Tracker4

APRS Tracker / TNC / Gateway

MANUAL

ARGENT DATA SYSTEMS

Version 1.02 Revised 8-2-2018

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Introduction

The Tracker4 is the successor to the OpenTracker, Tracker2, and Tracker3 series of tracker/TNC devices. It includes all of the major features of its predecessors and adds many more. Features include:

- Internal GPS receiver
- WiFi network support (802.11b/g/n)
- Standalone IGate support (no PC required)
- Simple browser-based configuration
- Telnet server for remote access
- BASIC interpreter for powerful scripting
- RS-485 interface with Modbus RTU support
- DTMF encoding and decoding
- WAV file playback
- 24 MB of internal file storage for data logging, scripts, etc.

Preliminary Documentation

This is the first public release of the Tracker4 and this manual. Please check www.argentdata.com frequently for documentation and firmware updates for the latest information, feature enhancements, and bug fixes.

Hardware Description

The Tracker4 measures 5.1" by 3.3" by 1.2", including its mounting flange. Its front panel has a male DE9 connector for RS-232 serial accessories such as weather stations, a 10-position 0.150" pitch pluggable terminal block with connections for power, RS-485, Dallas 1-Wire, and three analog inputs, and activity indicator LEDs.

The rear panel includes a 2.1x5.5mm center-positive DC power jack for power input in the range of 6 to 24 volts, a female DE9 connector for interfacing with a radio, a reverse-polarity SMA connector for the WiFi antenna (included), and a regular SMA connect for the GPS antenna (also included).

Interfaces

Interfaces are provided on various connectors on the front and rear panels of the tracker.

Radio Interface (Rear DE9 Female)

1	Audio out (to radio)	**5**	Audio in (from radio)
2	Unused	**6**	Ground
3	Push-to-talk (PTT) output	**7**	Power in (optional)
4	Unused	**8**	Unused

These pinouts are compatible with all prior Argent models using DE9 radio connectors, as well as other common TNCs including the Kantronics KPC-3+. If the power input isn't used by your tracker cable, ensure that the cable does not have that pin shorted to ground.

The PTT mode must be set appropriately for the radio being used. Most base station and mobile radios use a separate PTT input. Many handheld radios, with the notable exception of most Kenwood models, combine the microphone and PTT signals. For combined PTT models, the 'HT PTT' option must be enabled in the configuration.

USB

The USB mini-B connector is the primary way you'll connect the tracker to a PC. The tracker enumerates as a composite device with both mass storage device (MSD) and communications device class (CDC) functions. The MSD function provides access to the tracker's internal file system, and the CDC function allows console and KISS access through a virtual serial port.

For Mac OS X, Linux, and Windows 10, no drivers or INF files are required. For Windows versions prior to 10, an INF file (included on the tracker's own drive) is required for the CDC function. Windows 8 users will need to boot with driver signing turned off to install the INF file.

On Mac OS X and Linux, the CDC serial port will typically show up as /dev/ttyACM0 if no other CDC ACM devices are present. On Windows, you can check under 'Ports' in Device Manager to find the COM port number assigned to the tracker by Windows.

The CDC serial port defaults to console mode. You can access the console using a terminal program like PuTTY or Minicom. The baud rate setting is ignored. You should see a banner and command prompt immediately upon opening the connection.

If KISS packets are detected on the CDC serial port, the port will enter KISS mode automatically. This eliminates the need to manually configure the tracker for KISS operation. To exit KISS mode, enter control-C several times until the command prompt appears.

Serial Port

The front panel male DE9 connector is an RS-232 serial port that supports baud rates up to 921600 baud. Currently the serial port is used only for weather station interfacing.

RS-485 / Modbus RTU

An RS-485 serial port is provided on the front panel terminal block. RS-485 is a long-range multi-drop serial interface with good noise immunity. Modbus RTU is a widely-used protocol for interfacing with devices such as sensors and relays.

Setup

Before your Tracker4 is put into operation, some setup is required. Start by connecting the WiFi antenna, GPS antenna, and a power source. The tracker may be powered through the rear DC jack (a wall adapter may be purchased separately), the radio interface connector, the front terminal block, or via USB.

Once the tracker is powered up, the initial configuration can be done through the web interface or the command console. Both methods are detailed in their corresponding sections below. Regardless of the method used, a few parameters need to be set.

Callsign

A callsign must be set before many of the tracker's functions will operate. This callsign will usually be the legal radio callsign of the tracker's operator. A secondary station identifier (SSID) may be used to distinguish multiple trackers with the same callsign. The SSID follows the callsign after a dash and is a number from 0 to 15. The default SSID is 0, which is not displayed. For example, two trackers operating under the callsign W1AW could be set with SSIDs of 1 and 2, which would be represented as W1AW-1 and W1AW-2. W1AW alone is equivalent to W1AW-0.

Identification laws vary by country, but in most cases the callsign field is not required to be a legal callsign as long as appropriate identification is provided somewhere and sent at appropriate intervals. A common example is a tracker with a tactical callsign, for example 'ROVER-1', with the legal callsign being reported in the comment field.

Setting the tracker's callsign is not required for KISS mode. The KISS packets sent by the host application will include their own callsign fields. The callsign must be set for the tracker to work in standalone IGate mode, however, because gated packets include the gateway's callsign.

Push-to-talk method

Some handheld radios don't have a separate push-to-talk line and instead combine it with the mic audio. For these radios, the HT PTT option must be enabled. See the radio interfacing section of this manual for details

Audio levels

Proper audio levels are critical for reliable transmitting (TX) and receiving (RX) of data packets. For normal APRS operation, the tracker's RX audio level setting isn't critical - you can leave it set at its maximum. For certain voice features you'll need to adjust it to match the peak audio level coming from the radio. If the radio doesn't have a fixed level audio output, make sure you set its volume such that the level does not exceed the tracker's maximum of 3 volts peak-to-peak or clipping will occur and degrade receive performance.

The TX audio level setting is particularly important. Failure to set the TX audio level properly is the most common cause of readability problems. The correct level setting will depend on your radio. Setting the level too low will result in a weak signal that's easily lost in noise. Setting it too high will cause distortion that will render packets difficult or impossible to decode.

For typical APRS operation on the 2-meter band, a proper TX audio level setting is one that results in an FM deviation of about 3.0 to 3.5 kHz. Ideally this should be set with a service monitor or deviation meter. If you don't have equipment to measure the deviation directly, use another radio to listen to the tracker's transmitted packets. Start low and increase the TX audio level setting until the apparent loudness doesn't increase anymore, and then back it off by 10-20%.

Status LEDs

Two LEDs on the front panel provide various status indications. The TX/RX LED lights red when transmitting and green when receiving. ACT blinks green when a valid GPS fix is received or red if the fix is invalid.

File System

The tracker's file system can be used for storing scripts, logs, and voice announcements, among other things. Approximately 24 MB of storage space is available. The file system is used for temporary storage of downloaded updates, but otherwise its contents are not needed for normal operation of the device - the file system can be wiped and reformatted at any time without affecting operation, as the firmware and configuration data are stored outside of this file area.

WiFi Setup

To access the tracker's web interface or use any of its network-related features, you'll first need to configure its network settings. Out of the box, the tracker is configured to create a WiFi Direct group named 'Tracker4'. If you have a WiFi Direct-capable device like an Android phone or tablet, select 'WiFi Direct' from the WiFi network menu and you should see the tracker in the list of available networks.

For devices that don't support WiFi Direct, the tracker will also appear as a conventional WiFi access point with a prefix beginning with 'DIRECT-'. The default password is 'password'.

Once you're connected to the tracker's network, you can access its web configuration interface at <http://192.168.100.1>. From there, you can reconfigure the WiFi system as desired. For a fixed installation with an existing WiFi network, in most cases you'll want to enter your network's SSID and password. When it's rebooted, the tracker will then connect to the specified network.

If the 'create network' option is set, the tracker will fall back to creating its own network in WiFi Direct or Access Point mode, depending on settings, if no known network is available. This can be used to switch between independent operation, for example in a moving vehicle, and fixed location operation.

Accessing the Console

The Tracker4 features an improved version of the command shell found on earlier Tracker2 and Tracker3 series devices. At present, the console is accessible only through USB and not the front panel serial port.

When connected to a PC, the tracker will appear as both a mass storage device, like a USB flash drive, and a virtual serial port. Linux, Mac OS X, and Windows 10 should all work without any special configuration or drivers. On Linux and Mac, the serial device will typically appear as /dev/ttyACM0 if it's the first such device connected. On Windows, access the device manager (press Windows-X and select Device Manager) and check under 'Ports (COM & LPT)' to find the COM port number assigned to the tracker.

Windows versions prior to 10 require an INF file that tells the operating system what driver to load. This INF file is included on the tracker's own file system, and it can also be downloaded from argentdata.com. Please note that Windows 8 must have driver signing disabled first.

Once the virtual serial port is available, you can use a terminal program like PuTTY or Minicom to access the tracker's command console. The baud rate setting is ignored.

After opening the connection you should see the Tracker4 banner message and a `cmd:` prompt. For a list of commands, enter 'help' or '?'.

Settings can be viewed and set using the 'show' and 'set' commands. Enter 'show' alone to list all settings. Note that some settings are also accessible through their own commands for the sake of consistency and compatibility with earlier Argent trackers and also with TNC2 style devices. For example, 'MYCALL' is equivalent to 'show aprs_callsign' and 'MYCALL W1AW' is equivalent to 'set aprs_callsign w1aw'.

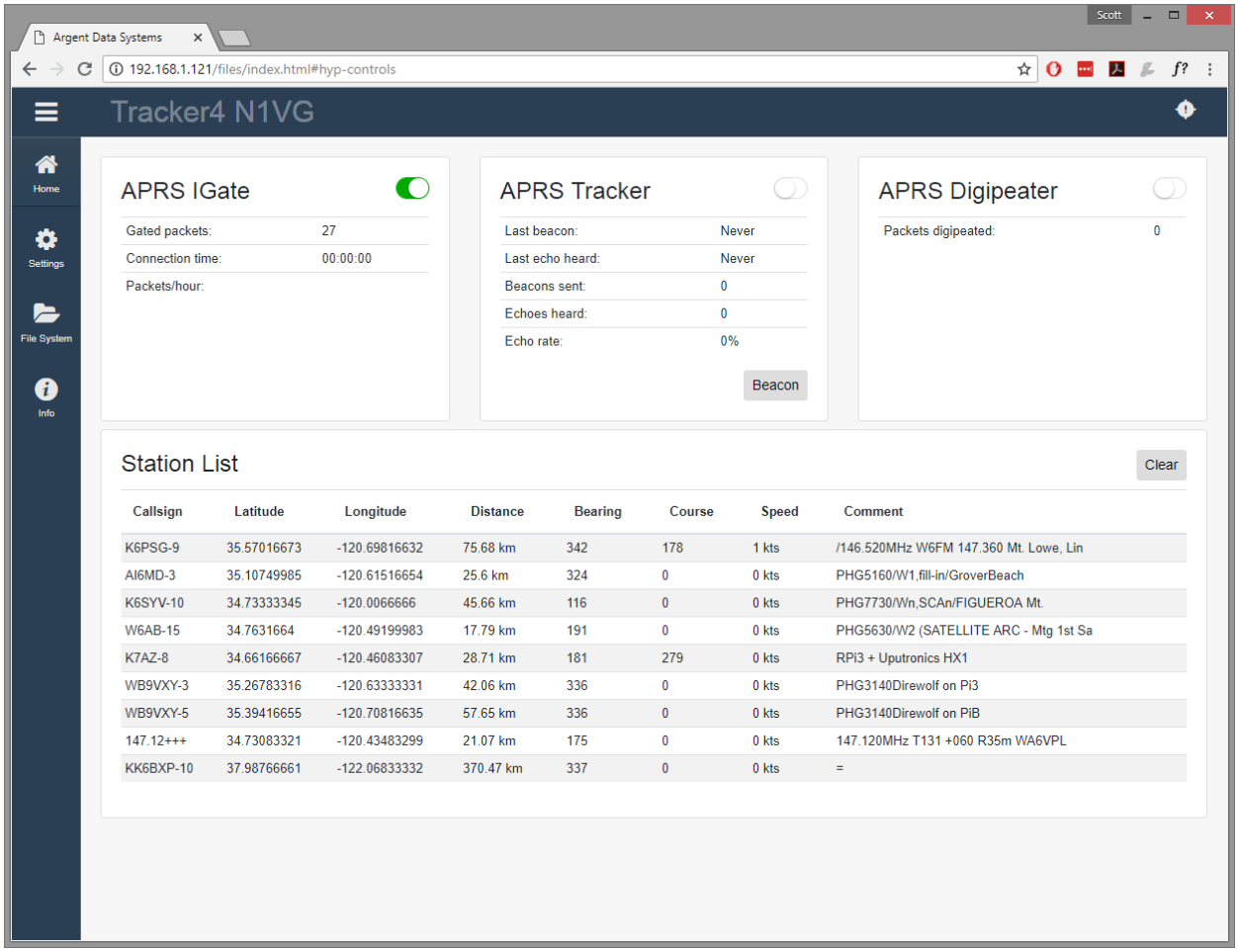
The tracker accepts many familiar MS-DOS style commands like 'dir', 'type', and 'move'. It also accepts their Unix-style equivalents like 'ls', 'cat', and 'mv'. Keep in mind that the tracker's shell is not POSIX-compliant and these commands may not behave exactly like the similarly named POSIX or DOS commands. Take particular care when moving or deleting files and using wildcards.

Alternative Setup Method

If you are unable to set up the tracker using either WiFi or the serial console, you can also configure the tracker by placing shell commands in a file called 'autoexec.cmd' in the tracker's root directory. Enter one command per line. The commands are executed in sequence as if they had been entered at the command prompt every time the tracker is powered up.

Web Interface

The tracker's web interface contains its own help system and is generally fairly self-explanatory, but there are a few things to be aware of. In Google Chrome, it should look something like this:



There are a number of status icons that may appear on the right side of the title bar. These are:

- No GPS lock
- Connection to tracker lost
- KISS interface is active
- Watchdog timer error

The icon will appear at startup, but should disappear as soon as the GPS receiver gets a valid fix. Make sure the GPS antenna has a clear view of the sky.

indicates that the web app has lost contact with the tracker. The network may be down, or

the tracker could be powered off. No new data will be displayed and no commands can be processed. The web app will continue to try to contact the tracker and this icon will disappear when the connection is reestablished.

The 🔗 icon appears whenever a KISS client is active, either through TCP or the serial port.

If the ⚠ symbol appears, the system has suffered a watchdog timeout error. The watchdog timer is an independent supervisory mechanism that ensures the transmitter timeout timers are enforced. If a software error causes the system to hang for more than 1/4 second, the watchdog timer will disable the PTT output and prevent any transmissions until the system is reset. This helps guarantee that the transmitter will never be stuck in transmit mode, and potentially overheat, because of a software glitch. If you see this icon, please contact support@argentdata.com and describe the circumstances in which it appeared.

The ☰ icon in the upper left corner toggles the visibility of the menu bar on the left side of the screen. On a mobile device with a small screen, this lets you free up more screen space for content.

Home Screen

A set of status panels are displayed on the home screen. These give the status and statistics for various features. Each has a toggle switch in the upper right to control the feature. These toggle switch settings take effect immediately and do not change the startup configuration.

The switch in the APRS IGate panel, for instance, will start or stop the IGate. The 'Enable IGate on Start' option in the IGate Settings screen, on the other hand, determines whether the IGate will be started each time the tracker is powered up.

The APRS Tracker panel also includes a 'Beacon' button that will transmit a position beacon immediately, whether the tracker option has been enabled or not.

The station list shows the most recently heard stations, along with their position and other details. The list may be cleared using the 'Clear' button.

Settings

The 'Settings' menu is divided into several sections. Each section has its own 'Cancel' and 'Save' buttons. Clicking 'Cancel' will restore the form to the current saved settings. 'Save' saves the settings to the tracker. For a detailed explanation of a setting, click the blue ? icon next to the setting's name.

Other actions can be performed from the Settings | Updates menu. 'Update Firmware' will download and install the latest firmware, if the tracker is connected to the Internet. 'Identify' will flash the LEDs on the front of the tracker to locate the physical device when configuring multiple trackers. 'Reboot' restarts the tracker. 'Save Config' downloads the tracker's entire configuration as a JSON file, which may be edited locally. Use 'Upload Config' to upload the JSON file.

When a configuration JSON file is loaded, the settings are loaded only into the settings forms and are not immediately sent to the tracker. You can review and save each section individually, or you can use the 'Save All Settings' button to save everything to the tracker at once.

File System

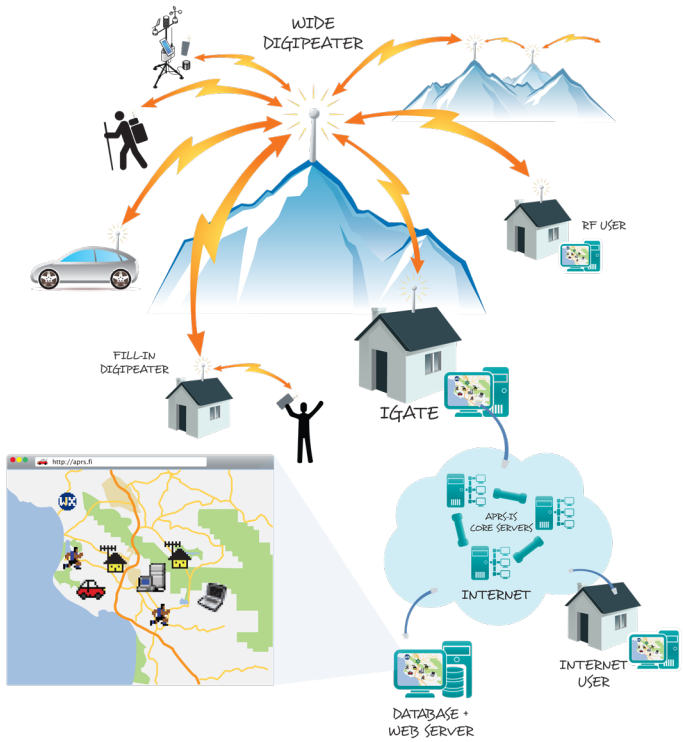
The 'File System' screen allows you to browse the files on the tracker's drive. You can also upload files to the tracker by dropping them in the box at the bottom. More file manipulation options will be added to this screen in future updates.

Info

The 'Info' screen shows another set of panels that give status information for various modules, including the GPS receiver, weather station, and general system information.

Introduction to APRS

To understand the Tracker4 and how it can be used, it is important to first understand exactly what APRS is.



APRS stands for Automatic Packet Reporting System. The name is a trademark of its creator, Bob Bruninga, WB4APR. What the name refers to can be a subject of considerable confusion to newcomers.

Primarily, APRS is a communications protocol. It defines how data (including station and map object positions, weather information, radio direction finding readings, text messages, and telemetry) can be communicated among packet radio stations.

APRS can also refer to the network that carries this information. Throughout the United States, Europe, and several other countries, a network of digital repeaters ('digipeaters'), usually on a common nationwide frequency, provides a transport for APRS packets. Most APRS stations operate on one of these common channels, but not all.

The APRS Internet System (APRS-IS) is an Internet-based adjunct to the radio network. Internet gateways (IGates), often simply home PCs with an Internet connection and a radio, pass traffic from the radio network to a shared, worldwide APRS stream. Many IGates will pass at least text message traffic, and sometimes other data, from the Internet back to the radio network. In this way, text messages can be passed from one station to another even when a digipeater path between the two doesn't exist or isn't reliable.

The name APRS is also sometimes used to refer to WB4APR's original MS-DOS APRS mapping program, but this is now properly called APRSdos. Numerous other mapping and messaging

programs exist, using either the APRS radio network, the APRS-IS, or both. Some of these programs can function as IGates as well.

Connected to the worldwide APRS-IS stream are a number of database services. These systems (aprs.fi and openaprs.net are two of the most popular) process and store all APRS traffic that finds its way to an IGate anywhere in the world, and most provide maps, weather displays, and telemetry graphs based on this traffic. This allows anyone with Internet access to monitor APRS data without needing radio equipment of their own or special software.

Getting data to a web-connected database isn't the only thing APRS is good for, of course. Depending on network coverage and load, it's possible to communicate over a range of hundreds of miles using the radio network alone. However, being a shared network, reliability decreases with each added digipeater hop. APRS is most reliable at the local level, and it's rarely advisable to use more than two or three digipeater hops. Often, a single hop is adequate for local coverage.

The APRS protocol, hardware, and software can be used independently of the national networks, as well. Local or temporary networks may be set up to cover special events or to fill the needs of a particular organization. Some uses may not require digipeaters at all – high altitude balloons, for example, often use APRS to transmit position and telemetry data on a dedicated frequency directly to the chase teams.

Mobile use of APRS can take a number of different forms. The simplest mobile APRS setup is a transmit-only tracker connected to a radio and GPS receiver. These trackers generally have no receive capability, other than to check that the channel is clear before transmitting. They allow the vehicle to be tracked by others, but can't receive messages or positions.

Another option is an APRS-capable radio, like those sold by Kenwood and Yaesu. These radios have a text display, but require a mapping GPS receiver to display the positions of other stations graphically.

An ordinary radio with a TNC can be used in conjunction with a laptop, tablet, or phone to provide full APRS functionality, including mapping and messaging, although this is usually the most expensive option and may not be practical to operate while driving.

Command Reference

All commands can be abbreviated to just the number of characters required to be unique, e.g., STA for STATUS. Use the arrow keys to scroll through the command history.

General System Commands

INFO

Displays status information, including battery voltage, uptime, hardware faults, transmitter status, and connected KISS clients.

IDENT

Flashes all LEDs to identify the device. Useful if you're connected via telnet and have multiple devices.

UPDATE

Starts the network update process. Downloads and installs new firmware, if available.

SET <parameter> <value>

Sets a configuration parameter. Parameter names are listed in the configuration parameters section of this manual.

SHOW <parameter>

Displays a configuration parameter.

SAVE

Saves the current configuration to non-volatile memory. Unlike previous trackers in the series, the Tracker4 doesn't immediately save most settings to non-volatile memory. This reduces the wear on the flash memory, but you must ensure that you use the SAVE command after changing settings if the settings are to be retained after power is lost.

WAIT <milliseconds>

Pauses the shell for the specified duration.

LOADFW <filename>

Loads a firmware update.

RUN <filename>

Executes a batch file or BASIC program.

RESET <sub-command>

RESET DEFAULTS

Resets to factory default configuration.

RESET SYSTEM

Reboots the system after a 3-second pause.

RESET FLASH

Performs a mass erase on the flash memory. All files and configuration data will be erased.

UPTIME

Displays the time elapsed since last reboot.

VERSION

Displays the firmware version.

ECHO <string>

Echoes text back to the command console.

PS

Displays information about running processes. This includes the process ID, task name, state, priority, CPU time (in 1/300 second ticks), and free memory.

REM

Comment, does nothing. Use for batch files.

EXIT

Exits shell. Only useful for telnet connections.

TIME [hh:mm:ss]

Displays or sets the current time of day.

DATE [mm/dd/yyyy]

Displays or sets the date.

LOGGER <text>

Writes a message to the syslog system.

APRS Commands

BEACON [text]

By itself, BEACON causes the tracker to immediately send a position beacon, assuming the callsign is set. If text is entered, the text is transmitted as the body of a plain text packet.

POSITION [latitude] [longitude] | [GPS]

If POSITION is entered with no parameters, the current GPS position is displayed, if the tracker has a valid GPS fix. Entering a latitude and longitude, in decimal degrees (west and south negative), sets the tracker to fixed position mode and beacons will be sent with the entered coordinates. POSITION GPS puts the tracker in GPS mode.

MONITOR [on | off]

When MONITOR is on, all packets transmitted or received will be displayed in the console.

MYCALL [callsign]

Sets the tracker's callsign. This is equivalent to 'set aprs_callsign' and is provided for backward compatibility.

IGATE [hostname] [port]

Without parameters, IGATE reports the status of the IGate subsystem and displays statistics about gated packets. If a hostname and option port are entered, the tracker will start the IGate subsystem and connect to the specified host.

MHEARD [clear]

Lists stations heard on RF. MHEARD CLEAR clears the list.

Radio Commands

Commands that affect the transmitter are processed through a first in, first out queue. The

shell commands will complete immediately, if the queue is not full, and they will be acted on in sequence. Playing a WAV file, for example, may take some time to complete. While the playback is in progress, other radio commands can be entered but they will not be acted on until the playback is finished.

STATUS <on | off>

Enables or disables display of the radio status bar in the console. The status display shows the current state of the radio port and the received audio level.

TONE <freq> <time> [fs]

Generates a tone on the radio port at the specified frequency (in Hertz) for the specified duration (in milliseconds). If FS is added, the tone will be produced at full scale for testing deviation, otherwise the tone will be at 50% of full scale.

PLAY <filename>

Plays a WAV file over the radio port. This can be used for voice announcements.

DTMFSEND <digits>

Sends a string of DTMF (Touch-Tone) tones over the radio port.

PTT <on | off | auto>

PTT ON keys the transmitter and PTT OFF ends the transmission. PTT AUTO enables automatic PTT mode, and radio-related commands like PLAY and TONE will automatically key the radio as needed. Default is AUTO.

TXPAUSE <milliseconds>

This command inserts a pause in the transmitter queue. Use this when a delay is needed between radio commands.

CWBEACON <text>

Sends a Morse code beacon at the configured tone frequency and keying speed.

CANCEL

Cancels all transmitter activity - clears the transmitter queue and drops PTT, if active.

Network Commands

WIFI [sub-command]

Includes several sub-commands. With no sub-command specified, displays WiFi status information, including the device's IP address and WiFi module firmware version. Some the sub-commands affect parameters that can be set with the SET command, but unlike the SET parameters, these commands act directly on the WiFi system and are executed immediately, rather than simply altering saved settings.

WIFI CONNECT [ssid] [password]

Connects to a WiFi network, with optional password. If no SSID is given, the default saved network is used. '*' connects to the first available network.

WIFI DISCONNECT

Disconnects from WiFi network.

WIFI SCAN

Scans for available networks.

WIFI CANCEL

Cancels an ongoing scan.

WIFI WPS

Starts WiFi Protected Setup scan.

WIFI LIST

Lists saved WiFi networks.

WIFI FORGET

Removes a saved network. '*' removes all networks.

WIFI IP <ip addr | DHCP>

Sets the IP address, or enter DHCP to set automatically.

WIFI NETMASK <mask>

Sets the subnet mask (default is 255.255.255.0).

WIFI GATEWAY <ip addr>

Sets the default gateway.

WIFI HOSTNAME <name>

Sets the network hostname for this device.

WIFI RESET

Resets the WiFi module.

WIFI REINIT

Re-initializes the entire network subsystem.

WIFI LOAD <filename>

Loads a WiFi module firmware update. The WiFi module's firmware can also be updated with the latest available version using the UPDATE command. Use WIFI LOAD to manually load a specific local firmware file.

WIFI MODE <client | ap | direct>

Sets operating mode. CLIENT sets client or STA mode, and requires the device to be connected to an access point. AP sets Access Point mode, and DIRECT sets WiFi Direct mode.

WIFI GROUP <name>

Sets the network SSID to be used for AP or Direct mode.

WIFI CHANNEL <0-13>

Selects the WiFi channel for AP or Direct mode. Selecting 0 causes the system to perform a scan and automatically pick the channel with the least interference.

WIFI OFF

Disables the WiFi module.

NSLOOKUP <hostname>

Performs a DNS lookup and returns an IP address.

NTP [hostname]

Synchronizes the local clock with that of a remote NTP server. If no server is specified, time.nist.gov is used.

TELNET <hostname> [port]

Starts telnet client and connects to a remote system.

NETSTAT

Displays information about active network connections and listeners.

FETCH <url> [filename]

Retrieves a file from the network. Supports HTTP and HTTPS. If a filename is entered, the downloaded file is saved with that name, otherwise it keeps its original name.

File Commands

The tracker's file commands work similarly to the equivalent MS-DOS commands, and can also be accessed using their Unix-style aliases.

CD [directory]

Changes working directory, or displays the current working directory if a new directory isn't specified. 'PWD' can also be used to print the working directory.

COPY <src> <dest>

Copies a file from <dest> to <src>. Also accessible with the alias 'cp'.

DEL<file>

Deletes a file. Also accessible with the alias 'rm'.

MKDIR <directory>

Creates a directory. Also accessible with the alias 'md'.

RMDIR <directory>

Removes a directory.

DIR [path]

Lists directory contents. If no path is specified, the contents of the current directory are displayed.

WRITE <file> <text>

Writes a line of text to a file. Appends if file exists.

TYPE <filename>

Displays contents of a text file. Also accessible with the alias 'cat'.

EDIT <filename>

Launches the full-screen text editor. Ctrl-S saves, Ctrl-Q quits. This feature is still in testing and should be used with caution.

RENAME <old> <new>

Renames a file.

MOVE <file> <destination>

Moves a file to the specified directory. Also accessible with the alias 'mv'.

REMOUNT

Forces a remount of the file system. This may be needed if files have been modified by a USB host.

MKFS

Format file system and erase all files.

Debugging / Diagnostics

These commands are provided for troubleshooting and debugging purposes, and are not needed for normal operation of the tracker.

DEBUG <sub-command>

DEBUG ON

Starts output of debugging messages on console.

DEBUG OFF

Disables debug output.

DEBUG SAVE

Saves raw configuration data in binary to config.bin. Use this to make an exact byte-for-byte backup of your tracker's configuration.

DEBUG LOAD

Loads raw configuration data from config.bin.

DEBUG QUEUE

Displays the contents of the transmitter queue.

NVMREAD <record 0-254>

Displays the contents of the specified record in non-volatile memory.

NVMWRITE <record 0-254> <data>

Sets a non-volatile memory record.

NVMDEFRAG

Consolidates non-volatile storage.

NVMFORMAT

Erases contents of NVM.

NVMDUMP

Dumps contents of NVM.

NVMERASE <record>

Erases an NVM record.

SNOOP <port | off>

Displays data from the specified port on the console. Use this to verify that peripherals like weather stations are sending valid data. SNOOP OFF disables the function. On the Tracker4, 'A' is the only valid port for the SNOOP command.

Configuration Parameters

From the console, most configuration parameters are accessed using the `SET` and `SHOW` commands. For example, to check the APRS callsign, use `SHOW APRS_CALLSIGN`. To set the callsign to W1AW, use `SET APRS_CALLSIGN W1AW`. True/false parameters can use true/false, on/off, and 1/0 interchangeably. To set a parameter to an empty string, use empty quotes (“”), for example `SET APRS_COMMENT ""`.

Parameter	Default	Range	Description
tx1_level		0-3300 mVp-p	Transmitter audio level
tx1_ptt_delay		0-255 ms	Delay after PTT before TX audio
tx1_timeout		0-9999 s	Transmitter safety timeout
tx1_cooldown		0-9999 s	Cooldown time after timeout
tx1_vox_threshold		0-99 %	VOX detect threshold, % of full scale
rx1_level		0-3300 mVp-p	Full-scale RX audio level
rx1_cor_mode		0, 1, 2	0 = VOX, 1 = COR Hi, 2 = COR Low
ht_ptt		true/false	Use combined audio / PTT
aprs_callsign	NOCALL	(callsign)	Tracker’s callsign (and optional SSID)
aprs_path		44 characters	APRS digipeater path for beacon packets
aprs_interval		0-65535 s	APRS position beacon interval
aprs_symbol	/k	2 characters	APRS symbol table and symbol code
aprs_comment		63 characters	Comment/status text for beacon packets
aprs_timestamp	false	true/false	Send timestamp with beacon packets
aprs_hms		true/false	Use HHMMSS for timestamp instead of DDHHMM
send_velocity		true/false	Send course and speed with beacon packets
send_dao	false	true/false	Send !DAO! extended precision position
base91	false	true/false	Use Base91 compression for beacon packets
send_altitude	false	true/false	Send altitude with position packets
send_climb_rate	false	true/false	Send climb rate (vertical speed) in comment text
send_voltage	false	true/false	Send tracker’s voltage reading in comment text
send_temp	false	true/false	Send internal temperature reading in text
send_hdop	false	true/false	Send GPS HDOP in comment text
enable_tracker	true	true/false	Enable automatic APRS position beacons
monitor	true	true/false	Display received packets in console
nice	0	0-255	Skip *n* beacons if digi echo is heard
aprs_timeslot	0	0-3600 s	GPS-coordinated timeslot, from top of hour
status_interval		0-255	Send status packet every *n* beacons
passall	false	true/false	Pass corrupted packets (FCS errors)

Parameter	Default	Range	Description
headerln	true	true/false	Print packet header on its own line
filter	true	true/false	Don't show unprintable characters in packet
digi_mycall	true	true/false	Digipeat packets with this unit's callsign in path
dupe_time	30	0-255 s	Digipeater duplicate packet elimination time
sb_low_speed			SmartBeaconing low speed threshold
sb_high_speed			SmartBeaconing high speed threshold
sb_minangle			SmartBeaconing minimum turn angle
sb_mininterval			SmartBeaconing minimum time interval
cw_speed		3-200 wpm	Morse code sending speed
cw_pitch		100-10000 Hz	Morse code tone pitch
cw_id_on		true/false	Send Morse code identification
cw_id		15 characters	Morse code identification string
cw_time			Morse code ID interval
name	Tracker4		Name of this device
enable_console	true	true/false	Enable USB CDC serial console
gps_time_sync	true	true/false	Synchronize system time to GPS time
ntp_sync	true	true/false	Periodically sync time with network server
network_name	Tracker4	32 characters	SSID of WiFi network to create in AP/Direct mode
enable_igate	false	true/false	Enable APRS IGate
gate_to_rf		true/false	Allow gating from APRS-IS to RF
gps_autosave		true/false	Periodically save last GPS position
double_pkt	false	true/false	Send each beacon twice
fixed_position	false	true/false	Transmit fixed position coordinates, not GPS
enable_smartbeacon		true/false	Use SmartBeaconing adaptive beacon algorithm
enable_kiss_usb		true/false	Use USB virtual serial port for KISS mode
kiss_tcp_port		1-32767	TCP port to listen on for KISS connections
ignore_kiss_exit	false	true/false	Ignore KISS 'exit' command from host
enable_weather	false	true/false	Enable weather beacons
enable_kiss_tcp		true/false	Allow KISS clients to connect using TCP
port_a_mode	auto		Sets function of serial port A (front panel)
port_a_baud		0-921600	Sets baud rate for serial port A
enable_digi	false	true/false	Enable digipeater module
digin_alias		(callsign)	Digipeater alias
digin_max_n		0-7	Digi will drop abusive paths with N > max_n
digin_max_hops		0-7	Maximum total hops to allow for digi'd packets
digin_enabled		true/false	Enable digipeater alias *n*

Parameter	Default	Range	Description
digin_insert_id		true/false	Insert digi's callsign in place of alias
wifi_autoconnect		true/false	Connect to WiFi network at startup
use_open_networks	false	true/false	Connect to unsecured WiFi networks
use_dhcp	true	true/false	Obtain network settings automatically
wifi_direct	true	true/false	Use WiFi Direct mode when creating network
wifi_enabled	true	true/false	Enable WiFi networking system
enable_telnet	true	true/false	Enable telnet server for remote access
use_telnet_password	true	true/false	Prompt for password at login
use_http_password	false	true/fase	Require password for access to web interface
remote_password		15 characters	Password for remote access (telnet or web)
create_network	true	true/false	Create a new WiFi network if not in client mode
wifi_channel	0 (auto)	0-11	WiFi channel for AP/Direct modes, 0 = auto
ip_address	192.168.100.1	(IPv4 address)	IP address for static configuration or AP mode
netmask	255.255.255.0	(IP4v netmask)	Subnet mask for static configuration or AP mode
gateway		(IP4v address)	Default network gateway
ap_password		64 characters	WiFi password for clients when in AP mode
wifi_ssid*n*			SSID of saved network *n*
wifi_password*n*			Password for saved network *n*
privacy_mode	false	true/false	If enabled, won't contact server to register
igate_filter			Filter string for IGate's APRS-IS connection
igate_server		32 characters	Hostname of APRS-IS server
igate_port		0-32767	TCP port number for IGate connection
syslog_server		64 characters	Hostname of syslog server
log_level		0-5	Console syslog message threshold
remote_log_level		0-5	Syslog level for remote logging
modbus_timeout		0-65535 ms	Modbus RTU timeout

Units: mVp-p = Millivolts peak to peak, ms = Milliseconds, s = Seconds, wpm = Words per minute, Hz = Hertz

Resetting to Defaults

If you need to reset the tracker to its factory default settings, you can either issue the command `RESET DEFAULTS` or, if you're not able to access the command prompt, open the tracker's case and install a shorting cap on the jumper marked 'SAFE' prior to powering the tracker on. Be sure to remove the jumper afterward or the tracker will erase its settings every time it starts.

Logging

Messages, warnings, and errors produced by the Tracker4 use a Unix-style syslog system. Messages have an associated severity level, ranging from 7 (DEBUG, least importance) to 0 (EMERGENCY, highest importance). Only messages of equal or higher severity (that is, numerically equal to or lower) than the log level setting will be displayed.

The console log level is set with the parameter log_level, and the network log level is set with remote_log_level. Both default to level 5 (NOTICE).

The network log destination is set with the parameter syslog_server. For Windows users, a program like Kiwi Syslog Server from SolarWinds Inc. can be used to receive messages. Of course, syslog messages can only be sent to a remote server when the network is up.

Firmware Updates

The Tracker4's firmware can be updated over the network or from the console. Assuming the device is connected to the Internet, the update process may be started using the console command `UPDATE` or by selecting 'Update Firmware' from the Settings | Updates menu in the web interface.

The main microcontroller and the WiFi network co-processor each have their own firmware. The automatic update process will check and update both as needed. The update process may also download additional files such as web assets and help files if needed.

Updates may also be installed manually. Firmware update packages will have a .bin file extension, and may contain updates for one or both processors. Once an update file has been

copied to the device, it can be installed using the `LOADFW` command. All applicable updates will be installed. To load firmware on the network co-processor only, use the `WIFI LOAD` command.

Avoid powering off or resetting the device during the update process. If the main firmware update is interrupted it will resume as soon as the device is powered up again, but the device may take several seconds to complete the update. Be sure to allow it enough time to complete before turning it off again. The network co-processor will also attempt to recover from an interrupted update, but this process may take several minutes.

Disassembly

It should not be necessary to open the tracker's case in the course of normal operation, but you may need to open it to replace the real-time clock battery or to set the safe mode jumper.

To open the Tracker4's case, remove the four case screws from the rear panel and the two hex screws from the DE9 connector on the front panel. The circuit board will pull out from the rear of the case.

The real-time clock battery is a CR2032 type and should last several years. To replace it, simply push it out of its holder and slide the new one in, positive side up.

The safe mode jumper is located to the left of the center of the board. Short the two pins before powering up the tracker to force entry into safe mode.

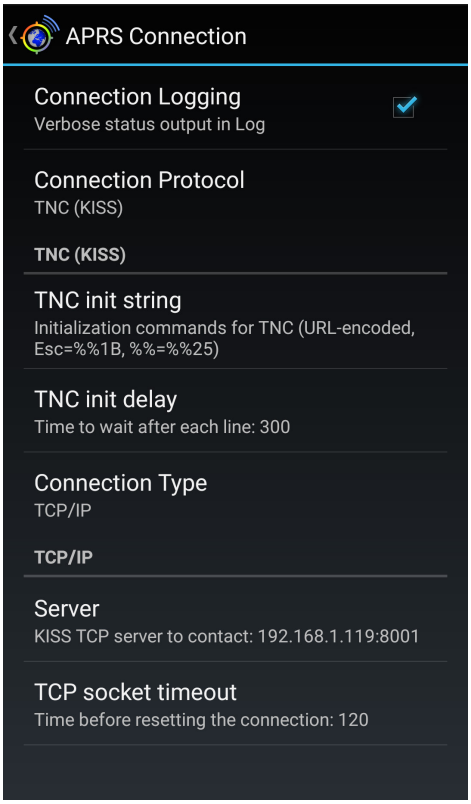
Application Setup

Many APRS client applications are available and this manual can't cover every application and every type of setup, but the instructions here can be used as a starting point.

APRSdroid

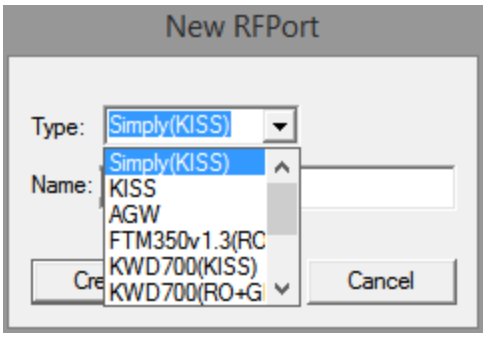
APRSdroid can connect to the Tracker4 using KISS over TCP. First, make sure KISS over TCP is enabled on the tracker. The setting can be found under 'TNC Settings' in the web app. The default port number is 8001.

The screenshot to the right shows an example of a properly-configured APRSdroid installation. The tracker in this example is at IP address 192.168.1.119.

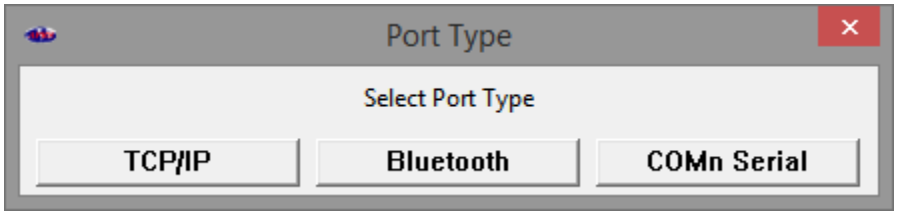


APRSISCE/32

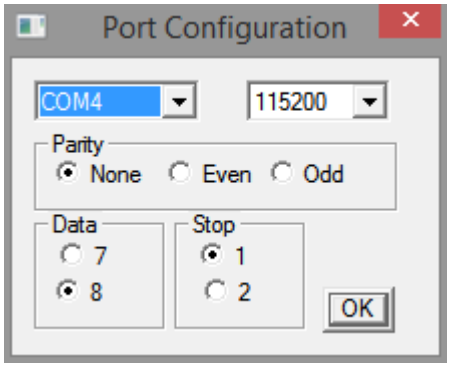
APRSISCE/32 can connect to the tracker using either USB or TCP. In either case, you'll start by creating a new 'Simply(KISS)' port by selecting Configure | Ports | New Port and changing the type to Simply(KISS):



Next you'll be prompted to select the port type. Select 'TCP/IP' to connect over the network, or 'COMn Serial' to connect over USB.

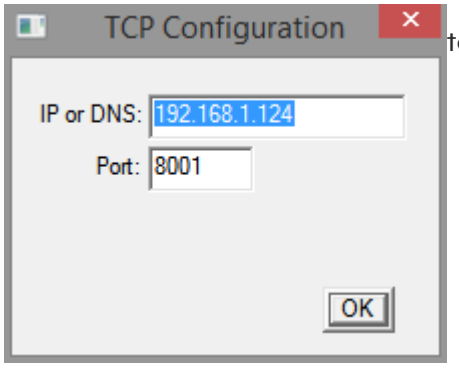


In this example, the port has been named 'KISS COM4'. From the port's setup dialog, select 'Device' to select the COM port. If you're not sure what COM port number Windows chose for the tracker, press Windows-X and select 'Device Manager' from the menu and find the tracker under 'Ports (COM & LPT)'.



In the tracker's 'TNC Settings' menu, you can select 'Enable KISS over USB' to place the tracker's USB virtual serial port into KISS mode. Alternatively, as soon as APRSISCE/32 tries to transmit a packet, the tracker will automatically switch the port to KISS mode.

If you're using TCP instead of USB, you'll need to enter the tracker's IP address. In this example the tracker is at 192.168.1.124 and has the default port number of 8001.



FCC Part 15 Notice

This device complies with Part 15 of the FCC Rules Operation is subject to the following two conditions: this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B Digital Device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communication. However, there is no grantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by tuning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

CE Declaration

This device complies with the essential protection requirements of the European Parliament and of the Council Directive 2004/108/EC on the approximation of the laws of the Member States relating to electromagnetic compatibility. Assessment of compliance of the product with the requirements relating to electromagnetic compatibility was based on the following standards:

EN 55022 : 2006
EN 61000 - 3 - 2 : 2006
EN 61000 - 3 - 3 : 1995+A1 : 2001+A2 : 2005
EN 55024 : 1998 + A1 : 2001+ A2 : 2003
EN 61000-4-2 /-3 /-4 /-5 /-6 /-11

Warranty

If this product fails due to defects in materials or workmanship during the period of one year from the date of purchase, Argent Data Systems will repair or replace the device, at our option.

This warranty covers defects in manufacturing discovered while using the product as recommended by the manufacturer. The warranty does not cover loss or theft, nor does coverage extend to damage caused by misuse, abuse, unauthorized modification, improper storage conditions, lightning, or natural disasters.

Should the product fail, your sole recourse shall be repair or replacement, as described in the preceding paragraphs. We will not be held liable to you or any other party for any damages that result from the failure of this product. Damages excluded include, but are not limited to, the following: lost profits, lost savings, lost data, damage to other equipment, and incidental or consequential damages arising from the use, or inability to use this product. In no event will Argent Data Systems be liable for more than the amount of your purchase price, not to exceed the current list price of the product, and excluding tax, shipping and handling charges.

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The Tracker4 software includes the following open source projects in whole or in part:

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kilo.c - Salvatore Sanfilippo

FatFs - ChaN

uBASIC - Adam Dunkels

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base64.c - Apple Computer

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