool.
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.

WELD SCHEDULE FUNCTION LIST

For a list of weld schedule functions and descriptions, see Chapter 13: Schedule Function List.

NOTE: 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 sequence in the chain is initiated.

EXAMPLE OF A WELD SCHEDULE

The following is an example of a typical weld schedule. The functions used and how they are programmed, are solely dependent upon the customer's application. Notice that each function has a corresponding number. This allows the user to select functions by number when programming or editing weld schedules.

FUNCTION NO.	FUNCTION NAME
00	START OF SCHEDULE # 1
82	LINEAR STEPPER #1 ASSIGNED (0=OFF)
76	SEC. CURRENT LIMITS: HI =00 LOW =99990
81	TRANSFORMER TUTNS RATIO 73:1
88	TURN ON ISOLATION CONTACTOR
58	TURN ON WELD IN PROGRESS
1	SQUEEZE 30 CYCLES
30	WELD 10 CYCLES 10000 AMPS
3	HOLD 5 CYCLES
63	TURN ON WELD COMPLETE
59	TURN OFF WELD IN PROGRESS
75	EXTEND UNTIL NO INITIATE
64	TURN OFF WELD COMPLETE
89	TURN OFF ISOLATION CONTACTOR
100	END OF SCHEDULE

NOTE: Functions (00) “Start of Schedule” and (100) “End of Schedule” are permanently programmed into each weld schedule and can be neither added nor deleted. Although, they appear in the weld schedules, they do not appear in the Insert Function Menu of any programming interface device.

NOTE: A maximum of 38 functions can be programed in a weld schedule. Start and End of schedule are not considered in the count of 38 functions.

HOW TO READ A WELD SCHEDULE

Weld schedules are read starting at the top and moving down, one line at a time. The time it takes the weld control to complete an entire weld schedule can be calculated by adding up all time parameters (cycle and/or milliseconds) programmed within each function throughout the entire schedule.

For example, in the weld schedule above, there is 30 Cycles of squeeze time, 10 Cycles of weld time, 5 Cycles of Hold time. Thus, the time to complete the entire weld schedule is approximately 45 Cycles.

PROGRAMMING A WELD SCHEDULE

There are several user interface options available to program a weld schedule. They include the following:

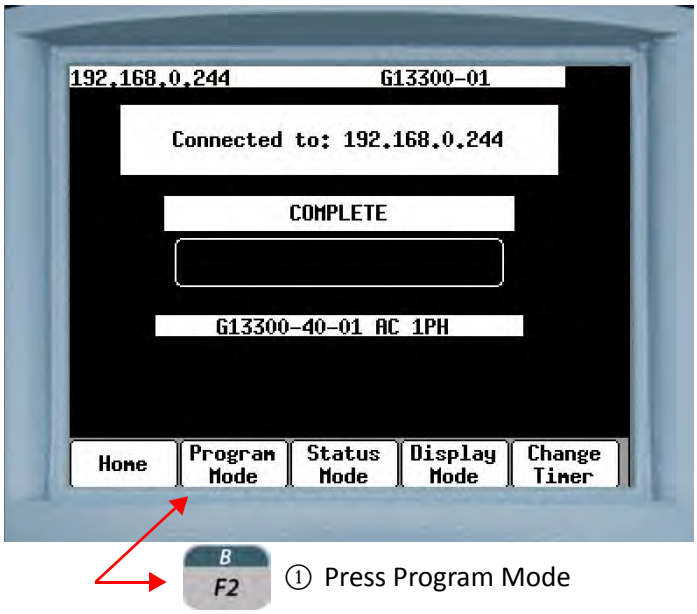
- WTC DEP-300s Data Entry Panel
- WTC ***RAFT***™ Gateway or Weld Gateway Network Software
- Robot Teach Pendant (via WTC's built-in web server)
- Touch Screen (HMI) Devices (via WTC's built-in web server)

NOTE: In certain instances of change a RAM Data Failure may be annunciated on the DEP 300s. This requires a manual reload of Defaults. Failure to so do may result in loss of data.

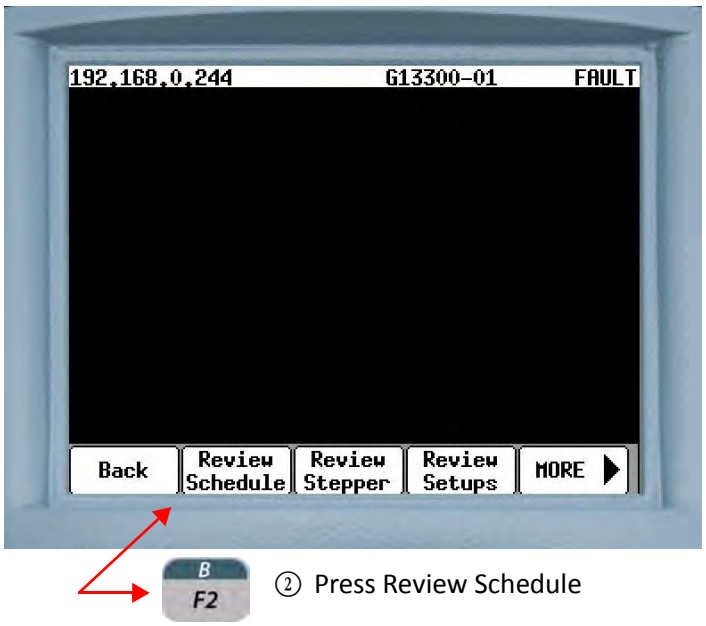
In this manual, the DEP-300s data entry panel is used in all programming instructions

INSERT A FUNCTION INTO A WELD SCHEDULE

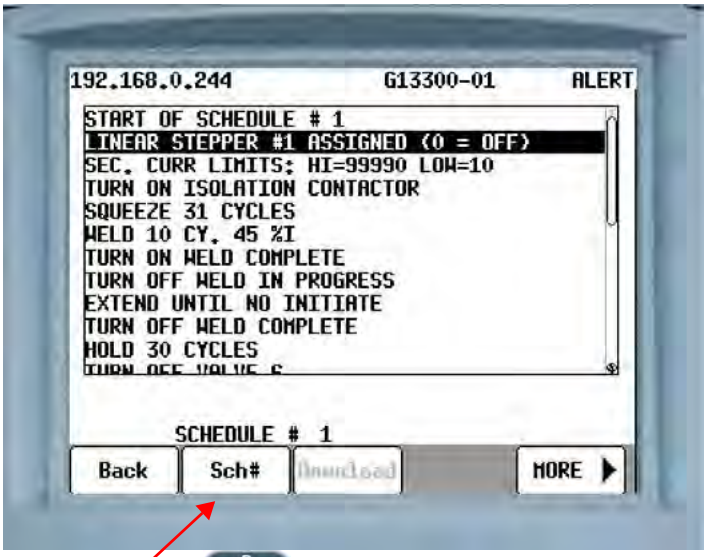
Perform the following steps on the DEP-300s to insert a function into a weld schedule:



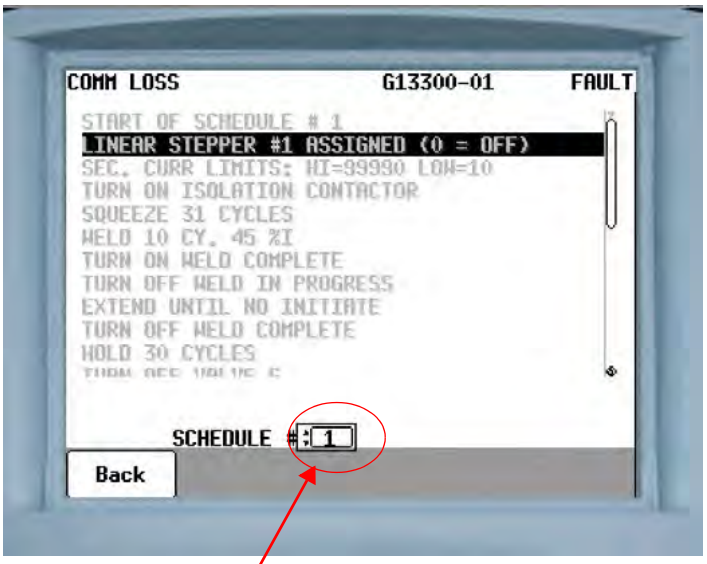
① Press Program Mode

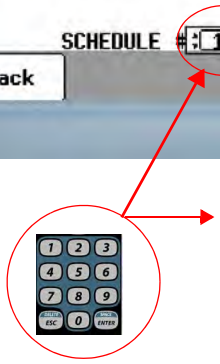


② Press Review Schedule



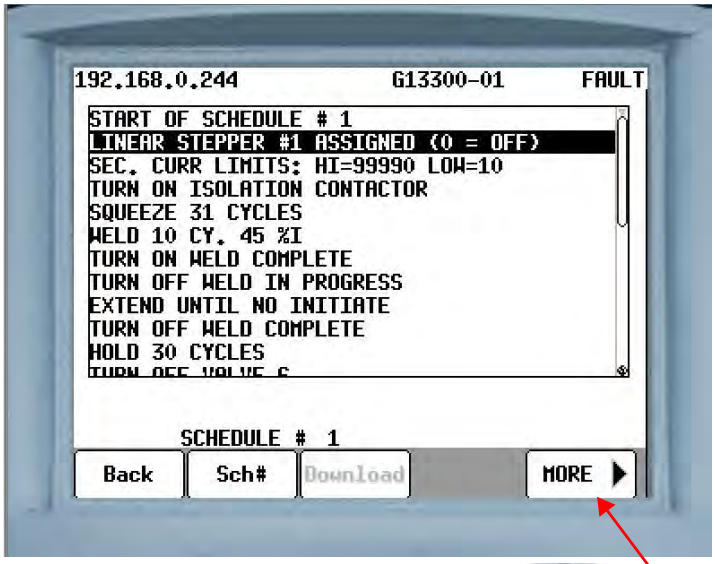
③ Press Sch#





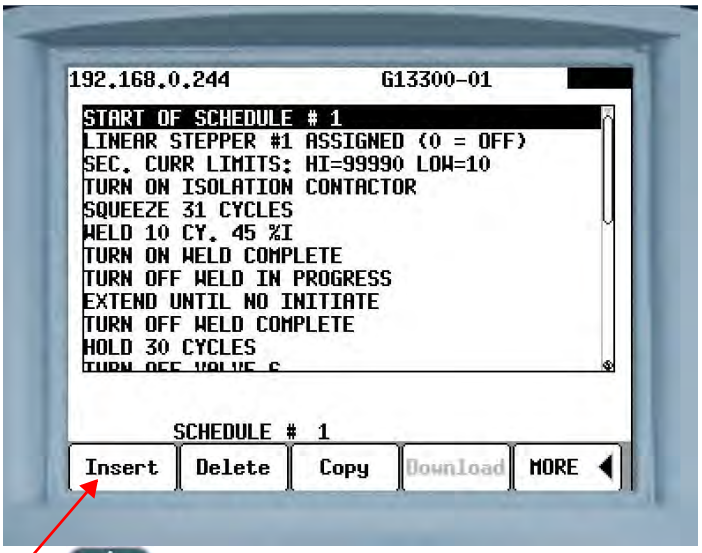
④ Enter Schedule Number

⑤ Press ENTER

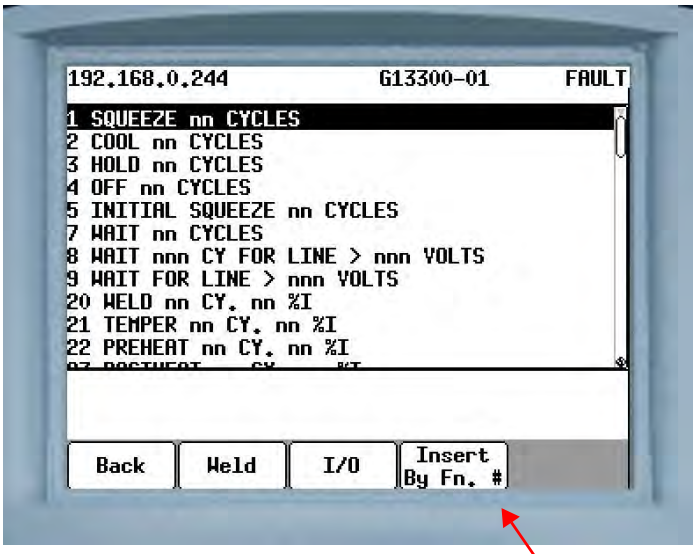


⑥ Press MORE 

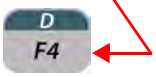
⑦ Press the  or  arrow keys to move the cursor to the line above where the function is to be inserted.

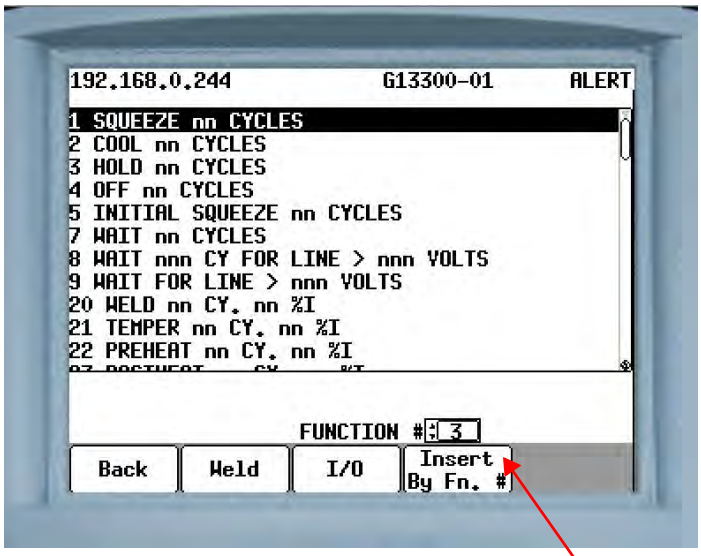


⑧ Press INSERT



⑨ Press INSERT BY FN. # [Insert by Function Number.]

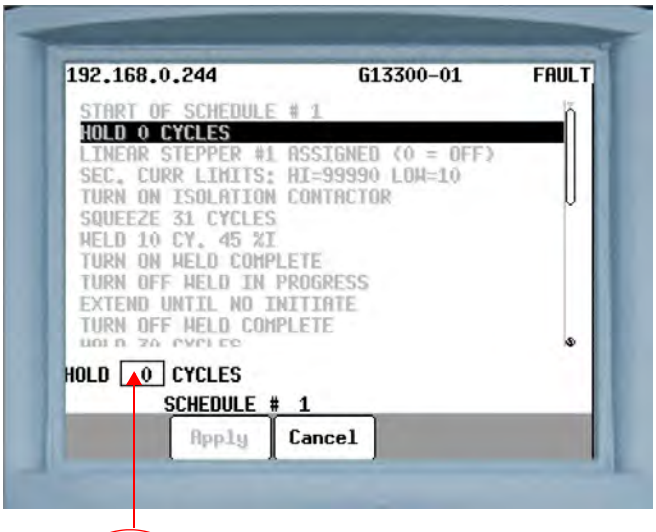




⑩ Enter the Function Number.

⑪ Press ENTER

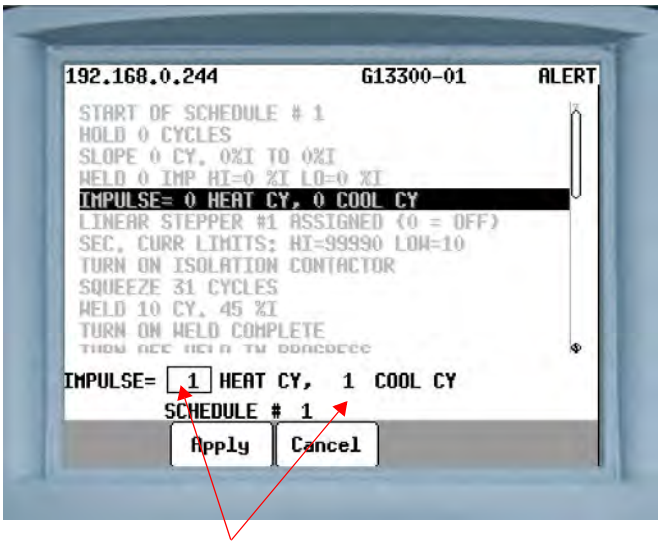
⑫ If the function requires parameters to be entered, proceed to step 13. If not, proceed to step 17.

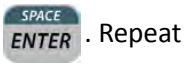


⑬ Enter parameter

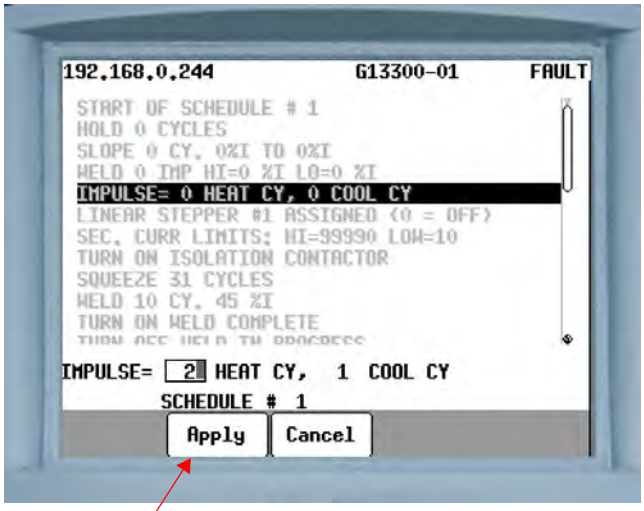
⑭ Press ENTER

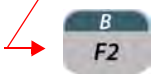
*** NOTE:** In the DEP 300s the zero in the ones placed is fixed. The tenths, hundredths and thousandths place are programmable up to a maximum of 9999.
For example:
Enter 5O for 5OO Amps.



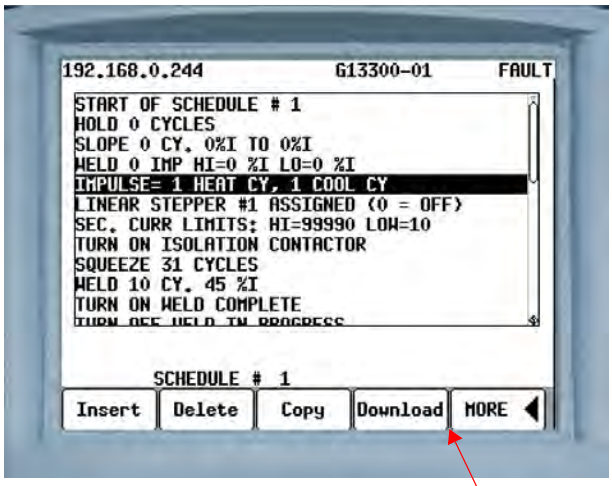
⑮ For functions with two or more parameters, press the  RIGHT arrow key to move the cursor to the next parameter box. Enter the desired value using the number pad  then press 

. Repeat steps 13 & 14. When complete, proceed to step 16.





⑯ Press APPLY (F2).
[Saves changes to the DEP-300s only.]

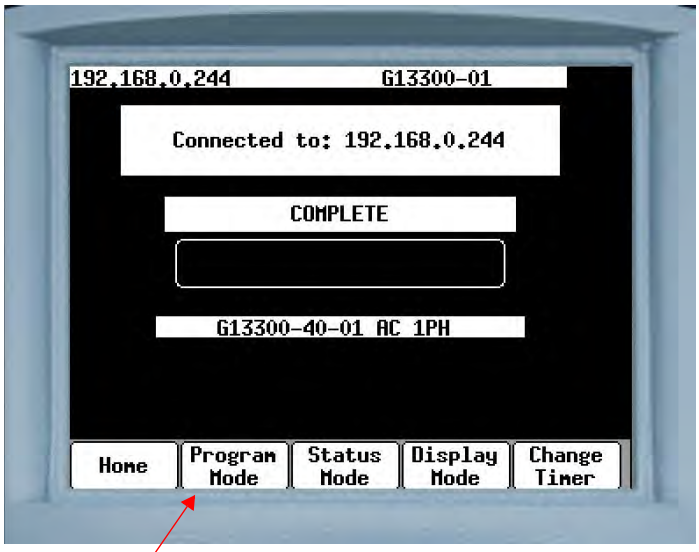


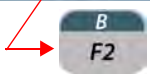
⑰ Press DOWNLOAD.
[Downloads the changes to the weld processor].

When complete, a “Download Complete” message will appear.

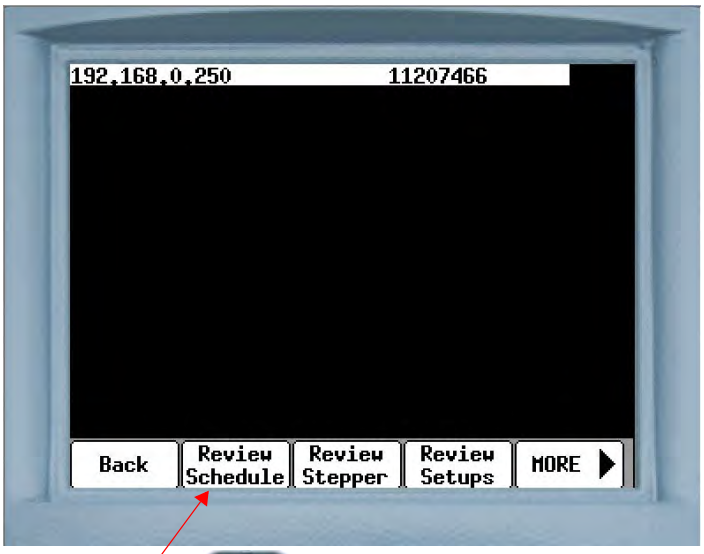
DELETE A FUNCTION FROM A WELD SCHEDULE

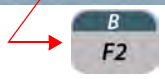
Perform the following steps on the DEP-300s to delete a function from a weld schedule:





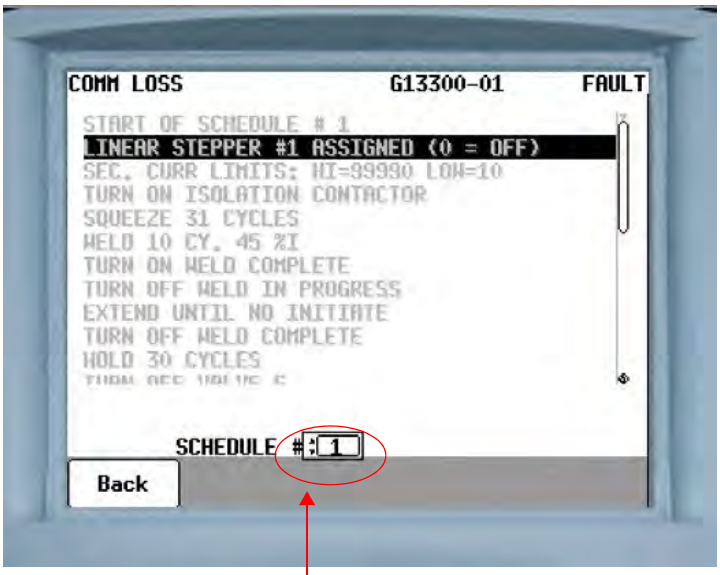
① Press Program Mode.

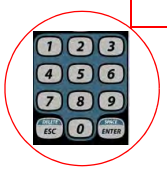




② Press Review Schedule.

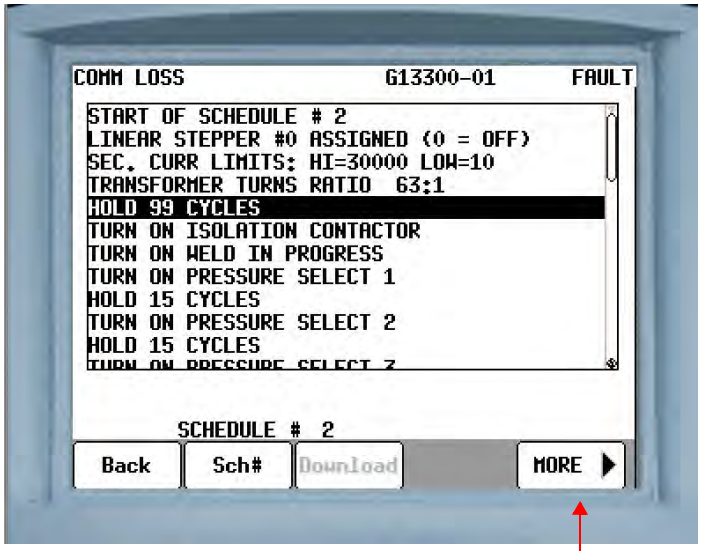
③ Press Sch#



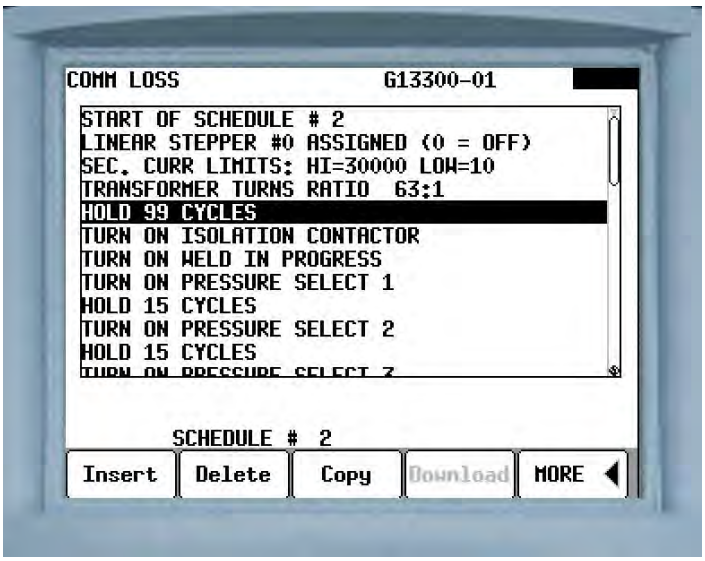


④ Enter Schedule Number

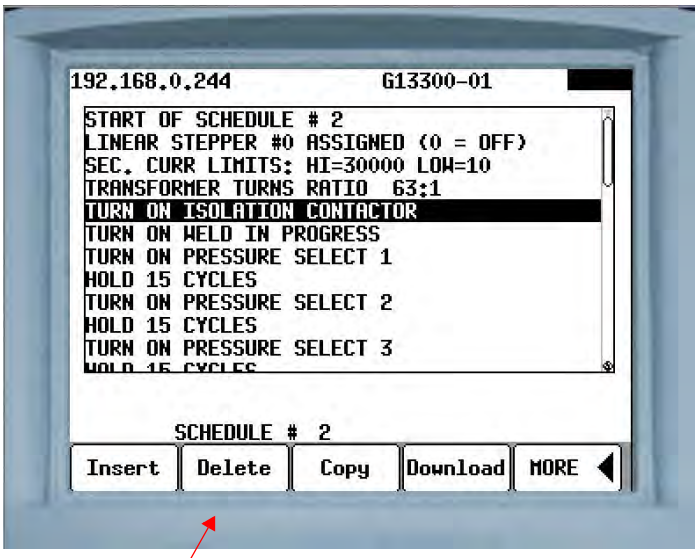
⑤ Press ENTER

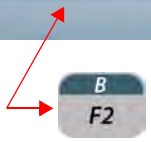


⑥ Press MORE 

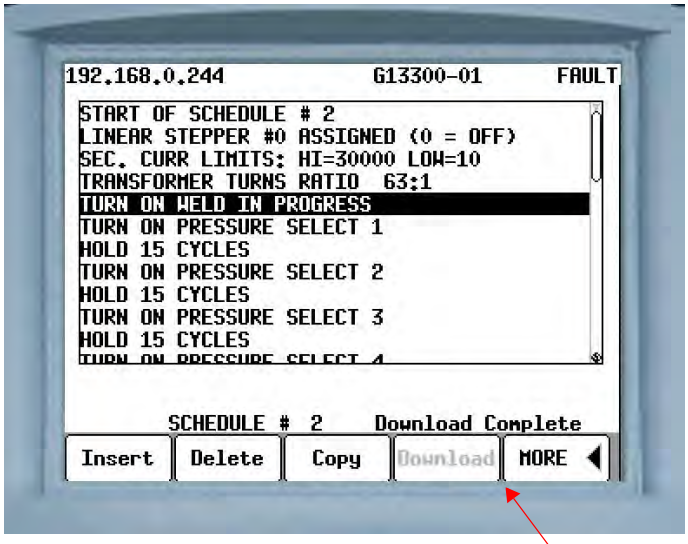


⑦ Press the  or  arrow keys to move the cursor onto the function line to be deleted.





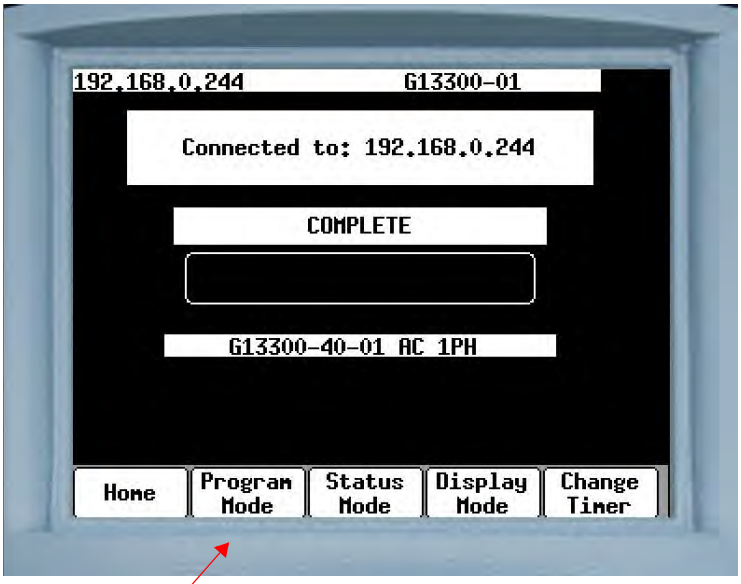
⑧ Press DELETE.
[The function is immediately deleted from the DEP-300s.]

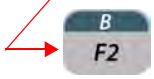


⑨ Press DOWNLOAD
[Downloads the changes to the weld processor. When complete, a “Download Complete” message will appear]

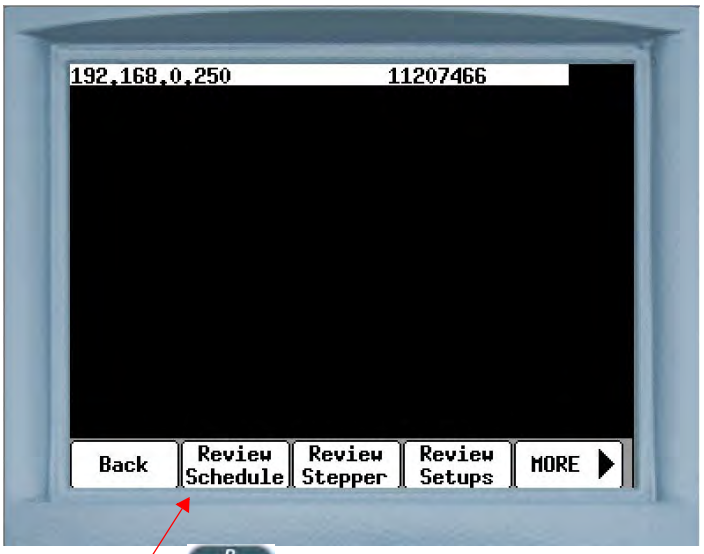
COPYING A WELD SCHEDULE

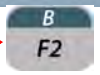
Perform the following steps on the DEP-300s to copy an entire weld schedule from one location and paste it into another:



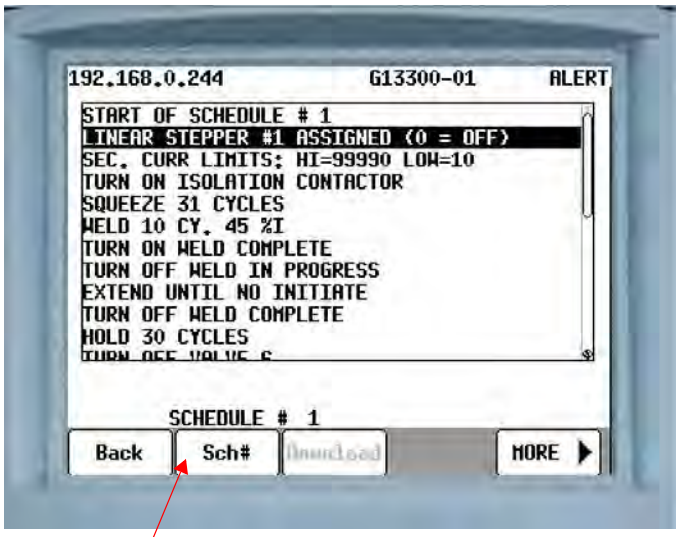


① Press Program Mode

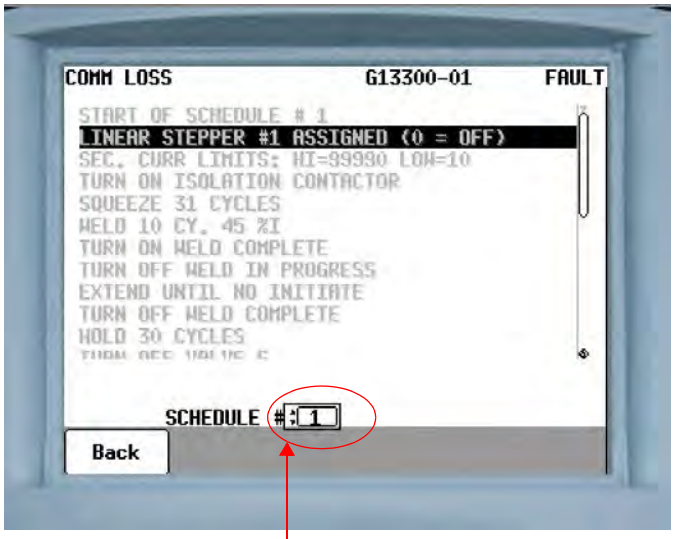




② Press Review Schedule

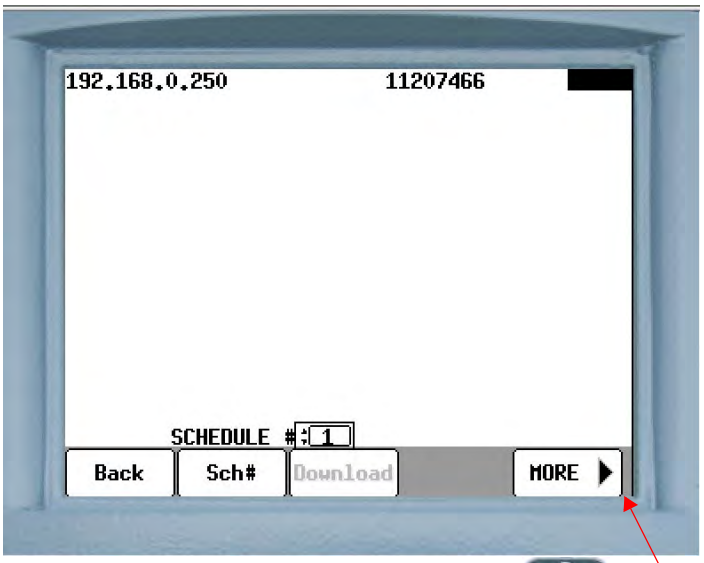


③ Press Sch#

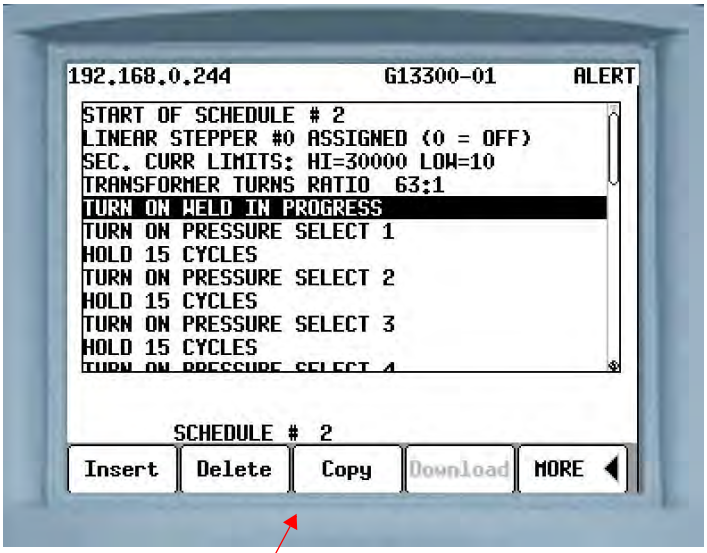


④ Enter Schedule Number

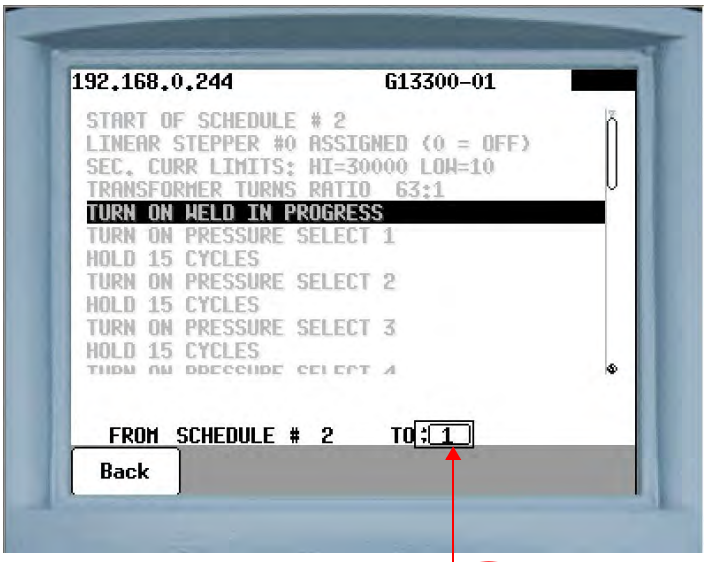
⑤ Press ENTER



⑥ Press MORE

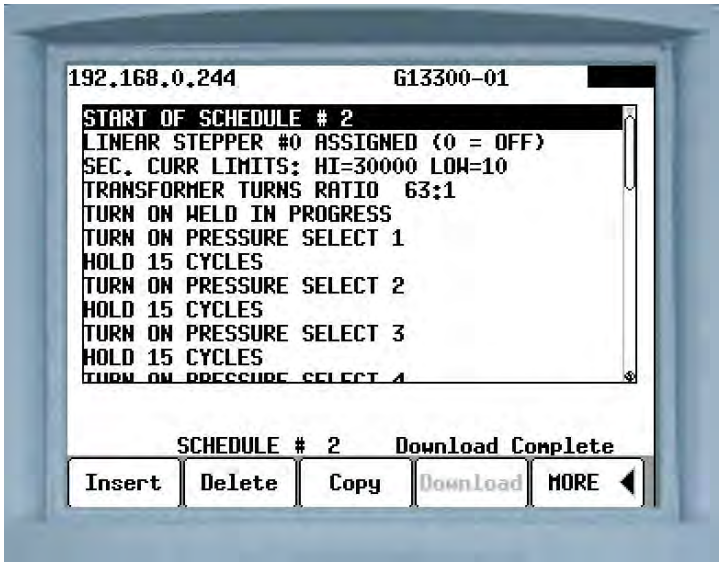


⑦ Press COPY



⑧ FROM SCHEDULE # (Current Schedule will be displayed) TO [Blank Field] enter the paste to Schedule Number

⑨ Press ENTER



⑩ The copy is immediately downloaded to the weld processor. When complete, a “Download Complete” message will appear.

NOTE: When copying a weld schedule from one location to another, any existing data in the paste location will be completely overwritten and permanently lost.

SPOT ID PROGRAMMING

The SPOT ID feature allows enhanced flexibility in setting up welding schedules that are associated with spot numbers. This allows the user to associate the spot number of the weld with programming data used to create the spot and the welding data results of the spot. A second option with this feature is to initiate the weld control based on spot numbers instead of schedule numbers. There are 255 weld schedules available for spot selection 1 -255. Spot numbers higher than 255 can be assigned freely via the Spot ID system. These schedules are a continuation of the binary sequence select bits (1-255). With this feature additional schedules can be added to the 255 schedules already available. Individual schedules can also be customized and duplicated.

Another usage is to have all the spots of the plant programmed into one timer (as long as the number of unique welding schedules is under the 255 schedule maximum) and the Robot picks the schedule based on the spot number. This allows the welding timers to be preprogrammed with all the data required to operate in any welder in the plant.

There is a limitation of 1000 associations of spot numbers to weld schedules. If more than 1000 associations are attempted, then the programming device will provide an error message. However, there is no limit on how many of these 1000 associations can be assigned to a single schedule. It is possible to have all 1000 associations with one schedule if the programmer desires.

If the SPOT ID is assigned, then the weld schedule associated with it will be initiated. If the spot ID selected is not assigned, then an INVALID SEQUENCE SELECTED fault is set.

The user will be able to select a schedule for view or edit through the use of the spot numbers. When a schedule is chosen for edit based on a spot number, the schedule will be shown along with the other spot numbers which are associated with that schedule.

SETUP PARAMETERS

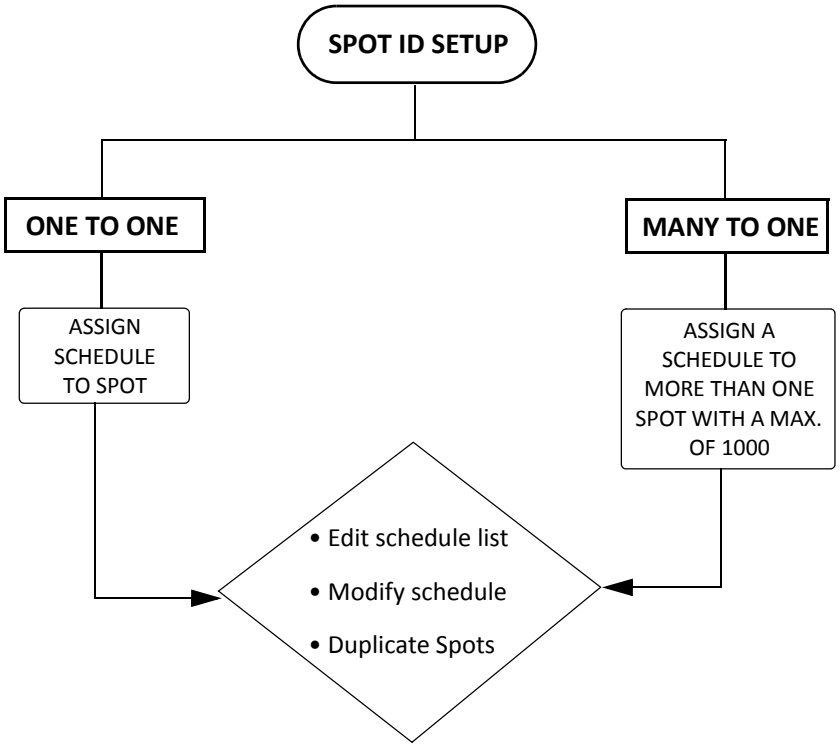
ONE TO ONE (Default)	One schedule assigned to one spot
MANY TO ONE	One schedule assigned to Many spots

SPOT No.	Min: 256
	Max: 1073741824

SETUP PROCEDURES

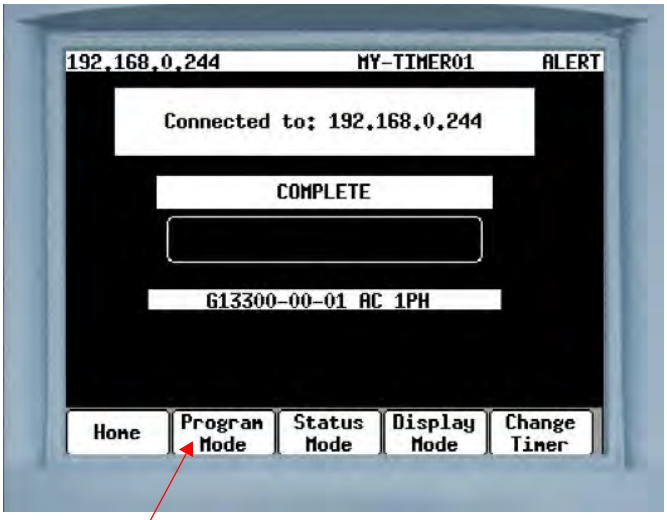
Weld schedules with Spot ID feature can be programed via the DEP 300s or the WebView.

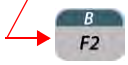
At the onset it is important to establish the system configuration by selecting from the two modes available:



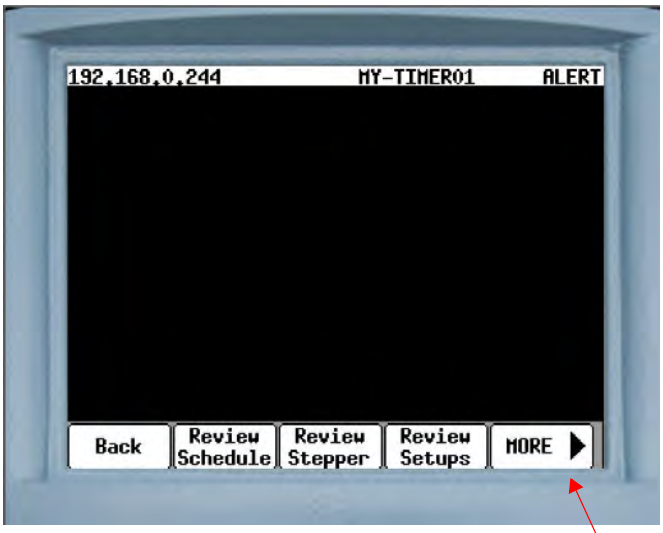
ONE TO ONE MODE

SETTING UP A NEW SPOT ID IN ONE TO ONE MODE



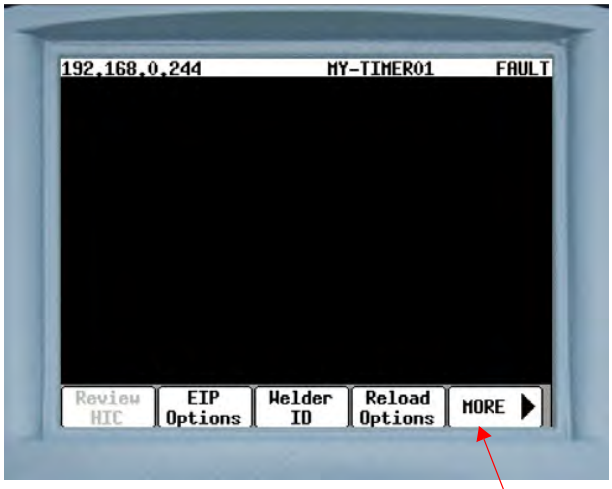


① Press Program Mode.

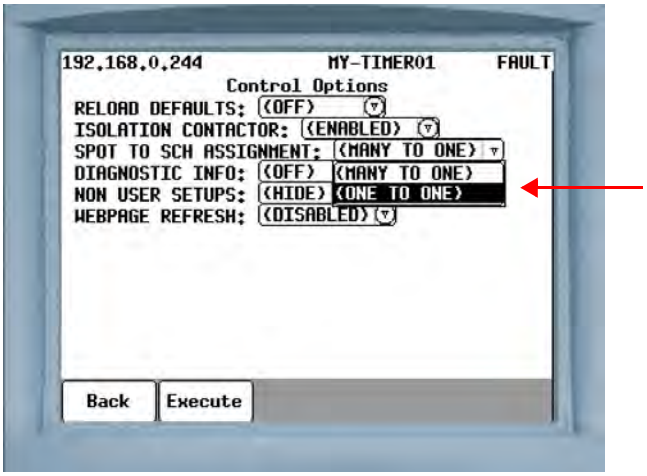


② Press More

NOTE: Your timer screen may display different information depending on software installed. The screen shots used in the following procedures are for illustrative purpose only.



③ Press Reload Options 



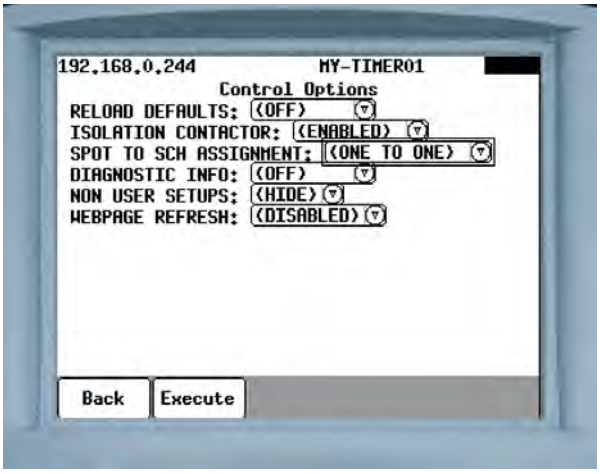
④ Press the 

arrow key to navigate to “SPOT TO SCH ASSIGNMENT”. Press 

to open the drop down list: MANY TO ONE and ONE TO ONE. Press the 

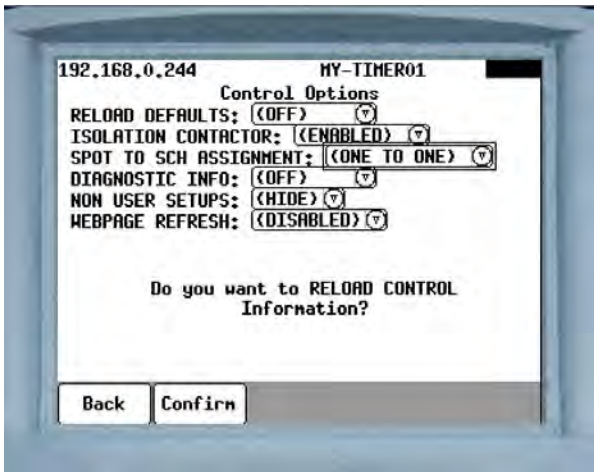
arrow key to select ONE TO ONE. Press 

.



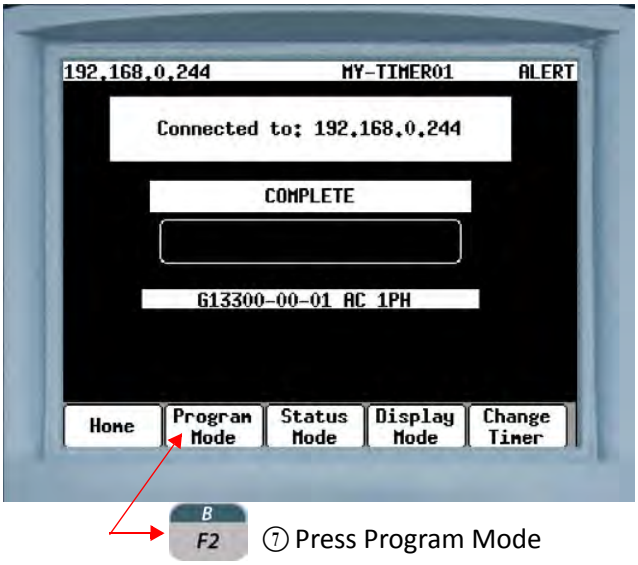
⑤ Press Execute 

.

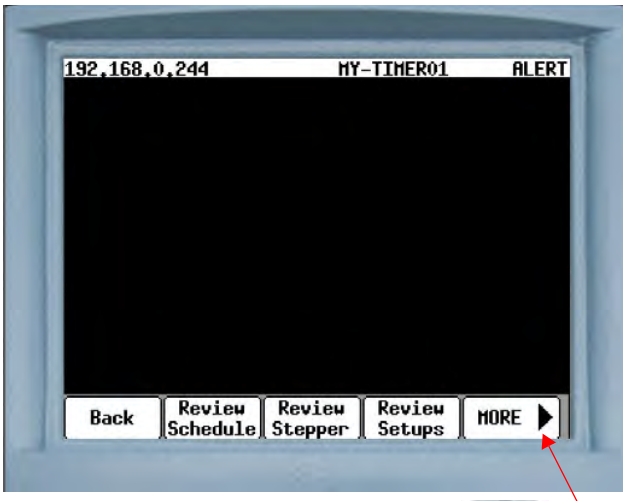


⑥ "Do you want to RELOAD CONTROL Information?" is displayed. Press 

to Confirm. This is followed by the message "Download Complete Power Cycle Required." Cycle power to the weld timer apply the selection.



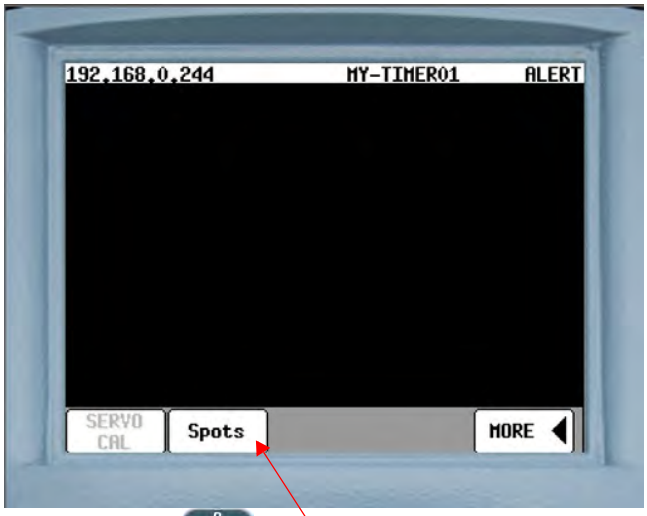
⑦ Press Program Mode



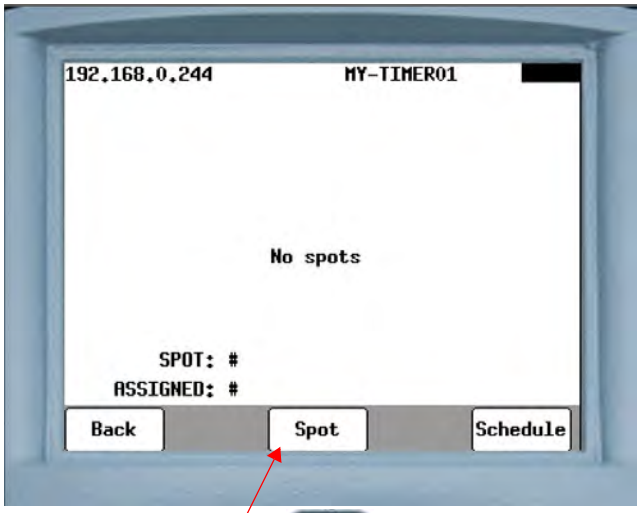
⑧ Press More

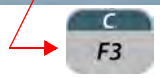
⑨ Press More 

⑩ Press More 

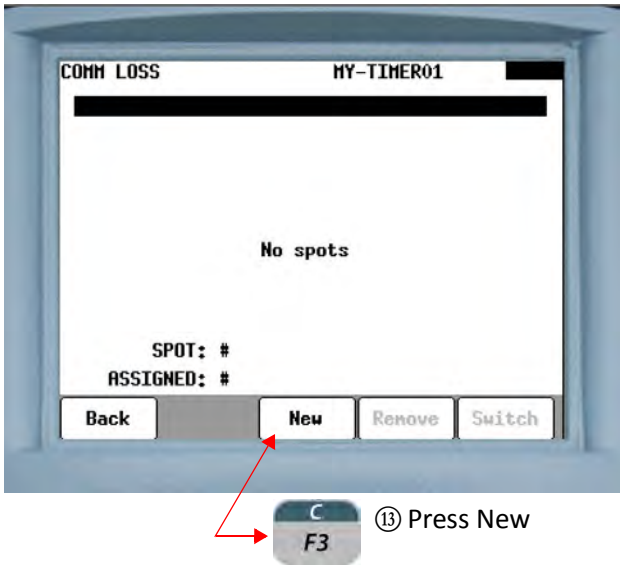


⑪ Press Spots 

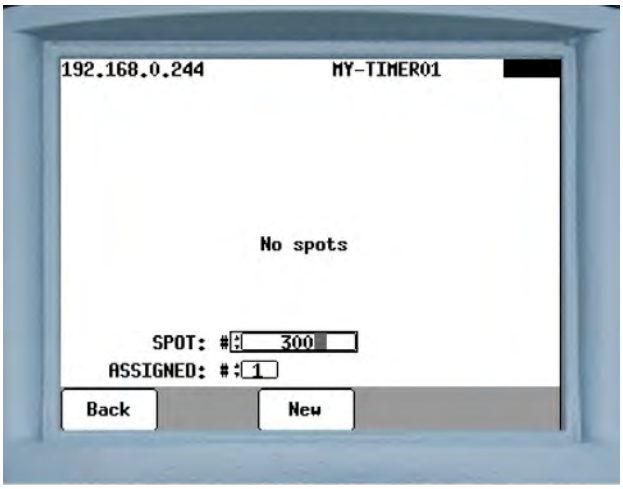




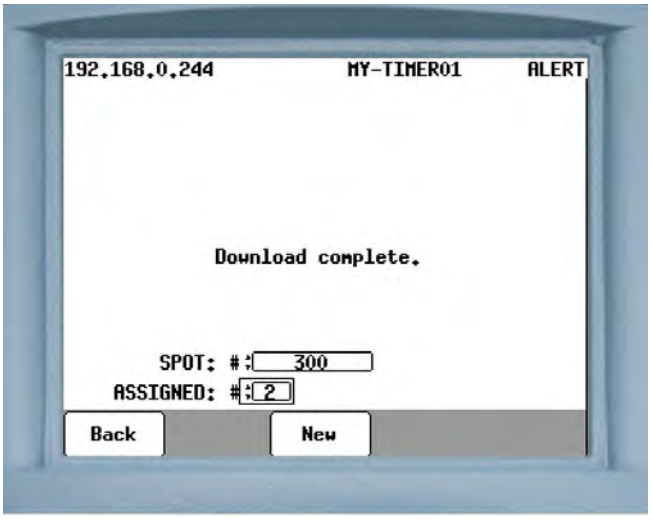
⑫ Press Spot



⑬ Press New



⑭ Using the number keys enter the spot number (300) in our example. Then press ENTER.



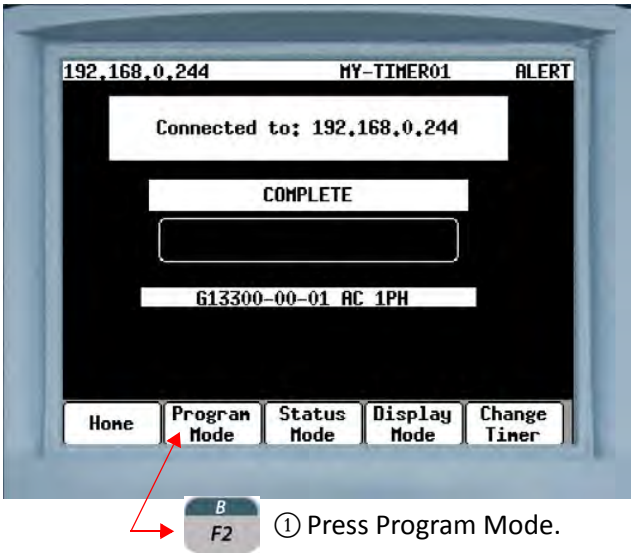
⑮ Press the  arrow key to move the cursor to the Assigned # field. Enter the schedule number using the number keys  (2 in our example)

Then press Enter  . Press New  .
Wait for the Download complete message before proceeding.
Spot 300 has now been assigned schedule 2.

NOTE: In ONE TO MODE a schedule can only be assigned to a specific spot. In case an attempt is made to assign previously used schedule number to another (New) spot number, the DEP 300s will alert the user with a “Duplicate spot entry” message.

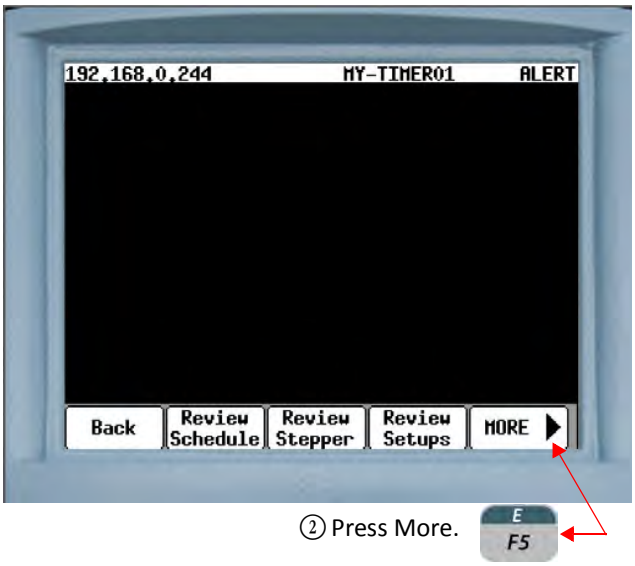
EDITING THE SCHEDULE FOR A NEW SPOT

The pre-programmed schedules 1-255 can be individually changed depending on specific spot requirements.



① Press Program Mode.

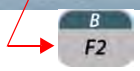
NOTE:
Check your DEP 300s communication settings - Local Ethernet, Global Ethernet or Serial before proceeding.



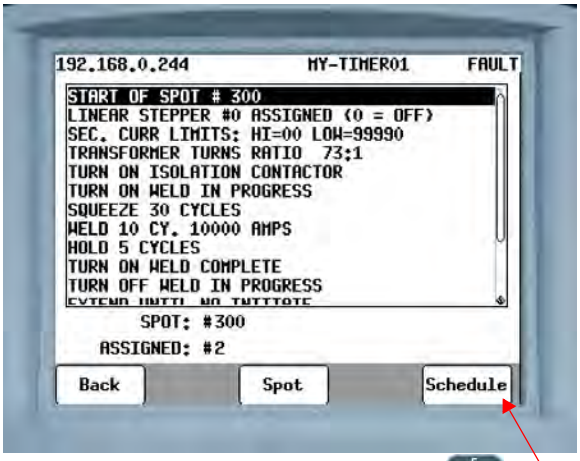
② Press More.

③ Press More. 

④ Press More. 



⑤ Press Spots.

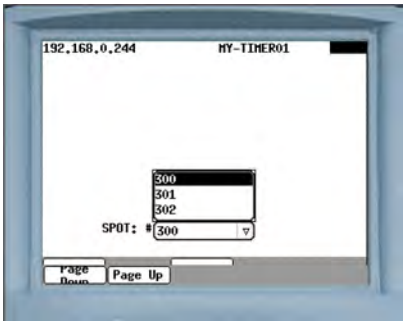


⑥ Press Schedule. F5

NOTE: By default the Spot with the lowest number* will be displayed. Spot #300 in our example. To select a spot other than the one displayed, press SPOT F3.

** Spots numbers start from 256*

Press Switch F5

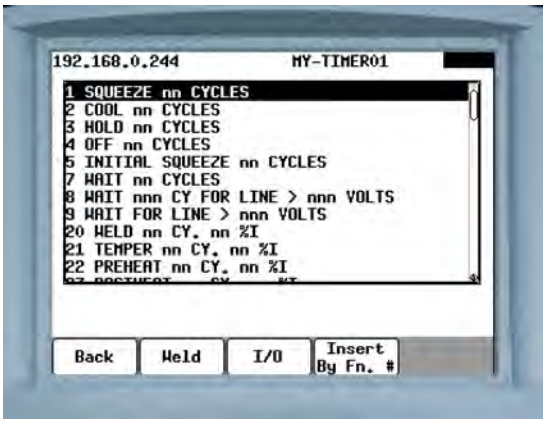


Press Enter ENTER to display the list of spots.

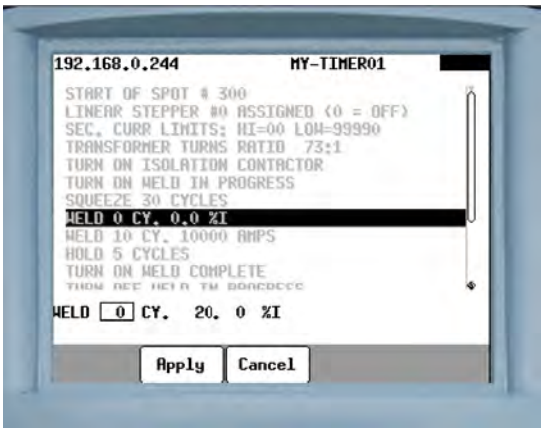
Use the ↓ to navigate to the desired spot#

and press ENTER then press Switch F3. This should bring you back to the screen that displays the Schedule on the top of the page in Step ②.

⑦ Using the S ↓ arrow key navigate to line in the schedule that has to be edited and press Insert D F4.



⑧ This will open up a list of functions. Using the S ↓ arrow key navigate to the function line to insert and press Insert SPACE ENTER. Alternately you can also insert a function by Function No. D F4.

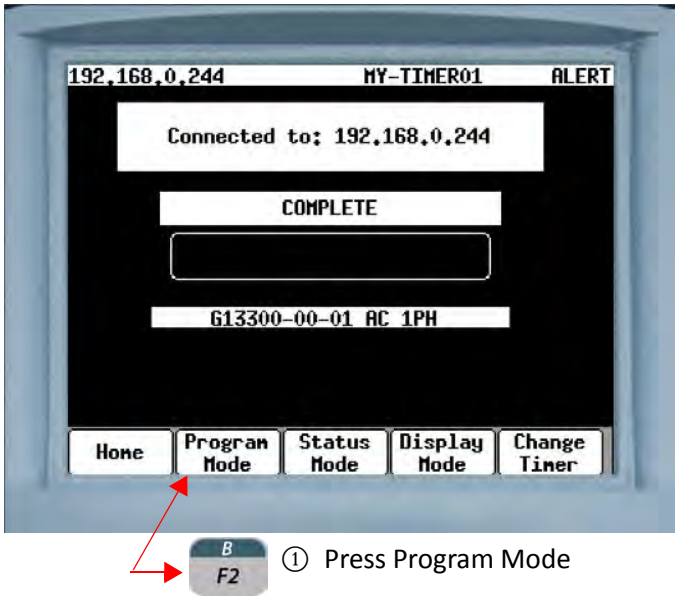


Note: Once a schedule is edited the change is carried over to all spots with the same schedule when in MANY TO ONE mode.

⑨ Edit the required parameters and press Apply B F2. Press Download to complete the change and wait for the “Download Complete” message on the DEP 300s screen.

MANY TO ONE MODE

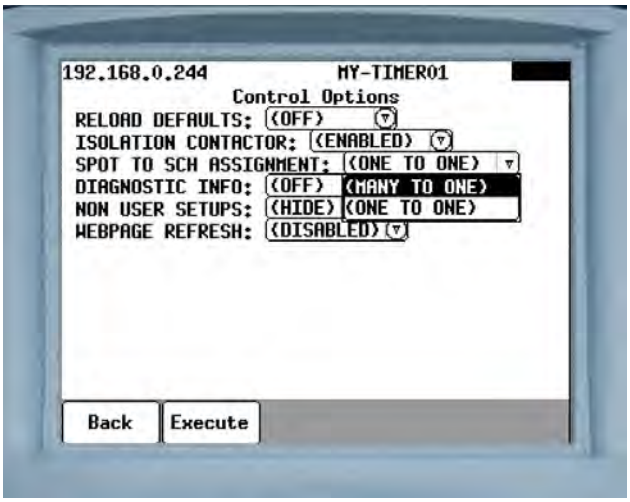
SETTING UP A NEW SPOT ID IN MANY TO ONE MODE



① Press Program Mode

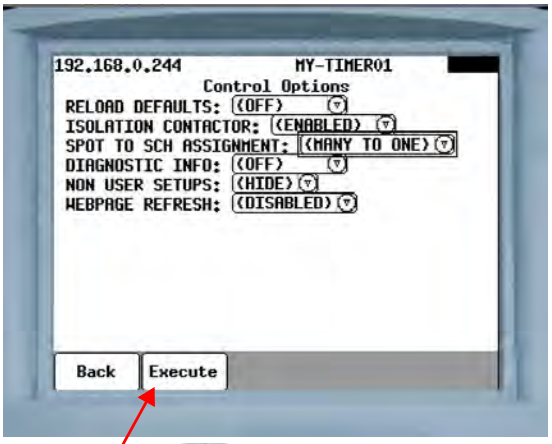
② Press More

③ Press Reload Options 

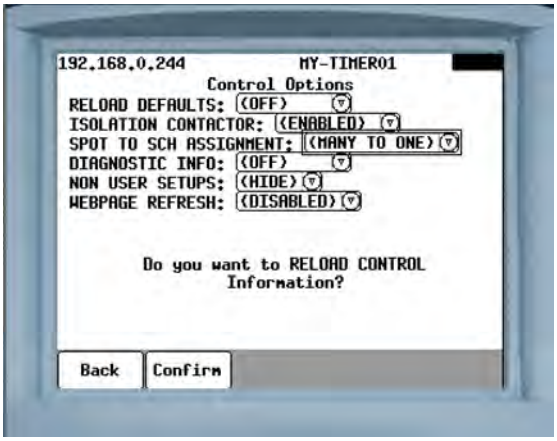


④ Press the  arrow key twice to bring the cursor to SPOT TO SCH ASSIGNMENT. Press  This opens up a drop down box displaying the available modes. Press the  arrow key to select MANY TO ONE.

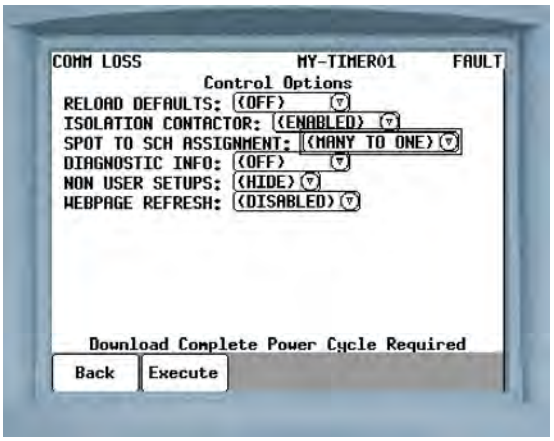
⑤ Press 



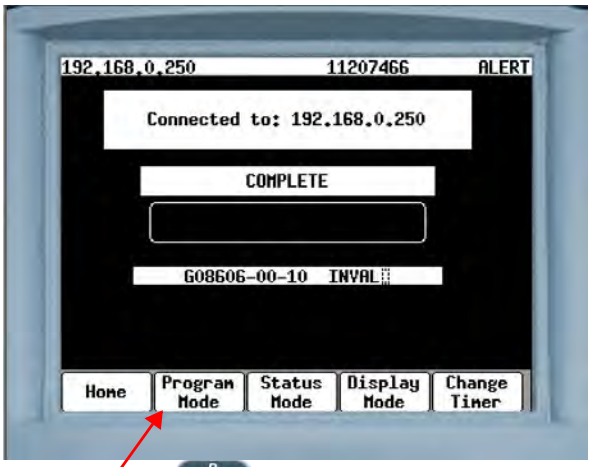
B F2 ⑥ Press Execute



⑦ Do you want to RELOAD CONTROL information will be displayed. Press B F2 to confirm.

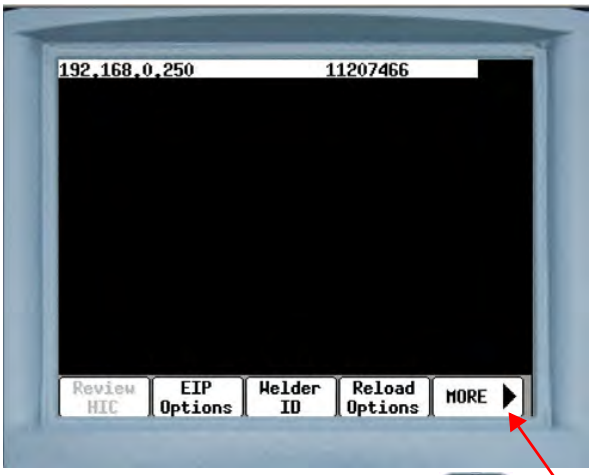


⑧ Press B F2 to Execute and cycle power to the timer confirm the change.



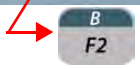
B F2 ⑨ Press Program Mode

⑩ Press More E F5

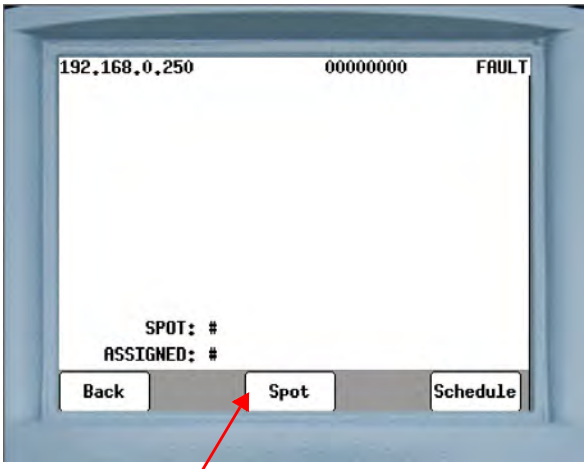


⑪ Press More E F5

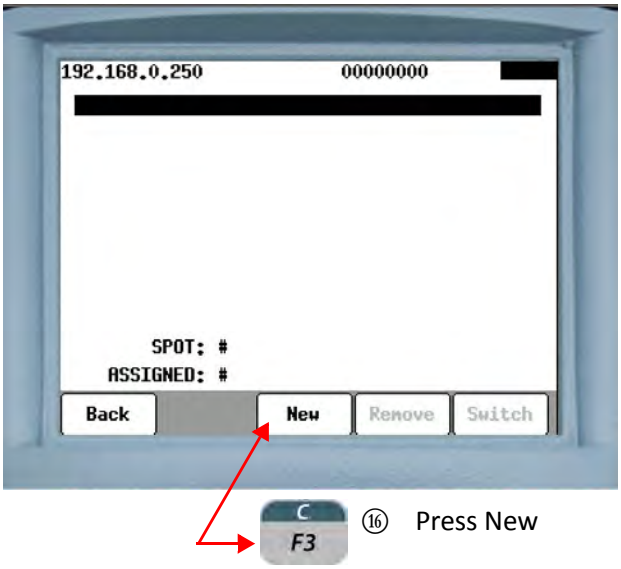
⑫ Press More 



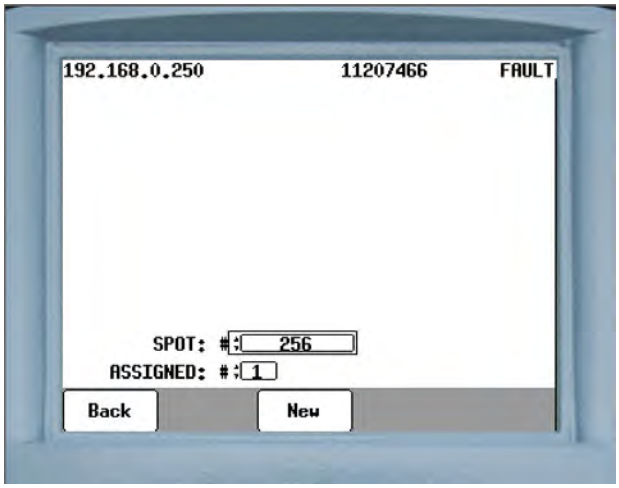
⑬ Press Spots



⑭ Press Spot



⑯ Press New

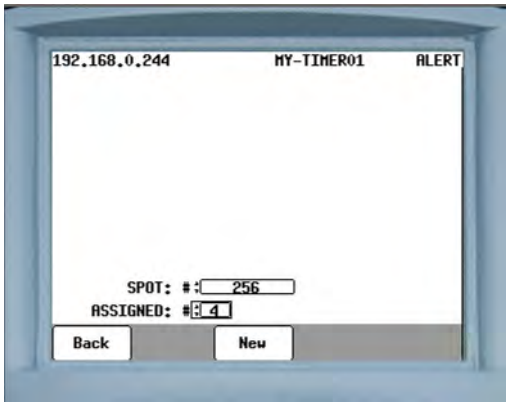


⑰ Press Enter 

. Using the number keys 

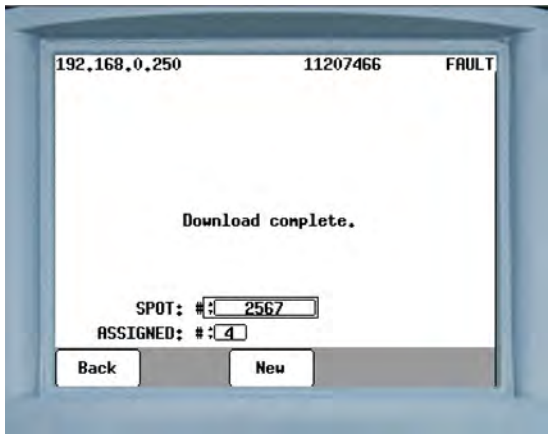
enter spot number (256 in our example)

Repeat Step 16 to add new spots to the selected schedule. Up to a **maximum of 1000 associations to a single schedule are allowed**.



⑱ Press the arrow key to move the cursor to the Assigned # field. Enter the schedule number using the number keys

Then press Enter Wait for the Download complete message before proceeding.

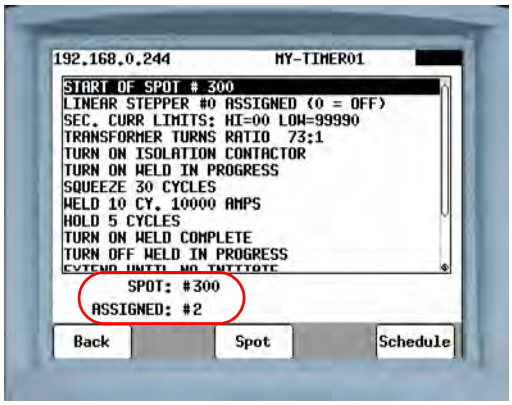


⑲ Press the arrow key to move the cursor to the Spot # field. Enter the new spot number using the number keys

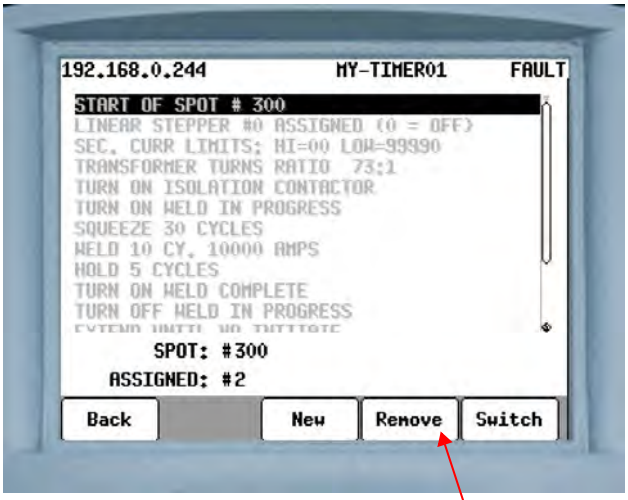
Then press Enter Wait for the Download complete message before proceeding.

REMOVING A SPOT

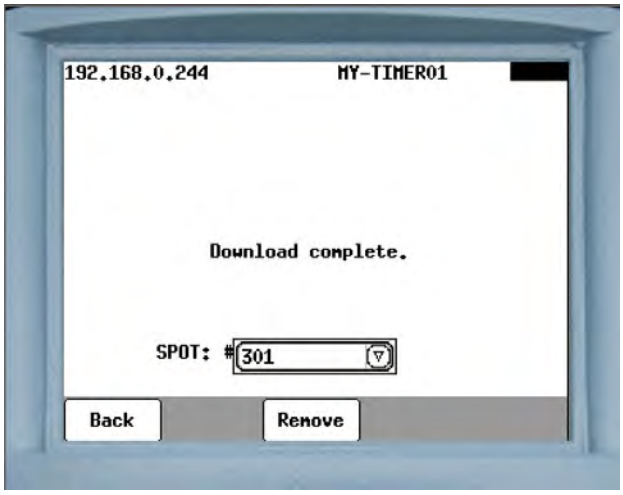
① Navigate to the Spots screen [Program Mode ▸ More ▸ More ▸ More ▸ Spots] and press Spots B F2.



② This will open up a page displaying the lowest spot number by default and assigned schedule. Press Spot C F3.



③ Press Remove 

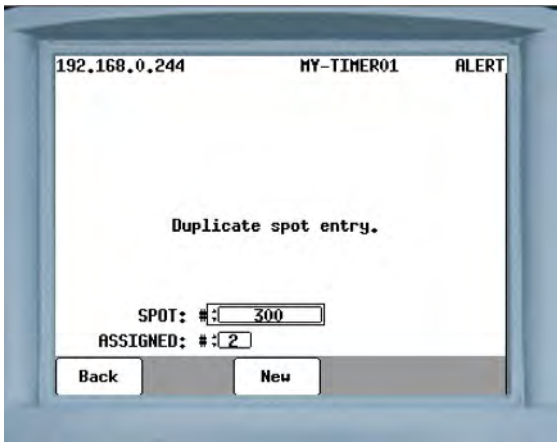


④ Press Remove 

. Wait for the “Download Complete” message before proceeding.

POSSIBLE ERROR MESSAGES

1. When the weld program is configured in ONE TO ONE mode a Duplicate Entry error message is generated when an attempt is made to assign a previously assigned schedule to a new spot



LIST OF SPOT I/O BITS

SPOT 9 (256)
SPOT 10 (512)
SPOT 11 (1024)
SPOT 12 (2048)
SPOT 13 (4096)
SPOT 14 (8192)
SPOT 15 (16384)
SPOT 16 (32768)
SPOT 17 (65536)
SPOT 18 (131072)
SPOT 19 (262144)
SPOT 20 (524288)
SPOT 21 (1048576)
SPOT 22 (2097152)
SPOT 23 (4194304)
SPOT 24 (8388608)
SPOT 25 (16777216)
SPOT 26 (33554432)
SPOT 27 (67108864)
SPOT 28 (134217728)
SPOT 29 (268435456)
SPOT 30 (536870912)

DEFAULT WELD SCHEDULES

ROBOT MODE - DEFAULT WELD SCHEDULES

SCHEDULE #	FUNC. #	DESCRIPTION
1-29 and 32 - 255	00	START OF SCHEDULE #N
	82	LINEAR STEPPER #0 ASSIGNED (0=0FF)
	76	SEC. CURR LIMITS: HI = 00 LO = 99990
	81	TRANSFORMER TURNS RATIO 73:1
	88	TURN ON ISOLATION CONTACTOR
	58	TURN ON WELD IN PROGRESS
	1	SQUEEZE 30 CYCLES
	30	WELD 10 CYCLES 1000 AMPS
	3	HOLD 5 CYCLES
	63	TURN ON WELD COMPLETE
	59	TURN OFF WELD IN PROGRESS
	75	EXTEND UNTIL NO INITIATE
	64	TURN OFF WELD COMPLETE
	89	TURN OFF ISOLATION CONTACTOR
	100	END OF SCHEDULE

ROBOT MODE - DEFAULT TIP DRESS SCHEDULE

SCHEDULE #	FUNC. #	DESCRIPTION
30 and 31	00	START OF SCHEDULE #N
	58	TURN ON WELD IN PROGRESS
	1	SQUEEZE 30 CYCLES
	59	TURN OFF WELD IN PROGRESS
	63	TURN ON WELD COMPLETE
	3	HOLD 5 CYCLES
	64	TURN OFF WELD COMPLETE
	100	END OF SCHEDULE

MACHINE MODE - DEFAULT WELD SCHEDULE

SCHEDULE #	FUNC. #	DESCRIPTION
1-255	00	START OF SCHEDULE #N
	82	LINEAR STEPPER #0 ASSIGNED (0 = OFF)
	76	SEC. CURR LIMITS: HI =00 LOW =99990
	81	TRANSFORMER TURNS RATIO 73:1
	88	TURN ON ISOLATION CONTACTOR
	58	TURN ON WELD IN PROGRESS
	1	SQUEEZE 30 CYCLES
	30	WELD 10 CYCLES 10000 AMPS
	3	HOLD 5 CYCLES
	63	TURN ON WELD COMPLETE
	59	TURN OFF WELD IN PROGRESS
	75	EXTEND UNTIL NO INITIATE
	64	TURN OFF WELD COMPLETE
	89	TURN OFF ISOLATION CONTACTOR
	100	END OF SCHEDULE

Chapter 7: FAULTS AND SETUP PARAMETERS

When Faults are detected, the WTC DEP-300S (Data Entry Panel) can be used edit a Programmable Fault or Setup Parameter.

WTC DEP-300S is a portable, hand-held, programming device, used to communicate with WTC weld timers through an EtherNet IP network.

[For detailed information on how to use the DEP-300s refer to User Manual # M-035030]

Connect DEP-300s to serial port on weld timer to power up and connect to the Ether Net port to access the ***RAFT™*** Gateway.

Perform the following steps on the DEP-300s to edit a Programmable Fault or Setup Parameter

① Press Program Mode (F2)

② Press Review Setups (F4)

③Press the ↑ or ↓ arrow keys to move the cursor to the fault or parameter line to be edited.

④ Press ENTER.

⑤ Press the ↑ or ↓ arrow keys to select a fault severity option or enter the required parameter value with the numeric keys.

⑥ Press ENTER.

⑦ Press APPLY (F2). [Saves changes to the DEP-300s only]

⑧ Press DOWNLOAD (F2). [Downloads the changes to the weld timer. When complete, a “Download Complete” message will appear]

FAULT SEVERITY

The user can set the severity of the programmable faults. The severity option tells the weld processor how to respond when a fault condition is detected. Conversely, the severity of non-programmable faults are fixed and cannot be changed. See Non-Programmable (Hidden) Faults on Page 107.

FAULT →

When a fault condition is detected by the weld processor, the Fault bit will go HIGH and the No Fault bit will go LOW. Fault conditions generally (with a few exceptions) inhibit the initiation of a weld schedule. A fault condition is remembered by the weld timer when power is re-cycled on the weld control cabinet.

ALERT →

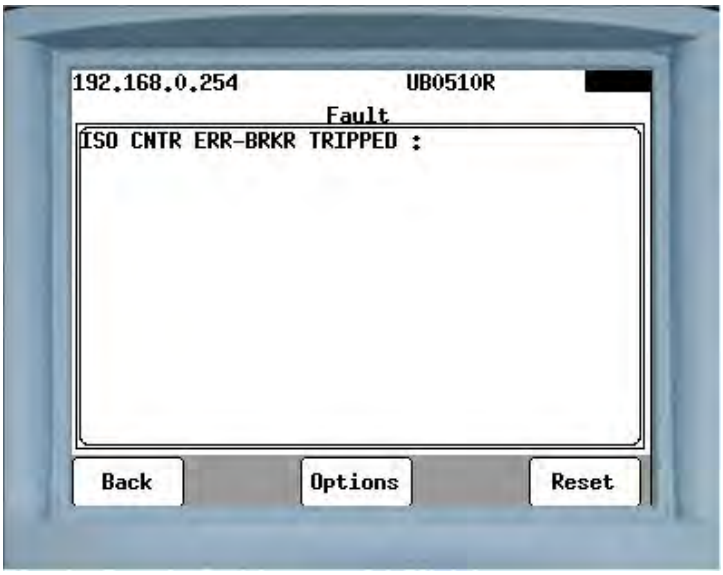
When an alert condition is detected by the weld processor, the Alert bit will go HIGH and the No Alert bit will go LOW. Alert conditions do not inhibit the initiation or execution of a weld schedule.

NONE →

When a fault condition is detected, the weld processor still logs the fault, but inhibits the Fault or Alert bits from turning on (HIGH). This condition will not inhibit the initiation of a weld schedule.

FAULT RESET

Faults can be reset by either pressing the Reset (F5) button on the Fault Status Menu in the DEP-300s or turning the Fault Reset input bit HIGH. Perform the following steps to reset faults via the DEP-300s

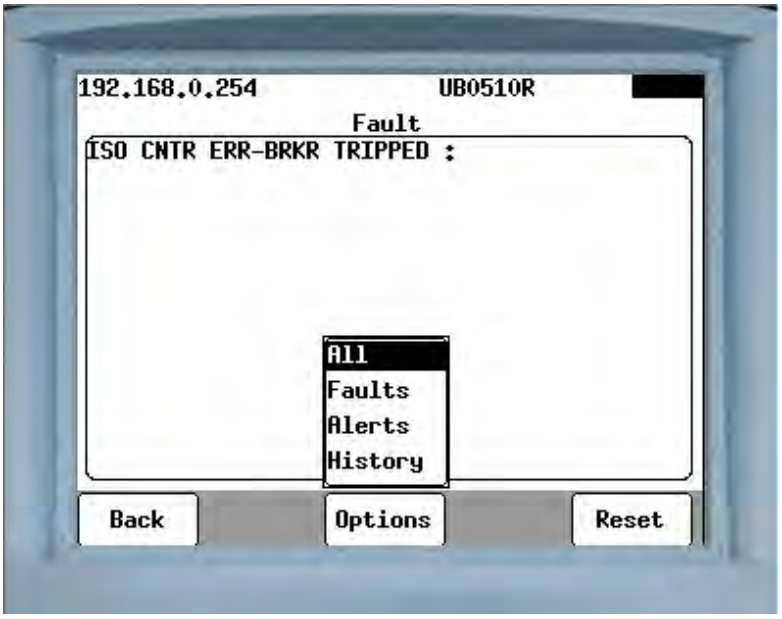


① Press Status Mode (F3)

② Press Fault (F2)

③ Press Reset (F5)

Press the Options (F3) button to filter what is viewed on the Fault Status Menu. Options include ALL, FAULTS, ALERTS or HISTORY.



① Press Options (F3)

② Press the ↑ or ↓ arrow keys to move the cursor over the desired filter option

③ Press Enter

PROGRAMMABLE FAULTS

FAULT	USER DEFINED PROGRAMMABLE OPTIONS	DEFAULT VALUE	POSSIBLE CAUSES	SOLUTIONS
WELD INITIATE NOT PRESENT	FAULT/ALERT	ALERT	Occurs when: 1. function #61 (ABORT IF NO INITIATE FOR nnnn MSEC) is used in the weld schedule and the Weld Initiate bit goes LOW within the amount of time programmed in the function. 2. the Weld Initiate bit goes LOW before function #63 - TURN ON WELD COMPLETE is executed in the weld schedule.	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. This is a post-weld check. 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.
STEPPER APPROACHING MAX	FAULT/ ALERT	ALERT	Indicates the final step in the stepper program has begun and End of Stepper is approaching. Occurs at the 1st weld of step 5 in the stepper program, if the tip dress function is disabled in the Setup Parameters.	1. The electrodes will soon need maintenance. Dress or replace the electrodes to avoid the END OF STEPPER fault condition. 2. Check the stepper profile to make sure it is programmed correctly.
END OF STEPPER	FAULT/ALERT	FAULT	This fault indicates that the stepper has completed the last weld in the final step of the assigned stepper. Occurs at the last weld of step 5 in the stepper program, if the tip dress function is disabled in the Setup Parameters.	Reset the stepper (using either the external reset input or the stepper display mode). You should also dress or replace the electrode caps.

FAULT	USER DEFINED PROGRAMMABLE OPTIONS	DEFAULT VALUE	POSSIBLE CAUSES	SOLUTIONS
EXTENDED WELD	FAULT/ALERT	FAULT	This fault indicates that the control had to restart the weld schedule due to insufficient secondary current during a 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 an ALERT for the Weld Complete bit to go HIGH after a successful extend weld (re-weld). Otherwise, if set to a 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	USER DEFINED PROGRAMMABLE OPTIONS	DEFAULT VALUE	POSSIBLE CAUSES	SOLUTIONS
HIGH C-FACTOR LIMIT	FAULT/ALERT	ALERT	This fault indicates that the actual C-Factor read during the weld exceeded the values programmed in the C-Factor function #92 (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 Ch. 9: Advanced Topics for more information.
LOW C-FACTOR LIMIT	FAULT/ALERT	ALERT	This fault indicates that the C-Factor read during the weld part of the schedule fell below the value programmed in function #92 (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	USER DEFINED PROGRAMMABLE OPTIONS	DEFAULT VALUE	POSSIBLE CAUSES	SOLUTIONS
WELD PROCEED	FAULT/ALERT	FAULT	This fault indicated 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. function #70 (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. Loose or incorrect 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 if faulty.

FAULT	USER DEFINED PROGRAMMABLE OPTIONS	DEFAULT VALUE	POSSIBLE CAUSES	SOLUTIONS
PRESSURE SWITCH	FAULT/ALERT	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. ***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 for mechanical problems with the weld gun related to air pressure, e.g. water in air lines, pressure regulator set too low, etc. 3. Check sequence initiated. If the pressure select input is not required, remove the function checking the input. 4. If the function is required, check the switch, contact or device providing the input. 5. If the error was caused by the initiates being removed while waiting for the input, check the initiates.
CONTROL IN NO WELD	FAULT/ALERT	ALERT	Occurs when a weld schedule is initiated while the weld processor is 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 module.	1. Check robot or PLC ladder to verify that the input is being held HIGH throughout the schedule. (Use the DEP 300s to observe the status of this input. To navigate do the following. Press - Status Mode ▶ More ▶ IO Status). 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.

FAULT	USER DEFINED PROGRAMMABLE OPTIONS	DEFAULT VALUE	POSSIBLE CAUSES	SOLUTIONS
RETRACT PILOT	FAULT/ALERT	FAULT	This fault indicates the retract cylinder was not out of retract when checked by the control. Occurs during the welding sequence when: 1. Function #86 (VERIFY CYLINDER #n IS OUT OF RETRACT) is inserted in the weld schedule, and the weld gun moved out of the weld position (Close Retract output bit HIGH) to the retract position (Close Retract output bit LOW) when checked by the weld processor. 2. When the weld gun is in the retract position (full open) and the weld sequence for that gun is initiated (Schedule Pilot input bit is HIGH). 3. Operator error. 4. Either the Retract Mode or the Cylinder Type setup parameters were changed and the control must be reset. 5. Loose or incorrect wiring to the input module. 6. Faulty input module. 7. 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 if found defective.

FAULT	USER DEFINED PROGRAMMABLE OPTIONS	DEFAULT VALUE	POSSIBLE CAUSES	SOLUTIONS
WELD INTER-RUPTION	FAULT/ALERT	ALERT	This fault is generated under three conditions: 1. If the control moves into No Weld Mode while sequencing. 2. If the control powers down while sequencing. This could be due to the circuit breaker on the weld cabinet being switched OFF while the weld control is passing current during the execution of a weld schedule. The fault will appear after the circuit breaker is switched back ON and the weld processor re-initializes.	1. Check the robot or PLC ladder to verify that the input is being held HIGH throughout the weld schedule. 2. Check for proper I/O designations. Verify that all wiring connections are secure. 3. Replace input module if found defective. 4. Ensure weld gun is not opening early. Check for intermittent open connection in the weld tooling (primary or secondary). 5. Clear fault and cycle power.
LOW LINE VOLTAGE	FAULT/ALERT	FAULT	Occurs when the weld initiate was removed or time expired while the control was waiting for the programmed line voltage in Function # 8 (WAIT nnn CY FOR LINE > nnn VOLTS) or Function # 9 (WAIT FOR LINE > nnn VOLTS). This can be caused by: 1. Overloading of the weld bus. 2. Brown-outs of the power source.	1. Check the line to ensure you have power on all phases. 2. Re-distribute weld bus load. 3. 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 300s.)

FAULT	USER DEFINED PROGRAMMABLE OPTIONS	DEFAULT VALUE	POSSIBLE CAUSES	SOLUTIONS
SCR MISFIRE	FAULT/ALERT	FAULT	This fault occurs when the weld processor detects conduction on one half-cycle and without conduction on the next half-cycle. This can be caused by: 1. Faulty Wiring. (For example the gate and cathode wires are swapped) 2. Insufficient Squeeze time in the weld schedule. (Metal is expelled at the electrode/material interface.) 3. Poor part fit-up or insufficient pressure. (Metal is being expelled at the faying surface.) 4. Isolation contactor is dropping out early or coming in late. 5. Faulty firing card.	1. Check all wiring connections. Verify that the 2L2 sense wire is attached to the 2L2 connection below the Isolation Contactor. Inspect to ensure all wires are secure and attached correctly. 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.

FAULT	USER DEFINED PROGRAMMABLE OPTIONS	DEFAULT VALUE	POSSIBLE CAUSES	SOLUTIONS
POWER FACTOR LIMIT	FAULT/ALERT	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. 2L2 sense wires not connected below the Isolation Contactor. 3. Any variation in the welding circuit inductance is reflected in the power factor. 4. Incorrect measurement of power factor. 5. Power factor values are 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. Check the power factor settings.

FAULT	USER DEFINED PROGRAMMABLE OPTIONS	DEFAULT VALUE	POSSIBLE CAUSES	SOLUTIONS
VOLTAGE COMPENSATION LIMIT	FAULT/ALERT	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. Adjust the stepper boost.

FAULT	USER DEFINED PROGRAMMABLE OPTIONS	DEFAULT VALUE	POSSIBLE CAUSES	SOLUTIONS
CURRENT REGULATION	FAULT/ALERT/ NONE	ALERT	The secondary current provided to a weld is monitored each cycle during an AC 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 hits a firing limit while trying to obtain the desired current, indicating that it could not compensate for the current drop. It can also occur if the amount of current programmed in the weld function causes the control to fire below 20%I. This results in: 1. Insufficient current. 2. Missing weld on the part. 3. Open circuit of the firing card primary or secondary. This fault may occur in conjunction with Systems Cooling fault. (See page 110)	1. Verify the primary and secondary cables, isolation contactor and weld transformer for any damage. 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. • If the secondary resistance is too high reduce the length of the secondary cable and install a cable with a larger diameter. • If the requested current reading is higher than the possible limit of the welding transformer and secondary resistance, correct the discrepancy in the weld schedule or stepper program. Tune the weld transformer tap to a higher ratio.

FAULT	USER DEFINED PROGRAMMABLE OPTIONS	DEFAULT VALUE	POSSIBLE CAUSES	SOLUTIONS
WELDER CURRENT SHUNTING	FAULT/ALERT	FAULT	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.
HEAT CYCLE LIMIT	FAULT/ALERT	FAULT	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. Lower the number of cycles where the weld control is firing. 2. Your application does not need the Heat Cycle Limit setup parameter. (To disable this parameter, set it to 0)

NON-PROGRAMMABLE (HIDDEN) FAULTS

The following is a list of standard non-programmable faults in the WT6000. Their default values are fixed and cannot be changed. Since these faults are non-programmable, they are hidden from view in the DEP-300s View Setups Menu.

FAULT NAME	DEFAULT VALUE	POSSIBLE CAUSE	SOLUTION
INVALID SEQUENCE SELECTED	FAULT	This fault occurs when the combination of BINARY SELECT inputs was invalid. This can be caused by: 1. The weld initiate was ON but no BINARY SELECT inputs were active. 2. Incorrect or loose wiring at the input module. 3. Bad connectors, improper seating or faulty SLC processor, input module or weld processor 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.
CONTROL STOP	FAULT	Occurs when: 1. The Control Stop input bit goes LOW anytime during the initiation of the weld sequence. This bit is normally maintained HIGH. 2. The external or internal wiring (feeding CS1 and CS2) or the input module is open, causing a loss of input voltage to the input. 3. In a single gun welding application when the weld sequence is initiated without the jumper plug inserted into the weld gun 2 connector (2PL). 4. The operator or ladder logic removed the CONTROL STOP input.	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. Insert jumper plug into 2PL connector. 3. Check the robot or PLC ladder to verify that the control stop input is being held HIGH throughout the weld schedule. 4. Check the wiring to verify that 24 VDC is being provided to the CONTROL STOP input.

FAULT NAME	DEFAULT VALUE	POSSIBLE CAUSE	SOLUTION
HIGH CURRENT LIMIT FAULT	FAULT	Occurs when: 1. the weld processor detects that the current passed during the weld schedule exceeded the value programmed into the HIGH CURRENT LIMIT WINDOW% in the Setup Parameters. 2. the weld processor detects that the current passed during the weld schedule exceeded the HI value programmed into function #76 (SEC. CURR LIMITS: HI = nnnn0 LOW = nnnn0) or # 84 (WINDOW: HI= nn% LOW= nn%) in the weld schedule is correct for the welding application (if used). 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. Ensure the HI value programmed into function #76 (SEC. CURR LIMITS: HI = nnnn0 LOW = nnnn0) in the weld schedule is correct for the welding application. 3. Ensure the value programmed into TRANSFORMER TURNS RATIO in the Setup Parameters is correct for the welding application. 4. 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. 5. Check for improper installation of either a kickless cable or shunt cable. 6. With a pressure gauge, verify that constant pressure is being maintained. Check for things affecting pressure (such as regulators). 7. Check for loose wiring at the J3 connector on the firing card. 8. Secure the cable that runs between the firing card and the processor. Check for bad connector. Replace as necessary. 9. Adjust the schedule to reduce expulsion while maintaining sufficient current to provide a good weld. 10. Replace the firing card. 11. Replace the processor card.

FAULT NAME	DEFAULT VALUE	POSSIBLE CAUSE	SOLUTION
LOW CURRENT LIMIT FAULT	FAULT	Occurs when: 1. The weld processor detects that the current passed during the weld schedule was less than the value programmed into the LOW CURRENT LIMIT WINDOW% in the Setup Parameters. 2. The weld processor detects that the current passed during the weld schedule was less than the LOW value programmed into either function #76 (SEC. CURR LIMITS: HI = nnnn0 LOW = nnnn0) or function #84 (WINDOW: HI= nn% LO= nn% C-FACTOR =nnn) in the weld schedule (if used). *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.) First check the Weld Data Screen to view the current reported by the control. *If zero current is reported:* 1. Verify the Isolation Contactor is closing and the contacts are good. 2. Verify the welding transformer is connected and continuity exists. 3. Verify the 2L2 wire is connected. 4. verify current coil connected to the firing board. *If less than 10 Amps is reported on the primary:* 1. Verify the welding gun is closing o the part being welded. 2. Verify no insulating material is present at the weld spot. 3. Verify the secondary shunts are not open.	1. Ensure the percentage value programmed into LOW CURRENT LIMIT WINDOW% in the Setup Parameters is correct for the welding application. 2. 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). 3. Ensure the value programmed into TRANSFORMER TURNS RATIO in the Setup Parameters is correct for the welding application. 4. 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. 5. 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. 6. Check for loose wiring at the J3 connector on the firing card. 7. Secure the cable that runs between the firing card and the processor. Check for bad connector. Replace as necessary. 8. Replace the firing card. 9. Replace the processor card.

FAULT NAME	DEFAULT VALUE	POSSIBLE CAUSE	SOLUTION
ISO CNTR OFF WHEN NEEDED	FAULT	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 the fault condition. If the control is in No Weld mode, it does not generate a fault.	1. Ensure function #88 (TURN ON ISOLATION CONTACTOR) is in the weld schedule and inserted before the squeeze function. 2. Check for defective isolation contactor aux contact module (contacts possible stuck closed). check for defective weld timer. 3. 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.
ISO CNTR ERR-BRKR TRIPPED	FAULT	Occurs when the weld processor detects the isolation contactor is energized (closed) when it should be de-energized (open). When this fault occurs, the weld processor activates the shunt-trip mechanism on the circuit breaker. This is monitored by the state of the isolation contactor aux contact.	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.
SYSTEM COOLING	FAULT	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 thermostat. 2. Loose/ incorrect connections to input module or in the circuit. 3. No or insufficient water/air flow. 4. Faulty input module.	1. Replace the thermostat if found defective. 2. Check for proper wiring. 3. Check the water flow, access holes, hoses and filters (if used). 4. Replace the faulty input module. 5. Troubleshoot and find out why the system cooling input is going LOW. Could be a robot / PLC logic issue or a legitimate system cooling problem.

FAULT NAME	DEFAULT VALUE	POSSIBLE CAUSE	SOLUTION
IO	FAULT	Occurs when: 1. An EtherNet/IP network communication timeout occurs. Once EtherNet/IP communication is re-established, the fault will automatically reset. 2. DeviceNet communication times out. Once DeviceNet communication is re-established, the fault will automatically reset. 3. Customer installed DeviceNet terminations were not properly wired. ***NOTE: Prior to resetting this fault, go to the Hardware Status screen in the DEP-300s by pressing the Display Mode (F4) key. The Hardware Status screen will provide more specific information regarding the nature of the fault.***	1. Determine why EtherNet or DeviceNet communications with the weld timer have been lost. 2. Inspect for loose EtherNet/ DeviceNet cable connections or defective cable. 3. Make sure the DeviceNet terminators are properly connected.
INITIATION ON POWER-UP	FAULT	Occurs when the weld control is powered-up (i.e. circuit breaker is switched ON) and the weld processor detects that one or more Schedule Pilot bit is HIGH. In this condition, a weld schedule WILL NOT initiate.	Ensure the Weld Initiate and the Binary Select input bits are set low by the Robot / PLC logic at time of power-up of the weld control cabinet.
EXCESSIVE REWELD	FAULT	Occurs when the number of extend welds (re-welds) exceeds the value programmed into the Excessive Extend Weld Limit in the Setup Parameters.	Correct the application problem that is causing excessive re-welds to occur or increase the value programmed into the Excessive Extend Weld Limit setup parameter.
CONTROL TRANSFORMER VOLTAGE	FAULT	Not used.	Not used.
AC LINE PHASE	FAULT	Occurs when the weld processor detects a line phase is either incorrect or missing. This fault is monitored continuously.	Correct power problem or replace / install missing phase.
POWER FAILURE	FAULT	Occurs when there is a detection of a bad circuit and 24V power source is being supplied power below 18V.	Verify the cause of power failure external to the weld control unit.

PROGRAMMABLE SETUP PARAMETERS

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.	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 Retract Valve output bit ON to close the gun to the Work position. **AIR-INVERTED:** In Air-Inverted mode, the weld tooling uses an air-only cylinder that requires a Retract Valve output bit OFF to close the gun to the Work position.	AIR-NORMAL

SETUP	DESCRIPTION	PROGRAMMABLE OPTIONS	DEFAULT VALUE
ISOLATION CONTACTOR DELAY (SEC)	This parameter tells the control how long to hold the isolation contactor pulled in after the function # 89 (TURN OFF ISOLATION CONTACTOR) executes. 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 #65 (ISOLATION CONTACTOR DELAY = nnnn SEC.) overrides this global setup parameter, when used locally in a weld schedule. **NOTE:** This parameter and function #89 are both disabled when the Isolation Contactor Saver input bit is set LOW or not mapped.	0-99	10
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.	0% to 99%	20
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.	0% to 99%	20
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 in Ch. 9: Advanced Topics.	0 to 99	2
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 in Ch. 9: Advanced Topics.	1 to 9999	5

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). **WARNING!** **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.	**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. **Danger!** **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.**	ENABLED

SETUP	DESCRIPTION	PROGRAMMABLE OPTIONS	DEFAULT VALUE
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. **WARNING!** **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 114.**	3-99	60
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
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 or an unconnected 2L2 sense wire below the Isolation Contactor.	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

SETUP	DESCRIPTION	PROGRAMMABLE OPTIONS	DEFAULT VALUE
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.	**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
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 #81 (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.	1 to 256	1:63
NOMINAL LINE VOLTAGE	The control use this parameter to establish a reference point for determining the compensation required for line voltage fluctuations when welding in the %I firing mode.	200 to 600	490

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 by the weld control. 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	220

Chapter 8: 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. New caps can also alloy during the process of welding causing a change in resistance. 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 WT6000 weld control with timer software G13300 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
27	WELD nn IMP HI =nn%I LO = nn%I
40	SLOPE nnnn CY nn%I TO 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
37	WELD nnn IMP HI= nnnn0 A LO= nnnn0 A
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 is a percentage value and the second value is an absolute Amps value. If the %I (Percentage Current) weld function is used, the current boost (rise) must be expressed in a percentage value. 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	1%	100 AMPS	5 WELDS
②	1%	100 AMPS	5 WELDS
③	3%	100 AMPS	5 WELDS
④	4%	100 AMPS	5 WELDS
⑤	5%	100 AMPS	5 WELDS

Stepper Group 2
Aux. Counter Max. Counts = 0

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.

EXAMPLE STEPPER PROGRAM #1 (NO TIP DRESS)

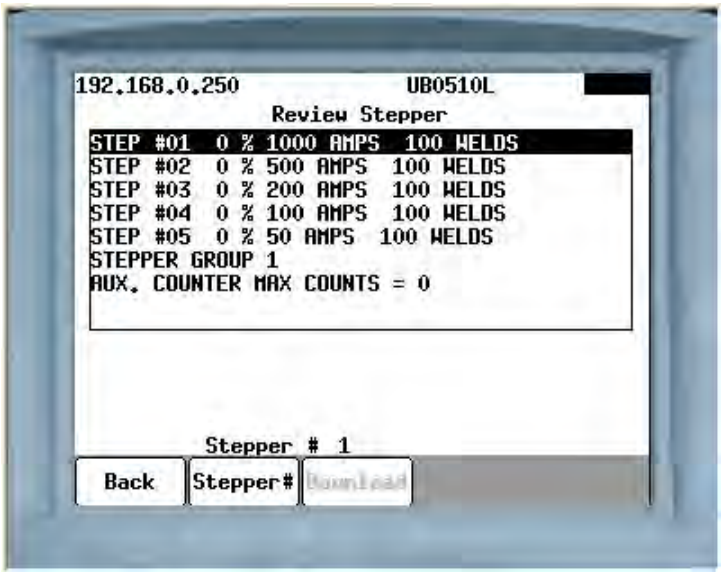
The following is an example of a linear stepper program without tip dressing. This example would typically be used in either a hard-tool welding application or any other application where dressing of the weld caps is not required.

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.

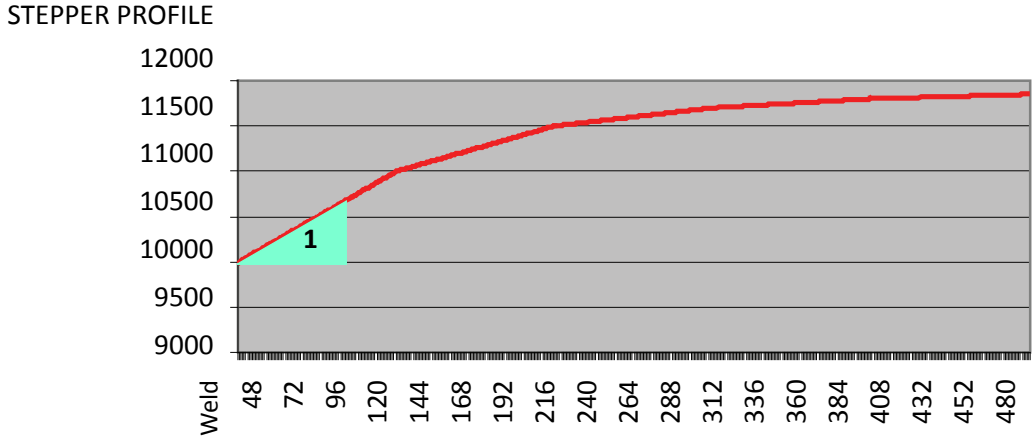
2. Current weld function #30 (WELD nnnn CY nnnn0 AMPS) is used and is programmed to deliver 10000A of base current for 10 Cycles.

EXAMPLE SCHEDULE #1 (NO TIP DRESS)	
00	START OF SCHEDULE # 1
82	LINEAR STEPPER # 1 ASSIGNED (0=OFF)
76	SEC. CURR LIMITS: HI =00 LOW = 99990
81	TRANSFORMER TURNS RATIO 73:1
88	TURN ON ISOLATION CONTACTOR
1	SQUEEZE 30 CYCLES
30	WELD 10 CYCLES 10000 AMPS
3	HOLD 5 CYCLES
63	TURN ON WELD COMPLETE
59	TURN OFF WELD IN PROGRESS
75	EXTEND UNTIL NO INITIATE
64	TURN OFF WELD COMPLETE
89	TURN OFF ISOLATION CONTACTOR
100	END OF SCHEDULE # 1

Below is the stepper profile as viewed from the DEP-300s Data Entry Panel.



THE FOLLOWING EXPLAINS EACH PARAMETER WITHIN THE PROFILE:

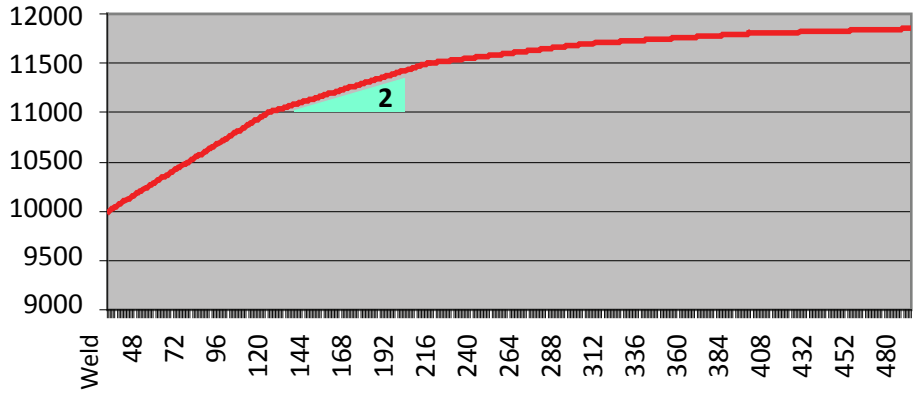


F 30: Weld 10 CY 10000 Amps - *Base Weld Current*

- **STEP #01 = +00% + 1000 A AFTER 0100 WELDS**

  Step 1 is programmed to deliver a 1000A boost over 100 welds. If the base current is 10000 Amps, the boost current will increment by 10A after each weld, thus by the 100th weld, the target current will be at 11000A.

STEPPER PROFILE

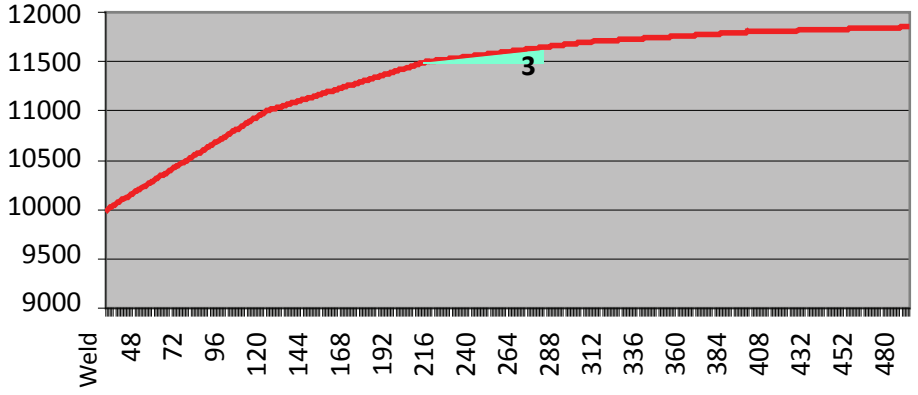


F 30: Weld 10 CY 10000 Amps - *Base Weld Current*

- **STEP # 02 = + 00% + 0500 A AFTER 0100 WELDS**

  Step # 02 is programmed to deliver a 500A boost over 100 welds. If the base current is 11000 Amps, the boost current will increment by 5A after each weld, thus by the 100th weld, the target current will be 11500A.

STEPPER PROFILE

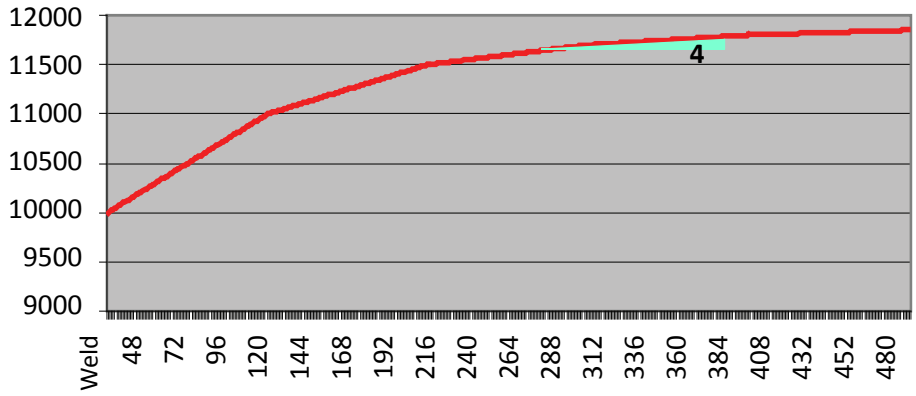


F 30: Weld 10 CY 10000 Amps - *Base Weld Current*

- **STEP # 03 = + 00% + 0200 A AFTER 0100 WELDS**

  Step 3 is programmed to deliver a 200A boost over 100 welds. If the base current is 11500 Amps, the boost current will increment by 2A after each weld, thus by the 100th weld, the target current will be 11700A.

STEPPER PROFILE

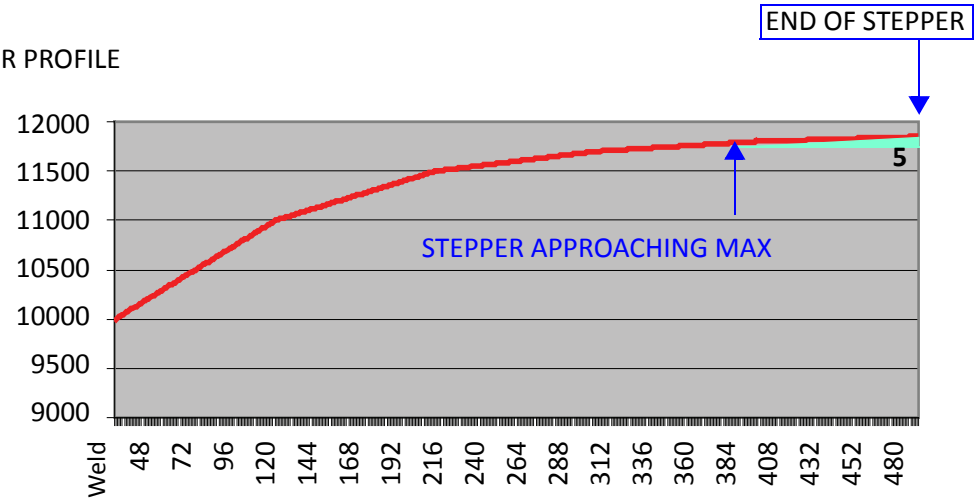


F 30: Weld 10 CY 1000 Amps - *Base Weld Current*

- **STEP # 04 = + 00% + 0100 A AFTER 0100 WELDS**

  Step 4 is programmed to deliver a 100A boost over 100 welds. If the base current is 11700 Amps, the boost current will increment by 1A after each weld, thus by the 100th weld, the target current will be 11800A.

STEPPER PROFILE



F 30: Weld 10 CY 1000 Amps - *Base Weld Current*

- **STEP # 05 = + 00% + 0500 A AFTER 0100 WELDS**

  Step 5 is programmed to deliver a 50A boost over 100 welds. If the base current is 11800 Amps, the boost current will increment by 0.5A after each weld, thus by the 100th weld, the target current will be 11850A.

*The following alerts are annunciated on the DEP 300s, **RAFT™** Gateway or the Fanuc Web page*

STEPPER APPROACHING MAX ALERT:
At the first weld of Step 5, a STEPPER APPROACHING MAX ALERT is generated. This alert indicates the stepper program has started its final step.

END OF STEPPER ALERT / FAULT:
END OF STEPPER: After the last weld of Step 5, an END OF STEPPER FAULT is generated.

STEPPER GROUP:
In example #1, Stepper #1 is assigned to Stepper Group 1 (Gun 1). For more information, see Stepper Groups Page 86.

AUX. COUNTER MAX COUNTS:
Attached to each stepper program is an Auxiliary Weld Counter, which is located in the Stepper Status screen. When a stepper increments, its auxiliary weld counter also increments. When the counter reaches the value programmed in this parameter, the Aux Counter at Max output bit goes HIGH. This output bit can be used for any purpose by the user. Turning the Stepper Aux Weld Cntr Reset input bit HIGH resets the Auxiliary Weld Counter to zero and turns the Aux. Counter at Max output bit LOW. In this example, the Aux. Counter Max Counts is set to zero. Therefore, the Aux Counter at Max output bit is disabled.

EXAMPLE STEPPER PROGRAM #2 (TIP DRESS)

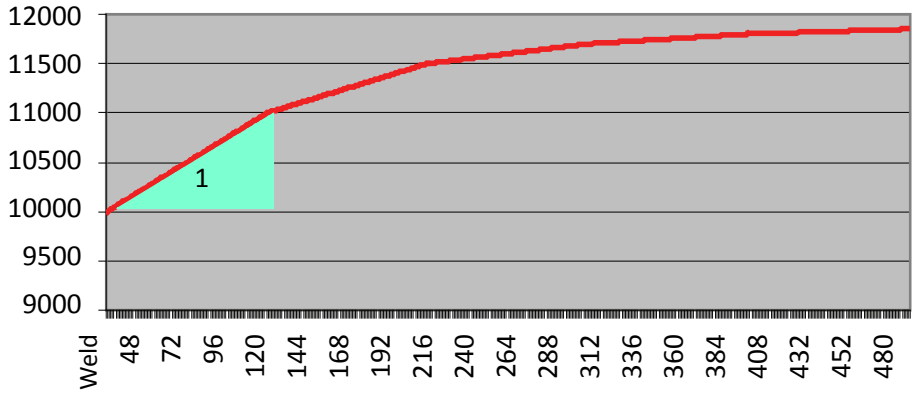
The following is an example of a linear stepper program with tip dressing. This example would typically be used in a robot welding application.

EXAMPLE SCHEDULE #1 (TIP DRESS)	
00	START OF SCHEDULE # 1
82	LINEAR STEPPER #1 ASSIGNED (0 = OFF)
76	SEC. CURR LIMITS: HI = 00 LOW =99990
81	TRANSFORMER TURNS RATIO 73:1
88	TURN ON ISOLATION CONTACTOR
58	TURN ON WELD IN PROGRESS
1	SQUEEZE 30 CYCLES
30	WELD 10 CYCLES 10000 AMPS
3	HOLD 5 CYCLES
63	TURN ON WELD COMPLETE
59	TURN OFF WELD IN PROGRESS
75	EXTEND UNTIL NO INITIATE
64	TURN OFF WELD COMPLETE
53	TURN OFF ISOLATION CONTACTOR
100	END OF SCHEDULE # 1

Below is the stepper profile as viewed from the DEP-300s Data Entry Panel.

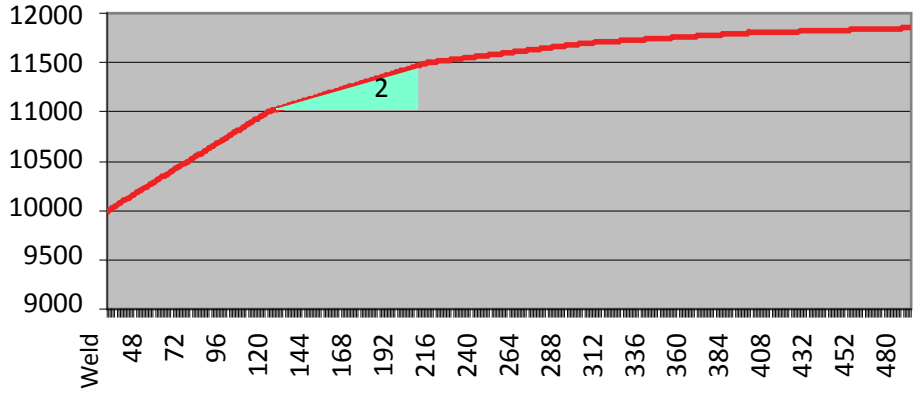
The following explains each parameter within the profile:

- **STEP # 01 = + 00% + 1000 A AFTER 100 WELDS**
  Step 1 is programmed to deliver a 1000A boost over 100 welds. If the base current is 10000 Amps, the boost current will increment by 10A after each weld, thus by the 100th weld, the target current will be at 11000A.



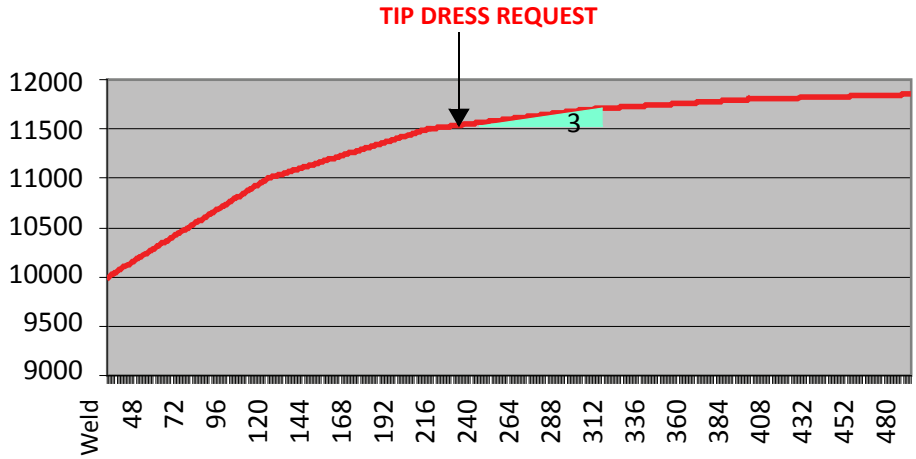
F 30: Weld 10 CY 10000 Amps - *Base Weld Current*

- **STEP # 02 = + 00% + 0500 A AFTER 100 WELDS**
  Step 2 is programmed to deliver a 500A boost over 100 welds. If the base current is 11000 Amps, the boost current will increment by 5A after each weld, thus by the 100th weld, the target current will be 11500A.



F 30: Weld 10 CY 10000 Amps - *Base Weld Current*

- **STEP # 03 = + 00% + 0200 A AFTER 100 WELDS (FIRST TIP DRESS)**
  At the first weld of Step 3 the weld processor will turn the Tip Dress Request output bit HIGH. Upon receiving the request, the robot initiates a tip dress schedule. Upon completion of the tip dress schedule, the weld processor will return the stepper program back to the first weld of Step 2.



F 30: Weld 10 CY 10000 Amps - *Base Weld Current*

ROBOT INITIATES A TIP DRESS SCHEDULE UPON RECEIVING REQUEST

TIP DRESS SCHEDULE	
00	START OF SCHEDULE # 61
56	SET PRESSURE = 0
58	TURN ON WELD IN PROGRESS
86	TIP DRESS ADVANCE: GROUP 01 - STEP 2
56	SET PRESSURE =00
50	TURN ON WELD COMPLETE
59	TURN OFF WELD IN PROGRESS
75	EXTEND UNTIL NO INITIATE
51	TURN OFF WELD COMPLETE
100	END OF SCHEDULE # 1

Weld Control Unit will return all steppers of the Group to the first weld of Step 2 (as programmed)

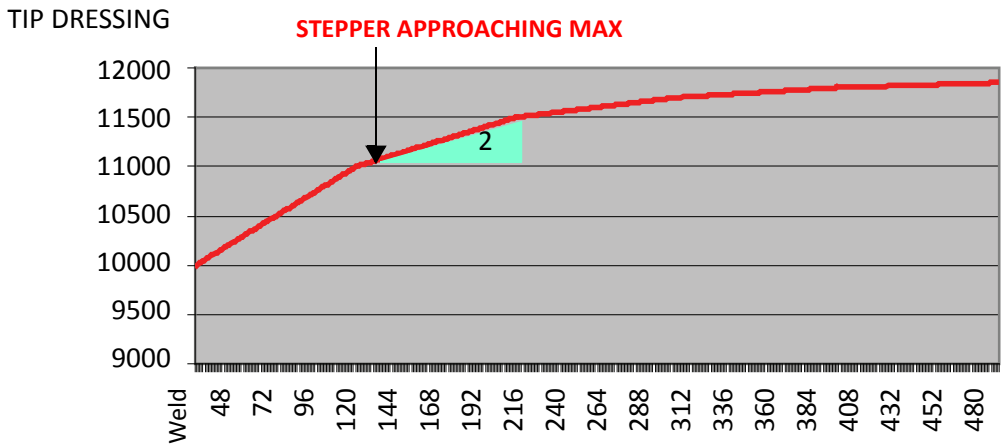
- **STEP # 02**
  If the Remaining Tip Dresses Count is > 0, the stepper program will continue towards Step 3 again.

  Step 2 is programmed to deliver a 500A boost over 100 welds. If the base current is 11000 Amps, the boost current will increment by 5A after each weld, thus by the 100th weld, the target current will be 11500A.

- **STEP # 03: (SECOND TIP DRESS)**
  At the first weld of Step 3 the weld processor will turn the Tip Dress Request output bit HIGH. Upon receiving the request, the robot initiates a tip dress schedule. Upon completion of the tip dress schedule, the weld processor will return the stepper program back to the first weld of Step 2.

- **STEP 02: (ZERO TIP DRESSES REMAINING)**
  Step 2 is programmed to deliver a 500A boost over 100 welds. If the base current is 11000 Amps, the boost current will increment by 5A after each weld, thus by the 100th weld, the target current will be 11500A.

- **STEPPER APPROACHING MAX:**
  If the Remaining Tip Dresses Count has decremented to 0, a STEPPER APPROACHING MAX ALERT is generated at the first weld of Step 2.



F 30: Weld 10 CY 10000 Amps - *Base Weld Current*

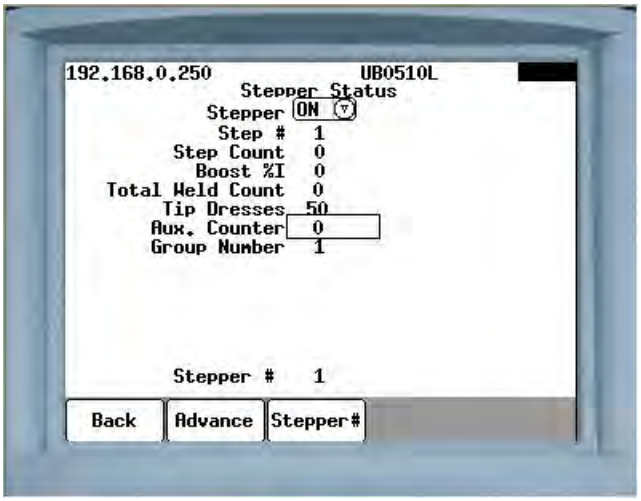
- **STEP #03 END OF STEPPER**
  If the Remaining Tip Dresses Count has decremented to 0, an END OF STEPPER FAULT is generated after the first weld of Step 5.

- **STEPPER GROUP:**
  In example #2, Stepper #1 is assigned to Stepper Group 1. For more information, see Stepper Groups.

- **AUX. COUNTER MAX COUNTS:**
  Included in each stepper program is an Auxiliary Weld Counter, which is located in the Stepper Status screen. When a stepper increments, its auxiliary weld counter also increments. When the counter reaches the value programmed in this parameter, the Aux Counter at Max output bit goes HIGH. This output bit can be used for any purpose by the user. Turning the Stepper Aux Weld Cntr Reset input bit HIGH resets the Auxiliary Weld Counter to zero and turns the Aux. Counter at Max output bit LOW. In this example, the Aux. Counter Max Counts is set to zero. Therefore, the Aux Counter at Max output bit is disabled.

STEPPER STATUS

Perform the following steps on the DEP-300s to navigate to the Stepper Status Screen:



① Press Status Mode (F3).

② Press Stepper Status (F3).

③ Press Stepper# (F3).

④ Enter Stepper Number.

⑤ Press ENTER.

The following chart describes the parameters, which appear on the Stepper Status Menu:

PARAMETER	DESCRIPTION
STEPPER	Turns the stepper either ON or OFF. The default position is ON.
STEP #	The step number the stepper program is currently in (1 through 10).
STEP COUNT	The weld count within the step, the stepper program is currently in (1 through 5).
BOOST %I	The current boost being applied to each weld. **NOTE:** If a Percentage of Available Volt-Seconds weld function is used, this value will be displayed as a percentage. Conversely, if a Constant Current weld function is used, this value will be displayed in absolute amps.
TOTAL WELD COUNT	The total weld count since the beginning of the stepper program.

PARAMETER	DESCRIPTION
TIP DRESSES	The Remaining Tip Dresses Count is a decrementing counter, which starts at the number entered in the Maximum Tip Dresses parameter in the stepper profile. This counter defines the maximum number of times the weld caps may be dressed before they must be changed. Each time the weld processor receives a tip dress advance request (see note below), the Remaining Tip Dresses Count decrements by one. When this count decrements to zero, the stepper program will proceed to the end, where an END OF STEPPER FAULT is generated. This indicates the weld caps must be changed. **NOTE**: A tip dress advance request occurs when (1) either the Tip Dress, Tip Dress Group 1 or Tip Dress Group 2 Input bits go HIGH or (2) function #93 (TIP DRESS ADVANCE: GROUP nnn - STEP nn) is used in the schedule.
AUX. COUNTER	The Auxiliary Counter is an incrementing counter, which mirrors the Total Weld Count counter. Its max count is set by the value entered in the Aux Counter Max Counts parameter in the stepper profile.
STEPPER #	The stepper program number currently displayed which increments until reset. The total weld counter will be adjusted when a tip dress is performed.
ADVANCE	Pressing the Advance (F2) key, advances the stepper program to the first weld of the next step. When the stepper advances, the following changes will occur in the Stepper Status Menu: 1. The Step Count will reset to zero. 2. The Total Weld Count will advance to where its count would be at the first weld of the next step. The Aux. Counter will not change when the stepper is advanced. If the user wants the Aux. Counter count to match the Total Weld Count, the value will have to be manually entered here.
RESET ALL	Pressing the Reset ALL (F4) key, globally resets all stepper programs.

STEPPER RESET OPTIONS

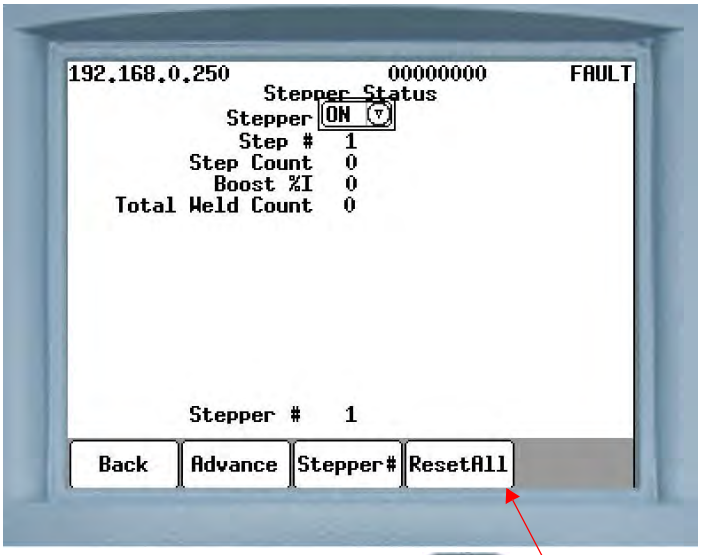
An END OF STEPPER FAULT indicates the stepper program has ended. At this point, the weld caps must be replaced on the gun and the stepper program(s) must be reset. Stepper Reset changes all counts within the stepper program back to their beginning value. See example below.

In weld processor software G13300, there are three ways in which the user can reset stepper programs:

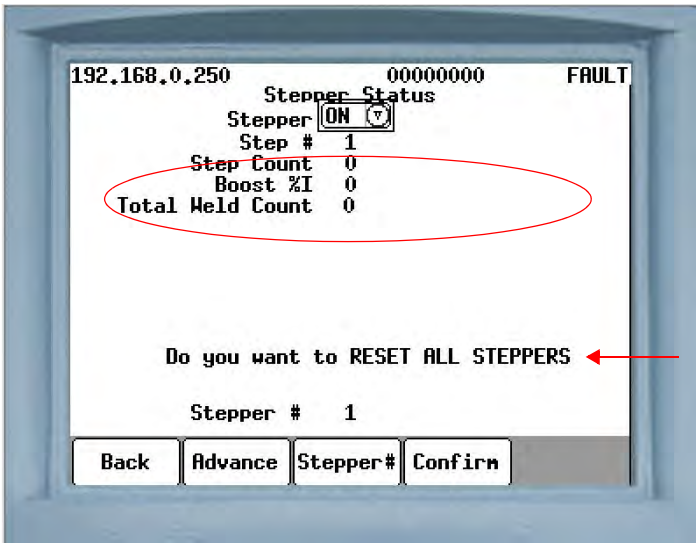
OPTION 1: GLOBAL STEPPER RESET

Stepper programs can be globally reset by pressing the Reset ALL (F4) button in the Stepper Status Menu. When this is done, all 10 stepper programs are “globally” reset, regardless of what group they are assigned to. The user needs to be cautious to only use this method if they are absolutely certain they want to globally reset every stepper program within the weld processor simultaneously.

Perform the following steps from the DEP-300s Stepper Status Menu to globally reset the stepper programs:



① Press Reset ALL



② The message “Do you want to reset all Steppers” will appear.

③ Press Confirm 

OPTION 2: GROUP STEPPER RESET (I/O)

Stepper programs can be globally reset by turning the Stepper Reset input bit HIGH. When this is done, all 10 stepper programs are “globally” reset, regardless of what group they are assigned to. The user needs to be cautious to only use this method if they are absolutely certain they want to globally reset every stepper program within the weld processor simultaneously.

OPTION 3: GROUP STEPPER RESET

Stepper programs assigned to either Group 1 or Group 2 can be reset as a group. When the Stepper Reset Group 1 input bit is turned HIGH, all the stepper programs assigned to Group 1 will be reset. Likewise, when the Stepper Reset Group 2 input bit is turned HIGH, all the stepper programs assigned to Group 2 will be reset.

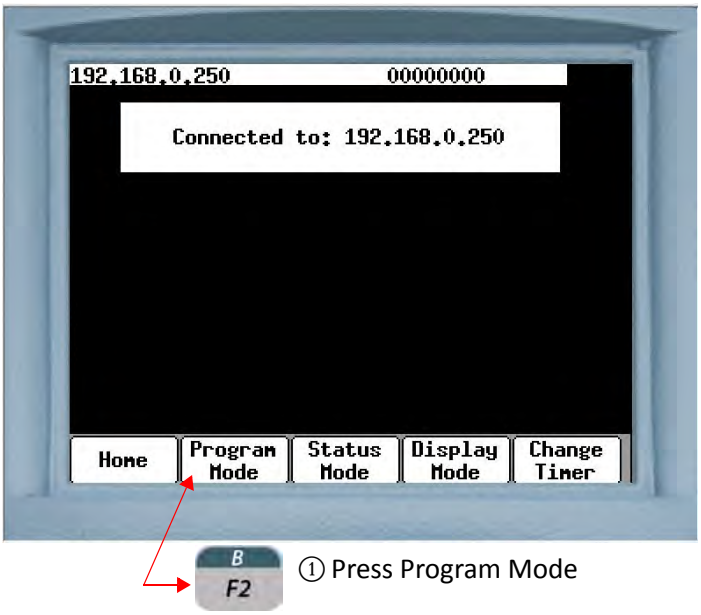
NOTE: Pressing the Fault Reset button on the DEP-300s will only reset the STEPPER APPROACHING MAX ALERT and the END OF STEPPER FAULT. It does not reset the stepper program(s)

THE FOLLOWING OCCURS AT STEPPER RESET:

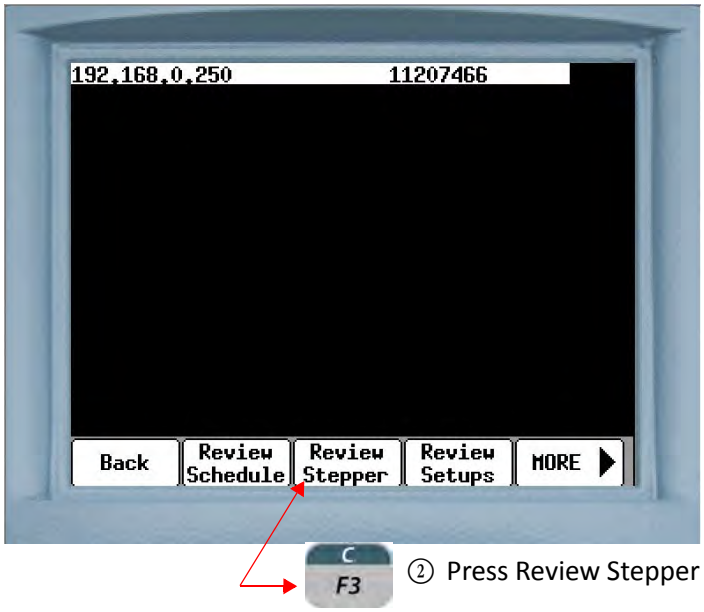
- STEPPER APPROACHING MAX ALERT is reset.
- END OF STEPPER FAULT is reset.
- All counts within the stepper program are changed back to their beginning value.

EDITING THE STEPPER PROFILE

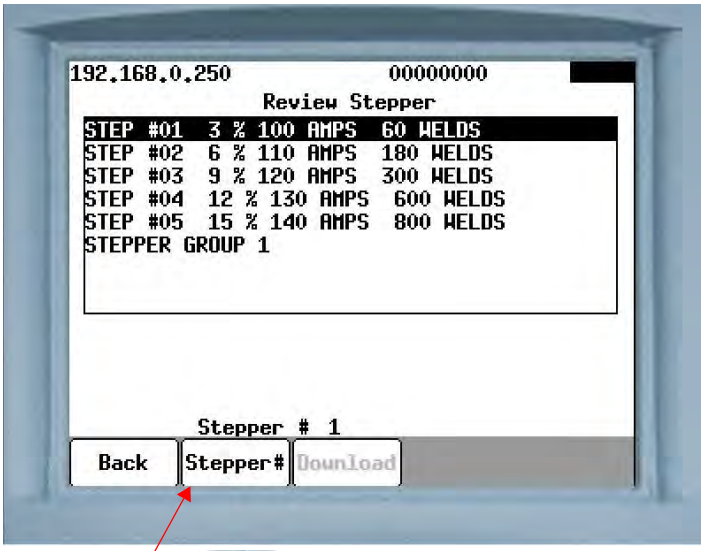
Perform the following steps on the DEP-300s to edit a parameter on the Review Stepper Menu:



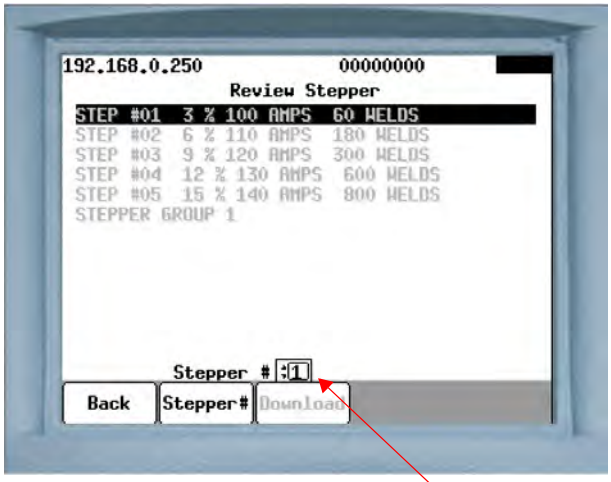
① Press Program Mode



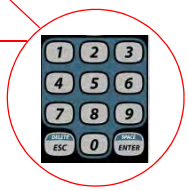
② Press Review Stepper



③ Press Stepper #

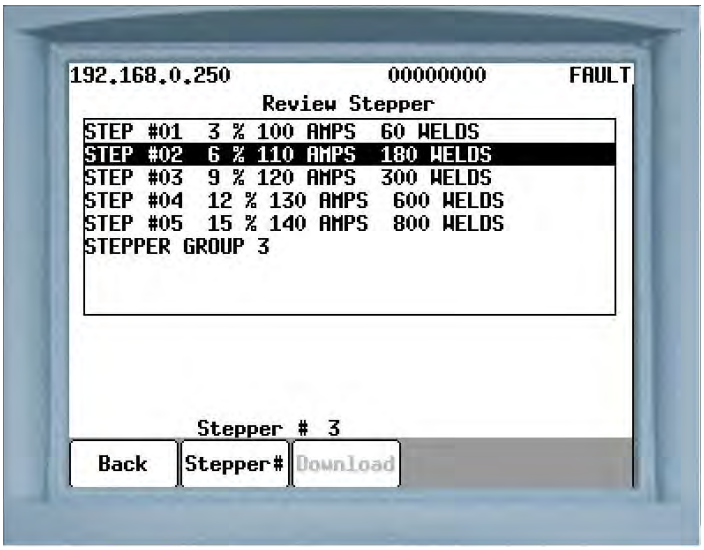


④ Enter Stepper Number



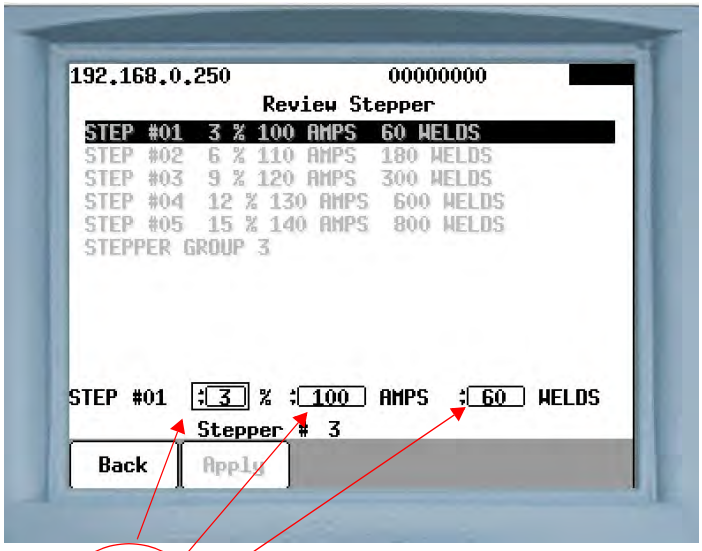
⑤ Press ENTER

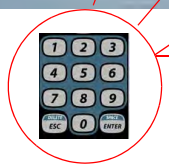
EDITING A PARAMETER ON THE REVIEW STEPPER MENU ON THE DEP 300s:



① Press the  or  arrow keys to move the cursor onto the parameter line to be edited.

② Press ENTER

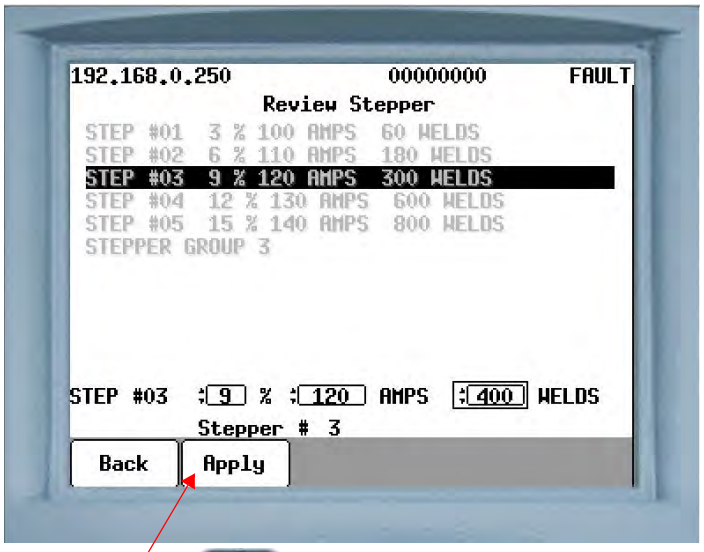




③ Enter parameter

SPACE ENTER ④ Press ENTER

⑤ For parameters with two or more data fields, press the O → arrow key to move the cursor to the next data field box, then repeat steps 3 & 4. When complete, proceed to step 6.



B F2 ⑥ Press APPLY
[Saves changes to the DEP-300s only.]

⑦ To edit more parameter lines, repeat steps 1 through 6. When complete, proceed to step 8.

⑧ Press DOWNLOAD C F3

[Downloads the changes to the weld processor. When complete, a **"Download Complete"** message will appear]

Chapter 9: ADVANCED TOPICS

C-FACTOR

C-Factor (or Capacity Factor) is a parameter, which is 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-300s.

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.

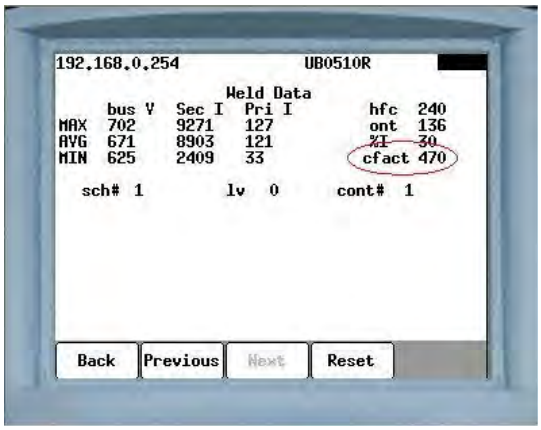
The C-Factor varies with changing conditions in the secondary. Decreasing C-Factor indicates that the total capacity of the system is decreasing. This is evident when the tool current pathways become more resistive. This, in turn, results in deterioration in the secondary circuit. (Two examples of this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

Perform the following steps on the DEP-300s to navigate to the Weld Data Menu.

① Press Status Mode (F3).
② Press More (F5).
③ Press Weld Data (F3).

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-300s for future reference.

Insert function #92 (C-FACTOR LIMIT: HI= nnnn LOW= nnnn) near the beginning of the weld schedule. See example schedule below:

NOTE: Function #92 must be inserted in the weld schedule before functions #30 (WELD nn CY. nnnn0 AMPS) and #63 (TURN ON WELD COMPLETE).

FUNCTION #	FUNCTION NAME
00	START OF SCHEDULE # 1
82	LINEAR STEPPER #1 ASSIGNED (0=0FF)
92	C-FACTOR LIMIT: HI= 220 LOW= 150
76	SET CURRENT LIMITS: HI =00 LOW =99990
81	TRANSFORMER TURNS RATIO 73:1
88	TURN ON ISOLATION CONTACTOR
58	TURN ON WELD IN PROGRESS
1	SQUEEZE 30 CYCLES
30	WELD 10 CYCLES 10000 AMPS
3	HOLD 5 CYCLES
63	TURN ON WELD COMPLETE
59	TURN OFF WELD IN PROGRESS
75	EXTEND UNTIL NO INITIATE
64	TURN OFF WELD COMPLETE
89	TURN OFF ISOLATION CONTACTOR
100	END OF SCHEDULE # 1

CALCULATE THE C-FACTOR HI / LOW LIMIT VALUES:

NOTE: The following instruction provides a starting point for the C-Factor HI / Low limits. 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).

LOW C-FACTOR LIMIT
The Low C-Factor Limit is used to detect an increase in resistance in the weld tooling, which is caused by cable and connection degradation. To calculate the Low C-Factor Limit value, determine the maximum weld current required at the end of the stepper program, add a 20% margin and divide that number by 100. *For Example:* For example, if the reference C-Factor parameter is 200: 200 *.80 = 160. Therefore, the Low C-Factor Limit would be 160.

HIGH C-FACTOR LIMIT
The High C-Factor Limit is used to detect a decrease in resistance in the weld tooling, which is caused by shunting paths. To calculate the High C-Factor limit value, add a 20% margin to the reference (tip-to-tip) C-Factor parameter for a known good weld tool. *For Example:* if the reference C-Factor parameter is 200: 200 * 1.2 = 240. Therefore, the High C-Factor Limit would be 240.

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.

SPC INDEXING CAPABILITIES

SPC (STATISTICAL PROCESS CONTROL) FUNCTIONS

With SPC 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.

Function #90: 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 #90 (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

Function #91: 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 #90 (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 #90 (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	1-99
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
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.

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.

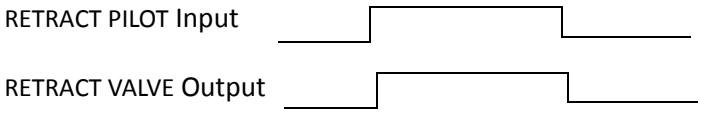
WARNING!

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.)

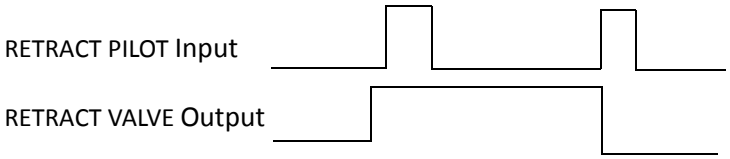
RETRACT MODE SETUP PARAMETER

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:

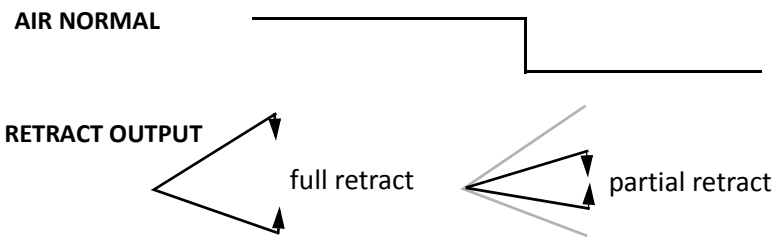
Air-Only Cylinders:

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

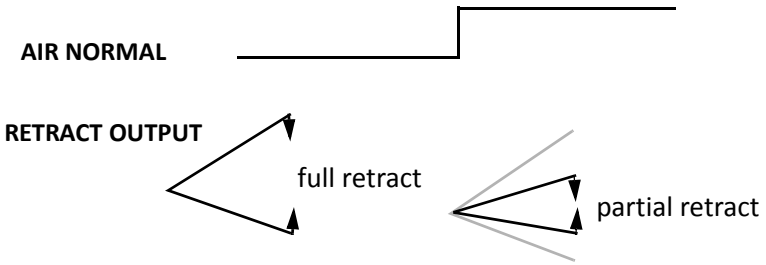
- The ***Retract*** valve allows the gun to close to a set gap position. Usually, a spring or a second return valve returns the gun to the full open position.
- The Weld valve closes the gun under the welding air pressure.

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.)

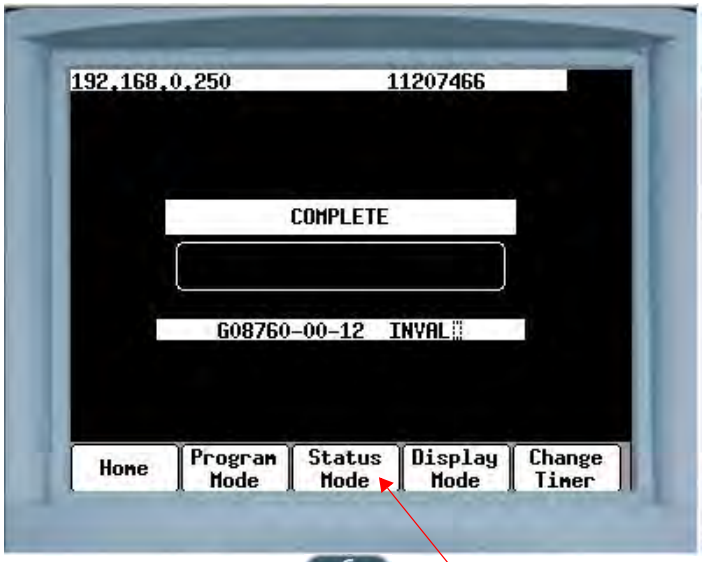


- ***AIR-INVERTED*** indicates an air-only cylinder, but the output is turned OFF to close the gun.



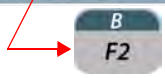
I/O STATUS

To navigate to the I/O Status Menu, perform the following steps on the DEP-300s

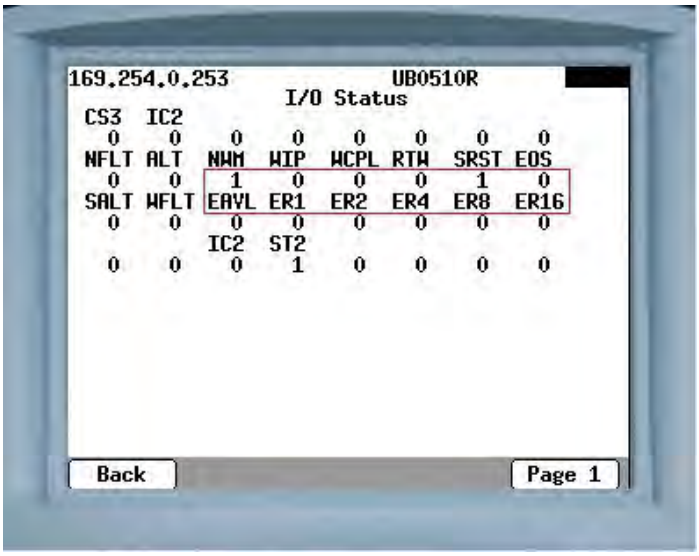


① Press Status Mode

② Press More



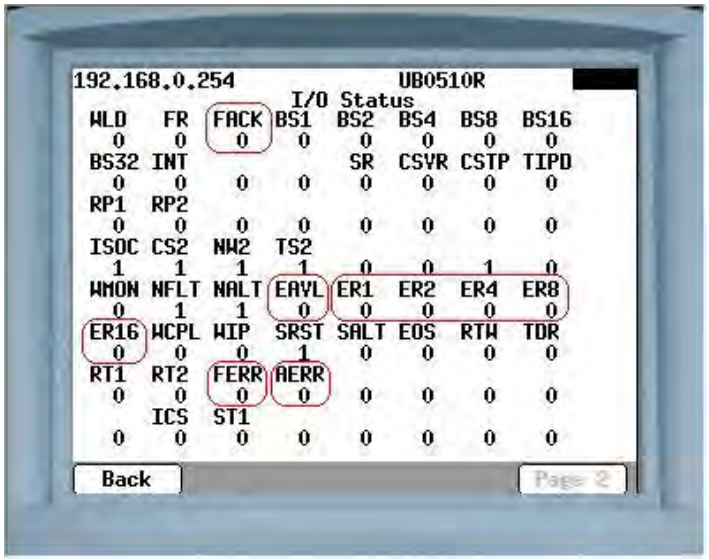
③ Press IO Status



④ Press Page 2 

to view more bits (if applicable)

In this example the I/O Status Menu shows the mapped bits relating to the application error codes (circled in red). It should be noted this is a simplified example and the customers application requirements may prescribe these bits to be mapped to different I/O locations.



Each bit is represented by a tag. Each tag will have either a “1” or “0” underneath it:

- “1” indicates the bit is HIGH or ON.
- “0” indicates the bit is LOW or OFF.

TAG NAME	BIT NAME	BIT TYPE
FACK	APP ERR ACKNOWLEDGE	Input
EVAL	APP ERROR AVAILABLE	Output
ER1	APP ERROR BIT 1	Output
ER2	APP ERROR BIT 2	Output
ER4	APP ERROR BIT 4	Output
ER8	APP ERROR BIT 8	Output
ER16	APP ERROR BIT 16	Output

NOTE: For more information on mapping I/O bits, see Chapter 11: Inputs and Outputs.

HOW WTC ERROR CODES ARE REPORTED

The following example is a robot welding application where the weld processor is reporting three application error codes:

ERROR CODE	FAULT FAMILY	WELD CONTROL FAULT	TYPE
5	END OF STEPPER	End of Stepper	FAULT
7	HIGH/ LOW CURRENT LIMIT	Low Current Limit Fault	FAILT
19	C-FACTOR LIMIT	Low C-Factor Limit	ALERT

NOTE: Multiple application error codes are reported in ascending order.

1. When a faults occurs, the **EVAL** output bit goes HIGH and application error code (5) is binarily displayed on the **ER1-ER16** output bits.
2. The HIGH **EVAL** output bit tells the robot to read the **ER1-ER16** output bits.
3. When the robot has read these output bits, it toggles the **FACK** input bit.
4. The toggling **FACK** input bit causes the **EVAL** output bit to toggle. When this toggle occurs, the next application error code (7) is binarily displayed on the **ER1-ER16** output bits.
5. The toggling **EVAL** output bit tells the robot to read the **ER1-ER16** output bit a second time.
6. When the robot has read the **ER1-ER16** output bits, it toggles the **FACK** input bit.
7. The toggling **FACK** input bit causes the **EVAL** output bit to toggle. When this toggle occurs, the next application error code (19) is binarily displayed on the **ER1-ER16** output bits.
8. The toggling **EVAL** output bit tells the robot to read the **ER1-ER16** output bits a third time.
9. When the robot has read the **ER1-ER16** output bits, it toggles the **FACK** input bit.

10. The toggling **FACK** input bit causes the **EVAL** output bit to toggle. When this toggle occurs, the weld processor scrolls and re-displays application error code (5) on the **ER1-ER16** output bits.

11. The toggling **EVAL** output bit tells the robot to read the **ER1-ER16** output bits a fourth time.

12. When the robot reads the **ER1-ER16** output bits, it recognizes that it has previously read application error code (5) and the reporting process ends.

APPLICATION ERROR CODES FOR 6000AC TIMER FIRMWARE G13300

FAULT FAMILY	ERROR CODE	APPLICATION ERROR BINARY OUTPUT BITS				
		ER1	ER2	ER4	ER8	ER16
INPUT / OUTPUT ERROR	1	1	0	0	0	0
INPUT / OUTPUT ALARM	2	0	1	0	0	0
INCOMPLETE WELD	3	1	1	0	0	0
STEPPER APPROACHING MAX	4	0	0	1	0	0
END OF STEPPER	5	1	0	1	0	0
SURE WELD TREND LIMIT	6	0	1	1	0	0
HIGH / LOW CURRENT LIMIT	7	1	1	1	0	0
FIRING ERROR	8	0	0	0	1	0
CYLINDER FAULT	9	1	0	0	1	0
CYLINDER ALARM	10	0	1	0	1	0
POWER FACTOR ERROR	11	1	1	0	1	0
COMPENSATION ERROR	12	0	0	1	1	0
INSUFFICIENT LINE VOLTAGE	13	1	0	1	1	0
EXTENDED WELD	14	0	1	1	1	0
ISOLATION CONTACTOR ERROR	15	1	1	1	1	0
WELDING BUS VOLTAGE	16	0	0	0	0	1
WELD DATA NOT PROGRAMMED	17	1	0	0	0	1
ANALOG PRESSURE ERROR	18	0	1	0	0	1
C-FACTOR LIMIT	19	1	1	0	0	1
EXTERNAL SENSOR	20	0	0	1	0	1
WELDING TRANSFORMER	21	1	0	1	0	1
OVER TEMPERATURE	22	0	1	1	0	1
SHORTED SCR	23	1	1	1	0	1
INTERNAL TIMER ERROR	24	0	0	0	1	1
INVERTER FAULT	25	1	0	0	1	1
WELDING ERROR	26	0	1	0	1	1
SERVO MOTION FAULT	27	1	1	0	1	1
SERVO AT MAX TRAVEL	28	0	0	1	1	1

FAULT FAMILY	ERROR CODE	APPLICATION ERROR BINARY OUTPUT BITS				
THICKNESS UNDER WINDOW	29	1	0	1	1	1
THICKNESS OVER WINDOW	30	0	1	1	1	1
SERVO LOW RESOLVER OUTPUT	31	1	1	1	1	1

FAULT FAMILY CROSS-REFERENCE TO WTC WELD CONTROL FAULT(S)

ERROR CODE	FAULT FAMILY	WTC WELD CONTROL FAULT(S)
1	**INPUT / OUTPUT ERROR**	• INVALID SEQUENCE SELECTED • WELD PROCEED • PRESSURE SWITCH • IO • INITIATION ON POWER-UP • RETRACT PILOT • WELD INTERRUPTION
2	**INPUT / 0UTPUT ALARM**	• WELD INITIATE NOT PRESENT • CONTROL IN NO WELD
3	**INCOMPLETE WELD**	• CONTROL STOP • WELD INTERRUPTION
4	**STEPPER APPROACHING MAXIMUM**	• STEPPER APPROACHING MAX
5	**END OF STEPPER**	• END OF STEPPER
7	**HIGH / LOW CURRENT LIMIT**	• HIGH CURRENT LIMIT FAULT • LOW CURRENT LIMIT FAULT
8	**FIRING ERROR**	• SCR MISFIRE
11	**POWER FACTOR ERROR**	• POWER FACTOR LIMIT
12	**COMPENSATION ERROR**	• SOFT OVERCURRENT • CURRENT REGULATION
13	**INSUFFICIENT LINE VOLTAGE**	• CONTROL TRANSFORMER VOLTAGE • LOW LINE VOLTAGE • AC LINE PHASE • POWER FAILURE
14	**EXTENDED WELD**	• EXTENDED WELD • EXCESSIVE REWELD

ERROR CODE	FAULT FAMILY	WTC WELD CONTROL FAULT(S)
15	**ISOLATION CONTACTOR ERROR**	• ISO CNTR OFF WHEN NEEDED • ISO CNTR ERR BRKR TRIPPED
16	**WELDING BUS VOLTAGE**	• AC LINE PHASE
19	**C-FACTOR LIMIT**	• HIGH C-FACTOR LIMIT • LOW C-FACTOR LIMIT
22	**OVER TEMPERATURE**	• SYSTEM COOLING • TEMPERATURE
23	**SHORTED SCR**	• SHORTED SCR • WELDER CURRENT SHUNTING

Chapter 10: PREVENTATIVE MAINTENANCE

The 6000AC weld control requires periodic preventative maintenance. The following chart can be used to design a preventative maintenance schedule for the entire weld control.

FREQUENCY	ACTION	CABINET POWER?
Monthly	**ISOLATION CONTACTOR**	✔
	Ensure that the Contactor operates properly. Contactor should turn OFF/ON smoothly.	
3 Months	**CIRCUIT BREAKER**	✔
	Test shunt trip button on circuit breaker.	
3 Months	**MOUNTING BOLTS**	✕
	Verify all mounting bolts holding cabinet in place are tight.	
3 Months	**CABLES & CONNECTIONS INSIDE WELD CABINET**	✕
	Verify tight connections and that internal cables show no wear.	
3 Months	**CABLING OUTSIDE CABINET**	✔
	External cabling should be secure and show little to no wear.	

FREQUENCY	ACTION	CABINET POWER?
3 Months	**WATER COOLING SYSTEM** Inspect water-cooling circuit for leaking fittings, hoses, etc. Inspect for worn or cracked hoses and replace as required. Ensure all hose clamps are tight. Check for proper water flow in accordance with specifications in Chapter 1. (Water-Cooled models only)	✔
3 Months	**TERMINALS & TERMINAL STRIPS** All screw connections should be tightened.	✕
3 Months	**FUSES AND FUSE TERMINALS** Inspect for damaged fuses and that fuses fit properly in holders.	✕
6 Months	**COOLING FINS AND FANS** Remove dust build-up between cooling fins and within air circulation fans. Ensure fans are functioning properly. (Air-Cooled models only)	✔
12 Months	**EXTERNAL CABINET** Inspect for damage external to cabinet and that labels are intact.	✔
12 Months	**CABINET DOOR** Inspect that door opens and closes smoothly and that seals are not cracked or broken.	✔
12 Months	**LED'S & LAMPS** Inspect for damaged LED's or warning lamps internal and external to the weld controller.	✕
12 Months	**WELD CONTROL GROUNDING** Verify weld control cabinet is properly connected to earth ground, using either a multimeter or other suitable test equipment.	✕

Contact WTC for spare parts information:

WTC Industrial Technical Services
Phone: +1 248-477-3900 | Fax: +1 248-477-8897
Email: service@weldtechcorp.com
Website: www.weldtechcorp.com

Chapter 11: INPUTS AND OUTPUTS

I/O LIST

The following is a complete list of the available I/O bits for the WT6000 weld control with timer software G13300. Each I/O bit has a tag name assigned to it. The tag name is used to identify the bit on the DEP-300s I/O Status Menu. These bits are applicable to Ethernet IP (EIP), Fieldbus and Discrete I/O

INPUTS

INPUT NAME	TAG	I/O #
NONE	(BLANK)	0
BINARY SELECT 1	BS1	1
BINARY SELECT 2	BS2	2
BINARY SELECT 4	BS4	3
BINARY SELECT 8	BS8	4
BINARY SELECT 16	BS16	5
BINARY SELECT 32	BS32	6
BINARY SELECT 64	BS64	7
BINARY SELECT 128	BS128	8
WELD INITIATE	INT	9
WELD / NO WELD	WLD	10
ISOLATION CONTACTOR SAVER	CSVR	11
FAULT RESET	FR	12
WELD PROCEED	WP1	13

STEPPER RESET	SR	14
STEPPER RESET GROUP 1	SRG1	15
STEPPER RESET GROUP 2	SRG2	16
TIP DRESS	TIPD	17
TIP DRESS GROUP 1	TDG1	18
TIP DRESS GROUP 2	TDG2	19
STEPPER AUX WELD CNTR RESET	SACR	20
APP ERR ACKNOWLEDGE	FACK	21
CONTROL STOP	CSTP	22
PRESSURE SWITCH	PS1	23
SYSTEM COOLING	COOL	24
PROGRAM DISPLAY SECURITY	PSEC	25
HEAT DISPLAY SECURITY	HSEC	26
USER INPUT 1	UI1	27
USER INPUT 2	UI2	28
USER INPUT 3	UI3	29
USER INPUT 4	UI4	30
USER INPUT 5	UI5	31
USER INPUT 6	UI6	32
RETRACT PILOT 1	RP1	33
RETRACT PILOT 2	RP2	34
SPOT 9 (256)	S9	35
SPOT 10 (512)	S10	36
SPOT 11 (1024)	S11	37
SPOT 12 (2048)	S12	38
SPOT 13 (4096)	S13	39
SPOT 14 (8192)	S14	40
SPOT 15 (16384)	S15	41
SPOT 16 (32768)	S16	42
SPOT 17 (65536)	S17	43
SPOT 18 (131072)	S18	44
SPOT 19 (262144)	S19	45
SPOT 20 (524288)	S20	46
SPOT 21 (1048576)	S21	47
SPOT 22 (2097152)	S22	48
SPOT 23 (4194304)	S23	49
SPOT 24 (8388608)	S24	50

NOTE:
Inputs: PSEC (Program Display Security) and HSEC (Heat Display Security) are ONLY acknowledged on the DEP 100/105. DEP 300s, WebView and ***RAFT*** Gateway ignore these inputs.

SPOT 25 (16777216)	S25	51
SPOT 26 (33554432)	S26	52
SPOT 27 (67108864)	S27	53
SPOT 28 (134217728)	S28	54
SPOT 29 (268435456)	S29	55
SPOT 30 (536870912)	S30	56

OUTPUTS

OUTPUT NAME	TAG	I/O #
NONE	(BLANK)	0
VALVE 1	V1	1
VALVE 2	V2	2
VALVE 3	V3	3
VALVE 4	V4	4
VALVE 5	V5	5
VALVE 6	V6	6
NO FAULT	NFLT	7
NO ALERT	NALT	8
FAULT	FLT	9
ALERT	ALT	10
WELD MODE ON	WMON	11
NO WELD	NWM	12
WELD IN PROGRESS	WIP	13
WELD COMPLETE	WCPL	14
READY TO WELD	RTW	15
STEPPERS ARE RESET	SRST	16
STEPPERS ARE RESET GROUP 1	SRG1	17
STEPPERS ARE RESET GROUP 2	SRG2	18
END OF STEPPER	EOS	19
END OF STEPPER GROUP 1	ESG1	20
END OF STEPPER GROUP 2	ESG2	21
STEPPER APPROACHING MAX	SALT	22
STPR APPROACHING MAX GROUP 1	SAG1	23
STPR APPROACHING MAX GROUP 2	SAG2	24

TIP CHANGE REQUIRED	TCR	25
TIP CHANGE REQUIRED GROUP 1	TCG1	26
TIP CHANGE REQUIRED GROUP 2	TCG2	27
TIP DRESS REQUEST	TDR	28
TIP DRESS REQUEST GROUP 1	TDG1	29
TIP DRESS REQUEST GROUP 2	TDG2	30
STEPPER AUX COUNTER AT MAX	SACM	31
APP ERROR AVAILABLE	EAVL	32
APP ERROR BIT 1	ER1	33
APP ERROR BIT 2	ER2	34
APP ERROR BIT 4	ER4	35
APP ERROR BIT 8	ER8	36
APP ERROR BIT 16	ER16	37
PRESSURE SELECT 1	PS1	38
PRESSURE SELECT 2	PS2	39
PRESSURE SELECT 3	PS3	40
PRESSURE SELECT 4	PS4	41
USER OUTPUT 1	UO1	42
USER OUTPUT 2	UO2	43
USER OUTPUT 3	UO3	44
USER OUTPUT 4	UO4	45
USER OUTPUT 5	UO5	46
USER OUTPUT 6	UO6	47
RETRACT VALVE 1	RT1	48
RETRACT VALVE 2	RT2	49
INVERTED RETRACT VALVE 1	IRT1	50
INVERTED RETRACT VALVE 2	AERR	51
WATER SAVER VALVE	WSVR	52
FORGE	FRG	53

FIXED LIO INPUTS

INPUT NAME	TAG
CONTROL STOP 2	CS2
ISOC AUX CONTACT	IC

FIXED LIO OUTPUTS

OUTPUT NAME	TAG
ISOC	ISOC
SHUNT TRIP 1	ST

I/O DESCRIPTIONS

INPUT DESCRIPTIONS

INPUT BIT NAME	DESCRIPTION
NONE	When the NONE bit is assigned to an input, the input is disabled and not used by the weld processor.
BINARY SELECT 1 / 2 / 4 / 8 / 16 / 32 / 64 / 128	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	When this bit goes HIGH, the weld processor will initiate the weld schedule selected through the Binary Select Inputs.
WELD / NO WELD	This is a Weld Input to the control. With this input closed (HIGH), the control is in Weld Mode. If this input is open, 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.
ISOLATION CONTACTOR SAVER	This is an input to the weld control enclosure, showing whether the isolation contactor is open or closed. It is normally open. If this contact fails to change states after a valid schedule is initiated, the control will generate a ISO-CNTR OFF WHEN NEEDED fault condition. 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. It will also de-energize the NO FAULT output and trip the circuit breaker.
FAULT RESET	When this bit goes HIGH, the weld processor will reset all faults.
WELD PROCEED	This bit is used to force the weld processor to pause the execution of a weld schedule until the bit goes HIGH. It is used with function #70 (WAIT FOR WELD PROCEED).
STEPPER RESET	When this bit goes HIGH the weld processor will “globally” reset all 10 stepper programs to Step 1 and Weld Count 0.
STEPPER RESET GROUP 1	When this bit goes HIGH the weld processor will reset only the stepper programs assigned to Group 1, to Step 1 and Weld Count 0.
STEPPER RESET GROUP 2	When this bit goes HIGH the weld processor will reset only the stepper programs assigned to Group 2, to Step 1 and Weld Count 0.

INPUT BIT NAME	DESCRIPTION
TIP DRESS	When this bit goes HIGH, the weld processor will: 1. Turn the Tip Dress Request output bit LOW 2. Return the stepper program to the 1st weld of step 2. This applies “globally” for all stepper programs.
STEPPER AUX WELD CNTR RESET	When this bit goes HIGH, the weld processor resets the Auxiliary Weld Counter to zero and turns the Aux. Counter at Max output bit LOW.
APP ERR ACKNOWLEDGE	The robot turns this bit HIGH to: 1. Send an acknowledgment to the weld processor that it has read the binary fault code from the App Error output bits. 2. To send the next binary fault code to the App Error output bits.
CONTROL STOP	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.
PRESSURE SWITCH	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 #68 has elapsed. It is used with function #68 (WAIT nnnn CY FOR PRESSURE SWITCH INPUT) and function #69 (WAIT FOR PRESSURE SWITCH INPUT).
SYSTEM COOLING	This bit is normally maintained HIGH. When a System Cooling problem exists external to the weld control unit (i.e. welding transformer, gun, etc.) this bit will go LOW. The weld schedule will initiate if the bit is LOW, but no current will be passed. At the end of the schedule, the weld processor will generate a LOW CURRENT FAULT and SYSTEM COOLING FAULT. If this bit goes LOW anytime during the execution of a weld schedule, the weld processor will generate a SYSTEM COOLING FAULT. Conversely, if this bit goes LOW before the weld function, a SYSTEM COOLING FAULT and LOW CURRENT LIMIT FAULT will occur.
PROGRAM DISPLAY SECURITY	When this bit is held LOW, only data within the Stepper Status menu can be edited. When this bit is held HIGH, all data can be edited.
HEAT DISPLAY SECURITY	When this bit is held HIGH, only data in the Stepper Status and Heat Display Menus can be edited. When the Heat Display Security and Program Display Security bits are held LOW simultaneously, only data in the Stepper Status, and Network Address menus can be edited.
USER INPUT 1 / 2 / 3 / 4 / 5 / 6	Spare user definable input bit. It is used with functions #66 (WAIT nnn CY INP #n TO BE n) and #67 (WAIT FOR INPUT #n TO BE n) in the weld schedule.

INPUT BIT NAME	DESCRIPTION
RETRACT PILOT 1	This input bit changes the state of the Close Retract 1 and Open Retract 1 output bits. A LOW to HIGH transition on the Retract Pilot input bit causes the state of the Close Retract 1 and Open Retract 1 output bits to change. **NOTE:** Both retract output bits remain off after the control is powered up and/or after a Control Stop condition. The retract input bit must always be toggled after these events to return the retract output bits to their expected states. **NOTE:** This bit must be mapped in the I/O to enable retraction. Operation is fixed in LATCHED mode only.
RETRACT PILOT 2	This input bit changes the state of both Retract Valve 2 and Inverted Retract Valve 2 output bits. How these output bits react to the input depends on the parameters programmed into the Retract Mode and Cylinder Setup Parameters.
SPOT 9 - 30	These bits is used by the robot to initiate a schedule by SPOT ID (SPOT ID = 3 digit Weld Body ID + 6 digit Location ID). When this bit goes high the robot will look for the weld schedule that has been previously assigned to the Spot. **NOTE:** For more details on Programming with Spot ID refer to Chp. 6: Programming Schedules - Spot ID Programming. When the combination of Binary Select Input bits and Spot ID input bits is greater than 1 and less than 256, the weld processor Initiate schedule with the selected schedule 1-255. When spot programming is set in the “One to One”, mode the spot ID will be set to the spot number assigned to the schedule. • When the combination of Binary Select Input bits and Spot ID is greater than 255,the weld processor performs a ‘Look Up” in the SPOT ID Reference Table: ▷ If there is no Schedule associated with the specific SPOT ID and this is: **INITIATE WELD,** then an “INVALID SEQUENCE” Fault is annunciated. ▷ If there is a Schedule associated with the specific SPOT ID and this is: **INITIATE WELD** request, then execute the desired weld schedule and place the Spot ID in the weld result data for tracking purposes. *The Weld Summary Record format will add the SPOT ID to the summary information.*

OUTPUT DESCRIPTIONS

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	This bit goes HIGH when function #50 (TURN ON VALVE 1) is executed in the weld schedule and goes LOW when function #51 (TURN OFF VALVE 1) is executed.
VALVE 2	This bit goes HIGH when function #50 (TURN ON VALVE 2) is executed in the weld schedule and goes LOW when function #51 (TURN OFF VALVE 2) is executed.
VALVE 3	This bit goes HIGH when function #50 (TURN ON VALVE 3) is executed in the weld schedule and goes LOW when function #51 (TURN OFF VALVE 3) is executed.
VALVE 4	This bit goes HIGH when function #50 (TURN ON VALVE 4) is executed in the weld schedule and goes LOW when function #51 (TURN OFF VALVE 4) is executed.
VALVE 5	This bit goes HIGH when function #50 (TURN ON VALVE 5) is executed in the weld schedule and goes LOW when function #51 (TURN OFF VALVE 5) is executed.
VALVE 6	This bit goes HIGH when function #50 (TURN ON VALVE 6) is executed in the weld schedule and goes LOW when function #51 (TURN OFF VALVE 6) is executed.
NO FAULT	This bit is normally maintained HIGH and indicates a FAULT condition does not exist. When a FAULT occurs, this bit will go LOW.
NO ALERT	This bit is normally maintained HIGH and indicates an ALERT condition does not exist. When an ALERT occurs, this bit will go LOW.
FAULT	This bit will go HIGH when a FAULT condition exists.
ALERT	This bit will go HIGH when an ALERT condition exists.
WELD MODE ON	This bit goes HIGH when the weld control is in WELD MODE.
NO WELD	This bit goes HIGH when the weld control is in NO WELD MODE.
WELD IN PROGRESS	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	This bit goes HIGH when function #63 (TURN ON WELD COMPLETE) is executed in the weld schedule and goes LOW when function #64 (TURN OFF WELD COMPLETE) is executed.

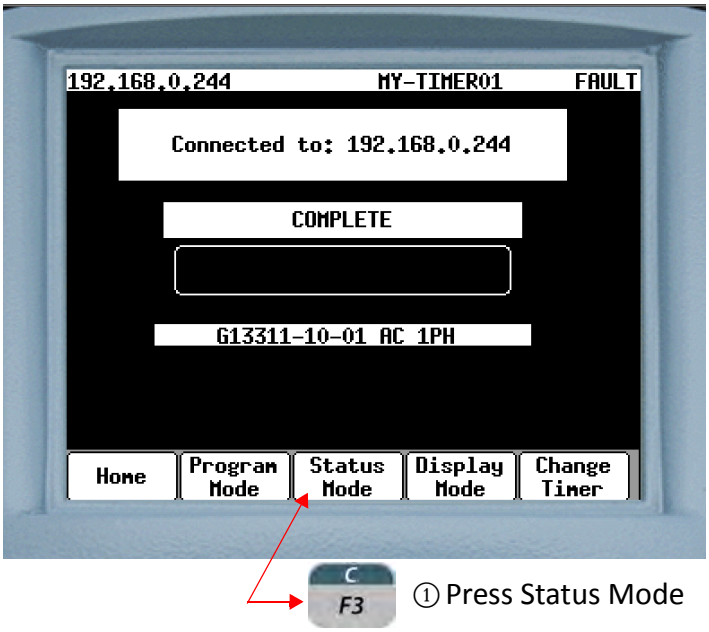
OUTPUT BIT NAME	DESCRIPTION
READY TO WELD	This bit goes HIGH when all the following conditions are true: 1 The weld control is in WELD MODE 2 No fault condition exists 3 The Control Stop input bit is HIGH 4 The System Cooling input bit is HIGH.
STEPPERS ARE RESET	This bit goes HIGH when all 10 stepper programs are globally reset.
STEPPERS ARE RESET GROUP 1	This bit goes HIGH when the stepper programs assigned to group 1 are reset.
STEPPERS ARE RESET GROUP 2	This bit goes HIGH when the stepper programs assigned to group 2 are reset.
END OF STEPPER	When the tip dress feature is enabled, this bit will go HIGH on the first weld of step 3 in the stepper program, if the Remaining Tip Dresses Count has decremented to 0. It will only go HIGH on the last weld of step 5 in the stepper program, if the tip dress function is disabled in the Setup Parameters or the tip dress count is greater than 0 when the tip dress feature is enabled. This bit will go LOW when either the Stepper Reset, Stepper Reset Group 1 or Stepper Reset Group 2 input bits go HIGH.
END OF STEPPER GROUP 1	This bit will go HIGH on the last weld of step 5 in the stepper program. This bit will go LOW when either the Stepper Reset or Stepper Reset Group 1 input bit goes HIGH.
END OF STEPPER GROUP 2	This bit will go HIGH on the last weld of step 5 in the stepper program. This bit will go LOW when either the Stepper Reset or Stepper Reset Group 2 input bit goes HIGH.
STEPPER APPROACHING MAX	When the tip dress feature is enabled, this bit will go HIGH on the 1st weld of step 2 in the stepper program, if the Remaining Tip Dresses Count has decremented to 0. It will only go HIGH on the 1st weld of step 5 in the stepper profile, if the tip dress function is disabled in the Setup Parameters or the tip dress count is greater than 0 when the tip dress feature is enabled. This bit will go LOW when either the Stepper Reset, Stepper Reset Group 1 or Stepper Reset Group 2 input bits go HIGH.
STPR APPROACHING MAX GROUP 1	This bit will go HIGH on the 1st weld of step 5 in the stepper profile. This bit will go LOW when either the Stepper Reset, Stepper Reset Group 1 or End of Stepper Group 1 input bit goes HIGH.
STPR APPROACHING MAX GROUP 2	This bit will go HIGH on the 1st weld of step 5 in the stepper profile. This bit will go LOW when either the Stepper Reset, Stepper Reset Group 2 or End of Stepper Group 2 input bit goes HIGH.
TIP CHANGE REQUIRED	This bit will go HIGH at the end of any stepper program, if the Remaining Tip Dress Count (Tip Dresses) has decremented to zero in the Stepper Status Menu. This bit will go LOW when the Stepper Reset input bit goes HIGH.
TIP CHANGE REQUIRED GROUP 1 / 2	This bit will go HIGH at the end of any stepper program assigned to Group 1, if the Remaining Tip Dress Count (Tip Dresses) has decremented to zero in the Stepper Status Menu. This bit will go LOW when either the Stepper Reset or Stepper Reset Group 1 / 2 input bit goes HIGH.

OUTPUT BIT NAME	DESCRIPTION
TIP DRESS REQUEST	This bit will go HIGH at the first weld of Step 3 in the stepper program, if the Remaining Tip Dresses Count is > 0. It is used as an indicator to the robot that a tip dress is required for the weld caps. This bit will go LOW when (1) the Tip Dress Request, Tip Dress Request Group 1 or Tip Dress Request Group 2 input bits go HIGH or (2) the tip dress schedule is initiated. **NOTE:** This bit does not latch on. It will turn off when the initiate bit is turned off.
TIP DRESS REQUEST GROUP I / 2	This bit will go HIGH at the first weld of Step 3 in the stepper program, if the Remaining Tip Dresses Count is > 0. It is used as an indicator to the robot that a tip dress is required for the weld caps. This bit will go LOW when the Tip Dress Group 1 / 2 input bit goes HIGH.
STEPPER AUX COUNTER AT MAX	This output bit goes HIGH when the Auxiliary Weld Counter has reached the value programmed in the Aux. Counter Max Counts field in the Stepper Profile.
APP ERROR AVAILABLE	When a fault occurs, this bit goes HIGH to advise the robot to read the binary fault code on the App Error Bit output bits.
APP ERROR BIT 1 / 2 / 4 / 8 / 16	These bits are used by the weld processor to send binary fault codes to the robot.
PRESSURE SELECT 1 / 2 / 3 / 4	During the execution of a weld schedule, the weld processor takes the value programmed in function #54 (TURN ON PRESSURE SELECT nnn) and turns the corresponding binary Pressure Select output bits HIGH. If SET PRESSURE = 0, all four bits (1, 2, 3, 4) are LOW.
USER OUTPUT 1 / 2 / 3 / 4 / 5 / 6	This bit goes HIGH when function #52 (TURN ON OUTPUT 1 / 2 / 3/ 4 / 5/ 6) is executed in the weld schedule and goes LOW when function #53 (TURN OFF OUTPUT 1 / 2 / 3 / 4 / 5 / 6) is executed.
RETRACT VALVE 1	The state of this bit changes according to the status of the Retract Valve 1 input bit. How this bits reacts depends on the parameters programmed into the Retract Mode and Cylinder Setup Parameters.
RETRACT VALVE 2	The state of this bit changes according to the status of the Retract Valve 2 input bit. How this bits reacts depends on the parameters programmed into the Retract Mode and Cylinder Setup Parameters.
INVERTED RETRACT VALVE 1	The state of this bit changes according to the status of the Retract Pilot 1 input bit. **NOTE:** This bit is functional when the Retract Pilot 1 input bit is mapped. **NOTE:** Both retract output bits remain off after the control is powered up and/or after a control stop condition. The retract input bit must always be toggled after these events to return the retract output bits to their expected states.
INVERTED RETRACT VALVE 2	The state of this bit changes according to the status of the Retract Valve 2 input bit. How this bits reacts depends on the parameter programmed into the Retract Mode Setup Parameter.

OUTPUT BIT NAME	DESCRIPTION
WATER SAVER	This bit goes HIGH when a weld schedule initiates. After the weld schedule is complete, the weld processor starts an internal timer holding the bit HIGH for an additional three minutes. When the timer has ended, the bit goes LOW.
FORGE	This bit goes HIGH when function #78 (TURN ON FORGE VALVE) is executed in the weld schedule and goes LOW when function #79 (TURN OFF FORGE VALVE) is executed.

I/O STATUS

To navigate to the I/O Status Menu, perform the following steps on the DEP-300s:



① Press Status Mode

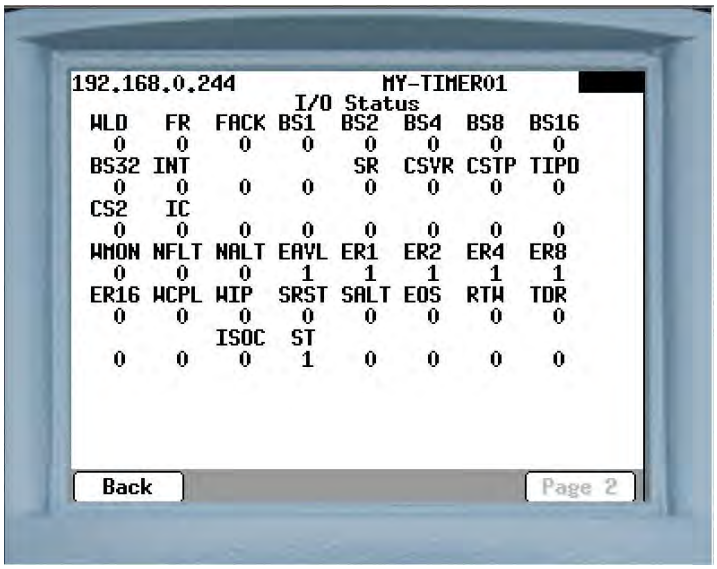
② Press More

EACH I/O BIT IS REPRESENTED BY A TAG WHICH WILL HAVE EITHER A "1" OR "0" UNDERNEATH IT:

▶"1" indicates the bit is HIGH or ON

▶"0" indicates the bit is LOW or OFF

B F2 ③ Press IO Status



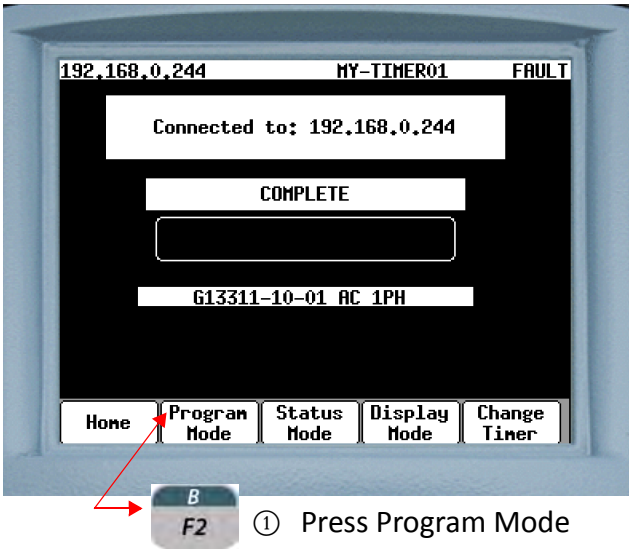
④ Press Page 2 E F5 to view more bits (if applicable).

The I/O Status Screen shows the status of every mapped I/O bit in the WT6000. Depending on the customer's application, this can include:

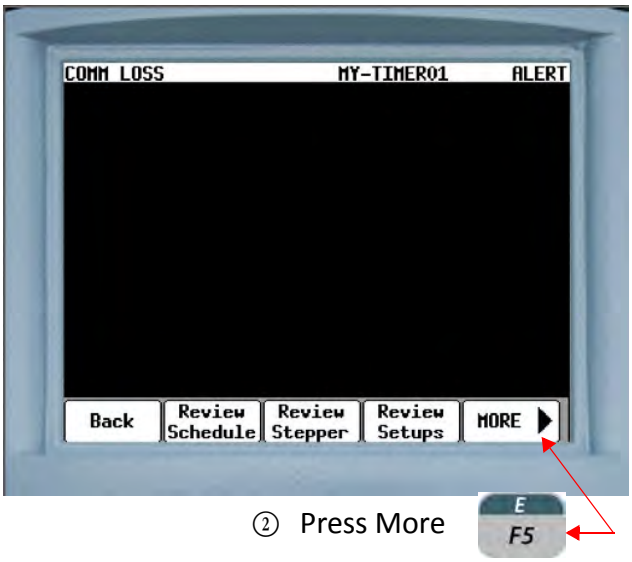
- Fieldbus I/O
- Ethernet I/O
- Local I/O

I/O DEFAULTS

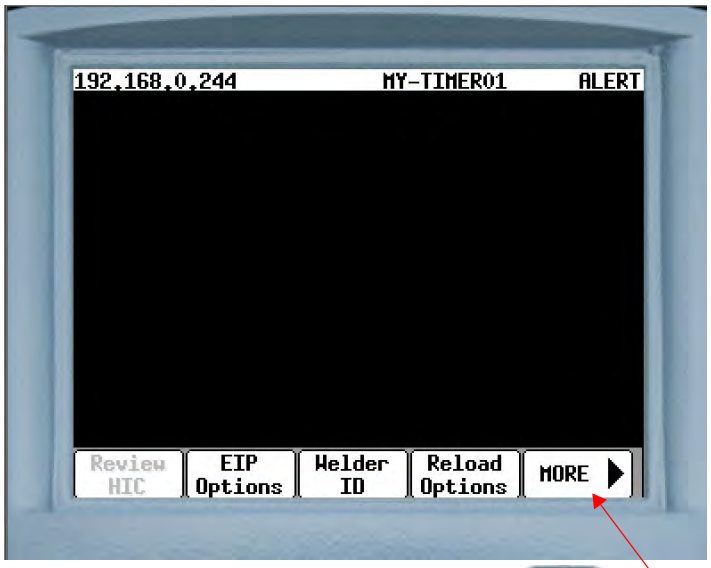
Weld processor software G13300 offers default I/O (DIO) in Fieldbus and Ethernet IP configurations. The following instructions show navigation to Fieldbus Default 1 on the DEP-300s. Use the same procedure to navigate to Default 2.



① Press Program Mode



② Press More



③ Press More 

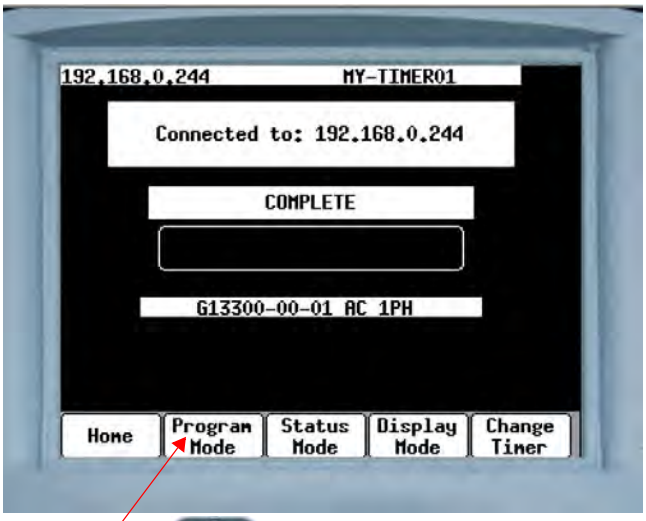
④ Press Fieldbus Mapping.

⑤ Press SPACE ENTER This opens a drop-down box with options available. Using the S ↓ arrow key navigate to the desired default (DEFAULT 1 or DEFAULT 2) and press SPACE ENTER.

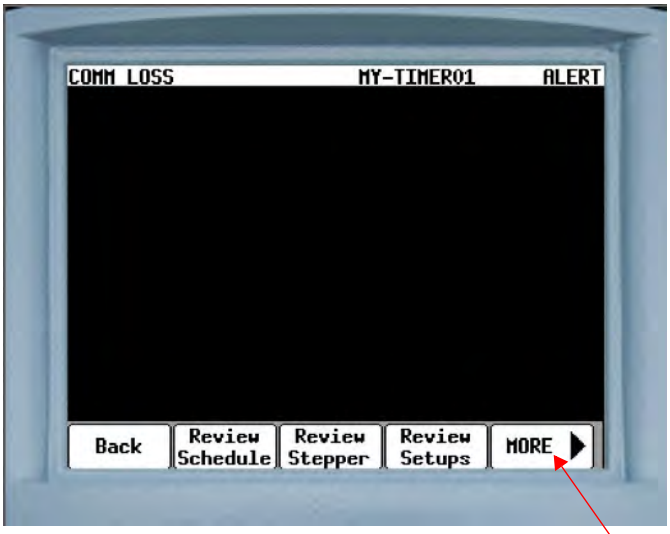
⑦ The message: “Do you want to change FIELD BUS Information?” is displayed. Press E F5 to Confirm.

⑧ “Download Complete Power Cycle Required” is displayed. Cycle power to apply the selection.

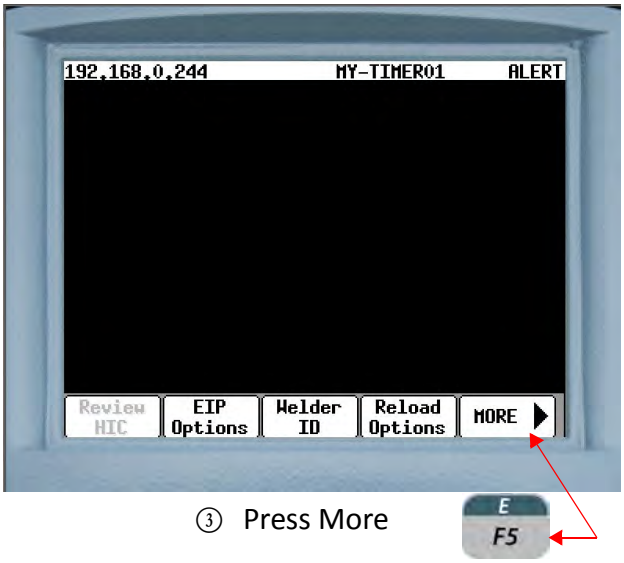
MAPPING THE FIELD BUS I/O



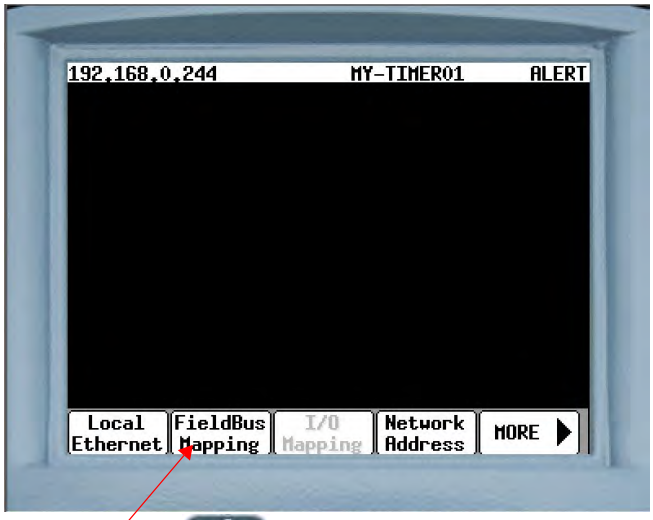
① Press Program Mode



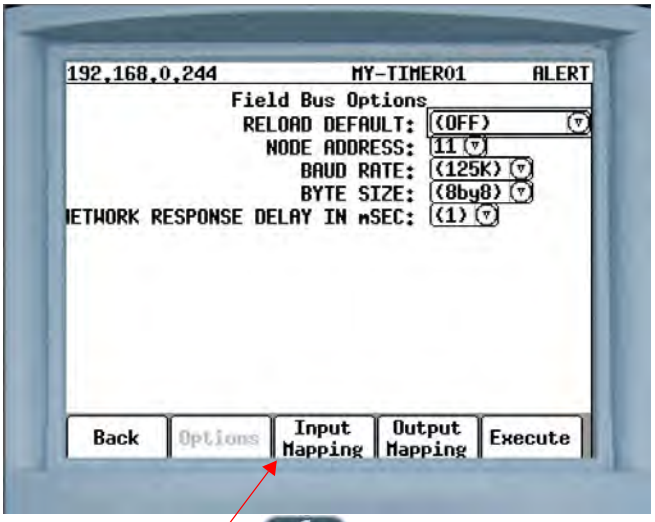
② Press More 

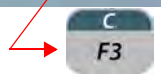


③ Press More

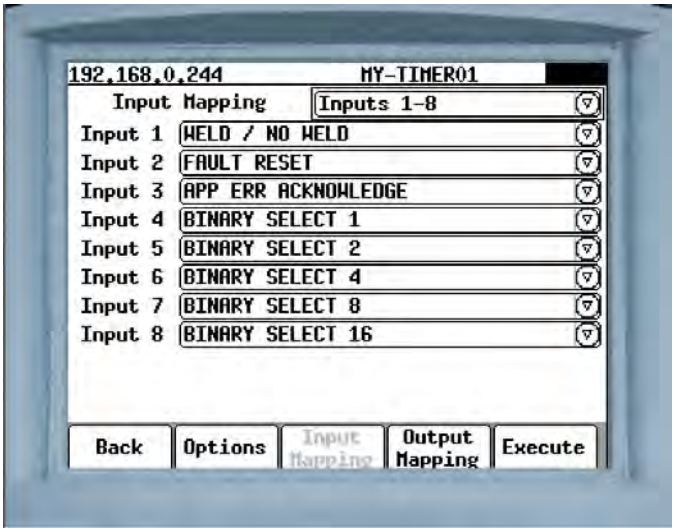


④ Press FieldBus Mapping.





⑤ Press Input Mapping.



⑤ Press 

to open a drop down box which will show the available mappable inputs. The total number of available inputs is 64.

Using the 

arrow key navigate to the default line you want mapped. For detailed instructions on mapping I/O refer to I/O Mapping on page 205.

FIELDBUS INPUTS- DEFAULT 1

INPUT #	FIELDBUS INPUT BIT NAME	TAG NAME	BYTE SIZE			
1	WELD / NO WELD	WLD	2 by 2	4 by 4		
2	FAULT RESET	FR				
3	APP ERR ACKNOWLEDGE	FACK				
4	BINARY SELECT 1	BS1				
5	BINARY SELECT 2	BS2				
6	BINARY SELECT 4	BS4				
7	BINARY SELECT 8	BS8				
8	BINARY SELECT 16	BS16				
9	BINARY SELECT 32	BS32				
10	WELD INITIATE	INT				
11	NONE	-				
12	NONE	-				
13	STEPPER RESET	SR				
14	ISOLATION CONTACTOR SAVER	CSVR				
15	CONTROL STOP	CSTP				
16	TIP DRESS	TIPD				
17	NONE	-				
18	STEPPER RESET GROUP 1	SRG1				
19	STEPPER RESET GROUP 2	SRG2				
20	NONE	-				
21	TIP DRESS GROUP 1	TDG1				
22	TIP DRESS GROUP 2	TDG2				
23	NONE	-				
24	NONE	-				
25	NONE	-				
26	NONE	-				
27	NONE	-				

28	NONE	-			6 by 6	8 by 8
29	NONE	-				
30	NONE	-				
31	NONE	-				
32	NONE	-				
33	NONE	-				
34	NONE	-				
35	NONE	-				
36	NONE	-				
37	NONE	-				
38	NONE	-				
39	NONE	-				
40	NONE	-				
41	NONE	-				
42	NONE	-				
43	NONE	-				
44	NONE	-				
45	NONE	-				
46	NONE	-				
47	NONE	-				
48	NONE	-				
49	NONE	-				
50	NONE	-				
51	NONE	-				
52	NONE	-				
53	NONE	-				
54	NONE	-				
55	NONE	-				
56	NONE	-				
57	NONE	-				
58	NONE	-				
59	NONE	-				
60	NONE	-				

61	NONE	-				
62	NONE	-				
63	NONE	-				
64	NONE	-				

FIELDBUS OUTPUTS - DEFAULT 1

OUTPUT #	FIELDBUS OUTPUT BIT NAME	TAG NAME	BYTE SIZE			
1	WELD MODE ON	WMON				
2	NO FAULT	NFLT				
3	NO ALERT	NALT				
4	APP ERROR AVAILABLE	EVAL				
5	APP ERROR BIT 1	ER1				
6	APP ERROR BIT 2	ER2	2 by 2			
7	APP ERROR BIT 4	ER4				
8	APP ERROR BIT 8	ER8				
9	APP ERROR BIT 16	ER16				
10	WELD COMPLETE	WCPL				
11	WELD IN PROGRESS	WIP				
12	STEPPERS ARE RESET	SRST				
13	STEPPER APPROACHING MAX	SALT				
14	END OF STEPPER	EOS		4 by 4		
15	READY TO WELD	RTW				
16	TIP DRESS REQUEST	TDR				
17	NONE	-				
18	STEPPERS ARE RESET GROUP 1	SRG1				
19	STEPPERS ARE RESET GROUP 2	SRG2				
20	NONE	-				
21	END OF STEPPER GROUP 1	ESG1			6 by 6	

22	END OF STEPPER GROUP 2	ESG2				8 by 8
23	NONE	-				
24	STPR APPROACHING MAX GROUP 1	SAG1				
25	STPR APPROACHING MAX GROUP 2	SAG2				
26	NONE	-				
27	TIP DRESS REQUEST GROUP 1	TDG1				
28	TIP DRESS REQUEST GROUP 2	TDG2				
29	NONE	-				
30	NONE	-				
31	NONE	-				
32	NONE	-				
33	NONE	-				
34	NONE	-				
35	NONE	-				
36	NONE	-				
37	NONE	-				
38	NONE	-				
39	NONE	-				
40	NONE	-				
41	NONE	-				
42	NONE	-				
43	NONE	-				
44	NONE	-				
45	NONE	-				
46	NONE	-				
47	NONE	-				
48	NONE	-				
49	NONE	-				
50	NONE	-				
51	NONE	-				
52	NONE	-				
53	NONE	-				
54	NONE	-				

55	NONE	-				
56	NONE	-				
57	NONE	-				
58	NONE	-				
59	NONE	-				
60	NONE	-				
61	NONE	-				
62	NONE	-				
63	NONE	-				
64	NONE	-				

FIELDBUS INPUTS - DEFAULT 2

INPUT #	FIELDBUS INPUT BIT NAME	TAG NAME	BYTE SIZE			
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	BS1				
10	BINARY SELECT 2	BS2				
11	BINARY SELECT 4	BS4	2 by 2			
12	BINARY SELECT 8	BS8				
13	BINARY SELECT 16	BS16				
14	BINARY SELECT 32	BS32				
15	BINARY SELECT 64	BS64				
16	BINARY SELECT 128	BS128				

17	SPOT 9 (256)	S9				
18	SPOT 10 (512)	S10				
19	SPOT 11 (1024)	S11				
20	SPOT 12 (2048)	S12		4 by 4		
21	SPOT 13 (4096)	S13				
22	SPOT 14 (8192)	S14				
23	SPOT 15 (16384)	S15				
24	SPOT 16 (32768)	S16				
25	SPOT 17 (65536)	S17			6 by 6	
26	SPOT 18 (131072)	S18				
27	SPOT 19 (262144)	S19				
28	SPOT 20 (524288)	S20				
29	SPOT 21 (1048576)	S21				
30	SPOT 22 (2097152)	S22				
31	SPOT 23 (4194304)	S23				
32	SPOT 24 (8388608)	S24				
33	SPOT 25 (16777216)	S25				
34	SPOT 26 (33554432)	S26				
35	SPOT 27 (67108864)	S27				
36	SPOT 28 (134217728)	S28				
37	SPOT 29 (268435456)	S29				
38	SPOT 30 (536870912)	S30				
39	NONE	-				
40	NONE	-				
41	NONE	-				
42	NONE	-				
43	NONE	-				8 by 8
44	NONE	-				
45	NONE	-				
46	NONE	-				
47	NONE	-				
48	NONE	-				
49	NONE	-				

50	NONE	-				
51	NONE	-				
52	NONE	-				
53	NONE	-				
54	NONE	-				
55	NONE	-				
56	NONE	-				
57	NONE	-				
58	NONE	-				
59	NONE	-				
60	NONE	-				
61	NONE	-				
62	NONE	-				
63	NONE	-				
64	NONE	-				

FIELDBUS OUTPUTS - DEFAULT 2

OUTPUT #	FIELDBUS OUTPUT BIT NAME	TAG NAME	BYTE SIZE			
1	WELD MODE ON	WMON				
2	NO FAULT	NFLT				
3	NO ALERT	NALT				
4	APP ERROR AVAILABLE	EVAL				
5	APP ERROR BIT 1	ER1				
6	APP ERROR BIT 2	ER2	2 by 2			
7	APP ERROR BIT 4	ER4				
8	APP ERROR BIT 8	ER8				
9	APP ERROR BIT 16	ER16				
10	WELD COMPLETE	WCPL				

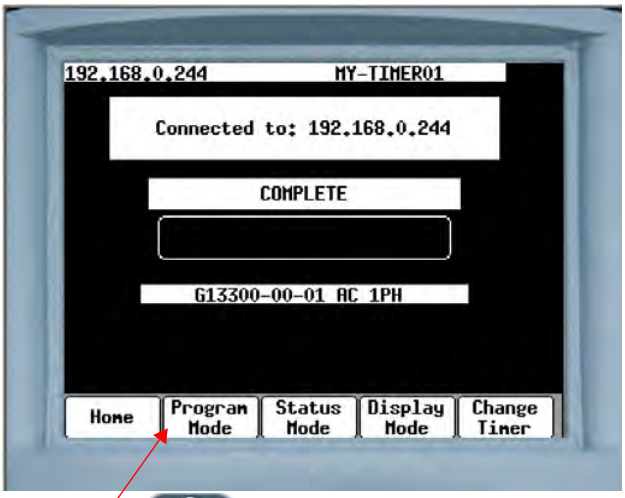
11	WELD IN PROGRESS	WIP		4 by 4	6 by 6	8 by 8
12	STEPPERS ARE RESET	SRST				
13	STEPPER APPROACHING MAX	SALT				
14	END OF STEPPER	EOS				
15	READY TO WELD	RTW				
16	TIP DRESS REQUEST	TDR				
17	NONE	-				
18	STEPPERS ARE RESET GROUP 1	SRG1				
19	STEPPERS ARE RESET GROUP 2	SRG2				
20	NONE	-				
21	END OF STEPPER GROUP 1	ESG1				
22	END OF STEPPER GROUP 2	ESG2				
23	NONE	-				
24	STEPPER APPROACHING MAX GROUP 1	SAG1				
25	STEPPER APPROACHING MAX GROUP 2	SAG2				
26	NONE	-				
27	TIP DRESS REQUEST GROUP 1	TDG1				
28	TIP DRESS REQUEST GROUP 2	TDG2				
29	NONE	-				
30	NONE	-				
31	NONE	-				
32	NONE	-				
33	NONE	-				
34	NONE	-				
35	NONE	-				
36	NONE	-				
37	NONE	-				
38	NONE	-				
39	NONE	-				
40	NONE	-				
41	NONE	-				
42	NONE	-				
43	NONE	-				

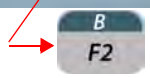
44	NONE	-				
45	NONE	-				
46	NONE	-				
47	NONE	-				
48	NONE	-				
49	NONE	-				
50	NONE	-				
51	NONE	-				
52	NONE	-				
53	NONE	-				
54	NONE	-				
55	NONE	-				
56	NONE	-				
57	NONE	-				
58	NONE	-				
59	NONE	-				
60	NONE	-				
61	NONE	-				
62	NONE	-				
63	NONE	-				
64	NONE	-				

EIP IP I/O DEFAULTS

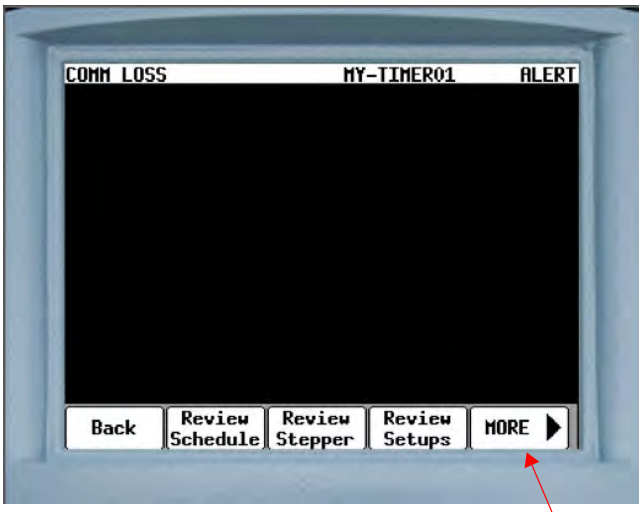
In weld processor software G13300, there are a maximum of 64 inputs and outputs that can be mapped. The number of mapped inputs and outputs is determined by selecting a Type and Size in the EIP configuration options, whose product is less than or equal to 64. The default map below is configured for 64 inputs and outputs. For more information, see EtherNet Setup in Chapter 5: Communications Setup.

Timer software G13300 offers 3 EIP I/O defaults. The following procedure describes navigation to EIP I/O Default 1 using the DEP 300s.

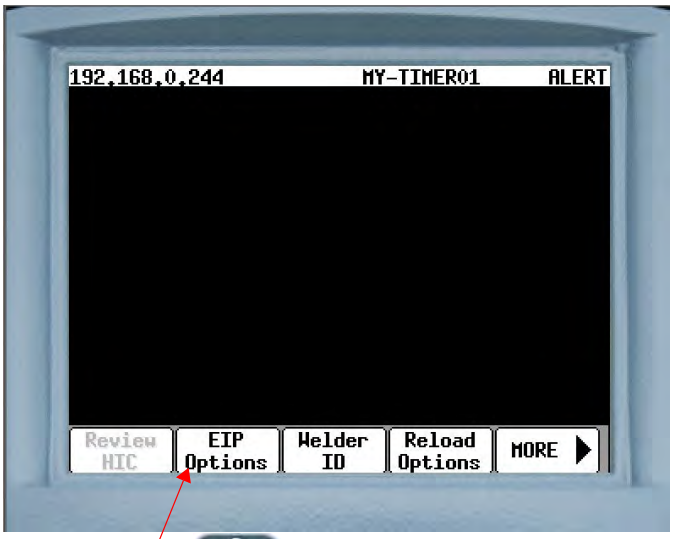




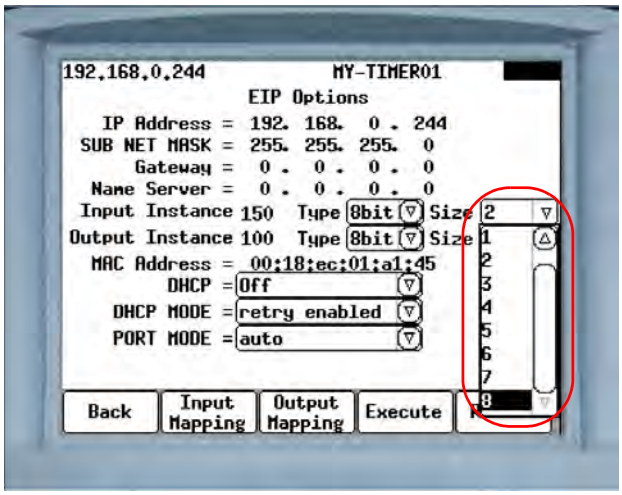
① Press Program Mode.



② Press More 

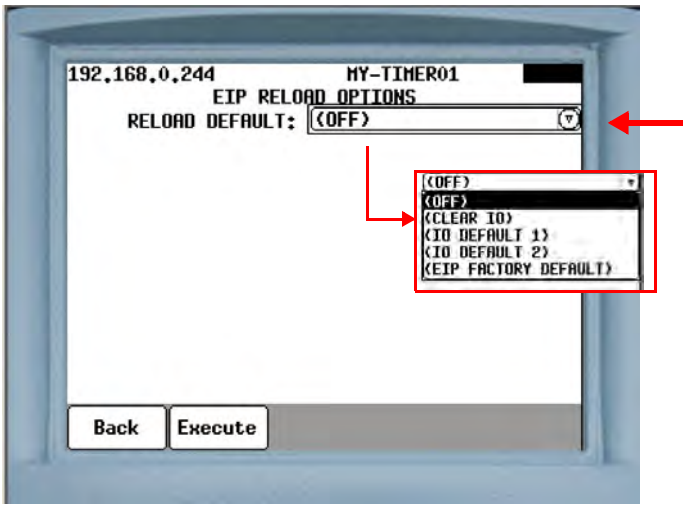


B F2 ③ Press EIP Options



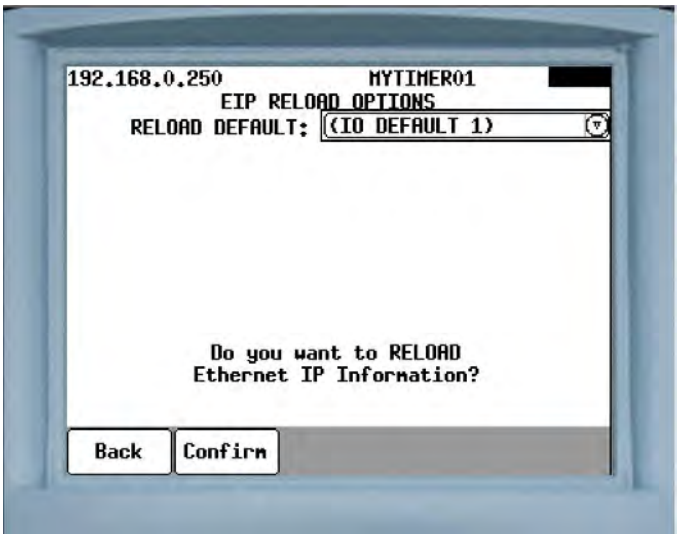
④ Press the S ↓ arrow key to navigate to Input Instance Type. Press the O → arrow key to navigate to Size and press SPACE ENTER This will display the drop down list with size options. Using the S ↓ move to “8” and press SPACE ENTER. This configuration will allow 64 bit input option.

⑤ Press E F5 to Reload.



⑥ Press SPACE ENTER This opens a drop down list of Reload Defaults. Use the S ↓ arrow key to select your desired default option and press SPACE ENTER .

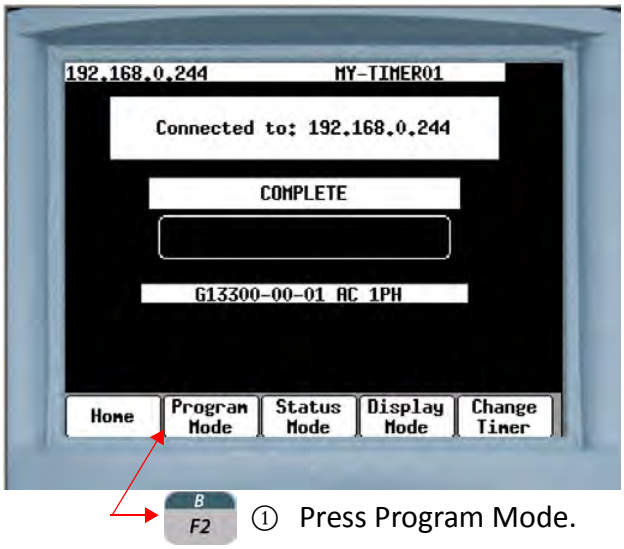
As the selected default is displayed in the Reload Default window press Execute B F2 .



⑦ The message “Do you want to RELOAD Ethernet IP Information?” is displayed. Press B F2 to Confirm the selection. This is followed by the prompt “Download Complete Power Cycle Required.” Cycle power to apply the selection.

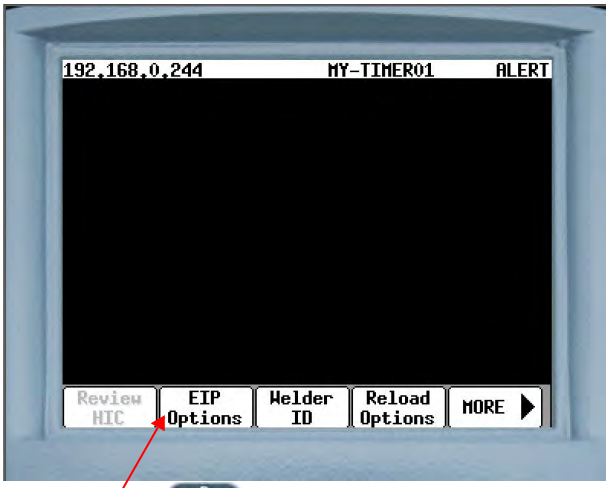
EIP IO MAPPING

Having made the selection of default options (OFF, CLLEAR IO, IO DEFAULT 1, IO DEFAULT 2, EIP Factory Default) as detailed in the procedure on the previous pages, follow the steps below to map the available EIP I/O points.

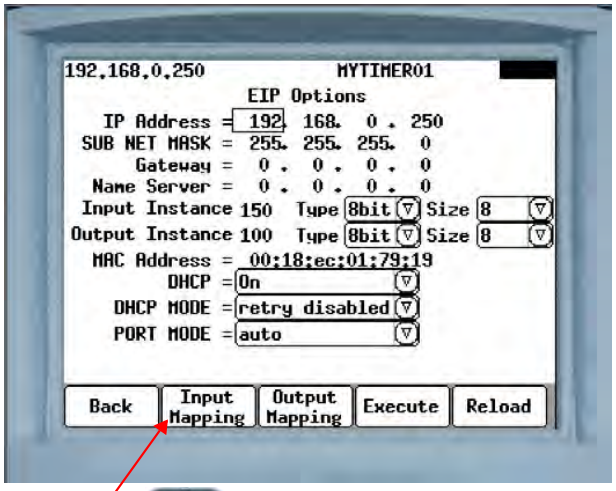


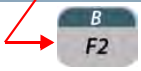
① Press Program Mode.

② Press More.



③ Press EIP Options





④ Press Input Mapping.

For Output Mapping follow the same procedure until step 4 and press 

For detailed I/O mapping instructions refer to Page 205.

EIP INPUTS DEFAULT 1

INPUT #	EIP INPUT BIT NAME	TAG NAME
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	BS1
10.	BINARY SELECT 2	BS2
11.	BINARY SELECT 4	BS4
12.	BINARY SELECT 8	BS8
13.	BINARY SELECT 16	BS16
14.	BINARY SELECT 32	BS32
15.	NONE	-
16.	NONE	-
17.	NONE	-
18.	NONE	-
19.	NONE	-
20.	NONE	-
21.	NONE	-
22.	NONE	-
23.	NONE	-
24.	NONE	-
25.	NONE	-
26.	NONE	-
27.	NONE	-

28.	NONE	-
29.	NONE	-
30.	NONE	-
31.	NONE	-
32.	NONE	-
33.	NONE	-
34.	NONE	-
35.	NONE	-
36.	NONE	-
37.	NONE	-
38.	NONE	-
39.	NONE	-
40.	NONE	-
41.	NONE	-
42.	NONE	-
43.	NONE	-
44.	NONE	-
45.	NONE	-
46.	NONE	-
47.	NONE	-
48.	NONE	-
49.	NONE	-
50.	NONE	-
51.	NONE	-
52.	NONE	-
53.	NONE	-
54.	NONE	-
55.	NONE	-
56.	NONE	-
57.	NONE	-
58.	NONE	-

59.	NONE	-
60.	NONE	-
61.	NONE	-
62.	NONE	-
63.	NONE	-
64.	NONE	-

EIP OUTPUTS DEFAULT 1

OUTPUT #	EIP OUTPUT BIT NAME	TAG NAME
1.	NO ALERT	NALT
2.	STEPPER APPROACHING MAX	SALT
3.	END OF STEPPER	EOS
4.	VALVE 1	V1
5.	VALVE 2	V2
6.	VALVE 3	V3
7.	VALVE 4	V4
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 DRESS REQUEST	TDR
15.	NONE	-
16.	NONE	-
17.	NONE	-
18.	NONE	-

19.	NONE	-
20.	NONE	-
21.	NONE	-
22.	NONE	-
23.	NONE	-
24.	NONE	-
25.	NONE	-
26.	NONE	-
27.	NONE	-
28.	NONE	-
29.	NONE	-
30.	NONE	-
31.	NONE	-
32.	NONE	-
33.	NONE	-
34.	NONE	-
35.	NONE	-
36.	NONE	-
37.	NONE	-
38.	NONE	-
39.	NONE	-
40.	NONE	-
41.	NONE	-
42.	NONE	-
43.	NONE	-
44.	NONE	-
45.	NONE	-
46.	NONE	-
47.	NONE	-
48.	NONE	-
49.	NONE	-

50.	NONE	-
51.	NONE	-
52.	NONE	-
53.	NONE	-
54.	NONE	-
55.	NONE	-
56.	NONE	-
57.	NONE	-
58.	NONE	-
59.	NONE	-
60.	NONE	-
61.	NONE	-
62.	NONE	-
63.	NONE	-
64.	NONE	-

EIP INPUTS DEFAULT 2

INPUT #	EIP INPUT BIT NAME	TAG NAME
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	BS1
10.	BINARY SELECT 2	BS2
11.	BINARY SELECT 4	BS4

12.	BINARY SELECT 8	BS8
13.	BINARY SELECT 16	BS16
14.	BINARY SELECT 32	BS32
15.	BINARY SELECT 64	BS64
16.	BINARY SELECT 128	BS128
17.	SPOT 9 (256)	S9
18.	SPOT 10 (512)	S10
19.	SPOT 11 (1024)	S11
20.	SPOT 12 (2048)	S12
21.	SPOT 13 (4096)	S13
22.	SPOT 14 (8192)	S14
23.	SPOT 15 (16384)	S15
24.	SPOT 16 (32768)	S16
25.	SPOT 17 (65536)	S17
26.	SPOT 18 (131072)	S18
27.	SPOT 19 (262144)	S19
28.	SPOT 20 (524288)	S20
29.	SPOT 21 (1048576)	S21
30.	SPOT 22 (2097152)	S22
31.	SPOT 23 (4194304)	S23
32.	SPOT 24 (8388608)	S24
33.	SPOT 25 (16777216)	S25
34.	SPOT 26 (33554432)	S26
35.	SPOT 27 (67108864)	S27
36.	SPOT 28 (134217728)	S28
37.	SPOT 29 (268435456)	S29
38.	SPOT 30 (536870912)	S30
39.	NONE	-
40.	NONE	-
41.	NONE	-
42.	NONE	-

43.	NONE	-
44.	NONE	-
45.	NONE	-
46.	NONE	-
47.	NONE	-
48.	NONE	-
49.	NONE	-
50.	NONE	-
51.	NONE	-
52.	NONE	-
53.	NONE	-
54.	NONE	-
55.	NONE	-
56.	NONE	-
57.	NONE	-
58.	NONE	-
59.	NONE	-
60.	NONE	-
61.	NONE	-
62.	NONE	-
63.	NONE	-
64.	NONE	-

EIP OUTPUTS DEFAULT 2

OUTPUT #	EIP OUTPUT BIT NAME	TAG NAME
1.	NO ALERT	NALT
2.	STEPPER APPROACHING MAX	SALT
3.	END OF STEPPER	EOS

4.	VALVE 1	V1
5.	VALVE 2	V2
6.	VALVE 3	V3
7.	VALVE 4	V4
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 DRESS REQUEST	TDR
15.	NONE	-
16.	NONE	-
17.	NONE	-
18.	NONE	-
19.	NONE	-
20.	NONE	-
21.	NONE	-
22.	NONE	-
23.	NONE	-
24.	NONE	-
25.	NONE	-
26.	NONE	-
27.	NONE	-
28.	NONE	-
29.	NONE	-
30.	NONE	-
31.	NONE	-
32.	NONE	-
33.	NONE	-
34.	NONE	-

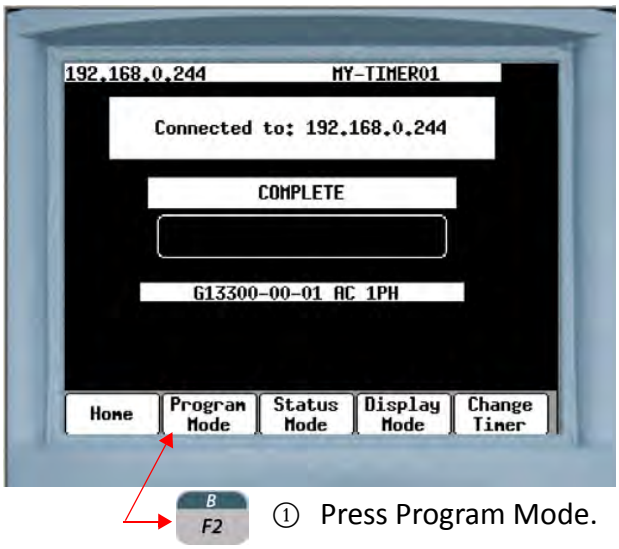
35.	NONE	-
36.	NONE	-
37.	NONE	-
38.	NONE	-
39.	NONE	-
40.	NONE	-
41.	NONE	-
42.	NONE	-
43.	NONE	-
44.	NONE	-
45.	NONE	-
46.	NONE	-
47.	NONE	-
48.	NONE	-
49.	NONE	-
50.	NONE	-
51.	NONE	-
52.	NONE	-
53.	NONE	-
54.	NONE	-
55.	NONE	-
56.	NONE	-
57.	NONE	-
58.	NONE	-
59.	NONE	-
60.	NONE	-
61.	NONE	-
62.	NONE	-
63.	NONE	-
64.	NONE	-

I/O MAPPING

The WT6000 is designed with Flexible I/O. This means the user has the capability of reconfiguring the I/O to meet the requirements of a particular application.

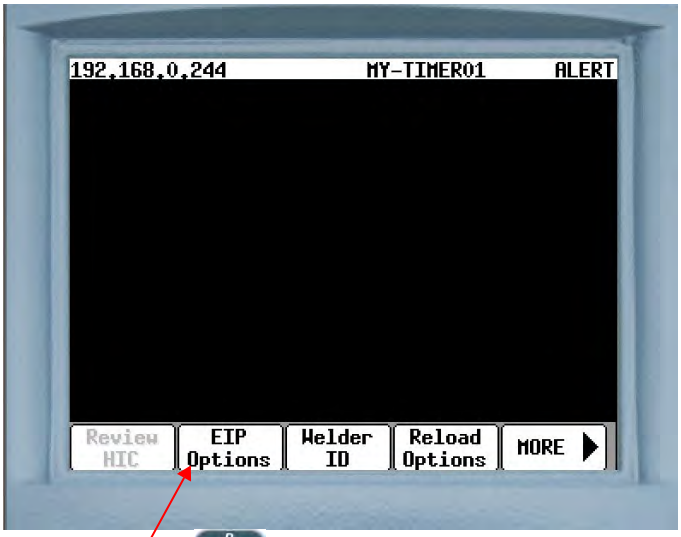
FIELDBUS INPUT MAPPING

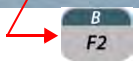
The following explains how to reconfigure the FieldBus Input Map. In this example, Input 4 will be re-mapped from NONE bit to the TIP DRESS bit:



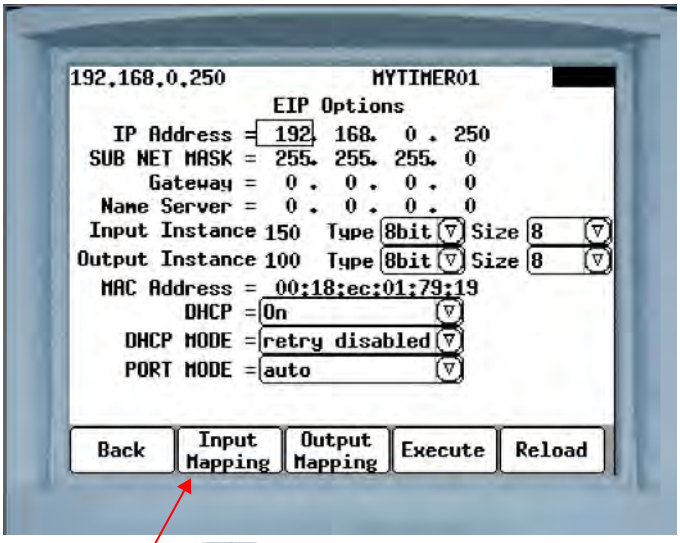
① Press Program Mode.

② Press More.

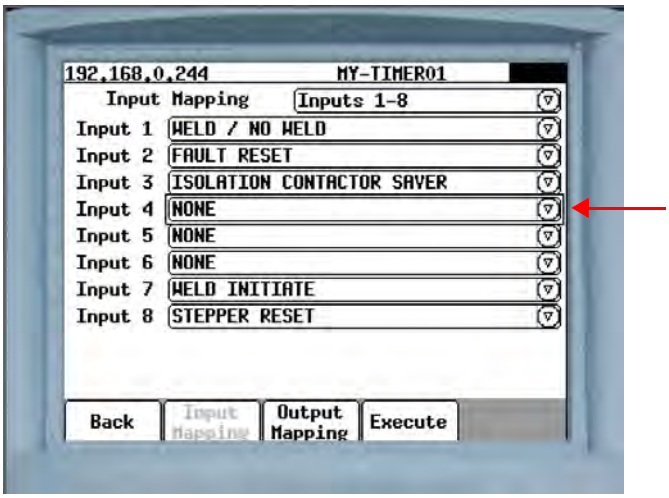




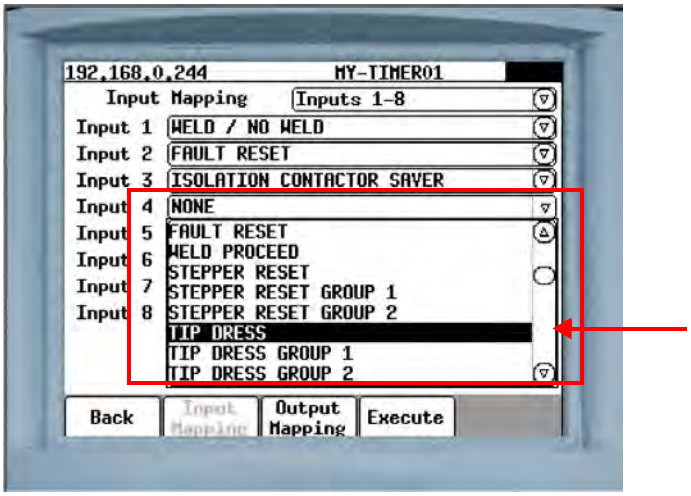
③ Press EIP Options



④ Press Input Mapping



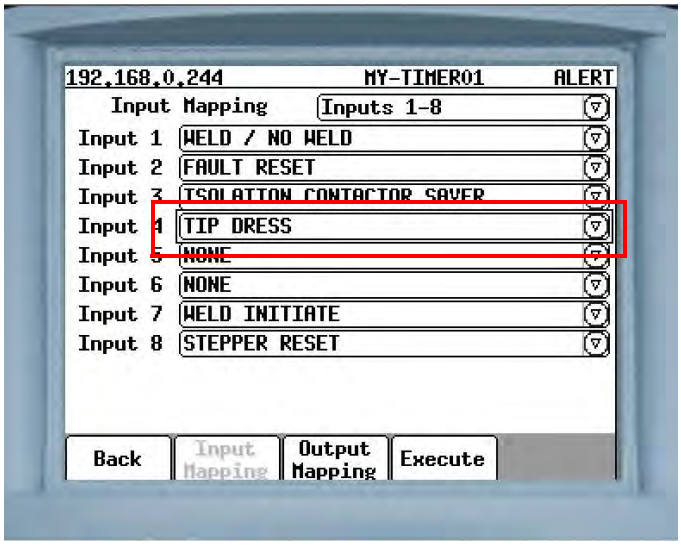
⑤ Press the  arrow key to move the cursor to the “Input 4" field.



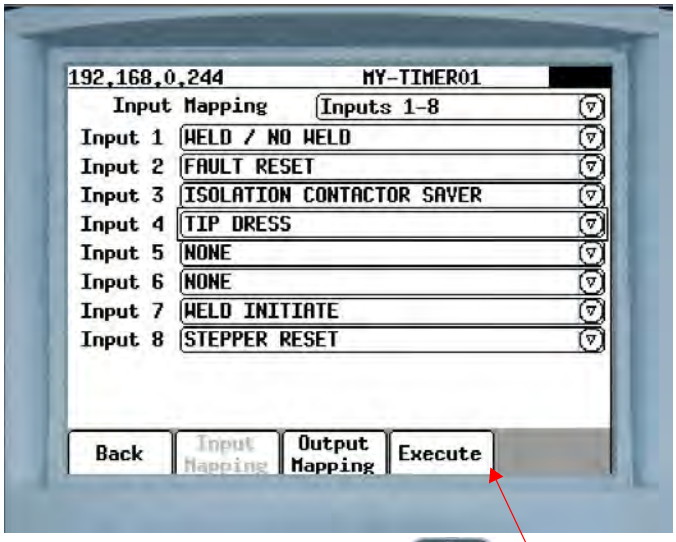
⑥ Press  A drop-down box will appear containing all the available input bits.

⑦ Press the  arrow key until the cursor is on the TIP DRESS bit.

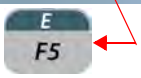
⑧ Press ENTER 

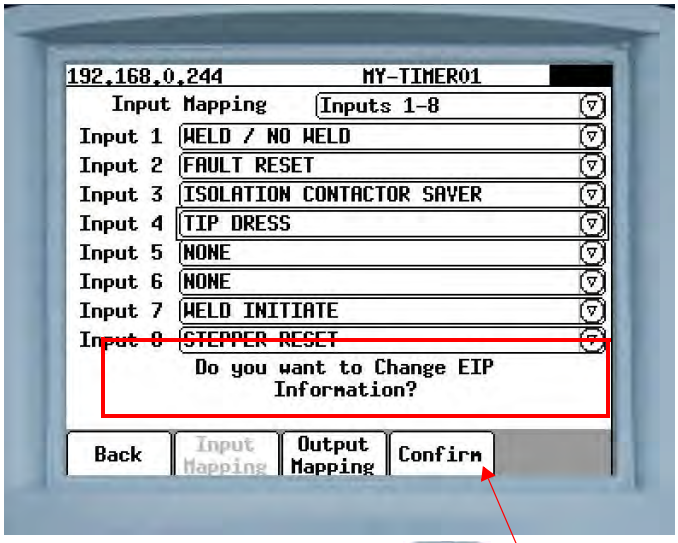


⑨ NONE will be replaced with TIP DRESS in the Input 4 field.

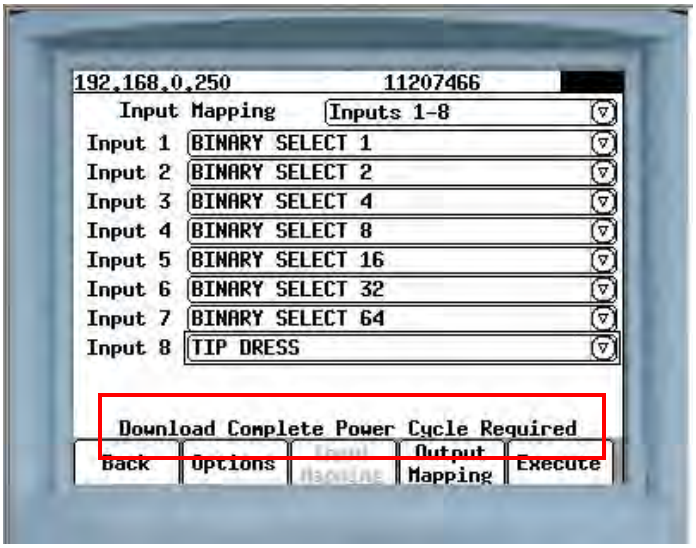


⑩ Press Execute. This begins the process to download the change to the weld processor.





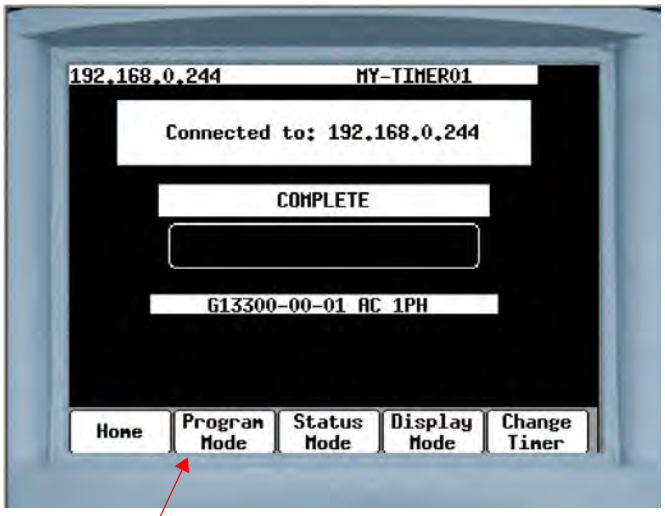
⑪ The message “Do you want to Change EIP Information” will appear. Press Confirm.

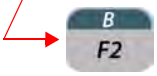


⑫ The message “Download Complete Power Cycle Required” will appear. Re-cycle power on the weld control to complete the process.

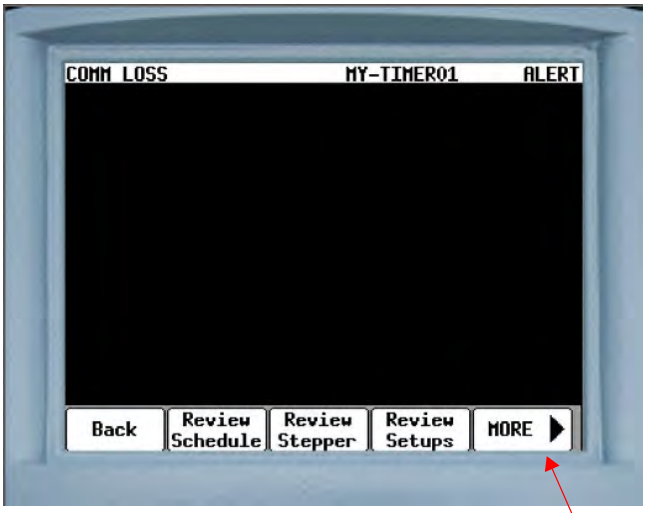
FIELDBUS OUTPUT MAPPING

The following explains how to reconfigure the FieldBus Output Map. In this example, Output 20 will be re-mapped from the NONE bit to the TIP DRESS REQUEST bit.



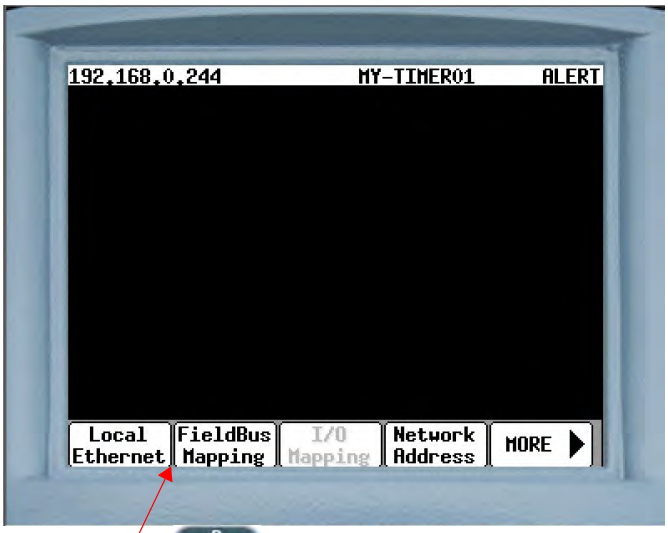


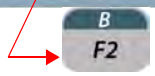
① Press Program Mode



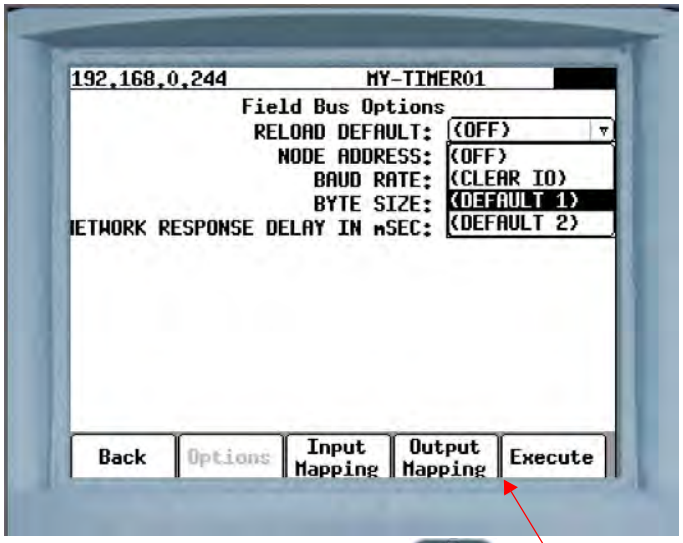
② Press More

③ Press More

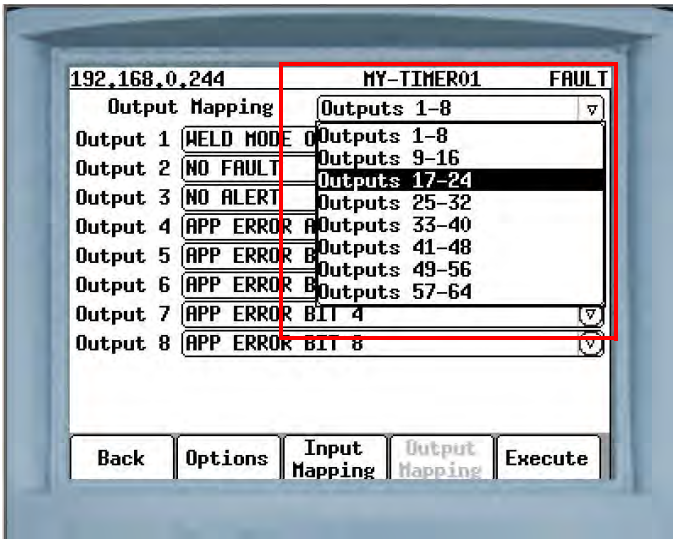




④ Press Fieldbus Mapping



⑤ Press output Mapping. 



⑥ Press 

A drop-down box will appear.

⑦ Press the 

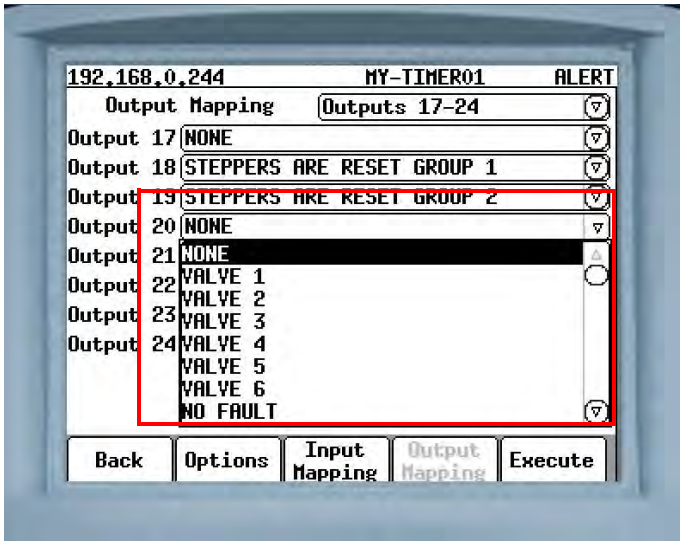
arrow key once to move the cursor to “Outputs 9-16”

⑧ Press ENTER 

.

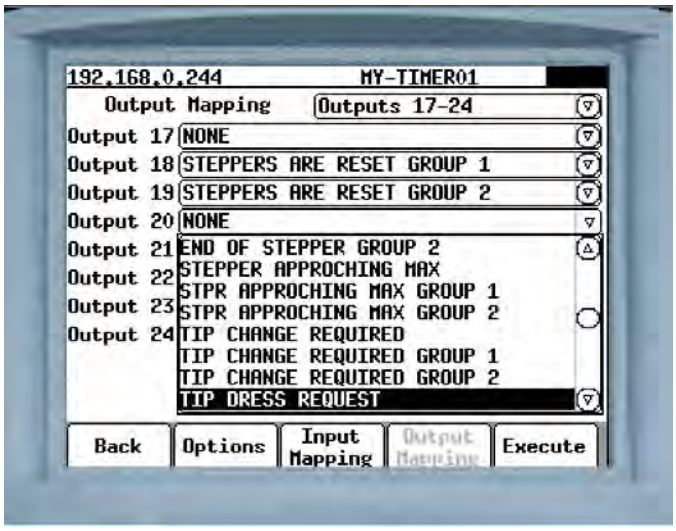
⑨ Press the 

arrow key to move the cursor to the "Output 20" field.

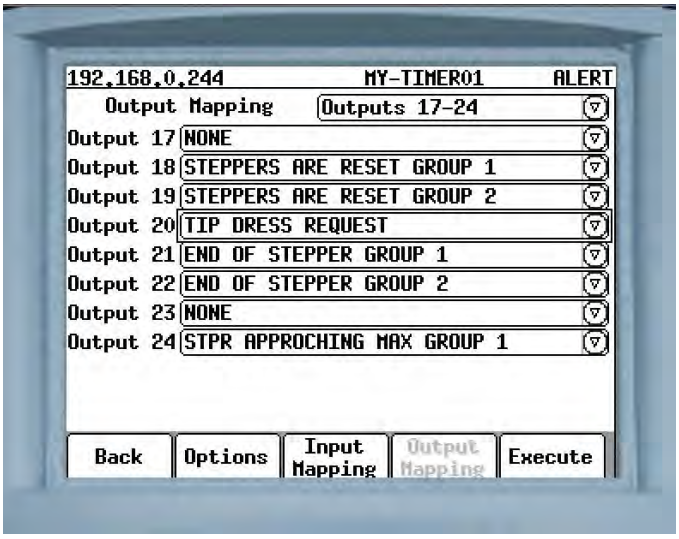


⑩ Press 

A drop-down box will appear containing all the available output bits.

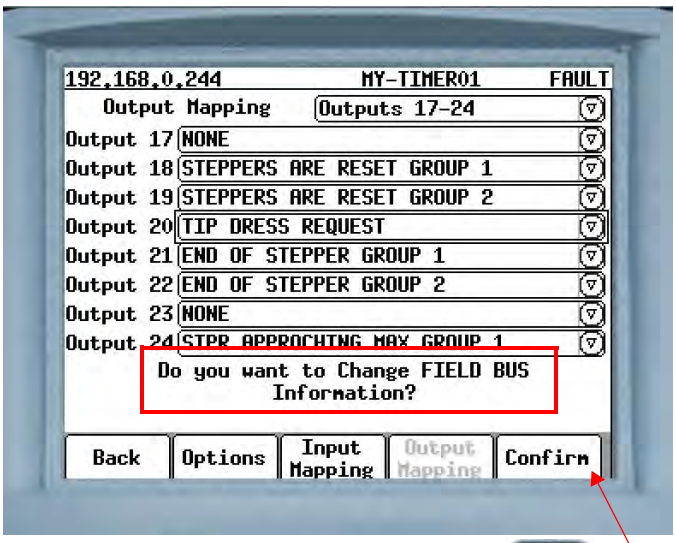


⑪ Press the  arrow key until the cursor is on the TIP DRESS REQUEST bit.

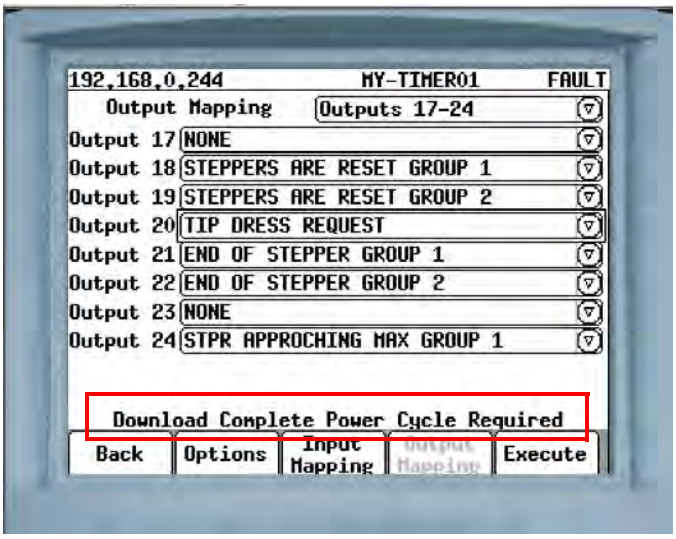


⑫ Press  NONE will be replaced with TIP DRESS REQUEST in the Output 20 field.

⑬ Press Execute  . This begins the process to download the change to the weld processor.



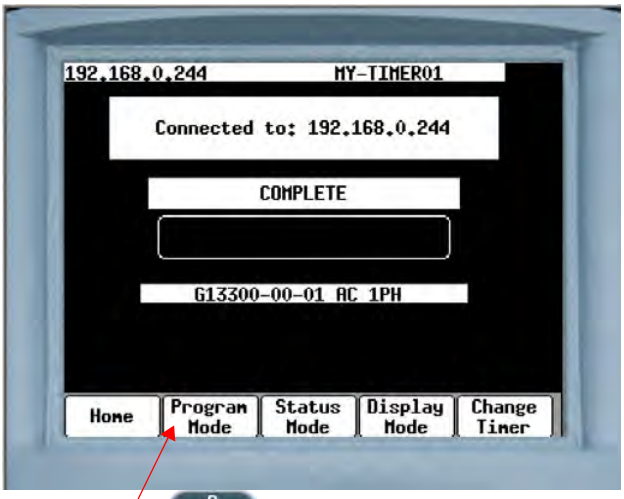
⑭ The message “Do you want to Change FIELD BUS Information” will appear. Press Confirm.



⑮ The message “Download Complete Power Cycle Required” will appear. Re-cycle power on the weld control to complete the process.

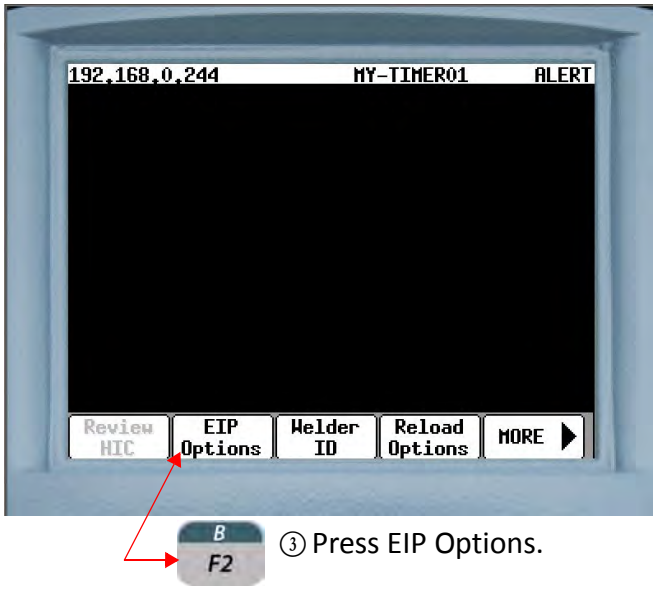
EIP I/O MAPPING

The steps to re-configure the EIP I/O Mapping is identical to the steps to re-configure the FieldBus I/O Mapping. First, follow the steps below to navigate to the EIP Options Menu on the DEP-300s. Then follow the steps explained in the previous pages on either FieldBus Input Mapping or FieldBus Output Mapping (whichever is applicable).

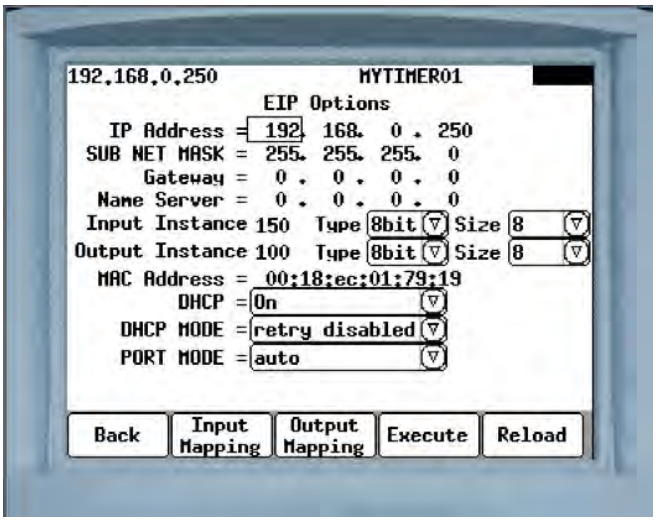


B F2 ① Press Program Mode.

② Press More. E F5



③ Press EIP Options.



④ Press either Input Mapping 

or

Output Mapping 

SCHEDULE FUNCTIONS

SCHEDULE FUNCTIONS LIST

FUNC. #	FUNCTION NAME	CATEGORY
1	SQUEEZE nnnn CYCLES	DELAY
2	COOL nnnn CYCLES	DELAY
3	HOLD nnnn CYCLES	DELAY
4	OFF nnnn CYCLES	DELAY
5	INITIAL SQUEEZE nnnn CYCLES	DELAY
6	“*”	
7	WAIT nn CYCLES	DELAY
8	WAIT nnn CY FOR LINE > nnn VOLTS	I/O
9	WAIT FOR LINE > nnn VOLTS	I/O
10	“*”	
11	“*”	
12	“*”	
13	“*”	
14	“*”	
15	“*”	
16	“*”	
17	“*”	
18	“*”	
19	“*”	
20	WELD nnnn CY/IMP nn %I	WELD
21	TEMPER nnnn CY/IMP nn %I	WELD
22	PREHEAT nnnn CY/IMP nn %I	WELD
23	POSTHEAT nnnn CY/IMP nn %I	WELD
24	PRE-WELD nnnn MS/IMP nn %I	WELD
25	WELD nn CY/IMP ernn.nn %I	WELD
26	WELD nnnn HALF CYCLES nn.nn %I	WELD
27	WELD nnnn IMP HI =nn %I LO =nn %I	WELD

NOTE:
Unless otherwise indicated, nn represents any two-digit number from 0 – 99. nnn is a 3-digit number from 0 – 999 and nnnn is a 4-digit number from 0-9999. Exceptions to this convention will appear next to the function.

28	“*”	
29	“*”	
30	WELD nnnn CY/IMP nnnn0 AMPS	WELD
31	TEMPER nnnn CY/IMP nnnn0 AMPS	WELD
32	PREHEAT nnnn CY/IMP nnnn0 AMPS	WELD
33	POSTHEAT nnnn CY/IMP nnnn0 AMPS	WELD
34	PRE-WELD nnnn CY/IMP nnnn 0 AMPS	WELD
35	“*”	
36	WELD nnnn HALF CYCLES nnnn 0 AMPS	WELD
37	WELD nnn IMP HI = nnnn 0A LO - nnnn 0A	WELD
38	“*”	
39	“*”	
40	SLOPE nn CY/IMP nn%I TO nn%I	SLOPE
41	“*”	
42	“*”	
43	“*”	
44	“*”	
45	SLOPE nnnn CY/IMP nnn0 A TO nnn0 A	SLOPE
46	“*”	
47	“*”	
48	“*”	
49	“*”	
50	TURN ON VALVE nnnn	I/O
51	TURN OFF VALVE nnnn	I/O
52	TURN ON OUTPUT nn	I/O
53	TURN OFF OUTPUT nnnn	I/O
54	TURN ON PRESSURE SELECT nnnn	I/O
55	TURN OFF PRESSURE SELECT nn	I/O
56	“*”	
57	“*”	
58	TURN ON WELD IN PROGRESS	I/O
59	TURN OFF WELD IN PROGRESS	I/O
60	IMPULSE= nnnn HEAT CY nnnn COOL CY	WELD

61	ABORT IF NO INITIATE FOR nn CYCLES	I/O
62	REPEAT (AT NEXT FUNCTION)	SPECIAL
63	TURN ON WELD COMPLETE	I/O
64	TURN OFF WELD COMPLETE	I/O
65	ISOLATION CONTACTOR DELAY = nnnn SEC.	EXTEND
66	WAIT nnn CY INP #nn TO BE nn (0 = OFF 1 = ON)	I/O
67	WAIT FOR INPUT #nn TO BE nn (0 = OFF 1 = ON)	I/O
68	WAIT nnnn CY FOR PRESSURE SWITCH INPUT	I/O
69	WAIT FOR PRESSURE SWITCH INPUT	I/O
70	WAIT FOR WELD PROCEED	I/O
71	“*”	
72	“*”	
73	“*”	
74	“*”	
75	EXTEND UNTIL NO INITIATE	EXTEND
76	SEC. CURR LIMITS: HI=nnnn0 LOW=nnnn0	SPECIAL
77	EXTEND WHILE INPUT #nnnn IS nn (0=OFF 1 = ON)	EXTEND
78	TURN ON FORGE VALVE	I/O
79	TURN OFF FORGE VALVE	I/O
80	FORGE DELAY nnn MS	I/O
81	TRANSFORMER TURNS RATIO nnnn:1	SPECIAL
82	LINEAR STEPPER #nn ASSIGNED (0 = OFF)	SPECIAL
83	“*”	
84	WINDOW: HI = % LO = % C-FACTOR = nn	SPECIAL
85	“*”	
86	VERIFY CYLINDER # nnn IS OUT OF RETRACT	SPECIAL
87	WAIT nnnn CY FOR WELD PROCEED	SPECIAL
88	TURN ON ISOLATION CONTACTOR	I/O
89	TURN OFF ISOLATION CONTACTOR	I/O
90	SET SPC OFFSET TO nnnn	SPECIAL
91	SEND ALL SAMPLES UNTIL NEXT SPC OFFSET	SPECIAL
92	C-FACTOR LIMIT: HI=nnnn LO=nnnn	SPECIAL
93	TIP DRESS ADVANCE: GROUP nnnn - STEP nn	SPECIAL

94	EXTEND WELD IF LOW CURRENT LIMIT FAULT	EXTEND
95	EXTEND WELD IF CURRENT LESS THAN nnnn0	EXTEND
96	POWER FACTOR LIMIT: HI =nnnn LOW =nn	SPECIAL
97	“*”	
98	“*”	
99	GOTO SEQ#nnn	SPECIAL

NOTE: Numbers with “*” appearing in the line, indicate no function is assigned to that number. Unassigned function numbers are not displayed.

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
01	SQUEEZE nnnn CYCLES	Squeeze time in cycles
02	COOL nnnn CYCLES	Cool time in cycles
03	HOLD nnnn CYCLES	Hold time in cycles
04	OFF nnnn MSEC	OFF time in cycles
05	INITIAL SQUEEZE nnnn CYCLES	Initial Squeeze time in cycles
07	WAIT nnnn CYCLES	Wait time in cycles

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.

Caution: THE TRANSFORMER TURNS RATIO SETUP PARAMETER (DESCRIBED ON PAGE 116) MUST BE ACCURATELY PROGRAMMED FOR THE CONTROL TO SUPPLY THE CORRECT AMOUNT OF SECONDARY CURRENT IN ACC FIRING MODE.

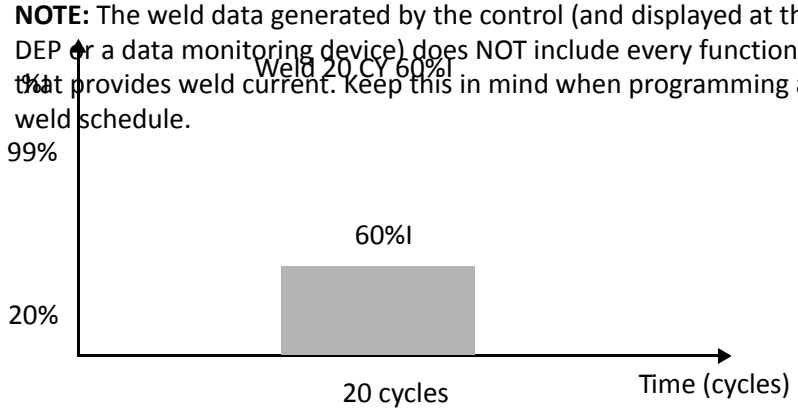
NOTE: The welding current includes current provided during Preheat, Preweld and Postweld Functions. When the difference between these functions and the main weld functions substantial the average current displayed for the weld maybe slightly higher or lower than the target current.

% I (AVC FIRING MODE)

FUNC. #	FUNCTION NAME	CATEGORY
20	WELD nnnn CY/IMP nn %I *	Weld time in cycles
21	TEMPER nnnn CY/IMP nn %I	Temper time in cycles
22	PREHEAT nnnn CY/IMP nn %I	Pre-Heat time in cycles
23	POSTHEAT nnnn CY/IMP nn%I	Post-Heat time in cycles
24	PRE-WELD nnnn CY/IMP nn%I	Pre-Weld time in cycles
25	WELD nn CY/IMP nn.nn %I	Weld time in cycles
26	WELD nnnn HALF CYCLES nn.nn%I	Weld time in half cycles

** The stepper is active during this function. Functions #20–26 select the AVC 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.



☞

NOTE: For all weld functions, mm = 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 pulsation weld. Refer to Function #60 on page 226 for more information.

AUTOMATIC CURRENT COMPENSATION FIRING MODE

FUNC. #	FUNCTION NAME	CATEGORY
30	WELD nnnn CY. nnnn0 AMPS	Weld time in cycles*
31	TEMPER nnnn CY. nnnn0 AMPS	Temper time in cycles
32	PREHEAT nnnn CY. nnnn0 AMPS	Pre-Heat time in cycles
33	POSTHEAT nnnn CY. nnnn0 AMPS	Post-Heat time in cycles
34	PRE-WELD nnnn CY. nnnn0 AMPS	Pre-Weld time in cycles
36	WELD nn HALF CYCLES nnnn0 AMPS	Weld time in Half Cycles

** The stepper is active during this function.*

NOTES:

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

NOTE: For all weld functions, mm = 20 – 99. The processor can fire a range from 20% to 99% I.

40	**SLOPE nn CY nn %I TO nn %I**
45	**SLOPE nn CY nnnn0 A TO nnnn0 A**

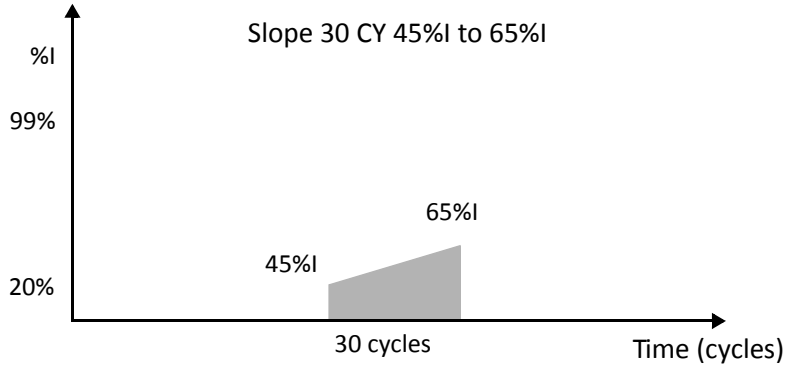
These functions provide weld current that starts at the first value and increase or decreases linearly to the second value over the number of cycles specified.

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

40 SLOPE 30 CY 45% I TO 65% I

tells the 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.

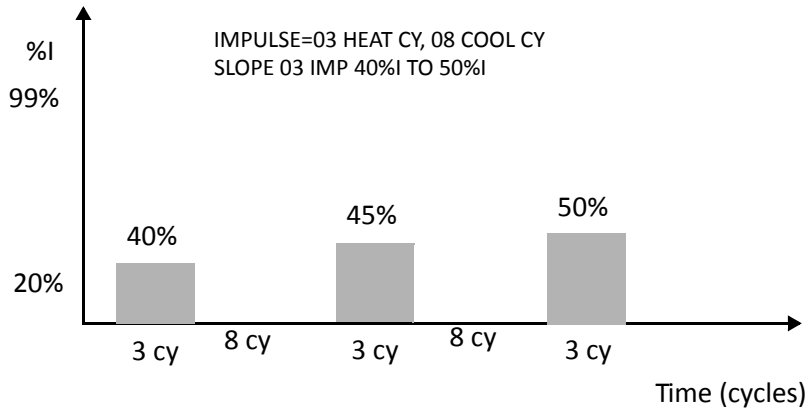


However, by defining the slope as an impulse (Function #60 appears

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

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



60	**IMPULSE= nn HEAT CY, nn COOL CY**

This function defines the length of a weld impulse. It tells the weld processor that the next function in the schedule should pulsation weld (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 pulsation weld.

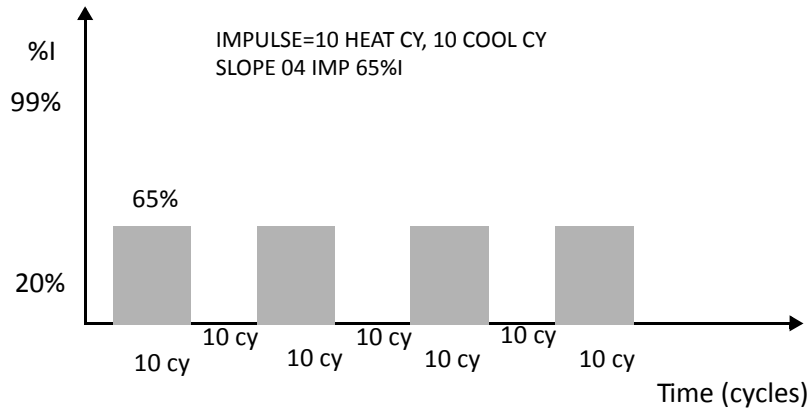
Pulsation welding provides a specified number of impulses. (An impulse is a number of heat cycles—when weld current flows—followed by a number of cycles when current does not flow.)

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 pulsation weld in the schedule.

Function #27 and #37 enable welding at two different heat settings.

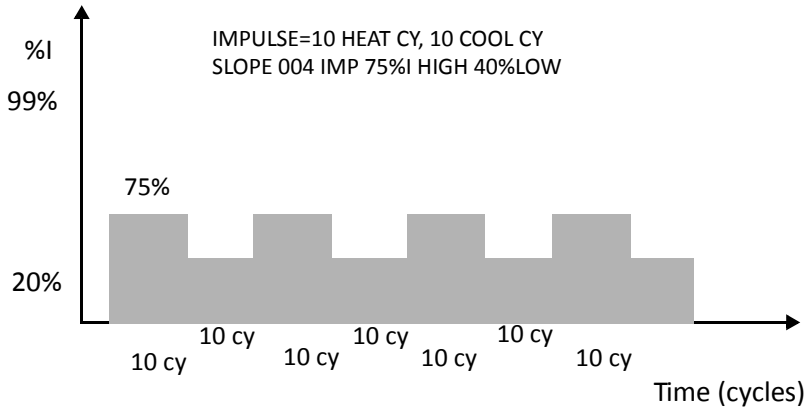
27	**WELD nnn IMP HI =nn%I LO =nn%I**
37	**WELD nnn IMP HI =nnnn0 A LO =nnnn0 A**

Function #27 welds in AVC (Automatic Voltage Compensation) mode and **Function #37** welds in ACC (Automatic Current Compensation) mode.

The two functions 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:



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

INPUT FUNCTIONS

FUNC. #	FUNCTION NAME	DESCRIPTION

8	WAIT nnnn CY FOR LINE nnn VOLTS	This function will wait in the sequence for up to the specified number of cycles, nnn for the WELD PROCEED input to become active.
9	WAIT FOR LINE nnnn VOLTS	This function waits indefinitely.
66	WAIT nnn CY INP #N TO BE n (0 =OFF 1 =ON)	This function waits 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 (1-6) 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
69	WAIT FOR PRESSURE SWITCH INPUT	This function waits for the Pressure Switch bit to go HIGH.
70	WAIT FOR WELD PROCEED	This function waits for the Weld Proceed bit to go HIGH.
87	WAIT nnnn 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.

93	TIP DRESS ADVANCE: GROUP nn - STEP n	This function advances all the steppers assigned to the specified GROUP number, to the specified STEP number. For example, if this function was programmed: TIP DRESS ADVANCE: GROUP 02 - STEP 05, every stepper assigned to Group #2 would advance to Step #5. **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.)

OUTPUT FUNCTIONS

FUNC. #	FUNCTION NAME	DESCRIPTION
50	TURN ON VALVE n	Turn ON Valve bit (1-6).
51	TURN OFF VALVE n	Turn OFF Valve bit (1-6).
52	TURN ON OUTPUT n	Turn ON User Output bit (1-6).
53	TURN OFF OUTPUT n	Turn ON User Output bit (1-6).
54	TURN ON PRESSURE SELECT n	Turn ON Pressure Select bit (1-4).
55	TURN OFF PRESSURE SELECT n	Turn OFF Pressure Select bit (1-4).
58	TURN ON WELD IN PROGRESS	Turn on Weld in Progress bit.
59	TURN OFF WELD IN PROGRESS	Turn off Weld in Progress bit.
63	TURN ON WELD COMPLETE	Turn on the Weld Complete bit. **NOTE:** This function will only activate the WELD COMPLETE output under the following conditions: There are no active fault conditions. This function also processes weld faults.
64	TURN OFF WELD COMPLETE	Turn off the Weld Complete bit.
78	TURN ON FORGE VALVE	Turn on the Forge Valve bit.
79	TURN OFF FORGE VALVE	Turn off the Forge Valve bit.

80	FORGE DELAY nnnn MSEC	Inserted in the weld schedule before function #79 (TURN OFF FORGE VALVE), this function delays turning on the Forge Valve bit for the number of milliseconds specified
88	TURN ON ISOLATION CONTACTOR	Turn on the Isolation Contactor bit. NOTE: 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.
89	TURN OFF ISOLATION CONTACTOR	Turn off the Isolation Contactor bit.

EXTEND FUNCTIONS

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

FUNC. #	FUNCTION NAME	DESCRIPTION
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.
77	EXTEND WHILE INPUT #n IS n (0=OFF 1 = ON)	This function tells the processor to monitor the status of the specified input bit (1-6) 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.
94	EXTEND WELD IF LOW CURRENT LIMIT FAULT	This function tells the processor to extend the weld function if a LOW CURRENT LIMIT FAULT occurs. An EXTEND WELD FAULT is generated. The weld function is extended only once. If the desired current is not reached on the re-weld, a 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.

95	EXTEND WELD IF CURRENT LESS THAN nnnn0	This function tells the processor to extend the weld function if secondary current is less than the value programmed (nnnn0). The weld function is extended only once. If the desired current is not reached on the re-weld, an EXTEND WELD 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

The following is an example of an extend function in a weld schedule:

30	WELD 20 CY. 5000 AMPS
75	EXTEND UNTIL NO INITIATE

NOTE: If the weld initiate input is removed before function #75 EXTEND UNTIL NO INITIATE is executed in the weld schedule and only 20 cycles of weld time will be executed. Otherwise, the weld time would be extended indefinitely until the weld initiate input is removed. This example is how a seam weld is accomplished.

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 initiates. If the initiates are not present at any time while it is waiting, the control will abort the sequence and generate the WELD INITIATE NOT PRESENT fault.

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 1:** This function should be placed in the weld schedule before the squeeze function. **NOTE 2:** Repeat and Extend functions are mutually exclusive. Do not use the Repeat function with any Extend function in a weld schedule.
82	LINEAR STEPPER #nn ASSIGNED (0 = OFF)	This function assign linear stepper 1-10 (0=OFF) to a weld schedule. The weld control can have up to 10 linear steppers with 5 programmable levels (called “steps”) to provide additional energy. When the function appears in a weld schedule, the appropriate stepper is advanced (incremented) each time you execute the weld schedule.
84	WINDOW: HI = % LO = % C-FACTOR = nn	This function permits defining a current limit window with high and low limit values. The action of this function is based on the firing mode used by the weld function: %I or Automatic Current Compensation.
86	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.

90	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 Ch. 9: Advanced Topics 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.
91	SEND ALL SAMPLES UNTIL NEXT SPC OFFSET	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.
92	C-FACTOR LIMIT: HI=nnnn LO=nnnn	This function sets HIGH and LOW C-Factor limits in the weld schedule. See Ch. 9: Advanced Topics for more information.
93	TIP DRESS ADVANCE: GROUP nn - STEP n	This function advances all the steppers assigned to the specified GROUP number, to the specified STEP number. For example, if this function was programmed: TIP DRESS ADVANCE: GROUP 02 - STEP 05, every stepper assigned to Group #2 would advance to Step #5. **NOTE 1:** This function must be inserted into a tip dress schedule, if the tip dress schedule is used in lieu of the Tip Dress input bit. **NOTE 2:** 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.

99	GOTO SEQ#nnn	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 1:** This function can be used to save memory in the weld processor by allowing multiple schedules to execute commonly used functions. **NOTE 2**: 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 3:** Only the originating weld schedule number is displayed in the weld data.

FUNCTIONS THAT OVERRIDE SETUP PARAMETERS

FUNC. #	FUNCTION NAME	DESCRIPTION
65	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.
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 Ch. 7: Faults and Setup Parameters.
81	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 Ch. 7: Faults and Setup Parameters.
92	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.
96	POWER FACTOR LIMIT: HI= nnn LOW= nn	This function is used to set the Power Factor Range when executing a weld schedule.

Welding Technology Corporation

24775 CRESTVIEW COURT | FARMINGTON HILLS, MI USA 48335 | PHONE: +1 248-477-3900