MFJ

HamProAudio™
Transmit Audio Equalizer

Model MFJ-652

INSTRUCTION MANUAL

CAUTION: Read All Instructions Before Operating Equipment

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DISCLAIMER

Information in this manual is designed for **user purposes only** and is *not* intended to supersede information contained in customer regulations, technical manuals/documents, positional handbooks, or other official publications. The copy of this manual provided to the customer will *not* be updated to reflect current data.

Customers using this manual should report errors or omissions, recommendations for improvements, or other comments to MFJ Enterprises, 300 Industrial Park Road, Starkville, MS 39759. Phone: (662) 323-5869; FAX: (662) 323-6551. Business hours: M-F 8-4:30 CST.

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INTRODUCTION & FEATURES

INTRODUCTION

The MFJ-652 *hamProAudio* **Transmit Audio Equalizer** is a quality microphone audio equalizer. With 4 adjustable center frequencies you can adjust your microphone audio for rich full audio for rag chewing. For serious DXing you can increase the high and decrease the lows for a signal that really punches through the pile-ups.

hamProAudio Quality: Designed with the serious ham in mind. Not just a typical audio equalizer being used with an amateur station. Choice of components and extensive RF filtering and bypassing allows for a unit that is designed to be used in a RF environment.

Fully adjustable Gain Amplifiers: You have full control of the input level from your microphone and output level to your radio. With MFJ's LED monitoring you set the output level once and then feel confident that you are driving your radio with the perfect level no matter how much you increase or decrease the gain of each section of the equalizer.

Audio Pass Through from your Radio: No need to switch the headphones from the MFJ-652 to the radio. At the push of a button you can instantly switch from normal operation to a test mode. This allows you to adjust the settings without going on the air with the built in monitor amplifier.

By-pass Function: Switch the MFJ-652 in or out and you still have the received audio in the headphones.

Multiple Outputs: The MFJ-652 has multiple audio outputs. Microphone audio is fed out through the RJ-45 connector or through the 3.5 -mm Auxiliary Output Jack.

Rugged Construction: Attractive all-metal cabinet, conservative component selection, space age SMD Circuitry and extensive RF filtering ensure solid performance for years to come. Fully covered by MFJ's "No Matter What" one year limited warranty.

Before attempting to operate your MFJ-652, please read the manual thoroughly. It contains important details about setting up your unit to obtain the best performance.

INTRODUCTION & FEATURES

TYPICAL SPECIFICATIONS

Input source……………………Dynamic or Electret mic low or high Z
Stereo or Monaural radio audio.
Sound card or Modem

Output ………………………….Adjustable signal level. RJ-45 or 3.5 –mm

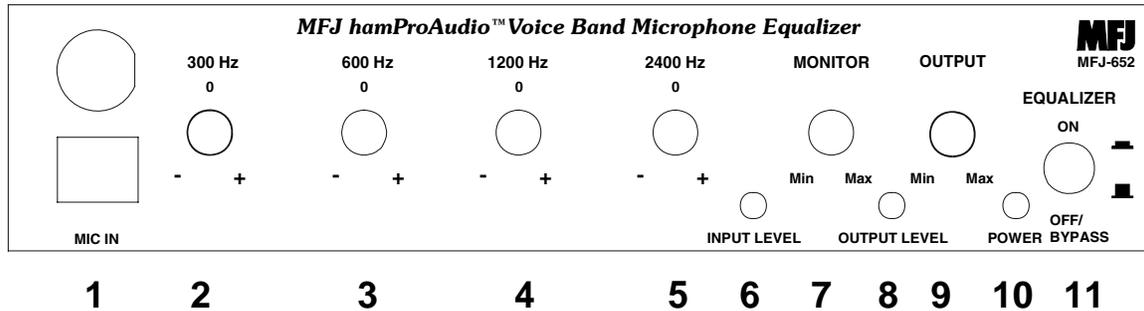Frequency Range……………..300, 600, 1200, 2400 Hz center

Overall Response……………..100-5000 Hz

Total harmonic distortion …….1% maximum, <0.2% typical

SYSTEM CONTROLS

MFJ-652 JACKS AND CONTROLS
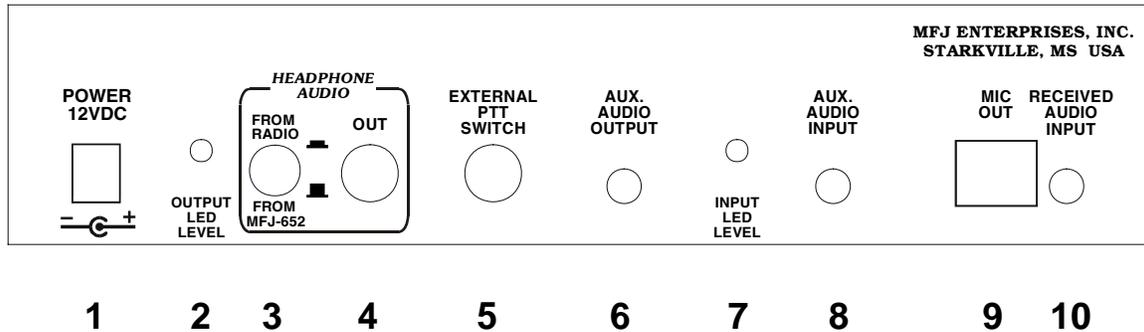

Figure 1: MFJ-652 Front Panel Jacks and Controls

1. **RJ-45 Microphone Input Jack:** Accepts input from a Standard RJ-45 microphone.
   8-Pin Microphone Input Jack: Accepts input from a standard 8 pin microphone.
2. **300 Hz:** Cuts or emphasizes lowest speech frequencies.
3. **600 Hz:** Cuts or emphasizes mid-range speech frequencies.
4. **1200 Hz:** Cuts or emphasizes upper-range speech frequencies.
5. **2400 Hz:** Cuts or emphasizes syllabant sounds and adjacent channel "chatter".
6. **Input Level LED:** Allows for easy setting of the input level to the equalizer. Never worry about overdriving the equalizer.
7. **Monitor Output Level:** Easily set the output monitor to a comfortable level in the headphones.
8. **Output Level LED:** Set the output level trimpot one time and you will have easy control of the signal sent to your radio.
9. **Output Level Control:** Adjusts the level sent to you radio.
10. **Power LED:** Visual indication whether the unit is in line or not.
11. **On & Off/Bypass Switch:** Allows you to use either your microphone direct or through the MFJ-652.

SYSTEM CONTROLS


Figure 2:   MFJ-652 Rear Panel Jacks and Controls

1. **Power:** Accepts 2.1 –mm power plug to supply 12-15 volts to the unit.
2. **Output LED Level adjust:** Sets the level at which the output led illuminates.
3. **From Radio/From MFJ-652:** This switch allows the audio to be fed from the radio to the headphones or in the test mode for the audio from the microphone to be fed to the headphones for setting the MFJ-652. Additionally in the test mode the PTT is disabled allowing you to key the microphone without keying the radio.
4. **Headphones Out:** Allows you to use a pair of ¼ stereo headphones.
5. **External PTT Input:** Accepts a ¼ inch plug from a remote hand switch or foot switch
6. **Auxiliary Output:** Accept a 3.5 –mm plug for direct audio output. With internal jumper set allows PTT also.
7. **Input LED Level:** Allows for adjustment of the input gain depending on your microphone.
8. **Auxiliary Input:** This multifunction input allows for just about anything to be used with the MFJ-652. Use a Heil boom mic, The MFJ-393 Boom Mic Headset or even a computer microphone by setting the appropriate internal jumper.
9. **RJ-45 Mic Output:** This is where the MFJ-5398 or MFJ-5397MX is attached.
10. **Received Audio Input:** This jack allows either stereo or mono (if wired properly) audio from your radio.

SYSTEM SETUP

INTERNAL HEADERS
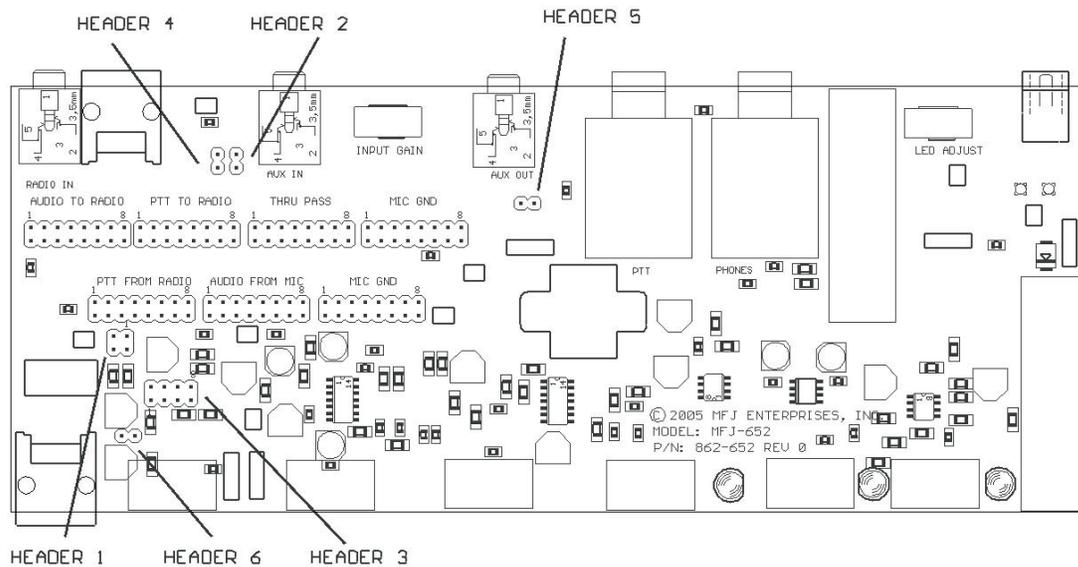
Figure 3:   MFJ-652 Internal Headers

1. **Header 1:** This sets the input of the unit to your specific microphone. Default 1-2 is set to 500-1000 ohms, the standard impedance setting for most stock microphones. If you need low impedance then move the jumper to positions 3-4. Remove for high impedance microphones.
2. **Header 2:** This allows the PTT line to be placed on the ring of the 3.5 – mm auxiliary input jack. Default is off.
3. **Header 3:** This header allows phantom voltage to be fed to electret microphones Default is 0 volts pins 1-2 shorted. Move this jumper to pins 3-4 for 1.5 volts, 5-6 for 5 volts or 7-8 for 8 volts.
4. **Header 4:** This header allows the phantom voltage set by header 4 to be passed to the ring of the Auxiliary input jack. Default is off.   If used with standard computer microphone/headphones set to 5 volts.
5. **Header 5:** This header allows the PTT to be placed on the ring of the 3.5 -mm Auxiliary Output Jack.
6. **Header 6:** This header places phantom voltage on the microphone input line and must be shorted for use with microphones that require phantom voltage.
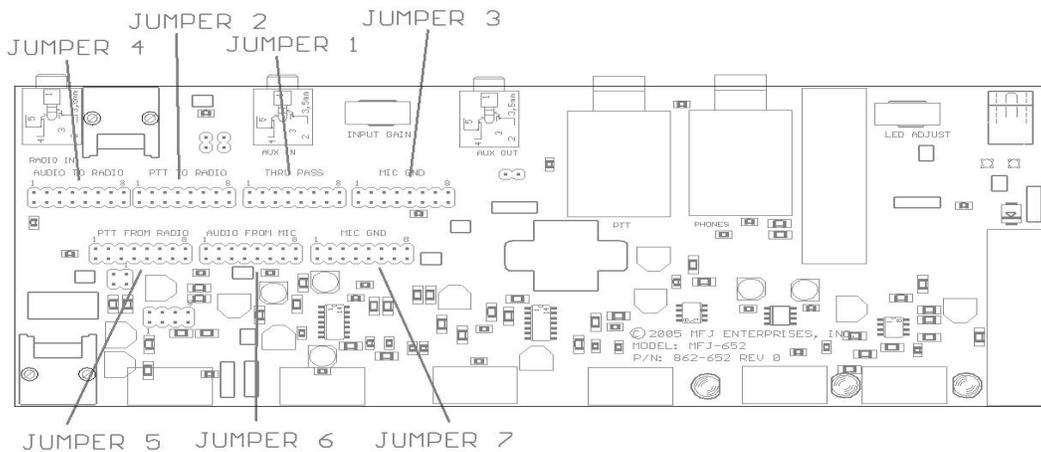
SYSTEM SETUP

INTERNAL JUMPER BLOCKS

Refer to **Table 1** for common microphones. Consult your owners' manual to determine your specific microphone pinout.
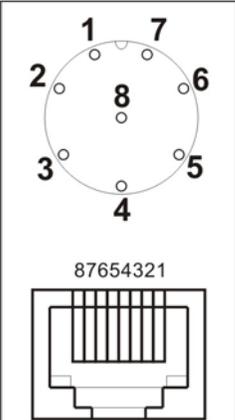

Figure 4: MFJ-652 Internal Jumper Blocks

1. **Jumper 1:** Pass/Thru. This allows you to pass any other lines from the microphone for feature such as up/down/fast. Normally all lines that are not being used for the Mic Audio, Mic Ground and PTT line will be jumpered.
2. **Jumper 2:** PTT to Radio. Place a jumper on the pin corresponding to the pin that your radio requires for PTT
3. **Jumper 3:** Microphone Audio Ground to Radio. Place a jumper on the pin that corresponds to the pin that your radio requires for the shielded ground.
4. **Jumper 4:** Microphone Audio to Radio. Place a jumper on the pin that corresponds to the pin on your radio that feeds microphone audio to the radio.
5. **Jumper 5:** PTT from the Microphone. Place a jumper on the pin number that corresponds to the pin of your microphone that supplies the PTT line to the radio.
6. **Jumper 6:** Microphone Audio Ground. Place a jumper on the pin number that corresponds to the pin that supplies the shielded ground from the microphone.
7. **Jumper 7:** Microphone Audio Input. Place a jumper on the pin number that corresponds to the pin that supplies microphone audio.
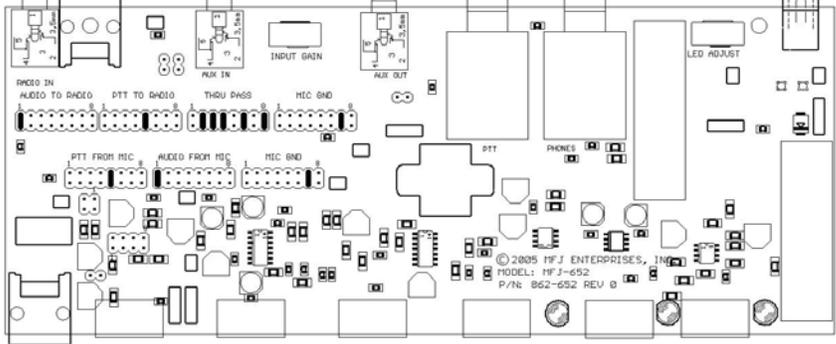
SYSTEM SETUP

INTERNAL JUMPER BLOCKS

The Jumper Installation diagrams within this instruction manual will help you in setting up your MFJ-652 to match your radio. If your radio is not listed with the diagram, it means that we have not verified your radio to use that diagram. You can try to install jumpers as indicated. If that does not work, please refer to the radio manual to identify the MIC pin assignment for you radio then follow the instructions given at the end of this section in the MFJ-652 instruction manual to install the jumpers.

	Refer to this figure for the pin numbering 1-8 on the internal jumper blocks. The RJ-45 connector is numbered with the clip down. Note the position of the key for the 8 pin round mic jack this could be rotated in your particular unit.

ICOM 8-Pin Round Microphone Setup:
IC-255, 288, 28, 290, 38A, 375, 707, 718, 725, 726, 728, 729, 730, 735, 737, 745, 746, 746PRO, 751, IC-756, 756PRO, 756PROII, 775DSP, 761, 78, 781, 910H

	This diagram may cover some other radios in the ICOM product line with 8-pin round microphone jack. If there are any Questions concerning the information provided, please refer to your RADIO INSTRUCTION MANUAL. MFJ is neither liable nor responsible for any mistakes or errors in the information provided. Receive Audio is taken from the Headphone Audio Output.

Figure 5: ICOM 8-Pin Round Microphone Setup

SYSTEM SETUP

ICOM 8-Pin Modular Microphone Setup:
IC-207H, 2720H, 2800H, 703, 706, 706MKII, 706MKIIG, V8000
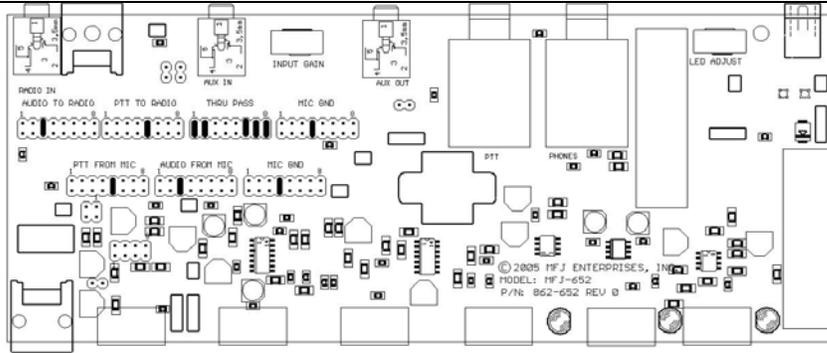
This diagram may cover some other radios in the ICOM product line with 8-pin modular microphone jack.
If there are any Questions concerning the information provided, please refer to your RADIO INSTRUCTION MANUAL.
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Receive Audio is taken from the Headphone Audio Output.

Figure 6: ICOM 8-Pin Modular Microphone Setup

YAESU 8-Pin Round Microphone Setup:

YAESU FT-650, 707, 712, 726, 736, 756, 767, 77, 790II, 700, 840, 890, 990, 1000D

This diagram may cover some other radios in the YAESU product line with 8-pin round microphone jack.
If there are any Questions concerning the information provided, please refer to your RADIO INSTRUCTION MANUAL.
MFJ is neither liable nor responsible for any mistakes or errors in the information provided.
Receive Audio is taken from the Headphone Audio Output.

Figure 7: YAESU 8-Pin Round Microphone Setup

SYSTEM SETUP

YAESU 8-Pin Modular Microphone Setup:
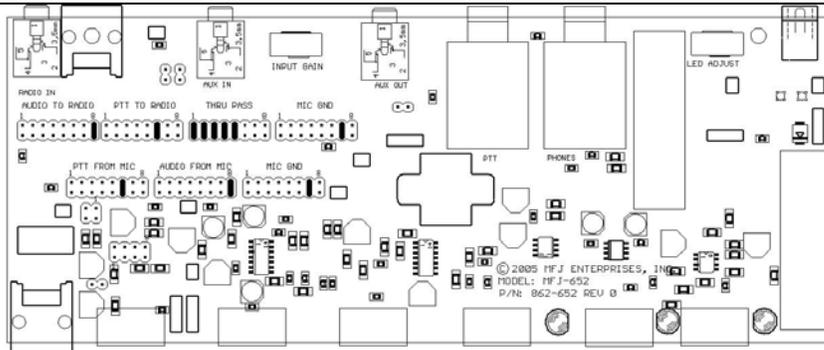
YAESU FT-817, 857, 897

This diagram may cover some other radios in the YAESU product line with 8-pin modular microphone jack.
If there are any Questions concerning the information provided, please refer to your RADIO INSTRUCTION MANUAL.
MFJ is neither liable nor responsible for any mistakes or errors in the information provided.
Receive Audio is taken from the Headphone Audio Output.

Figure 8: YAESU 8-Pin Modular Microphone Setup

KENWOOD 8-Pin Round Microphone Setup:

TS-50, 60, 140, 430, 440, 450, 570, 660, 670, 680, 690, 711, 780, 811, 850, 870, 930, 940, 950
TM-201A, 201B, 211, 221, 231, 241, 321, 331, 401A, 401B, 421, 431, 441, 521, 531, 541, 621
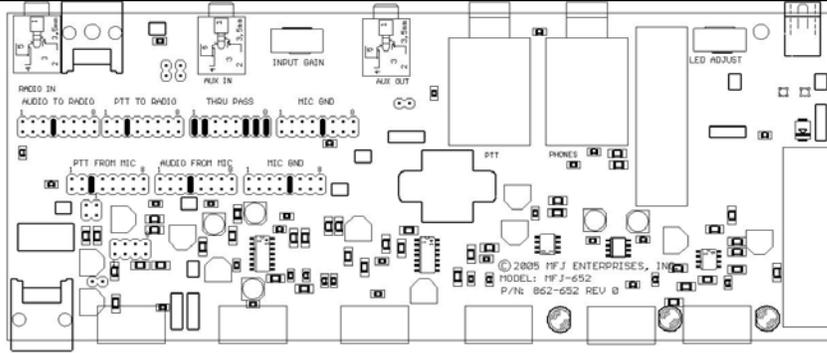**TM-631, 701, 721, 731, 2530, 2550, 2570, TR-50, 751, 851, TW-4000, 4100**

This diagram may cover some other radios in the Kenwood product line with 8-pin round microphone jack.
If there are any Questions concerning the information provided, please refer to your RADIO INSTRUCTION MANUAL.
MFJ is neither liable nor responsible for any mistakes or errors in the information provided.
Receive Audio is taken from the Headphone Audio Output
.

Figure 9: KENWOOD 8-Pin Round Microphone Setup

SYSTEM SETUP

KENWOOD 8-Pin Modular Microphone Setup:

TM-251, 255, 261, 451, 461, 641, 642, 732, 733, 741, 742, 941, 942, G707, V7A
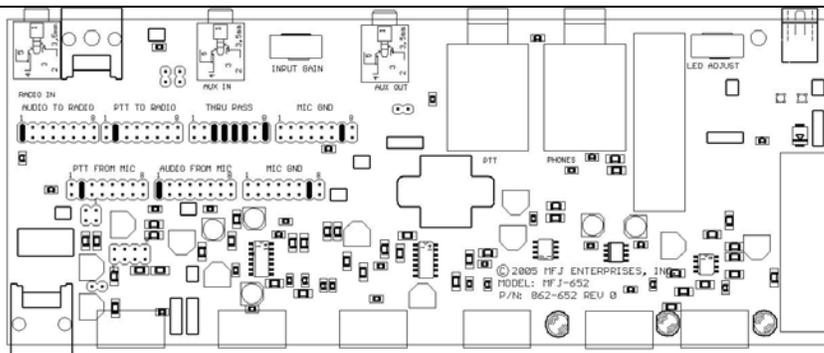

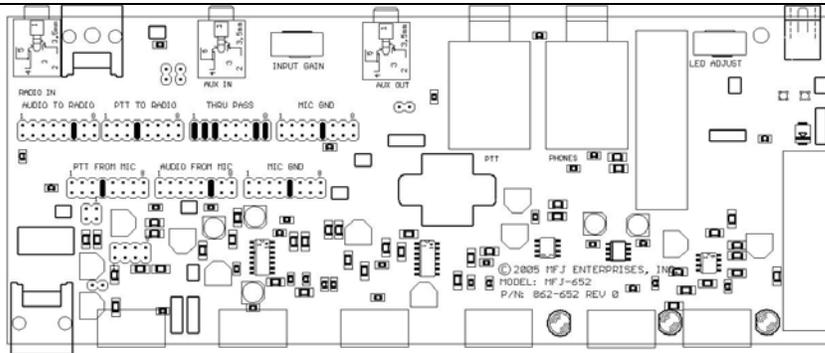This diagram may cover some other radios in the Kenwood product line with 8-pin modular microphone jack. If there are any Questions concerning the information provided, please refer to your RADIO INSTRUCTION MANUAL.
MFJ is neither liable nor responsible for any mistakes or errors in the information provided.
Receive Audio is taken from the Headphone Audio Output .

Figure 10: KENWOOD 8-Pin Modular Microphone Setup

SYSTEM SETUP

Radio	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
Alinco	MIC AUDIO	PTT	DOWN	UP	5 VOLTS	AF OUT	MIC GND	GND
Icom	MIC AUDIO	+8 VOLTS	UP/DOWN	SQL	PTT	PTT GND	MIC GND	
Kenwood	MIC AUDIO	PTT	DOWN	UP	8 VOLTS	NC	MIC GND	PTT GND
Yaesu FT1000 FT847	UP	GND	DOWN	FAST	GND	PTT	MIC GND	MIC AUDIO
Yaesu FT-990 FT-1000MP	UP	+5 VOLTS	DOWN	FAST	GND	PTT	MIC GND	MIC AUDIO

Table 1: Common Microphone Pinouts

SYSTEM SETUP

CABLES

Simply connect your microphone to the appropriate input and use either a MFJ-5398 for 8 pin Round or MFJ-5397MX for 8 pin Modular connector to the output on the rear of the unit and attach to your radio. .

Connect your audio from the headphone jack to the 3.5-mm jack on the MFJ-652. If your only output is mono then simply wire the tip and the ring of the cable to provide audio to both sides of the headphones.

Connect a foot Switch or Hand Switch to the PTT jack located on the rear of the unit.

POWER

The MFJ-652 will operate with any well-filtered 10-14 VDC power supply capable of at least 150 mA. The required power connector is a 2.1 -mm ID, 5.5 mm OD coaxial power plug.

As this is a quality audio unit, use of an unregulated wall power supply transformer is not recommended as the unloaded voltages can easily exceed 15 volts and the lack of filtration and regulation can introduce hum and other components into your signal.

Wire (+) voltage to center and (-) to common.

HEADPHONES

Use stereo headphones rated at 8-40 Ohms impedance. Jacks for either ¼ inch or 3.5 –mm headphones are included on the rear of the unit. Use of quality phones will aid in the reproduction of the audio when setting up the unit.
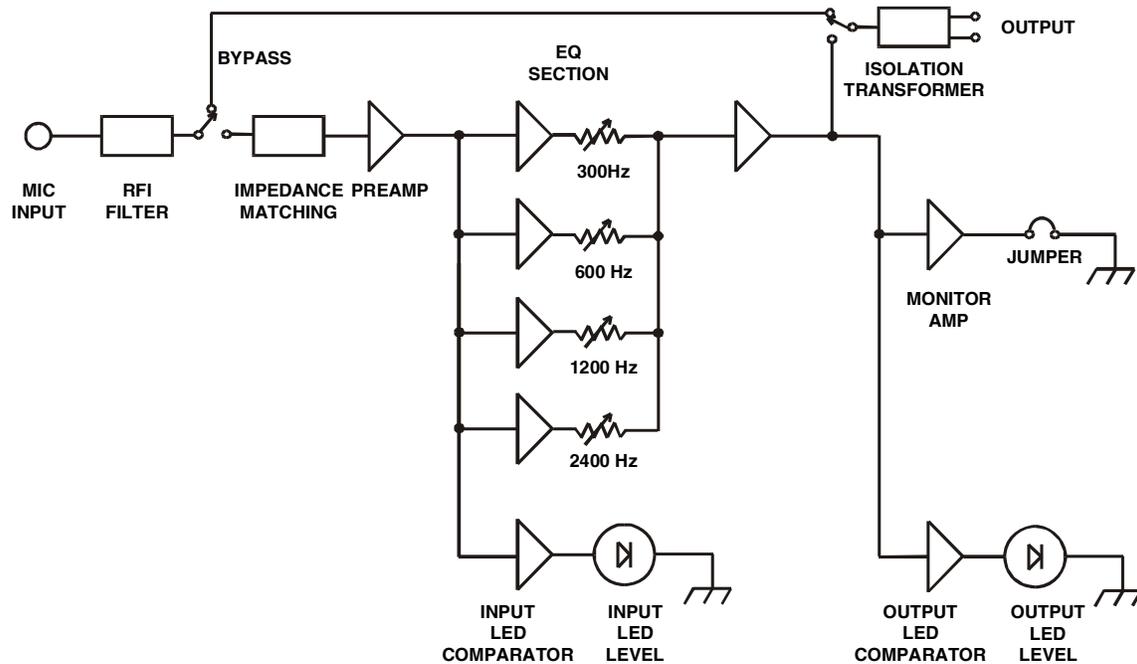
RADIO AUDIO

If your radio provides left and right output for a main and a sub-receiver then use a stereo 3.5 –mm to the termination that your radio uses.

If your radio provides mono output then either use a stereo 3.5 –mm cable and connect the tip and ring and then attach the termination that your radio uses.

THEORY OF OPERATION

Figure 11: Functional Diagram

Figure 5 shows the functional diagram of the MFJ-652. Microphone audio is fed in through J2, J3 or J4. Header 1 sets the impedance for the specific microphone in use. From there the microphone audio is routed to U1A where it is amplified and routed to the equalizer section consisting of U2A-U2D. Active filters U2A-U2D provide four octaves of adjustable audio conditioning at the input of summing amplifier U1C. Alternatively microphone audio is routed around the unit with *Bypass* switch SW1. The output of U1A also feeds U5B the comparator for the input LED. The output of U1C feed s U5A the comparator for the output LED.

EASY-START INSTRUCTIONS

1. Start with the MFJ-652 Equalizer Switch in the **OFF/Bypass** position. Using your microphone set your radio's microphone gain, alc and any other features to the proper operating conditions and levels. Set the front panel controls of the MFJ-652 as follows:

   300, 600, 1200 and 2400 Hz :   12 o'clock
   Output gain: Fully counterclockwise
   Monitor gain: Fully counterclockwise.

2. Connect a dummy load to your radio.

3. Set the From Radio/From 652 switch on the rear of the unit to the **From 652** position.

4. Turn on the MFJ-652 and while speaking into the microphone adjust the monitor gain to a comfortable level.

5. While speaking into the microphone adjust the input level trim pot on the rear of the unit until the input led just illuminates on voice peaks.

6. Place the From Radio/From 652 switch on the rear of the unit to the **From Radio** position.

7. While speaking into the microphone slowly increase the Output Gain Control until the readings on your radio's meter are the same with the unit either on or bypassed.

8. Once this level has been set place the unit in the **From 652** position and while speaking into the microphone adjust the trim pot on the rear of the MFJ-652 until the Output Gain Level LED on the front panel just illuminates on voice peaks. This allows you to have a handy reference for setting the Output Level Control under any condition.

EASY-START INSTRUCTIONS

Some Results of Research on Speech Intelligibility in hearing English Words

- The frequencies important for speech intelligibility are the consonant sounds from 500 to 4000 Hz. They contribute 83 % of word intelligibility.

- Frequencies from 500 to 1000 Hz contribute 35 % of word intelligibility and 35 % of sound energy.

- Frequencies from 1000 to 4000 Hz contribute 48 % of intelligibility but have only 4 % of sound energy.

- In contrast frequencies from 125 to 500 Hz contribute 55 % of sound energy but only   4 % of word intelligibility.

- In other words, nearly half the speech intelligibility is contained in the 1000 to 4000 Hz frequency range with only 4 % of the speech sound energy.

- On the other hand, the low frequencies 125 to 500 Hz have most of the speech energy but contribute very little to intelligibility.

How to adjust your *Transmit Audio Equalizer* for Maximum Speech Intelligibility:

This is done best on the air with a friend or someone who will give you an honest opinion. You can initially use the built in monitor amplifier and listen to your voice in the headphones or have someone else listen to your voice as you adjust the knobs. But nothing replaces over-the-air reports.

There are four frequency boost (increase in amplitude) and cut (decrease in amplitude) knobs spaced an octave apart in frequency. The center frequencies are approximately 300, 600, 1200, and 2400 Hz. With a knob set at 12 o'clock there is no boost or cut. Turning the knob clockwise boosts an octave of frequencies by up to 16 dB while counterclockwise rotation give up to 16 dB of cut.

EASY-START INSTRUCTIONS

Adjusting your *Transmit Audio Equalizer* is based on three principles:

First, reduce your speech energy below 500 Hz. These frequencies contribute only 4% of intelligibility but has 55% of the speech energy. Do this by turning the 300 and 600 Hz knobs fully counterclockwise. This will drastically reduce your speech in these two octaves. You may need to increase the amplitude in this range a little by rotating the 600 Hz knob to 9 to 12 o'clock. Use the bypass switch to compare. Always adjust the output level to maintain proper output to your radio.

Second, increase your speech energy above 1000 Hz. These frequencies contribute 48 % of intelligibility but only has 4 % of speech energy. Do this by turning the 1200 and 2400 knobs fully clockwise. Always adjust the output level control so you don't overdrive your radio. Use the bypass switch to compare.

Third, your voice characteristics are unique. Experiment by boosting and cutting each frequency range based on the two principles above until your find the right combination that gives *your* best speech characteristics

Remember – 12 o'clock is flat (no boost or cut), clockwise is boost and counterclockwise is cut.

Don't forget to use the bypass switch often to make comparisons.

Remember to adjust the output gain to maintain the proper output level.

TECHNICAL ASSISTANCE

IN CASE OF DIFFICULTY

[ ] Won't Power up: Check the polarity and connection to your power supply.

[ ] No microphone audio: Check the Mic Audio Jumper block and the Mic Ground Jumper block for proper placement of the jumper on the proper header position. If using a electret microphone ensure the phantom voltage has been set to the proper level.

[ ] No receiver audio: Check the cabling from your radio to the MFJ-652. Ensure the Test/Operate switch on the rear of the unit is in the Operate position.

[ ] Station PTT will not function: Check the PTT jumper block. Ensure that you have a ground between the radio and the MFJ-652 as the Mic Ground is isolated from the Chassis Ground.

[ ] Noisy audio, Hum: Magnetically induced hum can be caused to any modern piece of audio equipment by proximity to unshielded power transformers or equipment that radiated strong AC fields. Another source of hum can be caused by a ground loop. This is when equipment is connected together but do not have their grounds well connected. The use of "Daisy Chain" grounding techniques can contribute to this problem. The use of a single point ground is always recommended in Amateur Radio installations. Rf floating in the shack can also contribute to distortion. To determine if you have this problem simply transmit into a Dummy Load. If the distortion goes away then you have RF in the shack.

TECHNICAL ASSISTANCE

If you have any problem with this unit first check the appropriate section of this manual. If the manual does not reference your problem or is your problem is not solved by reading the manual, you may call *MFJ Technical Service* at **662-323-0549** or the *MFJ Factory* at **662-323-5869**. You will be best helped if you have your unit, manual and all information on your station handy so you can answer any questions the technician may ask.

You can also send questions by mail to MFJ Enterprises, Inc., 300 Industrial Park Road, Starkville, MS39759; by Facsimile (FAX) to 662-323-6551; or by email to techinfo@mfjenterprises.com. Send a complete description of your problem, an explanation of exactly how you are using your unit , and a complete description of your station.

Figure 12: Schematic

FULL 12-MONTH WARRANTY

MFJ Enterprises, Inc. warrants to the original owner of this product, if manufactured by MFJ Enterprises, Inc. and purchased from an authorized dealer or directly from MFJ Enterprises, Inc. to be free from defects in material and workmanship for a period of 12 months from date of purchase provided the following terms of this warranty are satisfied.

1.   The purchaser must retain the dated proof-of-purchase (bill of sale, canceled check, credit card or money order receipt, etc.) describing the product to establish the validity of the warranty claim and submit the original or machine reproduction of such proof of purchase to MFJ Enterprises, Inc. at the time of warranty service. MFJ Enterprises, Inc. shall have the discretion to deny warranty without dated proof-of-purchase. Any evidence of alteration, erasure, of forgery shall be cause to void any and all warranty terms immediately.

2.   MFJ Enterprises, Inc. agrees to repair or replace at MFJ's option without charge to the original owner any defective product provided the product is returned postage prepaid to MFJ Enterprises, Inc. with a personal check, cashiers check, or money order for **$10.00** covering postage and handling.

3.   MFJ Enterprises, Inc. will supply replacement parts free of charge for any MFJ product under warranty upon request. A dated proof of purchase and a **$8.00** personal check, cashiers check, or money order must be provided to cover postage and handling.

4.   This warranty is **NOT** void for owners who attempt to repair defective units. Technical consultation is available by calling (662) 323-5869.

5.   This warranty does not apply to kits sold by or manufactured by MFJ Enterprises, Inc.

6.   Wired and tested PC board products are covered by this warranty provided **only the wired and tested PC board product is returned.** Wired and tested PC boards installed in the owner's cabinet or connected to switches, jacks, or cables, etc. sent to MFJ Enterprises, Inc. will be returned at the owner's expense unrepaired.

7.   Under no circumstances is MFJ Enterprises, Inc. liable for consequential damages to person or property by the use of any MFJ products.

8.   **Out-of-Warranty Service:** MFJ Enterprises, Inc. will repair any out-of-warranty product provided the unit is shipped prepaid. All repaired units will be shipped COD to the owner. Repair charges will be added to the COD fee unless other arrangements are made.

9.   This warranty is given in lieu of any other warranty expressed or implied.

10. MFJ Enterprises, Inc. reserves the right to make changes or improvements in design or manufacture without incurring any obligation to install such changes upon any of the products previously manufactured.

11. All MFJ products to be serviced in-warranty or out-of-warranty should be addressed to **MFJ Enterprises, Inc., 300 Industrial Park Rd, Starkville, Mississippi 39759, USA** and must be accompanied by a letter describing the problem in detail along with a copy of your dated proof-of-purchase and a telephone number.

12. This warranty gives you specific rights, and you may also have other rights, which vary from state to state.