INSTRUCTION MANUAL

700145C

EN1280 SERIES CONTROLS

MICROPROCESSOR BASED
Weld Sequence Controls
With
Solid State Thyristor Contactors

Wiring Diagram   421376   "B" Cabinet

ENTRON

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MEMBER

ENTRON Controls, LLC.

MICROPROCESSOR BASED WELDING CONTROL
WITH SOLID STATE THYRISTOR CONTACTORS

INSTALLATION AND OPERATION MANUAL FOR:
Model Series EN1280

!	**CAUTION**	!
READ THIS MANUAL COMPLETELY BEFORE ATTEMPTING TO INSTALL OR OPERATE THIS CONTROL		

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FIGURES

1.0 GENERAL DESCRIPTION

The EN1280 Control is a microprocessor-based resistance welding control. It has been designed specifically for Flash Welding, Upset Welding, and Annealing applications. One outstanding feature of the EN1280 Control is its ability to allow the operator concurrent adjustment during an initiated sequence (during ANNEAL TIME). The EN1280 can store weld sequence parameters in each of 50 unique schedules. Weld schedule parameters are held in non-volatile memory for storage. Pilot initiations trigger specific sequences tailored to the intended application. Despite the seemingly complicated possible welding schedules, the EN1280 Control is simple to program and operate.

The control can operate in two different initiation modes – BEAT and NON-BEAT – depending on the pilot used to initiate. In BEAT mode, the control will pass weld current to the transformer as long as the initiation is closed. BEAT initiation is used for Flash Welding.

In NON-BEAT initiation mode, the control will execute a timed sequence on a momentary closure of the pilot initiation. NON-BEAT is typically used for Annealing. The EN1280 will perform a BEAT operation if initiated on TS1-FS3 and a NON-BEAT operation if initiated on TS1-FS7. The control can also perform BEAT operation on TS1-FS7 if there is *00* programmed in ANNEAL TIME.

Regardless of which initiation is used, after a weld has been started, the control cannot be re-initiated until the previous sequence is completed or the sequence has been terminated (interrupted) by providing a momentary switch open between TS1-ES1 and TS1-GND.

The following illustrations will show the sequence of events that the control will execute depending on which initiation terminal is used.

INITIATION ON FS3
A switch closure between TS1-FS3 and GND will begin a flash weld at the programmed PERCENT CURRENT. Current will continue to flow while the switch between TS1-FS3 and TS1-GND is closed. Opening this switch begins an upset weld for a programmed number of cycles at the programmed PERCENT CURRENT.
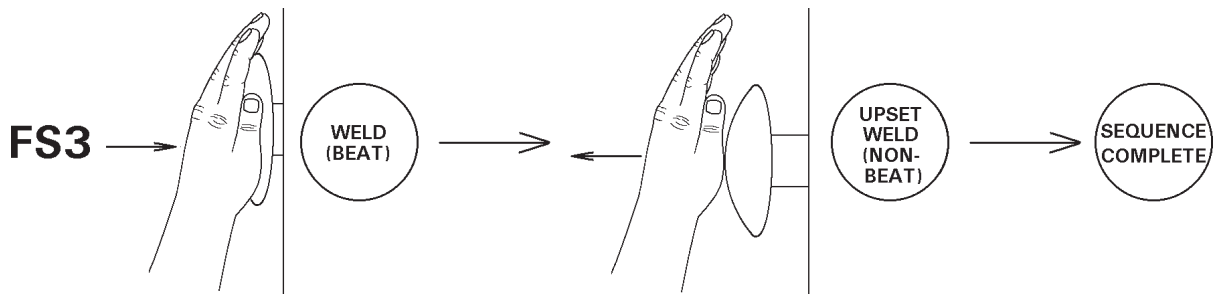

Figure 1-1. *FS3 initiation*

1.0 GENERAL DESCRIPTION (cont.)

INITIATION ON FS7

A momentary switch closure between FS7 and GND will begin ANNEAL 1 (in seconds) immediately followed by ANNEAL 2 sequence, typically a series of impulses.
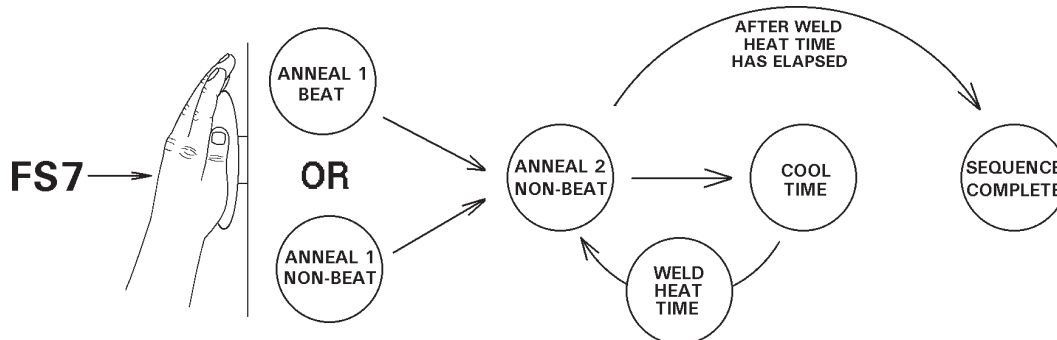

Figure 1-2. *FS7 initiation*

1.1 STANDARD FEATURES (ALL MODELS)

DIGITAL PHASE SHIFT CURRENT CONTROL varies the current from 0% to 99% of available current. Adjustable in 1% steps by means of Front Panel push buttons and direct reading LED displays. When using ignitron tube contactors, do not set below 40% for 240 volt operation or 20% for 480 volt operation.

FUNCTION TIMING of sequence parameters will differ depending on the initiation used and the parameter being discussed. For instance, all WELD times, with the exception of ANNEAL 2, are defined in cycles, each being 1/60 second (or 1/50 second if line frequency is 50 Hz). The ANNEAL 2 timing is programmed in units of one (1) second (1/60 x 60). In the case of 50 Hz line frequency, timing is longer than one (1) second by approximately 20%.

Cycle timing is achieved by counting each cycle of the line current directly. This method of timing allows this control to be used on either 60 or 50 Hz operation without special adjustments. See Section 2.1 and Section 5.2 for further information.

NOTICE
NO ADJUSTMENT is required for power factor or timing to change from 60 to 50 Hz operation.

87° DELAY OF FIRST CYCLE FIRING – The purpose of the 87° DELAY firing of each weld sequence is to prevent the build-up of a DC component in the welding transformer.

EMERGENCY STOP – When the Emergency Stop Switch is open, the control stops any and all processes (all valves and contactor). While in the Emergency Stop condition, the control will flash ERROR CODE **E.5.** on the DATA display until the condition has been cleared.

OPERATING CONDITIONS – Temperature Range: 0°C to 70°C (32°F to 158°F).

2.0 CONTROL PANEL LAYOUT
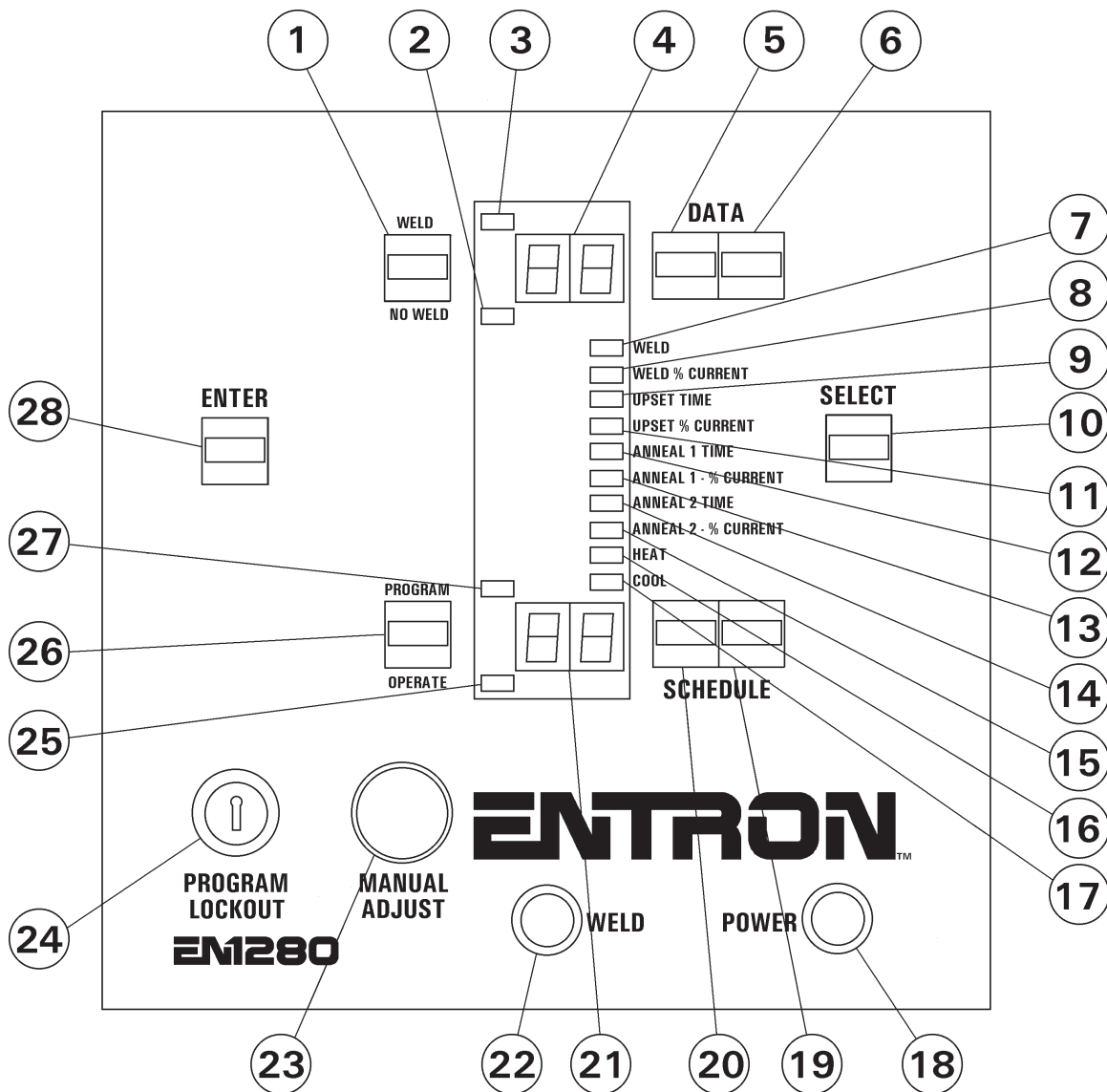
Figure 2-1. *Control Panel layout*

1 - WELD/NO WELD push button
2 - NO WELD mode indicator LED
3 - WELD mode indicator LED
4 - DATA display
5 - DATA 10s push button
6 - DATA 1s push button
7 - WELD indicator LED*
8 - WELD % CURRENT indicator LED*
9 - UPSET TIME indicator LED*
10 - SELECT push button
11 - UPSET % CURRENT indicator LED*
12 - ANNEAL 1 TIME indicator LED**
13 - ANNEAL 1 % CURRENT indicator LED**
14 - ANNEAL 2 TIME indicator LED**

15 - ANNEAL 2 % CURRENT indicator LED**
16 - HEAT indicator LED**
17 - COOL indicator LED**
18 - POWER light (red)
19 - SCHEDULE 1s push button
20 - SCHEDULE 10s push button
21 - SCHEDULE display
22 - WELD light (white)
23 - MANUAL ADJUST knob**
24 - PROGRAM LOCKOUT key switch
25 - OPERATE mode indicator LED
26 - PROGRAM/OPERATE push button
27 - PROGRAM mode indicator LED
28 - ENTER push button

  * Denotes those functions associated with initiation on FS3
  ** Denotes those functions associated with initiation on FS7

2.1 CONTROL FUNCTIONS – See Figure 2-1. *Control Panel layout*

WELD/NO WELD PUSH BUTTON (1) – This push button is active at all times. It puts the control in the WELD mode (enables the contactor to fire) or NO WELD mode (disables firing). This function is accessible while in OPERATE mode or while welding with few exceptions (generally during error conditions).

WELD (3)**/NO WELD** (2) **INDICATOR LEDs** – These LEDs indicate the active status of the control. The LEDs toggle whenever the WELD/NO WELD push button is pressed.

DATA PUSH BUTTONS (5) & (6) – The right button increments or decrements the DATA display (4) by one, and the left button increments or decrements by ten. When either digit reaches the maximum, it resets to zero. Pressing either DATA push button for more than one second will decrement rather than increment the data viewed on the numeric display. These push buttons are only active in PROGRAM mode.

NOTICE
Press and release of either push button will increment the data (7, 8, 9, 0, etc.). Hold and release of either push button will decrement the data (2, 1, 0, etc.).

FUNCTION INDICATOR LEDs (7-9 & 11-17) – The indicator LED adjacent to each programmable function will light when the chosen function is displayed in the DATA display. When in PROGRAM mode, the indicator LED will light to highlight the active function being edited.

SELECT PUSH BUTTON (10) – Use the SELECT push button in PROGRAM mode to choose any programmable function. When selecting a function, the indicator LED will indicate the selected function. Data pertaining to the selected function will appear in the DATA display. Tapping the SELECT push button will select the function below the one currently being displayed. Pressing the SELECT push button for more than one second will cause function indicator LEDs to change direction and select the previously displayed function.

EXTENDED FUNCTIONS – Section of memory dedicated as a second layer of parameters that apply to all the schedules, and can modify the way the control operates. This section of memory can be found by pressing the SELECT push button and paging through the functions until *EF* appears in the DATA display.

POWER LIGHT (18) – The red POWER lamp indicates when power is applied to the control.

SCHEDULE DISPLAY (21) – The SCHEDULE display shows the number of the active schedule. The EN1280 can store up to 50 schedules numbered from 00 to 49.

SCHEDULE PUSH BUTTONS (19) & (20) – The right button increments or decrements the SCHEDULE display by one, and the left button increments or decrements by ten. When either digit reaches the maximum, it resets to zero. Press and release of either SCHEDULE push button will increment the SCHEDULE display to the next integer. Press and hold of either SCHEDULE push button will decrement the SCHEDULE display to the previous integer selecting a lower schedule. SCHEDULE push buttons are active in both PROGRAM and OPERATE modes.

2.1 CONTROL FUNCTIONS (cont.) – See Figure 2-1. *Control Panel layout*

WELD LIGHT (22) – The white WELD lamp is connected directly across the welding transformer primary and will light when voltage is present at the welding transformer. The brilliance of the WELD lamp is an indication of the programmed PERCENT CURRENT and therefore provides a visual indication of the percent of RMS voltage supplied to the welding transformer.

PROGRAM/OPERATE PUSH BUTTON (26) – This push button will put the control in PROGRAM or OPERATE mode. The PROGRAM (27) and OPERATE (25) indicator LEDs indicate which mode the control is in:

> **PROGRAM** mode is the mode in which the individual schedules can be entered or modified. Welding parameters (times, valves, etc.) can only be changed in PROGRAM mode. The WELD (heat) parameter can be adjusted in PROGRAM mode or via the MANUAL ADJUST knob (23).

> **OPERATE** mode is the normal operating mode for the control. This is the only mode in which the control can initiate a weld. When the control is in OPERATE mode, the control is in a Ready (to initiate) state.

PROGRAM LOCKOUT KEY SWITCH (24) (Optional) – Allows the operator to lock the control in OPERATE mode only. A key is necessary to place the control in PROGRAM mode.

To put the control in PROGRAM mode using the PROGRAM LOCKOUT key switch:

1. Rotate the key 45 degrees clockwise.
2. Hold the key in this position and press the PROGRAM/OPERATE push button.
3. Release the PROGRAM/OPERATE push button.
4. Release the key. The OPERATE LED will now turn off and the PROGRAM LED will turn on, indicating programmability of all functions.

To put the control back in OPERATE mode:

> Press the PROGRAM/OPERATE push button again. The control will return to OPERATE mode without rotating the key.

ENTER PUSH BUTTON (28) – The ENTER push button is used to **store** the data shown **from** the DATA display **into** the non-volatile **memory** which retains data with the power off.

NOTICE
If ENTER is **not** pressed before other data is viewed (by pressing the SELECT push button) or before returning to OPERATE mode, the new data will not be stored and the previous data will be retained.

WELD INDICATOR LED (7)* – When the control is in OPERATE mode, this LED is lit when indicating WELD time is elapsing and the contactor is activated. In PROGRAM mode, the same LED is lit when indicating a value is being entered or changed in the selected schedule.

WELD % CURRENT INDICATOR LED (8)* – When the control is in PROGRAM mode, this LED is lit indicating a value representing the percentage of available current is being entered or changed in the selected schedule. This PERCENT CURRENT will be present during WELD time.

* Denotes those functions associated with initiation on FS3

2.1 CONTROL FUNCTIONS (cont.) – See Figure 2-1. *Control Panel layout*

UPSET TIME INDICATOR LED (9)* – When the control is in OPERATE mode, this LED is lit indicating another time interval when voltage is transferred to the welding transformer. UPSET TIME immediately follows the BEAT WELD time highlighted by the WELD LED when the sequence is initiated on FS3. In PROGRAM mode, the same LED is lit indicating a value may be entered or changed in the selected schedule. (Timing in cycles 1/60 @ 60 Hz.)

UPSET % CURRENT INDICATOR LED (11)* – When the control is in PROGRAM mode, this LED is lit indicating a value representing the percentage of available current is being entered or changed in the selected schedule. This PERCENT CURRENT will be present during UPSET TIME.

ANNEAL 1 TIME INDICATOR LED (12)** – When the control is in OPERATE mode, this LED is lit indicating ANNEAL (WELD) TIME is elapsing and the contactor is activated. In PROGRAM mode, the same LED is lit indicating a value may be entered or changed in the selected schedule. (Timing in seconds 1/60 sec. x 60.)

ANNEAL 1 % CURRENT INDICATOR LED (13)** – When the control is in PROGRAM mode, this LED is lit indicating a value representing the percentage of available current is being entered or changed in the selected schedule. This PERCENT CURRENT will be present during ANNEAL 1 (WELD) TIME. Adjustment is also possible in OPERATE mode with the MANUAL ADJUST knob.

ANNEAL 2 TIME INDICATOR LED (14)** – When the control is in OPERATE mode, this LED is lit indicating ANNEAL (WELD) TIME is elapsing and the contactor is activated. In PROGRAM mode, the same LED is lit indicating a value may be entered or changed in the selected schedule. (Timing in seconds 1/60 sec. x 60.)

ANNEAL 2 % CURRENT INDICATOR LED (15)** – When the control is in PROGRAM mode, this LED is lit indicating a value representing the percentage of available current is being entered or changed in the selected schedule. This PERCENT CURRENT will be present during ANNEAL 2 (WELD) TIME. Adjustment is also possible in OPERATE mode with the MANUAL ADJUST knob.

HEAT INDICATOR LED (16)** – When the control is in OPERATE mode, this LED is lit indicating an impulse sequence is elapsing. In PROGRAM mode, the same LED is lit indicating a value of HEAT cycles is being entered or changed in the selected schedule. (Timing in cycles 1/60 sec. @ 60 Hz.)

COOL INDICATOR LED (17)** – When the control is in OPERATE mode, this LED is lit indicating an impulse sequence is elapsing. In PROGRAM mode, the same LED is lit indicating a value of COOL (OFF) cycles is being entered or changed in the selected schedule. (Timing in cycles 1/60 sec.)

MANUAL ADJUST KNOB (23)** – Allows the manual increase or decrease of the PERCENT CURRENT. Adjustment in OPERATE mode can only be made in ANNEAL 1 and ANNEAL 2, or during a WELD time. This knob is not functional with a PROGRAM LOCKOUT key switch option installed.

＊ Denotes those functions associated with initiation on FS3
＊＊ Denotes those functions associated with initiation on FS7

3.0 WELD PARAMETERS (Count Functions)

WELD .... BEAT operation (Initiation – FS3 to GND)
UPSET TIME .... 0 to 99 cycles (Initiation – FS3 to GND)
ANNEAL 1 AND ANNEAL 2 .... 1 to 99 seconds (Initiation – FS7 to GND)
ANNEAL 1 AND ANNEAL 2 .... *00* = BEAT operation (Initiation – FS7 to GND)
HEAT .... 0 to 5 cycles (Impulses based on ANNEAL TIME)
COOL .... 0 to 5 cycles (Impulses based on ANNEAL TIME)

WELD TIME* – A value of 1 cycle (default setting) is programmed into this parameter to allow the control to pass current as long as the pilot switch between FS3 and GND is held closed. This parameter is not adjustable.

UPSET TIME* – The interval immediately following WELD time during which voltage is transferred to the welding transformer. UPSET TIME will begin immediately following the release of FS3. (Measured in cycles; 1 cycle = 1/60 sec. @ 60 Hz.)

HEAT COUNT** – The ON time during which voltage is transferred to the welding transformer during the impulse portion of an ANNEAL initiation on FS7.

COOL COUNT** – The OFF time during the impulse portion of ANNEAL initiation on FS7.

ANNEAL 1 TIME** – The number of seconds current will flow prior to the impulse portion of a typical ANNEAL 2 sequence.

ANNEAL 2 TIME** – The number of seconds that the control will pulse immediately following ANNEAL 1 TIME. If no value is programmed into ANNEAL 2 TIME, the control will operate in BEAT. (ON while the initiation is held closed.)

NOTICE
When a value is stored in HEAT and COOL, impulses occur after ANNEAL 1 TIME has elapsed.

4.0 SINGLE STAGE PILOT INITIATION

SINGLE STAGE INITIATION ON FS3 – Connect a normally open Pilot Switch between TS1-FS3 and TS1-GND. Once control is initiated, switch **must** remain closed for weld current to flow. Upon release of switch, control will automatically proceed to UPSET TIME for programmed UPSET % CURRENT. After UPSET TIME has elapsed, control is again in Ready state.

SINGLE STAGE INITIATION ON FS7 – Connect a normally open Pilot Switch between TS1-FS7 and TS1-GND. Once control is initiated, programmed ANNEAL TIME will elapse. If a value of *00* is programmed in ANNEAL TIME, control will allow current to the transformer as long as initiation is held closed (BEAT initiation). Immediately following ANNEAL 1 TIME, control will perform ANNEAL 2 which is typically a series of impulses for a time equivalent to programmed ANNEAL 1 TIME. Actual number of impulses is related to programmed HEAT and COOL times.

No connection is made to TS1-FS1 (see Sections 5.1 and 5.2).

* Denotes those functions associated with initiation on FS3
** Denotes those functions associated with initiation on FS7

4.1 OTHER CHARACTERISTICS

CONTACTOR TEMPERATURE LIMIT SWITCH – This feature is used to inhibit welding if the temperature of the contactor is above the rated operating temperature (149°F). If the Temperature Limit Switch is open (over temperature), the control cannot be initiated until the Temperature Limit Switch cools (resets/closes). If the Temperature Limit Switch becomes open during a weld, the firing pulses to the contactor will continue until the end of WELD time. A new sequence cannot be initiated until the Temperature Limit Switch cools and resets (closes).

In either of the above cases, the DATA display will show ERROR CODE *01* until the Temperature Limit Switch recovers its normally closed state; then, the control will return to normal operation.

NOTICE
If the Temperature Limit Switch is not used, place a jumper between PCB2-TLS1/AUX1 and GND. Temperature Limit Switches are standard on ALL supplied contactors.

EMERGENCY STOP SWITCH – When the Emergency Stop Switch is open, the control **stops any and all processes (all valves and contactor).** While in the Emergency Stop condition, the control will flash *E.S.* on the DATA display until the condition has been cleared. If the execution of a schedule was interrupted by means of the Emergency Stop Switch, the control cannot be re-initiated automatically (after the Emergency Stop condition is removed). Upon release of the switch, it must be re-initiated by closing the Pilot Switch.

NOTICE
If an Emergency Stop Switch is not used, place a jumper (factory installed) between TS1-ES1 and TS1-GND. Emergency Stop Switch is not supplied with the control.

4.2 NON-VOLATILE MEMORY ERROR

The EN1280 Control makes extensive use of non-volatile memory devices. These devices are sometimes susceptible to corruption due to electrical noise present in some systems.

To detect effects of electrical noise on the control, upon power-up, the control executes a diagnostic test that reads all memory locations within the schedule storage areas. If the microcontroller finds invalid data, it displays ERROR CODE *14* alternated with the number of the schedule where the error was found. The invalid data may also be found in the EXTENDED FUNCTIONS' memory area; in this case, the alternate flash displays *EF*.

Physically isolating high voltage wires from low voltage wires will avoid the introduction of electrical noise into the control (see Figure 4-1).
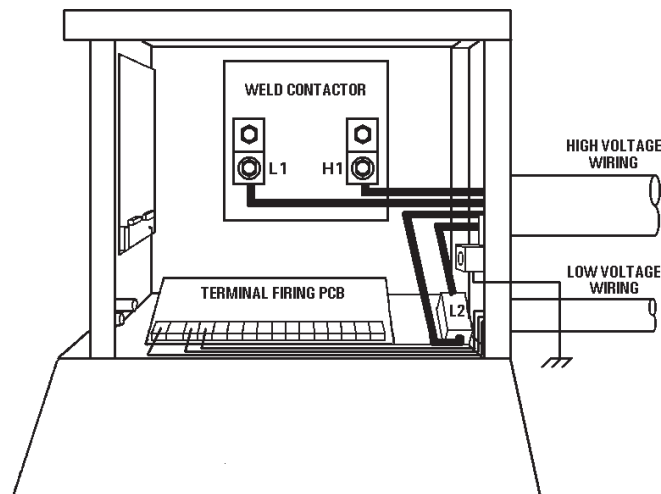

Figure 4-1. *Recommended wiring and routing*

If ERROR CODE *14* occurs, the following procedure should be performed to clear ERROR:
1. Press the SELECT push button to stop the flashing.
2. Place the control in PROGRAM mode.
3. The operator can use SELECT to find the function containing the invalid data.
4. Use the DATA push buttons to correct the data.
5. Press ENTER.
6. Return the control to OPERATE mode.

If more than one location has been affected, it may be necessary to use the CLEAR ALL command in the EXTENDED FUNCTIONS to erase all the memory locations and restore the default settings (factory settings).

NOTICE
If ERROR *14* persists, you may need to isolate high voltage wires (valve outputs, etc.) from low voltage wires (initiation inputs). Re-routing each type of wire to a separate grounded conduit may restore the control to normal operation.

NOTICE
If ERROR *14* is NOT flashing or appears in PROGRAM mode, the Main Control Board may need repair.

5.0 VOLTAGE PROGRAMMING

!   **CAUTION**   !
THE WELDING CONTROL AND/OR WELDING MACHINE WAS SHIPPED CONFIGURED FOR A SPECIFIC VOLTAGE. A TAG ATTACHED TO THE CONTROL TERMINAL BLOCK SPECIFIES THIS VOLTAGE.

!   **WARNING**   !
THIS WELDING CONTROL IS A MULTI-VOLTAGE UNIT WHICH CAN BE CHANGED FROM ONE VOLTAGE TO ANOTHER BY RE-ARRANGING JUMPERS ON THE TERMINAL STRIP INSIDE THE UNIT. OPERATING THE CONTROL AT A VOLTAGE OTHER THAN THAT PRESCRIBED BY THE VOLTAGE CONFIGURATION JUMPERS MAY CAUSE SERIOUS DAMAGE.

This control can be configured to operate at 208, 240, 380, 480, and 575 VAC. If operation at 380 or 575 VAC is required, please consult the factory.

Control Transformer: Jumpers on TS1-L2/CTH4, CTH2, CTH3, and L1/CTH1 must be configured to match the line voltage.

Sense Transformer: Jumpers on TS1-H4, TS1-H2, TS1-H3, and TS1-H1 must be configured to match the line voltage.

Refer to Wiring Diagram 421376 for jumper configuration to match intended operating voltage.

5.1 TERMINAL STRIP DIAGRAM
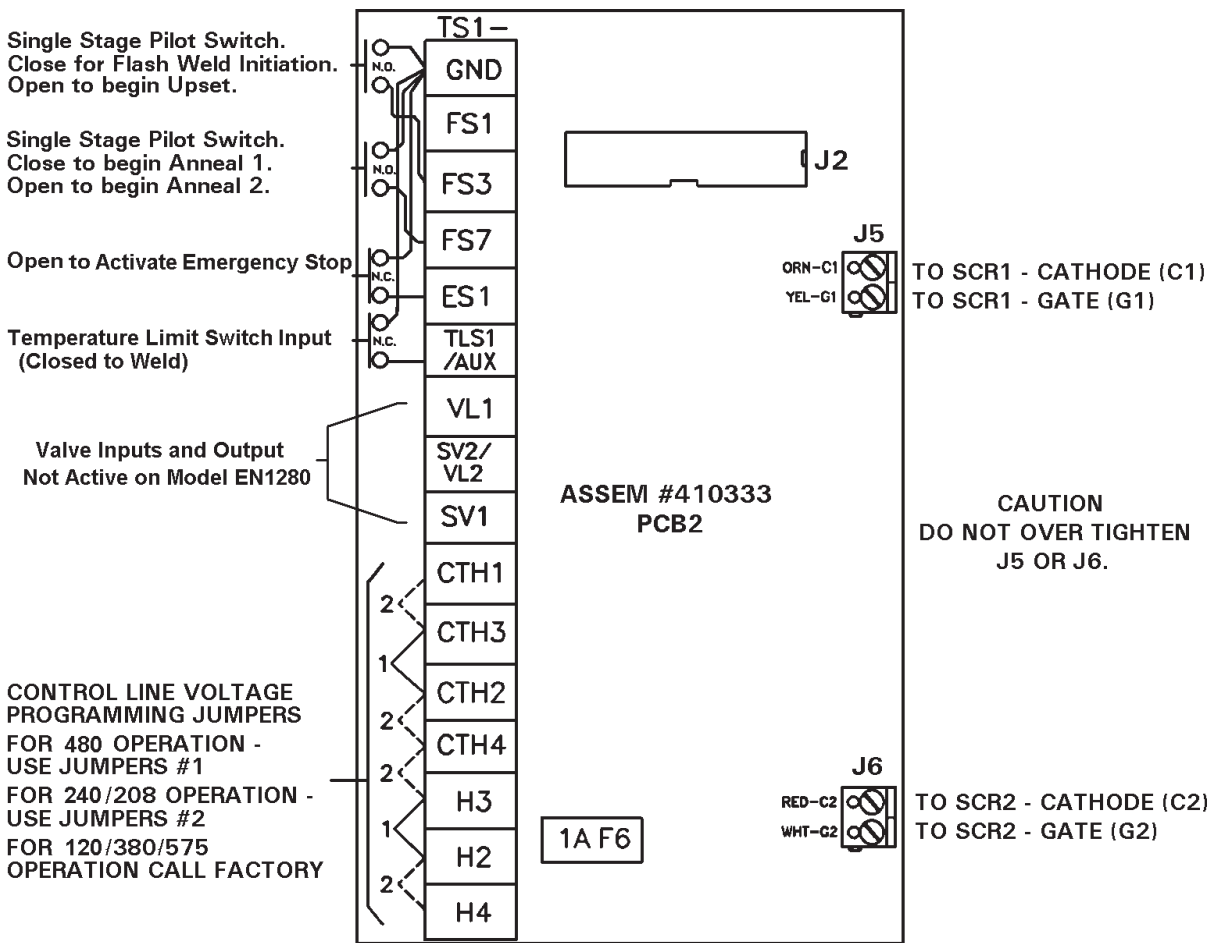
Figure 5-1. *Terminal Strip diagram*

5.2 TERMINAL STRIP CONNECTIONS

TS1-GND   Used as the **common connection point** for most all of the other Terminal Strip connections.

TS1-FS1   Not used. No connection is necessary to this terminal.

TS1-FS3   Used to connect **one side of a Single Stage Pilot.** Connect a Single Stage Pilot between TS1-FS3 and TS1-GND terminals. Use a single pole, normally open, momentary type switch.

When initiated via TS1-FS3, the switch **must** remain closed for flash weld current to flow. Upon release of the switch, the control will automatically proceed to UPSET TIME for the programmed UPSET % CURRENT.

TS1-FS7   Used to connect **one side of a Single Stage Pilot** for ANNEAL 1 or ANNEAL 2 initiation**.** Connect a Single Stage Pilot between TS1-FS7 and TS1-GND terminals. Use a single pole, normally open, momentary type switch.

5.2 TERMINAL STRIP CONNECTIONS (cont.)

TS1-FS7 (cont.)   When initiated via TS1-FS7, ANNEAL 1 TIME will elapse unless there is a value of **00** programmed in ANNEAL 1 TIME, in which case, the control will anneal as long as the switch remains closed (BEAT initiation); immediately followed by the ANNEAL 2 TIME. The control will perform a series of impulses for a time equivalent to the programmed ANNEAL 2 TIME (if programmed).

TS1-ES1   Used to connect **one side of an Emergency Stop Switch.** When used, remove jumper between TS1-ES1 and TS1-GND terminals and install a single pole, normally closed Emergency Stop Switch. It is possible to install several Emergency Stop Switches in series. Activation of any one switch will put the control into the Emergency Stop condition.

NOTICE
Connect a chassis ground to the lug provided on the right wall of the control cabinet and to an external earth ground. **A good earth ground is necessary for proper control operation.**

⚠ **DANGER**

HAZARDOUS VOLTAGE
Electrical shock will cause severe injury or death.

PE Connect this terminal directly to earth ground.
Do not remove or cover this sign.
460144C

TS1-TLS1   Used to connect **one side of a Temperature Limit Switch.** When used, remove jumper and install a normally closed Temperature Limit Switch between TS1-TLS1/AUX1 and TS1-GND terminals.

TS1-VL1   Not used. No connection is necessary to this terminal.
TS1-SV1   Not used. No connection is necessary to this terminal.
TS1-VL2   Not used. No connection is necessary to this terminal.

5.3 PRIMARY WIRING TO WELDING CONTACTOR

For your convenience, many electrical and mechanical connections have been performed at the factory. Check **ALL** electrical connections to insure integrity. Connections may loosen during shipping.

Connect L1 lead from incoming power to L1 connection located on contactor assembly. Connect H1 lead from the welding transformer to H1 connection located on contactor assembly.

Connect L2 lead from incoming power to terminal block labeled L2.

See Section 5.4 for installation diagram. Refer to Wiring Diagram 421376 for other connections.

⚠ **DANGER**

HAZARDOUS VOLTAGE FROM ONE OR MORE SOURCES
Turn off all voltage sources before touching any components.
Electrical shock or flash will cause severe injury or death.
Do not remove or cover this sign
460142B

5.4 INSTALLATION DIAGRAM – "B" CABINET

WELD CONTACTOR
150A - A/N 600613
300A - A/N 600520

600627
CONTROL/
DISPLAY
PCB

CONTROL
FUSE
F1
BBS 6/10

L1   H1

J2 J4
J1
J3

410333-005 TERMINAL
FIRING PCB

L2

STYLE "B" CABINET

11-3/4

4-5/16   2-13/16

REAR

3-1/2

1-1/2 CONDUIT
(1-15/16"D)
HIGH VOLTAGE
WIRING ACCESS

CONTROL
FUSE
F1
BBS 6/10

8-3/4

3-1/8

2

1/2 CONDUIT
(7/8" D) CONTROL
WIRING ACCESS

SIDE VIEW OF CABINET
No mounting holes provided

1

REAR VIEW OF CABINET

9-1/8   15/16

REAR

7   8-3/4

7/8

BOTTOM VIEW OF CABINET
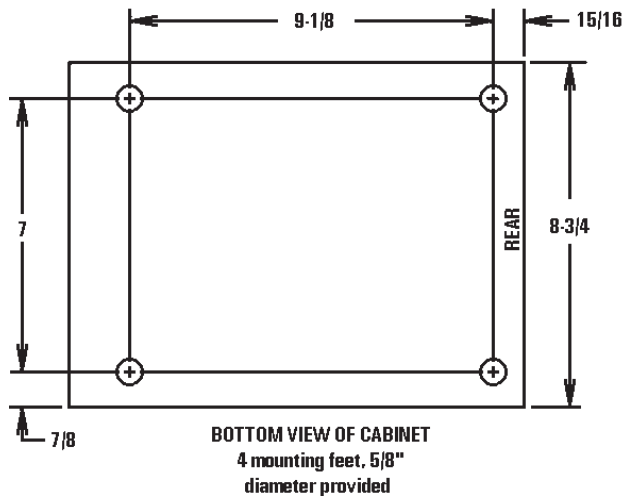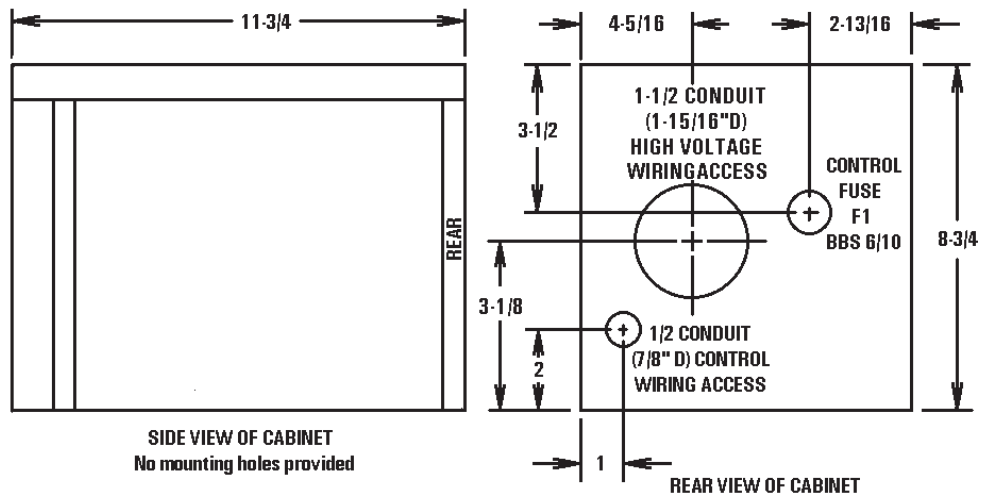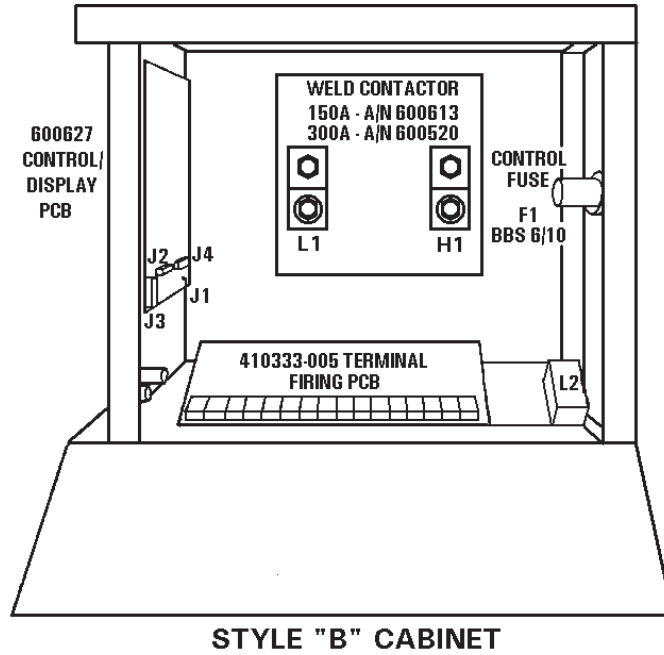4 mounting feet, 5/8"
diameter provided

Figure 5-2. *Style "B" Cabinet*

6.0 EXTENDED FUNCTIONS

To change settings of EXTENDED FUNCTIONS, put the control in PROGRAM mode. Use the SELECT push button to step once past COOL. All function indicator LEDs will turn off and the DATA display will read *EF*. This indicates that the control is in the EXTENDED FUNCTION mode. EXTENDED FUNCTIONS can now be viewed or altered.

To view all of the EXTENDED FUNCTIONS, press the SCHEDULE push buttons and step through the available EXTENDED FUNCTIONS in either direction. When a desired function is shown in the SCHEDULE display, the DATA display will read the current value programmed for that function.

To exit the EXTENDED FUNCTIONS mode, press SELECT once to advance the function indicator LED one more time.

The available EXTENDED FUNCTIONS parameters are listed below and described in the indicated sections.

Designation	Description	Section
C.C.	AVC	6.1
C.A.	Clear All	6.2
8.7.	87° Delay	6.3
P.P.	Manual Power Factor Programming	6.4

6.1   AVC – *C.C.*

The EN1280 Controls are shipped with the AUTOMATIC VOLTAGE COMPENSATION feature disabled. Under conditions of poor line voltage regulation, AVC will allow for consistently good quality welds in spite of varying line voltage.

To enable AVC:
1. Put the control in PROGRAM mode.
2. Use SELECT to find *EF*.
3. Use the SCHEDULE push buttons to find *C.C.*
4. Enter a value for *C.C.* of *00*, *01*, *02*, *03*, *04*, or *05* using the DATA push buttons,
    where: *C.C.=00*   AVC disabled
        C.C.=01   Nominal Line Voltage 120 VAC
        C.C.=02   Nominal Line Voltage 240 VAC
        C.C.=03   Nominal Line Voltage 380 VAC
        C.C.=04   Nominal Line Voltage 480 VAC
        C.C.=05   Nominal Line Voltage 575 VAC
5. Press the ENTER push button.

NOTICE
The AVC must be enabled at a time when the line voltage is nominal. Also, when using AVC, select a PERCENT CURRENT not higher than 85% to allow the AVC circuit operating space.

6.2 CLEAR ALL – *C.A.*

It is sometimes desirable to CLEAR ALL previous SCHEDULES and EXTENDED FUNCTIONS from the memory and return programmed control parameters to factory defaults.

To use the CLEAR ALL feature:
1. Put the control in PROGRAM mode.
2. Use SELECT to find *EF*.
3. Use the SCHEDULE push buttons to find *C.A.*
4. Enter a value for *C.A.* of *01* or *02* using the DATA push buttons,
   where: *C.A.=01*   Clears SCHEDULE data
              C.A.=02   Clears EXTENDED FUNCTION data
5. Press the ENTER push button.

NOTICE
ERASED DATA *CANNOT* BE RESTORED

6.3 87° DELAY – *8.7.*

The 87° DELAY helps to prevent the build-up of a DC component in the welding transformer. This DC component may be damaging. To program this function:
1. Put the control in PROGRAM mode.
2. Use SELECT to find *EF*.
3. Use the SCHEDULE push buttons to find *8.7.*
4. Use the DATA push buttons and make *8.7.=00* or *01*,
   where: *8.7.=00*   87° DELAY is disabled
              8.7.=01   87° DELAY is enabled (default factory setting)
5. Press ENTER.

6.4 MANUAL POWER FACTOR PROGRAMMING – *P.P.*

If required, the EN1280 Control can be placed in the MANUAL POWER FACTOR mode as follows:
1. Place the control in PROGRAM mode.
2. Use SELECT to find *EF*.
3. Use the SCHEDULE push buttons to find *P.P.*
4. Use the DATA push buttons to enter the machine's POWER FACTOR,
   where: *P.P.=00*   The control is in AUTOMATIC POWER FACTOR mode
              P.P.=[xx]   If *xx* is not *00*, the control is in MANUAL POWER FACTOR
                             mode and the programmed POWER FACTOR is *xx*
5. Press ENTER.

7.0 ERROR CODES

Please refer to other manual pages and Wiring Diagrams for location of Terminal Strip connections, etc. Please refer to Wiring & Logic Diagrams for Bills of Material.

ERROR	POSSIBLE CAUSE	REMEDY
Data/Schedule Display **E.r.=01**	Error Code #01 Temperature Limit Switch open or overheated.	Wait for the Temperature Limit Switch to cool or check for open circuit. **See Section 4.1, 5.1, and 5.2**.
Data/Schedule Display **E.r.=02**	Error Code #02 FS1 and FS7 both closed.	Remove any connection to FS1. **See Section 4.0, 5.1, and 5.2.**
Data/Schedule Display **E.r.=04**	Error Code #04 Attempt to weld in PROGRAM mode.	Return to OPERATE mode. **See Section 2.1.**
Data/Schedule Display **E.r.=05**	Error Code #05 FS1,FS3,FS7 closed to GND before power on.	All initiations must be open at power on. **See Section 4.0, 5.1, and 5.2**.
Data/Schedule Display **E.r.=07**	Error Code #07 FS1 initiated while another seq. active.	Remove any connection to FS1. **See Section 4.0, 5.1, and 5.2.**
Data/Schedule Display **E.r.=08**	Error Code #08 FS3 initiated while another seq. active.	Open TS1-FS3. **See Section 4.0, 5.1, and 5.2**.
Data/Schedule Display **E.r.=09**	Error Code #09 FS7 initiated while another seq. active.	Open TS1-FS7. **See Section 4.0, 5.1, and 5.2**.
Data/Schedule Display **E.r.=11**	Error Code #11 Control Board. Control Relay problem.	Replace Control Board.
Data/Schedule Display **E.r.=12**	Error Code #12 Control Board. Hardware error.	Replace Control Board.
Data/Schedule Display **E.r.=13**	Error Code #13 Full conduction detected.	Change to higher welding transformer tap.
Data/Schedule Display **E.r.=14** (Flashing)	Error Code #14 Flashing EEROM error. Possible electrical noise causing invalid data storage.	Follow procedure in **Section 4.2 and 6.2**.
Data/Schedule Display **E.r.=14** (Non-Flashing)	Error Code #14 Non-Flashing EEPROM memory failure.	Replace Control Board. **See Section 4.2 and 6.2**.
Data/Schedule Display **E.r.=26**	Error Code #26 SCR Contactor short detected.	1. Check Contactor for short. 2. Check Firing Module 410333.

For list of all Error Codes, refer to Appendix A (Application Note 700158).

7.1 TROUBLESHOOTING

Please refer to other manual pages and Wiring Diagrams for location of Terminal Strip connections, etc. Please refer to Wiring & Logic Diagrams for Bills of Material.

TROUBLE	POSSIBLE CAUSE	REMEDY
POWER light will not light.	1. Fuse F1, type BBS 6/10, control fuse blown. 2. Defective POWER light. 3. Main welder disconnect open. 4. L2 wire to Terminal Strip missing.	1. Check that control is wired for proper input line voltage (H1, H2, H3 and H4 and CTH1, CTH2, CTH3 and CTH4 jumpers on Terminal Strip). 2. Replace POWER light. 3. Check that fuse or circuit breaker is of sufficient size for KVA demand of welding transformer. 4. Add L2 wire.
Control will not initiate.	1. Initiation switch(es) defective. 2. Loose or broken wire(s) at initiation switch(es). 3. Defective Control/Display.	1. Replace switch(es). 2. Check for loose or broken wire(s) at initiation switch(es) and at Terminal Strip (FS3, FS7, etc.). 3. Replace board with another board stamped with same A/N.
HALF CYCLE during WELD time.	1. Defective thyristor. 2. Defective Terminal Strip/Firing PCB.	1. Check thyristor for open. Replace. 2. Replace Board. See Wiring Diagram for correct A/N.
Control sequences but will not weld.	1. WELD/NO WELD push button on Front Panel of control. 2. Open Temperature Limit Switch. 3. Welding transformer tap switch in OFF position. 4. Welding transformer secondary open. (WELD light may light.) 5. Defective Terminal Strip/Firing PCB. 6. Defective Control/Display PCB.	1. Check to see that control is in WELD. 2a) Contactor overheated, causing switch to open. 2b) Defective switch. Replace. 2c) Connect jumper across TLS1 & GND if TLS is not used. 3. Set to ON or at one of the tap positions. 4. Check for corroded or open connections. Be sure welding electrodes close on work. 5. Replace board. See Wiring Diagram for correct A/N. 6. Replace board with another board stamped with same A/N.

7.1 TROUBLESHOOTING (cont.)

TROUBLE	POSSIBLE CAUSE	REMEDY
Weld too cool or too small.	1. Line voltage drop. 2. Excessive force at electrodes. 3. Weld transformer set low. 4. WELD count too short. 5. PERCENT CURRENT too low. 6. Electrode face too small. 7. Excessive electrode wear.	1. KVA demand for welding transformer too high for input power line. 2. Check force setting. 3. Increase transformer tap setting. 4. Increase WELD count duration. 5. Increase PERCENT CURRENT. 6. Select correct electrode face diameter. 7. Properly dress electrodes.
"HOT" Welds	1. Low force. 2. Weld transformer set high. 3. WELD count set too high. 4. PERCENT CURRENT set too high. 5. Electrode face too small.	1. Check force at electrodes. 2. Reset tap to lower setting. 3. Reduce WELD count duration. 4. Decrease PERCENT CURRENT. 5. Dress or replace electrode with proper size.
Inconsistent Welds	1. Work not square with electrodes. 2. Poor part fit-up. 3. Dirty material to be welded.	1. Check welding fixtures setup or electrode alignment. 2. Check parts for proper fit-up. 3. Work should be free from excessive dirt, paint and oxides.

8.0 ENTRON LIMITED WARRANTY AND FACTORY SERVICE

ENTRON Controls, LLC., warrants that all ENTRON control panels, **EXCEPT** Mid-frequency Inverter controls, silicon controlled rectifiers (SCRs), insulated gate bipolar transistors (IGBTs), SCR and IGBT assemblies, circuit breakers, and electro-mechanical contactors, are free of manufacturing defects for a period of **TWO YEARS** from the date of original purchase and, in the event of a manufacturing defect, ENTRON will repair or replace, at its discretion, the defective part without any cost for parts or labor.

All silicon controlled rectifiers, SCR and IGBT assemblies, circuit breakers, and electro-mechanical contactors in ENTRON control panels are covered by **a limited warranty from the original manufacturer**. If these parts fail because of a manufacturing defect, they will not be repaired or replaced by ENTRON, but will be returned by ENTRON to the original manufacturer in accordance with said manufacturer's warranty.

ENTRON Controls, LLC., warrants that all Mid-frequency Inverter controls are free of manufacturing defects for a period of **ONE YEAR** from the date of original purchase and, in the event of a manufacturing defect, ENTRON will repair or replace, at its discretion, the defective part without any cost for parts or labor.

To obtain repairs or replacement parts under this warranty, the defective part must be returned, prepaid, to ENTRON Controls, LLC., 1402 S. Batesville Road, Greer, SC 29650. Please send your repair to the attention of "Service" with a description of the problem you are experiencing, contact person, and phone number.

EXCLUSIONS: This warranty does not cover damage by accident, misuse, unauthorized repair or modification to any control assembly by the customer.

IMPORTANT NOTE: The warranty period is considered from the date of shipment and is tracked by a serial number code.

Use of Out of Warranty Repair Service:
To obtain service for any printed circuit board assembly or welding control after the warranty period, send the assembly or control, prepaid, to ENTRON Controls, LLC., and ENTRON will repair the printed circuit board assembly or control and return it to you without further warranty. Additional service charges will be invoiced at time of shipment.

> **Your ENTRON Controls, LLC., Original Equipment Manufacturers (OEMs), Dealers and Distributors are your first response contact to secure technical assistance on control or welding problems. Should they be unable to assist you, please contact your ENTRON sales representative or the factory directly. Contact the factory at 864-416-0190.**

APPENDIX A – ERROR CODES

APPLICATION NOTE 700158L
ERROR CODES*

ERROR CODE	Reason or Cause
01	Temperature limit exceeded (TLS open). / Incorrect **b.5.** or **P.0.** programmed.
02	FS1 & FS7 are both active.
03	FS1 & FS11 are both active.
04	Weld initiated while in PROGRAM mode.
05	FS1, FS3, FS7, or FS11 is active upon power up.
06	BACK-STEP is active too long. / Input switch closed. / Incorrect **b.5.** or **P.0.** programmed.
07	FS1 still active after weld.
08	FS3 still active after weld.
09	FS7 still active after weld.
10	FS11 still active after weld.
11	Control Relay still active after weld.
12	Hardware error is detected.
13	Full conduction is detected.
14	EEPROM error is detected (refer to Application Note 700127).
14 - **flashing**	Invalid data in EEPROM (refer to Application Note 700127).
15	Pressure Switch is open too long.
16	Emergency Stop is active.
17	Nominal AVC reading is too low.
18	Nominal AVC reading is too high.
19	AVC reading is too low.
20	AVC reading is too high.
21	+5 VDC is out of range.
22	+18 VDC is out of range.
23	Maximum firing angle exceeded during AVC correction.
24	Minimum firing angle exceeded during AVC correction.
25	Power factor measured as zero.
26	Sense input active while not welding. / Shorted SCRs. / Incorrect wiring or missing L2.
27	Retraction not active upon initiation.
28	Front Panel NO WELD switch is active for **P.0.**=**10** or for *EN1000/EN1001 Cascade only* **P.0.**=**33**.
29	Schedule out of range for **5.5.**=**03** when using S49 or S99 option.
30	Over current (*EN1200 and EN1201 only*).
31	IIC Error.
32 - **flashing**	Invalid data in EEPROM (refer to Application Note 700127).
33	MM2 is not found. Memory Module required.
34	Downloading data from MM2 Checksum Error.
35	Copy data to MM2 Checksum Error.
36	Pressure Sense input is too low or too high.
37	Calibration data out of range (*EN1001 only*).
38	DC bus voltage is too low (*EN1200 and EN1201 only*).
39	DC bus voltage is too high (*EN1200 and EN1201 only*).
40	Control with programmed ID not found on the RS485 network (*RT4 only*).
41	Message is not received from the control (*RT4 only*).
42	Communication Error (*RT4 only*).
43	Checksum Error in data bytes (*RT4 only*).
44	DC bus voltage is too high. Send signal to Circuit Breaker Shunt Trip (*EN1200 and EN1201 only*).
45	One or two of the three phases are missing (*EN1200 and EN1201 only*).
46	Setup failed. Control failed to adjust for signal level *(EN1001/EN1001 Cascade only)*.
47	Over current from Primary Current Sensor (*EN1200 and EN1201 only*).
48	SCR's Firing Board is not ready for weld (*EN1200 and EN1201 only*).
90	Error Output from control to ENLINK, High.
91	Error Output from control to ENLINK, Low.
d.o.u.n.	VCC power supply voltage below safe operating range.
H.i. or L.o.	Flashing on DATA display if control is unable to correct and maintain constant current during weld. Generally shown after weld for **P.0.**=**12**, **13**, **14**, **22**, **23**, **24** or **25** (*EN1001 and EN1201 only*).
E.5. - **flashing**	Emergency Stop is active.

*These ERROR CODES affect controls in Series EN1000, EN1001, EN1000B, EN1003, EN1000/EN1001 Cascade, EN1200, EN1201, EN1280, TW1280, EN1380, EN1500 and EN1501.