SERVICE MANUAL

ADDITIONAL INFORMATION ON MODEL RT-1020L

Notice: **CONTROL CIRCUIT ASSEMBLY OF MODEL RT-1020L**

On account of modification due to improvement, conventional Assembly RWG-040 will be replaced by a new type of Assembly RWG-037-A starting at the serial No. 14351 and the following in serial order.

Subject:

(1) Conventional Assembly RWG-040 and improved version RWG-037-A are mutually interchangeable.

(2) You are requested to make use of this additional information together with the furnished service manual.

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CIRCUIT DESCRIPTION

The addition of a transistor to the control circuit (the timing circuit operative when switching from Fast Forward or Rewind to Playback) has increased the stability of the relay timing (i.e. the delay).
The summary of the circuit is shown in Fig. 1. It operates as follows:

RELAY FUNCTIONS (Fig. 1)

The control circuit employs three relays which function as follows:

RL601... functions during Fast Forward and Rewind.
Switching to Fast Forward (or Rewind), negative bias is applied to the base of transistor Q604 via resistor R613 ~ diode D613 ~ R609 ~ switch S17-2 (S16-2), the transistor comes ON, and the relay operates.

RL602... functions during Playback and Recording.
Switching to Playback or Recording functions, current flows through the fuse resistor FR602 ~ RL602 ~ relay contact RL601 ~ S20 ~ S18-1 ~ S16-2 ~ S17-2 and the relay operates.

RL603... functions at 'Stop' (which means the stopping of tape running).
When the POWER switch S12 and the shut-off switch S15 are ON, current flows through D605 ~ FR603 ~ RL603 ~ S18-1 ~ S16-2 ~ S17-2 and the relay operates.

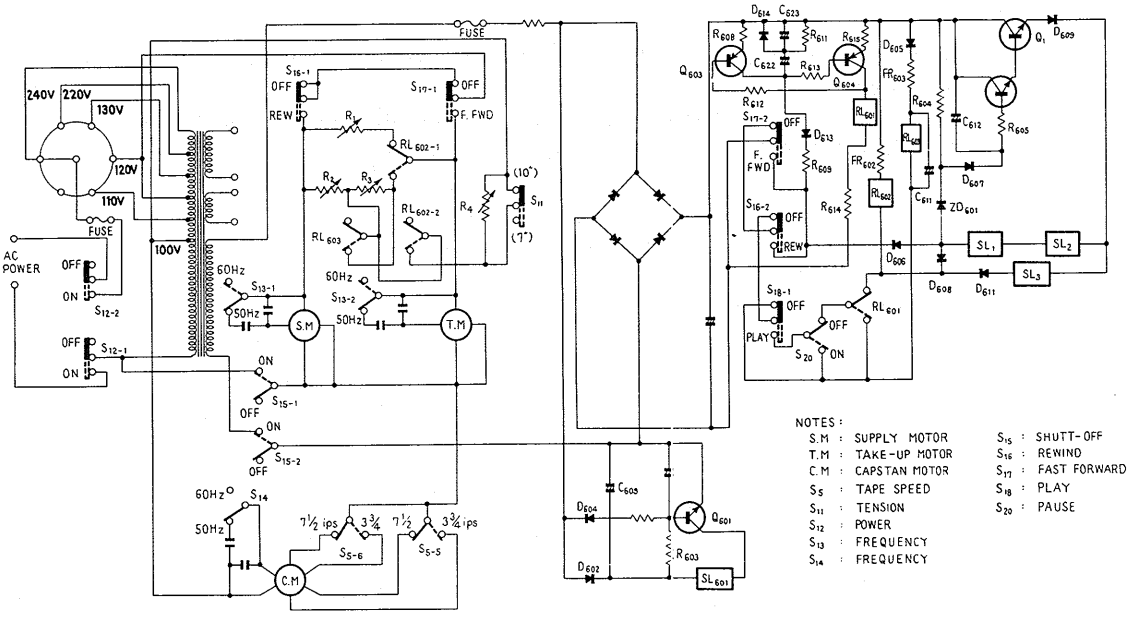


Fig. 1

PROTECTIVE CIRCUIT AT PLAYBACK FOLLOWING FAST FORWARD (OR REWIND) (Fig. 2)

When switching directly from Fast Forward (or Rewind) to Playback, in order to protect the tape, the high-speed tape motion is arrested for a moment before being resumed at the normal speed.

1. When the tape deck has been set to Stop or the Playback mode, a negative bias is applied to the base of Q_{603} via $R_{612} \sim RL_{601} \sim R_{614}$, and Q_{603} is conductive.
2. When switching to Fast Forward (or Rewind), the base of Q_{604} is biased negatively via $R_{613} \sim D_{613} \sim R_{609} \sim S_{17\text{-}2}$ (or $S_{16\text{-}2}$), so that Q_{604} goes ON.
   This, in turn, via the Q_{604} collector and R_{612} drives the base of Q_{603} positive, and Q_{603} cuts off.
   Further, at this time C_{622} is fed by a charging current via R_{611} (C_{623}) $\sim C_{622} \sim D_{613} \sim R_{609} \sim S_{17\text{-}2}$ (or $S_{16\text{-}2}$).

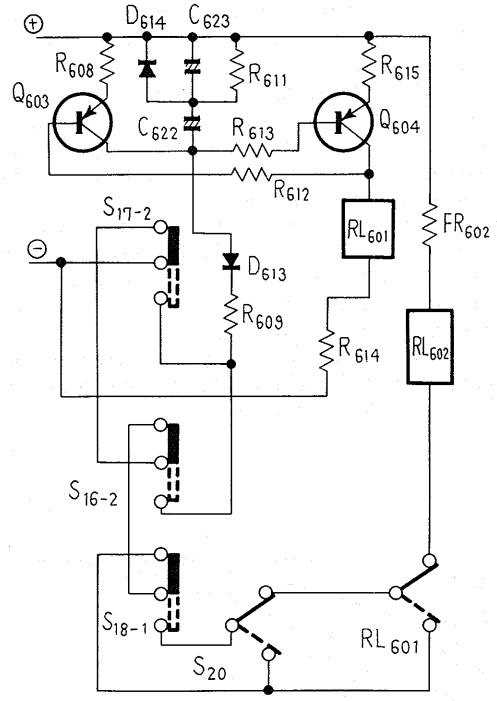


Fig. 2

3. When switching from Fast Forward (or Rewind) to the Playback mode, $S_{17\text{-}2}$ (or $S_{16\text{-}2}$) returns to the OFF position, and the bias on the base of Q_{604} mentioned in step 2 above disappears, but a discharge current from the charge accumulated in C_{622} flows via $D_{614} \sim R_{615} \sim Q_{604} \sim R_{613}$, and this forms the base current of Q_{604}. In this way Q_{604} remains ON for 6 ~ 7 seconds holding relay RL_{601} operative.
4. While RL_{601} is operative, as shown in Fig. 2, the relay contact RL_{601} is as indicated by the dotted lines, and current does not flow to RL_{602}, which does not operate.
5. As the discharge current from C_{622} (the base current of Q_{604}) gradually reduces, the internal resistance of Q_{604} increases. Thus, a voltage appears between the emitter and collector of Q_{604}.
6. When the potential difference between the emitter and collector of Q_{604} reaches a certain value (3V), the base of Q_{603} is biased negatively via $R_{614} \sim RL_{601} \sim R_{612}$. Q_{603} therefore becomes conductive, and C_{622} is rapidly discharged via $D_{614} \sim R_{608} \sim Q_{603}$.
   For this reason Q_{604} goes OFF and relay RL_{601} is restored.
7. Upon the restoration of relay RL_{601}, a current flows through $FR_{602} \sim RL_{602} \sim$ relay contact $RL_{601} \sim S_{20} \sim S_{18\text{-}1} \sim S_{16\text{-}2} \sim S_{17\text{-}2}$, and causes relay RL_{602} to operate. This ensures that current is supplied to the motors and that the tape runs at the normal speed.

WHEN FAST FORWARD (OR REWIND) IS PERFORMED FOR ONLY 0.5 sec. OR LESS (Figs. 2, 3 and 4)

When Fast Forward (or Rewind) is only performed for an extremely short time (0.5 sec. or less) before switching to the Playback mode, there may be contingency of tape slack or breakage. To eliminate this accidental happening, C_{623} has been fitted.

Operation of C_{623}

During Fast Forward operation (or Rewind), as indicated in step 2, Q_{604} is ON and relay RL_{601} is operative.

a. If we assume that C_{623} is omitted from the circuit, it would be equal to the circuit shown in Fig. 3-(1), where C_{622} is charged via R_{611}.
b. Upon switching to the Playback mode, if the charging time is less than 0.5 sec. C_{622} will not be charged sufficiently to keep Q_{604} conductive, so that Q_{604} will cut off immediately.
c. This would mean that the motion of the tape would change from Fast Forward (or Rewind) to the Playback mode without first momentarily stopping, which would give rise to tape breakage.

As is evident from Fig. 3-(2), with C_{623} present and C_{622} almost instantaneously charge sufficiently to give a base current which will ensure the operation of Q_{604} (the charging current only flows in C_{623} and C_{622}).
In this case, even if the deck is switched to the Playback mode, there will be a short period during which Q_{604} will be ON, and relay RL_{601} maintained operative.
As shown in Fig. 3-(2), the charge on C_{623} and C_{622} will be discharged through $D_{604} \sim R_{615} \sim Q_{604} \sim R_{613}$ and form the base current of Q_{604}, maintaining Q_{604} in the ON state. (It flows primarily in the initial stages of the charge of C_{623}.)

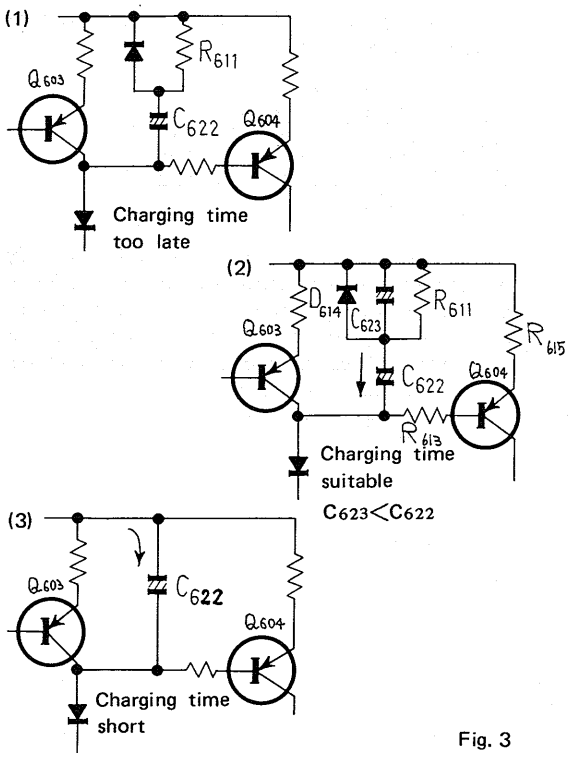


Fig. 3

WHEN FAST FORWARD (OR REWIND) IS PERFORMED FOR ONLY BETWEEN 0.5 AND 8 sec.

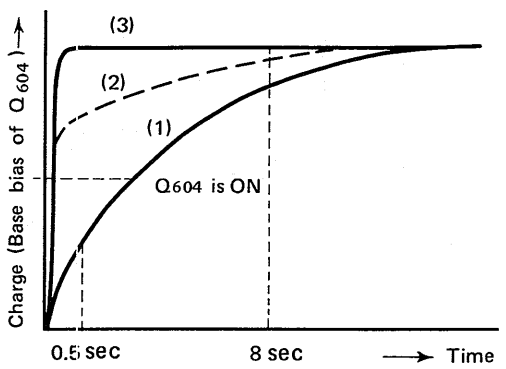
When Fast Forward (or Rewind) is performed for only between 0.5 and 8 sec. before switching to the Playback mode, in order to reduce the waiting time before the tape commences motion, R_{611} has been fitted.

Operation of R_{611}

During Fast Forward operation (or Rewind), as indicated in step 2, Q_{604} is ON and relay RL_{601} is operative.

a. If we assume that R_{611} is omitted from the circuit, it would be equal to the circuit shown in Fig. 3-(3), where C_{622} would be abruptly charged fully in an extremely small span of time.
b. Upon switching to the Playback mode, because C_{622} will be fully charged, discharge will take some time, so Q_{604} is ON (and RL_{601} operative) for some considerable time.
c. This would mean that the tape would only begin to run at normal speed after some 6 or 7 seconds.

As is evident from Fig. 3-(2), with R_{611} present, because C_{622} is charged via R_{611}, there is an increase in the time taken to charge it: the charging time as short as 0.5 to 8 sec. is not enough to fully change it.
In this case, if the deck is switched to the Playback mode, C_{622} will be discharged via $D_{614} \sim R_{615} \sim Q_{604} \sim R_{613}$, and the discharge time (the time for which Q_{604} remains ON) will be shortened.
There is actually a very small current which flows as a discharge current through C_{623} and R_{611}, but it is negligible

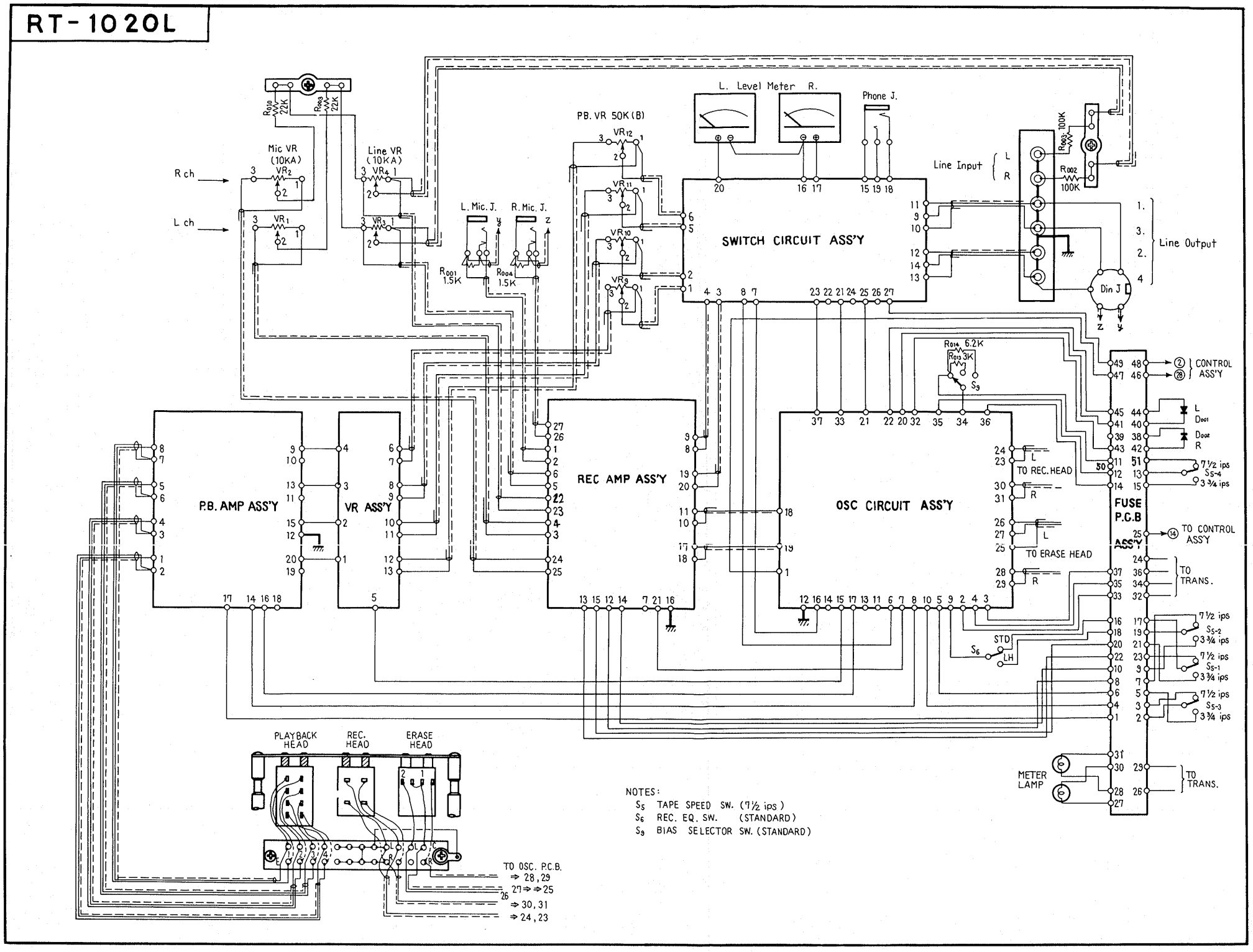


How C622 is charged in state (1), (2) and (3) of Fig. 3 is diagramed in curves (1), (2) and (3) in Fig. 4.

Fig. 4

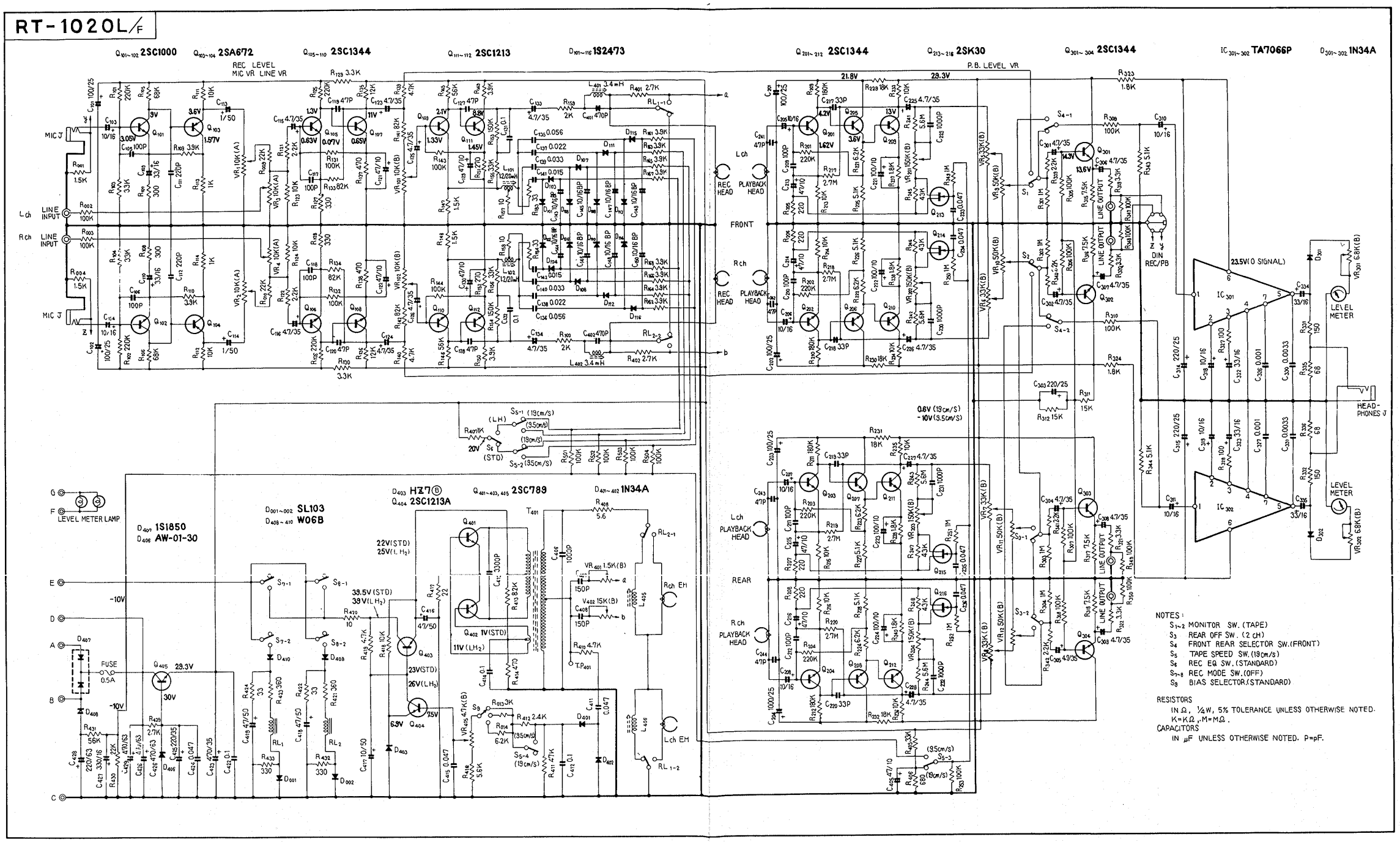
SCHEMATIC DIAGRAMS, P.C. BOARD PATTERN AND PARTS LIST

CONNECTION DIAGRAM



SCHEMATIC DIAGRAM (AMPLIFIER)

RT-1020L/F

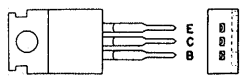


NOTES:
- $S_{1\sim2}$ MONITOR SW. (TAPE)
- S_3 REAR OFF SW. (2 CH)
- S_4 FRONT REAR SELECTOR SW. (FRONT)
- S_5 TAPE SPEED SW. (19cm/s)
- S_6 REC EQ SW. (STANDARD)
- $S_{7\sim8}$ REC MODE SW. (OFF)
- S_9 BIAS SELECTOR (STANDARD)

RESISTORS
Ω, ¼W, 5% TOLERANCE UNLESS OTHERWISE NOTED.
K=KΩ, M=MΩ.
CAPACITORS
μF UNLESS OTHERWISE NOTED. P=pF.

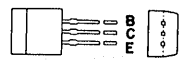
2SA672
2SC1344

2SC789

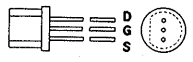


2SC1000

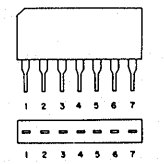
2SC1213
2SC1213A



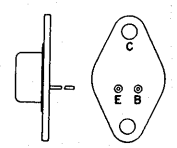
2SK30



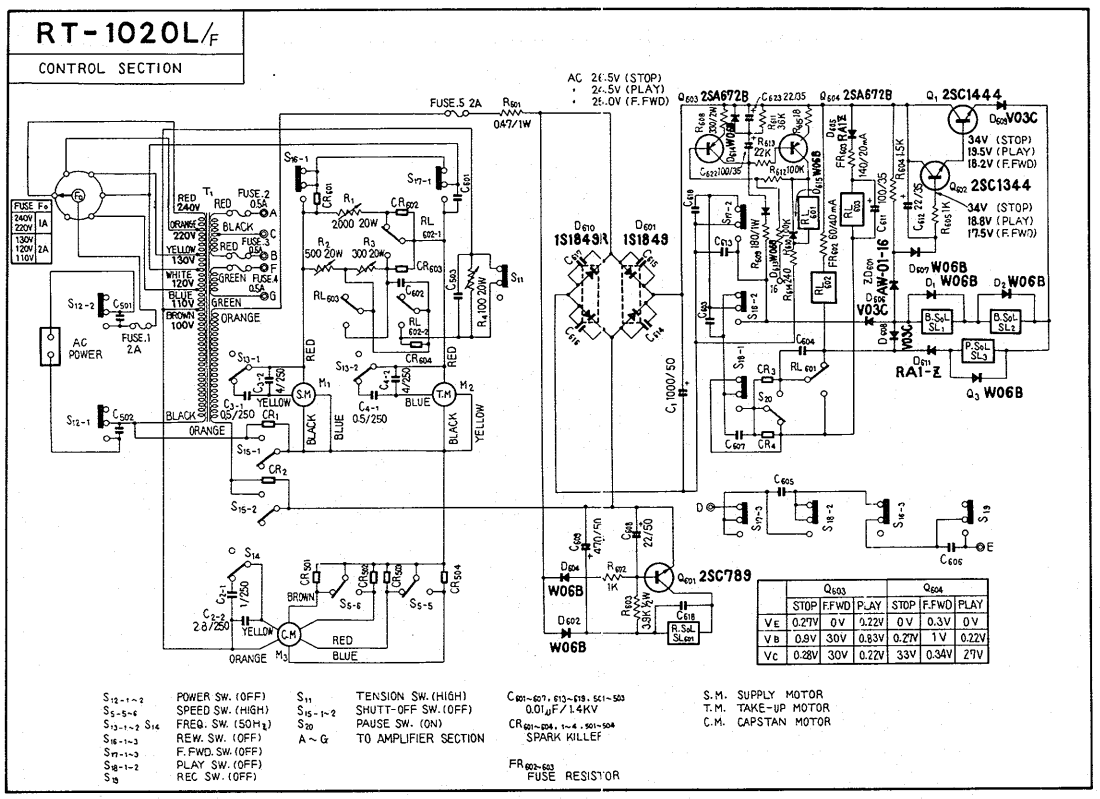
TA7066P



2SC1444



CONNECTION DIAGRAM (CONTROL)



	Q603			Q604		
	STOP	F.FWD	PLAY	STOP	F.FWD	PLAY
VE	0.27V	0V	0.22V	0V	0.3V	0V
VB	0.9V	30V	0.83V	0.27V	1V	0.22V
Vc	0.28V	30V	0.22V	33V	0.34V	27V

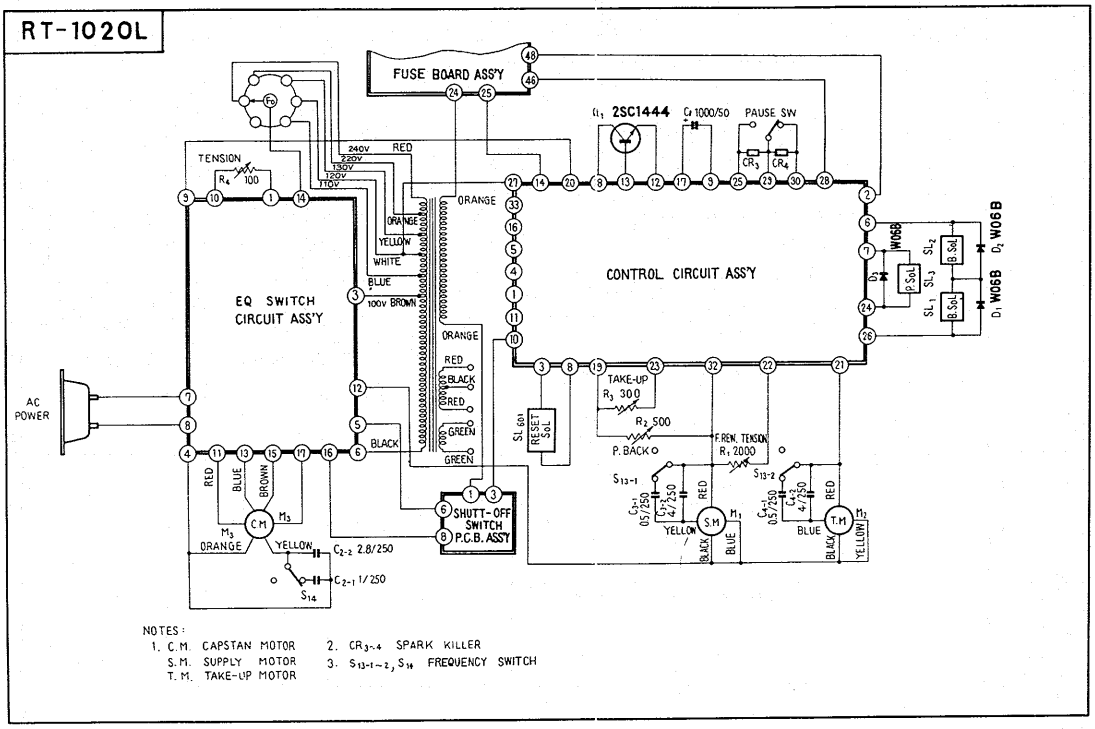
$S_{12-1\sim2}$ POWER SW. (OFF)
$S_{5-5\sim6}$ SPEED SW. (HIGH)
$S_{13-1\sim2}$ S_{14} FREQ. SW. (50Hz)
$S_{16-1\sim3}$ REW. SW. (OFF)
$S_{17-1\sim3}$ F.FWD. SW. (OFF)
$S_{18-1\sim2}$ PLAY SW. (OFF)
S_{19} REC SW. (OFF)

S_{11} TENSION SW. (HIGH)
$S_{15-1\sim2}$ SHUTT-OFF SW. (OFF)
S_{20} PAUSE SW. (ON)
A ~ G TO AMPLIFIER SECTION

$C_{601\sim607,\ 613\sim618,\ 501\sim503}$ 0.01μF / 1.4KV
$CR_{601\sim604,\ 1\sim4,\ 501\sim504}$ SPARK KILLER
$FR_{601\sim603}$ FUSE RESISTOR

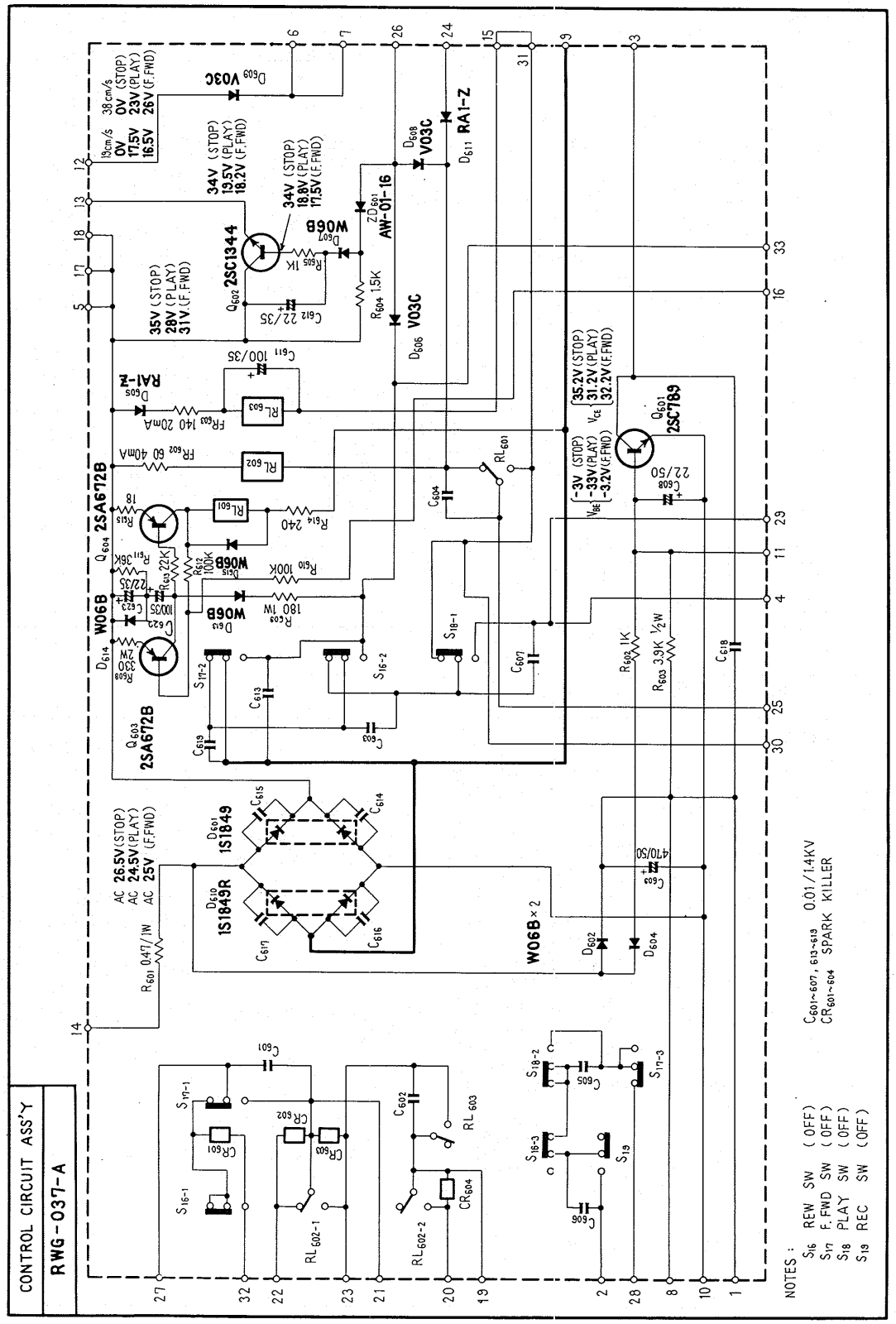
S.M. SUPPLY MOTOR
T.M. TAKE-UP MOTOR
C.M. CAPSTAN MOTOR

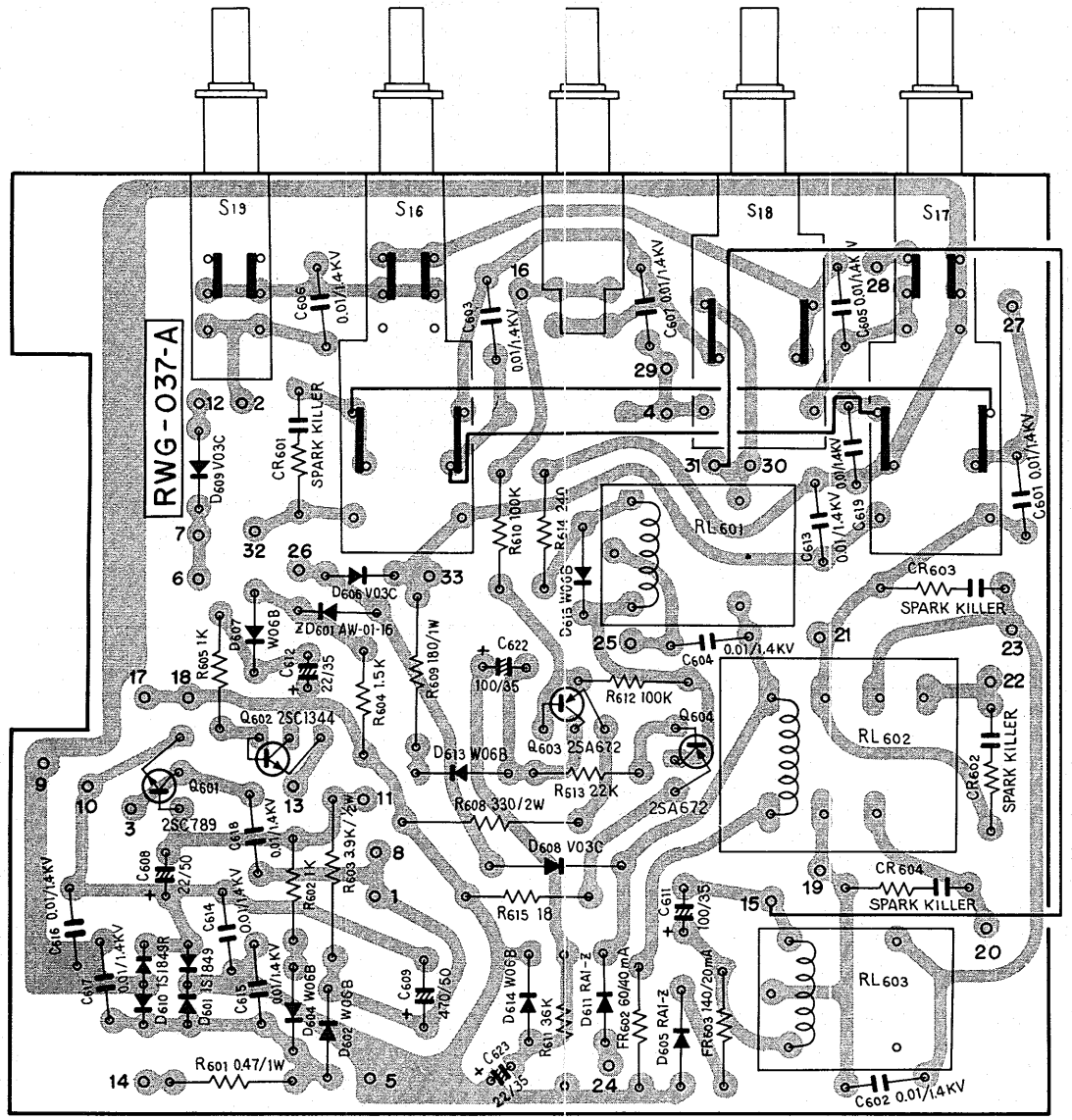
SCHEMATIC DIAGRAM (CONTROL)



NOTES:
1. C.M. CAPSTAN MOTOR
S.M. SUPPLY MOTOR
T.M. TAKE-UP MOTOR
2. $CR_{3\sim4}$ SPARK KILLER
3. $S_{13-1\sim2}$, S_{14} FREQUENCY SWITCH

CONTROL CIRCUIT ASSEMBLY (RWG-037-A)




RWG-037-A
S19
S16
S18
S17
RL601
RL602
RL603
CR601 SPARK KILLER
CR602 SPARK KILLER
CR603 SPARK KILLER
CR604 SPARK KILLER
D609 V03C
D606 V03C
ZD601 AW-01-16
D607 W06B
D613 W06B
D608 V03C
D614 W06B
D604 W06B
D602 W06B
D610 1S1849R
D601 1S1849
D611 RA1-Z
D605 RA1-Z
Q602 2SC1344
Q601 2SC789
Q603 2SA672
Q604 2SA672
R610 100K
R614 220
R612 100K
R605 1K
R604 1.5K
R609 180/1W
R613 22K
R608 330/2W
R603 3.9K/2W
R602 1K
R615 18
R601 0.47/1W
R611 36K
FR602 60/40mA
FR603 140/20mA
C622 100/35
C612 22/35
C608 22/50
C609 470/50
C611 100/35
C623 22/35
C606 0.01/1.4KV
C603 0.01/1.4KV
C607 0.01/1.4KV
C605 0.01/1.4KV
C601 0.01/1.4KV
C613 0.01/1.4KV
C619 0.01/1.4KV
C604 0.01/1.4KV
C618 0.01/1.4KV
C614 0.01/1.4KV
C615 0.01/1.4KV
C616 0.01/1.4KV
C617 0.01/1.4KV
C602 0.01/1.4KV

Foil side

Parts List of Control Circuit Assembly

● CAPACITORS: IN μ F UNLESS OTHERWISE NOTED p:pF
● RESISTORS: IN Ω, ¼W UNLESS OTHERWISE NOTED k:kΩ, M: MΩ

CAPACITORS

Symbol	Description			Part No.	
C601	Ceramic	0.01	DC 1.4kV	C43-003-O	
C602	Ceramic	0.01	DC 1.4kV	C43-003-O	
C603	Ceramic	0.01	DC 1.4kV	C43-003-O	
C604	Ceramic	0.01	DC 1.4kV	C43-003-O	
C605	Ceramic	0.01	DC 1.4kV	C43-003-O	
C606	Ceramic	0.01	DC 1.4kV	C43-003-O	
C607	Ceramic	0.01	DC 1.4kV	C43-003-O	
C608	Electrolytic	22	50V	CEA 220P 50	
C609	Electrolytic	470	50V	CEA 471P 50	
C610					
C611	Electrolytic	100	35V	CEA 101P 35	
C612	Electrolytic	22	35V	CEA 220P 35	
C613	Ceramic	0.01	DC 1.4kV	C43-003-O	
C614	Ceramic	0.01	DC 1.4kV	C43-003-O	
C615	Ceramic	0.01	DC 1.4kV	C43-003-O	
C616	Ceramic	0.01	DC 1.4kV	C43-003-O	
C617	Ceramic	0.01	DC 1.4kV	C43-003-O	
C618	Ceramic	0.01	DC 1.4kV	C43-003-O	
C619	Ceramic	0.01	DC 1.4kV	C43-003-O	
C620					
C621					
C622	Electrolytic	100	35V	CEA 101P 35	
C623	Electrolytic	22	35V	CEA 220P 35	

RESISTORS

Symbol	Description			Part No.	
R601	Wire wound	0.47	1W	PT1P R47K	
R602	Carbon film	1k		RD¼PS 102J	
R603	Carbon film	3.9k	½W	RD½PW 392J	
R604	Carbon film	1.5k		RD¼PS 152J	
R605	Carbon film	1k		RD¼PS 102J	
R606					
R607					
R608	Metal oxide	330	2W	RS2P 331J	
R609	Metal oxide	180	1W	RS1P 181J	
R610	Carbon film	100k		RD¼PS 104J	
R611	Carbon film	36k		RD¼PS 363J	
R612	Carbon film	100k		RD¼PS 104J	
R613	Carbon film	22k		RD¼PS 223J	
R614	Carbon film	240		RD¼PSF 241J	
R615	Carbon film	18		RD¼PS 180J	

SEMICONDUCTORS

Symbol	Description		Part No.	
Q601	Transistor	2SC789-O or Y		
Q602	Transistor	2SC1344-D or E		
Q603	Transistor	2SA672-B		
Q604	Transistor	2SA672-B		
D601	Diode	1S1849		
D602	Diode	W06B		
D603				
D604	Diode	W06B		
D605	Diode	RA1-Z		
D606	Diode	V03C		
D607	Diode	W06B		
D608	Diode	V03C		
D609	Diode	V03C		
D610	Diode	1S1849R		
D611	Diode	RA1-Z		
D613	Diode	W06B		
D614	Diode	W06B		
D615	Diode	W06B		
ZD601	Zener diode	AW01-16		

OTHERS

Symbol	Description	Part No.	
CR601	Spark Killer	RWX-030-O	
CR602	Spark Killer	RWX-030-O	
CR603	Spark Killer	RWX-030-O	
CR604	Spark Killer	RWX-030-O	
FR602	Metal film fuse resistor 60Ω/40mA	REK-012-B	
FR603	Metal film fuse resistor 140Ω/20mA	REK-013-B	
S16	Switch (REW)	RSG-013-A	
S17	Switch (F. FWD)	RSG-013-A	
S18	Switch (PLAY)	RSG-013-A	
S19	Switch (REC)	RSG-013-A	
RL601	Timing relay	RSR-011-O	
RL602	Relay	RSR-016-O	
RL603	Timing relay	RSR-011-O	
	Capacitor sleeve (A)	REC-150-O	

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