

# MBD-8F

## Automatic Antenna Switch Controller



**MBD-8F** is an intelligent controller compatible with all eight-antenna switches manufactured by Hamplus. It has a band decoder to receive the information coming from the connected radio equipment. In addition to antenna switching, the **MBD-8F** also offers five frequency-driven **GPOs** ( **General Purpose Output**), one **Band Data BCD Output**, one output to command **Band Pass Filter**, **12 GPOs** to automate the operation with TopBeam's Waller Flag receiving antenna. The **MBD-8F** also commands the **RS-24** and **RS-44** Rotator switches. There are four ways that antennas and enabled rotators can be selected; 1) manually by the front panel of the **MBD-8F**, 2) manually by frequency or band change on the front panel of the transceiver, 3) automatically by frequency or band change by the remotely controlled transceiver, or 4) automatically by a remotely controlled personal computer via **RS-232** serial port to the **MBD-8F**.

On the front panel is a set of eight illuminated push buttons for manual selection of antennas, eight "Busy" LEDs to indicate which antennas are in use by other **MBD-8F** Controllers, four LEDs to indicate rotator selection, one LED to indicate when the radio is transmitting, one LED to indicate the controller is in "Split Antenna" mode and one LED to indicate when the **MBD-8F** is connected to +13.8 Vdc power.

### Functions and operation

#### 1- Startup (after all cable connections are made to switches, controllers and transceivers)

Powering the **MBD-8F** will energize the antenna switch relay for the previously, manually selected antenna. Or, when connected to a transceiver, the controller will check the frequency or band the transceiver has selected and will immediately trigger and light the push button switch of the last antenna selected at that frequency or on that band. If connected, the rotator switcher, or other external equipment that is programmed using the **GPO** outputs, the **MBD-8F** will select the last used devices.

#### 2- Activation of the antennas

To choose any antenna, just press the corresponding push button. When the push button is pressed, it changes the state of the antenna switch control line that activates the corresponding antenna relay on the **AS-81**, **AS-82F**, **AS-84F** or **AS-86F** Antenna Switch. It also activates the selected rotator for that antenna through one of the Rotator Switches, model **RS-24** or **RS-28**, if used. Antenna and rotator switching are reported on the Busy Net network so the other **MBD-8F** busy and rotator red LEDs signal, not allowing any other **MBD-8F** to switch to any antenna and rotator already in use. Any conflict is signaled on the front panel of the **MBD-8F** by blinking the

push button LED for two seconds, and the rotator LED with short and continuous flashes every second. The rotator signal remains as long as there is a conflict.

### **3- Split Antenna Mode**

This mode allows operation with two different antennas. One for transmission and one for reception.

#### **Procedure to enter SPLIT mode:**

**A-** First select the transmission antenna.

**B-** Then press and hold the PTT of the radio and press the desired antenna push button for reception for two seconds. The push button will blink to confirm that the setting has been made. Then release the push button and the PTT. From this point the Split LED on the panel will be lit indicating that it is working with two antennas.

Immediately after programming the Split mode, perform the function test by pressing and releasing the PTT of the radio and observing the push buttons of the **MBD-8F** that should alternate between the chosen antennas.

**To exit Split mode simply change the radio band or press the transmit antenna push button.**

### **4- Permanent Split Mode**

Permanent Split is used with antenna(s) connected to the switch that are exclusively for reception. When we select an antenna configured for permanent Split on the keyboard of the **MBD-8F** the Split mode is automatically activated. This way we guarantee the use of the receiving antenna only in reception. This procedure must be duplicated on all controllers connected to the same antenna switch that has receive only antenna(s) connected.

#### **Procedure to configure Permanent Split mode:**

**A-** First choose a transmission antenna.

**B-** Then press and hold the PTT of the radio and press the desired antenna push button for reception for a little more than ten seconds. Notice the flashing of the push buttons that will confirm the acceptance of the programming.

**C-** To undo this setting, first make sure that the Split LED is not lit. Then, while holding down the PTT, press the desired push button for ten seconds. It is the same process used when programming was done.

### **5- GPOs with frequency drive ( GPO = General Purpose Output )**

These **GPOs** are used to trigger the tuning box of shortened antennas that use "high Q" coils. The trigger points of the **GPOs** depend on the operating frequency. These points are defined by the user through the keyboard of the **MBD-8F**. This procedure is only possible when the radio is connected to the **MBD-8F** in the CI-V (Icom) or RS-232 mode for other manufacturers.

#### **Procedure to configure the GPOs:**

Press the chosen antenna push button for 5 seconds to enter Setup mode. In the configuration mode, the antenna push button flashes eight times. Push buttons 5, 6 and 7 correspond to **GPOs 1, 2 and 3** respectively. Initially these three push button will be erased. Start with the lowest frequency within the band. Use the Radio VFO and find the frequency for triggering the first **GPO (GPO1)**. Once the desired frequency is found press push button 5. The **GPO1** will be highlighted and the 5 push button will be highlighted. Increase the frequency by turning the VFO to the next desired point and press the push button 6 which will mark the second trigger point (**GPO2**). Repeat the operation to find the third trigger point (**GPO3**) and press the push button 7. Perform a quick test, turn the VFO of the radio through all frequencies of the band and check that the marking push buttons light up at the frequencies that you have marked. In each segment of frequency only one push button will be illuminated. Once the selection has been completed, it must be saved and returned to the normal operating mode. To **SAVE**, simply press push button 8.

## 6- Rotator Switch

The **MBD-8F** can also command a Hamplus model **RS-24**, or **RS-44** rotator switch. With this equipment it is possible to use one, two, three or four rotator controllers to read and control up to 4 rotators. The **RS-24** is suitable for stations with up to two transceivers and **RS-44** for stations with up to four transceivers.

### Procedure to configure the Rotators

Enter setup mode by pressing the antenna push button you wish to associate with a particular rotator for 5 seconds. This will cause the **MBD-8F** to enter configuration mode. Then, while in this mode, press the 1, 2, 3 or 4 push button to choose the rotator of this antenna. Once configured, the rotator indicator LED is lit. To exit the configuration mode and **SAVE**, press push button 8. From this moment on, whenever the antenna associated to the rotator is used, the rotator indicator LED in use (RT1, RT2, etc.) will light up and the respective rotator will be connected to the control Used in this **MBD-8F**.

## 7- Communication with Icom, Yaesu, Kenwood, Elecraft K-3 via RS-232 and BCD

To use the MBD-8F's automation functions, it must communicate with the radio. For ICOM brand radios, we use the CI-V protocol (MBD-8F CI-V port). With this protocol all the features described above will be able to work. For the equipment of the YAESU brand we use the band data information, which allows all configurations except the activation of the GPOs by frequency. For those of the brand Kenwood and Elecraft K3 the protocol used is by the RS-232 communication port that allows use of all functions of the MBD-8F.

**Elecraft K3 also has band-data information like the Yaesu.**

**CI-V Baud Rate 19200 ( Icom Radios ) RS-232 Baud Rate 9600 (Kenwood and K3)**

## 8- Band Data Table

### BCD Band Data

Band	Frequency			BCD
160 m	0.0	to	2.9 MHz	0001
80 m	3.0	to	4.8 MHz	0010
60 m	4.9	to	5.9 MHz	0000
40 m	6.0	to	8.9 MHz	0011
30 m	9.0	to	12.9MHz	0100
20 m	13.0	to	16.9 MHz	0101
17 m	17.0	to	18.9 MHz	0110
15 m	19.0	to	22.9 MHz	0111
12 m	23.0	to	25.9MHz	1000
10 m	26.0	to	34.9 MHz	1001
6 m	35.0	to	54.9 MHz	1010

## Frequency Band for communication via RS-232 and CI-V

**Band 1** from 0 to 400 KHz, **Band 2** from 400KHz to 550KHz, **Band 3** from 550 KHz to 1.7 MHz, **Band 4** from 1.7 to 3.0 MHz, **Band 5** from 3.0 to 5.0 MHz, **Band 6** from 5.0 to 6.0 MHz, **Band 7** From 6.0 to 8.5 MHz, **Band 8** from 8.5 to 12 MHz, **Band 9** from 12 to 16 MHz, **Band 10** from 16 to 18.5 MHz, **Band 11** from 18.5 to 23 MHz, **Band 12** from 23 to 27 MHz, **Band 13** from 27 MHz to 34 MHz MHz, **Band 14** from 34 to 55 MHz, **Band 15** above 55 MHz.

## 9- Antenna memory per band

The **MBD-8F** has a non-volatile memory for each of the eight antennas so that whenever an antenna is selected this memory registers the band selected by the Radio. With each band change in the radio the **MBD-8F** will activate the last antenna that was used in that band.

Note: The setting mode is only possible when the Radio is properly connected to the **MBD-8F**.

**10- Connectors description (connector # on rear panel image)**

**a- Band Data Out (#3)**

The DB-9 **Band Data Out** connector on the rear of the **MBD-8F** provides a Band Data output that matches the frequency of the radio that is connected. When the **MBD-8F** receives the band information from the Band Data, this same information will be passed to the Band Data Out connector. When receiving the information through Frequency the conversion to Band Data will be done according to the table in item 8.

**DB-9 Band Data Out connector**

<u>Pins</u>	<u>Function</u>
1	Band Data A
2	Band Data B
3	Band Data C
4	Band Data D
5	+ 13.8 Vdc
6	Cmd 1
7	Cmd 2
8	GND
9	Cmd 3

**b- Bandpasser Out (#2)**

The DB-9 **To Bandpasser** connector on the rear of the **MBD-8F** sends + 13.8 Vdc for the Band Pass Filter relays. They are outputs to 160m, 80m, 40m, 20m, 15m, 10m and one to Bypass. The Bypass output will be triggered when the information received from the Frequency Radio or BCD is different from the information available here for the Bandpasser Out.

**DB-9 To Bandpasser connector**

<u>Pins</u>	<u>Band</u>	<u>Frequency</u>	<u>Function</u>
1	20 m	13.0 to 16.9 MHz	On +13.8Vdc
2	40 m	6.0 to 8.9 MHz	On +13.8Vdc
3	80 m	3.0 to 4.8 MHz	On +13.8Vdc
4	160 m	0.0 to 2.9 MHz	On +13.8Vdc
5	-----	-----	GND
6	-----	-----	
7	-----	-----	Bypass On +13.8Vdc
8	10 m	26.0 to 34.9 MHz	On +13.8Vdc
9	15 m	19.0 to 22.9 MHz	On +13.8Vdc

All control pins are Active High + 13.8 Vdc

**c- TOPBEAM Waller Flag (#5)**

The **HD-15** connector labeled **TB WF** on the rear of the **MBD-8F** provides power (+ 13.8 Vdc) and the controls for activating the filters of the **Waller Flag** receiving antenna control box. The commands follow the Band data table or the Radio frequency.

**HD-15 TB WF connector**

<u>Pins</u>	<u>Band</u>	<u>Frequency</u>	<u>Data</u>	<u>Function</u>
1	160 m	0.0 to 2.9 MHz	0001	On Active Low
2	80 m CW	3.4 to 3.59MHz	0010	On Active Low
3	80 m SSB	3.6 to 4.8 MHz	0010	On Active Low

4	40 m	6.0 to 8.9 MHz	0011	On Active Low
5	30 m	9.0 to 12.9MHz	0100	On Active Low
6 and 7	-----	-----	-----	+ 13.8vDc
8	-----	-----	-----	PTT
9 and 10	-----	-----	-----	GND
11	-----	-----	-----	RTX On Active Low
12	-----	-----	-----	RX1 On Active Low
13	-----	-----	-----	RX2 On Active Low
14	-----	-----	-----	RX3 On Active Low
15	-----	-----	-----	RX4 On Active Low

**d- DB-25 To Radio Connector (#7)**

This connector receives power from the Radio (+ 13.8 Vdc), the transmit command (PTT) and the data for frequency reading via RS-232 and Band reading via Band Data BCD.

**DB-25 To Radio Connector**

Pins	Function	Pins	Function	Pins	Function
1	GND	10	NC	19	GND
2	BCD D	11	NC	20	GND
3	BCD B	12	NC	21	+ 13.8 Vdc IN
4	GND	13	NC	22	NC
5	NC	14	GND	23	NC
6	GND	15	BCD C	24	NC
7	GND	16	BCD A	25	NC
8	+ 13.8 Vdc IN	17	GND		
9	PTT In	18	GND		

**e- DB-25 To Switch Connector (#1)**

DB-25 connector on the rear of the **MBD-8F** provides the commands for driving eight Antennas, four Rotators and four special GPOs driven by frequency or Band

**DB-25 To Switch Connector**

Pins	Function	Pins	Function	Pins	Function
1	Ant 1	10	GND	18	Rotator 1
2	Ant 2	11	GPO1	19	Rotator 2
3	Ant 3	12	GPO3	20	Rotator 3
4	Ant 4	13	Expansion	21	Rotator 4
5	Ant 5	14	Rotator 1	22	Cmd 80m
6	Ant 6	15	Rotator 2	23	Cmd 40m
7	Ant 7	16	Rotator 3	24	GPO 2
8	Ant 8	17	Rotator 4	25	GND
9	+ 12v				

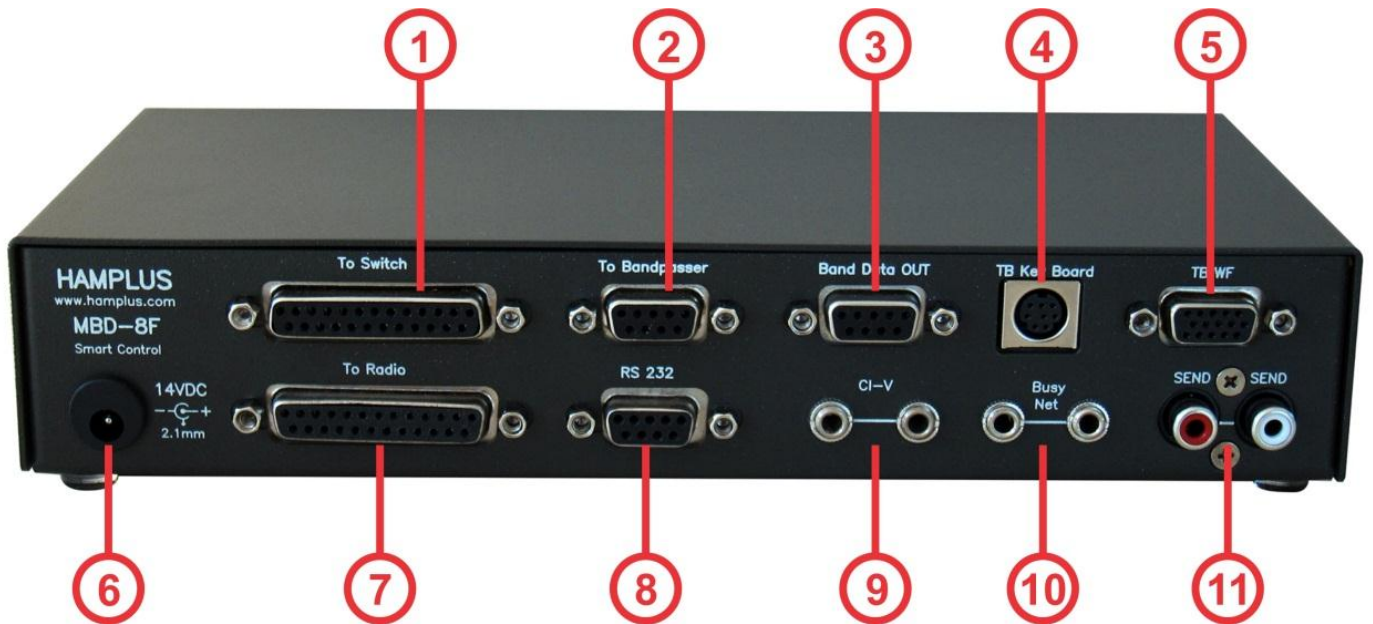
**f- DB-9 RS-232 connector (#8)**

The DB-9 connector identified as **RS-232** on the back of the **MBD-8F** provides connection to computers and with Elecraft and Kenwood radios.

**DB-9 RS-232 connector**


Pins	Function
1	NC
2	<b>RX</b>
3	<b>TX</b>
4	NC
5	<b>GND</b>
6	NC
7	NC

- 8 NC
- 9 NC



- |                      |   |
|----------------------|---|
| 1- To Switch         | Output Commands to Antenna Switch and Rotator Switch              |
| 2- To Bandpasser     | Output Commands for Bandpass Filter                               |
| 3- Band Data Out     | Band Data Output (BCD)  |
| 4- TB Key Board      | Output for Key Board Antenna TopBeam Receiver Waller Flag         |
| 5- TB WF             | Connects to the PFIU of the receiving antenna TopBeam Waller Flag |
| 6- AUX. Power Supply | Auxiliary Power Input (13.8 Vdc)                                  |
| 7- To Radio          | Input Power, Band Data and PTT Radio                              |
| 8- RS-232            | Communication with Kenwood, Elecraft K3 to PC COM port            |
| 9- CI-V              | Communication with Icom radios via CI-V port                      |
| 10- Busy Net         | Busy Network for indication of antennas in use                    |
| 11- Send             | Auxiliary input and pass-through output for PTT (Send)            |

MBD-8F CONNECTOR PIN IDENTIFICATION



**MBD-8F**

**Band Data OUT**

B.Data A (1) (6) Cmd 1  
 B.Data B (2) (7) Cmd 2  
 B.Data C (3) (8) Gnd  
 B.Data D (4) (9) Cmd 3  
 +12VDC (5) DBSM

**To Bandpasser**

20m (1) (6) Aux  
 40m (2) (7) Bypass  
 80m (3) (8) 10m  
 160m (4) (9) 15m  
 Gnd (5) DBSM

**RS 232**

(1) (6)  
 RX (2) (7)  
 TX (3) (8)  
 (4) (9)  
 Gnd (5) DBSM

**To Switch**

Ant 1 (1) (14) Rot 1  
 Ant 2 (2) (15) Rot 2  
 Ant 3 (3) (16) Rot 3  
 Ant 4 (4) (17) Rot 3  
 Ant 5 (5) (18) Rot 1  
 Ant 6 (6) (19) Rot 2  
 Ant 7 (7) (20) Rot 3  
 Ant 8 (8) (21) Rot 4  
 +12VDC (9) (22) Cmd 80m  
 Gnd (10) (23) Cmd 40m  
 Cmd 1 (11) (24) Cmd 2  
 Cmd 3 (12) (25) Gnd  
 Expansion (13) DBSM

**To Radio**

Gnd (1) (14) Gnd  
 Bcd A (2) (15) Bcd B  
 Bcd C (3) (16) Bcd D  
 Gnd (4) (17) Gnd  
 (5) (18) Gnd  
 Gnd (6) (19) Gnd  
 Gnd (7) (20) Gnd  
 +12VDC (8) (21) +12VDC  
 Send (PTT) (9) (22)  
 (10) (23)  
 (11) (24)  
 (12) (25) DBSM

**TB WF**

+12VDC (6) (11) RTX  
 160m (1) (12) RX 1  
 +12VDC (7) (13) RX 2  
 80cw (2) (14) RX 3  
 Send (PTT) (8) (15) RX 4  
 80 ssb (3) (16)  
 Gnd (9) DB15M  
 48m (4) VGA  
 Gnd (10)  
 30m (5)

**TB Key Board**

(7) Gnd  
 Gnd (8) (6) +12VDC  
 RX 4 (5) (3) RX 2  
 RX 1 (2) (4) RX 3  
 RX 1 (2) (1) RTX 1

HAMPLUS			
Size:	Number:	Connector Pin Identification	Rev.
<b>A4</b>		<b>MBD-8F</b>	1.0
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