TRS Challenger Model 460 Service Manual

40 - C H A N N E L C. B. T R A N S C E I V E R

T R S C H A L L E N G E R M O D E L 460

S E R V I C E A N D M A N T E N A N C E M A N U A L

T R S M A R K E T I N G I N C .

A Subsidary of C.C.E. Corp.

137 E. Savarona Way, Carson, CA. 90746 213/323-4201

M D K - 9 1 0 MEISEI ELECTRIC CO., LTD.

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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 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 operator 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 (from 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 for 505. Forward form 505 to the Federal Communications Commission, Gettysburg, PA. 17325.

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.

B. S P E C I F I C A T I O N S

GENERAL

Channels		:	40
Frequency Range		:	26.965 to 27.405 MHz
Frequency Control		:	P.L.L. Synthesizer
Frequency Tolerance		:	0.005%
Frequency Stability		:	0.001%
Operating Temperature Range		:	-30°C to+ 50°C
Humidity		:	95%
Microphone		:	Dynamic with push to talk switch and coiled cord.
Supply Voltage		:	13.8V (positive or negative ground)
Current Drain	-Transmit-	:	Full mod 2.0A
	-Receive-	:	Squelched 0.2A
			1W audio output 1.3A
Dimensions		:	2" (H) x 5.9" (W) x 10" (D)
Weight		:	4.0 pounds
Antenna Connector		:	RF M type

TRANSMITTER

Output Power	:	4.0 W
Modulation Capability	:	AM 100%
Harmonic Suppression and Spurious Emission	:	Better than FCC requirement
Frequency Response	:	300 to 2,700 Hz
Output Impedance	:	50 ohms, unbalanced
Output Indicator	:	Meter gives true proportional RF output indication.
		L.E.D.

1. RECEIVER

P.L.L. (Phase Locked Loop) Frequency Synthesizer controlled double superheterodyne system.

1.1)	Frequency Range	:	26.965 - 27.405 MHz
1.2)	Number of channels	:	40 channels (from 1 to 40)
1.3)	Tunable bands	:	440 KHz with CB band
1.4)	Intermediate frequency	:	1st IF 10.695 MHz 2nd IF 455 KHz
1.5)	VCO (Voltage Controlled Oscillator) Frequency	:	16.270 - 16.710 MHz (440 KHz)
1.6)	Input impedance (Antenna impedance)	:	50 ohms
1.7)	Output impedance (audio impedance)	:	8 ohms
1.8)	Delta tune range	:	1.0 KHz continuous tune
1.9)	Voltage requirements	:	13.8V DC

2. TRANSMITTER

P.L.L. (Phase Locked Loop) Frequency Synthesizer controlled oscillator and collector modulation system.

2.1)	Frequency Range	:	26.965 - 27.405 MHz
2.2)	Number of channels	:	40 channels (from 1 to 40)
2.3)	VCO (Voltage controlled oscillator) Frequency	:	16.270 - 16.710
2.4)	Output impedance (RF output impedance)	:	50 ohms
2.5)	Voltage requirements	:	13.8V DC

3. TYPE OF EMISSION 6A3

4. RADIO FREQUENCY POWER OUTPUT

4.0 watts

5. PA SYSTEM POWER OUTPUT

4.0 watts

OPERATING INSTRUCTION

DESCRIPTION:

This unit is an all-transistorized, 40 Channel Citizens Band Transceiver, ideally suited for mobile operation from 13.8V negative or positive ground DC power source. A 12V DC power cord and a mounting bracket are included.

The receiver is a sensitive superheterodyne circuit featuring, dual conversion, low noise RF stage, adjustable squelch, automatic noise limiting, delta tuning, S-meter, mechanical filter, external speaker jack, and instantaneous selection of any of P.L.L. (Phase Locked Loop) controlled channels. The transmitter section is designed around highly reliable silicon transistors and the DOUBLE CONVERSION CIRCUIT SYSTEM. This circuit makes use of the output of P.L.L. controlled oscillators which are mixed to produce the desired frequency. The transmitter output stage is a conservatively rated high gain RF power transistor.

FUNCTION OF CONTROLS AND INDICATORS

CHANNEL SELECTOR:

The channel selector switch has 40 operating positions. This switch sets both transmit and receive 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.). Delta frequency control: CLARIFIER) Turning this control to 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.

SQUELCH CONTROL:

The Squelch Control is used to silence background noise (atmospheric or man-made noise) in the abscence of a received radio signal. In the full counter-clockwise position, the unit is unsquelched (no noise silencing at all). In the fully clockwise position, the unit is squelched for even quite strong signals.

VOLUME CONTROL AND ON-OFF SWITCH:

This control turns the power ON and OFF and adjusts the loudness of received signals, and P.A. speaker.

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 signal reception.

PA-CB SWITCH:

This switch is used for selecting normal CB communications, or public address paging. In the PA position, it disables the transceiver and the internal

speaker unit, and connects the audio amplifier output circuit to an external loud speaker unit (8 ohms). During PA operation, the "S" meter is not illuminated.

DELTA FREQUENCY 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.

The center position of this control is the center of the channel frequency.

FUNCTION OF TRANSCEIVER STATUS LAMPS

RED: Indicates that the transceiver is in the transmit mode.

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

WARNING: DO NOT PRESS TALK SWITCH BEFORE CONNECTING ANTENNA

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 ground.

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 to a comfortable listening level.
3. Turn the channel selector to the 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. The DELTA FREQUENCY CONTROL should be 1.0 KHz, when necessary, to tune to signals that may not be exactly on frequency.

TRANSMISSION

To transmit, press the Push to Talk Switch on the left side of microphone. The Red Lamp and S-Meter will operate to indicate transmission power.

WARNING: DO NOT PRESS TALK SWITCH BEFORE CONNECTING ANTENNA

DELTA FREQUENCY 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.

The center position of this control is the center of the channel frequency.

FUNCTION OF TRANSCEIVER STATUS LAMPS

RED: Indicates that the transceiver is in the transmit mode.

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WARNING: DO NOT PRESS TALK SWITCH BEFORE CONNECTING ANTENNA

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 ground.

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 to a comfortable listening level.
3. Turn the channel selector to the 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. The DELTA FREQUENCY CONTROL should be 1.0 KHz, when necessary, to tune to signals that may not be exactly on frequency.

TRANSMISSION

To transmit, press the Push to Talk Switch on the left side of microphone. The Red Lamp and S-Meter will operate to indicate transmission power.

WARNING: DO NOT PRESS TALK SWITCH BEFORE CONNECTING ANTENNA

FUNCTION OF METER

This meter has six 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. RECEIVER - ON INDICATOR: When receiving, meter illumination is green.
4. TRANSMITTER - ON INDICATOR: When transmitting, meter illumination is red.
5. MODULATION INDICATOR: The meter illumination fluctuates when the Transmitter is modulated.
6. 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 push 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.

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 red transmit lamp will light and fluctuates as you speak, indicating modulation.

C I R C U I T D E S C R I P T I O N

RECEIVER CIRCUIT

(Refer to attached block diagram and schematic diagram). The incoming signal

(fi) is amplified by RF amplifier Q1, mixed with the frequency of PLL oscillator IC 501, Q502, Q501 and Q6 (fvco). The incoming Frequency is converted to the 1st IF frequency (f3) by 1st mixer Q2.

Example

fi - fvco = f3

f3 : 10.695 MHz

fvco : 16.270 - 16.710 MHz

27.405 (CH40) - 16.710 = 10.695

1st local oscillator is commonly used for both transmit and receiver. 1st IF frequency is 10.695 MHz.

Incoming signals which are amplified and converted are supplied to 2nd mixer Q3, and 2nd local oscillator is IC 501 and Q7 (10.240 MHz) controlled by crystal. 2nd IF frequency is 455 KHz, and 2nd local oscillator frequency is 10.24 MHz (f4).

Example

f3 (10.695 MHz) - F4 (10.24 MHz) = 455 KHz

2nd IF signal of 455 KHz is amplified by Q4 and Q5 through mechanical filter and band pass filter, and detected by D5, D6.

Output signalof detector is amplified by audio amplifier Q20, Q21 and AF power amplifier Q22, Q23 after passing through the automatic noise limitter network (ANL). Q21, Q22 and Q23 are for both transmitter modulation and receiver audio. Q8 is squelch circuit.

PLL CIRCUIT

PLL frequency synthesizer system is used in this transceiver. 10.240 MHz is oscillated by IC 501 (PLL). Q502 (VCO) is variable frequency oscillator controlled by PLL (Voltage Controlled Oscillator) and frequency range are 16.270 to 16.710 MHz. VCO frequency and output signal from IC 501 (5,12MHz) are mixed by Q506 through buffer amplifier Q503 and Q505, and PLL is controlled by the

mixed frequency. VCO frequency through buffer amplifier Q501 and the frequency of the local oscillator Q504 are mixed by Q9 which is controlled by crystal.

TRANSMITTER CIRCUIT

(Refer to the attached block diagram and schematic diagram). The two frequencies of crystal oscillator Q505 (f5) and VCO Frequency which is amplified by Q6 are

mixed by Q10 and converted as below -

Example

f5 fvco = f TX Out

16.27 10.695 = 26.965 MHz (1 ch)

16.71 10.695 = 27.405 MHz (40 ch)

Output signal of Q10 are supplied to Q11 buffer amplifier, and through 27 MHz band pass filter. This signal is amplified by Q11, Q12 and Q13. Collector modulation is used in this transmitter. Driver Q12 and final RF power amplifier Q13 are modulated by the Class - B push-pull modulator Q22 and Q23 through transformer T16 with limitter to prevent over modulation. Harmonic spurious frequency are eliminated by LC filter. Input audio signal from microphone are amplified by Q19 (with limitter to prevent over modulation) and Q21, Q22, Q23.

OPERATION OF MODULATION LIMITTER

The audio input signal of the microphone is amplified by transistor Q19, Q21, Q22 and Q23. The output of Q22 and Q23 drive the modulation transformer T16. This modulation signal is detacted by diode, D8 and D9 to produce D.C. voltage proportional to the modulation level. This D.C. voltage is added to the gate voltage of Audio Limitter Circuit Q15 and Q16, and hence controls the gain Q17 and Q18. As modulation level increases the gain of Q17 and Q18 are reduced.

TRANSMITTER FREQUENCY STABILIZATION

The final transmitter frequency is determined by the difference in frequency of two highly stable quartz crystal oscillators. Any drift in these oscillators, whether caused by aging or temperature, is always in the same direction and hence, have a tendancy to cancel.

The basic block diagram for the fixed frequency and stabilizing system is as shown in the above figure.

The operational summary is as explained below;-

The transceiver uses PHASE LOCKED LOOP (PLL) frequency synthesizer system. Reference frequency is of 10.24 MHz and oscillates from Q509.

The reference frequency is divided at 1024 by the work of PLL (IC501) to gain reference signal of 10 KHz. The voltage controlled oscillator (VCO) functions as oscillator which varies oscillation frequency by the input DC voltage. This oscillator is composed by Q502 and its oscillation frequency gains frequencies ranging from 37.66 to 38.1 MHz. The VCO signal and the 36.75 MHz signal oscillated by Q507 are mixed by Q506, and are converted to signal ranging from 0.91 MHz to 1.35 MHz through Q505 buffer and jointed into PLL 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 divided frequencies ranging from 91 to 135 (CH1-CH40) which in result obtains 10 KHz signal by the programmable divider. The PLL phase detector compares both phases of reference 10 KHz 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 frequency. The VCO signal and 10.695 MHz crystal oscillation signal oscillated by Q504 are mixed by Q508 which in result obtains Transmitter frequency. VCO is also used as receiver to the first local oscillation signal through Q501 buffer amplifier (BUFF AMP).

The second local oscillation signal used 10.24 MHz reference signal oscillating at Q509.

Spurious Radiation:

Spurious radiation of transmitter are supressed by next circuits

Band Pass filter : T507, T508, T112, T114

Low Pass filter : L106, L107, L108, C110, C112, C114, C118

The second harmonic Trap : L109, C117

PHASE LOCKED LOOP

uPD 861C is CMOS LSI

intended for Phase Locked Loop

(PLL) Frequency Synthesizer for 40 channels Citizen Band transceiver.

MANUFACTURE :

SEMI - CONDUCTOR AND IC SALES DIVISION

NIPPON ELECTRIC COMPANY LIMITED

VOLTAGE AND CURRENT ON FINAL AMP.

TYPE Number : 2SC1306 or 2SC1975 or 2SC2029

(RFE : Manufacturer's Specification Sheet)

Manufactured by Nippon Electric Company or Matsushita Electronics Corp. or Fujitsu Limited.

DESCRIPTION

NPN Expitaxial Plener Silicon Transistor for high frequency Power amplifiers

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 Ampmeter : YOKOKAWA ELECTRO WORKS NO. 14
   V Voltmeter " " "

FUNCTION OF SOLID STATE DEVICES

1. DIODES

D2, 3	:	Receiver Input Protector
D4	:	Receiver Protector for Standly
D5, 6	:	Receiver Detector
D7	:	Noise Limitter
D8, 9	:	Modulation Limitter
D10	:	Transmitter Power Detector for Power indicator
D11, 12	:	Squelch
D13	:	Q13 Protector
D14	:	Voltage Regulator
D15, 16	:	DC Cut
D17	:	Protector
D18	:	TX Indicator
D19	:	RX Indicator
D501	:	Voltage Controlled Oscillator (Variable Capacitance Diode)
D502	:	Clarifier (Variable Capaxitance Diode)
D503	:	DC Switch
D504	:	Voltage Regulator
D505	:	Oscillator Control

2. IC

IC501	:	PLL Frequency Synthesizer

3. TRANSISTORS

Q1	:	Receiver RF Amp (RX TOP)
Q2	:	Receiver 1st Mixer
Q3	:	Receiver 2nd Mixer

Q4	:	Receiver IF Amp
Q5	:	"
Q6	:	1st Local OSC buffer Amp
Q7	:	2nd "
Q8	:	Squelch Amp
Q10	:	TX Amp
Q11	:	"
Q12	:	TX Driver
Q13	:	TX RF Power Amp
Q14	:	LED Driver
Q16	:	MOD Limitter
Q17	:	MIC Amp
Q18	:	"
Q19	:	"
Q20	:	RX AF Amp
Q21	:	AF Driver
Q22	:	Audio Output and Modulation Power Amp
Q23	:	"

Q501	:	VCO Buffer Amp
Q502	:	Voltage Controlled Oscillator (V.C.O.)
Q503	:	VCO Buffer Amp
Q504	:	TX Local Oscillator (10.695 MHz)
Q505	:	Buffer Amp
Q506	:	Mixer
Q507	:	Local Oscillator (36.75 MHz)
Q508	:	TX MIX Amp
Q509	:	PLL Reference Oscillator (10.24 MHz)

LIST OF EQUIVALENT TRANSISTOR

A.	FINAL AMP	2SC1306	NIPPON ELECTRIC COMPANY (NEC)
		2SC1975	MATSUSHITA ELECTRONICS CORP.
		2SC2029	FUJITSU LIMITED
B.	RF DRIVER	2SC1449	(NEC)
		2SC1973	MATSUDHITA
		2SC2028	FUJITSU
C.	MOD AMP	2SC1096	(NEC)
		2SC789	TOSHIBA
		2SC1226	MATSUSHITA
D.	RX RF AMP	2SC1675	(NEC)
		2SC829	MATSUSHITA
		2SC380	TOSHIBA
E.	RX IF, MIX	2SC945	(NEC)
		2SC828	MATSUSHITA
		2SC372	TOSHIBA
F.	MOD DRIVER	2SC227	(NEC)
		2SC509	TOSHIBA

ALIGNMENT PROCEDURE

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 GENERATOR
7. FC.....FREQUENCY COUNTER
8. DCV.....D.C. VOLTMETER

1. ALIGNMENT PROCEDURE OF P.L.L. SECTION

1.1) STANDARD FREQUENCY (10.24 MHz)

Set the channel of transceiver at CH20 and F (CLARIFIER) "O", and cinnect FC to Testing point. TP504

Align variable capacitor CV501 to obtain 10.240 MHz reading on FC.

1.2) VCO

Same condition of 1.1, connect FC to Drain of Q502, DCV to testing point TP501. Align T503 to obtain 2.8V D.C. reading on DCV and 37.90- MHZ reading on FC.

1.3) BUFFER AMP

Connect RF VTVM to Base of Q505, and align T506 to obtain maximum reading on RF VTVM.

1.4) LOCAL OSCILLATOR

Connect RF VTVM to testing point TP503 and align T506 to obtain maximum reading on RF VTVM.

1.5) TX LOCAL OSCILLATOR

Connect RF VTVM to collector of Q504 and align T505 to obtain maximum reading on RF VTVM.

1.6) VCO BUFFER AMP

Connect RF VTVM to point B and align T501 and T502 to obtain maximum reading on RF VTVM.

1.7) TX MIX AMP

Connect RF VTVM to point D and align T507 and T508 to obtain maximum reading on RF VTVM.

2. ALIGNMENT PROCEDURE OF TRANSMITTER SECTION

2.1) RF-Power - Amp

Set the channel of transceiver at CH20, align coils T112, T114 L101, L103, L105 and L107 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).5W (DC power ; 13.8V).

2.2) Frequency Deviation

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

2.3) Second Harmonics

Align coil L109 on channel 20 until spectrum analyzer indicates minimum scale reading (about 70 dB) and check for other spurious frequency.

2.4) Parastic and Self Oscillator

With the limitter circuit disabled, check the wave form at 100 percent modulation on all channels.

2.5) Limitter Circuit

2.5.1) Set audio input to 1 KHz at 3MV RMS.

2.5.2) Adjust VR3 for 50 percent modulation

2.5.3) Increase audio input to 30MV RMS.

2.5.4) Insure that 100 percent modulation is found in 2.5.4 above, re-adjust VR3 to give 99 - 100 percent modulation.

2.6) RF Meter

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

2.7) Noise Measurement (NB. ANL)

Check that noise voltage is less than 300MV on all channels, when NB ON and ANL ON.

2.8) Noise of PA.

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

2.9) RF Gain

Check effect of RF gain control.

3. ALIGNMENT PROCEDURE OF TRANSMITTER SECTION

3.1) RF Power - Amp

Set the channel of transceiver at CH20, align coils T14, T15, L1, L4, L5 and L7 for maxium 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 0.2W (DC power: 13.8V).

3.2), Frequency Deviation

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

3.3) Second Harmonics

Align coil L6 on channel 20 until spectrum analyzer indicates maxium scale reading and check for other spurious.

3.4) Parastic and Self Oscillator

With the limitter circuit disabled, check the wave from at 100 percent Modulation on all channels.

3.5) Limitter Circuit

3.5.1.) Set audio input to 1 KHZ at 3MV.

3.5.2.) Adjust VR4 for 50% 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 VR4 to give 99 - 100 percent modulation.

PARTS LIST

TRS Marketing Inc.

Circuit Symbol	Description	Type	Parts No.
IC. FET, TRANSISTORS & DIODES			
IC501	Intergrated Circuit	μPD861CE	10-001
Q1,3,6,7,11,501,503	Transistor	2SC1675	10-002
Q504,506,507,508	"	"	10-002
Q509	"	"	10-002
Q4,5,8,14,17-20	"	2SC945	10-003
Q505	"	"	10-003
Q10, 502	FET	2SK61Y	10-004
Q16	"	2SK30AY	10-005
Q12	Transistor	2SC2028	10-006
Q13	"	2SC2029	10-007
Q21	"	2SC 509	10-008
Q22, 23	"	2SC1096	10-009
D2-6,8-12,503,505	Diode	IS 953	10-010
D7	"	HV 80	10-011
D13, 15, 16, 17	"	V06E	10-012
D14	"	RD9.1FB	10-013
D18	"	IS1029	10-014
D501, 502	"	ISV50	10-015
D504	"	RD5.6EB	10-016
COILS & TRASFORMERS			
L101	Coil	K2009	11-001
L102	"	K1001	11-002
L103	"	K1002	11-003
L104	"	K1003	11-004
L105	"	K1004	11-005

PARTS LIST

TRS Marketing Inc.

Circuit Symbol	Description	Type	Parts No.
COILS & TRANSFORMERS (continued)			
L106	Coil	K1005	11-006
L107, 109	"	K1006	11-007
L108	"		11-008
L110	"		11-009
L501	Micro Inductor	L51-101K	11-010
L502	"		11-011
L11	(LFT Trans)		11-012
T101	Transformer	K2010	11-013
T102	"	K2011	11-014
T103	"	K2012	11-015
T104, 105	"	K2003	11-016
T106	"	K2004	11-017
T107, 108	"	K2006	11-018
T109	"	K2013	11-019
T110	"	K2014	11-020
T112, 114	"	K2008	11-021
T15	"	DRV	11-022
T16	"	MOD	11-023
T501, 502	"	K2016	11-024
T503	"	K2017	11-025
T504	"	K2018	11-026
T505	"	K2019	11-027
T506	"	K2020	11-028
T507	"	K2021	11-029
T508	"	K2022	11-030

PARTS LIST

TRS Marketing Inc.

Circuit Symbol	Description	Type	Parts No.
VARIABLE RESISTORS			
VR2, 6	Semi-Fixed Resistor	50K-V1/4W	12-001
VR3	" "	100K-B	12-002
VR4	" "	20K-B1/4W	12-003
VR5	" "	10K-B1/4W	12-004
VR8	" "	2K-B1/4W	12-005
VR1	Variable Resistor	GM81A002 -5M1612-10KAX2	12-006
VR7	" "	VM10A509-50KB	12-007
VR501	" "	VM10E151-10KB	12-008
RESISTORS			
R40, 44, 49	Carbon Resistor	RD1/4WPJ33 ohm	13-001
R99		" 51 "	13-002
R29,46,71,76,89		" 100 "	13-003
R93,94,97,98,100		" 100 "	13-003
R27, 38, 69, 77		" 220 "	13-004
R32		" 270 "	13-005
R23, 42, 52, 56, 83		" 470 "	13-006
R45, 55		" 680 "	13-007
R30, 41, 81		" 1K "	13-008
R1		" 1.2K "	13-009
R28		" 1.5K "	13-010
R101		" 2.2K "	13-011
R75, 80		" 4.7K "	13-012
R53,59,72,78,84		" 5.6K "	13-013
R19,34,39,43,48		" 6.8K "	13-014
R57, 67, 96		" 6.8K "	13-014
R58		" 10K "	13-015
R73		" 15K "	13-016

PARTS LIST

TRS Marketing Inc.

Circuit Symbol	Description	Type	Parts No.
RESISTORS (continued)			
R68		RD1/4WPJ18Kohm	13-017
R51, 62, 64, 79, 85	Carbon Resistor	" 22K "	13-018
R54		" 27K "	13-019
R20, 95		" 33K "	13-020
R92		" 47K "	13-021
R60, 61		" 68K "	13-022
R63		" 100K "	13-023
R31	(M)	RS1/2WPJ0.5ohm	13-024
R82		RS1WPJ680 ohm	13-025
R33		RS2WPJ8.2 "	13-026
R86		RS2WPJ120 "	13-027
R36	Carbon Resistor	RD1/4WPRJ10ohm	13-028
R87		" 33 "	13-029
R26,511,516,543,544,546		" 100 "	13-030
R16, 535		" 220 "	13-031
R547		" 330 "	13-032
R74, 502, 521, 530, 533		" 470 "	13-033
R35		" 680 "	13-034
R17,21,513,520,512,542		" 1K "	13-035
R13		" 1.8K"	13-036
R50,506,508,523,532		" 2.2K"	13-037
R534		" 2.2K"	13-037
R524,536		" 2.7K"	13-038
R37, 503		" 3.3K"	13-039
R12,18,65,70,539		" 4.7K"	13-040
R22		" 5.6K"	13-041
R15, 24		" 6.8K"	13-042
R509,525,545		" 10K "	13-043
R504, 514		" 12K "	13-044
R515, 537		" 15K "	13-045
R519, 540		" 22K "	13-046

PARTS LIST

TRS Marketing Inc.

Circuit Symbol	Description	Type	Parts No.
RESISTORS (continued)			
R505, 541	Carbon Resistor	RD1/4WPRJ27Kohm	13-047
R14, 25		" 33K "	13-048
R538		" 51K "	13-049
R522		" 75K "	13-050
R6, 9, 507		" 100K "	13-051
R528, 531		" 200K "	13-052
R8, 11		" 220K "	13-053
R526		" 330K "	13-054
R10, 510		" 470K	13-055
CAPACITORS			
C522	Tantalum Condenser	35V1 µF	14-001
C10	Electrolytic "	10V47 "	14-002
C121, 516		" 22 "	14-003
C26,38,45,62,82,18		16V10 "	14-004
C523, 554		" 10 "	14-004
C14, 20		" 33 "	14-005
C122		" 47 "	14-006
C22, 123		"470 "	14-007
C67, 166		35V10 "	14-008
C19		" 47 "	14-009
C7,11,64,65,66,521		50V 1 "	14-010
C152, 153		" 2.2	14-011
C81		" 3.3	14-012
C150, 509	Mylar Condenser	CQ92MC1H104M	14-013
C3, 12, 13		" 223M	14-014
C9, 16, 51, 56		" 333M	14-015

PARTS LIST

TRS Marketing Inc.

Circuit Symbol	Description	Type	Parts No.
CAPACITORS (continued)			
C63,504,525,526,540	Ceramic Condenser	50VB221K	14-016
C6,72,77,537,538		" 471K	14-017
C21, 33, 39		" 472K	14-018
C530, 531, 532, 533, 534		" 102P	14-019
C505, 510		50VCH050C	14-020
C527		" 100C	14-021
C69		" 100K	14-022
C116, 506		" 150K	14-023
C76,88,97,104,555		" 300K	14-024
C30,36,87,106,117		" 390K	14-025
C508		" 470K	14-026
C29,58,71,74,100		" 510K	14-027
C99		" 688K	14-028
C519, 551		" 101K	14-029
C118, 549		" 151K	14-030
C43		50VCK010C	14-031
C31, 80, 501, 553		" 020C	14-032
C518		" 030C	14-033
C94		50VCJ030C	14-034
C4,15,17,46,50,62		50VF 103Z	14-035
C502,503,511,512,513		" 103Z	14-035
C517,524,536,548		" 103Z	14-035
C8,23,25,28,35,37,40		" 203Z	14-036
C42,47,49,53,54,55			14-036
C59,60,61,70,73,75			14-036
C78,79,86,89,91,96,98			14-036
C101,103,108,109,113			14-036
C163, 115, 119, 120, 125			14-036
C126, 128, 129, 130, 140			14-036
C142, 165			14-036

PARTS LIST

TRS Marketing Inc.

Circuit Symbol	Description	Type	Parts No.
CAPACITORS (continued)			
C2,32,41,48,52,57	Ceramic Condenser	50VF203Z	14-036
C83,154,155,520,541		" 203Z	14-036
C542,543,545,546		" 203Z	14-036
C550		" 203Z	14-036
C27,34,105,111,124		" 473Z	14-045
C141		" 473Z	14-045
C110		50VSL121K	14-046
C90, 95		" 131K	14-047
C114		" 251K	14-048
C507		50VUJ180K	14-049
C529, 552		" 510K	14-050
C514, 515		" 620K	14-051
C112	Polystyrene Capacitor	CQ095-1H-470RD-K05B	14-052
C84, 85	Line By-Pass Capacitor	IHP53Y-F102PFA01	14-053
C501	Variable Capacitor	ECV-1ZW40x32	14-054
X'TALS			
X501	X'tal	10.695MHz	15-001
X502	"	10.240MHz	15-002
X503	"	36.750MHz	15-003
FILTER			
CFI	Ceramic Filter	CFU455Hz	16-001

PARTS LIST

TRS Marketing Inc.

Circuit Symbol	Description	Type	Parts No.
SWITCHES			
SW1	(PA-CB)	SLE64204B	17-001
SW2	(ANL)	SLE12207	17-002
SW501	(40CH)	CH Swich	17-003
LED			
TX-LD	LED	SEL103R	18-001
RX-LD	LED	SEL303E	18-002
MISCELLANEOUS			
SP	Speacker	S9G70B	19-001
	SP. Stopper		19-002
	SP. Cover		19-003
	Cover (Lower)		19-004
	Cover (Upper)		19-005
	Knob		19-006
	Knob		19-007
	CH. Filter		19-008
	Lable		19-009
	Name Plate		19-010
	FCC Lable		19-011
	MIC. Name Plate		19-012

PARTS LIST

TRS Marketing Inc.

Circuit Symbol	Description	Type	Parts No.
MISCELLANEOUS (continued)			
	MIC.		19-013
	Hunger		19-014
	Hunger Bolt		19-015
	Sub Panel		19-016
	Chassis		19-017
	Heat Sink A		19-018
	Heat Sink B		19-019
	Spacer		19-020
	Glomerate		19-021
	Washer		19-022
M1	Meter		19-023
PL	Lamp 14V (W)		19-024
PL-TX	Lamp 14V (R)		19-025
PL-RX	Lamp 6V (G)		19-026
	MIC. Connector		19-027
	Earth Lug		19-028
PA.SP, ET. SP	Jack	3.5ø	19-029
	Earth Lug		19-030
	MO Connector		19-031
	Connector	CN-3795	19-032
	Rivet		19-033
		BT2-2.6-6	19-034
		NI-2.3-5	19-035
		NI-2.6-4	19-036
		NI-2.6-6	19-037
		NI-3-8-3EF	19-038
		NI-3-10	19-039
		NT2-2.6-8	19-040
		PN1-3-6	19-041
		S1-2.6-5	19-042
		S1-2.6-6	19-043

PARTS LIST

TRS Marketing Inc.

Circuit Symbol	Description	Type	Parts No.
MISCELLANEOUS (continued)			
		SN1-3-8	19-044
		TP2-2.6-6	19-045
		TT2-5-14	19-046
		AHIN3	19-047
		3PIW	19-048
		3LMIW	19-049
	Power Cable		19-050
	Spacer A		19-051
	Spacer B		19-052
	Sealed Cover A		19-053
	Sealed Cover B		19-054
	PBKT Terminal		19-055
PCB			
	TX-RX PCB	MDK-910	20-001
	PLL PCB	MDK-910	20-001