TMA44 Audio Panel

Installation Manual

01849-00-AD
29 March 2018

Trig Avionics Limited
Heriot Watt Research Park
Riccarton, Edinburgh
EH14 4AP
Scotland, UK

This page intentionally left blank

CONTENTS

1. Preface

1.1 Purpose

This manual describes the physical and electrical characteristics and the installation requirements for a TMA44 Audio Panel.

1.2 Scope

This manual applies to the installation of the TMA44 Audio Panel.

1.3 Changes from Previous Issue

Changes from Issue AC to Issue AD are:

Throughout	Front Panel images updated to show realistic lighting patterns.

1.4 Document Cross-References

01848-00	TMA44 Audio Panel Operating Manual	
TSO C35d	Airborne Radio Marker Receiving Equipment	FAA
ETSO 2C35d	Radio Marker Receiving Equipment	EASA
TSO C50c	Audio Selector Panels and Amplifiers	FAA
ETSO C50c	Audio Selector Panels and Amplifiers	EASA

2. Introduction

2.1 Equipment Description

The TMA44 is a state of the art audio isolation amplifier and audio selector that contains a voice activated (VOX) intercom system. It can switch up two transceivers (Com 1, Com 2) and six receivers (Nav 1, Nav 2, ADF, DME, MKR and AUX). In addition, there are two unswitched inputs, for priority audio sources such as TAWS or altimeter warning. Push buttons select the receiver audio sources provided to the headphones. A speaker button allows the user to listen to the receiver(s) selected on the cabin speaker. Except for the unswitched inputs, all speaker audio is muted during transmit. Push buttons select one of the transceivers for the pilot and co-pilot position in transmit. In "Split Mode" the TMA44 allows the pilot and co-pilot to operate different transmitters independently.

A fail-safe mode connects the pilot headphone and microphone to Com 1 and unswitched input 1 if power is removed for any reason, or if the audio panel is turned off by pushing the volume control.

A four-station voice activated (VOX) intercom is included in the TMA44. Pilot isolate and crew modes, two mono music inputs with Smooth Fade and transmit indications. Intercom control is through front panel mounted knobs. Dual concentric knobs control intercom volume and intercom squelch.

A 3-light Marker Beacon receiver is integral to the TMA44. This provides the necessary Marker Beacon light and audio indications necessary for an Instrument Landing System (ILS) approach.

2.2 TSO Holder

The TSO holder and manufacturer of the TMA44 is PS Engineering, Lenoir City, TN, USA.

US patents no. 5,903,227 and 6,160,496 apply.

3. Technical Specifications

Specification	Characteristics
Compliance	Marker Beacon: TSO C35d, Class A, ETSO 2C35d Audio Selector/Intercom: TSO C50d, Class A, ETSO C50c
Applicable documents	RTCA DO-160B, RTCA DO-170 and RTCA DO-143
Power Requirements	Voltage: 14 or 28 VDC* Maximum current 1 amp (externally protected by a 2 amp circuit breaker). Typical operating current 350 mA (speaker off), 600 mA (speaker on). *28 VDC requires 15W dropping resistor (included)
Altitude	Up to 50,000 feet in a non-pressurised area of the cockpit
Operating Temperature	-20°C to +55°C
Storage Temperature	-40°C to +85°C
Input impedance	510 Ω
Input Isolation	-70 dB (min.)
Speaker Muting	-60 dB (min.)
Speaker Output (into 4 Ω)	3 watts (min.) with no clipping
Switched Receiver Inputs	8 (Com 1, Com 2, Nav 1, Nav 2, ADF, DME, MKR, AUX)
Unswitched Inputs	2
Transmitter Selections	3; Com 1, Com 2, Com 1/2

Speaker Impedance	4 Ω
Headphone Impedance	150 - 1000 Ω
Headphone Output	45 mW each headset with no clipping
Microphone Impedance	150 - 600 Ω
Intercom Positions	4 places (monaural)
Music Inputs	2
Music Muting	>50 dB "Smooth Fade" when Radio or intercom active
Distortion	<1% THD@ 45 mW into 150 Ω
Mic Freq. Response, ±3 dB	350 Hz - 6000 Hz
Music Freq. Response, ±3 dB	200 Hz - 15 kHz
Marker Beacon Receiver Frequency	75 MHz Crystal Controlled
Marker Beacon Receiver Sensitivity	Low: 450 µV (Hard) Factory adjusted to 1400µV (Soft)
	High: 160 µV (Hard) Factory adjusted to 150µV (Soft)
Marker Beacon Receiver Selectivity	-6 dB at 10 kHz, -40 dB at 120 kHz
External Lamp Output	7.0 (+/- 4) VDC positive when active, max. current 125 mA
MM Sense	Active high (4.7 VDC +/- 0.5V) during Middle Marker acquisition, for autopilot use

3.1 Physical Specifications

Specification	Characteristics
Height	33 mm (1.30”)
Width	159 mm (6.25”)
Depth	173 mm (6.8”)
Weight	0.68 kg (1.5lbs)

3.2 Approval basis

The TMA44 is FAA authorised under TSO C50c (Audio Amplifiers) and TSO C35d (Marker Beacon Receivers).

The TMA44 is EASA authorised under ETSO C50c and ETSO 2C35d, ref EASA.IM.21O.10028565

All systems comply with RTCA DO-143, DO-160B, DO-170, and EUROCAE 1/WG7/70.

TSO Holder and Manufacturer PS Engineering, Lenoir City TN USA

Operation is subject to the following conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation

3.3 License Requirements

None

4. Unit and Accessories supplied

4.1 Equipment Supplied

Unit Description	Qty	Part Number
TMA44 Audio Panel	1	01861-00-01
TMA44 Installation kit	1	250-604-0000
TMA44 Mounting Tray	1	430-890-0040
TMA44 Pilots Operating Handbook	1	01848-00
TMA44 Installation Manual	1	01849-00

4.2 Installation Kit

The TMA44 installation kit includes the following items:

Unit Description	Qty	Part Number
Cable Clamp	1	625-001-0002
6-32 Clip Nut	6	475-630-0002
6-32 x ½" Phillips flat head screw	6	475-632-0012
4-40 x 7/16" Phillips pan head screw, nylon patch	4	475-440-0007
4-40 x 3/8" Phillips truss head screw, nylon patch	2	475-440-1038
4-40 x ¼" Phillips pan head screw, lock washer	2	475-440-0001
Solder lug terminal	2	475-009-0001
TMA44 backplate	1	430-890-0050
DB44 metal backshell	1	625-025-2465
Cast DB44 retaining block	1	431-891-0100
44-pin connector kit	1	120-891-2045

Unit Description	Qty	Part Number
15Ω, 15W dropping resistor	1	701-015-1501

4.3 Required Items

Additional items you will require, but which are not in the TMA44 package, include:

- Speaker, 4 Ω
- Headphones, mono, up to 4 as required
- Microphones, up to 4 as required
- Marker Antenna (75 MHz, VSWR <1:1.5, as appropriate)
- Interconnect Wiring
- Headphone Jacks (Up to 4 as required)
- Microphone Jacks (Up to 4 as required)
- Circuit Breaker, 2 amp

5. Installation

This section provides detailed installation and interconnect instructions for the TMA44 Audio Panel.

Please read this manual carefully before beginning any installation to prevent damage and post installation problems. Installation of this equipment requires special tools and knowledge.

5.1 Unpacking and Preliminary Inspection

Use care when unpacking the equipment. Inspect the units and parts supplied for visible signs of shipping damage. Examine the unit for loose or broken buttons, bent knobs, etc. Verify the correct quantity of components supplied with the list in Section 4. If any claim is to be made, save the shipping material and contact the freight carrier. Do NOT return units damaged in shipping to Trig. If the unit or accessories shows any sign of external shipping damage, contact Trig to arrange for a replacement. Under no circumstances attempt to install a damaged unit in an aircraft. Equipment returned to Trig for any other reason should be shipped in the original Trig packaging, or other UPS approved packaging.

5.2 Equipment Installation Procedures

5.2.1 Cooling Requirements

Forced-air cooling of the TMA44 is not required. However, the unit should be kept away from heat producing sources such as defrost or heater ducts, dropping resistors or heat producing avionics without adequate cooling air provided.

If the TMA44 is installed in a 28 VDC aircraft system, a 15 Ω, 15 watt dropping resistor (p/n 701-015-1501) should be installed. Failure to do so will generate unnecessary heat inside the unit and may void Trig's warranty.

5.2.2 Mounting Requirements

The TMA44 must be rigidly mounted to the instrument panel of the aircraft structure and within view and reach of the pilot position(s). Installation must comply with FAA Advisory Circular AC 43.13-2B. The unit may be mounted in any area where adequate clearance for the unit and associated wiring bundle exist.

5.2.3 Mounting Rack Installation

Remove the unit from the mounting tray unscrewing the 3/32-inch hex-head screw that is in the centre of the unit. The hex-head screw is the lower opening. Carefully slide the unit free of the tray. Set the unit aside in a safe location until needed. Install the tray using six flat head Phillips 6-32 x ½-inch screws, P/N 475-632-0012 and 6-32 clip nut, P/N 475-630-0002. The audio selector panel must be supported at front and rear of the mounting tray.

5.2.4 Audio Panel Tray and Connector Assembly

The rack connectors mate with one 44-pin connector in the TMA44. The connector is a sub-miniature crimp-type, and require the use a hand crimp tool, from table below (or equivalent). The connector is mounted to the tray back plate with 4-40 screws (475-440-1038), from the inside of the tray and the mounting block, 431-891-0100. Ensure that proper strain relief and chafing precautions are made during wiring and installation, using the cable clamp (625-001-0002).

Two grounding lugs are provided, which may be attached to the rear mounting plate with 2 4-40 x ¼" screws with captive lock washers. These provide a convenient location to connect the shield ground terminations.

Manufacturer	Crimping Tool	Positioner	Extraction Tool
AMP	601966-1	601966-6	91067-1
Daniels	AFM8	K42	M24308-1
ITT-Cannon	995-0001-584	995-0001-739	91067-1

Table 5-1 Connector Pin crimping tools

5.3 Cable Harness Wiring

Refer to Appendix C for assembling the wiring harness as required for the installation. All wires must be MIL-SPEC in accordance with current regulations. Two- and three-conductor with shield wire must be used where indicated, and be MIL-C-27500 or equivalent specification. Proper stripping, shielding and soldering technique must be used at all times. It is imperative that correct wire be used.

Refer to FAA Advisory Circular 43.13-2B for more information. Failure to use correct techniques may result in improper operation, electrical noise or unit failure. Damage caused by improper installation will void the Trig warranty.

5.3.1 Noise

Due to the variety and the high power of radio equipment often found in today's general aviation aircraft, there is a potential for both radiated and conducted noise interference.

The TMA44 power supply is specifically designed to reduce conducted electrical noise on the aircraft power bus by at least 50dB. Although this is a large amount of attenuation, it may not eliminate all noise, particularly if the amplitude of noise is very high. There must be at least 13.8 VDC present at the bottom connector, pin 43, of the TMA44 for the power supply to work in its designed regulation. Otherwise, it cannot adequately attenuate power line noise. Shielding can reduce or prevent radiated noise such as beacons, electric gyros, or switching power supplies, but installation combinations can occur where interference is possible. The TMA44 is designed in a RFI hardened chassis and has internal Electromagnetic Interference (EMI) filters on all inputs and outputs.

Ground loop noise occurs when there are two or more ground paths for the same signal, such as the airframe and a ground return wire. Large cyclic loads such as strobes or inverters can inject noise signals onto the airframe that are detected by the audio system. Follow the wiring diagram very carefully to help ensure a minimum of ground loop potential. Use only MIL-SPEC shielded wires (MIL-C-275000, or better). Under no circumstances combine a microphone and headphone wiring into the same shielded bundle. Always use a 2 or 3 conductor shielded wire as shown on the installation wiring diagram.

The shields can be daisy-chained together, and then connected to the ground lugs mounted on the back plate shown in Appendix B.

Radiated signals can be a factor when low-level microphone signals are "bundled" with current carrying power wires. Keep these cables physically separated. It is very important that you use insulated washers to isolate the ground return path from the airframe to **all** headphone and microphone jacks.

> *Note: Adding a high-performance audio control system, particularly in conjunction with active noise cancelling headsets, cannot improve on older avionics that were designed for cabin-speaker use. Trig makes no claim that the audio panel will provide a noise-free audio quality under all installation conditions, particularly with older avionics.*

5.3.2 Entertainment Input (J1 pin 9 & 25)

Two entertainment devices (MP3 player, Portable Satellite Radio, CD player, etc.) can be connected to the unit. Install two 1/8-inch jacks in a convenient location so that the pilot can plug in the entertainment devices into the system.

> *NOTE: Use the low level output of any entertainment device to connect to the audio panel. Maximum signal level is 2 VAC p-p. DO NOT use a speaker-level output, this will cause internal damage in the audio panel.*

For a stereo input, we do not recommend tying the left and right channels (tip and ring) directly together unless approved by the music source manufacturer. A small series resistor in each channel is usually required. The audio signal at the entertainment input must be a minimum of 500 mV P-P for optimum music performance.

5.3.2.1 Smooth Fade

The TMA44-system incorporates a "Smooth Fade" system. This will mute the entertainment devices during ICS or radio traffic. While in the ALL or ISO modes, entertainment 1 is heard by everyone (except by the pilot in ISO mode). While in the CREW mode, pilot and co-pilot will hear entertainment 1 while the passengers will hear entertainment 2.

The “Mute” button can be used to inhibit the Smooth Fade function, keeping

music at the same level. In CREW mode, passengers will hear Music 2, and this will be controlled by the “Mute” button located on the front panel.

Entertainment inputs 1 and 2 can be paralleled so a single entertainment source can serve both the passengers and the crew in "crew" mode. It is suggested however, that a switch (DPDT) is installed between the single entertainment device and entertainment input 1. This will allow the pilot and co-pilot to decide if they hear entertainment while in the Crew mode.

Local oscillators and internal signals from some entertainment equipment can cause undesired interference with other aircraft systems. Before take-off, operate the entertainment devices to determine if there is any adverse effect within the aircraft systems. If any unusual operation is noted in flight, immediately switch off the entertainment devices.

5.3.3 TMA44 Pin assignments

Pin	Function	Pin	Function
1	Co-pilot Mic Audio	2	Pilot Mic Audio Hi
3	Passenger Mic Hi	4	Com 1 Mic Audio
5	Com 1 Mic Key	6	Com 1 Audio In
7	Unswitched 1 Hi	8	Nav 1 Input
9	Music 1 Hi	10	Pilot Headphone
11	Swap	12	Blue Lamp Out
13	Amber Lamp Out	14	Speaker Ground
15	Marker Antenna	16	Co-pilot Mic Lo
17	Pilot Mic Low	18	Passenger 1 Mic Lo
19	Passenger Mic Lo	20	Com 1 Lo
21	Com 2 Mic Key	22	Unswitched 2 Hi
23	Nav 2 Audio Hi	24	Audio Low
25	Music 2 Hi	26	Co-pilot Phones Hi
27	MM Sense	28	Marker Low
29	Airframe Ground	30	Marker Antenna Ground
31	Co-pilot Mic PTT	32	Pilot Mic PTT
33	Passenger Mic Hi	34	Com 2 Mic Audio
35	Com 2 Audio Lo	36	Com 2 Audio
37	ADF Audio Input	38	Aux Audio Hi
39	DME Audio Hi	40	Passenger Phones Hi
41	Dimmer Input	42	White Lamp Out
43	Aircraft Power	44	Speaker Hi

5.3.4 External Push-to-Talk (J1 pin 32 pilot, J1 pin 31 co-pilot)

An important part of the installation is the PTT (Push-To-Talk) switches that allow the use of your aircraft communications radio for transmissions. There are three typical configurations that can be used. Select the case that best fits the installation. Only the person who presses their PTT switch will be heard over the radio. If the pilot and co-pilot both use the PTT, the co-pilot position has access to the radio. The pilot position will have PTT control regardless of the co-pilot when the TMA44 is in the FAIL-SAFE mode.

CASE 1: PTT is built into both pilot and co-pilot yokes.

CASE 2: PTT is in pilot yoke only. This configuration requires a modified external PTT switch plugged into the co-pilot's microphone jack. (See Appendix A). When the co-pilot's PTT is pressed, the intercom switches the mic audio from pilot to co-pilot mic.

CASE 3: No built in PTT. This requires two built in PTTs to be installed, or modified external PTT switches to be used. Modify external PTT as required (See Appendix A).

5.3.5 Transmit Interlock

Some communications transceivers use a transmit interlock system which changes the behaviour of one radio when the other one is transmitting. In order to use the Split Mode feature, this function will need to be correctly configured.

If you are using Trig radios, the transmit interlock pin on each radio should be connected to the PTT of the other radio. For other brands, consult the manufacturer installation manual.

5.3.6 Power (J1 pin 43)

The TMA44-Series are compatible with both 14 and 28 volt DC systems. A two (2) amp circuit breaker is required. Power and ground wires must be a twisted 22 AWG pair.

Included with this product is a power dropping resistor to be connected in

series with the power input, bottom connector, pin 43. This dropping resistor is supplied for 28 volt systems so that unnecessary heat dissipation inside the TMA44 can be avoided.

> *NOTE: To reduce the amount of heat dissipated in the audio selector panel, when used in a 28 volt aircraft, a 15Ω, 15 watt dropping resistor (p/n 701-015-1501) must be installed in series with the power input. This resistor should be mounted to aircraft structure to dissipate heat.*

5.3.7 "Swap" Mode (J1 pin 11)

When a normally-open, momentary, push-button switch is connected between pin 29 on the connector and aircraft ground, the user can switch between Com 1 and 2 by depressing this switch without having to change the mic selector. This yoke mounted switch eliminates the need of removing your hands from the yoke to change transceivers.

5.3.8 Backlighting (J1 pin 41)

The brightness of the green audio selection indicators is automatically controlled by a photocell located in the centre of the unit. The brightness of the buttons is set by the dimmer control input on pin 41. The unit has an internal jumper to select between 14 volt and 28 volt electrical systems; when shipped from the factory it is set to 14 volts. To change to 28 volts, follow the instructions in section 5.3.9.

If the dimmer control is not connected, a constant low level illumination of the buttons will be provided for night-time viewing.

5.3.9 Backlight Voltage Adjustment

As shipped from the factory, the TMA44 is configured for 14V dimmer systems. For 28V dimmer systems remove jumper J9.

NOTE: Take precautions to prevent ESD damage prior to servicing unit

1. Remove the 4 Phillips head screws from the TMA44.

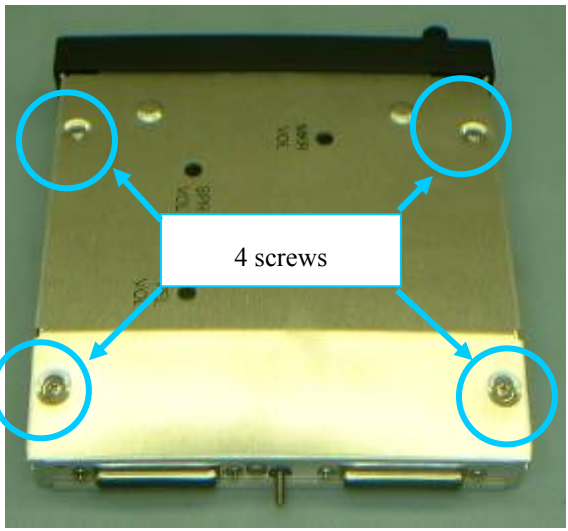


Figure 5-1 Screw Locations

2. Remove the jumper located in the back corner away from the sub-D connector from *both* pins of J9. See Figure 5-2.
3. Place the lid back on the unit, aligning holes.
4. Install and tighten the 4 screws into the lid.

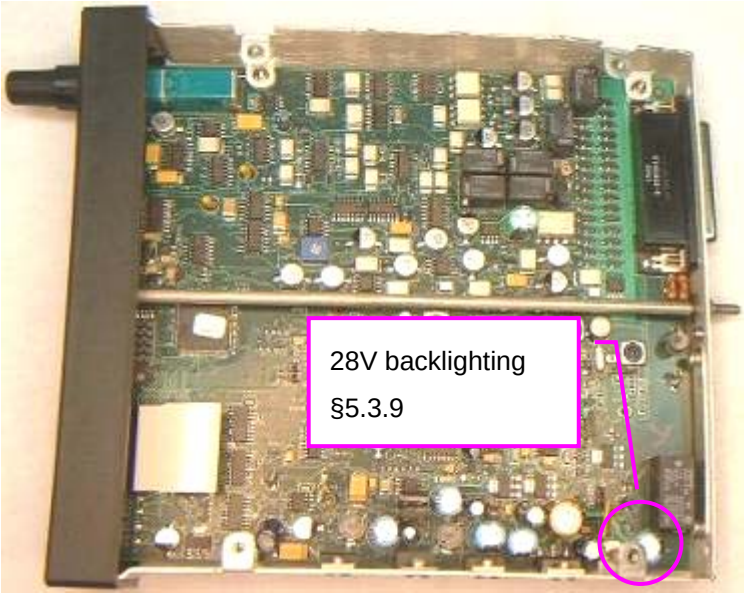


Figure 5-2 Backlight selection jumper location

5.3.10 Middle Marker Sense (J1 pin 27 & 28)

The MM Sense output Pin 27, is connected to certain specific autopilots, and goes high only when a middle marker signal is received, not in test.

5.3.11 Unswitched Inputs (J1 pin 7, 22 & 24)

The TMA44 has two unswitched inputs. Pin 7 and pin 22 are unswitched/unmuted inputs that are heard by the crew and over the cockpit speaker at all times.

5.3.12 Intercom

All mic and headphone (monaural) jacks must have insulating washers, the cable must be Teflon coated, twisted-shielded wire, and the shield must only be connected to the ground return wire **only** at the intercom connector.

5.4 Adjustments

The TMA44 is factory adjusted to accommodate the typical requirements for most aircraft configurations. There are four adjustments however that will allow the installer to tailor the specific functions.

Adjustment	Clockwise Results In
Cabin Speaker Level	Increase Speaker Volume
Marker Beacon Level	Decrease Marker Volume
MKR High Sense	Increase sensitivity
MKR Low Sense	Increase Sensitivity

To make the necessary adjustments, use a small jeweller's slotted screwdriver.

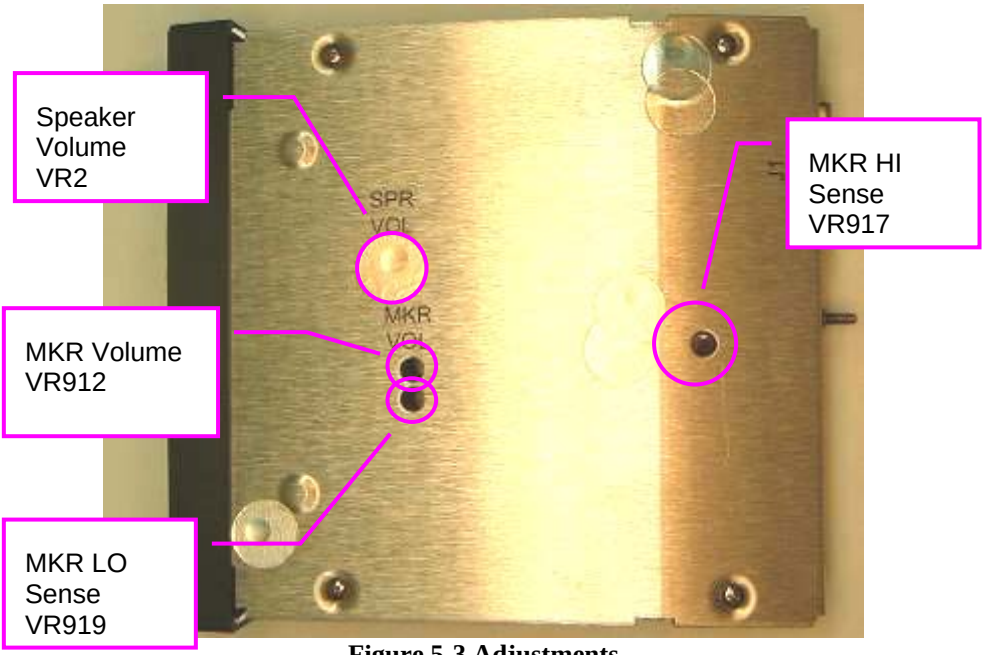


Figure 5-3 Adjustments

5.5 Marker Antenna Installation

Refer to aircraft and antenna manufacturer's installation instructions, as well as AC43.13-2B (or later revision), Chapter 3, for information on proper antenna installation techniques. The marker beacon antenna must be mounted on the bottom of the aircraft.

5.6 Communications Antenna Installation Notes

For best results while in Split Mode, it is suggested that the one VHF communications antenna be located on top of the aircraft while the other communications antenna be on the bottom. Any antenna relocation must be accomplished in accordance with AC 43.13-2B, aircraft manufacturers' recommendations and FAA-approved technical data.

> *Warning: It is probable that radio interference will occur in the split mode when the frequencies of the two aircraft radios are adjacent, and/or the antennas are physically close together. Trig makes no expressed or implied warranties regarding the suitability of the TMA44 in Split Mode.*

5.7 Unit Installation

To install the TMA44, gently slide the unit into the mounting rack until the hold-down screw is engaged. While applying gentle pressure to the face of the unit, tighten the 3/32" hex-head screw next to the co-pilot control shaft until the unit is secure. DO NOT OVER TIGHTEN.

> *Warning: Do not over-tighten the lock down screw while installing the unit in tray. Internal damage will result.*

6. Post Installation Checkout

6.1 Required Test Equipment

In order to return an aircraft to service after installation of the TMA4, the installer must have access to a Marker Beacon signal generator such as one of the following:

IFR NAV401L, NAV402AP, IFR4000, TIC T-30D, T-36C

Equivalent test equipment is acceptable as long as the testing requirements can be met.

6.2 Power Test

After wiring is complete, verify power is ONLY on pin 43 of the connector, and airframe ground on connector pin 29. Failure to do so may cause serious internal damage and void Trig's warranty.

1. Apply power to the aircraft and avionics.
2. Plug headsets into the pilot, co-pilot, and occupied passenger positions.
3. Verify fail-safe operation by receiving and transmitting on COM 1 from the pilot position, with the audio panel power off.
4. Switch on the unit by pressing the volume (VOL) knob.
5. Check intercom operation.
6. Push the XMT1 select button.
7. Verify that both the LEDs (Light Emitting Diode) near the **COM1 and XMT1** buttons light. Verify that transmit button LED near the mic selector is not blinking. If the LED is blinking, stop testing and troubleshoot the microphone PTT installation.
8. Verify proper transmit and receive operation from the co-pilot position, noting that the co-pilot PTT switch allows proper transmission on the selected transceiver. Verify that the LED near the XMT1 button blinks when transmitting.

9. Verify that pushing the **COM2** button causes the LED near the button to illuminate, and the COM2 receiver to be heard. Verify operation on COM1 from the pilot position.
10. Repeat for COM2
11. Press and hold the XMT1 button. While holding the XMT1 button, press the XMT2 button. This places the unit in "Split Mode"; verify that the pilot can transmit and receive on COM1, while the co-pilot transmits and receives on COM2.
12. Verify proper operation of all receiver sources by selecting them using the appropriate button. The button illuminates to show which source is in use.
13. Push the speaker button. Verify that all selected audio is heard in the cockpit speaker. Verify that the audio mutes when the mic is keyed.
14. Verify that the appropriate LED in the lower button row blinks when either push to talk is keyed.
15. Verify proper Intercom system operation in the **ALL, ISO** and **CREW** modes (see Section 8.12).
16. Verify that the audio selector panel system does not adversely affect any other aircraft system by systematically switching the unit on and off, while monitoring the other avionics and electrical equipment on the aircraft.

6.3 Marker Checkout

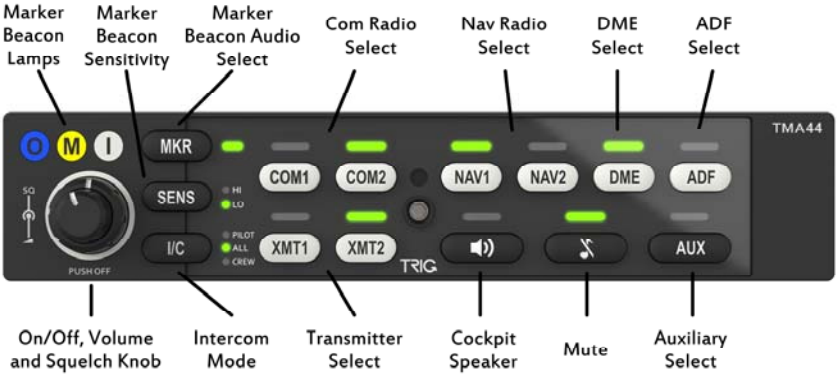
1. Connect a ramp generator at the antenna end of the marker coax. With the unit under test in HI sensitivity, verify that a 160 μV, modulated 95% with 1300 Hz, signal will illuminate the amber (M) marker light, and that marker audio is present in the headphones when the Marker Audio (MKR) push-button has been depressed. Select the button with the speaker symbol to verify marker audio availability on the cabin speaker. Verify that the white (I) and blue (O) lights will illuminate within ± 3dB of the amber lamp, with 3000 HZ and 400 Hz applied, respectively.
2. Repeat with the unit in LOW sensitivity, with 430 μV applied.
3. Connect the marker antenna and verify proper operation.

7. Final Inspection

Verify that the wiring is bundled away from all controls and no part of the installation interferes with aircraft control operation. Move all controls through their full range while examining the installation to see that no mechanical interference exists. Verify that the cables are secured to the aircraft structure in accordance with good practices, with adequate strain relief. Ensure that there are no kinks or sharp bends in the cables and coaxial cables. Verify that the cables are not exposed to any sharp edges or rough surfaces, and that all contact points are protected from abrasion. Complete logbook entry, FAA Form 337, weight and balance computation and other documentation as required.

8. Normal Operation

8.1 Front Panel



8.2 Power On and Fail-Safe Operation

The audio panel is turned on and off by pressing the volume control knob (smaller, inner knob on left side of unit).

When the system is turned off or if power is removed the audio panel will be placed in the fail-safe mode. In the off or fail-safe mode, the pilot is connected directly to Com 1 and to unswitched input 1, allowing transmit, receive and alert capability regardless of audio panel condition.

8.3 Transmitter Selection

To select a radio for transmission, press either the XMT1 or the XMT2 button; the green indicator lamp above the button will light up, indicating which radio you will transmit on. The corresponding COM1 or COM2 indicator will also light up; you always hear the audio from the transceiver that is selected for transmit.

Both pilots can transmit on the selected radio, but only the person who presses their Push-To-Talk switch will be heard over the aircraft radio.

8.4 Receiver Selection

To listen to both radios press the COM1 or COM2 button as required to enable the second radio. Both radios will remain selected until one is manually deselected.

8.5 Navigation Audio Selection

The MKR, NAV1, NAV2, DME, ADF and AUX buttons select the switched navigation receivers. Press once to turn on the corresponding source, press again to turn it off.

A green lamp above the button will light indicating which audio source is selected.

8.6 Cockpit Speaker

This button will place all selected audio on the cockpit speaker when active.

> *Note: In Split mode (see below), only unswitched inputs will play through the speaker.*

To help reduce power consumption and internal heat build-up in the avionics stack, switch off the speaker when not in use.

8.7 Swap Mode

The optional Swap button, usually mounted on the control yoke, switches between the Com transmitters without having to reach for the audio panel. Pressing the Swap button has exactly the same effect as switching between XMT1 and XMT2 on the audio panel.

8.8 Split Mode

Pressing both XMT1 and XMT2 buttons at the same time puts the TMA44 into Split mode; all four COM and XMT indicators will light up. This

connects the pilot to Com 1 and the co-pilot to Com 2, and they can use their respective radios independently. The passengers will not hear the radios or crew intercom in Split mode.

Press either XMT button to exit Split mode.

It is not possible to place the pilot on Com 2 and the co-pilot on Com 1.

In Split mode only the pilot will hear the selected navigation audio.

An example of this feature is when the pilot may want to talk to Air Traffic Control, while the co-pilot may be speaking to ground handling agents.

> **Note: Due to the nature of VHF communications signals, and the size constraints in general aviation aircraft, it is probable that there will be some transmission bleedover in Split Mode, particularly on adjacent frequencies. Split Mode may not be suitable in all aircraft conditions.**

8.9 Intercom Volume

Turning the volume control knob (the smaller, inner knob on the left side of the audio panel) adjusts the intercom volume in all headphones for pilot, co-pilot, and passengers. It has no effect on selected radio audio or music levels.

Many general aviation headsets have a built-in volume control, so volume can also be adjusted locally.

8.10 Intercom Squelch

The TMA44 provides a single VOX squelch control for the pilot, co-pilot and the passengers, although each microphone input has its own squelch circuit.

Only the microphones spoken into will be open, thus reducing the amount of background noise.

With the engine running, set the VOX squelch by slowly rotating the SQ control knob (the larger, outer knob on left side of unit) clockwise until you no longer hear the engine noise in the headphones. When the microphone is positioned properly near the lips, normal speech levels should open the channel.

When you have stopped talking, there is a delay of about ½ second before the channel closes. This helps prevent choppy communications.

8.11 Intercom Modes

The Intercom (I/C) button is a 3-function mode selector that allows the pilot to tailor the intercom function to best meet the situation; it cycles through the following modes, from top to bottom:

- PILOT: The pilot is isolated from the intercom and is connected only to the aircraft radios. Co-pilot and passengers will hear the intercom and Music 1, but not the aircraft radio receptions or pilot transmissions.
- ALL: All parties will hear the aircraft radios, intercom, and Music 1.
- CREW: Pilot and co-pilot are connected on one intercom channel and have exclusive access to the aircraft radios. They may also listen to Music 1. Passengers can continue to communicate amongst themselves without interrupting the crew and may listen to Music 2.

When in Split mode the pilot and co-pilot do not have any intercom function, the passengers will maintain communications.

8.12 Intercom Mode Table

Mode	Pilot Hears	Co-pilot Hears	Passengers Hear	Comments
Pilot	Radios Sidetone	Passengers Music 1	Co-pilot Passengers Music 1	This mode allows the pilot to communicate with air traffic control without the co-pilot or passengers hearing the conversation. Co-pilot and passengers can continue to talk and listen to music.
All	Radios Sidetone Co-pilot Passengers Music 1	Radios Sidetone Pilot Passengers Music 1	Radios Sidetone Pilot Co-pilot Passengers Music 1	This mode allows all on board to hear radio reception as well as communicate on the intercom.
Crew	Radios Sidetone Co-pilot Music 1	Radios Sidetone Pilot Music 1	Passengers Music 2	A second music source is automatically enabled for the passengers.

8.13 Music Inputs

The audio selector panel has provisions for up to two separate music input devices. Which device is heard is determined by the intercom mode selected.

It is also possible to use a single input device for both music inputs. A switch may be installed between the single input device and music input 1; this will allow the pilot and co-pilot to decide if they hear music devices while in Crew mode.

8.14 Music Muting

The Mute button controls the muting circuits of both music inputs. During voice communication, the music volume automatically decreases when mute is active; the music volume increases gradually back to the original level after

communications are complete.

8.15 Marker Beacon Receiver

The marker beacon receiver uses visual and audio indicators to alert you when the aircraft passes over a 75 MHz beacon transmitter.

The marker beacon audio can be enabled and disabled by pressing the MKR button. A green lamp to the right of the button will light when the audio is enabled.

- The blue outer marker lamp has an associated 400 hertz 'dash' tone. The lamp and tone are keyed at a rate of two per second when the aircraft is in the range of the outer marker.
- The amber middle marker lamp is coupled with a 1300 hertz tone, keyed alternately with short 'dot' and long 'dash' bursts at 95 combinations per minute.
- The white inner marker lamp has a 3000 hertz 'dot' tone. The lamp and tone are keyed at a rate of six times per second.

The sensitivity (SENS) button can be used to change the marker beacon receiver sensitivity to high or low. Use HI sensitivity only when navigating using fan markers on airways. For normal ILS marker beacons the sensitivity should always be set to LO.

Holding the SENS button for one second illuminates all three lamps simultaneously to assure the lamps (internal and external) are in working order. It will also cause the marker audio to mute for that beacon; the next beacon received will reactivate the audio. Releasing the SENS button restores the last sensitivity.

9. Continued Airworthiness

Other than for periodic functional checks required by the regulations, the TMA44 audio panel has been designed and manufactured to allow “on condition maintenance”. This means that there are no periodic service requirements necessary to maintain continued airworthiness, and no maintenance is required until the equipment does not properly perform its intended function. When service is required, a complete performance test should be accomplished following any repair action. Repairs should only be carried out in accordance with Trig Avionics Limited service procedures.

9.1 Cleaning the Front Panel

The plastic body and switches should be cleaned with a soft cotton cloth moistened with clean water.

10. Limited Warranty

Trig Avionics Limited warrants our products to be free from defects in materials and workmanship for a period of two (2) years from the date of installation by an authorised dealer.

This warranty covers repair and/or replacement at our option, of any parts found to be defective, provided such defects in our opinion are due to faulty material or workmanship and are not caused by tampering, abuse, or normal wear.

All warranties are F.O.B.

Trig Avionics Limited
Heriot Watt Research Park
Riccarton, Edinburgh, EH14 4AP

Trig Avionics will not accept or pay for any charges for warranty work performed outside our factory without prior written consent.

This warranty applies only to products in normal use. It does not apply to units or circuit boards defective due to improper installation, physical damage, tampering, lightning or other electrical discharge, units with altered serial numbers, or units repaired by unauthorised persons or in violation of Trig Avionics Limited service procedures.

Trig Avionics Limited assumes no responsibility for any consequential losses of any nature with respect to any products or services sold, rendered, or delivered.

11. Environmental Qualification Form

Nomenclature:	TMA44 Audio Panel	
Part Number:	PS Engineering Part Number: 6000, Trig Part Number 01801-00-01	
TSO	C50c, C35b Class A	
ETSO:	C50c, 2C35d EASA.IM.21O.10028565	
Manufacturer:	PS Engineering Incorporated, 9800 Martel Road, Lenoir City, TN	
Conditions	**DO-160B**	**Description of Conducted Tests**
Temperature and Altitude	4.0	Equipment tested to Category A1
Low temperature	4.5.1	-20°C
High temperature	4.5.2	+55°C
Altitude	4.6.1	50,000 feet, Equipment tested to Category D1
Temperature Variation	5.0	Equipment tested to Category C
Humidity	6.0	Equipment tested to Category A
Shock	7.0	Equipment tested to Category B
Vibration	8.0	Equipment tested to Category M, Standard
Explosion	9.0	Equipment identified as Category X – no test required
Waterproofness	10.0	Equipment identified as Category X – no test required
Fluids Susceptibility	11.0	Equipment identified as Category X – no test required
Sand and Dust	12.0	Equipment identified as Category X – no test required
Fungus	13.0	Equipment identified as Category X – no test required
Salt Spray	14.0	Equipment identified as Category X – no test required
Magnetic Effect	15.0	Equipment identified as Category X – no test required

Power Input	16.0	Equipment tested to Category B
Voltage Spike	17.0	Equipment tested to Category B
Audio frequency conducted susceptibility	18.0	Equipment tested to Category B
Induced signal susceptibility	19.0	Equipment tested to Category B
Radio frequency susceptibility	20.0	Equipment tested to Category A
Radio frequency emission	21.0	Equipment tested to Category A
Lightning induced transient susceptibility	22.0	Equipment not tested

Appendix A External PTT Hook Up

Part of the installation includes the installation of PTT (Push-To-Talk) switches that allow the use of your aircraft radio for communications transmissions. There are three configurations that can be used, you must select the case that best fits your installation.

CASE 1 - The PTT is built into the pilot and co-pilot yokes

Simply install the plugs from the headset into the aircraft headphone jacks. Then use the yoke mounted PTT to transmit. No other action is required.

CASE 2 - Built in PTT only on the pilot side only

This configuration requires a modified external PTT switch plugged into the co-pilot's mic jack – see modification details below. When the co-pilot's PTT is depressed, this activates an internal relay that switches the mic audio to the aircraft radio from the pilot to the co-pilot.

CASE 3 - No built in PTT switch at all

Two built-in PTT must be installed, or two external, modified PTT switches will be required for both the pilot and co-pilot – see modification details below.

Push To Talk Modifications

When received from the manufacturer, an after-market PTT switch opens the mic audio path to the "ring" connection of the PTT mic plug until the button is pressed. When the PTT is between the intercom and the headset, the intercom function will not work unless the PTT switch is depressed. A simple modification can be performed to allow proper intercom operation. NOTE: This mod does not alter normal operation.

Below are some examples of typical modifications. Contact Trig Support or the PTT manufacturer for more details if necessary.

Procedures for David Clark PTT

1. Unscrew the round black plastic cover from the jack.

2. Connect the joined black wires to the red wire.

3. Replace the round black plastic cover.

Procedures for Telex PT-200

1. Unscrew the round black plastic cover from the jack.

2. Cut the red wire in the middle of the wire.

3. Strip both ends of the insulation.

4. Solder the two ends to the ground lug to the PTT jack.

5. Replace the round black plastic cover.

Procedures for Telex PT-300

1. Unscrew the round black plastic cover from the plug jack.

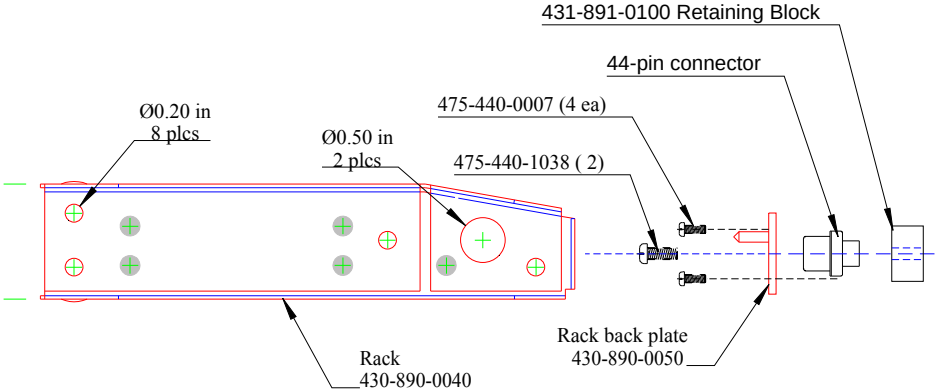
2. Remove the heat shrink material from the joined black wires.

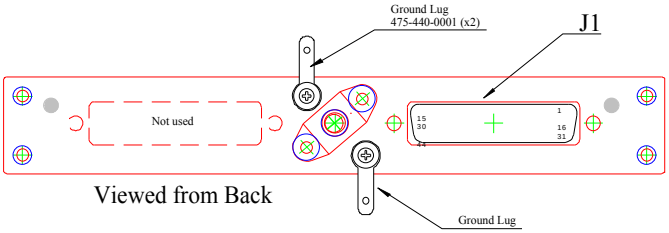
3. Solder these two wires to the lug that has a white wire already soldered to it.

4. Replace the round black plastic cover

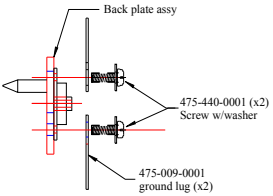
Appendix B Installation Drawings

Drawings are not to scale

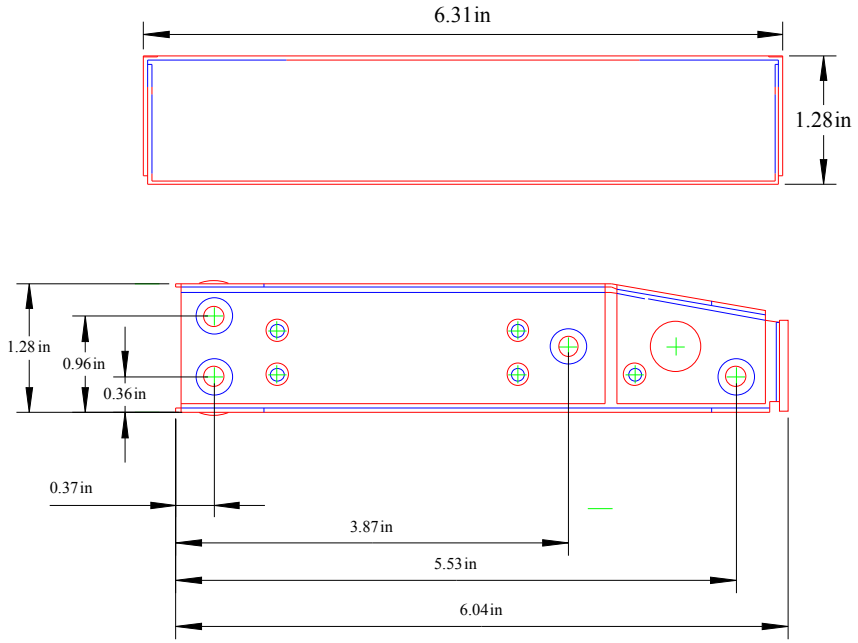




Viewed from Back

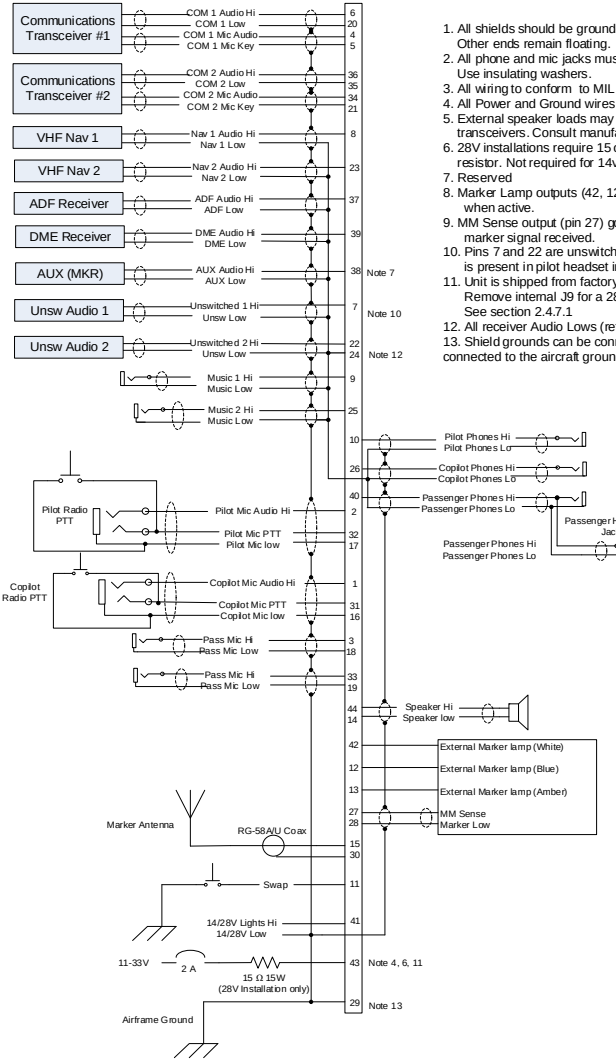


Ground lug detail



Caution: Apply steady pressure to the bezel while screwing the unit into the tray to ensure even seating of the unit and connectors.

Appendix C Wiring/Interconnect



1. All shields should be grounded at audio panel only. Other ends remain floating.
2. All phone and mic jacks must be floating from ground. Use insulating washers.
3. All wiring to conform to MIL 22750 or 27500.
4. All Power and Ground wires must be #22 gage wire
5. External speaker loads may be required on some transceivers. Consult manufacturer's information.
6. 28V installations require 15 ohm, 15W dropping resistor. Not required for 14v aircraft.
7. Reserved
8. Marker Lamp outputs (42, 12, 13) go to +7 VDC, +/- 4VDC when active.
9. MM Sense output (pin 27) goes high when middle marker signal received.
10. Pins 7 and 22 are unswitched, unmuted input. Pin 7 is present in pilot headset in Fail-Safe.
11. Unit is shipped from factory for 14v lights. Remove internal J9 for a 28v lighting bus. See section 2.4.7.1
12. All receiver Audio Lows (returns) connected to Pin 24
13. Shield grounds can be connected to the solder lug, and lug connected to the aircraft ground pin.

This page intentionally left blank