

X-DIGI TNC-X Digipeater Daughter Board

Assembly, Configuration, and Operating Instructions

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X-Digi is a daughter board for the TNC-X KISS mode TNC. It is designed to emulate the most popular features of the widely used UI-DIGI EEPROM for TNC-2's. In addition, X-Digi provides digipeater services for both UI APRS frames and for connected packets. It makes it easy to put up a temporary digipeater to fill in coverage "holes" in emergency situations. It consumes very little current. Both TNC-X and X-Digi can be powered all day on a single 9 volt battery. It can be configured in the field through the TNC-X serial port using any computer with any terminal program. It also contains a "firmware bootloader" so that future firmware revisions can be easily uploaded using any Windows PC.

Assembly Instructions

The kit is supplied with the following parts. Please verify that all parts are included before proceeding:

- | | |
|--------------------------------|-----------------------------|
| 1. Printed Circuit Board | 5. Programmed 18F2525 (IC1) |
| 2. .1 uf Capacitor (C3) | 6. 28 Pin IC Socket |
| 3. 10 MHz Crystal (PAD 1) | 7. 8 PIN SIP Socket (6. J1) |
| 4. 2- 22pf Capacitors (C1, C2) | 8. Two jumpers |
| 5. 7 x 2 pin header. | |

Installation of the parts is pretty straightforward. Note the following:

- 1. The 8 pin SIP Socket should be installed on the BOTTOM of the PC board. This enables it to be plugged into the 8 pin header on the TNC-X.**

2. Make sure that the IC socket and IC are both installed with the notch as indicated on the PC board.
3. The following parts are referenced on the circuit board, but are not part of the XDigi kit: LED1, R1, JP1. No parts should be installed in these locations.

Installation Instructions

To install the X-Digi Daughter Board, first remove the two jumpers on header **JP5** on the TNC-X (this is the 8 pin header). Then insert the X-Digi board so that the notch on the 18F2525 is toward the back of the TNC-X. C3 will be toward the LED side of the TNC-X board. Set the TNC-X so that it runs at 9600 baud: **JP1** on the TNC-X board should be off, while **JP2** should be on.

Configuration Instructions

The X-Digi Daughter Board is configured via the standard TNC-X serial port. Connect your computer to the primary serial port. You can use either the serial port connection or the USB port (if you have this option installed). You can even use a hand held device like a Palm Pilot running a terminal program to configure the device. However, you cannot connect the USB port on a Palm Pilot to the USB port on TNC-X. To configure the X-Digi, set the 14 pin jumper block up as follows:

Corner of board =>



Run a terminal program on the PC that you have connected to the TNC-X serial or USB port. If you are running a Windows computer, Hyperterminal will do fine. If you are using the USB port to configure TNC-X, you may find the easiest way to do this is to remove JP4 of TNC-X so that the USB module is powered up but the TNC is not. Then run your terminal program (it will recognize the USB serial port). Then replace JP4 to power up the TNC. Set your terminal program for 9600 baud and no flow control. Turn on the TNC-X with the X-Digi daughterboard installed and within 20 seconds strike any key in the terminal program to get the X-Digi's attention. You should see the following menu:

X-Digi Ver 2.0E Configuration Menu

```

C.   Set Digipeater Callsign.      :URCALL
A.   Set Digipeater Alias.        :URDIGI
F.   Set UIFlood Callsign.       :NY
L.   Set UIFlood Limit.          :7
T.   Set UITrace Callsign.       :WIDE
M.   Set UITrace Limit.          :4
1.   Set UICall 1.               :
2.   Set UICall 2.               :
3.   Set UICall 3.               :
4.   Set UICall 4.               :
5.   Set UICall 5.               :
6.   Set UICall 6.               :
7.   Set UICall 7.               :
8.   Set UICall 8.               :

D.   Set Dupe Time (x5 secs).     :6
P.   Set Remote Password.        :

B.   Set Beacons.
Q.   Quit.

```

Enter Selection:

Choose the item you wish to reconfigure by pressing the letter or number in the left hand column. The Callsign and Alias are fairly straightforward, but some of the other parameters may require explanation. The UIFlood callsign supports the WIDEn-N paradigm. When the digi receives a packet with a path of, say **WIDE3-3**, it will decrement the SSID value (to **WIDE3-2**) and retransmit the packet. When it reaches WIDE3-0, it will replace this value with the X-Digi's callsign. UITrace works in a similar manner, but adds X-Digi's callsign to the path. So, for example, **WIDE3-3** becomes **URCALL**, **WIDE3-2** in the above example. The limits for UIFlood and UITrace are provided to allow the X-Digi to stop overly long paths. In the above case the UITrace limit is set to 3, so an incoming path of **WIDE4-4**, for example, would be simply be digipeated as **URCALL**. The UICall fields allow you to specify up to 8 calls for which X-Digi will simply do callsign substitution.

For example, if you wanted to support **RELAY** (not currently recommended) you could do so by adding this value in UICALL. Packets with a path of **RELAY** would be digipeated with a path of **URCALL**. The menu also allows you to specify a dupe time value in 5 second intervals. Duplicates are calculated based on a CRC that is applied to the entire packet except for the path. So if X-Digi sees a packet with the same source and destination address and the same contents within the time period specified by dupetime, it will not digipeat it. Because this timer is set in increments of 5 seconds, a value of 6, for example, will result in a 30 second duplicate checking period. Do not set this value higher than about 24 (2 minutes). Setting the dupe value to 0 turns off dupe checking.

Selecting the B value from the menu brings up another menu that allows you to set up the beacons. X-Digi supports 4 different beacons, each of which can be sent at a different interval, have a different path, and have a different text. To set up these beacons, hit the B key. The time values here are in increments of 5 seconds, so to set a beacon to transmit every 10 minutes, for example, you would use a value of 120. The offset value allows you to specify a time period to elapse before the first beacon is sent. For example, if you set Beacon 1 to be sent every 5 minutes and Beacon 2 to be sent every 10 minutes, every other time you would have both beacons sent at the same time. While this will work, you might prefer to have X-Digi wait a minute or two before sending the first beacon so that the two beacons would never be sent at the same time. You can do this with offset.

The path for each beacon can also be set via this menu. Simply enter the path with a comma between each callsign, for example **W2SB,WIDE3-3**. Selecting Q will exit the beacon menu. Another Q will exit configuration.

After programming, turn off the unit and change the jumpers so that they are set up as follows:

Corner of board =>



Also, make sure JP3 is toward U5. By using this setup, incoming data will be routed through to the PC serial port (**but not the USB port**). As a result, you will be able to run a standard APRS program (such as WinAPRS, MacAPRS, UIView, etc.) and watch the activity coming in to the digipeter. It is not necessary to operate XDigi with a PC attached, it will work perfectly well as a stand alone unit. However, this option is available to you if you like. If you decide to run the XDigi as a stand alone unit, you can simply leave the jumpers in their "configuration" setting.

X-Digi is designed to be field upgradeable. It has boot loader built in that allows you to upload new firmware if and when it becomes available.

Instructions on how to use the boot loader are available on a link from the TNC-X webpage:
<http://www.tnc-x.com/firmware.htm>

There is a Yahoo group called XDigi that is available to support users of the X-Digi daughter board. Announcements of firmware revisions will be posted to this group.

Using the Remote Sysop Feature

As of version 2.0 of the X-Digi firmware, it is possible to change the parameters of X-Digi remotely. Doing so requires a 5 letter password. All X-Digi parameters except the password are remotely configurable. In order to use the remote sysop feature, you must first set a remote password using the configuration procedure described above. The password must have exactly 5 characters and is case sensitive. To disable the remote sysop feature, set the password to five spaces.

When you boot up X-Digi, it will wait 20 seconds for a command to reconfigure before it starts up. When the 20 second timer has expired, XDigi will send the text in the first beacon to let you know it is in digipeter mode (and is available to be remote sysop-ed).

To reconfigure X-Digi remotely, change the UNPROTO parameter in your remote TNC to specify the callsign that is configured in X-Digi. So, for example, if the X-Digi callsign is UROCAL you could set up UNPROTO as follows:

```
UNPROTO UROCAL
```

After you have changed the UNPROTO parameter, go into converse mode (with a k on most TNC's) and hit the return key. This will send an empty packet out using the UNPROTO path.

When X-Digi hears your transmission, it will respond with a string of four letters. This four letter combination is a function of a random number generator inside X-Digi and the password that you have specified. You must then respond with the proper 4 letter code in order to enter remote sysop mode. This code can be obtained from a program that is available on the XDigi webpage (<http://www.tnc-x.com/XDigi.htm>) called calcpw.jar. The program was written in Java, so it should run on any platform and it is an executable .jar file so you should be able to run it simply by double-clicking on it. Of course you will need to have the Java runtime environment on your computer to run the program, but most computers these days already have this loaded. This program is fairly self-explanatory. You enter your password (the one you entered in the configuration screen) and the four letter code you received from X-Digi, and then it tells you what your response should be. Send the response back to the X-Digi. The X-Digi will respond with either "yes" (if you were successful) or "not" if you were not.



The image shows a Java application window titled "XDigi". The window has a standard Windows-style title bar with minimize, maximize, and close buttons. The main content area is light gray and contains three text labels with corresponding input fields: "Enter Password:" followed by a single-line text box, "Enter Data from XDigi:" followed by a single-line text box, and "Data to Send to XDigi:" followed by a single-line text box. At the bottom center of the window is a blue "Submit" button.

Once you have successfully entered remote sysop mode, you can send commands to the X-Digi in the form:

X value

for commands from the first configuration page.

X-Digi Ver 2.0E Configuration Menu

```
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A.  Set Digipeater Alias.        :URDIGI
F.  Set UIFlood Callsign.        :NY
L.  Set UIFlood Limit.           :7
T.  Set UITrace Callsign.        :WIDE
M.  Set UITrace Limit.           :4
1.  Set UICall 1.                :
2.  Set UICall 2.                :
3.  Set UICall 3.                :
4.  Set UICall 4.                :
5.  Set UICall 5.                :
6.  Set UICall 6.                :
7.  Set UICall 7.                :
8.  Set UICall 8.                :
D.  Set Dupe Time (x5 secs).     :6
```

So, for example, to change the Dupe Time to 10, you would send the command:

D 10

X-Digi will respond by telling you the new value of the parameter you entered. If you simply want to inquire about the current value of a parameter send:

X?

where X is the letter of the parameter you want sent back to you. So to ask what the Dupe Time value is send

D?

Note that any changes take effect immediately. So if you change the callsign of the X-Digi, you will need to change the UNPROTO value in your TNC to be able to continue to communicate with it. You can send as many commands as you want during a remote sysop session. The session will conclude in one of two ways. If you send the command:

Q

You should receive back the word "Done" and the X-Digi will exit remote sysop mode. If 45 seconds passes and the X-Digi does not receive a command, it will automatically reboot. You'll send the Beacon 1 text transmitted to let you know that the session has expired.

To make changes on the Beacon menu:

Beacon Configuration Menu

- 0. Set Beacon Destination Call :APRS
- 1. Set Beacon 1 Path :WIDE2-2
- 2. Set Beacon 2 Path :
- 3. Set Beacon 3 Path :
- 4. Set Beacon 4 Path :

- 5. Set Beacon 1 interval (x5 secs) :00120 Offset :0
- 6. Set Beacon 2 interval (x5 secs) :00000 Offset :0
- 7. Set Beacon 3 interval (x5 secs) :00000 Offset :0
- 8. Set Beacon 4 interval (x5 secs) :00000 Offset :0

- A. Set Beacon 1 text:X-Digi Test.
- B. Set Beacon 2 text:
- C. Set Beacon 3 text:
- D. Set Beacon 4 text:

Send a command in the following form:

BX value

where X is the letter of the parameter you wanted to change. So, for example to change the Beacon 1 text you would send:

BA This is the new beacon text.

Note that for parameters 5 through 8 you must specify 2 values, the interval and the offset. To change beacon 1 so that it beacons every minute with an offset of 5 seconds, for example, you would enter:

B5 00012 001

In the case of items 5 through 8 you must specify exactly 5 digits followed by 1 space and 3 digits. You can inquire about the value of a parameter from this page using the syntax:

BX?

where X is the parameter from the Beacons page that you want to ask about.

All beacons are turned off during a remote sysop session. However, regular digipeting does continue. Of course a collision between you transmitting a command and a user having a packet digipeted will result in both packets being lost. I have not tried the remote sysop capability on a busy frequency, so I would be interested in reports of your experiences in the field.