Taut-Wire System & FG7 LCD Platform
Installation Guide
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INTRODUCTION

Thank you for choosing our product! The NEMTEK Taut-Wire system and FG7 LCD Platform is designed and manufactured to provide many years of reliable use, if installed and maintained correctly. The guidelines provided in this manual will assist you with the basic operation and maintenance of your Taut-Wire System.

Currently this product is designed and manufactured in South Africa for the South African and international markets. More information on our products and general information are available on our web site at: http://www.nemtek.com.

COMPANY PROFILE

The NEMTEK Group of Companies manufacture and distribute intelligent electronic agricultural fencing systems, security and perimeter control systems and have been involved in the security industry since 1990.

We have our own research and development team, designing and manufacturing a full range of globally competitive electric fence energizers and related products.

NEMTEK is continually updating its products according to South African and international standards in order to ensure the highest quality products and continuous customer satisfaction.

Electric fencing can be lethal. Avoid head contact with the fence. When installing please take careful note of the options available for current limiting resistors, the programmable output energy levels as well as the low-voltage operation of the energizer.
GUARANTEE

The Taut-Wire System and FG7 LCD Platform, manufactured by IO Tech Manufacturing (Pty) Ltd, is guaranteed for a period of two years from date of sale against defects due to faulty workmanship or materials.

IO Tech Manufacturing (Pty) Ltd will, at its discretion, either repair or replace a product that proves to be defective.

IO Tech Manufacturing (Pty) Ltd guarantees that the product, when properly installed and used in line with the specification as determined by IO Tech Manufacturing (Pty) Ltd from time to time, will execute its function of generating a suitable potential. IO Tech Manufacturing (Pty) Ltd does not guarantee that the operation of the product will be uninterrupted and totally error free. Faulty units must be returned to one of the Nemtek Group outlets. The buyer shall pay all shipping and other charges for the return of the product to Nemtek or Nemtek Security Warehouse.

LIMITATION OF GUARANTEE

The guarantee does not apply to defects resulting from acts of God, modifications made by the buyer or any third party, misuse, neglect, abuse, accident and mishandling.

EXCLUSIVE REMEDIES

The remedies provided herein are IO Tech Manufacturing (Pty) Ltd’s sole liability and the buyer’s sole and exclusive remedies for breach of guarantee. IO Tech Manufacturing (Pty) Ltd shall not be liable for any special, incidental, consequential, direct or indirect damages, whether based on contact, tort, or any other legal theory. The foregoing guarantee is in lieu of any and all other guarantees, whether expressed, implied, or statutory, including but not limited to warranties of merchantability and suitability for a particular purpose.
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Manufactured in South Africa
The Nemtek FG7 LCD platform is used for providing a graphical interface and connectivity to a network of Nemtek Energizers and Input/Output Cards (IO Cards) and Taut-Wire Sensors.

The platform may be configured with different internal printed circuit boards and software to provide the required functionality.

**Warning:**
Test the functionality of the system after configuration and before commissioning.
The purpose of the Taut-Wire System is to provide another layer of perimeter security that is independent of any other security system. It provides a means of detecting any change in tension on a wire by using Taut-Wire sensor/s. An on-screen image of the perimeter is displayed. Lines are drawn on the image to represent each of the sectors that are being monitored. Up to 31 sensors may be used. Any sensor may be associated with any sector and any number of sensors can be used per sector.

Under normal operation each sector will be shown as a green line. Should any sensor assigned to that sector be deflected the line will change colour to red. The sensor will remain in alarm condition for a minimum of ten seconds. The “Active Alarms:” indicator will revert to green. If an appropriate personal identification number (PIN) is entered, the “Clr” button can be pressed and the alarm indication will be reset. Both the PIN activation and alarm event will be recorded in the system log.

Users 1 to 3 may only reset the alarm indication on the screen.

The Administrator is able change PIN details, view the logs, and download the logs to a USB stick. The Installer, in addition to the Administrator permissions, can do firmware upgrades, assign sectors and TW sensors to sectors, the number of sensors on the system, and adjust the parameters of each TW sensor.

Each TW sensor has a unique address that can be configured by the Installer. Operational parameters of each TW sensor can be altered by the Installer. This allows each sensor to have unique sensing capabilities. However, the default values are normally adequate. These configuration settings can be done from the FG7 screen.

If a Nemtek Network IO card is attached to the FG7, Sector 1 will activate Relay 1 on the card, Sector 2 will activate Relay 2 etc. up to four sectors. Relay 5 will activate on any alarm condition of any of the four sectors. When the alarm condition(s) no longer persists, and the “Clr” button is pressed, the associated relay(s) will be reset.

If more than four sectors are envisaged, relays will not be used, and the data corresponding to each sensor can be accessed via the TCP protocol.
OPENING THE FG7B

On the opposite side to the LCD display are two screws that need to be removed. With the LCD facing you, slide the LCD gently to one side by approximately 15mm.

Leverage the LCD out as shown in the picture.

A green printed circuit board IOT1601 JM and a dark blue control unit are inside the unit.
The IOT1601 JM board is responsible for generating the different supply voltages. The input voltage is 12Vdc and is polarity protected. The board also monitors and processes the different communication signals before sending the information to the control unit.

You will find jumpers, connectors, and LEDs on the board for selecting, connecting, and indicating.

The control unit hosts the software and has all communication ports on board.
**JUMPER SETTINGS**

Jumper setting as viewed with terminals at the bottom.

- **TTL Serial communication**
  - JP7 (2) To the left if serial TTL is selected (For Nemlink) To the right if RS 485 or RS 232 communication is required

- **RS485/RS232**
  - JP8 (2) To the left for RS 485 communication To the right for RS 232 communication

- **RS485out**
  - JP3 (1) Down to enable RS 485 transmitting (standard) Up to disable RS 485 transmitting (nonstandard use)

- **RS485in**
  - JP2 (1) Up to enable RS485 receiving (standard) Down to disable RS485 receiving (nonstandard use)

- **Line Bias**
  - JP1 (2) Up to have line bias (star configurations) Down for no line bias (daisy chain configuration)

- **Watch Dog timer 1**
  - JP6 (1) Down for auto reset with transmission failure of the control unit Up for no auto reset of the control unit

- **Watch Dog timer 2**
  - JP4 (1) Down for auto reset of the power supply with transmission failure of the control unit Up for no auto reset of the power supply

**CONNECTORS**

The connectors on the IOT1601JM board are self-explanatory. However for Taut-wire only the 3 way taut-wire connector and the two way Power In connector are used. If an IO card is used the RS 232 or RS 485 terminals can be used for the card.

**PUSH BUTTONS**

There are two push buttons on the green board. The one is marked “B3 PWR” (Power) and the other “B3 RESET”. The B3 PWR button is used to manually power the control unit on and off, this is usually required when programming the settings on the FG7-Taut wire. The B3 RESET button is used to manually reset the FG7-Taut wire Controller.
LED'S

There are 8 LED’s on the green board.

LED9 – If flashing, indicates transmission of data from the control unit to TTL SERIAL/RS232/485
LED8 – If flashing, indicates that the control unit is receiving data from TTL SERIAL/RS232/485
LED7 – If flashing, indicates that the control unit is receiving data from the taut wire sensors
LED6 – If flashing, indicates that the control unit is transmitting data to the taut wire sensors
LED5 – When on, indicates control board heartbeat
LED4 – When flashing, indicates that the watchdog timer is operational
LED3 – 5V supply indicator
LED2 – 3V3 supply indicator

The control unit hosts the software and gives outputs via the touch screen, HDMI, Ethernet or USB port. All other ports should not be used by the installer.

USB PORT

The USB port is used for upgrading software, uploading site images, downloading logs and can also be used for a mouse, so that a pointer can be used on the touch screen display.

HDMI PORT

The HDMI port is a standard micro-HDMI connector. To activate the HDMI port a shell script has to be loaded (contact distributor for details) and the touchscreen ribbon cable has to be disconnected from connector LCD1 (brown ribbon cable). A USB mouse should be used for operating the system when using an HDMI display.

ETHERNET PORT

The Ethernet port is used for communication with Druid FenceProbe or third party software.

TOUCHSCREEN

The touchscreen is the standard display used on the stand-alone units, without Druid FenceProbe or third party software.
1. Taut-Wire Sensors

**Electrical Connection:**

The TW sensors are connected via a three wire interface plus shield that is responsible for power as well as bi-directional communications. The wiring can be multidropped, i.e. three wires from the FG7 to the first sensor and then onto the second sensor etc.

- The red wire of the sensor goes to “supply” on the Taut-wire connector of the FG7B
- The green wire of the sensor goes to “comms” on the Taut-wire connector of the FG7B.
- The blue wire together with the screen goes to the “GND” on the Taut-wire connector of the FG7B.

**Caveat:** if the wiring diameter is too small, or the distance is too far, then the wire resistance will be too high and some sensors will not operate. Ideally the wiring will form a loop back to the FG7. This helps with power reticulation to the sensors and allows for twice the distance.

**Mechanical Connection:**

Ideally a TW sensor is mounted in the middle of a linear span of wire. The maximum span is 100m and the wire must be free to move in a horizontal direction. TW sensors operate effectively when there is no residual deflection of the sensor. The wire should be installed and tensioned, but not clamped at the TW sensor. All wires should be installed and tensioned in a given sector before the TW sensor is clamped onto the wire

2. Nemtek IO Network Card

A Nemtek IO Network card can be connected to the FG7. The Nemtek Network card must have all its address jumpers inserted. Communication with the Network IO card can be via RS232 from the FG7, via some media converter, to RS422 and the Network card or alternatively via the RS 485 terminals (RS 422) on the FG7 direct to data terminals on the Network IO card. (Obviously, from RS422 media converter/s and back to RS422 is also acceptable. Fibre-optic cable is the preferred media).

An Ethernet connection could also be made between the FG7 and the IO card with the use of the Nemtek Nemlink and Nemlink IO card.
PROGRAMMING THE FG7B-TW

The FG7B-TW should be programmed with the number of Taut-wire sensors. If required a graphic site image can be loaded on the FG7B-TW and zones (sectors) can be drawn on the image.

CONFIGURE THE NUMBER OF SENSORS ON THE NETWORK

1) On the FG7, press the PIN tab on the top screen and select ▼ Installer, enter the appropriate PIN number and press Enter. Check that Installer stays on the screen and has not revert back to select.

2) Press the Image tab, followed by the System tab on the top of the screen and use the ▼ and ▲ markers next to the No. of TW Sensors to select the correct number of sensors in the network. Press Save No of TW sensors.

3) If jumper 4 and 6 are set to auto reset (normal operation), then after about two minutes the application will restart. Otherwise one can push the B3-PWR button and this will close the application and after the Nemtek logo has disappeared from the screen you press the B3-PWR button again to restart the unit.

4) Check under the System tab that the number of sensors is now correct.

CONFIGURE THE IO CARD ON THE NETWORK
JUMPER SETTINGS:

<table>
<thead>
<tr>
<th>JP</th>
<th>Setting</th>
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<tbody>
<tr>
<td>1</td>
<td>Data Pass Through set to No</td>
</tr>
<tr>
<td>2</td>
<td>Daisy/Multidrop set to Daisy</td>
</tr>
<tr>
<td>3</td>
<td>Not Used</td>
</tr>
<tr>
<td>4/5/6</td>
<td>Config &amp; Address set all in except D out</td>
</tr>
<tr>
<td>8/9</td>
<td>Not Used</td>
</tr>
<tr>
<td>7/10/11/12/13</td>
<td>Wet/Dry contacts set for customer requirements</td>
</tr>
</tbody>
</table>

AUDIBLE ALARM

Under the System Tab you can select for the FG7 giving an audible alarm when there is an alarm or service condition on the energizers by clicking on the word audible next to the audible tick box.

FACTORY DEFAULT

Under the System Tab you can reset the FG7 to Factory default settings by pressing the default button the IP address will be reset to 10.0.0.20 and all pin setting will default back to the numbers as stated in the user manual.

LOADING A GRAPHIC SITE IMAGE

1) Load nemshell7BIMAGE on an USB stick (nemshell7BIMAGE is available from Nemtek or its distributors)
2) Get a suitable image of your site and scale the image to about 370 x 370 pixels. Save the image in a png format and call it image.
3) Load the image on the USB stick.
4) If you can access the USB port without removing the unit from its base than start the unit otherwise remove the unit from its base for access to the USB port and then start the unit.
5) Go to the PIN tab and select Installer, enter the Installer code and press enter. Make sure it stays on Installer and does not go back to select
6) Place the USB stick in the USB port on the control board.
7) Go to the Image tab and then to System tab and press firmware upgrade (the screen will go black and says system login).
8) If jumper 4 and 6 are set to auto reset (normal operation), then after about two minutes the application will restart. Otherwise one can push the B3-PWR button and this will close the application and after the Nemtek logo has disappeared from the screen you press the B3-PWR button again to restart the unit.
9) Remove the stick and place the unit back in its base.
DRAWING SECTOR LINES AND ALLOCATING SENSORS TO SECTORS

1. On the FG7 press the PIN tab on the top of the screen and “Select ▼” “Installer”. Type in the appropriate PIN number and press “ENTER”.
2. Press the “Image” tab on the top of the screen.
3. Use the “▲” and “▼” keys under the “Sector#” label to select the desired sector. The maximum number of sectors is equal to the maximum number of TW sensors in the system. The absolute maximum is 31 TW sensors. See TW Installation Notes.
4. Press “Start” and touch the screen at the desired points corresponding to that sector. Once the last point is reached press “Stop”. A maximum of eight points is permissible but typically only two will be used. Press “View” to see what your sector looks like. If unhappy with the result, simply press “Start” and repeat the exercise.
5. You can randomly do all the sectors repeating the steps 3 and 4 above.
6. You may arbitrarily assign any TW Sensor number to any perimeter Sector. Therefore you may choose to have only one Sector with all the TW sensors, or only one TW Sensor per Sector, or for example, 4 Sectors with three TW Sensors on each sector. It is the responsibility of the installer to do the allocation of any TW Sensor to any Sector. Select the appropriate Sector by using the “▲” and “▼” keys under the “Sector#” label. Select the appropriate TW Sensor by using the “▲” and “▼” keys under the “TW#” label. Press the “+TW” button. If more than one TW Sensor is associated with that same Sector, then select the next appropriate TW Sensor number and press the “+TW” button again.
7. The installer must press “Save” when you have done all your allocations. Failure to do so will result in a loss of all the information on a reset or power down.
8. The system will automatically load this graphical layout on power-up.
9. You may, after entering Installer mode, edit any individual Sector and/or TW Sensor at any time and re-save.
10. The labels “Sector1” etc. are placed automatically at the start of each Sector on the graphical image. These labels are at a fixed position at the start of the Sector.
SETTING THE IP ADDRESS

1) On the FG7, press the PIN tab on the top screen and select ▼ Installer, enter the appropriate PIN number and press enter. Check that Installer stays on the screen and has not revert back to select.
2) Press the “Image” tab on the top of the screen.
3) Press the NET tab on the top of the screen and use the ▼ and ▲ markers next to the address boxes to set the correct IP address, Network Mask and Gateway address.
4) Press the Set IP Address button on the bottom of the screen and the new IP address will be programmed into the FG7.
5) To ensure that the setting is correct ping the new IP address from a computer.

LCD CALIBRATION

The touch screen display can be calibrated, this will be necessary if the screen is replaced or if it is difficult to touch the buttons on the screen. If the touch position on the screen is too far out to touch the LCD calibration button a USB mouse can also be used to recalibrate the screen otherwise a pen can be used.

1) On the FG7, press the PIN tab on the top screen and select ▼ Installer, enter the appropriate PIN number and press enter. Check that Installer stays on the screen and has not revert back to select.
2) Press the “Image” tab on the top of the screen.
3) Press the Net tab on the top of the screen and press the LCD calibration button. The Nemtek screen should appear followed by the calibration screen.
4) Touch the crosshair and a second crosshair will appear. Touch the second crosshair.
5) Carry one until all five crosshair markers are done. The unit will then automatically reboot with the new calibration.

FIRMWARE UPGRADE

1) Load on a USB stick the latest available software for the FG7B control unit. The file normally is called nemtekfg7BTW??? where ??? normally is a number indicating the version. The latest version will be available from Nemtek or its distributors.
2) If you can access the USB port without removing the unit from its base than start the unit otherwise remove the unit from its base for access to the USB port and then start the unit.
3) Go to the PIN tab and select Installer, enter the Installer code and press enter. Make sure it stays on Installer and does not go back to Select.
4) Press the “Image” tab on the top of the screen.
5) Place the USB stick in the USB port on the control board.
6) Go to the System tab and check the version number and then press firmware upgrade (the screen will go black and says system login).
7) If jumper 4 and 6 are set to auto reset (normal operation), then after about two minutes the application will restart. Otherwise one can push the B3-PWR button and this will close the application and after the Nemtek logo has disappeared from the screen you press the B3-PWR button again to restart the unit.

8) Go back to the System tab and check that the new version has been loaded. Remove the stick and place the unit back in its base.
Individual Taut Wire Parameters:

Each TW Sensor has its own unique address 0-31 that can be programmed. Address 0 is reserved for un-programmed sensors.

Each TW Sensor has its own micro-controller that has certain parameters that may be set by the installer. In reality a perimeter wire is a very dynamic entity subjected to many physical elements, wind, rain, temperature fluctuations, fencing posts that gradually move, or a kid’s soccer ball being kicked into the fence. By having built-in intelligence into each sensor the number of false alarms and maintenance requirements can be dramatically reduced. However, under normal operation the default settings will be adequate. If need be, the response of the TW sensor can be tailored for unique circumstances.

The “TW#” tab gives an installer access to the sensor parameters. Note, when on this TW# screen, the FG7 will only communicate with one specific sensor. All other sensors are ignored and no alarm conditions will occur. As soon as the tab is changed, or the system times out, all sensors will be communicated with.

**TW Sensor#:**
the number of the sensor being interrogated or the desired address of the sensor to be programmed.

**Alarm Trig:**
“alarm trip threshold” 1 - 255. The lower the value, the more sensitive the TW Sensor. Default 50.

**Filter Aver:**
“frequency response and alarm rate adjustment” 1 - 100. Technically: 100/(Filter Aver) = number of alarm decisions per second. Default 49 => 2 decisions per second.
This is neither a harmonic of 50 or 60 Hz.

Once any of the listed parameters have been changed, apart from the address, press the “ZeroPWM” for the sensor to be updated with the new parameters. Change the sensor address and then revert to the previous address and your new parameters will be displayed in the “Alarm Trig: …” values.

The above settings do not work independently. If you need to experiment, change one setting at a time. Be realistic and allow this remarkable sensor to “track” what is happening on your fence.

The TW Sensor, once triggered, will maintain its alarm state for ten seconds. This will be displayed in the “Active Alarm:” label on the LHS of the screen. It will be logged, and the associated sector will change colour on the “Image” screen.
How to set a sensor address:

You can only assign a sensor address, apart from the address zero, for a sensor with an address of zero that is in an alarm condition. This enables you to wire all the new sensors with default address zero on the TW communication bus and start programming.

1. **New Sensor with a default address of zero:** Change the TW Sensor# with the ▲ or ▼ buttons to the desired sensor address (even if the desired address is 1, you must change it to another value and back to 1 again). Sensor addresses must start at 1 and be contiguous. Deflect the sensor slightly, and within ten seconds press the “SetAddr” button on the FG7. The sensor must be in alarm before its address can be programmed. Change the TW Sensor# address to some other value and then back to your chosen value. The PWM: Strain: and SetP: bar graphs should be near midpoint. The sensor has been successfully programmed. A slight deflection on the sensor should be indicated by a change in the Strain: bar graph. Default factory sensor parameters will be initiated.

   Repeat with new sensors and different sensor addresses.

2. **Revert a sensor address to zero:** Change the TW Sensor# address to the address of the sensor that must be changed. Press “RstAddr”. This sensor will now have the address zero. (Firmware Issue: even once the address is set to zero, the bar graphs will be deflected. When the FG7 is powered down and up again it will be apparent that this old address is no longer valid).

   The sensor can now be re-assigned a new address by following the steps in 1 above.
Routine Maintenance

TW sensors will be attached to sectors of wire whose tension will change over time. If a TW sensor is being constantly deflected it will attempt to cancel that deflection by an internally generated electronic signal. It can only do this up to a point. At this point a service alarm will be given.

The installer can then select the appropriate TW sensor address from the FG7 and TW# screen, and simply press the “ZeroPWM” button without having changed any of the other sensor parameters. This may be sufficient to clear the service condition. If not, the wire attached to that particular sensor must be loosened, the wire must be tensioned, then clamped at the sensor, and then the “ZeroPWM” button pressed. Verify alarm activation

Known Issues

- When a RstAddr is pressed on the TW# screen the bar graph indication should be cleared.
- The TW Sensor# must be changed before it is valid. The implication is the system must have at least two sensors on it.

Document Revision history

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<td>Beta</td>
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<tr>
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