



MSA ENGINEERING SYSTEMS LIMITED

NEXUS 500 Series Electrofusion Control Unit

Operating Manual

2008 - Revision A



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1.0 Equipment Required

To successfully join polymer pipes using electrofusion couplers you will need the following equipment:

1. An MSA NEXUS 500 Series Electrofusion Control Unit
2. A TIN-12 certified generator (110/220Vac, depending on ECU) with a 3.5kw minimum output
3. A set of electrofusion clamps
4. Tools for de-burring and scraping the pipeline
5. Approved couplings

2.0 Equipment List

Equipment included in the basic package includes:

- MSA NEXUS 500 Series Electrofusion Control Unit
- Nexus Remote Keypad hand held unit (HHU)
- 4.0mm and 4.7mm Terminal Ends
- Operating Manual
- Calibration Certificate

For a list of available accessories, see section 10.2

3.0 Warranty

MSA NEXUS Electrofusion Control Units are guaranteed against faulty materials or workmanship for a period of 12 months from the date of purchase. Any units which fail under the warranty will be repaired or replaced free of charge at the discretion of MSA Engineering Systems Limited.

4.0 Safety and Care

4.1 General Safety

Most welding tasks may be considered as hot work in site situations and may be subject to specific permits to work.

This equipment should only be used by an operator who has been deemed competent to do so by his/her employer.

This equipment should be used by an able bodied, competent adult who has read and understood the operating instructions. Anyone with either a temporary or permanent disability should seek expert advice before using it.

Keep children, animals and bystanders away from the work area. Cordon off a NO GO area using cones and either barriers or tape.

NEXUS 500 Series Electrofusion Controller

WARNING : If you are wearing an electronic life support device (a heart Pacemaker) you must consult your doctor before going near or working with the equipment. Magnetic fields associated with high currents may affect these devices.

Never use this equipment if you are ill, feeling tired, or under the influence of alcohol or drugs.

Wear practical, protective clothing, gloves and footwear.

Always switch OFF the equipment when not in use.

Never use welding equipment near computers or any sensitive electronic equipment.

This equipment is designed to be within the lifting allowance of an able bodied male.

Ensure the work area is well lit and ventilated.

Make sure you know how to switch this machine OFF before you switch it on, in case you get into difficulty.

Check the condition of the equipment before use. If it shows signs of excessive wear or damage, contact your supplier.

4.2 Electrical Safety

If the equipment fails, or any of it's cables or plugs become damaged, return it. Never try to repair it yourself.

Keep cables out of harm's way and clear of the work area.

All leads should be fully unwound, loosely coiled and suspended from the handle utilising the strap provided when storing or transporting the unit (see picture to the right). Never run them through water, over sharp edges, or where they could trip someone.

This equipment is IP65 rated, but please bear in mind that using electrical equipment in very damp or wet conditions can be dangerous.



4.3 Equipment Care

Never push the equipment beyond its design limits. Check the technical specification to ensure you are using the correct equipment. When not in use, store the equipment somewhere clean, dry and safe. Keep the equipment clean. It is recommended to clean the unit with a dry cloth.

5.0 Specifications

Input Voltage:	110V Unit ▶ 90Vac to 130Vac, 40 – 75 Hz 220V Unit ▶ 190Vac to 260Vac, 40 – 75 Hz
Input Current:	32A (Maximum) On 110V unit 16A (Maximum) On 220V unit
Output Power:	3.5kVA maximum
Output Voltage:	8 – 48Vac _{RMS} ± 0.5Vac _{RMS}
Output Current:	100A (Maximum)
Duty Cycle, t _d :	t _d = 30 minutes Full Load at 40°C or 5 cycles of 10 minutes ON and 10 minutes OFF
Operating Temperature:	-10°C to +50°C
Fusion Capability:	Diameter range 20 – 315mm (NOTE: can weld greater than 315mm subject to meeting conditions for duty-cycle and output characteristics).
ECU:	500(W) x 180(D) x 330(H) mm – <i>approximate overall dimensions</i>
Remote Keypad	116(W) x 220(D) x 119(H) mm – <i>approximate overall dimensions</i>
Remote Keypad Cable:	3 metres (Remote Keypad detachable)
Input Supply Cable:	3 metres – STANDARD
Output Welding Cable:	3 metres – STANDARD / 6 metres for COMBI units
Net weight – ECU:	17.8kg (110V) and 19.3Kg (220V)
Net weight - remote keypad:	0.6kg
Fusion Timer:	1 – 899 time in seconds, 901 – 999 time as 1 – 99 minutes preceded by the digit "9" (Limited by welding transformer capability)
Input Protection:	35A Circuit Breaker reset externally
Seal Rating:	Control Unit ▶ IP65
Display:	Remote Keypad ▶ LCD 20characters x 4lines, LED back-lit
Data Entry:	16 Keys Alpha-numeric system
Operating Modes:	Weld 39.5V, Weld 8-48V and Auto (Barcode)
Temperature compensation:	Yes – in Barcode mode
Memory Storage:	2048 Joints
Additional Features:	Data retrieval to serial RS232 PC download Temperature compensation in Barcode mode Fusion status buzzer indication Welding voltage display Welding current display Input voltage display Ambient temperature display User friendly

NEXUS 500 series ECU classification according to ISO 12176:

Classification Number: **P₂3US₂VKADX**

P ₂	Low voltage input – 110V / 240V (AC)
3	Output power maximum – 3kW
U	Regulation mode – Voltage
S ₂	Very low output voltage – 8V to 48V (RMS)
V	Control unit type – Variable
KA	Data introduction – Manual and Automatic
D	Equipped with data retrieval system
X	Polyvalent and Multi-mode – capable of welding wide range of electrofusion fittings from different manufacturers

6.0 Introduction

6.1 Description

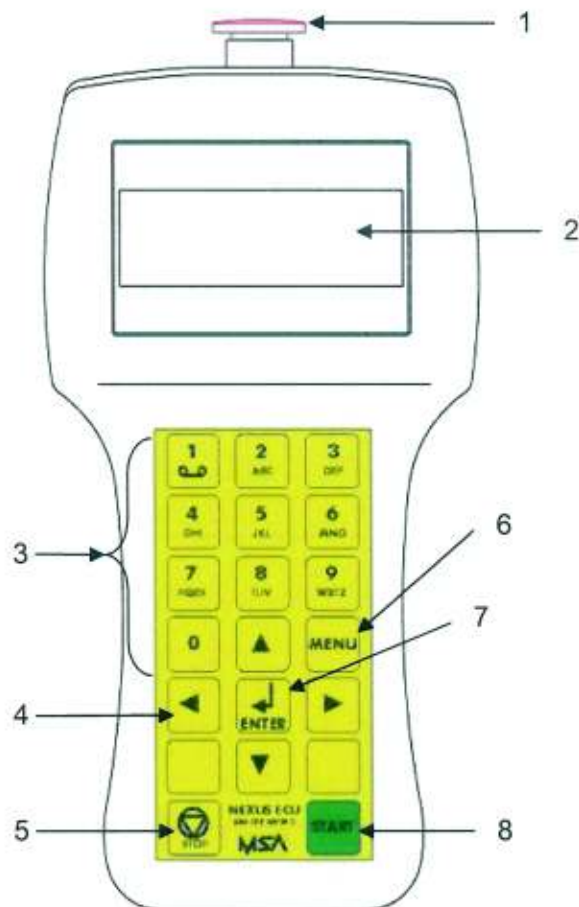
The NEXUS has been designed to be extremely versatile, able to accommodate all 8 to 48 Volt fittings currently manufactured within the specifications of the device.

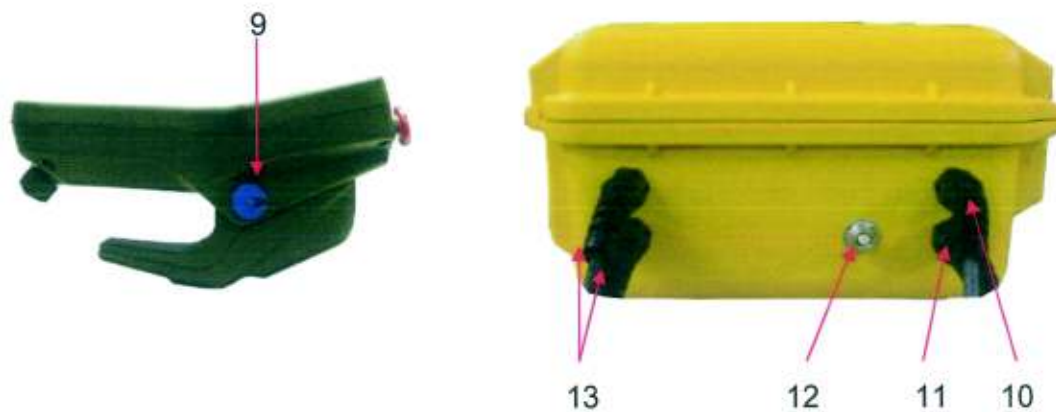
The NEXUS aims to supply a constant output voltage. The output is, in addition, timed to guarantee an identical faultless joint every time. The control unit also monitors it's own functions as well as the power inlet and outlet, and prompts the user if any parameters fall outside pre-determined limits.

User interface is via a Remote Keypad (HHU - Hand Held Unit), featuring an alphanumeric keypad and a 4-line, 20-digit backlit LCD display. The microprocessor generated prompts and messages instruct and offer information, which do not require a reference table or guide sheets. The digital display indicates the fusion time selected and, during a fusion cycle, the time left to run.

6.2 Control Layout

1. HHU ON/OFF, E-STOP button
2. 4-line, 20 character, alphanumeric, backlit LCD screen
3. Alpha-numeric keys (x10)
4. Arrow keys (x4)
5. STOP Button
6. MENU Button
7. ENTER Button
8. START Button





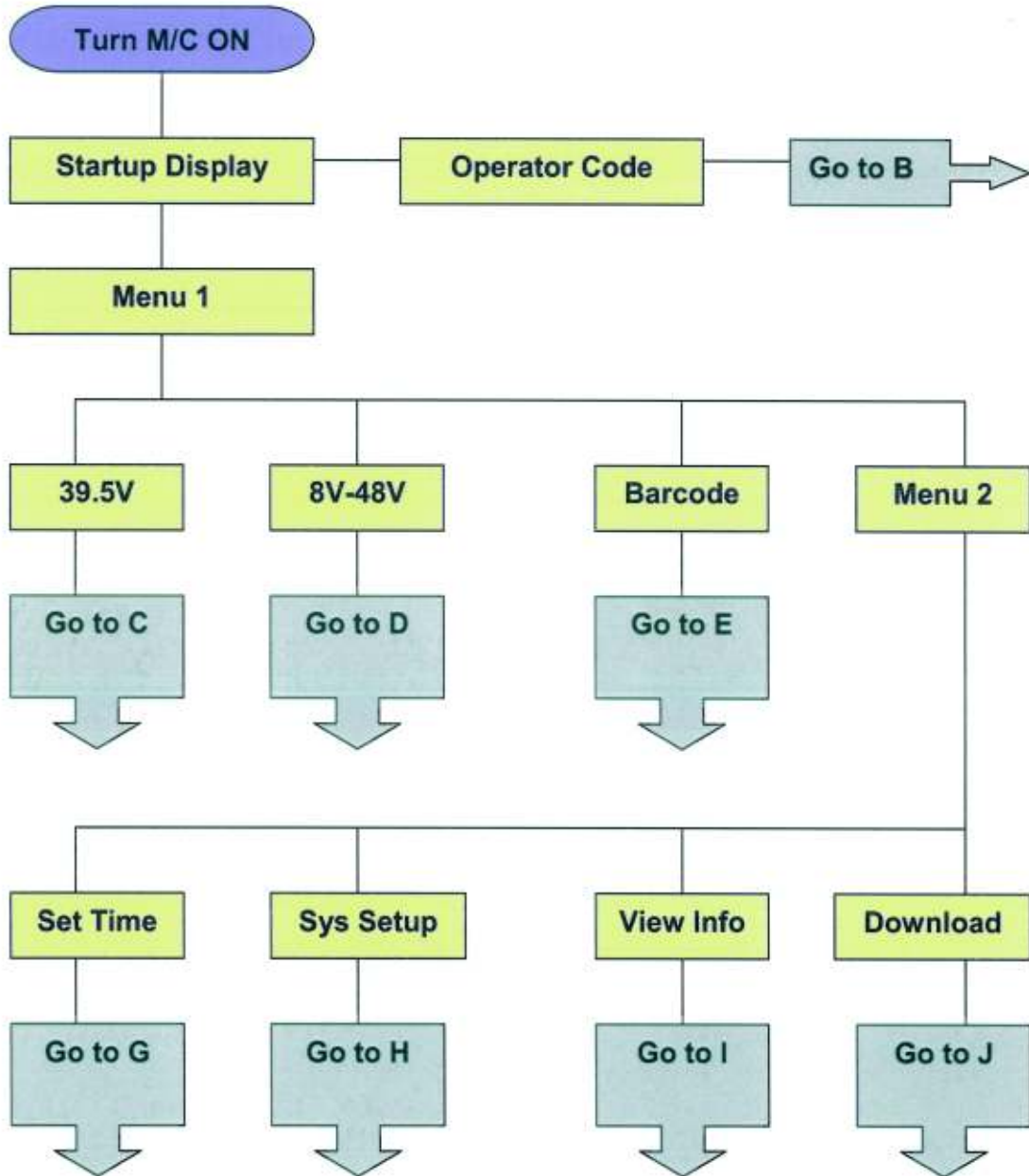
- 9. RS232 serial port for barcode scanner and PC data download
- 10. Remote Keypad lead
- 11. Input lead
- 12. Circuit breaker (2 breakers fitted for 110V unit)
- 13. Output leads

6.3 Preliminary Checks Before Operation

Refer to Control layout (section 6.2) above.

1. To turn unit ON/OFF use button (1).
2. Check RCD breaker (10) is switched on.
3. Check RCD window (10) is not damaged and is secured to protect seal rating of IP65, i.e. thumbscrew is fully fastened.
4. Check Circuit breaker (13) is pushed-in, i.e. not tripped.
5. Check RS232 port (8) dust cover is secured all the time when not in use to protect seal rating of IP65.

7.0 Operation





MSA ENG. SYSTEMS LTD
NEX510-BD-220-LT
V08-01-02
S/N: 2001

OPERATOR CODE
6 DIGITS: MSA123
Press ENTER
RIGHT, LEFT, STOP=CLR

This screen
can be turned
on/off from
Menu 2

MENU1: 1=39.5V
2=8V-48V
3=BARCODE
4=MENU2

Operator code:

This screen prompts the user for a 6-digit Operator Code, used as identification for the user. This code is entered with the following sequence:

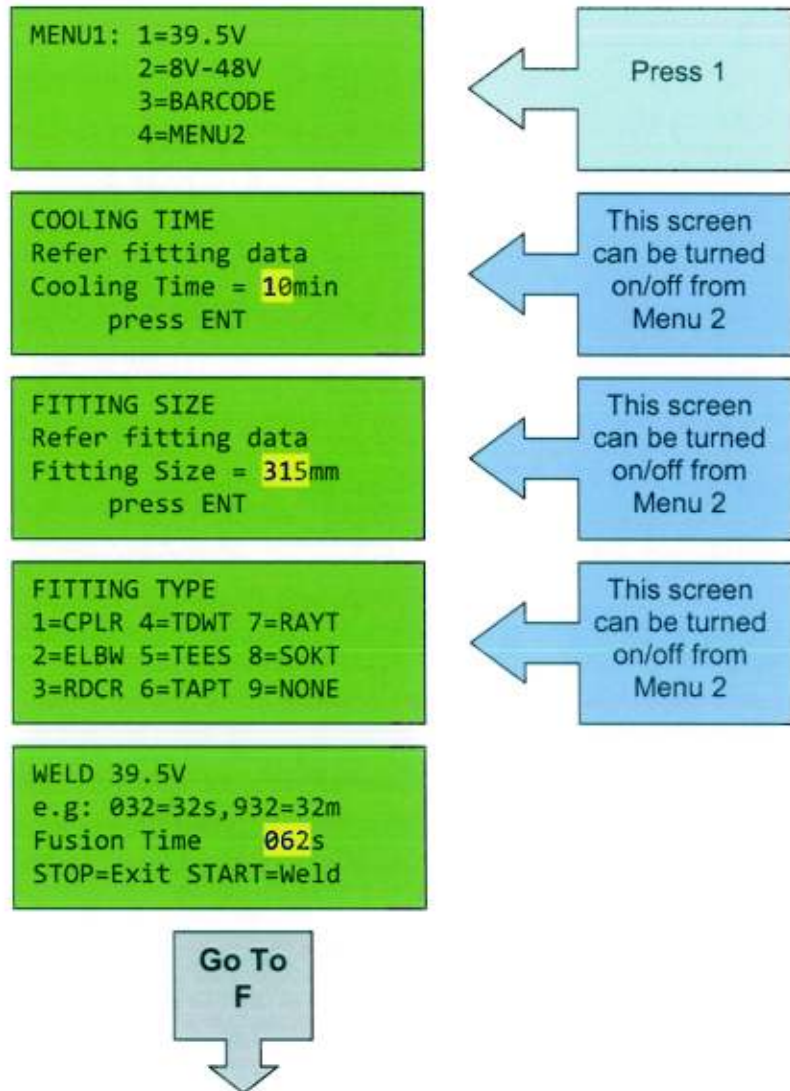
Use alphanumeric keypad to enter desired characters.

Use RIGHT_ARROW key to advance cursor position to right (next character).

Use LEFT_ARROW key to backspace cursor position to left (previous character).

Use KEY_STOP to clear all characters and start again.

Use KEY_ENTER to accept and save code.



WELD 39.5V:

The following screens can be turned ON/OFF from Menu 2 (refer to Menu 2 section for details):

- COOLING TIME – enter required cooling time as specified in the fitting’s data. Unit will go into countdown mode after a weld for the duration of cooling time entered. This information will be displayed in data retrieval.
- FITTING SIZE – this information is stored for data retrieval purpose only.
- FITTING TYPE – this information is stored for data retrieval purpose only. Refer below for more details on abbreviations.

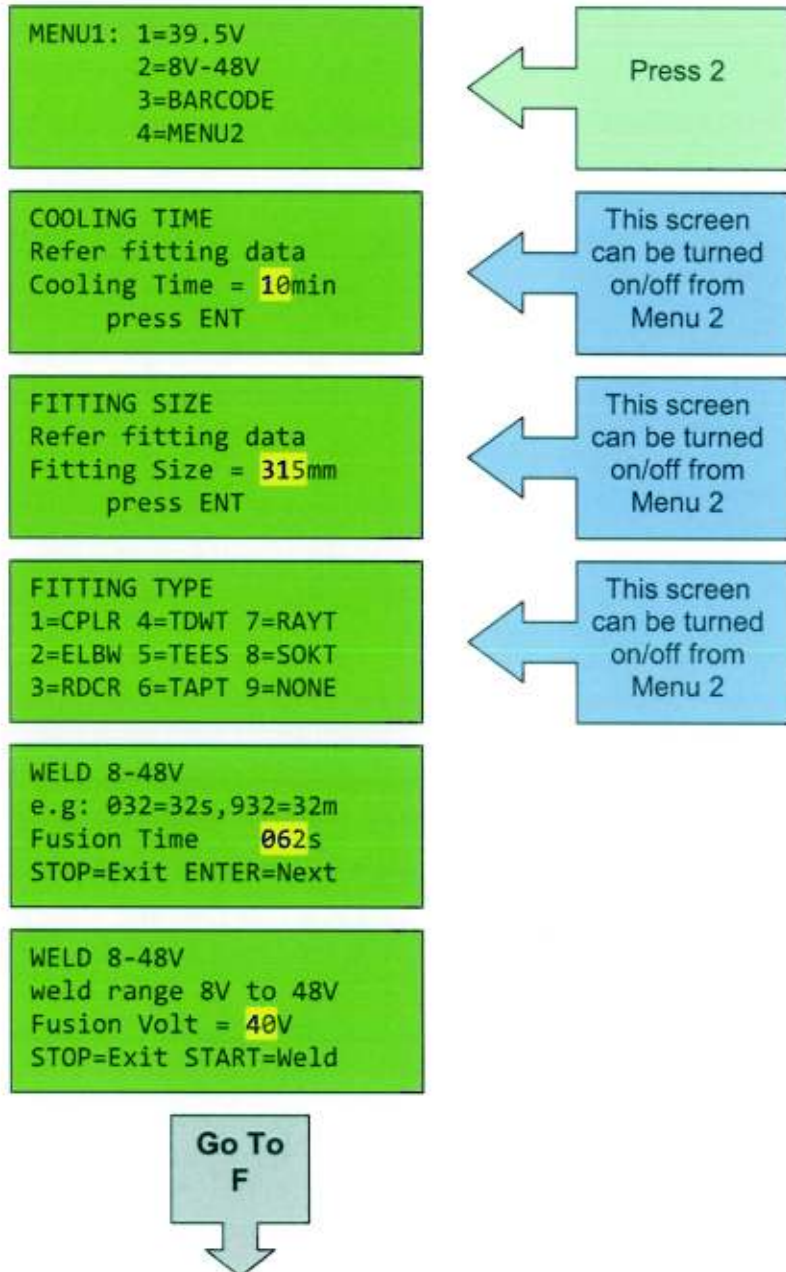
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CPLR = COUPLER
ELBW = ELBOW
RDCR = REDUCER
TDWT = TDW TAPPING TEE
TEES = TEES
TAPT = TAPPING TEE
RAYT = RAYTRANS
SOKT = SINGLE SOCKET
NONE = NONE OF ABOVE

The unit will accept welding time in seconds and minutes according to ISO 13950. Values between 1-899 will be referred to seconds and values between 901-999 will be referred in minutes. See example below:

32 seconds will entered as 032 or 32.
320 seconds will entered as 320.
32 minutes will entered as 932.

KEY_MENU will quit to Menu 1 screen.
KEY_START will proceed to welding process.



WELD 8-48V:

The following screens can be turned ON/OFF from Menu 2 (refer to Menu 2 section for details):

- COOLING TIME – enter required cooling time as specified in the fitting's data. Unit will go into countdown mode after a weld for the duration of cooling time entered. This information will be displayed in data retrieval.

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- FITTING SIZE – this information is stored for data retrieval purpose only.
- FITTING TYPE – this information is stored for data retrieval purpose only.
Refer below for more details on abbreviations.

CPLR = COUPLER
ELBW = ELBOW
RDCR = REDUCER
TDWT = TDW TAPPING TEE
TEES = TEES
TAPT = TAPPING TEE
RAYT = RAYTRANS
SOKT = SINGLE SOCKET
NONE = NONE OF ABOVE

The unit will accept welding time in seconds and minutes according to ISO 13950. Values between 1-899 will be referred to seconds and values between 901-999 will be referred in minutes. See example below:

32 seconds will entered as 032 or 32.
320 seconds will entered as 320.
32 minutes will entered as 932.

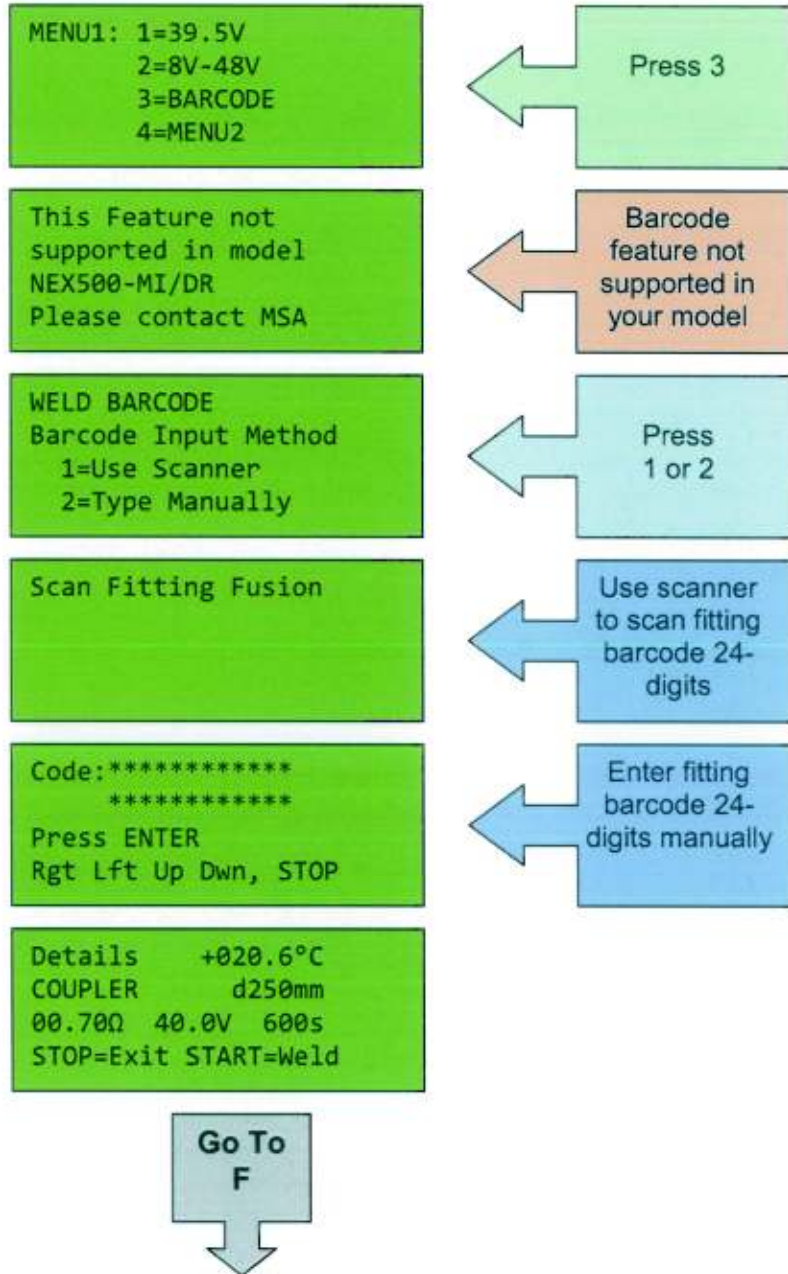
KEY_MENU will quit to Menu 1 screen.

KEY_ENTER will proceed to next screen to enter welding voltage.

The welding voltage accepted in range 8V to 48V RMS value.

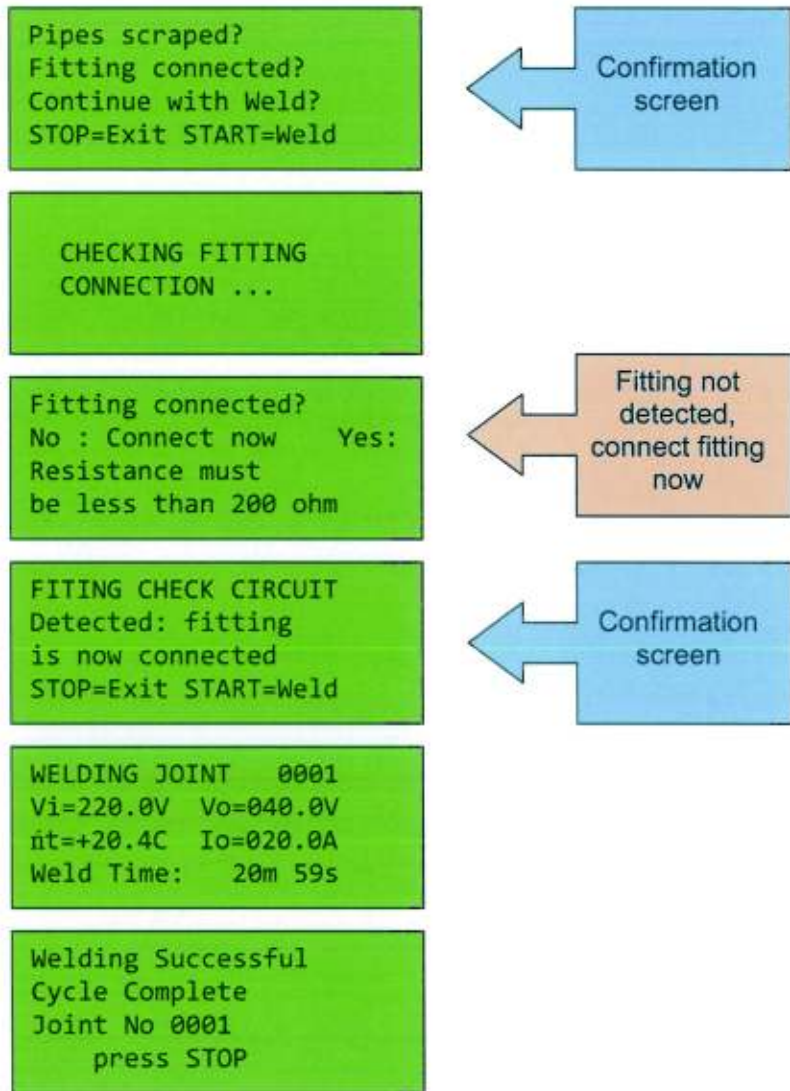
KEY_MENU will quit to Menu 1 screen.

KEY_START will proceed to welding process.



BARCODE:

This welding feature is not supported in models MI and DR. Error screen will be displayed as shown above if tried to use Barcode feature.



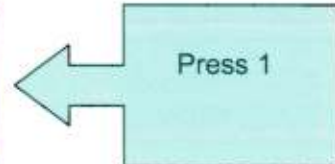
WELDING PROCESS:

If memory is full, welding may not be stored or process denied depending on systems settings from Menu 2.

Refer to "Additional Screens" section for more details on error screens.



MENU2: 1=Set-Time
2=SysSetup
3=ViewInfo
4=Download



SETUP - TIME (24hr)
HOUR:MINUTE
hh:mm
press ENTER

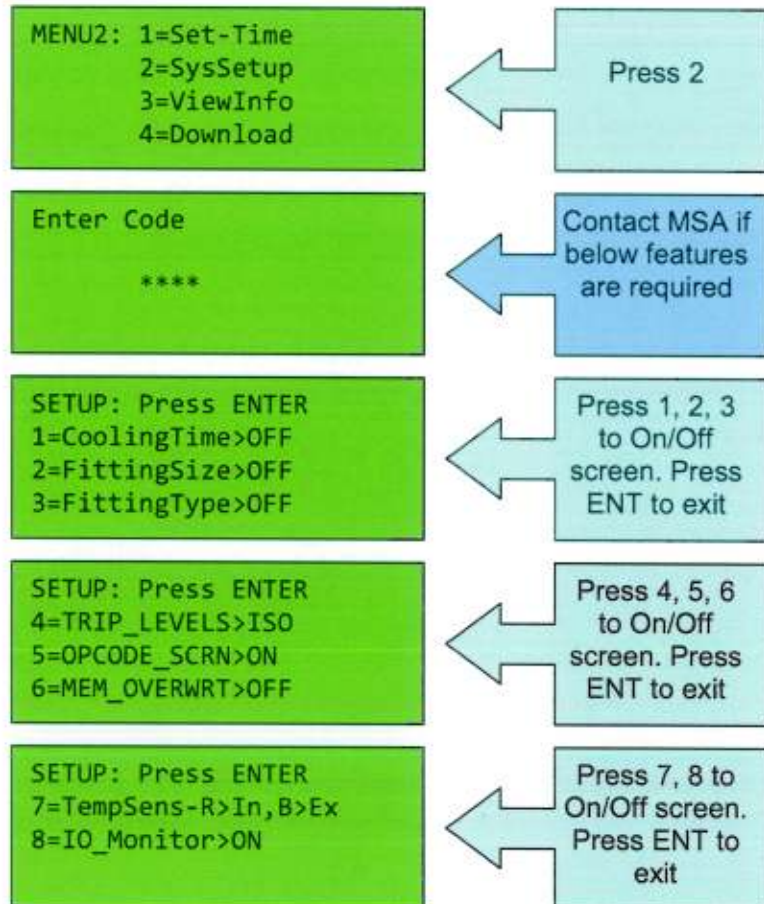
Set-Time:

Enter time in 24hr format.

E.g. 8.00AM = 08:00

8.00PM = 20:00

Press ENTER button to accept.



System Setup:

Certain features can be enabled or disabled with this System setup menu. Following items described below:

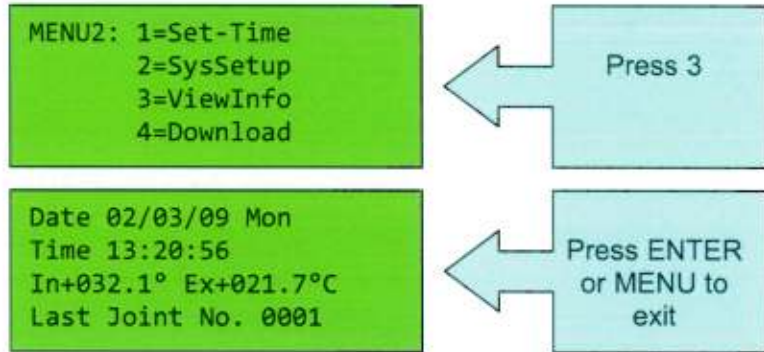
1. Cooling Time – if enabled, will prompt extra screen during welding procedure to input fitting's cooling time. This cooling time information will be saved for data retrieval and also will put unit in countdown mode after the welding is completed.
2. Fitting Size – if enabled, will prompt for extra screen during welding procedure to input fitting's size. This information is saved for data retrieval purpose only.
3. Fitting Type – if enabled, will prompt for extra screen during welding procedure to input fitting's type. This information is saved for data retrieval purpose only.
4. Trip Levels – for MSA internal use only, please **DO NOT** change this value.

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5. Operator Code – if enabled, will prompt for extra screen during start-up to input operator's name, code, ID etc. This 6-digit alphanumeric information is saved for data retrieval purpose only.
6. Memory Overwrite – if enabled, will automatically erase and overwrite old welding information when memory is full. If disabled, it will not allow welding to perform when memory is full.
7. Temperature Sensors – for MSA internal use only, please **DO NOT** change this value.
8. IO Monitor – for MSA internal use only, please **DO NOT** change this value.

Default settings are:

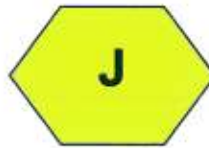
1. CoolingTime = OFF
2. FittingSize = OFF
3. FittingType = OFF
4. Trip_Level = ISO
5. OPCODE_SCRN = OFF
6. MEM_OVERWRT = ON
7. TempSens-R=In, B=Ex
8. IO_Monitor = ON



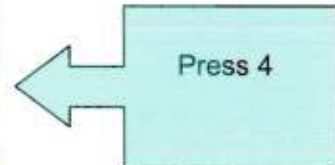
View Information:

This menu provides the following information (you can not edit from this menu):

- **Date:** 02/02/09 (in format dd/mm/yy)
- **Day:** Mon (i.e. Monday)
- **Time:** 13:20:56 (24hr format hh:mm:ss)
- **Internal Temperature:** +32.1°C (inside unit temperature)
- **External Temperature:** +21.7°C (ambient temperature)
- **Last Joint Number:** 0001 (Number of welds done by the unit)



```
MENU2: 1=Set-Time  
        2=SysSetup  
        3=ViewInfo  
        4=Download
```



```
DATA DOWNLOAD:  
Settings:19200,N,8,1  
Last :    123 Joints  
STOP=Exit START=Print
```

Download:

This menu lets you download welding information to PC. Your computer settings for serial COM port should be:

- **Baud:** 19200
- **Parity:** None
- **Data:** 8 bits
- **Stop:** 1 bit

Enter number of joints to print, e.g. 123 will print the last 123 joints from total number of joints the unit has done.

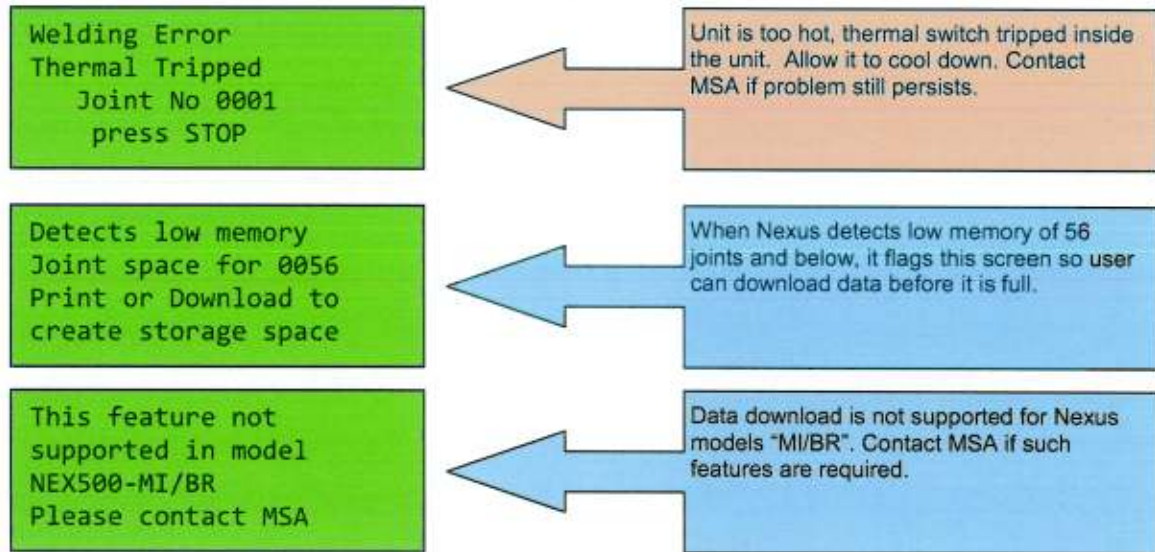
Press KEY_STOP to exit.
Press KEY_START to print.

8.0 Additional Screens

<p>Please wait... ECU in cooling mode Time min sec Remaining 12 36</p>		<p>The unit is in cooling mode - countdowns cooling time after a weld. Switching unit On/Off will remove this screen.</p>
<p>MEMORY FULL Joint 1234(12/05/06) Joint 5678(12/06/06) Delete? 1=Yes 2=No</p>		<p>This screen is displayed when memory is full. Press 1 will delete oldest memory section after a confirmation screen. Press 2 will exit.</p>
<p>Unit Requires Calibration Please contact MSA TEL:+44(0)1162608866</p>		<p>This is ONLY a reminder screen that unit requires calibration every 12 months according to ISO/ECE standards. It does NOT affect the performance of a weld.</p>
<p>Battery Low! replace with CR1225 and contact MSA for new RTC code</p>		<p>This screen is displayed when real-time clock (RTC) battery needs replacing. Obtain new RTC code from MSA for clock reset.</p>
<p>BadgeNo :MSA123 Skill :Automatic Expiry :Jun 2009 Company :MS</p>		<p>Nexus model "TO" uses operator badge to enable welding process depending on user's skill defined in 30-digit barcode. This is for traceability purpose. Contact MSA for more details.</p>
<p>Error! Invalid Badge The operator badge is expired,can not proceed further</p>		<p>This error screen is related to Nexus model "TO" when the operator badge is expired/invalid. Contact MSA for more details.</p>
<p>Enter Code ****</p>		<p>This screen is displayed when unit is asking for password.</p>
<p>Scan Pipe1 Tracecode STOP=Skip</p>		<p>Nexus model "TR/TO" requires scans of Pipe1 and Pipe 2 barcodes for traceability. This is a 40-digit barcode. Contact MSA for more details. Press CLR to skip.</p>
<p>Scan Fitting Trace STOP=Skip</p>		<p>Nexus model "TR/TO" requires scans of Fitting's trace barcodes for traceability. This is a 26-digit barcode. Contact MSA for more details. Press CLR to skip.</p>

<p>Warning! Unit is very hot allow it to cool Please weld later</p>		<p>Thermal switch inside the unit tripped. Please allow unit to cool down for switch to reset. This switch protects unit from overheating and causing damage.</p>
<p>invalid code Please contact MSA</p>		<p>Certain setup codes obtained from MSA checks for validity against serial number and date. Please obtain another code from MSA and use it within seven days validity period.</p>
<p>This Feature not supported in model NEX500-MI/DR Please contact MSA</p>		<p>Nexus models "MI/DR" does not support use of barcode features. Contact MSA if such features are required.</p>
<p>MEMORY FULL !WILL NOT SAVE WELD! CLR=Clear Memory ENT=Continue Weld</p>		<p>This screen is displayed when MEM_OVERWRT=OFF in Systems Setup from Menu 2. Weld is possible but will not save joint information.</p>
<p>Welding Error Cycle Reset Joint No 0001 press STOP</p>		<p>User aborted welding cycle by pressing Stop key.</p>
<p>Welding Error Output Voltage Fault Joint No 0001 press STOP</p>		<p>Incorrect output voltage. Check input voltage is within spec during weld. Check correct pin 4.0mm or 4.7mm is used in fitting. Try another fitting. Contact MSA if problem still persists.</p>
<p>Welding Error Fitting Shorted Joint No 0001 press STOP</p>		<p>Check input voltage is within spec during weld. Try another fitting. Contact MSA if problem still persists.</p>
<p>Welding Error Fitting Opened Joint No 0001 press STOP</p>		<p>Check input voltage is within spec during weld. Check correct pin 4.0mm or 4.7mm is used in fitting. Try another fitting. Check cables not damaged. Contact MSA if problem still persists.</p>
<p>Welding Error Input Voltage Fault Joint No 0001 press STOP</p>		<p>Check input voltage is within spec during weld. Contact MSA if problem still persists.</p>

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9.0 Maintenance

9.1 Spare Parts

Spare parts for the unit include:

Part Number	Description	Quantity
Acc. to Model	Manual	1
6610-0064	IP68 Dust Cap for Barcode Scanner Cable Plug	1
6610-0063	IP68 Dust Cap for connection socket on Remote Keypad for the Barcode Scanner	1
FL2001-4.0-4.7A	Terminal Pin Adaptor 4.0 - 4.7mm	1 pair
FL2001-4.7-4.0A	Terminal Pin Adaptor 4.7 - 4.0mm	1 pair

9.2 Testing

Functional tests (simulating Open and Short Circuit conditions) are possible with the use of a load bank (contact MSA for further information).

PAT Testing:

The Health and Safety Executive (HSE) have found that a quarter of reportable electrical accidents are due to faulty portable appliances. There is a need to inspect and test such appliances, with a view to reduce the number of accidents. The NEXUS 500-LT Series is classified as CLASS 2, therefore the only test that can be performed on the unit is the Insulation Test.

WARNING! DO NOT CARRY OUT FLASH TEST.

9.3 Service

It is recommended that your unit is calibrated at least once every year (once every six months, if used for Gas installations).

MSA provide a full after-sales service for repair and maintenance of NEXUS Electrofusion Controllers. Equipment can be re-programmed for new working practices or upgraded to include use of the latest automatic control systems.

Equipment to be returned to MSA should be clearly marked with suspected fault and/or service required, as well as contact name, address, telephone and fax numbers, and details of return address. All equipment should be returned to our Sales and Service Department at the address below.

MSA ENGINEERING SYSTEMS LIMITED
3 Assured Drive, Thurmaston, Leicester, LE4 8BB, United Kingdom
Phone: +44 (0)116 260 8866 Fax: +44 (0)11 260 8861
Email: sales@msa-engineering.co.uk Web: www.msa-engineering.co.uk

10.0 Appendix One – Models and Accessories

10.1 NEXUS Models

Models	Operating Modes / Functions (110 or 220/240V Input)
NEX510-MI	Manual Input (39.5V fixed & 8 to 48V variable)
NEX510-BR	Manual Input (39.5V fixed & 8 to 48V variable) Barcode Recognition (ISO TR 13950) Inc. CCD Scanner (NEX7100-01-000)
NEX510-DR	Manual Input (39.5V fixed & 8 to 48V variable) Data Retrieval (weld information)
NEX510-BD	Manual Input (39.5V fixed & 8 to 48V variable) Barcode Recognition (ISO TR 13950) Data Retrieval (weld information) Inc. CCD Scanner (NEX7100-01-000)
NEX520-TR	Manual Input (39.5V fixed & 8 to 48V variable) Barcode Recognition (ISO TR 13950) Traceability Barcode Recognition Data Retrieval (traceability & weld information) Inc. CCD Scanner (NEX7100-01-000)
NEX520-TO	Manual Input (39.5V fixed & 8 to 48V variable) Barcode Recognition (ISO TR 13950) Traceability Barcode Recognition Operator Badge/Barcode Recognition Data Retrieval (traceability & weld information) Inc. CCD Scanner (NEX7100-01-000)

* Pre-fix is NCU for Nexus Combi-Unit

10.2 Accessories

Part No.	Description
NEX7100*	CCD Bar Code Scanner (Gun Type)
DataSoft 3.*	PC Interface Software & Adaptor Lead (Data Retrieval – traceability/weld information)

Please enquire directly to MSA for the following items:

- Transport cases
- Load banks and equipment for testing the working status of ECU's
- Self-calibration check equipment/procedure using barcode scanner.