



Application Note

EN7000 CT Sensitivity Setting

Firmware Version

All Versions

January 22

Document no. 700254-0



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Document Revisions

Date	Document Number	Approved By	Document Changes
27-01-2022	700254-0	Sean Simmons	Initial release of EN7000 CT Sensitivity application note

Languages

This document is only published in the English language.

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1 BACKGROUND

1.1 Description of the User

This application note is intended for anyone intending to calibrate the EN7000 control using the Primary CT provided in the weld control. This is typically a PLC programmer, Weld Engineer or Maintenance technician with the appropriate skills and tools necessary to carry out the calibration.

1.2 Conventions Used in This Manual

The following style conventions are used in this document:

Bold Italics type font is used for emphasis

- Bulleted lists generic lists and do not define a sequence or procedures

- 1) Numerical lists define a sequence or procedures

`Courier` text is used for system output, such as an error message or script
URLs, complete paths, filenames, prompts, and syntax

1.3 Explanation of Symbols

This section defines the symbols used throughout this document.

DANGER!



DANGER!
Danger indicates a hazard with a high level of risk which, if not avoided, will result in immediate, serious personal injury or loss of life. Examples are: exposed high voltage; exposed fan blades.

WARNING!



WARNING!
The Warning symbol indicates a hazard with a potential hazard which *could result* in personal injury or loss of life. Examples are: not using proper personal protect; removal of guards.

1.4 Important Safety Instructions

Before installing, starting up, or operating the [EN7000. All models produced in the USA], carefully read all safety instructions to ensure safe use of the product.

SAVE THESE INSTRUCTIONS

The safety instructions are part of the product. Keep the instructions in a safe and easily accessible place near the product.

DANGER!



Never open the enclosure door when the breaker is in the ON position.

DANGER!



Always disconnect power before servicing or establishing electrical connections with the product.

2 INTRODUCTION

2.1 Scope

All EN7000 AC controls are shipped with a Primary CT that measures primary current. The Primary CT has a Burden Resistor connected to it. The Burden Resistor is connected parallel to the Primary CT. Within the Primary CT there is a sensitivity parameter which will allow you to change the sensitivity value. The CT sensitivity value must be set to match the Burden Resistor value. All controls shipped from the factory should already have the correct CT sensitivity set.

For field installations of EN7000 weld timers, check the sensitivity parameter within the Primary CT is at the correct sensitivity value before calibration.

2.2 Product

This note applies to: All EN7000 AC, EN7000 Cascade and EN7000 3 Phase DC controls.

2.3 Main Component Overview

The Primary CT and Burden Resistor are shown in [Figure 1](#).

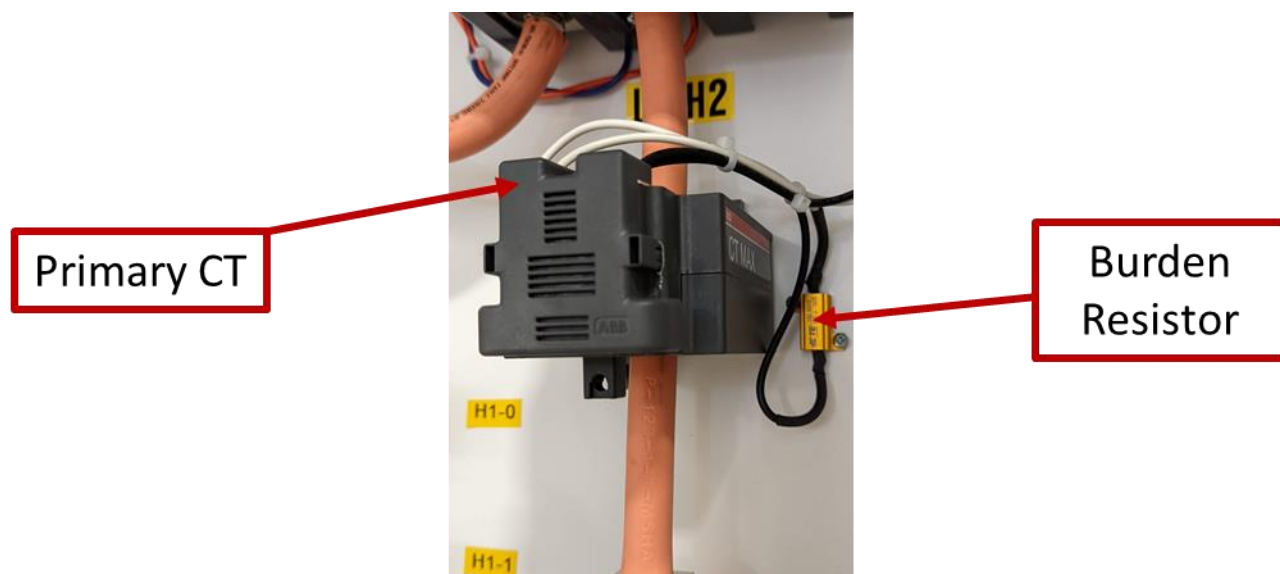


Figure 1 Primary CT and Burden Resistor

DANGER!



Never open the enclosure door when the breaker is in the ON position.

The EN7000 can be supplied with two different types of Burden Resistors. Both Burden Resistor’s have different values. Depending on the value of the Burden Resistor the CT sensitivity value must be changed to match the Burden Resistor value. This is shown in [Table 1](#).



Figure 2 Standard Burden Resistor value R39

Item	Burden Resistor value	Description	CT Sensitivity value
1	R39	Burden Resistor 0.390 Ohm	1950 mV/kA
2	R33	Burden Resistor 0.330 Ohm	1650 mV/kA

Table 1 CT Sensitivity Values

2.4 Tools Required

The CT Sensitivity value can be modified using the programming tools below.

- 1) EN7000TS – Touchscreen interface on the weld timer
- 2) NetFlash™ Software – the software can be connected to a PC through an Ethernet cable
- 3) WSP3 – handheld pendant

2.5 Instructions to Set the CT Sensitivity

The CT Sensitivity value in the EN7000 control must be set as a function of the burden resistor installed in the product. The factory sets the CT Sensitivity parameter during final test. However, a factory reset or field installation of the EN7000 weld timer may result in the CT Sensitivity value being improperly set.

To set the CT Sensitivity a user must use the following steps:

- 1) Determine which Burden Resistor is installed in the control
- 2) Set the CT Sensitivity parameter in the control based on the burden resistor value

NOTICE



Multiple Ways to Promgram CT Sensitivity value

The CT Sensitivity value can be programmed using various interfaces to the EN7000 weld timer. The options are the touchscreen, NetFlash™ software, or the WSP3 pendant. The user should use their preferred method.

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Instructions to Set the CT Sensitivity

2.5.1 Determine the Burden Resistor in your Control

The user must identify which Burden Resistor is installed with the control. Identifying which Burden Resistor is installed will allow the user to determine the correct sensitivity value to program into the EN7000 weld timer.

All instructions below are for a SINGLE electrode set up. For a MULTI electrode set up, please repeat instructions set out for the SINGLE set up below for each electrode so they are set to the same value. For more information on a MULTI electrode set up please refer to EN7000 User Guide.

STEP	INSTRUCTION							
1	<div><div><div>DANGER!</div><div></div></div><div>Never open the enclosure door when the breaker is in the ON position.</div></div>							
2	With the POWER OFF, open cabinet and locate the CT and Burden Resistor.							
3	Identify if the Burden Resistor value is R39 or R33.	<div></div>						
4	Write down the CT sensitivity value for the Burden Resistor value found.	<table><tr><th>Burden Resistor value</th><th>CT Sensitivity value</th></tr><tr><td>R39</td><td>1950 mV/kA</td></tr><tr><td>R33</td><td>1650 mV/kA</td></tr></table>	Burden Resistor value	CT Sensitivity value	R39	1950 mV/kA	R33	1650 mV/kA
Burden Resistor value	CT Sensitivity value							
R39	1950 mV/kA							
R33	1650 mV/kA							
5	Go to the instructions to program the CT sensitivity for your preferred programming method.							

INTRODUCTION

Instructions to Set the CT Sensitivity

2.5.2 Program the CT Sensitivity value



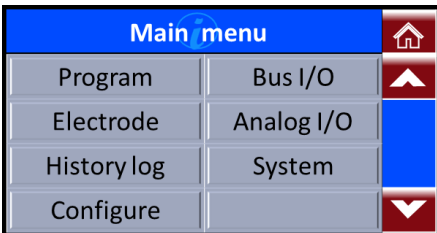

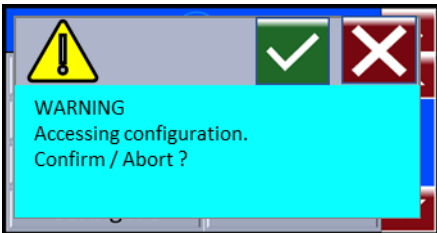

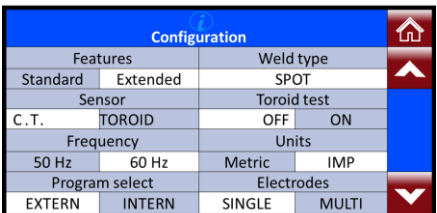
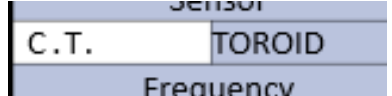
The CT Sensitivity value can be programmed using your preferred method of programming. The options to program are as follows:

- 1) EN7000TS – Touchscreen interface on the weld timer
- 2) NetFlash™ Software – the software can be connected to a PC through an Ethernet cable
- 3) WSP3 – handheld pendant

The instructions to set the CT sensitivity value for each interface method is defined below.

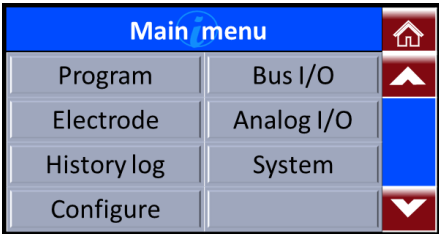

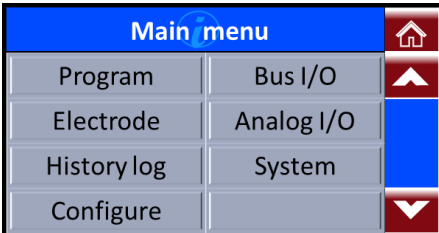

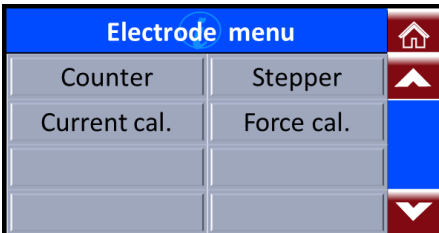

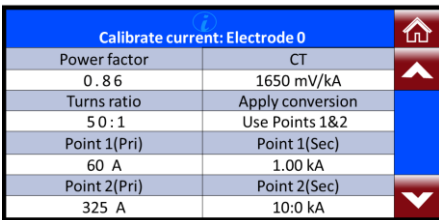
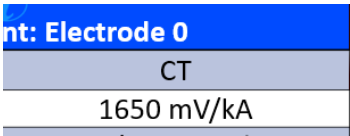
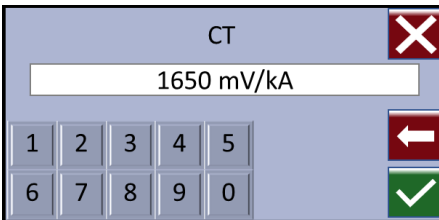

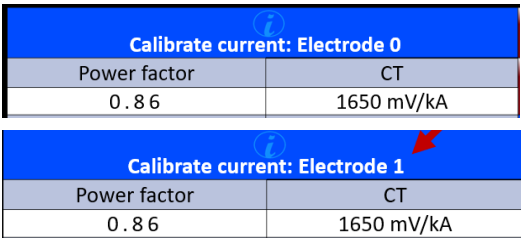
2.5.2.1 EN7000TS Models – Touchscreen

If your EN7000 has a touchscreen interface, you can follow the instructions below to set the CT sensitivity value.

STEP	INSTRUCTION	SCREEN	TOUCH MENU SELECTION
1	On the STARTUP Screen, Press the Home button		
2	On the Main Menu, scroll down to find the CONFIGURE button Press the CONFIGURE BUTTON		
3	When configure is selected a warning box will show. To progress select the checkmark.		
4	In the CONFIGURATION menu: Confirm the Sensor is set to C.T.		

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Instructions to Set the CT Sensitivity

5	Press the HOME Key to return to Main menu		
6	In the Main Menu: Press the Electrode menu		
7	In the Electrode menu: Press the Current cal. button		
8	In the Calibrate current menu: Press the CT field to edit CT value		
9	Adjust CT Value as follows: If using R33 set 1650 mV/kA If using R39 set 1950 mV/kA Press the check mark to accept		
10	When timer is configured to MULTI all electrodes 0-7 must use the same value.		

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If any changes have been made during this set up then you will need to do a complete CT calibration.

Refer to EN7000 User Guide for the CT calibration procedure.

EN7000 User Guide

4.3. Current calibration

The welding current can be measured by a Current Transformer (CT) or by a coil (toroid) on the primary or secondary circuit. If the sensor is measuring the primary current EN7000 can display secondary current when the relationship between primary and secondary current has been calibrated.

Parameter	Units	Range	Description
Power factor	cos (°)	0 - 0.99	The power factor of the welding transformer ¹
Toroid	mV/kA	100 - 60000	The sensitivity of the toroid
Toroid factor		1 - 10	The ratio of the external attenuator (1 if no attenuator fitted)
CT	mV/kA	100 - 60000	The sensitivity of the CT
Point 1 (primary)	kA	0 - 92.0	The measured value of primary current at a low heat (Ip1)
Point (secondary)			
Point 2 (primary)	kA	0 - 92.0	The measured value of primary current at a high heat (Ip2)
Point (secondary)			
Point	kA	0 - 92.0	The measured value of secondary current at a high heat (Is2)
Apply conversion	off/points/ratio		Use the conversion to display secondary current (CT only)
Turns ratio		1 - 999	The turns ratio of the welding transformer (CT only)
CCR gain ²		1 - 10	The CCR gain. Set to 5 as a starting point
CCR 0V ³	kA	0 - 500.0	Scales the analog control input for CCR operation
CCR 10V ³	kA	0 - 500.0	Scales the analog control input for CCR operation

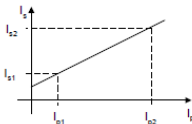
¹ See Tutorial: Setting the power factor.

² Seam mode only.

³ Analog control mode only.

If using a CT the turns ratio of the transformer can be used to scale the current. Alternatively, the scaling can be determined by measuring the values of primary and secondary current at two different heat levels.

- Produce a short circuit weld at a low heat in PHA mode and measure the primary current (Ip1) and secondary current (Is1) using an external weld current meter.
- Repeat the short circuit weld at a higher heat and measure the primary current (Ip2) and secondary current (Is2) using an external weld current meter.



Enter the measured values into the Point 1/Point 2 parameters. Select the appropriate conversion method.

The current can be independently calibrated for each electrode.

The latest version of the EN7000 user guide can be found on our website.

Click the link below.

[ENTRON Document Library - Entron Controls](#)

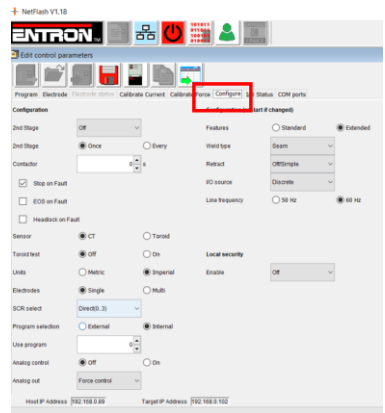

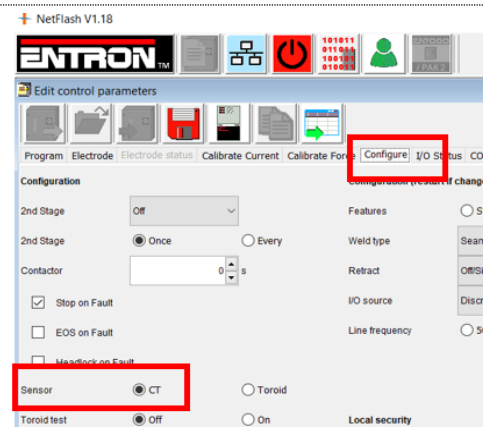

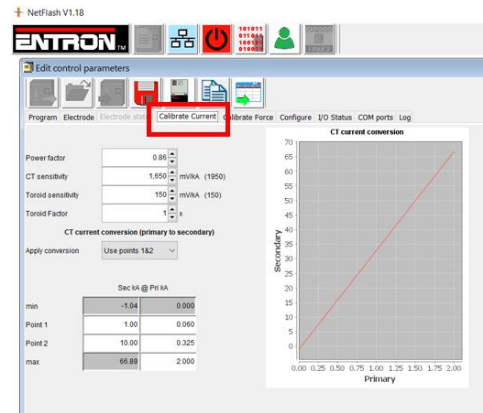
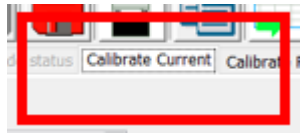
Table 2 Instructions Using EN7000TS Touch Screen

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Instructions to Set the CT Sensitivity

2.5.3 NetFlash™ Software

If you have the NetFlash™ software, a PC, and an ethernet cable to connect to the EN7000 timer, you can follow the instructions below to set the CT Sensitivity value for all EN7000 models.

1	Open Net Flash Software and select CONFIGURATION tab.		
2	In Configure Tab: Confirm parameter is set to Sensor CT		
3	Select CALIBRATE CURRENT Tab		

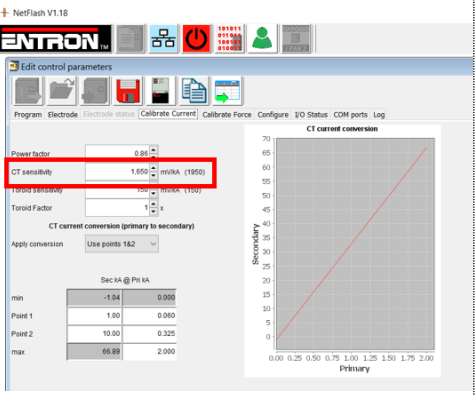

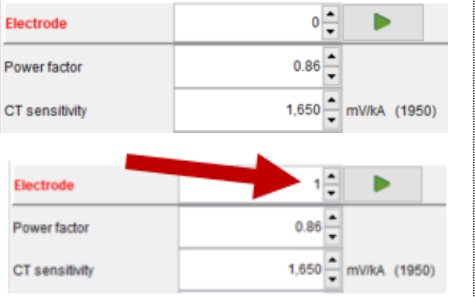
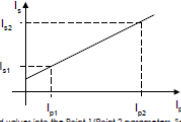
4	<p>Adjust Primary CT Sensitivity</p> <p>If using R33 set 1650 mV/kA</p> <p>If using R39 set 1950 mV/kA</p>																																																										
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5	<p>If any changes have been made during this set up then you will need to do a complete CT calibration.</p> <p>Refer to EN7000 User Guide for the CT calibration procedure.</p>	<p>EN7000 User Guide</p> <p>4.3. Current calibration</p> <p>The welding current can be measured by a Current Transformer (CT) or by a coil (toroid) on the primary or secondary circuit. If the sensor is measuring the primary current EN7000 can display secondary current when the relationship between primary and secondary current has been calibrated.</p> <table><thead><tr><th>Parameter</th><th>Units</th><th>Range</th><th>Description</th></tr></thead><tbody><tr><td>Power factor</td><td>cos (°)</td><td>0 - 0.86</td><td>The power factor of the welding transformer¹</td></tr><tr><td>Toroid</td><td>mV/kA</td><td>100 - 60000</td><td>The sensitivity of the toroid</td></tr><tr><td>Toroid factor</td><td></td><td>1 - 10</td><td>The ratio of the external attenuator (1 if no attenuator fitted)</td></tr><tr><td>CT</td><td>mV/kA</td><td>100 - 60000</td><td>The sensitivity of the CT</td></tr><tr><td>Point 1 (primary)</td><td>kA</td><td>0 - 32.0</td><td>The measured value of primary current at a low heat (Ip1)</td></tr><tr><td>Point 1 (secondary)</td><td>kA</td><td>0 - 500.0</td><td>The measured value of secondary current at a low heat (Is1)</td></tr><tr><td>Point 2 (primary)</td><td>kA</td><td>0 - 32.0</td><td>The measured value of primary current at a high heat (Ip2)</td></tr><tr><td>Point 2 (secondary)</td><td>kA</td><td>0 - 500.0</td><td>The measured value of secondary current at a high heat (Is2)</td></tr><tr><td>Apply conversion</td><td>off/points/ratio</td><td></td><td>Use the conversion to display secondary current (CT only)</td></tr><tr><td>Turns ratio</td><td></td><td>1 - 999</td><td>The turns ratio of the welding transformer (CT only)</td></tr><tr><td>CCR gain²</td><td></td><td>1 - 10</td><td>The CCR gain. Set to 5 as a starting point</td></tr><tr><td>CCR 0V³</td><td>kA</td><td>0 - 500.0</td><td>Scales the analog control input for CCR operation</td></tr><tr><td>CCR 10V³</td><td>kA</td><td>0 - 500.0</td><td>Scales the analog control input for CCR operation</td></tr></tbody></table> <p>¹ See Tutorial 6: Setting the power factor.</p> <p>² Seam mode only.</p> <p>³ Analog control mode only.</p> <p>If using a CT the turns ratio of the transformer can be used to scale the current. Alternatively, the scaling can be determined by measuring the values of primary and secondary current at two different heat levels:</p> <ul style="list-style-type: none">Produce a short circuit weld at a low heat in PHA mode and measure the primary current (Ip1) and secondary current (Is1) using an external weld current meter.Repeat the short circuit weld at a higher heat and measure the primary current (Ip2) and secondary current (Is2) using an external weld current meter.  <p>Enter the measured values into the Point 1/Point 2 parameters. Select the appropriate conversion method.</p> <p>The current can be independently calibrated for each electrode.</p>	Parameter	Units	Range	Description	Power factor	cos (°)	0 - 0.86	The power factor of the welding transformer ¹	Toroid	mV/kA	100 - 60000	The sensitivity of the toroid	Toroid factor		1 - 10	The ratio of the external attenuator (1 if no attenuator fitted)	CT	mV/kA	100 - 60000	The sensitivity of the CT	Point 1 (primary)	kA	0 - 32.0	The measured value of primary current at a low heat (Ip1)	Point 1 (secondary)	kA	0 - 500.0	The measured value of secondary current at a low heat (Is1)	Point 2 (primary)	kA	0 - 32.0	The measured value of primary current at a high heat (Ip2)	Point 2 (secondary)	kA	0 - 500.0	The measured value of secondary current at a high heat (Is2)	Apply conversion	off/points/ratio		Use the conversion to display secondary current (CT only)	Turns ratio		1 - 999	The turns ratio of the welding transformer (CT only)	CCR gain ²		1 - 10	The CCR gain. Set to 5 as a starting point	CCR 0V ³	kA	0 - 500.0	Scales the analog control input for CCR operation	CCR 10V ³	kA	0 - 500.0	Scales the analog control input for CCR operation	<p>The latest version of the EN7000 user guide can be found on our website.</p> <p>Click the link below.</p> <p>ENTRON Document Library - Entron Controls</p>
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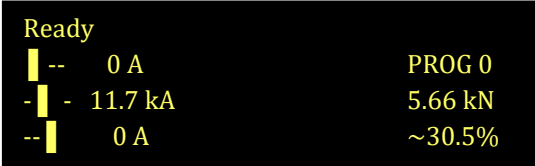
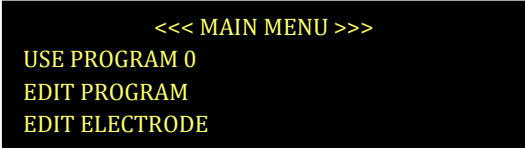

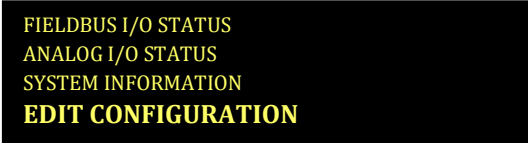

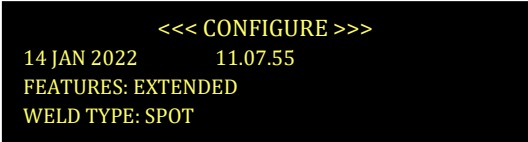


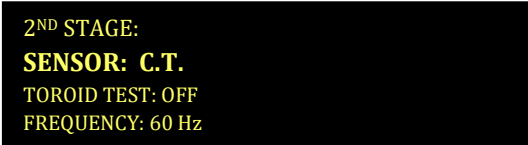
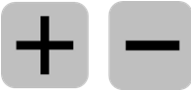
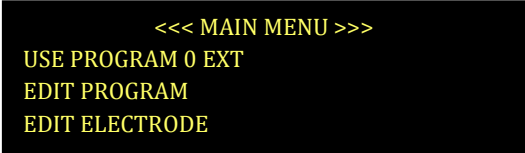

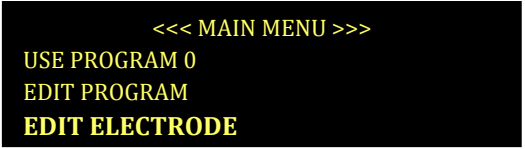

Table 3 Instructions using NetFlash PC Software

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Instructions to Set the CT Sensitivity

2.5.4 WSP3 Handheld Pendant

If you have the WSP3 Handheld pendant, you can set the CT Sensitivity value on all EN7000 models by following the instructions below.

Step	Description	Screen / Parameters	Key Inputs
1	Turn ON the EN7000 Weld Control		
2	The Status Screen will be displayed on the WSP3		
3	Press the F key to navigate to the <<Main Menu>>		
4	Scroll down to find EDIT CONFIGURATION		
5	Open the CONFIGURATION menu Press and hold enter key then press the F key		 + 
6	Scroll down to find SENSOR confirm is set to C.T.		
7	Return to Main Menu		
8	Use arrows to scroll and then select EDIT ELECTRODE		

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9	Use arrows to scroll and then select CALIBRATE CURRENT menu	<div><<<ELECTRODE>>></div> <div>EDIT COUNTER</div> <div>EDIT STEPPER</div> <div>CALIBRATE CURRENT</div>																																																									
10	Adjust CT Sensitivity to: 1650mV/kA if using R33 1950mV/kA if using R39	<div><<<CURRENT CAL>>></div> <div>POWER FACTOR:0.86</div> <div>CT: 1650 mV/kA</div> <div>URNS RATIO: 50:1</div>	<div>+</div> <div>-</div>																																																								
11	Refer to EN7000 User Guide 1.23 Section 4.3, P34: Current Calibration. Proceed to calibrate weld control from this point.	<div>EN7000 User Guide</div> <div>4.3. Current calibration</div> <div>The welding current can be measured by a Current Transformer (CT) or by a coil (toroid) on the primary or secondary circuit. If the sensor is measuring the primary current EN7000 can display secondary current when the relationship between primary and secondary current has been calibrated.</div> <table><thead><tr><th>Parameter</th><th>Units</th><th>Range</th><th>Comments</th></tr></thead><tbody><tr><td>Power factor</td><td>cos (φ)</td><td>0 - 0.98</td><td>The power factor of the welding transformer</td></tr><tr><td>Toroid</td><td>mV/kA</td><td>100 - 20000</td><td>The sensitivity of the toroid</td></tr><tr><td>Toroid factor</td><td></td><td>1 - 10</td><td>The ratio of the external attenuator (1) if no attenuator fitted</td></tr><tr><td>CT</td><td>mV/kA</td><td>100 - 20000</td><td>The sensitivity of the CT</td></tr><tr><td>Point 1 (primary)</td><td>kA</td><td>0 - 32.0</td><td>The measured value of primary current at a low heat (p1)</td></tr><tr><td>Point (secondary)</td><td>kA</td><td>0 - 500.0</td><td>The measured value of secondary current at a low heat (s1)</td></tr><tr><td>Point 2 (primary)</td><td>kA</td><td>0 - 32.0</td><td>The measured value of primary current at a high heat (p2)</td></tr><tr><td>Point (secondary)</td><td>kA</td><td>0 - 500.0</td><td>The measured value of secondary current at a high heat (s2)</td></tr><tr><td>Apply conversion</td><td>off/points/ratio</td><td></td><td>Use the conversion to display secondary current (CT only)</td></tr><tr><td>Turns ratio</td><td></td><td>1 - 999</td><td>The turns ratio of the welding transformer (CT only)</td></tr><tr><td>CCR gain¹</td><td></td><td>1 - 10</td><td>The CCR gain. Set to 5 as a starting point</td></tr><tr><td>CCR 0V²</td><td>kA</td><td>0 - 500.0</td><td>Scales the analog control input for CCR operation</td></tr><tr><td>CCR 10V²</td><td>kA</td><td>0 - 500.0</td><td>Scales the analog control input for CCR operation</td></tr></tbody></table> <div>¹ See Tutorial: Setting the power factor. ² Exam mode only. ³ Analog control mode only.</div> <div>If using a CT the turns ratio of the transformer can be used to scale the current. Alternatively, the scaling can be determined by measuring the values of primary and secondary current at two different heat levels.</div> <ul style="list-style-type: none">Produce a short circuit weld at a low heat in PHA mode and measure the primary current (p1) and secondary current (s1) using an external weld current meter.Repeat the short circuit weld at a higher heat and measure the primary current (p2) and secondary current (s2) using an external weld current meter. <div></div> <div>Enter the measured values into the Point 1/Point 2 parameters. Select the appropriate conversion method.</div> <div>The current can be independently calibrated for each electrode.</div>	Parameter	Units	Range	Comments	Power factor	cos (φ)	0 - 0.98	The power factor of the welding transformer	Toroid	mV/kA	100 - 20000	The sensitivity of the toroid	Toroid factor		1 - 10	The ratio of the external attenuator (1) if no attenuator fitted	CT	mV/kA	100 - 20000	The sensitivity of the CT	Point 1 (primary)	kA	0 - 32.0	The measured value of primary current at a low heat (p1)	Point (secondary)	kA	0 - 500.0	The measured value of secondary current at a low heat (s1)	Point 2 (primary)	kA	0 - 32.0	The measured value of primary current at a high heat (p2)	Point (secondary)	kA	0 - 500.0	The measured value of secondary current at a high heat (s2)	Apply conversion	off/points/ratio		Use the conversion to display secondary current (CT only)	Turns ratio		1 - 999	The turns ratio of the welding transformer (CT only)	CCR gain ¹		1 - 10	The CCR gain. Set to 5 as a starting point	CCR 0V ²	kA	0 - 500.0	Scales the analog control input for CCR operation	CCR 10V ²	kA	0 - 500.0	Scales the analog control input for CCR operation	<div>The latest version of the EN7000 user guide can be found on our website.</div> <div>Click the link below.</div> <div>ENTRON Document Library - Entron Controls</div>
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Table 4 Instructions using WSP3 Hand Held Pendant

3 Technical Support

3.1.1 Internet

The latest version of the documentation and other helpful resources in the ENTRON Document Library page found in the Resource section of the ENTRON website: <https://www.entroncontrols.com>

3.1.2 Documentation Request

Documentation, user instructions and technical information can be requested by emailing ENTRON Controls at customerservice@entroncontrols.com or support@bfentron.co.uk

Please include your name and email

3.1.3 Service and Technical Support

For service and technical support, we request that customers fill out the Technical Support Form found on our website at link below:



TECHNICAL SUPPORT FORM LINK

<https://www.entroncontrols.com/resources/technical-support.html>

After the web form has been completed, your case will be assigned to one of our technical specialists who will contact you directly.

and service sites is shown in the table below. Please contact the site for your specific region.

Manufacturing Site	Country	Phone	Email	Regions Supported
ENTRON UK	England	+44-1384-455401	support@bfentron.co.uk	Europe, Asia, Africa, Rest of World
ENTRON US	USA	+1-864-416-0190	tech.support@entroncontrols.com	USA, Canada
ENTRON MX	Mexico	+52-844-415-9081	soporte@entronmx.com	Mexico, Central America