



MasterLink 3000

Wireless Strain Gage Transducer Amplifier and Data Acquisition System

USER'S GUIDE

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1.0 INTRODUCTION

The MasterLink 3000 is a stand-alone wireless strain gage device amplifier that is configurable to either a handheld display, an analog output, or a USB interface.

The MasterLink 3000 software allows for the full configuration of the system. A spectrum analyzer allows the user to determine an optimal channel selection and signal health can be monitored. A nine point direct input or applied load calibration is setup through the software and USB device, giving maximum measurement linearity. Battery voltage of the MasterLink 3000 can be monitored as well. Peak and valley conditions are inherently captured utilizing the logging capability of the software.



SINGLE DEVICE OR SIMULTANEOUS COMMUNICATION CAPABLE

2.0 SPECIFICATIONS

2.1 General System Specifications

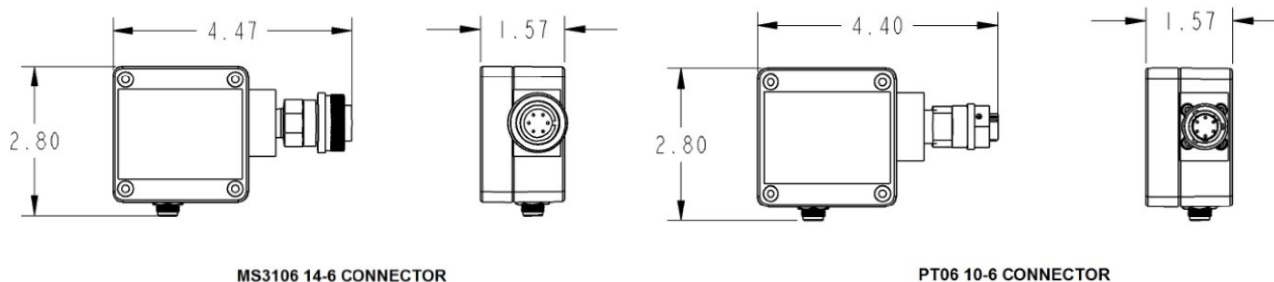
Modulation Method	QPSK
Radio Type	Transceiver (2 way)
Data Type	250 Kbits/sec
Radio Frequency	2.4 GHz nominal
Power	1 mW
Available Channels	16

Noise Free Resolution	
Sample Time <10 ms	15.5 bits
Sample Time <50 ms	16 bits
Sample Time <100 ms	17.25 bits
Sample Time <1000 ms	18 bits
Maximum Input	+/-3.2 mV/V
Excitation Voltage	5 VDC
Range**	150 ft

**Extended Range available

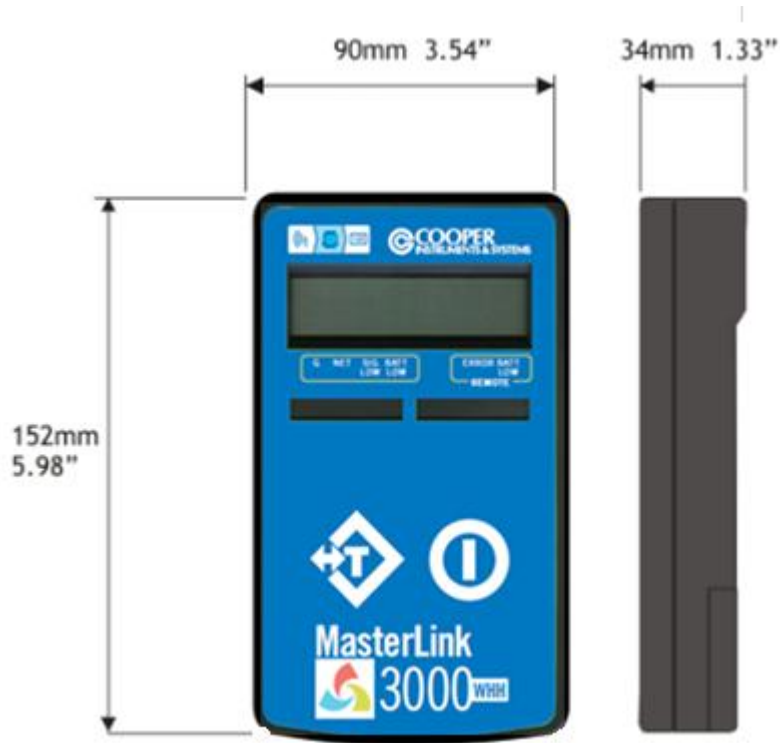
2.1 MasterLink 3000 Amplifier Specifications

IP Rating	IP65
Battery Life between charges (3 Hz, Low Power Mode)	450 Hours
Operation Temp	-40 to 85 deg C
Weight	7 oz
Optional Connectors	
PT06-10-6S	
MS3106-14-6S	
Dimensions	



2.2 MasterLink 3000 Wireless Handheld (WHH) Specifications

Display	8 digit LCD
Channels	1 Standard, 12 Optional
Auto Power on/off of MasterLink 3000 Amplifier	
IP Rating	IP65
Battery Life	
Standby mode (powered off)	1.5 Years
Continuous Operation	40 Hours
Operation Temp	-40 to 50 deg C
Dimensions	

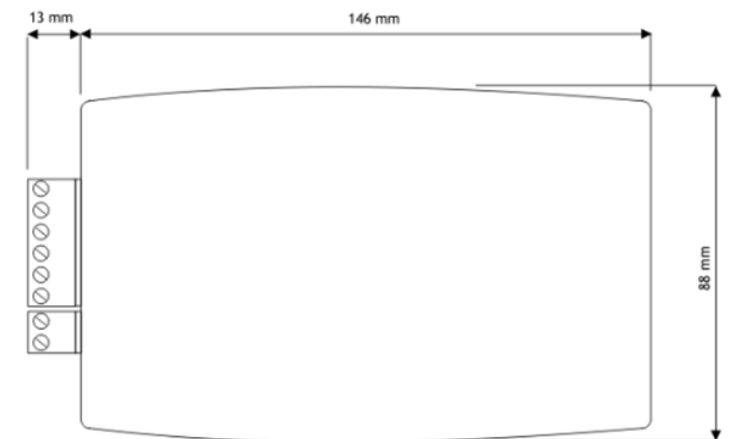


2.3 MasterLink 3000 Wireless Analog Output (WAO) Specifications

Available Outputs	0-10V 4-20mA, 0-20mA, $\pm 10V$, $\pm 5V$
Update Rate	Up to 2000 Hz
Power Supply	9-36 VDC
Range	IP65
Desktop Unit	65 ft
Industrial Unit**	150 ft
Operation Temp	-40 to 85 deg C

**Extended Range Available

Dimensions



3.0 SOFTWARE

3.1 System Requirements

- Supported Operating Systems – Windows Vista, XP, and 7 32 or 64 bit
- USB Port

3.2 T24 Toolkit Software Installation

****It is not necessary to have the MasterLink 3000 amplifier or USB connected to a computer to install the software**

Insert CD into computer and run setup.exe. Follow the prompts to install the software.

3.3 T24 Quickview Software Installation

****It is not necessary to have the MasterLink 3000 amplifier or USB connected to a computer to install the software**

Insert CD into computer and run setup2.exe. Follow the prompts to install the software.

The Quickview Software is the standard USB viewing and logging software.

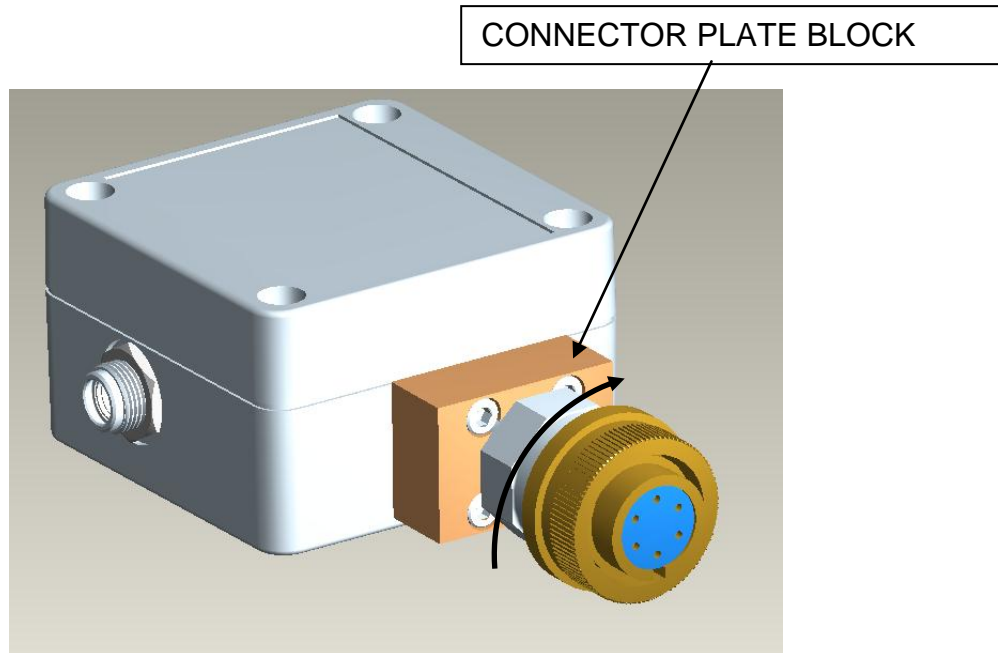


The software allows for a remote "wake" or "sleep" of the MasterLink 3000 amplifier to preserve battery power. A .csv log file is also generated through the "Start Log" command. This .csv file can then be opened in a spreadsheet program for graphing and other analysis. Battery power and signal integrity can also be monitored utilizing this tool.

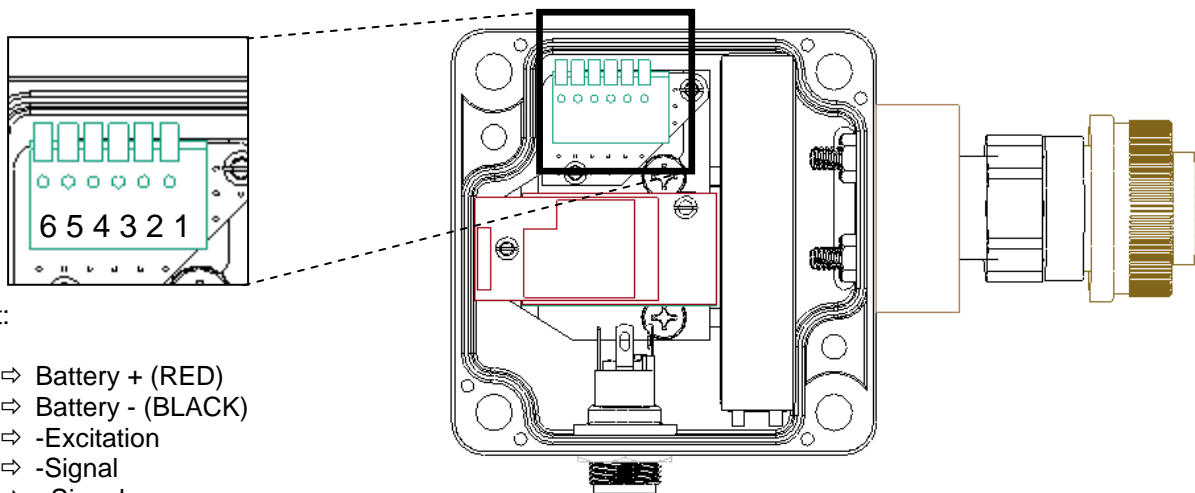
4.0 HARDWARE CONFIGURATION

4.1 Connector Alignment

As the MasterLink 3000 has been developed to provide a compact integration to connectorized strain gage transducers, the connector has the ability to rotate to a desired orientation for the application. The connector adapter is a pipe thread which screws into the connector plate block. To maintain the IP rating of the system, the connector must always be tightened into the block and not loosened. In order to tighten the connector, a wrench must be used both on the connector plate block and the connector adapter. **If for some reason the connector needs to be removed, the threads must be cleaned and a new layer of teflon tape must be used.**



4.2 Connector Wiring



Pinout:

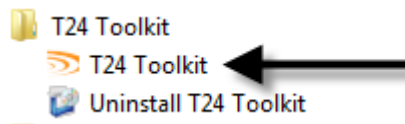
- | | |
|---|---------------------|
| 1 | ⇒ Battery + (RED) |
| 2 | ⇒ Battery - (BLACK) |
| 3 | ⇒ -Excitation |
| 4 | ⇒ -Signal |
| 5 | ⇒ +Signal |
| 6 | ⇒ +Excitation |

5.0 CONFIGURATION AND CALIBRATION VIA TOOLKIT SOFTWARE

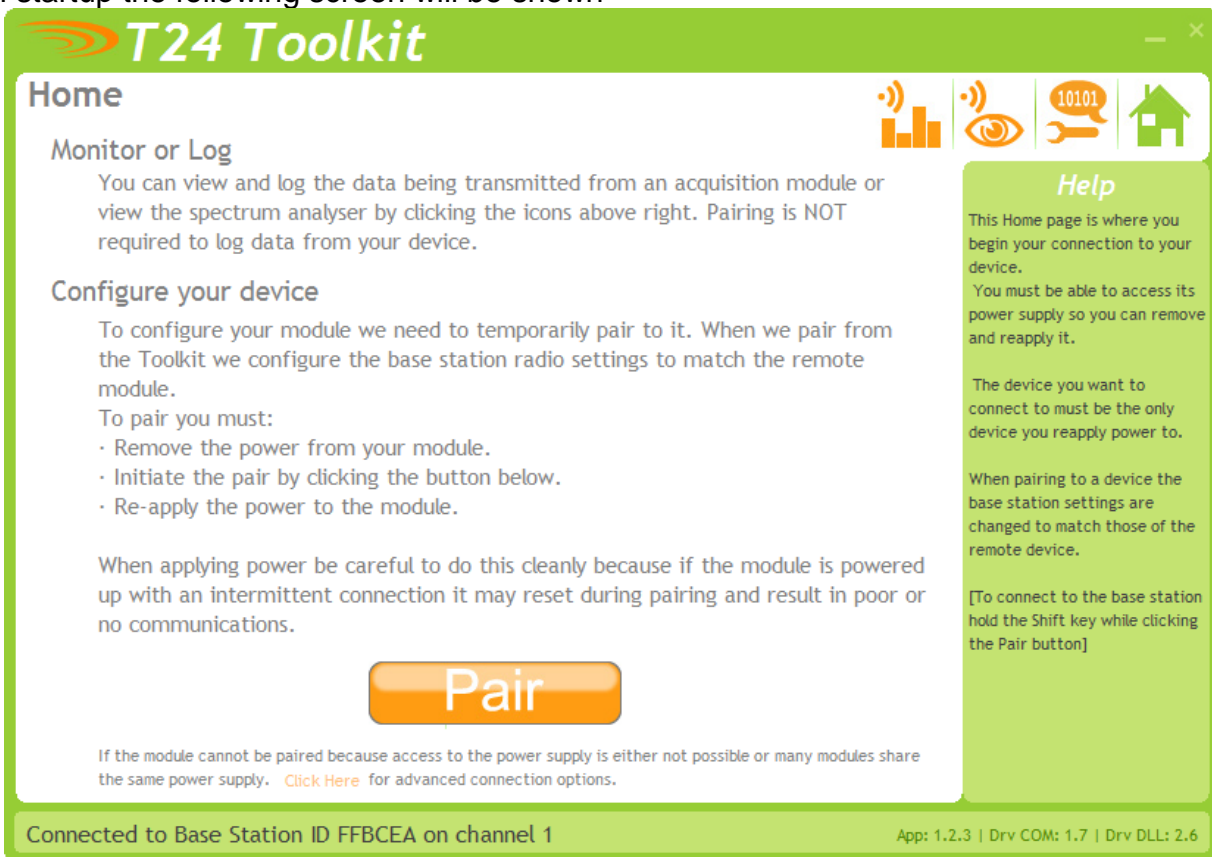
****This section is only necessary for changing the default operation characteristics of the MasterLink 3000 or for calibrating a strain gage transducer to a MasterLink 3000 and linking to various data display units (DDU). If a system has been purchased, the applicable DDU's have been setup to the MasterLink 3000 amplifier. The MasterLink 3000 USB unit must be used for calibration of a strain gage transducer. Cooper Instruments can perform a yearly calibration or the customer can purchase the USB module to perform in-house calibration.**

5.1 Utilizing the Toolkit Software for setting up a MasterLink 3000 amplifier

Goto Start -> Program Files -> T24 Toolkit and click on "T24 Toolkit" in the folder



Upon startup the following screen will be shown



The "Pair" button is used to link the MasterLink 3000 amplifier, the MasterLink 3000 Handheld, and the MasterLink Analog Output to the MasterLink 3000 USB module. This is a one-time step necessary to configure the relative device.

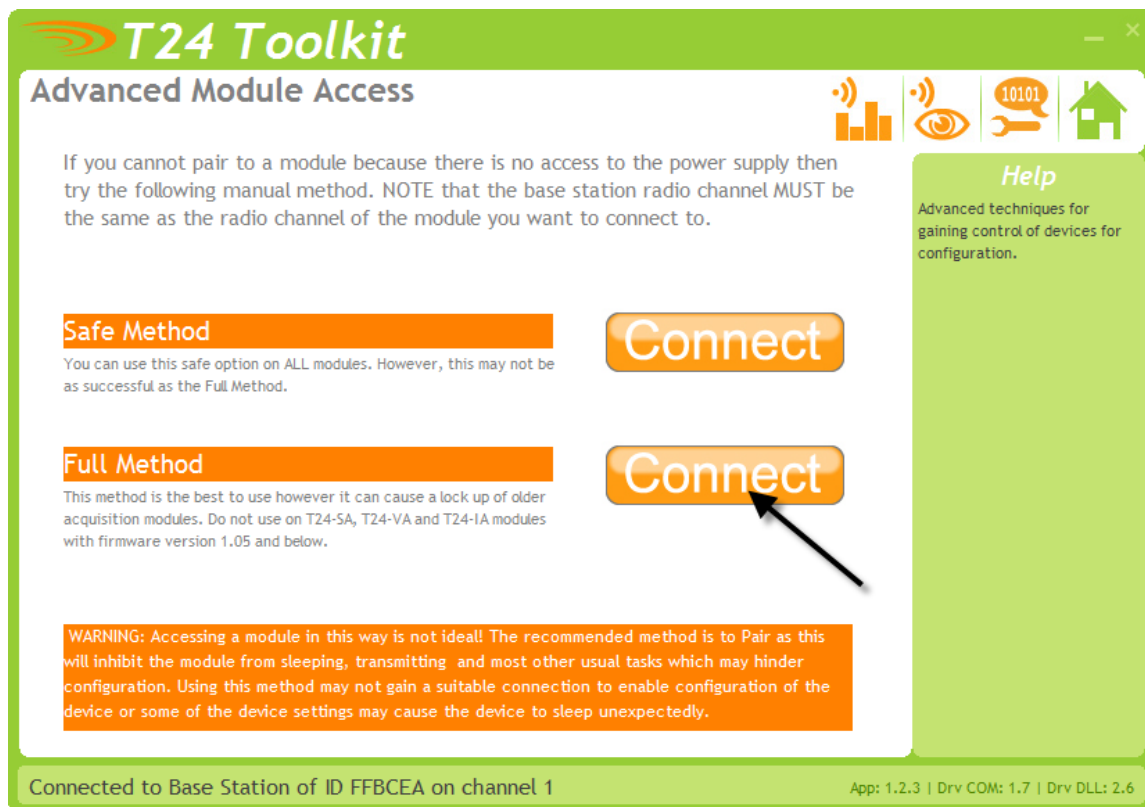
****THE TOOLKIT SOFTWARE WILL AUTOMATICALLY CONNECT TO THE USB MODULE AS LONG AS THE USB MODULE IS CONNECTED TO THE COMPUTER**

To pair the device, rather than disconnecting the internal battery and reconnecting, simply click on the "click here" link as shown below

When applying power be careful to do this cleanly because if the module is powered up with an intermittent connection it may reset during pairing and result in poor or no communications.



This will bring up the screen allowing you to connect to the amplifier using its unique hexadecimal ID, which can be found engraved onto the amplifier enclosure. Select the "Full Method" means to connect



Enter ID

Enter the hexadecimal ID of the module you want to wake.


FFBA02

OKCancel

Enter the hexadecimal ID of the amplifier and click "OK". The next prompt is as follows

Enter Data Tag

If the module has a low power mode (such as acquisition modules) then knowing the Data Tag of the module will help greatly in connecting. If this is not required or is unknown then set as 0000



It is not necessary to enter the data tag, therefore it can be left at 0000.

The next screen brought up will be the amplifier device ID screen



The default name is the S/N of the device, but this is something that could be changed to something like "LC-Tank 1" at the customer's discretion.

5.2 Utilizing the Toolkit Software Calibration of device from Calibration Certificate

T24 Toolkit

Calibration
Calibrate by entering certificate info

Number of Calibration Points
2 Select the number of points you want to use.

Calibration Points

	mV/V	Engineering Units		mV/V	Engineering Units
1	1.0	0.0	6	0.0	0.0
2	3.0	1000.0	7	0.0	0.0
3	0.0	0.0	8	0.0	0.0
4	0.0	0.0	9	0.0	0.0
5	0.0	0.0			

Once you have entered the desired number of points click the Calibrate button. Please note that when you return to this page the numbers may not be those you last entered. The values entered and displayed are used ONLY when you click the Calibrate button and therefore cannot be used to verify current calibration settings.

To reset calibration back to factory defaults [Click Here](#)

Calibrate

Back

Help
This advanced page allows you to modify the internal calibration table directly.

Connected to T24-SA of ID FFC6F0 on channel 1
App: 1.1.93 | Drv COM: 1.6 | Drv DLL: 2.6

In some circumstances it may not be possible to apply inputs in which case the calibration can be entered manually from the calibration table or certificate for a loadcell without ever having to connect the loadcell.

Items you can change:

Number of Calibration Points

Enter the number of points you wish to calibrate over. In its simplest form you could select two for a linear calibration. For more complex calibrations which include linearization select three to nine points.

Input Points 1 – 9
(mV/V shown in this screenshot)

Enter the input point for which you will specify a required engineering output value

Engineering Units 1 - 9

Enter the required engineering unit output for the specified input value

Calibrate

Click this button to calculate and update the device calibration

5.2 Utilizing the Toolkit Software Calibration of device with applied loading

T24 Toolkit

Calibration
Calibrate by applying known inputs

Number of Calibration Points
2 Select the number of points you want to calibrate over. This can be between 2 and 9 points.

Calibration Points

1	0.0	Acquire	6	0.0	Acquire
2	0.0	Acquire	7	0.0	Acquire
3	0.0	Acquire	8	0.0	Acquire
4	0.0	Acquire	9	0.0	Acquire
5	0.0	Acquire			

To start again [Click Here](#) To perform System Zero [Click Here](#)

mV/V Input
3.0100
Shows the input applied.
[Strain Gauge]
[Format](#)

Calibrated Value
305.9951
Shows the calibrated value. This may not display correctly until you have Acquired the second point!
[Format](#)

[By Cert.](#)
[Advanced](#)

Help
This page allows you to calibrate and linearise the device by applying a number of known loads.
Simply select the number of calibration points you require and enter the required engineering unit value for each point then apply each load and click the [Acquire] link.
NOTE: Clicking any of the [Acquire] links may invalidate any existing calibration and will remove any existing System Zero.

Connected to T24-SA of ID FFC6F0 on channel 1 App: 1.1.93 | Drv.COM: 1.6 | Drv.DLL: 2.6

Here you can calibrate the acquisition module and set a system zero if required. This simple page allows semi-automated calibration where you can apply known inputs to calibrate. This calibration includes linearization and is automatically applied

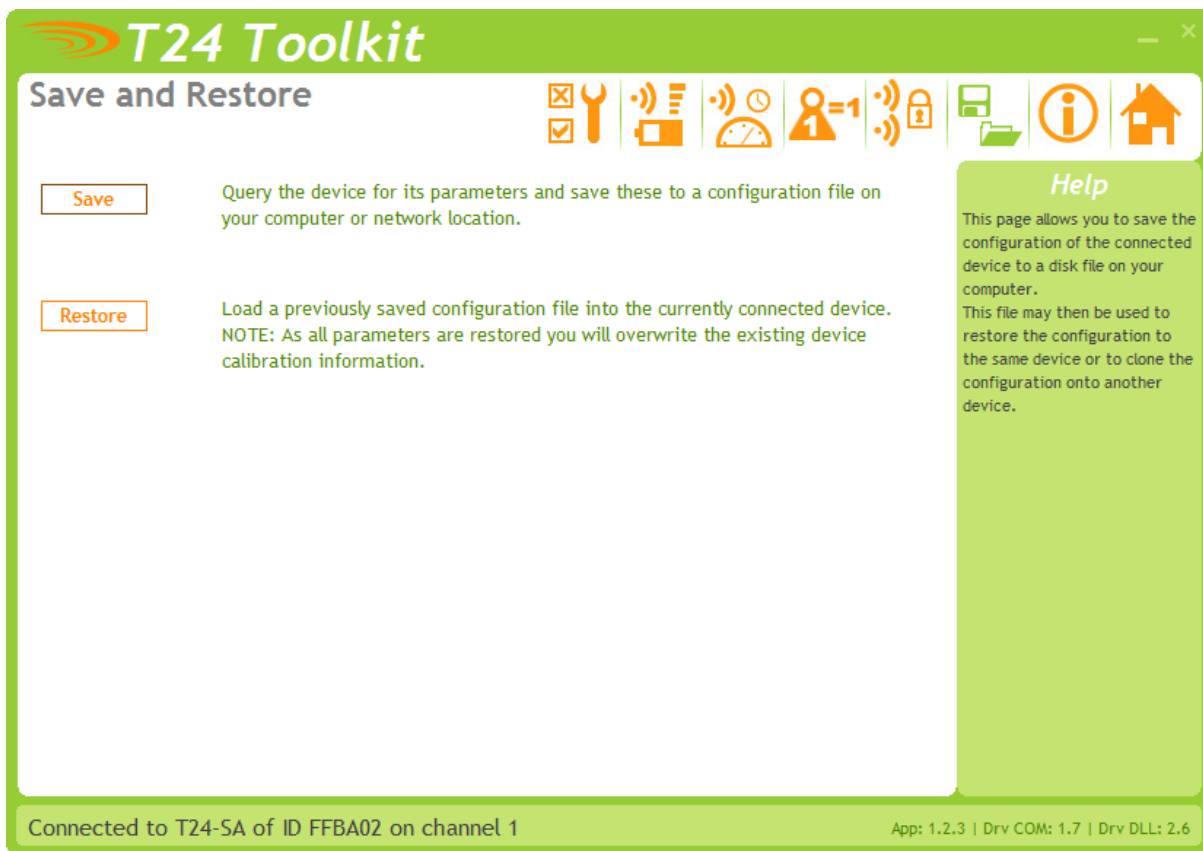
Calibration Process

- Decide on how many points you will calibrate over.
- Decide what inputs will be applied (in ascending order) at each point.
- Enter the actual input (in the required units) that you want the module to read at each point.
- Now proceed to apply each input in turn (allowing a settle time) and click the **Acquire** button at that point. You can now apply the next input and click **Acquire** until all the points are completed.

The bottom of the page shows the **Input Value** and the **Calibrated Value**. Once the second point has been acquired this **Calibrated Value** should display the actual calibrated value.

5.3 Utilizing the Toolkit Software to save/restore the overall and calibration settings to a configuration file

Here you can save the device settings to a file on your PC so that they can be later loaded back into the same or different device.



6.0 HANDHELD DEVICE

6.1 Connecting Power

Remove the two screws on the rear battery compartment. Insert two alkaline AA batteries. Refit the battery compartment cover. The handheld device is now switched on so should be turned off until the acquisition module is ready. To turn off just hold down the power key until the display shows BUSY then release it.

6.2 Using Toolkit Software to setup Device

*Follow steps in section 5.1 to connect to handheld device.



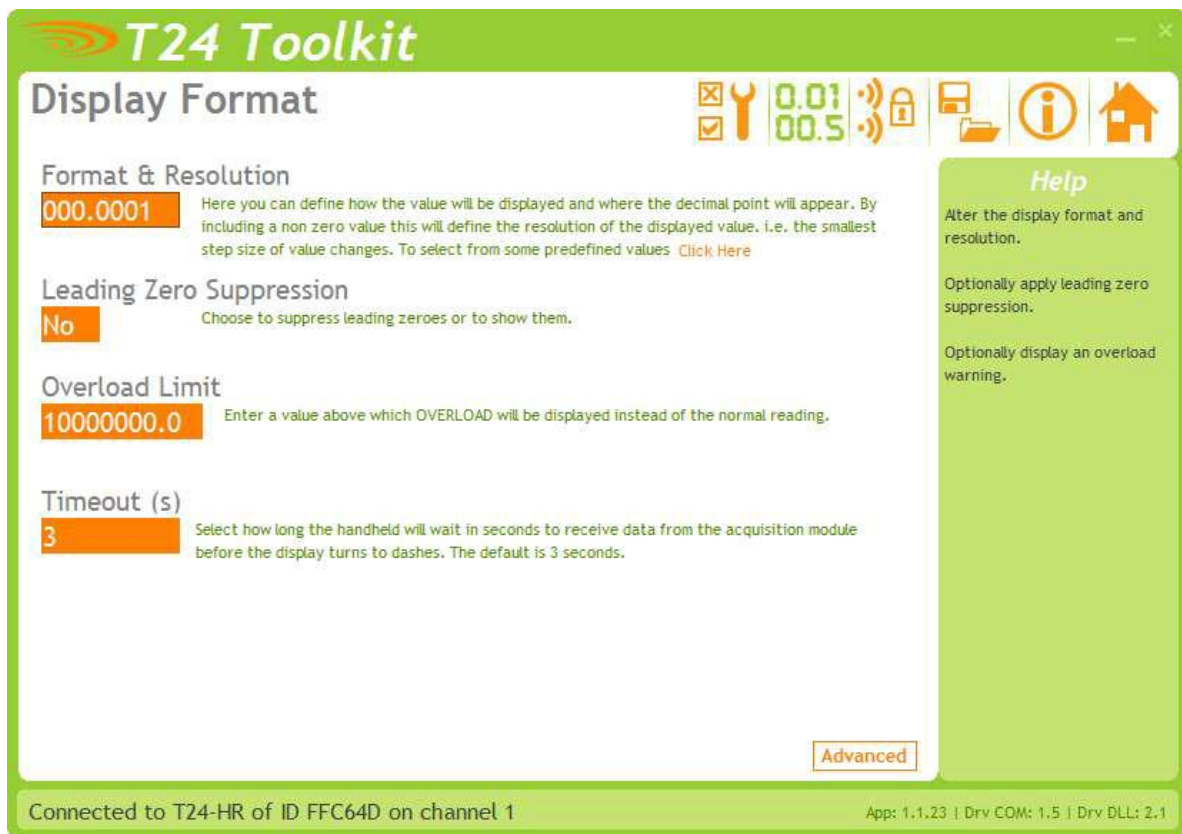
Items you can change:

Power On Auto Zero

Here you can determine whether the device performs automatic zero when it is powered on. Enter zero to disable this function. If you enter a non-zero value then when the handheld is first turned on it checks the value read from the acquisition module. If this falls within \pm of this value then the display will be altered so this reads zero. In its simplest form you could select two for a linear calibration. For more complex calibrations which include linearization select three to nine points.

Zero Indication Band

Using this setting you can mask tiny changes in input after you press the Tare button. Entering zero will disable this function. Entering a non-zero value will provide a band within which the display will always read zero. Once the reading exceeds this value the real weight will be displayed as no taring is taking place.



Items you can change:

Format & Resolution

Here you can define how the values are displayed on the LCD. There are 7 digits available and you can define where the decimal point is shown by entering text where a zero indicates a numeric digit position. When the data is being displayed the number of decimal places you define may be overridden as the display will always show the correct number of integer digits. Example: If you set the format to 000.0000 and the value to display is 1000.1234 the display will show 1000.123

You can also define the resolution, which is the block size of changes to the display.

Example: If you enter the format as 000.0005 the display will only change in steps of .0005 which can be used to mask noisy digits at high resolutions.

Leading Zero Suppression


This can be turned on or off and will suppress leading zeroes when on.

Example: If the display reads 000.123 with leading zero suppression turned off it will display 0.123 when turned on.

Overload Limit	You can enter a limit here above which Overload will be shown on the display instead of the actual value. Enter zero to disable this feature. This can be turned on or off and will suppress leading zeroes when on.
----------------	---

Timeout	Enter the timeout in seconds. This sets the time allowed without any data arriving from the viewed module before all dashes are displayed on the LCD. Should be at least 3 times the interval between the data being transmitted by the acquisition module.
---------	---



6.3 Connecting to the MasterLink 3000 Amplifier using Toolkit



T24 Toolkit


Advanced Settings

☒
☒







0


0.01
00.5










Waker Duration (ms)

11000

Select how long the handheld will wait to wake the paired device. The default is 12 seconds (12000 ms).

Pair Wait Duration (s)

5

This determines how long to wait in seconds when pairing a device to the handheld. The default is 5 seconds.

Do Sleep Wake

Yes

Choose whether the handheld will wake the paired device when it is turned on and will send it to sleep again when turned off. The default is YES.

Paired Data Tag

C879

Enter the Data Tag of the paired acquisition module.

Auto Off Delay (m)

5

Enter a delay in minutes after which the handheld will power off if no button is pressed. Enter zero to disable this function. The default is 5 minutes.

Paired ID

FFC879

Enter the ID of the paired acquisition module. (Required to wake the module).

Keep Awake Interval (s)

5

Once the handheld has woken the paired device it keeps it awake by sending a Keep Awake signal at regular intervals. This interval is entered in seconds. The default is 5 seconds.

Decode Binary Data Provider

Used to decode a single value from a non standard binary data provider.

Start Byte

000

Enter the data byte to start extracting data. Zero is the first byte.

Data Type

3-INT32

Select the data type of the data contained in the binary packet.

Help

These are advanced settings and do not normally require changing.

Connected to T24-HS of ID FFFCFB on channel 1

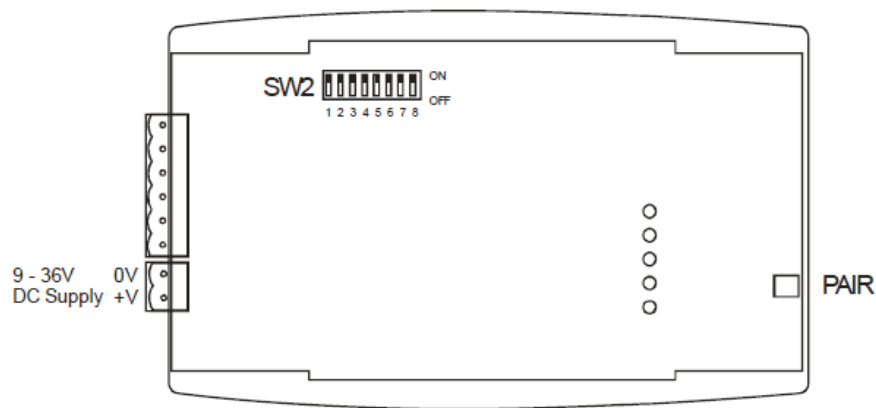
App: 1.1.90 | Drv COM: 1.6 | Drv DLL: 2.6

Paired Data Tag and **Paired ID** of the MasterLink 3000 amplifier need to be entered into these fields. These correspond to the Data Tag and ID of the MasterLink 3000 amplifier.

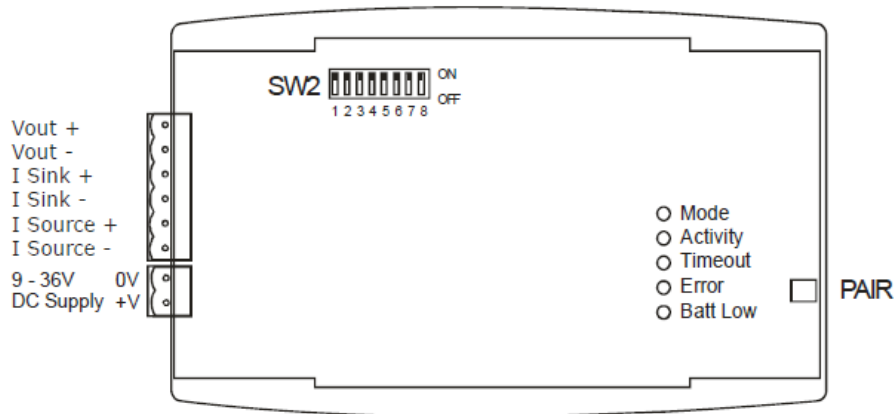
7.0 ANALOG OUTPUT

7.1 Connecting Power

You will need to connect a power supply to the device for it to operate and to enable configuration using a base station and the appropriate toolkit software. Power is supplied via the screw terminals and can be in the range of 9 to 36V DC.



7.2 I/O Connection and DIP Switch Settings

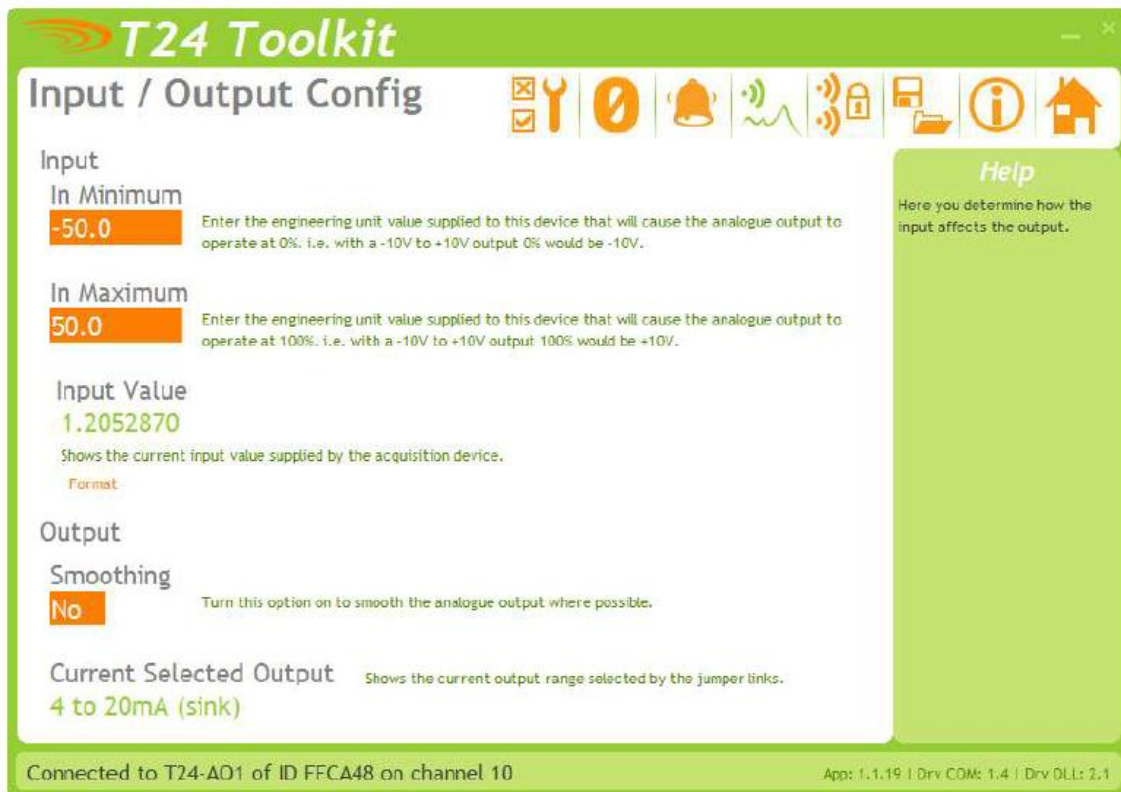


SW2 Switch Settings								
Range	1	2	3	4	5	6	7	8
0-10 V	ON	OFF	OFF	X	X	OFF	ON	OFF
+/-10 V	OFF	OFF	ON	X	X	OFF	ON	ON
0-5 V	ON	ON	OFF	X	X	OFF	OFF	OFF
+/-5 V	ON	OFF	ON	X	X	OFF	OFF	ON
0-20 mA Sink	X	X	X	OFF	ON	ON	OFF	OFF
0-20 mA Source	X	X	X	ON	OFF	ON	ON	OFF
4-20 mA Sink	X	X	X	OFF	ON	ON	OFF	ON
4-20 mA Source	X	X	X	ON	OFF	ON	ON	ON

Where X = Don't care

7.3 Using Toolkit Software to setup Device

*Follow steps in section 5.1 to connect to analog amplifier.



Items you can change:

Input

In Minimum

Enter the input value that should result in the minimum output. The minimum output depends on the Current Selected Output which is determined by the SW2 DIP switch settings.

Range	Minimum Output
0-10 V	0 V
+/-10 V	-10 V
0-5 V	0 V
+/-5 V	-5 V
0-20 mA Sink	0 mA
0-20 mA Source	0 mA
4-20 mA Sink	4 mA
4-20 mA Source	4 mA

In maximum

Enter the input value that should result in the maximum output. The maximum output depends on the Current Selected Output which is determined by the SW2 DIP switch settings.

Range	Minimum Output
0-10 V	0 V
+/-10 V	-10 V
0-5 V	0 V
+/-5 V	-5 V
0-20 mA Sink	0 mA
0-20 mA Source	0 mA
4-20 mA Sink	4 mA
4-20 mA Source	4 mA

Input value

This shows the currently supplied value to the device. An active acquisition module must be in place to view this value.



Here you can set the action to take when certain errors occur. The actions are applied when the errors occur and if more than one error is present the actions are applied with the following priorities: Timeout Action, Remote Error Action, Remote Batt Action

When errors are removed the analog output resumes reflecting the current input.

Items you can change:

Timeout	Enter the timeout in milliseconds for the input to timeout. If a new Data Provider packet does not arrive within this time the Timeout Action will trigger. Generally this timeout should be set to at least three times the acquisition module transmission rate.
Timeout Action	Select the action to take place when a timeout occurs. i.e. when communications (for more than the duration of the Timeout value) is lost with the acquisition module. See the Output Actions section for the available actions and the effect of these choices on the different output ranges.
Remote Error Action	Acquisition modules can report errors. See the Output Actions section for the available actions and the effect of these choices on the different output ranges.
Remote Batt Action	When the acquisition module reports a low battery this action will occur. See the Output Actions section for the available actions and the effect of these choices on the different output ranges.

Output Actions

The following actions can be selected.

None	Do nothing
Minimum Full Scale	Set analog output to the minimum full scale value
Maximum Full Scale	Set analog output to the maximum full scale value
Minimum Output	Set analog output to the minimum possible value
Maximum Output	Set analog output to the maximum possible scale value
Half Full Scale	Set analog output to halfway between minimum and maximum full scale value
Hold Last Output	Hold the last output. (Does the same as None for the Timeout Action)

WARRANTY REPAIR POLICY

Limited Warranty On Products

Any Cooper Instruments product which, under normal operating conditions, proves defective in material or in workmanship within one year of the date of shipment by Cooper will be repaired or replaced free of charge provided that a return material authorization is obtained from Cooper and the defective product is sent, transportation charges prepaid, with notice of the defect, and it is established that the product has been properly installed, maintained, and operated within the limits of rated and normal usage. Replacement or repaired product will be shipped F.O.B. from our plant. The terms of this warranty do not extend to any product or part thereof which, under normal usage, has an inherently shorter useful life than one year. The replacement warranty detailed here is the buyer's exclusive remedy, and will satisfy all obligations of Cooper whether based on contract, negligence, or otherwise. Cooper is not responsible for any incidental or consequential loss or damage which might result from a failure of any and all other warranties, express or implied, including implied warranty of merchantability or fitness for particular purpose. Any unauthorized disassembly or attempt to repair voids this warranty.

Obtaining Service Under Warranty

Advance authorization is *required* prior to the return to Cooper Instruments. Before returning the item, contact the Repair Department c/o Cooper Instruments at (540) 349-4746 for a Return Material Authorization number. Shipment to Cooper shall be at buyer's expense and repaired or replacement items will be shipped F.O.B. from our plant in Warrenton, Virginia. Non-verified problems or defects may be subject to a \$150 evaluation charge. Please return the original calibration data with the unit.

Repair Warranty

All repairs of Cooper products are warranted for a period of 90 days from date of shipment. This warranty applies only to those items that were found defective and repaired; it does not apply to products in which no defect was found and returned as is or merely recalibrated. It may be possible for out-of-warranty products to be returned to the exact original specifications or dimensions.

* Technical description of the defect: In order to properly repair a product, it is *absolutely necessary* for Cooper to receive information specifying the reason the product is being returned. Specific test data, written observations on the failure and the specific corrective action you require are needed.