Byonics TinyTrak3Config Software Manual

version 1.4e

The Byonics TinyTrak3 is an APRS position encoder used to convert position data from a serial GPS receiver, and send it over a voice radio transmitter. It is available from http://www.byonics.com either as the TinyTrak3Plus controller, or as part of a complete APRS Tracker, such as the Micro-Trak RTG. The TinyTrak3 functionality is accomplished with an 18-pin PIC chip, which can be configured with a Windows computer running the TinyTrak3Config program. This manual is intended to explain the use of that program.

Interfacing

The TinyTrak3 device must be connected to a computer serial port. This can either be a built in serial port, or one created by using a USB-to-serial adapter. If using a USB-to-serial adapter, be sure to have the proper drivers loaded.

Usually, a female-to-female NULL modem adapter will be needed to connect the TinyTrak3 to the serial port. A F-F NULL modem adapter is 2 female DB-9 connectors with pins 2 and 3 swapped between the connectors, and pin 5 connected straight through. When using the TinyTrak3Plus controller, the null modem should be connected to the J2 serial connector on the right side. When using the Micro-Trak RTG, the null modem should be connected to the DB-9 on the MT-RTG interface cable.

The TinyTrak3 must be powered externally in order to configure it with this software, since power is not available on a serial port. When using the TinyTrak3Plus controller, this is normally done using a radio-power cable connected to J1. The radio need not be connected. When using the Micro-Trak RTG, power should be supplied via the MT-RTG interface cable cigarette lighter plug. Be sure an antenna is connected to the SMA connector, as the MT-RTG will usually transmit when it is powered.

Configuring

Once the TinyTrak3 device is connected, start the TinyTrak3Config program, and select the connected COM port in the bottom left Configure section. Click the **Read Version** button to confirm that the software can communicate with the TinyTrak3, and to enable the features of the particular firmware version being used. Some settings may be greyed out if they are not applicable to the firmware version being used.

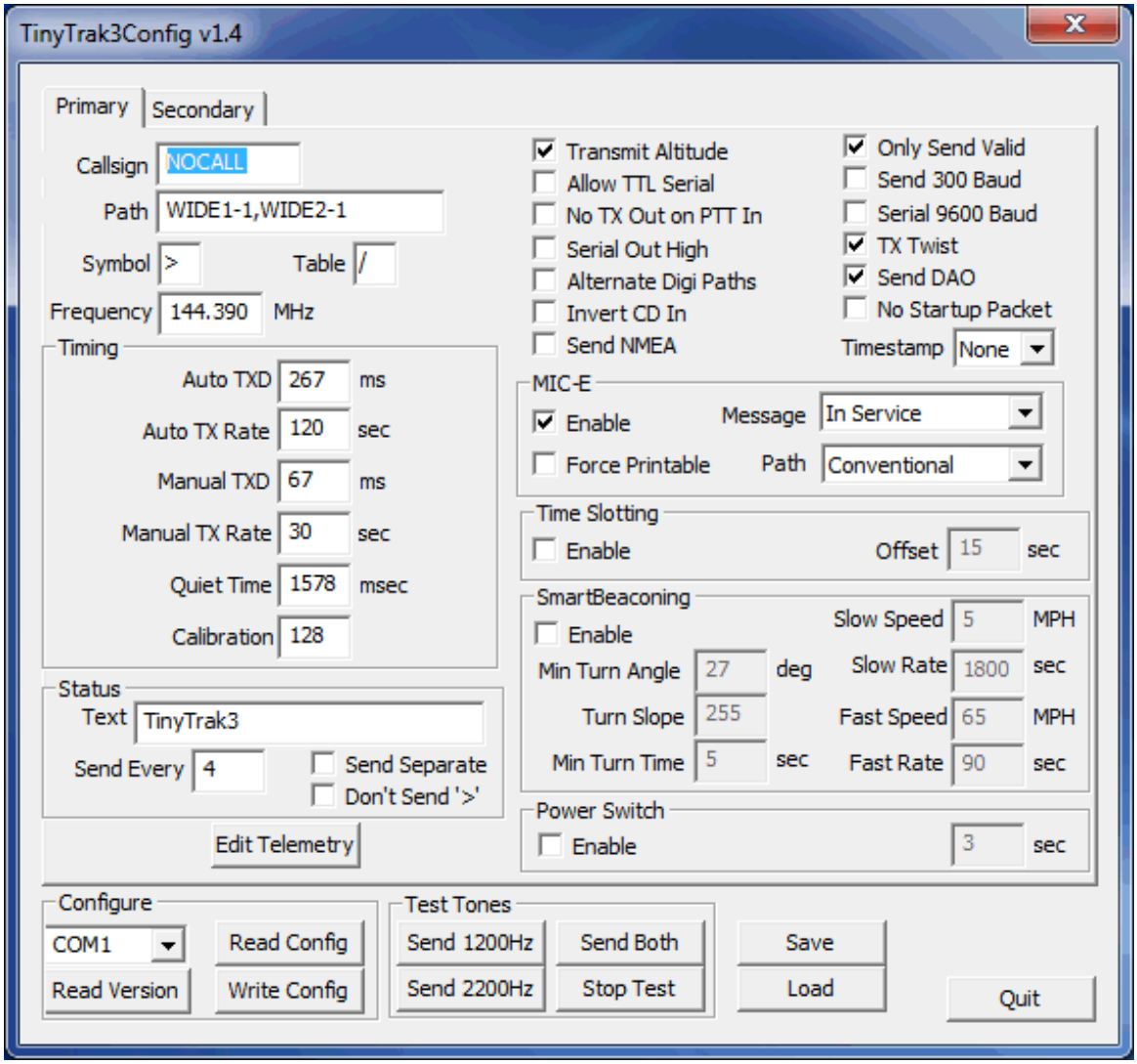
If the software reports that the TinyTrak3 cannot be found, check your hardware connections, power, and COM port settings. Be sure the set COM port can be found in the Windows Device Manager, and that it is not being used by any other program.

The **Read Config** button can be used to read the current settings from the TinyTrak3. This can be useful to change just a few options, while keeping the others as they were.

After the desired settings are set in the software, click the **Write Config** button. This will store the displayed settings to the device, and verify that the write was successful. After writing, disconnect the computer, plug the GPS receiver into the TinyTrak3, and it is ready for operation.

Settings

This section will explain each of the settings in the TinyTrak3Config dialog windows. When started, the program should look similar to this:



Primary/Secondary Configuration Tabs

The TinyTrak3 is capable of store two complete sets of configuration data, and the selected tab tells which configuration bank is being viewed or edited. The user can select which configuration bank to use during operation by adding a SPST switch to the TinyTrak3Plus or Micro-Trak RTG circuit board. If no switch is installed, or if the switch is open, the primary settings will be used. When the switch is closed, the secondary settings will be used. Switching between settings generally causes all running internal timers to reset, and a transmission to be sent with the newly selected bank of settings.

Callsign

The callsign sets the identification of the tracker. This is typically an amateur radio callsign, optionally followed by an SSID. The SSID is a dash, followed by a number from 1 to 15, and is used to uniquely identify multiple trackers belonging to the same amateur radio operator, such as N1ABC-4. A “tactical callsign” can be used in place of the amateur callsign, such as FOLLOW to indicate a follow vehicle. When using a tactical callsign, a valid amateur callsign should be used in the Status Text to comply with amateur radio identification requirements. The callsign can be up to 6 capital letters or numbers, plus the SSID.

Path

The optional Path sets the desired digipeater network path the transmissions should follow. The standard for most locations is **WIDE1-1, WIDE2-1** which means to be repeated by a low level fill in digipeater, and then repeated by a high level digipeater. Some areas have a different convention for their local digipeaters. Note that more callsign used in the path will limit the space available for status text and some other options.

Symbol and Symbol Table

These two options set the desired symbol to be displayed on the map. The Symbol is specified as a single character, such as **>** to represent a car. The Table is also a single character, usually **/** to select the primary symbol table, or **** to select the secondary symbol table, but other characters can also be used here to specify an overlay. Symbols are not used when sending NMEA protocol (the **Send NMEA** setting). Refer to the APRS Symbols section below for most common symbols. Note that the TinyTrak3 does not send the actual graphical icon, just the character code to request a particular symbol. It is up to the APRS mapping program that displays the station as to how it will actually look.

Symbol Table

The Symbol Table, along with the Symbol code above, sets the desired symbol.

Frequency

The frequency sets the desired transmit frequency on devices with a frequency agile transmitter, such as the Micro-Trak RTG FA. The frequency commonly used for North America is 144.39MHz. and for Europe is 144.800MHz.

Auto TXD

The Auto TXD (Transmit Delay) sets the time in milliseconds between the radio being keyed to transmit, and the actual data being sent. The purpose for this delay is to allow the transmitter and receiver to synchronize without missing any important data. This setting is only applicable for automatic transmissions triggered by the Auto TX Rate.

Auto TX Rate

The Auto TX Rate sets how often a position report should be sent. Typically this is set to 120 seconds (2 minutes). Setting to a lower time is not recommended when using the national APRS frequency, as it will make it difficult for all users to share the receiving network.

Manual TXD

The Manual TXD (Transmit Delay) is similar to the Auto TXD, but applies to manual transmissions. Manual transmissions are those triggered by a microphone PTT line wired to the TinyTrak3. When this is enabled, the TinyTrak3 will watch for the manual PTT to be released by the user, and the hold the PTT for a bit longer to send the position report at the end of the voice transmission. Because the transmitter was already active for the voice transmission, a shorter TXD is needed here than for automatic transmissions.

Manual TX Rate

The Manual TX Rate sets a minimum time between manual transmissions, so not every voice transmission will necessarily be followed by a position report.

Quiet Time

The Quiet Time sets the amount of time the TinyTrak3 needs to hear a quiet frequency before it will transmit. This is only applicable on TinyTrak3s with a radio receiver. When the TinyTrak3 detects a busy channel via the Carrier Detect input, the yellow CD LED will light solid. When the channel is clear, the yellow CD LED will flash for the quiet time while it waits to see if any other station will transmit. If the frequency is clear until the end of the quiet time, then the TinyTrak3 will transmit if it is time to do so.

Calibration

The Calibration setting is used to adjust the timing of the TinyTrak3's oscillator. This is usually not necessary, and should be left at the default 128.

Status Text

The Status Text is an optional comment that can be added to periodic position reports. Typically this is used to add additional information about the user or the user's vehicle, such as an email address. The number of digipeaters in the path can reduce the space available for the status text. If the primary and secondary status texts are identical, they will be combined to use less EEPROM space.

Send Every

The Send Every sets how often to send the status text in units of position reports. For example, Send Every 3 means to add the status text to every third position report.

Send Separate

The Send Separate option causes the status text to be sent as a separate packet right after a position report, rather than as a comment embedded in the report.

Don't Send '>'

The Don't Send '>' is used to give more freedom to status text transmissions. When the status text is sent as a separate transmission, it is typically sent after a > character, which signifies it as an APRS status. In order to send other types of APRS packets, such as a static position report, the > character must not be present.

Edit Telemetry

The Edit Telemetry buttons opens a new dialog with settings to control the telemetry options for the current configuration bank. See the Telemetry Settings section below for more details. This is only available for hardware which supports telemetry.

Transmit Altitude

The Transmit Altitude option allows the TinyTrak3 to transmit the GPS reported altitude, if present. Altitude information is found in the GPS's $GPGGA sentence. Sending altitude is not an option when using the NMEA output protocol.

Allow Serial TTL

The Allow Serial TLL option will enable the TinyTrak3 to determine on power up whether it is connected to an RS-232 or TTL level GPS. This option is only needed when used with a TTL GPS. When enabled, the TinyTrak3 will flash the yellow and green LEDs 3 times together on power up, and then check for a TTL GPS. If a TTL GPS is found, it will flash the LEDs 3 more time to show that it is not in TTL mode.

No TX Out on PTT In

The No TX Out on PTT In option is used with the PTT IN line for manual transmissions. Typically, when the PTT IN is active, the PTT OUT line will be set active and the red PTT LED will light to show that a transmission will follow this voice transmission. When this option is checked, the PTT OUT line will not be activate until right after the PTT IN line is released. This can possibly cause a noticeable glitch as the transmitter unkeys and keys again, but it allows a single line to connect to both PTT IN and PTT OUT.

Serial Out High

The Serial Out High option forces the serial output line to be held high rather than the default low. This is sometimes needed for GPSs, such as the Garmin eTrex, that have a sleep mode that stop NMEA output when no voltage is detected on the serial input line.

Alternate Digi Paths

The Alternate Digi Paths option will cause every other transmission to use the callsign and path settings from the unselected configuration bank. This can be used to send position packets over 2 different paths.

Invert CD In

The Invert CD In option causes the TinyTrak3 to consider a high level on the CD input pin to signify an active frequency, rather than the default low level. This is typically used when interfacing to a mobile radio via the 6 pin mini-din data jack. On the TinyTrak3Plus, R9 should be removed or centered when using that interface.

Only Send Valid

The Only Send Valid option prevents the TinyTrak3 from sending a position report when no GPS is connected, or when the connected GPS position is not known.

Send 300 Baud

The Send 300 Baud option puts the TinyTrak3 in 300 baud HF mode, where packet data is sent slower, and with the tones 1600Hz and 1800Hz. The 30-meter HF/FSK APRS frequency pair in the United States is 10.149.200 / 10.149.400 MHz. To transmit the correct frequency pair with the TinyTrak3's 300 baud audio tone pair, set your transceiver to 10.150.00 LSB or to 10.147.60 USB.

Serial 9600 Baud

The Serial 9600 Baud option set the serial baud rate to 9600 baud, rather than the default 4800 baud.

TX Twist

The TX Twist option causes the low tone of 1200Hz to be attenuated to ½ level compared to the high tone of 2200Hz. This can be used to compensate for pre-emphasis and de-emphasis, or lack thereof, in the radios used.

Send DAO

The Send DAO option adds extra resolution to the transmitter position report. Typical APRS resolution is about 20 meters, but with DAO enabled, the resolution is about 20 centimeters, which is usually higher than most GPSs accuracy. The DAO data is appended to the end of the position report, and it not available with the NMEA Out protocol.

No Startup Packet

The No Startup Packet option disabled the initial identification transmission that is sent when a TinyTrak3 is first powered up.

Timestamp

The Timestamp option enables a timestamp to be sent with the position report. The time sent is from the latest GPS data, and can either be in hours, minutes, & seconds (HMS) or days, hours, & minutes (DHM). This option is not used with the Mic-E protocol.

Enable Mic-E

The Enable Mic-E option set the TinyTrak3 to use the Mic-E protocol. This protocol is recommended because is it the most concise, and contains position, speed, course, and altitude, but it is binary encoded, so not easily human readable.

The transmission data will look something like this: **`N6BG-9>S8PRPY,RELAY,WIDE:'2+"!r,j/]"4K}`** If Mic-E is not enabled, APRS Text protocol will be used.

Force Printable

The Force Printable option is a depreciated feature to correct a problem in older TNCs. It modified the Mic-E data slightly to avoid unprintable characters. It is not typically enabled.

Mic-E Message

The Mic-E Message sets one 8 pre-defined status messages encoded in the Mic-E protocol. Caution should be used when selecting the **Emergency!** setting, as it will alert most APRS users to your emergency status.

Mic-E Path

The Mic-E Path sets one of 16 pre-defined routing paths encoded in the Mic-E protocol. This is typically not used, and should be left as **Conventional**.

Time Slotting Enable & Offset

The Time Slotting option is used to synchronize multiple trackers to pre-defined transmission times. When enabled, the tracker will transmit at the specified time offset after the top of the hour, and every Auto TX Rate seconds after that.

SmartBeaconing Enable & Settings

The Smart Beaconing options are used to enable a dynamic automatic transmit rate. Rather than sending at a fixed time rate, SmartBeaconing allow transmissions to be sent more often as the speed increases, and less often when stopped. It also supports Corner Pegging, which causes transmission to be sent when the course changes. The Auto TX Rate is ignored when using SmartBeaconing.

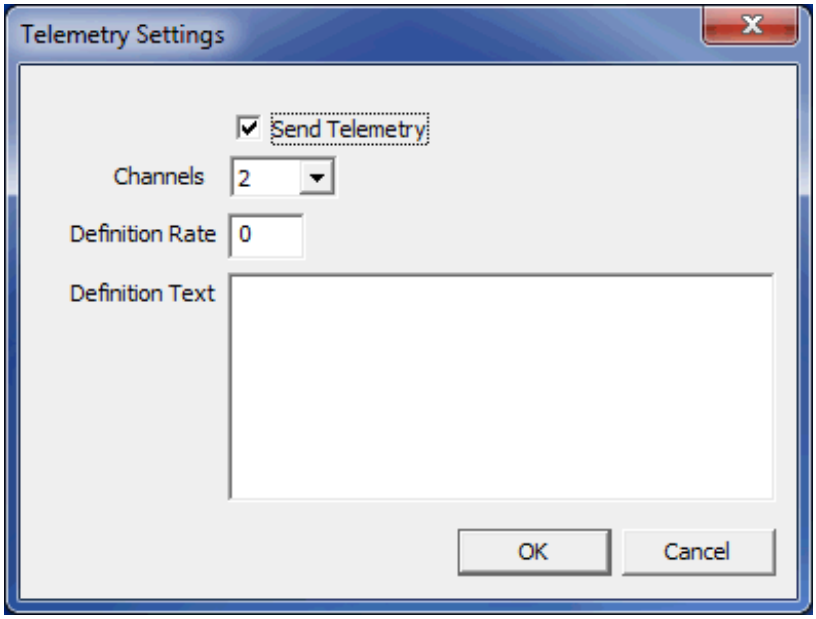
The SmartBeaconing algorithm basically says that if the speed is faster than the Fast Speed setting, position reports will be sent at the Fast Rate. If the speed is slower than then Slow Speed, position reports will be sent at the Slow Rate. If the speed is in between, position reports will be scaled from the Fast Rate. So if the speed is ½ of the Fast Speed, the transmissions will be sent at ½ the Fast Rate frequency (i.e., if the Fast Rate was 90 seconds, it would send every 180 seconds.) More details on the SmartBeaconing algorithm can be found at http://www.hamhud.net/hh2/smartbeacon.html

Power Switch Enable & Time

The Power Switch option allows the power switch output line (J6 on the TinyTrak3Plus PCB) to be activated a preset time before a transmission will occur. This can be used to drive a relay to power up a GPS or a radio only when needed, in order to save battery. The Micro-Trak AIO should typically have this enabled.

Telemetry Settings

This section will explain each of the settings in the Telemetry Settings dialog window, which is displayed when the **Edit Telemetry** button is pressed.



Send Telemetry

The Send Telemetry option causes telemetry data to be appended to a Mic-E position report, after the optional status text.

Telemetry Channels

The Telemetry Channels sets how many channels of telemetry should be sent in the telemetry data. The first channel is usually the supply voltage, sampled from PIC pin 7, the second channel is usually the temperature, sampled from PIC pin 8. The optional third channel will be sampled from PIC pin 11.

Telemetry Definition Rate

The Telemetry Definition Rate sets how often to send the telemetry definitions strings, in units of telemetry reports.

Telemetry Definition Text

The Telemetry Definition Text allows telemetry definitions to be sent regularly to describe and adjust the telemetry reports. It should be entered in a form like this:

```
:MYCALL    :PARM.Battery,Temp
:MYCALL    :UNIT.Volts,Deg.F
:MYCALL    :EQNS.0,0.0293,0,0,0.88,-459.67
:MYCALL    :BITS.00000000,TinyTrak
```

Where MYCALL is the callsign of the tracker, padded with spaces to length 9. The PARM line give a description of each telemetry channel. The UNIT line gives a textual unit to describe each channel. The EQNS line gives a A B, and C for each channel such that the telemetry x value should be calculated to be Ax^2 + Bx + C. The BITS line describes the digital telemetry (not used) and give a project name for the telemetry.

The EQNS above were calculated in the following way. Since the supply voltage is fed through a 10K & 2K voltage divider, the voltage presented to PIC pin 7 is 2K/(10K+2K) or 1/6 the supply voltage. The read value is converted to a

number between 0 (for 0 volts) and 1023 (for 5 volts). So the actual voltage can be found my multiplying the reported number by 5V/1023*6 or 0.0293. So A = 0, B = 0.0293, and C = 0 (the first 3 numbers in the EQNS list.

The temperature sensor reports 10mV / deg K, and deg F = deg K * 9/5 – 459.67, so to convert to deg F, the reported value is multiplied by (5V/1023) / 0.01V * 9/5 = 0.88 and then 459.67 is subtracted.

For Celsius, deg C = deg K – 273.15, so to convert to deg C, the reported value is multiplied by (5V/1023) / 0.01V = 0.489 and then 273.15 is subtracted. Use the equations below.

```
:MYCALL    :PARM.Battery,Temp
:MYCALL    :UNIT.Volts,Deg.C
:MYCALL    :EQNS.0,0.0293,0,0,0.489,-273.15
:MYCALL    :BITS.00000000,TinyTrak
```

APRS Symbols

Primary Table /							
!		Police Stn	P		Police
"		No Symbol	Q		TBD
#		Digi	R		Rec Veh'le
$		Phone	S		Shuttle
%		DX Cluster	T		SSTV
&		HF Gateway	U		Bus
'		Plane sm	V		ATV
(		Mob Sat Stn	W		WX Service
)		WheelChair	X		Helo
*		Snowmobile	Y		Yacht
+		Red Cross	Z		WinAPRS
,		Boy Scout	[		Jogger
-		Home	\		Triangle
.		X	]		PBBS
/		Red Dot	^		Plane lrge
0		Circle (0)	_		WX Station
1		Circle (1)	`		Dish Ant.
2		Circle (2)	a		Ambulance
3		Circle (3)	b		Bike
4		Circle (4)	c		ICP
5		Circle (5)	d		Fire Station
6		Circle (6)	e		Horse
7		Circle (7)	f		Fire Truck
8		Circle (8)	g		Glider
9		Circle (9)	h		Hospital
:		Fire	i		IOTA
;		Campground	j		Jeep
<		Motorcycle	k		Truck
=		Rail Eng.	l		Laptop
>		Car	m		Mic-E Rptr
?		File svr	n		Node
@		HC Future	o		EOC
A		Aid Stn	p		Rover
B		BBS	q		Grid squ.
C		Canoe	r		Antenna
D		No Symbol	s		Power Boat
E		Eyeball	t		Truck Stop
F		Tractor	u		Truck 18wh
G		Grid Squ.	v		Van
H		Hotel	w		Water Stn
I		Tcp/ip	x		XAPRS
J		No Symbol	y		Yagi
K		School	z		Shelter
L		Usr Log-ON	{		No Symbol
M		MacAPRS	|		TNC Stream Sw
N		NTS Stn	}		No Symbol
O		Balloon	~		TNC Stream Sw

Secondary Table \							
!		Emergency	P		Parking
"		No Symbol	Q		Quake
#		No. Digi	R		Restaurant
$		Bank	S		Sat/Pacsat
%		No Symbol	T		T'storm
&		No. Diam'd	U		Sunny
'		Crash site	V		VORTAC
(		Cloudy	W		No. WXS
)		MEO	X		Pharmacy
*		Snow	Y		No Symbol
+		Church	Z		No Symbol
,		Girl Scout	[		Wall Cloud
-		Home (HF)	\		No Symbol
.		UnknownPos	]		No Symbol
/		Destination	^		No. Plane
0		No. Circle	_		No. WX Stn
1		No Symbol	`		Rain
2		No Symbol	a		No. Diamond
3		No Symbol	b		Dust blwng
4		No Symbol	c		No. CivDef
5		No Symbol	d		DX Spot
6		No Symbol	e		Sleet
7		No Symbol	f		Funnel Cld
8		No Symbol	g		Gale
9		Petrol Stn	h		HAM store
:		Hail	i		No. Blk Box
;		Park	j		WorkZone
<		Gale Fl	k		SUV
=		No Symbol	l		Area Locns
>		No. Car	m		Milepost
?		Info Kiosk	n		No. Triang
@		Hurricane	o		Circle sm
A		No. Box	p		Part Cloud
B		Snow blwng	q		No Symbol
C		Coast G'rd	r		Restrooms
D		Drizzle	s		No. Boat
E		Smoke	t		Tornado
F		Fr'ze Rain	u		No. Truck
G		Snow Shwr	v		No. Van
H		Haze	w		Flooding
I		Rain Shwr	x		No Symbol
J		Lightning	y		Sky Warn
K		Kenwood	z		No. Shelter
L		Lighthouse	{		Fog
M		No Symbol	|		TNC Stream Sw
N		Nav Buoy	}		No Symbol
O		Rocket	~		TNC Stream Sw

Rev H - Sep 28, 2005 - Table generated by N6BG - Images courtesy of WA8LMF