Instruction **Manual**

- TDS-JS5
- TDS-JS5-BP

BOILER BLOW-DOWN CONTROLLER
BOILER BLOW-DOWN CONTROL SYSTEM

Supplied by:

Convergent Water Controls Pty Ltd
2/4 Huntley Street
Alexandria NSW 2015
Tel: (02) 9698 3131
Fax: (02) 9698 3210
www.cwc.com.au
info@cwc.com.au

Note: On-going product development at Convergent Water Controls may lead to changes in the specifications of this product.

Warranty: This product is guaranteed for a period of 12 months from installation date. The warranty applies to manufacturing or component defects which may cause the unit to malfunction under specified conditions. The guarantee does not cover damage due to abuse, tampering or improper installation.

Disclaimer: Convergent Water Controls will not be held liable for any consequential damage or loss arising resulting from product malfunction.

TABLE OF CONTENTS

1. INTRODUCTION

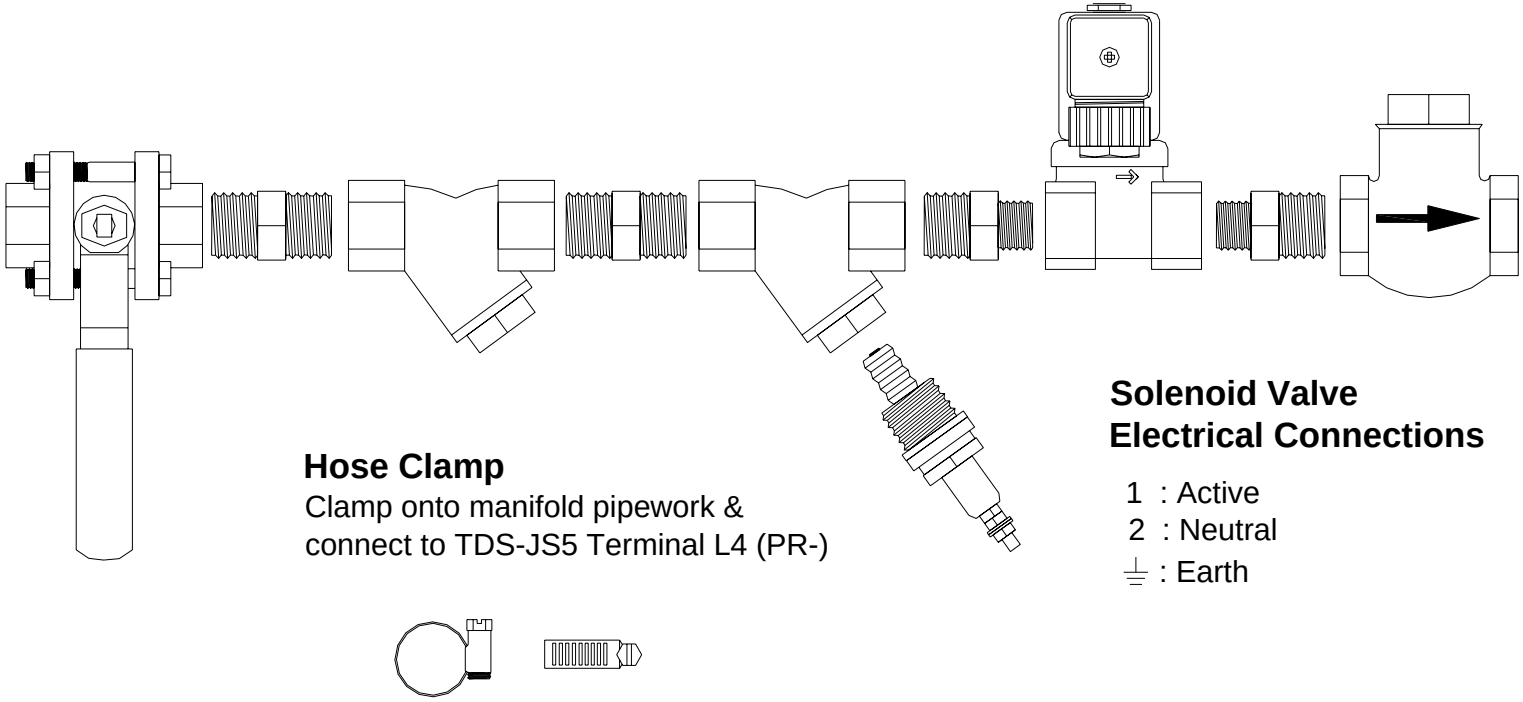
The TDS-JS5 controller, normally used for boiler-blowdown control, is easy to set up and operate, and has built in features to warn the user should any part of the process fail. The instrument samples the boiler water periodically and when the TDS exceeds the user programmable SETPOINT, then a controlled blow-down takes place. Once the TDS is corrected, blow-down stops. The speed of TDS correction is programmable, preventing excessive blow-down.

1.1 Components of a Boiler Blow-down System

The following components are required for boiler TDS control:

1. TDS Controller (eg. TDS-JS5).
2. Isolation Valve installed on outlet of sample line of boiler.
3. Y-strainer to prevent solids from clogging the solenoid valve.
4. Conductivity Probe.
5. Steam Solenoid Valve.
6. Check Valve.
7. Blow-down line.

The diagram overleaf outlines the Bypass Assembly used in a boiler blow-down system. This assembly consists of an isolation valve, Y-strainer, probe & probe holder, a steam solenoid and a check valve.



Hose Clamp
Clamp onto manifold pipework &
connect to TDS-JS5 Terminal L4 (PR-)

Solenoid Valve
Electrical Connections

1 : Active
2 : Neutral
⏚ : Earth

Manifold Components

2. DESCRIPTION OF OPERATION

The TDS-JS5 controller has two modes of operation:

- Monitoring Mode
- Blow-down Mode

2.1 Monitoring Mode

During this mode the boiler conductivity (μS/TDS) is monitored periodically. The steam solenoid valve is opened (activated) to draw a fresh boiler water sample past the probe. (The active period of the solenoid valve is called the **'Sample Time'**.) The TDS-JS5 controller then closes the valve and measures the conductivity of the new sample. Should the measured conductivity (μS/TDS) be below the setpoint, the controller enters a **dormant** period, called the **'Idle Time'**. Both the **'Sample Time'** and **'Idle Time'** period are programmable.

This cycle is repeated until the measured conductivity (μS/TDS) of the boiler water exceeds the Setpoint at which time the **Blow-down mode** commences.

Important: See diagram of Monitoring Mode on page 4

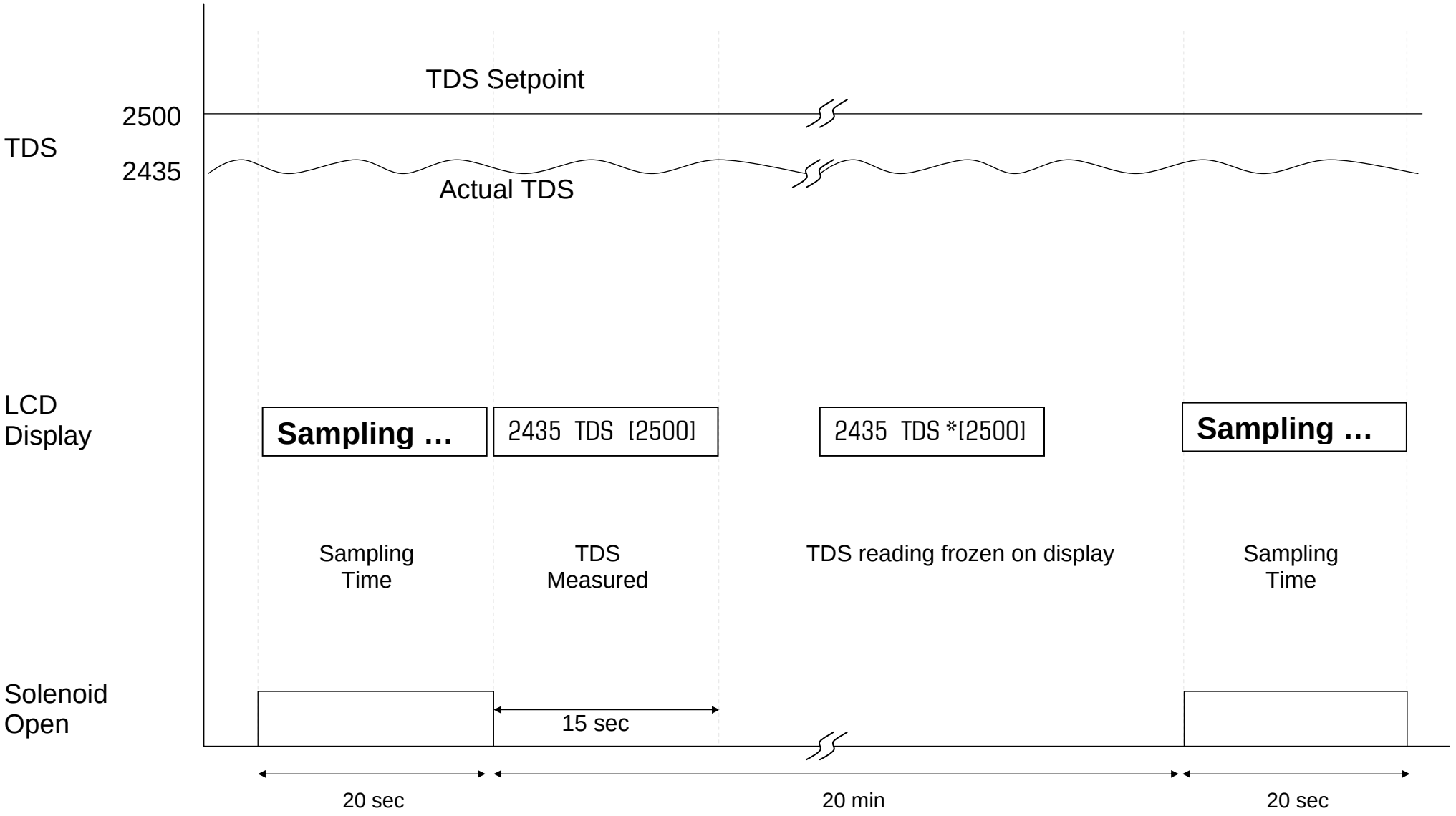
2.2 Blow-down Mode

Once the measured conductivity (μS/TDS) of the boiler water exceeds the setpoint, the solenoid valve is activated (ie. opened). The solenoid will remain active for the programmed **'Blow-down'** time plus the programmed 'sample time'. The TDS-JS5 controller then closes the solenoid valve and measures the conductivity (μS/TDS) of the boiler water again. Should the conductivity (μS/TDS) of the boiler water still be above the setpoint, the solenoid valve is re-opened and the **'Blow-down'** cycle is repeated.

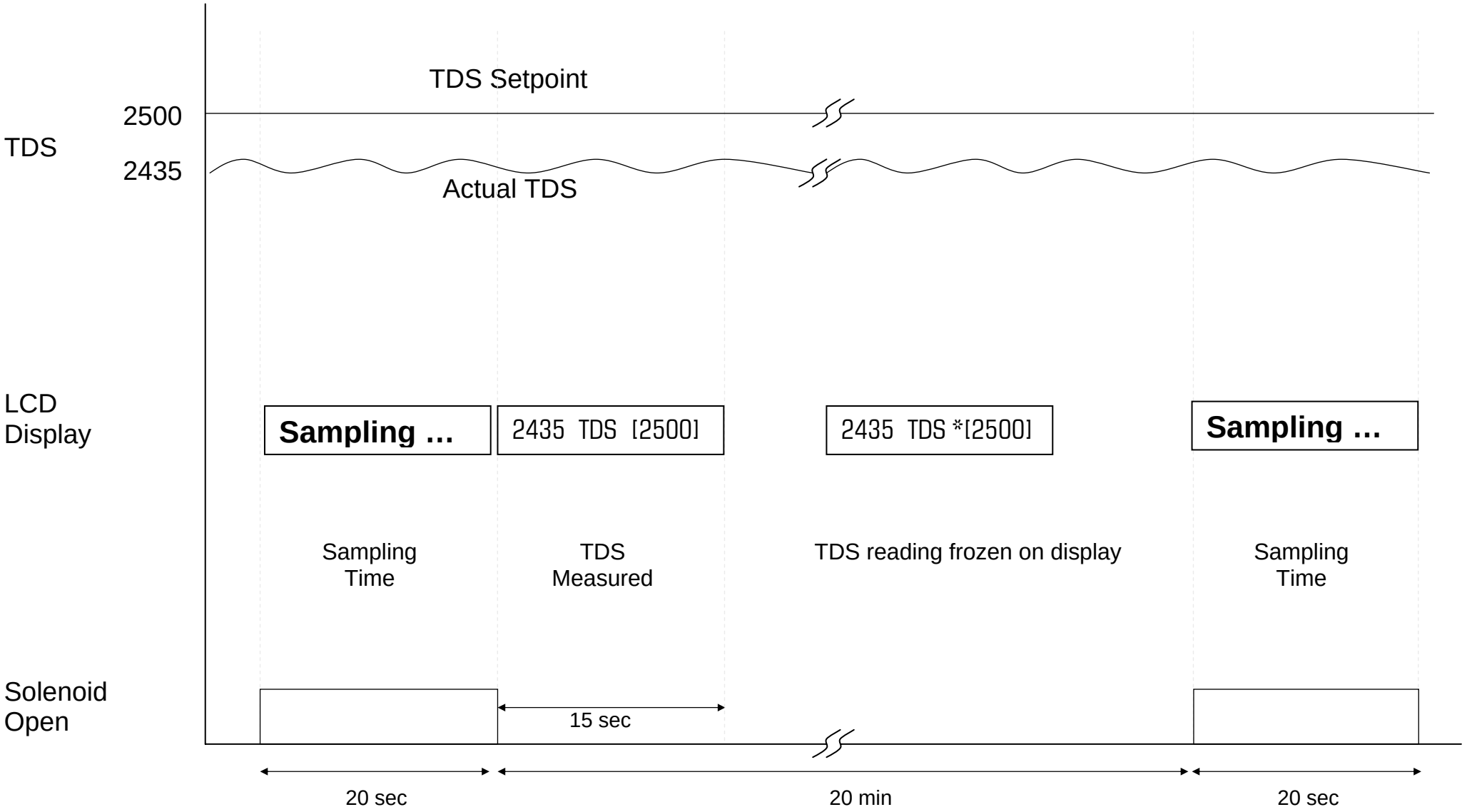
Once the conductivity (μS/TDS) falls below the setpoint, **'Blow-down'** is stopped and the monitoring mode is started.

Note: The TDS-JS5 is not temperature compensated and the conductivity readout will drop as the sample cools down. This will not be a true reflection of the boiler TDS. The TDS-JS5 will freeze the display 15 seconds after a sample. This will ensure that the readout on the display is a true reflection of boiler TDS. The display will show an asterisk next to the SETPOINT when the displayed TDS is frozen.

Important: See diagram of Blow-down Mode on page 5



Monitoring Mode



Blow-down Mode

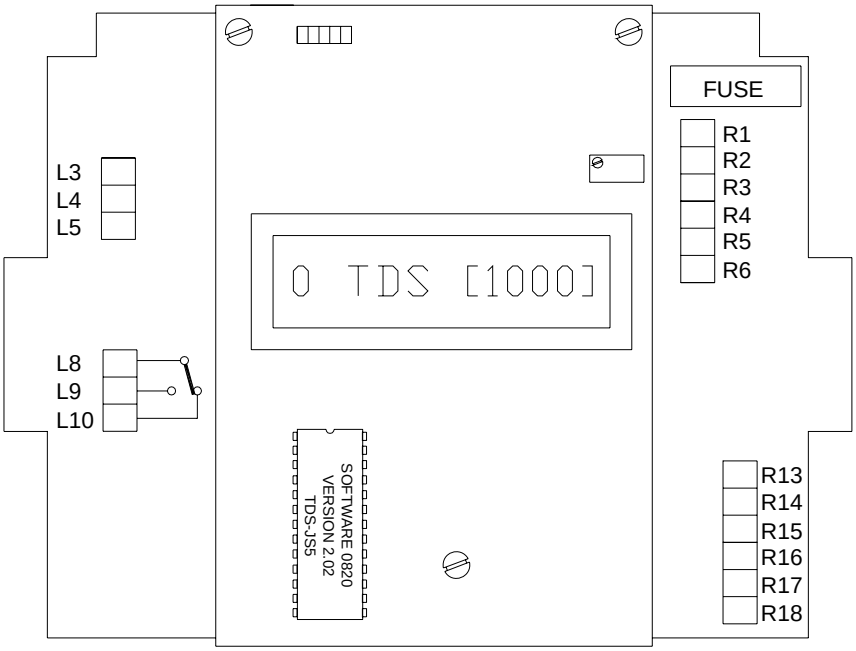
3. INSTALLATION

3.1 Mounting the Controller & Bypass Manifold Assembly

1. Mount the controller on a flat vertical surface away from extreme heat, humidity or areas where temperature variation is extreme.
2. Mount the TDS-JS5 such that the instrument is at eye-level to allow good visibility of the LCD display.
3. Make up the bypass manifold assembly as shown in section 1.1 which should be plumbed from the sample line. THIS SHOULD ONY BE PERFORMED BY A QUALIFIED BOILER FITTER.
4. Use sufficient PTFE tape to provide leak-proof connection to sample line and other fittings.
5. Fit point ‘A’ of the bypass assembly to the sample line of the boiler.
6. Fit point ‘B’ of the bypass assembly to the main blow-down line. If necessary, weld a socket to the blow-down line. Make sure that no manual ‘bottom’ blow-down takes place when doing this installation.
7. Wire the probe by using two crimp lugs. The first lug must be wired to the probe electrode, which is located at the tip of the exposed part of the probe. Using fine sandpaper, sand down any paint or coating on the exposed pipe-work and with the aid of a hose clamp (which should be stainless steel), fit the other lug between the pipe-work and clamp (this serves to ground the probe). Tighten the clamp to secure good electrical connection between the pipe-work and the lug.
8. See section 3.2 below for wiring the probe and solenoid to the TDS-JS5 controller.

3.2 Electrical Wiring Information

The diagram below shows the connections to the TDS-JS2 controller circuitry.



Note: Silicone coated wire is recommended for wiring the probe and solenoid.

L3:	Conductivity Probe +
L4:	Conductivity Probe -
L5:	not used
L8+ L9:	Alarm Relay N/O volt-free
L8+ L10:	Alarm Relay N/C volt-free
R1:	Mains Active 240VAC (power supply)
R2:	Mains Neutral
R3:	Auxiliary Active 240VAC (eg. for AF09 4-20mA card)
R4:	Auxiliary Neutral
R5:	Output (solenoid) Active 240VAC
R6:	Output (solenoid) Neutral
R13 – R18:	Earth

Fuse: 2A/250VAC (M205, 20mm x 5mm diameter)

Notes on Alarm Relay Contacts :

1. Alarm relay is energised (ie. L8 connected to L9) during normal operation of the unit.
2. Alarm relay de-energises (ie. L8 connected to L10) when an alarm is raised or when the unit loses power.

3.3 Probe & Y-strainer Maintenance

The probe's electrode should periodically be cleaned to maintain accurate TDS measurements. The frequency of cleaning required will vary from one application to another.

To clean the probe, first close the isolation valve. Then remove the crimp lug from the probe and unscrew the probe from the manifold. The probe can normally be cleaned using a cloth or paper towel. Occasionally the probe's stainless steel electrode may be coated with certain substances which requires more vigorous cleaning (this coating may not always be visible). To clean a coated electrode, use a fine grit abrasive, such as emery paper.

After cleaning, apply more Teflon® tape to the probe thread and screw back into the manifold.

The controller should always be calibrated after probe cleaning.

The Y-strainer should also be cleaned before opening the isolation valve again.

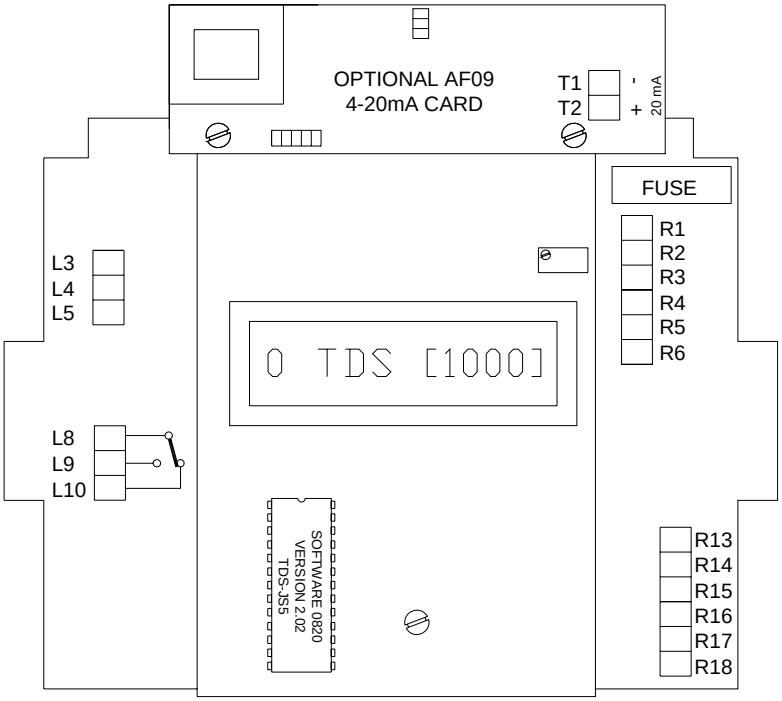
3.4 Adding Optional 4-20mA Card (ordering code AF09)

The TDS-JS5 can be fitted with an optically isolated 4-20mA interface card to provide an output to a data logger, chart recorder or building management system. The interface card is an ordering option and can be retro-fitted to the TDS-JS5, or can be supplied factory fitted.

The AF09 optional kit consists of the following:

1. Optically isolated 4 – 20mA card
2. Interconnecting communications cable.
3. 2 x 15mm metal spacers.

You may skip this section if the card is factory fitted.



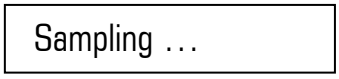
1. Make sure that the power is switched off and the controller is unplugged from mains power.
2. Remove cover of enclosure.
3. Locate the two screws as indicated in the diagram above and remove. Do not discard these screws.
4. Plug the interconnecting cable into the USB socket.
5. Screw the 2 metal spacers into space where the screws were removed.
6. Locate the two mounting holes on the interface card.
7. Use the screws removed in step 3 and fasten the card to the 2 metal spacers (installed in step 5).
8. Connect the RED wire of the interface card to terminal 3.
9. Connect the BLACK wire of the interface card to terminal 4.
10. Connect the +ve and –ve terminal of the 4-20mA card to your chart recorder, data logger or building management system. It is important to observe the correct polarity of these connections.
11. Replace cover of enclosure.
12. Plug into mains and switch on.

NOTE: Refer to section 5.8 for explanation on the 4 and 20mA settings.

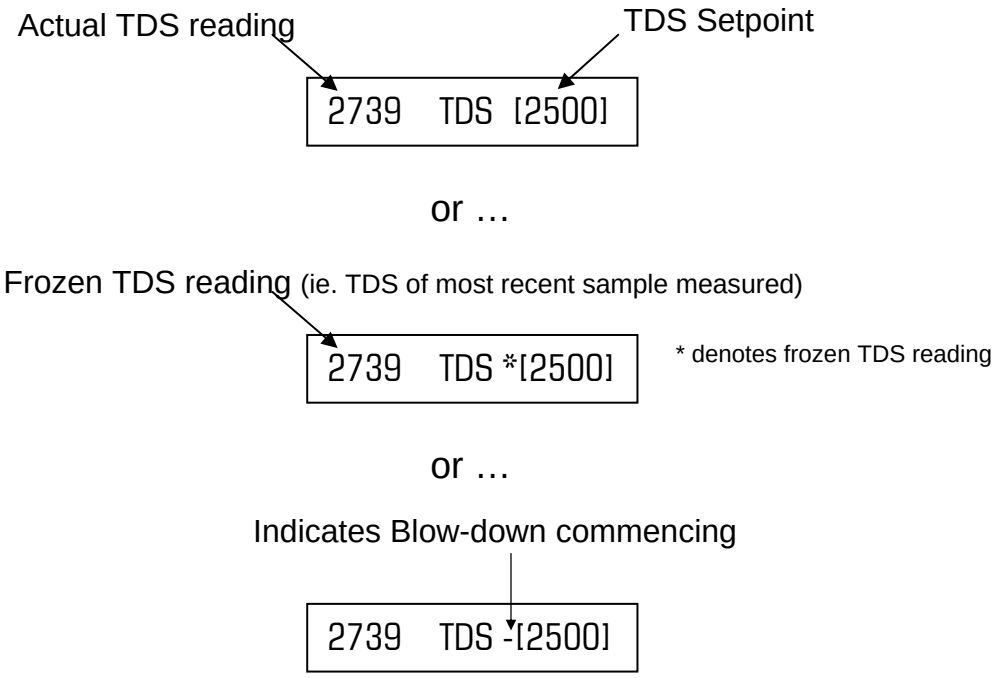
4. COMMISSIONING

4.1 Start-Up

A few seconds after power-up, the Operate LED should illuminate and the solenoid valve will activate, drawing a sample of boiler water past the probe. The LCD display will indicate Sampling:



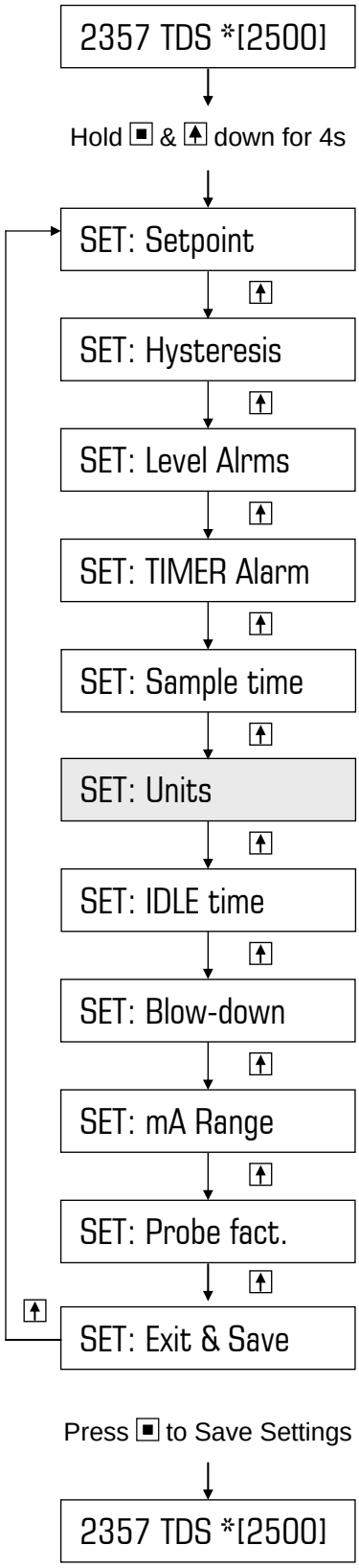
Once the sampling period is finished, the display will revert to operating mode and all the relevant information is displayed as explained below.



Note: The TDS-JS5 is not temperature compensated and the conductivity readout will drop as the sample cools down. This will not be a true reflection of the boiler TDS. The TDS-JS5 will freeze the display 15 seconds after a sample. This will ensure that the readout on the display is a true reflection of boiler TDS. The display will show an asterisk next to the SETPOINT when the display is frozen.

Display **during normal operation**:	Measured TDS & TDS Setpoint, as shown above.
Display **during programming**:	Programming information (eg. “SET: Setpoint”).
Display **if alarm is reported**:	Displays alarm activated, eg. “**Alarm !! [HIGH]**”

4.2 Set UNITS



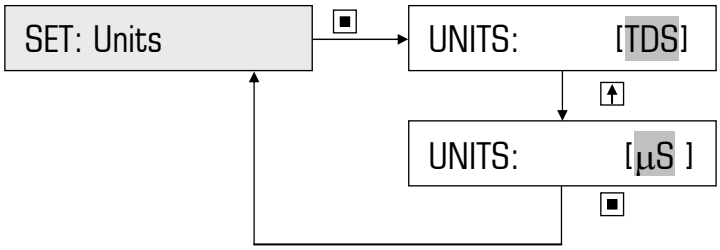
Conductivity can be displayed in either:

TDS (ie. Total Dissolved Solids), or
μS (ie. microsiemens)

The displayed units, ie. either TDS or μS should be selected before performing calibration and before programming conductivity setpoint.

To leave the display in TDS, ie. factory default setting, proceed to section 4.3.

Example:
Changing the factory default of TDS to μS



Item flashing on display:

▲ Press to Scroll
■ Press to Select/Enter

Note: Shading represents flashing

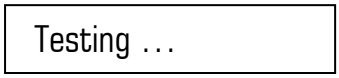
4.3 Calibration

Take a neutralised sample of water from the boiler and measure the TDS with a hand-held conductivity meter. Should the TDS readout on the display differ from the sample taken, calibrate the controller as follows:

The following can be performed, BUT only by a qualified technician.

IMPORTANT: AS THE UNIT NEEDS TO BE POWERED, BE VERY CAREFUL NOT TO TOUCH ANY OF THE SCREW TERMINALS OR THE CIRCUIT BOARDS, AS THEY MAY BE LIVE, AND CAN RESULT IN ELECTRIC SHOCK, OR EVEN DEATH.

1. Remove the lid of the controller
2. Keeping the keypad cable connected, press and hold the ⍐ button until the display indicates the following:



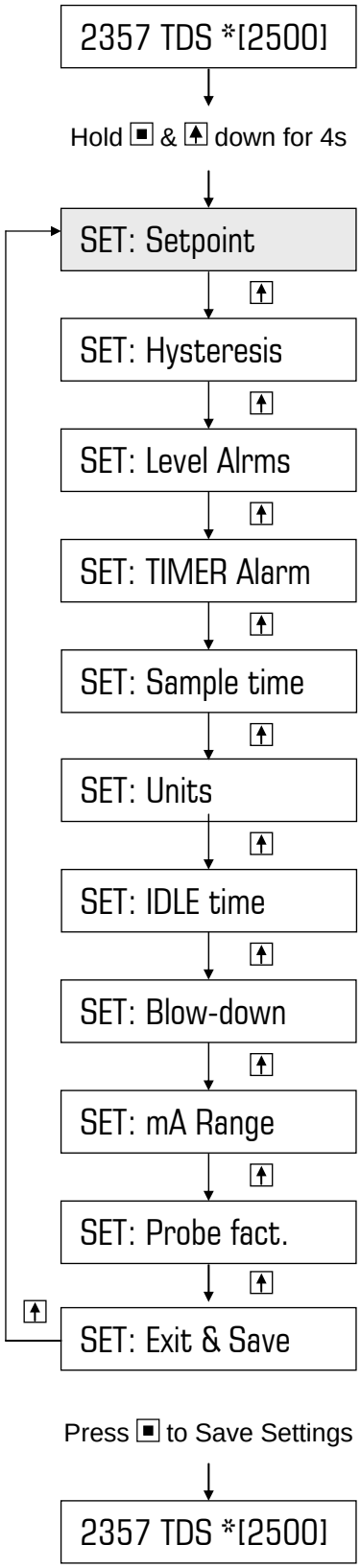
3. Locate the trim potentiometer on the right-hand side of the processor board.
4. Wait until the display returns to normal mode.
5. Slowly turn the potentiometer with an insulated miniature screwdriver until the desired reading is obtained. If the '*' or '-' appears on the display, go back to step 2.
6. Repeat steps 2 to 5 to fine tune the calibration.
7. If the measured conductivity exceeds the setpoint, it may help to temporarily raise the setpoint to 9900(see section 5.1) in order to force the unit into monitoring mode. This will allow you to have up to 3 minutes to calibrate after the solenoid closes (ie. after a sample is taken).
8. Replace the lid of the controller, ensuring that the seal is in place and no wires are trapped between the lid and the base.

5. PROGRAMMING STEPS IN DETAIL

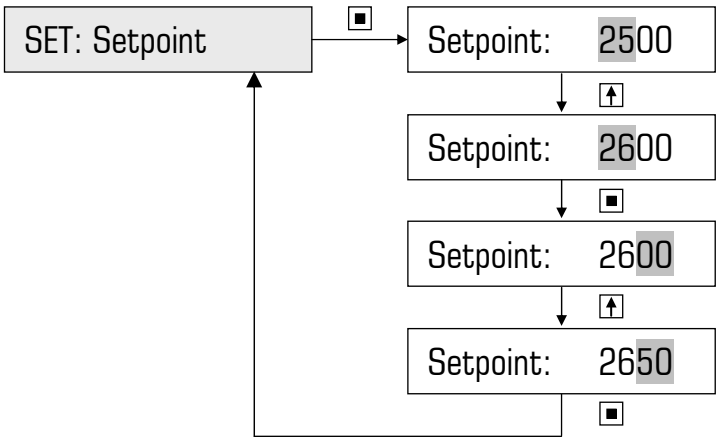
5.1 Set Conductivity Setpoint

The main operation of the TDS-JS5 is conductivity blow-down control.

The setpoint is entered as an actual number (eg. 2500 TDS).



Example:
Increasing factory default setpoint of 2500 TDS to a new setting of 2650 TDS

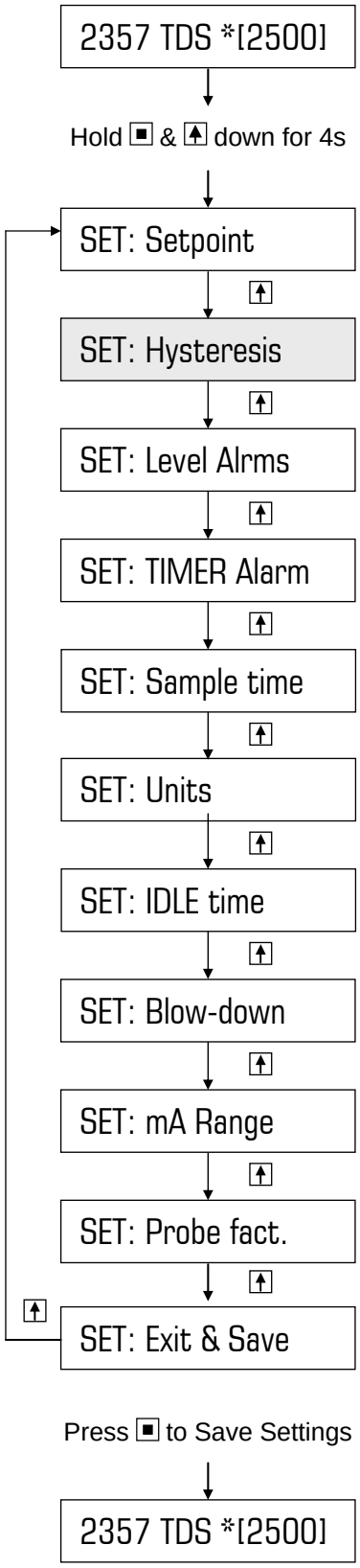


Item flashing on display:

▲ Press to Scroll
▣ Press to Select/Enter

Note: Shading represents flashing

5.2 Set Hysteresis

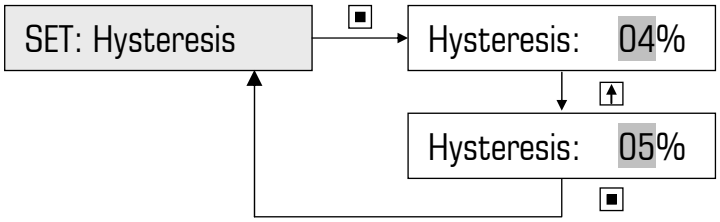


Hysteresis sets the margin/band of TDS control. 'Hysteresis' is the difference in TDS level at which the solenoid opens and closes.

Blow-down will occur when the TDS readout rises above the SETPOINT . Blow-down will stop once the readout drops below the SETPOINT minus a percentage. (This percentage is the hysteresis value and is a percentage of the SETPOINT).

For example, if the SETPOINT is 2500 TDS and the hysteresis value is 4% then the calculated hysteresis value is 100 TDS and when subtracted from the Setpoint, the Setpoint will be 2400. When the readout drops below 2400 TDS, blow-down will stop.

Example:
Increasing factory default hysteresis of 4% to a new setting of 5%

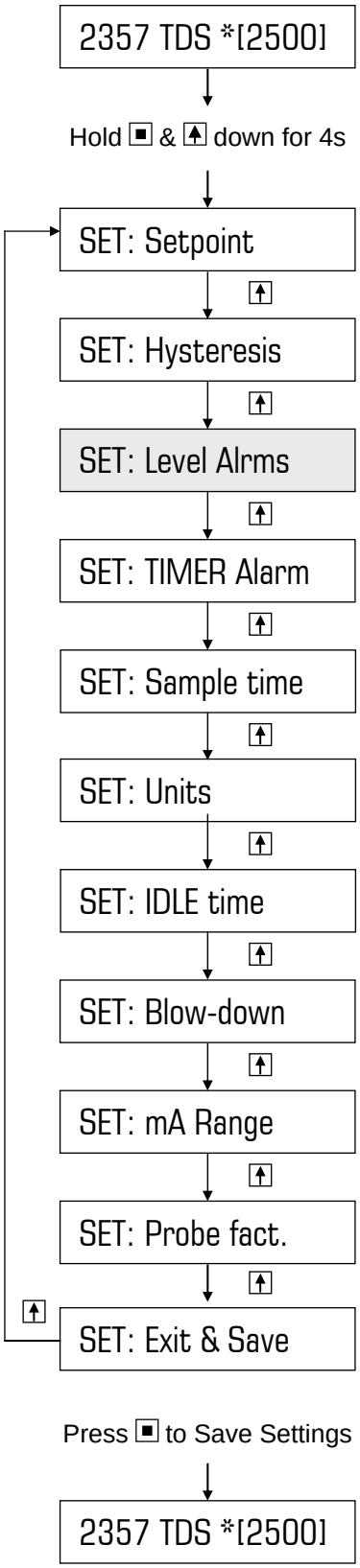


Item flashing on display:

▲ Press to Scroll
■ Press to Select/Enter

Note: Shading represents flashing

5.3 Set LEVEL Alarms



Item flashing on display:

▲ Press to Scroll
▣ Press to Select/Enter

Note: Shading represents flashing

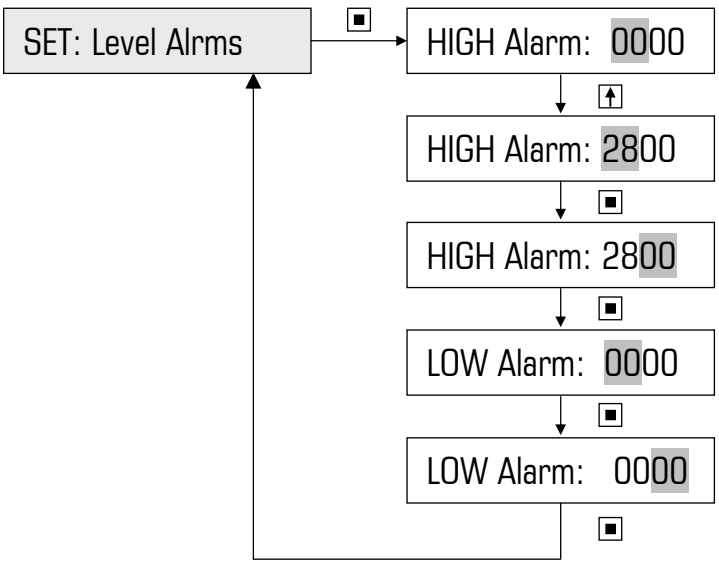
To leave the alarms in their disabled state, ie. factory default settings of 0000, proceed to section 5.4.

Enabling one or both of the alarms requires you to program a HIGH TDS Alarm level (higher than the TDS Setpoint) and/or a LOW TDS Alarm level (lower than the TDS Setpoint).

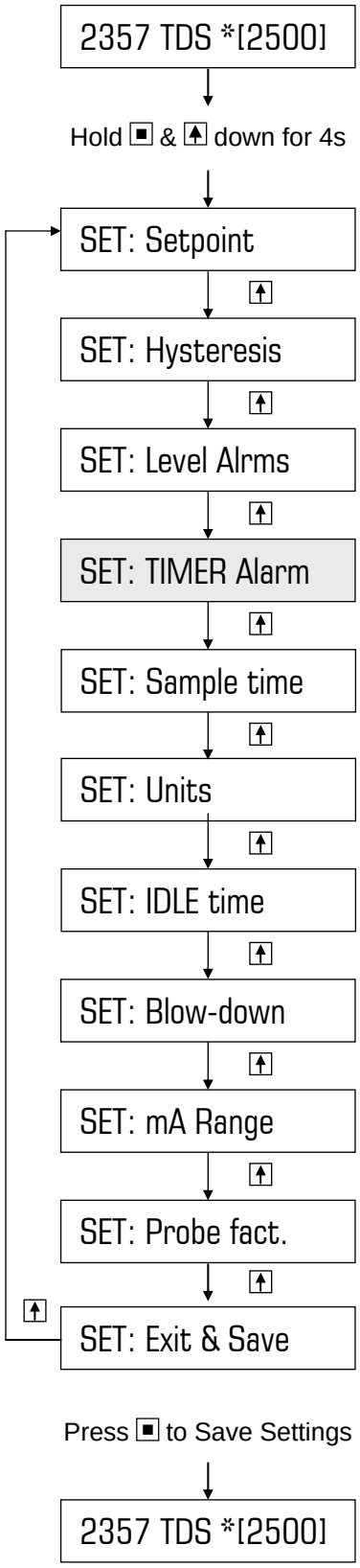
If the system TDS rises above the HIGH alarm level, the HIGH alarm activates. Similarly, if the system TDS drops below the LOW alarm level, the LOW alarm activates. The alarm LED will illuminate and the display will alternate between the alarm and the normal display. For instance, if HIGH Alarm = 2800 TDS, the display will alternate between "Alarm !! [HIGH]" and "2850TDS [2500]", assuming 2850 TDS is the measured TDS. Furthermore, if enabled, the audible alarm buzzer will sound.

Either alarm condition can be reset by pressing & holding the ENTER button (until the Alarm LED switches off) or will automatically cancel if the system TDS is again between the HIGH and LOW alarms levels.

Example:
HIGH Alarm: Change factory default of 0 TDS to 2800 TDS (ie. alarm reported when TDS > 2800)
LOW Alarm: Leave factory default of 0 TDS (ie. alarm disabled)



5.4 Set TIMER Alarm



Item flashing on display:

▲ Press to Scroll
■ Press to Select/Enter

Note: Shading represents flashing

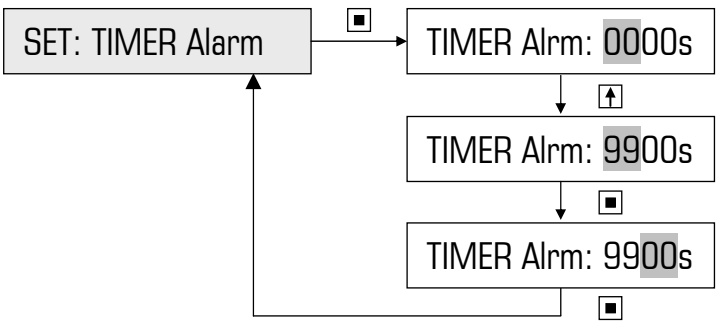
The TIMER alarm activates when the maximum permissible continuous blow-down time is exceeded. This alarm is designed to protect the system from excessive blow-down. Should there be a problem with make-up water not entering the boiler, the solenoid will continue to bleed indefinitely as no dilution takes place. Alternatively, a faulty TDS probe may read a high TDS when in fact the TDS is low, and the solenoid will continue to blow-down indefinitely. The TIMER alarm prevents these excessive conditions.

To leave the alarm in its disabled state, ie. factory default setting of 0000s, proceed to section 5.5

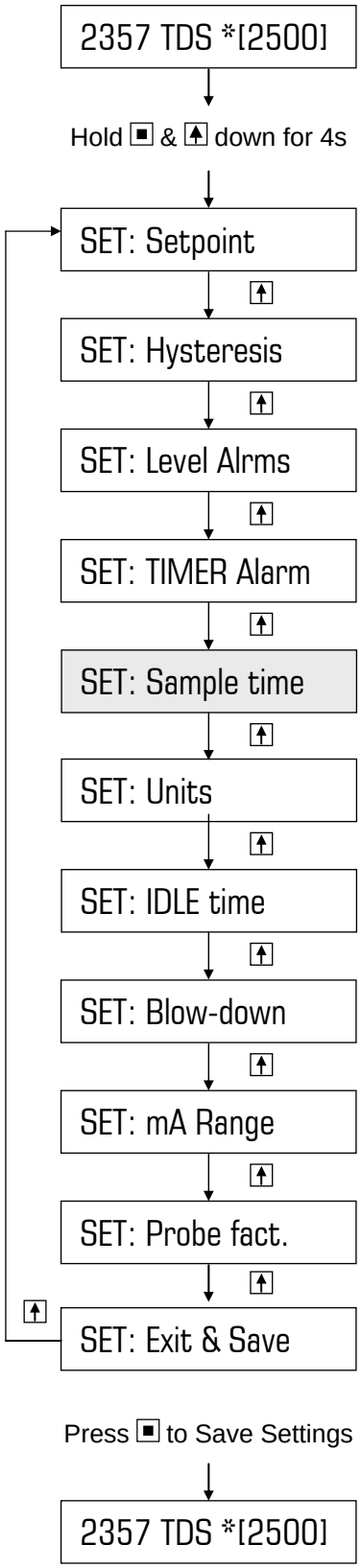
If the TDS reaches the setpoint within the programmed time, the timer resets. However, if the timer times out before the TDS reaches the setpoint, the solenoid switches off and is disabled until the unit is manually reset by holding down the ENTER button. Until then, the alarm will be reported on the display and the alarm LED will illuminate. Furthermore, if enabled, the audible alarm buzzer will sound.

When an alarm is reported, the display will alternate between the alarm and the normal display. For instance, the display will alternate between "Alarm !! [Timer]" & "2610 TDS [2500]", assuming the TDS reading from the probe is 2610 TDS.

Example:
Factory default: 0000s (ie. alarm disabled)
Change to: 165min, ie. 9900s



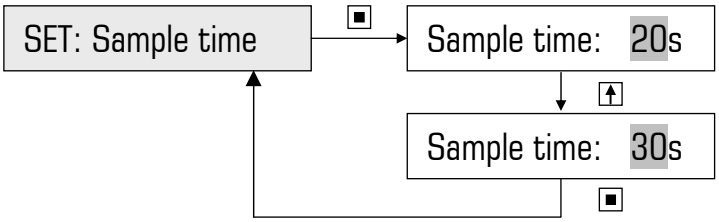
5.5 Set Sample Time



To leave the default factory Sample Time setting of 20 seconds, proceed to section 5.6. A time of 20 seconds is recommended as a starting point.

The sample time is the period the solenoid valve stays open to draw a fresh boiler water sample past the probe, before taking the conductivity measurement.

Example:
Increasing factory default Sample time of 20sec to a new setting of 30 sec.

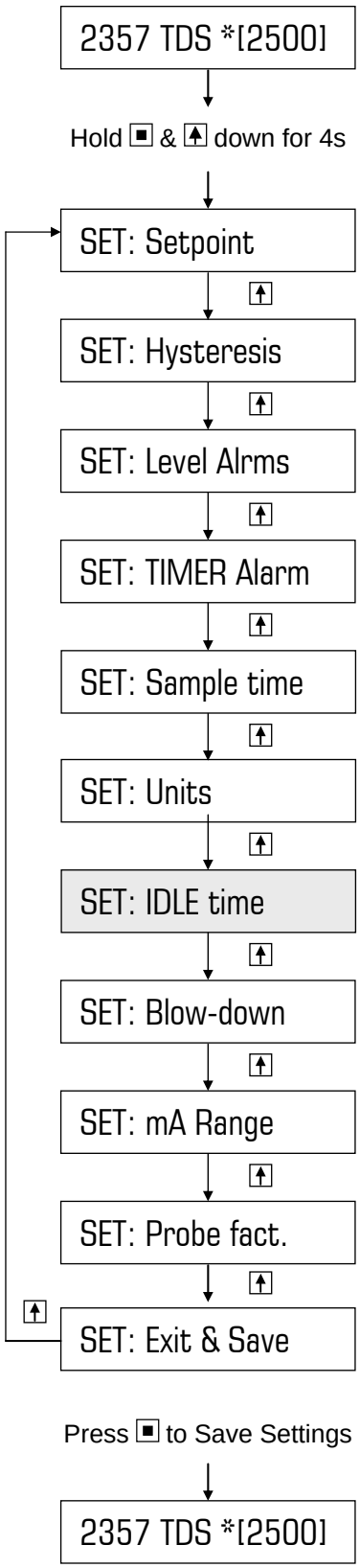


Item flashing on display:

▲ Press to Scroll
■ Press to Select/Enter

Note: Shading represents flashing

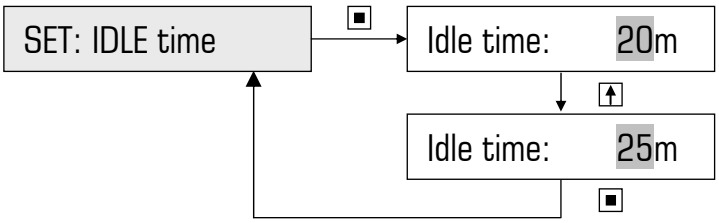
5.6 Set IDLE Time



To leave the default factory IDLE Time setting of 20 minutes, proceed to section 5.7. A time of 20 minutes is recommended as a starting point.

The IDLE time is the dormant time between samples.

Example:
Increasing factory default IDLE time of 20 min to a new setting of 25 min.

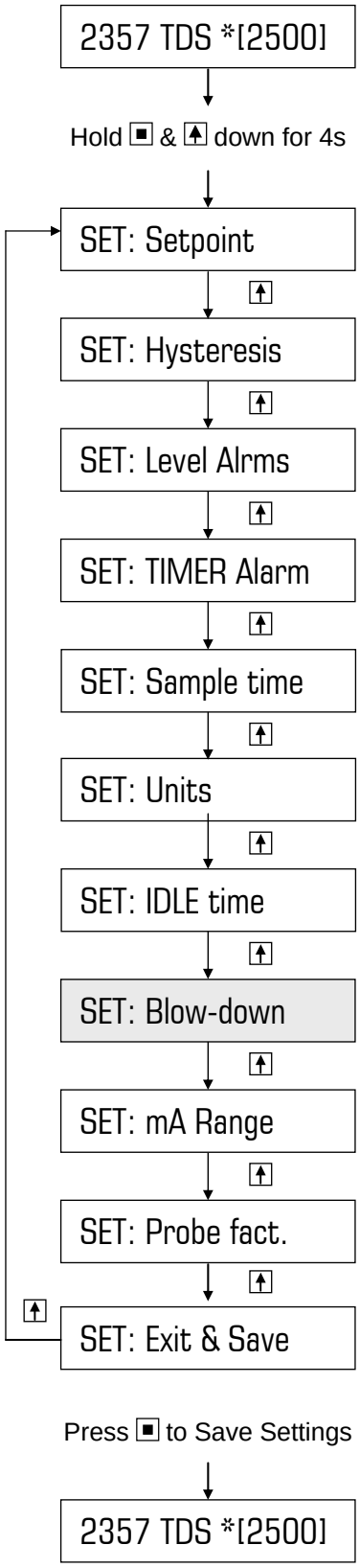


Item flashing on display:

▲ Press to Scroll
▣ Press to Select/Enter

Note: Shading represents flashing

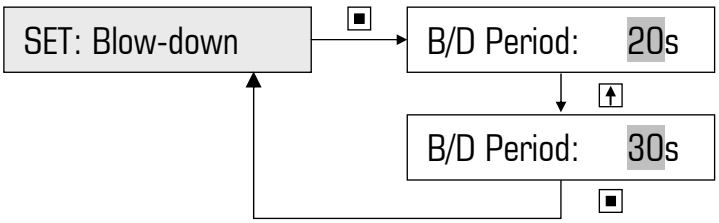
5.7 Set Blow-Down Time



To leave the default factory Blow-down Time setting of 20 seconds, proceed to section 5.8. A time of 20 seconds is recommended as a starting point.

When the measured TDS (taken during the sample period) exceeds the setpoint, blow-down mode is entered. Each sample period is followed by a blow-down period, which is repeated until the TDS drops below the setpoint.

Example:
Increasing factory default blow-down time of 20 sec to a new setting of 30 sec.

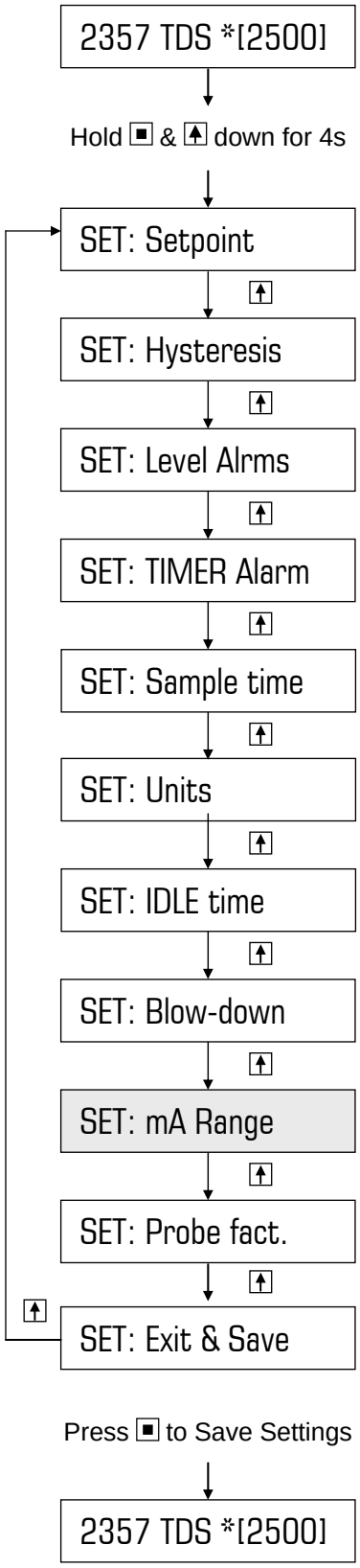


Item flashing on display:

▲ Press to Scroll
■ Press to Select/Enter

Note: Shading represents flashing

5.8 Set mA Range



Item flashing on display:

▲ Press to Scroll
■ Press to Select/Enter

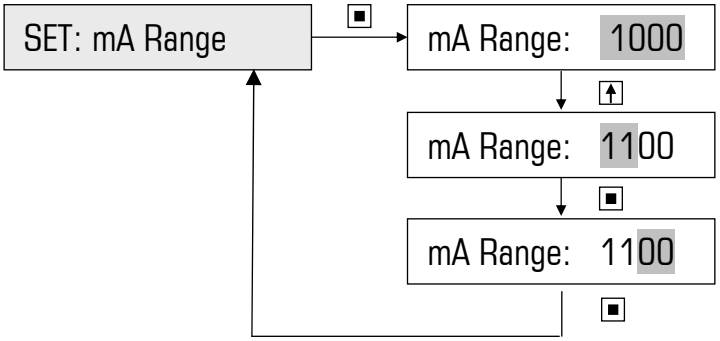
Note: Shading represents flashing

The mA range of the TDS-JS5 is programmable between 1 to 9999 μS/TDS.

For example, if the mA range is set at a conductivity of 5000 μS, then 20mA will be transmitted at 5000 μS, 12mA at 2500 μS and 4mA at 0 μS.

The mA Range is entered as an actual number (eg. 5000 μS), in 1 μS/TDS increments.

Example:
Increasing mA Range of 1000 μS to a new setting of 1100 μS

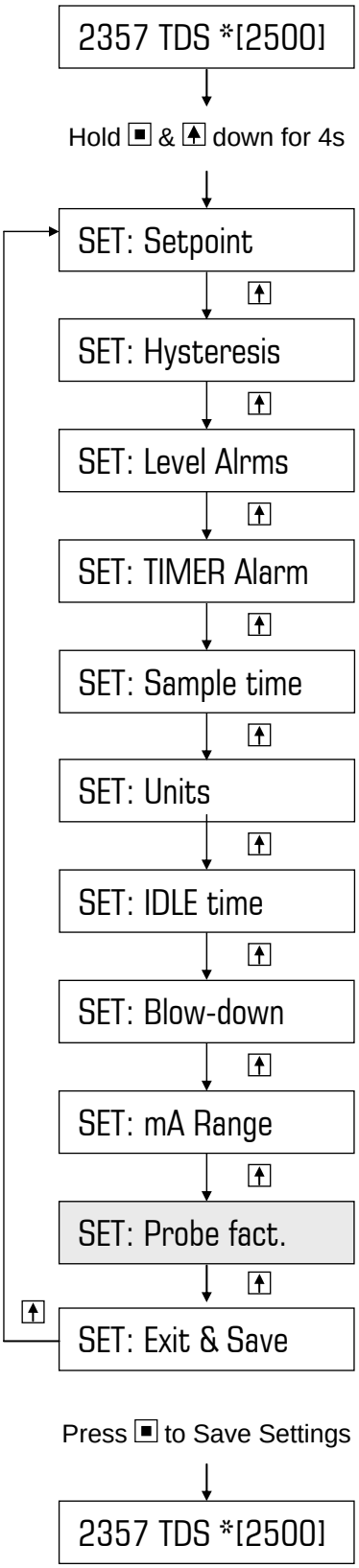


Item flashing on display:

▲ Press to Scroll
■ Press to Select/Enter

Note: Shading represents flashing

5.9 Set Probe Factor



Item flashing on display:

▲ Press to Scroll
■ Press to Select/Enter

Note: Shading represents flashing

Do not change this setting unless you are familiar with electrode cell constants, or if the readout cannot be calibrated to match the conductivity of the sample. However, if the TDS is out of range of the maximum pot adjustment, the probe probably needs cleaning. Please use this setting with care as it can affect the accuracy of the unit.

Cell Constant

The TDS-JS5 is designed to use the DCON-P10S probe. If a different probe is used, the cell constant must match the DCON-P10S probe. If calibration is not possible, even after probe cleaning, change the probe factor setting as follows:

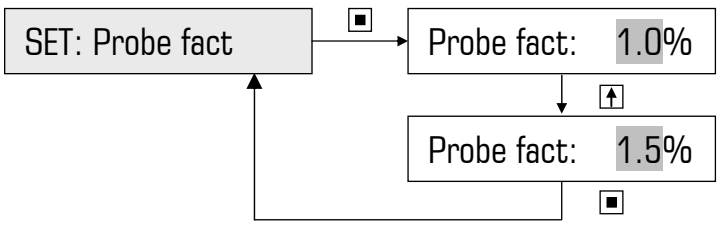
If the readout is less than actual, calculate the error factor, double the error factor and add it to the default probe factor value. *The factory default is 1.0*.

Example 1: Readout: 1200 TDS Actual: 1800 TDS
Factor out by 0.5. Double this value to 1.
Now increase the probe factor by 1 to 2. The readout will now be 1200 x 2 = 2400 TDS.
Calibrate The controller until it reads 1800.

If the readout is more than actual, calculate the error factor, decrease the probe factor value by double the error factor value.

Example 2: Readout: 2000 TDS Actual: 1700 TDS
Factor out by 0.15. Double this value to 0.3.
Now decrease the probe factor by 0.3 to 0.7
The readout will now be 2000 x 0.7 = 1400 TDS
Calibrate the readout until it reads 1700 TDS

Example:
Increasing factory default Probe factor of 1% to 1.5%



6. FACTORY SETTINGS / PROGRAMMABLE OPTIONS

Item	Factory Setting	Option	Note
Setpoint	2500 TDS	1 – 10,000 μS	Determine the desired system TDS/μS
Hysteresis	4%	1 – 90 %	Lower value ensures tighter control
High Alarm/ Low Alarm	0000 TDS	0 – 10,000 μS	0000 = alarm disabled Otherwise HIGH alarm setting must be greater than Setpoint / LOW alarm setting must be less than Setpoint
Timer Alarm	0000 sec	0 – 9999 sec	0000 = alarm disabled
Sample time	20s	1 - 99 sec	
Units	TDS	TDS or μS	Must be set before calibrating
Idle time	20m	1 - 99 min	
Blow-down time	20s	1 - 99 sec	
Probe factor	1	0.1 – 9.9 %	Leave at 1.0%

7. SPECIFICATIONS

Power Supply:	220 – 240 VAC, 50/60 Hz
Inputs:	Conductivity Probe DCON-P10S supplied
Standard Outputs:	240VAC applied to Solenoid – 5 Amp rated. Potential free contact available on request.
Optional Outputs:	AF09: Isolated 4-20mA card to remotely monitor conductivity level
Measured TDS Resolution:	1 TDS / μS
LED Indication:	Power ON, Solenoid Operate, Alarm
Controller Enclosure rating:	IP55 (ie. completely weatherproof)
Operating Temperature:	0 - 50°C
Memory backup:	EEPROM. Data retention of 10 years min.