TRS Challenger Model 850 Service Manual

40 CHANNEL C.B. TRANSCEIVER

TRS CHALLENGER

MODEL 850

SERVICE AND MAINTENANCE

MANUAL

TRS MARKETING INC.

A Subsidary of CCE Corp.

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CA. 90746 213/323-4201

MDK-4000 MEISEI ELECTRIC CO., LTD.

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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 radiotelephone 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 radiotelephone 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 Commission, 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 radiotelephone licensed person. A citizens Band or Amateur License is NOT sufficient.

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

GENERAL DESCRIPTION

This device is a fully designed solid state 40 Channel Citizens Band Transceiver, ideally suited for mobile operation with a nominal 12 volts positive or negative ground DC power source. A 12-volt DC power cord and mounting bracket are included.

It can be operated in the conventional AM mode, or in the single sideband suppressed carrier (SBB) mode, using either the upper sideband (USB) or

lower sideband (LSB). In the sideband mode, up to 80 channels are available. The transceiver has been carefully designed for ease of operation. Selection of AM, upper sideband, or lower sideband is acheived by a mode switch.

The transceiver utilizes the latest development in analog, digital and solid state techonology to generate all 40 Citizens Band transmit and receive frequencies.

When using conventional AM transmission modes, the carrier wave is radiated whenever the transmitter is on, and when the operator speaks, modulation takes place, thus generating double sideband. All of the speech information is contained in each of the sideband.

The carrier, which uses most of the power, is used only to transfer the audio to the receiver.

The use of single sideband (SSB) can give an effective gain of 9 dB over conventional AM equivalent to increasing the transmitter power 8 times. This is possible since the carrier is not transmitted, allowing all of the power available to be used in transmitting one sideband. When transmitting on SSB, RF power is generated only while actually talking.

Five highly stable quartz crystal oscillators supply accurate reference signals to a large integrated circuit (L.S.I.). This L.S.I. is the heart and brain of the phase locked loop (P.L.L.) digital frequency synthesizer section by utilizing programmable dividers, and read only memory (R.O.M.).

The L.S.I. controls a voltage controlled oscillator (V.C.O.), the frequency of which is continuosly 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. AM double sideband requires a 6 KHz band width, while single sideband requires only half-3 KHz.

This narrow band width allows less noise to be received, and thus enables weaker signals to be received more clearly.

The receiver section is a sensitive superheterodyne circuit, featuring single conversion, low noise R.F. stage, M.O.S.F.E.T. mixed, switchable automatic noise limitter, noise blanker, clarifier, RF Gain, squelch, signal strength meter, lattice crystal filter, external speaker jack, PA speaker jack and instantaneous selection of any of the 40 digitally synthesized channel frequencies. The transmitter section is designed around highly reliable silicon transistors and integrated circuits (I.C.).

Any of the 40 digitally synthesized frequencies are instantaneously selectable. The transmitter output stage is a conservatively rated high gain R.F. power transistor.

The selected channel number is displayed on the light emitting diodes (L.E.D.) digitally read out.

SPECIFICATIONS

GENERAL

Phase Locked Loop Digital Synthesizer

Channels	120 ch operating mode in all 40 ch AM.40 ch USB. 40 ch LSB
Frequency Range	26.965 MHz to 27.405 MHz
Supply Voltage	13.8V Positive/Negative Ground
Controls, Indicators, and	Connectors
	Off/On, Volume Control
	MIC Gain Control
	RF Gain Control
	Squelch Control
	Clarifier Control

	AM/Upper Sideband/Lower Sideband Mode Switch
	Channel Selector Knob
	ANL Switch
	NB Switch
	PA/CB Switch
	Power Supply Socket
	External Speaker Jack
	Detachable Dynamic Microphone
	Illuminated LED Digital Channel Indicator
	Illuminated S/RF Power Meter TX/RX/PA indicators
Dimensions	2-3/8"(H) x 7-1/2" (W) x 9-3/8" (D)
Weight	9.0 pounds

Transmitter: SSB Section

Output Power:	12 watts P.E.P. at 13.8VDC
Type of Emission	A3J
Carrier Supression	-40dB
Supurious Hamonic Suppression:	better than -60dB
Output Impedance	50 ohms unbalanced
Frequency Stability	±0.003% at -30 C to +50 C

Transmitter: AM Section

Output Power	4 watts at 13.8V DC
Type of Emission	6A3
Modulation Capability	100%
Suprious Hamonic Suppression:	better than -60dB
Output Impedance	50 ohms
Frequency Stability	±0.003% at -30 to +50 C
Modulation Distortion	less than 5% at 80% mod. at 1 KHz

Receiver: SSB Section

Sensitivity	Less than 0.3µV for 10dB S/N
Selectivity	±1 KHz at 6 dB down
Adjacent Channel Rejection:	-60 DB average
Squelch Sensitivity	0.5µV to 1000uV
I.F. Frequency	9.7835 MHz
A.G.C. Range	Less than 10 dB change audio for input from 15dBu to 80dBµ

Receiver: AM Section

Sensitivity	Less than 0.7µV for 10dB (S+N)/N
Selectivity	±3 KHz at 6 dB down
Adjacent Channel Rejection:	60dB average

Squelch Sensitivity	0.5uV to 100μV
I.F. Frequency	9.785 MHz
A.G.C. Range	Less than 10 dB change audio for input from 15dBμ to 80dBμ
Noise Limiter (A.N.L.)	Series diode Type

Both AM & SSB Sections

Clarifier	±1 KHz (Receive only)
RF Gain Control	Variable 40dB
Noise Blanker	AM & SSB
Audio Output Power	3.5 watts minimum at 8 ohms
Frequency Response	300 Hz to 2700 Hz ± 6dB
Built-in Speaker	8 ohms 3 1/2" Speaker
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 1 KHz
Power Comsumption	13.8V DC
	Receive (Squelch) 0.4A
	Receive (3 watts audio) 0.8A
	Transmit (maximum modulation) 2A

OPERATING FUNCTION OF CONTROLS AND FEATURES

1. S/RF METER

   This meter is automatically switched to indicate incoming signal strength in the receiver mode, and relative RF Power output in the transmit mode.

2. NOISE BLANKER (NB) SWITCH

   The NB circuit is designed to reduce impulse noises such as ignition noise from vehicles, etc., without significantly affecting the basic sensitivity of the receiver.

   The NB Switch is used to turn the noise blanker circuit ON and OFF. The noise blanker is designed to reduce IMPULSE-TYPE noise, 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.

3. ANL SWITCH

   The ANL switch is used to turn the ANL circuit 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 signal reception.

   The ANL switch is workable on AM mode only.

4. PA-CB SWITCH

   This switch is used for selecting normal CB communications, or public address paging. In the PA position, it disconnects the transceiver and internal speaker unit, and connects the audio amplifier output circuit to an external loud speaker unit (8 ohms, not supplied) or paging.

5. TX INDICATOR

   The red light emitting diode will glow when the push-to-talk button is pressed and the unit is in the transmit mode.

6. PA INDICATOR

   The yellow indicator denotes selection of Public Address.

7. RX INDICATOR

   The green indicator denotes selection of receive mode.

8. CHANNEL INDICATOR

LED Digital display provides large, clear indication of selected channel.

9. CHANNEL SELECTOR

The channel selector switch has 40 operating positions. The switch sets both transmit and receiver frequencies simultaneously by selecting the correct portion of the read only memory (R.O.M.) section of the PHASE LOCKED LOOP (P.L.L.) large scale integrated circuit (L.S.I.).

10. CLARIFIER CONTROL

Turning this control to left or right changes the receiver frequency and permits very accurate tuning of stations that may be slightly off frequency.

11. AM. USB. LSB MODE SWITCH

Selects either of the SSB modes (USB or LSB) or standard double sideband AM. The mode selector switch changes the mode of operation of both transmit and receive simultaneously.

12. SQUELCH CONTROL

The squelch Control is used to silence background noise (atmospheric or man-made noise) in the absence of a received radio signal. In the full counterclockwise position, the unit is unsquelched (no noise silencing at all).

In the fully clockwise position, the unit is squelched for even quite strong signals.

13. 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.

14. MIC GAIN CONTROL

Rotating this control counterclockwise reduces the microphone sensitivity when talking on SSB mode to a close station. Normally, the control should be fully clockwise.

15. VOLUME CONTROL AND OFF-ON SWITCH

The volume control varies the sound output of the loud speaker. It also

functions as an "off-on" switch. Clockwise rotation increases volume and P.A. speaker.

16. MICROPHONE CONNECTOR

Attach the four pin connector at the end of the microphone coil cord into the microphone connector. Be certain that it is secured firmly with the knurled ring.

17. ANTENNA CONNECTOR

A C.B. antenna of 50 ohms impedance, 27 MHz must be used. Push Antenna Cable Plug into Antenna Jack on the rear Panel, and finger tighten the outside Ring Nut.

18. EXTERNAL SPEAKER JACK

3.5mm Jack for connection of optional speaker, Built-in speaker to be automatically disconnected when external speaker plugged in.

19. P.A. SPEAKER JACK

This will be used for the connection of a P.A. speaker, (see PA-CB switch in this manual). This Jack accepts a standard (3.5mm) 2 circuit phone plug.

20. POWER SUPPLY CONNECTOR

Used for connection of DC power cord supplied with the unit.

INSTALLATION

TRANSCEIVER LOCATION

Before installing the TRS CHALLENGER 850 in the car, truck, boat, etc., make certain to use a location which permits the driver to operate the controls of the unit without interferring 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 communication 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.

Most quality antennas previously suitable for use on AM will also be satisfactory for SSB. Due to the nature of an SSB transmitter, the VSWR must be kept below 2:1. The recommended method of antenna tuning is to use an in-line wattmeter or VSWR bridge to adjust the antenna for minimum reflection power on channel 18 in the AM mode. When the antenna system is adjusted for proper matching in the AM mode, no further adjustment for SSB wil be necessary.
Antenna height is an important factor when maximum range is desired.

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 850 will operate on 12 volts positive or negative ground system. Connect the red wire to the positive (+) battery terminal, black wire to the negative (-) battery terminal. If the tranceiver'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 varaiation as the vehicle changes direction.

Base Station

For base station operation, the TRS CHALLENGER 850 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 850 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 interferring 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 850 is used as a 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 receive 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.

CIRCUIT DESCRIPTION

Tuning Range: Frequency Range: 26.965 MHz to 27.405 MHz
CH. No. - Frequency

MHz	CH*	MHz	CH*	MHz	CH*	MHz	CH*
26.965	1	27.085	11	27.215	21	27.315	31
26.975	2	27.105	12	27.225	22	27.325	32
26.985	3	27.115	13	27.255	23	27.335	33
27.005	4	27.125	14	27.235	24	27.345	34
27.015	5	27.135	15	27.245	25	27.355	35
27.025	6	27.155	16	27.265	26	27.365	36
27.035	7	27.165	17	27.275	27	27.375	37
27.055	8	27.175	18	27.285	28	27.385	38
27.065	9	27.185	19	27.295	29	27.395	39
27.075	10	27.205	20	27.305	30	27.405	40

* = Channel Indication Number responds to the allocated frequencies.

Frequency Range of the 1st Local Oscillator

Frequency Range: 17.180 MHz to 17.620 MHz including the fundamental frequency and other frequencies used to generate local oscillator frequencies.

IF frequencies : 9.785 MHz

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

The basis block diagram for the determining frequency and stabilizing system is 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.

P.L.L. UNIT

The Basic block diagram for the fixed frequency and stabilizing system is as shown in the attached drawings.

The operational summary is as explained by A.M. Mode and S.S.B. Mode.
The transceiver uses PHASE LOCKED LOOP (P.L.L.) frequency synthesizer system. Reference frequency is of 10.24MHz and oscillates from IC501.
The reference frequency is divided at 1024 by the work of PLL (IC501) to gain reference signal of 10KHz.
The voltage controlled oscillator (V.C.O.) functions as oscillator which varies oscillation frequency by the input DC voltage.
This oscillator is composed by IC502 and its oscillator frequency gains frequencies ranging from 17.18MHz to 17.62MHz.
The V.C.O. signal and the 16.27MHz signal oscillated by Q502 are mixed by IC502 and are converted to signal ranging from 0.91MHz to 1.35MHz through IC502 Boffer and joined into P.L.L. Programmable divider.
Through code convertor, the programmable divider is connected to the channel selector (Rotary Switch).
The selected code is put into channel selector at the divider frequencies ranging from 91 to 135 (26.965MHz to 27.405MHz) which in result obtains 10KHz signal by the programmable divider.
The P.L.L. phase detector compares both phases of feference 10KHz and programmable divider. The phase error voltage is integrated and then is applied into VCO.
It then tracks onto frequency selected by the channel selector in order to obtain stabilizing.

VCO signal is carried to MIX IC2 through Q503 Buff Amp. A signal at 9.785MHz of MIX is made by Q7 Quarty Crystal Oscillator.
This signal is carried to IC2 for Mixture through 08 Buff, AM Switch Q22, D1-D3. Then preferable Transmit Frequency can be gotten.

LIMITING MODULATION

This transceiver has Integrated Devise - IC501 (Voice operated Gain Adjusting devise) for limiting modulation devise. IC501 consists of 3 sections, namely Main Amp., AGC system and Voltage Regulator.

Main Amp- consists of Input stage of Balance Input and control stage for gain control. Output power of Input stage is connected to next stage as signal output power.

Stage connected set the threshold which is the point for starting AGC to make Frequency Response Range, also this stage drive Detector Circuit to make AGC Voltage Regulator in itself. Audio output signal from Microphone is carried to IC501 through input transformer. Microphone input signal is amplified at main amplifier of IC501.

Amplified Audio Signal is amplified through detector. Amplified detector signal is carried to gain control stage of main amplifier. Through this method, Gain of main amplifier is dropped at lower fixed level.

The ouput when A.G.C. Is operating is just under 90mV rms.
The controlled audio signals are amplified and fed to RF amplifier Q2 and Q3. At the result the modulation is not exceeded 100% by a adjusting volume VR1.

LIMITING POWER

In case of single side-band transmission, Integrated devise IC501, D5 D34, Q17 works to control transmitter output power. IC501 amplify input signal from Microphone to certain fixed level. At same time, input signal level of RF Liner Amplifier is controlled at certain fixed level.

Amplified RF signal is detected by Diode D5 at final stage.
Detector Voltage is carried to Base of Q17 through D34, and control gain of Q14. Setting of control voltage is made by VR8.

LINER AMPLIFIER

Liner Amplifier is used in Transmitter Portion of this transceiver. Liner Amplifier makes only very few High Harmonic Spurious and also this transceiver has good transistors in Driver Stage (Q3) and Final stage in linnearity. Spurious radiation in transmitter is limited by the following circuit:

BAND PASS FILTER	T1, L1, L14, T2, Te
LOW PASS FILTER	t2, L5, L6, L10

FINAL AMPLIFIER (RF)

Type Number : 2SC2050 or 2SC2043 or 2SC2195

DESCRIPTION Q4 FINAL RF AMP

NPN Epitaxial Plener Silicon Transistor for high frequency Power Amplifiers

NOTE: 1. All voltage 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 Ampmeter : Yokogawa Electroworks No. 14

V Voltmeter " " "

ELECTRICAL FUNCTION OF SOLID STATE DEVICES

1. DIODES

D1,2,3,	:	Transmitter AM, SSB MODE Switch
D4	:	Transmitter Power Detector for Power Indicator
D5	:	Transmitter Power Detector for A.L.C.
D6,7	:	Receiver Detector for N.B.
D8,9	:	Oscillator AM, SSB MODEL Switch
D10	:	Oscillator Control
D12,13	:	Receiver AGC Detector
D14,32	:	AGC Protector
D15,16	:	Receiver input protector
D17	:	Receiver AGC Protector
D18,19	:	Signal Control Switch
D20,21	:	Receiver AM Detector
D22	:	Noise Limitter
D23	:	TX Indicator
D24	:	RX Indicator
D25	:	PA Indicator
D26	:	Squelch switch
D27	:	Protector
D28	:	Relay protector
D29	:	Protector
D501	:	Variable capacitance diode
D502,503	:	Oscillator AM, SSB MODE switch
D504	:	Clarifier control switch
D505	:	Voltage regulator
D506	:	Variable capacitance diode (V.C.O.)

D507-510	:	Matrix for Digital Readout
D31	:	Regulator
D32	:	AGC Protector
D33	:	SSB AGC Protector
D34	:	ALC Protector
D35	:	Oscillator control

2. I.C.

IC1	:	Balanced Modulator
IC2	:	Balanced Mixer
IC3	:	AGC Generator for SSB
IC4	:	SBB Detector
IC5	:	AF Power Amplifier
IC6	:	Voltage Regulator
IC501	:	P.L.L. Frequency Synthesizer
IC502	:	V.C.O. and Balanced Mixer
IC503	:	Voice Operated Gain Adjusting AMP

3. TRANSISTOR

Q1,2	:	Transmitter Buffer Amplifier (AMP)
Q3	:	" Driver Amp
Q4	:	" Final Amp.
Q5	:	Q4 Protector
Q6,7	:	Noise Blanker Amp
Q8	:	Noise Blanker Switch
Q9	:	Oscillator
Q10,11	:	Buffer Amp
Q12	:	AGC Amp
Q13,14	:	Squelch Amp

Q15 : Receiver RF Amp

Q16 : " Mixer

Q17,18,19,20: I.F. Amp

Q21 : AGC Buffer Amp

Q22 : AGC Buffer Amp

Q23 : Mic Amp

Q501 : Clarifier Switch

Q502 : Oscillator (16.27MHz and 16.273MHz)

Q503 : Buffer Amp.

LIST OF EQUIVALENT TRANSISTOR

A. Transmitter Final Amp.

2SC2050	(Matsushita)
2SC2043	(Fujitsu)
2SC2195	(NEC)

B. Transmitter Driver Amp.

2SC1974	(Matsushita)
2SC2029	(Fujitsu)

C. Transmitter Buffer Amp.

2SC2086	(Mitsubishi)
2SC1973	(Matsushita)

D. Receiver RF and IF Amp.

2SC1393	(NEC)
2SC1686	(Matsushita)

E. Receiver Mixer Amp.

3SK49Q	(Matsushita)
3SK59	(Toshiba)
3SK40	(NEC)

F. Receiver IF Amp.

2SC945R	(NEC)
2SC710	(Mitsubishi)
2SC828R	(Matsushita)

G. Oscillator

2SC1675L	(NEC)
2SC1359	(Matsushita)

TUNE-UP PROCEDURE

Abbreviations

1. RFVM ----------RADIO FREQUENCY VOLTMETER
2. ATT ----------ATTENUATOR
3. PA ----------PUBLIC ADDRESS
4. RF ----------RADIO FREQUENCY
5. AF ----------AUDIO FREQUENCY 500 Hz & 2400 KHz
6. SSG ----------STANDARD SIGNAL GENERATOR
7. FC ----------FREQUENCY COUNTER
8. DCV ----------D.C. VOLTMETER
9. OSC ----------OSCILLOSCOPE
10. SA ----------SPECTRUM ANALYZER

CAUTION BEFORE ALIGNMENT

A) Microphone must be connected.

B) The AF output terminal (EXT. JACK) must be connected to either an 8 ohm speaker or 8 ohm non inductive resistor.

C) Standard voltage is 13.8V

D) ANT. terminal (rear panel) must be connected to either a 50 ohm non inductive resistor or other 50 ohm Dummy Load.

1. AUGNMENT PROCEDURE OF PLL SECTION

Set the channel of transceiver at CH19, and clarifier center position at all alignment.

1.1) Standard Frequency (10.24MHz)

Connect FC to Pin 16 of IC 501.

Align Variable Capacitor CV 503 to obtain 5.12Mhz reading on F.C.

1.2) V.C.O.

Connect DC. V between R521 and R522 (TP-502).

Align L502 to obtain 3.5V DC reading on DC reading on DC. V.

1.3) P.L.L. Output

Connect VM Output of T501 Coil.

Set the mode of Am and aligh variable capacitor CV501 to obtain 17.4MHz reading on FC. Set the mode of USBand align variable.

Capacitor CV502 to obtain 17.403MHz reading on FC.

2. AUGNMENT PROCEDURE OF RECEIVER SECTION

Set the channel of SSG to CH19, SSG frequency at 1KH with 30 percent modulation and Att of SSG to + 20dB.

2.1) RF. Gain

Set the channel of transceiver at Ch19, set the Volume to maximum, the squelch to minimum and the RF Volume turn clockwise.

Align coils T4 to T9 for maximum audio output.

2.2) Maximum Sensitivity

Set the ATT of SSG to 0dB Load Voltage.

And set the channel of transceiver to CH19. Set the volume to maximum and the Squelch to minimum, and the RF GAIN Volume turn Clockwise. Re-align coils T4 to T9 to obtain maximum sensitivity.

2.3) S Meter Calibration

Set the ATT of SSG to + 40dB Load Voltage.

And set the channel of transceiver to CH19 and set squelch to minimum and the RF Volume turn clockwise.

Align VR9 to indicate 9 on Smitter.

2.4) Squelch

Set the ATT of SSG to = 60dB Load Volt.

Set the channel of transceiver to CH19, Volume to maximum and squelch to maximum and the RF Volume turn clockwise.

With above condition, adjust VR10 so as audio output just ceases and check AF output when output of "SSG" becomes 61 to 65 dBuVolt.

2.5) S/N

Set the ATT of SSG to 0 dBu Load Volt.

Set the channel of transceiver to CH19, and adjust volume control to obtain AF output voltage 2V.

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

2.6) A.G.C. Voltage Measurement

Same condition of 2.5, connect DCV between R50 and R103 (TP-) align VR13 to obtain 1.8 VDC reading on DCV. However set the maximum sensitivity.

2.7) SSB Product & Local OSC Of Transmitter

Set the mode of USB at transceiver connect FC to Emite of Q10 (TP-2) align variable capacitor CV1 to obtain 9.785 MHz reading on FC.

2.8) Noise Blanker & Noise Liniter

Check effect of Noise Blanker and Noise Limiter switches on and Noise Source add antenna conector.

2. RECEIVER

2.1) Rf Amplifier

The RF Amplifier is used both AM and SSB.
The RF Signal which passes through the antenna filter from the antenna is fed into T4 and T4 which provides the impedance match.
The RF Amplifier, Q15 raises the RF Signal after being tuned by T6 it is fed into the gate of the mixer, Q16 which mixes the RF Signal from the P.L.L. Synthesizer through C95.

2.2) I.F. Amplifier

The I.F. Amplifier is used both AM & SSB.
The I.F. singanal is fed into the crystal filter which cut the undesirable signal out and lets the desired signal pass through and then it is amplified by Q17, Q18, Q19 and Q20 amplified signal is detection.

2.3) Squelch

When no signal is present, turn the squelch knob clockwise, and the collector ampere of Q14 is current, thus the collector voltage is ground, and the transistor Q23 becomes non operating, and the circuit not operating as an audio signal, neither sound nor noise will be heard. As soon as a signal is fed, a A.G.C. Voltage is supplied into base of Q13, and opposite procedures of fanctions mentioned above are traced, and the signal is beard through the speaker.

2.4) Noise Blanker

The NB is a circuit designed to reduce impulse noises such as ignition noise from vehicles, without significantly of the receiver.
The impulse noises and ignition noise amplified by Q15.
As soon as a signal is fed, a voltage rectified by D6 and D7 is supped into gate of Q6, and amplified Q6 and Q7. The noise signal switvhed by Q8, and grounded by the drain of Q16.

2.5) Am Receiver

The output of the I.F. amplifiers is applied to the detector diodes D20, D21 and filtering circuit. The detected audio output is coupled into the input of EC5 through the noise limiter D22 and Squelch amp. Q23 and Volume Control.
The amplified audio signal by EC5 is connected by output transformer.
The out put transformer T11 is coupled by the switch to the speaker.
The I.F. signal coming through C120 is rectifited by D12 and D13 and after being amplified by Q12. This retified and amplified Voltage is the AGC Voltage which controls Q15, Q17, Q18 and Q19.

2.6) SSB Receiver

The Rf amplifier and the mixer are exactly the same as the AM.
The output of the mixer is fed into the crystal filter.
The signal is fed into the crystal filter which cuts the undesirable signal out and lets the desired signal pass through and then

It is amplified by Q17, Q18, Q19 and Q20 amplified signal is fed into the balanced modulator which works as the detector.
The audio signal is detected at Balanced Detector, then amplified at IC5 Stage in same manner as AM reeiver portion.

3. ALIGNMENT PROCEDURE OF TRANSMITTER SECTION

3.1) SSB Transmitter

3.1.1) SSB Transceiver Performance Check and Alignment

- Set channel 19 and set mode switch USB or LSB.
- Connect RF output power to oscilloxcope or spectrum analyzer through RF ATT.
- Set Mic Gain control on full position to clockwise, and add mixed signall (10mV r.m.s.) of 500 Hz and 2.4KHz into Microphone input.
- Press push-to-Talk switch on Microphone.
- Adjust coil T1, T2, T3, L1, L2, L5, L14 till indication of OSC or A.S. to Maximum Position.
- Incase of adjustment with using of OSC,adjust variable resistor VR2 to 69VP-P as maximum output power, and adjust ALC with VR8 to output power 65VPP.
- In case of adjustment with using S.A., adjust VR2 to Max. output power about +31.7dB, and adjust ALC with VR8 to output power +31dB.

3.1.2) Final Transistor Bias Adjustment

- Set as specitied in 3.1.1.
- Connect DC ammeter to disconnected lumper wire of TP-3.
- Set Mic Gain control to full counter clockwise position to eliminate
- Microphone input zero signal.
- Bias adjustment should be effected to adjust VR6 till reading of DC ammeter scale 150mA with keeping Push-to-Talk switch of Microphone on "PRESS" position.

3.1.3) Carrier Balance

- Set as specified in 3.1.1.
- Insert 1,500Hz signal into microphone input.
- Connect F.C. to Antenna output through RF ATT.

. Read Frequency on Indicator.

Frequency on Indicatir - 1500Hz = Center Frequency on USB

Frequency on Indicator - 1500Hz = Center Frequency on LSB

3.2) AM Transmitter

3.2.1) RF Power

. Conncet 50 ohm Load power Meter to antenna jack for measuring of High Frequency.

. Set channel 19 and set Am Mode.

. Press Push-to-Talk switch on Microphonw.

. Adjust VR15 to Power Indicator 3.5W

3.2.2) Modulation Performance Check and Alignment

. Connect an Oscilloscope acress the 50 ohm dummy load through RF adapter probe.

. Conncet and Audio Generator to the Microphone input circuit the injection frequency in 2.5KHz at 3mV rms.

. Adjust VR1 for 80 percent modulation.

. Increase audio input to 30mV rms.

. Insure that 100 percent modulation is not exceeded.

. If more than 100 percent modulation is found in above, re-adjust VR1 to give 99-100 percent modulation.

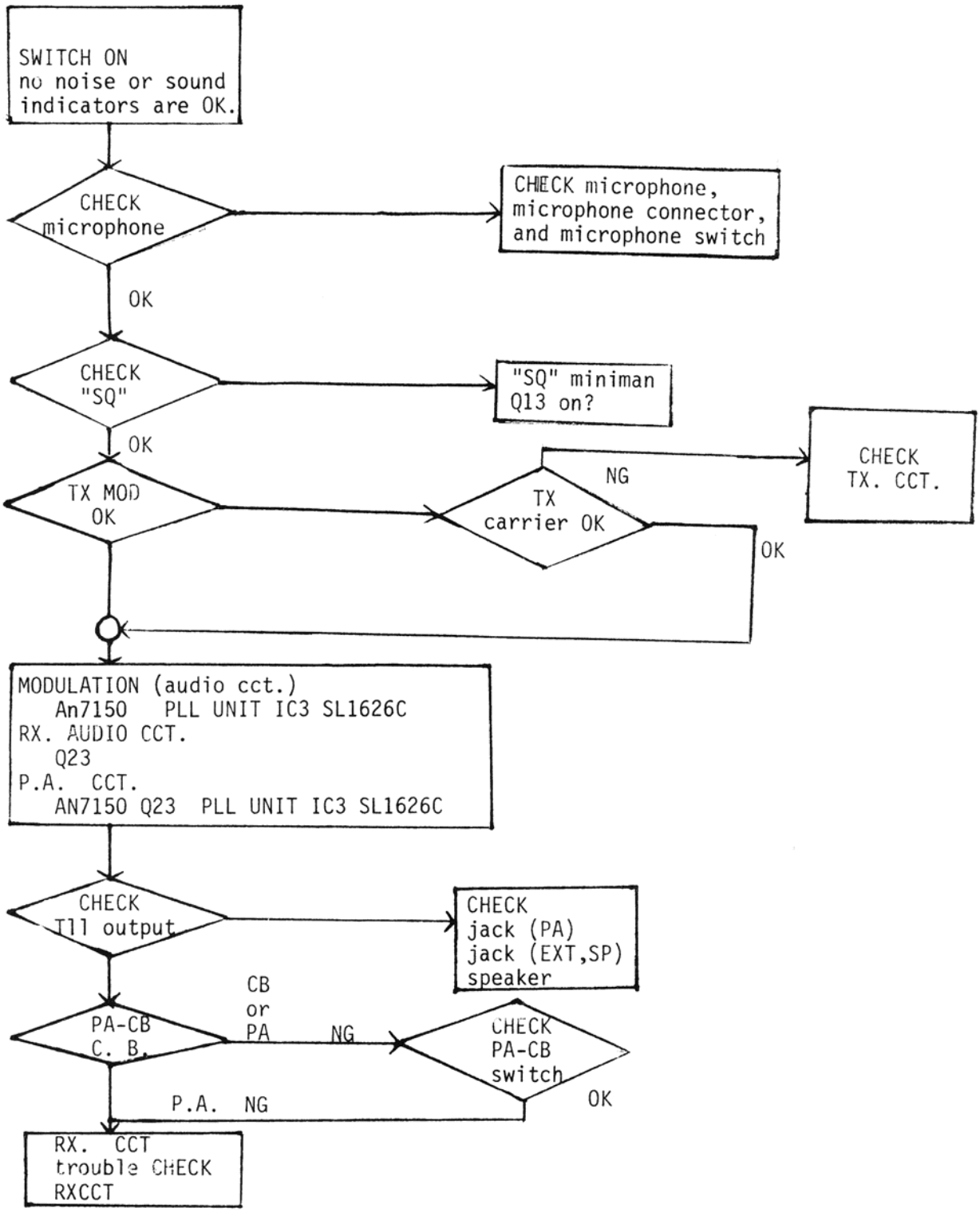
3.2.3) Frequency Deviation

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

3.2.4) RF Meter

Same condition of 3.2.1 and align VR1 to indicate 7/10 on the RF meter without modulation.

NO SOUND FLOW CHART NO. 2



TRANSMITTER CIRCUIT FLOW CHART NO. 4

TRANSMITTER TROUBLE

CONNECT MICROPHONE

ON THE AIR INDICATOR OK?

trouble with MICROPHONE and TX/RX Cont. line

CHECK carrier

CHECK Q10, 11

CHECK 1st OSC.

CHECK IC2 SL1641C Pin No. 3

NG

SEE FLOW CHART No. 5

CHECK mixer

MIXER IC is SL1641C

CHECK BUFFER excitor

BUFFER transistor is Q1
EXCITOR transistor is Q2

CHECK driver

Driver transistor is Q3

CHECK RF.amplifier

RF.AMPLIFIER is Q4

CHECK antenna
antenna circit
antenna matching

PLL UNIT FLOW CHART No. 5

PLL UNIT
TROUBLE

CHECK
Power + 8VDC
L4 coil

L4 is between
IC6 REGURATOR

CHECK
TP1 5.12MHz

CHECK
CRYSTAL 10.24MHz
IC1 PD2810C

CHECK
CRYSTAL OSCILLATOR
Q2

Q2
CRYSTAL X',X'2

CHECK
V.O.C. and MIX
IC2

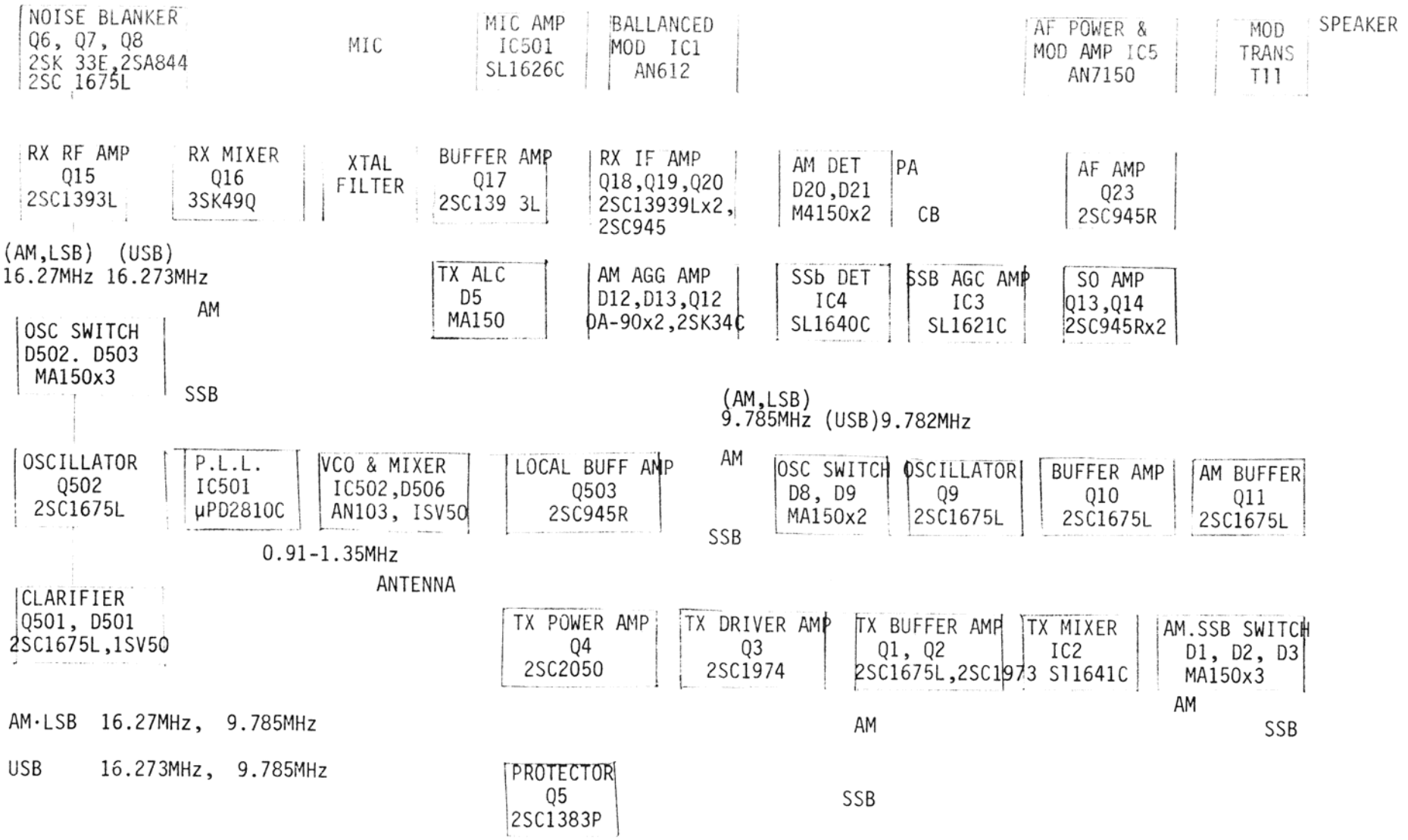
IC2 An103

CHECK
TP2 DC1.5-4.5V

MOVE L2 coil

T1 OUT PUT
17.18MHz -
17.62MHz

ATTACHMENT BB TRANSCEIVER BLOCK DIAGRAM



PARTS LIST

TRS Marketing Inc.

Circuit Symbol	Description	Type	Parts No.
IC, FET, TRASISTOR & DIODES			
IC5	LSI	AN7150	10-001
IC201	"	μPD2810C	10-002
IC202	Integrated Circuit	AN103	10-003
IC1	"	AN612	10-004
IC3	"	SL1621C	10-005
IC203	"	SL1626C	10-006
IC4	"	SL1640C	10-007
IC2	"	SL1641C	10-008
IC6	"	μPC14308(AC)	10-009
Q6	FET	2SK33-E	10-010
Q12	"	2SK34-C	10-011
Q16	"	3SK49-Q	10-012
Q7	Transistor	2SA844-D	10-013
Q13,14,20,21,22,23,203	"	2SC945-R	10-014
Q5	"	2SC1383-P	10-015
Q15, 17, 18, 19	"	2SC1393-L	10-016
Q1, 8, 9, 10, 11, 201, 202	"	2SC1675-L	10-017
Q2	"	2SC1973	10-018
Q3	"	2SC1974	10-019
Q4	"	2SC2050	10-020
D201, 206	Diodes	1SV50	10-021
D202-204, 207-210	"	MA150	10-022
D1-5, 8, 9, 10, 14-21, 28	"	MA150	10-022
D32, 33, 34, 35, 36	"	MA150	10-022
D6, 7, 12, 13, 31	"	OA-90	10-023
D27, 29	"	V06E or ~~RA-1Z(T)~~	10-024
D205	Zener Diodes	RD5.6EB	10-025
D22	Vavistor	HV80	10-026
TH1	thermister	12D26	10-027

PARTS LIST

TRS Marketing Inc.

Circuit Symbol	Description	Type	Parts No.
IC, FET, TRANSISTORS & DIORDES (continued)			
D23 (TX)	L.E.D.	SEL103R	10-028
D25 (PA)	"	SEL103W	10-029
D24 (RX)	"	SEL303E	10-030
LED1	2 digit LED	SL-1272	10-031
COILS & TRANSFORMERS			
L8	Coil	K6002	11-001
L12, 13	"	K6003	11-002
L1	Choke	K1014	11-003
L2	"	K1020	11-004
L3	"	K1016	11-005
L4, 9	"	K1001	11-006
L5	"	K1017	11-007
L6	"	K1009	11-008
L7	"	K1019	11-009
L10	"	K1021	11-010
L14	"	K1022	11-011
L16	"	K1018	11-012
L201	"	K1023	11-013
L202	"	K1024	11-014
L203	"	K1015	11-015
L204	"	K1001	11-016
L15	Micro Inductor	LF1-330K	11-017
L11	Transformer	LFT	11-018
T1	"	K2038	11-019
T2	"	K2039	11-020
T3	"	K2040	11-021

PARTS LIST

TRS Marketing Inc.

Circuit Symbol	Description	Type	Parts No.
COILS & TRANSFORMERS (continued)			
T4, 5	Transformer	K2041	11-022
T6	"	K2042	11-023
T7, 8, 10	"	K2043	11-024
T9	"	K2044	11-025
T201	"	K2046	11-026
T11	MOD Transformer	K5003	11-027
T202	IN PUT Transformer	K5004	11-028
VARIABLE RESISTORS			
VR1, 2, 4, 13	Semi-Fixed Resistor	EVN-K4A-A00 B14	12-001
VR9	" "	" B24	12-002
VR3, 8	" "	" B53	12-003
VR7, 10	" "	" B54	12-004
VR5, 6	" "	VZ103KTH,200ohm B	12-005
VR15	Variable Resistor	RWH10AG100J	12-006
SQLRF (VR11)	"	DM10A030-50KC-10KB	12-007
CLARIFIER (VR16)	"	VM10A509-10KB	12-008
VOL MIC (VR14)	"	VM11A052-10KAx2	12-009

PARTS LIST

TRS Marketing Inc.

Circuit Symbol	Description	Type	Parts No.
RESISTORS			
R121	Carbon Resistor	RD1/4WPRJ4.7ohm	13-001
R19, 21, 63, 76, 83	"	" 10 "	13-002
R13, 78, 87	"	" 33 "	13-003
R15, 18	"	" 51 "	13-004
R110, 118	"	" 68 "	13-005
R16, 50, 57, 250	"	" 100 "	13-006
R3, 9, 17, 20, 64, 66, 69,70	"	" 220 "	13-007
R71, 81, 93, 213	"	" 220 "	13-007
R11, 84, 88	"	" 270 "	13-008
R14, 26, 36, 40, 75, 90	"	" 330 "	13-009
R226	"	" 330 "	13-009
R227-229	"	" 560 "	13-010
R43, 85, 106, 113, 249	"	" 680 "	13-011
R10, 44, 61, 62, 79, 98, 120	"	" 1K "	13-012
R22, 210-212, 214, 215	"	" 1K "	13-012
R230-234, 244-248	"	" 1K "	13-012
R253, 256, 252, 253	"	" 1.8K"	13-013
R4, 5, 6, 23, 24, 45, 47	"	" 2.2K"	13-014
R56, 72, 82, 86, 102, 104	"	" 2.2K"	13-014
R111, 116, 201, 202, 218	"	" 2.2K"	13-014
R221	"	" 2.2K"	13-014
R219	"	" 2.7K"	13-015
R35, 37, 38, 54, 206	"	" 3.3K"	13-016
R254	"	" 3.3K"	13-016
R7, 65, 208, 209	"	" 3.9K"	13-017
R12, 25, 48, 58, 112, 225	"	" 4.7K"	13-018
R30, 31	"	" 5.6K"	13-019
R89	"	" 6.8K"	13-020

PARTS LIST

TRS Marketing Inc.

Circuit Symbol	Description	Type	Parts No.
RESISTORS (continued)			
R8,34,46,53,80,92,96,97	Carbon Resistor	RD1/4WPRJ10Kohm	13-021
R99, 103, 108, 114, 117	"	" 10K"	13-021
R220, 224	"	" 10K"	13-021
R42, 77, 100	"	" 22K"	13-022
R41, 95	"	" 27K"	13-023
R91, 109	"	" 33K"	13-024
R203, 204, 222	"	" 51K"	13-025
R2	"	" 75K"	13-026
R33, 68	"	" 100K"	13-027
R1	"	" 270K"	13-028
R216	"	" 330K"	13-029
R28, 49, 257	"	" 470K"	13-030
R29, 32	"	" 1M	13-031
R94	"	RD1/4WPJ47ohm	13-032
R73	"	" 330 "	13-033
R223	"	" 560 "	13-034
R74, 105, 107	"	" 680 "	13-035
R101, 236-243, 251	"	" 1K "	13-036
R255	"	" 1K "	13-036
R115	"	" 4.7K"	13-037
R60	"	" 6.8K"	13-038
R119, 205	"	" 10K "	13-039
R59	"	" 15K "	13-040
R52	"	" 22K "	13-041
R217	"	" 51K "	13-042
R67	"	" 100K "	13-043

PARTS LIST

TRS Marketing Inc.

Circuit Symbol	Description	Type	Parts No.
CAPACITORS			
C216	Tantalum Condenser	35V 0.47μF	14-001
C78	Electiolytic Conderser	10V 22 "	14-002
C141, 142	"	" 33 "	14-003
C45, 81, 102, 133, 213	"	" 47 "	14-004
C80, 82, 84, 146, 156	"	" 100 "	14-005
C175	"	" 100 "	14-005
C243	"	" 220 "	14-006
C42, 125, 128, 130, 145	"	16V 10 "	14-007
C170, 251, 258	"	" 10 "	14-007
C150, 151	"	" 100 "	14-008
C148	"	" 470 "	14-009
C149	"	"1000 "	14-010
C159	"	"2200 "	14-011
C55, 143	"	25V 4.7 "	14-012
C32, 75, 83, 124, 139	"	50V 1 "	14-013
C176	"	" 1 "	14-013
C254	"	" 2.2 "	14-014
C140, 144	Mylar Condenser	CQ92MC1H102M	14-015
C134, 138	"	" 103M	14-016
C12,14,15,48,49,72,131	"	" 223M	14-017
C135, 168, 169	"	" 473M	14-018
C22, 74, 132, 255, 256	"	" 104M	14-019
C1, 79, 147, 157, 215	"	" 104M	14-019
C158	"	" 224M	14-020
C63, 64	Polystyrene Capacitor(A)	CQ09S-1H-470RD-K05B	14-021
C210	" (B)	150PF	14-022
C162, 163	Line By-Pass Capacitor	1HP53Y-F102PFA01	14-023
CV1,2,3,201, 202	Trimmer Condenser	ECV-1ZW20x53D	14-024

PARTS LIST

TRS Marketing Inc.

Circuit Symbol	Description	Type	Parts No.
CAPACITORS (continued)			
C52, 226, 233	Ceramic Conderser	50V B 471K	14-025
C25,65,94,95,219-224	"	" 102K	14-026
C249, 250	"	" 102K	14-026
C21, 56, 57	"	" 472K	14-027
C18, 37, 177	"	50VCH 010C	14-028
C248	"	" 030C	14-029
C38, 89	"	" 060C	14-030
C93, 115	"	" 100J	14-031
C181	"	" 150J	14-032
C208	"	" 150K	14-033
C3,60,61,101,104	"	" 220J	14-034
C214, 231, 244	"	" 220K	14-035
C13, 17, 69	"	" 300J	14-036
C227, 228, 245	"	" 300K	14-037
C86	"	" 330J	14-038
C46	"	" 360J	14-039
C51,88,92,120,121	"	" 390J	14-040
C19,73,98,108,119,178	"	" 470J	14-041
C235	"	" 470K	14-042
C23	"	" 680J	14-043
C27	"	" 820J	14-044
C211, 239	"	" 820K	14-045
C31, 58, 67	"	" 101J	14-046
C230, 234, 240	"	" 101K	14-047
C28, 229	"	" 131K	14-048
C10, 34, 39, 66, 238	"	" 151K	14-049
C136	"	50VSL 121K	14-050
C36, 179	"	" 221K	14-051
C35	"	" 391K	14-052

PARTS LIST

TRS Marketing Inc.

Circuit Symbol	Description	Type	Parts No.
CAPACITORS (continued)			
C2,4,5,6,7,8,9,11,16,20	Cabon Resistor	50VF 203Z	14-053
C24,26,29,33,40,41,43	"	" 203Z	14-053
C44,47,50,59,62,68,70,71	"	" 203Z	14-053
C76,77,85,90,91,96,97,99	"	" 203Z	14-053
C100,103,105,106,107,109	"	" 203Z	14-053
C110,112,113,114,116,117	"	" 203Z	14-053
C118,122,126,127,129	"	" 203Z	14-053
C111, 152-155, 164-167	"	" 203Z	14-053
C171,174,180,201-207	"	" 203Z	14-053
C209,212,217,218,225	"	" 203Z	14-053
C232,236,237,241,242	"	" 203Z	14-053
C246,247,253,257	"	" 203Z	14-053
C30,53,54,160,161	"	" 473Z	14-054
CRYSTALS			
X1	Crystal	9.785MHz	15-001
X2	"	9.782MHz	15-002
X201	"	16.270MHz	15-003
X202	"	16.273MHz	15-004
X203	"	10.240MHz	15-005

PARTS LIST

TRS Marketing Inc.

Circuit Symbol	Description	Type	Parts No.
MISCELLANEOUS			
CF1	Ceramic Filter	9.785MHz	16-001
XF1	Crystal Filter	9.785MHz	16-001
AM USB LSB(S1)	Rotary Switch	SRN2083N	16-002
	"	GA type	16-003
PA-CB (S2)	Switch	SLE 64204B	16-004
NB(S3) ANL(S4)	"	SLE 12207	16-005
RY-1	Relay	HB2-12V	16-006
S/RF M1	Lebel Meter	GM572	16-007
PL	Lamp (white)		16-008
J1	4P Conector(with Lug)		16-009
J2	RF-M Type Conector		16-010
J3, 4	3.5ø Jack (with Lug)		16-011
J5	3P Conector		16-012
TP1-3, 201-203	PBKT Terminal		16-013
	Flat Cable		16-014
	Shielded Cover A		16-015
	" B		16-016
	Wire Ass'y		16-017

PARTS LIST

TRS Marketing Inc.

Circuit Symbol	Description	Type	Parts No.
MISCELLANEOUS (continued)			
	S9G70B Speaker		16-018
	Front Panel		16-019
	Cover (A)		16-020
	Cover (B)		16-021
	Seat		16-022
	Indicator		16-023
	Knob A		16-024
	" B		16-025
	" R		16-026
	" F		16-027
	S.P. Stopper		16-028
	S.P. Net (Himeron)		16-029
	Name Plate		16-030
	Label		16-031
	FCC Label		16-032
	Brind Rivet		16-033
	Name Plate		16-034
	Dynamic Mic.		16-035
	Hunger		16-036
	Hunger Bolt		16-037
	Power Cable		16-038
	Bolt (TT2-5-14)		16-039

PARTS LIST

TRS Marketing Inc.

Circuit Symbol	Description	Type	Parts No.
MISCELLANEOUS (continued)			
	(User's Guid F)		
	FCC Part 95		16-040
	FCC 555B		16-041
	FCC 505		16-042
	Sub Panel		16-043
	Chassis		16-044
	Glomerate		16-045
	Washer		16-046
	Clamp		16-047
	(Bolt)		
	N1-2.3-5		16-048
	N1-2.6-4		16-049
	N1-2.6-6		16-050
	N1-3-6		16-051
	N1-3-8		16-052
	N1-3-10		16-053
	N1-3-12		16-054
	(Washer)		
	3PIW		16-055
	3SIW		16-056
	3LMIW		16-057
	AHIN3		16-058
	BT2-2.6-6		16-059

PARTS LIST

TRS Marketing Inc.

Circuit Symbol	Description	Type	Parts No.
MISCELLANEOUS (continued)			
	N1-3-8-3EF		16-060
	S1-2.6-6		16-061
	NT2-2.6-8		16-062
	TP2-2.6-6		16-063
	MDK-4000 TXRX P.C.B.		16-064
	" PLL P.C.B.		16-065
	" LED P.C.B.		16-066
	" SUB P.C.B.		16-067