OPERATING INSTRUCTIONS

DSU

27-1300

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In the interests of improving and updating its equipment, ELE reserves the right to alter specifications to equipment at any time.
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1 Introduction and Specification

The DSU is a versatile instrument designed to accommodate the general logging requirements of geotechnical engineers and scientists. Its intelligent interface allows the user to work with a range of different sensors.

The DSU has two distinct modes of operation. These are referred to as DS mode (DataSystem) for operation with DS7 and DU mode (Data Unit) for standalone operation with a license free PC based data logging application.

The setup and operation of the unit in DS mode is detailed in section 3.

DU mode is detailed in sections 4 and 5.

The DSU may be connected to 2 different compression frames if required and independent tests run on each.

- Multiplex 50 (fully automatic start and stop facility)
- Marshall Test 50 (requires manual start and stop of DSU and load frame)
- CBR Test 50 (requires manual start and stop of DSU and load frame)

The DSU itself may be connected to any standard personal computer via an RS232 interface or Ethernet link. An additional USB connection is available for updating software and viewing/copying the test result files.

1.1 Use of this Manual

This manual has not been written with the technical user in mind, that is, someone who intends to write their own software to control the DSU in DS mode, and therefore needs to know about the Data acquisition Operating System command set (GDOS commands). This user should refer to the GDU/GDOS Technical Manual 9901X0264 for more information.

Where appropriate, symbols are used to indicate the significance of any particular point in the manual. The following symbols are used:

	This symbol indicates that YOU have to do something.
	This symbol indicates that whatever follows is for information only.
	This symbol indicates that whatever follows should be noted. It could be a warning.

WARNING : The DSU is only designed for use as a data acquisition system for recording geotechnical data. The safety of the system may be compromised if used for any other purposes.

NOTE : The DSU has no maintenance requirements. A build up of dust on the unit may be removed by using a clean damp cloth.

WARNING : The DSU case should only be opened by trained service personnel. It may contain hazardous voltages and hot surfaces. Before cleaning switch off the DSU and disconnect its power cable.

1.2 Electrical Safety

Warning : The unit does not contain any user-serviceable parts.

- Do NOT attempt to open the case as dangerous voltages are present internally.
- Do NOT operate the unit if the supply cord appears damaged.
- Only connect the unit to a polarised earthed power socket.
- Switch off and unplug the unit before cleaning.

1.3 The DS Mode Operating System

The Data acquisition Operating System (GDOS) is the control software that runs in the DSU's CPU when running in DS mode. It is able to interpret the English-like commands (GDOS commands) sent from a computer. These GDOS commands are used to configure the GDU for data acquisition and control and additionally may be used to interrogate the operating conditions of the DSU and recall logged data.

The DSU uses a touch screen for display and data entry. Highlighted buttons indicate when that option is active/available.

1.4 Specification

Unit Specification	
Voltage	Single phase 115/230VAC ±10% 50/60Hz
Current	Fused at 400mA T
Power	15VA
Degree of protection	IP30
Operational temperature	0°C...40°C
Transport and storage	-40°C...70°C
Humidity	10%...90% (with no condensation)
EMC - General	EN 61326-1:2013
EMC - Emissions	EN 61000-3-2:2006+A2:2009
EMC - Flicker	EN 61000-3-3:2008
Size (W x D x H)	260 x 260 x 100mm
Weight	2.1kg

1.4.1 Replacement Parts

The user replaceable parts include the AC inlet fuses; see section 2.3 for details on fuse replacement.

1.5 Supported Tests

1.5.1 DS Mode Tests

In DS mode the DSU may support any DS7 test that requires 4 or less sensor inputs. These tests, which can be to BS or ASTM standards include:

- Up to four concurrent one dimensional consolidation tests
- Up to two concurrent CBR tests
- One direct/residual shear test
- One triaxial quick un-drained test

1.5.2 DU Mode Tests

In DU mode the DSU can support the following tests to BS and ASTM standards.

- Up to two Marshall tests
- Up to two CBR tests
- Up to two Unconfined compression tests

1.6 Test Result Storage and Retrieval

The DSU can store test data and results in fast non-volatile memory and an SD memory card. The SD card has a limit of 500 days of test results. After this limit is exceeded, test result folders need to be deleted from the unit via its USB link.

1.6.1 DS Mode Storage

In DS mode test data is stored in fast non-volatile memory. Up to four individual tests may be run simultaneously. If CBR or One dimensional consolidation tests are interrupted by a power failure the user is optionally permitted to continue tests on resumption of power. Test data storage is maintained by the DSU and managed by the DS7 application.

1.6.2 DU Mode Storage

In DU mode test data is stored in fast non-volatile memory and transferred to SD card storage at the completion of the test. CBR and Unconfined compression tests may optionally be restarted in the case of a power interruption; Marshall tests cannot.

1.7 Load Frame Interface

The DSU, through the Safety/ID connection, provides overload/over-range protection for all load frames in the event of a transducer exceeding 99% of its maximum range. Should this occur, the DSU stops the load frame's platen and disables its Up switch. This protection remains in force until the user drives the platen downwards and the measurement from the overloaded sensor measures 95% or less of its maximum range. When this occurs, the DSU re-enables the instrument's Up switch.

The Safety/ID connection also allows the DSU to interrogate test load frames and automatically configure itself for the supported test type.

When used in conjunction with a Multiplex 50, the DSU provides a number of additional features:

- Monitoring of the platen speed for compatibility with the selected test. If this is not appropriate, the DSU halts the test and displays a warning message prompting you to confirm or change the speed setting.
- In Automatic mode, the DSU starts recording data when a new test is initiated on the Multiplex 50 control panel. Marshall and User tests have all the same features including automatic start and stop of the DSU and frame.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

The DSU contains a primary (non-rechargeable) Li battery used to provide current to the unit's clock circuit in the event of the main power supply being off. This battery should not be opened or exposed to heat because exposure of the battery's contents could be harmful under some circumstances. The battery may be flammable if damaged.

2 INSTALLATION AND CONNECTION

Install the DSU on a suitable bench next to the testing equipment. Avoid positions where there is a likelihood of liquid spillage onto the unit as this may cause serious damage. Ensure that the back of the instrument is not less than 50mm from any wall or obstruction that may reduce ventilation.

2.1 Inspection

Before shipping, the DSU was fully tested; on arrival carefully check that the unit shows no signs of damage.

2.2 Pre-Installation Checks

Before connecting power to the DSU, check that the voltage selection switch is correctly set.

2.3 Power Connections

The power connection for your DSU is on the rear panel of the unit. The power cable for the unit will depend which model DSU you have.

If your DSU is designed to operate on 230V then you will have been supplied with a UK or EU approved cable set. If the DS is designed to operate on 115V then a US style moulded cable set is provided.

The DSU must be operated from a clean power supply or UPS (uninterrupted power supply) or you may incur power down errors.

The DSU has two 400mA anti-surge (T) fuses that are used to protect the unit in the case of over-current conditions. These fuses are housed in the AC input/switch on the rear panel. If these fuses are to be replaced use a 250V rated, UL/CSA certified part and fit in the positions shown below.

After replacing the fuse housing confirm that the operating voltage displayed is correct for the current AC supply.

2.4 Portable Appliance Test

All ELE designed products are tested for electrical safety prior to sale.

An electrical safety label is fitted on the base of the unit.

Should no label be found, please contact ELE Service Department quoting the serial number of the equipment.

Organisations have an obligation to ensure equipment is maintained and is safe for use. Regular PAT testing is one means of ensuring equipment continues to be electrically safe.

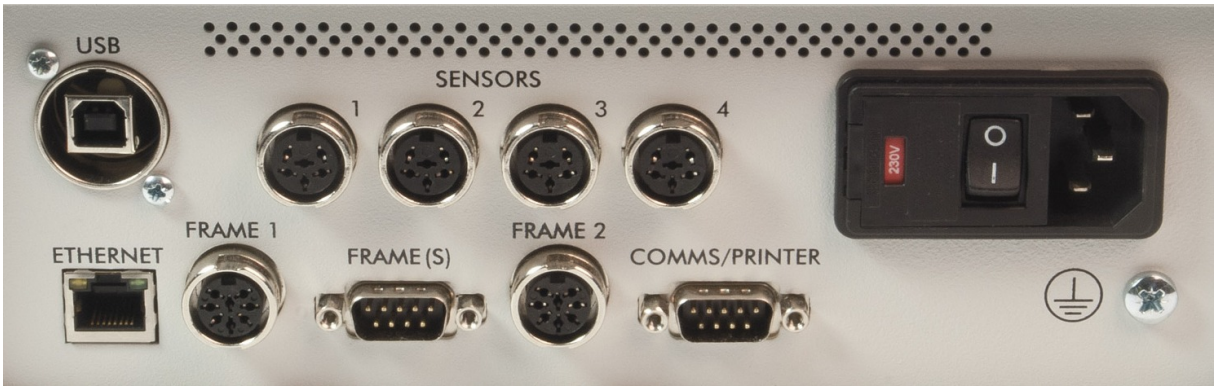
Important: Do not connect PAT leads to sensitive components such as PCBs control switches and the like.

DO NOT FLASH TEST EQUIPMENT.

Use the earth stud on the rear panel when testing or contact ELE Service Department for assistance.

2.5 Rear Panel Connections

The rear panel of the DSU has all the electrical/electronic connections for the unit.



2.5.1 Computer Communications Interfaces

The DSU is supplied with an RS232, Ethernet and USB port for communication with a host computer.

The RS232 interface is a 9 way D socket labelled COMMS/PRINTER. Refer to section 6 for details.

The ETHERNET connection is a standard RJ45 connection.

The USB port uses a Type B socket. Refer to section 7 for details.

2.5.2 Sensor Connections

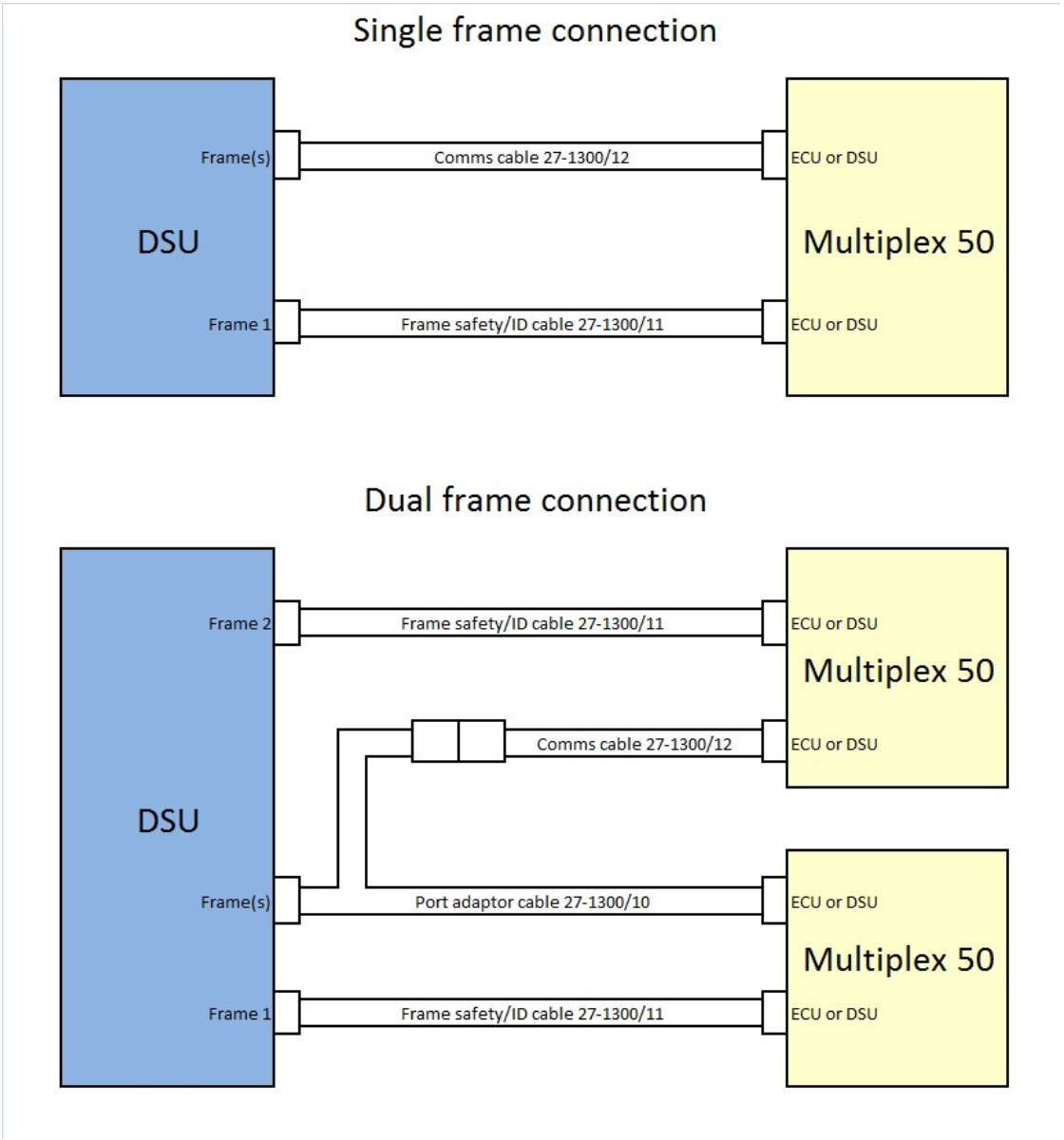
There are four sensor inputs that are configured to connect to various ELE load, displacement and pressure sensors. Refer to Appendix A for details, or section 4.1 if the unit is being run in DU mode.

2.5.3 Frame Connections

There are two sockets and a 9 way D plug for connection for the compression frames used in the testing.

The 8 way DIN sockets labelled FRAME 1 and FRAME 2 are safety/ID ports. The cable 27-1300/11 should be used to connect to any of the ELE compression frames used.

The other 9 way D plug FRAME(S) is an RS232 port that connects to ‘intelligent’ frames (for example the Multiplex 50) to allow automatic operation. Use cable 27-1300/12 to connect the DSU to the frame. When two frames are connected to this port an adaptor cable 27-1300/10 is also required.


Single frame connection
Frame(s)
Comms cable 27-1300/12
ECU or DSU
DSU
Multiplex 50
Frame 1
Frame safety/ID cable 27-1300/11
ECU or DSU
Dual frame connection
Frame 2
Frame safety/ID cable 27-1300/11
ECU or DSU
Multiplex 50
Comms cable 27-1300/12
ECU or DSU
DSU
Frame(s)
Port adaptor cable 27-1300/10
ECU or DSU
Multiplex 50
Frame 1
Frame safety/ID cable 27-1300/11
ECU or DSU

3 SYSTEM SETUP WITH DS MODE

The initial configuration of the DSU is for DS Mode.

On ‘power up’ the unit will display the ELE logo and then the initial setup screen for 10 seconds.

If no changes are required the screen will revert to the default DS mode Home screen.

The ‘X’ button in the top right corner of the screen acts as a ‘Back’ function.

3.1 DS Mode with RS232 comms

If the unit is to be operated communicating via RS232 to a PC running DS7, no changes are required. All further setup and calibration is performed via the DS7 application.

3.2 DS Mode with Ethernet comms

The default configuration for the unit is for an automatically assigned IP address, with a device name of ELE-DSU01. If the unit is to be operated communicating via Ethernet to a PC running DS7 some further changes may be needed.

Initially connect the unit to the available LAN. When the front panel COMMS LED is on constantly an IP address has been assigned and communication is possible. If this does not happen it may be necessary to have the network administrator assign a static IP address.

When more than one DSU is on the LAN the default DSU number must be changed. See section 2.5.2.3 below.

3.2.1 DS Mode with Ethernet and static IP address

A Manual IP Address setup is made using three address values supplied by the local IT administrator.

To perform a manual IP address setup make the following actions.

From the top level menu screen (press ‘X’ if necessary) select Settings>System Settings>Network Setup.

Touch the Auto button to toggle it to Man (manual), then touch the IP Address button.

Now touch the ‘Edit’ button to manually enter the assigned value.

The back button will delete any previous value. Once the IP address has been entered make a note of it.

This value IP address will later have to be entered in the DS7 Communications Settings screen.

This feature is only available from DS7 version 7.2 onwards; refer to the DS7 manual for details.

Next, touch the ‘Next’ button to move to enter Net Mask value and enter in the same manner.

Finally touch ‘Next’, enter the Gateway address and ‘X’ to exit and save.

It may be necessary to power cycle the unit for any new IP address to be recognised by the LAN.

3.2.2 DS Mode with Ethernet and automatically assigned IP address

With an automatically assigned IP address it is possible to either use the assigned address or the device name when communicating with the unit from DS7. Some LAN servers take some time to register a device name so it may be necessary to initially only use the assigned IP address.

This can be viewed by the following actions. From the top level menu select Settings>System Settings>Network Setup>IP Address.

3.2.3 DS Mode with Ethernet and Point to Point connection

Refer to Appendix C for details.

3.2.4 DS Mode with Multiple DSUs

More than one DSU can be hosted on the LAN at one time.

From the top level menu select:

Settings>System Settings>Network Setup>DSU No. Then enter a number between 1 and 16. Confirm that DSUs on the LAN do not have identical DSU numbers.

3.3 DS Mode Sensor Inputs

There are up to four sensor inputs that may be used with DS7 tests. This allows for the following tests.

- Up to four concurrent one dimensional consolidation tests
- Up to two concurrent CBR tests
- One direct/residual shear test
- One triaxial quick un-drained test

The sensor numbers on the rear panel align with the transducer channel numbers in DS7.

4 SYSTEM SETUP WITH DU MODE

The DSU may operate in a standalone mode with (or without) a PC data logging application. This is referred to as DU mode.

To change the unit to DU mode touch the ‘X’ key until the home screen is seen. Then select ‘Change Mode’ and confirm.

The unit will reboot and restart in DU mode.

The default settings when DU mode is first entered are as follows:

Sensors : Not assigned.

Frames : Not set.

Units : SI

Once the unit has restarted the Home screen will show the configuration of the two frames, which at this point have not been configured. A frame’s sensors must be calibrated before it is assigned to a test type.

4.1 DU Mode Sensor Assignment

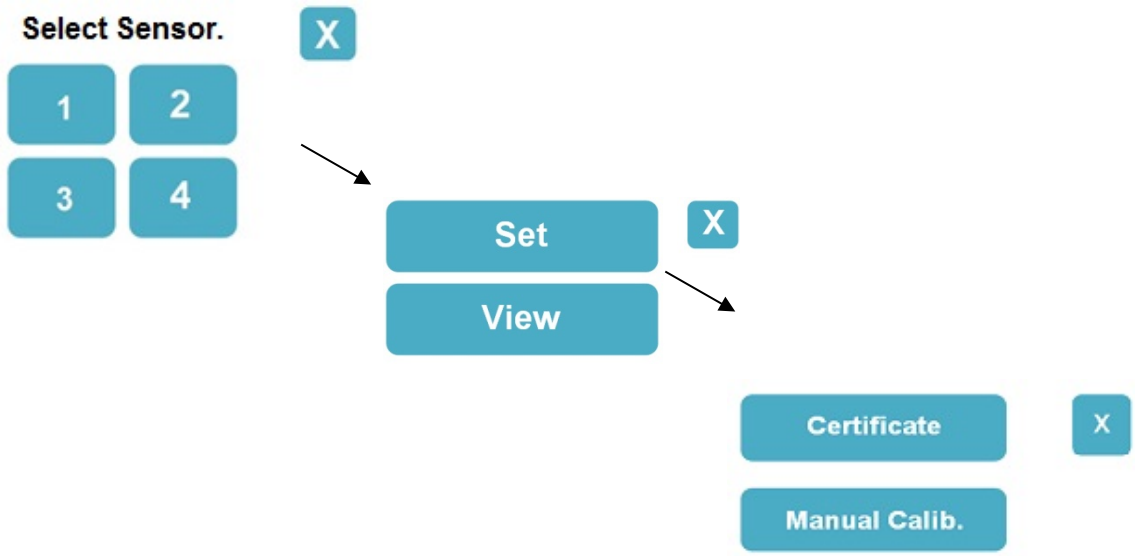
The first operation required in DU mode is to set up the sensors. There are four sensor inputs to the DSU and in DU mode they are assigned as follows.

Sensor 1	Frame 1	Load cell
Sensor 2	Frame 1	Displacement transducer
Sensor 3	Frame 2	Load cell
Sensor 4	Frame 2	Displacement transducer

4.2 DU Mode Sensor Calibration

Set up the sensors by selecting the Calibration button from the Top level menu.

Select the sensor number to be setup, select Set, and then use either Certificate or Manual Calibration to enter the sensors data.



4.2.1 DU Mode Sensor Calibration with Certificate Entry

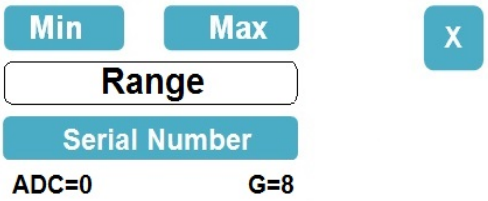
Certificate entry uses the calibration certificate provided with each sensor. Enter the Gain, Slope and Range in order. The polarity of the Slope parameter is an important factor and must be entered correctly.

The value for Range should be entered when the sensor is at its minimum value/position. Finally enter the serial number for the sensor, with numeric data only.

Going back to the View menu, the entered data can be checked before moving onto the next sensor.

4.2.2 DU Mode Sensor Calibration with Manual Entry

It is possible to set up a sensor using the Manual Calib. Menu. The calibration sequence must be made in the order below and the sensor should be stable when the Minimum and Maximum readings are taken.



Adjust the sensor so it has its minimum output and select Min. Wait until the Gain (G value) is stable and the Min button is off.

Adjust the sensor to its maximum output and select Max. Wait until the Range button is on.

Return the sensor to its minimum output and select the Range button. Enter the value of its maximum load or displacement.

Finally enter the serial number for the sensor, with numeric data only.

Going back to the View menu, the applied Gain and Slope data can be viewed before moving onto the next sensor.

4.3 DU Mode Settings

Once the sensor calibration data has been entered, other DSU parameters can be set up. From the Top level menu select the Settings button.

Three further options are now given.

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4.3.1 DU Mode User Settings

The DSU User Settings allow the date, time, frame type and measurement units to be setup.

4.3.1.1 DU Mode Date/Time

The Date/Time menu displays the current date and time held by the unit's internal calendar. Select the Date or Time button to make adjustments.

The asterisk in the Date menu indicates the currently selected format for the date parameter.

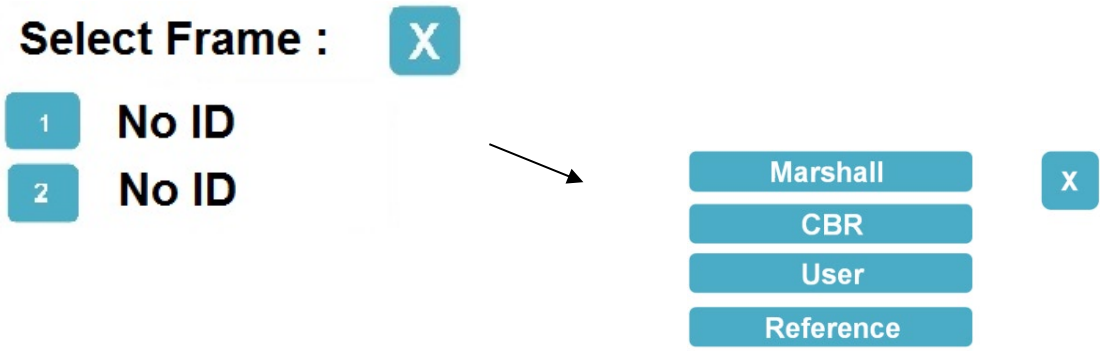
Selecting either button defines the selected date format and allows any adjustment to be made. Use the '-' character to delimit the day, month and year parameters when making adjustments. Make changes to Time as required in a similar way.

4.3.1.2 DU Mode Frame Setup

The ‘Frame’ option enables the user to set up the test type for each frame. A frame cannot be set up unless the sensors it uses have already been set up. First select which frame is to be set. Note that frames with the ID cable connected will have a defined ID at this point. The expected frame IDs are Marshall, CBR or Multiplex.

The Marshall and CBR frames are ‘manual’ frames that require the operator to manually start and stop the frame’s compression motor. The DSU must then have its test also start manually by selecting the ‘Start’ button. These frames have fixed speeds that conform to both BS and ASTM standards for their test.

The Multiplex 50 is an automatic frame that automatically test data acquisition in the DSU and is then automatically stopped when the DSU completes the test.



Once a frame has been assigned to a test type an asterisk is placed against the test name. If the frame ID does not match the test type selected, the user will have the option of continuing despite this mismatch.

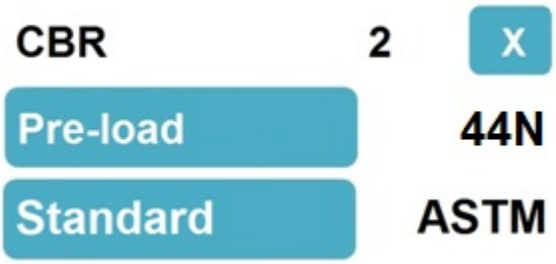
Once the test type has been selected further parameters can be adjusted.

The Marshall test options allow for the Follow Thru percentage and Peak Hold display to be configured.

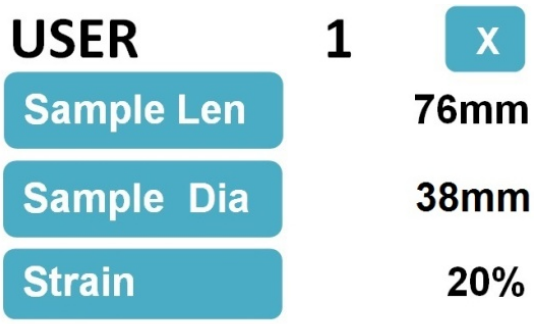
The Follow Thru is the percentage of the peak load that the measured load has to drop to for the test to be automatically stopped. The default is 20%.

The Peak Hold parameter selects which, if any, of the LOAD and DISPlacement values are to be held displayed at their peak values after the test completes. The default is BOTH.

The CBR test options allow for the selection of the BS or ASTM testing standard and the specification of the Pre-load value. The ASTM standard is the default. The Pre-load value will be dependent on the expected CBR value. The default for both stands is for an expected value of less than 5%. Selecting the Pre-load button allows the value to be modified.



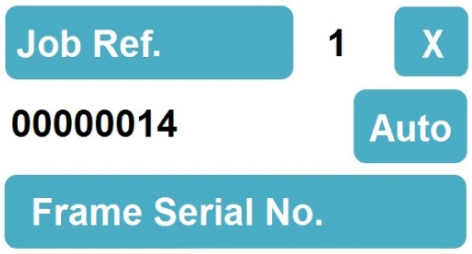
The User test is for unconfined triaxial testing. The test parameters required are Sample Length, Sample Diameter and maximum strain.



The default parameters are those shown above. The test data is sampled on intervals based on the sample length as defined by an amalgamation of the requirements of both BS and ASTM Triaxial QU/UU tests.

4.3.1.3 DU Mode Job Reference Number

The Job Reference number for a test is configured on a by frame basis. Select Reference from the Frame set up menu.



The Job Reference number may initially be assigned by selecting the Job Ref. button. The default condition is for the reference number to be automatically incremented (Auto). Selecting the Auto button cycles round the other options of not incremented (Off) or not used (None).

4.3.1.4 DU Mode Frame Serial Number

A frame's serial number can be entered from the Reference menu. The normal format for a frame serial number is XXXX-XX-XXXX.

5 DU MODE OPERATION

In DU mode the DSU can be configured for Marshall, CBR or User testing. It is the frame test type (section 4.3.1.2) that defines what test type is being performed.

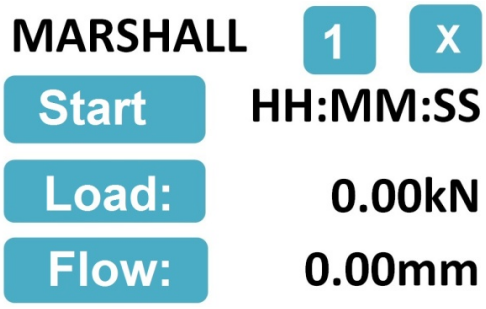
In DU mode the DSU will default to the frame selection screen if no keys are pressed within 10 seconds.

Selecting the '1' or '2' takes the user to the running screen associated with Frame 1 or Frame 2 respectively.

5.1 Marshall Test

The running screen for a Marshall test with frame 1 being a Marshall frame will typically appear as shown below.

The Follow Thru percentage and sensor holds should previously have been set up as per section 4.3.1.2. The test is run so both ASTM and BS sampling requirements are satisfied.



Once the test has been started data acquisition commences once a 1kN load is seen. Ten samples are recorded every second.

If the frame used was a Multiplex, then the 'Start' button will appear as 'Auto' and the control of the test start will be entirely from the Multiplex frame.

It is also necessary to use the frame comms cable when a Multiplex frame is connected.

Once started the test will run until one of the following occurs :

- The user stops the test.
- The user defined Follow Thru % is recorded.
- An overload or over-range condition occurs.
- The maximum number of samples for the test is reached.

The user may stop the test in different ways depending on the frame type.

Test	Frame	User Stop
Marshall	Multiplex	Press frame Stop button or
		Press the DSU Stop button
	Marshall	Push frame Stop button and press ‘Stop’ on the DSU

If an overload/over-range condition occurs, either frame type will be stopped automatically via the Safety/ID connection.

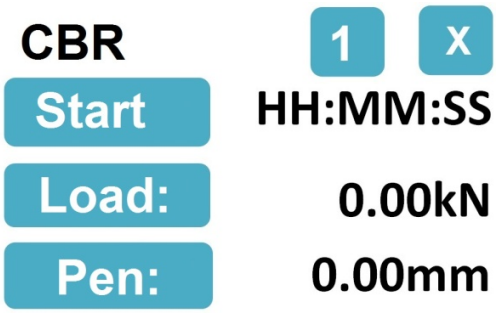
The overload/over-range condition must be removed before restarting the frame.

When the test is ended, the reason for the completion will be displayed. The display will then flash and display the sensor hold values until the # Finish # button is pressed.

5.2 CBR Test

The running screen for a CBR test with frame 1 being a CBR frame will typically appear as shown below.

The Pre-load value and test standard should previously have been set up as per section 4.3.1.2.



The data acquisition rate occurs at penetration distance defined by the relevant standard. If the frame used was a Multiplex, then the 'Start' button will appear as 'Auto' and the control of the test start will be entirely from the Multiplex frame.

It is also necessary to use the frame comms cable when a Multiplex frame is connected.

Once started the test will run until one of the following occurs :

- The user stops the test.
- The standard's defined maximum penetration has been reached.
- An overload or over-range condition occurs.

The user may stop the test in different ways depending on the frame type.

Test	Frame	User Stop
CBR	Multiplex	Press frame Stop button or
		Press the DSU Stop button
	CBR	Return the 'Run' switch to the stop position and press 'Stop' on the DSU.

If an overload/over-range condition occurs, either frame type will be stopped automatically via the Safety/ID connection.

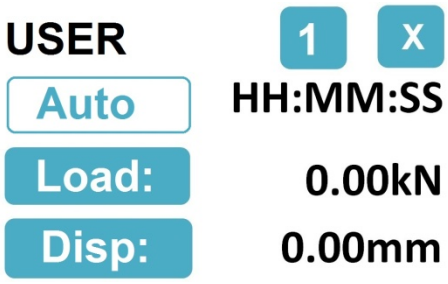
The overload/over-range condition must be removed before restarting the frame.

When the test is ended, the reason for the completion will be displayed. The display will then flash until the # Finish # button is pressed.

5.3 Unconfined (User) Test

The running screen for a User test with frame 1 being a Multiplex frame will typically appear as shown below.

The Sample Length and Diameter, and the Strain % for failure should previously have been set up as per section 4.3.1.2.



The data acquisition rate occurs at a rate defined by the sample length and applicable to both ASTM and BS standards. If the frame used was a Multiplex, then the 'Start' button will appear as 'Auto' and the control of the test start will be entirely from the Multiplex frame.

It is also necessary to use the frame comms cable when a Multiplex frame is connected.

Once started the test will run until one of the following occurs :

- The user stops the test.
- The Strain % is reached.
- An overload or over-range condition occurs.

The user may stop the test in different ways depending on the frame type.

Test	Frame	User Stop
User	Multiplex	Press frame Stop button or
		Press the DSU Stop button
	CBR	Return the 'Run' switch to the stop position and press 'Stop' on the DSU.

If an overload/over-range condition occurs, either frame type will be stopped automatically via the Safety/ID connection.

6 COMMS/PRINTER PORT

In DS mode the DSU may connect to the PC based DS7 application via the COMMS/PRINTER port or via Ethernet. The COMMS/PRINTER port is a standard 9 way ‘D’ RS232 interface connector located on the DSU rear panel and has the following pin connections:

Pin	Signal
1	Not connected
2	TxD (from DSU)
3	RxD (to DSU)
4	Not connected
5	Signal 0v
6	Not connected
7	Not connected
8	Not connected
9	Not connected

In DU mode this port may function in one of several ways.

6.1 Printer

The COMMS/PRINTER port may connect to a standard serial ASCII printer. Test results will automatically be printed at the completion of a test. The data transfer is at a Baud rate of 9600, Word size is 8 BITS with no PARITY check, and finally 1 STOP BIT.

6.2 Debug Output

The COMMS/PRINTER port may be used to output test debug information. See section 8.1.3.

7 USB PORT AND TEST RESULTS

The USB port on the rear panel of the DSU is used for accessing previously recorded test results or updating the DSU's firmware. Connection of the USB port will only be active when all tests are stopped.

7.1 Test Results

The test results are held in the DSU on an SD card that appears as a 2GB memory device when connected to a PC running the Windows operating system.

Test results are stored as CSV files in day dated folders. The SD card setup allows for up to 500 days' worth of test results to be held. If the number of test days exceeds this then folders should be transferred from the DSU to free up directory assignment space. A typical results file will have the form shown below.

Test type	CBR	
Frame No.	2	
Standard	BS	
Job Ref	2-00000016	
Day	15/05/2014	
Time	13:37:06	
Duration	00:09:10	
Frame S/N	1278-01-0009	
Test mode	Automatic	
Units	SI	
Peak Load	4.78kN	
Peak Disp	10.00mm	
Stop Reason	Max. samples	
Firmware	V1.00	
CBR Preload	10N	
Control value(mm)	Displacement(mm)	Load(kN)
0	0	-0.04
0.24	0.24	0.11
0.5	0.5	0.18
0.74	0.74	0.21

Test data continues to the end sample.

7.2 DSU Firmware Updates

The DSU firmware is updated via the USB connection. A new DSU_BOOT.BIN file is copied to the SD card to OVERWRITE the old version. The DSU must then be power cycled for the update to be installed. See Appendix D for details.

8 MISCELLANEOUS SETTINGS

The DSU has a number of additional features that are detailed below.

8.1 **User** Interface

There are 3 miscellaneous options under the System Settings>User Interface menu.

8.1.1 LCD Contrast

The LCD contrast can be adjusted for display clarity. The value may vary between 1 and 10 with the default being 6.

8.1.2 Audible Touch

The audible feedback for the touch screen may be enabled (default) or disabled (Silent Touch).

8.1.3 Debug

The COMMS/PRINTER Port may be used for diagnostic information (Debug On). This is not for general use.

8.2 Network Setup

The Ethernet Network Setup information is entered via the System Settings>Network Setup menu. Refer back to section 3.2 for information on the Ethernet port setup that is relevant to both DS mode and DU mode when used with the Logger application.

8.3 Service Options

The System Settings>Service options menu requires passcode entry. The default passcode is 937707.

8.3.1 Calibrate Screen

This menu allows for the recalibrating of the touch screen.

8.3.2 New passcode

This menu allows a different passcode to be assigned to the Service Options menu.

8.3.3 Load Defaults

This menu will prompt the user before performing a reload of the factory default setup. All calibration and other setup information with the exception of DSU serial number, DSU number and any static IP address will be overwritten.

8.4 Hardware and Firmware Version

The hardware and firmware version (including date) of the DSU can be viewed via the Settings>About menu.

APPENDIX A

Sensor Input

The input signals can range from +/-5 volts full scale when used with a system gain of 1, to +/-19.52 m.volts full scale when used with a system gain of 1024. The input channels are connected to the system analogue to digital conversion module by a 4 channel 2 pole solid state multiplexer.

The DSU features a stabilised power supply for transducer excitation, thus simplifying the tasks of connecting many types of sensor, and has input overvoltage protection to prevent system damage in the event of incorrect connections being made.

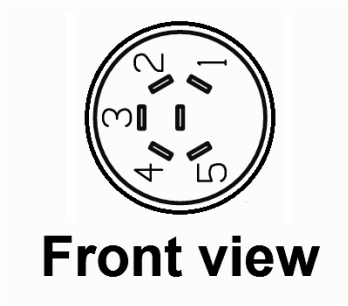
Specification

Number of input channels	4 Differential
Signal Range	+/-5 Volts Full Scale (x1 system gain) to +/-19.52mV Full Scale (x1024 system gain)
Cross Talk Immunity @ 1MHz	60 dB
Leakage Current	7 nA
Transducer Supply	10 Volts +/-10 mV
Stability	50 ppm/^{o}C
Maximum Input Voltage	± 5 Volts

Signal Input Configurations

Signals within the input module are switched to the input of a programmable gain instrumentation amplifier. This amplifier will accept differential signals within a ± 5 volt range of the system common (Signal 0v). For single ended inputs connect Signal 0v to the –ve signal input. Ideally this should be done at the signal source. If this is not possible then make the link on the input module connector.

Pin	Signal
1	-ve Channel Input
2	+ve Channel Input
3	Signal 0v
4	-5v Supply
5	+5v Supply



5 Way Din Connectors and Screw Terminal Connections

APPENDIX B

DSU Logger Application

The DSU is provided with a simple logger application that may be installed on a PC running Windows 7/10 and 2 GB of Ram.

The screen resolution should be a minimum of 1280 x 768.

Installation

To install the Logger run its installer batch file on the data stick provided and follow the instructions. On 32 bit PCs the default location for the program is Program Files\ELE International\ELE Logger.

On a 64 bit PC the default location is Program Files (x86)\ELE International\DSU Logger.

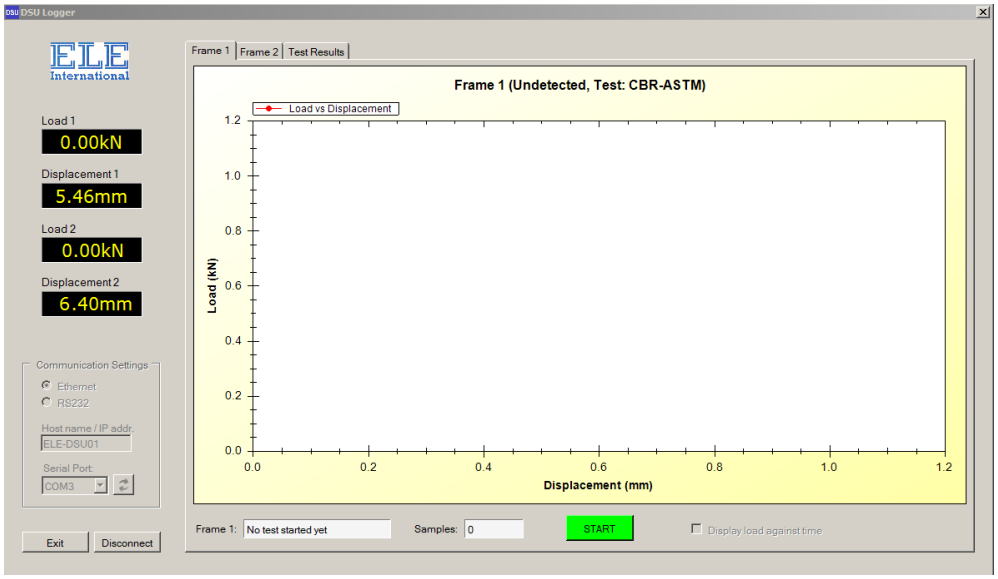
A short cut is generated automatically, but needs to be copied to the desktop.

When the Logger application runs, the connection to the DSU must be initiated before anything else can be done. If the link is to be via Ethernet, the DSU can be specified either by its IP address or its Host Name (if registered).

Logger features

DSU Logger V1.0.0

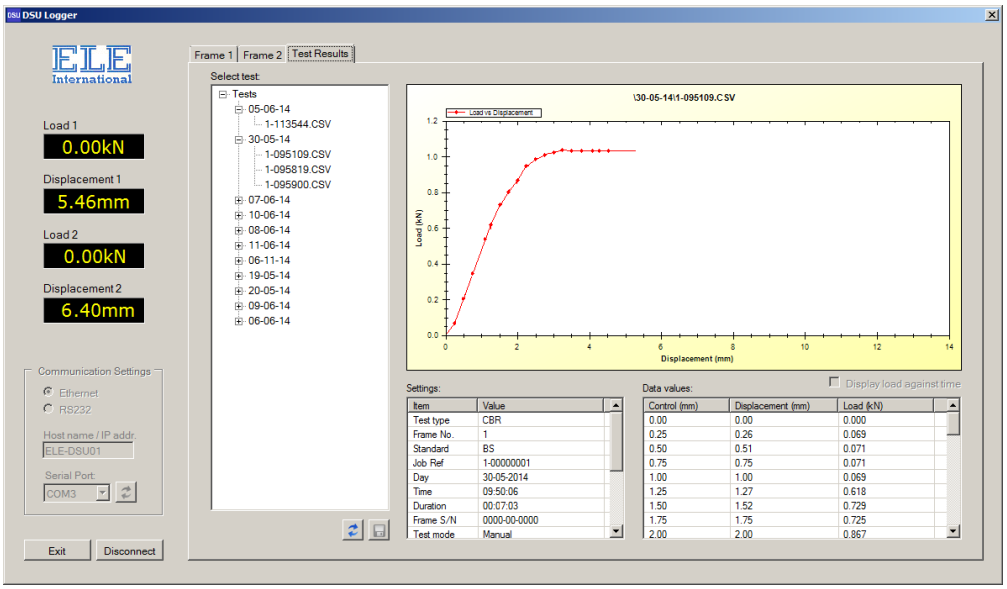
The initial version of the logger only offers a comms link to the DSU via Ethernet. Real-time data from both frames (Frame 1 and Frame 2 tabs) may be viewed.



ELE Logger V2.1.0.0

This common version of the logger offers the features above and the ability to copy individual results files to the PC over the Ethernet connection.

Tests may be started or stopped. Previous test results (Test Results tab) stored on the SD card may be viewed.



Connection to the DSU can be terminated via the Disconnect button.

APPENDIX C

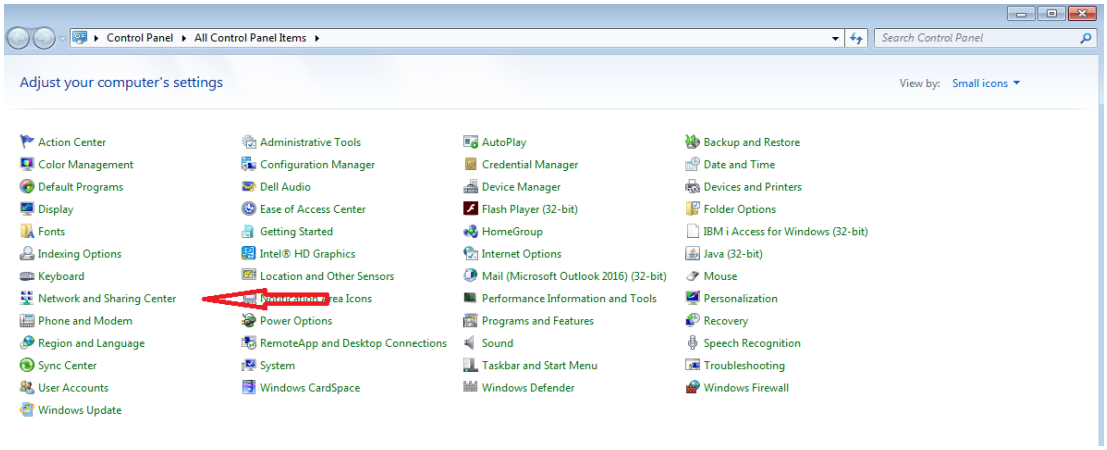
Direct Connection to the DSU (Point-to-Point), PC Configuration

To connect a DSU to a PC with a point to point Ethernet connection, use the ELE Logger program, make the following actions.

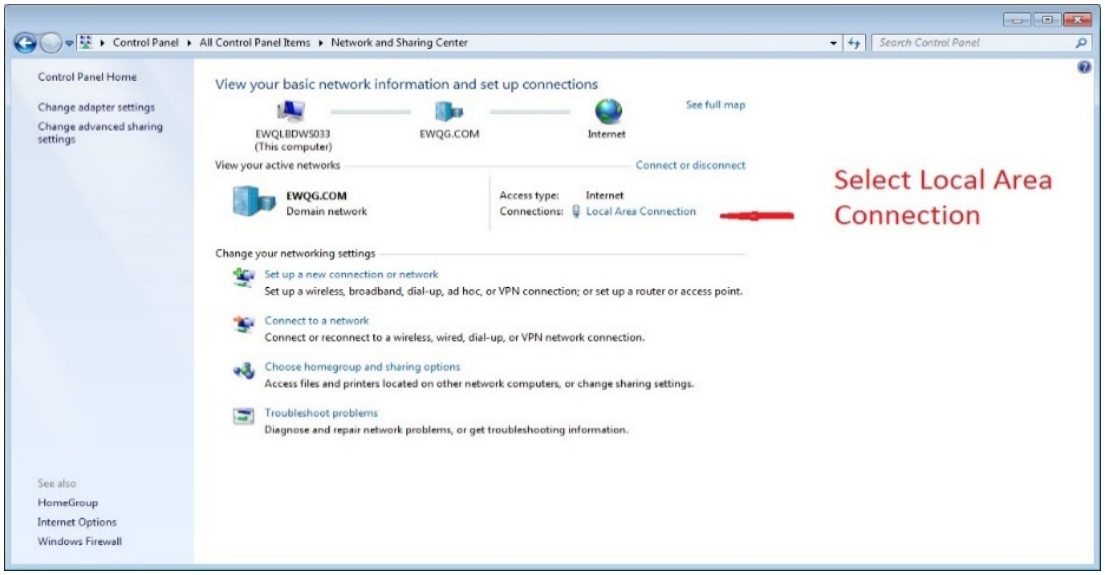
Make an RJ45 Ethernet connection between the PC and the DSU. Access the Control Panel of the PC.

For Windows 7 PCs: follow the instructions and screen shots below for Windows 7 PCs.

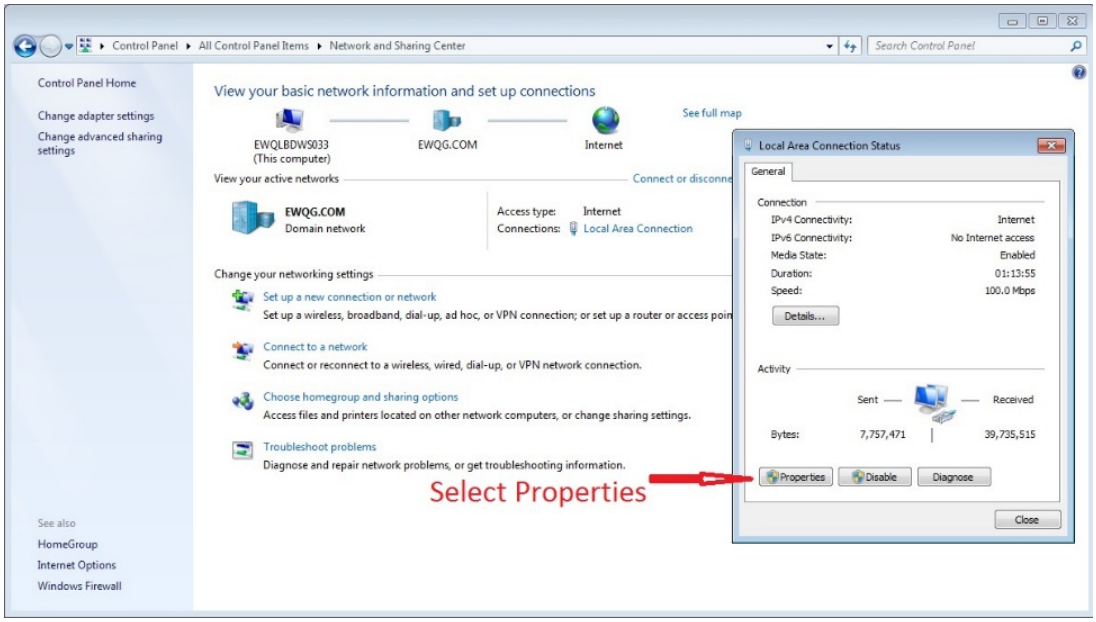
Select Network and Sharing Centre.



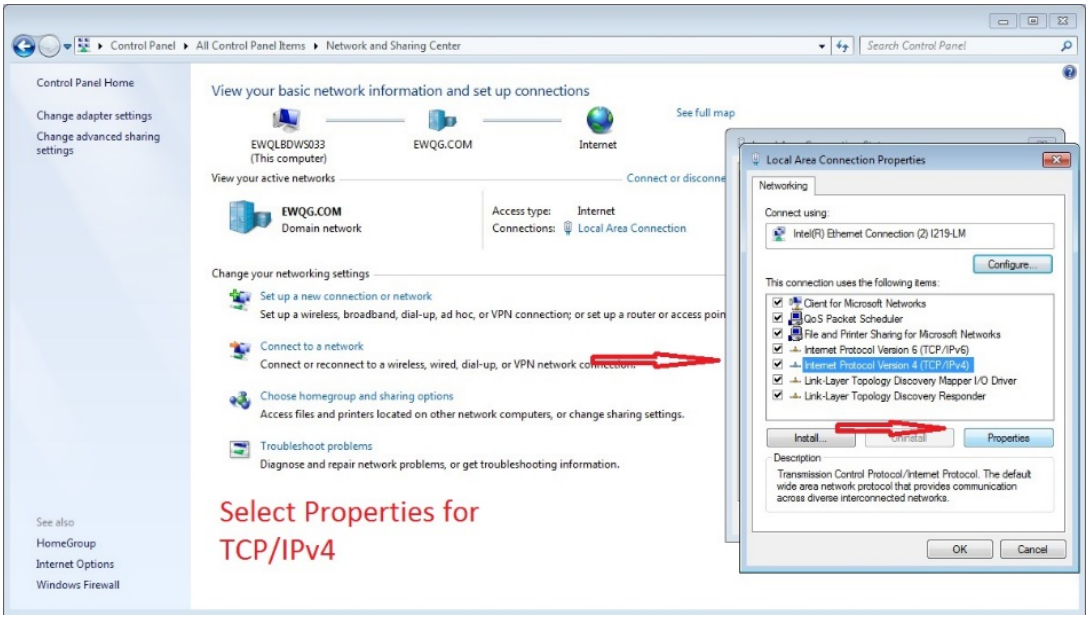
Select the LAN Connection option. If none is shown, check that the Ethernet cable between the PC and the DSU has been connected.



Select Properties



Select Properties for Internet Protocol Version 4 (TCP/IPv4)



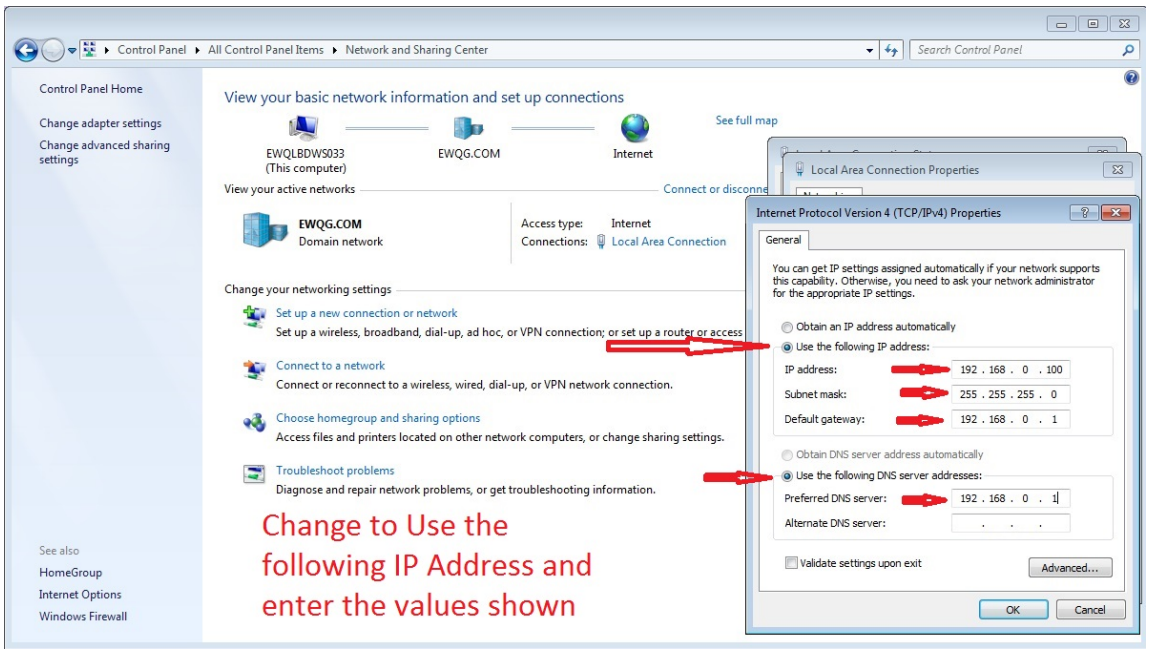
Set the following parameters:

Select ‘Use the following IP Address’.

The IP address of the PC can be almost anything but an arbitrary value of 192.168.0.100 is chosen.

The Subnet mask should be 255.255.255.0.

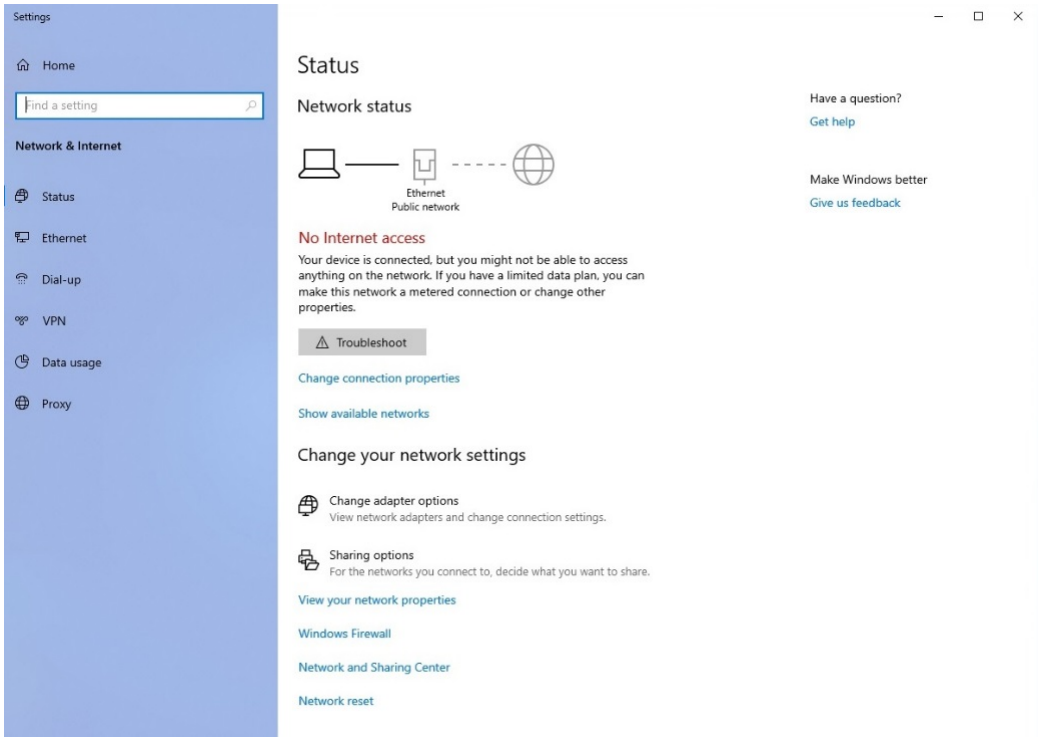
The Default Gateway and DNS server address should be 192.168.0.1. This setting is based on the original IP address selected.



Select OK when the values have been entered and then close and exit.

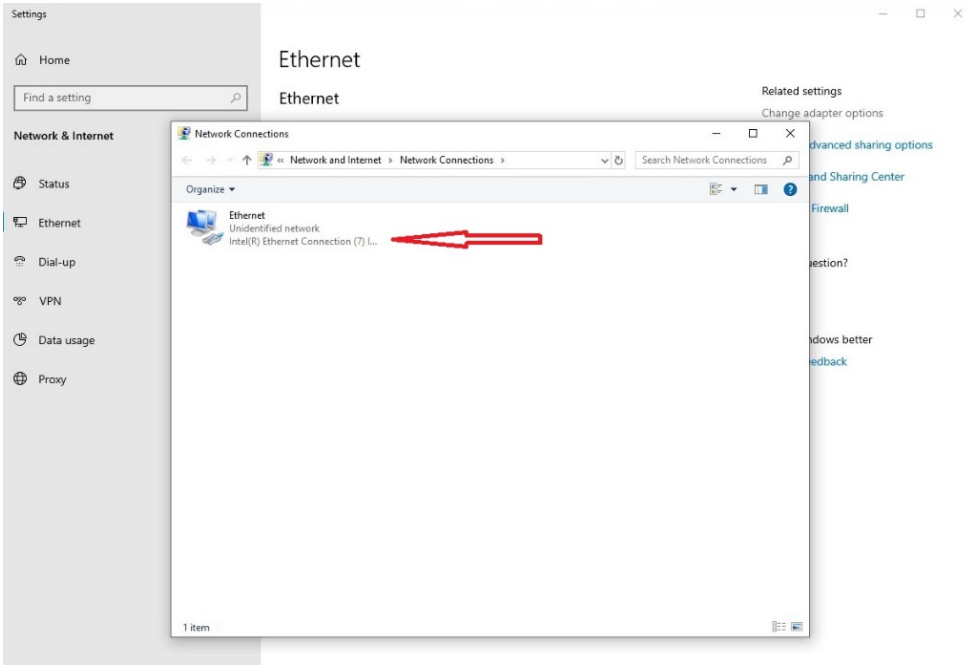
For Windows 10 PCs: follow the instructions and screen shots below for Windows 10 PCs.

Right click the Start button and Select Network Connections.

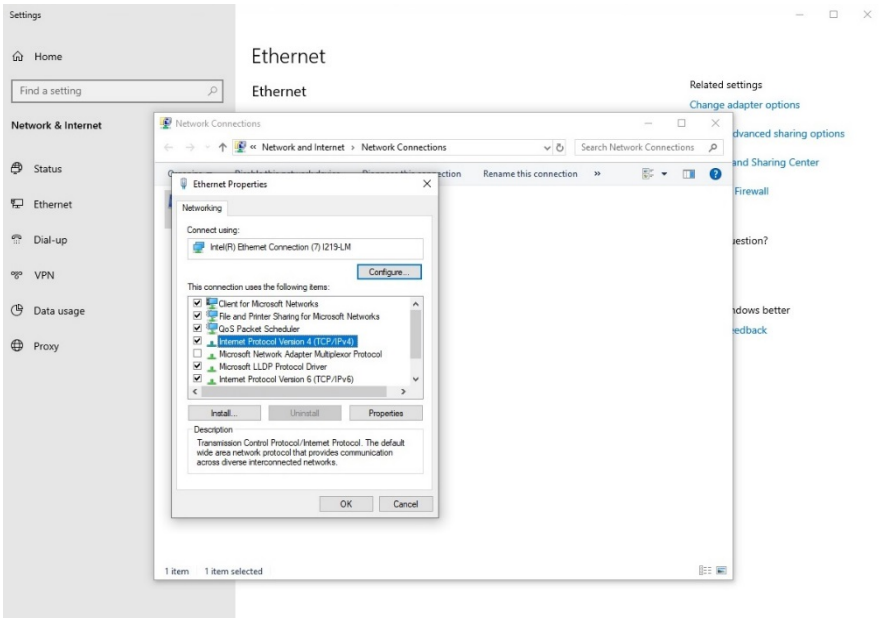


Select the Change adaptor options.

Then Right click on the network and select properties.



Select Internet Protocol Version 4 (TCP/IPv4) and then click on Properties.



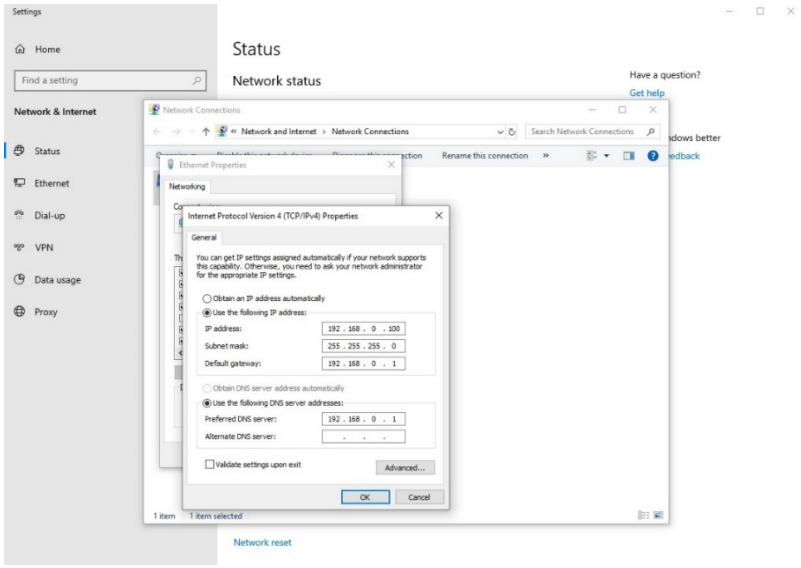
Set the following parameters:

Select ‘Use the following IP Address’.

The IP address of the PC can be almost anything but an arbitrary value of 192.168.0.100 is chosen.

The Subnet mask should be 255.255.255.0.

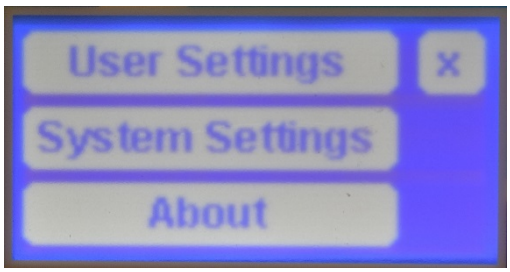
The Default Gateway and DNS server address should be 192.168.0.1. This setting is based on the original IP address selected.

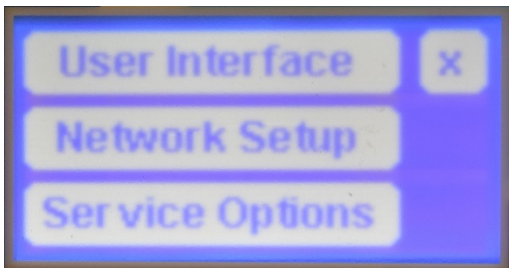


Select OK when the values have been entered and then close and exit.

Make the following changes to the DSU to enable it to connect point to point to the PC and ELE Logger application.

Select System Settings>Network Setup

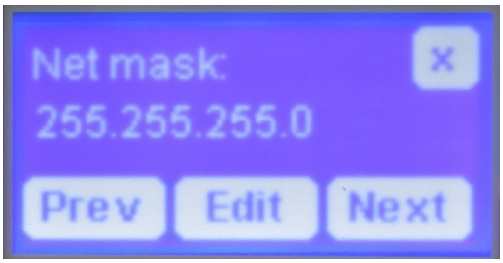




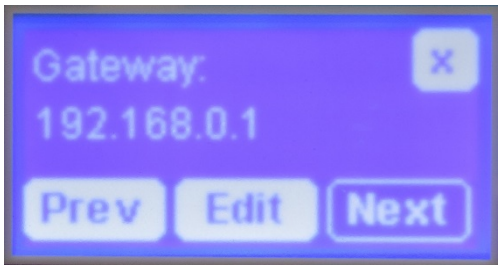
Set the IP Address type to be shown as ‘Man’ for manual, then select IP Address.

Set the IP Address to 192.168.0.101.

Then select Next and then set the Netmask to 255.255.255.0, then Next.



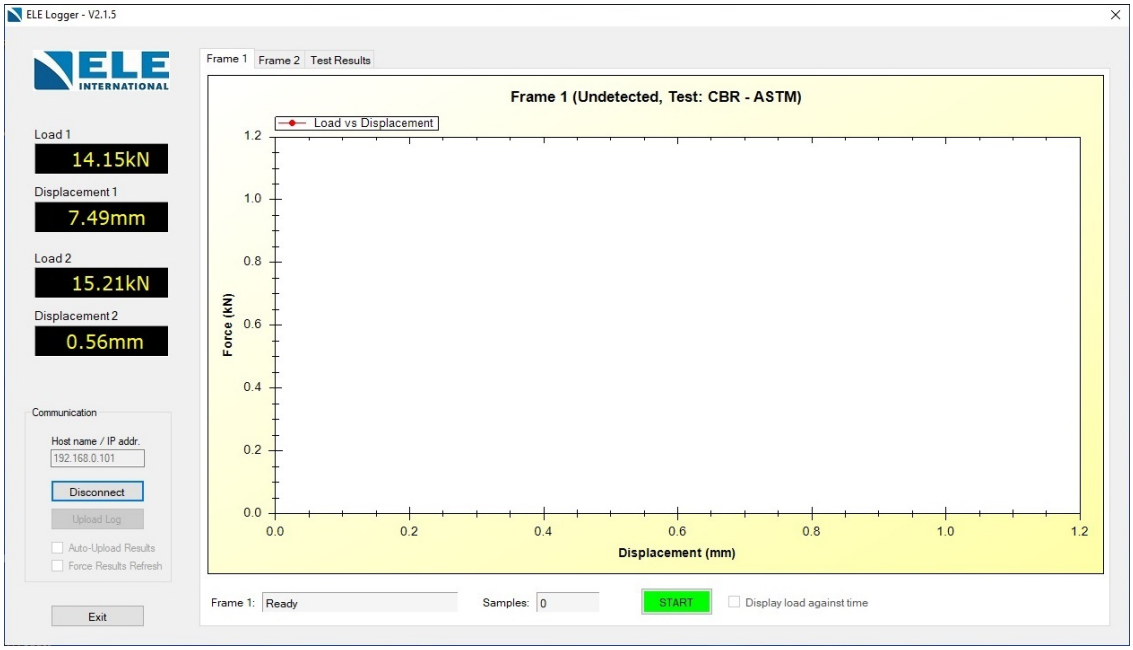
Lastly set the Gateway to 192.168.0.1 and exit.



Power cycle the DSU off for 10 seconds and then back on.
Confirm the IP Address settings have been correctly entered and stored.

Run the ELE Logger application.

Enter the Host name / IP addr. as 192.168.0.101 and select Connect.



If the unit fails to connect check the ELE website https://www.ele.com/Page/downloads for the latest application and firmware updates.

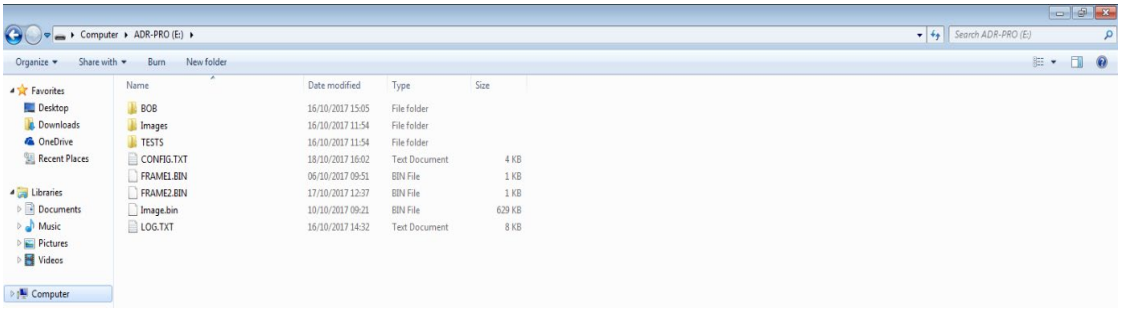
A P2P connection can also be made with the DSU and a PC running the DS7 application. The DSU must be running in DS Mode for connection to the DS7 application and it will be necessary to exit and restart DS7 if a change is made to the IP address.

APPENDIX D

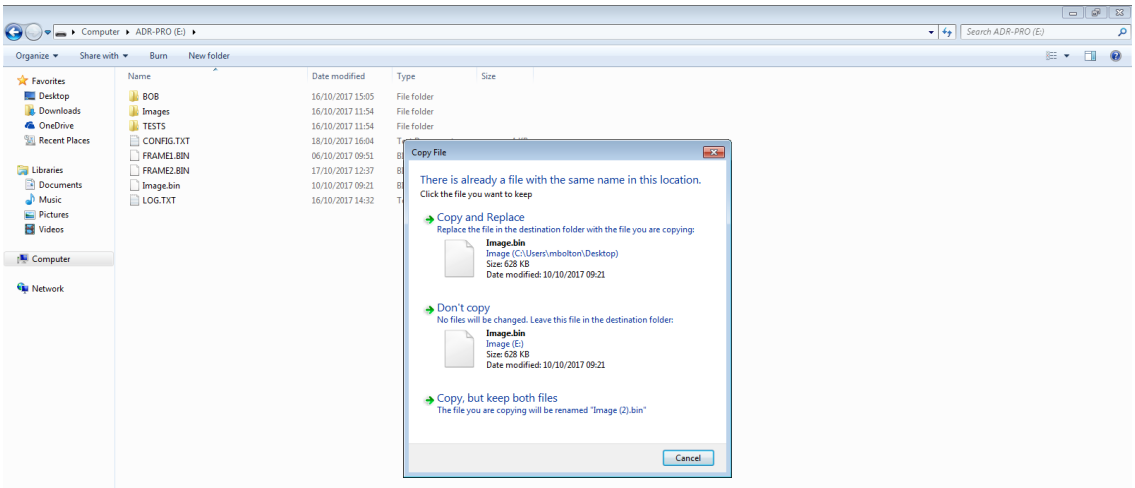
Updating the Firmware

In certain circumstances, it may be necessary to update the firmware stored in the DSU.

Connect the DSU to a Windows PC or laptop via the USB port. The DSU will now be visible to the external PC as a removable memory device. The USB icon and 'USB Connected' message will be displayed on the DSU. The root directory of the DSU will contain a file called DSU_BOOT.BIN - this is the firmware file.



In order to update the firmware file, take a copy of the existing file and save it to another location. Copy and paste the updated firmware file into the root directory of the DSU, selecting "Copy and Replace" when prompted.



After updating the firmware, safely remove the device from the **PC using the 'Eject' function and remove the USB cable**. Switch the DSU OFF and back ON. Confirm the new update is programmed when the DSU unit powers up. The message displaying the % update as the file is installed should be seen. To check the version of firmware loaded, look in the Settings > About Menu section.

EC DECLARATION OF CONFORMITY

This Original Declaration of Conformity is suitable to Decision No 768/2008/EC of the European Parliament and the Council of 9 July 2008 on a common framework for the marketing of products and contains the elements specified in the relevant modules set out in Annex II of that Decision for the applicable Directives.
This declaration relates exclusively to the equipment in the state in which it was placed on the market, and excludes components which are added and/or operations carried out subsequently by the final user.

Applied Council Directives(s)

The fulfilment of all relevant provisions specified in Council Directive(s)

2014/30/EU Electromagnetic Compatibility (EMC)
2014/35/EU Low Voltage Directive (LVD)
2011/65/EU RoHS2 Directive and Commission Delegated Directive (EU)2015/863

have been demonstrated

We, the Manufacturer:

ELE International, Chartmoor Road, Chartwell Business Park, Leighton Buzzard Bedfordshire LU7 4WG, UK

declare under our sole responsibility that the following equipment

Product : **DSU 1934C0001 revision 1**
Catalogue Number : **27-1300/nn**
Description : **Data logger for geotechnical sample testing**

The object of the declaration described above, is in conformity with the relevant Union Harmonisation Decision and the provisions of the following standard(s) or other normative document(s) when installed in conformance with the installation instructions contained in the product documentation

EMC		
Emissions:	EN61326-1:2013	Group 1, Class A
Immunity:	EN61326-1:2013	Industrial Location Immunity

Clauses pertinent to the Low Voltage Directive of

EN61010-1:2010	Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1 General requirements
RoHS2:	EN 50581:2012 Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances.

The technical file's authorised compiler (named below) is at the address above.
We, the undersigned, hereby declare that the product(s) specified above conform to the listed directive(s)and Standard(s)

Date of issue : 18/11/2015

Signed :

Name: Prakash Iyengar

Position: Managing Director

BS EN ISO9001: 2008 approved
Certificate number 860461

DIRECTIVE ON WASTE ELECTRICAL & ELECTRONIC EQUIPMENT

Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August of 2005. In conformity with European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of life equipment to the Producer for disposal at no charge to the user.

Note: *For return for recycling, please contact the equipment producer or supplier for instructions on how to return end-of-life equipment for proper disposal.*

Important document. Retain with product records.

GERMAN

Elektrogeräte, die mit diesem Symbol gekennzeichnet sind, dürfen in Europa nach dem 12. August 2005 nicht mehr über die öffentliche Abfallentsorgung entsorgt werden. In Übereinstimmung mit lokalen und nationalen europäischen Bestimmungen (EU-Richtlinie 2002/96/EC), müssen Benutzer von Elektrogeräten in Europa ab diesem Zeitpunkt alte bzw. zu verschrottende Geräte zur Entsorgung kostenfrei an den Hersteller zurückgeben.

Hinweis: *Bitte wenden Sie sich an den Hersteller bzw. an den Händler, von dem Sie das Gerät bezogen haben, um Informationen zur Rückgabe des Altgeräts zur ordnungsgemäßen Entsorgung zu erhalten.*

Wichtige Informationen. Bitte zusammen mit den Produktinformationen aufbewahren.

FRENCH

A partir du 12 août 2005, il est interdit de mettre au rebut le matériel électrique marqué de ce symbole par les voies habituelles de déchetterie publique. Conformément à la réglementation européenne (directive UE 2002/96/EC), les utilisateurs de matériel électrique en Europe doivent désormais retourner le matériel usé ou périmé au fabricant pour élimination, sans frais pour l'utilisateur.

Remarque : *Veuillez vous adresser au fabricant ou au fournisseur du matériel pour les instructions de retour du matériel usé ou périmé aux fins d'élimination conforme.*

Ce document est important. Conservez-le dans le dossier du produit.

ITALIAN

Le apparecchiature elettriche con apposto questo simbolo non possono essere smaltite nelle discariche pubbliche europee successivamente al 12 agosto 2005. In conformità alle normative europee locali e nazionali (Direttiva UE 2002/96/EC), gli utilizzatori europei di apparecchiature elettriche devono restituire al produttore le apparecchiature vecchie o a fine vita per lo smaltimento senza alcun costo a carico dell'utilizzatore.

Nota: *Per conoscere le modalità di restituzione delle apparecchiature a fine vita da riciclare, contattare il produttore o il fornitore dell'apparecchiatura per un corretto smaltimento.*

Documento importante. Conservare con la documentazione del prodotto.

DANISH

Elektriske apparater, der er mærket med dette symbol, må ikke bortskaffes i europæiske offentlige affaldssystemer efter den 12. august 2005. I henhold til europæiske lokale og nationale regler (EU-direktiv 2002/96/EF) skal europæiske brugere af elektriske apparater nu returnere gamle eller udtjente apparater til producenten med henblik på bortskaffelse uden omkostninger for brugeren.

Bemærk: *I forbindelse med returnering til genbrug skal du kontakte producenten eller leverandøren af apparatet for at få instruktioner om, hvordan udtjente apparater bortskaffes korrekt.*

Vigtigt dokument. Opbevares sammen med produktdokumenterne.

SWEDISH

Elektronikutrustning som är märkt med denna symbol kanske inte kan lämnas in på europeiska offentliga sopstationer efter 2005-08-12. Enligt europeiska lokala och nationella föreskrifter (EU-direktiv 2002/96/EC) måste användare av elektronikutrustning i Europa nu återlämna gammal eller utrangerad utrustning till tillverkaren för kassering utan kostnad för användaren.

Obs! *Om du ska återlämna utrustning för återvinning ska du kontakta tillverkaren av utrustningen eller återförsäljaren för att få anvisningar om hur du återlämnar kasserad utrustning för att den ska bortskaffas på rätt sätt.*

Viktigt dokument. Spara tillsammans med dina produktbeskrivningar.

SPANISH

A partir del 12 de agosto de 2005, los equipos eléctricos que lleven este símbolo no deberán ser desechados en los puntos limpios europeos. De conformidad con las normativas europeas locales y nacionales (Directiva de la UE 2002/96/EC), a partir de esa fecha, los usuarios europeos de equipos eléctricos deberán devolver los equipos usados u obsoletos al fabricante de los mismos para su reciclado, sin coste alguno para el usuario.

Nota: *Sírvase ponerse en contacto con el fabricante o proveedor de los equipos para solicitar instrucciones sobre cómo devolver los equipos obsoletos para su correcto reciclado.*

Documento importante. Guardar junto con los registros de los equipos.

DUTCH

Elektrische apparatuur die is voorzien van dit symbool mag na 12 augustus 2005 niet meer worden afgevoerd naar Europese openbare afvalsystemen. Conform Europese lokale en nationale wetgegeving (EU-richtlijn 2002/96/EC) dienen gebruikers van elektrische apparaten voortaan hun oude of afgedankte apparatuur kosteloos voor recycling of vernietiging naar de producent terug te brengen.

Nota: *Als u apparatuur voor recycling terugbrengt, moet u contact opnemen met de producent of leverancier voor instructies voor het terugbrengen van de afgedankte apparatuur voor een juiste verwerking.*

Belangrijk document. Bewaar het bij de productpapieren.

POLISH

Sprzęt elektryczny oznaczony takim symbolem nie może być likwidowany w europejskich systemach utylizacji po dniu 12 sierpnia 2005. Zgodnie z europejskimi, lokalnymi i państwowymi przepisami prawa (Dyrektywa Unii Europejskiej 2002/96/EC), użytkownicy sprzętu elektrycznego w Europie muszą obecnie przekazywać Producentowi stary sprzęt lub sprzęt po okresie użytkowania do bezpłatnej utylizacji.

Uwaga: *Aby przekazać sprzęt do recyklingu, należy zwrócić się do producenta lub dostawcy sprzętu w celu uzyskania instrukcji dotyczących procedur przekazywania do utylizacji sprzętu po okresie użytkowania.*

Ważny dokument. Zachować z dokumentacją produktu.

PORTUGESE

Qualquer equipamento eléctrico que ostente este símbolo não poderá ser eliminado através dos sistemas públicos europeus de tratamento de resíduos sólidos a partir de 12 de Agosto de 2005. De acordo com as normas locais e europeias (Directiva Europeia 2002/96/EC), os utilizadores europeus de equipamentos eléctricos deverão agora devolver os seus equipamentos velhos ou em fim de vida ao produtor para o respectivo tratamento sem quaisquer custos para o utilizador.

Nota: *No que toca à devolução para reciclagem, por favor, contacte o produtor ou fornecedor do equipamento para instruções de devolução de equipamento em fim de vida para a sua correcta eliminação.*

Documento importante. Mantenha junto dos registos do produto.