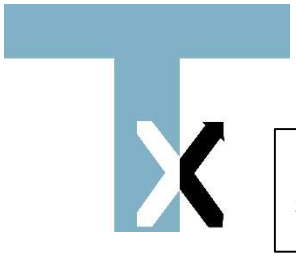
Instructions for Use



V14 8.7.20

Firmware 246 or later

Reason for update:

Switch Alarm clarification

Quick Install

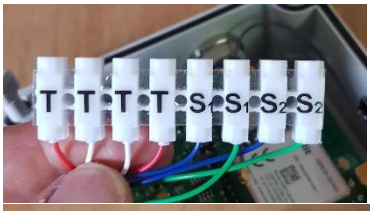
Dosing Solutions Ltd

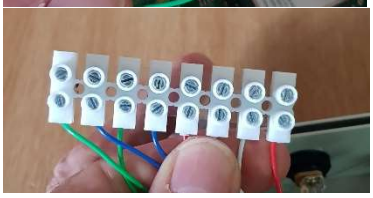
Clavering, UK, CB11 4PW www.dosingsolutions.com

- Power connected (12V DC)
- Solid = processor starting
  Flashing = processor operating
- Solid = looking for GSM signal
  Flashing fast = logging onto GSM network (1/sec)
  Flashing slow = connected to GSM network (1/3 sec)

Tx-1
The lead shown plugs into a Select doser. Power and flow sensor info will be shared between the doser and Tx box. Connect the flow sensor to the socked marked “Flow Sensor”.
There are 6 spare glands for the addition of further sensors.
Large black side gland is for extension GSM antenna if needed.

Tx-2
The Tx-2 is supplied with a 12V DC power supply. Connect the plug from the power supply into the black socket as shown.
Any sensors are connected to the Tx box through the 6 grey glands.

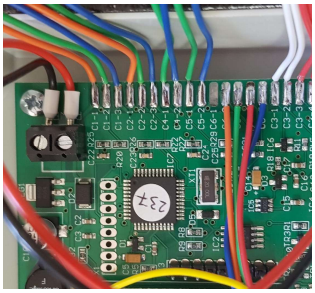




You will find connectors inside the Tx box for the temperature (T), 2 x flow sensors (F1 and F2) and the two switches S1 and S2.
A small screwdriver is supplied with the Tx box to assist you.

Use a Micro SIM (12mm x 15mm) and insert in the orientation shown.

If you have large fingers, you might find it useful to temporarily remove the screw (bottom right) when installing the SIM card.

		
If the green light continues to flash fast, GSM signal may be low. Lift off the internal antenna connector as shown.	Connect the external antenna as shown. Take care not to cross the threads. The antenna connector needs to be inserted into the Tx box through the black side gland.	The version number of the firmware installed in each Tx box is handwritten on a paper label as shown (237 in this case).

Principles

The Tx box is a relatively simple device to operate, but it has a huge range of facilities to help with the management of your day-to-day processes.

From sending you an Alert message when a sensed temperature is too high, to sending recorded data to your computer for graphing and conformance purposes, THE TX BOX SIMPLY AND EFFICIENTLY PERFORMS THESE TASKS FOR YOU.

All communication with the Tx box is by SMS messages via GSM networks. This method is used as GSM networks have the best geographical coverage and SMS being the most robust transit method.

So that you know when an SMS has reached the Tx box, the blue light will flash fast a few times. It will flash fast again when it sends a message back to you.

The following instructions will guide you through the initial set-up and help you with configuring your Tx box to perform in the way you want it to.

A full list of SMS commands is at the end of these Instructions.

The Tx Box

What is supplied:

Tx-1	**Tx-2**
The Tx box	The Tx box
Fitted lead to connect to a Select doser	12V DC power supply
Internal connections for:	Internal connections for:
❖ 1 x extra flow sensor	❖ 2 x flow sensor
❖ 1 x temperature sensor	❖ 1 x temperature sensor
❖ 2 x switches	❖ 2 x switches
SIM card holder	SIM card holder
Internal antenna	Internal antenna
Connector for external antenna	Connector for external antenna

The SIM Card

For the Tx box to function, you need to insert a **micro sized SIM card** (Standard = largest, Micro is the middle size at 12mm x 15mm, with the Nano size being the smallest. SIM cards are generally supplied pre-cut so that all sizes are possible by snapping out the size that you need.

It is recommended, if at all possible, to use a monthly paid contract SIM card from the GSM network provider that has the strongest signal in your area. There are occasionally transmission problems if pay-as-you-go SIM cards are used. Also, with pay-as-you-go cards, you will not know when your credit balance reaches zero.

When purchasing a SIM card, you need the cheapest possible deal. The Tx box needs to use only SMS. Purchasing talk time and data is unnecessary as these will not be used.

Once the SIM card is inserted as shown above (note the position of the cut-off corner of the SIM card) and the power connected (Tx-1 connected to an active Select-doser, TX-2 connected to a 12V DC power supply), the lights on the front of the box will show as here:

- Power connected (12V DC)
- Solid = processor starting
  Flashing = processor operating

The red light will always be on when power is connected. There is no major back-up battery installed inside the Tx box, a small battery keeps the time settings only. A Tx battery backup box is available. This backup box is necessary particularly if you need to receive Alerts when the mains electricity power fails and resumes.

The blue light purely shows that the processor is operating correctly.

You will see (left) the position of the green light. After you fit a SIM card, if the green light continues to flash fast (1/sec)for more than 2 minutes, there could be one or more of the following issues:

- ❖ The SIM card may not have been activated by your supplier

- Solid = looking for GSM signal
  Flashing fast = logging onto GSM network (1 per sec)
  Flashing slow = connected to GSM network (1 per 3 sec)

- The SIM card is inserted incorrectly
- The SIM has no credit (pay-as-you-go)
- There is no GSM signal available or a very low signal, in this case use an external antenna plus an extra extension cable to expose the antenna to the best chance of seeing a GSM signal

Time

A feature of the Tx box is that you do not normally need to supply the present time to the operating system. This is picked up automatically from the local GSM network. However, if you disconnect the power from the Tx box and then reconnect quickly, it may take some time for the correct time setting to be re-established.

Adjustments are automatically made to take daylight saving changes into account. If for any reason this does not happen, reset the time on the Tx box using the *TXSC command (below).

However, not all GSM networks function in the same way. If the Tx box is not able to get the present time from the GSM network on first power-up, Contact Number 1 will receive an SMS with the format:

TX System Serial Number 000100
Time Not Set!

To set the time on the Tx box manually, send an SMS to the Tx box with the format ***TXSC,080319,1633** (*effectively Set the Time and date as 8 March 2019, 16.33pm*.)

The present date and time will be preserved in the Tx box using the fitted battery.

Establishment Step 1 – The 5 Contacts

The Tx box can store 5 telephone numbers for outgoing communications. These numbers can be for mobile telephones, or for modems attached to office computers. It is your choice which proportion of the 5 numbers are for telephones, and which for computers.

All contact with Tx is via SMS. All instructions you send to the Tx box will start with *TX (note capital letters need to be used). If the instruction you send to the Tx box is successful and has been understood correctly and processed well, you will receive an SMS response starting with TX.

The blue light will flicker to show that a message has been received and is being processed.

To enter the telephone numbers of Contacts into the Tx box, send an SMS to the Tx box with the format ***TXON1,+447777123456** (*effectively establish the outgoing telephone number for Contact 1 as +44 (for a UK telephone number) 7777 123456*). A response will be received with the format:

TXON1 (For Contact 1)

To enter the telephone number for Contact 2, send an SMS with the format ***TXON2,+447788234567** (*effectively establish the outgoing telephone number for Contact 2 as +44 (for a UK telephone number) 7788 234567)*

The Outgoing Numbers for Contacts are entered in the same way whether the Contact is a person or the telephone number is a modem attached to an office computer.

NOTE – All entered telephone numbers must be in the format +country code followed by the telephone number without the leading zero. So for a South Africa telephone number being entered into a Tx box in South Africa, of 08112 345678, this has to be sent to the Tx box as *TXON1,+278112345678

If you wish to change the Contact 1 telephone number, simply resend the *TXON1 command with the new telephone number.

List All 5 Contact Numbers

After a time, you may find it useful to receive a summary of all of the Contact telephone numbers established in the Tx box. To do this send an SMS to the Tx box with the format ***TXLO** (*effectively instruct the Tx box to list Outgoing Numbers)* The response will be received with the format:

TXLO
1: +27888123456
2: +277621234567
3: +27711245678
4: +27766645678
5: +27665678111

Note: Tx boxes are despatched from manufacture with Contacts 1 and 5 set as the Dosing Solutions central SMS service in UK. Contacts 2, 3 and 4 are NOT SET.

If a contact needs to be deleted, send an SMS to the Tx box with the format ***TXDO2** (*effectively instruct the Tx box to Delete Outgoing Contact Number 2)* A response will be received with the format:

TXDO2

Establishment Step 2 – The 5 Sensors

The Tx box is supplied as standard with connections for 5 sensors.

The 5 sensors are designated as Channel Numbers for ease of communications:

Channel 1	Temperature (T1)
Channel 2	Flow 1 (F1)
Channel 3	Flow 2 (F2)
Channel 4	Switch 1 (S1)
Channel 5	Switch 2 (S2)

If you have purchased a Tx-1 model, there is a pre-fitted lead connection that can be plugged into any Select doser. This connection will supply electric power to the Tx box, and also share the signal from the water flow sensor that was driving the Select doser. This water flow will be on Channel 2.

For the Tx-2 model, use the power supply that came with the Tx box. Any sensors will need to be connected to the Tx box.

Name a Channel (Sensor)

You can name each connection so that when Alerts for out of range messages are sent to you from the Tx box, they will be recognisable. To do this send an SMS to the Tx box in the format ***TXCN1, Temp House 4** (*effectively instruct Tx to Change Name on Channel 1 to Temp House 4*). You will receive a TX response to your phone with the format: (Note, you can use up to 20 characters for your channel name)

TXCN1

***TXCN2** will be the instruction for changing the name of Channel 2 etc.

Name the System

You can name the Tx box (name the system). This is useful as some incoming messages from the Tx box will be more easy to identify should you have more than one Tx box operating. To do this send an SMS to the Tx box in the format ***TXNS,Boggis Farm** (*effectively instruct Tx to name the Tx box as Boggis Farm*). You will receive a TX response to your phone with the format: (Note, you can use up to 20 characters for your channel name)

TXNS

Connection of Sensors

There are connector blocks already installed inside the Tx box marked with T1, F1 etc.

T1	There are 4 connections to be made each marked T1. Match the red and white leads to the existing wires coming from the board.	
F1	If you have a Tx-1, the connection lead to the Select doser will be pre-connected to F1. Note; generally, wires from the board: Green = Signal Blue = Ground Orange = Power	
F2	As for F1	
S1	There is a pair of wires coming from the board coloured blue and green. Nominally, the blue is ground and the green is signal. Connect your switch device across the blue and green.	
S2	As for S1	

Sensor Types

<table>
<tr><td>Temperature</td><td>Tx can only use PT100 type sensors. These are supplied in various forms (ceramic, stainless steel etc.) by Dosing Solutions Ltd.
Although 2-wire temperature sensors are acceptable, it is recommended that 4-wire sensors are used so that the length of connecting cable can be allowed for in the calculation of temperature values. See below for correction factor.</td></tr>
<tr><td>Flow</td><td>The Tx box needs to be told which type of flow sensor is attached. You do this by sending an SMS in the format *TXST2,3 (effectively tell TX the sensor type on Channel 2 is a sensor type 3)
<table>
<tr><td>Sensor Type 1</td><td>TBR10</td><td>Flows between 3 and 400 l/hr
Green = signal
Red = power
Blue = ground
(Supplied by Dosing Solutions Ltd)</td></tr>
<tr><td>Sensor Type 2</td><td>VTY10</td><td>Flows between 20 and 1,500 l/hr
Green = signal
White = power
Brown = ground
(Supplied by Dosing Solutions Ltd)</td></tr>
<tr><td>Sensor Type 3</td><td>VTH25</td><td>Flows between 200 and 10,000 l/hr
Green = signal
White = power
Brown = ground
(Supplied by Dosing Solutions Ltd)</td></tr>
<tr><td>Sensor Type 4</td><td>K = 1</td><td>Water meter that gives 1 pulse/L</td></tr>
<tr><td>Sensor Type 5</td><td>VTH40</td><td>Flows between 400 and 25,000 l/hr
Green = signal
White = power
Brown = ground
(Supplied by Dosing Solutions Ltd)</td></tr>
<tr><td>Sensor Type 6</td><td>K = 10</td><td>Water meter that gives 1 pulse/10L</td></tr>
<tr><td>Sensor Type 7</td><td>VTY20</td><td>Flows between 30 and 3,300 l/hr
Green = signal
White = power
Brown = ground
(Supplied by Dosing Solutions Ltd)</td></tr>
<tr><td>Sensor Type 8</td><td>Mag20</td><td>MagFlo 20mm, flows between 300 and 6000 l/hr</td></tr>
<tr><td>Sensor Type 9</td><td>Mag15</td><td>MagFlo 15mm, flows between 150 and 3000 l/hr</td></tr>
<tr><td>Sensor Type 10</td><td>K = 0.25</td><td>Water meter that gives 1 pulse per 0.25L</td></tr>
<tr><td>Sensor Type 11</td><td>K = 0.5</td><td>Water meter that gives 1 pulse per 0.5L</td></tr>
</table></td></tr>
</table>

	Sensor Type 12	Mag8	MagFlo 8mm, flows between 60 and 1200 l/hr
	Sensor Type 13	K = 100	Water meter that gives 1 pulse per 100L
	Sensor Type 14	VTH25	Reads in '10 of litres for whole farm use.
Switch	You do not need to tell Tx which switch type is being used. Channels 4 and 5 (labelled S1 and S2 on the connector blocks inside the Tx box) are looking for an open or a closed circuit. Blue (ground) and green (signal) wires come from the Tx board. Connect the switch (float, contact, relay etc.) in either order to the S1 and S2 connections.		

If you wish to check which sensor is set for a particular channel, send an SMS with the format ***TXSQ2** (*effectively sensor query for Channel 2*)

Temperature Calibration

Whilst all PT100 temperature sensors should perform the same, in practice there are small variations in manufacture which means that readings can be a couple of degrees out.

To trim an individual PT100 sensor, connect the sensor to the T1 connections in the Tx box, ensure that the Tx box is powered up and connected to the GSM network (green light flashing slowly). Place the sensor close to a room thermometer or a digital thermometer so that you can see what the temperature reading should be. Then sent an SMS to the Tx box with the format *TXDR1 (effectively send a daily report or status for Channel 1). This will return the Current Temperature as seen by TX.

If Tx sees a temperature that is (for example) 3 deg C lower than the temperature shown on the room thermometer, we need to use a temperature correction value of +3C. So, send an SMS with the format ***TXTC1,3** Note: do not use the + sign, (*effectively use a temperature compensation on Channel 1 of +3 Degrees C).* Use the format ***TXTC1,-4** if the Tx box is seeing a temperature that is 4C too high.

A response will be received with the format:

TXTC1,3

Establishment Step 3 – Daily Reports

The Daily Report is the message that is sent each day at a specified time to the mobile phones of Contacts.

The Daily Report will be received in this format:

House 4 Flow 03/2/19 2164L +2% 04/2/19 2185L +1% 05/2/19 2251L +3% 06/2/19 1913L -15%	This shows the total water flows over the last 4 days and the percentage change in flows between each day and the day before. Significant benefit can be derived from having early warning of unexpected flow rates potentially signifying a serious problem.

To Activate the Daily Report

To activate the Daily Report, send an SMS with the format ***TXRE2** (effectively, Report Enabled on Channel 2). Similarly *TXRE3 etc. for the other channels.

A response will be received with the format:

TXRE2

To stop Daily Reports being issued on any channel, send an SMS with the format ***TXRD1** (effectively, Reports Disabled on Channel 1). Similarly *TXRD3 etc. for the other channels.

A response will be received with the format:

TXRD1

Who receives the Daily Report?

To tell the Tx box who should receive the Daily Report, send an SMS in the format ***TXRR,11000** (*effectively, set Recipients to receive the Daily Report to Contacts 1 and 2 but not to Contacts 3, 4 and 5. Note; all five digits need to be sent, *TXRR,11 is not acceptable*). A response will be received with the format:

TXRR,11000

At what time do you wish to receive the Daily Report?

For many people, receiving the Daily Report from each channel at 07.00 each day will be ideal, for others this will need to be changed. To set the receiving time, send an SMS with the format ***TXRH08** (*effectively change the reporting hour to 08.00*). NOTE – the 24 hour clock is used. Two digits need to be used for time. A response will be received with the format:

TXRH08

Daily Reports and Daily Updates (see below) are sent out from the Tx box at the same time of day.

Repeating Daily Reports (to all enabled recipients)

If you see that Daily Reports were not sent to established recipients at the normal time (possibly due to a poor GSM signal), you can request that Daily Reports are sent now to the normal recipients by sending an SMS to the Tx box with the format ***TXMR** (*effectively request a Manual sending of Daily Reports)*

Request a Daily Report

To get a Daily Report only to your phone for a particular Channel Number, send an SMS to the Tx box with the format ***TXDR3** (*effectively send me a Daily Report for Channel 3*). This is also the best way to get a current status report for a particular channel.

In case the Daily Report was not sent correctly to all nominated recipients earlier in the day, you can request that all of the nominated people receive the Daily Report again by sending a message with the format ***TXMR** (*effectively call for a Manual resending of Reports*)

Establishment Step 4 – Daily Updates

The Daily Updates are SMS messages sent from the Tx box to GSM modems attached to office computers. These messages will contain a string of 24 hourly values that will be loaded into spreadsheets or databases.

To Activate the Daily Updates

To activate the Daily Updates, send an SMS with the format ***TXUE2** (effectively, Updates Enabled on Channel 2). Similarly *TXUE3 etc. for the other channels.

A response will be received with the format:

TXUE2

To stop Daily Updates being issued on any channel, send an SMS with the format ***TXUD1** (effectively, Updates Disabled on Channel 1). Similarly *TXUD3 etc. for the other channels.

A response will be received with the format:

TXUD1

Who receives the Daily Updates?

To specify which of the 5 contacts receives the Update messages, send an SMS to the Tx box with the format ***TXUR,00001** (*effectively only Contact 5 will receive the Daily Update messages*). A response will be received with the format:

TXUR,00001

NOTE; It is possible for any Contact to receive both Daily Reports and Daily Updates.

If you wish to see the hourly data values from a sensor until the present time, and not wait for the Daily Update report to be sent to a computer, you can do this by sending an SMS with the format

***TXDU1,2** (*effectively send a Daily Update report for Channel 3 for today so far to my phone*). The Report will be sent to you with the format:

> 1: Temp Top Shed,
> 24:02:19,12,13,12,14,12,12,12,12,13,14,14,na,na,na,na,na,na,na,na,na,
> na,na,na,na
> (*where na is not yet available*)

You can also see a copy of the Daily Update report for yesterday on your phone (this would normally have been sent to a modem attached to an office computer). To do this send an SMS to the Tx box with the format ***TXDU3,1** (*effectively send a Daily Update report for Channel 3 for yesterday)*.

Repeating Daily Updates

If you see that Daily Updates were not sent earlier today to your office computer, you can request that Daily Updates are sent now to all enabled recipients by sending an SMS with the format ***TXMU** (*effectively request a Manual Update*)

List all recipients of Alerts, Daily Reports and Daily Updates

To get a summary of recipients of Alerts, Daily Reports and Daily Updates, send a message to the Tx box with the format ***TXVR** (*effectively View Recipients of Alerts, Daily Reports and Daily Updates*).

The response will be similar to:

> SMS Recipients
> Alert 10000 (*only Contact 1 is receiving Alerts*)
> Report 10000 (*only Contact 1 is receiving Daily Reports*)
> Update 00001 (*only Contact 5 (modem) is receiving Daily Updates*)

Establishment Step 5 – Alarm levels

One of the great benefits of operating the Tx system is the ability to set limits on each of the connected sensors. Once that limit is exceeded, an Alert SMS is sent to specified recipients.

You can establish six Alarms for each sensor. This means you can have different limits on different days at different times.

What makes things a little complicated for setting up Alarms, is that there are some choices to be made – Above or below a limit? Who to receive the Alert message? Etc.

There is a difference between setting up an Alarm initially, compared with giving it a quick edit later. Initially, it is better to ask the Tx box for a full format message. You can then edit this message.

An example:

We want to set up Channel 2 (flow) to send an Alert message when there is a flow rate of greater than 1,217 l/hr. We want this Alarm only on weekend days between 07.00 and 14.00. We will use Alarm number 1 (out of 6) for this.

Send an SMS to the Tx box with the format ***TXSA2,1** (*effectively send settings for Alarms on Channel 2 for Alarm Number 1*).

This (or similar) will be returned to you by SMS – *TXCA2,1,0,2,0700,1100,1111111,0

This can be broken down as:

TXSA2	Channel 2
1	Alarm Number 1
0	Disabled (1 for Enabled)
2	Above limit Alarm (1 for below limit Alarm)
0700	Start time for the Alarm period
1100	Finish time for the Alarm period
1111111	The days of the week that the Alarm will be active, the first digit is Sunday.
0	This is the limit value

Note: The return message starts with *TXCA… so that this message (Change Alarms) can be pasted straight back into an SMS to be sent to the Tx box.

So, you can now edit this string of characters to give us the SMS to send to the Tx box. Use the Copy Text facility on your phone and paste the copy into the send area of the screen.

Edit the characters using the screen on your telephone to give:

***TXCA2,1,1,2,0700,1400,1000001,1217** *(Effectively Change Alarm on Channel 2, Alarm number 1, activate it, set an above limit, have it active between 07.00 and 14.00, have it effective only on Sundays and Saturdays, and make the limit level 1,217 litres per hour).* Send this message to the Tx box. You will receive a confirmation response if your formatting is correct.

If you need to change just the limit value you can use a different, simpler, command. To change the limit in this example from 1,217 l/hr to 1,350 l/hr send an SMS to the Tx box with the format ***TXCL2,1,1350** (*effectively change the limit on channel 2, Alarm number 1 to 1350 l/hr*). A response will be received with the format:

TXCL2,1,1350

Alarm delays

It can be useful to have a delay put on an Alarm so that an Alert is not raised immediately a problem is detected. This could, for example, be to connect the switch connections to a relay that activates when a piece of machinery is turned on. Introducing a delay of, say, 30 minutes, would mean that if the machine over-ran beyond 30 minutes an Alert would be raised.

For Switch connections the limit value is the delay time, so - ***TXCA4,1,1,2,0000,0000,1111111,120** means that on Channel 4, Alarm 1 there will be an Alert raised should a contact be seen that lasts for longer than 120 seconds (2 minutes). The maximum delay possible is 65,000 seconds.

For connections other that switches (temperature, pH, flow etc.) and for Firmware versions 237 or later, the delay function is established using a specific command ***TXAD1,30** (*effectively apply a delay of 30 seconds to any Alarm on Channel 1).* For this type of connection, establish all other Alarm settings first, then use the *TXAD command.

pH Alarm levels

If Channel 7 (on I2C) is a pH channel, by sending the SMS message ***TXSA7,1** you will receive a response similar to:

*TXCA7,1,1,2,07.00,17,00,0111110,825

This shows that the Alarm limit is set at a pH level of 8.25 (the final digits in the string of 825). If you wish to change the limit of the Alarm to 7.65 you can edit the string to *TXCA7,1,1,2,07.00,17,00,0111110,7.65. Note that you set the limit as 7.65 but the returned confirmation will be 765. You can also use the command ***TXCL7,1,7.65** (*effectively change the limit on Channel 7 Alarm 1 to 7.65).*

Switch Alarms

Users of the Tx system may find it useful to have a delay on the sending of an Alert when a switch contact is made or broken. For instance, if a float switch is used to signify when product is running low in a bucket being stirred by a Spinstir, it may be better to receive and Alert when the float switch has been activated for a full 10 minutes, rather that when the float switch has been briefly opened by the wave motion in the stirred product.

To introduce a delay of 10 minutes (600 seconds), set the limit for the switch Alarm to 600: *TXCA2,1,0,2,0700,1100,1111111,600

To check the current status of a device connected to the Switch Channels (e.g. a magnet sensor on a door), if this is on Channel 4 send an SMS ***TXDR4** (*effectively send the Daily Report for Channel 4*)

The SMS response will be in this format:

TX000100
Bloggs Farm
4: BARN DOOR OPEN
Current status 1
At 13.13
On 08.07.20

Status 1 means that the switch contact is open. Status 0 would mean that the switch contact is closed.

An example of setting up a switch Alarm:

We want to set up Channel 4 (switch) to send an Alert message when there is a door open between 19.00 and 06.00hrs all days of the week. We will use Alarm number 1 (out of 6) for this.

Send an SMS to the Tx box with the format ***TXSA4,1** (*effectively send settings for Alarms on Channel 4 for Alarm Number 1*).

This (or similar) will be returned to you by SMS – *TXCA4,1,0,2,0700,1100,1111111,0

This can be broken down as:

TXSA4	Channel 4
1	Alarm Number 1
0	Disabled (1 for Enabled)
2	Above limit Alarm = Open contact (1 for below limit Alarm = closed contact)

0700	Start time for the Alarm period
1100	Finish time for the Alarm period
1111111	The days of the week that the Alarm will be active, the first digit is Sunday.
0	This is the delay in seconds

Note: The return message starts with *TXCA… so that this message (Change Alarms) can be pasted straight back into an SMS to be sent to the Tx box.

So, you can now edit this string of characters to give us the SMS to send to the Tx box. Use the Copy Text facility on your phone and paste the copy into the send area of the screen.

Note: For an overnight active range, you need to set up two Alarms. One for the evening hour until midnight, and one for midnight to the morning hour.

Edit the characters using the screen on your telephone to give:

***TXCA4,1,1,2,1900,0000,1111111,0** *(Effectively Change Alarm on Channel 4, Alarm number 1, activate it, set an above (Open) limit, have it active between 19.00 and midnight, have it effective every day, and have no delay time).* Send this message to the Tx box. You will receive a confirmation response if your formatting is correct.

Also send:

***TXCA4,2,1,2,0000,0600,1111111,0** *(Effectively Change Alarm on Channel 4, Alarm number 2, activate it, set an above (Open) limit, have it active between midnight and 06.00hrs, have it effective every day, and have no delay time).* Send this message to the Tx box. You will receive a confirmation response if your formatting is correct.

Establishment Step 6 – Alerts Received

When a limit is exceeded, if you are nominated to receive an Alert, it will be delivered to your phone. The Alert will be in this format:

Alert!
2:Flow Top Shed,1 (*Channel 2, flow sensor named Flow Top Shed on Alarm 1*)
Above limit,
Actual 520
Limit 35
At 19.09
On 19.02.19

Who Receives Alert Messages?

You need to decide who will receive Alert messages. Anyone nominated will receive all of the Alerts generated from a Tx box. Send a message to the Tx box with the format ***TXAR,11110** (effectively Contacts 1 to 4 will be the Alert recipients. Contact 5 will not receive Alerts)

Establish Number of Alert Messages

When a limit is exceeded, if you are nominated to receive Alerts from a particular Tx box, an Alert will be raised and sent to you within seconds. It will reach your phone as rapidly as allowed by the

GSM network in your country. The Alert will be repeated each 30 minutes up to 5 times. You can limit the number of Alerts raised if you think that fewer than 5 Alerts will be sufficient.

Send an SMS to the Tx box with the format ***TXMS2,3** (*effectively manage SMS on Channel 2 and send only 3 SMS Alerts per event).* A response will be received with the format:

TXMS2,3

Obviously, if you receive an Alert, this signifies that there is a problem that has been detected by a sensor attached to the Tx box. To stop Alerts being generated, you would normally:

- Fix the problem that is causing an Alert to be generated
- Change the limit of the Alarm setting if that now needs to be done because of changed circumstances (use the *TXCL command described above)
- Disable the Alarm if it is no longer needed by using the command ***TXDA2,1** (*effectively disable the Alarm number 1 on Channel 2*). NOTE – Remember that you will need to re-enable the Alarm again to activate it again. To do this send an SMS to the Tx box with the format ***TXEA2,1** (*effectively enable the Alarm number 1 on Channel 2*)

Status Reports

The Daily Report is sent to nominated contacts each day, and the Daily update is sent to nominated computer modems each day, but you may need to contact the Tx box to get a Status Report to inspect the current level being seen by any sensor. You can do this by sending an SMS with the format ***TXDR1** (*effectively request a daily report for Channel 1*). The Status Report will be delivered to your phone with the format:

1: TEMP
Current Temperature
26

I2C (pronounced Eye Two See)

In order to expand the Tx box to include 7 more channels, the I2C extension is available.

These extra channels can be configured to have any sensor attached to them. So, while the basic 5 channels (1 to 5) in the Tx box are fixed in terms of what can be attached to them (2 x flow, 2 x switch and 1 x temperature), the 7 Channels in I2C can be temperature, pH, ORP, switches etc.

This is the Tx box with the I2C extension board added: (Shown below)

The enclosure is larger than the standard Tx box to allow for the extra connections – extra glands are also provided for connection cables.

The connection style on the I2C board will depend on the sensor type being used. Here a PT100 POD is attached: (the grey connectors are not necessarily to be part of production models)

The I2C Channels

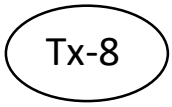
There are 7 extra channels available on the I2C board. Unlike the Tx board where there are 5 fixed Channels (1 = Temperature, 2 and 3 = Flow, 4 and 5 = Switch), with I2C any of the 7 connections can be attached to a variety of devices. For example, there could be 2 ORP devices attached where the ORP value needs to be recorded, 1 pH doser and 2 more temperature sensors, and 2 positions

without any device attached which could be used in the future. Any combination is possible, and the position at which you attach the device is not important.

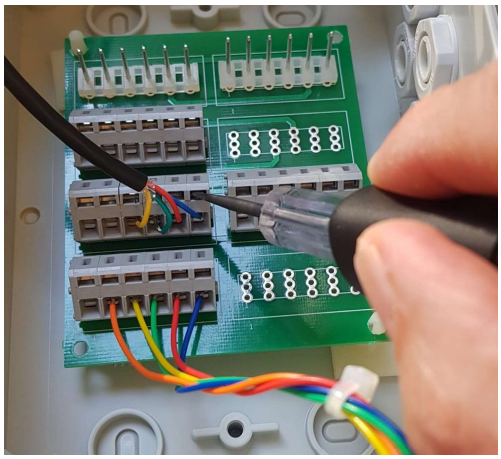
Sensors cannot be connected directly to the I2C board. Whether it is pH or ORP electrodes, PT100 temperature sensors or flow sensors, these need to be connected first to a processing device before a sensible connection can be made to the I2C board:

Temperature	Connect a PT100 sensor to the I2C Temp POD with the wiring sequence red-red-white-white, or white-white-red-red. The I2C POD is then connected to the I2C board as shown in the picture above. The POD will have a pre-allocated channel number embedded.
pH	A suitably programmed Select-pH doser can be connected to I2C using the Device to I2C connection cable shown below. Also, a pH Monitor can be connected to I2C using the Device to I2C connection Cable.
ORP	A suitably programmed Select-ORP doser can be connected to I2C using the Device to I2C connection cable shown below. Also, an ORP Monitor can be connected to I2C using the Device to I2C connection Cable.
Flow	Work is in progress to enable flow sensors to be connected to I2C.

The devices (ph/ORP/Temp) themselves are programmed with their channel number. This channel number will be shown on the device with a sticker. For example, if an ORP doser is programmed to be Channel 8, there will be a sticker like this on the ORP doser:



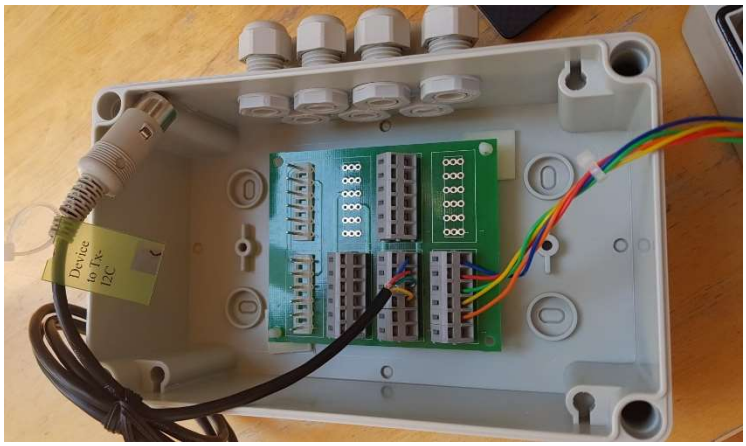
You need to inform Dosing Solutions or your supplier which channels are currently occupied on your Tx-I2C device so that new devices can occupy unique channels.



Device to Tx-I2C Connection Cable

In order to connect the I2C board to a doser (pH or ORP) this connection cable is used:

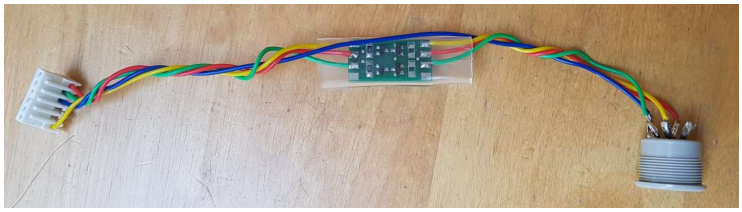
The label tag is marked “Device to Tx-I2C”. There are four coloured wires inside the cable – blue, red, green, yellow. Connect the colours to any connector on the I2C board in the same positions as the colours of the connecting loom that joins the I2C board to the Tx board:



To insert the wires into the connector block, use the small screwdriver that was supplied with the Tx system to gently lever the contact jaws open:

This is a bit fiddly, but the connector gives a firm grip once the stripped ends of the cable are inserted.

It is only possible to connect I2C to dosers that have been specially programmed to be interrogated by the Tx system. These devices will be marked with the Tx channel number as shown above, and will have this sensor loom device (level shifter) inside the doser:



Temperature to I2C

PT100 temperature sensors can be connected to I2C, but only via a Tx Temperature POD:

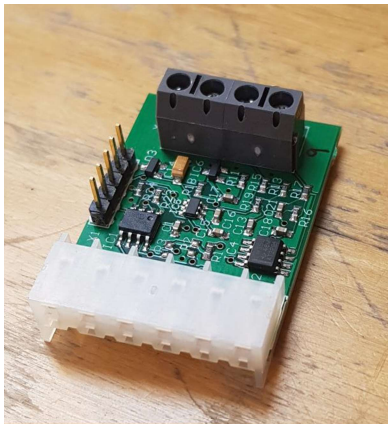
This POD either pushes onto the row of 6 pins on the I2C board or connects with coloured wires to one of the 6-way connector blocks on the board.

A 4-wire PT100 sensor cable is connected to the 4-way connector on the POD in the order red, red, white, white (or white, white, red, red).

The designated channel number will be printed on a label on the POD.

Channel Types

When using the I2C extension, each of the additional 7 Channels can be of any sensor type. The first Tx-I2C units produced needed to be told by SMS which type of sensor was assigned to which Channel.



Newer versions of Tx-I2C have the sensor type programmed into the device (ph/ORP/Temp POD etc.). If you need to confirm the type of sensor attached to each Channel, send an SMS with the format ***TXLC** (*effectively request a list of Channels*). An SMS similar to the following will be returned:

1: Temp Fungi bath: Type 4

2: Bin count: Type 3

3: FLOW2: Type 3

4: Chlor bucket empty: Type 1

5: SWITCH2: Type 1

6: pH Chlor bath: Type 2

7: pH Fungi bath: Type 2

8: ORP Chlor bath: Type 9

9: Temp Chlor bath: Type 4

10: I2C: Type 4

11: I2C: Type 4

12: I2C: Type 4

Battery Backup

For Tx to send Alert message to warn of a power failure, it needs to have electric power to operate its modem when there is no external electric power available.

This picture shows the Tx Backup device. It can be used with Tx-2 units only (not Tx-1 which takes its power from the Select doser). A 12V 1A power supply is connected to the DC socket on the Backup box, this keeps the internal battery charged. There are two cables coming from the Backup box. The one with a 2.1mm plug is connected to the Tx box to provide power. The cable with the two (green and blue) wires can be fed through one of the glands on the Tx box and connected to either S1 (Channel 4) or S2 (Channel 5). The channel can then be set to raise an Alert should the power fail.

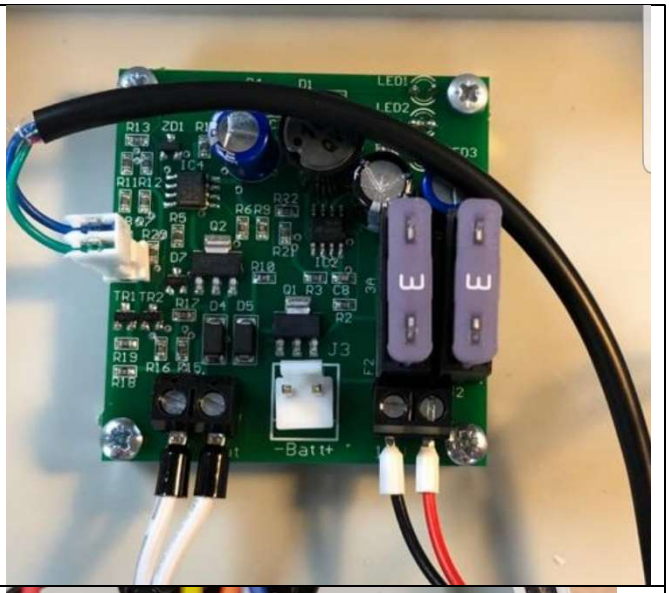
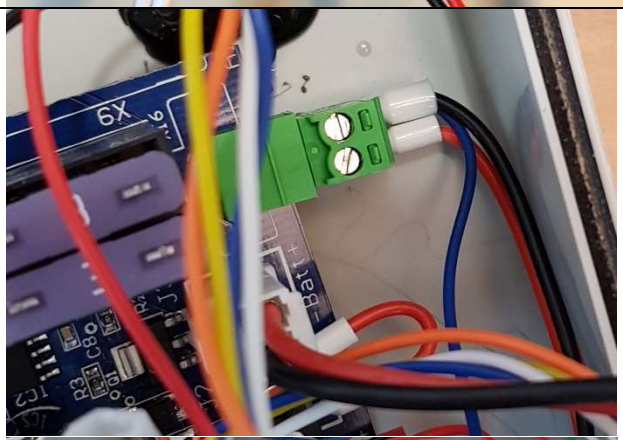
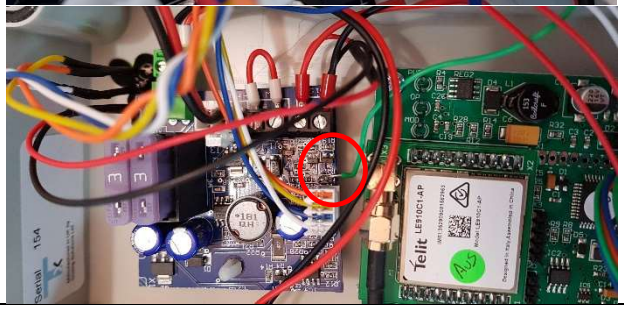
There are three lights on the Backup box.

- The top light is red when the battery is charging turning green when the battery is fully charged.
- The middle light is off when there is a good external power source charging the battery and powering the Tx box, this turns blue when the external power fails, and the battery is being used to power Tx.
- The bottom light is red when external power is on. This light is off when the external power fails.

Power Down Alert

To be notified with an Alert that there has been a power failure, there needs to be a connection made between the battery charging board in the Backup box and the Switch connections (Channel 4 or 5) on the Tx board.

There are two types of battery charging board in use. A bespoke board and an adapted board from the now defunct General Alert system.

Bespoke It is the blue and green wire connection shown that is connected to the Switch channels on Tx.	
On the adapted board, a blue and green wire need to go to the Tx Switch channels. The blue is connected in with the back on the green connector as shown in the upper picture. The Green wire needs to be soldered onto the battery backup board as shown (circled in red).	 

To receive an Alert to notify power down, make sure that your mobile phone number has been added to the Tx box (*TXON command), and that yours is one of the numbers to be contacted with

Alerts (*TXAR command). If you have connected the blue and green wires from the battery backup board to S1 (Channel 4) on Tx, you need to send this SMS message to the Tx box to establish the Alarm - ***TXCA4,1,1,2,0000,0000,1111111,0** *(effectively Change Alarm on Channel 4, Alarm 1, activate it, set an Above limit, have it effective from midnight to midnight every day of the week, and have zero second delay on the Alert being raised).* If you change the final zero to 60 there will be a one minute delay in the Alert being raised. This can be useful if you want Tx to ignore small power fluctuations and only Alert on any power cut lasting longer than one minute.

Security

As the purchaser of a Tx box, the data generated by the Tx system remains your property. This data is transmitted directly from your Tx box to either telephones that you are aware of, or to computers that you have nominated. The telephone numbers of the SIM inside the Tx box and the telephone numbers of the SIM cards inside any computer modems are known to you and should not be divulged to others except as necessary. Regular data transmissions do not pass through any systems operated by either Dosing Solutions Ltd (the manufacturer) or your retail supplier. However, on initial power-up with a new SIM card, your Tx box will attempt to send a single Registration SMS to Dosing Solutions Ltd in the United Kingdom. The purpose of the Registration SMS is to allow Dosing Solutions Ltd to provide any back-up technical service as may be required from time-to-time. By operating the Tx system you agree that Dosing Solutions Ltd will have access to your Tx box(es) for the purposes of maintenance and technical service and that any data that comes into the possession of Dosing Solutions Ltd will be treated with the strictest confidence and will not be divulged to Third Parties without the permission of the owner of the Tx box from which the data was gleaned.

Tx Terminal

The Tx Terminal is the USB device that receives Daily Update SMS messages from any number of Tx boxes and facilitates the data contained in the messages to be stored on a computer.

Once the data is stored it can be manipulated as desired for the purposes of graphing or permanent record.

The Terminal will only function with a SIM card installed. The type of SIM needed, and the method of installation is the same as detailed in the Quick Install section above at the start of the Instructions.

Connection

The USB lead connects to any free USB port on the desired computer.

Power

Although a USB connection generally provides sufficient power to drive USB devices, the Tx Terminal requires more electric current than that provided by USB. Therefor connect the 5A power supply that is part of the Tx Terminal package to the DC connection on the side of the Terminal box.

Operation

There are two lights on the front panel of the Terminal box. The red light will indicate that the 5A power supply is connected.

The green light will flash fast when a GSM signal is being sought. When the GSM signal has been found and a connection established the green light will flash slowly.

Computer App

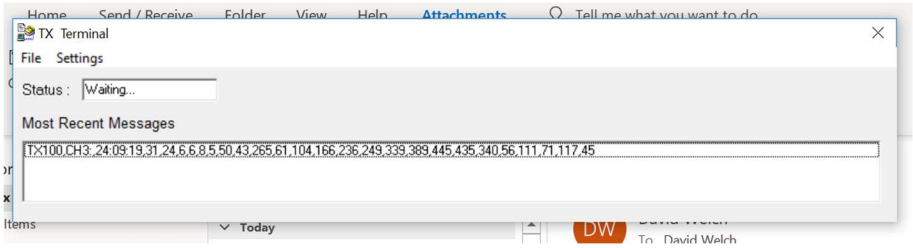
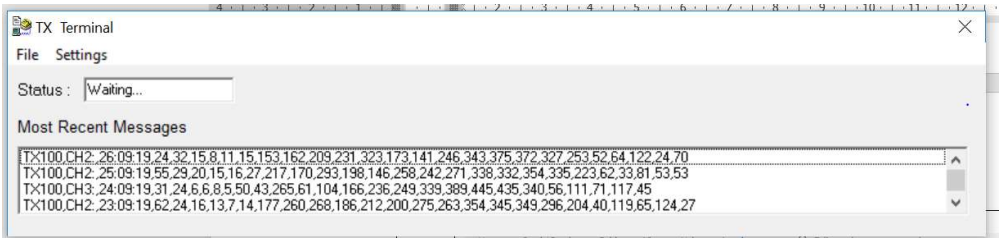
The app to be installed on the computer will either be sent to you as an email attachment in zipped form, or on a portable memory drive.

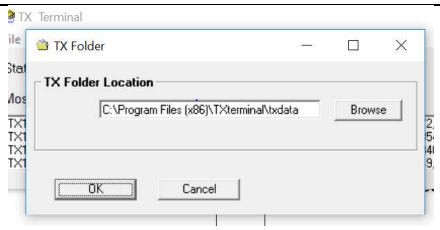
WE ENDEVOUR TO ENSURE THAT THE TX TERMINAL APP IS FREE FROM ANY MALICIOUS MALWARE, HOWEVER IT IS ADVISED THAT YOU TAKE STEPS TO ENSURE THAT THE APP AND ITS SETUP FIRMWARE IS HARMLESS BEFORE YOU INSTALL IT ON YOUR COMPUTER. DOSING SOLUTIONS LTD WILL ACCEPT NO RESPONSIBILITY FOR LOSS OR CONSEQUENTIAL LOSS, HOWEVER CAUSED, BY THE USE OF THE TX TERMINAL FIRMWARE.

The following steps assume that the Tx Terminal app is supplied in zipped format. Follow these steps to create the environment on your computer for data to be received and stored:

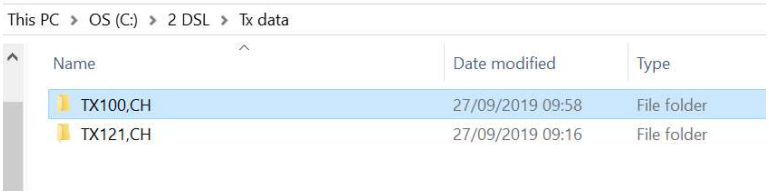
This sequence is for Windows 10.

1	Click on the zipped Tx Terminal file to open it.
2	Once you can see the files contained within the zipped folder, click on the Tx Install file.
3	Click Setup
4	For dialogue box “Allow app to make changes from unknown publisher?”, click Yes
5	You will be asked which directory you want the app to operate from. Normally the C:\ location offered is OK.
6	Click Continue
7	You will see Tx Setup was completed successfully
8	Click OK
9	You can now close the compressed folder window
10	Now click the Windows icon on the very bottom left of the screen. Scroll down the list of Apps to get to the Tx terminal (new) app. Click on this.
11	It is likely you will see a message to say that Com 1 is not available (or similar). Click OK as you now need to allocate a Com port for the app to use.
12	Click on the Windows icon at bottom left of the screen again and without clicking anything else, type Device Manager.
13	You should now be offered a window showing Device Manager – Control Panel. Click this.

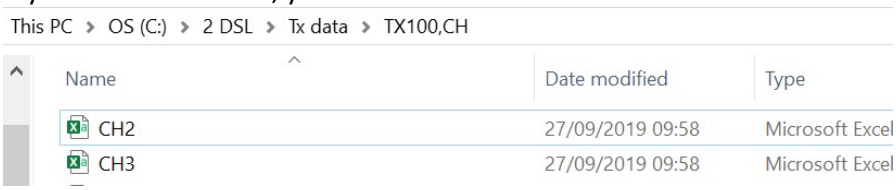
14	A long list of all of the computer connections should be shown possible showing Batteries, Cameras etc. Find Ports (Com and LPT) and click on this.
15	If the Tx Terminal is the only USB device connected to the computer, you will see one connection as USB Serial Port (Com 10) or similar. It may not be Com 10 which has been allocated, but make a note of which port has been allocated. If many USB connections are shown and you are not sure which is the one for Tx Terminal, it may be useful to disconnect all other USB devices leaving only Tx Terminal.
16	Close the Device Manager
17	Click on the Windows icon again at the bottom left of the screen and scroll down the App list to find Tx Terminal. Click on this and then on any sub icon that appears.
18	A warning sign will come up ref. the wrong Com Port. Click OK
19	The Tx Terminal window will now open.
20	In the Tx Terminal window, Click Settings
21	Click on Com Port and quickly scroll through the Com Ports offered and click on the one your computer has allocated (Com 10 in this example).
22	You will see that there is a Status box:  This will either show Waiting… (as here), or it will show Collecting Messages… The Tx Terminal app will periodically check to see if any new Daily Update SMSs have been received by the Terminal and transfer this data to the computer. The last four recent Daily Updates will be shown:  The lines of info show; the Tx box that the data has come from, the Channel number the date the data refers to, then each of the hourly recorded values.
23	It is worth considering establishing a location for the data files to be stored on your computer. A location you can easily find when you want to work on your data. Click on Settings, then Tx File Location. You can browse your computer and set up a new folder that you can name to store your data:



24 When you open the file location, you will see that data is stored in folders according to the Tx box from which the data came:



If you click on a Tx Box, you will see that there are different files for each channel:



Inside each of these channel specific folders are records of data in date order:

A	B	C	D	E	F	G	H	I
TX100	CH3:	18:09:19	45	26	7	12	8	5
TX100	CH3:	26:09:19	39	20	14	11	10	7

For Windows 7, the installation procedure is similar to the above. If any windows open with warnings regarding access violation / .dll files missing, click continue / ignore. The required .dll files are included in the zipped setup installation pack and will be found by Tx Terminal.

Because of the large number of Windows variants in use on computers worldwide, it is possible there will be some difficulties encountered in installing Tx Terminal. Please consult you IT specialist or Distributor, or if necessary, contact Dosing Solutions Ltd in UK.

Parts List

Item	Code	Notes
Tx-1	10TX100	
Tx-2	10TX200	
External antenna	20TX05	5m lead
Antenna extension cable	21TX05	5m
Power supply 12V DC		
Temperature sensor	30TX01	Ceramic with 1m lead
	30TX05	Ceramic with 5m lead
	30TX10	Ceramic with 10m lead
	30TX--	Ceramic, customer specified lead length

	31TX01	Stainless steel with 1m lead
	31TX05	Stainless steel with 5m lead
	31TX10	Stainless steel with 10m lead
	31TX--	Stainless steel, customer specified lead length
Float switch		
Flow sensor	160CA07	TBR10 – 3 to 400 l/hr, 3/8” thread
	160CA03	VTY10 – 20 to 1,500 l/hr, ¾” thread
	160CA20	VTY20 – 30 to 3,300 l/hr, 1” thread
	160CA05	VTH25 – 200 to 10,000 l/hr, 1.25” thread
	160CA08	VTH40 – 400 to 25,000 l/hr, 2” thread
Battery Backup box	45TX00	To enable Power Down Alerts to be raised
pH Amplifier box	42TX00	
ORP Amplifier box	42TX01	
pH Monitor	40TX00	To display pH values locally, and enable a connection to Tx-I2C
ORP Monitor	40TX01	To display ORP values locally
Temperature Monitor	40TX02	To display temperature values locally
Flow Monitor	40TX03	To display flow values locally

Summary of SMS commands

SMS Command	See Page No.	Description
***TXSC,080319,1633**	**5**	Effectively Set the Clock and date as 8 March 2019, 16.33pm.
***TXON1,+447777123456**	5	Establish the outgoing telephone number for Contact 1 as +44 (for a UK telephone number) 7777 123456
***TXDO2**	6	Delete outgoing number for Contact 2
***TXLO**	6	Instruct the Tx box to list Outgoing Numbers
***TXCN1,Temp House 4**	7	Instruct Tx to Change Name on Channel 1 to Temp House 4
***TXNS,Boggis Farm**	7	Name the Tx box (name system)
***TXST2,3**	9	Tell TX the sensor type on Channel 2 is a sensor type 3
***TXSQ2**	10	Report the sensor type set for Channel 2
***TXTC1,3**	10	Temperature correction of +3 Deg C on Channel 1
***TXTC1,-4**	10	Tell the Tx box to apply a temperature correction on Channel 1 of -4C

***TXRR,11000**	11	Set Recipients to receive the Daily Report to Contacts 1 and 2 but not to Contacts 3, 4 and 5
***TXRE1**	11	Enable the Daily Report on Channel 1
***TXRD1**	11	Disable the Daily Report on Channel 1
***TXDR3**	12	Request a Daily Report (Status) to your phone now
***TXMR**	12	Request Daily Reports are resent to all nominated recipients manually now
***TXRH08**	11	Change the reporting hour to 08.00
***TXUR,00001**	12	Only Contact 5 will receive the Daily Update messages
***TXUE1**	12	Enable the Daily Update on Channel 1
***TXUD1**	12	Disable the Daily Update on Channel 1
***TXDU3,2**	12	Send a Daily Update report for Channel 3 for today so far
***TXDU3,1**	13	Send a Daily Update report for Channel 3 for yesterday
***TXMU**	13	Request a manual sending of Daily Updates
***TXSA2,1**	13	Send settings for Alarms on Channel 2 for Alarm Number 1. This will return the long, complete Alarm settings string starting with *TXCA….
***TXCA2,1,1,2,0700,1400,1000001,1217**	14	Change Alarm on Channel 2, Alarm number 1, activate it, set an above limit, have it active between 07.00 and 14.00, have it effective only on Sundays and Saturdays, and make the limit level 1,217 litres per hour. If this was a Switch channel (4 or 5), the final number would be the number of seconds delay to be applied.
***TXAD1,120**	14	Apply a delay to an Alert being raised on Channel 1 (temperature) for 120 seconds
***TXCL2,1,1350**	15	Change the limit on channel 2, Alarm number 1 to 1350 l/hr
***TXAR,11110**	15	Contact Numbers 1 to 4 will receive Alert messages from the Tx box.
***TXMS2,3**	15	Manage SMS on Channel 2 and send only 3 SMS Alerts per event
***TXDA2,1**	16	Disable the Alarm number 1 on Channel 2
***TXEA2,1**	16	Enable the Alarm number 1 on Channel 2
***TXVR**	13	Effectively View Recipients of Alerts, Daily Reports and Daily Updates
***TXLC**	20	List sensor types associated with each channel