



Arc Welding Power Supply

**PA20P-x, PA40P-x, PA60P-x, PA100P-x,
PA-200P-x**

**Single & Multi-output
DC TIG Welders**

OPERATION MANUAL



Annex:

- Safety Regulations
- General References on Arc welding
- Contact addresses

Versions		
Version	Date	Basis of Version
10	2018-10	Conversion to new layout
11	2020-04	Detail Update

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Table of Contents

1	General Information	5
2	Technical Description.....	6
2.1	Technical Specification	6
2.2	Introduction	7
3	Commissioning	8
3.1	Electrical Connections	8
3.2	Shield Gas Connections.....	9
3.3	Rear Panel Layout.....	10
3.4	Getting Started	12
3.4.1	Power on	12
3.4.2	The Default Menu Screen	12
3.4.3	Information Colour Coding Key.....	13
3.4.4	Memory Organisation	14
3.4.4.1	Memory Locations (Profiles)	14
3.4.4.2	Scratchpad Memory	14
3.5	Limit Functions	15
3.5.1	Monitored Limit Parameters	15
3.5.2	High Voltage Limit	15
3.5.3	Low Voltage Limit	15
3.5.4	High Energy Limit	15
3.5.5	Low Energy Limit	15
3.6	Password Entry Screen (Log in/out).....	16
4	Setup (Man mode).....	17
4.1	Setup screen.....	17
4.2	Setup (Man mode) Graph Screen	19
4.3	Setup (Man mode) Load Screen	20
4.4	Setup (Man mode) Save Screen	21
5	Profile Editor.....	22
5.1	Profile Editor screen.....	22
5.2	Profile Editor Load Screen.....	24
5.3	Profile Editor Save Screen	25
6	Run (Auto Mode)	26
6.1	Run (Auto Mode) Main Monitor Screen	26
6.2	Run (Auto mode) Monitor Screen.....	27
6.3	Run (Auto mode) Load Screen	30
7	Configuration Screen	31
8	Gas Control Screen	32
9	IO Monitor Screen	33
10	Control Connections	34

10.1	RS232 Port (9way D Type).....	34
10.2	MWSBus.....	34
10.3	USB Port	34
10.4	AVM Voltage Output Terminals	35
10.5	Single Output Digital I/O (37way D Type)	35
10.6	Multiple Output Digital I/O (37way D Type)	36
10.7	Remote Profile Select (15way D Type).....	37
11	Process Faults and Warnings.....	38
11.1	High Voltage Limit Fault.....	38
11.2	Low Voltage Limit Fault.....	38
11.3	High Energy Limit Fault.....	38
11.4	Low Energy Limit Fault	38
11.5	Additional Warnings	38
12	Basic Trouble Shooting Guide	40
13	Index.....	42
13.1	Headword Index	42

1 General Information



Information about safety regulations, symbols, copyrights, protection rights, usage location conditions can be found in the back section of these operating instructions.

Please read this information carefully before using these operating instructions.

These operating instructions should help you familiarize yourself with the system and take advantage of its application possibilities when used as directed.

It contains important notes to help operate the unit safely, properly, and economically.

Observing the notes will help avoid risks, decrease repair costs and down times, and enhance reliability and the service life of the unit.



Warning

It is a rule: **Safety first!**



Danger

Incorrect or inappropriate configuration, installation, settings, handling or use can cause mechanical, electrical or thermal hazards, which may result in serious damage or injury.

Ensure the correct execution of these points and follow the respective notes in the operating instructions.



Do not put the system into operation before you have read the **operating instructions!**



Danger



Persons with **cardiac pacemakers** and **metallic implants** are prohibited from approaching to within a radius of **at least 5 m** of welding equipment!



Warning

Crushing Hazard

There is a risk of crushing during the adjustment movement due to closing electrodes, stops for limiting adjustment or stroke movement and the stop on the basic pincers unit for limiting floating movement.



Warning

This **Class A welding equipment** is not supposed to be used in living quarters, where the power supply is carried out by a public low voltage supply.

There it can be difficult to ensure electromagnetic compatibility because of conducted or radiated disturbances.



Warning

Restrictions on use environment conditions

Use this equipment in an environment without conductive dust. If conductive dust enters into equipment, it may cause failure, electric shock or ignition. If using equipment in such environment, consult Amada Weld Tech.

2 Technical Description

2.1 Technical Specification

	PA-20P-x	PA-40P-x	PA-60P-x	PA-100P-x	PA-200P-x
Maximum Output Current	20Amps	40Amps	60Amps	100Amps	200Amps
Output Voltage	Main Supply 80V D.C. Auxiliary Starting Supply 200V D.C. High Voltage Starting Supply 12KV	Main Supply 70V D.C. Auxiliary Starting Supply 150V D.C. High Voltage Starting Supply 12KV	Main Supply 70V D.C. Auxiliary Starting Supply 150V D.C. High Voltage Starting Supply 12KV	Main Supply 45V D.C. Auxiliary Starting Supply 150V D.C. High Voltage Starting Supply 12KV	Main Supply 45V D.C. Auxiliary Starting Supply 150V D.C. High Voltage Starting Supply 12KV
Duty Cycle	100% 20Amps	25% 40Amps	5% 60Amps	5% 100Amps	5% 100Amps
RS232 baud rate	9600,38400 & 57600				
Accuracy	Within +/-1%				
Cooling	Air-cooled with over temperature protection				
Data Retention	Trend data/user password 100 days with fully Charger lithium battery. (96 hour charge). Profile/Calibration data 10 years.				
Dimensions	Depth	490mm	490mm	490mm	630mm
	Width	270mm	270mm	270mm	450mm
	Height	300mm	300mm	300mm	250mm
Weight	38Kg	38Kg	38Kg	40Kg	40Kg
Supply Rating	110-240vac 50/60Hz single phase (factory selected)	110-240vac 50/60Hz single phase (factory selected)	110-240vac 50/60Hz single phase (factory selected)	380-480vac 50/60Hz 3 phase (factory selected)	380-480vac 50/60Hz 3 phase (factory selected)
	Please refer to machine serial number plate for power rating				

2.2 Introduction

Thank you for purchasing this MacGregor Arc welding power source.

This manual is designed to help the new user to understand and operate the equipment quickly and safely. Please take a few moments to become familiar with the equipment and this manual before attempting to use the equipment.

The following information covers the model you have purchased and others in the range and should be kept for reference. This will also help you identify model specific features mentioned in this manual.

All PA-xxP's are comprised of a linear DC power unit controlled by a microprocessor and colour touch screen interface.

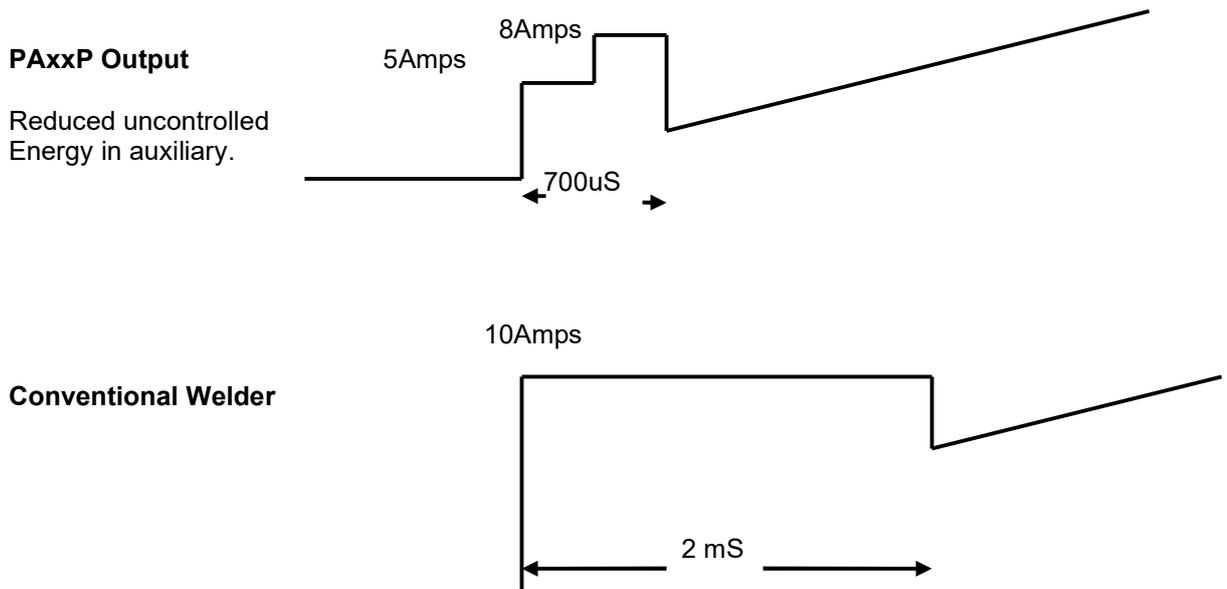
It is the user's responsibility to ensure that their installation is safe both electrically and mechanically.

The PAxxP allows you to program the delivery of electrical energy into a weld by allowing adjustment of time and amplitude. Typically, energy into the weld is gradually ramped up, held at a peak and then reduced. The amount of energy will depend on the length of these times together with the value of the peak amplitude achieved. In some cases it is beneficial to use 2 pulses in a weld, usually with the first pulse acting as a means of pre-conditioning the parts.

A weld profile that is used to make a satisfactory weld can be saved as a PROFILE in the units memory.

The starting system of the PAxxP range has been optimised for low current use. The arc is struck by a 12KV impulse, which starts current flowing in the 5A unregulated supply (rated at 200Vdc). Once the auxiliary current is detected, the main controlled current is turned on. This lower voltage and higher current (up to 60Amps at 80V DC depending on model), then controls the weld and the auxiliary system is switched off.

Unlike conventional arc welders, where this can take several milliseconds, the PAxxP achieves this in under 700uS, giving more precise low current/power control.



PLEASE NOTE :- DUE TO THE REDUCED UNCONTROLLED AUXILIARY ENERGY, IT MAY BE NECESSARY TO ADJUST YOUR SETTINGS IF REPLACING A CONVENTIONAL WELDER.

3 Commissioning

3.1 Electrical Connections



Caution

- DO** Use a properly rated Mains Service Supply
An identification plate on the rear panel specifies the input mains voltage requirement.
- DO** Provide Proper Ventilation
- DO** Use Lifting Gear to Move the Unit

- DO NOT** Operate Machine Without Covers
- DO NOT** Operate With Suspected Failures
- DO NOT** Operate in an Explosive Atmosphere
- DO NOT** Operate in Wet/Damp Conditions

IF IN DOUBT, CONTACT YOUR DISTRIBUTOR

Inspect the unit for any shipping damage prior to connecting to the mains supply.

Ensure you use green safety goggles when operation unit.

Maximum inlet gas pressure : 0.03Mpa

This product **MUST** be connected to the correct mains supply voltage. Refer to the identification plate located on the rear panel.

Single-Phase connections :

BROWN :	Live
BLUE :	Neutral
GREEN/YELLOW :	Safety Earth / Ground

Three-Phase connections :

BLACK 1, BLACK2, BLACK3 :	Phase colours
GREEN/YELLOW :	Safety Earth / Ground

Ensure a good earth / ground connection is provided for operator safety. The internal electrical circuits are earthed. To comply with Class 1 protection, the positive output terminal should be earthed.

The unit must **NOT** be operated with any of the negative outputs grounded. Ensure unused negative outputs have the supplied protection covers fitted.

3.2 Shield Gas Connections

The recommended shielding gas is Argon.
This should be connected to the 'GAS IN'
port on the rear of the welder.

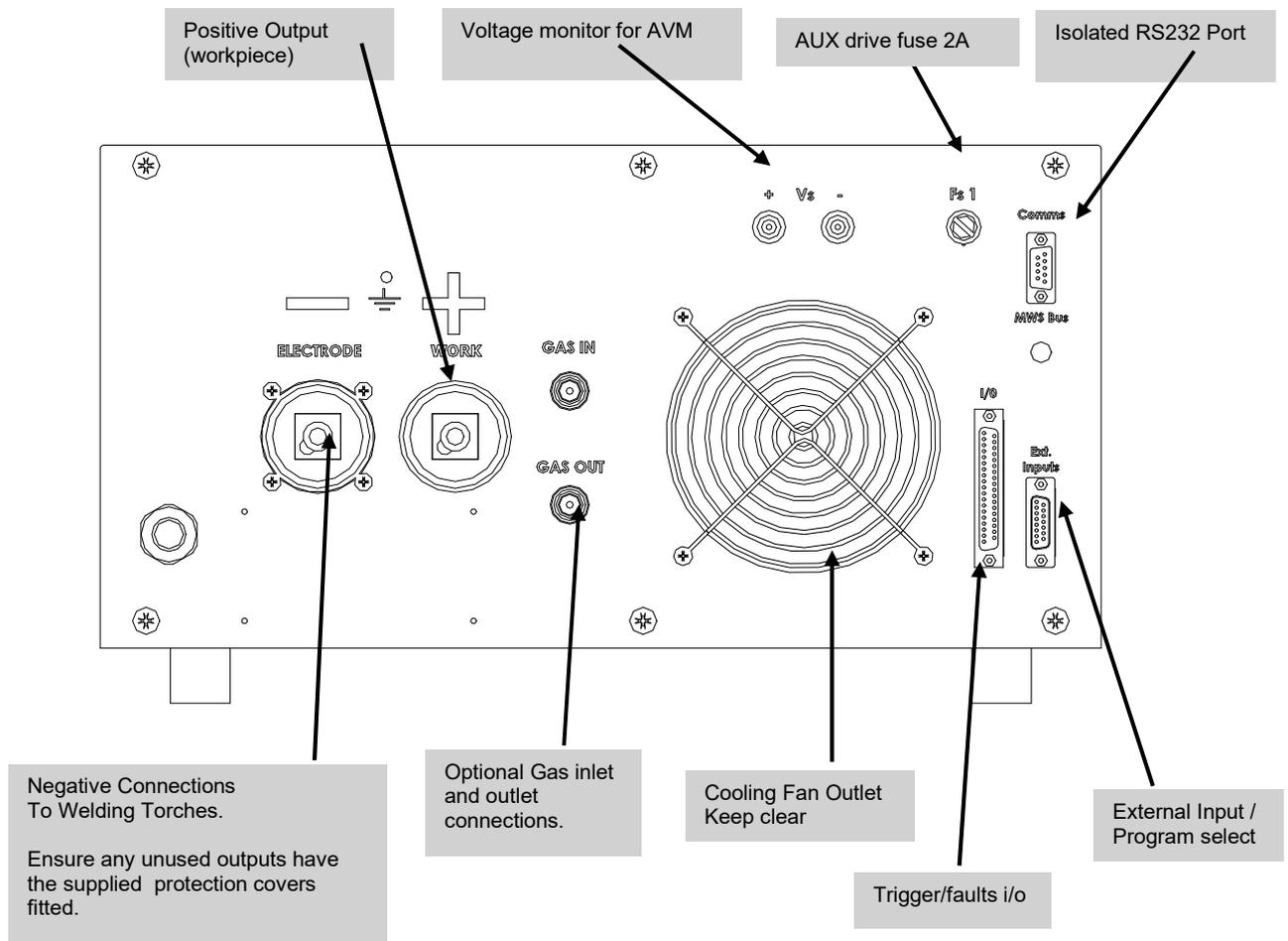


Caution

Please ensure the Argon gas is shut off at the bottle, and that the pressure is a maximum of 0.03MPa, before connecting to the welder.

3.3 Rear Panel Layout

PA-100P and PA-200P



MWSBus PORT – NOT USED.

ISOLATED RS232 PORT – PC CONNECTION PORT FOR UP & DOWN LOADING OF PARAMETERS, & DATA LOGGING.

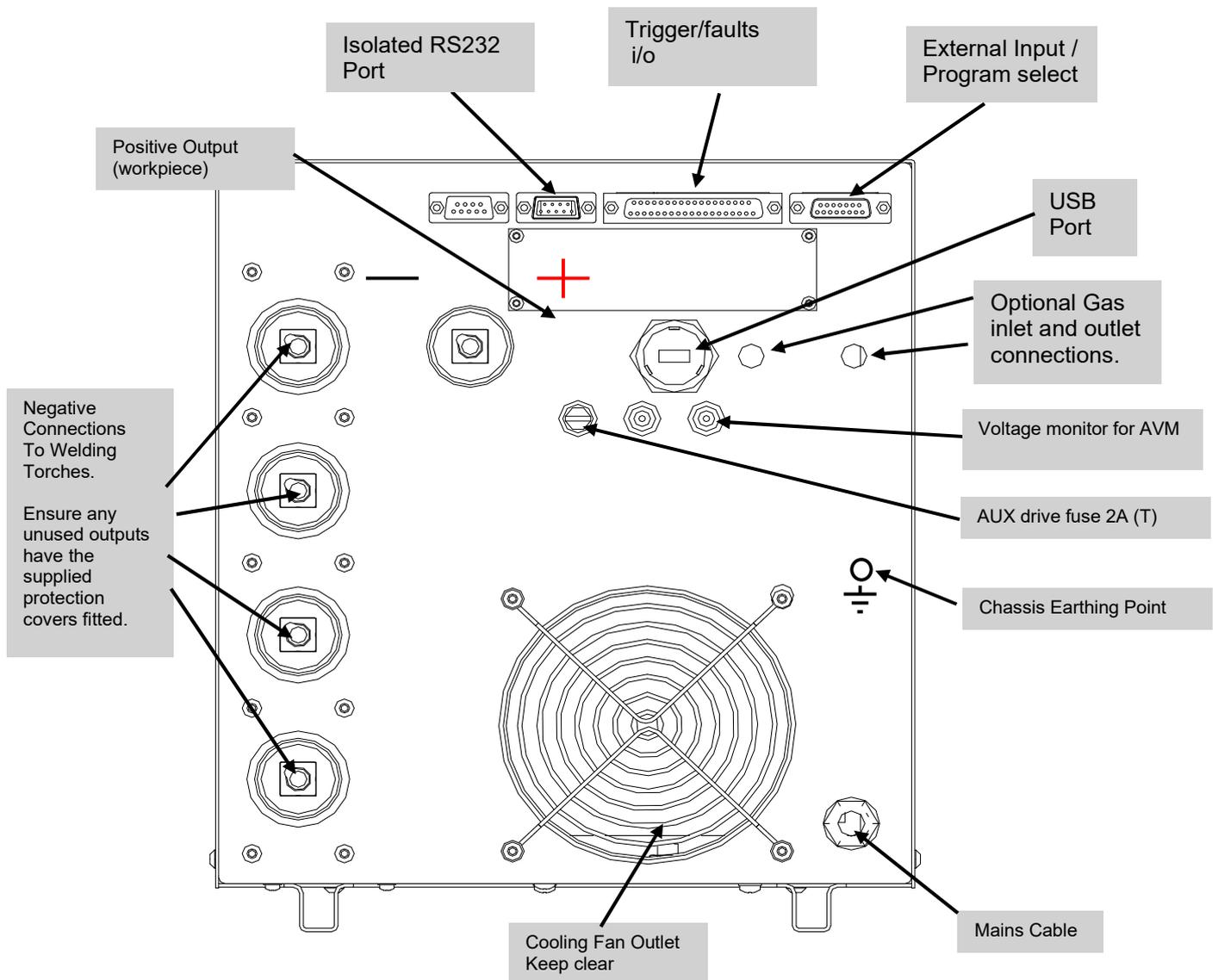
USB PORT – REPROGRAMMING OF HMI.

POSITIVE/NEGATIVE OUTPUTS – OUTPUT FOR THE POWER CABLES TO THE TORCHES/WORKPIECE.

EXTERNAL INPUT– FOR REMOTE PROGRAM SELECTION.

TRIGGER & FAULTS i/o PORT – EXTERNAL TRIGGER & FAULT SIGNALS PORT.

PA-20P, PA-40P and PA-60P



MWSBus PORT – NOT USED.

ISOLATED RS232 PORT – PC CONNECTION PORT FOR UP & DOWN LOADING OF PARAMETERS, & DATA LOGGING.

USB PORT – REPROGRAMMING OF HMI.

POSITIVE/NEGATIVE OUTPUTS – OUTPUT FOR THE POWER CABLES TO THE TORCHES/WORKPIECE.

EXTERNAL INPUT– FOR REMOTE PROGRAM SELECTION.

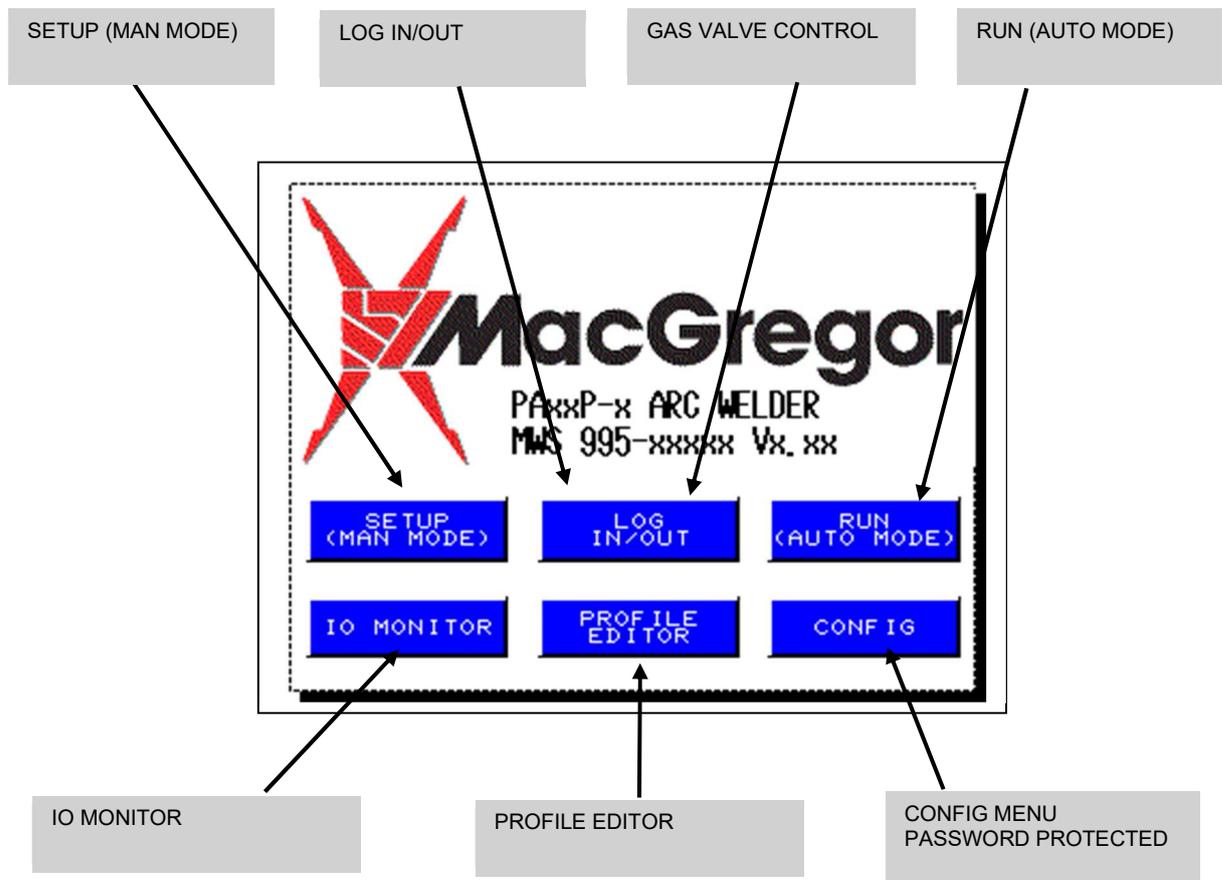
TRIGGER & FAULTS i/o PORT – EXTERNAL TRIGGER & FAULT SIGNALS PORT.

3.4 Getting Started

3.4.1 Power on

Ensure the unit is connected to a suitable mains lead and all the cables are properly connected to the welding torch. Switch on. The Indicator LED below the left corner of the screen will illuminate red, then flash orange (while system booting up), then go steady green. The colour touch screen will display an initialisation screen.

3.4.2 The Default Menu Screen



The **DEFAULT MENU SCREEN** is the screen shown after power up.

SETUP (Man Mode) allows the user to setup and store weld profiles offline manually.

LOG IN/OUT provides password protection entry to allow access to varying levels of machine adjustment.

GAS allows the user to select how the gas valve is controlled.

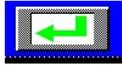
RUN (Auto Mode) allows monitoring of the system when operated by a PLC on a production line.

I/O MONITOR provides a graphical view of the machine inputs and outputs with provision to test them.

PROFILE EDITOR allows weld profiles to be adjusted dynamically while the machine is operating under external high speed control.

3.4.3 Information Colour Coding Key

All of the menus on the welder use the following colour code. Additionally the background colour of the screen changes to indicate whether the welder is either in SETUP (MAN MODE) black background or RUN (AUTO MODE) blue background.



- Pressing this key returns or exits the current screen.



- Data field where the user can change the value, touch to obtain a keypad to enter value.



- Data field, not editable.



- Button.



- Illuminated button, OFF background is brown, ON background is green.



- Indicator light, grey OFF, red ON

3.4.4 Memory Organisation

3.4.4.1 Memory Locations (Profiles)

The PAxxP has 99 memory locations each of which is able to store the complete details of either a single or double pulse weld profile. In order to identify the memories, each location is given a number between 1 and 99.

The memory system uses a special memory location internally to store and display temporary data. This is known as the scratchpad.

3.4.4.2 Scratchpad Memory

When a program is loaded, it is loaded into the scratchpad. This allows the parameters to be changed without affecting the data in the original memory store.

Upon loading a profile from memory, the memory location will be displayed as **PROFILE x** in the middle of the display. If the user changes this data, the **PROFILE x** value background will change to red to indicate that the current Program is different to the saved Program.

This indicates that the scratchpad now contains data which is different from that which was originally loaded.

If the user wishes to save and use the modified data, the scratchpad memory must be stored.

3.5 Limit Functions

3.5.1 Monitored Limit Parameters

The PAxxP controls the weld current output. Since $V=IxR$ (Ohms Law), as the arc resistance changes, the voltage will reflect this change. Hence the PAxxP measures this voltage parameter in real time as the weld occurs, thereby allowing the machine to react to unexpected weld conditions.

Since arc current is controlled, the output circuit/arc voltage is monitored. Feedback within the system ensures that the output current matches the demand set by the user. As resistance increases, so does the circuit/arc voltage. This relationship can be used to trip the machine at a particular voltage level. Since current is constant, the voltage proportionally indicates the circuit/arc resistance.

3.5.2 High Voltage Limit

The High Voltage limit setting for a weld pulse provides a trip point. If the High Voltage Limit is reached at any time during the weld, then a fault is indicated at the end of weld.

To set a High Limit, refer to the Main Monitor > Profile Editor for more information.

3.5.3 Low Voltage Limit

The Low Voltage limit setting is used for monitoring during the peak time for a weld pulse. If for any reason the value set is not achieved during the peak period, a Low Voltage Limit Fault will be caused.

This method maybe used to detect a weld condition in which not enough energy was imparted to the weld. For example, if the circuit resistance is reduced, this will produce less voltage. This can happen if electrode and work piece touch.

To set a Low Limit, refer to the Main Monitor > Profile Editor for more information.

3.5.4 High Energy Limit

The High Energy limit setting for a weld pulse provides a trip point. If the High Energy Limit is exceeded at the end of the weld pulse, then a fault is indicated.

To set a High Limit, refer to the Main Monitor > Profile Editor for more information.

3.5.5 Low Energy Limit

The Low Energy limit setting for a weld pulse provides a trip point. If the Low Energy Limit is exceeded at the end of the weld pulse, then a fault is indicated.

To set a Low Limit, refer to the Main Monitor > Profile Editor for more information.

3.6 Password Entry Screen (Log in/out)

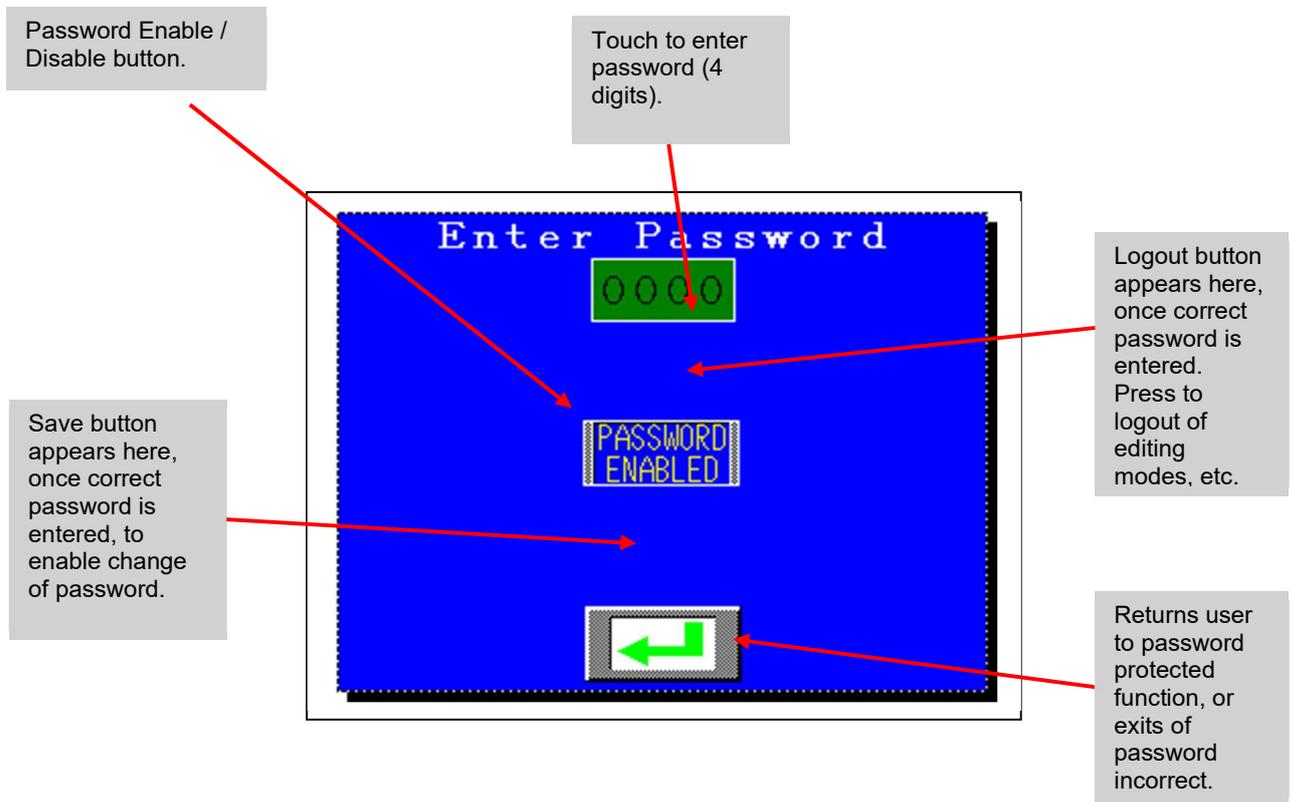
The password screen will appear whenever a password is required for the function that is being accessed. There are three 4 digit passwords on the system.

USER. The factory default for this is 0000.

BACKUP. Maintained by Amada Weld Tech UK Ltd for each machine. Can be supplied to customer if user password changed and then lost/forgotten.

MWS ENGINEER. For Amada Weld Tech engineers calibration use only.

To enter a password, touch the password field, a keypad appears. Type in the number and press the ENT button.



4 Setup (Man mode)

4.1 Setup screen

The screenshot shows the 'PROFILE' setup screen. At the top, there are two toggle switches: 'VOLTAGE LIM OFF' and 'ENERGY LIM OFF'. Below these are several digital displays: 'HI 0.0', 'VAL 0.00', 'LO 0.00', '0.0 MAX', '0.0 MIN', '0.0', '0.0 LEVEL (AMPS)', '0.0 UP (ms)', '0.0 PEAK (ms)', and '0.0 DOWN (ms)'. A yellow trapezoidal pulse waveform is shown in the center. At the bottom, there are five buttons: 'WELD', 'GRAPH', 'LOAD', 'SAVE', and a left-pointing arrow. Red callout boxes provide the following information:

- VOLTAGE LIM OFF:** Enable/Disable Voltage limits Pulse 1. Turns GREEN to indicate limits enabled/on.
- ENERGY LIM OFF:** Enable/Disable Energy limits Pulse 1. Turns GREEN to indicate limits enabled/on.
- FAULT:** Turns RED on a fault, press for information.
- VAL:** Measured energy of weld pulse.
- SINGLE PULSE:** Single/Double Pulse Mode.
- WELD:** Weld button. Press to fire weld on this output, or STOP to terminate
- GRAPH:** Display Weld Monitor
- LOAD/SAVE:** Press to load or save profiles.
- Arrow:** Exit returns to main monitor display.
- 0.0 MAX/MIN:** Minimum and Maximum voltage measured during peak period.
- 0.0 PROFILE:** Displays Current Profile number And name.

The setup profile screen shows the currently selected profile for that particular output. From this screen, it is possible to edit the profile data, save or load profile, trigger a test weld, setup limits (both voltage and energy) or enter the monitor menu to view further information about this output.

Profile time. There are three areas to a weld pulse, the upslope, peak and downslope times.

To enter data, touch the appropriate field you wish to change.

A numeric keypad pops-up, as shown opposite.

This shows the current value, and the minimum and maximum values permitted.

Use the number keys to enter the appropriate value.

CANCEL – exits keypad without changing value.

CLR – erases current value.

ENT – enters current value, and closes keypad.

BS – deletes character to the left of cursor.

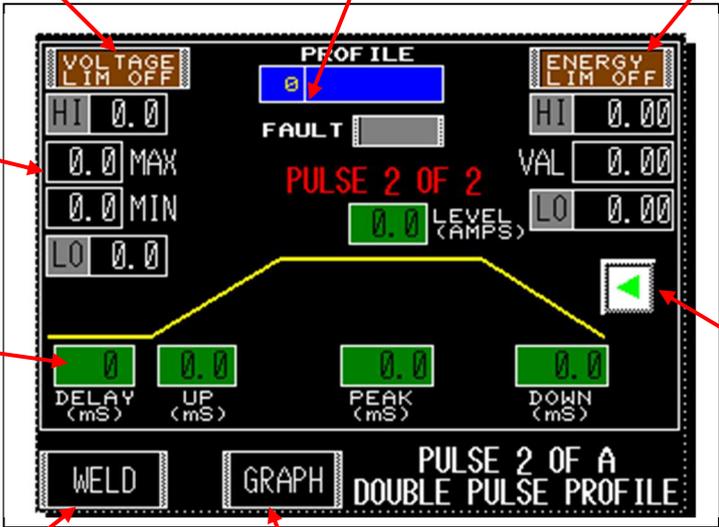
DEL – deletes character under cursor.

<> - move cursor left and right.



Profile Current. This is labelled LEVEL (Amps). The data range is depends upon the model. Data entry is carried out the same way as for profile time.

Voltage/Energy Limits. These fields can only be edited if they are turned on by pressing the appropriate button at the top of the screen. Data entry is carried out in the same way as for profile time.



The screenshot shows a control panel for 'PULSE 2 OF 2' with the following elements and callouts:

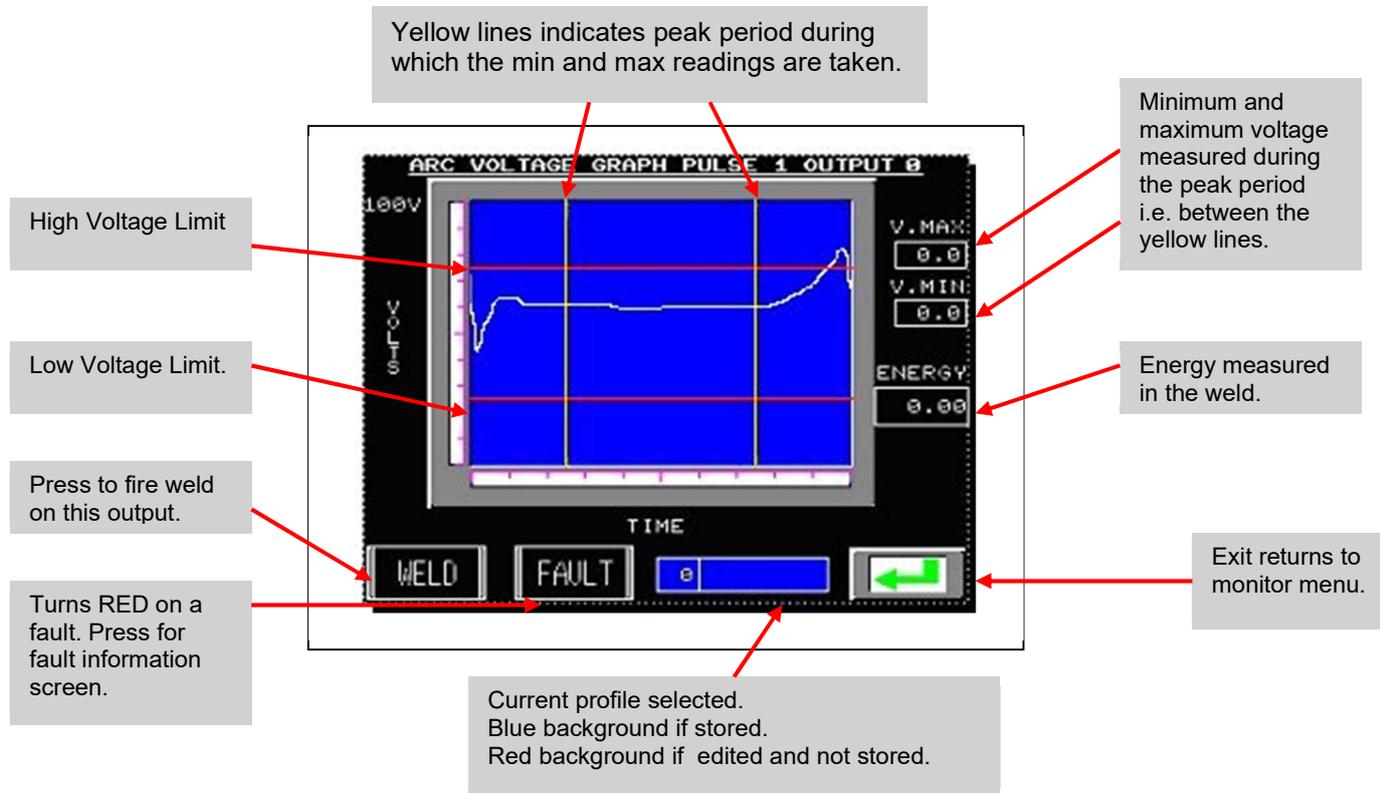
- VOLTAGE LIM OFF** (top left) and **ENERGY LIM OFF** (top right): Callouts explain that these buttons enable/disable voltage and energy limits for Pulse 2, turning GREEN when limits are enabled.
- PROF ILE** (top center): A blue box containing '0' is labeled 'Displays Current Profile number and name.'
- FAULT** (top center): A grey box.
- VOLTAJE** (left side): A vertical stack of four green displays showing 'HI 0.0', '0.0 MAX', '0.0 MIN', and 'LO 0.0'. A callout points to the 'MAX' and 'MIN' values, stating: 'Minimum and Maximum voltage measured during peak period.'
- VAL** (right side): A vertical stack of four green displays showing 'HI 0.00', '0.00', 'LO 0.00', and '0.00'.
- LEVEL (AMPS)** (center): A green display showing '0.0'.
- DELAY (mS)** (bottom left): A green display showing '0'. A callout points to it, stating: 'Delay time between pulse 1 and 2 in milli - seconds.'
- UP (mS)** (bottom left-center): A green display showing '0.0'.
- PEAK (mS)** (bottom center): A green display showing '0.0'.
- DOWN (mS)** (bottom right-center): A green display showing '0.0'.
- Left Arrow** (right side): A green arrow button. A callout points to it, stating: 'Returns to the pulse 1 screen.'
- WELD** (bottom left): A button. A callout points to it, stating: 'Weld button. Press to fire weld on this output.'
- GRAPH** (bottom center): A button. A callout points to it, stating: 'Display Weld Monitor'
- PULSE 2 OF 2** (center): Large red text.
- PULSE 2 OF A DOUBLE PULSE PROFILE** (bottom right): Large white text.
- Graph**: A yellow line graph showing a trapezoidal pulse shape.

The pulse 2 profile screen follows the format of the pulse 1 screen. From this screen, it is possible to edit the profile data, trigger a test weld, setup limits (both voltage and energy) or enter the graph menu to view further information about this output.

The setup procedure is the same as that for the first pulse.

Delay time. This is the delay between two weld pulses. The time is set in milli-seconds, from 1 to 999ms.

4.2 Setup (Man mode) Graph Screen



Voltage Graph. This shows the voltage waveform for the selected profile (this is set on this screen). The graph updates each time a weld is carried out on this profile, on this output. If the voltage limits are enabled for this profile, then these are also displayed, as red horizontal lines. The vertical scale is 0v to 100v. The time scale is the width of the profile. The yellow vertical lines indicate the beginning and end of the peak period.

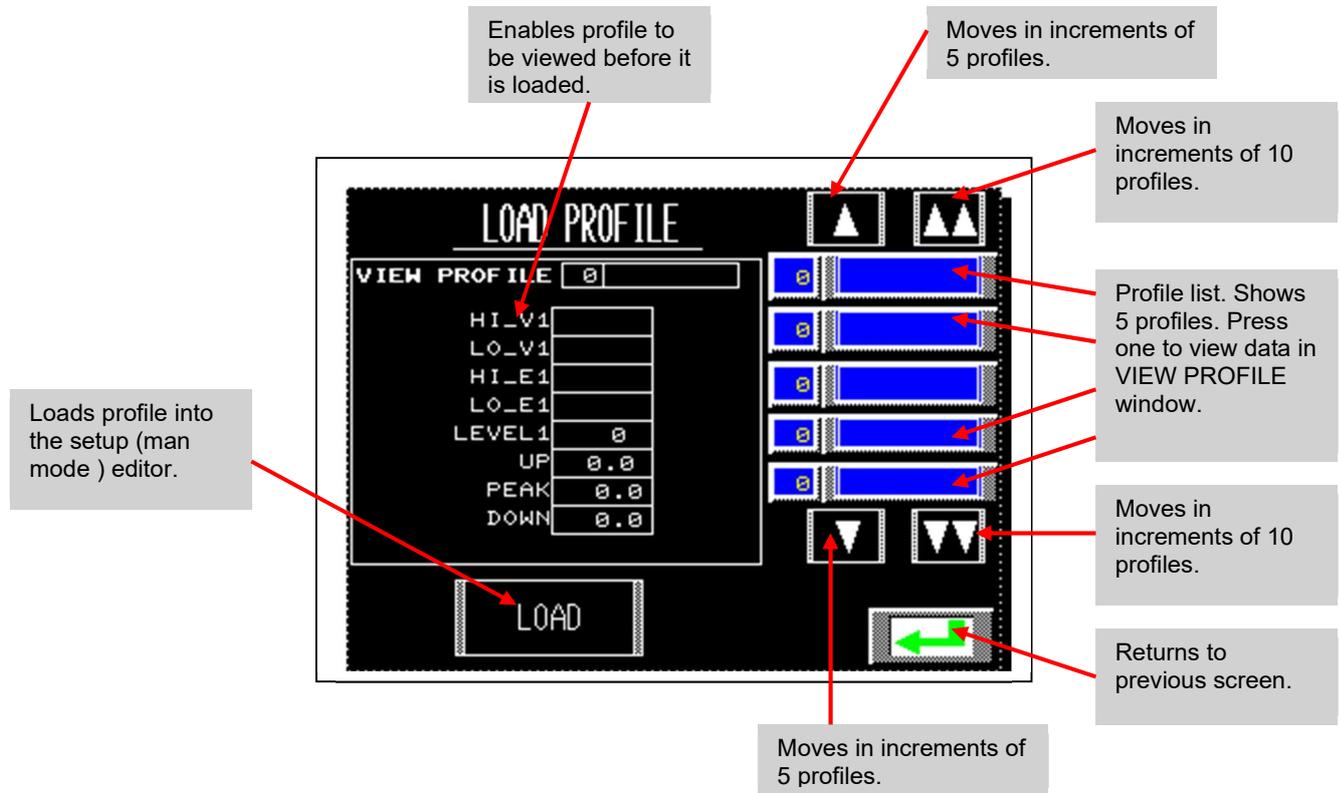
Energy Readout. This is the measured energy in the last weld.

Vmin/Vmax Readout. This is the measured minimum and maximum voltages measured during the peak period. The peak period is indicated on the graph by the two yellow lines.

Weld button. This triggers a weld on the selected output. The screen will update with the arc voltage waveform at the end of weld.

Fault Light/button. This turns red to indicate a fault on the output. Pressing the button shows the fault information display.

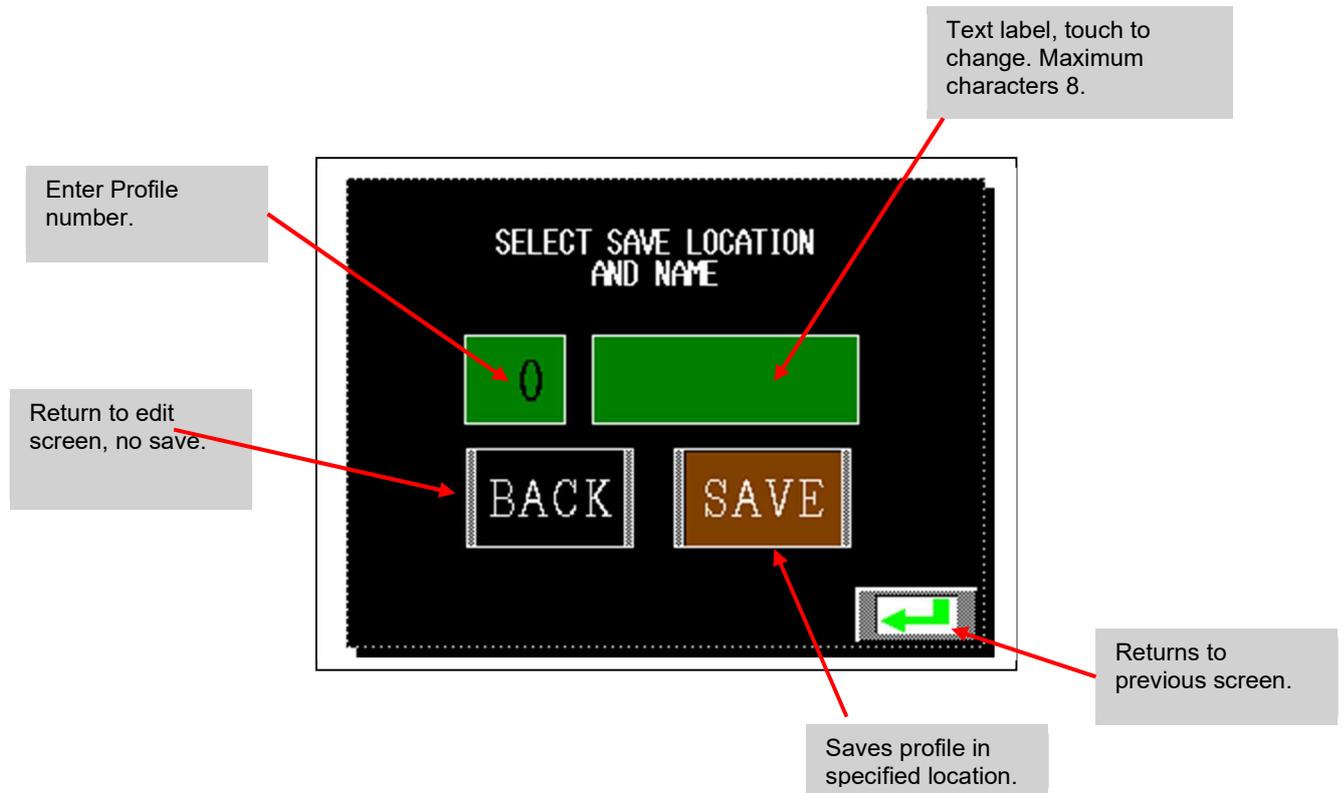
4.3 Setup (Man mode) Load Screen



This screen enables a profile to be loaded into setup mode for manual welding. The boxes on the right hand side show 5 of the profile memory locations. Pressing the buttons above and below these boxes scroll up and down the 99 profile memory locations. The single arrows move 5 increments, and the double arrows move 10 increments. To view the profile (before loading into the system), touch the appropriate profile from the ones listed on the right. The data for this profile is then shown in the VIEW PROFILE window. If this is the required data, to load the profile, touch the LOAD button.

View Profile Window. This details the data within the profile. Hi_V and Lo_V are the high and low voltage limits. Hi_E and Lo_E are the high and low energy limits. If the limits are turned off for this profile, then they are not displayed.

4.4 Setup (Man mode) Save Screen



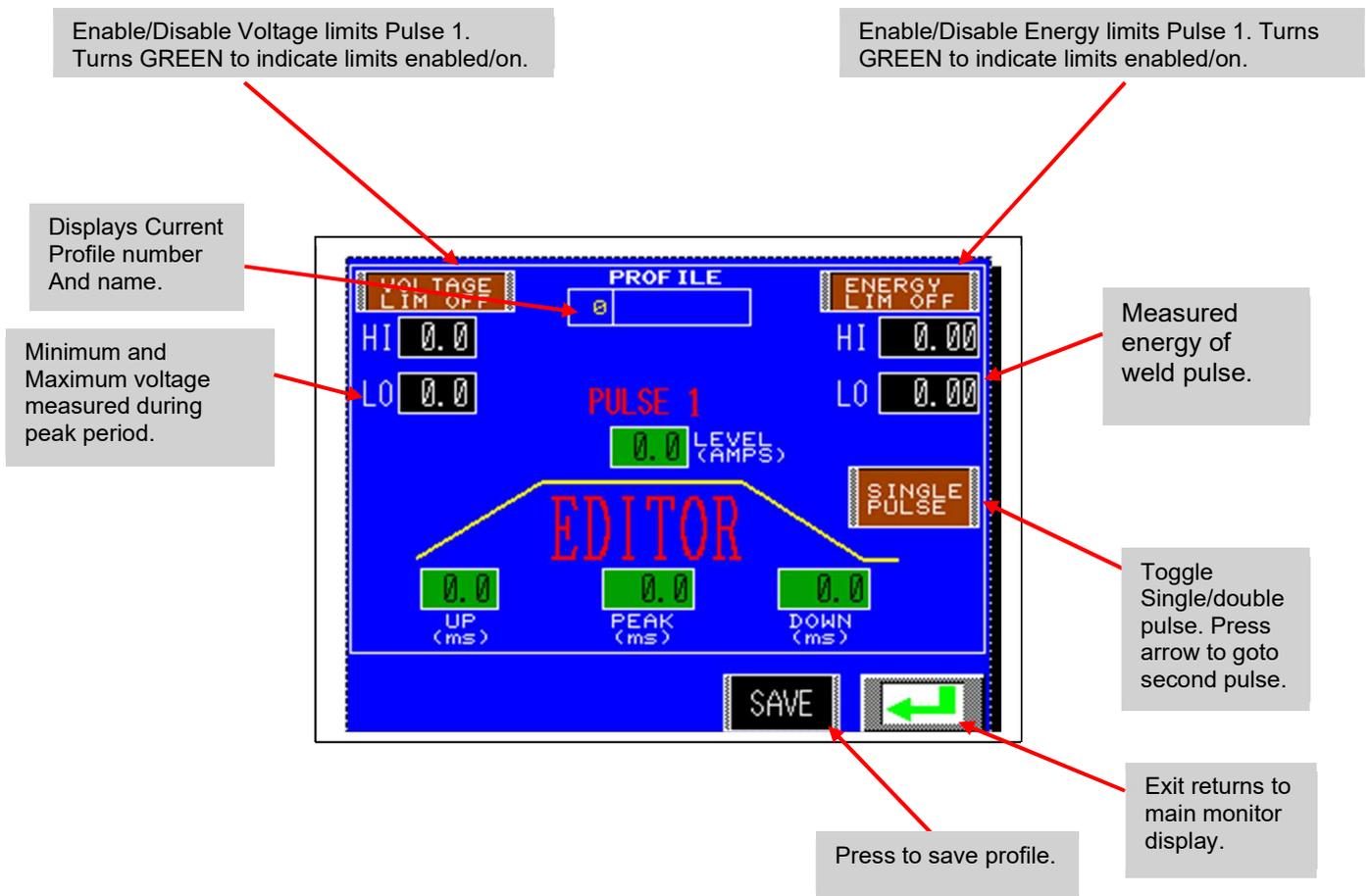
This screen enables a profile to be saved. To select the location or change the name, touch the appropriate box. A keypad will appear. The maximum number of characters for the name is 8. To save the data, press the save key.

Multiple Output Units have the option to select the output required for setup as shown below.



5 Profile Editor

5.1 Profile Editor screen



The profile editor screen shows the profile loaded for editing.

Profile time. There are three areas to a weld pulse, the upslope, peak and downslope times.

To enter data, touch the appropriate field you wish to change.

A numeric keypad pops-up, as shown opposite.

This shows the current value, and the minimum and maximum values permitted.

Use the number keys to enter the appropriate value.

CANCEL – exits keypad without changing value.

CLR – erases current value.

ENT – enters current value, and closes keypad.

BS – deletes character to the left of cursor.

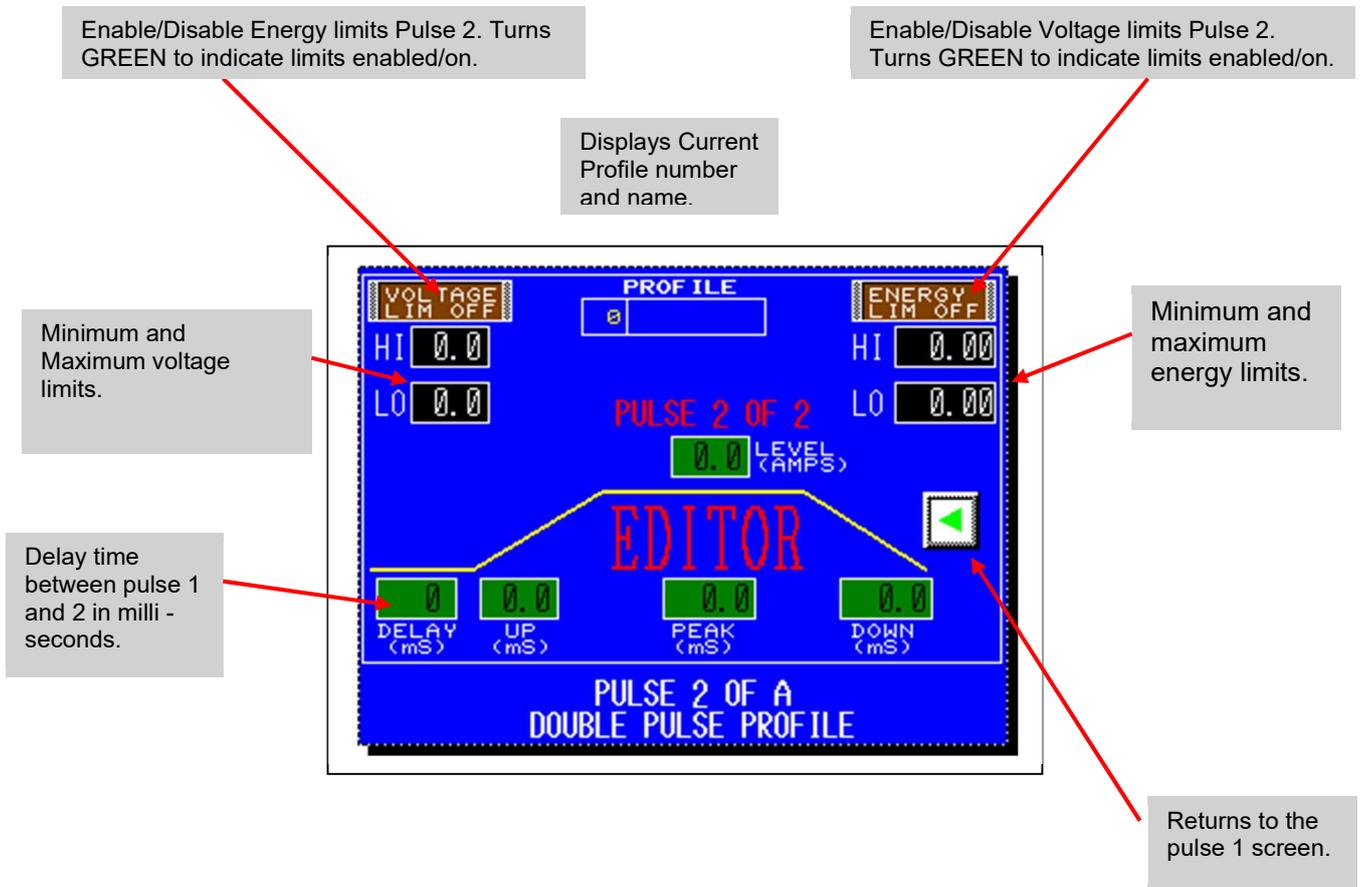
DEL – deletes character under cursor.

<> - move cursor left and right.



Profile Current. This is labelled LEVEL (Amps). The data range is dependent upon the model. Data entry is carried out the same way as for profile time.

Voltage/Energy Limits. These fields can only be edited if they are turned on by pressing the appropriate button at the top of the screen. Data entry is carried out in the same way as for profile time.

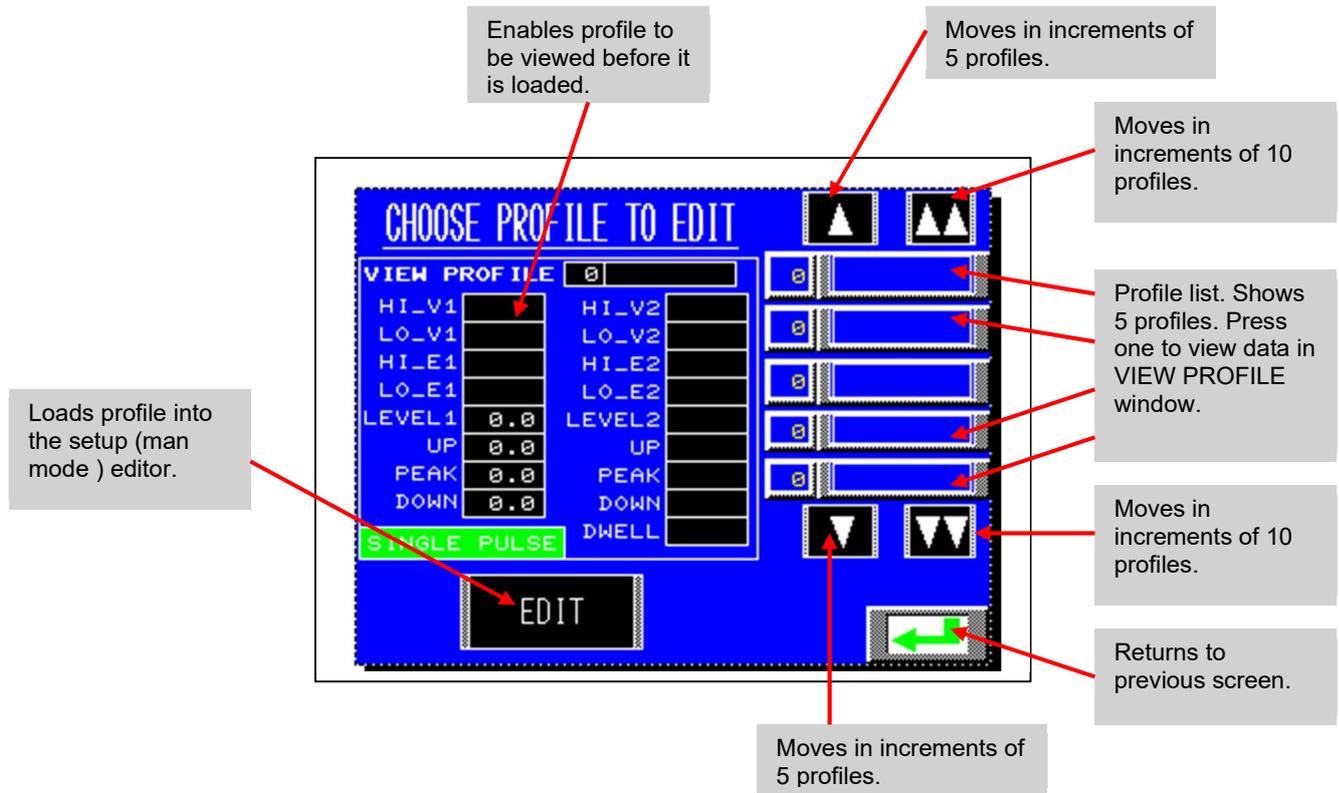


The pulse 2 profile editor screen follows the format of the pulse 1 screen.

The setup procedure is the same as that for the first pulse.

Delay time. This is the delay between two weld pulses. The time is set in milli-seconds, from 1 to 999ms.

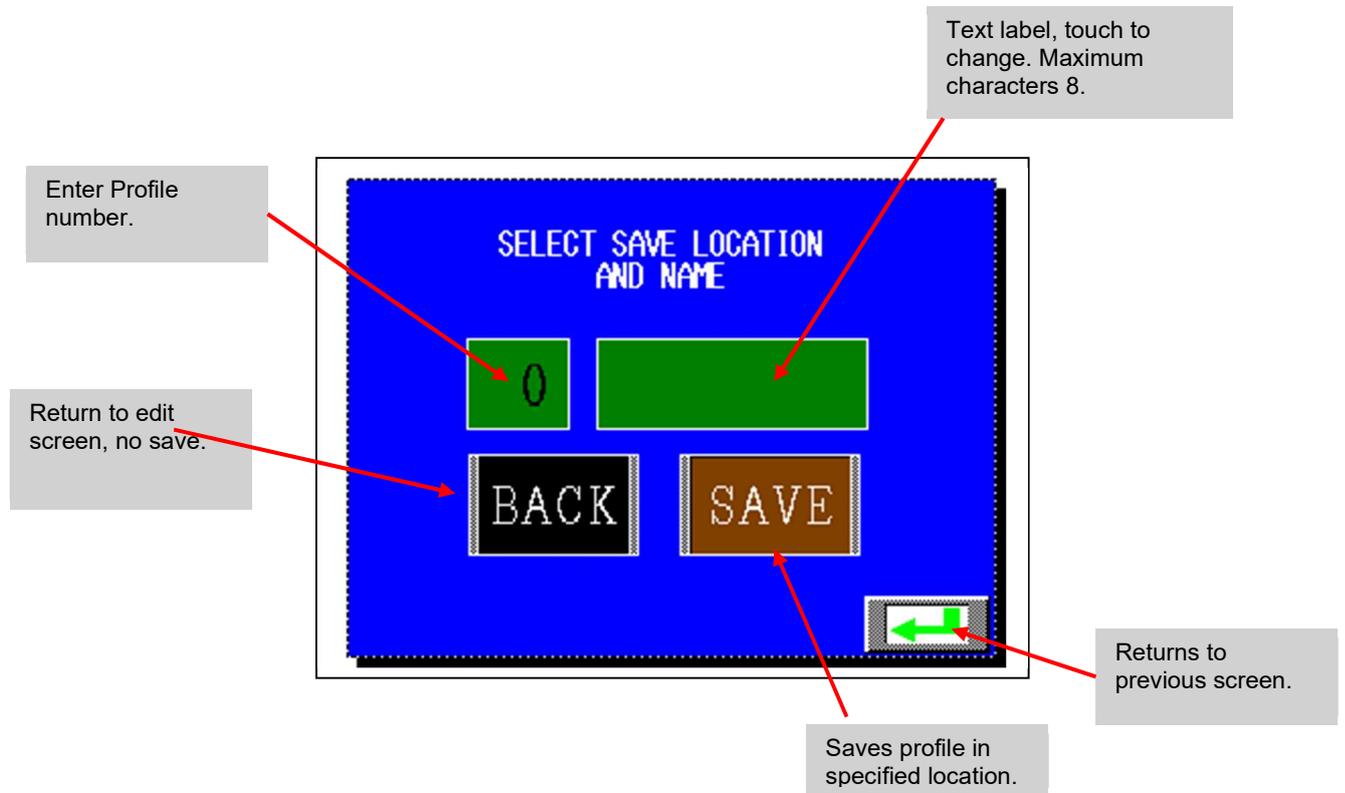
5.2 Profile Editor Load Screen



This screen enables a profile to be loaded into editor for manual welding. The boxes on the right hand side show 5 of the profile memory locations. Pressing the buttons above and below these boxes scroll up and down the 99 profile memory locations. The single arrows move 5 increments, and the double arrows move 10 increments. To view the profile (before loading into the system), touch the appropriate profile from the ones listed on the right. The data for this profile is then shown in the VIEW PROFILE window. If this is the required data, to load the profile, touch the LOAD button.

View Profile Window. This details the data within the profile. Hi_V and Lo_V are the high and low voltage limits. Hi_E and Lo_E are the high and low energy limits. If the limits are turned off for this profile, then they are not displayed.

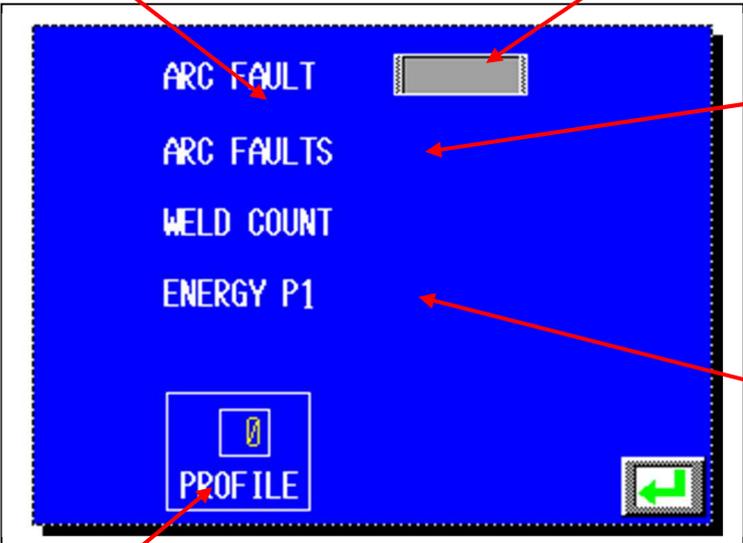
5.3 Profile Editor Save Screen



This screen enables a profile to be saved. To select the location or change the name, touch the appropriate box. A keypad will appear. The maximum number of characters for the name is 8. To save the data, press the save key.

6 Run (Auto Mode)

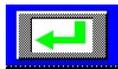
6.1 Run (Auto Mode) Main Monitor Screen



The main monitor screen displays the following information:

- ARC FAULT**: A small grey box that turns red to indicate a fault. Callout: "Turns RED to indicate last weld caused a fault, Press for more information."
- ARC FAULTS**: A numerical display for the number of arc fails/faults. Callout: "Number of arc fails/faults"
- WELD COUNT**: A numerical display for the number of weld attempts. Callout: "Number of weld attempts"
- ENERGY P1**: A numerical display for the last weld energy in Joules. Callout: "Last weld energy in Joules"
- PROFILE**: A button showing the weld profile number currently being used. Callout: "Weld profile number currently being used."
- Navigation**: A green arrow button in the bottom right corner.

The main monitor screen shows information about welder.



Pressing this key returns to the Default Menu Screen.

To monitor in more detail, touch the middle of the screen, or output number if a multiple output unit.

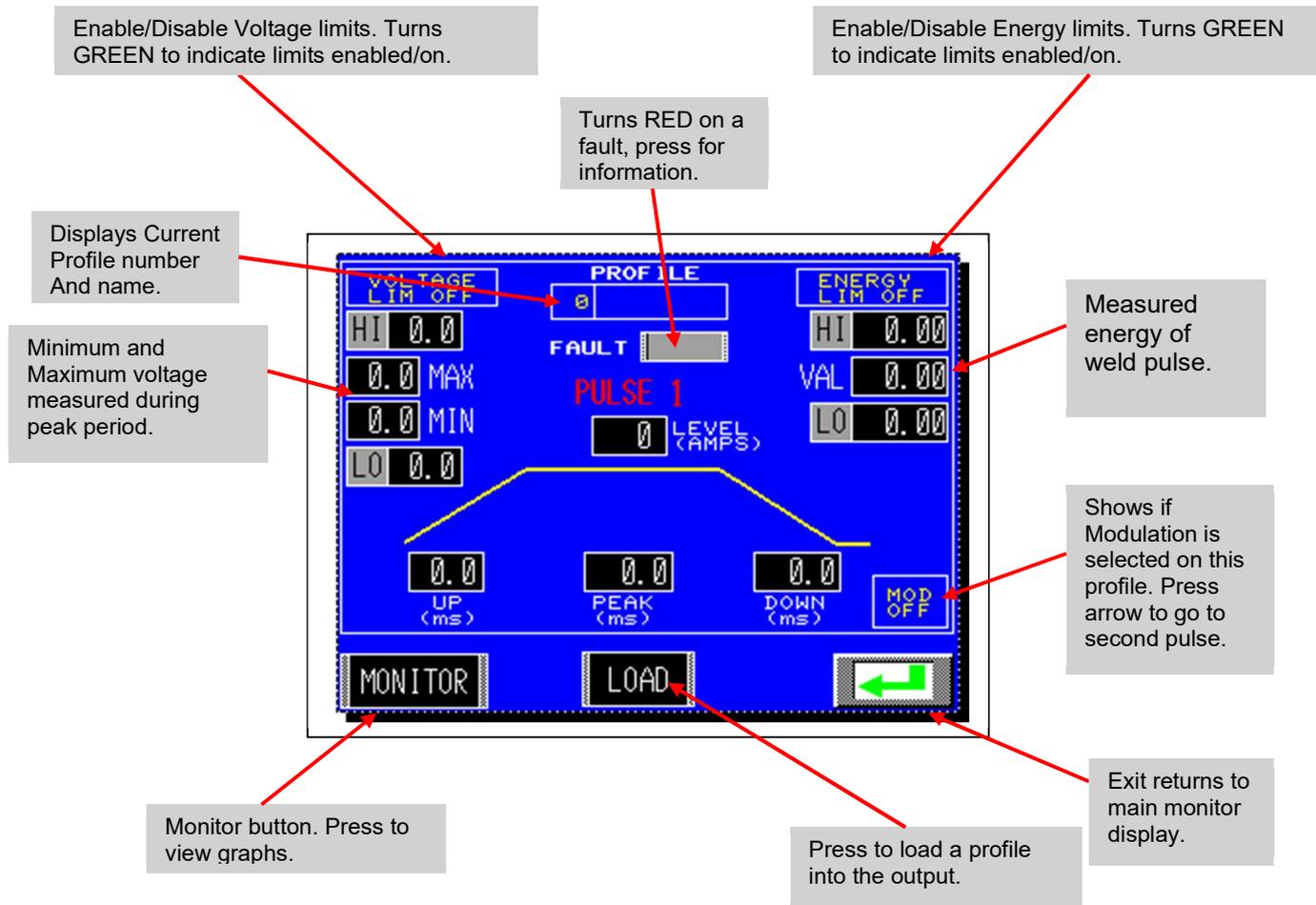
To view more detailed fault information, touch the fault light.
Multiple output unit screen shown below.



The multiple output unit screen displays four panels (OP1, OP2, OP3, OP4) for monitoring different output units. Each panel includes:

- ARC FAULT**: A small grey box that turns red to indicate a fault.
- ARC FAULTS**: A numerical display for the number of arc fails/faults.
- WELD COUNT**: A numerical display for the number of weld attempts.
- ENERGY P1**: A numerical display for the last weld energy in Joules.
- ENERGY P2**: A numerical display for the last weld energy in Joules.
- PROFILE**: A button showing the weld profile number currently being used.
- SINGLE PULSE**: A green button for pulse control.
- Navigation**: A green arrow button in the center of the screen.

6.2 Run (Auto mode) Monitor Screen



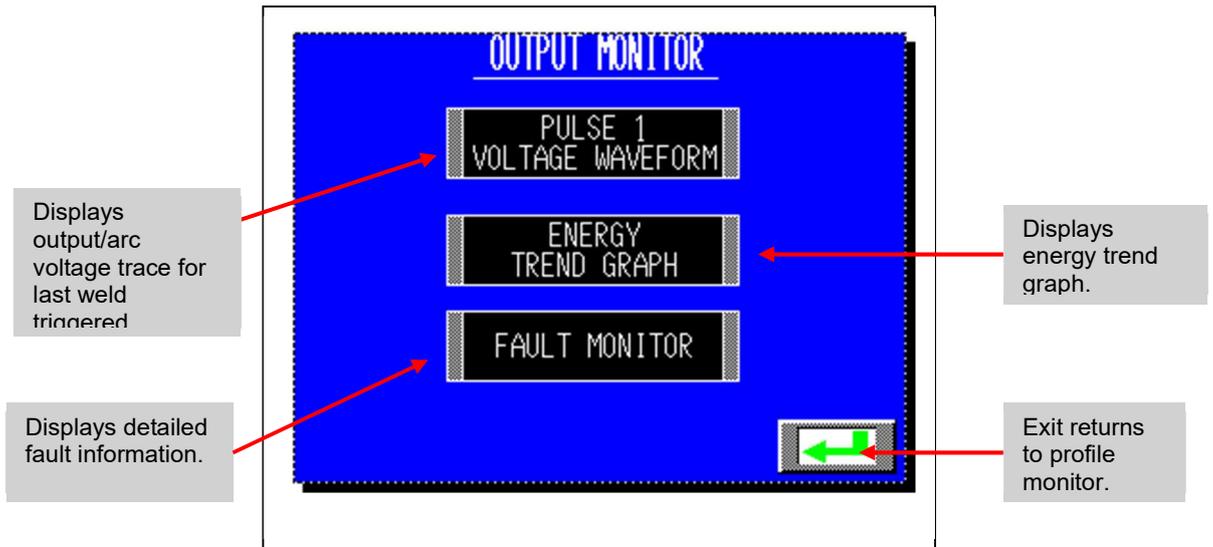
This screen only enables the user to view data. No data can be edited. To edit profiles use the profile editor.

From the output monitor screen, it is possible to select either a display of the voltage waveform, an energy trend graph for the last 1000 welds or a fault information screen, showing detailed information for the last weld. These are detailed on the following two pages.

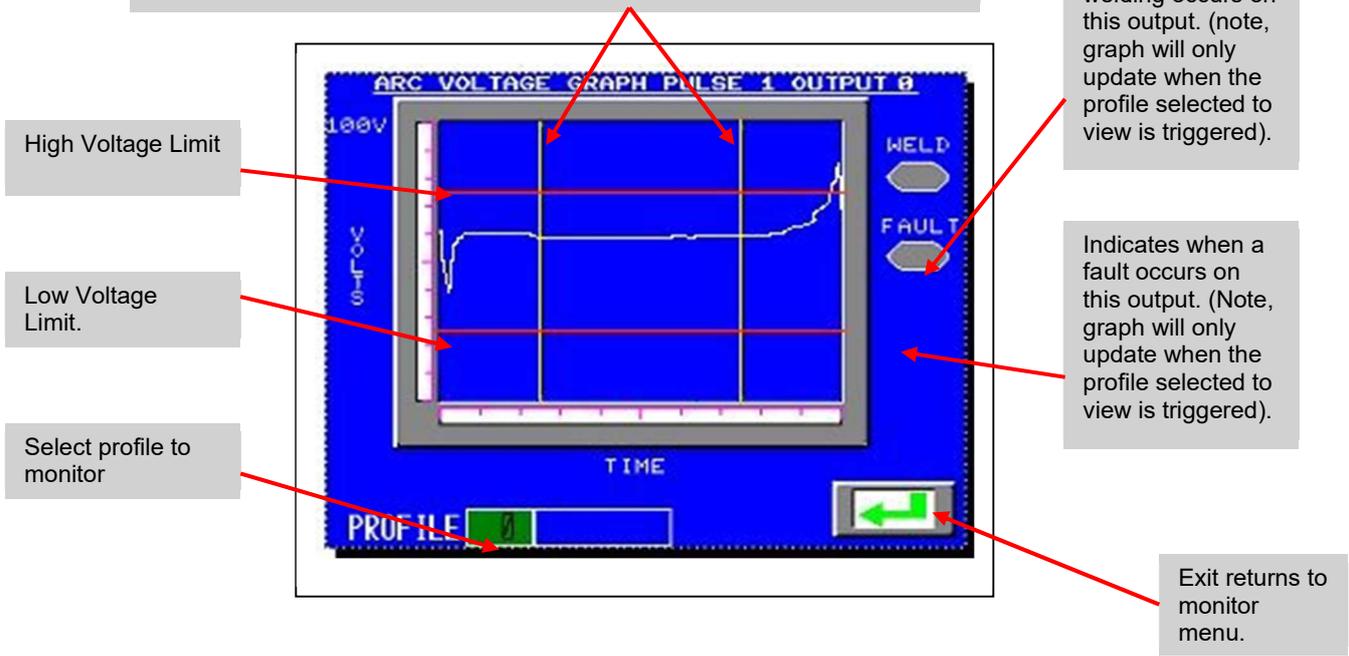
Voltage Graph. This shows the voltage waveform for the selected profile (this is set on this screen). The graph updates each time a weld is carried out on this profile, on this output. If the voltage limits are enabled for this profile, then these are also displayed, as red horizontal lines. The vertical scale is 0v to 100v. The time scale is the width of the profile. The yellow vertical lines indicate the beginning and end of the peak period.

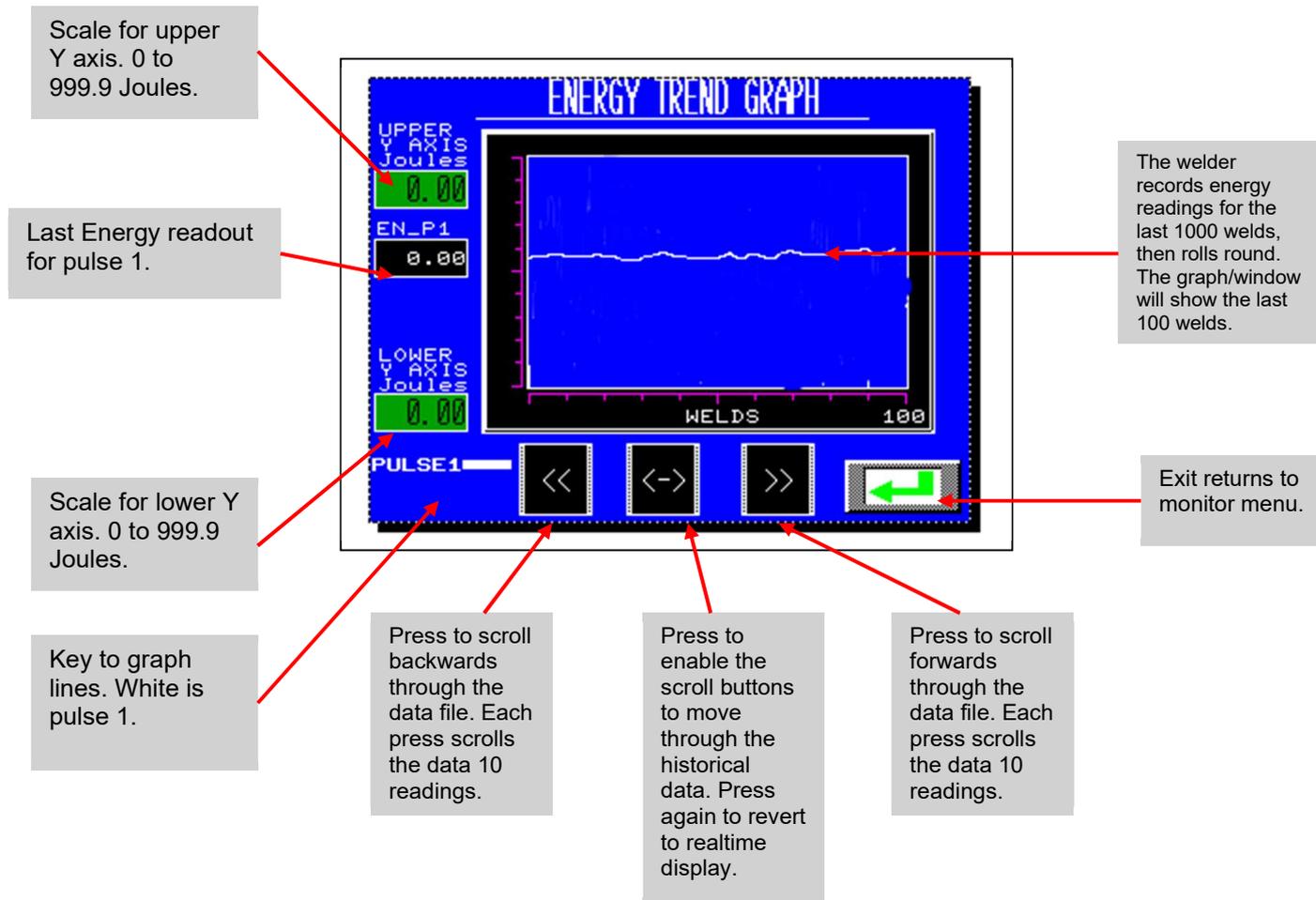
Weld Light. This turns green to indicate a weld has been triggered on this output. If remote programs are selected, this light will flash every time, however, the graph will only update for the selected profile.

Fault Light. This turns red to indicate a fault on the output. See **weld light** re update of graph.



Yellow lines indicates the peak weld period during which the minimum and maximum voltage readings are taken. Time is scaled to the overall weld pulse period.



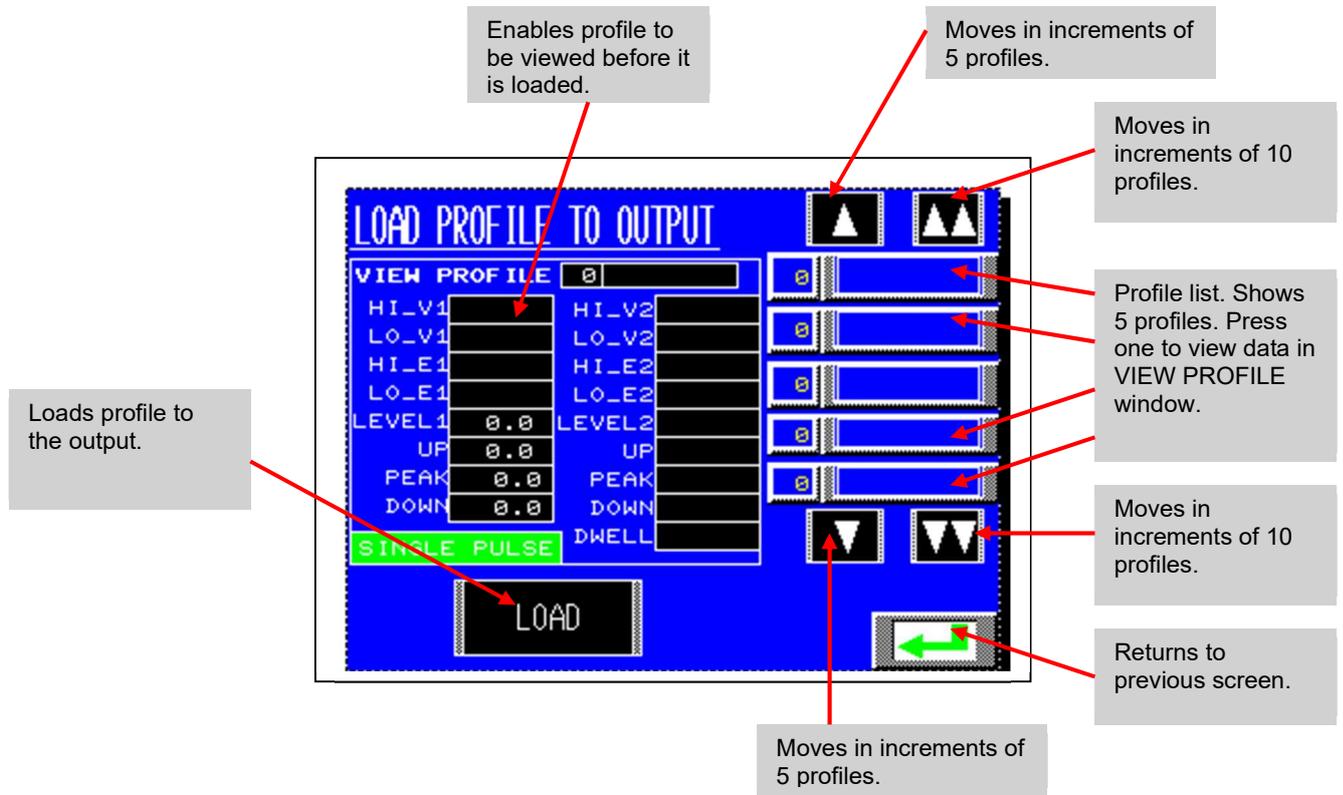


Energy Graph. Each time the welder does a weld on each of the outputs, the energy readout is recorded for display on the energy trend graph. The welder will record the energy readings from the last 1000 welds, and then automatically roll round and overwrite the oldest data. It is possible to expand the y-axis to 'zoom' into the waveform for more detailed examination.

The screen will show the last 100 welds, and then automatically scroll to the left. To view older data, press the DISP button, the realtime display updates are switched off, however, the data is still recorded for all new welds. Pressing the PREV or FWD buttons will scroll along the historical data, 10 welds at a time. Pressing the DISP button again, will revert to the realtime display, including any welds done while in the historical mode.

The energy readouts on the left are updated after each weld.

6.3 Run (Auto mode) Load Screen

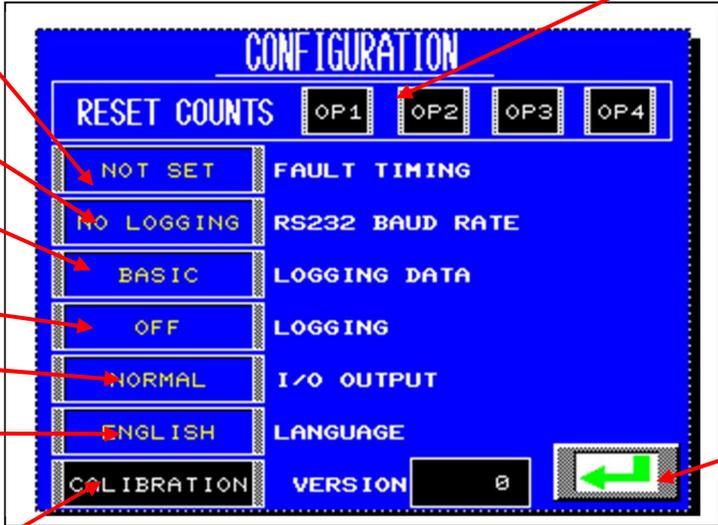


This screen enables a profile to be loaded into the output. The boxes on the right hand side show 5 of the profile memory locations. Pressing the buttons above and below these boxes scroll up and down the 99 profile memory locations. The single arrows move 5 increments, and the double arrows move 10 increments.

To view the profile (before loading into the system), touch the appropriate profile from the ones listed on the right. The data for this profile is then shown in the VIEW PROFILE window. If this is the required data, to load the profile, touch the LOAD button.

View Profile Window. This details the data within the profile. Hi_V and Lo_V are the high and low voltage limits. Hi_E and Lo_E are the high and low energy limits. If the limits are turned off for this profile, then they are not displayed.

7 Configuration Screen



The screenshot shows the CONFIGURATION screen with the following settings and callouts:

- RESET COUNTS:** OP1, OP2, OP3, OP4. Callout: "Resets the weld and fault counters shown on the run (auto mode) display."
- FAULT TIMING:** NOT SET. Callout: "Selects either 50ms, 100ms, 200ms, or LATCHED for the output fault signals."
- RS232 BAUD RATE:** NO LOGGING. Callout: "Either 9600, 38400 or 57600 Baud rate."
- LOGGING DATA:** BASIC. Callout: "Selects either Full or Basic mode."
- LOGGING:** OFF. Callout: "Either on or off."
- I/O OUTPUT:** NORMAL. Callout: "Normal or inverted IO."
- LANGUAGE:** ENGLISH. Callout: "Select Language."
- VERSION:** 0. Callout: "Enters calibration mode. For Amada Weld Tech engineers only, requires the MWS password."
- Navigation:** A green arrow button in the bottom right. Callout: "Exit to main menu."

This screen enables the configuration of the welder to be changed. This screen is password protected, and requires the user password to be entered.

Fault timing. This provides a timed control over the fault indication status lines. Timed signals are held asserted for the timed period as set.

Basic Logging. Upon weld termination, basic weld information is transmitted from the RS232 port.
Basic data comprises : Output Number, Profile Number, Pulse 1 energy, Pulse 2 energy, Fault code

Full Logging. Upon weld termination, comprehensive weld information is transmitted from the RS232 port.
Full logging data comprises : Output Number, Profile Number, Pulse 1 energy, Pulse 2 energy, Fault code, Pulse 1 High Limit, Pulse 1 Low Limit, Pulse 2 High Limit, Pulse 2 Low Limit, Weldcount for the output, Fault count for the output, Pulse 1 graphical trace (100 points), Pulse 2 graphical trace (100 points)

I/O output. This is the logic of the digital outputs either normal, or inverted.

Language. Changes the current default language for the display.

Calibration. This screen is password protected, and requires the Amada Weld Tech engineer password to be entered.

Fault timing. This provides a timed control over the fault indication status lines. Timed signals are held asserted for the timed period as set.

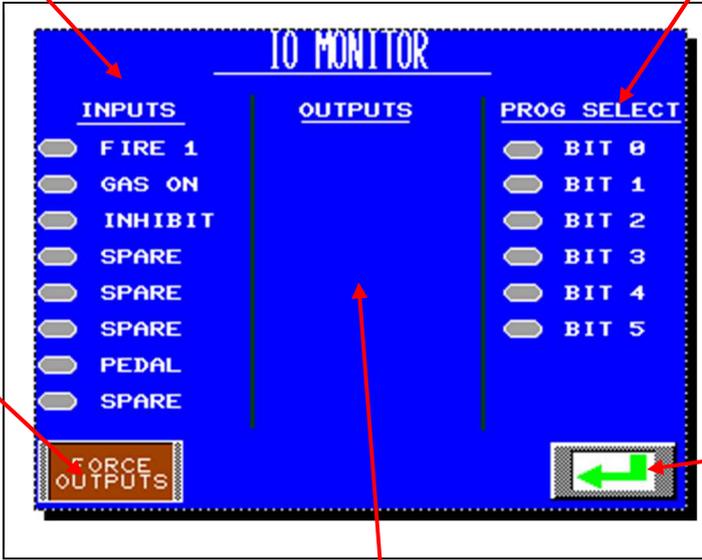
8 Gas Control Screen



Units fitted with gas control provide the ability to set pre and purge gas valve actuations.

In addition, the gas valve maybe turned on and off either via the keypad or from an external input

9 IO Monitor Screen



The screenshot shows the IO Monitor screen with three columns: INPUTS, OUTPUTS, and PROG SELECT. The INPUTS column lists FIRE 1, GAS ON, INHIBIT, SPARE, SPARE, SPARE, PEDAL, and SPARE. The OUTPUTS column is currently empty. The PROG SELECT column lists BIT 0 through BIT 5. A FORCE OUTPUTS button is at the bottom left, and a back arrow button is at the bottom right.

Callout boxes provide the following information:

- Top Left:** Show the status of the inputs on the 37 way IO connector.
- Top Right:** Shows the status of the program select bits, on the 15 way connector.
- Bottom Left:** Touch to force the outputs on to test the wiring and setup the PLC inputs. This function requires the user password to be entered. Welding is inhibited while this function is enabled.
- Bottom Center:** This section will display the outputs if the force output button is enabled. To switch the outputs on, touch the light next to the output. When the light is red, the output is on.
- Bottom Right:** Exit to main menu.

This screen enables the digital inputs and outputs to be both monitored and forced (set). The light next to each of the signals indicates whether the input is on or off. Due to the high response speed of the welder, not all digital inputs may be displayed when operating at maximum duty. If there is a problem with the inputs, then these should be forced on the PLC and confirmed using this screen.

Outputs are only shown if the force output button is pressed. Pressing this button, asks for a password to be entered, (user password) before the outputs can be tested. Pressing the light next to the output, turns the output on and off. Grey indicates off, and red indicates on.

When the force output light is on, then all welding is inhibited.

10 Control Connections

Amada Weld Tech recommend the use of screened cables for all connections.

10.1 RS232 Port (9way D Type)

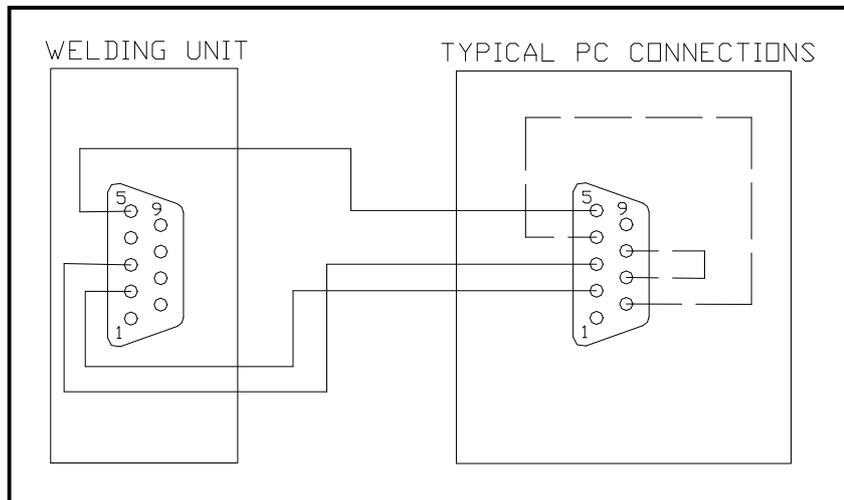
The 9 Way D type connector provides an optically isolated RS232 communications port.

Connections are as follows;

TXD pin 2
 RXD pin 3
 0V pin 5

Isolation is rated at 500V continuously, or 1000V for 1 second.

Full duplex 9600, 38400 & 57600 baud



Connecting a typical PC to the PAxxP

A PC uses either a 9-pin D-type serial connector or a 25-pin D-type. The table below shows how to interface the PAxxP to either type of PC serial communication port. (Handshake lines CTS, RTS, DSR & DTR can usually be omitted)

Comms signal description	25-pin comms port	9-pin PC comms port	Connection required	9-pin D-sub connector on PAxxP
Protective ground	pin 1	pin 5		
Tx	pin 2	pin 3	←	pin 3 (Rx)
Rx	pin 3	pin 2	←	Pin 2 (Tx)
RTS	pin 4	pin 7	←	
CTS	pin 5	pin 8	←	
DSR	pin 6	pin 6	←	
Logical Ground	pin 7	pin 5	←	pin 5 (isolated 0V)
DTR	pin 20	pin 4	←	

10.2 MWSBus

This connection is no implemented on these machines.

10.3 USB Port

This port connects directly to the HMI. It can be used for reprogramming. It is a USB type A connector, and conforms to the USB 1.1 standard. We currently do not recommend use of memory sticks greater than 1 Gigabyte.

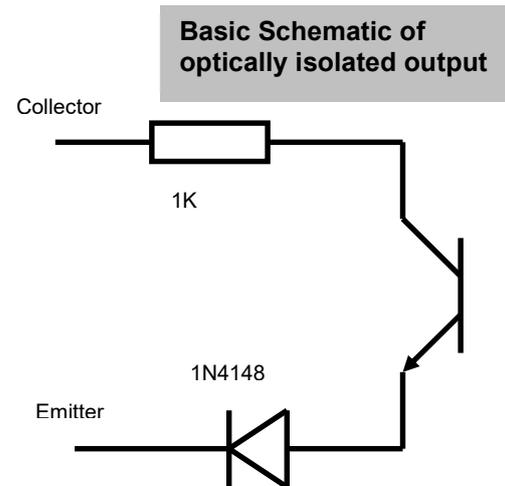
10.4 AVM Voltage Output Terminals

These terminals are designed for connection to a MacGregor AVM (Arc Voltage Monitor). They are not isolated from the welding circuit, and should NOT be used for any other purpose. Take care when making these connections to match polarity, RED is positive, BLACK is negative. Take care that these wires are not short circuited or crossed.

10.5 Single Output Digital I/O (37way D Type)

The following tables show the standard outputs and inputs available at the 37W D type PLC interface socket on a single output unit. 24V 20mA nominal rating - - Inputs and Outputs ARE fully protected against short circuit and overload.

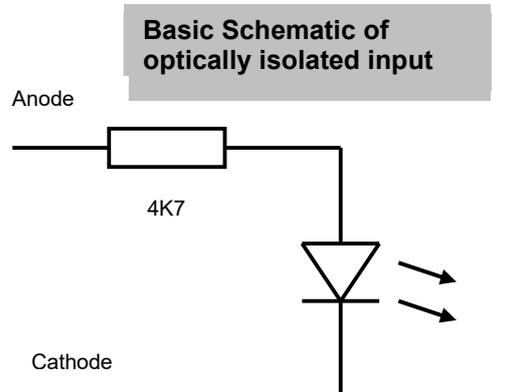
Output	Description	D-Type Pin Out
Pulse 2 Fault	Collector	14
	Emitter	16
Energy Limit Fault Pulse 2	Collector	33
	Emitter	34
Busy	Collector	12
	Emitter	15
Pulse 1 Fault	Collector	11
	Emitter	13
Voltage Limit Fault Pulse 2	Collector	31
	Emitter	32
Energy Limit Fault Pulse 1	Collector	29
	Emitter	36
Voltage Limit Fault Pulse 1	Collector	10
	Emitter	35
FAULT	Collector	28
	Emitter	17



Typically, the collector connection is pulled up to +24VDC and is used as the input to a PLC, while the emitter is connected to the +24V return (0V) connection

All the output transistors are normally ON, and go OFF when active. The BUSY signal turns OFF for the duration of the weld cycle. The Arc Fault outputs turn off for the duration specified in the configuration screen, if there is an arc fail or fault.

Input	Description	D-Type Pin In
Spare	Anode	23
	Cathode	25
Pedal	Anode	4
	Cathode	5
Spare	Anode	3
	Cathode	8
Spare	Anode	22
	Cathode	7
Spare	Anode	21
	Cathode	27
Inhibit	Anode	2
	Cathode	6
GAS	Anode	20
	Cathode	24
Start 1	Anode	1
	Cathode	26



Typically, the anode is connected directly to +24VDC (obtained on pin 37) while the cathode is connected via a PLC or switch to 0V(24) (obtained on pin 19). Passing current, activates the input.

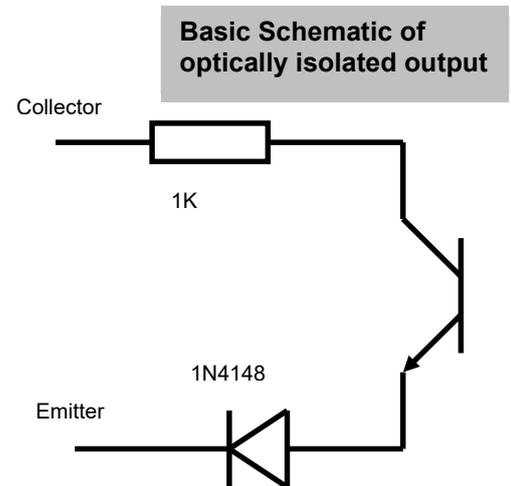
The Pedal input is only active when the machine is in setup (man mode).

10.6 Multiple Output Digital I/O (37way D Type)

The following tables show the standard outputs and inputs available at the 37W D type PLC interface socket on a multiple output unit.

24V 20mA nominal rating - - Inputs and Outputs ARE fully protected against short circuit and overload.

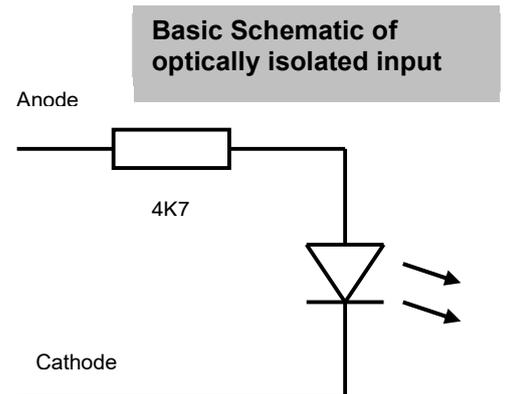
Output	Description	D-Type Pin Out
Spare	Collector	14
	Emitter	16
Spare	Collector	33
	Emitter	34
Busy	Collector	12
	Emitter	15
Arc Fail/Fault Torch 4	Collector	11
	Emitter	13
Spare	Collector	31
	Emitter	32
Arc Fail/Fault Torch 3	Collector	29
	Emitter	36
Arc Fail/Fault Torch 2	Collector	10
	Emitter	35
Arc Fail/Fault Torch 1	Collector	28
	Emitter	17



Typically, the collector connection is pulled up to +24VDC and is used as the input to a PLC, while the emitter is connected to the +24V return (0V) connection

All the output transistors are normally ON, and go OFF when active. The BUSY signal turns OFF for the duration of the weld cycle. The Arc Fault outputs turn off for the duration specified in the configuration screen, if there is an arc fail or fault.

Input	Description	D-Type Pin In
Start 3 (Spare)	Anode	23
	Cathode	25
Pedal	Anode	4
	Cathode	5
Sequence Start	Anode	3
	Cathode	8
Start 2 (Spare)	Anode	22
	Cathode	7
Start 4	Anode	21
	Cathode	27
Inhibit (Start 3)	Anode	2
	Cathode	6
Gas (Start 2)	Anode	20
	Cathode	24
Start 1	Anode	1
	Cathode	26



Typically, the anode is connected directly to +24VDC (obtained on pin 37) while the cathode is connected via a PLC or switch to 0V(24) (obtained on pin 19). Passing current, activates the input.

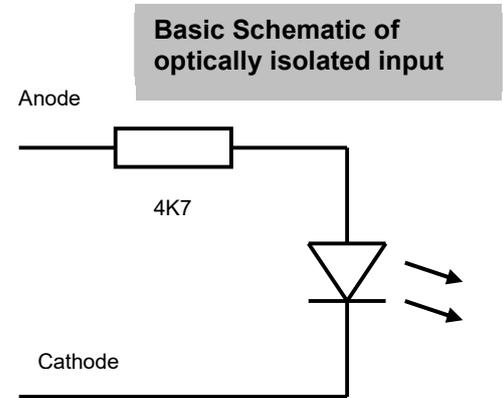
The Sequence Start input fires outputs 1 to 4, with a delay of 100ms between welds. The Pedal input is only active when the machine is in setup (man mode).

Amada Weld Tech recommend the use of screened cables for all connections.

10.7 Remote Profile Select (15way D Type)

The following tables show the inputs available at the 15W D type remote profile select interface plug. 24V 20mA nominal rating - - Inputs ARE fully protected against short circuit and overload.

Input	Description	D-Type Pin In
Bit 0	Anode	1
	Cathode	9
Bit 1	Anode	2
	Cathode	10
Bit 2	Anode	3
	Cathode	11
Bit 3	Anode	5
	Cathode	4
Bit 4	Anode	7
	Cathode	6
Bit 5	Anode	15
	Cathode	8



Typically, the anode is connected directly to +24VDC while the cathode is connected via a PLC or switch to 0V(24). Passing current, activates the input. User to provide 24V supply.

If the remote profile select inputs are used, the data presented here must be stable for a minimum of 1 millisecond before the weld is triggered. It should be maintained until the weld is completed.

The data on the port is a binary code. Bit 0 is the LSB, and bit 5 the MSB.

If no profile is selected, the welder welds with the profile number displayed on the front panel screen.

Profile numbers that can be selected are 1 to 63. All other numbers are invalid.

Amada Weld Tech recommend the use of screened cables for all connections.

11 Process Faults and Warnings

Please refer to the 'Trouble Shooting Guide' if the arc is failing to ignite. The unit will display context based warning screens, reporting where appropriate the fault detail.

11.1 High Voltage Limit Fault

Violation of a high voltage limit can indicate an increase in the arc gap or a loose connection in the torch or work piece. This is normally due to incorrect setting of the electrode, or incorrect part positioning. In some applications, such as coil winding, this can also be caused by bent pins, or poor return contact clamp pressure.

11.2 Low Voltage Limit Fault

Violation of a low voltage limit can indicate a reduction in the arc gap or a short circuit between the electrode and the work piece. This is normally due to incorrect setting of the electrode, or incorrect part positioning. In some applications, such as coil winding, this can also be caused by stray pieces of wire sticking up, touching the electrode. In the case of a short circuit, the PAxxP will still pass the correct current, so the current detection circuitry will still say the arc is ok. However, appropriate use of the low voltage limit will indicate the short circuit, and hence the 'no weld' condition.

11.3 High Energy Limit Fault

Violation of a high energy limit can indicate an increase in the arc gap or a loose connection in the torch or work piece, since as the current is constant, variations in arc voltage will cause variations in arc energy. This is normally due to incorrect setting of the electrode, or incorrect part positioning. In some applications, such as coil winding, this can also be caused by bent pins, or poor return contact clamp pressure.

11.4 Low Energy Limit Fault

Violation of a low energy limit can indicate a reduction in the arc gap or a short circuit between the electrode and the work piece, since as the current is constant, variations in arc voltage will cause variations in arc energy. This is normally due to incorrect setting of the electrode, or incorrect part positioning. In some applications, such as coil winding, this can also be caused by stray pieces of wire sticking up, touching the electrode. In the case of a short circuit, the PAxxP will still pass the correct current, so the current detection circuitry will still say the arc is ok. However, appropriate use of the low energy limit will indicate the short circuit, and hence the 'no weld' condition.

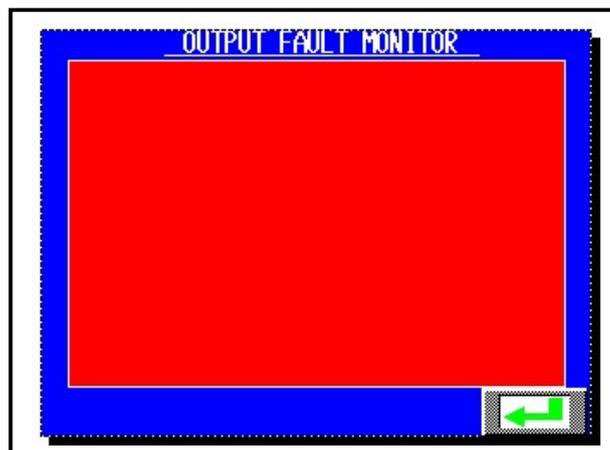
11.5 Additional Warnings

For units fitted with gas control, the front panel gas LED indicator is designed to indicate that gas flow is enabled. Should there be insufficient gas flow, this LED will flash intermittently.

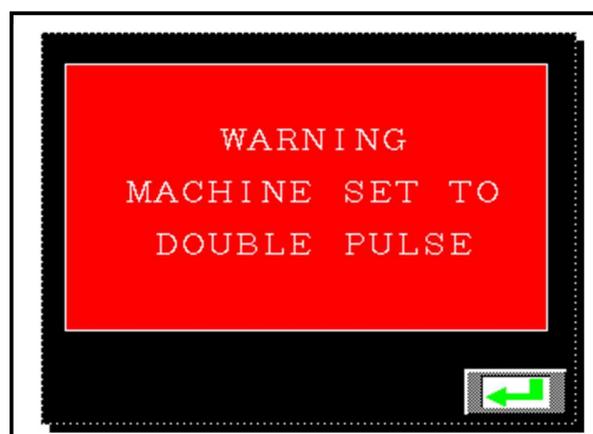
In the unlikely event of a software problem, the unit is designed to emit audible beeps on a continual basis until reset/power cycled. Under such circumstances, please contact your distributor for advice.



Overheat condition warning



General warning screen format



Double pulse warning at power up

12 Basic Trouble Shooting Guide

The following section has been prepared as a basic checklist to use in the event of the system problem. The design and reliability of the PAxxP products is such that power supply failure itself is extremely rare. More often than not, a system problem will be caused by a change in the overall welding process, and not the actual power supply itself. It is therefore **VERY IMPORTANT** to consider the variables that may affect the welding process, and to check these before suspecting a problem with the power supply.

Typical process changes may be:

1. An electrode change; dirty or damaged electrodes.
2. Dimensional changes in product.
3. Material quality, e.g. Oxide layer, substrate thickness etc.
4. Faulty weld torches; loose connections; timing problems between making return contact and asserting the trigger signal.

If the welding torch is not striking an arc to the work piece this could be for a number of reasons:

1. Check settings on the welding power supply and ensure current is not set to 0 Amps
2. Check the BINZEL connections – these are the connectors and cables that carry the main arc current. If you have connectors that do not fit properly or the insulation has aged and perished these should be replaced immediately. There are four types, male / female / panel mounting and cable.
3. Check the fuse FS1 on the rear panel of the PAxxP Power Supply. This protects the pilot current supply. It is rated at 2A anti surge. If this fails then the PAxxP will not be able to start the pilot current or any weld current although you may see a spark “track” for the High Voltage ignition.
4. Check if the electrodes may have become contaminated. Try cleaning them and the holders, and grind a new tip if possible with a 30° chamfer - this shape helps the arc to establish.
5. Check the electrode holders which can in some cases “track” the arc away from the work piece, normally through the contamination. It is recommended that ceramic electrode holders are used. These should be grounded (to earth) to prevent the build-up of static charge.
6. Check the gas flow or air suction as excessive turbulence at the weld head will disrupt the plasma column and prevent the arc forming. A typical shielding gas flow should be 2 litres per minute. Care should also be taken that gas or air nozzles are not designed to produce highly directional “jet streams” for the same reason.
7. Check the electrode material used as this can affect the ease with which the arc can initiate.
8. Check that the arc gap is correct. Normally this should be 0.8 mm to 1.2 mm in air. If the gap is too great then the arc will not establish. If shielding gas is used the arc distance, can be increased as this lowers the arc voltage requirement for welding.
9. If the problem is still present after performing all of the tests above, it could be that the internal fuse has blown. If it is suspected that this is the fault with the unit, please contact Amada Weld Tech for assistance, as it may be necessary to return the unit for repair.



Warning

If the timing of the external signals (weld trigger inputs) is too fast, then the welder will stop operating. All of the external fault signals are energised, and no inputs are recognised. The welder will start sounding its beeper on and off. To recover, power cycle the unit, and check the timing of the external PLC signals.

If these aspects have been considered, then the following checklist should be worked through. The PAxxP offers several fault-reporting methods that are designed to assist in fault diagnosis.

Check / Symptom	Reasons	Remedy
Is the status indicator illuminated?	This LED illuminates to show the machine is ON and that the internal +24VDC supply is functioning. No mains power.	Disconnect ALL external connections. <i>(It is quite common for external wiring faults to cause the +24VDC supply to be overloaded).</i> Check mains fuse. Check mains supply to machine.
Is the LCD illuminated?	The machine display will illuminate ONLY if the +24V internal supply is good.	Check mains supply to machine. Check mains fuse.
Machine displays 'Main Transistor Bank Over Temperature'.	The machine output will be inhibited if the machine overheats. Cooling of the main transistors is achieved by an internal heatsink and cooling fan which "pulls" air through the heatsink, blowing warm air out of the rear panel. In the event that the heatsink reaches 70°C, the drive to the transistors is inhibited and all the fault signals on the remote control socket are active. The temperature must fall to 50°C before welding can continue.	Clear any faults and the inhibit setting. Allow machine to cool down and investigate reasons for over heating. Check output connections. Check that the cooling air is able to circulate and that the fan is not obstructed.
Machine will not start an arc.	Check that the arc gap is correct. Normally this should be 0.8 mm to 1.2 mm in air. If the gap is too great then the arc will not establish. If shielding gas is used the arc distance, can be increased as this lowers the arc voltage requirement for welding. Check the electrode material used as this can affect the ease with which the arc can initiate.	Check arc gap. Check correct electrode material.
No RS232 communication.	Problems generally occur with incorrect wiring or incompatible software or Baud rate settings.	Check connections, particularly Tx & Rx. Verify the PC and the PAxxP are set to the same Baud rate, and are using the same protocols. Ensure 'logging' option is set to ON, on the configuration screen.
Machine continually exceeds upper or lower limits.	Often caused by variations in electrode, particularly when new, or variations in arc gap.	Run several trial welds and check electrode alignment and arc gap.
Machine will not trigger	Most often caused by loss of +24VDC or faulty trigger wiring, external PLC IO timing.	Check wiring for the trigger signal. Check PLC timing, refer note on page 32.



Warning

DO NOT REMOVE THE MACHINE COVER. THERE ARE NO USER SERVICEABLE PARTS INSIDE.

13 Index**13.1 Headword Index**

A	
Additional Warnings	38
AVM Voltage Output Terminals	35
B	
Basic trouble Shooting Guide	40
C	
Commissioning	8
Configuration Screen	31
Control Connections.....	34
D	
Default Menu Screen	12
E	
Electrical Connections.....	8
G	
Gas Control Screen.....	32
General Information	5
Getting Started	12
H	
High Energy Limit.....	15
High Energy Limit Fault.....	38
High Voltage Limit.....	15
High Voltage Limit Fault.....	38
I	
Information Colour Coding Key.....	13
Introduction.....	7
IO Monitor Screen	33
L	
Limit Functions	15
Low Energy Limit.....	15
Low Energy Limit Fault.....	38
Low Voltage Limit.....	15
Low Voltage Limit Fault.....	38

M	
Memory Locations (Profiles).....	14
Memory Organisation	14
Monitored Limit Parameters	15
Multiple Output Digital I/O (37way D Type).....	36
MWSBus.....	34
P	
Password Entry Screen (Log in/out).....	16
Power On	12
Process Faults and Warnings.....	38
Profile Editor	22
Profile Editor Load Screen.....	24
Profile Editor Save Screen	25
Profile Editor screen	22
R	
Remote Profile Select (15way D Type)	37
RS232 Port (9way D Type).....	34
Run (Auto mode)	26
Run (Auto mode) Load Screen.....	30
Run (Auto mode) Monitor Screen.....	27
S	
Scratchpad Memory.....	14
Setup (Man mode).....	17
Setup (Man mode) Graph Screen	19
Setup (Man mode) Load Screen	20
Setup (Man mode) Save Screen	21
Setup screen.....	17
Shield Gas Connections	9
Single Output Digital I/O (37way D Type)	35
T	
Technical Description	6
Technical Specification.....	6
U	
USB Port.....	34