EN7000-TS

Touch-screen programming

User Guide

This user guide demonstrates the use of the EN7000 touchscreen. Reference the EN7000 Technical Manual for further details of parameters.

For firmware version 1.12

Document revision 1

Contents

Note: Not all parameters are visible at any one time. Many parameters are dependent on other parameters. Only relevant parameters are displayed as this reduces clutter on the screen. The screens shown here are typical and may not be exactly what you will see.

1.1 Start-up

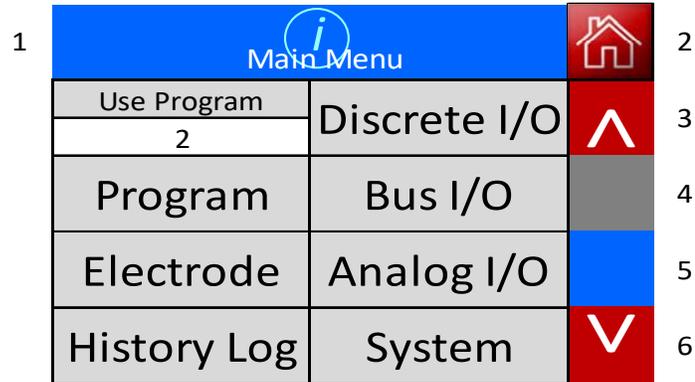On Start-up, the display will show the *splash* screen.

- Proceed to the **Main Menu** by tapping the **Home** icon (bottom right).

1.2 Menu screen

The items described below are common to every menu screen.

1	Tapping the *i* in the center of the banner will display the *Status* screen. Tapping it from the *Status* screen will return to the previous screen.
2	Tapping the *Home* icon will return to the previous screen.
3	Tapping the *UP* arrow scrolls the display up one line at a time.
4	The size of the scroll bar handle indicates how many additional items there are in the menu. The smaller the handle, the more items there are in the entire menu to be displayed.
5	Tapping the blue area in the scroll bar will scroll the display up or down one page at a time.
6	Tapping the *DOWN* arrow scrolls the display down one line at a time.

The remaining area is divided up into eight labeled buttons. Tapping one of these buttons will either

- Open the sub-menu for that function.

OR

- Open an information window.

OR

- If the button contains a parameter, edit that parameter.

1.3 Status screen

This screen presents useful information regarding the status of the control and the measurements from the last weld. Access the **Status** screen by tapping on the **i** icon on the banner of any menu.

i	Status	⌂
1	**Ready**	∧
2	Pre-heat **2.00 kA**	Program **2**	5
3	Main Heat **5.00 kA**	Force **100 lb**	6
4	Post-heat **1.00 kA**	Conductior **35.5%**	∨	7

1	This field displays the control status. Tapping on this field will display a message screen giving the option to reset the status.
2	Pre-heat current from the last weld
3	Main heat current from the last weld
4	Post-heat current from the last weld (**Extended Features** must be enabled in the **Configuration** menu)
5	Program used for the last weld
6	Force measured from the last weld
7	Percent Conduction of the SCR from the last weld

- Tap the **i** in the center of the banner to return to the previous screen.

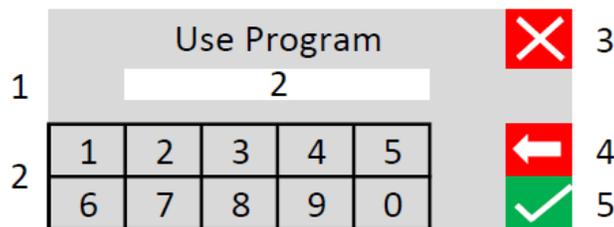- Tap the **HOME** key to go to the main menu

Parameters can be edited in several different ways, depending upon their nature.

2.1 Numeric

When you tap on a button showing a numeric parameter, an editor window opens:

e.g.

1	Present value of parameter
2	Use the keypad to enter a new value
3	Cancel the entry (present value remains unchanged)
4	Backspace the value in field 1
5	Enter the selected value (parameter is changed to new value)

- Initially, the present value is shown. In the above example the parameter called **Use Program** is set to the value **2**.

- Tap on the numeric buttons to enter a new value, then tap the **green tick key**. The editor will close and return to the previous screen, showing the new value entered.

- If you enter an illegal value, a warning message appears and the parameter is not changed. Close the warning message by taping on the **red X** key in the top right corner.

2.2 Radio button

This type of parameter has only two options.

e.g.

Features	
Standard	Extended

- The presently selected option is highlighted. In the above example the parameter called **Features** is set to **Standard**.

- Each time you tap on the button, the parameter is set to the other option.

2.3 Multi-option

This type of parameter has more than two options.

e.g.

I/O Source
DISCRETE

- The presently selected option is shown. In the above example the parameter called **I/O source** is set to **DISCRETE**.

- Each time you tap on the button the parameter will change to the next option in the list. After the final option, the list starts again with the first option.

2.4 Check box

This type of parameter is either **on** (box ticked) or **off** (box clear).

e.g.

✓ Stop on Fault

- In the above example the parameter called 'Stop on fault' is **on**.

- Each time you tap on the button the parameter toggles between **on** (box ticked) and **off** (box clear).

This section describes the hierarchy of menus which allow access to the parameters.

Not all parameters are visible at any one time. Many parameters are dependent on other parameters. Only relevant parameters are displayed as this reduces clutter on the screen. The screens shown here are typical and may not be exactly what you will see.

Wherever you see the symbol Extended in this section, this indicates that the parameter is only available if **Extended** features is selected in the Configure menu.

The Main menu is the hub from which all sub-menus are accessed.

3.1 Use Program (parameter)

Sets the program number selected to execute when the START signal is applied. This parameter will not be available if the configuration parameter **Program select** is set to **Extern.**

3.2 Program menu

The **Program** menu is used to configure parameters in a weld schedule. There are settings in the **Options** and **Configuration** menus that will determine which of these parameters are displayed.

Program menu	
Program	Link to program
0	1
Electrode	Time
0	
Current	Force
Valves	Options
Copy	START

3.2.1. Program (parameter)

Select the program to edit. Subsequent program parameter edits will apply only to the program set here.

3.2.2. Link to Program (parameter)   Extended

Select the program to link to the program being edited. **Linking** must be enabled in the **Options** menu for this field to be displayed. The linked program will automatically begin after the program being edited executes if the START signal is maintained.

3.2.3. Electrode (parameter)   Extended

Select the electrode to be assigned to the program being edited. **Multi Electrodes** must be selected in the **Configuration** menu.

3.2.4. Timing menu

Timing: Program 0	
Squeeze	Pre-heat
20 ~	10 ~
Cool 1	Upslope
2 ~	2 ~
Main Heat	Cool 2
30 ~	20 ~
Downslope	Post-heat
2 ~	20 ~
Hold	
50 ~	

3.2.4.1. Presqueeze (parameter)

Time interval between program initiation and the start of squeeze time. Only occurs on the first spot of a **Repeat mode** spot sequence. Used to allow for large initial movements of the welding electrodes.

3.2.4.2. Squeeze (parameter)

Time interval between end of **Presqueeze** time and the application of weld current. Used to allow the electrodes to develop the desired force.

3.2.4.3. Pre-heat (parameter)

Time interval where the Pre-heat current is applied. **Pre-heat** must be enabled in the **Program Options** menu.

3.2.4.4. Cool1 (parameter)

Time interval between end of **Pre-heat** time and start of **Upslope** time where no current is passed. Pre-heat must be enabled in the **Program Options** menu to use this feature.

3.2.4.5. Upslope (parameter)

Time interval for the welding current to change from the Pre-heat value to the Main Heat value.

3.2.4.6. Main heat (parameter)

Time interval for the main welding current.

3.2.4.7. Cool2 (parameter)

Time interval where no current is passed. For spot mode, there must be more than 1 Pulsation in the *Program Options* menu to use this feature.

3.2.4.8. Downslope (parameter)

Time interval for the welding current to change from the Main Heat value to the Post-heat value.

3.2.4.9. Post-heat (parameter)   Extended

Time interval where the Post-heat current is applied. To use this feature, *Post-heat* must be enabled in the *Program Options* menu.

3.2.4.10. Hold (parameter)

Time interval where the force is maintained and no current is passed. Used to allow the nugget to congeal.

3.2.4.11. Off (parameter)

Time interval where the electrode force is released until the next sequence begins. *Repeat* spot mode or *Roll-spot* mode must be enabled in the *Program Options* menu to use this feature.

3.2.5. Current menu

Current: Program 0		
Pre-heat mode		Pre-heat
PHA	CCR	0%
Current (pre)	☐	Monitor Current (pre)
2.00 kA		
Main heat mode		Main heat
PHA	CCR	0%
Current (main)	☐	Monitor Current (main)
10.00 kA		
Post-heat mode		Post-heat
PHA	CCR	20%
Current (post)	☐	Monitor Current (post)
2.00 kA		
Low Limit		High Limit
5%		5%

3.2.5.1. Pre-heat mode (parameter)

Regulation mode for pre-heat. Phase Angle (PHA) provides no current regulation but uses a fixed SCR firing angle. Constant Current Regulation (CCR) provides closed loop regulation to control the current to a specified value.

3.2.5.2. Pre-heat (parameter)

Percent heat (0 – 99.9%) to be used in PHA mode.

3.2.5.3. Current (pre) (parameter)

Current to be used in CCR mode. This parameter also serves as the pre-heat monitor set-point for both PHA and CCR modes.

3.2.5.4. Monitor Current (pre) (parameter)

Check this box to enable current monitoring during the pre-heat interval. Current will be monitored to be within the Low and High Limit parameters in this menu.

3.2.5.5. Main heat mode (parameter)

Regulation mode for main heat. <u>P</u>hase <u>A</u>ngle (PHA) provides no current regulation but uses a fixed SCR firing angle. <u>C</u>onstant <u>C</u>urrent <u>R</u>egulation (CCR) provides closed loop regulation to control the current to a specified value.

3.2.5.6. Main heat (parameter)

Percent heat (0 – 99.9%) to be used in PHA mode.

3.2.5.7. Current (Main) (parameter)

Current to be used in CCR mode. This parameter also serves as the main-heat monitor set-point for both PHA and CCR modes.

3.2.5.8. Monitor Current (main) (parameter)

Check this box to enable current monitoring during the main heat interval. Current will be monitored to be within the Low and High Limit parameters in this menu.

3.2.5.9. Post-heat mode (parameter)   Extended

Regulation mode for post-heat. <u>P</u>hase <u>A</u>ngle (PHA) provides no current regulation but uses a fixed SCR firing angle. <u>C</u>onstant <u>C</u>urrent <u>R</u>egulation (CCR) provides closed loop regulation to control the current to a specified value.

3.2.5.10. Post-heat (parameter)   Extended

Percent heat (0 – 99.9%) to be used in PHA mode.

3.2.5.11. Current (post) (parameter)   Extended

Current to be used in CCR mode. This parameter also serves as the post-heat monitor set-point for both PHA and CCR modes.

3.2.5.12. Monitor Current (post) (parameter)   Extended

Check this box to enable current monitoring during the post-heat interval. Current will be monitored to be within the Low and High Limits set in this menu.

3.2.5.13. Balance (parameter)   Extended

Seam welds only. Adjusts the current in the first half-cycle of any pulse within a seam weld, to reduce transient effects.

3.2.6. Force menu

If ***Force Profile*** is not selected (or not shown) in the ***Options*** menu, the Force menu will only include the items shown below.

The Force value shown below will be used for the entire duration of the program:

Force: Program 0		
☐ Wait for Force	☐ Monitor Force	∧
Low Limit	High Limit	
5%	5%	
Force		
500 lb		
		∨

Force Menu without Force Profile

Extended

If ***Force Profile*** is selected in the ***Options*** menu, the Force menu will include the items shown below. Using the Force Profile provides the opportunity to use different force values in each program interval.

Force: Program 0		
☐ Wait for Force	☐ Monitor Force	∧
Low Limit	High Limit	
5%	5%	
Squeeze	Pre-heat	
500 lb	600 lb	
Cool 1	Upslope	∨
500 lb	550 lb	
Main Heat	Cool 2	
450 lb	500 lb	
Downslope	Post-heat	
500 lb	500 lb	
Hold		
500 lb		

Force Menu with Force Profile

3.2.6.1.   Wait for Force (parameter)

Checking this box will cause the control to wait for the Analog Force input to be within the High and Low Force Limits before proceeding to weld. It can be set to occur before or after Squeeze in the *Configuration* menu (see 3.5.10).

3.2.6.2.   Monitor Force (parameter)

Check this box to monitor the force at the end of the main-heat interval. The measured value is checked between the Low and High limits.

3.2.6.3.   Low Limit (parameter)

The Low Force Limit in percent used by the Force Monitor

3.2.6.4.   High Limit (parameter)

The High Force Limit in percent used by the Force Monitor

3.2.6.5.   Squeeze (parameter)   Extended

Force used from the start of the Squeeze interval

3.2.6.6.   Pre-heat (parameter)   Extended

Force used from the start of the Pre-heat interval

3.2.6.7.   Cool 1 (parameter)   Extended

Force used from the start of the Cool 1 interval

3.2.6.8.   Upslope (parameter)   Extended

Force used from the start of the Upslope interval

3.2.6.9.   Main Heat (parameter)   Extended

Force used from the start of the Main Heat interval

3.2.6.10.   Cool 2 (parameter)   Extended

Force used from the start of the Cool 2 interval

3.2.6.11.   Downslope (parameter)   Extended

Force used from the start of the Downslope interval

3.2.6.12.   Post-heat (parameter)   Extended

Force used from the start of the Post-heat interval

3.2.6.13. **Hold (parameter)** `Extended`

Force used from the start of the Hold interval

3.2.6.14. **Off (parameter)** `Extended`

Force used from the start of the Off interval

3.2.7. Valves menu

Valves		
WAV	1 - - - - - - -	
MOTOR	- 2 - - - - - -	
Squeeze	- - 3 - - - - -	
Pre-heat	- - - - - - - -	
Cool 1	- - - - - - - -	
Upslope	- - - - - - - -	
Main heat	- - - - - - - -	
Cool 2	- - - - - - - -	
Downslope	- - - - - - - -	
Post-heat	- - - - - - - -	
Hold	- - - - - - - -	
Off	- - - - - - - -	

There are eight valve outputs on the EN7000. Each valve is assignable to a program interval as described below. To assign a valve to a program interval, tap either button in the program interval row. In the figure above, WAV is assigned valve 1, Motor is assigned valve 2, and the AUX output during the Squeeze interval is assigned valve 3. The table below shows constraints of how the valves may be assigned.

Features	Electrodes	WAV	Motor	
Standard	n/a	AV1	n/a	AV1 is automatically assigned
Extended (spot)	Single	AV1	n/a	AV1 is automatically assigned
	Multi	AV1 – AV8	n/a	Any AV output may be assigned
Extended (seam)	Single	AV1	AV2	AV1 and AV2 are automatically assigned
	Multi	AV1 – AV8	AV1 – AV8	Any AV output may be assigned

3.2.7.1. WAV

The WAV (Weld Air Valve) turns on at the start of the sequence and turns off at the end of Hold. Valves not being used for the WAV function may be used as AUX valves. WAV settings will always override any AUX setting assigned to the same valve.

3.2.7.2. MOTOR   Extended

This feature is available in **Seam** mode only. For normal seam welding, the MOTOR output turns on according to the **2nd Stage** setting in the **Configuration** menu and turns off at the start of the Hold interval. If the **Roll-spot** option is selected, the MOTOR output operates during the Off interval only. Valves not being used for the MOTOR function may be used as AUX valves. MOTOR settings will always override any AUX setting assigned to the same valve.

3.2.7.3. AUX

An AUX valve may be programmed to turn on during any interval in the welding sequence. **Repeat mode** must be enabled in the **Options** menu to access the OFF interval. WAV and MOTOR settings will always override any AUX setting assigned to the same valve.

3.2.8. Options menu

3.2.8.1.   Program Inhibit (parameter)

Checking this box will prevent a program from executing. If the program is not linked, attempting to run it will produce an error message. If the program is linked, it will be skipped and the next linked program will run.

3.2.8.2.   Pre-heat (parameter)

Checking this box will enable the Pre-heat parameters.

3.2.8.3.   Post-heat (parameter)   `Extended`

Check this box to enable Post-heat features.

3.2.8.4.   Pulsations (parameter)

This value is the number of times the Main Heat – Cool 2 interval is repeated.

3.2.8.5.   Link (parameter)   `Extended`

Check this box to enable linking. The linked program selected in the Program menu will begin automatically if the START signal is maintained. Linking cannot be used if *Repeat* is selected.

3.2.8.6.   Repeat (parameter)

Checking this box will set repeat mode in the program. It is available in Spot weld mode only, as set in the *Configuration* menu. *Repeat* cannot be used if *Linking* is selected.

3.2.8.7. Force profile (parameter) `Extended`

Checking this box will enable the setting of different force values during each interval of the schedule. This is described in the Force menu section.

3.2.8.8. Roll-spot (parameter) `Extended`

Checking this box will set roll-spot mode in the program. It is available in Seam weld mode only, as set in the **Configuration** menu.

3.2.9. Copy program

Copy parameters from the program being edited to another program or to a range of programs.

3.2.10. START button

Initiate the program being edited. A warning message will be displayed asking for Confirm or Abort prior to initiation. This button is not displayed if Seam is selected as the Weld Type in the **Configuration** settings.

3.3 Electrode Menu

The EN7000 Electrode may be thought of as a container that includes several items specific to an electrode on a welder. Each program may be assigned to an electrode.

Electrode Menu ⓘ		🏠
Electrode	SCR/Transformer	∧
2	0	
Counter	Stepper	
Current Cal	Force Cal.	
Copy		∨

3.3.1. Edit Electrode (parameter)   `Extended`

Select the electrode to edit. Subsequent electrode parameter edits will apply only to the electrode set here.

Multi Electrode must be selected in the *Configuration* menu for this parameter to be displayed. If not displayed, the weld program will be assigned to a single default electrode.

3.3.2. SCR/Transformer (parameter)   `Extended`

Select the transformer assigned to the electrode. *Multi Electrode* must be selected in the *Configuration* menu for this parameter to be displayed. Up to four transformers can be directly connected. Up to eight transformers may be connected by using an external decoder.

3.3.3. Counter menu

Counter: Electrode 0		
☑ Enable Counter	☑ Stop at end of count	∧
Count	End Count	
38	9999	
Reset Count		
Dressings Done	Max Dressings	∨
1	3	
☑ Enable Tip Dress	Reset to	
	0	

3.3.3.1. Enable Counter (parameter)

Checking this box enables counting.

3.3.3.2. Count (parameter)

The number of welds since the Counter was reset. The value is also editable by tapping the field.

3.3.3.3. Reset Count

Pressing this button will reset the Counter to zero.

3.3.3.4. Dressings Done (parameter)

The number of times the electrode has been dressed.

3.3.3.5. Enable Tip Dress (parameter)

Checking this box enables the tip dress feature. If enabled, the EN7000 will activate the Tip Dress Request output when the count value reaches the value set in *End Count*.

3.3.3.6. Stop at End of Count (parameter)

Checking this box will inhibit further welding once the *Count* is equal to the *End Count*.

3.3.3.7. End Count (parameter)

The end point for the counter.

3.3.3.8. Max Dressings (parameter)

The maximum number of times the electrode can be dressed.

3.3.3.9. Reset to (parameter)

The weld count after a tip dress operation.

3.3.4. Stepper menu

3.3.4.1. Enable Stepper (parameter)

Checking this box enables the Stepper feature.

3.3.4.2. Stop at End of Stepper (parameter)

Checking this box will inhibit further welding at the end of the last step.

3.3.4.3. Spots Done

This field displays the number of welds made in the entire stepper.

3.3.4.4. Progress

This is a graphical representation of the percent complete for the entire stepper.

3.3.4.5. Reset Stepper

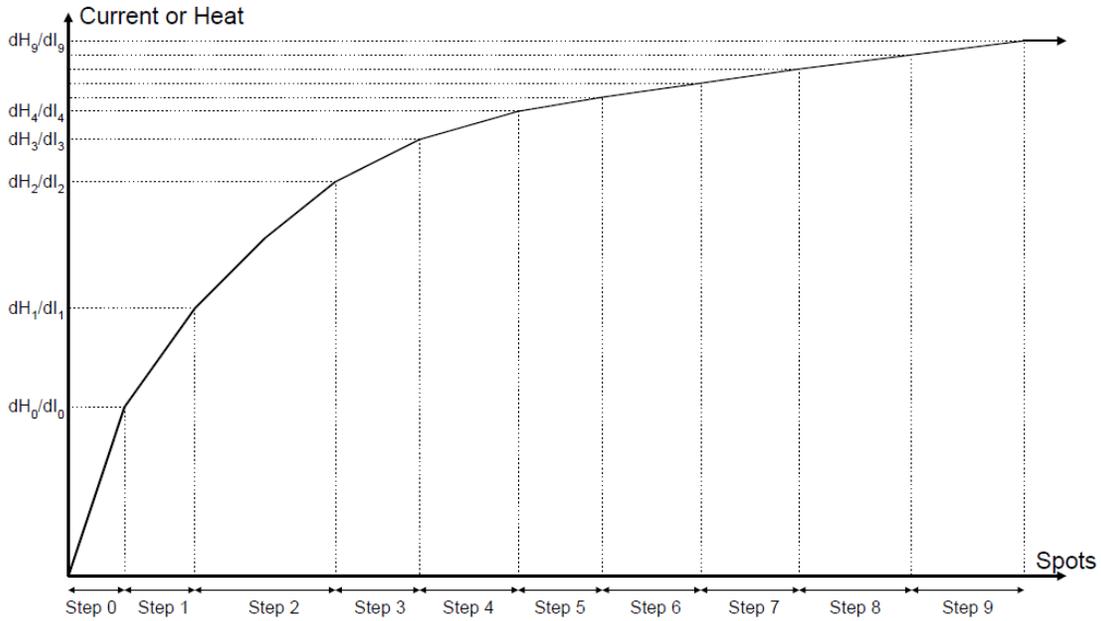Tapping this button will reset the stepper to the beginning.

3.3.4.6. Curve

Tap this button to access the Curve screen.

Step	Spots	(i)+Heat	
0:	5	1.2%	6.3%
1:	5	1.2%	6.3%
2:	5	1.2%	6.3%
3:	5	1.2%	6.3%
4:	5	1.2%	6.3%
5:	5	1.2%	6.3%
6:	5	1.2%	6.3%
7:	5	1.2%	6.3%
8:	5	1.2%	6.3%
9:	5	1.2%	6.3%
Preset #1		Preset #2	
Preset #3		Preset #4	
Preset #5			

The screen displays the parameters of each step in the stepper. This screen also includes five Preset Curves that may be loaded by tapping the respective button. A preset curve may be used to save time in developing a new curve.

Tap the button for any of the ten steps to access the step edit screen.

Curve Data: Electrode 0: Step 0		
Spots		∧
5		
+Heat	+Current	
0.70%	3.80%	
		∨

3.3.4.6.1. Spots (parameter)

The number of spots in the step.

3.3.4.6.2. +Heat (parameter)

The percent increase in heat over the entire step. This value will be used if the **Current Mode** is PHA (phase angle)

3.3.4.6.3. +Current (parameter)

The percent increase in current over the entire step. This value will be used if the **Current Mode** is CCR (constant current regulation).

3.3.5. Current calibration menu

The welding current can be measured by a current transformer (Primary CT) or by a coil (Secondary Toroid). The Calibration process provides the ability to measure primary current and display secondary current.

Calibrate Current: Electrode 0	
Power Factor	CT
0.30	1950 mV/kA
Turns Ratio	Apply Conversion
1:1	Off
Point 1 (Pri)	Point 1 (Sec)
12:00 AM	1.00 kA
Point 2 (Pri)	Point 2 (Sec)
500 A	10.0 kA
Toroid	
150 mV/kA	

3.3.5.1. Power Factor (parameter)

Enter the Power Factor of the Electrode. To determine the Power factor, consult the *EN7000 Technical Manual, Section 14.07*.

3.3.5.2. Toroid (parameter)

Sets the toroid sensitivity. This field is only displayed when the *Weld Type* is set to *Spot* in the *Configuration* menu. The nominal sensitivity is 150 mV/kA.

3.3.5.3. CT (parameter)

Sets the CT sensitivity. The EN7000 can be fitted with a CT and corresponding burden resistor, based on the SCR size. The standard value is 1950 mV/kA.

3.3.5.4.   Apply Conversion (parameter)

There are two different methods of converting primary current (measured from the CT) to secondary current.

3.3.5.4.1.   Use Points 1&2

The two-point method of current calibration is performed by measuring the values of primary and secondary current at two different heat levels. This procedure can be found in *Section 7* of the *EN7000 Technical Manual*

3.3.5.4.2.   Use Turns Ratio

This method calculates the secondary current by multiplying the primary current by the transformer turns ratio.

3.3.5.4.3.   Off

No conversion will be done. Select this option if using a secondary toroid to measure the current. In this case the *Sensor* must be set to *Toroid* in the *Configuration* menu.

3.3.5.5.   Point 1 (Pri) (parameter)

Lower primary current reading.

3.3.5.6.   Point 2 (Pri) (parameter)

Higher primary current reading.

3.3.5.7.   Point 1 (Sec) (parameter)

Lower secondary current reading.

3.3.5.8.   Point 2 (sec) (parameter)

Higher secondary current reading.

3.3.5.9.   Turns Ratio (parameter)

Transformer turns ratio (usually found on the transformer nameplate).

3.3.5.10. CCR Gain (parameter)   Extended

This field is only displayed when the **Weld Type** is set to **Seam** in the **Configuration** menu. This gain is used to trim the Constant Current Regulation. Set this value to 5 as a starting point.

3.3.5.11. 3-phase trim (parameter)   Extended

Used to balance the current in each phase of a 3-phase system. The **SCR Select** must be set to **3-Phase** in the **Configuration** menu.

3.3.6. Force calibration menu

If the EN7000 is used for force control, the Force must be calibrated. In the **Configuration** menu select the units of force **METRIC / IMP** (kN / lbf) and **Analog Output** to **FORCE CONTROL**. The analog input and output channels are calibrated separately. Using a low (Point 1) and high (Point 2) force, measure the force and voltage for each channel. Enter these values in the Calibrate Force screen.

Calibrate Force: Electrode 0		
OUT Point 1		
0 mV	0 lb	
OUT Point 2		
10.0 V	2247 lb	
IN Point 1	)	
0 mV	0 lb	
IN Point 2		
10.0 V	2200 lb	

3.3.7. Copy electrode

Copy parameters from the electrode being edited to another electrode or to a range of electrodes.

3.4 History Log menu

The EN7000 stores the results of the last 6000 spot welds in a history log. The following data is stored in each record:

- Time/Date
- Measured Pre-heat current
- Measured Main current
- Measured Post-heat current
- Program used
- Measured force.

3.4.1. Records in log

The number of records in the History log.

3.4.2. Clear log

Pressing this button will clear the History log.

3.4.3. View log

Press this button to display a record in the log. Scroll through the available records by pressing the left or right arrows at the top of the screen.

Log entry #1 of 250		
Time	Program	∧
24 Jul 2019 16.02.38	0	
Current (pre)	Force	
5.50 kA	113 lb	
Current (main)		
10.0 kA		
Current (post)		∨
3.55 kA		

3.5 Configure menu

Global parameters of the EN7000 are configured in this screen. Refer to the **EN7000 Technical Manual Section 12** for further details of these parameters.

Configuration			
Features		Weld Type	
Standard	Extended	SPOT	
Sensor		Toroid Test	
C.T.	TOROID	OFF	ON
Frequency		Units	
50 Hz	60 Hz	METRIC	IMP
Program Select		Electrodes	
EXTERN	INTERN	SINGLE	MULTI
SCR Select		2nd Stage	
DIRECT		OFF	
2nd Stage		Retract	
Once	Every	SIMPLE	
✓ Stop on Fault		✓ EOS on Fault	
☐ Headlock on Fault		I/O Source	
		DISCRETE	
Analog Output		Waveform: 10V =	
FORCE CONTROL		20.0 kA	
Contactor		Clock	
10 s		24 JUN 2019 14.57.30	
COM0		COM1	
COM2		COM3	
EXP (E/IP)		Initialise	
192.168.0.122			
Restart			

3.5.1. Features

Sets *Extended* or *Standard* features. Set to *Extended* to enable the following features:
- Seam welding
- Post-heat interval
- Force profile
- Multi electrodes
- Cascade
- Multi WAV.

If the application does not need these features, select *Standard* to reduce the number of menu items displayed. The EN7000 must be restarted after changing this setting.

3.5.2. Weld type `Extended`

Select *Spot* / *Seam*. The EN7000 must be restarted after changing this setting

3.5.3. Sensor

Select *CT* or *Toroid* for the type of sensor connected to the control for current measurement. Normally, a CT is used on the primary and a Toroid is used on the secondary.

3.5.4. Toroid test

If set to *ON*, the EN7000 will test the resistance of the external toroid to be within a range of 10 – 300 Ohms.

3.5.5. Frequency (parameter)

Set to *50 Hz* or *60 Hz* to match the frequency of the AC line.

3.5.6. Units (parameter)

Select *METRIC* / *IMPERIAL*

3.5.7. Program select (parameter)

Set the source for Program selection. Select *EXTERN* for discrete input or field bus. Select *INTERN* to use the program number entered in the *Use program* parameter.

3.5.8. Electrodes `Extended`

Select *Single* for one electrode or *Multi* for up to eight.

3.5.9. SCR select   `Extended`

Select **Direct** (1 – 4 SCRs) / **Encoded** (5 – 8 SCRs) / **3-Phase**

3.5.10. 2nd stage (1)

- **Off** – the 2nd Stage input is not tested
- **Before Squeeze** - the 2nd Stage input is tested Before Squeeze
- **After Squeeze** - the 2nd Stage input is tested After Squeeze

3.5.11. 2nd stage (2)

In a cascade sequence select **Once** to test 2nd Stage only at the start of the sequence or **Every** to test 2nd Stage at the start of every program within a cascade sequence.

3.5.12. Retract (parameter)

Select how the EN7000 will respond to the Retract input.

- Simple – HAV output will follow the Retract input prior to the Start input.
- HiLift + – HAV output will turn on when the Retract input turns on and remain on until the Retract input turns on again.
- HiLift - – HAV output will turn off when the Retract input turns on and remain off until the Retract input turns on again.
- Maintained – HAV output will follow the Retract input before and after the Start input.

3.5.13. Stop on fault

Checking this box will inhibit further welds until the fault is reset. If this occurs within a cascade sequence, the sequence will resume once the fault is reset.

3.5.14. EOS on fault

Checking this box will cause the EOS output to activate on a fault.

3.5.15. Headlock on fault

Checking this box will cause the head to lock on a fault.

3.5.16. I/O source

Select the I/O source

- Discrete – use the discrete terminals X2 and X3.
- COM0 – use MODBUS TCP/IP (Ethernet) on COM0
- COM1 – use MODBUS TCP/IP (Ethernet) on COM1.
- COM2 – use MODBUS RTU (RS485) on COM2.
- COM3 – use RS232 on COM3.
- COM4 – use MODBUS TCP/IP (Ethernet) on COM4.
- COM5 – use MODBUS TCP/IP (Ethernet) on COM5
- COM6 (E/IP) – use EtherNet/IP on COM6.

3.5.17. Analog output

Select *Force Control* or *Analog Waveform*

3.5.18. Waveform 10V=

The full-scale value of current that corresponds to 10 Vdc on the Analog output channel. *Analog Output* must be set to *Analog Waveform* to use this function.

3.5.19. Contactor

The time that the Isolation Contactor (if equipped) is to remain on after the last weld (delay off).

3.5.20. Clock menu

Tap this button to open the clock menu and set the current time and date.

3.5.21. COM0

Tap to view the COM0 information.

3.5.22. COM1

Tap to view the COM1 information.

3.5.23. COM2 menu

Tap this button to access the COM2 settings.

COM2		
RS485	MODBUS-RTU SLAVE	∧
Address	Baud rate	
2	57600	
		∨

3.5.23.1. Address

Address of the MODBUS RTU Slave (the EN7000).

3.5.23.2. Baud rate

Baud rate of the MODBUS RTU Slave (the EN7000).

3.5.24. COM3 information

Tap this button to view the COM3 information.

3.5.25. Initialize button

Tap this button to initialize the EN7000 to factory settings. Use with caution as all previous settings will be lost.

3.5.26. Restart button

Tap this button to restart the EN7000.

3.5.27. EXP (E/IP) button

Selects the EtherNet/IP adapter menu, and shows the assigned IP address. Only shown if EtheNet/IP adapter board is fitted.

EXP (E/IP)		
IP address [0]	Sub-net mask [0]	
192	255	
IP address [1]	Sub-net mask [1]	
168	255	
IP address [2]	Sub-net mask [2]	
0	255	
IP address [3]	Sub-net mask [3]	
122	0	
Gateway [0]	COM4	
192		
Gateway [1]	COM5	
168		
Gateway [2]	COM6 (E/IP)	
0	CONNECTED	
Gateway [3]	MAC ID	
250	54:10:EC:9F:9D:41	

3.5.27.1. IP address [0 to 3]
The IP address for COM4,5,6.
3.5.27.2. Sub-net mask [0 to 3]
The Sub-net mask for the IP address.
3.5.27.3. Gateway [0 to 3]
The gateway address (not used by EN7000)
3.5.27.4. COM4
Tap to view COM4 information.
3.5.27.5. COM5
Tap to view COM5 information.
3.5.27.6. COM6
Shows the status of the EtherNet/IP Class 1 (implicit) connection.
3.5.27.7. MAC ID
Shows the hardware ID.

3.6 Discrete I/O status

The status of the discrete inputs and outputs are available by tapping the Discrete I/O button on the Main menu. The 16 inputs are displayed on the top eight rows (yellow LED icon) and correspond to the X3 input terminals on the EN7000. The outputs are the lower eight rows (red LED icon) and correspond to the X2 output terminals. The indicator to the left of the item will be illuminated if the input or output are ON.
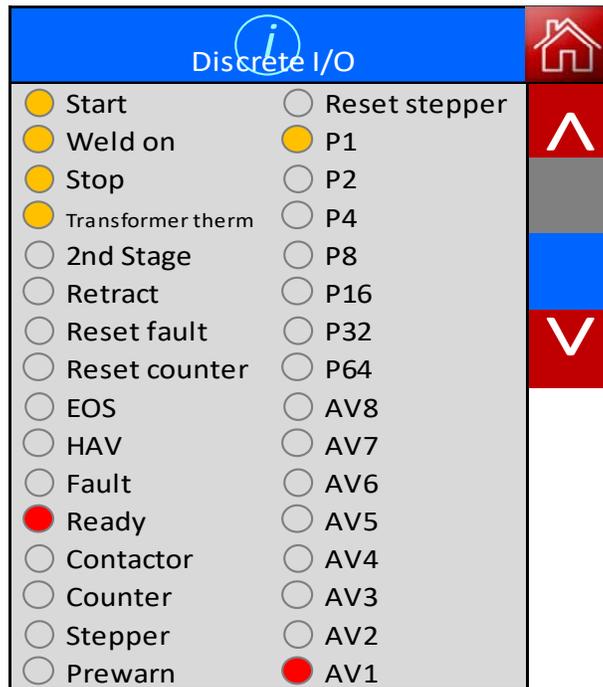
3.7 Bus I/O Status

The BUS I/O is identical to the Discrete I/O with the following exceptions:

- Transformer Thermal is a hardwired input only and is not communicated over fieldbus.
- The Program Select bits P1 – P64 are not displayed. Their decimal value is converted internally and shown in the **Use Program** field of the **Main menu**.
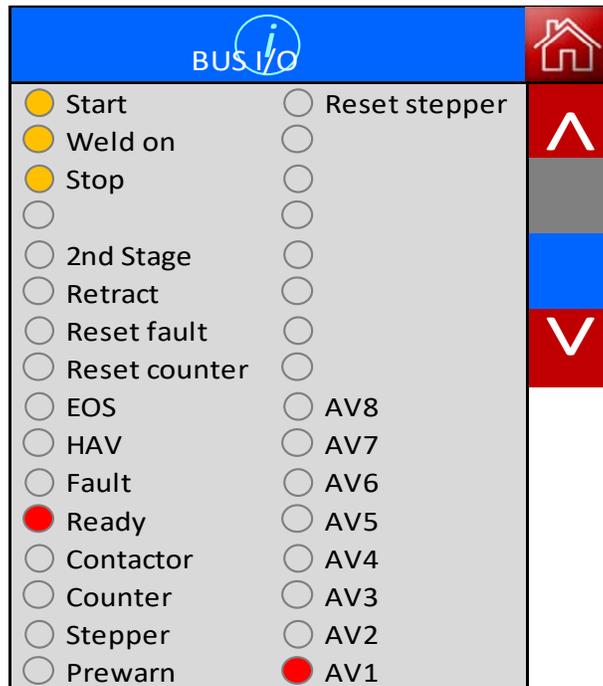
3.8 Analog I/O Status

The Analog I/O screen displays the dynamic voltage of the analog input and output channels.

3.9 System information

Displays the following information:

- EN7000 firmware version
- EN7000 BIOS version
- Hardware version
- RAM size
- Display firmware version
- Type of adapter board fitted

⚠️ **This procedure must be performed by qualified personnel.**

Once the EN7000 is installed and power has been applied, the Quick Start procedure below can be performed to make a basic spot weld.

This example makes use of a single stage foot switch and a pneumatic solenoid valve controlling manually regulated air.

4.1 Wire the discrete I/O

If not already wired, make the connections to the EN7000 as shown below:
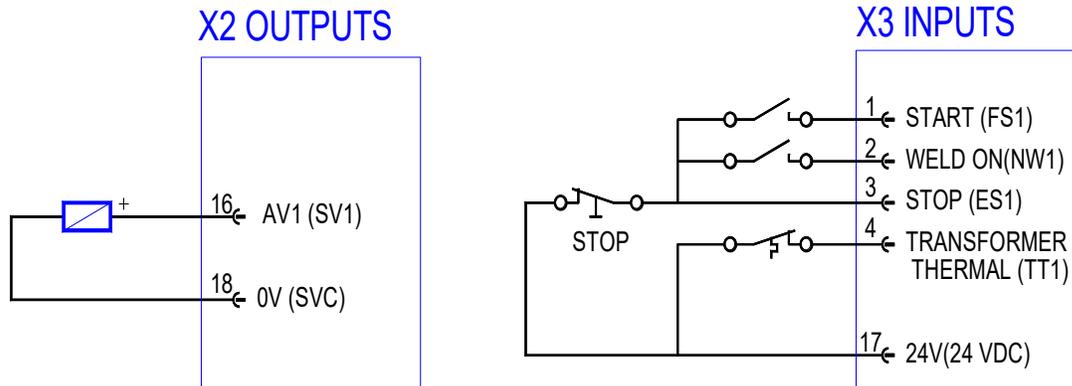
The load connected to AV1 is the solenoid for the welding machine air valve. The switch connected to START is usually a foot switch.

If any switch shown is not required, then replace it with a link.
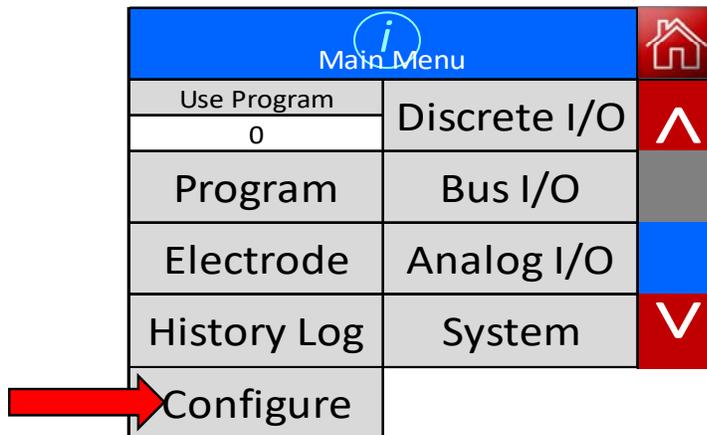
4.2 Access the Main menu

On power-up, the splash-screen is displayed.

Tap the **HOME** icon to go to the Main menu

4.3 Access the Configuration menu

Scroll down the Main Menu and tap **Configure**. You will be asked to confirm this selection.

4.3.1. Set the Configuration parameters

Set the Configuration parameters as shown here:

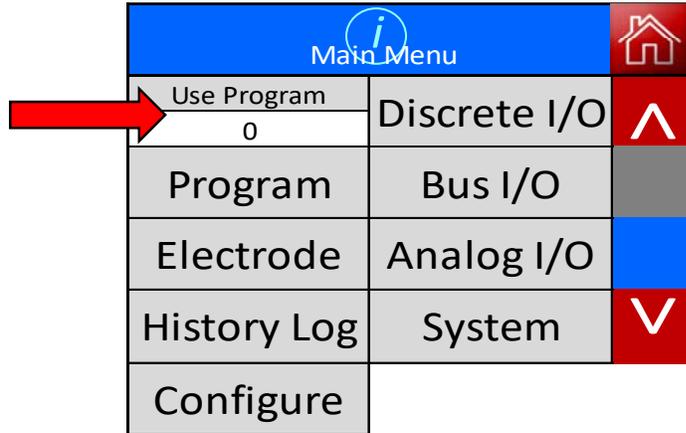| Configuration		
Features		**Weld Type**
Standard	Extended	SPOT
Sensor		**Toroid Test**
C.T.	TOROID	OFF / ON
Frequency		**Units**
50 Hz	60 Hz	METRIC / IMP
Program Select		**Electrodes**
EXTERN	INTERN	SINGLE / MULTI
SCR Select		**2nd Stage**
DIRECT		OFF
2nd Stage		**Retract**
Once	Every	SIMPLE
☑ Stop on Fault		☑ EOS on Fault
☐ Headlock on Fault		**I/O Source** DISCRETE
Analog Output FORCE CONTROL		**Waveform: 10V =** 20.0 kA
Contactor 10 s		**Clock** 24 JUN 2019 14.57.30
COM0		COM1
COM2		COM3
Initialise		Restart

Select the appropriate line frequency.

After all changes have been made, RESTART the EN7000

4.4 After the Restart, tap the HOME icon to access the Main menu (as in 4.2)
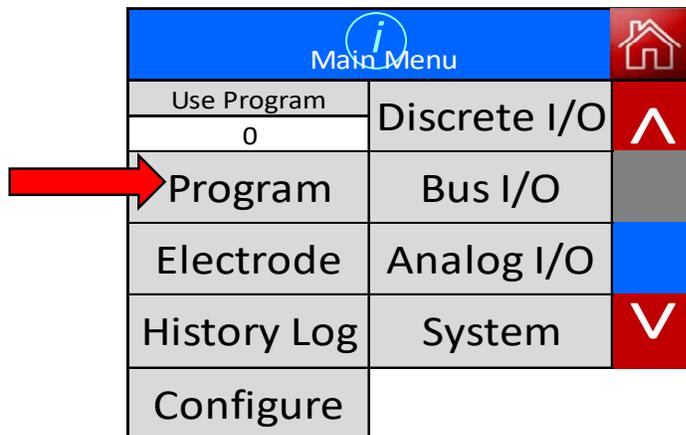
4.5 Edit the Use Program parameter

Program 0 will be used for this example.

4.6 Access the Program menu

4.6.1. Select Program 0

4.7 Access the Options menu

i Program menu		🏠
Program **0**	Time	∧
Current	Force	
Valves	Options	←
Copy	START	∨

4.7.1. Assign options

Assign the values shown:

i Options: Program 0		🏠
☐ Program Inhibit	☐ Pre-heat	∧
Pulsations **1**	☐ Repeat	
		∨

⚠️ Make sure that the ***Program Inhibit*** item is **<u>not</u>** selected.

Tap the HOME icon to return to the Program menu.

4.8 Access the Current menu

Program menu		
Program 0	Time	∧
Current	Force	
Valves	Options	
Copy	START	∨

4.8.1. Set the Current parameters

Assign the values shown:

Current: Program 0		
Main heat mode	Main heat	∧
PHA | CCR	0%	
Current (main)	☐ Monitor	
10.00 kA	Current (main)	
Low Limit	High Limit	
5%	5%	
		∨

Tap the HOME icon to return to the Program menu.

4.9 Access the Timing menu

Program menu		
Program	Time	∧
0		
Current	Force	
Valves	Options	
Copy	START	∨

4.9.1. Assign the Time values

Assign the values shown:

Timing: Program 0		
Squeeze	Upslope	∧
99 ~	0 ~	
Main Heat	Downslope	
10 ~	0 ~	
Hold		
99 ~		
		∨

Tap the HOME icon to return to the Program menu, then tap HOME again to return to the Main menu.

4.10   Access the Electrode menu

Main Menu		
Use Program	Discrete I/O	∧
0		
Program	Bus I/O	
Electrode	Analog I/O	
History Log	System	∨
Configure		

4.10.1.   Access the Current Calibration screen

Electrode menu		
Counter	Stepper	∧
Current cal.	Force cal.	
		∨

4.10.1.1. Set the current calibration parameters

Set the parameters as shown:

Calibrate Current: Electrode 0		
Power Factor	CT	∧
0.30	1950 mV/kA	
Turns Ratio	Apply Conversion	
1:1	Off	
Point 1 (Pri)	Point 1 (Sec)	
200 A	1.00 kA	
Point 2 (Pri)	Point 2 (Sec)	∨
500 A	10.0 kA	
Toroid		
150 mV/kA		

4.11   We're ready to weld!

At this point the EN7000 is programmed to make a basic spot weld. Adjust the current by changing the *Main heat* parameter (see 4.8.1 above).

BF Entron Ltd. England.	Entron Controls LLC. USA.	Entron Controls De Mexico.
Tel: +44 (0)1384 455401	Tel: 864-416-0190	Tel: +52 (844) 415 9081

www.entroncontrols.com