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**TRS Challenger Model 730 Service Manual**

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40 - CHANNEL C. B. TRANSCIVER

TRS CHALLENGER

MODEL 730

SERVICE AND MAINTENANCE MANUAL

TRS MARKETING INC.

A Subsidiary of C.C.E. Corporation

137 E. Savarona Way, Carson, California 90746

213/323-4201

MDK-2000 MEISEI ELECTRIC CO., LTD.

## T A B L E O F C O N T E N T S

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## GENERAL INFORMATION

### WARNING

- A. All adjustments, except for external knobs and controls, must be made by or under the immediate supervision of a person holding a commercial first or second-class radio operator license.
- B. Replacement or substitution of crystals, transistors, and other components are regulated under the Federal Communications Commission (FCC) Rules and Regulations Part 95 and Part 2. All changes or modifications must be made by or under the immediate supervision of a person holding a first or second-class radio operators license. Proper and qualified servicing is necessary to assure continued compliance with FCC Rules and Regulations.
- C. The Federal Communications Commission (FCC) requires a valid CLASS D license or a complete TEMPORARY PERMIT (Form 555-B) to operate the transmitter portion of this unit.

The address of the FCC is:

FEDERAL COMMUNICATIONS COMMISSION,  
WASHINGTON, D.C. 20554

### GENERAL INFORMATION

#### LICENSING:

Before filing formal application for a station license, you must read the sections covering Class D Citizens radio stations in Part 95 of the FCC Rules and Regulations. Complete TEMPORARY PERMIT, FCC Form 555-B and APPLICATION FOR CLASS C OR D STATION LICENSE IN THE CITIZENS RADIO SERVICE, FCC Form 505. Forward form 505 to the Federal Communications Commissions,

Gettysburg PA. 17326.

Should you require advice and/or assistance, your dealer will be glad to help you. Remember, DO NOT operate your transmitter until FCC Form 555-B has been completed and your permanent license applied for.

#### SERVICING:

It is the user's responsibility to see that this unit is operating at all times, in accordance with the FCC Citizens Radio Service Regulations.

If you install your own transceiver, DO NOT attempt to make any transmitter tuning adjustment. Adjustments are prohibited by the FCC unless you hold or are in the presence and under the supervision of a first or second class radio telephone licensed person. A citizens Band or Amateur License is NOT sufficient.

Replacements of crystals, transistors or other components, must be those supplied by the manufacturer.

#### DESCRIPTION:

This unit is a fully solid state 40-Channel Citizens Band Transceiver, ideally suited for mobile operation from a nominal 12 volt positive or negative ground D.C. power source. A 12 volt D.C. cord and a mounting bracket are included. This transceiver utilizes the latest development in analog, digital and solid state technology to generate all 40 Citizens Band transmit and receive frequencies.

The functions of channel change, volume, squelch, and channel 9 selection switch are contained in the microphone head. Additionally, the selected channel number is displayed on the light emitting diodes (L.E.D.) digital

read out in it.

A single highly quartz crystal oscillator supplies accurate reference signals to a large scale integrated circuit (L.S.I.). This L.S.I. is the heart and brain of the phase lock loop (P.L.L.) digital frequency synthesizer. By utilizing programmable dividers and read only memories (R.O.M.S.).

The L.S.I. controls a voltage controlled oscillator (V.C.O.), the frequency of which is continuously compared with that of the quartz crystal oscillators, by the frequency and phase comparator section of the L.S.I.; hence, the final V.C.O. frequency is made to track the quartz crystal oscillators and is as stable as the quartz crystal reference frequency.

The receiver section is a sensitive superheterodyne circuit featuring dual conversion, low noise R.F. stage switchable automatic noise limiting, delta tuning, signal strength meter, mechanical filter, external speaker jack and instantaneous selection of any of the 40 digitally synthesized channel frequencies. The transmitter section is designed around highly reliable silicon transistors. Any of the 40 digital synthesized frequencies are instantaneously selectable. The transmitter output stage is conservatively rated high gain R.F. power transistor.

## SPECIFICATIONS

### General

#### Phase Locked Loop Digital Synthesizer

Channels	40 channels
Frequency Range	26.965 MHz to 27.405 MHz
Supply Voltage	12.4 - 15.2V DC, Positive or negative ground
Operating Temperature Range	-30°C to +50°C
Humidity	Less than 95%
Microphone	Detachable Dynamic Microphone
Dimensions	2-3/8(H)x7-1/2(W)x9-3/8(D)
Weight	7-1/5 pounds

#### Controls, Indicators and Connectors

##### MICROPHONE CONTROLS

Channel Selector UP/DOWN SWITCHES

Volume Control

Squelch Control

Emergency Call Switch

Illuminated LED Digital Channel Indicator

PA Volume Control, OFF/ON Switch

RF Gain Control

NB Switch

ANL Switch

PA/CB Switch

Delta Tune Control

Status Lamps 3 LED (RX, MOD, PA)

Illuminated "ON-THE-AIR" Light

Illuminated S/RF Power Meter

External Speaker Jack

PA Speaker Jack

Detachable Dynamic Microphone

## TRANSMITTER

Output Power	4 watts (maximum) (at input voltage 13.8V DC)
Type of Emmission	6A3
Modulation Capability	100%
Supirous Harmonic Suppression	Better than -60dB
Output Impedance	50 ohms
Frequency Stability	$\pm 0.003\%$ at 30 °C to 50 °C
Modulator Response	300Hz-2500Hz $\pm 3-10$ dB
Modulator Distortion	Less than 5% at 80% mod. at 1KHz

## Receiver

Sensitivity	Less than 0.7 uV for 10dB (S+N) at 1KHz 30% modulation
Selectivity	$\pm 4$ KHz at 6dB Down
Adjacent Channel Rejection	-60B average
Squelch Sensitivity	0.1uV to 1,000uV
IF Frequency	10.695MHz 455KHz
Automatic Gain Control	Less than 10dB change in audio output for signal input from 15dBu to 70dBu
Noise Blanker	Built-in ON-OFF
Noise Limiter (ANL)	Series diode Type
Delta Tune	$\pm 1$ KHz (Receiver only)
RF Gain Control	Variable 30dB
Audio Output Power	3.5 watts minimum at 8 ohms
Frequency Response	300Hz to 3,000Hz $\pm 6$ dB
Built-in speaker	8 ohms, 3.5" Round
External Speaker	8 ohms, Built-in Speaker to be automatically disconnected when external speaker plugged in.
Audio Distortion	Less than 7% at 3 watts at 1KHz

## Miscellaneous

PA System	3.5 watts into an external 8-ohm speaker. The front panel mike gain control allows the operator to control the PA speaker volume when the CB/PA switch is in the PA position.
Power Consumption	13.8V DC Receive (squellch) 0.3 amps. Receive (3.5 watts audio) 0.6 amps. Transmit (90% modulation) 1.8 amps.

## FUNCTION OF CONTROLS AND INDICATORS

### Control Functions - Microphone

#### Channel Selector

The buttons marked UP and DOWN located on the top of the microphone select the desired channel. In order to select the desired channel for operation, simply depress the UP or DOWN button once. This will automatically change channels on the TRS CHALLENGER 730 moving either UP OR DOWN one channel. To advance by more than one channel, simply hold the UP or DOWN button in, which causes the channel to automatically advance up or down until the button is released.

#### Channel Indicator

The channel indicator is LED display which indicates the channels selected for transmission and reception. All channels, except channels 9 and 11, may be used between units operating under the same or different license. Channel 9 has been reserved by the FCC for emergency communications or immediate protection of property. Channel 9 may also be used to render assistance to a motorist; it is commonly called the HELP channel. Channel 11 has been reserved as the calling channel and may be used to make initial contact before moving to a clear channel.

#### Press-to-Talk Microphone

The receiver and transmitter are controlled by the press-to-talk switch on the microphone. Press the switch and the transmitter is activated; release the switch to receive. When transmitting, hold the microphone two inches from the mouth and speak clearly in a normal voice.

#### Volume Control

Rotate counterclockwise to set the desired listening level.

## Squelch Control

Blanks out unwanted noise when no signals are present. Turn the control fully clockwise and then slowly counterclockwise until receiver noise disappears. Any signal to be received must now be slightly stronger than the average received noise. Further counterclockwise rotation will increase the squelch threshold which a signal must overcome in order to be heard. Only strong signals will be heard at the maximum clockwise setting.

## Emergency Call Switch ON-OFF

Slide switch located on the reverse side of hand held microphone can set CB Device on channel-9 automatically. Slide the switch to "ON" position, with an emergency, and the device is ready to transmit on CH-9 with pressing Press-to-Talk switch.

## Control Functions - Panel

### Off-On/PA Gain

Turn clockwise to apply power to the unit. When the CB/PA switch is in the PA position, the PA gain will control the volume level to the PA speaker.

## RF GAIN CONTROL

The RF gain control is used to reduce the sensitivity of the receiver. By turning this control counterclockwise weak signals can be eliminated and very strong signals which overload the RF amplifier and cause audio distortion can be reduced.

## DELTA FREQUENCY CONTROL:

Allows the receiver to be tuned above and below the center channel frequency so reception of stations operating slightly off frequency may be optimized.

## ANL SWITCH

The ANL switch is used to turn the ANL circuits ON and OFF. Normally, when driving, or, if stopped in traffic, it would be advisable to have the ANL switch ON because of the strong ignition noises present. If, however, you are stopped on a quiet road, turning the ANL switch OFF may improve very weak reception.

## PA-CB SWITCH:

This switch is used for selecting normal CB communications or public address paging. In the PA position, it disengages the transceiver and the internal loud speaker unit (8ohms, not supplied) for paging. During PA operation, the PA lamp is illuminated.

## NB SWITCH:

The NB switch is used to turn the noise blanker circuits ON and OFF. The noise blanker is designed to reduce IMPULSE-TYPE noises, such as those created by an automobile ignition system. To ensure reception of very weak signals it is recommended that the NB switch only be turned on when noise becomes excessive.

## FUNCTION OF TRANSCEIVER STATUS LAMPS

RED: Indicates that the transceiver is in the PUBLIC ADDRESS mode.

YELLOW: Indicates that the transmitter is being modulated.

When the transceiver is in the transmit mode, the brightness of this lamp will fluctuate as you speak into the microphone.

GREEN: Indicates that the transceiver is in the receive mode.

ON-THE-AIR: Indicates that the transceiver is in the transmit mode.

WARNING: DO NOT PRESS TALK SWITCH  
BEFORE CONNECTING ANTENNA

## FUNCTION OF METER:

This meter has three functions as follows:-

1. SIGNAL STRENGTH METER: The metering circuit is calibrated so that 100 microvolts will read S9.
2. RELATIVE POWER OUTPUT METER: A reading of 4-10 under normal conditions is to be expected.
3. STANDING WAVE RATIO METER: In the transmit mode, the power output meter indicates S.W.R., as well as relative R.F. power.

To check S.W.R., press the Press-to-Talk switch and cover the microphone with your hand.

A meter reading of "7" on the upper scale indicates maximum antenna efficiency and an S.W.R. of 1.0.

If the meter indicates below 4 or over 10, the antenna, cables, and antenna connectors should be checked or replaced.

## INSTALLATION

### TRANSCEIVER LOCATION

Before installing the TRS CHALLENGER 730 in the car, truck, boat, etc., make certain to use a location which permits the driver to operate the controls of the unit without interfering with his driving functions. The transceiver can be mounted to the innerside of the instrument panel, on the floor, or above the driver's head if in a truck cab. Using the bracket as a pattern, locate the positions of the screws and drill holes. After mounting the bracket, secure the transceiver to the bracket by means of the knurled screws.

## ANTENNAS

One of the important keys to achieving an optimum communications system performance is the installation of a good antenna system. Only a properly matched antenna system will allow maximum power transfer from the 50 ohms transmission line to the radiating element.

### Power Supply

Almost all cars and most trucks currently operating in the U.S. are negative ground. There are some large trucks and construction equipments which do operate on positive ground. Your TRS CHALLENGER 730 will operate on 12 volts positive or negative ground system. Connect the red wire to the positive (+) battery terminal, black wire to the (-) battery terminal. If the transceiver's power lead must be lengthened, use #14 (or large) wire.

### Mobile ANTENNA

The antenna type best suited for mobile applications is either a base/center loaded or full length quarter wave vertical whip. This type of antenna is non-directional thus assuring minimum signal variation as the vehicle changes direction.

### Base Station

For base station operation, The TRS CHALLENGER 730 can also be used as a base station by addition of the optional power supply. The power supply provides a regulated 13.8 volts DC output with an input voltage of 110 - 120 volts AC, 50-60 Hz.

### Base Station Antenna

The TRS CHALLENGER MODEL 730 may be used with any type of 50 ohms base station antenna. A ground plane vertical antenna will provide the most uniform horizontal coverage. This type of antenna is best suited for communication with a mobile unit. For point-to-point operation where both stations are fixed, a directional beam will usually increase communications range since this type of antenna concentrates transmitted energy in one direction. The beam antenna also allows the receiver to "listen" in only one direction thus reducing interfering signals.

#### Public Address

An external 8 ohms, 4 watts speaker may be connected to the PA Jack located on the rear panel when the TRS CHALLENGER 730 is used as public address system. When the PA system is used, the front panel volume control allows variation of the PA speaker output volume.

The PA speaker should be directed away from the microphone to prevent acoustical feedback.

#### Remote Speaker

The external speaker jack on the rear panel is used for remote receiver monitoring. The external speaker may be 8 ohms impedance and should be rated at 3 watts power dissipation. When the external speaker is plugged in, the internal speaker is disconnected.

#### MICROPHONE CONNECTION

Insert Microphone Plug into Microphone Connector on the Front Left Side Panel and finger tighten the outside Ring Nut.

#### PRIMARY POWER CONNECTION

Connect the red lead from the connector assembly supplied with the unit to the Positive battery terminal of your car. Connect the black lead to the negative terminal. Either terminal may be grounded.

## ANTENNA CONNECTION

A CB antenna of 50 ohm impedance, 27 MHz must be used. Push Antenna Cable Plug into Antenna Jack on the Rear Panel and finger tighten the outside Ring Nut.

## OPERATING PROCEDURE-RECEIVE

1. The PA-CB switch should be in the CB position.
2. Turn the power on by turning the ON-OFF volume control clockwise.  
Adjust volume control on the microphone to a comfortable listening level.
3. Press channel buttons to obtain desired channel.
4. While listening to background noise (wait until the channel is clear if signals are present), adjust the SQUELCH CONTROL until the background noise JUST disappears. The receiver will remain quiet until a signal is received that is greater in strength than the background noise.  
Be careful not to advance the SQUELCH CONTROL further than is necessary to quiet the background noise, or weak signals may not be heard.
5. Turning F knob to the left or right changes the receiver frequency and permits very accurate tuning of stations that may be slightly off frequency. The center position of this control is the center of the channel frequency.
6. The RF gain control should be turned fully clockwise during normal operation. Turning this control counterclockwise will reduce the receiver sensitivity, eliminating weak signals, and allowing very strong signals to be received without overload distortion.

## OPERATING PROCEDURE-TRANSMIT

1. Select the desired channel.
2. If the channel is clear, press the press-to-talk switch on the microphone.  
Hold the microphone close to, but to the side of your mouth and speak in a normal voice. The ON-THE-AIR lamp will light and the yellow modulation

lamp will fluctuate as you speak, indicating modulation.

#### P.A. SYSTEM

1. Connect a Public Address Speaker to the PA Speaker Jack on the Rear Panel.
2. Turn the PA-CB SWITCH to PA position.
3. Adjust volume as required with Volume Control.
4. Press the Press-to-Talk button on the microphone.

#### CIRCUIT DESCRIPTION

This system is a 40 channel or double conversion P.L.L. (Phase Locked Loop) controlled CB Transceiver.

The basic block diagram for the determining frequency and stabilizing system is as shown in the P.L.L. UNIT. The constitutional section to 1st local, 2nd local and TX frequency of the transceiver used P.L.L. system.

The P.L.L. UNIT is controlled by CHANNEL SCANNING SYSTEM of 27 MHz 40 channel CITIZEN'S Band Transceiver. (REF: LC7180, LC7191 DATA SHEET)

#### PLL-UNIT

A digital-phase-locked (PLL) synthesizer is employed to determine and stabilize output frequencies using a CMOS/LSI device in combination with VCO (voltage controlled oscillator).

To understand the operation of the PLL synthesizer, refer to block diagrams and schmatic diagram.

Its reference crystal-controlled frequency is 10.24 MHz and is oscillated by C-Mos Amp in the IC1. Such frequency is divided into 2048 by Fix Divider to make 5 KHz and becomes signal of phase comparator.

The V.C.O. signal, again mixed at Q3 to make 0.91 1.35 MHz (at

receiving mode), 1.365 1.805 MHz (at transmission mode) signals, joins into IC1 inner programmable Divider input.

Through the code convertor, programmable divider is connected to channel selector.

Channel selector specifies comparable divided-frequencies ranging from 182 270 (at receiving mode), 273 361 (at transmission mode) Divided Frequencies (CH1 CH40) to programmable divider.

As a result, divider output obtains 5 KHz signal.

The PLL phase comparator, compares both phase of reference 5 KHz programmable divider.

The phase error voltage is integrated and then is applied into V.C.O.

It then tracks onto frequency selected by the channel selector in order to obtain stabilizing frequency.

The above mentioned frequencies ranging from 16.27-16.7 MHz is used as the first local oscillation signal of receiver, 10.24 MHz signal functions as the second local oscillation signal, 26.965-27.405 MHz is used as the transmission signal.

(REF : Schematic diagram and Block diagram)

#### Limiting Modulation :

The audio input signal of the microphone is amplified by transistor Q203, Q204, and AN 7150 drives the modulation transformer T202. This modulation signal is detector by diodes D201 and D202. These Diodes produce D.C. Voltage proportional to the modulation level. This D.C. Voltage is added to the gate voltage of audio limiter circuit FET Q201 and Q202 (variable attenuator), and hence controlled the audio signals from a microphone. The controlled audio signals are amplified and fed to RF Amplifier Q222 and Q223. As the result, the modulation is not exceeded 100% by adjusting volume VR-1.

Spurious Radiation :

Spurious radiation of transmitter are suppressed by next circuits

Low Pass Filter : L205, L206, L207, L208, C117, C118, C119, C120, C121,  
C122, CV101

VOLTAGE AND CURRENT ON FINAL AMP

TYPE Number : 2SC1306 or 2SC1975 or 2SC2029

REF : Manufactuer's Specification Sheet)

Manufactured by Nippon Electric Company or Matsushita Electronics Corp.  
or Fu itsu Limited.

DESCRIPTION Q223 FINAL RF AMP.

NPN Epitaxial Plener Silicon Transistor for high frequency Power amplifiers.

560mA

	C116	L205	L206	L207	L208	
Q223						
L203		C117	C119	C121	C122	50 OHM LOAD
L204						
		C118	CV101	C120		
		C115				
L202	R112					
	0.8V					
R118						
R111	C126					
	<u>A</u>	0.022	<u>V</u>	0.022	12.6V	
			D217			
			13.8V DC			

- NOTE: 1. All voltages and current shown are D.C. Values.  
 2. Transmitter section was operated without modulation.  
 3. Test Set-up shown is typical for each reading.
- A Ammeter : Yokokawa Electro Works No. 14  
 V Voltmeter: " " " "

ELECTRICAL FUNCTION OF SOLID STATE DEVICES (MDK-2,000)

1. DIODES

- D1 : P.L.L. Control  
 D2 : " "  
 D3 : Voltage Regulator  
 D4 : P.L.L. Control
- D201 : Modulation Limiter  
 D202 : " "  
 D203 : " "  
 D204 : Receiver Detector  
 D205 : A.N.L.  
 D206 : Voltage Regulator  
 D207 : Receiver Detector  
 D208 : Squelch  
 D209 : "  
 D210 : Voltage Regulator  
 D211 : Noise Blanker  
 D212 : " "  
 D213 : Protector  
 D214 : "

D215 : TX Indicator  
D216 : Protector  
D217 : "  
D218 : "

(PLL Unit)

D1 : Voltage Regulator  
D2 : Voltage Controlled Oscillator  
D3 : P.L.L. Control  
D4 : " "  
D5 : Clarifier

(MIC)

D1 : Channel Indicator

2. TRANSISTORS

Q1 : P.L.L. Control  
Q2 : Voltage Regulator  
  
Q201 : Modulation Limiter  
Q202 : " "  
Q203 : MIC Amp.  
Q204 : "  
Q205 : Receiver AF Amp.  
Q206 : " RF Amp.  
Q207 : Receiver 1st Mixer  
Q208 : " 2nd "  
Q209 : Receiver IF Amp.  
Q210 : " " "  
Q211 : " " "  
Q212 : 1st Local Amp.

Q213 : 2nd Local Amp.  
Q214 : SQ Amp.  
Q215 : LED Driver  
Q216 : Noise Blanker  
Q217 : " "  
Q218 : " "  
Q219 ; " "  
Q220 : " "  
Q221 : TX Butter Amp.  
Q222 : " " "  
Q223 : TX Final

(PLL Unit)

Q1 : 2nd Local Butter  
Q2 : Butter Amp.  
Q3 : Mixer  
Q4 : Voltage Regulator  
Q5 : Unlock Circuit  
Q6 : TX/RX Control

3. IC

ICI (LC7180) : PLL Control  
IC201 (AN7150): AF Amp. and MOD Amp.

(PLL Unit)

IC1 (TC9103P) : P.L.L.  
IC2 (TA7310P) : Double Balance Mixer

(MIC)

ICI (LC7191) : P.L.L. Control

LIST OF EQUIVALENT TRANSISTOR

A. FINAL AMP	2SC1306	Nippon Electric Electric Company (NEC)
	2SC1975	Matsushita Electronics Corp.
	2SC2029	Fujitsu Limited
B. RF Driver	2SC1449	(NEC)
	2SC1973	Matsushita
	2SC2028	Fujitsu
C. MOD AMP	AN7150	Matsushita
	AN7151	Matsushita
D. RX RF, MIX	2SK61-Y	Toshiba
	2SK33	Mitsubishi
	3SK49	Matsushita
E. RX IF, MIX	2SC945	(NEC)
	2SC828	Matsushita
	2SC372	Toshiba
F. ALC	2SK-30	Toshiba
	2SK-33	Mitsubishi
G. AVR	2SC1096	(NEC)
	2SC789	Toshiba
	2SC1226	Matsushita
	2SC509	Toshiba
	2SC1383	Matsushita

## Attachment D: Tune-up Procedure

### ABBREVIATIONS :

1. RF VTVM . . . Radio Frequency Vacum Tube Volt Meter
2. ATT . . . . .Attenuator
3. PA . . . . .Public Address
4. RF . . . . .Radio Frequency
5. AF . . . . .Audio Frequency
6. SSG . . . . . Standard Signal Gen
7. FC . . . . .Frequency Counter
8. DCV . . . . . D.C. Voltmeter

## 1. ALIGNMENT PROCEDURE OF PLL UNIT

### 1.1 Band Pass Filter

- a) Input the signal from Sweep Generator (26,965 - 27,405 MHz) into T.P.3 (IC2 No.4) under transmission.
- b) Connect the oscilloscope to T.P.1 (terminal T out)
- c) Adjust T3, T4, T5 for flat and maximum response of the filter.

### 1.2) V.C.O.

- a) Turn channel switch to CH1 under receiving mode.
- b) Connect the volt meter to lock voltage T.P.2 (between R12 and R15) and adjust T1 at 2V.

### 1.3) Frequency adjust

- a) Turn channel switch CH1 under transmission.
- b) Connect the frequency counter to T.P.1 (terminal T out)
- c) Adjust to 26,965 MHz by TC1.

### 1.4) 10.24 MHz Mixing level

- a) Connect the RF volt meter to T.P.1 (terminal T out)
- b) Adjust T2 for maximum.

## 2. ALIGNMENT PROCEDURE OF RECEIVER SECTION

### 2.1) 2nd Local OSC (10.24 MHz)

Connect RF VTVM output of T213 coil and align to maximum reading on RF VTVM.

### 2.2) RF Gain

Set the channel of "SSG" to CH20 and set "SSG" frequency to 1000 Hz at 30 percent modulation.

### 2.3) Maximum Sensitivity

Set the channel of "SSG" at CH20, set "SSG" frequency at 1000 Hz with 30 percent modulation, and set the "ATT" to +3dB. micro, and set the channel of transceiver to Ch20, set the volume to maximum and the squelch to minimum, and the RF volume turn clockwise. Re-align coils T204 to T213 to obtain maximum sensitivity.

### 2.4) S Meter Calibration

Set the channel of "SSG" to CH20, "SSG" frequency at 1000 Hz with 30 percent modulation, and the "ATT" to 66dB. micro set the channel of transceiver to CH20 and set squelch to minimum and the RF volume turn clockwise.

Align VR3 to indicate 7/10 on S Meter.

### 2.5) Squelch

Set the channel of "SSG" to CH20, "SSG" frequency at 1000 Hz with 30 percent modulation and the "ATT" to 66dB. micro.

Set the channel of transceiver to CH20, volume to maximum and squelch to maximum and the RF volume turn clockwise.

With above condition, adjust VR5 so as audio output just ceases and check AF output when output of "SSG" becomes 67 to 70 dB. micro.

### 2.6) S/N

Set the channel of "SSG" to CH20, "SSG" frequency at 1000 Hz with 30 percent modulation and the "ATT" to +3 dB micro.

Set the channel of transceiver to CH20, and adjust volume control to obtain AF output voltage 2V.

Check that AF output voltage is less than 0.615V when "SSG" modulation is turned off.

### 2.7) Noise Measurement

Check the noise voltage is less than 300MV on all channels, when NB ON and ANL ON. (Align T203)

### 2.8) Noise of PA

Check that no noise is present when the transceiver is operated in the PA mode.

### 2.9) RF Gain T

Check effect of RF gain control and tune.

## 3. ALIGNMENT PROCEDURE OF TRANSMITTER SECTION

### 3.1) RF-Power Amp.

Set the channel of transceiver at CH20, align coils T214, 204 and CV101 for maximum indication on power meter.

Output power must be less than 3.5W and output power difference between each channel (CH1 to CH40) must be less than 0.5W  
(DC Power : 13.8V)

### 3.2) Frequency Deviation

Using frequency counter, check whether frequency deviation is within  $\pm 500$  Hz on all channels.

### 3.3) Harmonics

Align CV101 on channel 20 until spectrum analyzer indicated minimum scale reading and check for other spurious.

### 3.4) Parastic and Self Oscillator

With the limiter circuit disabled, check the wave form at over 80 percent modulation on all channels.

### 3.5) Limiter Circuit

3.5.1) Set audio input to 1KHz at 7MV.

3.5.2) Adjust VR1 for 50 percent modulation

3.5.3) Increase audio input to 0.25V RMS.

3.5.4) Insure that 100 percent modulation is not exceeded.

3.5.5) If more than 100 percent modulation is found in 3.5.4. above,  
re-adjust VR1 to give 95 percent modulation.

### 3.6) RF Meter

Set the channel of transceiver at CH20, and align VR4 to indicate  
7/10 on the RF meter without modulation.

### 3.7) PA Output Measurement.

Set the switch of the transceiver to PA position and adjust  
microphone input voltage to 10MV at 1KHz.

PA output must be more than 3.0V on VTVM.

## 4. MIC UNIT

Check the function of Microphone.

(channel select, VR, SQ and CH9 call.)

# PARTS LIST

TRS  
Marketing  
Inc.

Circuit Symbol	Description	Type	Parts No.
IC. FET. TRANSISTORS & DIODES			
IC201	Integrated Circuit	AN7150	10-001
IC301	"	LC7180	10-002
Q201, 202	FET	2SK30A-Y	10-003
Q206, 207, 216	"	2SK61-Y	10-004
Q219	Transistor	2SA844	10-005
Q203, 204, 205, 209, 210	"	2SC945	10-006
Q211, 214, 215, 217, 218	"	2SC945	10-006
Q301	"	2SC945	10-006
Q302	"	2SC1383	10-007
Q208, 212, 213, 220, 221	"	2SC1675	10-008
Q222	"	2SC2028	10-009
Q223	"	2SC2029	10-010
D201-204, 207-209	Diodes	1S 953	10-011
D213-216, 301, 302	"	1S 953	10-011
D304	"	1S 953	10-011
D211, 212	"	1N60	10-012
D217, 218	"	V06E	10-013
D303	Zener Diode	RD7.5EB	10-014
D210	"	" FB	10-015
D206	"	RD9.1FB	10-016
D205	Varistor	HV-80	10-017
PA-LD (D222)	L.E.D	SEL103R	10-018
MOD-LD (D221)	"	SEL103W	10-019
RX-LD (D220)	"	SEL303E	10-020

# PARTS LIST

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Circuit Symbol	Description	Type	Parts No.
COILS & TRANSFORMERS			
L209	Coil	K6002	11-001
L314	"	LF1-101K	11-002
L301-306, 309, 311-313	"	LF4-100K	11-003
L307	"	LF4-100K	11-003
L201	Choke	K1001	11-004
L202	"	K1003	11-005
L203, 310	"	K1004	11-006
L204	"	K1002	11-007
L205	"	K1009	11-008
L206	"	K1010	11-009
L207	"	K1011	11-010
L208	"	K1007	11-011
L210	Transformer	LFT	11-012
T202	"	K5003 MOD	11-013
T203-205	"	K2023	11-014
T206	"	K2025	11-015
T207	"	K2045	11-016
T208	"	K2027	11-017
T209, 210	"	K2028	11-018
T211	"	K2029	11-019
T212	"	K2030	11-020
T213	"	K2031	11-021
T214	"	K2009	11-022

# PARTS LIST

TRS  
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Inc.

Circuit Symbol	Description	Type	Parts No.
VARIABLE RESISTORS			
VR1	Semifixed Resistor	500 ohm B	12-001
VR6	"	VZ103KTH, 200ohmB	12-002
VR3, 4	"	20K ohm B	12-003
VR2	"	50K ohm B	12-004
VR5	"	100K ohm B	12-005
F (VR)	Variable Resistor	VM10E151-10KB	12-006
PA-GAIN (VR8)	"	VM11A996-5MII-2-10KA	12-007
RF-GAIN (VR7)	"	VM10A509-10KB	12-008
RESISTORS			
R111	Carbon Resistor	RD1/4WPJ 33ohm	13-001
R72, 104, 108	"	" 100 "	13-002
R38	"	" 330 "	13-003
R10, 16, 54, 75	"	" 470 "	13-004
R25, 70, 103, 112	"	" 1K "	13-005
R80	"	" 1.5K "	13-006
R15, 83, 94	"	" 2.2K "	13-007
R14, 59	"	" 4.7K "	13-008
R85	"	" 5.6K "	13-009
R39, 56, 302	"	" 10K "	13-010
R74, 79	"	" 33K "	13-011
R17	"	" 75K "	13-012
R2, 29, 86	"	" 100K "	13-013
R92	"	" 220K "	13-014
R26	"	RD1/4WPRJ4.7ohm	13-015
R47	"	" 22 "	13-016
R41	"	" 33 "	13-017

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# PARTS LIST

TRS  
Marketing  
Inc.

Circuit Symbol	Description	Type	Parts No.
RESISTORS (continued)			
R36,43,58,77,81,110	Carbon Resistor	RD1/4WPRJ100ohm	13-018
R310	"	" 100 "	13-018
R52	"	" 47 "	13-019
R115	"	" 150 "	13-020
R34,107,113,153	"	" 220 "	13-021
R23, 71, 309	"	" 330 "	13-022
R30, 49, 57, 93, 109, 151	"	" 470 "	13-023
R19, 40, 46, 51, 69, 88	"	" 1K "	13-024
R90	"	" 1K "	13-024
R20	"	" 1.2K "	13-025
R44	"	" 1.8K "	13-026
R98, 99, 102	"	" 2.2K "	13-027
R31, 35	"	" 3.3K "	13-028
R22, 48, 53, 61, 101, 308	"	" 4.7K "	13-029
R4	"	" 5.1K "	13-030
R311-316	"	" 5.6K "	13-031
R106	"	" 6.8K "	13-032
R1, 5, 24, 45, 50, 55, 66	"	" 10K "	13-033
R67, 73, 76, 78, 82, 87	"	" 10K "	13-033
R304	"	" 10K "	13-033
R28, 42	"	" 15K "	13-034
R13, 63, 68, 89, 97, 105	"	" 22K "	13-035
R305	"	" 22K "	13-035
R18	"	" 27K "	13-036
R95	"	" 33K "	13-037
R9, 306	"	" 47K "	13-038
R33, 64, 65	"	" 51K "	13-039
R91	"	" 68K "	13-040
R100	"	" 75K "	13-041
R6, 32, 62, 96, 303	"	" 100K "	13-042
R3, 7, 8, 12, 301	"	" 220K "	13-043

# PARTS LIST

TRS  
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Circuit Symbol	Description	Type	Parts No.
RESISTORS (continued)			
R60	Carbon Resistor	RD1/4WPRJ330Kohm	13-044
R11	"	" 470K "	13-045
R21	"	" 270ohm	13-046
R27		2W8.2 ohm	13-047
CAPACITORS			
C339	Electrolytic Condenser	10V 47 $\mu$ F	14-001
C22, 77	"	10V 100 $\mu$ F	14-002
C15, 18, 24, 25, 65, 100	"	16V 10 "	14-003
C101, 151	"	" 10 "	14-003
C12, 13, 16, 23, 26, 131	"	" 47 "	14-004
C31	"	" 100 "	14-005
C29	"	" 220 "	14-006
C30, 136	"	" 470 "	14-007
C11	"	" 33 "	14-008
C130	"	" 1000 "	14-009
C7, 89, 90	"	35V 4.7 "	14-010
C5, 6, 75	"	50V 1 "	14-011
C110	"	" 10 "	14-012
C8, 55, 61, 67	Mylar Condenser	50V 102M	14-013
C14, 72, 96, 98	"	" 222M	14-014
C313	"	" 153M	14-015
C312	"	" 223M	14-016
C19, 20, 73	"	" 333M	14-017
C9, 17, 28, 71, 74, 76	"	" 104M	14-018

# PARTS LIST

TRS  
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Inc.

Circuit Symbol	Description	Type	Parts No.
CAPACITORS (continued)			
C134, 135	Line By-Pass Capacitor	IHP53Y-F102PFA01	14-019
CV-101	Trimmer Condenser	ECV-1ZW40x32	14-020
C137	Ceramic Condenser	50V B 471K	14-021
C27, 47, 99, 303-306	"	" 102Z	14-022
C331-336	"	" 102Z	14-022
C153	"	" 472K	14-023
C39, 46, 124	"	50VCH 020C	14-024
C54	"	" 050C	14-025
C45, 91	"	" 100K	14-026
C44, 119	"	" 150K	14-027
C36, 37	"	" 220K	14-028
C38, 78, 82	"	" 300K	14-029
C92, 111, 112, 123	"	" 390K	14-030
C40, 109	"	" 470K	14-031
C88	"	" 510K	14-032
C79	"	" 560K	14-033
C108	"	" 680K	14-034
C122	"	" 820K	14-035
C321, 322	"	" 101K	14-036
C83	"	" 101Z	14-037
C120	"	" 181K	14-038
C48	"	50VSL 121K	14-039
C121	"	" 151K	14-040
C117	"	" 251K	14-041
C52, 93, 102, 118	"	" 331K	14-042
C10, 21, 59, 86, 87, 97, 125	"	50VF 103Z	14-043
C337, 338	"	" 103Z	14-043
C32-35, 41-43, 49, 50	Ceramic Condenser	" 203Z	14-044
C53, 56-58, 60, 62-64	"	" 203Z	14-044



# PARTS LIST

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Circuit Symbol	Description	Type	Parts No.
MISCELLANEOUS			
PA-CB (SW-1)	Switch	SLE64204B	16-001
ANL(SW-2), NB(SW-3)	"	SLE12207	16-002
M1	Lebel Meter	49F300	16-003
	Meter Absorber		16-004
PL	Lamp (PL)		16-005
On the air	6V-550-Lamp		16-006
	Mic. P.C.B.		16-007
	16P Mic. Jack		16-008
PA-SP, EXT-SP	3.5ø Jack (with Lug)		16-009
ANT	RF-M-Type Terminal		16-010
	3P Power Conector		16-011
P-U-1	PLL Unit		16-012
SP	Speaker	S9G70B	16-013
	Front Panel		16-014
	Cover (A)		16-015
	Cover (B)		16-016
	Knob		16-017
	Speaker Stopper		16-018
	Black Net (Himelon)		16-019
	Label		16-020
	Filter (on the air)		16-021
	Name Plate		16-022
	Blind Rivet		16-023
	FCC Label		16-024



