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APRS TNC Digi Tracker

Operating Manual

version 1.6

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Cross Country Wireless

Contents

1 What is APRS?

APRS stands for Automatic Packet Reporting System.

It was invented by Bob Bruninga, WB4APR in the early 1980's initially to track local mobile stations.

It is based on the AX.25 packet radio system but used the unconnected mode to send positions, information and messages to all stations.

Today it is widely used by amateur radio emergency communication networks throughout the world as a tactical emergency communications system of tremendous capability that allows local APRS networks to be viewed worldwide via internet gateways.

It can also be used on HF and via satellite. An APRS digipeater is installed on the International Space Station and regularly re-transmits APRS packets from earth-bound stations.

More information taken from Bob Bruninga's website http://aprs.org

APRS provides situational awareness to all operators of everything that is going on in his local area, whether it be Weather reporting, traveller information, direction finding, objects pointing to Echolink or IRLP or traffic reporting and emergency response. All of this while providing not only instantaneous operator-to-operator keyboard messaging capability for special events but also an always-on Voice Alert back channel between mobiles in simplex range. There is even an APRS interface to the WinLINK system called APRSlink so that mobiles can send and receive Email without needing a PC. Think of APRS as a signalling channel to reveal ALL amateur radio resources and live activities that are in range of the operator at any instant in time.

Consistent with providing information on all resources within range, APRS must also work across all boundaries and in all areas of the world for all travellers. For this reason, 144.800 MHz is dedicated to APRS throughout Europe. Other continents have similar single frequencies such as 144.390 MHz in North America and 145.175 MHz In Australia.

Also after 14 years of evolution, APRS was greatly simplified beginning in 2004 to eliminate obsolete and inefficient routing. Now, there is only one recommended PATH everywhere, and it is VIA WIDEn-N for fixed stations where N is usually 2 in most metropolitan areas and no more than 3 most everywhere else. Mobiles can use VIA WIDE1-1,WIDE2-1 in those 2 hop areas to gain help from nearby WIDE1-1 fill-in digipeaters.

2 Cross Country Wireless APRS TNC Digi Tracker

At the 2008 UK RAYNET National Convention at Liverpool I was part of a small group giving a presentation on the latest developments in APRS (Automatic Packet Reporting System).

As always at events such as the Convention the feedback from those attending the presentation was invaluable. Many RAYNET members had simple APRS trackers but wanted to upgrade to the next level where they could use APRS with a computer using UI-View or similar programs or operate a fill-in digipeater from home or from the car. The only hardware option at the time was to buy an old packet radio TNC (rarely available working these days) or to buy an expensive new product.
The feedback from RAYNET members was that a simple to use low cost unit with basic TNC, digipeater and tracker facilities would be welcomed.

After nine months research, development and testing the APRS TNC Digi Tracker is available for sale.

The hardware has been designed for easy field operation with eight switches for power, mode, configuration and digipeater control and six LEDs to indicate correct operation. High performance audio filtering has been added to filter the receive audio. Extensive RFI suppression is employed. High quality components have been used to extend the working temperature range and life of the TNC. As an example metal film resistors are used throughout and the voltage regulator operates at 10% of it's maximum current rating even when powering a GPS receiver through the serial port.

The APRS TNC Digi Tracker meets the requirements of EC Directives EN50082-1 EMC Generic Immunity Standard (Residential, Commercial and Light Industrial), RoHS (Restriction of Hazardous Substances) and WEEE (Waste Electrical and Electronic Equipment).

The firmware has been developed to add APRS features and improve reliability. The features include a unique Digi All digipeater feature, compatibility with UI-View, compatibility with WinPack for converse packet radio, improved digipeater operation, fast text entry, simple configuration with a serial terminal program and position / status beaconing in GPS mode.

Firmware reliability has been designed for use with poor or intermittent power supplies by employing the microcontroller on-chip power up, brown out and crystal oscillator timers. In addition a two second power up delay has been added to ensure that the power supply is stable before reading from the EEPROM. Write and code protection has also been added to avoid any possibility that an intermittent power supply could corrupt the firmware program or configuration data.

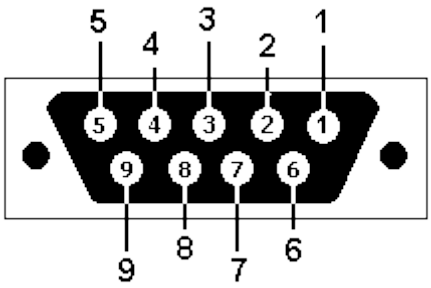
Extensive hardware and firmware testing has taken place to prove the TNC reliability. Prototypes have survived 2m drops onto concrete floors, freezing to -35 degrees Centigrade, heating to + 60 degrees Centigrade, being installed in a Land Rover off road competition vehicle during several events and just driving to the shops in the family car!

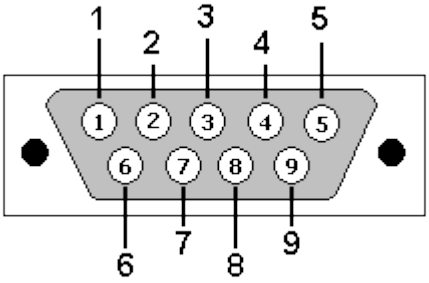
I hope you enjoy using the APRS TNC Digi Tracker!

73,

Chris Moulding, G4HYG

3 Connections, switches, deviation adjustment and specification





DB9 Male RADIO

Pin 1	Transmit audio out
Pin 2	No connection
Pin 3	PTT out
Pin 4	Pre-emphasis receive audio in
Pin 5	Receive audio in
Pin 6	Ground (negative earth only)
Pin 7	+ 7 to 28 V in
Pin 8	No connection
Pin 9	No connection

DB9 Female GPS / Terminal

Pin 1	No connection
Pin 2	Terminal / GPS data in
Pin 3	TNC data out
Pin 4	+5V from switch 5
Pin 5	Ground (negative earth only)
Pin 6	No connection
Pin 7	No connection
Pin 8	No connection
Pin 9	+5V from switch 6

Connector type and pins numbers are for a connector plugged into the unit.

DIL switch

Switch	OFF	ON
1	Power off	Power on
2	Terminal operation	GPS Tracker operation
3	No PTT output (RX only)	PTT output on
4	No PTT output on audio	PTT output on audio
5	No +5V on pin 4	+5V output on pin 4
6	No +5V on pin 9	+5V output on pin 9
7	Transmit audio low level	Transmit audio high level
8	Digipeater off	Digipeater on (if DIGI ON or DIGI ALL selected)

Deviation Adjustment

The transmit audio output is adjusted by the sealed cermet potentiometer on the circuit board. Start adjustment with switch S7 in the OFF position.

If the unit is in Terminal mode connected to a PC running a terminal program typing CAL will operate the transmitter PTT and send a continuous audio output. The tone can be toggled between high and low tone using the Space bar. Enter Ctrl-C to close the Calibration mode and release the transmitter PTT.

Set the deviation using high tone (2200 Hz) because pre-emphasis in the transmitter will make this louder than the low tone (1200 Hz). The deviation should be set so that it is below the level that is clipped by the audio clipper in the transmitter.

If the adjustment is done without a deviation meter listen to the high tone audio received using another receiver, adjust until the audio limits and then back off from that. It is far better better to transmit at a low deviation than to over-drive the transmitter with the risk of spurious emissions to adjacent radio channels.

If a high audio level is required for certain models of transceiver then switch S7 ON.

Pre-emphasis Receive input

Some handheld radios have extra de-emphasis in the receiver to compensate for the use of a small loudspeaker. An alternative audio input on pin 4 of the Radio socket adds additional pre-emphasis to correct this. If APRS packet detection appears poor when using the unit with a handheld try pin 4.

Specification

Size:	142 mm (5.6”) length 110 mm (4.4”) wide 35 mm (1.4”) high
Supply voltage:	7 to 25 volts DC negative earth
Supply current:	35 mA (at 13.8 V)

4 Configuration with a Serial Terminal program

The APRS TNC Digi Tracker can be configured by any personal computer using Microsoft Windows with a serial terminal program e.g. Hyper Terminal or Tera Term Pro or with a Linux personal computer using the Cutecom serial terminal program.

A Serial to USB converter may be used to connect to USB only computers.

The terminal program set-up table follows:

Baud rate	4800 or 9600 bd depending on the TNC firmware
Data bits	8
Stop bits	1
Handshaking	None
Host mode	None
Parity	None
Comm Port	The serial port the TNC is connected to

When the APRS TNC Digi Tracker is powered up in Terminal mode (switch 2 set to Terminal mode or OFF) the following boot-up text should be seen:

Cross Country Wireless APRS TNC Digi Tracker v 3.34
developed by Chris Moulding G4HYG
1200 baud APRS with 4800 baud GPS/Terminal data rate
APRS is a registered trademark of Bob Bruninga, WB4APR
licensed to Cross Country Wireless (2009) Ltd, UK
Type HELP for Info
Type DISP to display all options

cmd:

The full list of TNC terminal commands is listed in Appendix 2 TNC Text Commands.

The HELP text file showing typical commands follows:

cmd: help
Commands are case insensitive
Use backspace key (<--) for correction
Use the DISP command to display all options
Switch 2 ON and connect to GPS for APRS tracker operation
Switch 2 OFF and connect to terminal for command interpreter

Commands (with example):
MYCALL (mycall g4hyg-9)
UNPROTO (unproto aprs v wide3-3) - Fixed station APRS unproto
UNPROTO (unproto gpsc30 v wide1-1 v wide2-2) - Mobile station APRS unproto
UNPROTO (unproto aprs v ariss v sgate v wide2-2) - ISS APRS unproto
BTEXT (btext >Chris in Bolton) - beacon comment - 100 chars max
BEACON (beacon every n)- n=0 is off and 1<n<60 mins
MONitor (mon all, mon me, or mon off)
DIGIpeat (digi all or digi on) switch 8 digi off)

MYALIAS (myalias wide1-1) for fill-in digipeater

PERM (to store set-up in EEPROM)
ECHO (echo on or echo off)
TXDELAY (txdelay n 0<n<201 n is number of delay flags to send)
CAL (calibrate mode - testing only)
CONV (converse mode - Ctrl C to exit)

OK
cmd:

5 Mobile GPS mode configuration

The main list of setup commands is displayed by typing DISP at the :cmd prompt in Terminal mode (switch 2 set to Terminal or OFF). Note that all text commands are case insensitive. During configuration the digipeater switch 8 should be ON to allow the digipeater function to be selected.

After configuration the settings should be permanently saved to EEPROM using the PERM command. Set switch 2 set to GPS or ON before installation in the vehicle.

A typical mobile configuration using GPS mode follows:

cmd: disp
ECHO ON
TXDELAY 64
GPS GPGLL
MONitor ALL
DIGIpeater ON - fill-in digipeater
BEACON On EVERY 3
UNPROTO GPSC86-0,WIDE1-1,WIDE2-2
MYCALL G4HYG-9
MYALIAS WIDE1-1
BTEXT >Chris testing new TNC firmware...
OK
cmd:

ECHO ON allows typed text to be displayed on the terminal screen.

TXDELAY has a default setting of 40. That number is the number of idle bytes sent before the APRS frame after the PTT is keyed. At 1200 bd that works out at 6.6 mS per byte so the default setting gives a delay of 260 mS. The maximum delay setting of 200 gives a delay of 1.33 seconds.

The GPS NMEA GPGLL string is selected as default. GPGGA and GPRMC are alternative options.

The GPS NMEA string is transmitted as the APRS information string. This gives far greater position accuracy (typically +/- 1m under 2009 GPS conditions) than the standard APRS position format (+/- 18.5m) or the compressed format (+/- 3m). This is very useful when used with various modern internet tools using Google Maps where the inaccuracy of the other methods becomes readily apparent.

Another reason for the use of the GPS NMEA string is that in many countries it is a condition of the amateur radio licence that no coded messages are transmitted. The standard APRS position format and the compressed format can be considered to be coded messages and may be illegal in those countries.

The GPS NMEA string is an internationally recognised format and is transmitted unmodified. The string selected may be any one of three. The table below gives further details:

GPS NMEA string	Length	Information carried
GPGLL (default)	40	Latitude, longitude, time, validity
GPGGA	65	Time, validity, latitude, longitude, fix quality, satellites tracked, HDOP, altitude above the geoid (m), geoid (m)
GPRMC	68	Time, validity, latitude, longitude, speed (knots), track angle, date, magnetic variation

The GPGLL string is selected as the default due to it's shorter transmitted length but if the APRS data is being recorded for future analysis after an emergency we would recommend the use of the GPRMC string as the date, time and speed are also included.

MONItor defaults to ALL in GPS mode to allow other programs and attachments to translate the received APRS packets into GPS waypoints.

DIGI ON will allow the APRS TNC Digi Tracker to digipeat other mobile stations with myalias WIDE1-1 in their unproto if MYALIAS is set to WIDE1-1.

DIGI ALL is a unique option in the APRS TNC Digi Tracker. Any APRS packet received with a valid digipeater unproto setting is digipeated with call substitution. This is intended for two uses. The first is for emergency work. For example a mobile operator could have DIGI ALL configured in the TNC but switched off with switch 8. In an emergency he/she drives up to the local hilltop turns switch 8 on and digipeats all local APRS traffic to the emergency control station.
The second use is to digipeat all traffic on a specific channel to the main APRS channel. This could be traffic on an emergency channel, ISS traffic on 145.825 MHz (as long as no satellite operator is within range) or in a recent (April 2009) example to digipeat an APRS tracker on a trans-atlantic balloon on the US APRS frequency of 144.390 MHz to the European APRS frequency of 144.800 MHz.

DIGI OFF turns the digipeater off.

Switch 8 can switch the digipeater manually to OFF if DIGI ON or DIGI ALL is set. The orange LED confirms that DIGI ON or DIGI ALL is on if selected.

The APRS TNC Digi Tracker is firmware configured to send a status packet every 5 position packets when in GPS mode. If the beacon timing is set to “BEACON EVERY 3” then the position packet is sent every 3 minutes with the status packet sent every 15 minutes. This complies with the net cycle time concept in the APRS specification.

As the APRS symbol is not included in the position packet an alternative method using the AX.25 destination address in the UNPROTO is used.

This method uses GPSCnn for primary symbols and GPSEnn for the secondary symbols. In the example above GPSC86 is a van. Other examples are GPSC30 car, GPSC59 pedestrian, GPSC74 jeep and GPSC85 truck. The APRS symbols are listed in APPENDIX 3 APRS symbol table. Optional GPSxyz settings for symbols with overlays are also included.

The UNPROTO should also include the digipeater aliases WIDE1-1,WIDE2-2 to allow transmitted packets to be digipeated by the local APRS digipeater network. WIDE1-1,WIDE2-2 is now internationally agreed as the recommended mobile unproto settings used worldwide. In some countries like the UK with a limited digipeater and internet gateway network the settings can be increased up to WIDE1-1,WIDE7-7 to extend RF coverage via digipeater. RELAY and TRACE unproto settings are now obsolete worldwide.

Use MYCALL to configure your own callsign and SSID. No SSID or SSID -0 is a fixed station. -7 is a hand portable and -9 is a mobile.

MYALIAS is usually set to WIDE1-1 to digipeat mobile stations with a matching digipeater alias when DIGI ON is set.

In GPS mode the BTEXT is sent as a status beacon. The status text should always start with a > APRS data type identifier i.e. BTEXT >Chris in Bolton
The status text can be up to 62 characters long.

6 Fixed station Terminal mode configuration

The main list of setup commands is displayed by typing DISP at the :cmd prompt in Terminal mode (switch 2 set to Terminal or OFF). Note that all text commands are case insensitive. During configuration the digipeater switch 8 should be ON to allow the digipeater function to be selected.
After configuration the settings should be permanently saved to EEPROM using the PERM command.

A typical fixed station configuration follows:

cmd: disp
ECHO ON
TXDELAY 64
GPS GPGLL
MONitor ALL
DIGIpeater ON - fill-in digipeater
BEACON On EVERY 15
UNPROTO APRS-0,WIDE3-3
MYCALL G4HYG-0
MYALIAS WIDE1-1
BTEXT =5332.76N/00225.91W-Chris in Bolton
OK
cmd:

ECHO ON allows typed text to be displayed on the terminal screen.

TXDELAY has a default setting of 40. That number is the number of idle bytes sent before the APRS frame after the PTT is keyed. At 1200 bd that works out at 6.6 mS per byte so the default setting gives a delay of 260 mS. The maximum delay setting of 200 gives a delay of 1.33 seconds.

The GPS NMEA GPGLL string is selected as default but is not used in Terminal mode.

MONItor may be set to OFF (nothing sent to the terminal), ME (just packets addressed to mycall or myalias) or ALL (all packets received sent to terminal).

DIGI ON will allow the APRS TNC Digi Tracker to digipeat mobile stations with digipeater alias WIDE1-1 in their unproto if MYALIAS is set to WIDE1-1.

DIGI ALL is a unique option in the APRS TNC Digi Tracker. Any APRS packet received with a valid digipeater unproto setting is digipeated with call substitution. This is intended for two typical uses. The first is for emergency work. For example a fixed operator could have DIGI ALL configured but switched off with switch 8. In an emergency he/she diverts turns switch 8 on and digipeats all local APRS traffic to the emergency control station.
The second use is to digipeat all traffic on a specific channel to the main APRS channel. This could be traffic on an emergency channel, ISS traffic on 145.825 MHz (as long as no satellite operator is within range) or in a recent (April 2009) example to digipeat an APRS tracker on a trans-atlantic balloon on the US APRS frequency of 144.390 MHz to the European APRS frequency of 144.800 MHz.

DIGI OFF switches the digipeater off.

Switch 8 can switch the digipeater manually to OFF. The orange LED confirms that DIGI ON or DIGI ALL is on or off.

BEACON EVERY is set to 15 so that a beacon is sent every 15 minutes. BEACON EVERY 0 turns the beacon off.

The unproto is set to an AX.25 destination address of APRS with a digipeater unproto setting of WIDE2-2. WIDE2-2 is now internationally agreed as the recommended fixed station unproto settings.

In some countries like the UK with a limited digipeater and internet gateway network the settings can be increased to WIDE7-7 to extend RF coverage via digipeaters. RELAY and TRACE settings are now obsolete worldwide.

Use MYCALL to configure your own callsign and SSID. No SSID or SSID -0 is a fixed station. -7 is a hand portable and -9 is a mobile.

MYALIAS is usually set to WIDE1-1 to digipeat mobile stations with a matching digipeater alias when DIGI ON is set.

In Terminal mode BTEXT is transmitted as an APRS information field.
In the following example the position is encoded as degrees and decimal minutes (to two decimal places) with a N/S or E/W character. The position accuracy is +/- 18.5m.

BTEXT =5332.76N/00225.91W-Chris in Bolton

The initial character can be either = to show messaging possible or ! to show that messaging is not possible.

The character between latitude and longitude is either / for primary symbols or \ for secondary symbols.

The character after the longitude direction (in this example W) is – which is the primary APRS symbol for Home (VHF station). A full list of APRS symbols is included in Appendix 3 APRS symbol table.

The text following the APRS symbol is comment text up to a maximum of 43 characters.

7 Use with a Serial Terminal program

The APRS TNC Digi Tracker works in Terminal mode with a serial terminal program. Move Switch 2 to the TNC (off) position.

The TNC should be connected to the PC with a null modem cable. A Serial to USB converter may be used to connect to USB only computers. It will also work with the simplified null modem cable described in the following table:

9 way D type female connector (TNC)	**9 way D type female connector (PC)**
Pin 3 Receive data	Pin 2 Transmit data
Pin 2 Transmit data	Pin 3 Receive data
Pin 5 Ground	Pin 5 Ground

In the serial terminal program select the following options:

Baud rate	4800 or 9600 bd depending on the TNC firmware
Data bits	8
Stop bits	1
Handshaking	None
Host mode	None
Parity	None
Comm Port	The serial port the TNC is connected to

Incoming APRS packets will be displayed in the serial terminal program. A typical fixed station configuration demonstrating APRS messaging using a serial terminal program is shown below:

cmd: disp
ECHO ON
TXDELAY 64
GPS GPGLL
MONitor ALL
DIGIpeater OFF
BEACON On EVERY 15
UNPROTO APRS-0,WIDE3-3
MYCALL G4HYG-2
MYALIAS WIDE1-1
BTEXT =5332.76N/00225.91W-Chris in Bolton
OK
cmd: conv

:mb7ubn :Test 123
G4HYG-2>APRS,MB7UBN*,WIDE3-2<UI>::mb7ubn :Test 123
MB7UBN>APU25N<UI>::G4HYG-2 :Test 123 received{03

The TNC is placed in Converse mode by typing CONV followed by Enter. The message format for unacknowledged messages consists of:
: followed by nine character field for the addressee callsign followed by : followed by the message text. In the example the callsign is six characters long and three spaces are typed to fill in the remainder of the nine character field. The message text can be up to 67 characters long**.**

In the example :mb7ubn :Test 123 is typed in followed by Enter.

G4HYG-2>APRS,MB7UBN*,WIDE3-2<UI>::mb7ubn :Test 123 shows the transmitted packet digipeated by the MB7UBN digipeater.

MB7UBN>APU25N<UI>::G4HYG-2 :Test 123 received{03 is a message reply sent by the operator at MB7UBN indicating that the test message was received.

Control-C closes Converse mode and returns to Command mode.

8 Using with UI-View

The APRS TNC Digi Tracker works in Terminal mode with UI-View. Move Switch 2 to the TNC (off) position to select Terminal mode.

The TNC should be connected to the PC with a null modem cable. It will also work with the simplified null modem cable described in the following table:

9 way D type female connector (TNC)	**9 way D type female connector (PC)**
Pin 3 Receive data	Pin 2 Transmit data
Pin 2 Transmit data	Pin 3 Receive data
Pin 5 Ground	Pin 5 Ground

Move the file **ccw_tnc.cmd** from the CD disc or downloaded from the Cross Country Wireless website into the CMD folder in UI-View.

In a typical UI-View installation the CMD folder is found in Program Files / Peak Systems / UI-View32 / CMD

In UI-View Comms Setup select the following options:

Baud rate	4800 or 9600 bd depending on the TNC firmware
Data bits	8
Stop bits	1
Handshaking	None
Host mode	None
Parity	None
TNC Type	CCW_TNC
Comm Port	The serial port the TNC is connected to

When UI-View boots up it will temporarily over-write the settings permanently stored in the TNC with the settings from UI-View Station Setup. If power is interrupted to the TNC during operation the TNC will reboot with it's original permanent settings.
If it is planned to run the TNC with UI-View for a long period we recommend that the user sets the TNC configuration and UI-View Station Setup to the same settings to avoid re-boot changes due to power outage.

UI-View puts the TNC into Converse mode so that any text sent from UI-View is transmitted by the TNC using the MYCALL and UNPROTO settings previously temporarily set in the TNC by UI-View.
If there is a power outage to the TNC it will re-boot into Command mode. UI-View should recognise the cmd: prompt sent by the TNC and send the CONV command to re-set it into Converse mode.
If the user wants to re-set the TNC manually in UI-View then open Terminal and click the Conv button.

In the configuration file the digipeater function of the TNC is enabled as a fill-in digipeater (as long as MYALIAS is set to the recommended setting of WIDE1-1). The digipeater can be switched on and off manually independently of UI-View by switch 8 on the TNC.

9 Using with WinPack

The APRS TNC Digi Tracker works in Terminal mode with WinPack. Move Switch 2 to the TNC (off) position to select Terminal mode.

The TNC should be connected to the PC with a null modem cable. It will also work with the simplified null modem cable described in the following table:

9 way D type female connector (TNC)	**9 way D type female connector (PC)**
Pin 3 Receive data	Pin 2 Transmit data
Pin 2 Transmit data	Pin 3 Receive data
Pin 5 Ground	Pin 5 Ground

In WinPack Options / Comms Setup select the following options:

Baud rate	4800 or 9600 bd depending on the TNC firmware
Data bits	8
Stop bits	1
Handshaking	None
Host mode	None
Parity	None
DCD show con	No
Comm Port	The serial port the TNC is connected to

Before use with WinPack the TNC UNPROTO should be set to CQ,WIDE1-1,WIDE2-2.

The TNC should be set to converse mode by typing CONV followed by Enter.

The WinPack program will now work in unconnected mode with the TNC.

10 Fill-in digipeater

DIGI ON will allow the APRS TNC Digi Tracker to digipeat mobile stations with a digipeater alias WIDE1-1 in their unproto.

In order for the digipeater to function MYCALL, MYALIAS and DIGI ON need to be configured.

MYALIAS should be set to WIDE1-1 to digipeat mobile stations with a matching digipeater alias.

DIGI OFF will switch the digipeater off.

Switch 8 can switch the digipeater manually to OFF when DIGI ON is selected. The orange LED confirms that the digipeater is operating if DIGI ON or DIGI ALL is selected.

11 DIGIpeat ALL

DIGI ALL is a option unique to the APRS TNC Digi Tracker. Any APRS packet received with a valid digipeater unproto setting is digipeated with call substitution.

This is intended for two typical uses. The first is for emergency work. For example a mobile operator could have DIGI ALL configured but switched off with switch 8. In an emergency he/she drives up to the local hilltop, turns switch 8 on and digipeats all local APRS traffic received to the emergency control station.

The second use is to digipeat all traffic on a specific channel to the main APRS channel. This could be traffic on an emergency channel, ISS traffic on 145.825 MHz (as long as no satellite operator is within range) or in a recent (April 2009) example to digipeat an APRS tracker on a trans-atlantic balloon using the US APRS frequency of 144.390 MHz to the European APRS frequency of 144.800 MHz.

In order for DIGIpeat ALL to function MYCALL, MYALIAS and DIGI ALL need to be configured.

DIGI OFF will switch the digipeater off.

Switch 8 can switch the digipeater manually to OFF if DIGI ON or DIGI ALL is selected. The orange LED confirms that the digipeater is operating if DIGI ON or DIGI ALL is selected.

The sample text below shows DIGI ALL in operation:

cmd: disp
ECHO ON
TXDELAY 64
GPS GPGLL
MONitor ALL
DIGIpeater ALL - DIGIPEAT EVERYTHING! ARE YOU SURE?
BEACON On EVERY 15
UNPROTO APRS-0,WIDE3-3
MYCALL G4HYG-2
MYALIAS WIDE1-1
BTEXT =5332.76N/00225.91W-Chris in Bolton
OK
cmd: G1AAA>APU25N,MB7UBN*<UI>:;TRAFFIC *051408z5336.11N\00250.53W?10 In 10 Minutes
G7HHH>APU25N,G1EUH,MB7UBN,WIDE2*<UI>:=5349.81N/00302.47W-g7hhh@???.com
GX0ZZZ>APU25N,G4HYG-2*<UI>:=5322.16N/00201.36WK {UIV32}
M0AAA>APU25N,G4HYG-2*<UI>:=5332.30N/00237.13W- {UIV32N}
M0AAA>APU25N,G4HYG-2*<UI>:>051410zUI-View32 V2.03
M0AAA>APU25N,G4HYG-2*<UI>:?APRS?
MB7UBN>APU25N,G4HYG-2*<UI>:=5332.76N/00225.91W&2m digi + 2m/30m igate Bolton
GX0ZZZ>APU25N,G4HYG-2*<UI>:=5322.16N/00201.36WK {UIV32}

The text after the DISP command shows typical fixed station operation using DIGI ALL.

The first two APRS packets from G1AAA and G7HHH (original callsigns changed) shows that all digipeater unproto aliases have been used previously by other digipeaters and the packet is therefore NOT digipeated.

The remaining six APRS packets in the example have valid digipeater aliases and are digipeated with call substitution (in this example G4HYG-2*).
This also stops the packets received being digipeated by other digipeaters. The DIGI ALL option is intended for emergency use only or to digipeat all traffic on a radio channel to the main APRS frequency.

12 Other firmware options

The firmware is available in three versions for 1200 bd VHF operation.

The standard version usually supplied has a GPS / Terminal data rate of 4800 bd for use with GPS receivers with a standard 4800 bd NMEA output.

The second version has a GPS / Terminal data rate of 9600 bd for use with GPS receivers with a 9600 bd NMEA output.

The third version has a GPS / Terminal data rate of 19.2 kb for use in fixed station Igate installations.

Cross Country Wireless

Appendix 1 Tracker Manifesto

APRS TRACKER Manifesto:

Welcome to APRS!
Bob Bruninga, WB4APR See website http://aprs.org

Thank you for investing in this exciting aspect of the Ham radio hobby. You will find APRS as a great real-time communications and information distribution system that keeps everyone informed of all surrounding APRS and other Ham Radio activity and that also facilitates communications by data and voice among all members of the APRS network.

In that regard, APRS was intended to be a two-way communications system between operators. Although you have purchased an APRS "Tracking Device" which is sometimes connected to only a transmitter, you can still fully participate as an operator in the APRS net. The best way to do that is to connect your APRS tracking device to a transceiver and although the receiver is not used for data, the receiver and speaker with a CTCSS tone can still be fully used as an APRS "intercom" channel for back-channel voice coordination and radio-proximity detector. In effect, you get dual use out of the radio (Data and Voice)!

As noted on the web page above, placing the frequency of your voice receiver in the Beacon Text of your tracker, everyone that receives your position report can also then see how to contact you, and include you in the voice net as needed. If you use the proper format then your frequency will show up properly on everyone else's displays such as shown here. This way, other operators can then easily tune to your calling channel and make needed contact. Although any voice calling channel can be used, we recommend using a radio with CTCSS-100 and tuned to the APRS data channel (144.39 in the USA, 144.800 in Europe). This way, your speaker is muted to all packets, yet you can be called by voice by anyone using PL-100. Another advantage of this method, is that your speaker also becomes a "radio proximity detector" to other similar mobiles in simplex range. This is called "Voice Alert".

Including your own voice monitoring frequency in all of your packets is just part of the use of the APRS *frequency* parameter. Under the New-N Paradigm, the locally recommended voice repeater for all travellers is also being transmitted by most digipeaters as an object. This informs travellers in the area, what frequency is useful to them right there, right now. These objects show up in the station list of all APRS stations for easy visibility as shown above.

If your tracker device has its own transmitter and no receiver, you can still include your monitoring voice contact frequency in a periodic beacon to facilitate communications with you even if you are not onboard. If not a frequency, you might consider including your email address instead. If not in every packet, then once every 10 minutes is suggested.

Both of these methods, Voice Alert and local Frequency Objects fulfil the objective in APRS of facilitating communications between all operators in any situation.

Enjoy! Bob, WB4APR

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Appendix 2 TNC text commands

BEACON EVERY	Set beacon timing from 1 to 60 mins. BEACON EVERY 0 is beacon off.
BTEXT	Status text i.e. BTEXT >Chris in Bolton
CAL	Keys transmitter with permanent tone for transmitter FM deviation adjustment. Use Space bar to toggle between high and low tones.
CONV	Start Converse mode
Ctrl C	Exit Converse mode or Exit CAL mode
DIGI ALL	Digipeat ALL received APRS packets with a valid digipeater alias
DIGI ON	Fill-in digipeat – digipeats all WIDE1-1packets received
DIGI OFF	Digipeater off (Switch 8 can also switch the digipeater off if DIGI ALL or DIGI ON are selected).
ECHO ON	Turn on echoed typed text to screen
ECHO OFF	Turn off echoed typed text to screen
GPS GPGGA	Select GPGGA GPS NMEA data string for position packet in GPS mode
GPS GPGLL	Select GPGLL GPS NMEA data string for position packet in GPS mode
GPS GPRMC	Select GPRMC GPS NMEA data string for position packet in GPS mode
HELP	Display HELP file in Terminal mode
MON ALL	Send ALL received packets to GPS / Terminal port
MON ME	Send received packets addressed to mycall or myalias to GPS / Terminal port
MON OFF	Send no received packets to GPS / Terminal port
MYALIAS	TNC digipeater alias (typically WIDE1-1 for fill-in digipeater) i.e. MYALIAS WIDE1-1
MYCALL	Your callsign and SSID I.e. MYCALL G4HYG-9
PERM	Store settings permanently in the EEPROM
RESTART	Re-boot TNC (for use by UI-View on closing program)
TXDELAY	TXDELAY has a default setting of 40. The number is the number of idle bytes sent before the APRS frame after the PTT is keyed. At 1200 bd that works out at 6.6 mS per byte so the default setting gives a delay of 260 mS. The maximum delay setting of 200 gives a delay of 1.33 seconds.
UNPROTO	APRS AX.25 destination address and digipeater settings. Typical options:

Mobile	unproto GPSC30,WIDE1-1,WIDE2-2
Fixed	unproto APRS,WIDE3-3
ISS	unproto GPSC30,ARISS,SGATE,WIDE2-2

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Appendix 3 APRS symbol tables

Primary symbol table

	/	GPSxyz	GPSCnn	Icon
	/ !	BBz	01	Police, Sheriff
	/ “	BCz	02	(reserved)
	/ #	BDz	03	Digi green star white centre
	/ $	BEz	04	Phone
DX	/ %	BFz	05	DX cluster
	/ &	BGz	06	HF gateway
	/ '	BHz	07	Small aircraft
	/ (	BIz	08	Mobile satellite ground station
	/)	BJz	09	Wheelchair
	/ *	BKz	10	Snowmobile
	/ +	BLz	11	Red Cross
	/ ,	BMz	12	Boy Scouts
	/ -	BNz	13	House QTH (VHF)
	/ .	BOz	14	X
	/ /	BPz	15	Dot
0	/ 0	P0z	16	Numerical circle 0
1	/ 1	P1z	17	Numerical circle 1
2	/ 2	P2z	18	Numerical circle 3
3	/ 3	P3z	19	Numerical circle 4
4	/ 4	P4z	20	Numerical circle 4

Alternate symbol table

	\	GPSxyz	GPSEnn	Icon
	\ !	OBz	01	Emergency
	\ “	OCz	02	(reserved)
	\ #	ODz	03	Digi green star (with overlay)
	\ $	OEz	04	Bank or ATM
	\ %	OFz	05	Power plant (with overlay)
	\ &	OGz	06	Gateway (with overlay)
	\ '	OHz	07	Incident site (with overlay)
	\ (	OIz	08	Cloudy
	\ )	OJz	09	Firenet MEO
	\ *	OKz	10	Snow
	\ +	OLz	11	Church
	\ '	OMz	12	Girl Scouts
	\ -	ONz	13	House (HF)
	\ .	OOz	14	Indeterminate position
	\ /	OPz	15	Waypoint or destination
	\ 0	A0z	16	Circle (with overlay)
	\ 1	A1z	17	Not used
	\ 2	A2z	18	Not used
	\ 3	A3z	19	Not used
	\ 4	A4z	20	Not used

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	/	GPSxyz	GPSCnn	Icon		\	GPSxyz	GPSEnn	Icon
	/ 5	P5z	21	Numerical circle 5		\ 5	A5z	21	Not used
	/ 6	P6z	22	Numerical circle 6		\ 6	A6z	22	Not used
	/ 7	P7z	23	Numerical circle 7		\ 7	A7z	23	Not used
	/ 8	P8z	24	Numerical circle 8		\ 8	A8z	24	Network nodes (with overlays)
	/ 9	P9z	25	Numerical circle 9		\ 9	A9z	25	Petrol station
	/ :	MRz	26	Fire		\ :	NRz	26	Hall
	/ ;	MSz	27	Camp site		\ ;	NSz	27	Park / Picnic area
	/ <	MTz	28	Motorcycle		\ <	NTz	28	NWS advisory (gale flag) (with overlays)
	/ =	MUz	29	Railway Engine		\ =	NUz	29	APRS Touch Tone user
	/ >	MVz	30	Car		\ >	NVz	30	Car (with overlay)
	/ ?	MWz	31	File server		\ ?	NWz	31	Information kiosk
	/ @	MXz	32	Hurricane future prediction		\ @	NXz	32	Hurricane / Tropical Storm
	/ A	PAz	33	Aid station		\ A	AAz	33	Numbered box
	/ B	PBz	34	BBS		\ B	ABz	34	Blowing snow
	/ C	PCz	35	Canoe		\ C	ACz	35	Coastguard
	/ D	PDz	36	Not used		\ D	ADz	36	Drizzle
	/ E	PEz	37	Eyeball (eyecatcher)		\ E	AEz	37	Smoke
	/ F	PFz	38	Farm vehicle		\ F	AFz	38	Freezing Rain
	/ G	PGz	39	Grid Square (6 character)		\ G	AGz	39	Snow shower
	/ H	PHz	40	Hotel (blue bed icon)		\ H	AHz	40	Haze (overlays are Hazards)
	/ I	PIz	41	TCP/IP		\ I	AIz	41	Rain Shower
	/ J	PJz	42	Not used		\ J	AJz	42	Lightning
	/ K	PKz	43	School		\ K	AKz	43	Kenwood

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	/	GPSxyz	GPSCnn	Icon		\	GPSxyz	GPSEnn	Icon
	/ L	PLz	44	Logged on user via APRS-IS		\ L	ALz	44	Lighthouse
	/ M	PMz	45	MacAPRS		\ M	AMz	45	Not used
	/ N	PNz	46	NTS station		\ N	ANz	46	Navigation Buoy
	/ O	POz	47	Balloon		\ 0	AOz	47	Rocket
	/ P	PPz	48	Police		\ P	AOz	48	Parking
	/ Q	PQz	49	Earthquake		\ Q	AQz	49	Earthquake
	/ R	PRz	50	Recreational Vehicle		\ R	ARz	50	Restaurant
	/ S	PSz	51	Space shuttle		\ S	ASz	51	Satellite / PACSAT
	/ T	PTz	52	SSTV		\ T	ATz	52	Thunderstorm
	/ U	PUz	53	Bus		\ U	AUz	53	Sunny
	/ V	PVz	54	Amateur TV		\ V	AVz	54	VORTAC Nav aid
	/ W	PWz	55	National Weather Service site		\ W	AWz	55	NWS site (with overlay)
	/ X	PXz	56	Helicopter		\ X	AXz	56	Pharmacy
	/ Y	PYz	57	Yacht		\ Y	AYz	57	Overlays for radios and other APRS devices
	/ Z	PZz	58	WinAPRS		\ Z	AZz	58	Not used
	/ [	HSz	59	Human		\ [	DSz	59	Wall cloud (overlays are humans)
	/ \	HTz	60	Triangle (DF)		\ \	DTz	60	Not used
	/]	HUz	61	PBBS		\ ]	DUz	61	Not used
	/ ^	HVz	62	Large aircraft		\ ^	DVz	62	Aircraft
	/ _	HWz	63	Weather station (blue)		\ _	DWz	63	WX station with digi (with overlay)
	/ '	Hxz	64	Dish antenna		\ '	DXz	64	Rain
	/ a	LAz	65	Ambulance		\ a	SAz	65	A=ARRL, R=RACES

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	/	GPSxyz	GPSCnn	Icon		\	GPSxyz	GPSEnn	Icon
	/ b	LBz	66	Bicycle		\ b	SBz	66	Blowing dust or sand
	/ c	LCz	67	Incident Command Post		\ c	SCz	67	Civil defence (RACES)
	/ d	LDz	68	Fire station		\ d	SDz	68	DX spot (from callsign prefix)
	/ e	LEz	69	Horse (equestrian)		\ e	SEz	69	Sleet
	/ f	LFz	70	Fire appliance or truck		\ f	SFz	70	Funnel cloud
	/ g	LGz	71	Glider		\ g	SGz	71	Gale flags
	/ h	LHz	72	Hospital		\ h	SHz	72	Amateur radio store
	/ i	LIz	73	IOTA (Island on the Air)		\ i	SIz	73	Indoor short range digi (with overlay)
	/ j	LJz	74	4x4 (Land Rover or Jeep)		\ j	SJz	74	Work Zone (mobile digger)
	/ k	LKz	75	Truck		\ k	SKz	75	Special vehicles (with overlays)
	/ l	LLz	76	Laptop		\ l	SLz	76	Not used
	/ m	LMz	77	MIC repeater		\ m	SMz	77	Value signpost (3 character display)
	/ n	LNz	78	Node		\ n	SNz	78	Triangle (with overlay)
	/ o	LOz	79	Emergency operations centre		\ o	SOz	79	Small circle
	/ p	LPz	80	Rover (dog or puppy)		\ p	SPz	80	Partly cloudy
	/ q	LQz	81	Grid square shown above 128m		\ q	SQz	81	Not used
	/ r	LRz	82	Antenna		\ r	SRz	82	Rest rooms
	/ s	LSz	83	Ship (or power boat)		\ s	SSz	83	Ship / Boat top view (with overlay)
	/ t	LTz	84	Truck stop		\ t	STz	84	Tornado
	/ u	LUx	85	Large truck		\ u	SUz	85	Truck (with overlay)
	/ v	LVz	86	Van		\ v	SVz	86	Van (with overlay)
	/ w	LWz	87	Water station		\ w	SWz	87	Flooding

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	/	GPSxyz	GPSCnn	Icon		\	GPSxyz	GPSEnn	Icon
	/ x	LXz	88	Xastir (Unix / Linux)		\ x	SXz	88	Not used
	/ y	LYz	89	Yagi antenna at location		\ y	SYz	89	Skywarn
	/ z	LZz	90	Shelter		\ z	SZz	90	Shelter (with overlay)
	/ (	J1z	91	Not used		\ (	Q1z	91	Fog
	/ |	J2z	92	Reserved (TNC stream switch)		\ |	Q2z	92	Reserved (TNC stream switch)
	/ }	J3z	93	Not used		\ }	Q3z	93	Not used
	/ ~	J4z	94	Reserved (TNC stream switch)		\ ~	Q4z	94	Reserved (TNC stream switch)

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Chris Moulding, G4HYG