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Bandmaster III Universal Band Decoder



Using USB (RS232) or band data (BCD) information, the Bandmaster III converts that frequency/band data to allow meaningful automated control of your station.

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Introduction

The **Bandmaster III** universal band decoder is a highly integrated unit that not only decodes band information using **YAESU** "band data" (note 1), but can sense band information for all bands from 160M through 6M, including 160M, separate 80M and 75M, 60M, WARC bands and 6M by monitoring **CAT** (note 2) data going to and from the radio. The **Bandmaster III** also contains all circuitry for level conversion thus eliminating the need for a separate **CAT** radio interface (note 3).

It supports radios from **ICOM**, **KENWOOD**, **YAESU** as well as other radios like the Elecraft **K3** or **TENTEC ORION** using CAT protocols from these manufacturers (note 4). You can even use the decoder as a stand-alone unit where it will monitor the **CAT** commands, **YAESU** "band data" (note 1) or **ICOM CI-V** data from the radio and automatically switch to the band being used at that time by the radio and this without any computers attached to the **Bandmaster III** or the radio! Or it can be connected to your computer and used with your favorite logging or radio control program as your CAT interface or level converter, thus replacing your existing converter (note 3) and antenna selector.

Using the **Bandmaster III** software you will also have the ability to configure the radio interface and set the frequency limits for each band, thus providing even a great deal more flexibility. The **Bandmaster III** gives you two separate relay contact outputs for each band. One set of contacts (The B contacts) switch to ground when activated and the other set (A) is switched to a "Common" pin(13). This "Common" pin may be connected to ground or any voltage source you desire.

Note 1: **YAESU** BCD Band Data information does not support 75M and 60M.

Note 2: **CAT** = **C**omputer **A**ided **T**ransceiver, CAT is used to control your radio via computer based software, these are often stand alone software or can be integrated into logging software and/or satellite control software.

Note 3: **ICOM** CT-17 or **YAESU** FIF-232 or the **KENWOOD** IF10a/IF-232C.

Note 4: The **K2** uses **KENWOOD** protocol and some of the **TENTEC** emulates an **ICOM** IC-735, the **K3** produces Yaesu Band-data.

1 Physical description

The **Bandmaster III** is a fairly simple device. The front panel has a power LED and 12 LEDs indicating the currently selected band. The back of the **Bandmaster III** has five connectors (figure 1 below) used for the various connections;

1. The Relay Output is a 25-pin D-sub connector used to connect the **Bandmaster III** to other devices. A mating connector and shell are supplied with the unit.
2. The USB connector is used to connect the **Bandmaster III** to your computer.
3. The CI-V connector is a 1/8" phone jack used for Icom radios. When using any radio type except Icom this connector will transmit a CI-V frequency data stream to allow automatic band switching of Icom amplifiers (exception: The PW-1 will not work) and other Icom accessories with non-Icom radios.
4. The Radio connector is a 9-pin D-sub male connector used to connect the **Bandmaster III** to your radio (RS-232, TTL, BCD Band Data, etc).
5. The network connector is used to supply power to the **Bandmaster III** and the 4-Wire antenna control network. The connector block has screw terminals for easy connection and is supplied with the unit.



Figure 1 - Rear View

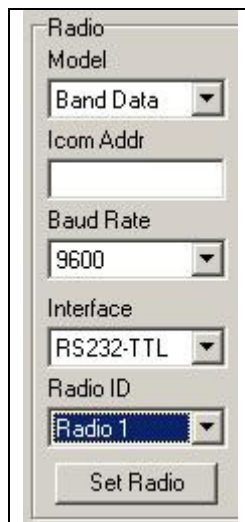
2 Bandmaster III Hardware Configuration

In this section we will look at the different ways of configuring the **Bandmaster III** hardware.

The unit may (should) be configured via the **Bandmaster III** software (preferred method) or by DIP switch settings on the Bandmaster III circuit board.

Note: When using the decoder with the optional 4-Wire Network control system you **must use the software configuration option.**

Band Data: Yaesu / Elecraft Band Data users will configure the Bandmaster III for “Band Data” as the Radio Model as shown in the following image (i.e.; Band Data should be chosen instead of the radio model):



The image shows a software configuration window for the Bandmaster III. It contains several fields and dropdown menus:

- Radio Model:** A dropdown menu with "Band Data" selected.
- Icom Addr:** An empty text input field.
- Baud Rate:** A dropdown menu with "9600" selected.
- Interface:** A dropdown menu with "RS232-TTL" selected.
- Radio ID:** A dropdown menu with "Radio 1" selected.
- Set Radio:** A button at the bottom of the window.

The interface type is automatically determined from the radio type. Switch settings are dependent on which configuration mode you select, manual or software. A '0' in the tables indicate OFF and '1' indicates ON. Switch settings are:

Software mode

When configuring the **Bandmaster III** via software switches 1-4 set the 4-Wirenetwork address of the unit. Each Bandmaster III on the network must have a different address. Switches 5-8 must be in the OFF position. Instructions for the **Bandmaster III** configuration software are located in section 6.

Address	SW #1	SW #2	SW #3	SW #4
1	1	0	0	0
2	0	1	0	0
3	1	1	0	0
4	0	0	1	0
5	1	0	1	0
6	0	1	1	0
7	1	1	1	0
8	0	0	0	1
9	1	0	0	1
10	0	1	0	1
11	1	1	0	1
12	0	0	1	1
13	1	0	1	1
14	0	1	1	1
15	1	1	1	1

Manual Mode

The following table shows the switch settings for manually configuring the decoder. Note that no Icom address can be set in the manual mode. You must turn the VFO knob on Icom radios when first powering on the decoder for the band to be detected.

Switch #7 (OPT3) must be on to enable the manual configuration. The following tables show the switch settings to select the radio type and baud rate.

Radio	SW #1	SW #2	SW #3	SW #4
Band data	0	0	0	0
Icom	1	0	0	0
Kenwood	0	1	0	0
FT840/890	1	1	0	0
FT847	0	0	1	0
FT920	1	0	1	0
FT1000MP	0	1	1	0
FT2000	1	1	1	0
Orion	0	0	0	1

Baud	SW #5	SW #6
1200	0	0
4800	1	0
9600	0	1
57600	1	1

Switch #8 – Program mode (**Must be OFF**)

3 Connections and cable configurations

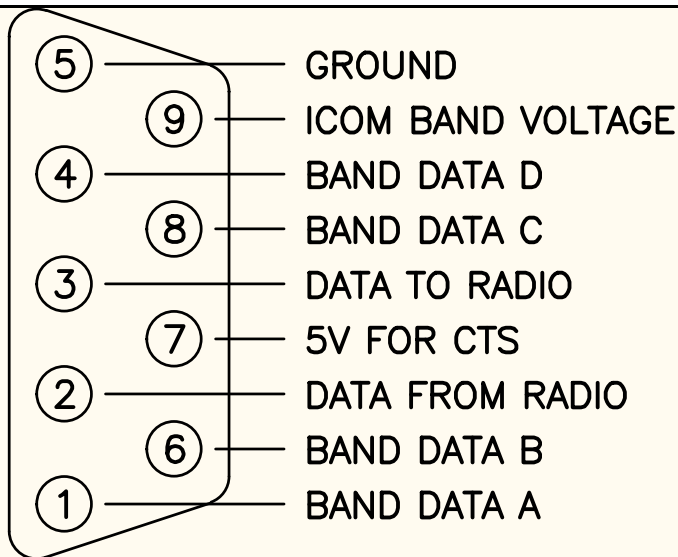
Using the **Bandmaster III** via the **CAT** interface by far gives you the most out of your **Bandmaster III**. But if for different reasons you cannot, the **Bandmaster III** gives you the flexibility of monitoring **YAESU BCD "band data"** from the radio. In this section we will look at different ways of connecting your **Bandmaster III** and how to make the cables to connect your radio to the decoder.

3.1 USB interface

A computer is not required for operation of the **Bandmaster III**, but the decoder is compatible with most logging/control software. Connecting the **Bandmaster III** to a computer increases its flexibility. To do so, simply connect a standard USB cable between the **Bandmaster III** USB connector and a USB port on your computer. The USB interface in the **Bandmaster III** emulates a standard COM port and you must configure the radio control in your logging software to use this emulated COM port and set the baud rate to 9600 regardless of the radio baud rate. Any required baud rate conversions are done automatically in the decoder. No other special settings are required as the **Bandmaster III** is transparent to the logging/control software.

3.2 Radio interface

The Radio connector on the back of the **Bandmaster III** is used to interface the decoder to the radio, thus giving the possibility of the **Bandmaster III** to be automatically controlled by the radio. The Radio connector is also used as the output of the computer radio interface toward the radio when using the **Bandmaster III** as your computer interface.



VIEW FROM REAR
OF DECODER

Figure 5: Radio connector pinouts

3.2.1 ICOM CI-V

To make an **ICOM CI-V** connection to the **Bandmaster III**, simply connect a cable with 1/8" phone plugs on each end to the Remote jack on the radio and the CI-V jack on the decoder. When the **Bandmaster III** is connected to an **ICOM** radio via a **CI-V** connection it can replace the ICOM CT-17 since the **Bandmaster III** contains all the required interface circuitry. The **Bandmaster III** then monitors all **CI-V** data from the radio for frequency or band changes and selects the appropriate band. The **Bandmaster III** can be used autonomously without any computer attached to the radio. In this case, the radio still sends out commands indicating the frequency whenever you turn the VFO knob or change bands.

3.2.2 RS-232 connections

Manufacturers using direct RS232c DB9 connections can be attached to the **Bandmaster** via the J5 connector and a specially designed cable.

3.2.3 TTL connections

Some older radios, such as FT840 and FT890, use TTL signal levels (0-5V) instead of the standard bipolar RS-232 voltages. Both types of interfaces are supported by the **Bandmaster III**.

Note: The pin out of the connector at the radio end may vary, check your radio reference manual for proper hook up.

Bandmaster III J5 pin out	
Pin 2	Send Data
Pin 3	Receive Data
Pin 5	CTS (Optional)
Pin 7	Ground

Table 2: RS232 cable configuration for Radio connector

3.2.4 YAESU BCD band selector

YAESU also offers BCD band data outputs on most models that can be used to control external devices. The **Bandmaster III** can, via the Radio connector and a specially designed cable, decode this information. The pins used on the Radio connector for this are;

Bandmaster	Radio pin out
Pin 1	Band Data A
Pin 6	Band Data B
Pin 8	Band Data C
Pin 4	Band Data D

Table 4: YAESU BCD input connections on J1

Table 5 below shows the **YAESU** band data selection in BCD mode, note that in this mode 75M and 60M are not supported

Band	Code
160m	0001
80m	0010
40m	0011
30m	0100
20m	0101
17m	0110
15m	0111
12m	1000
10m	1001
6m	1010

Table 5; **YAESU** BCD band selection.

3.3 Relay Outputs

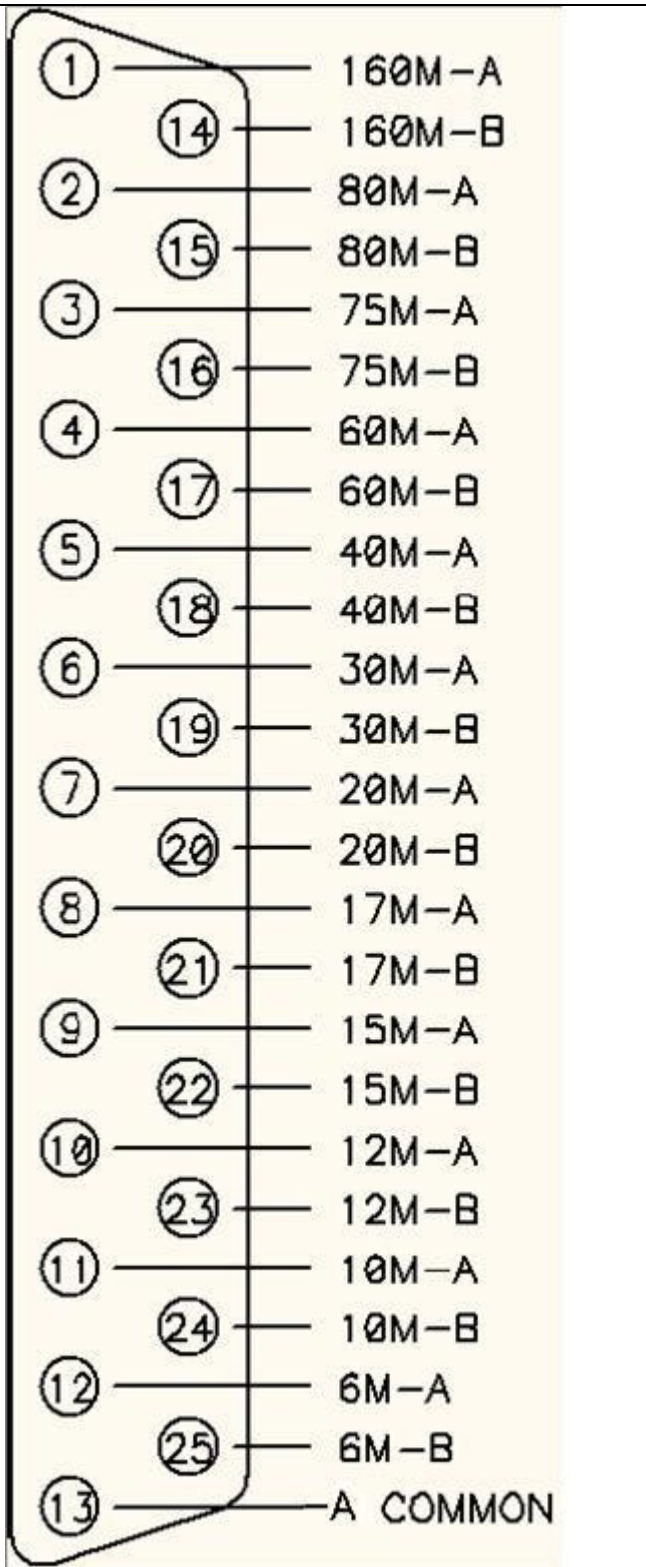
The **Bandmaster III** Relay connector (See figure 1 on page 4) is a Female DB25, where pins 1 through 12 are used for Outputs A (160M to 6M) and pin 13 is used as the COMMON for Output A.

The COMMON (Pin 13) for Output A may be connected to ground or any voltage source you desire. (Sourcing or Sinking)

Pins 14 through 25 are used for Output B (160M to 6M) The output B switches to ground when activated. (Sinking)

The pinout of J8 is shown in figure 7. The connector is shown looking at the rear panel of the unit.

All of the outputs of the Bandmaster III are isolated relay contacts, so no diodes are necessary, for example, to connect the control wire for a tribander (20,15,10m) to three pins (#7, 9, and 11) all in parallel. This will select the same antenna regardless of whether you're on 20, 15 or 10m.



4 Hooking up your Bandmaster III.

- 1 Verify your radio configuration as per your manufacturer's reference manual.
- 2 Configure the **Bandmaster III** according to your radio as per section 2.
- 3 Make our cable for your radio as per section 3.
- 4 Connect your **Bandmaster III** to your radio using the Radio connector (DB9M) according to the connection option you selected in section 3.2.
- 5 Connect your **Bandmaster III** to your computer using the USB connector using a standard USB cable (optional).
- 6 Connect **Bandmaster III** to the device(s) to be controlled (antenna switch, BPF, SixPak, etc...) via the Relay connector.
- 7 Connect **Bandmaster III** to the 4-wire network for control of devices such as 8-Pak, FilterMax III, etc.
- 8 Connect the 12 Volt DC power to the 4-wire connector on the **Bandmaster III**.
- 9 And you are done.

5 Operations

Once your radio is cabled correctly, apply power to the **Bandmaster III**. As you switch bands on your radio or logging/control software, the **Bandmaster** will switch to your band of choice within .25 to .5 seconds. This delay ignores transients and false signals from the radio which can cause unwanted problems.

If using computer logging/control programs, the application should be configured to the computer emulated COM port where the **Bandmaster III** is connected and **be sure the radio baud rate is set to 9600**. The Logging/control programs will use the **Bandmaster III** as the **CAT** level converter interface thus making the **Bandmaster III** transparent to the application.

*Note: you can not run the **Bandmaster III** configuration application at the same time as a logging/control program because you can not have two applications grabbing the same serial port. Thus make certain your **Bandmaster III** configuration application is closed before running any other application using your **Bandmaster III**.*

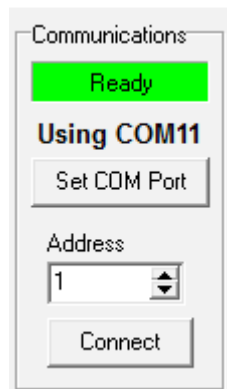
6 Bandmaster Configuration Software

The **Bandmaster III** also includes a software utility that can be used to customize the band segments, set the radio type, interface type, baud rate and radio number.

Run the software utility and select the proper COM port. You may now customize the band segments by clicking on the band you wish to change. The radio configuration is set by selecting the desired entries in the radio fields. Click on the Set button to save your changes to the Bandmaster III.

Establish Communications

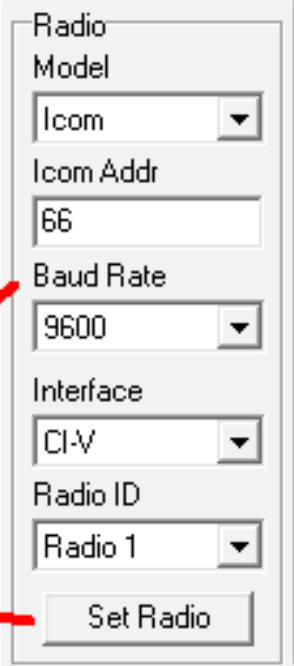
It is recommended that you unplug the USB cable from the decoder before running the configuration software. This makes it a simple process to identify which COM port the USB driver assigns to the decoder. Apply power to the decoder and run the configuration software. Click on the Set COM Port button to open the Com Ports window. Now plug the USB cable into the decoder and the assigned COM port should appear in the COM Port block. If it does not, you may click on the Manual button and enter the port number. Click on the appropriate port to select it and then click on the OK button. Select the 4-wire network address of the decoder. This is #1 for most users. Now click on the Connect button. If successful, the current configuration will be loaded and the Communicatinos indicator will show Ready. You are now ready to begin the configuration process.



Radio Configuration

Select your radio model* from the drop-down list and the default baud rate and interface type will be automatically selected. If these are not correct you may change them after selecting the radio model. If you are using an Icom radio you must enter the CI-V address also. You can find this number in the radio manual or from the radio's menus. When using more than one radio on the 4-Wire network you will need to set the Radio ID accordingly. When finished, click on the Set Radio button. The link status indicator will show Updating and return to Ready when complete. You may now connect your radio to the decoder and verify that the proper bands are being selected. This will complete the configuration process for most users. If you wish to enter custom band segments or have more than one antenna on a band continue to the next steps.

*Note: If you are using band data, select **Band Data** as your radio model.



The image shows a 'Radio Configuration' dialog box with the following fields and controls:

- Radio Model: Icom (dropdown)
- Icom Addr: 66 (text input)
- Baud Rate: 9600 (dropdown)
- Interface: CI-V (dropdown)
- Radio ID: Radio 1 (dropdown)
- Set Radio (button)

Annotations include a red arrow pointing to the 'Radio Options' label and another red arrow pointing to the 'Set Radio' button with the text 'Click here when finished'.

Band Limits (Optional)

For most users the default band segments will work just fine. If you wish to change any of the band segments, such as the border frequency between 80M and 75M, click on the frequencies you wish to change and enter the upper frequency limit when prompted. To change the lower frequency limit you must change the upper frequency of the preceding band. The only limit on how you configure the band segments is they must go in ascending order. The new settings are automatically saved when you enter the new upper frequency.

	Frequency Limits (KHz)
160M	1 to 2499
80M	2500 to 3750
75M	3751 to 5000
60M	5001 to 6000
40M	6001 to 8500
30M	8501 to 12000
20M	12001 to 16000
17M	16001 to 19900
15M	19901 to 23000
12M	23001 to 25500
10M	25501 to 40000
6M	40001 to 125000

Click on frequencies to change segments

Default Antennas (Optional)

If you have more than one antenna on a band the decoder gives you the ability to select which antenna will be selected by default when the 4-Wire Control Center software is not running. Simply select which antenna you wish as the default for that band. If only a single antenna is available for a band leave the setting at 1. Click on the Set button when finished and the new settings will be stored in the decoder.

Set default antenna
for each band

Click here when
finished

Default Antenna
1
1
3
1
4
1
1
1
1
1
1
1
1
1
Set

This completes the configuration process. You may now close the decoder software and start your logging program and connect to your radio.

*Note: you can not run the **Bandmaster III** configuration application at the same time as a logging/control program because you can not have two applications grabbing the same serial port. Thus make certain your **Bandmaster III** configuration application is closed before running any other application using your **Bandmaster III**.*