MFJ

Speech Articulator

Model MFJ-653

INSTRUCTION MANUAL

CAUTION: Read All Instructions Before Operating Equipment

MFJ ENTERPRISES, INC.

300 Industrial Park Road
Starkville, MS 39759 USA
Tel: 662-323-5869 Fax: 662-323-6551

VERSION 0A

COPYRIGHT © 2003 MFJ ENTERPRISES, INC.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION & FEATURES

INTRODUCTION

The MFJ-653 ***hamProAudio Speech Articulator*** was designed with the serious operator in mind. Based on the Broadcast Industry Standard Speech Compression IC the SSM-2166 from Analog Devices it allows the operator flexibility in the use of input sources and output methods.

The Equalizer was designed to use the most desired center frequency and "Q" possible.

FEATURES

Choice of 3 Input Sources: In order to add versatility MFJ has included the following input sources for the MFJ-653:

1. A standard RJ-45 input jack common to most new radios.
2. Standard 8 pin round chassis connector for the majority of the radios produced in the last 25 years.
3. MFJ's own input consisting of a 3.5 –mm jack that allows the user to choose from feeding audio for use with the Heil series of Boom-Mic Headsets, or even provides phantom voltage on the tip for the MFJ-393 Boom-Mic Headphones or on the ring for use with a computer Boom-Mic or Boom-Mic headset.

.

Fully Adjustable Gain Amplifier: You have control of the output level to bring weak microphones up to a useful level.

Wide Range Compression Settings: With an adjustable compression setting from 1:1 to 15:1 you control the amount of compression to get your signal thought the toughest of band conditions.

Adjustable Downward Expansion Level and Delay: No more feeding the background noise into your signal. The MFJ-653 allows you to set the level of Downward Expansion to only pass audio when you are talking and a delay to minimize the cutting in and out between words.

Single Equalizer Stage: You have full control of your audio with up to ±16dB of control centered at 2 Khz.

Switchable High Pass Filter: For that added punch when you need it. Set at 1 Khz.

INTRODUCTION & FEATURES

By-pass Function: Switch the MFJ-653 in or out. Useful when you want to Ragchew and don't need the Compression or Downward Expansion of the MFJ-653.

Multiple Inputs: The MFJ-653 has multiple inputs for various mics. Your choice of 8-pin round, RJ-45 or 3.5MM.

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-653, please read the manual thoroughly. It contains important detail about setting up your unit to obtain the best performance.

TYPICAL SPECIFICATIONS

Input source……Dynamic or electret microphone low or high Z

Output ……High or low Z. Adjustable signal level

Bandwidth ……20 kHz

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

SYSTEM CONTROLS AND INDICATORS

MFJ-653 CONTROLS AND INDICATORS

FRONT PANEL

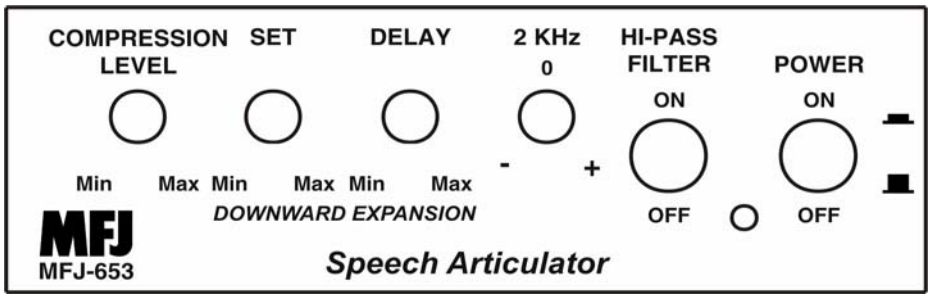


Figure 1: MFJ-653 Front Panel Jacks and Controls

1. **Compression Level Set:** Controls the Compression function from no Compression to 15:1 maximum Compression.
2. **Downward Expansion Level Set:** Allows adjustment of the required audio level to allow the unit to pass audio. Great for noisy conditions.
3. **Downward Expansion Delay Set:** Sets the amount of time that the internal amplifier will remain open with no audio. Great to hold the audio open between syllables and words.
4. **2 KHZ Boost/Cut:** Sets the level of the single equalization stage.
5. **1 KHZ High Pass In/Out:** Switches the Butterworth High Pass filter in and out.
6. **Power On LED:** Instant visual identification if you are using the MFJ-653 or just the standard microphone.
7. **Power ON & OFF/Bypass:** Allows you to either use your Microphone direct or through the MFJ-653.

SYSTEM CONTROLS AND INDICATORS

REAR PANEL

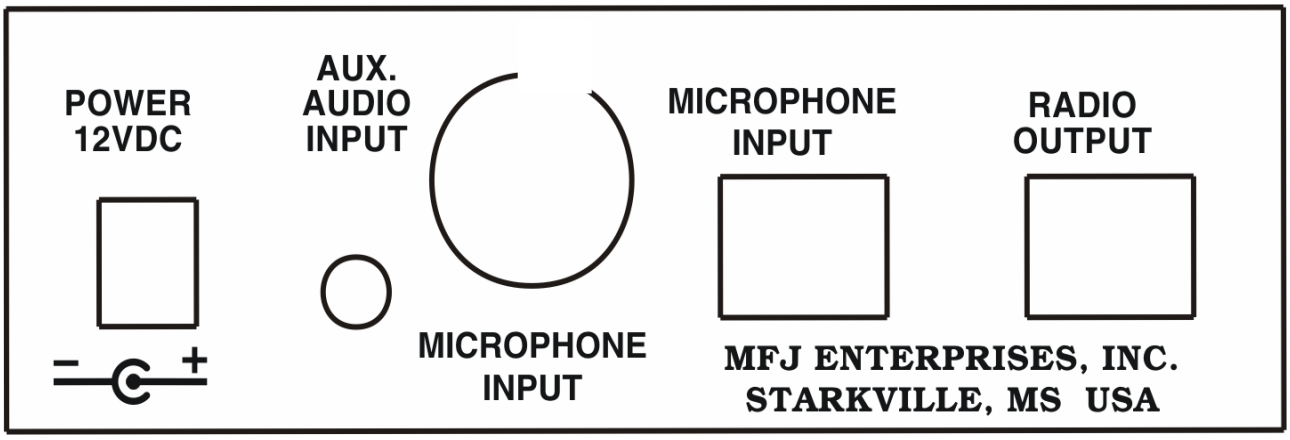


Figure 2: MFJ-653 Rear Panel Jacks and Controls

1. **Power:** Accepts 2.1 –mm power plug to supply 12-15 Vdc to the unit.
2. **Auxiliary Input:** This 3.5 -mm multifunction input allows just about anything to be used with the MFJ-653 by setting the appropriate input jumpers.
3. **8 pin round Input:** Allow connection of a 8 pin round Microphone.
4. **RJ-45 Input:** Allows direct connection of a RJ-45 Microphone.
5. **RJ-45 Output:** This is where the MFJ-5398 or the MFJ-5397MX is attached.

SYSTEM SETUP

INTERNAL HEADERS

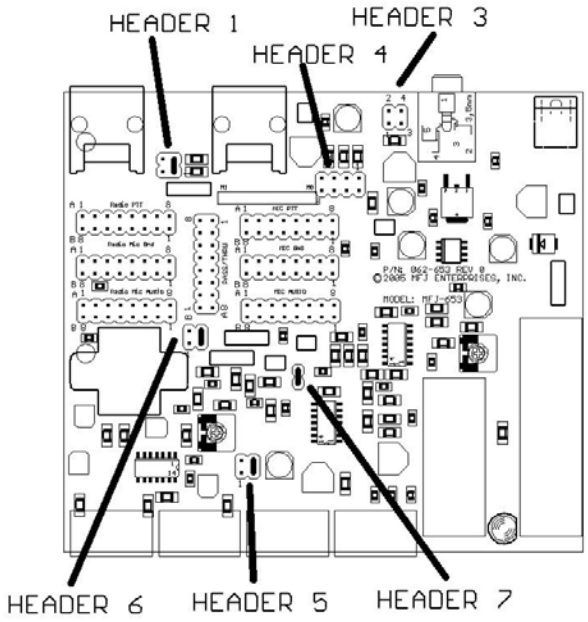


Figure 3: MFJ-653 Internal Headers

1. **Header 1:** This sets the input of the unit to your specific microphone. Default 3-4 is set to 680 ohms the standard impedance setting for most stock microphones. If you need low impedance then move the jumper to positions 1-2. Remove for high impedance microphones.
2. **Header 3:** This header allows the phantom voltage set by header 4 to be passed to the tip or the ring of the Auxiliary input jack. Default is off. If placed to the tip position it allows the voltage to be placed on the Microphone Audio line. Pins 1-2 place it on the Ring and 3-4 place it on the tip and on the Mic line. ***MOST ICOM MICS REQUIRE THIS VOLTAGE.***
3. **Header 4:** 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. ***MOST ICOM MICS REQUIRE 8 VOLTS.***
4. **Header 5:** This header allows the transformer to be bypassed to increase the low frequency response. Default is 3-4 bypassed.
5. **Header 6:** This header allows the transformer to be bypassed to increase the low frequency response. Default is 3-4 bypassed.
6. **Header 7:** This header grounds the Mic Ground to the radio and must be shorted if the transformer is being bypassed. Default is on.

SYSTEM SETUP

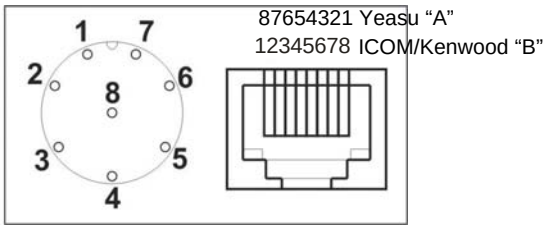


Figure 4: Rear panel view of Mic Jacks.

Refer to this drawing for the numbering of the headers from 1 to 8. The RJ-45 is numbered with the clip down. Note the position of the key for the 8 pin round connector. This position may be different on your particular unit. The round connector follows the A row of jumper numbering. Also note the view of the RJ-45 jack. The RJ-45 connector is numbered differently by different radio vendors. The numbering follows the "A" jumper numbering for Yaesu, and the B row of Jumper numbering for ICOM and Kenwood. Just to be sure, map the actual pin function – not the pin number – of your radio's mic connector to the numbered pins shown above so as to determine the correct jumper positions to use in the MFJ-653.

INTERNAL JUMPER BLOCKS

The Jumper Installation diagrams within this instruction manual will help you in setting up your MFJ-653 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-653 instruction manual to install the jumpers.

SYSTEM SETUP

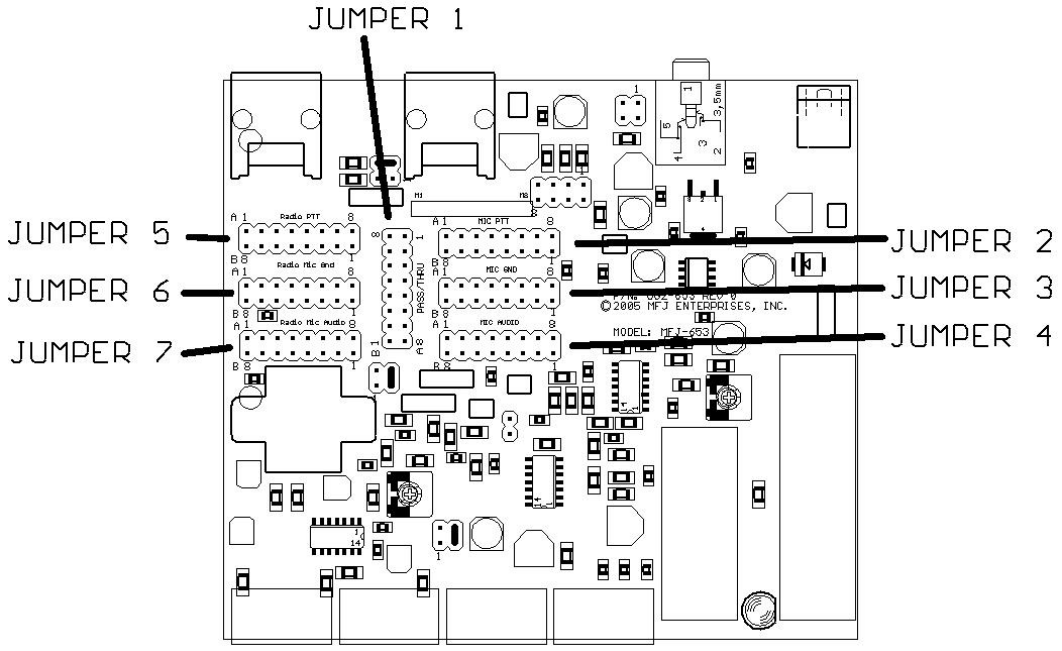
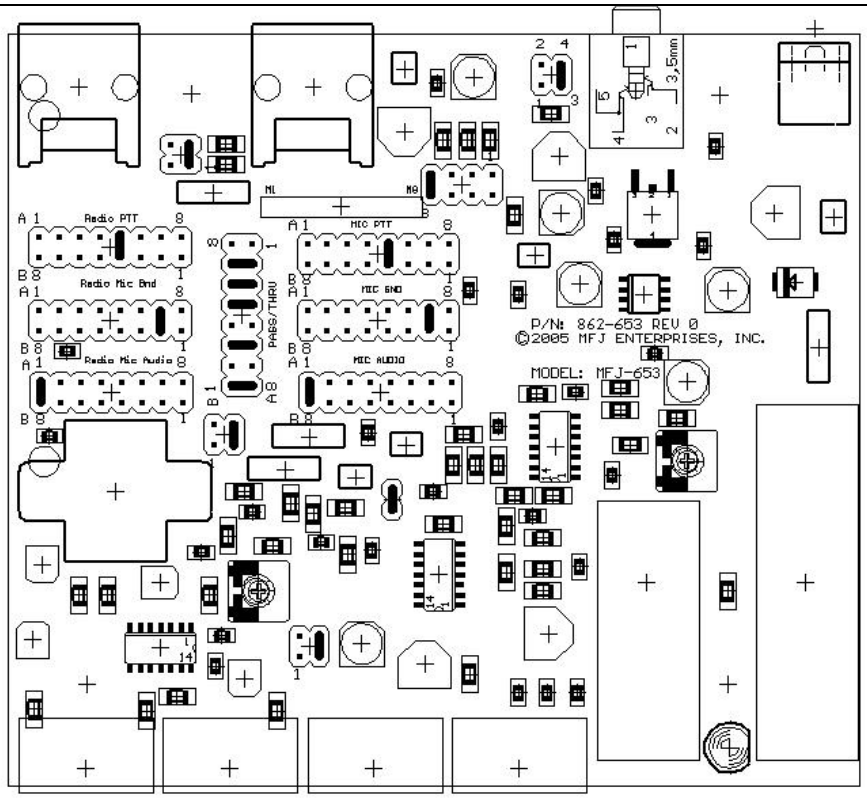


Figure 5: MFJ-653 Internal Jumpers

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 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
3. Jumper 3: Microphone Audio Ground. Place a jumper on the pin number that corresponds to the pin that supplies the shielded ground from the microphone.
4. Jumper 4: Microphone Audio Input. Place a jumper on the pin number that corresponds to the pin that supplies microphone audio.
5. Jumper 5: PTT to Radio. Place a jumper on the pin corresponding to the pin that your radio requires for PTT.
6. Jumper 6: Microphone Audio Ground to Radio. Place a jumper on the pin that corresponds to the pin that your radio requires for the shielded ground.
7. Jumper 7: 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.

SYSTEM SETUP

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



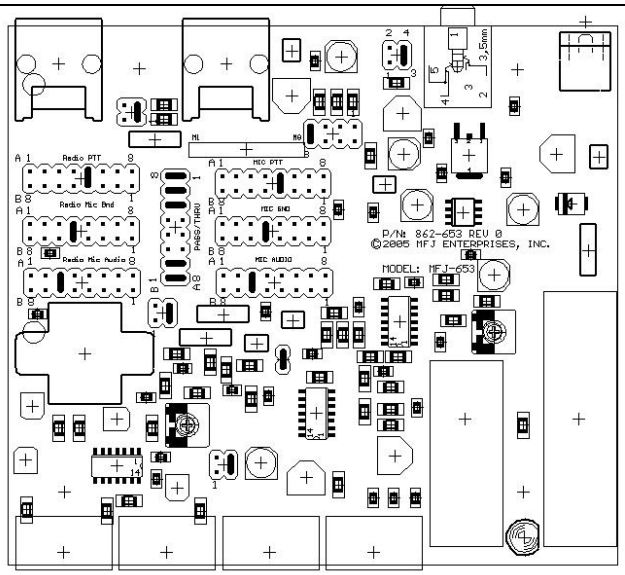
This diagram may cover some other radios in the ICOM product line with 8-pin round microphone jack.
If there are any Questions concerning the information provided, please refer to your RADIO INSTRUCTION MANUAL.
MFJ is neither liable nor responsible for any mistakes or errors in the information provided.

Figure 6: ICOM 8-Pin Round Microphone Setup

SYSTEM SETUP

ICOM 8-Pin Modular Microphone Setup:

IC-207H, 2720H, 2800H, 703, 706, 706MKII, 706MKIIG, V8000

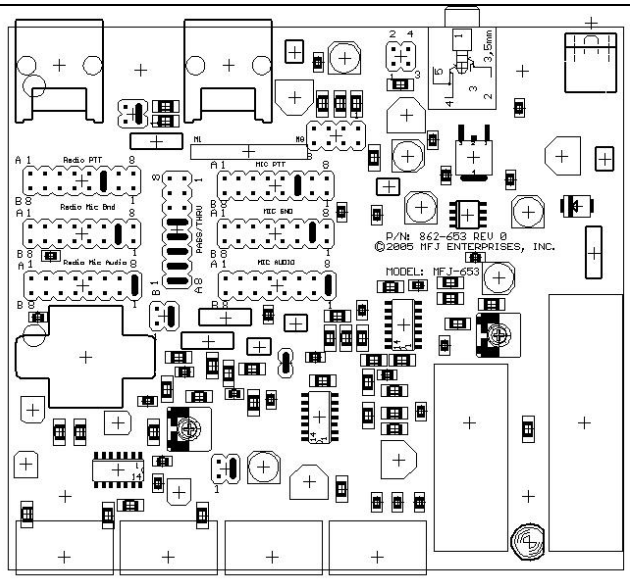


This diagram may cover some other radios in the ICOM product line with 8-pin modular microphone jack.
If there are any Questions concerning the information provided, please refer to your RADIO INSTRUCTION MANUAL.
MFJ is neither liable nor responsible for any mistakes or errors in the information provided.

Figure 7: 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



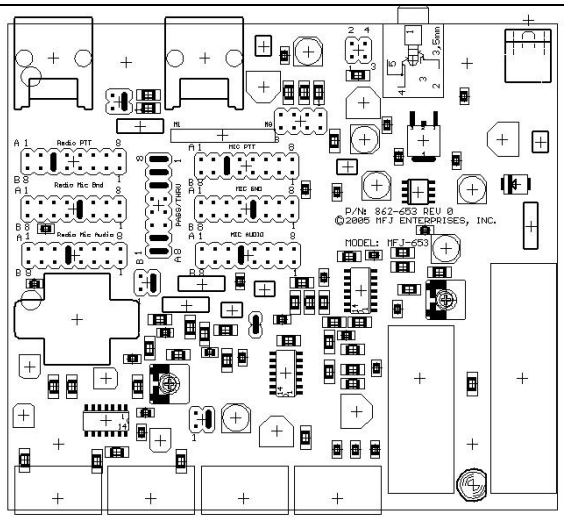
This diagram may cover some other radios in the YAESU product line with 8-pin round microphone jack.
If there are any Questions concerning the information provided, please refer to your RADIO INSTRUCTION MANUAL.
MFJ is neither liable nor responsible for any mistakes or errors in the information provided.

Figure 8: YAESU 8-Pin Round Microphone Setup

SYSTEM SETUP

YAESU 8-Pin Modular Microphone Setup:

YAESU FT-817, 857, 897

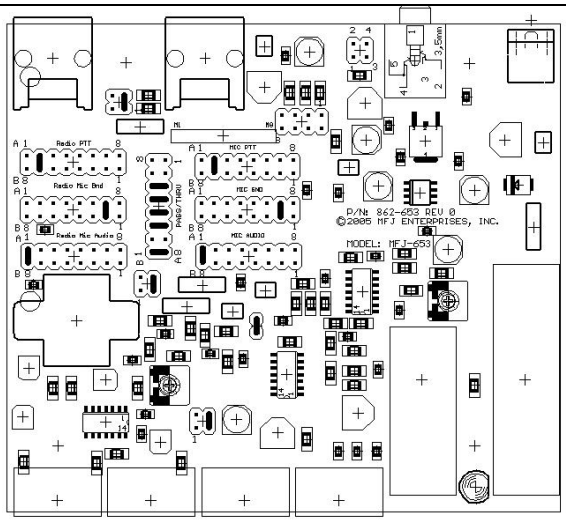


This diagram may cover some other radios in the YAESU product line with 8-pin modular microphone jack.
If there are any Questions concerning the information provided, please refer to your RADIO INSTRUCTION MANUAL.
MFJ is neither liable nor responsible for any mistakes or errors in the information provided.

Figure 9: 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



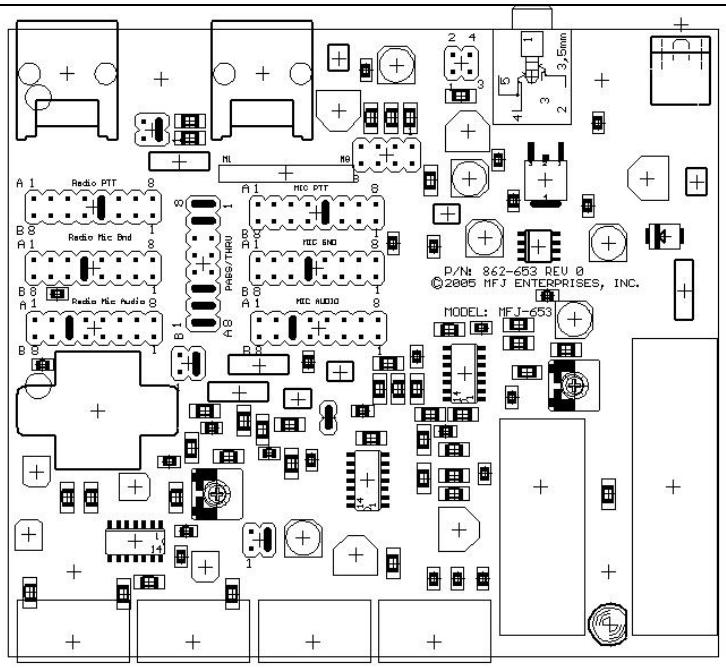
This diagram may cover some other radios in the Kenwood product line with 8-pin round microphone jack.
If there are any Questions concerning the information provided, please refer to your RADIO INSTRUCTION MANUAL.
MFJ is neither liable nor responsible for any mistakes or errors in the information provided.

Figure 10: 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.

Figure 11: KENWOOD 8-Pin Modular Microphone Setup

SYSTEM SETUP

CUSTOMIZING INTERNAL JUMPERS

If your radio is not listed above, you can create a custom jumper position table.

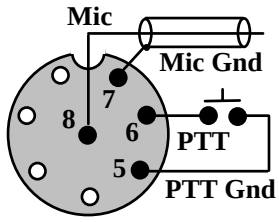
Begin by removing the screws from the sides of the cabinet. Lift the cover off. Look from the front view and notice the group of pins and black jumpers on the left side behind the microphone connector and in front of the microphone output jack. Fill in a custom table like the following:

Pin	JP1 Pass	Jp2 Mic PTT	JP3 Mic Gnd	JP4 mic audio	JP5 Rdo PTT	JP6 Rdo Gnd	JP7 Rdo audio
1	X						
2	X						
2	X						
4	X						
5	X						
6		X			X		
7			X			X	
8				X			X

Table 1: Sample Jumper Settings Table for Yaesu FT-1000 Series

UNLISTED RADIOS

To make a jumper table for an unlisted radio, you must look at the radio manual. Find the page that shows the microphone wiring. This is a sample of a Yaesu-style wiring diagram that was used above:



Yaesu Mic Jack Pin-out, Front View

Figure 12: Yaesu Mic Jack Pin-out

If you compare table 1 to this connector diagram, you will see how it is laid out. Notice an “X” was placed at the appropriate PTT and MIC pins according to the rules below.

SYSTEM SETUP

Look at the microphone-wiring diagram in your radio manual, fill in a table, and connect the leads as we have done in our example. We have provided a blank chart below for you to fill in.

1.) **Jumper 4 and 7 should copy each other, and use the same jumper pin number for the center MIC wire.**

2.) **Jumper 2 and 5 also jointly share the same pin numbers as the PTT pin.**

3.) **The MIC GND, Jumper, should connect to the same pin as the outer MIC lead and only that pin.**

4.) **Be sure to place a pass-through connection jumper on every lead EXCEPT numbers used on HD 2, 4, 5, and 7.**

The following blank table is for your personal use. Use your radio's manual to complete the table. This will assist you in properly setting the jumpers for your radio.

Remember!!! Use the following wiring chart rules:

1.) **Never ground the microphone audio ground to the chassis ground!**
2.) **JP2 and JP5 are always the same jumper slot number**
3.) **JP4 and JP7 are always the same jumper slot number**
4.) **JP1 always has a jumper <u>except</u> where JP2, JP4, JP5 and JP7 are jumpered!**

SYSTEM SETUP

Pin	JP1 Pass	JP2 Rdo PTT	JP3 Rdo Mic Gnd	JP4 Rdo Mic Audio	JP5 Mic PTT	JP6 Mic Gnd	JP7 Mic Audio
1							
2							
3							
4							
5							
6							
7							
8							

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	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 2: 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.

POWER

The MFJ-653 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.

THEORY OF OPERATION

The SSM2166 is a complete microphone signal condition system on a single IC. It provides amplification, RMS detection, limiting, variable Compression and Downward Expansion.

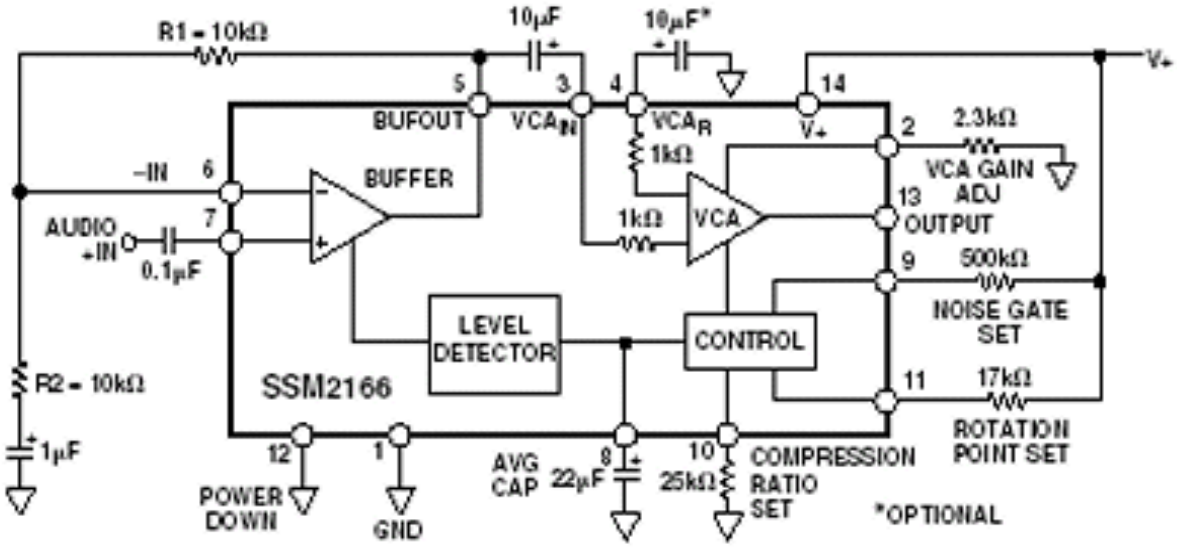


Figure 13: Functional Diagram

Figure 12 shows the functional diagram of the SSM2166. Input signals below Vde set by The Downward Expansion control on the front panel are downward expanded, that is a -1dB change in the input signal level causes a -3dB change in the output level. The average time for this feature is set by the Delay control on the front panel. Overall gain of the MFJ-653 is set by controlling the Vca through the front panel control. Gains of up to 20 dB are available. Compression is set by the front panel control and ratios of 1:1 up to 15:1 are possible.

THEORY OF OPERATION

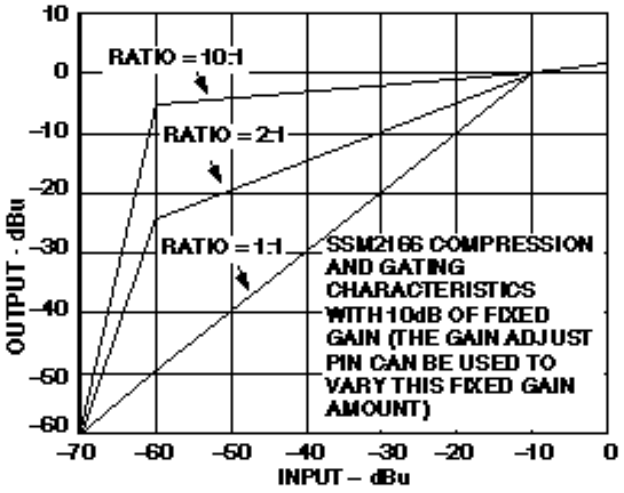


Figure 14: Compression and Gating Characteristics

Figure 14 shows how the input levels are compressed for various levels of compression within the SSM2166. Compression is a method of signal processing that the loudest signals are made softer and the quietest signal are boosted this reduces the overall dynamics of the signal but this also makes the output appear louder to the ear.

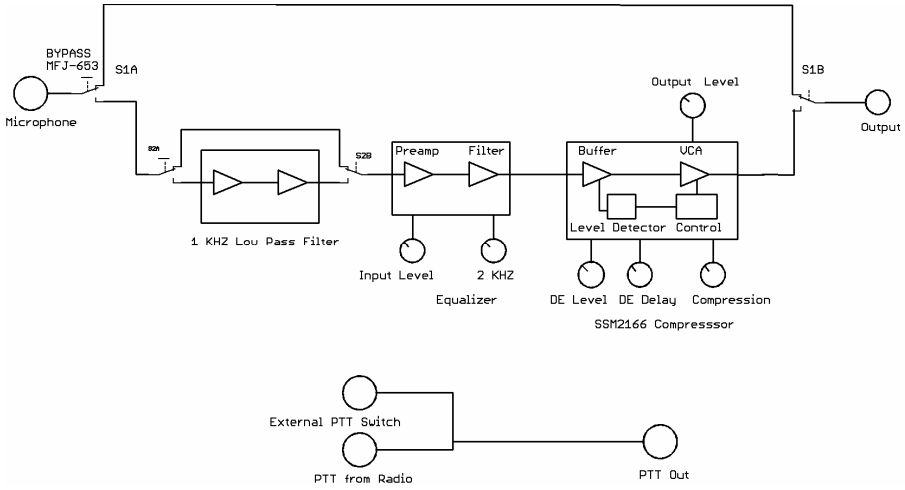


Figure 15: Block Diagram

EASY-START INSTRUCTIONS

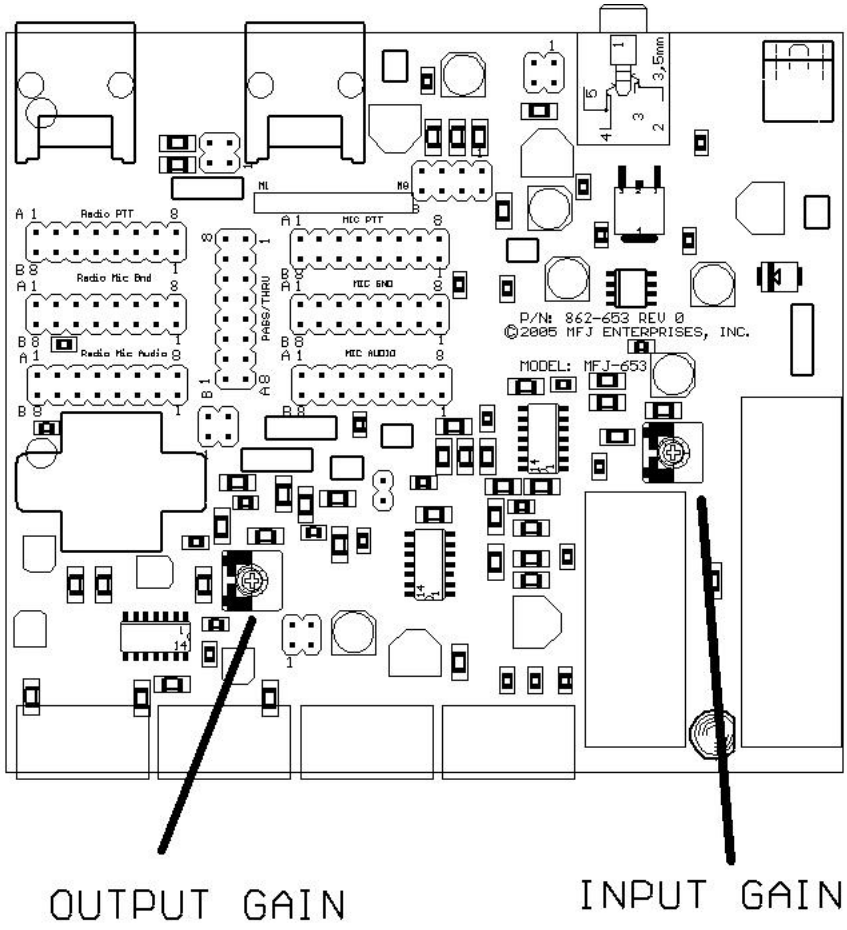


Figure 16: Gain Control Locations

1. The above figure shows the location of the input and output gain controls. Normally the factory setting for the input gain control will be sufficient for most microphones but on occasion with a low mic some adjustment will be necessary.

2. Start with the MFJ-653 in the Power Off/Bypass position. Using your microphone, set your radio's mic gain, ALC and any other features to the proper operating condition. Set the front panel controls as follows:

Compression level:	9 o'clock
Downward Expansion Set:	Fully clockwise
Downward Expansion Delay:	Fully clockwise
Equalizer (2 KHz):	12 o'clock
Highpass Filter:	Off

EASY-START INSTRUCTIONS

3. Hook up a Dummy Load to your radio and turn ON the MFJ-653.

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

   Note: If you cannot get sufficient audio with the Output Gain Control set to maximum, reduce the Output Gain Control by about 25% and adjust the Input Gain control for the proper output as indicated by your radio's metering.

5. Set the Downward Expansion Control. Fully rotate the Control counter clockwise and then while speaking into the microphone rotate the Control until the desired effect of the Downward Expansion is obtained. It should be set so that your voice is passed through the unit but background noise is not. Some experimentation is necessary until you are comfortable with the use of Downward Expansion.

6. While speaking into the Microphone Slowly rotate the Delay Control counter clockwise until you have set the delay so that the unit does not cut out between word and syllables.

You are now set to use the MFJ-653 on the air. It will take some to get familiar with the amount of Compression that you need as it is always a trade off between fidelity and the use of Compression to get that rare DX station you have been after. You will also find that the High Pass filter and the Equalizer can be adjusted to give you that added "punch" necessary for getting through in noisy or weak-signal conditions. Experiment with these controls to determine the best settings.

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. Also if using an electret microphone element ensure the proper phantom voltage is programmed using the proper jumper.

[ ] Station PTT will not function: Check the PTT jumper block. Ensure that you have a ground between the radio and the MFJ-653 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 reading the manual does not solve your problem, 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 technicians may ask.

You can also send questions by mail to MFJ Enterprises, Inc., 300 Industrial Park Road, Starkville, MS 39759; 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.

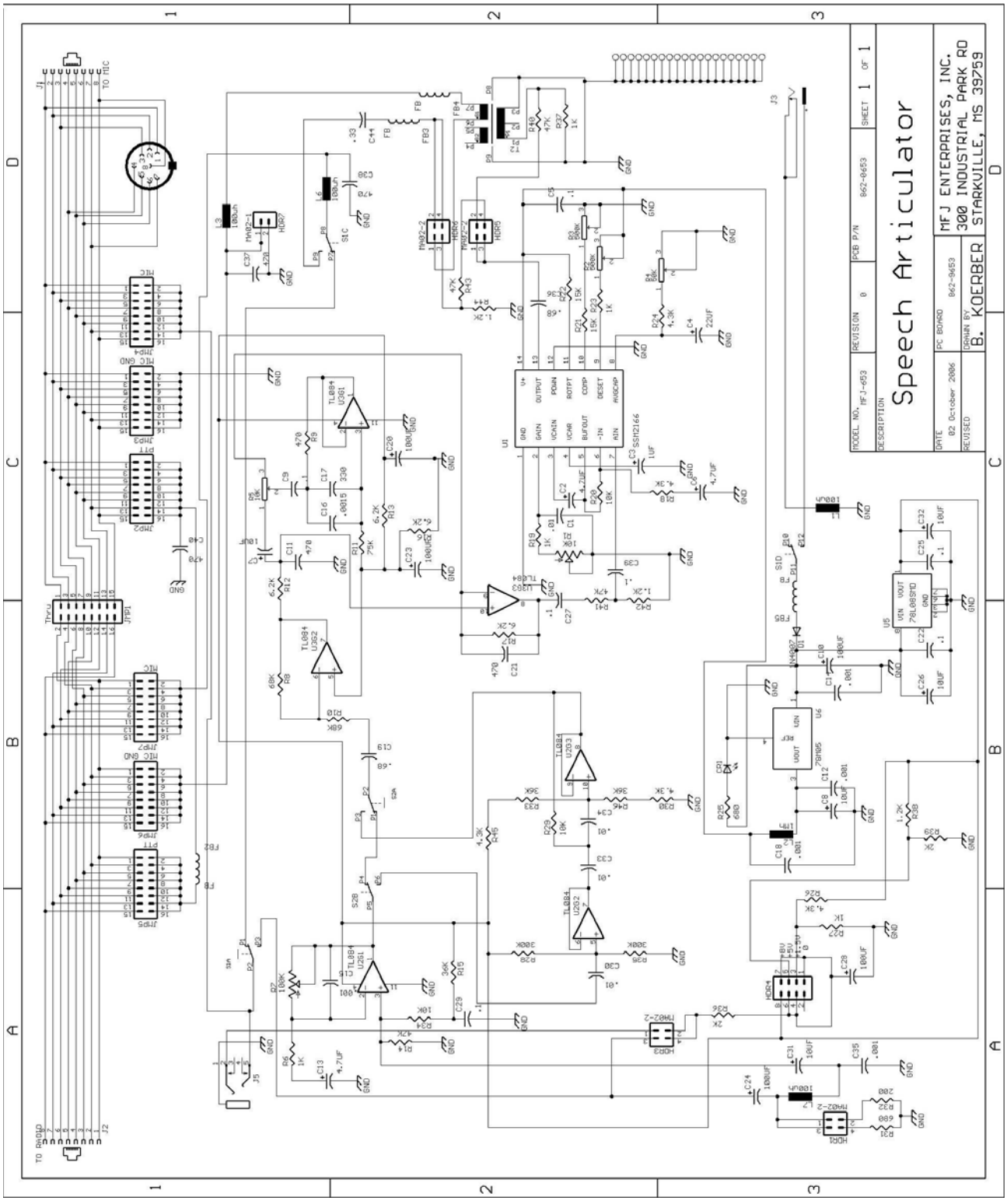


FIGURE 17: SCHEMATIC DIAGRAM

MFJ ENTERPRISES, INC.
300 Industrial Park Road
Starkville, MS 39759

MFJ-653
Version 0A
Printed In U.S.A.