

SteppIR Controller Hardware

The SteppIR Antenna Controller serial interface can be used with a wide range of Amateur Radio transceivers to automatically track frequency changes. The controller can also be commanded from a computer via the serial interface. The SteppIR Controller typically connects to a radio on the Data In connector, and can connect to a computer on the Data Out connector.

Serial Cable Connections

The Serial interface plugs into the driver board inside the SteppIR controller. Externally, it has two 9-pin D-sub connectors labeled **Data In** and **Data Out**.

Data In is the radio connection port. This port has a unique pin-out requiring non-standard cables to connect to particular radio models. This was done so that only a cable change is necessary to support different radio types. The Data In port baud rate can be changed to standard values between 4800 and 57600 baud.

Pin	Purpose
1	Data out RXD
2	RXD to RS232 Radio TXD
3	TXD to Radio RXD
4	TTL Kenwood and active high for Radio CTS
5	Signal Ground
6	Optional ICOM TXD
7	TTL version of pin 2
8	NC
9	TTL RXD for Steppir.

Figure 1 -Pinout of the 9-pin D-SUB DATA IN CONNECTOR

Data Out is the Computer or Daisy chain port. This port is wired like a Computer serial port and requires a standard Null Modem cable (pins 2 and 3 crossed) to connect to a computer or the Data In of another SteppIR controller. This port's baud rate ranges from 4800 to 19.2k baud. If the controller baud rate is set higher than 19.2k, this port will remain at 19.2k.

Pin	Purpose
1	Internally connected to pins 4 and 6
2	RXD
3	TXD
4	Internally connected to pins 1 and 6
5	Signal Ground
6	Internally connected to pins 4 and 1
7	Internally connected to pin 8
8	Internally connected to pin 7
9	Radio TTL RXD

Figure 2 - Pinout of the 9-pin D-SUB DATA OUT CONNECTOR

Operation

For the SteppIR controller to follow the Radio frequency the baud and radio type must be set (in the case of the Fluidmotion controller, it also needs to be in the “General Freq” mode). With most radios, the controller or logging program will request radio status every 1 to 7 seconds. It's normal that on startup that there will be a delay before the SteppIR controller frequency changes.

The SteppIR controller behaves differently when used with ICOM radios. Due to the way that ICOM radios communicate, the Controller will only track when the radio frequency is changed. When initially powered on, the controller will not track the radio frequency until the radio front panel knob is moved.

The controller breaks each band up into approximately 50 kHz segments. Small radio frequency changes may not cause a change of antenna lengths until a segment boundary is crossed.

There several operating configurations depending on how the SteppIR is connected to other equipment.

- Stand-alone Radio to SteppIR Controller – This is the most basic configuration and only requires the proper cable, and on some radios a serial adapter, to go between the radio's serial port and the Steppir Serial interface **Data In**.
- Computer Logging program and SteppIR Controller – In this configuration the SteppIR must share the radio's computer port with the logging program which creates a conflict with the transmit data going to the radio. To address this problem the SteppIR Controller uses a “Y” cable that allows it to passively listen to the data being sent to the computer from the radio. The drawback to this method is that the logging program must request the radio to report the frequency so the SteppIR can see it. Most logging programs, such as TRX Manager and Logic 6, do query the radio for the frequency at periodic intervals. However, a few don't and they will not work with the Steppir. We had originally designed the serial interface to pass through the data so we could hear both sides but quickly learned that many radios were passing huge amounts of data for a simple frequency change that easily overran our microprocessor serial buffer so we had to abandon that approach. ICOM radios will work with any logging program because their “transceive” mode sends out the frequency the radio is on every few hundred milliseconds.
- Computer Control – The Computer typically connects to the Data Out connector and programs like N8LP's Virtual Control Panel (VCP) or YO3DMU's PstRotator use SteppIR serial commands to control the antenna direction and frequency. The Computer can also be connected to the Data In with the Radio type set to SteppIR, this will respond to the same commands as the Data Out but acts like the master controller sending out a request for status every second. It is also possible to have a radio attached to the Data In while the computer is attached to the Data Out.
- Connecting to a SteppIR controller – In this configuration you can use one controller to make several SteppIRs follow each other or just pass the Radio Data through to the next controller down the line. This feature makes controlling a stack of antennas simple.

Daisy chaining Controllers

- There are several ways to get multiple controllers to track the radio frequency. It will depend on your preferences and the Radio type. With ICOM radios you have the ability of connecting 5 devices directly to the Radio using a CT-17 or similar device. If you have a RS-232 radio you would need a “Y” cable to do the same thing with the first controller being the only controller connected to the Radio RXD pin.

- Alternately you can Daisy chain controllers having one controller be the master and the rest slaves. This has the advantage of allowing you to select the direction or the frequency of all the controllers connected together from the Master.

Remote Control Considerations with latest software versions

In some cases you may want to control the SteppIR remotely from a computer.

- The SteppIR will remember the state of the power switch, but the state is written approximately 3 minutes after the last change. After this delay you can remove power from the controller and it will turn on when power is restored.
- Use the Retract (HOME) elements command before removing power.
- If the Controller loses power while it is tuning, it will get out of sync with the SteppIR Antenna Element location. A recalibration command can be used to bring the controller and antenna elements into sync.

Radio Considerations

ALL Radios

The baud rate must be set to the same value on both the radio and the SteppIR. The SteppIR is not compatible with any auto baud rate feature that some radios have.

ICOM Radios

NOTE: Please be aware the new serial interface software will not operate at 1200 baud, which is the default for older ICOM radios. Simply choose a baud rate of 4800 or higher.

- The Radio must have the CI-V transceive mode enabled. This mode is used to make more than one radio follow the master radio.
- When using more than one CI-V device (a computer and a SteppIR) the SteppIR should be connected directly to the CI-V port through a “Y” connector or an ICOM CT-17. If connected to a “Y” cable through a RS-232 Converter (CT-17) the SteppIR will only track if the logging program polls the radio.
- Using a logging program with an ICOM radio is quite transparent with the SteppIR connected directly to CI-V port. It will follow the frequency of the logging program or the radio.
- There are a few logging programs that want the transceive mode disabled, in this configuration the SteppIR will only follow the frequency when the logging program requests status.

Kenwood Radios and the Elecraft K2, K3, KX3

- The Kenwood uses several different port and interface configurations, requiring different cables for different models check table at end of the document.
- The newer RS-232 Kenwood radios like the TS-2000 and TS-570 are sensitive to RS-232 levels and require a different cable than the radios using the Kenwood IF10.
- To use a logging program and the SteppIR requires a “Y” cable that connects the radio transmit pin to the SteppIR receive pin. This allows the SteppIR to monitor the data coming from the radio for the frequency information. The limitation of the “Y” cable is that the SteppIR will only track when the logging program is loaded and active.

YAESU Radios

- Only radios that are part of the families listed will work (i.e. FT1000MP, FT1000MP-V, FT1000MP-Field) this has to do with each one having a unique response to the status command.
- To use a logging program will require a “Y” cable that connects the radio transmit pin to the SteppIR Receive pin. This allows the SteppIR to monitor the data coming from the radio for the frequency information. The limitation of the “Y” cable is that the SteppIR will only track when the logging program is loaded and active. It should be further noted that when using a “Y” cable that it is possible to get the incorrect frequency information. This only happens with some logging programs and can be caused by polling frequency and configuration. This is because Yaesu does not mark which radio command requested the data, or the start of the data stream, or the end of data so the SteppIR only knows that there was new data. Our current software does a better job than earlier versions did at handling the Yaesu communications. You may want to consider using a separate PC serial port rather than the Y cable with Yaesu radios.

Ten-Tec ORION

- This radio only operates at 57.6k baud so you should remember that when the Radio (Data IN) is set higher than 19.2k baud that the Data OUT port will default to 19.2k. It is important to remember to set the slave controllers to 19.2k if you are daisy chaining SteppIRs.
- To use a logging program requires a “Y” cable that connects the radio transmit pin to the SteppIR receive pin. This allows the SteppIR to monitor the data coming from the radio for the frequency information. The limitation of the “Y” cable is that the SteppIR will only track when the logging program is loaded and active.

Steppir Slave Mode

This mode allows you to gang multiple controllers together under the control of one master controller. The master controller will control the slaves either manually or from a radio. The master is controlled via Data In port (the upper 9-pin DB connector) by the radio and the first slave is then connected to the master Data Out port (the lower 9-pin DB connector). Use a 9-pin to 9-pin null modem cable to connect each controller's Data Out to the next-in-line's Data In port.

- This mode is provided to make the radio port (Data In) so it can read data from the Data Out port of the SteppIR.
- In this master slave mode the controllers with the widest frequency range (i.e. 40m to 6m) should be first in the chain so the frequency gets passed along.

Data Out Port (Computer Control)

For information on the communications protocol (for writing software programs to interface with the controller) please contact SteppIR directly at support@steppir.com.

Radio type table:

Tested and working Logging programs: TRX manager, DX4win, Logger, Logic7, Logger32, MixW, TRLog, WIN-EQF, WriteLog, LogWindows, N1MM, CT

ICOM				
Radio	Cable Type	Plug Type	Interface Port	Notes
ICOM	S01	3.5 mm Phono	CI-V	All Icom - does not need Y cable for logging.
KENWOOD				
Radio	Cable Type	Plug Type	Interface Port	Notes
TS850S	S15	6 pin din	ACC1	
TS940S	S15	6 pin din	ACC1	Requires optional IF-10B
TS950S	S15	6 pin din	ACC1	
TS680S	S15	6 pin din	ACC1	Requires optional IF-10C
TS690S	S15	6 pin din	ACC1	
TS440S	S15	6 pin din	ACC1	Requires optional IC-10
TS450S	S15	6 pin din	ACC1	
TS140S	S15	6 pin din	ACC1	Requires optional IF-10C
TS711A	S15	6 pin din	ACC1	Requires optional IF-10A
TS790A	S15	6 pin din	ACC1	
TS811A	S15	6 pin din	ACC1	Requires optional IF-10A
R5000	S15	6 pin din	ACC1	Requires optional IC-10
TS570	S18	9 pin male cross		
TS870	S18	9 pin male RTS		Requires Kenwood cable
TS2000	S18	9 pin male RTS		
TS50S	S12	9 pin male cross		Requires optional IF-10D
TS480	S18	9 pin male RTS		
TS450D	S18	9 pin male RTS		
TS990	S18	9 pin male RTS		
TS590S	S18	9 pin male RTS		
YAESU				
Radio	Cable Type	Plug Type	Interface Port	Notes
FT847	S12	9 pin male cross	CAT	
FT897	S13	9 pin M to F	CAT	Requires CT-62
FT857	S13	9 pin M to F	CAT	
FT920	S13	9 pin	CAT	May require an S00 in some

				cases
FT990	S13	9 pin	CAT	May require an S19 in some cases (25 pin); Requires an IFF2332 RS232 interface
FT991	S18	9 pin male RTS	CAT	Requires transceiver interface firmware 9E or later. Select "FT9000D" in the transceiver setup menu.
FT950	S18	9 pin	CAT	ROM of version -04 or later ONLY
FT1000D	S13	9 pin	CAT	Requires FIF-232 interface; may use the S19 25 pin in some cases
FT1000MP	S18	9 pin	CAT	Same with FIELD models; may use S00 in some cases
FT2000	S18	9 pin male RTS	CAT	
FT5000	S18	9 pin male RTS	CAT	
FT9000DX	S18	9 pin male RTS	CAT	
FTDX101D	S18	9 pin male RTS	CAT	Requires transceiver interface firmware 9E or later. Select "FT9000D" in the transceiver setup menu.
ELECRAFT				
Radio	Cable Type	Plug Type	Interface Port	Notes
K2	S26	9 pin M to F		Needs K2 serial kit
K2 + ser kit	S26	9 pin M to F		Select Kenwood 4800 baud
K3	S26	9 pin M to F		
KX3	S28	3.5 mm phono		
TEN TEC				
Radio	Cable Type	Plug Type	Interface Port	Notes
Omni 5	NA	NA	NA	Does not work
Omni 6	S01	3.5 mm phono		Has Icom interface; May use the S13
Omni 7	S01	3.5 mm phono		Has Icom interface; May use the S13
Orion	S13	9 pin M to F		Requires 57.6K baud, new crystal
Orion II	S13	9 pin M to F		Need latest Orion flash
Pegasus	S13	9 pin M to F		Not tested. Similar to Orion
Jupiter	S01	3.5 mm phono		Has Icom interface; May use the S13

FLEX				
Radio	Cable Type	Plug Type	Interface Port	Notes
All Models	S12	9 pin male cross		
MISC				
Radio	Cable Type	Plug Type	Interface Port	Notes
Microham	S16	9 pin female cross		Models: StationMaster & MK2R; may also use S16.
SteppIR	S16	9 pin female cross		Used for slaving controllers or computer
Y-Cable	S14			One XCVR data port to two 9 pin (SteppIR controller and a computer)