

**TMA 230 D**  
**AUDIO PANEL/MARKER BEACON RECEIVER**  
**OPERATOR'S/INSTALLATION MANUAL**



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PART NUMBER 1910-0005-01  
REV. D, ECO #1126



TMA 230D AUDIO MARKER RECEIVER

OWNER/INSTALLATION MANUAL

TERRA CORPORATION

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## SECTION I

### 1. INTRODUCTION

#### 1.1 SCOPE

This manual provides installation and operation instructions for the Terra TMA 230D Audio Panel/Marker Beacon Receiver manufactured by Terra Corporation of Albuquerque, New Mexico.

#### 1.2 DESCRIPTION

The TMA 230D is a small, lightweight, solid-state audio selector panel and marker beacon receiver. This unit is equipped with a speaker isolation amplifier. It also provides a two station intercom system.

The controls consist of selector switches for both speaker and headphone outputs and a microphone selector switch with an intercom select position. The TMA 230D has switched 500 ohm audio inputs for three transceivers and up to five receivers. Also there are three unswitched audio inputs. The "Auto" function automatically selects the audio output of the transceiver being used. The auto switch can be selected for speaker or headphones. Speaker output is provided for an external (ramp hail) speaker. An unamplified non-muted, unisolated emergency phones output is also provided. Cabin speaker power output is typically between ten and twelve watts. Speaker loads for each of the three transceivers are provided using internal resistors. When a microphone is keyed, all audio inputs except the altimeter are muted to the speaker but not muted to the headphones.

The marker beacon receiver is a crystal-controlled super heterodyne receiver. It features the standard three light display with remote light capabilities. Another feature is the "Auto" function which switches the marker receiver from high to low sensitivity and mutes the audio automatically.

The TMA 230D weighs .92 lbs (.417 Kg) without tray and 1.31 lbs (.590 Kg) with tray. The unit is 6.25" (15.9 cm) wide x 1.20" (3.05 cm) high and 5.94" (15.1 cm) long overall. 4.74" (12.0 cm) plus connector space is required behind the panel. Connector space should be approximately 3" (7.6 cm).

## 1.2 DESCRIPTION (Continued)

The TMA 230D is mounted with a sleeve supplied with the unit and is secured by means of a hex key type locking screw accessible via a hole in the front panel. Power, control wiring and the antenna connection are all made to the 44 pin "MOLEX" type connector.

The TMA 230D is designed to operate from either a 14VDC or 28VDC aircraft power system.

## 1.3 SPECIFICATIONS

The following are pertinent specifications for the Terra Model TMA 230D

### 1.3.1 MECHANICAL

Mounting: Panel mounted using sleeve supplied with unit.

Overall Dimensions: 5.94" long, 6.25" wide, 1.48" high.

15.09 cm long, 15.88 cm wide, 3.76 cm high.

Mounting Dimensions: 4.74" behind front of instrument panel, 6.31" wide, 1.48" high.

12.04 cm long, 16.03 cm wide, 3.76 cm high.

Panel Cut Out: 6.12" wide, 1.13" high  
15.54 cm wide, 2.87 cm high

Weight (with tray): 1.3 lbs (.590 kg)

Connectors: Antenna connect and interconnect cable - 44 pin "MOLEX" type

### 1.3.2 POWER REQUIREMENTS:

TMA 230D idle current: 13.75VDC-150mA  
27.50VDC-150mA

TMA 230D Maximum 13.75VDC-1.5 Amps



1.3 SPECIFICATIONS (Continued)

Operating Current: 27.50VDC-1.5 Amps

Instrument Lights: 13.75VDC-126 mA  
27.50VCC-65mA

1.3.3 ENVIRONMENTAL SPECIFICATIONS

Temperature Range: -20° C to + 55° C

1.3.4 ELECTRICAL SPECIFICATIONS

MARKER BEACON RECEIVER

Frequency: Crystal controlled at 75 MHz

Sensitivity: Low-1000uV with 90%  
modulation. High-200uV  
with 90% modulation.  
Auto-Switches from high to low  
sensitivity and mutes audio  
automatically

Selectivity: -6dB ± 7 kHz  
-60dB ± 20 kHz

Freq Stability: .005%

AGC Control: 10dB audio deviation  
maximum from 200 uV to 10,000uV.

Lamps: Auto dimming with remote 3 lamp  
capability. 12VDC at 150 mA max  
per lamp.

Phone Output: 50 milliwatts into 600  
ohms.

SPEAKER ISOLATION AMPLIFIER

Inputs: 7 switchable inputs; 2 Comms, 2  
Navs, ADF, DME and aux for HF  
or telephone. 3 unswitched  
inputs; possible inputs, radar  
altimeter DH and telephone  
rings.

SPEAKER ISOLATION AMPLIFIER

Input Selector: Each switched audio  
input uses one switch  
to select one of the

1.3.4 ELECTRICAL SPECIFICATIONS (Continued)

following options:  
speaker, off or  
phones.

Mic Selector: Selects either comm 1,  
comm 2, Aux (HF or telephone) and  
EXT or IC/X. EXT or IC/X position  
can be used for intercom or ramp  
hailer.

Input Impedance: 510 ohms

Input Isolation: 40dB between inputs

Input Muting: 60dB when the mic is keyed

Speaker Output: 13.75VDC-10 watts typical  
into 3.2 ohm load.  
27.50VDC-12 watts typical  
into 3.2 ohm load.

Frequency Response: 300Hz-3 KHz

Total Harmonic Distortion: 10% at rated  
output.

HEADPHONE AMPLIFIER

Input: Same as speaker amp

Input Source: 500 ohms recommended  
impedance

Input Isolation: Not specified depends  
on output impedance  
and number of other  
inputs selected

Phone Output: Depends on level of input  
and number of other inputs  
selected.

1.4 EQUIPMENT SUPPLIED

- 1 ea Audio Panel/Marker Beacon Receiver, TMA 230D  
Terra Part Number 0900-0402-00
- 1 ea Mounting Tray (Sleeve), Terra Part Number  
1900-0344-03
- 1 ea Install Kit, Terra Part Number 1901-5305-00
- 1 ea TMA 230D Operator/Install Manual Terra Part  
Number 1910-0005-01
- 1 ea Warranty Card

1.5 ADDITIONAL EQUIPMENT REQUIRED

Sufficient RG58 A/U 50 ohm coaxial cable to reach, after proper routing, from the receiver to the marker beacon antenna.

Various lengths and gauges of MIL 22759 or equivalent MILSPEC wire to harness the unit according to drawing 9-1130-0032-02 and aircraft interfacing requirements.

BNC coaxial fittings as required for the particular installation.

Microphone and headphone jacks as required.

Circuit breaker rated at 3.0 amps.

Speakers as required.

Marker Beacon Antenna. Suggested antennas are listed below:

Aviation Development - AD-8  
Dorne & Margolin - DM 43-1; 43-3  
Comant - C1-102; C1-118

1.6 LICENSE REQUIREMENTS

Not applicable

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## SECTION II

### 2. INSTALLATION

#### 2.1 GENERAL

This section contains all necessary installation instructions and checkout procedures for the Terra TMA 230D Audio Panel/Marker Beacon Receiver.

#### 2.2 PREPARATION FOR USE

Every precaution has been taken to protect your TMA 230D during shipment. Upon receipt of the equipment, perform the following inspections:

1. Remove the unit from the shipping container and visually inspect for damage.
2. Check controls and switches to determine if they may have been damaged.
3. Make sure that all hardware and connectors listed in Section I, under "Equipment Supplied", are present.

If the unit is damaged, a claim must be filed with the carrier. The carrier assumes title of the unit when it accepts it for shipment. Do not return it to Terra or its representatives.

It is suggested that the package be retained for inspection by the carrier in the case of damage or for future use should it be necessary to ship the unit for service or to transfer it to another location.

#### 2.3 INSTALLATION

The following items and suggestions should be considered prior to installation of your Terra TMA 230D Audio Panel/Marker Beacon Receiver.

1. Discuss the location of this TMA 230D with your customer, preferably in a position that provides ease of operation.
2. Avoid installing the TMA 230D near heat sources. If unavoidable, insure additional cooling is provided.
3. Insure that adequate clearance exists behind the panel for sleeve, connectors, and additional cooling if required. A minimum of 7.75 inches (19.69 cm) is recommended.

## 2.3 INSTALLATION (Continued)

4. Refer to Terra TMA 230D Outline Drawing (Figure 3-1) for panel cut-out details and mounting dimensions as well as pertinent notes.
5. Install the sleeve assembly in the instrument panel. Insure compliance with standards set forth in the FAA Aircraft Inspection and Repair Document AC 43.13-2A.
6. The 44 pin connector assembly supplied with the Terra TMA 230D must be wired correctly to connect to the aircraft avionics systems or severe damage may result to the Terra TMA 230D or other systems. The interconnecting wiring for the 44 pin connector is shown in Figure 3-2 (9-1130-0032-02). Comply with standards set forth in FAA Aircraft Inspection and Repair Document AC 43.13-1A Section 7 and other pertinent FAR's as required. Insure MIL-SPEC wire is utilized for all interconnects.
7. Slide the TMA 230D into the sleeve after making power and ground checks and secure with a 3/32 allen (hex) wrench accessible through the the front panel to the right of the word "Phone". Rotate clockwise, while applying gentle pressure to the front panel, until the radio engages the rear connector at the rear of the tray. Use caution to prevent stripping the threads. When properly installed, the front panel of the unit will be very close to the instrument panel. To remove the Terra TMA 230D, simply insert a 3/32 Allen (hex) wrench in the locking screw and turn counter-clock wise until the unit is no longer secured in the sleeve. The TMA 230D may now be removed from the sleeve by hand.

## 2.4 ANTENNA INSTALLATION AND CONNECTIONS

A dedicated Marker Beacon Antenna is recommended. See Section 1.5 for recommended manufactures and models. Insure maximum speed matches maximum speed of aircraft.

Connect the antenna to the Terra TMA 230D using standard 50 ohm coaxial cable such as RG58 A/U. Terminate the cable with a BNC coaxial cable connector. Ohm out coax to insure no shorts are present in coax. Insure proper bonding of antenna for better reception in precipitation static conditions.

## 2.5 OPERATIONAL CHECKOUT

1. Turn on avionics master switch.
2. Hold the Marker Beacon Switch in the test or down position. All three lights should illuminate. Place a finger over the auto dimming photo cell, (lower right hand corner of the panel) and verify the marker beacon lights dim.
3. Verify proper performance of all inputs by setting the comm 1 rocker switch to speaker. All other receiver switches should be set to the middle position or "off". Tune the receiver to an active channel and verify audio in the speaker. Move the switch to the center or "off" position and verify audio muting. Move switch to bottom position and verify audio in the headphones.
4. Rotate microphone switch to "C1" and verify transmit and microphone audio. Place the "comm 1" rocker switch to off and the "auto" rocker switch to "speaker" with the microphone rotary switch on "C1" audio received on comm 1 will be heard over the cabin speaker. Move "auto" switch to "phone" and audio should be heard over the headphone.
5. Repeat steps 3 and 4 for "C2 and "AUX" if required. Then repeat step 3 for all of remaining receivers and verify correct operation of intercom if applicable.
6. Turn up aircraft dimmers and verify uniform brightness of all letters.
7. Secure aircraft power and insure avionics master switch and aircraft battery master switches are in the off position.
8. It is recommended that an operation performance flight test be conducted after the installation is complete to ensure performance of the TMA 230D in a normal environment.

## 2.6 FINAL INSPECTION

1. Insure that all wiring is properly routed and secure. Dress harnessing neatly and secure in place with cable ties. Check connector integrity and locking devices. Insure locking devices are functioning properly and are secured. Verify cabling is not "clotheslined" and provisions have been made for service loops. Pull yoke to its maximum travel.

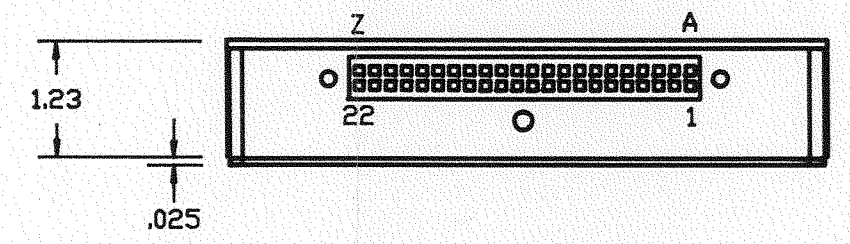
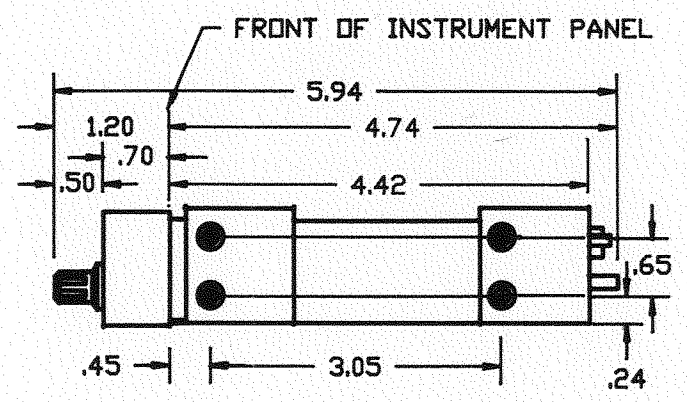
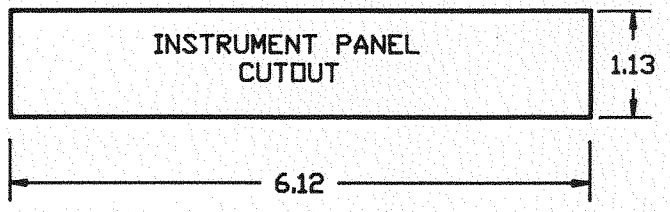
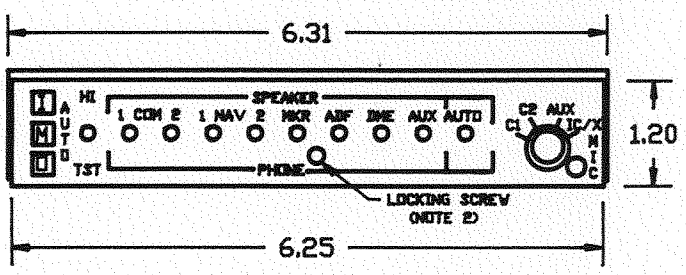
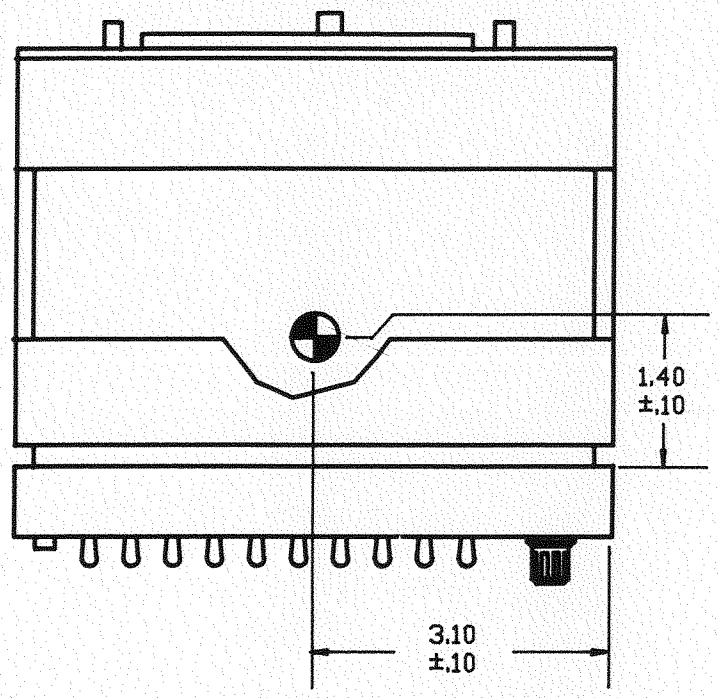
## 2.6 FINAL INSPECTION (Continued)

While slowly returning yoke to its normal position, rotate yoke left and right to insure all cabling is routed and tied up properly. Cycle rudder pedals and verify that they are free and cables are unobstructed. Install gust locks, perform complete checkout of all avionics including dimmers. Secure aircraft power and all master switches.

2. Have installation inspected by someone authorized under Federal Aviation Regulation Part 65.
3. Add the Terra TMA 230D to the aircraft equipment list, including serial number. Complete FAA Form 337 if required, and make required airframe logbook entries. A weight and balance change may be required, depending on the type of aircraft.
4. Complete FCC License Applications as required and file them.
5. Complete warranty card and return to Terra.



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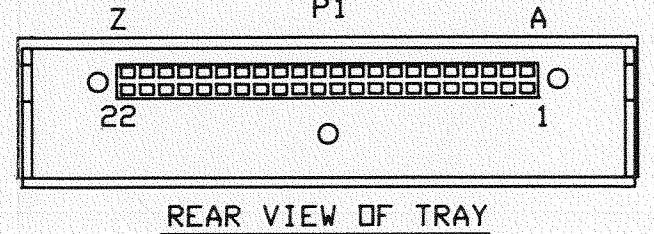
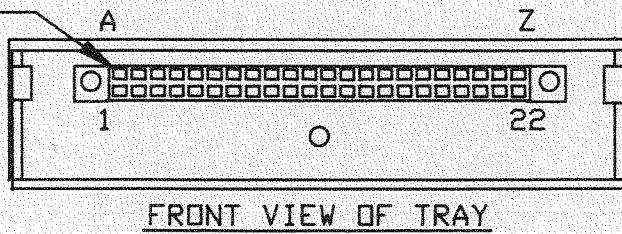
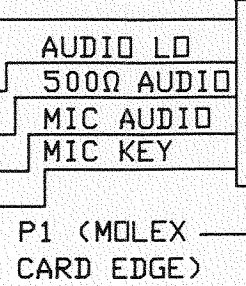
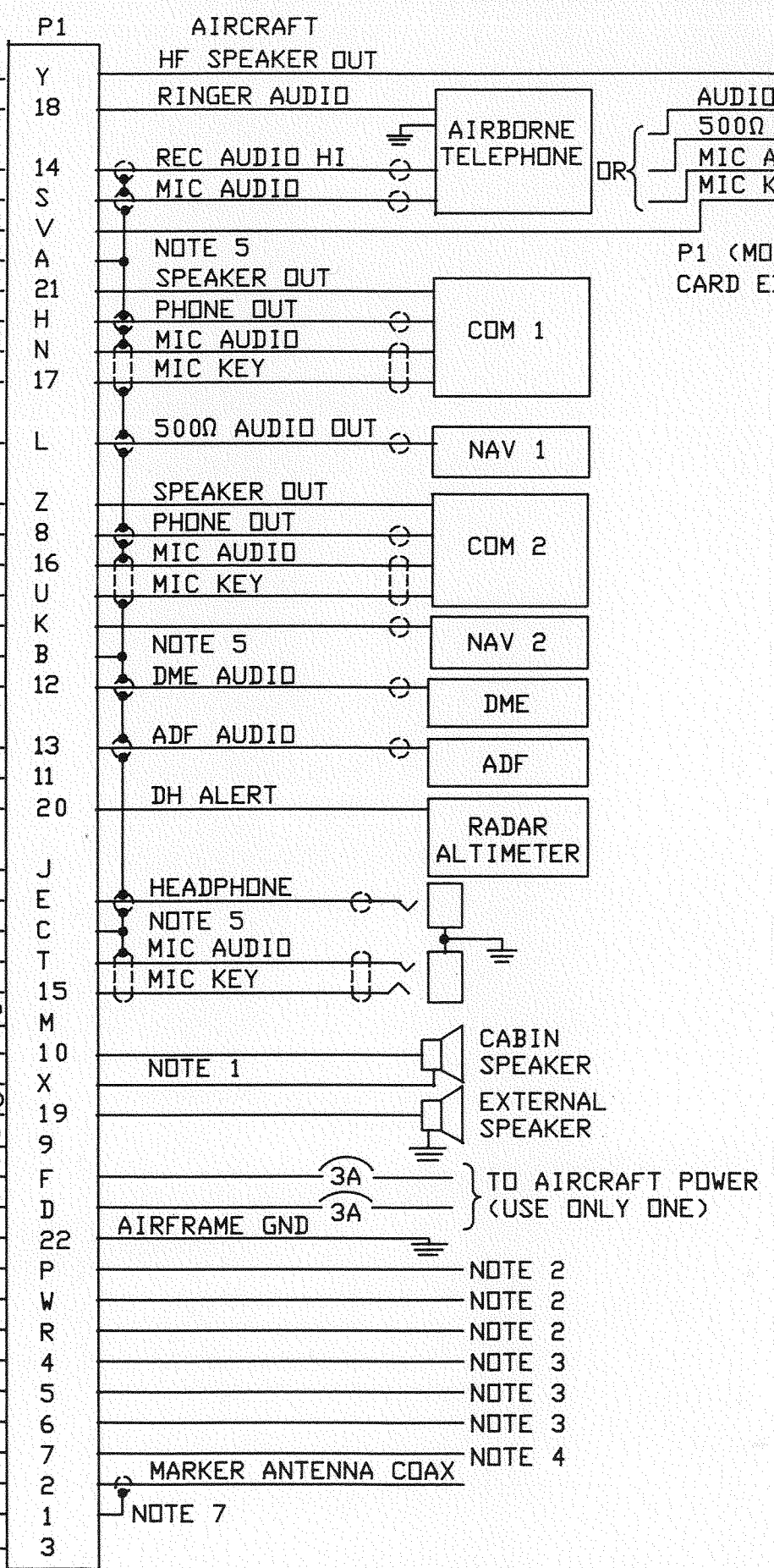
NOTE:

1. WEIGHT WITH TRAY: 1.3 LBS.
2. LOCKING SCREW REQUIRES A 3/32 HEX KEY.

SCALE: NTS	UNLESS SPECIFIED: DIMENSIONS ARE IN INCHES. TOLERANCES: .XX ± .015 .XXX ± .005 ANGLES ± 1/2°	<b>TERRA</b> CORP. ALBQ. N.M. U.S.A. TITLE: OUTLINE DIMENSION DRAWING, TMA 230 D		
MAT'L:				
FINISH:	DR. BY: JRG	DATE: 06-27-90	DWG. NO. 9-1120-0023-02	REV A
	CHK'D: <i>WHD</i>			
	APPR.: <i>JF</i>	USED ON:	SHEET 1 OF 1	

TMA 230 / TMA 230 D

AUX SPEAKER LOAD
UNSWITCHED 500Ω IN
AUX 500Ω IN
HF/TEL MIC AUDIO OUT
HF/TEL MIC KEY OUT
AUDIO GND
COM 1 SPEAKER LOAD
COM 1 500Ω IN
COM 1 MIC AUDIO OUT
COM 1 MIC KEY OUT
NAV 1 500Ω IN
COM 2 SPEAKER LOAD
COM 2 500Ω IN
COM 2 MIC AUDIO OUT
COM 2 MIC KEY OUT
NAV 2 500Ω IN
AUDIO GND
DME 500Ω IN
ADF 500Ω IN
UNSWITCHED 500Ω IN
UNSWITCHED 500Ω IN
SPARE
HEADPHONE OUT
AUDIO GND
MIC AUDIO IN
MIC KEY IN
EXTERNAL SPKR OUT(LD)
CABIN SPKR OUT (LD)
CABIN SPKR OUT (HI)
EXTERNAL SPKR OUT(HI)
EXTERNAL SPKR OUT(HI)
13.75 VDC IN
27.5 VDC IN
PWR GND
INSTRUMENT LIGHT
INSTRUMENT LIGHT
INSTRUMENT LIGHT
WHITE LAMP OUT
BLUE LAMP OUT
AMBER LAMP OUT
OUTER MKR SENSE
MKR ANT HI
MKR ANT LOW
CHASSIS GND



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- NOTES:
- FOR NEW SPEAKER INSTALLATIONS, CONNECT THE SPEAKER PINS X AND 10, FOR 10 WATTS AUDIO AMP. FOR EXISTING SPEAKER INSTALLATIONS WITH SPEAKER LOW GROUNDED TO AIRFRAME, CONNECT PIN X TO HIGH SIDE OF SPEAKER FOR 5 WATTS AUDIO AMP. CAUTION: DO NOT GROUND PIN 10.
  - FOR 28 VOLTS DIMMER BUSS CONNECT PIN P TO 28V BUSS AND R TO GRD. FOR 14VOLTS DIMMER BUSS CONNECT PIN W TO 14V BUSS AND PINS P AND R TO GRD.
  - MAXIMUM EXTERNAL LAMP LOAD 14V @ 150 MA EACH.
  - OUTER MARKER SENSE IS AN OUTPUT FROM THE TMA230 FOR CONNECTION TO AUTOPILOTS UTILIZING OUTER MARKER SENSE. (ACTIVE HI)
  - ALL SHIELDS SHOULD BE GROUNDED ON ONE END ONLY. THE END THAT IS GROUNDED SHOULD BE LOAD END AS SHOWN.
  - WIRE SIZE AND TYPE: POWER INPUT & POWER GRD 20AWG ALL OTHER 24 AWG. USE TEFLON WIRE, MIL-22759 OR EQUIVALENT.
  - MARKER ANTENNA COAX, USE RG-58 A/U OR EQUIVALENT. MARKER ANT SHIELD CONNECTION MUST BE LESS THAN 1/2 INCH LONG.
  - FOR INTERCOM USE-PARALLEL TWO MICS AND HEADPHONES TO INPUTS AND TMA 230 / TMA 230 D USE MIC SELECTOR POSITION 'EXT' OR 'IC/X'.

UNLESS SPECIFIED: DIMENSIONS ARE IN INCHES. TOLERANCES: .XX ± .015 .XXX ± .005 ANGLES ± 1/2	<b>TERRA CORP.</b> ALBQ. N.M. U.S.A. 		
	TITLE: TMA 230 / TMA 230-D AUDIO PANEL, INTERCONNECT DIAGRAM		
DR. BY: JRG	DATE: 06-05-90	DWG. NO. 9-1130-0032-02	REV A
CHK'D: <i>MW</i>	USED ON:	SHEET 1 OF 1	
APPR.: <i>JF</i>			

## SECTION IV

### 4. OPERATION

#### 4.1 SCOPE

This section is to instruct the owner/operator in the proper "care and feeding" of their new Terra TMA 230D Audio Panel/Marker Beacon Receiver.

#### 4.2 OPERATION

##### **CAUTION**

Insure your new TMA 230D is turned off until after engine start-up procedures are completed. This precaution will greatly increase the life-time of all of your avionics as well as your TMA 230D.

##### 4.2.1 MARKER BEACON RECEIVER

The TMA 230D includes a complete marker beacon receiver. This will give you a visual and audio signal when you pass over a marker beacon. The three lights and the audio tone will identify the beacon type you are passing over.

The outer marker signal is modulated at 400Hz and is keyed at the rate of two dashes per second. This means when passing over the outer marker, the blue light, labeled "O" will flash two times per second and the marker audio, if selected, will be a set of low tone dashes.

The middle marker signal is modulated at 1300Hz and is keyed with alternating dots and dashes. When passing over a middle marker the amber light, labeled "M" will flash simultaneously with a medium pitch tone of alternating dots and dashes.

The inner marker signal is modulated at 3000Hz and is keyed with dots, six times per second. When passing over this marker the white light, labeled "I", will flash simultaneously with a series of high pitched tones six times per second.

#### 4.2.1 MARKER BEACON RECEIVER (Continued)

The marker beacon switch is normally in one of two positions. The first position is up or "HI", this position provides continuous high sensitivity in the receiver. The middle position or "AUTO" provides a high receiver sensitivity until a strong signal is encountered and goes to a low level of sensitivity to indicate a more accurate indication of marker location, the marker beacon audio will also be muted automatically with the low sensitivity. The three marker beacon lights can be tested by pushing the marker beacon switch to the down or "TST" position. This simply applies a voltage to the lamps to indicate correct function.

SECTION VI

6. INSTALLATION BULLETINS/NOTES

6.1 INSTALLATION BULLETINS

N/C

6.2 INSTALLATION NOTES

See Terra Drawing 9-1130-0032-02 (included) for all installation notes.

