

NEMTEK
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Network Guide

For Druid LCD 2X Energizers

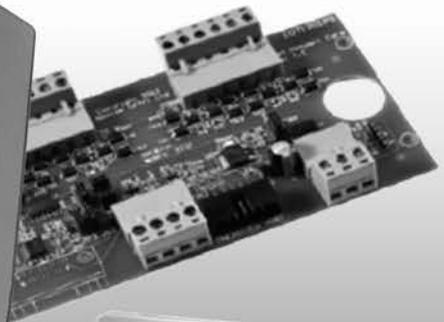


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1 INTRODUCTION

The NEMTEK Druid LCD 2x energizer and NEMTEK 8-way Relay Board provide the network connection capability for the synchronisation, centralised control and/or remote control and feedback of multiple energizers and relay boards. Various network topologies are possible, ranging from a simple two energizer network linked by a keypad, to a large network consisting of up to 32 energizers and up to 32 relay boards linked by ethernet cable, optic fibre, RS485 or wireless connection.

This manual aims to provide a setup guide for these different topologies on hardware and software level. All software mentioned in this guide can be found online at <http://www.nemtek-druid-fenceprobe.com>. All required hardware mentioned in this manual is available directly from NEMTEK.

2 DISCLAIMER

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3 NEMTEK Group Outlets

HEAD OFFICE

Tel: +27 (0)11 462 8283

Fax: +27 (0)11 462 7132

Northriding Commercial Park
Stand 251, Aintree Street, Northriding
Randburg, South Africa

EXPORTS

Tel: +27 (0)11 462 8283

Fax: +27 (0)11 462 7132

exports@nemtek.com

EDENVALE

Tel: +27 (0)11 453 1970

Fax: +27 (0)11 453 1858

Unit 4, Meadowdale Park
Cnr. Dick Kemp & Herman Roads
Meadowdale, Edenvale, South Africa

CAPE TOWN

Tel: +27 (0)21 386-3742

Fax: +27 (0)21 386-5573

27B Concord Crescent, Airport City
Cape Town, South Africa

NELSPRUIT

Tel: +27 (0)13 752-2187

Fax: +27 (0)13 752-2188

Waterval Ave, Riverside Industrial
Nelspruit, South Africa

KWAZULU-NATAL

Tel: +27 (0)31 701-2125

Fax: +27 (0)31 701-2125

19 Henwood Road
Pinetown, South Africa

AUSTRALIA

Tel: (08) 9303 9855

Email: nemtek@bigpond.net.au

Unit 5, 19 Innovation Circuit,
Wangara, 6065, Perth, WA, Australia

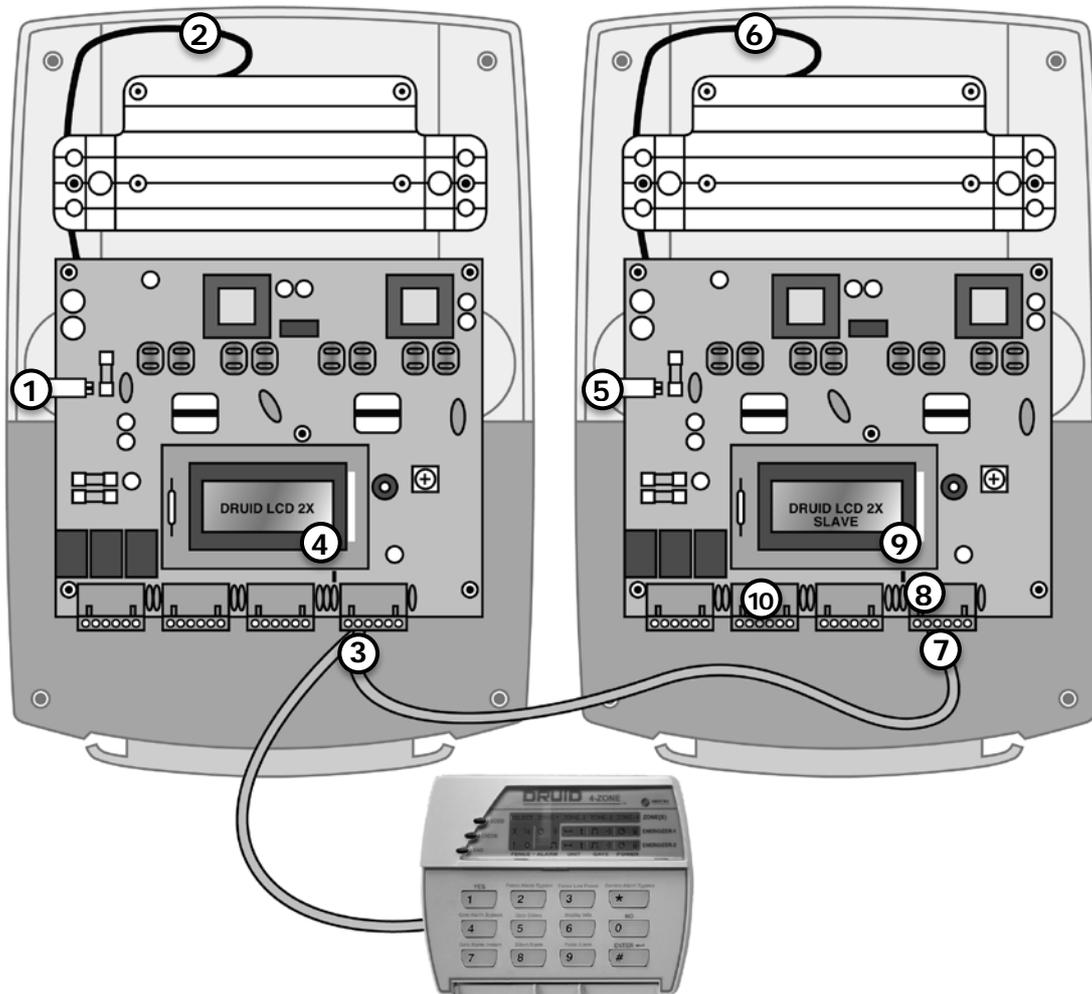
Website: www.nemtek.com

E-mail: nemtek@nemtek.com

Manufactured in South Africa

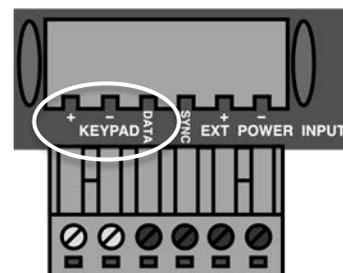
4 4-Zone Keypad Energizer Setup A

A 4-zone energizer network can be created by connecting two Druid LCD 2x energizer via the keypad bus, using the NEMTEK 4-Zone Keypad. Both energizers can be controlled with one keypad and alarms generated on either energizer will be visible on the keypad. The output pulses of both energizers will also be synchronised with this setup. The master energizer will be displayed as Energizer 1 (Zone 1 & 2) and the slave energizer as Energizer 2 (Zone 3 & 4) on the keypad. Follow the setup instructions chronologically, with the corresponding number in the figure, given after the steps in brackets.



1. Set up the master energizer:

- a. Disconnect the energizer mains and battery power. [1, 2]
- b. Connect the keypad's power (marked + and -) and data line (marked DATA) to the master energizer. [3]

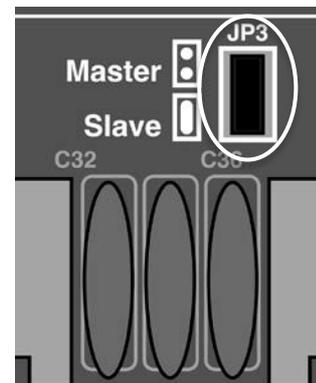


4 4-Zone Keypad Energizer Setup B

- c. Ensure the energizer is restored to factory default:
 - i. Reconnect the battery power. [2]
 - ii. Reconnect the mains power. [1]
 - iii. Within 60 seconds of reconnecting the power, enter 2389# on the keypad.
- d. Enter installer mode by entering 012345*0#. Ensure the energizer LCD display turns purple. [4]
- e. Enter 5001*# to activate 4-zone mode. Refer to the Druid LCD installer manual for more detail on the codes.
- f. Configure all user-preferences, for example alarm bypasses, specific to this energizer as individual energizer configuration is not possible once connected in the 4-zone configuration.
- g. Exit installer mode by entering *#. Ensure the energizer LCD display turns blue. [4]
- h. Disconnect the energizer mains and battery power. [1, 2]
- i. Remove the keypad from the energizer. [3]

2. Set up the slave energizer:

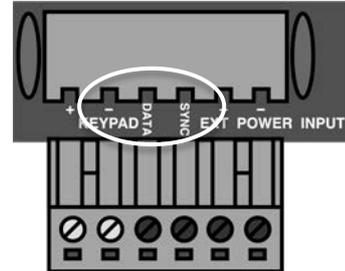
- a. Disconnect the energizer mains and battery power. [5, 6]
- b. Connect the keypad to the slave energizer and reset to factory default by following the same procedure as the master. [7]
- c. Configure all user-preferences, for example alarm bypasses, specific to this energizer as individual energizer configuration is not possible once connected in the 4-zone configuration.
- d. Insert the slave jumper JP3. [8]
- e. Power up the energizer by first connecting the battery and then the mains power. [6, 5]
- f. Ensure that "SLAVE" is displayed on the LCD. [9]
- g. Disconnect the energizer mains and battery power. [5, 6]
- h. Remove the keypad from the energizer. [7]



4 4-Zone Keypad Energizer Setup C

3. Connect the master energizer, slave energizer and keypad:

- a. Connect the master energizer's keypad ground (marked -), data line (marked DATA) and synchronisation line (marked SYNC) to the slave energizer's keypad ground, data line and synchronisation line. (Do not Connect the master and slave energizer's positive lines (marked +) together). [3, 7]
- b. Connect the keypad's power (marked + and -) to the master or slave energizer. Note the ground terminals on both energizers were already used to connect the energizers together (step 1), therefore two wires must be fastened together in the same terminal. [3, 7]
- b. Connect the keypad's data line (marked DATA) to the same data line used to connect the master and slave energizers, by connecting the wire to either the master or slave energizer. Note the data terminal on both energizers were already used to connect the energizers together (step 1), therefore two wires must be fastened together in the same terminal. [3, 7]



4. Testing the connection:

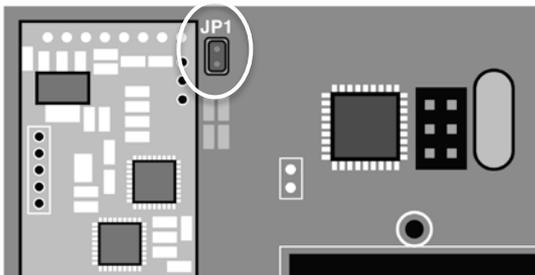
- a. Power both energizers by first connecting the battery and then the mains power. [2, 1, 6, 5]
- b. Open the gate contact on the "slave" energizer and make sure it is displayed on the keypad. Close the gate contact. [10]
- c. Enter 1234# and make sure both energizers are activated.

5 NEMTEK Ethernet Module Setup A

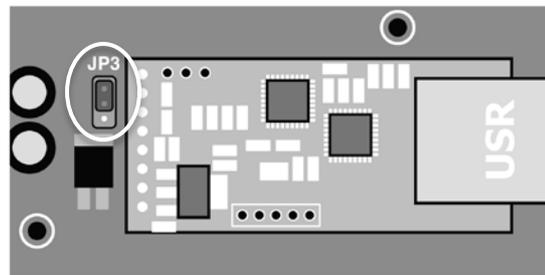
The NEMTEK Ethernet Module provides network connectivity to various NEMTEK products.

To set up the module successfully, follow these steps:

1. Download and save the USR-M0 setup software from <http://www.NEMTEK-druid-fenceprobe.com/downloads/USR-M0-V2.1.2.118.exe>
2. Install the jumper as per the relevant NEMTEK product shown in the figures below.

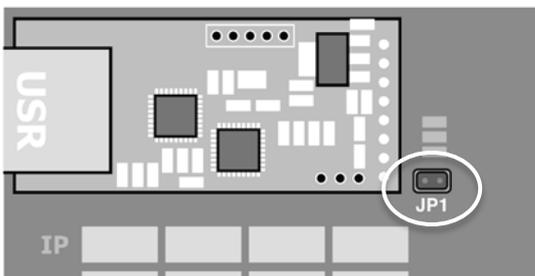


Taut Wire Node JP1

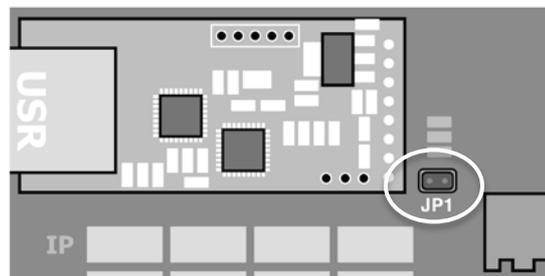


8-Way Relay Board and 8-Way Smart IO Board JP3

Ensure jumper installed on the 2 upper pins as in the figure



NemLink JP1



NemLink Network IO JP1

3. Connect the Ethernet Module directly to your computer using a suitable Ethernet cable.
4. Power up the NEMTEK board and ensure the green POWER LED is lit (For the NemLink board, power the board via either the J1 or J2 connector).
5. Run the USR-M0 setup software on your computer.
6. Click on the "Search Device" button.
7. A device should appear in the dialog box above the "Search Device" button. If no device appears check that the jumper is correctly installed, the ethernet cable is connected and that the board is powered.
8. Click on the device to display the device parameters.

5 NEMTEK Ethernet Module Setup B

9. If the module is still configured as factory default, the following parameters should be displayed (if the parameters differ, change the fields as shown in the figure):

The screenshot displays the configuration interface for the NEMTEK Ethernet Module, divided into two main sections: Base Param and Port Param.

Base Param (which is without j, usually keep default):

- IP Type: Static IP (dropdown)
- ModuleStaticIP: 192.168.0.100 (text input)
- SubnetMask: 255.255.255.0 (text input)
- Gateway: 192.168.0.201 (text input)
- HTTP Port: 80 (text input)
- User Name: admin (text input)
- Password: admin (text input)
- Device Name: USR-TCP23 (text input)
- Device ID: 1 (text input)
- RS422: (checkbox)
- RS485: (checkbox)
- Index: (checkbox)
- Link: (checkbox)
- Send device ID when connected: (checkbox)
- Reset: (checkbox)
- RFC2217: (checkbox)
- Send data with device ID: (checkbox)

Port Param:

- Parity/Data/Stop: NONE | 8 | 1 (dropdowns)
- Baudrate: 19200 (dropdown)
- Module work mode: UDP Server (dropdown)
- Local Port: 20108 (text input)
- RemoteIP: 192.168.0.150 (text input)
- Remote Port: 20108 (text input)
- Enable USR Cloud: (checkbox)
- Device ID: (text input)
- Communication code: (text input)

At the bottom of the interface is a button labeled "Save Config" with a checkmark icon.

10. If you are configuring a NemLink Ethernet Module connected to an energizer or 8-way Relay Board, and the device is installed on a local, private network, ONLY the *“ModuleStaticIP”* needs to be changed as explained in step 13 (Step 14 can be ignored).
11. If you are configuring a NemLink Ethernet Module connected to an FG7 or 8-way Smart IO Board, and the device is installed on a local, private network, the *“Module work mode”* needs to be changed to *“UDP”*. The *“ModuleStaticIP”* and *“RemoteIP”* need to be changed as explained in step 13 and 14.
12. Large, public networks, including routing and remote access via an internet connection, are not covered by this guide. Please consult your network administrator.
13. Enter a new *“ModuleStaticIP”* adhering to the following criteria:
- Every NEMTEK network device needs to have a unique *“ModuleStaticIP”* address. Devices cannot share the same address.
 - It is recommended that the *“ModuleStaticIP”* is chosen from the range 192.168.0.1 to 192.168.0.254

5 NEMTEK Ethernet Module Setup C

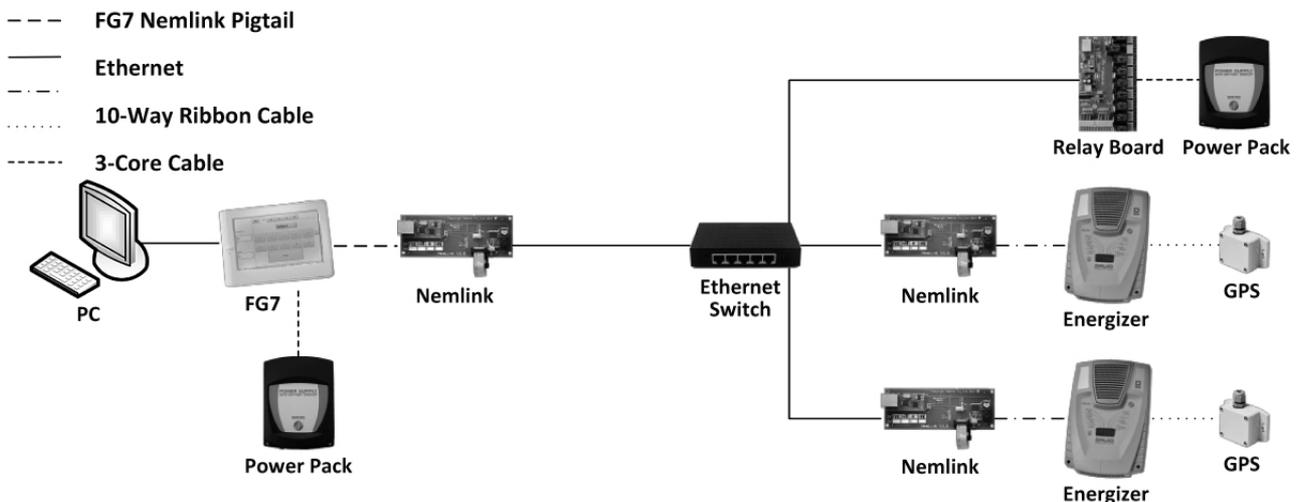
- c. Ensure that all *"ModuleStaticIP"* addresses are in the same IP range. This means that for the range mentioned in (b.), the first 3 numbers (e.g. 192.168.0) of the *"ModuleStaticIP"* address must be exactly the same for all network devices and the last number may range from 1 to 254. An example of valid *"ModuleStaticIP"* addresses on the same network will be:
 - i. NEMTEK NemLink (connected to NEMTEK FG7): 192.168.0.150
 - ii. NEMTEK NemLink (connected to Energizer): 192.168.0.100
 - iii. NEMTEK 8-way Relay Board: 192.168.0.55
 - iv. NEMTEK Smart IO Board: 192.168.0.200
14. Enter a new *"RemoteIP"* adhering to the following criteria:
 - a. The NemLink connected to the FG7, must have a *"Remote IP"* address where the first three numbers are exactly the same as the first three numbers of all the devices on the network and the last number is 255.
 - b. The NEMTEK Smart IO Board can only communicate with one energizer, therefore the *"RemoteIP"* must be identical to the *"ModuleStaticIP"* of the energizer it communicates with.
 - c. With reference to the *"ModuleStaticIP"* addresses in the example in step 13, the following is an example of valid *"RemoteIP"* addresses on the same network:
 - i. NEMTEK NemLink (connected to NEMTEK FG7): 192.168.0.255
 - ii. NEMTEK NemLink (connected to Energizer): not required
 - iii. NEMTEK 8-way Relay Board: not required
 - iv. NEMTEK Smart IO card: 192.168.0.100
15. Click on *"Save Config"* to change the parameters on the module. *"ACK"* will appear three times in the lower left dialog box if the changes were successful.
16. To check that the settings were saved successfully, click on the *"Search Device"* button again. The changed network device IP address should appear in the dialog box above the *"Search Device"* button. Click on this device and ensure that all parameters were changed correctly.
17. Remove the jumper as mentioned in step 2 for the Taut Wire Node, NemLink and Nemlink Network IO boards. Install the jumper on the 2 lower pins for the 8-way Relay Board and 8-way Smart IO Board.
18. The network device is now ready for installation.

6 Ethernet Network Setup A

By using a NEMTEK FG7 module and associated hardware, remote control and feedback are possible to multiple Druid LCD 2x and 8-way Relay Boards, via an ethernet or network.

6.1 Basic Ethernet Setup

The example diagram below illustrates the required hardware and wiring required for the network setup. Note that the NEMTEK GPS module can be used to synchronise the pulsing of multiple energizers, where physical wiring between the energizers are not possible. The NEMTEK Power Pack may be used to provide a 12V supply with battery backup to the FG7 and 8-way Relay Board. Note that all ethernet cables should have a maximum length of 100m and the FG7-Nemlink pigtail and 10-way ribbon should have a maximum length of 1m.

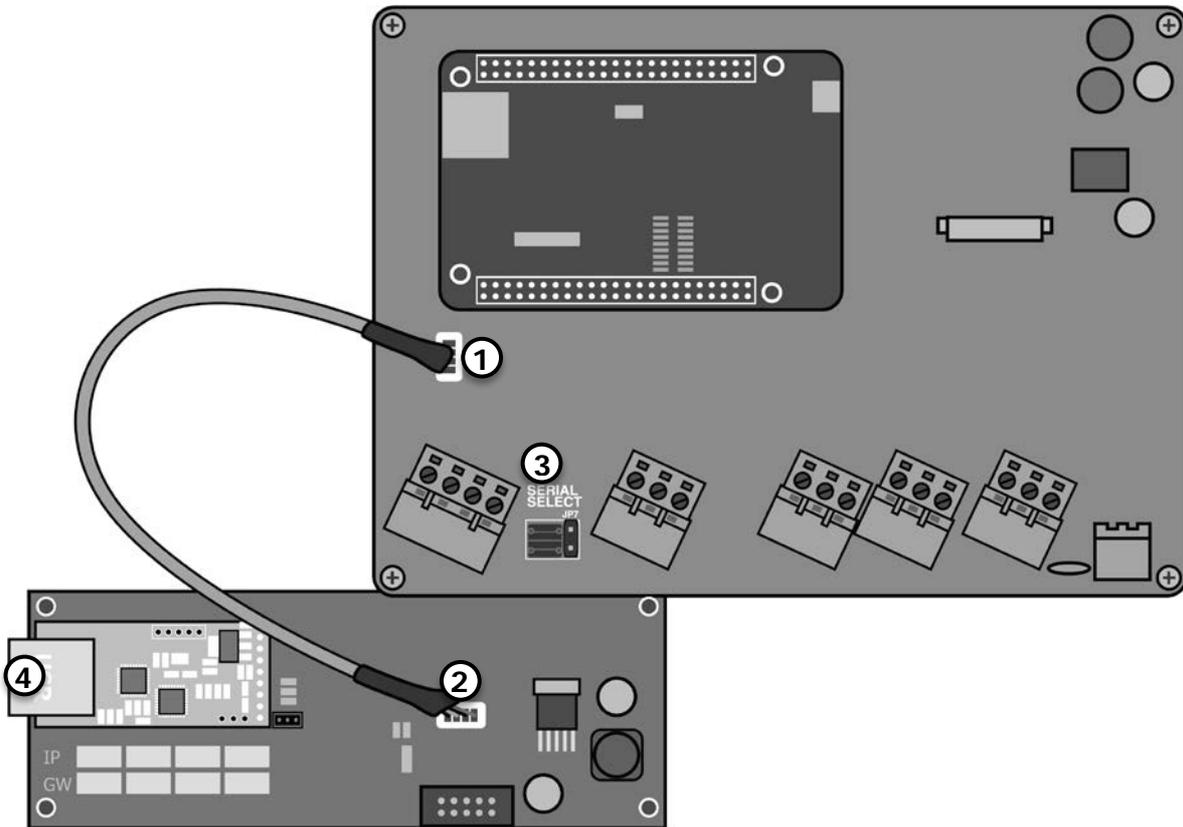


To set up the network successfully, follow these steps:

1. Configure all Ethernet Modules installed on the Nemlinks and 8-way Relay Boards by referring to section 5 of this document.
2. For the connection setup between the PC and FG7 module, refer to the FG7 installer manual. The PC to FG7 link is optional to run the NEMTEK Fenceprobe software.

6 Ethernet Network Setup B

3. For the FG7:

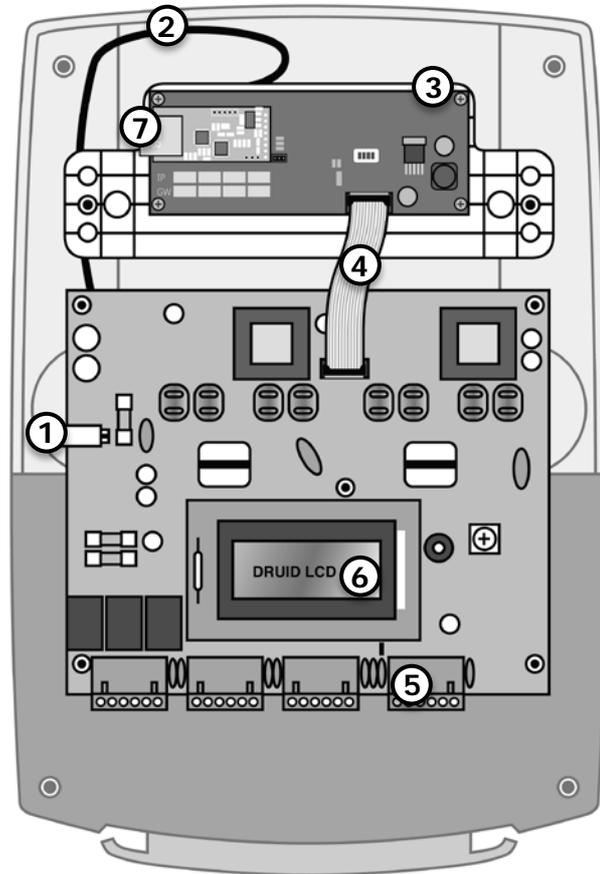


- Disconnect the power and open the NEMTEK FG7 (Refer to the FG7 Installer Manual).
- Connect the supplied FG7-Nemlink pigtail to the FG7 J1 connector. [1]
- Connect the other end of the pigtail to the Nemlink J1 connector. [2]
- Configure the SERIAL SELECT jumper JP7 to TTL. No other jumpers need to be changed. Refer to the Installer Manual for a complete list of jumper configurations. [3]
- Close the FG7.
- Connect the FG7 to a port on the ethernet switch (the port number does not matter) with an ethernet cable. [4]
- Power up the FG7.
- Configure the FG7 software by referring to the FG7 Installer Manual.



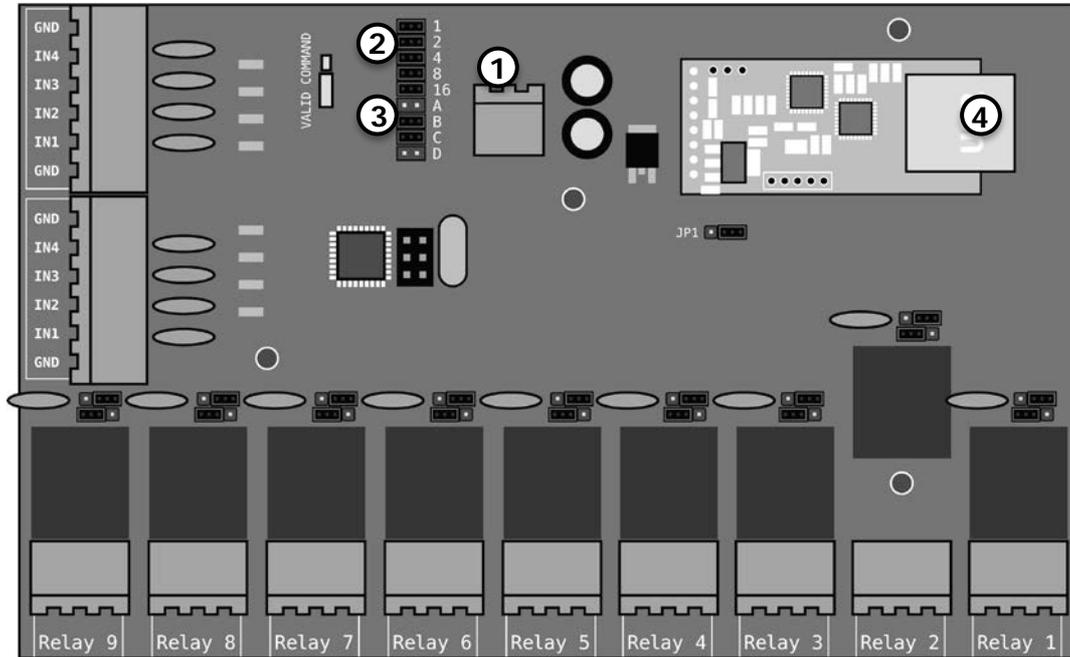
6 Ethernet Network Setup C

4. For the Druid LCD 2x energizer:
 - a. Disconnect the energizer mains and battery power. [1, 2]
 - b. Install the Nemlink board on top of the battery brace and fasten with 4 screws. [3]
 - c. Install the 10-way ribbon cable between the energizer and Nemlink board. [4]
 - d. Connect a keypad to the energizer. [5]
 - e. Ensure the energizer is restored to factory default:
 - i. Reconnect the battery power. [2]
 - ii. Reconnect the mains power. [1]
 - iii. Within 60 seconds of reconnecting the power, enter 2389# on the keypad.
 - f. Enter installer mode by entering 012345*0# on the keypad. Ensure the energizer LCD display turns purple. [6]
 - g. Configure the network address from by entering 51xx*#, where xx is the address from 1 to 32. Energizer addresses must be chronologically configured starting at 1. For example, three energizers on a network with addresses 5, 18 and 22 is not allowed, as they need to be addressed 1, 2 and 3. Relay boards and energizers are addressed separately from 1 to 32.
 - h. Exit installer mode by entering *#. Ensure the energizer LCD display turns blue. [6]
 - i. Ensure the energizer network address is displayed on the LCD. [6]
 - j. Connect the energizer to a port on the ethernet switch (the port number does not matter) with an ethernet cable. [7]
 - k. Route the ethernet cable out the bottom of the energizer enclosure and install the lid.



6 Ethernet Network Setup D

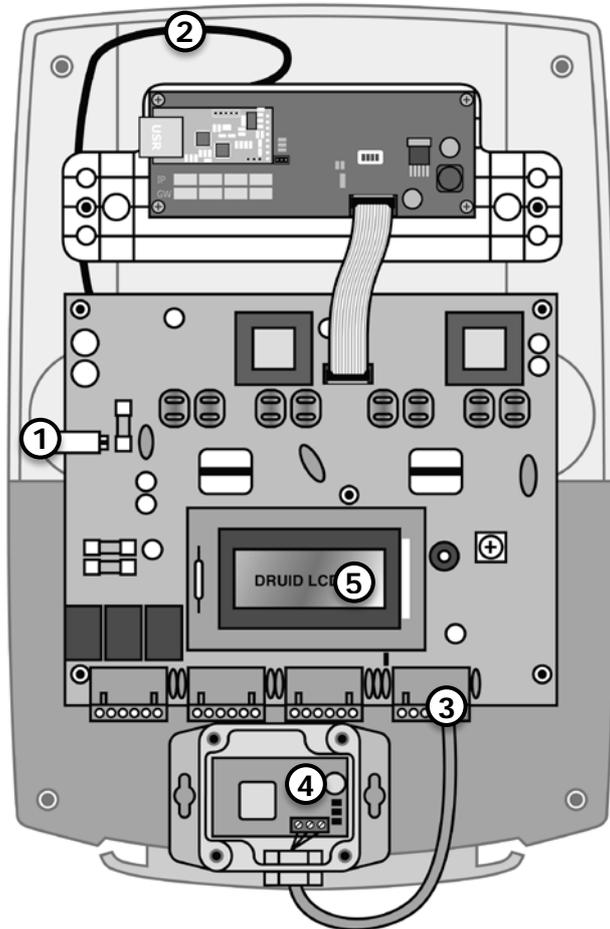
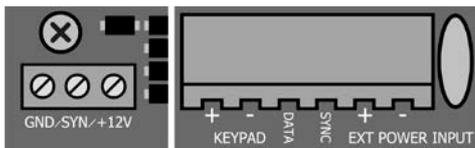
5. For the Ethernet 8-way Relay Board:



- Disconnect the power connector. [1]
- Configure the address of each relay board chronologically using jumpers JP7 1 to 16. When all jumpers are populated, the address is 1. When a jumper is removed, the corresponding number will be added to the network address. For example, if jumpers 1, 4 and 8 are removed, the address will be $1+1+4+8=14$. The first relay board in the network **MUST** be configured as address 1, the second as address 2 etc. Addressing, for example, 3 boards in the network with addresses 3, 6 and 20 is not allowed, as their addresses must be 1, 2 and 3. Relay boards and energizers are addressed separately from 1 to 32. Relay boards and energizers are addressed separately from 1 to 32. On the FG7 module, an address offset of 32 is added to all relay boards. Therefore, relay board 1 will be referred to as 33 ($1+32$), relay board 2 as 34 ($2+32$) etc. on the FG7. [2]
- Ensure jumpers JP5 B and C are populated. Jumpers JP5 A and D can either be populated or not. [3]
- Connect the relay board to a port on the ethernet switch (the port number does not matter) with an ethernet cable. [4]
- Power up the relay board (The NEMTEK Power Pack can be used to power the relay board).

6 Ethernet Network Setup E

6. For the NEMTEK GPS Module:
 - a. Disconnect the energizer mains and battery power. [1, 2]
 - b. Connect connecting the GPS module's power (marked GND and +12V) and synchronisation line (marked SYN), to the energizer's external power (marked EXT POWER INPUT + and -) and synchronisation line (marked SYNC), respectively. [3, 4]

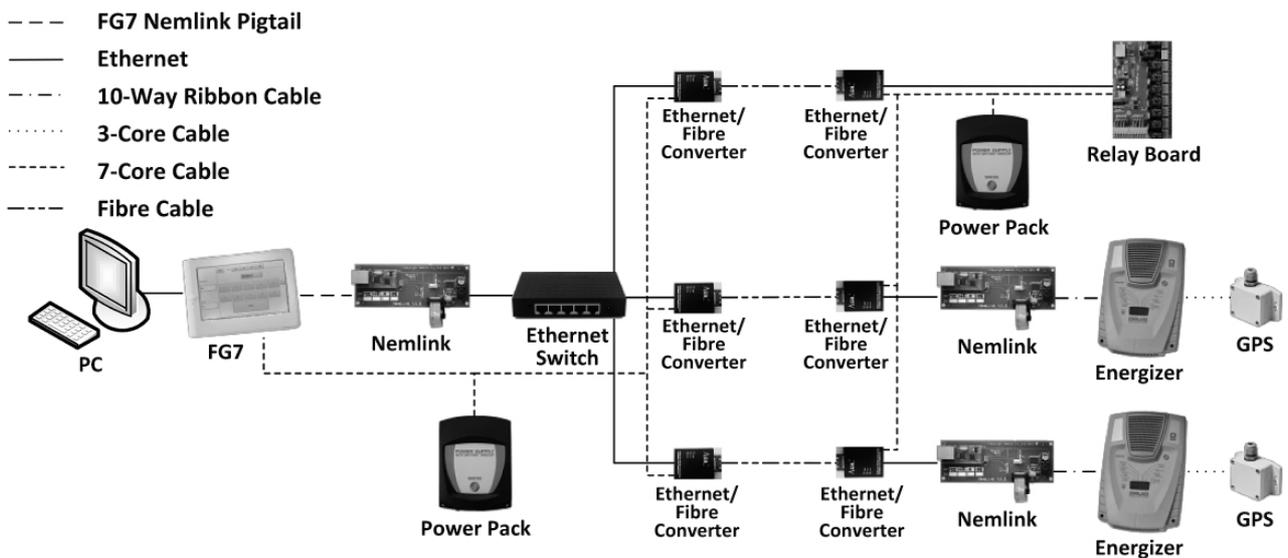


- c. Connect a keypad to the energizer. [3]
- d. Connect the battery and mains power. [2, 1]
- e. Enter installer mode by entering 012345*0# on the keypad. Ensure the energizer LCD display turns purple. [5]
- f. Configure passive synchronisation (GPS synchronisation) by entering 5031*#.
- g. Exit installer mode by entering *#. Ensure the energizer LCD display turns blue. [5]
- h. The red SYNC LED on the GPS module will start flashing if a GPS signal was obtained. The time to obtain a signal will vary depending on the signal strength. Ensure the GPS module is not obstructed to the sky by metal or thick concrete structures, which will lead to a loss of signal.
- I Route the GPS cable out the bottom of the energizer enclosure and install the lid.
- j. The energizer will automatically go into low voltage mode if the synchronisation GPS signal is lost. A synchronisation error will also be displayed on the FG7 screen, under the energizer tab.

6 Ethernet Network Setup E

6.2 Ethernet/Optic Fibre Network Setup

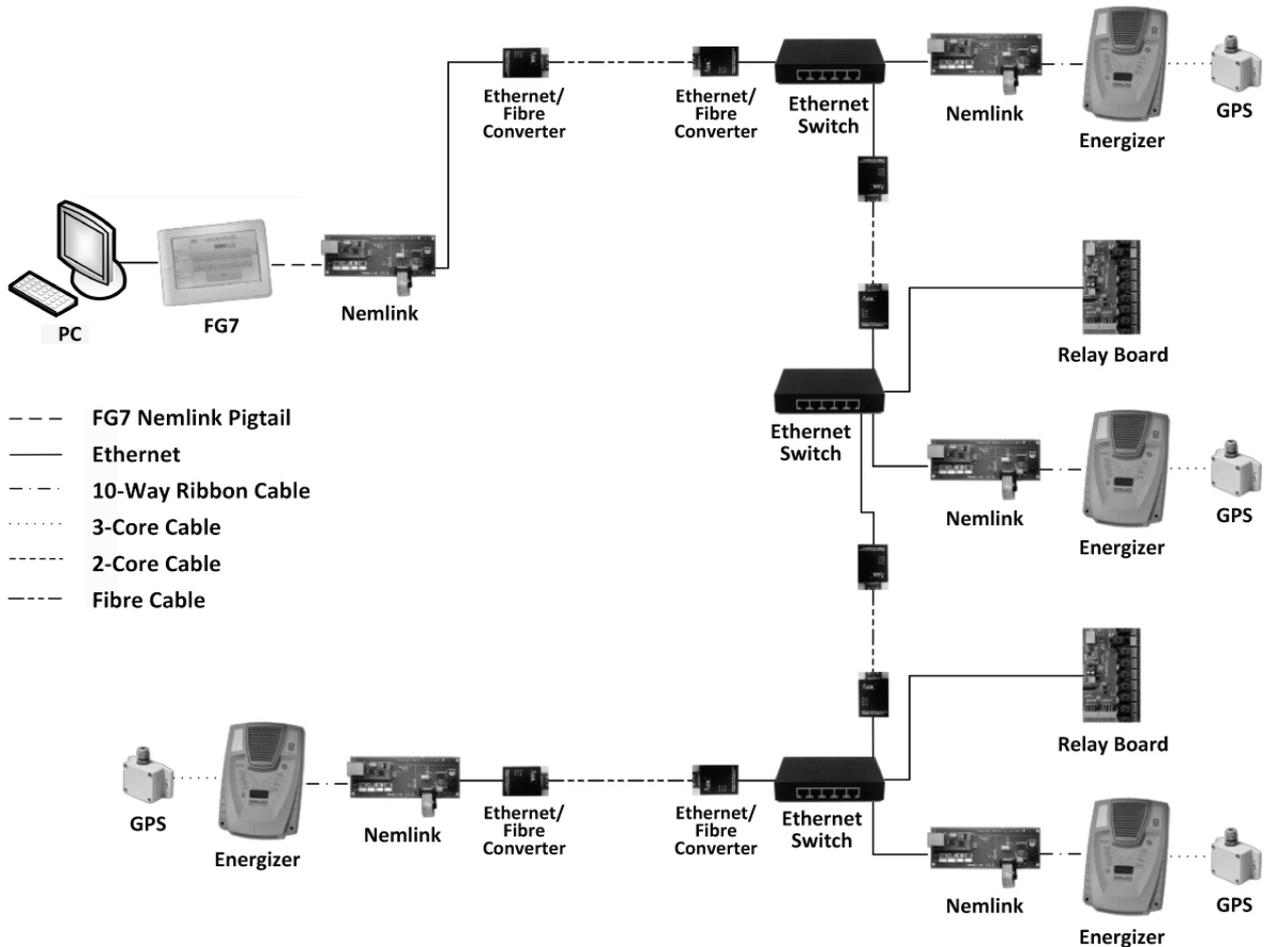
Where ethernet communication further than 100m are required for the network mentioned in section 6, the long-distance cables can be replaced with optic fibre, as shown in the figure below. The ethernet signals are converted to and from optic signals, by using a pair of ethernet/optic fibre converters. Either Single-Mode converters and cable, with a maximum distance of 20km, or Multi-Mode converter and cable, with a maximum distance of 2km, may be used. These converters require a 12V dc power supply, which can be supplied by the NEMTEK Power Pack. The rest of the network configuration remains the same as explained in section 6.1.



6 Ethernet Network Setup F

6.3 Ethernet/Optic Fibre Ring Example

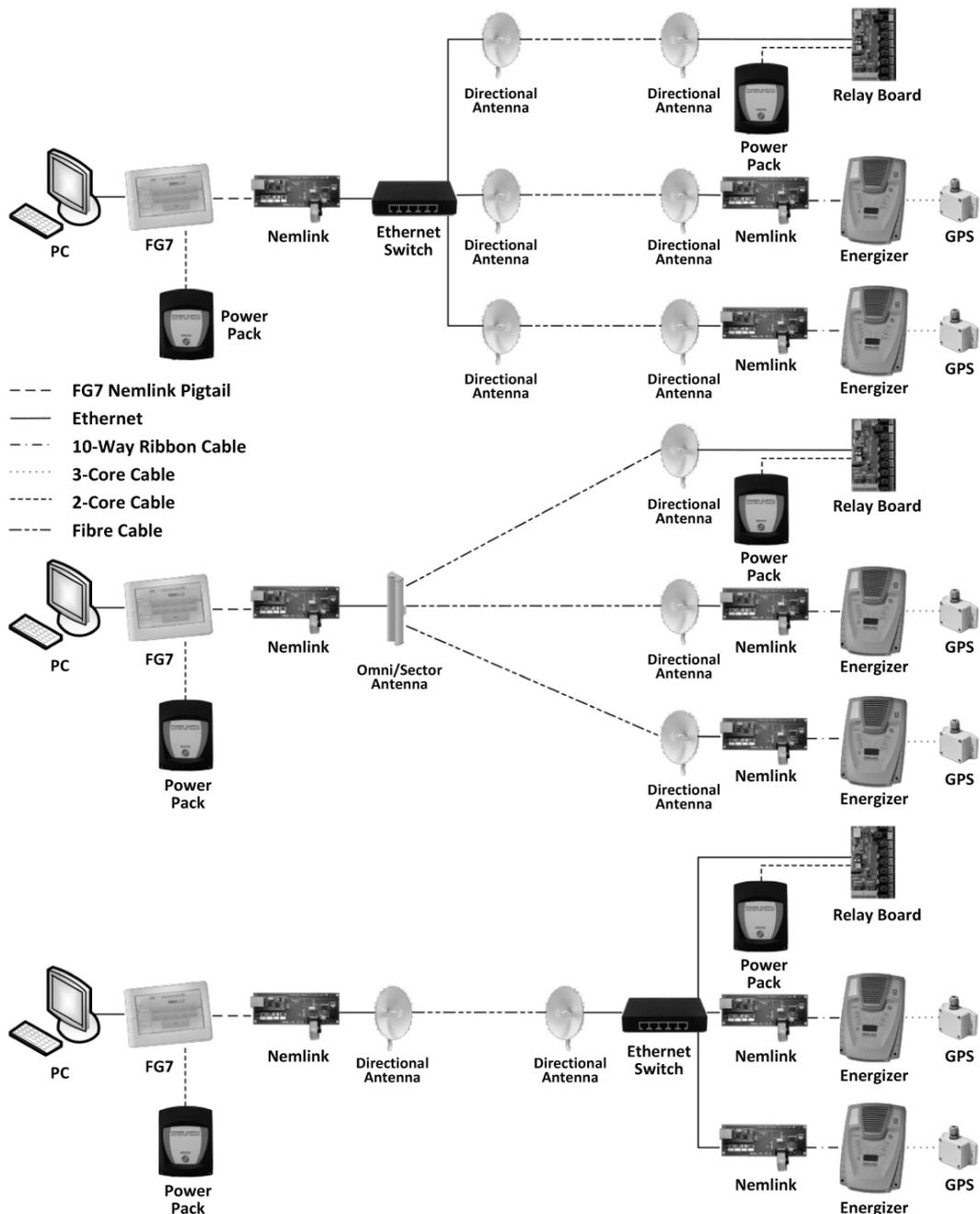
The ethernet/optic fibre network discussed in section 7 may be installed in a ring-like fashion as shown in the figure below, by using multiple network switches. This is useful when optic fibre cables are installed along the perimeter fence/wall and energizers or IO boards need to be installed consecutively near the fence/wall. More than one energizer or IO board can be installed on any ethernet switch as long as the total number of energizers and IO boards in the network are both less or equal than 32. Note the power supplies were omitted, but can be installed as in section 7.



6 Ethernet Network Setup G

6.4 Ethernet/Wireless Network Setup

Long distance ethernet cables may also be replaced with wireless technology for ease of installation. Different topologies are possible depending on the client's requirements as shown in the figures below. The software setup explained in this document will be identical for the different topologies. Note that all antennas depicted have built-in radios.



6 Ethernet Network Setup H

The antennas should be set up and configured to the specific manufacturer requirements. The network parameters should be as follows:

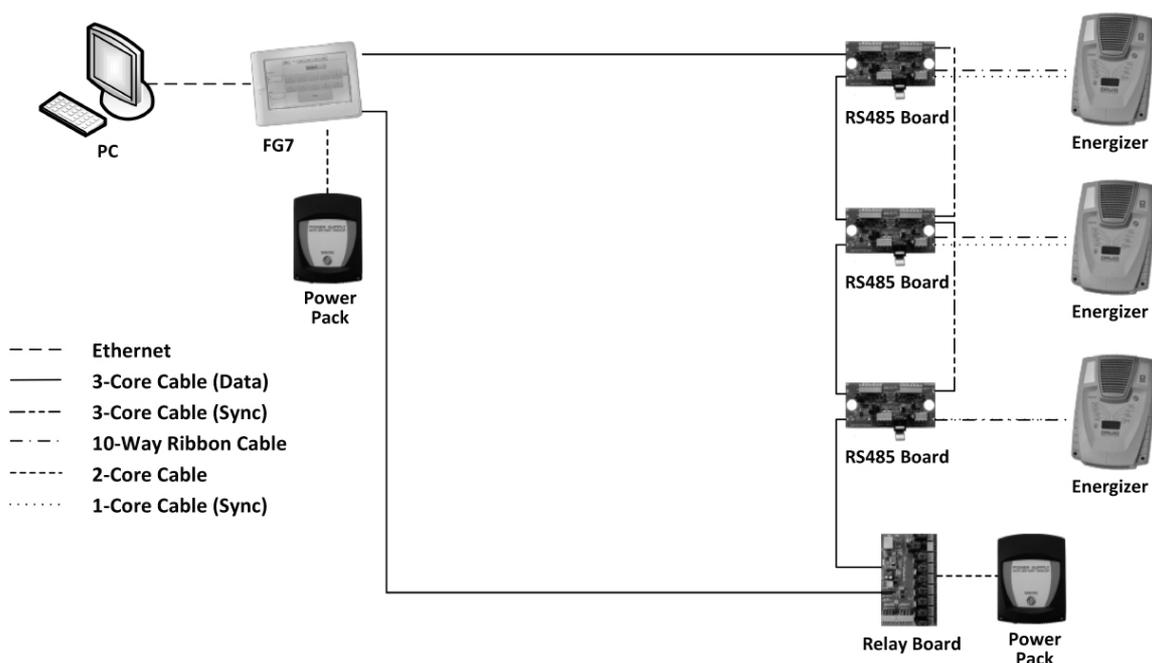
- a. IP address: Should be in the same IP range as the rest of the NEMTEK network devices and all antenna should have a unique static IP. Don not use DHCP. See section 5 of this document for further details.
- b. Subnet mask: Should be in the same as the rest of the NEMTEK network devices (recommended 255.255.255.0). See section 5 of this document for further details.
- c. Network mode (all antennas): Bridge
- d. Wireless mode (antenna on FG7 side): Access point
- e. Wireless mode (antenna on energizer/relay board side): Station

7 RS485 Network A

By using a NEMTEK FG7 module and associated hardware, remote control and feedback are possible to multiple Druid LCD 2x and 8-way Relay Boards, via an RS485 daisy chain or star network. The RS485 board also has the capability to synchronise energizer pulsing on a separate RS485 synchronisation channel. The synchronisation network is separate from the data network and can be configured for daisy chain or star, irrespective of the data network configuration. Alternatively, GPS synchronisation, as discussed in section 6, can still be used if required.

7.1 Daisy Chain Network Setup

The example diagram below illustrates the required hardware and wiring required for an RS485 daisy chain network setup. The NEMTEK Power Pack may be used to provide a 12V supply with battery backup to the FG7 and 8-way Relay Board. Note that all RS485 3-core cables should have a maximum length of 1000m and the 10-way ribbon should have a maximum length of 1m. It is recommended that the 3-core cables for RS485 communication are shielded and that the shields are grounded only on one end of the cable to prevent ground loops. Ensure that the daisy chain forms a complete ring by wiring the DATA OUT terminal of each RS485 device to the subsequent device's DATA IN terminal, as in the figure below.

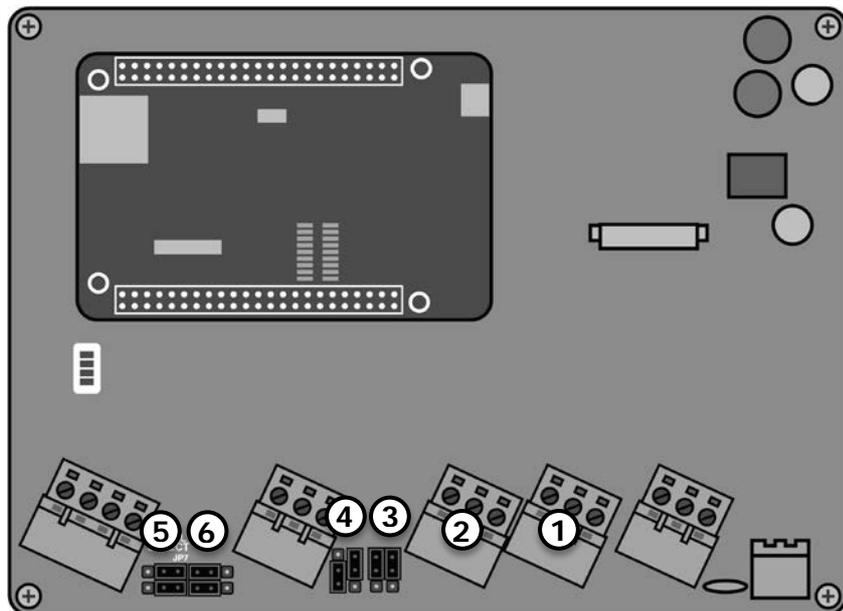


7 RS485 Network B

To set up the network, follow these steps:

1. For the connection setup between the PC and FG7 module, refer to the FG7 installer manual. The PC to FG7 link is optional to run the NEMTEK Fenceprobe software.

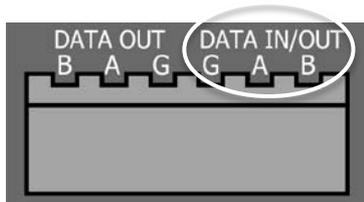
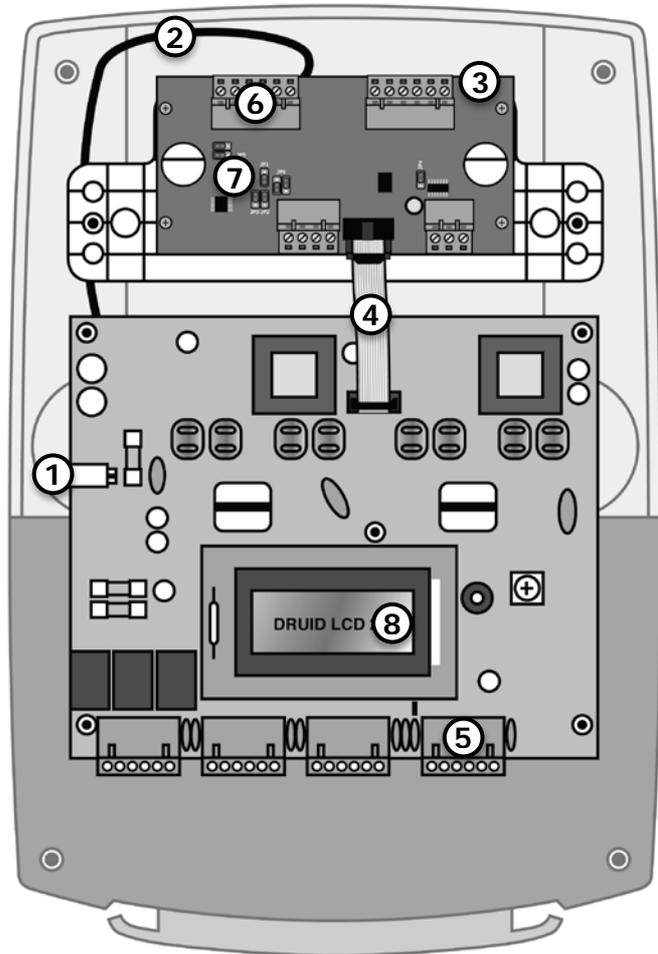
2. For the FG7:



- a. Disconnect the power and open the NEMTEK FG7 (Refer to the FG7 Installer Manual).
- b. Connect the GND, A and B wires coming from the DATA OUT of the previous RS485 network device to the RS485 IN GND, A and B terminals of the FG7. [1]
- c. Connect the GND, A and B wires going to the next RS485 network device to the RS485 OUT GND, A and B terminals of the FG7. [2]
- d. Configure the LINE BIAS jumper JP1 to DISABLE. [3]
- e. Configure the RX EN and TX EN jumpers JP2 and JP3 to ENABLE. [4]
- f. Configure the SERIAL SELECT jumper JP7 to RSXXX. [5]
- g. Configure the RSXXX jumper JP8 to RS485. [6]
- h. Close the FG7.
- i. Power up the FG7, when all network connections have been done.
- j. Configure the FG7 software by referring to the FG7 Installer Manual.

7 RS485 Network C

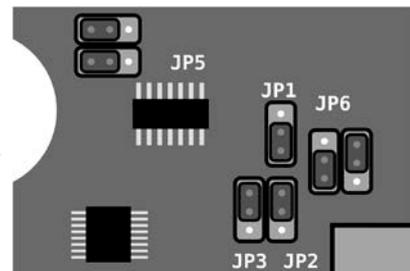
3. For the Druid LCD 2x energizer:
 - a. Disconnect the energizer mains and battery power. [1, 2]
 - b. Install the RS485 board on top of the battery brace and fasten with 4 screws. [3]
 - c. Install the 10-way ribbon cable between the energizer and RS485 board. [4]
 - d. Connect a keypad to the energizer. [5]
 - e. Connect the GND, A and B wires coming from the DATA OUT of the previous RS485 network device to the DATA IN GND (marked G), A and B terminals of the RS485 board. [6]



- f. Connect the GND, A and B wires going to the next RS485 network device to the DATA OUT GND (marked G), A and B terminals of the RS485 board. [6]



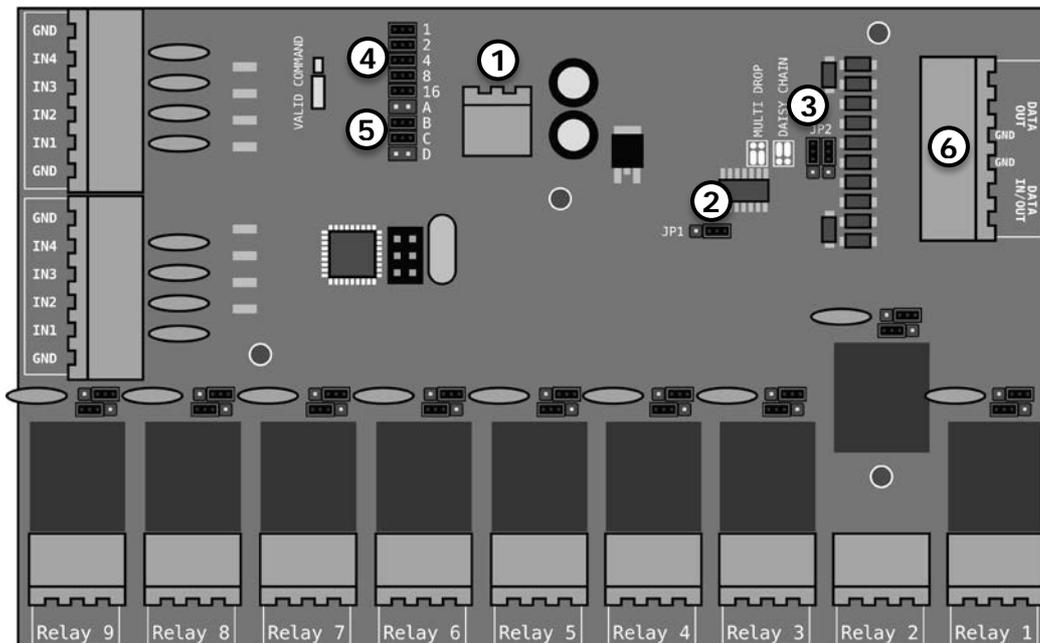
- g. Configure jumpers JP1, JP2, JP3, JP5 and JP6 like in the figure on the right. For jumper functions refer to the RS485 board installer manual. [7]



7 RS485 Network D

- h. Ensure the energizer is restored to factory default:
 - i. Reconnect the battery power. [2]
 - ii. Reconnect the mains power. [1]
 - iii. Within 60 seconds of reconnecting the power, enter 2389# on the keypad.
- i. Enter installer mode by entering 012345*0# on the keypad. Ensure the energizer LCD display turns purple. [8]
- j. Configure the network address from by entering 51xx*#, where xx is the address from 1 to 32. Energizer addresses must be chronologically configured starting at 1. For example, three energizers on a network with addresses 5, 18 and 22 is not allowed, as they need to be addressed 1, 2 and 3. Relay boards and energizers are addressed separately from 1 to 32.
- k. Exit installer mode by entering *#. Ensure the energizer LCD display turns blue. [8]
- l. Ensure the energizer network address is displayed on the LCD. [8]
- m. Route the cables out the bottom of the energizer enclosure and install the lid.

4. For the RS485 8-way Relay Board:

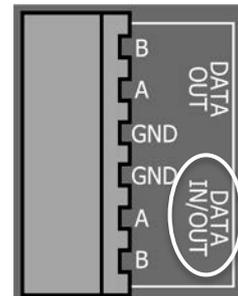


- a. Disconnect the power connector. [1]
- b. Configure jumper JP1 for "YES" for data pass through. [2]
- c. Configure jumper JP2 for daisy chain. [3]

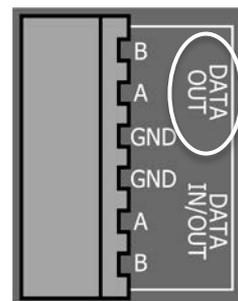
7 RS485 Network E

- d. Configure the address of each relay board chronologically using jumpers JP7 1 to 16. When all jumpers are populated, the address is 1. When a jumper is removed, the corresponding number will be added to the network address. For example, if jumpers 1, 4 and 8 are removed, the address will be $1+1+4+8 = 14$. The first relay board in the network MUST be configured as address 1, the second as address 2 etc. Addressing, for example, 3 boards in the network with addresses 3, 6 and 20 is not allowed, as their addresses must be 1, 2 and 3. Relay boards and energizers are addressed separately from 1 to 32. On the FG7 module, an address offset of 32 is added to all relay boards. Therefore, relay board 1 will be referred to as 33 ($1+32$), relay board 2 as 34 ($2+32$) etc. on the FG7. [4]
- e. Ensure jumpers JP5 B and C are populated. Jumpers JP5 A and D can either be populated or not. [5]

- f. Connect the GND, A and B wires coming from the DATA OUT of the previous RS485 network device to the DATA IN GND, A and B terminals of the relay board. [6]



- g. Connect the GND, A and B wires going to the next RS485 network device to the DATA OUT GND, A and B terminals of the relay board. [6]

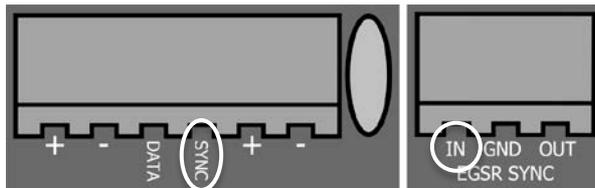
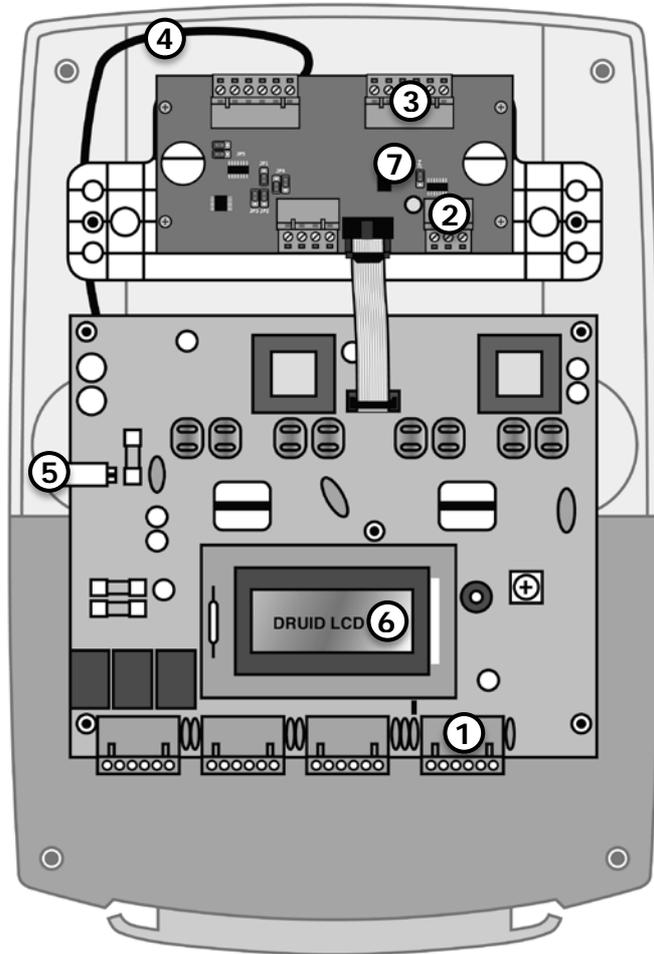


- h. Power up the relay board once all data connections in the daisy chain ring has been completed. (The NEMTEK Power Pack can be used to power the relay board)

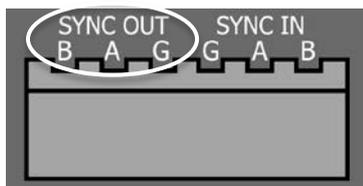
7 RS485 Network F

5. For energizer synchronisation:

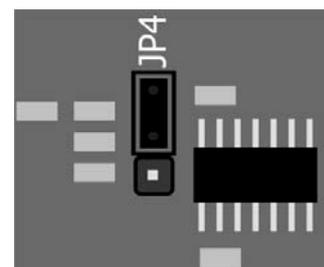
- a. Follow steps 3. a – d in this section to install the RS485 board and keypad, if not already completed. Ensure the power is disconnected before continuing.
- b. Choose one energizer in the network that will be used as the master for synchronisation. Connect a single core wire from the master energizer's sync terminal (marked SYNC) to the synchronisation input terminal (marked IN) of the RS485 board. [1, 2]



- c. Connect the SYNC GND, A and B wires going to the next energizer's RS485 synchronisation terminals to the SYNC OUT GND (marked G), A and B terminals of the master energizer's RS485 board. [3]

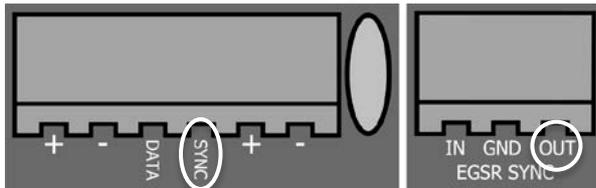


- d. Configure jumper JP4 like in the figure on the right. [7]

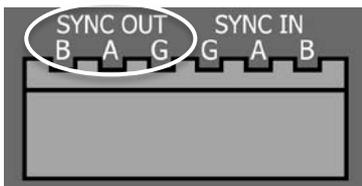


7 RS485 Network G

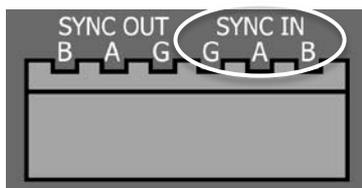
- e. Reconnect the battery and mains power. [4, 5]
- f. Repeat step a. and d. for all other slave energizers on the network.
- g. Connect a single core wire from the slave energizer's sync terminal (marked SYNC) to the synchronisation output terminal (OUT) of the RS485 board. [1, 2]



- h. Connect the SYNC GND, A and B wires going to the next energizer's RS485 synchronisation terminals to the SYNC OUT GND (marked G), A and B terminals of the energizer's RS485 board. If this is the last energizer in the network DO NOT connect the SYNC OUT terminals to the first energizer. [3]



- i. Connect the SYNC GND, A and B wires coming from the previous energizer's RS485 synchronisation terminals to the SYNC IN GND (marked G), A and B terminals of the energizer's RS485 board. [3]

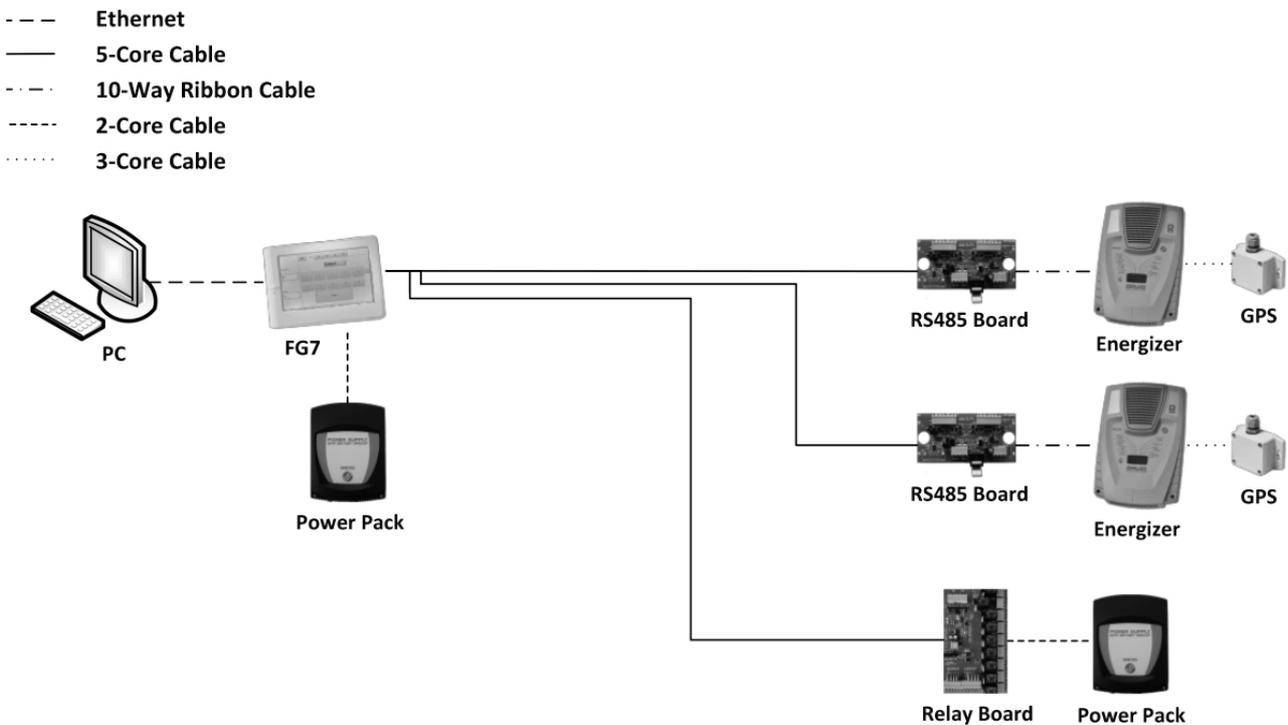


- j. Enter installer mode by entering 012345*0# on the keypad. Ensure the energizer LCD display turns purple. [6]
- k. Enter 5030*# to put the slave energizer in passive synchronisation mode. Do not perform this step for the master energizer.
- l. Exit installer mode by entering *#. Ensure the energizer LCD display turns blue. [6]
- m. Route the cables out the bottom of the energizer enclosure and install the lid.
- n. All energizers on the network should now pulse at the same time when activated.

7 RS485 Network H

7.2 Star Network Setup

The example diagram below illustrates the required hardware and wiring required for an RS485 star network setup. The NEMTEK Power Pack may be used to provide a 12V supply with battery backup to the FG7 and 8-way Relay Board. Note that all RS485 5-core cables should have a maximum length of 1000m and the 10-way ribbon should have a maximum length of 1m. It is recommended that the 5-core cables for RS485 communication are shielded and that the shields are grounded only at one end of the cable to prevent ground loops.

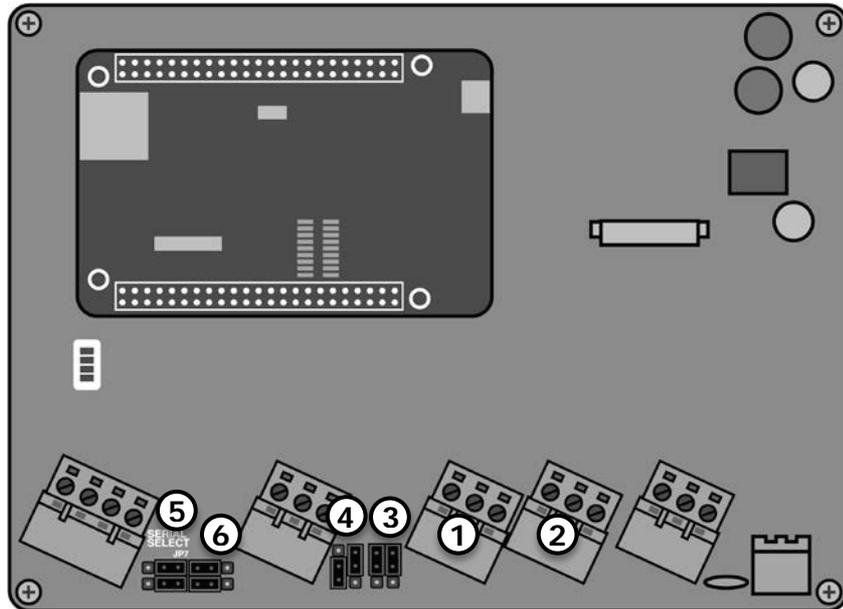


To set up the network, follow these steps:

1. For the connection setup between the PC and FG7 module, refer to the FG7 installer manual. The PC to FG7 link is optional to run the NEMTEK Fenceprobe software.

7 RS485 Network I

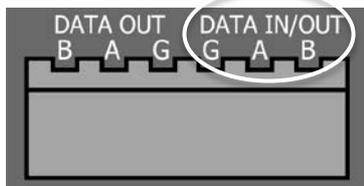
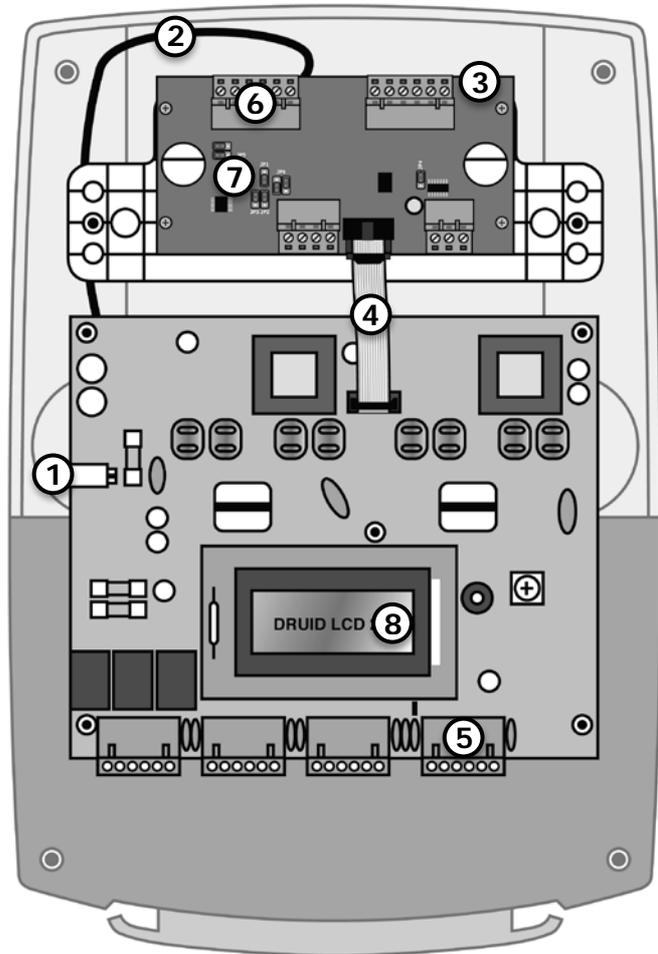
2. For the FG7:



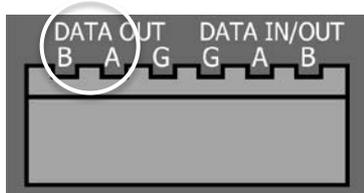
- a. Disconnect the power and open the NEMTEK FG7 (Refer to the FG7 Installer Manual).
- b. Connect the GND, A and B wires going to the all RS485 network device IN terminals, as explained in steps 3 and 4, to the RS485 OUT GND, A and B terminals of the FG7. Since more than one network device may be connected to the FG7, it will be necessary to add all the wires together in the same screw terminal. [1]
- c. Connect the A and B wires going to the all RS485 network device OUT terminals, as explained in steps 3 and 4, to the RS485 IN A and B terminals of the FG7. Since more than one network device may be connected to the FG7, it will be necessary to add all the wires together in the same screw terminal. The ground wire does not need to be connected in this step. [2]
- d. Configure the LINE BIAS jumper JP1 to ENABLE. [3]
- e. Configure the RX EN and TX EN jumpers JP2 and JP3 to ENABLE. [4]
- f. Configure the SERIAL SELECT jumper JP7 to RSXXX. [5]
- g. Configure the RSXXX jumper JP8 to RS485. [6]
- h. Close the FG7.
- i. Power up the FG7, when all network connections have been done.
- j. Configure the FG7 software by referring to the FG7 Installer Manual.

7 RS485 Network J

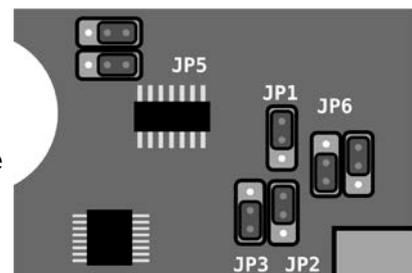
3. For the Druid LCD 2x energizer:
 - a. Disconnect the energizer mains and battery power. [1, 2]
 - b. Install the RS485 board on top of the battery brace and fasten with 4 screws. [3]
 - c. Install the 10-way ribbon cable between the energizer and RS485 board. [4]
 - d. Connect a keypad to the energizer. [5]
 - e. Connect the GND, A and B wires coming from the DATA OUT of the FG7 to the DATA IN GND (marked G), A and B terminals of the RS485 board. [6]



- f. Connect the A and B wires coming from the DATA IN of the FG7 to the DATA OUT A and B terminals of the RS485 board. It is not necessary to connect the GND terminals in this step. [6]

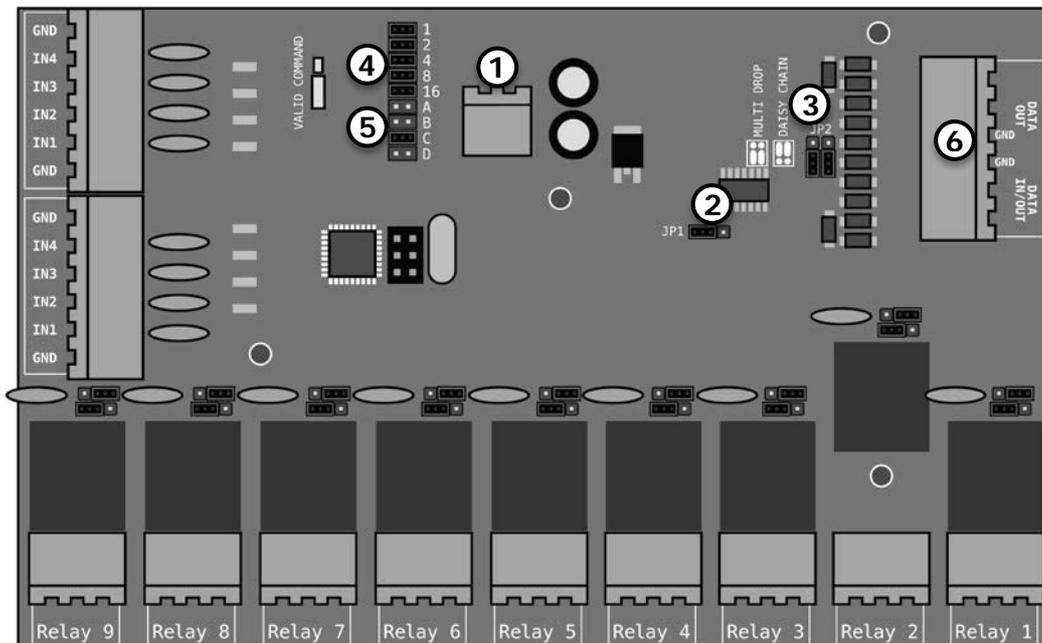


- g. Configure jumpers JP1, JP2, JP3, JP5 and JP6 like in the figure on the right. For jumper functions refer to the RS485 board installer manual. [7]



7 RS485 Network K

- h. Ensure the energizer is restored to factory default:
 - i. Reconnect the battery power. [2]
 - ii. Reconnect the mains power. [1]
 - iii. Within 60 seconds of reconnecting the power, enter 2389# on the keypad.
 - i. Enter installer mode by entering 012345*0# on the keypad. Ensure the energizer LCD display turns purple. [8]
 - j. Configure the network address from by entering 51xx*#, where xx is the address from 1 to 32. Energizer addresses must be chronologically configured starting at 1. For example, three energizers on a network with addresses 5, 18 and 22 is not allowed, as they need to be addressed 1, 2 and 3. Relay boards and energizers are addressed separately from 1 to 32.
 - k. Exit installer mode by entering *#. Ensure the energizer LCD display turns blue. [8]
 - l. Ensure the energizer network address is displayed on the LCD. [8]
 - m. Route the cables out the bottom of the energizer enclosure and install the lid.
4. For the RS485 8-way Relay Board:



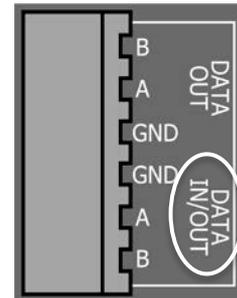
- a. Disconnect the power connector. [1]
- b. Configure jumper JP1 for "NO" for data pass through. [2]
- c. Configure jumper JP2 for daisy chain. [3]

7 RS485 Network L

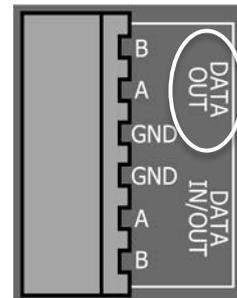
- d. Configure the address of each relay board chronologically using jumpers JP7 1 to 16. When all jumpers are populated, the address is 1. When a jumper is removed, the corresponding number will be added to the network address. For example, if jumpers 1, 4 and 8 are removed, the address will be $1+1+4+8=14$. The first relay board in the network MUST be configured as address 1, the second as address 2 etc. Addressing, for example, 3 boards in the network with addresses 3, 6 and 20 is not allowed, as their addresses must be 1, 2 and 3. Relay boards and energizers are addressed separately from 1 to 32. On the FG7 module, an address offset of 32 is added to all relay boards. Therefore, relay board 1 will be referred to as 33 ($1+32$), relay board 2 as 34 ($2+32$) etc. on the FG7. [4]

- e. Ensure jumpers JP5 C is populated and JP5 B not. Jumpers JP5 A and D can either be populated or not. [5]

- f. Connect the GND, A and B wires coming from the DATA OUT of the FG7 to the DATA IN GND, A and B terminals of the relay board. [6]



- g. Connect the GND, A and B wires coming from the DATA IN of the FG7 to the DATA OUT GND, A and B terminals of the relay board. [6]



- h. Power up the relay board once all data connections in the multi-drop network has been completed (The NEMTEK Power Pack can be used to power the relay board).

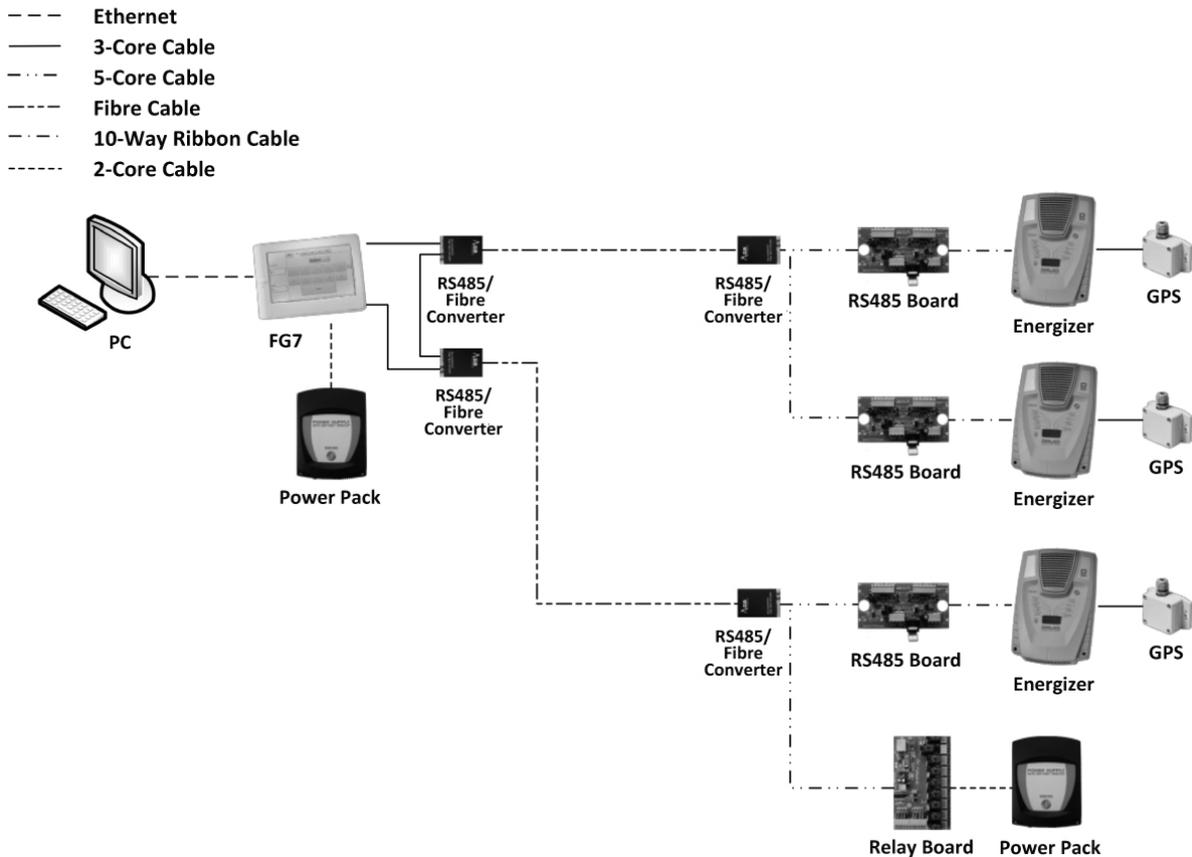
5. For the NEMTEK GPS Module:

For the GPS module setup refer to step 6 in section 6.1.

7 RS485 Network M

7.3 RS485/Optic Fibre Network Setup

Where RS485 communication further than 1000m are required, the long-distance cables can be replaced with optic fibre. The RS485 signals are converted to and from optic signals, by using a pair of RS485/optic fibre converters. Either Single-Mode converters and cable, with a maximum distance of 20km, or Multi-Mode converter and cable, with a maximum distance of 2km, may be used. These converters require a 12 Vdc power supply (not shown in figure), which can be supplied by the NEMTEK Power Pack. The diagrams below show the different possible optic fibre configurations. Note the wiring from the RS485/Fibre converter to the energizers or relay boards must be in a star topology and will not function correctly if wired in a daisy chain topology.



To set up the network, follow these steps:

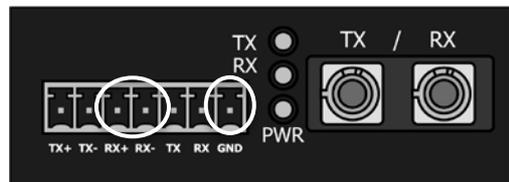
1. For the connection setup between the PC and FG7 module, refer to the FG7 installer manual. The PC to FG7 link is optional to run the NEMTEK Fenceprobe software.

7 RS485 Network N

2. For the FG7:
 - a. Set the FG7 up by following the steps in section 7.1
 - b. Connect the GND, RX+ and RX- wires going to the first RS485/fibre converter to the RS485 OUT GND, A and B terminals of the FG7 (see FG7 figure in section 7.1).
 - c. Connect the GND, TX+ and TX- wires coming from the of the last RS485/fibre converter back to the RS485 IN GND, A and B terminals of the FG7 (see FG7 figure in section 7.1).

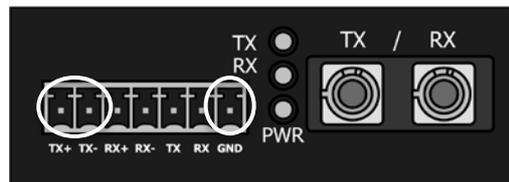
3. For the RS485/fibre converters on the FG7 side:

- a. Connect the GND, A and B wires coming from the output of the FG7 to the GND, RX+ and RX- of the first RS485/fibre converter.

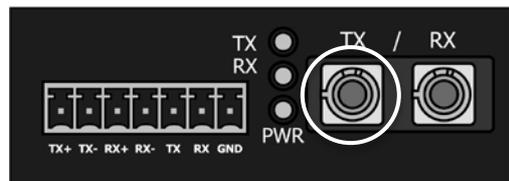


- b. Connect the GND, TX+ and TX- wires to the next RS485/fibre converter's GND, RX+ and RX- terminals, to form a chain.

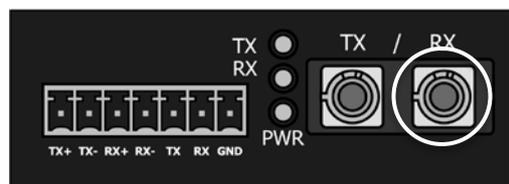
- c. Connect the GND, A and B wires going to the input of the FG7 to the GND, TX+ and TX- of the last RS485/fibre converter, to complete the chain.



- d. Connect the fibre optic cable going to the RX port of the RS485/fibre converter at the energizers or relay boards, to the TX port.



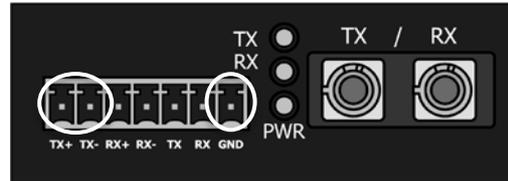
- e. Connect the fibre optic cable going to the TX port of the RS485/fibre converter at the energizers or relay boards, to the RX port.



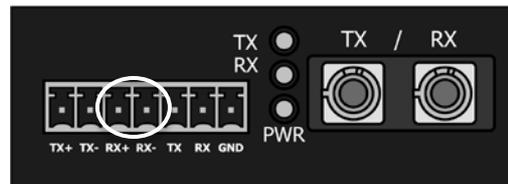
7 RS485 Network O

4. For the RS485/fibre converters on the energizer/relay board side:

- a. Connect the wires going to the DATA IN GND, A and B of all energizers and relay boards, to the GND, TX+ and TX- connectors of the RS485/fibre converter.



- b. Connect the wires going to the DATA OUT A and B of all energizers and relay boards, to the RX+ and RX- connectors of the RS485/fibre converter.



It is not necessary to connect the GND wire.

- c. Connect the optic fibre cables as mentioned for the converters on the FG7 side.

5. For the Druid LCD 2x energizer:

Set up the energizer by following the steps in section 7.2 and replacing the FG7 with the RS485/fibre converter. The converter's TX+ and TX- terminals are the same as the FG7's RS485 Output A and B terminals. The converter's RX+ and RX- terminals are the same as the FG7's RS485 Input A and B terminals.

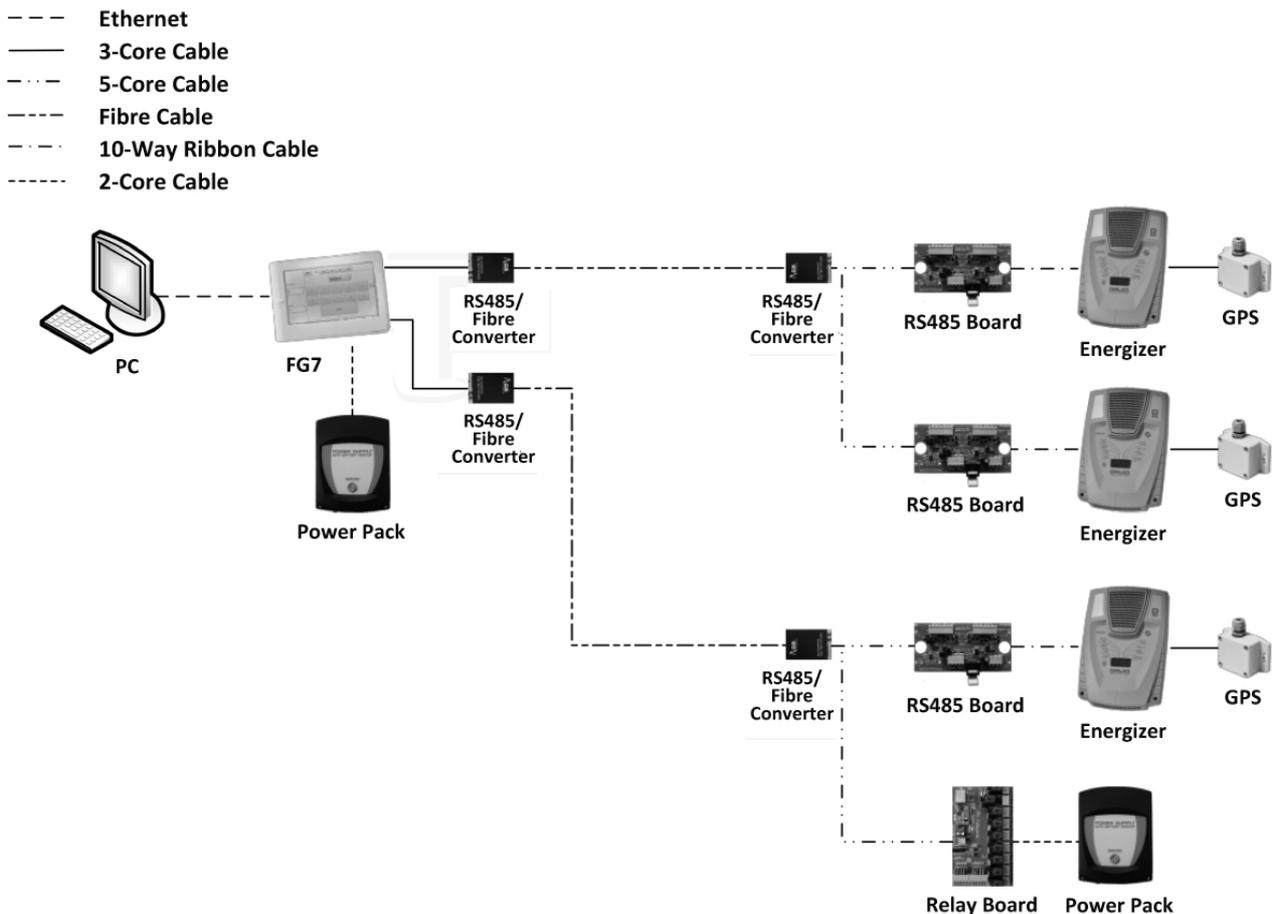
6. For the RS485 8-way Relay Board:

Set up the relay board by following the steps in section 7.2 and replacing the FG7 with the RS485/fibre converter. The converter's TX+ and TX- terminals are the same as the FG7's RS485 Output A and B terminals. The converter's RX+ and RX- terminals are the same as the FG7's RS485 Input A and B terminals.

7. For the NEMTEK GPS Module:

For the GPS module setup refer to step 6 in the section 6.1 section.

7 RS485 Network P



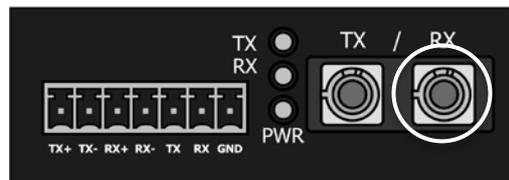
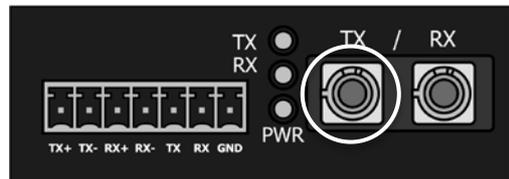
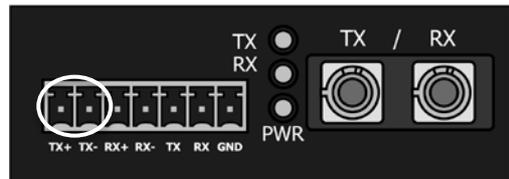
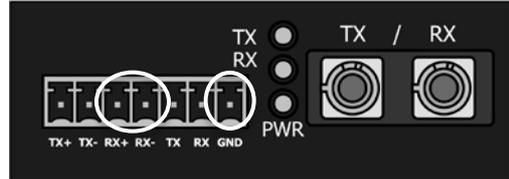
To set up the network, follow these steps:

1. For the connection setup between the PC and FG7 module, refer to the FG7 installer manual. The PC to FG7 link is optional to run the NEMTEK Fenceprobe software.
2. For the FG7:
 - a. Set the FG7 up by following the steps in section 7.2.
 - b. Connect the GND, RX+ and RX- wires going to all RS485/fibre converters to the RS458 OUT GND, A and B terminals of the FG7 (see FG7 figure in section 7.2).
 - c. Connect the GND, TX+ and TX- wires coming from all the RS485/fibre converters to the RS485 IN GND, A and B terminals of the FG7 (see FG7 figure in section 7.2).

7 RS485 Network Q

3. For the RS485/fibre converters on the FG7 side:

- Connect the GND, A and B wires coming from the output of the FG7 to the GND, RX+ and RX- of all the RS485/fibre converters.
- Connect the A and B wires going to the input of the FG7 to the TX+ and TX- of all the RS485/fibre converters. It is not necessary to connect the ground wire.
- Connect the fibre optic cable going to the RX port of the RS485/fibre converter at the energizers or relay boards, to the TX port.
- Connect the fibre optic cable going to the TX port of the RS485/fibre converter at the energizers or relay boards, to the RX port.



4. For the RS485/fibre converters on the energizer/relay board side:

Set up the RS485/fibre converters as explained in step 4 of the previous topology.

5. For the Druid LCD 2x:

Set up the energizer as explained in step 5 of the previous topology.

6. For the RS485 8-way Relay Board:

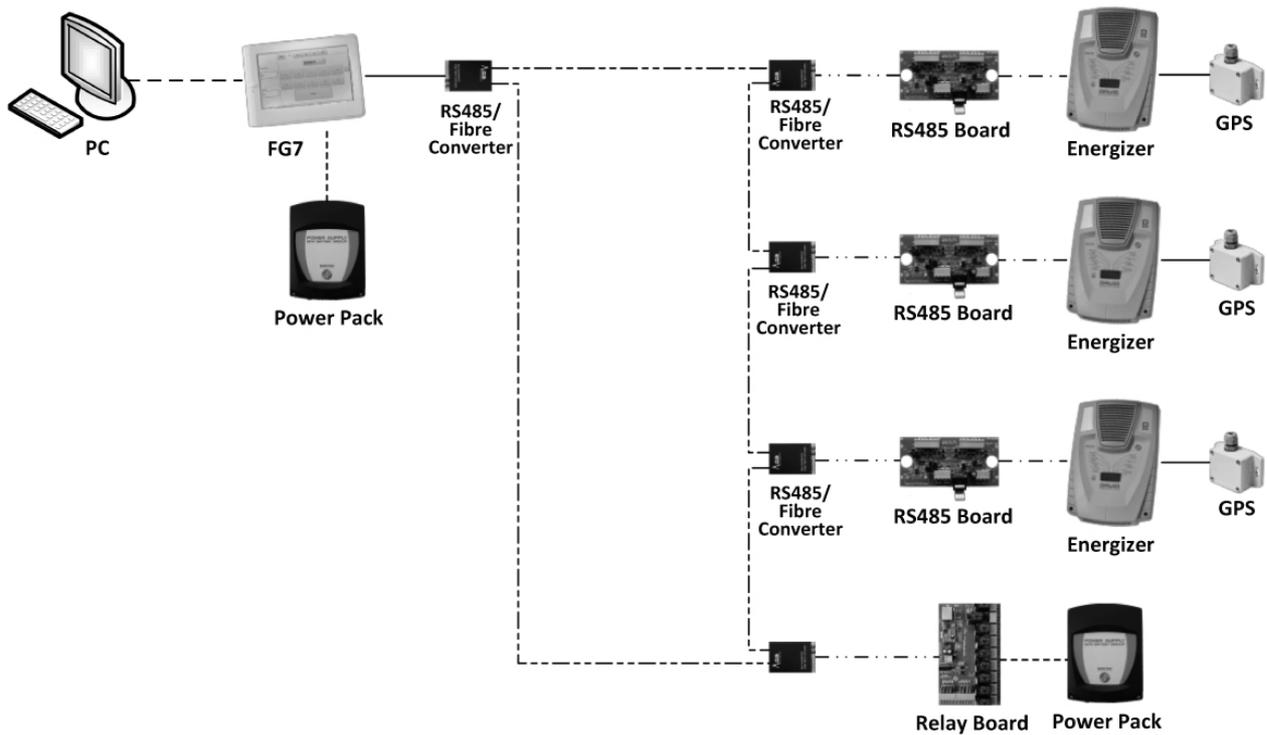
Set up the relay board as explained in step 6 of the previous topology.

7. For the NEMTEK GPS Module:

For the GPS module setup refer to step 6 in the section 6.1 section.

7 RS485 Network R

- Ethernet
- 3-Core Cable
- - - 5-Core Cable
- Fibre Cable
- - - - 10-Way Ribbon Cable
- 2-Core Cable



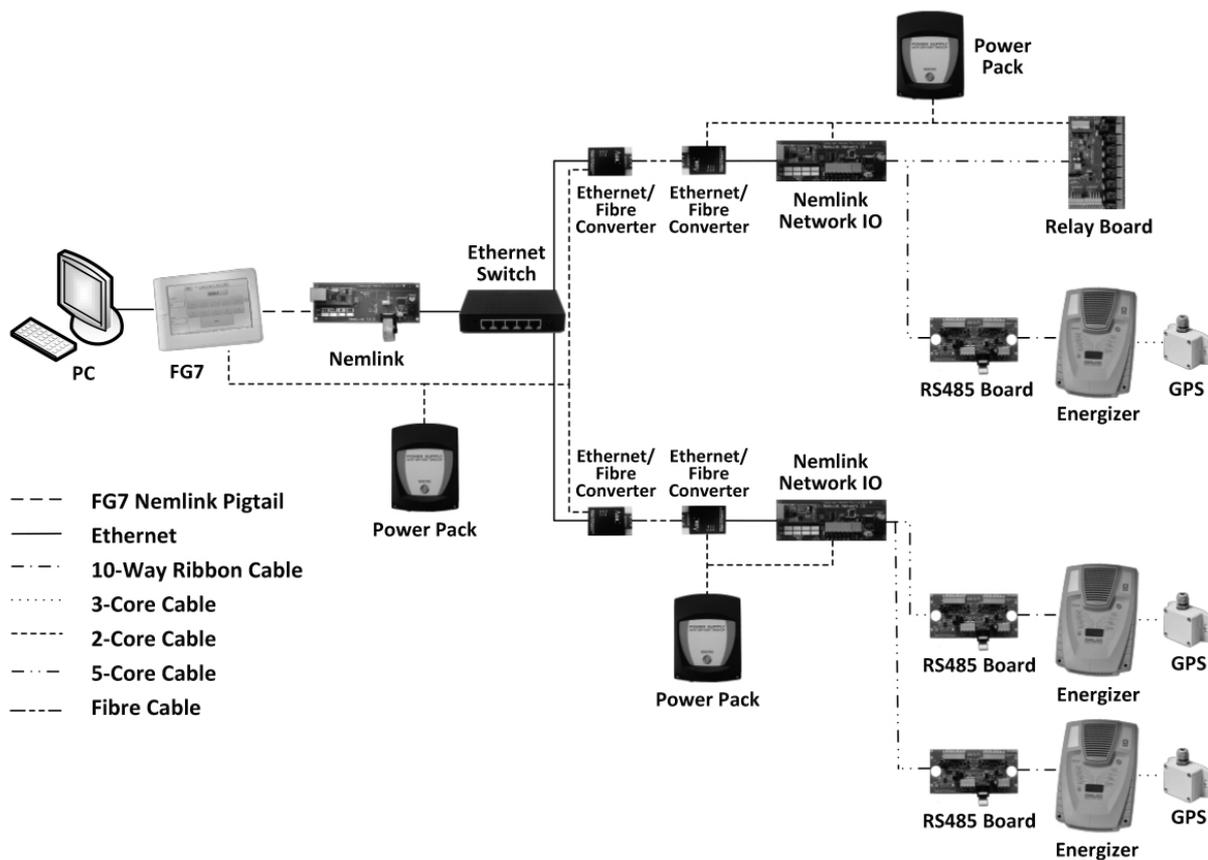
To set up the network, follow these steps:

1. For the connection setup between the PC and FG7 module, refer to the FG7 installer manual. The PC to FG7 link is optional to run the NEMTEK Fenceprobe software.
2. There will only be one RS485/fibre converter per network device (FG7, Energizer, Relay board) in this topology, but all wiring can be done as explained in the previous topology, except for the fibre connections.
3. Connect the converters' optic fibre ports in a daisy chain topology, making sure the previous converter's TX port is connected to the next converter's RX port. The last converter's TX port will must be connected back to the FG7's converter's RX port.

8 Ethernet/Optic Fibre/RS485 Combined Network A

8 Ethernet/Optic Fibre/RS485 Combined Network

The example diagram below illustrates the required hardware and wiring required for a network that combines ethernet, optic fibre and RS485 star topology. The NEMTEK Power Pack may be used to provide a 12V supply with battery backup FG7 and 8-way Relay Board and optic fibre converters. Note that the ethernet, RS485 5-core and 10-way ribbon cables should have a maximum length of 100m, 1000m and 1m respectively. It is recommended that the 5-core cables for RS485 communication are shielded and that the shields are grounded only at one end of the cable to prevent ground loops.

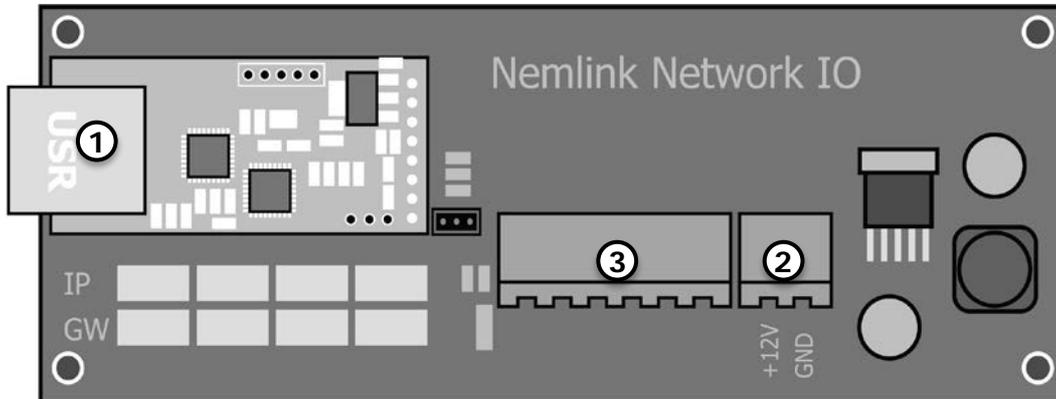


To set up the network, follow these steps:

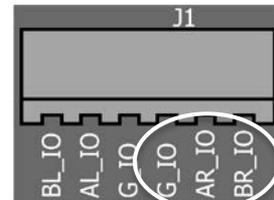
1. For the connection setup between the PC and FG7 module, refer to the FG7 installer manual. The PC to FG7 link is optional to run the NEMTEK Fenceprobe software.
2. For the setup of the ethernet part of the network including the FG7, Nemlink and Ethernet/Fibre converters, refer to section 5 (NEMTEK Ethernet Module Setup) and 6.2 (Ethernet/Optic Fibre Network Setup) of this document.

8 Ethernet/Optic Fibre/RS485 Combined Network B

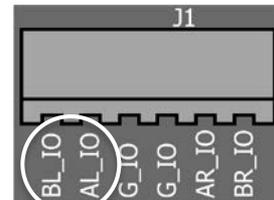
3. For the Nemlink Network IO:



- a. Configure the ethernet module by referring to section 5 of this document. [1]
- b. Disconnect the power connector. [2]
- c. Connect the GND, A and B wires coming from the DATA OUT of all the network devices in this network section to the DATA IN GND (marked G), A (marked AR_IO) and B (marked BR_IO) terminals of the Nemlink Network IO board. Since more than one network device may be connected to this board, it will be necessary to add all the wires together in the same screw terminal. [3]



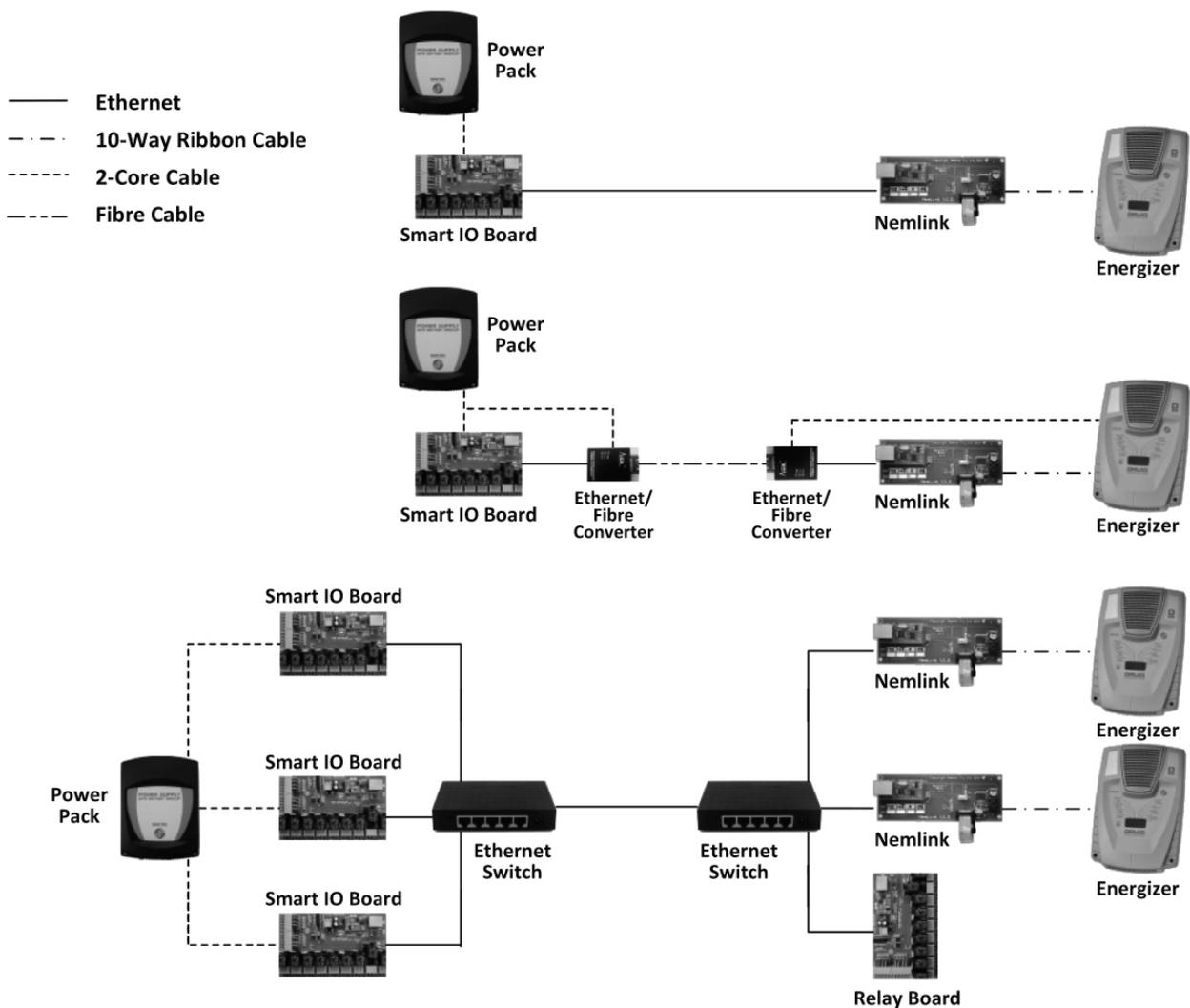
- d. Connect the A and B wires coming from the DATA IN of all the network devices in this network section to the DATA OUT A (marked AL_IO) and B (marked BL_IO) terminals of the Nemlink Network IO board. It is not necessary to connect the GND terminals in this step. Since more than one network device may be connected to this board, it will be necessary to add all the wires together in the same screw terminal. [3]
- e. Connect the ethernet cable to the board. [1]
- f. Connect the power connector. [2]



4. For the setup of the 8-way relay board and energizer in RS485 star topology, refer to section 7.2 of this document. Instead of connecting the devices to the FG7, as explained in section 7.2, connect them to the Nemlink Network IO board.
5. For the setup of the GPS module, refer to step 6 in section 6.1.

9 8-Way Smart IO Board Setup

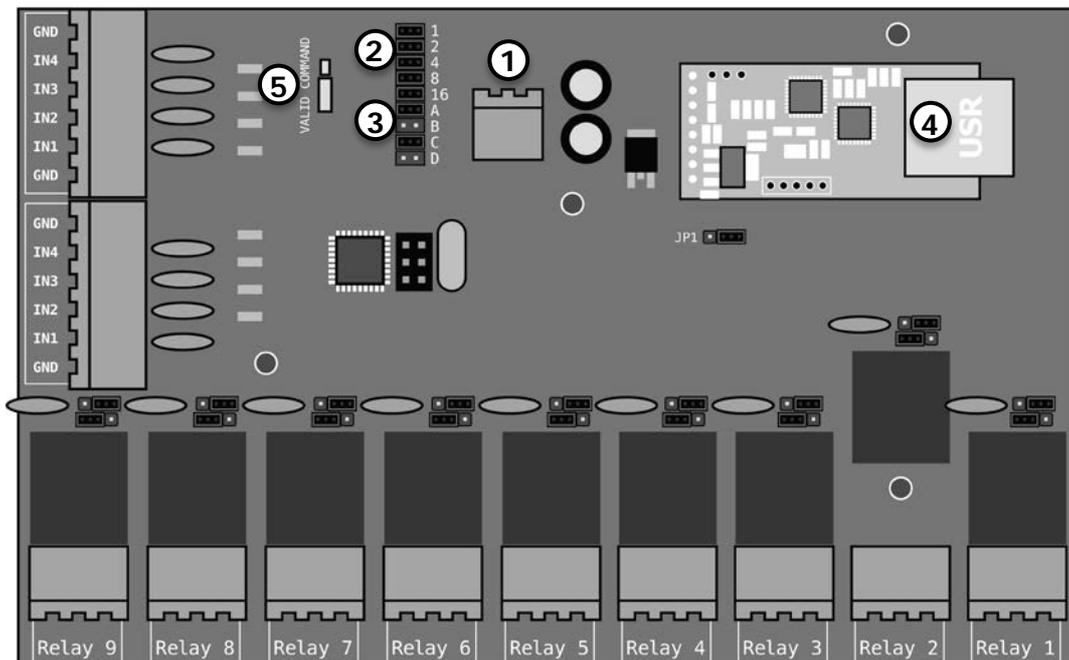
The NEMTEK 8-way Smart IO Board can be used for one-to-one communication to a Druid 2x energizer or 8-way Relay Board. This is useful where the energizer needs remote communication to a third-party device like an alarm panel. The board provides 8 inputs and 8 relay outputs that can be independently linked to different inputs and outputs of the energizer (or 8-way Relay Board), by using the software application. The figure below shows the possible connections. Although the boards and energizers are connected on an Ethernet network in the third diagram, every Smart IO Board can only communicate to one energizer. The ethernet link between the two network switches can be replaced with an optic fibre link if longer distances are required. The NEMTEK Power Pack may be used to provide a 12V supply with battery backup to the FG7 and 8-way Smart IO Board.



9 8-Way Smart IO Board Setup

To set up the network successfully, follow these steps:

1. Configure all Ethernet Modules installed on the 8-way Smart IO Board, Nemlinks and 8-way Relay Boards by referring to section 5.
2. For the 8-way Smart IO Board:



- a. Disconnect the power connector. [1]
- b. Configure the address of the board to 1, by populating jumpers JP7 1, 2, 4 and 16. Refer to section 6.1 step 5b for more detail. [2]
- c. Populate jumper JP7 A to put the board in programming mode. [3]
- d. Jumper JP7 C is only used when the board is connected to a Druid energizer. When the jumper is populated, the Smart IO board will force the state of its inputs onto the energizer and no changes will be possible on the energizer itself. When the jumper is not populated changes are possible on the energizer and the Smart IO board will only change the energizer state, once a change on the Smart IO board inputs happen. [3]
- e. Jumpers JP7 B and D can either be populated, or not. [3]
- f. Connect the Smart IO board to a computer, using an ethernet cable. [4]

9 8-Way Smart IO Board Setup

- g. Download and save the NEMTEK SIO8Cfg setup software from <http://www.NEMTEK-druid-fenceprobe.com/downloads/NemtekSmartIOCardConfigurationSoftware.exe>
- h. Power up the board (The NEMTEK Power Pack can be used to power the board).
- i. Open the NEMTEK SIO8Cfg.exe application on the computer
- j. Select the device (Druid 2x, TW Node or 8-way Relay Board) to which the Smart IO board will be connected to by clicking on one of the three top tabs.
- k. Enter the same IP address (*ModuleStaticIP*) of the Smart IO board that was configured in step one, in the IP address field, in the top right corner.
- l. Ensure 20108 is entered in the Port field, in the top right corner.
- m. If the Smart IO board will be connected to an energizer, map the energizer status and alarms to the Smart IO relay outputs, by ticking appropriate boxes. The Smart IO Board Inputs are preconfigured to activate certain functions on the energizer and can't be changed. For more detail refer to the Smart IO board manual.
- n. If the Smart IO board will be connected to an 8-way Relay Board, map the 8-way Relay Board inputs to the Smart IO relay outputs, by ticking the appropriate boxes. The Smart IO Board inputs are configured one-to-one to the 8-way Relay Board's outputs and can't be changed. For more detail refer to the Smart IO board manual.
- o. Click Send in the lower left corner. The VALID COMMAND LED will momentarily flash on the Smart IO Board, indicating the board was programmed. [5]
- p. Remove jumper JP7 A. [3]
- q. Disconnect the board from the computer and connect to the energizer, relay card or ethernet switch with an ethernet cable.

9 8-Way Smart IO Board Setup

8. For the Druid LCD 2x energizer:

Set up the energizer by following the steps in section 6.1 and setting the energizer address to 1.

9. For the Ethernet 8-way Relay Board:

Set up the relay board by following the steps in section 6.1 and setting the board address to 1.