Galaxy Saturn

Circuit Theory

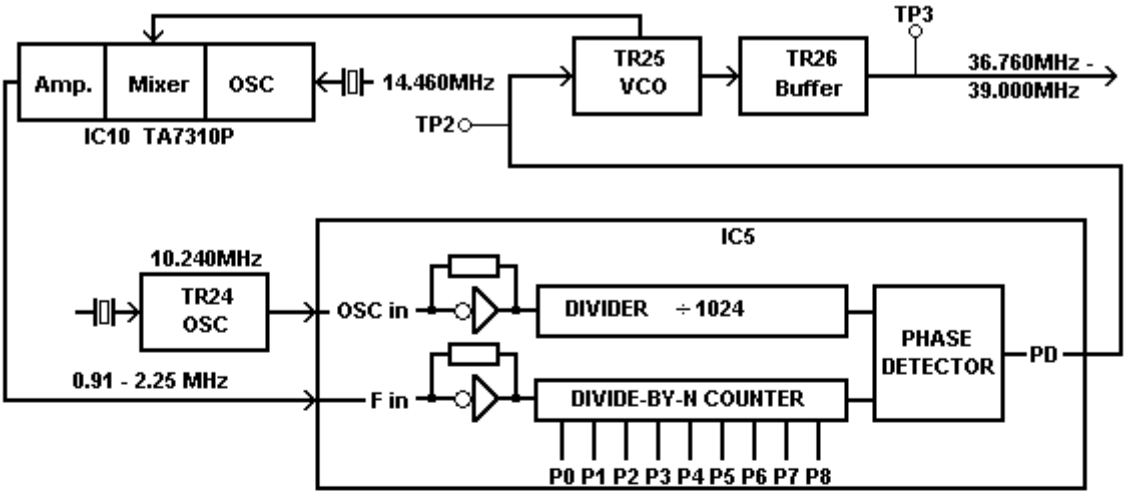
PLL Circuitry. PLL is an abbreviation of the phase-locked loop which is fundamentary composed of a closed loop feedback citcuit. The feedback component is the balance of frequency drift and the PLL circuit acts to cancel it out. To detect out the frcquency drift of the PLL output, a fixed reference ocillator (10 kHz, 1/1024 divided down from 10.240 MHz) is compared constantly with the input frequency (10 kHz). The input frequency is obtained by dividing the VCO frequency. A functionalI block diagram is provided below under "PLL Circuit" for the easier understanding.

Off-Set frequency oscillator IC10. The off-set-frequency oscillator IC10 oscillates at 14.460 MHz for all band. Switching between these oscillating frequencies is made by biasing the diodes D34 to D36.
The off-set frequency signal is obtained at IC10 Oscillator and flows into IC10 Mixer where it is beat with the VCO signal. The VCO signal is obtained from the following:
$f_{vco} = f_{off\text{-}set} + N_{fr}$
Where, f_{vco} = VCO frequency, N = programming code for divider output, and fr = referency frequency step (10kHz).

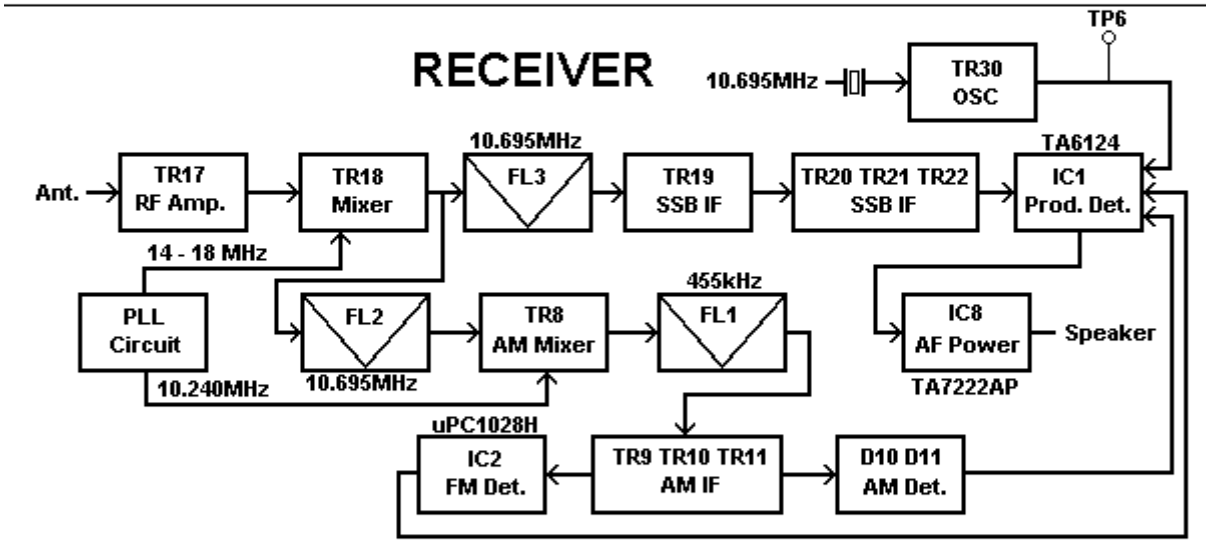
i.e.: At channel #1 in band A, and band corresponding N code is 91:
$f_{vco} = 14.010 + 91 \times 0.01 = 14.920$MHz.

Since the mixer output determined by two factors the off-set frequency output (dependent on band selector switch) and the VCO output, the mixer output contains the subtracted frequency of 0.91 to 2.25 MHz. These frequencies appears in pin #2 of IC5, and divided by the programmable divider in IC5 down to 10 kHz which is compared with another 10kHz signal obtained from the reference oscillator TR24 (10.240MHz).
The VCO output is mixed with the off-set frequency signal and applied to the TX mixer IC9 through band-pass filters.
i.e. At channel 1 in band A, and AM band, the TX mixer IC9 accepts 14.920 + 10.695MHz = 25.615MHz is TX frequency.
When receiving channe 1 in band A (26.065MHz), the 1st RX mixer TR18 accepts 15.370 local ignal at its base, and converts down it down to 10.695MHz IF (for AM/FM mode, this is the 1st intermediate frequency). TR18 off-sets the 10.695MHz signal so that TR30 can oscillate at 10.6975MHz for LSB.

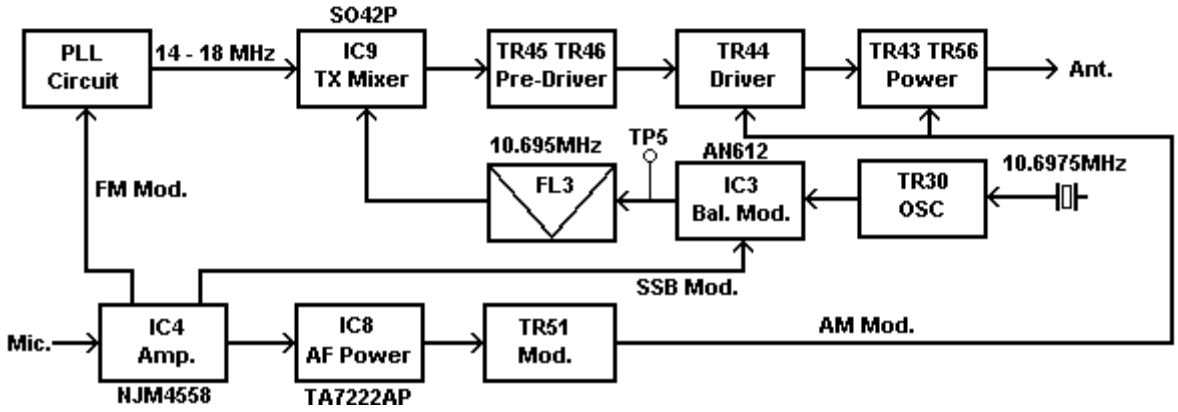
PLL CIRCUIT



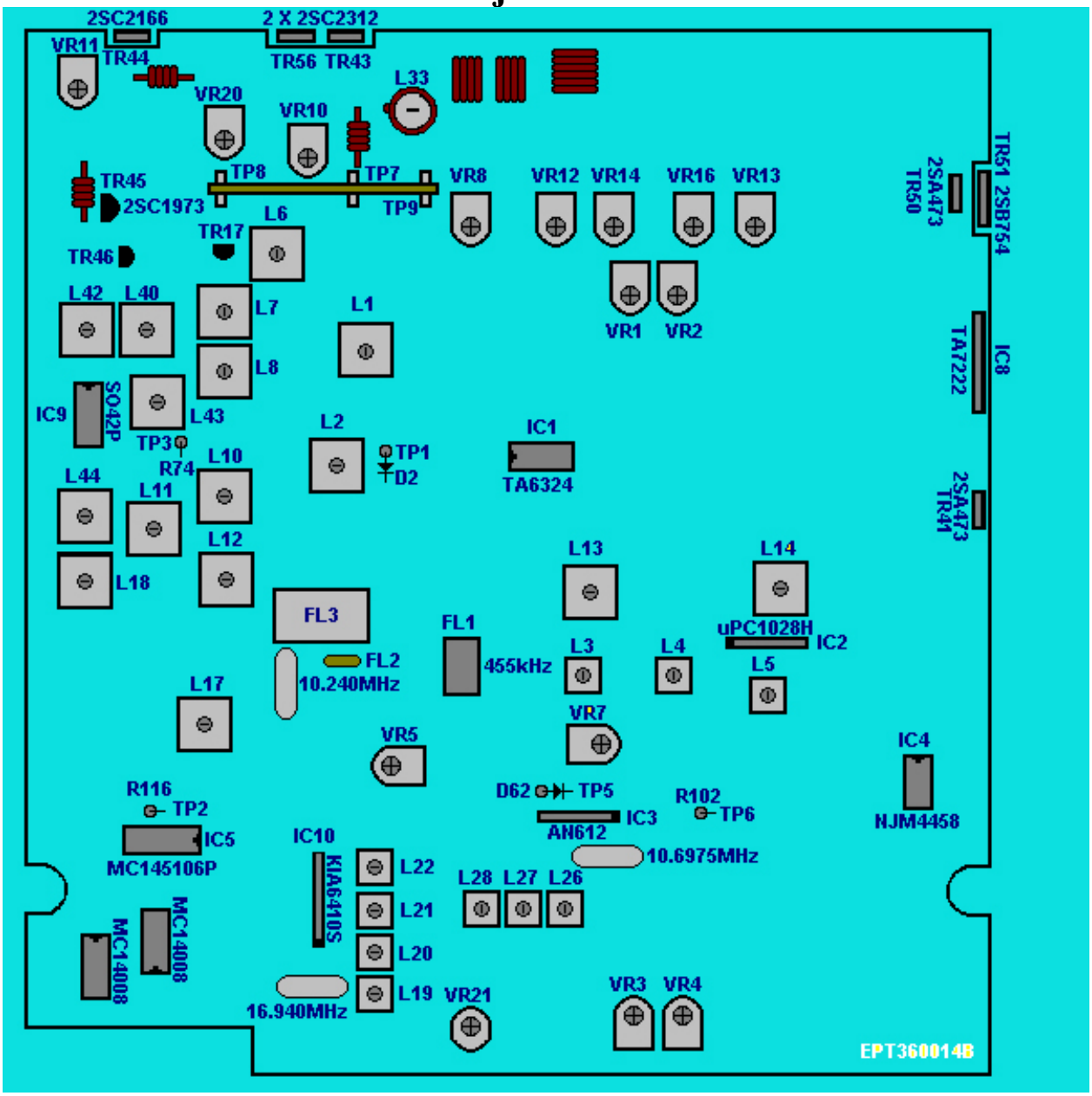
RECEIVER



TRANSMITTER



Adjustment



Test equipment required:

Power Supply: 13,8 V	Frequency Counter DC Amperemeter	Dummy Load 50 ohm RF SSG	Oscilloscope AF SSG

Preparation alignment:

Clarifier	Mid.
SQ GAIN	Max.
AF GAIN	Max.
RF GAIN	Max.
MIC GAIN	Max.
MOD, S/RF	S/RF
NB/ANL	Off
Band	D
Channel	19

Reading Point	Condition	Adjustment	Procedure
PLL			
IC5 Pin 3	-	Check	10.2400MHz
TP2	Band:D, Ch.:40	L17	5,0 Volt
TP3	-	L18	Maximum on Oscilloscope
OSCILLATOR			
IC10 Pin 9	AM	L19	16.9400MHz
IC10 Pin 9	USB	L20	16.9425MHz
IC10 Pin 9	LSB	L21	16.9375MHz
IC10 Pin 9	TX AM	VR21	16.9400MHz (TX-Frequency)
TP5	TX AM	L26	10.6950MHz
TP6	RX USB	L27	10.6925MHz
TP6	RX LSB	L28	10.6975MHz
TP5	TX USB	VR7	SSB Modulator Balance
RECEIVER			
	RX AM	L6 L7 L8	RF Input
	RX AM	L10 L11 L12	AM/FM/SSB IF
	RX AM	L3 L4	AM/FM IF
	RX FM	L5	Discriminator Coil (FM Demodulator)
TP1	RX USB	L1 L2	Noise Blanker IF
	RX USB	VR3	SSB Squelch
	RX AM	VR4	AM/FM Squelch
AM/FM S- Meter	RX AM	VR1	
SSB S- Meter	RX SSB	VR2	
TRANSMITTER			
TP9 (+) TP8 (-)	Bias Driver	VR11	10mA
TP9 (+) TP7 (-)	Bias Finale	VR10	100mA
TP9 (+) TP7 (-)	Bias Finale	VR20	100mA
	TX AM	L42	Maximum
	TX AM	L43	Mixer Coil (VCO-frequency input)
	TX AM	L44	Mixer Coil (TX-carrier 10.695MHz input)
	TX AM	L40 L42	Maximum RF output
	TX AM	L33	Minimum Harmonic
	TX AM	VR13	15 Watt (30 Watt with Dual Finale output) AM/FM
	TX USB	VR12	20 Watt (40 Watt with Dual Finale output) SSB (ALC)
	TX AM	VR14	90% AM-Modulation (AMC)
	TX FM	VR5	2 kHz FM-Deviation
	TX CW	VR16	CW Tone (Not in all model`s)
Power Meter	TX AM	VR8	

Microphone Connection

Pin	Description
1	Ground
2	Microphone
3	TX Key (Connect to Ground)
4	Speaker (Connect to Ground)

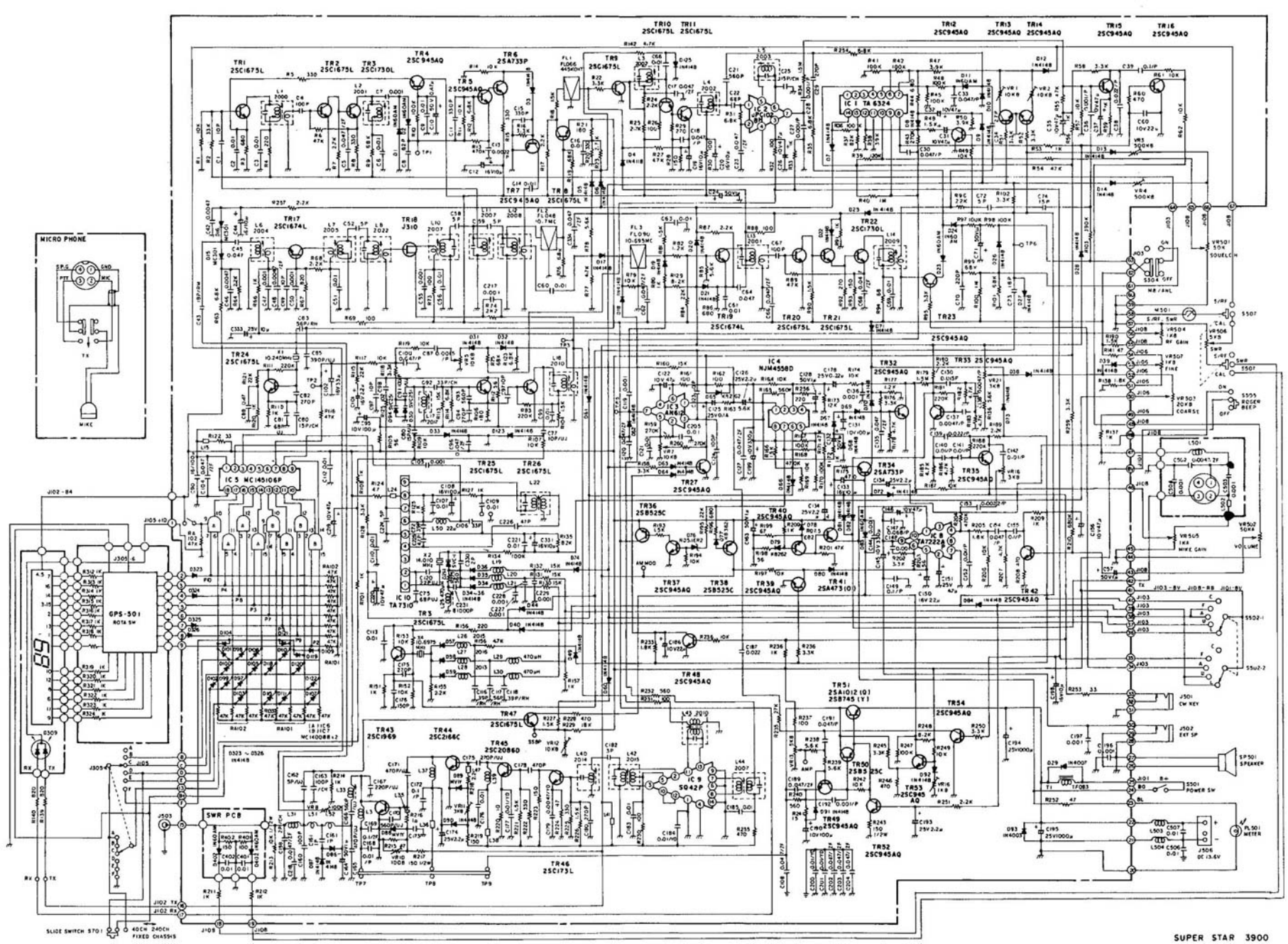
Dual Finale output modification
PLL and Frequency band modification
Frequency List

COMPONENTS

MC145106P PLL Frequency Synthesizer
S042P TX Mixer
KIA6410S Oscillator, Mixer and Amplifier
uPC1028H FM IF Amplifier and Detector
AN612 Balanced SSB Modulator
TA7222 Audio Power Amplifier
NJM4558 Dual Operational Amplifier
TA6324 Quad Operational Amplifier
2SC1969 RF Finale Transistor (SuperStar 3900)
2SC2312 RF Finale Transistor (Alan 87)
2SC2166 RF Driver Transistor
2SC2086 RF Pre-Driver Transistor
2SB754 LF Power Transistor
2SA473 LF Power Transistor

Improved receive gain

Quieting of AM reception and improving gain of incoming signals is a common request from radio operators. In the first stages of the HF input 2SC1674 transistor can be found. This transistor is responsible for the amplification of a small detected signals. A problems exist if the transistor itself is noisy as is such the case of the 2SC1674 when compared to other low noise packages. Along with the amplification of the incoming signals is transistor noise. Replacement of this transistor with a higher gain, lower noise transistor greatly improves the signal to noise ratio of your receiver.
We will use an 2SC2999 transistor that has higher gain lower noise characteristic. Replace the 2SC1674 (TR17) with an 2SC2999 (or similar low noise and high gain transistor) to achieve this improved signal to noise ratio.
Re-Adjust L6 and L7
The gain will improved with more than 6dB with the same signal to noise ratio.


MICRO PHONE
SPKR
GND
PTT
MIC
TX
MIKE
TR1 2SC1675L
TR2 2SC1675L
TR3 2SC1730L
TR4 2SC945AQ
TR5 2SC945AQ
TR6 2SA733P
TR7 2SC945AQ
TR8 2SC1675L R
TR9 2SC1675L
TR10 2SC1675L
TR11 2SC1675L
TR12 2SC945AQ
TR13 2SC945AQ
TR14 2SC945AQ
TR15 2SC945AQ
TR16 2SC945AQ
IC 1 TA 6324
TR17 2SC1674L
TR18 J310
TR19 2SC1675L
TR20 2SC1675L
TR21 2SC1675L
TR22 2SC1730L
TR23 2SC945AQ
TR24 2SC1675L
TR25 2SC1675L
TR26 2SC1675L
TR27 2SC945AQ
IC 4 NJM4558D
TR32 2SC945AQ
TR33 2SC945AQ
TR34 2SA733P
TR35 2SC945AQ
TR36 2SB525C
TR37 2SC945AQ
TR38 2SB525C
TR39 2SC945AQ
TR40 2SC945AQ
TR41 2SA473(O)
TR42 2SC945AQ
IC 5 MC145106P
GPS-501
ROTA SW
IC 10 TA7310
TR3 2SC1675L
TR43 2SC1969
TR44 2SC2166C
TR45 2SC2086O
TR46 2SC1730L
TR47 2SC1675L
TR48 2SC945AQ
TR51 2SA1012 (O) 2SB745 (Y)
TR52 2SC945AQ
TR53 2SC945 AQ
TR54 2SC945AQ
IC 9 SO42P
SWR PCB
SLIDE SWITCH S701
40CH 240CH
FIXED CHASSIS
SUPER STAR 3900