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KODEN

SERVICE MANUAL

DRILLING MONITOR

DM-682/684

This product is specifically desingned to be installed on boats and other means of maritime transport. If your country forms part to the EU, please contact your dealer for advice before attempting to install elsewhere.

DM-682/642.SM.E. 0093870122-04

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1. General

The drilling monitors DM-682/684 series were developed as predecessors for the DM-686/686 drilling monitors. The functions of this series are mostly identical to former models; however, a newly employed Micro Processor Chip replaces most of the control hardware sections. This allows the number of component parts to greatly be reduced while the effective and simple serviceability are maintained. From safety reason, a leakage current detector and a high voltage protection circuit are used in the recorder unit. These elements protect the whole system from possible failure caused by jets of water for cleaning or a wrong power supply connection to a higher AC power source. Also, a Non Fuse Breaker (NFB) is newly employed that replaces a conventional tubular fuse, needing no provisions for spare fuses.

Scope of the service manual

This service manual can be used for servicing the following drilling monitor models.

DM-684684253 and after

DM-682682251 and after

For the equipment with serial numbers specified below, please contact KODEN for technical assistance.

DM-684684251, 684684252, 682682251 - 682682258

1.1 Major Specifications

Recorder unit

***Specifications subject to change without notice.**

Measuring system			Ultrasonic echo sensing system			
Recording system		DM-682	Direct recording using the belt. Measurement is available in two directions (X - X' or Y - Y').			
		DM-684	Direct recording using the belt. Simultaneous measurement is available in four directions (X, X', Y, Y').			
Recording paper			Electrosensitive recording paper 250 mm x 20 m (DMP-250)			
Frequency			100 kHz			
Transmitting output power			5 W			
Directional angle			25 ° (half value at all angle)			
Pulse repetition rate (PRR)			2500 times/min max. (at 0.5 m range)			
Measuring range (radius)			0.5 m	1.0 m	2.0 m	4.0 m
		0%	0 to 0.5 m	0 to 1.0 m	0 to 2.0 m	0 to 4.0 m
	shift	50%	0.25 to 0.75 m	0.5 to 1.5 m	1.0 to 3.0 m	2.0 to 6.0 m
		100%	0.5 to 1.0 m	1.0 to 2.0 m	2.0 to4.0 m	4.0 to 8.0 m
Paper speed	Constant		7.5 mm/min, 15 mm/min, 30 mm/min, 60 mm/min			
	Synchronization with the depth	1/40	25 mm/m of sensor unit up/down movement.			
		1/50	20 mm/m of sensor unit up/down movement.			
		1/100	10 mm/m of sensor unit up/down movement.			
		1/200	5 mm/m of sensor unit up/down movement.			
Accuracy			±0.2%, F.S.			
Depth marker			A depth mark is printed every 1 m and depth is automatically printed numerically every 5 m.			
Power supply protection circuit			Non-fuse breaker (2 A, 8 A), Leak breaker (20 A), Excessive voltage protection circuit			
Power supply			100 VAC, 50/60 Hz	110V/120 V/220 V/230 V/240 VAC, 50/60 Hz (Optional)	380 V/ 440 V AC, 50/60 Hz (Optional)	
Power consumption			500 VA (at 100 VAC)	840 VA (at 220 VAC)	880 VA (at 440 VAC)	
Operating temperature			— 10 ° to + 50 °C (+ 14 ° to 122 °F)			

Winch unit

Up/down speed	0 to 20 m/min (continuously controllable from recording unit)
Up/down movement distance	100 m maximum
Bottom and casing sensing system	Automatic sensing by limit switch
Operating temperature	— 10 ° to + 50 °C (+14 ° to 122 °F)

1.2 Standard Equipment

No.	Article	Type	Remarks	Weight/length	Quantity
1	Recorder unit	DMR-682/684	Housed in a alminum box	47 kg (105 lb)	1
2	Winch unit	DMW-001/002	With a sensor unit and cable	121 kg (270 lb)	1
3	Connnecting cable	CW-61	With 15-pin connectors	10 m (32 13/16 ft)	1
4	AC power cable	CW-73	With 3-pin connectors	10 m (32 13/16 ft)	1
5	Spare part kits		Stored in the recorder unit, refer to the spare parts list		1 set
6	Operation manual	93170102			1
7	Brief operating instructions	93070103	For DM-682, attached to the recorder unit lid		1
		93070102	For DM-684, attached to the recorder unit lid		

Spare parts

No.	Article	Type	Remarks	Quantity
1	Recording paper	DMP-250	250 mm x 20 m, A3-560	2
2	Recording stylus	DMS-001	Stored in a vinyl cover	2
3	Current feed stylus	DMS-002	Stored in a vinyl cover	2

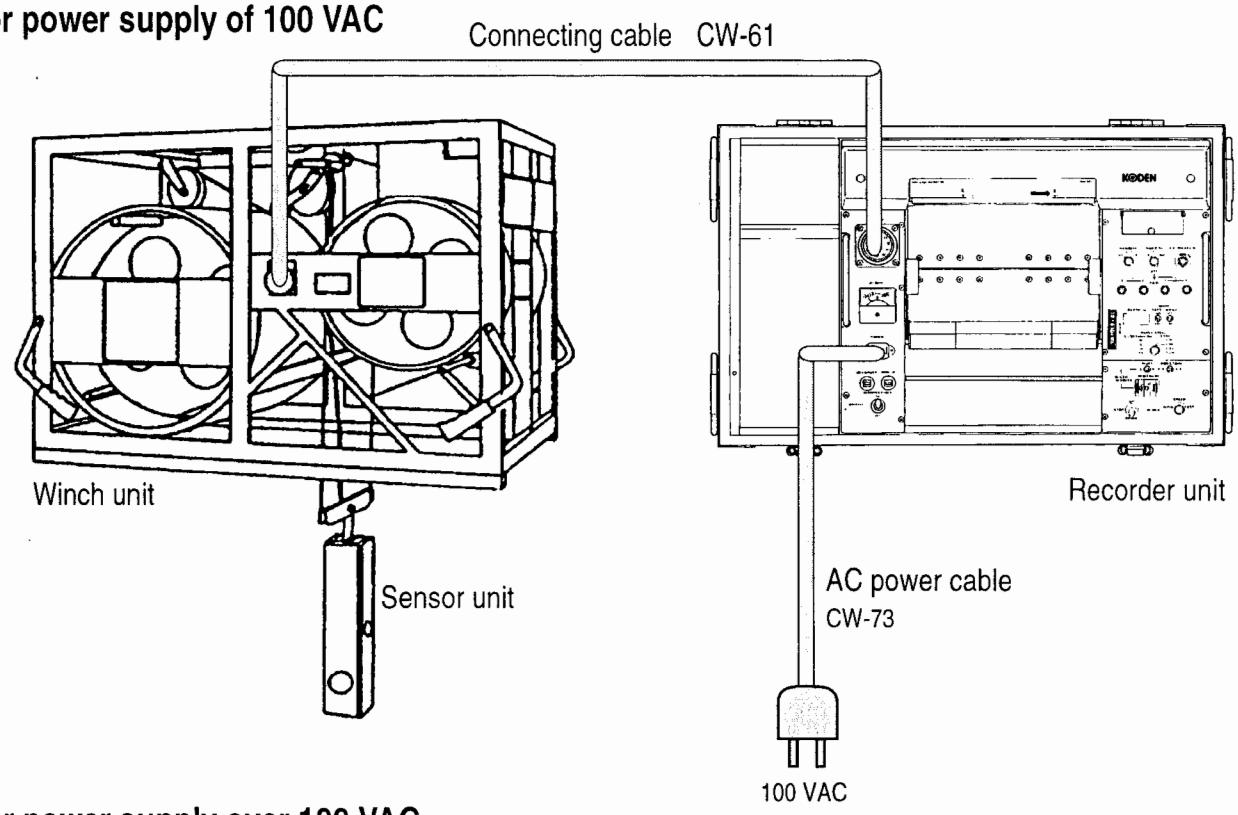
1.3 Options

No.	Article	Type	Remarks	Weight/length
1	Power transformer	DMT-001/002	Selectable 110 V, 120 V, 220 V, 230 V, 240 VAC. housed in an alminum box	10 kg (22.5 lb)
		DMT-003	Selectable 380 V, 440 VAC. housed in an alminum box	12 kg (26.5 lb)
2	AC power cable	CW-71	With 3-pin connector and one end plain	10 m (32 13/16 ft)
3	Recording paper	DMP-250	250 mm x 20 m, A3-560	
4	Recording stylus	DMS-001		
5	Current feed stylus	DMS-002		

1.4 Interconnecting Diagram

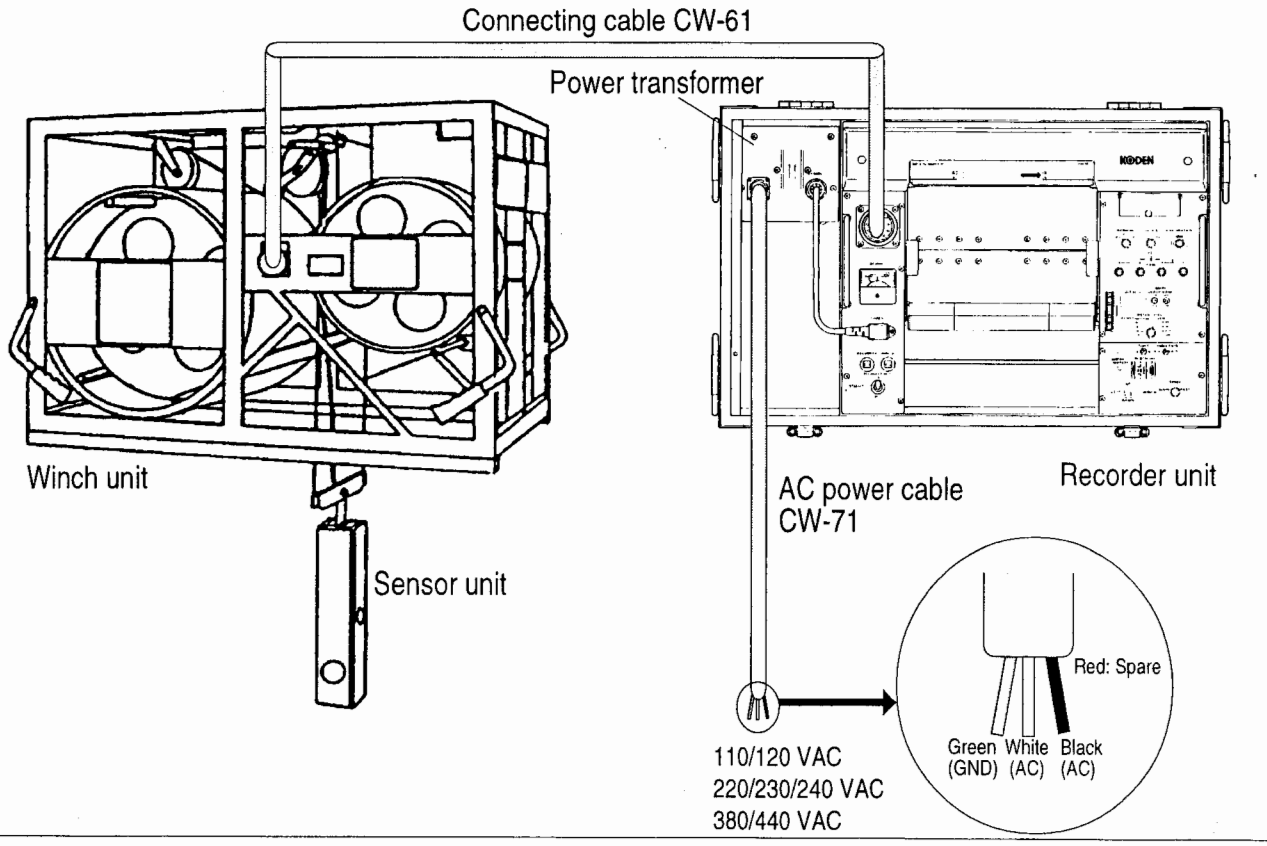
Scale differs among drawings.

For power supply of 100 VAC



For power supply over 100 VAC

Power transformer required at 110 V, 120 V, 220 V, 230 V, 240 V, 380 V, 440 VAC power supply.



2. Functional Descriptions

2.1 Winch Assembly

2.1.1 General operation

The winch unit controls the sensor unit to hoist, lower and stop, as well as to control its speed via the recorder unit. Four sensor elements are attached to the sensor unit. The signal from the sensor unit is applied to the transmitter/receiver circuit via the 14-active cable and the slip ring. The winch turning motor drives the wire drum. The cable drum is also rotated by the motor via the chain. The number of the wire drum revolution is proportional to the depth of the sensor. The rotary encoder coupled to the wire drum outputs the pulse signals as the drum rotates. The pulse signals represent the depth. The winch turning motor will be automatically stopped when the sensor unit reaches the bottom or is stowed in the hold. The limit switch attached in the winch unit detects the position of the sensor and its status is transferred to the motor control board (DM-686-300) to stop the motor. This board also controls the motor to turn ON or OFF, forward or backward by the control signal applied from the operation panel. This motor operation is performed in the recorder unit as shown in the diagram. Each protection circuit is activated at the threshold specified in the following table.

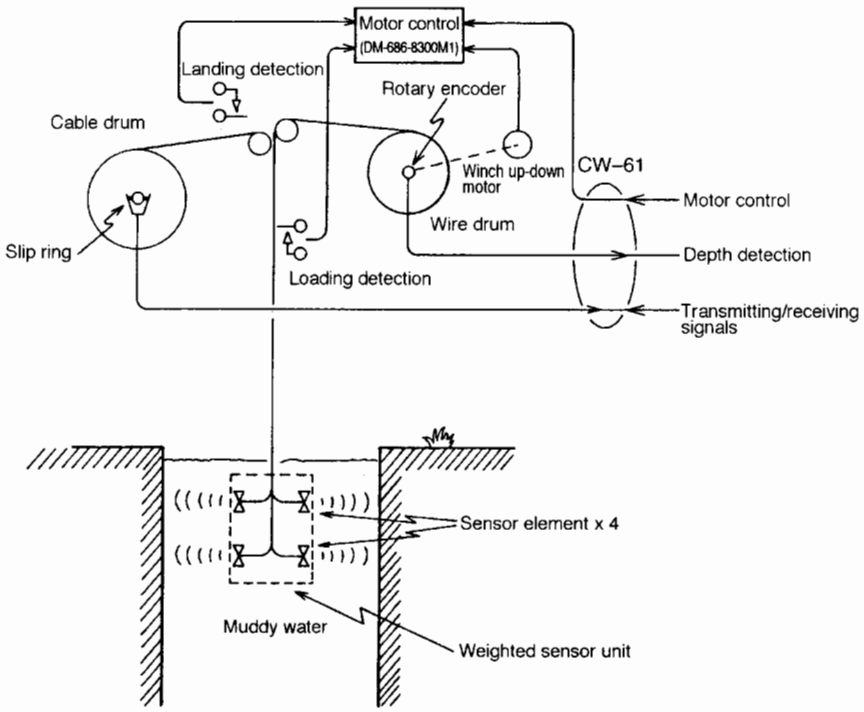


Fig. 2.1 Winch operation

Protection circuit	Threshold
Over-voltage protection:	120 VAC and upper
Leakage current detector:	Leakage current exceeding 15 mA
NFB:	AC input current exceeding 8A

Warning: When the 2A NFB trips to OFF, the winch unit stops despite the 8A NFB has not tripped to OFF. This is because the over-voltage detection circuit becomes inoperative in this case, causing the over-voltage protection circuit to be brought to non-energized condition. This allows the SSR (Solid State Relay) to turn off, supplying no DC power supply to the winch unit.

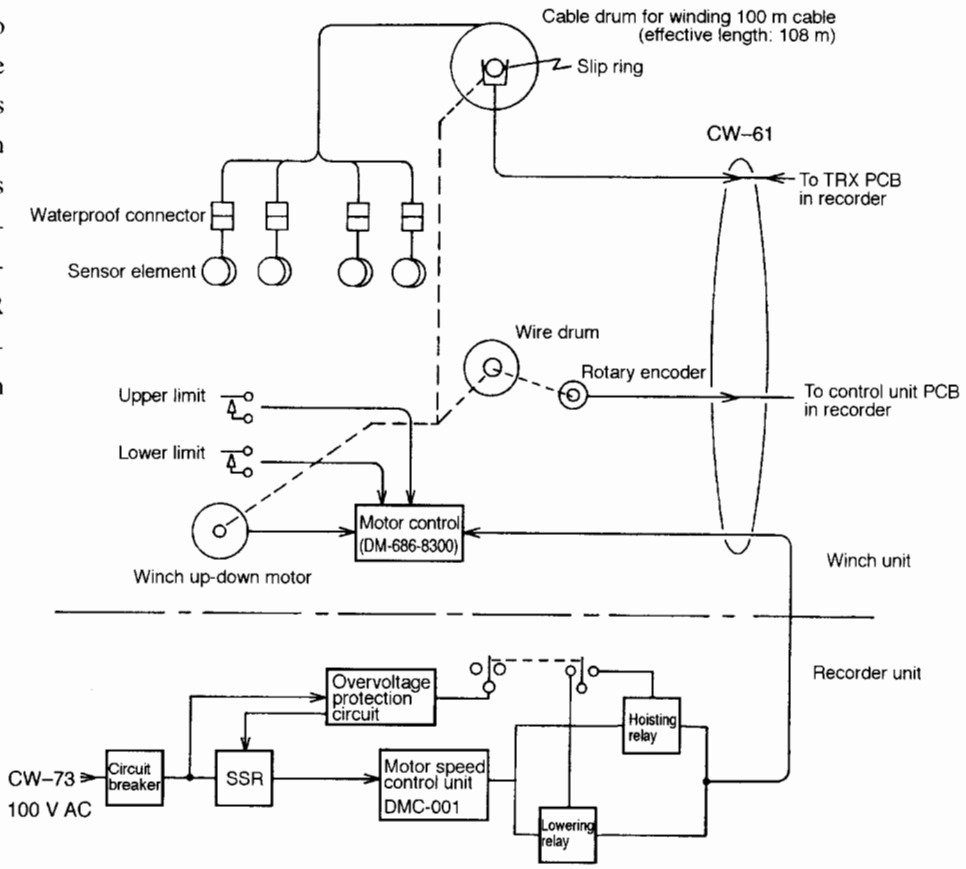


Fig. 2.2 Block diagram of winch

2.2 Recorder Unit

2.2.1 General operation

The recorder consists of the components shown in Fig. 2.3.

The recorder unit consists of four PC boards composed of transceiver (DM-684-TRX1000), control unit (DM-684-7000), power supply (DM-684-PS6000), control panel (DM-684-9000 or DM-682/4-9001), recording mechanism, belt timing (DM-684-HOLE1001) and winch motor controller.

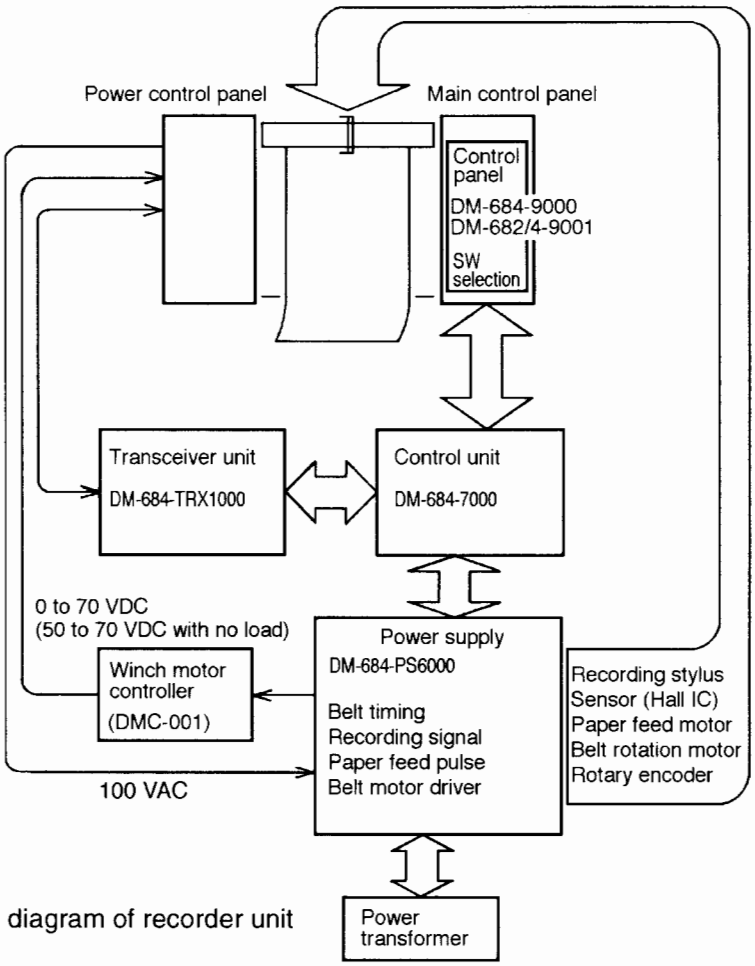


Fig. 2.3 Block diagram of recorder unit

2.2.2 Power supply PCB (DM-684-PS6000)

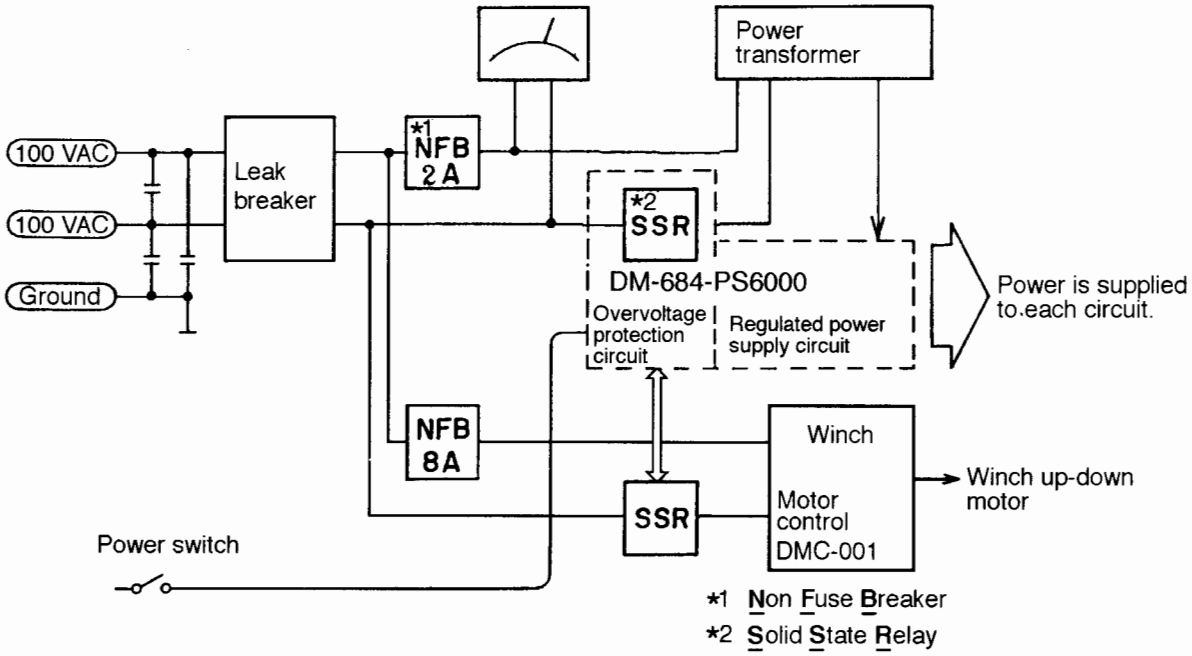


Fig. 2.4 Block diagram of Power Supply PCB (DM-684-PS6000)

Power Supply Uses

+250 V	Recording output circuit
+165 V	Transmitting power supply
+24 V	Paper feed motor/recording motor
+15 V	Transceiver unit and control unit oscillation circuit
+5 V	Control unit control panel

Functions of Power Supply PCB (DM-684-PS6000

(1) Recording motor control circuit
(2) Depth detection circuit
(3) Belt timing (recording position setting) circuit
(4) Paper feed motor control circuit
(5) Recording output circuit
(6) Power supply circuit
(7) Overvoltage protection circuit

a. Recording motor control circuit

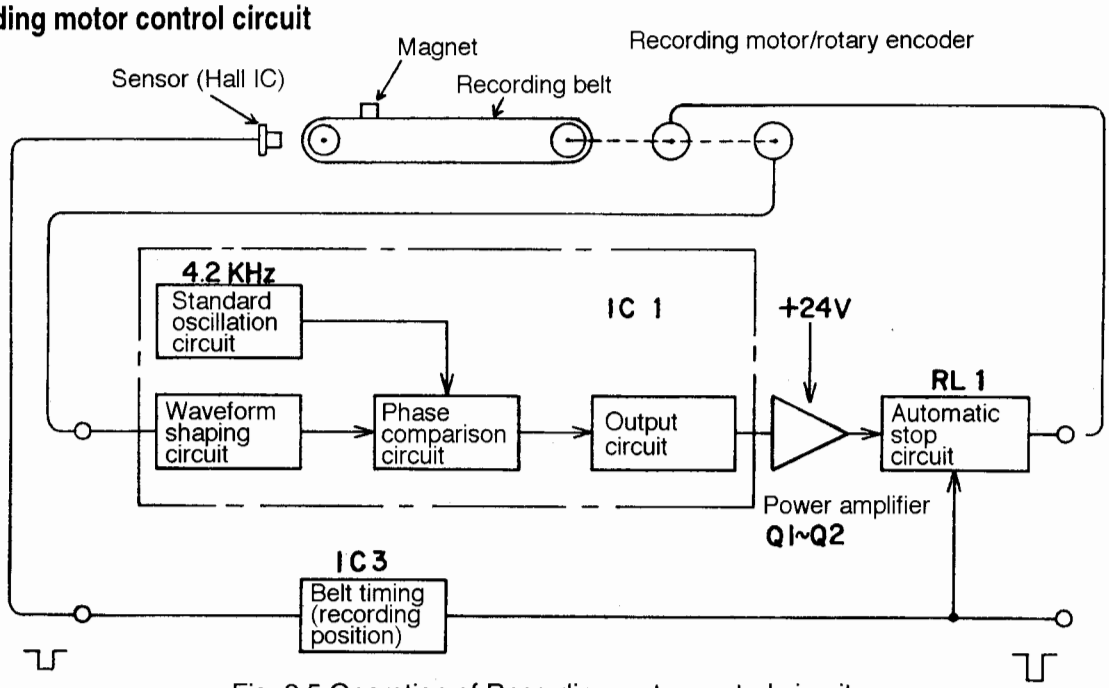


Fig. 2.5 Operation of Recording motor control circuit

This section is composed of the Phase Locked Lop (PLL) circuit that regulates the recording stylus belt to run at constant speed of 2500 rpm. The PLL circuit synchronizes the signal from external rotary encoder with that of the reference oscillation signal generated in this circuit. As a result, the accuracy of the belt motor rotation is maintained at the same accuracy with that of the reference signal. The belt motor is driven by +16V DC and, the entire circuit is operated by unregulated +24V DC. The automatic stop circuit functions to allow the stylus to rest at the backside of the conductive plate after the power switch is turned off. This prevents possible stylus damage caused by an erratic handling of the unit while replacing the recording paper roll. The belt timing circuit sets initial stylus position on the recording paper before the recording to start.

b. Depth detection circuit

The depth pulse signal sent from the rotary encoder at the winch unit is sent via the PCB (DM-684-PS6000) to the control PCB (DM-684-7000).

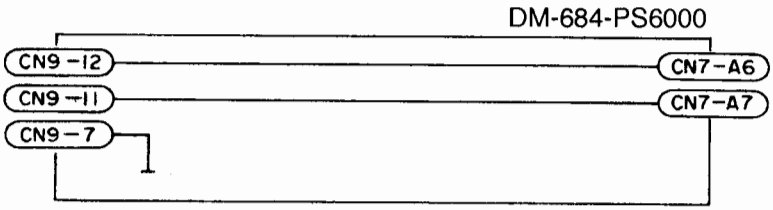


Fig. 2.6 Bottom detection circuit

c. Paper feed control circuit

This circuit drives the 4-phase stepping motor that rotates the recording paper roll. The paper feeding speed can be selected to NORMAL or TEST speed by the switch S1 on the printed board. The S1 is initially set to the NORMAL position allowing the speed selection as shown in the table below. In the TEST mode, this circuit operates on the test signal where the paper speed is fixed.

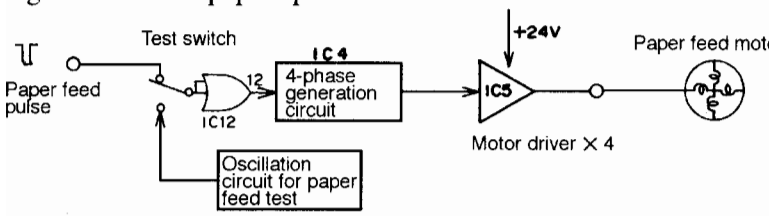


Fig. 2.7 Operation of Paper feed motor circuit

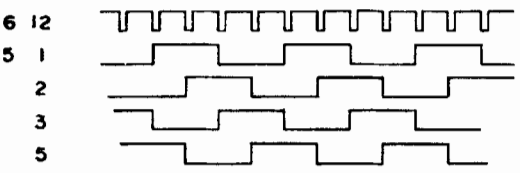


Fig. 2.8 Timing chart

CONST	7.5, 15, 30, 60 mm/min
SYNC	1/40, 1/50, 1/100, 1/200
	In the Depth Proportional Speed mode, the paper feed speed is set proportional to the winch speed.

In depth proportional mode, the paper feed motor fails to follow the winch speed when the winch speed exceeds approximately 120 mm/min (converted to paper feed speed). In this case, the depth indicator on the control panel flickers to warn the failure.

Example:The paper feed control circuit follows the winch speed up to 4.8 m/min when the depth proportional speed is set to 1/40. When the winch speed exceeds 4.8 m/min, the paper feed speed is automatically set to 120 mm/min constant.

d. Record output circuit

This section amplifies incoming record signals (reception signal mark, signal, characters, numerals) up to the level at which those signal can be printed on the recording paper. Further, by switching the TEST switch, the sounding image can be recorded in different shades of gray.

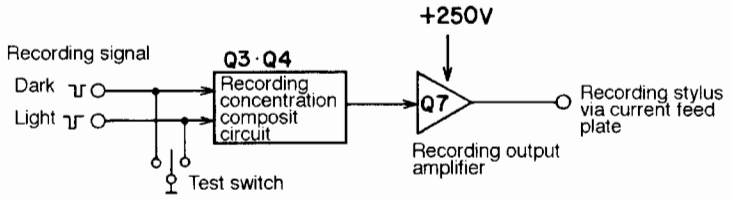


Fig. 2.10 Operation of power supply circuit

e. Power supply circuit

This section provides the following various DC supplies:

- Regulated DC supplies: +5V, +15V, +165V (With Over-voltage protection),
- Unregulated DC supplies: +24V, +250V

Each DC supply line is provided with an LED lamp that indicates the power is turned on or off.

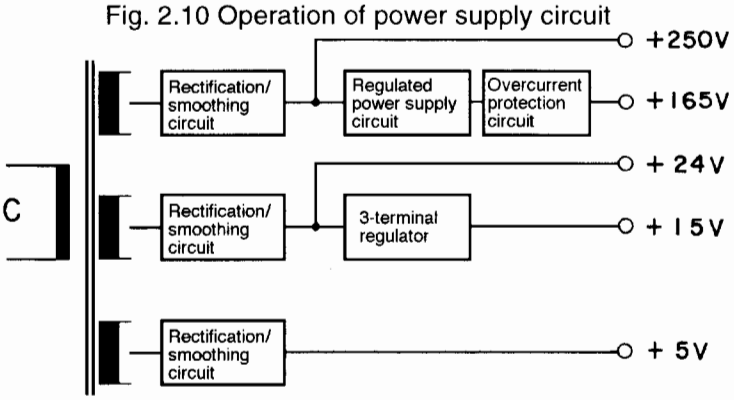


Fig. 2.9 Operation of recorder output circuit

f. Over-voltage protection circuit

This circuit prevents the instrument from being burnt by an input overvoltage. When the input voltage exceeds 120 V, this circuit functions to turn off SSR and the power supply of each circuit.

It is automatically reset when the input voltage becomes lower than 120 V.

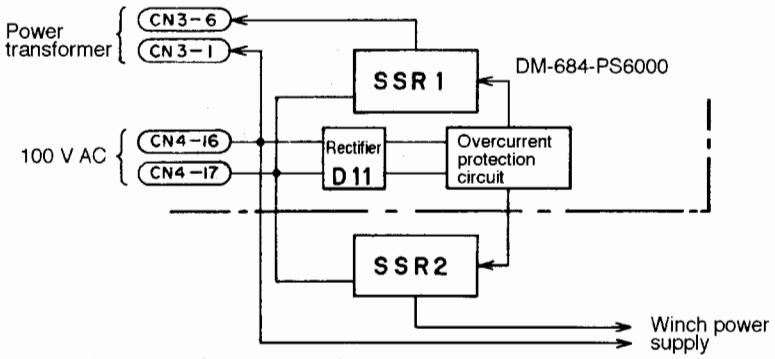


Fig. 2.11 Operation of overvoltage protection circuit

2.2.3 Transceiver PCB (DM-684-TRX1000)

This PCB contains 4 sets of the Transmitter/Receiver (TX/RX hereafter) circuits and self-test circuit.

a. Transmitter circuit

The transmitter circuit is composed of the CR Oscillator and power amplifier. Transmission and reception sequentially switch by the Control PCB, from Channel 1 through to Channel 4. The pulse length can be adjusted on each channel and on each range scale.

b. Receiver circuit

The receiver circuit is of a straight amplifier type, having a fixed bandwidth (f0 = 88 KHz, BW = 30 KHz). The receiver gain can be adjusted by the GAIN control on the operating panel. This amplifier gain is controlled by varying the DC voltage, instead of having the signal put in series of the gain control pot. This arrangement is effective in preventing the noise induced on the signal line.

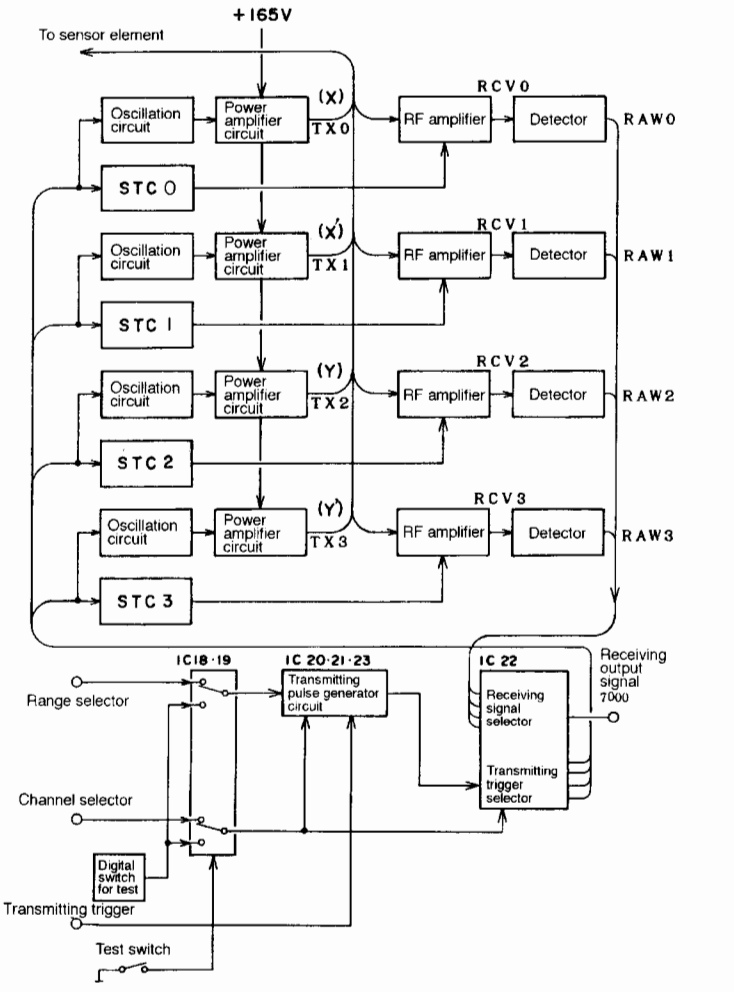


Fig. 2.12 Transceiver unit PCB (DM-684-TRX1000)

c. TEST circuit

The TX pulse length can be adjusted itself without having the Control PCB (DM-684-7000) connected. To do so, the Dip Switch SW1 is provided on the TX/RX PCB (DM-684-TRX1000). For detail, refer to the table below.

Range	Channel	DSW value*	Adjustable position
0 – 0.5 m	CH 0	F	VR19
	CH 1	E	VR22
	CH 2	D	VR13
	CH 3	C	VR16
0 – 1 m	CH 0	B	VR20
	CH 1	A	VR23
	CH 2	9	VR14
	CH 3	8	VR17
0 – 2 m	CH 0	7	VR21
	CH 1	6	VR24
	CH 2	5	VR15
	CH 3	4	VR18
0 – 4 m	CH 0	3	None
	CH 1	2	None
	CH 2	1	None
	CH 3	0	None

* DSW is effective only when the test switch is set to LOCAL.

2.2.4 Control unit PCB (DM-684-7000)

An 8-bit microprocessor unit (MPU hereafter) is used on this board for signal processing, timing controls, status monitor, etc. The following block diagram shows the entire system configuration.

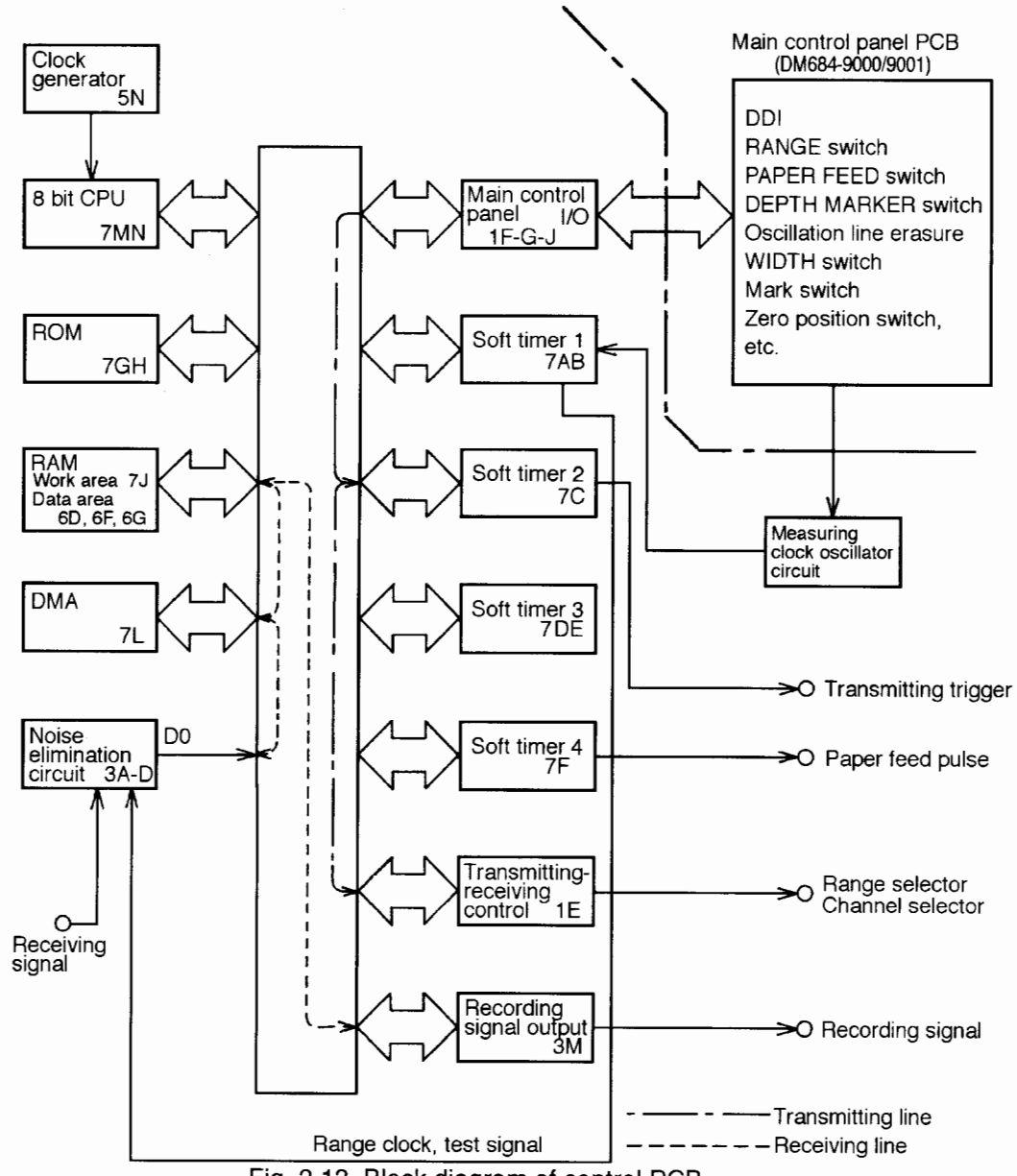


Fig. 2.13 Block diagram of control PCB

The signal flow on the control panel PCB is as follows:

The Control Panel I/O section reads the range data set up on the Control Panel and the data is processed to form the TX trigger. The TX trigger is output from Soft Timer 2. The reception signal is processed in the Noise Reduction circuit and stored in the specified address in RAM (Random Access Memory) on DMA (Direct Memory Access) basis. The reception signal data stored in RAM is processed by MPU and output to the signal output circuit in synchronism with the recording belt timing. The depth pulse sent from the winch encoder is applied to MPU and the corresponding data is set to Soft Timer 4, to create the paper feed motor pulse. MPU also monitors the panel switch status whether any switch is operated. If so, MPU accordingly executes corresponding processing while no other tasks are executed. The technical descriptions for respective blocks are given next.

a. MPU (Micro Processor Unit)

This is an 8-bit microprocessor chip with an 8-bit data bus. The MPU has powerful instructions including Bit Processing, BCD Operation, High Speed Arithmetic Operation, etc.

b. Clock pulse generator

This generator generates a clock signal that is applied to MPU.

c. ROM (Read Only Memory)

This memory stores the program that runs MPU. The type number of this memory chip is "27128".

d. RAM (Random Access Memory)

Two memory areas are provisioned for the Work memory and Data Buffer memory. The Data Buffer memory can be set to "write protected" status. Using this function, each bit is defined as shown in the list and to become the data to be recorded.

D0: Raw data (received data)
D1: Processed data (the wall echo data obtained from the raw data)
D2: Mark (fix, depth and hole wall diameter)
D3: Character and numerals (Depth, range, shift, etc.)

e. DMA (Direct Memory Access)

This section transfers the raw reception signal stored in the Buffer Memory to the Buffer Memory provisioned in MPU (MPU Buffer Memory). It also transfers the data stored in MPU Buffer Memory to Printer Buffer while the printing is executed.

f. TX/RX control

This section selects various functional items associated with transmission and reception and, at the same time run those selected.

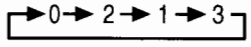
Channel select (CS0 and CS1)

Channel select		Channel
CS1	SC0	CH
0	0	0
0	1	1
1	0	2
1	1	3

Range select (RS0 and RS1)

Channel select		Range
RS1	RS0	
0	0	0 – 0.5 m
0	1	0 – 1.0 m
1	0	0 – 2.0 m
1	1	0 – 4.0 m

Channel select in case of DM-684



g. Measuring clock oscillator

This section generates the measuring clock of 3 MHz, which is obtained by dividing the master clock of 6 MHz. The frequency of Measuring Clock varies when the operator turns the RANGE CALIBRATION control.

h. Soft timer 1

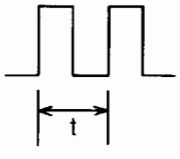
This section produces the reception clock and the test data.

Receiving clock: The time base clock produced from the Measuring Clock of 3 MHz. The time base clock varies according to the range scale selected.

Test data: The simulated echo data that is printed on the recording paper during the test mode.

Range	t (µsec)
0 – 0.5 m	1.33
0 – 1 m	2.66
0 – 2 m	5.32
0 – 4 m	10.64

TP–20



i. Soft timer 2

This section produces the receiving delay time, reception time, and the transmission trigger.

Reception Delay Time: The timing that determines the reception to take place, in order to eliminate the printed echo obscured with residual transmission energy.

Receiving time: The duration for reception, produced from the Reception Clock.

Transmission Trigger: The trigger to activate the transmission, produced from the Reception Clock. The pulse length is approximately 200 µs.

j. Soft timer 3

This section produces various timings for the test data position, Recording Clock and Fundamental Clock.

Test Data position: The timing when the test video data starts to be printed after the transmission. The master clock is 4 MHz, which is unchanged irrelevant to the range scale selected. The test data image starts at the midpoint of the range scale selected.

Recording clock: The clock that determines the writing timing of the image on the recording paper. The clock is generated from the master clock (4 MHz).

Clock for CPU Timer: The 100 KHz clock signal used for MPU timer, produced from the master clock (4 MHz).

k. Soft timer 4

This section produces the CPU Timer, Paper Feed Synchronizing signal as well as the Controlled Pulse Burst signal to advance the recording paper.

CPU Timer: This is the interrupt timer for MPU.

Paper Feed Synchronizing Clock: This signal is used to generate the pulse that synchronizes the clock for driving the stepping motor.

Controlled Pulse Burst: The pulse burst in which the number of pulses are determined according to the number of paper advancing clock assigned by MPU.

l. Noise reduction circuit

This section correlates the reception signal obtained over a certain number of transmissions in order to eliminate unwanted signal or noise.

m. Recording output circuit

This section converts the reception data processed in the Control Panel into the signal codes that represent a different shade of gray. The processed signals are sent to the recording output circuit in the power supply unit.

n. I/O Interface for Operating Panel

The input and output ports for various switches, controls and depth display mounted on the Control board (DM-684-7000) and Operating Panel boards (DM-684-9000 and DM-682/4-9001).

3. Adjustment Procedure

This section provides the technical information including check and setting up procedures required to diagnose each component board, to determine it is normal or faulty. The voltage and waveform data are also provided for each board.

3.1 Parts Location

The following drawings show where to find the boards, component parts, mounted on the DM-682/684 equipment.

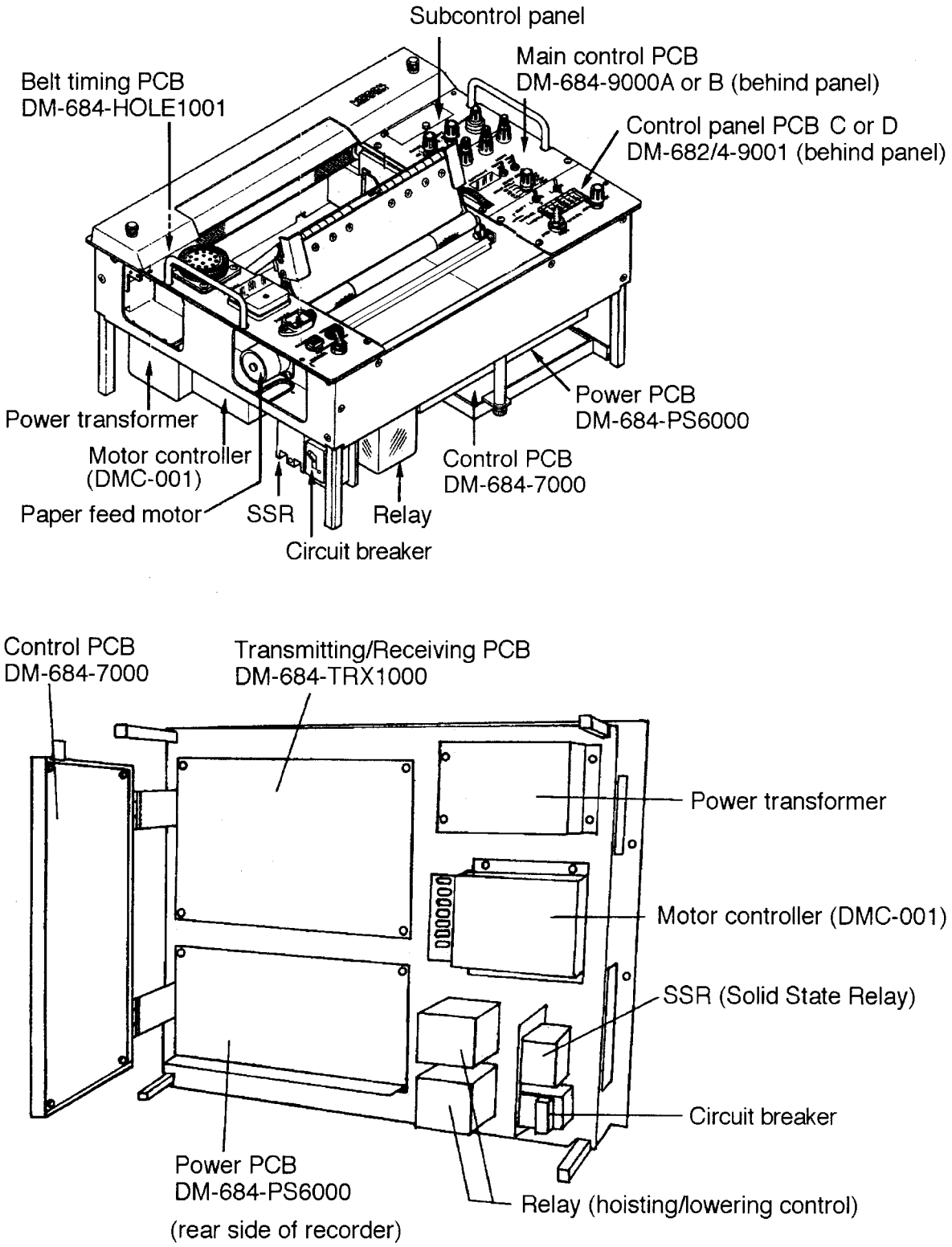


Fig. 3.1 Parts location of recorder unit

3.2 Power Supply Unit (DM-684-PS6000)

This PCB contains the overvoltage protection circuit, various power supply circuits to feed each voltage required for the recorder, recording belt and paper feed motor control circuit, and other circuits. Check these circuits for normal operation according to the following procedures.

3.2.1 Preset controls and check points on PCB DM-684-PS6000

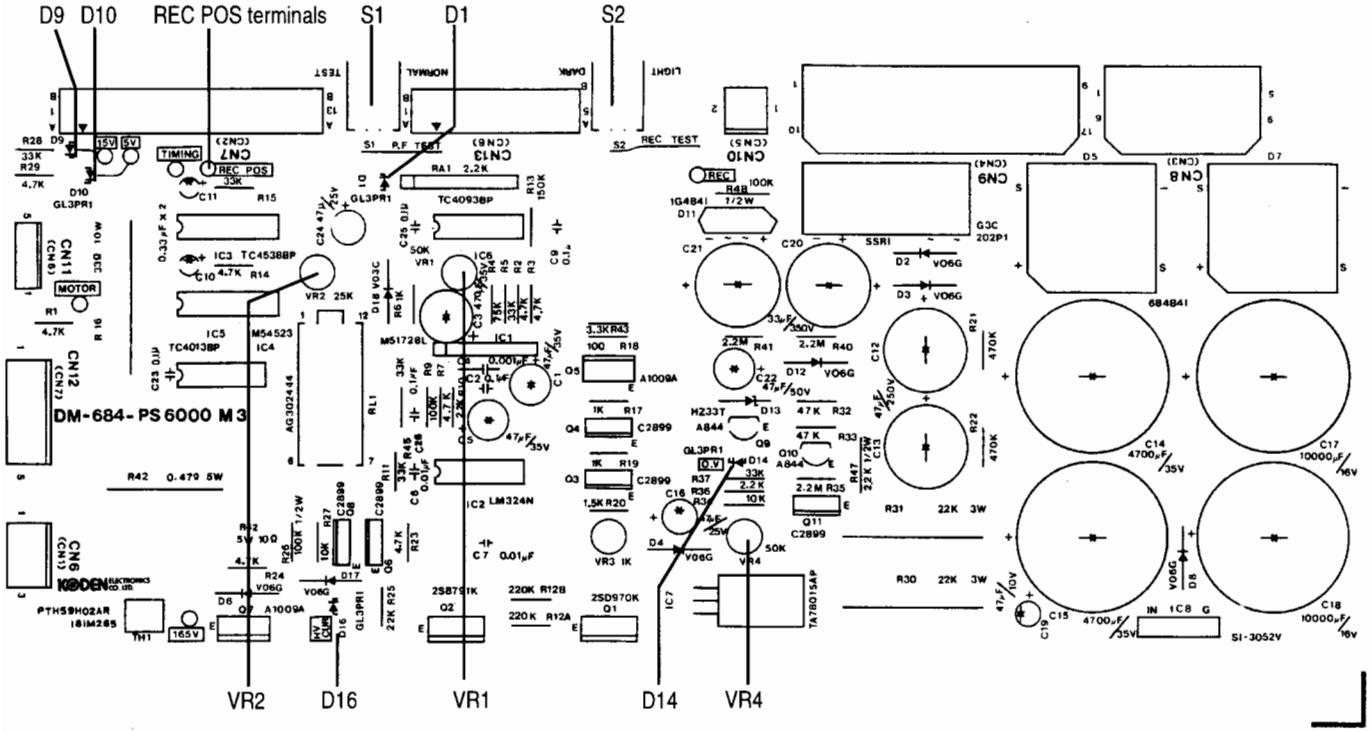


Fig. 3.2 Adjustment portions on PCB DM-684-PS6000

3.2.2 Overvoltage protection circuit

(1) Turn off RECORDER POWER switch.
(2) Set the WINCH UP/DOWN switch to STOP.
(3) Turn off the circuit breaker.
(4) Connect the POWER connector of the Recorder unit to 100 VAC main supply.
(5) Turn on the circuit breaker. Make sure that LED D14 (0.V) lights up for 1-2 seconds and then goes out. Refer to the following procedures, if the LED remains lit or if the setting value of the overvoltage protection circuit is adjusted.
(6) Turn control VR4 completely counterclockwise.
(7) Increase the input voltage to 120 V AC gradually.
(8) Turn control VR4 clockwise slowly until LED D14 (0.V) lights up.
(9) Reset the input voltage to 100 V AC.

3.2.3 Various power supply circuit

(1) Make sure that each voltage monitor LED lights up.
(2) Check the voltage at check terminals by using a circuit meter.

Voltage	LED No.	Check terminal indication
+5 V	D10 (+5 V)	+5 V
+15 V	D9 (+15 V)	+15 V
+165 V	D16 (HV CUR)	+165 V

3.2.4 Recording output circuit

(1) Make sure that the range scale and each mark are recorded on the recording panel.
(2) Make sure that the dark and light marks are recorded on the recording paper when REC TEST switch S2 is set to DARK or LIGHT.
(3) Adjust control VR3, if it is desired to make a light recorded part darker when SIG PRCS switch is turned on. The recording becomes darker as VR3 is turned clockwise. Keep this control VR3 in the center position.

3.2.5 Paper feed motor control circuit

(1) Make sure that the paper is fed as shown by each CONST setting value by selecting the PAPER SPEED switch.
(2) Set P.F TEST switch S1 to TEST, and make sure that the paper is fed at constant speed (about 60 mm/min).

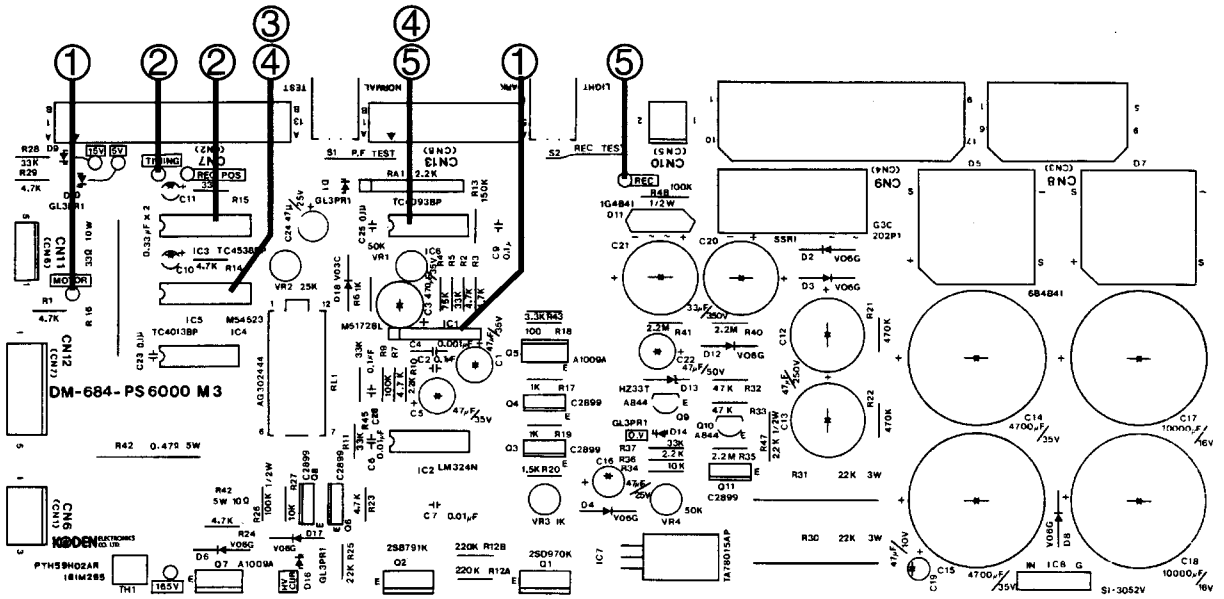
3.2.6 Recording motor timing circuit

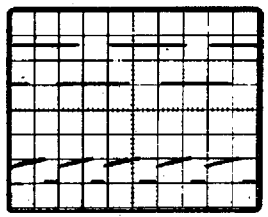
(1) Make sure that LED D1 flickers.
(2) Turn the preset control VR2 to allow the recording to start at 15 mm right side of the paper feed.

3.2.7 Recording motor control circuit

(1) Make sure that the range scale is set to 5 mm pitch on the paper.
(2) Adjust the preset control VR1, if the range scale is not set as specified. The frequency becomes 4.2 kHz at check terminal MOTOR.
(3) Make sure that the recording stylus stops at the rear side of the current feed plate when power is turned off.
(4) To determine the rest position of the recording stylus, adjust the value of fixed resistor R42.

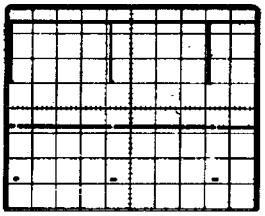
3.2.8 Checkpoints and waveforms





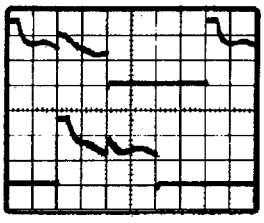
Upper·····TP-MOTOR
Lower·····IC1-5pin

X-scale : 50μs/div
Y-scale : Upper···2V DC/div
Lower···2V DC/div



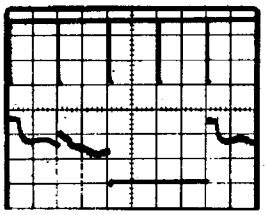
Upper·····IC3-5pin
Lower·····TP-TIMING

X-scale : 50ms/div
Y-scale : Upper···2V DC/div
Lower···2V DC/div



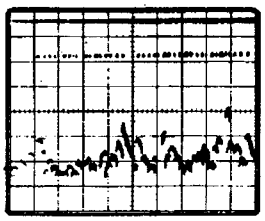
Upper·····IC5-16pin
Lower·····IC5-15pin

X-scale : 5ms/div
Y-scale : Upper···10V DC/div
Lower···10V DC/div



Upper·····IC6-12pin
Lower·····IC5-16pin

X-scale : 5ms/div
Y-scale : Upper··· 2V DC/div
Lower···10V DC/div



Upper·····IC6-5pin
Lower·····TP-REC

X-scale : 5ms/div
Y-scale : Upper··· 2V DC/div
Lower···10V DC/div

3.3 Transceiver Unit (DM-684-TRX1000)

This PCB contains four sets of transceiver circuits, signal selector circuit, and test circuit.

3.3.1 Adjustment portion on PCB DM-684-TRX1000

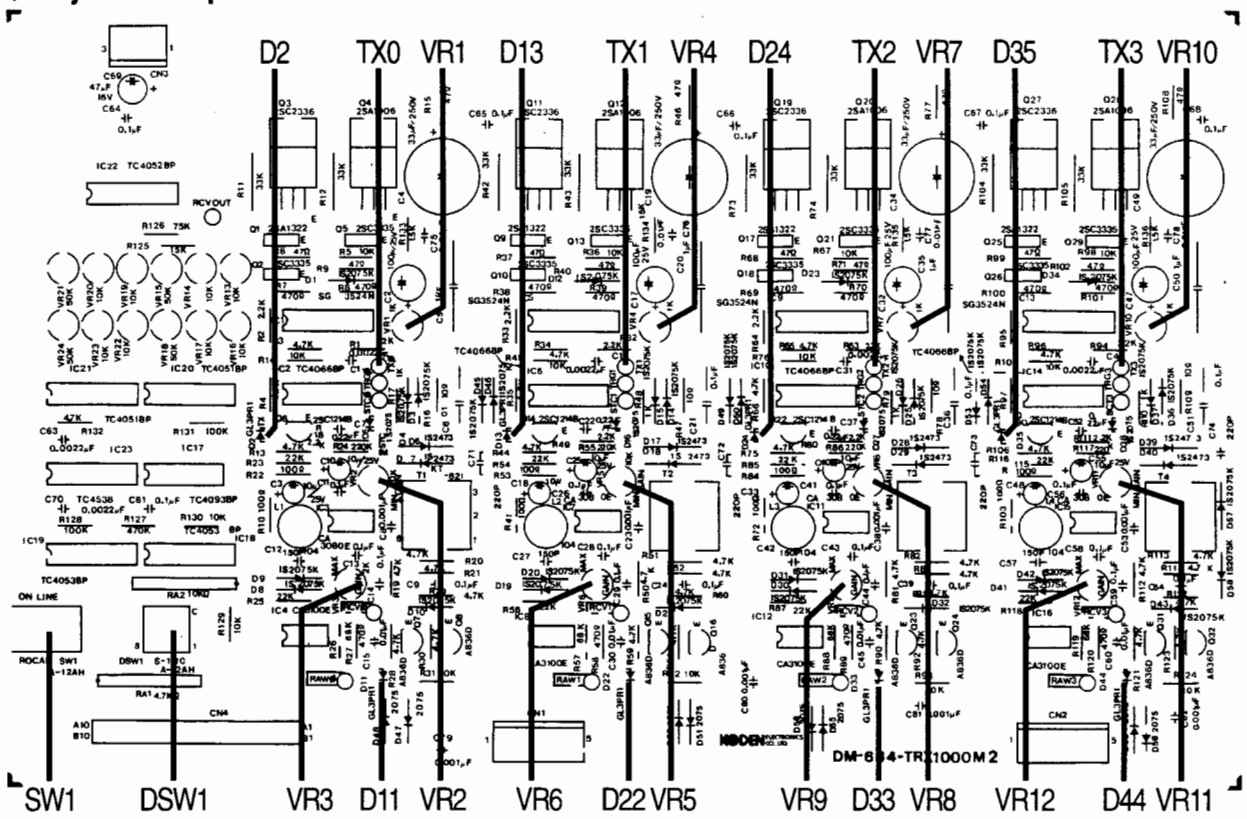


Fig. 3.4 Adjustment portions on PCB DM-684-TRX1000

3.3.2 Transceiver circuit

(1) Make sure that the transmission monitor LEDs, D11, D22, D33 and D44 flicker on each range.
NOTE: Although both LEDs light alternately, they seem to be lit continuously.

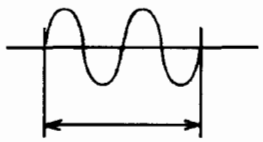
(2) Make sure that the reception monitor LEDs (D11, D22, D33 and D44) flicker on each range.

(3) Press the ON LINE-LOCAL switch (SW1) to the LOCAL position, and then rotate the digital switch (DSW1) from notch "0" through to "7". Confirm that the transmission monitor LEDs (D2, D13, D24 and D35) flicker as shown in the table below. In case SW1 is switched to the position "8" through to "F", each LED flickers at short interval. This causes visual acknowledge on flickering to be impossible.

(4) After confirmation, reset the switch to the "ON LINE" position.

Range	Channel	DSW value	LED	Check terminal for adjustment		Adjustable VR
				Transmitting trigger	Transmitting pulse	
0 – 0.5 m	CH0	F	D2	TRG0	TX0	VR19
	CH1	E	D13	TRG1	TX1	VR22
	CH2	D	D24	TRG2	TX2	VR13
	CH3	C	D35	TRG3	TX3	VR16
0 – 1.0 m	CH0	B	D2	TRG0	TX0	VR20
	CH1	A	D13	TRG1	TX1	VR23
	CH2	9	D24	TRG2	TX2	VR14
	CH3	8	D35	TRG3	TX3	VR17
0 – 2.0 m	CH0	7	D2	TRG0	TX0	VR21
	CH1	6	D13	TRG1	TX1	VR24
	CH2	5	D24	TRG2	TX2	VR15
	CH3	4	D35	TRG3	TX3	VR18
0 – 4.0 m	CH0	3	D2	TRG0	TX0	None
	CH1	2	D13	TRG1	TX1	None
	CH2	1	D24	TRG2	TX2	None
	CH3	0	D35	TRG3	TX3	None

Range	No. of transmitting waves	Transmitting pulse width
0 – 0.5 m	2 waves	Approx. 22 µS
0 – 1.0 m	4 waves	Approx. 50 µS
0 – 2.0 m	10 waves	Approx. 120 µS
0 – 4.0 m	19 – 21 waves	Approx. 250 µS



Set the number of waves accurately.

(5) For adjusting the transmitting pulse length, connect an oscilloscope to check terminals TXO-3, and adjust VR13-24 to the specified wave number. Synchronize the oscilloscope with the transmitting trigger in the same channel during this adjustment

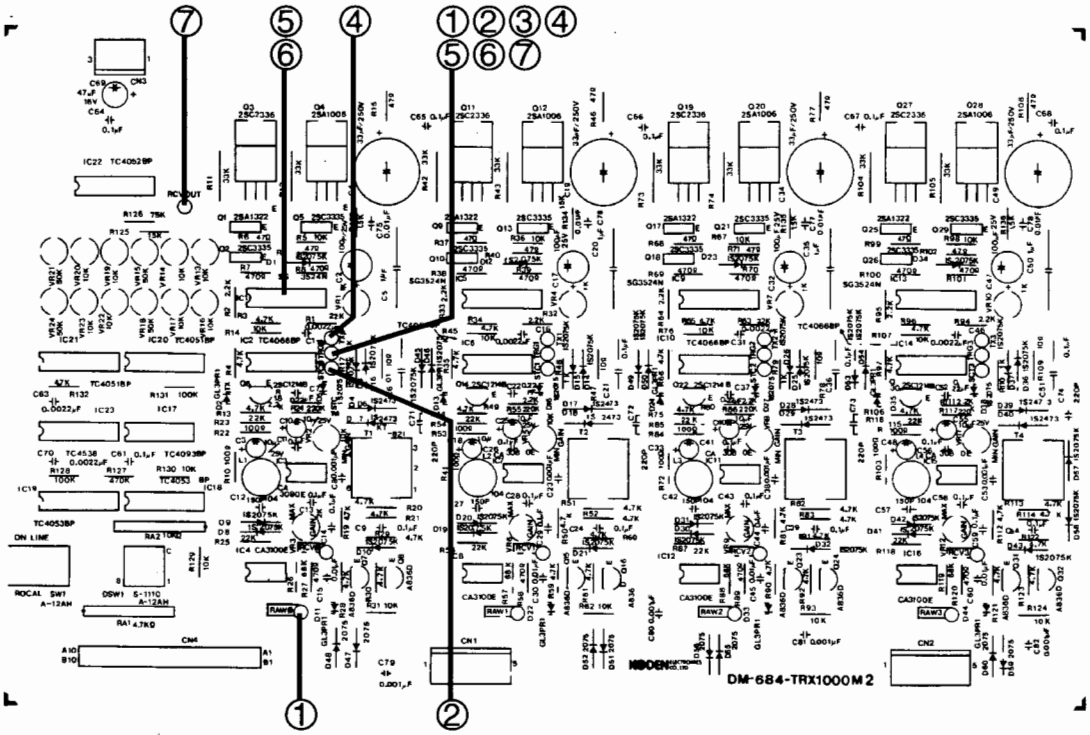
(6) For adjusting the transmitting/receiving frequencies, adjust controls VR1, VR4, VR7 and VR10 so that the transmitting pulse frequency becomes 88 kHz measured at check terminals TXO-TX3.

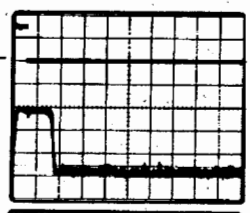
(7) Preset controls of VR3, VR6, VR9 and VR12 adjust the receiver gain for each channel. Take due care when presetting the gain, not too low, not too high.

(8) Preset controls of VR2, VR5, VR8 and VR11 determine the minimum gain level when the operator's GAIN control is turned to fully CCW position. Take note when these presets are readjusted, the entire GAIN control range varies.

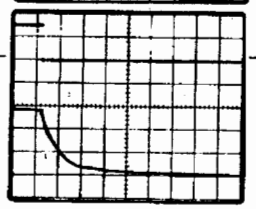
Channel	Gain setting control (max.)	
	(Max.)	(Min.)
CH0	VR3	VR2
CH1	VR6	VR5
CH2	VR9	VR8
CH3	VR12	VR11

3.3.3 Checkpoints and waveforms

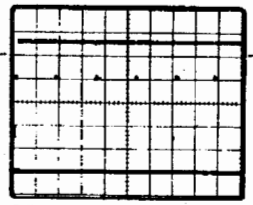




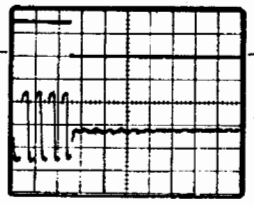
① Upper·····TP-TRG 0
Lower·····TP-RAW 0
X-scale : 500μs/div
Y-scale : Upper···10V DC/div
Lower··· 2V DC/div



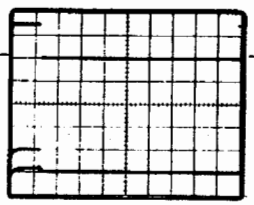
② Upper·····TP-TRG 0
Lower·····TP-STC 0
X-scale : 200μs/div
Y-scale : Upper···10V DC/div
Lower··· 5V DC/div



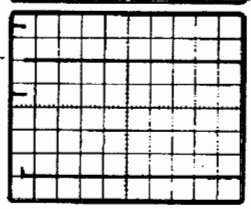
③ Upper·····IC19-5pin
Lower·····TP-TRG 0
X-scale : 2ms/div
Y-scale : Upper···10V DC/div
Lower···10V DC/div



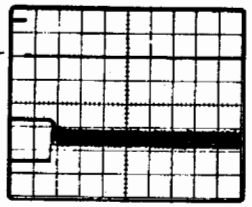
④ Upper·····TP-TRG 0
Lower·····TP-TX 0
X-scale : 20μs/div
Y-scale : Upper···10V DC/div
Lower···50V AC/div



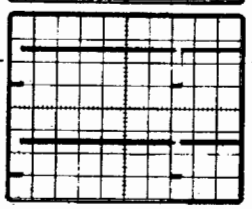
⑤ Upper·····TP-TRG 0
Lower·····IC1-11pin
X-scale : 200μs/div
Y-scale : Upper···10V DC/div
Lower···500mV DC/div



⑥ Upper·····TP-TRG 0
Lower·····IC1-9pin
X-scale : 500μs/div
Y-scale : Upper···10V DC/div
Lower··· 1V DC/div



⑦ Upper·····TP-TRG 0
Lower·····TP-RCV 0
X-scale : 500μs/div
Y-scale : Upper···10V DC/div
Lower··· 5V DC/div



⑧ Upper·····IC19-5pin
Lower·····IC19-4pin
X-scale : 500μs/div
Y-scale : Upper···10V DC/div
Lower···10V DC/div

3.4 Control Board (DM-684-7000)

This PCB controls the transceiver unit and executes receiving signals and various recording marks processing by using an 8-bit CPU.

3.4.1 Adjustment on PCB DM-684-7000

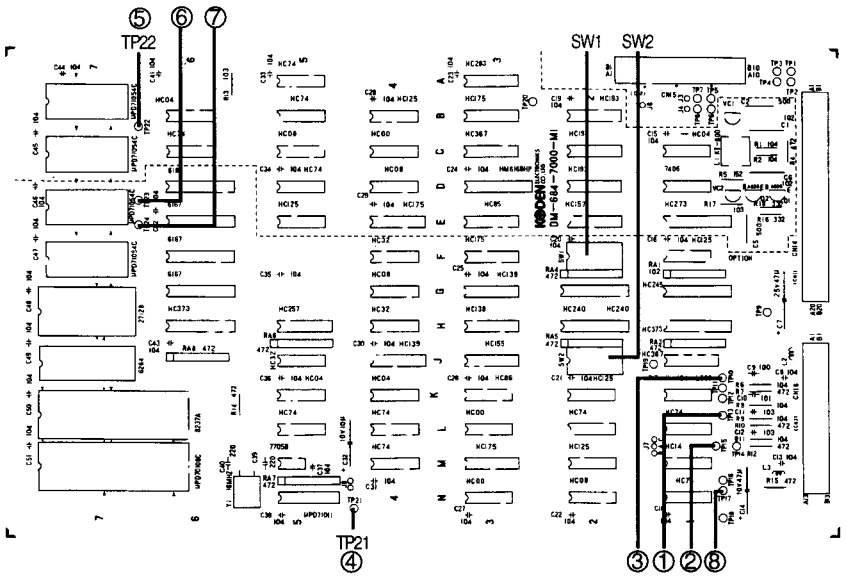


Fig. 3.6 Adjustment portions on PCB DM-684-7000

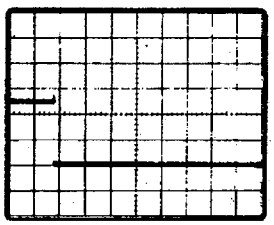
(1) Carry out visual inspections to confirm the recording is accomplished as set by operating controls and switches on the control panel.

(2) Confirm that the settings of digital switches SW1 and SW2 are such that only SW1-1, 4, 5, 8 are set to ON, providing compensation factor of 99. Meanwhile, one winch pulse refers to 1.01 cm, which is divided by the divide-by-100 counter. This results in the 1.01 m depth mark, deviated by 1 cm. In order to obtain accurate 1 m mark, the settings of SW1 produces the modified division factor of 99. As a result, the depth mark of 0.999 m is obtained, with 1 mm accuracy.

(3) Check that the 3.0 MHz reception clock appears at TP22 when the distance correction dial on the operating panel is set to "8" notches.

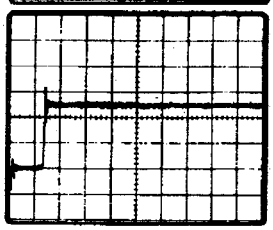
(4) Check that the 8.0 MHz master clock apprears at TP21.

3.4.2 Checkpoints and waveforms

① 

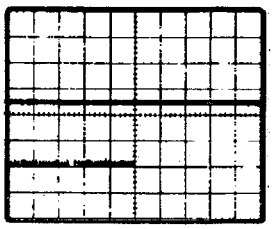
TP-13

X-scale : 5ms/div
Y-scale : 2V DC/div

② 

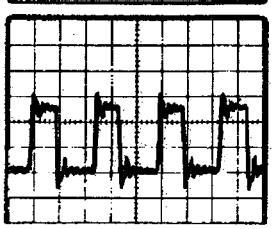
TP-15

X-scale : 200ns/div
Y-scale : 2V DC/div

③ 

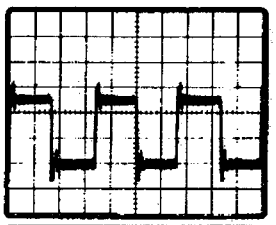
TP-10

X-scale : 10ms/div
Y-scale : 2V DC/div

④ 

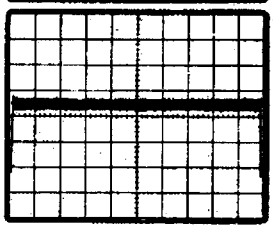
TP-21(8MHz)

X-scale : 50ns/div
Y-scale : 2V DC/div

⑤ 

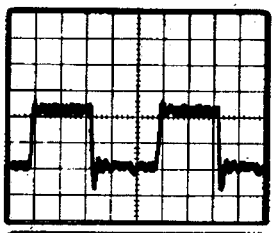
CALIBRATION
TP-22(3MHz)・・・(at 8)

X-scale : 100ns/div
Y-scale : 2V DC/div

⑥ 

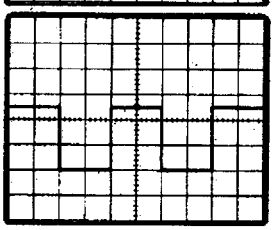
TP-23

X-scale : 1μs/div
Y-scale : 2V DC/div

⑦ 

TP-24

X-scale : 50ns/div
Y-scale : 2V DC/div

⑧ 

TP-17

X-scale : 20ms/div
Y-scale : 2V DC/div
The frequency changes according to the winch speed.

3.5 Operating Pulse PCB (DM-684-9000)

The status of the various switches is sent from this PCB to the Control Unit. Make sure the operation of the respective switches correctly reflects on the recording paper.

3.6 Motor Controller (MDC-001)

This unit controls the winch motor speed.

(1) Set the WINCH UP/DOWN switch of the control panel to UP or DOWN without connecting the winch, and turn the SPEED CONTROL completely counterclockwise. Make sure that about +50 V appears across the terminals (+) and (-).

(2) Turn the speed control completely clockwise, and make sure that about +70 V appears across the terminals (+) and (-). For adjusting the winch up-down motor speed, mount the winch on the hole wall, and connect it to the recorder.

(3) Adjustment of LOW speed: This adjustment sets the minimum winch descending/ascending speed to zero m/min. First, set the EINCH UP/DOWN switch to the DOWN position, and then turn the SPEED CONTROL knob to completely counter clockwise position.

(4) Adjustment of HIGH speed: This adjustment sets the maximum winch descending/ascending speed to 20 m/min. First, turn the speed control completely clockwise, and then adjust the preset control VR1 so that the 1m-depth marker appears every 3 seconds. If completed, the sensor speed will be set to 20 m/min.

3.7 Belt Timing PCB (DM-684-HOLE1001)

This PCB carries a Hall device as a sensor that detects the position of the recording stylus attached on the timing belt. The resultant signal is sent to the Control PCB to establish the recording timing.

(1) Whenever replacing the PCB, make sure to set the clearance between the Hall device and the magnet to be 1 mm to 2 mm. To do this fit the PCB loosely using four fixing screws, then fix the PCB to allow the specified gap. After the adjustment, move the timing belt rightward by hand to make sure both the stylus holder and the magnet run freely.

(2) Turn on the Recorder unit and confirm the LED (D1) on the Power Supply PCB blinks.

3.8 How to Check the Receiver Sensitivity in the Air

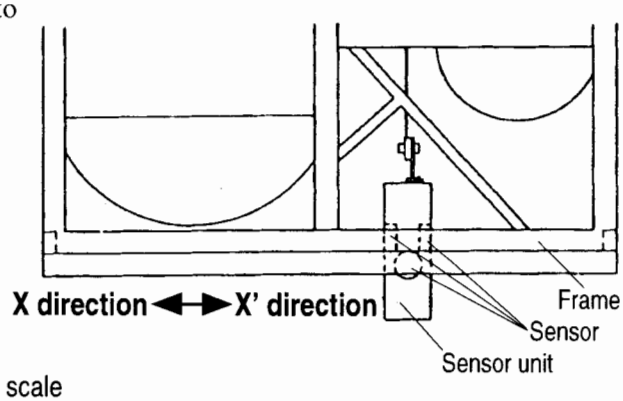
In case the wall echo is weak, use the following procedure to determine whether the receiver sensitivity is normal or not.

(1) Connect the recorder unit to the winch unit.

(2) Stop the sensor at the position indicated in the right figure.

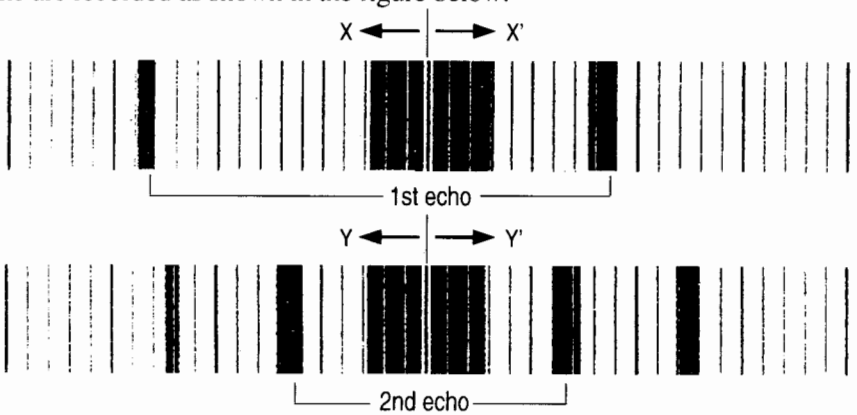
(3) Set the controls and switches on the operating panel as follows.

RANGE switch:	4 m
CALIBRATION dial:	8
SHIFT switch:	0 %
GAIN control:	Fully clockwise
STC control:	Fully counter-clockwise
PAPER FEED switch:	60 mm/min on CONSTANT mode scale

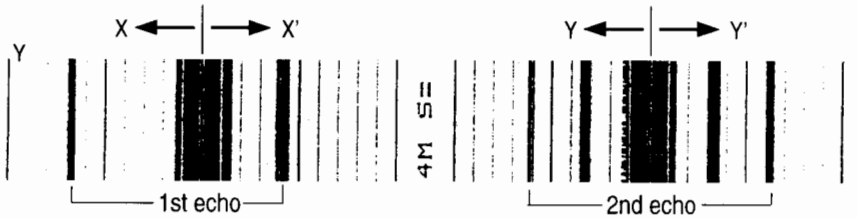


(4) Confirm that the echoes of the winch frame are recorded as shown in the figure below.

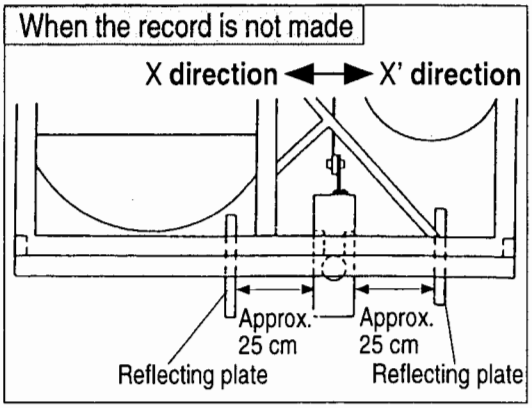
DM-682: Set DIRECTION switch to the X-X' side and confirm the first echo images are recorded as shown in the right figure.
Set DIRECTION switch to the Y-Y side and confirm the second echoes are recorded as shown in the right figure.



DM-684: Confirm the first echoes are shown in the X-X' direction and the second echoes are in the Y-Y' direction.



(5) In case no echoes are recoded, put a metallic plate in parallel to each surface of the sensor element and confirm that the echoes are clearly recorded. Carry out this procedure for X-X' and Y-Y' directions.
Note: The distance of the echo obtained in the above procedure is not an actual distance because the medium is not the slurry but the air.
(6) Should the echoes be normally recorded, the slurry filled in to the hole may be contaminated. Replace the slurry and re-try the measurement, according to the operating procedure detailed in the operation manual.
(7) Should the echoes be poorly recorded or not recorded, sensor elements or cable connection may be wrong. Refer to para. "3.8"

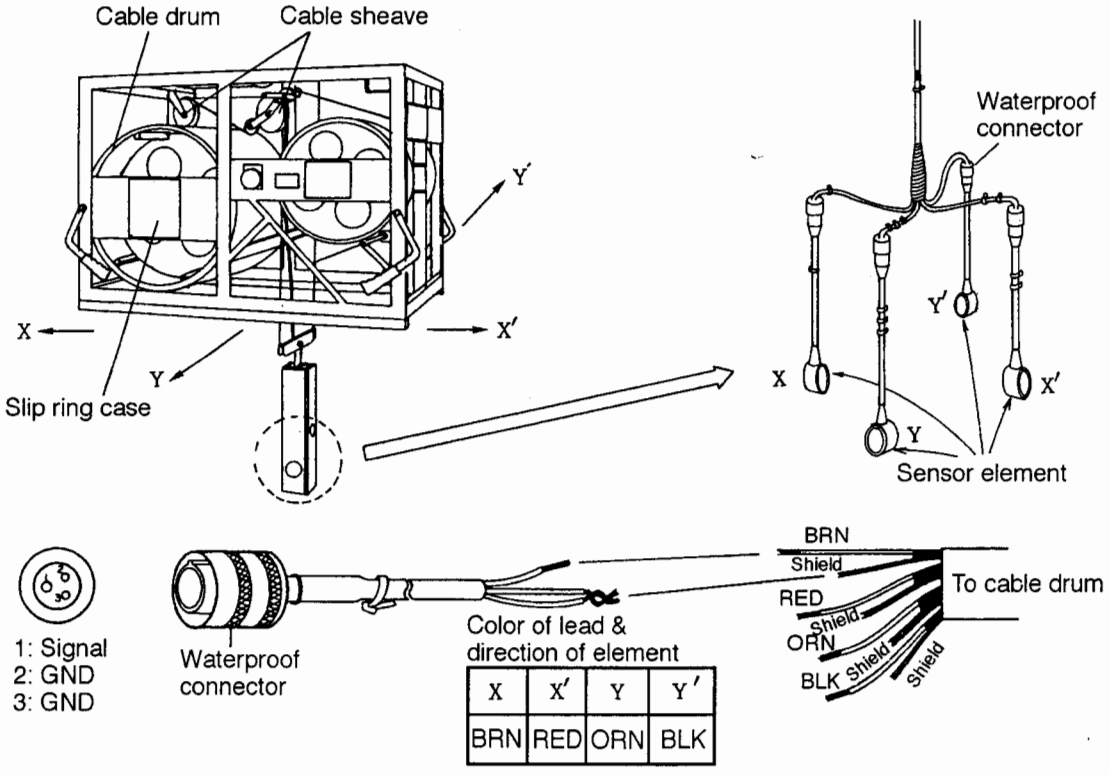


3.9 How to Check the Sensor Unit Cable and Sensor Elements

If the equipment is confirmed to be defective, check the sensor unit and sensor elements by the following procedures.

3.9.1 Checking the sensor unit cable for discontinuity

(1) Check if any damage on the sensor cable be found. Also check if the cable becomes thinner in exterior.
(2) Disassembly the sensor unit and measure the resistance between the electrodes on the waterproofed connector and the slip rings. Check the line one by one, for HOT line and GND line, respectively. There are 8 lines in total.
(3) If you find the lines are discontinued, cut the cable at the damaged part and re-wire each lead.
(4) If you find the cable is normal, suspect faulty sensor element or the sensor cable connecting the waterproof connector and the sensor elements should be discontinued. Refer to para "3.8.2 Diagnosing the faulty sensor element and cable discontinuity".



X	X'	Y	Y'
BRN	RED	ORN	BLK

3.9.2 Diagnosing the faulty sensor element and cable discontinuity

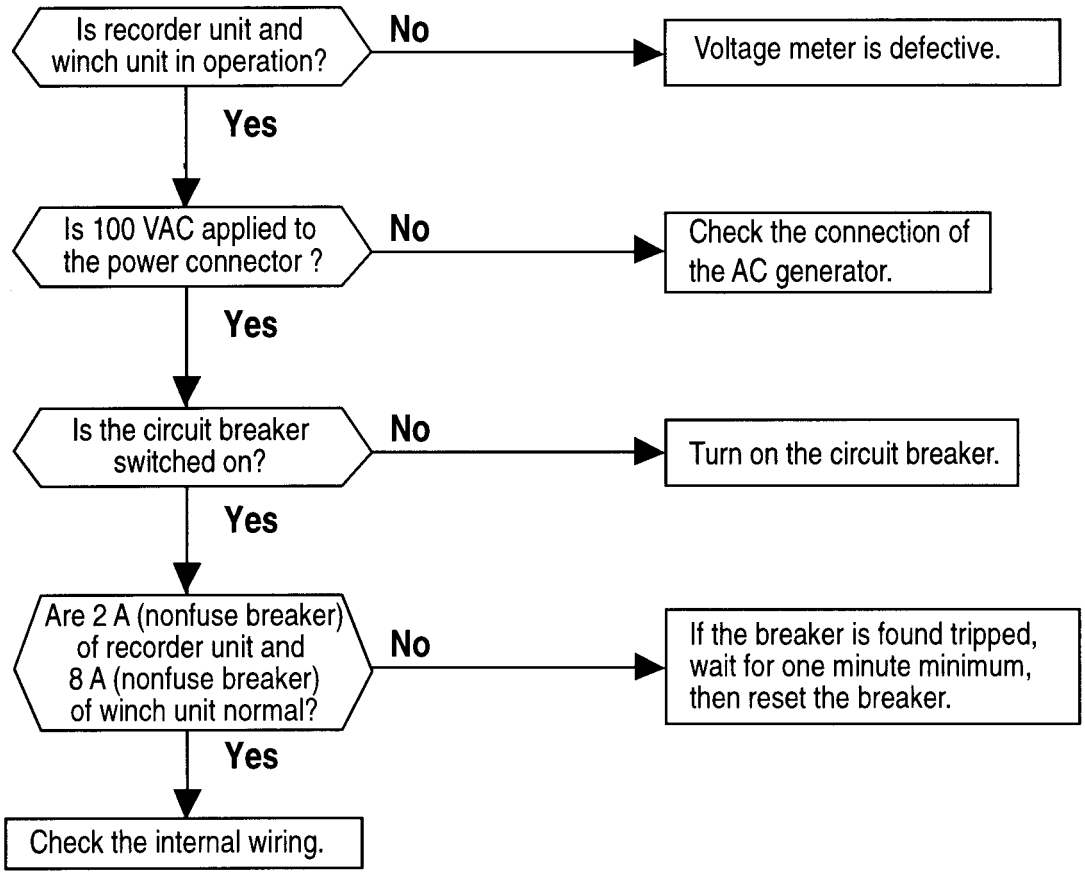
(1) Disassemble the sensor unit and replace the defective lines with normal lines by changing the waterproof connectors one another.
(2) If the sensor element is suspected to be faulty, measure the insulation of each electrode in the waterproof connector. Normal insulation should be more than 1 M Ohms. Also check if the electrodes are rusted, causing poor contact on electrodes.

4. Troubleshooting

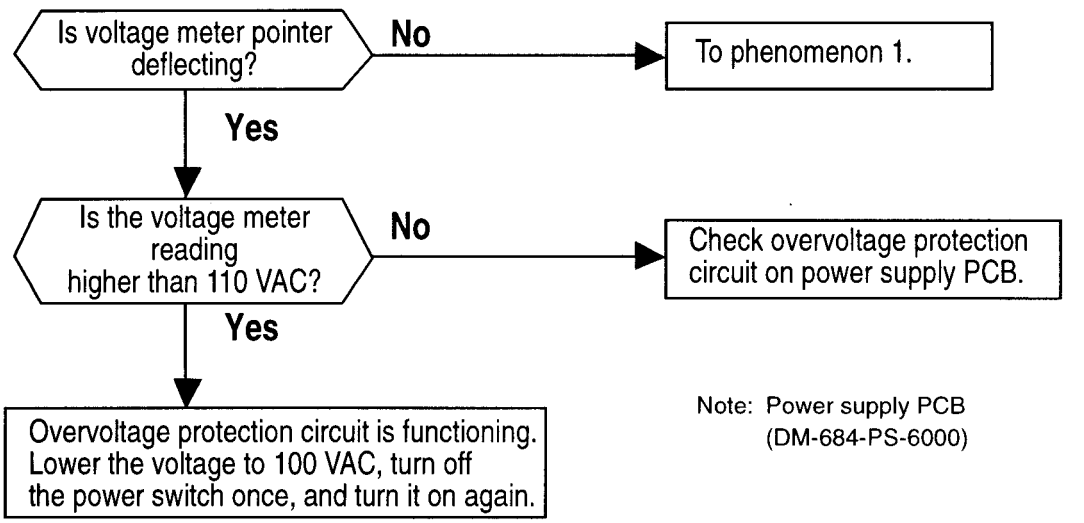
4.1 Troubleshooting Flow Chart by Symptom

If the winch unit or recorder unit fails to function, implement the following performance check. Notify the results to our local office of your convenience.

Phenomenon 1: Voltage meter pointer does not deflect.

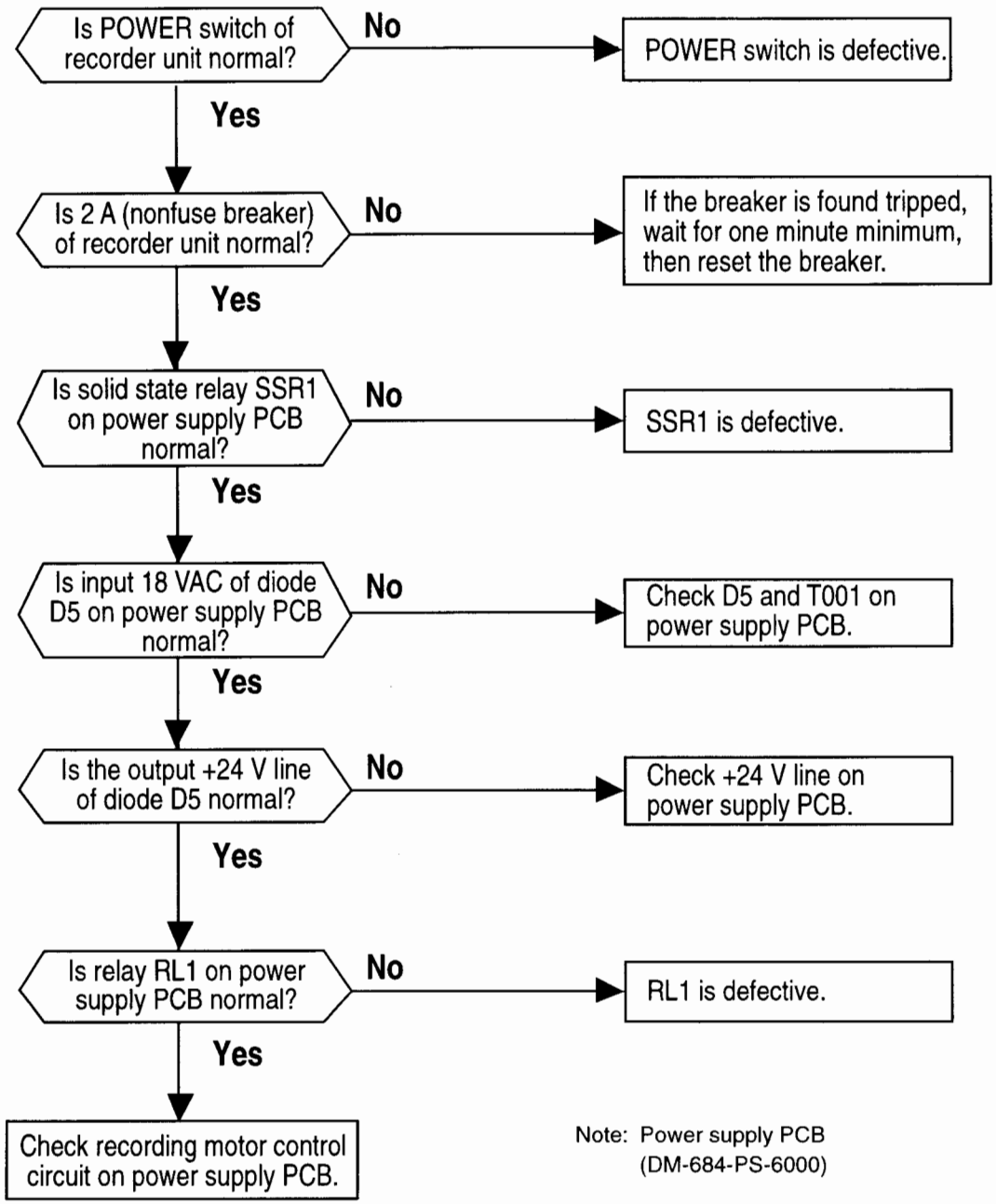


Phenomenon 2: Neither recorder unit nor winch unit functions



Note: Power supply PCB (DM-684-PS-6000)

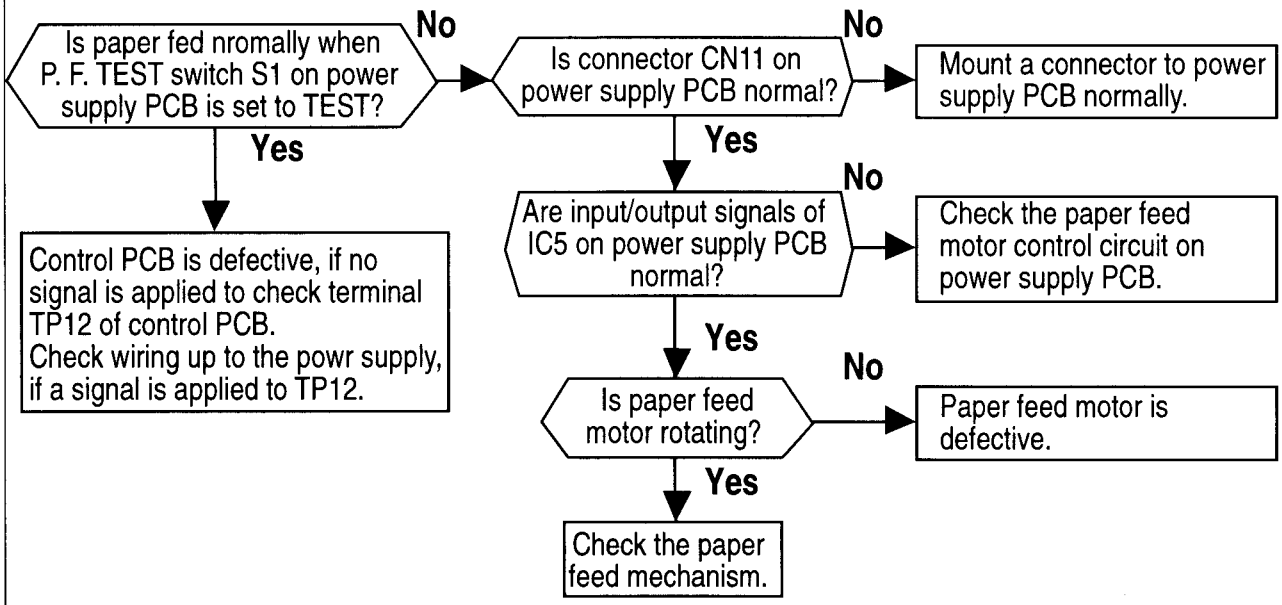
Phenomenon 3: Recording belt does not turn.



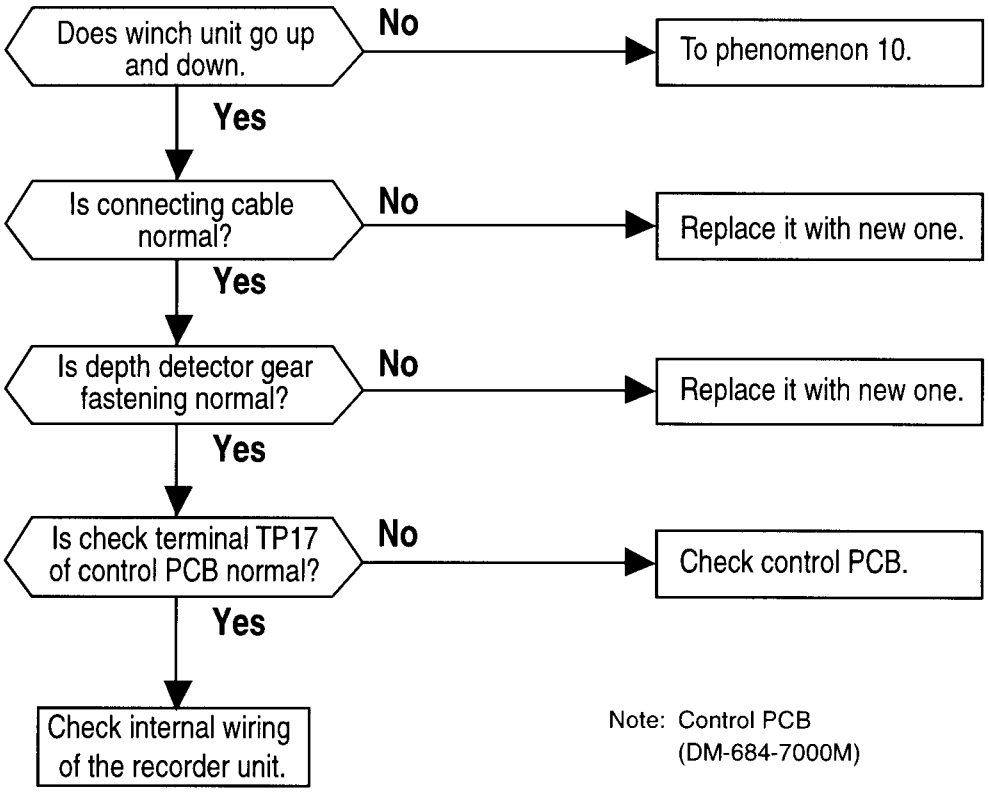
Note: Power supply PCB (DM-684-PS-6000)

Phenomenon 4: No paper is fed though recrding belt turns.

Phenomenon 4-1: Paper feed defective in both CONST apeed and SYNC modes.

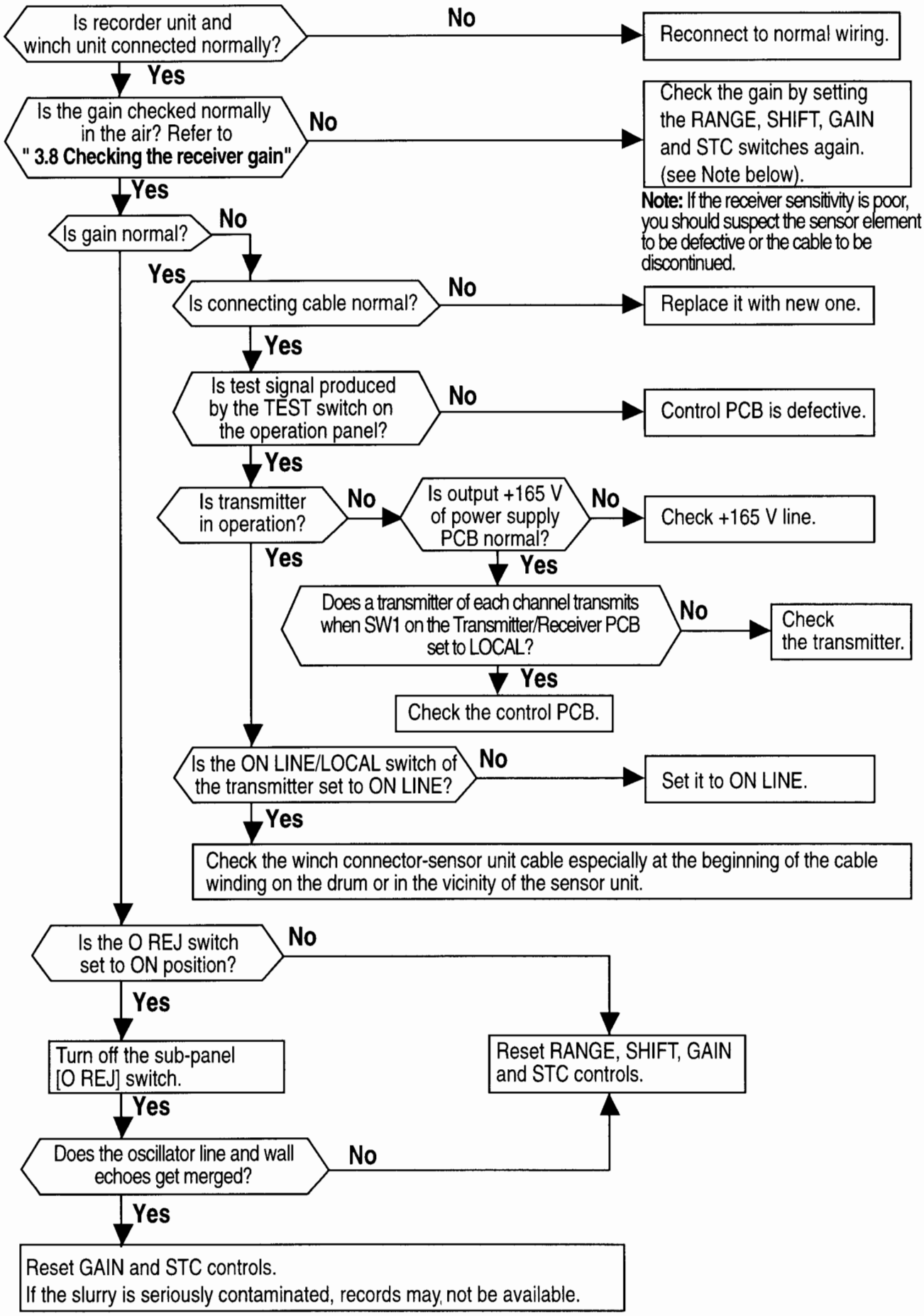


Phenomenon 4-2: Paper feed defective in SYNC mode.

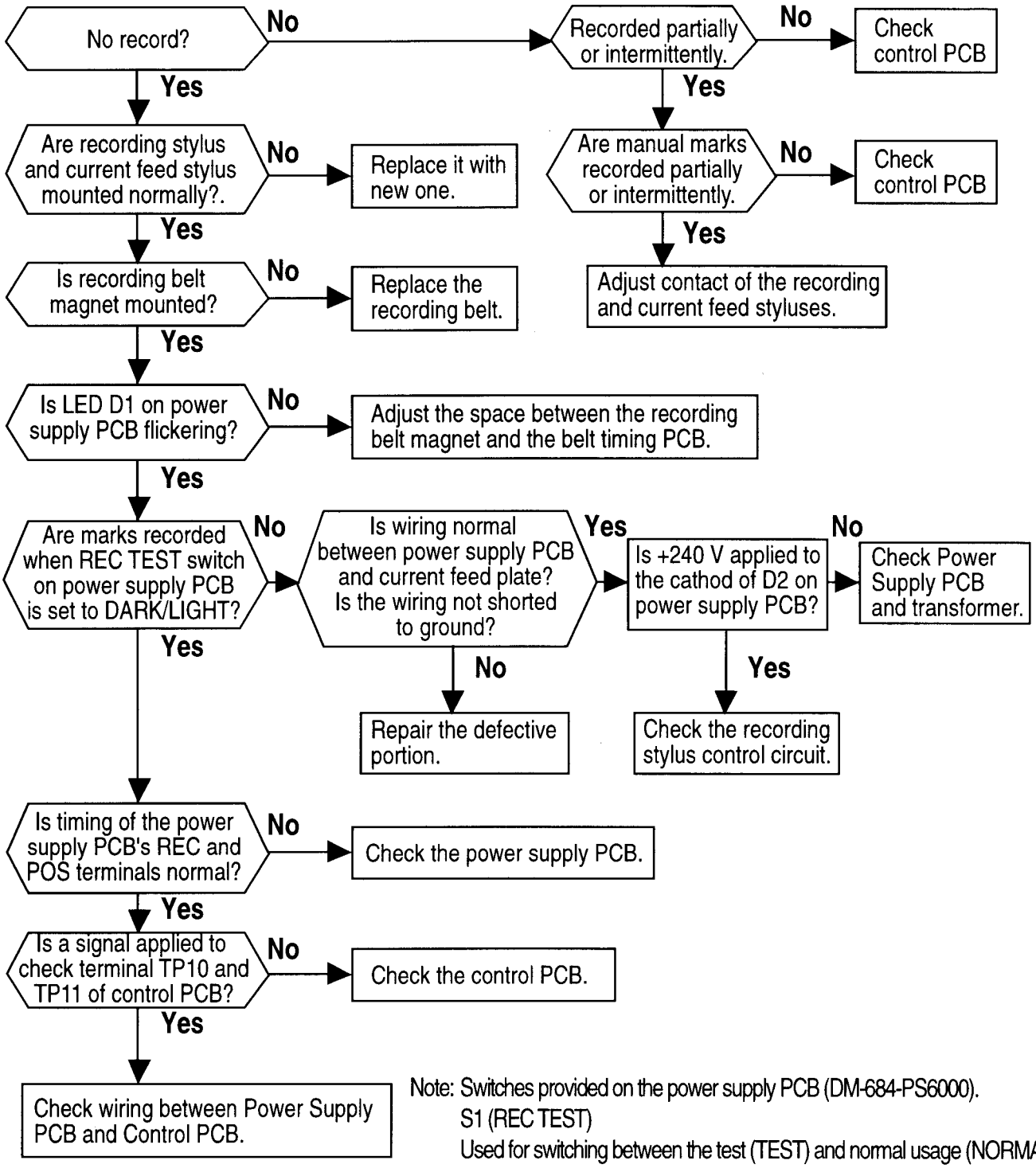


Note: Control PCB
(DM-684-7000M)

Phenomenon 5: No wall face is recorded while various marks are recorded.

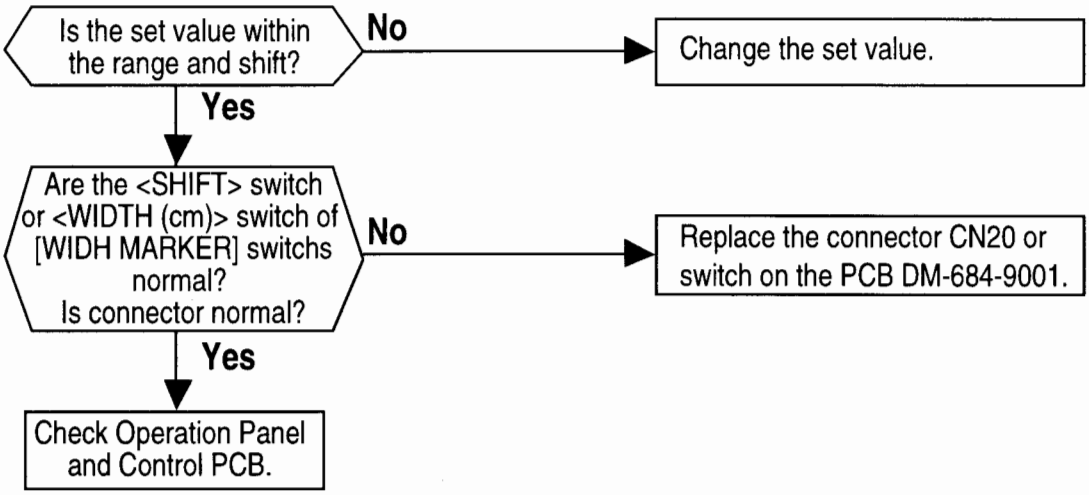


Phenomenon 6: No record appears (None of various marks appears, too).

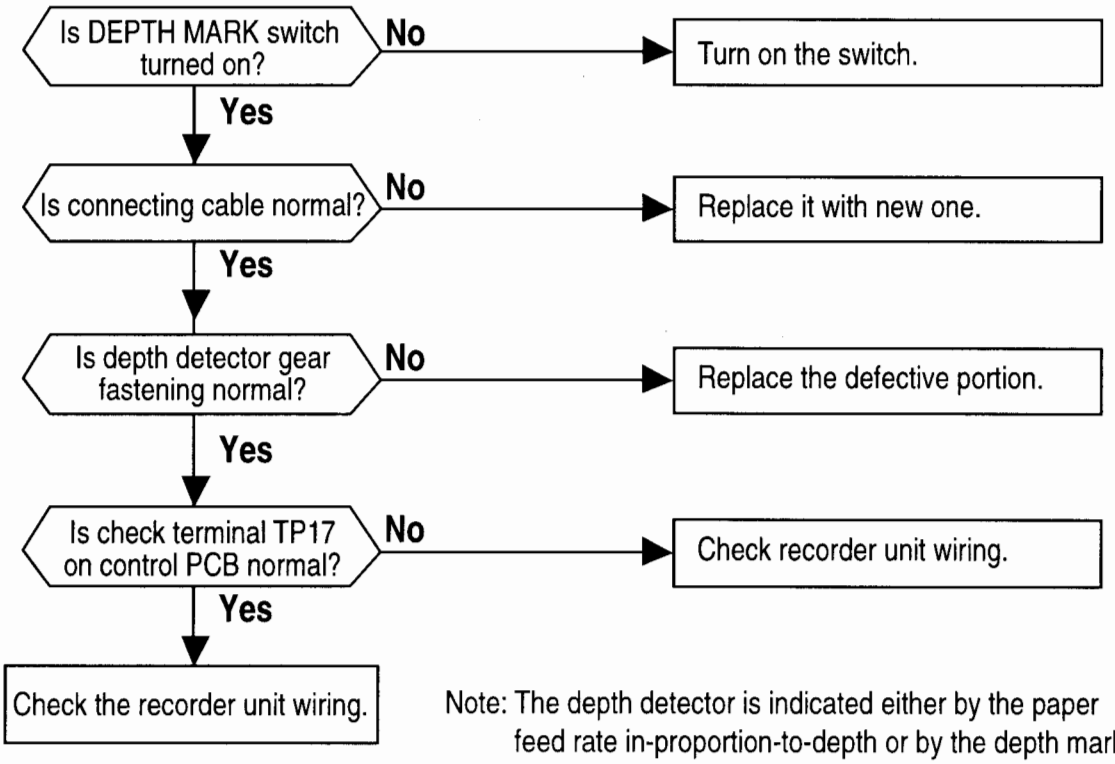


Note: Switches provided on the power supply PCB (DM-684-PS6000).
S1 (REC TEST)
Used for switching between the test (TEST) and normal usage (NORMAL).
Usually, it is set to NORMAL.
S2 (P.F TEST)
Used for switching between the LIGHT and DARK of records printed.

Phenomenon 7: No width mark (drilling hole mark) appears.

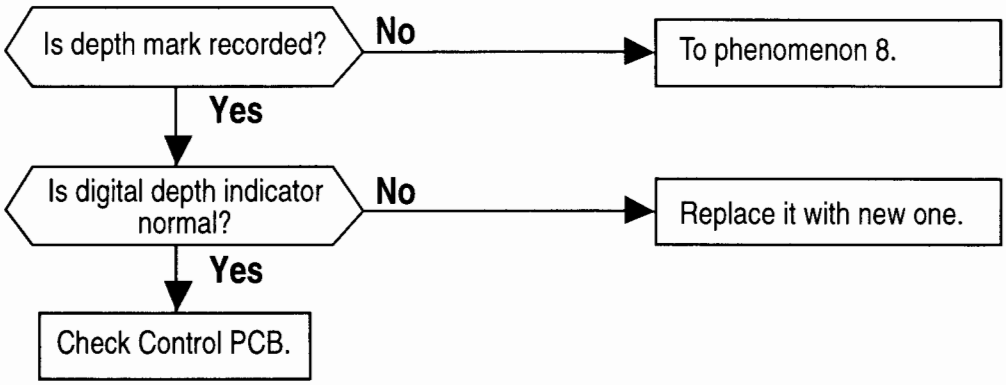


Phenomenon 8: Only depth mark does not appear.

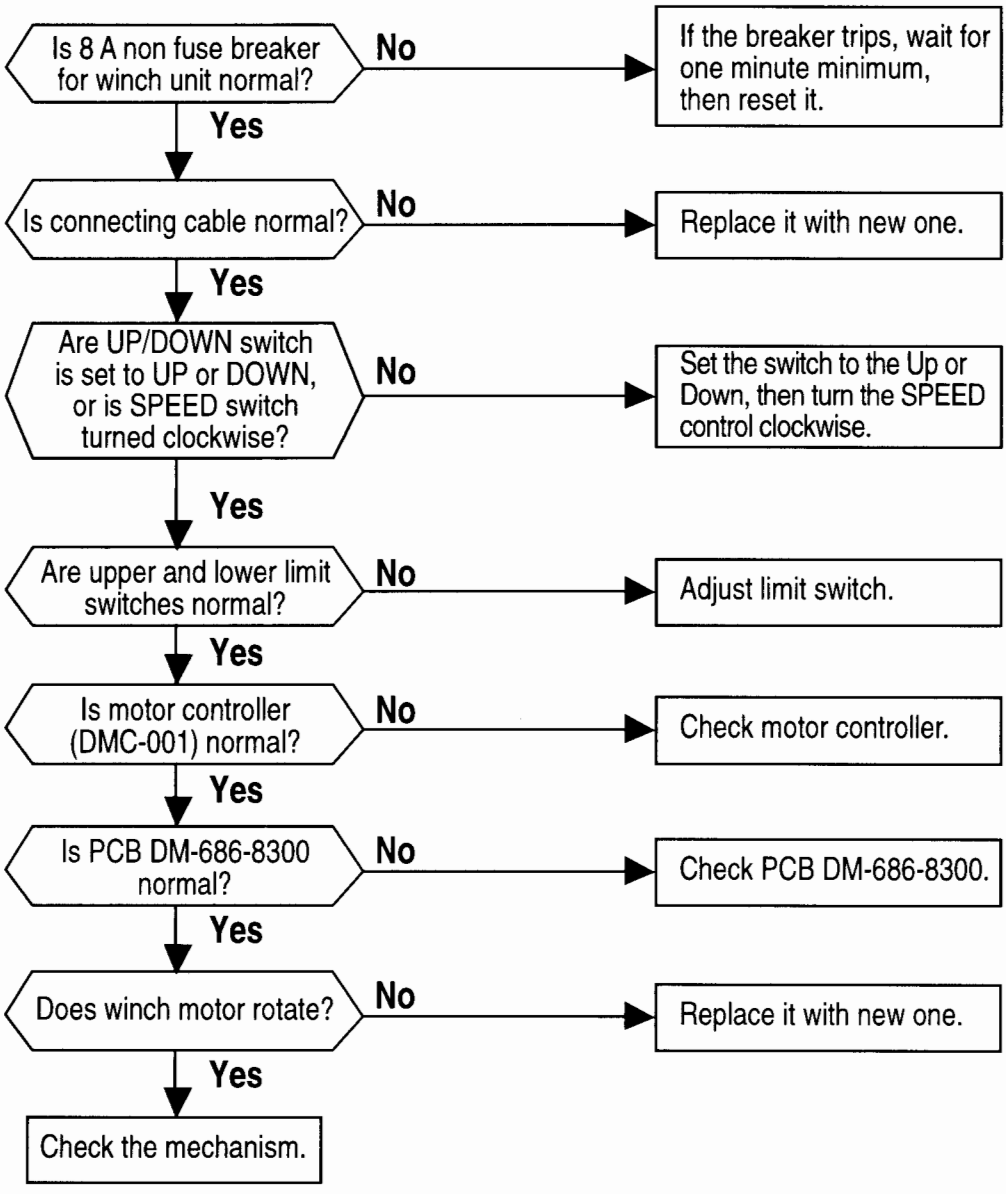


Note: The depth detector is indicated either by the paper feed rate in-proportion-to-depth or by the depth mark. Check one of them.

Phenomenon 9: Depth digital indicator does not turn on.



Phenomenon 10: Only winch unit does not operate.



4.2 Replacing Methods of Winch Parts

Make sure to remove the winch covers before replacement of the winch parts.

4.2.1 How to remove the winch covers

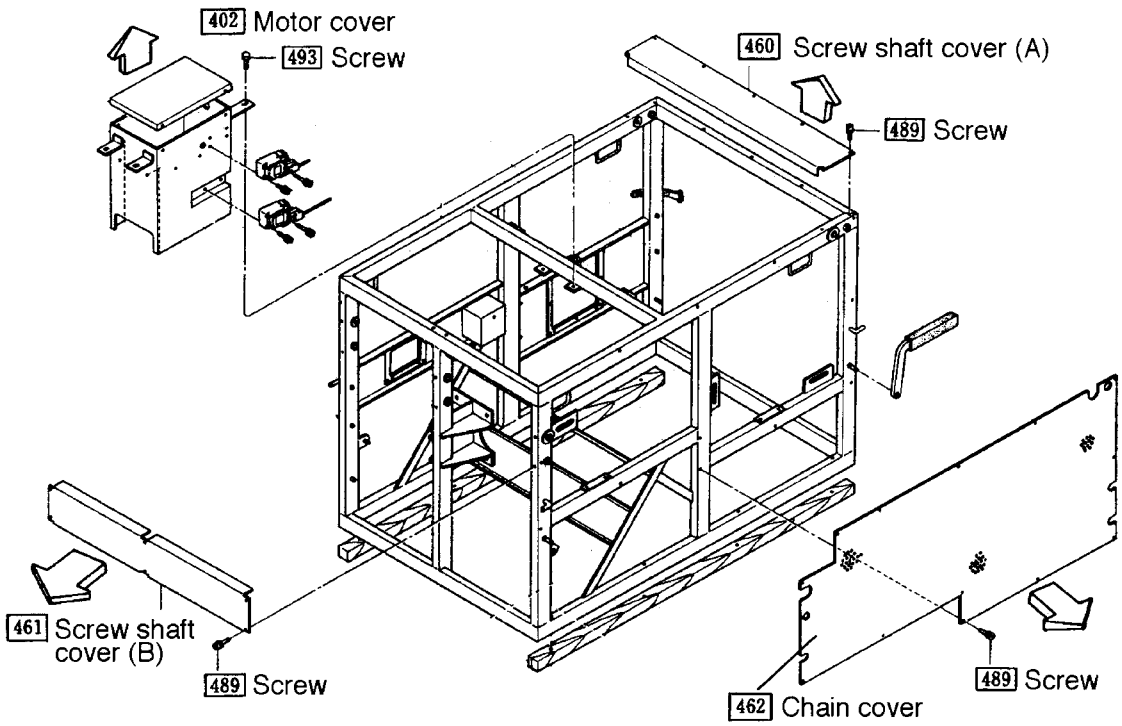


Fig. 4.1 How to remove the winch cover

a. How to remove the motor cover

(1) Remove four motor covers fixing screws from the upper part of the winch.
(2) Pull out the motor leads from the PCB (DM-686-8300) in the motor cover.
(3) Pull the motor cover upward.

b. How to remove the screw shaft cover (A)

(1) Remove seven screw shaft cover fixing screws from the upper part of the winch.
(2) Pull the screw shaft cover (A) upward.

c. How to remove the screw shaft cover (B)

(1) Remove six screws that fasten the shaft cover from the side of the winch.
(2) Remove the screw shaft cover (B).

d. How to remove the chain cover

(1) Remove 14 screws that fasten the chain cover from the side of the winch.
(2) Remove the winch cover carefully so that the chain cover will not be caught by a handle.

4.2.2 How to replace the chain

There are three kinds of chains: roller chain, bush chain A and bush chain B. The location of each chain is shown in Fig. 4.2.

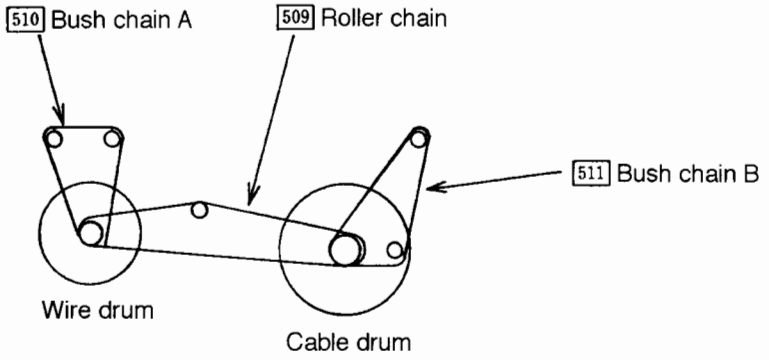


Fig. 4.2 Location of the chain and cable drum

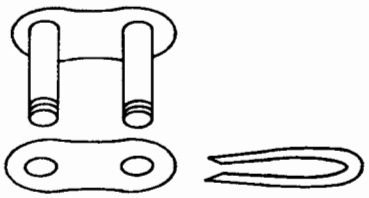


Fig. 4.3 Joint link

Each chain has a joint link as shown in Fig. 4.3. Remove this joint link when you change the chain. After replacement of the chain, make sure to apply grease to the chain.

Note: Do not apply tension to the cable around the drum when changing roller chain.

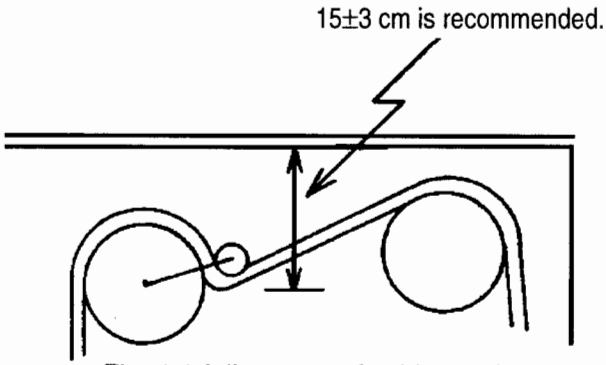
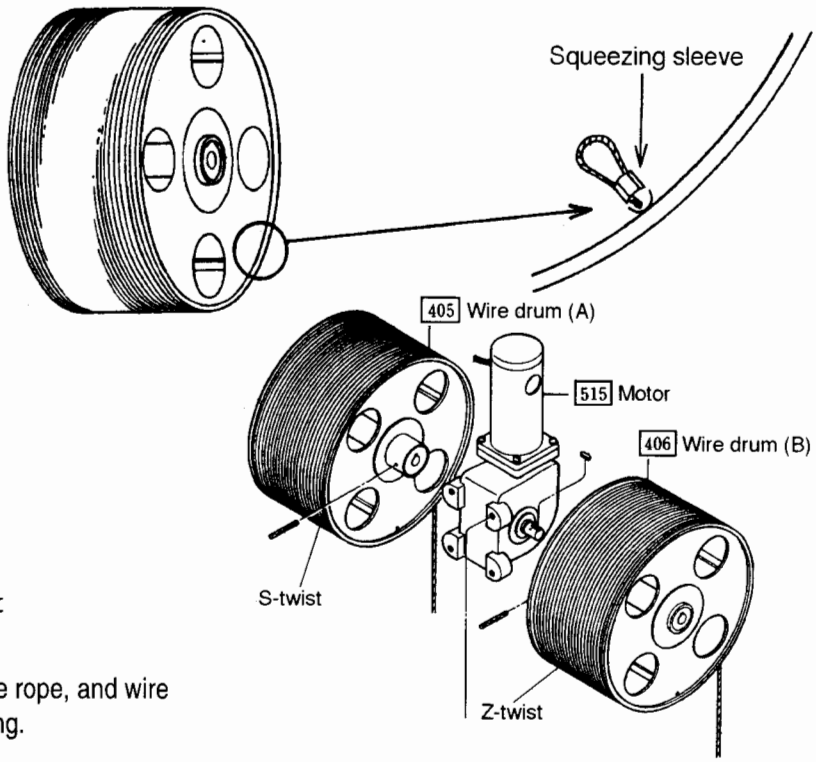


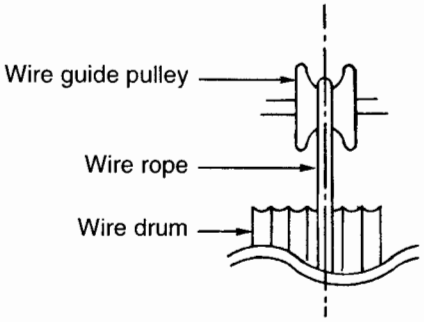
Fig. 4.4 Adjustment of cable tension

4.2.3 How to replace the wire rope

There are two wire ropes attached to the winch unit. As the wire drum cannot be rotated manually, make sure to connect the recorder unit and winch unit when you replace the wire rope, then replace it by the following procedures:

(1) Remove the roller chain (509).
(2) Fix the new wire rope end by using squeezing sleeve through the wire drum hole as shown in the figure below.
(3) Rotate wire drum and wind the rope around the drum. Do not make knots, twist the portion, or put slack on the wire.
(4) The wire rope must be set in the center of the wire drum groove and wire guide pulley as shown in the figure below.





Note: Align the center of wire sheeve, wire rope, and wire drum groove to avoid irregular wire winding.

4.2.4 How to wind the cable around the drum

(1) Remove the roller chain (509).
(2) Wind cable with 1 meter left from slip ring side around the cable drum (404). Do not make knots, twist the portion, or put slack on the cable. Cable drum can be rotated manually.
(3) Processing method of the cable wiring is referred to item "3.8.1 How to check the disconnection of sensor cable."
(4) Set the roller chain as it was.

4.2.5 How to replace the screw shaft (A)

(1) Remove the screw shaft cover (A). See "4.2.1 How to remove the winch cover."
(2) Remove the roller chain.
(3) Move the slide bracket (B) to either side by rotating the screw shaft (A) manually.
(4) Remove the C-ring attached to the opposite side to slide bracket (B) by using pliers.
(5) Pull out the screw shaft (A) through the hole.
(6) Loosen the fixing screw (483), then pull slide bracket (B) and sprocket (D) by rotating screw shaft (A) manually.
(7) After replacement, assemble them by the reverse procedure.

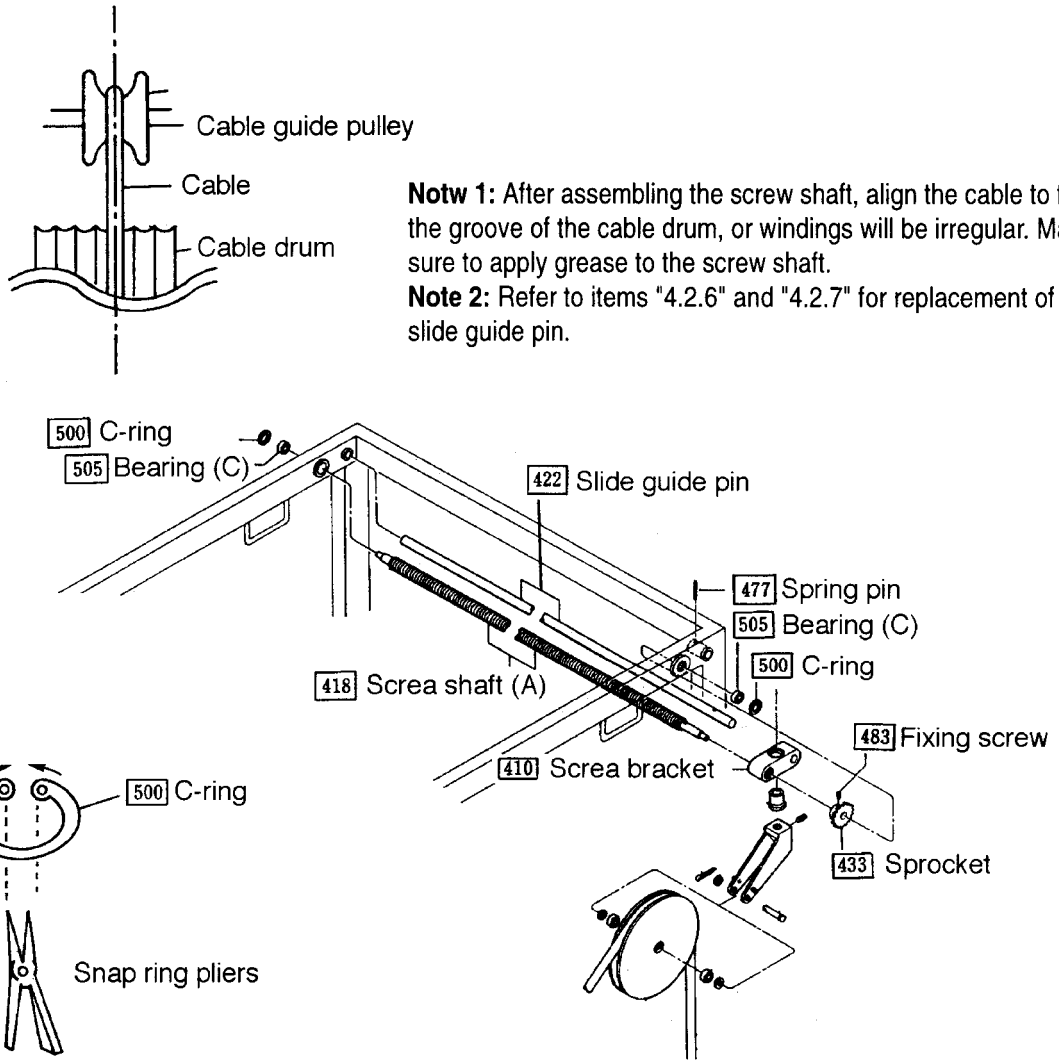


Fig. 4.4 Replacement of the screw shaft (A) and slide guide pin

4.2.6 How to replace the slide guide pin

(1) Remove the screw shaft cover (A) by referring to item "4.2.1."
(2) Pull out the split pin.
(3) Pull out the slide guide pin.
(4) After replacement, assemble them by reversing the above procedure.

4.2.7 How to replace slide bracket (B)

(1) Remove the slide bracket (B) by the same procedure as item "4.2.5" and "4.2.6."
(2) Loosen the fixing screw and remove the rotation center pin.
(3) Assemble them by reversing the above procedure.

4.2.8 How to replace the wire side roller

(1) Remove the screw, holding plate, collar (C), and wire side roller in that order.
(2) Replace the wire side roller and bearing with new ones.
(3) Assemble them by reversing the above procedure.

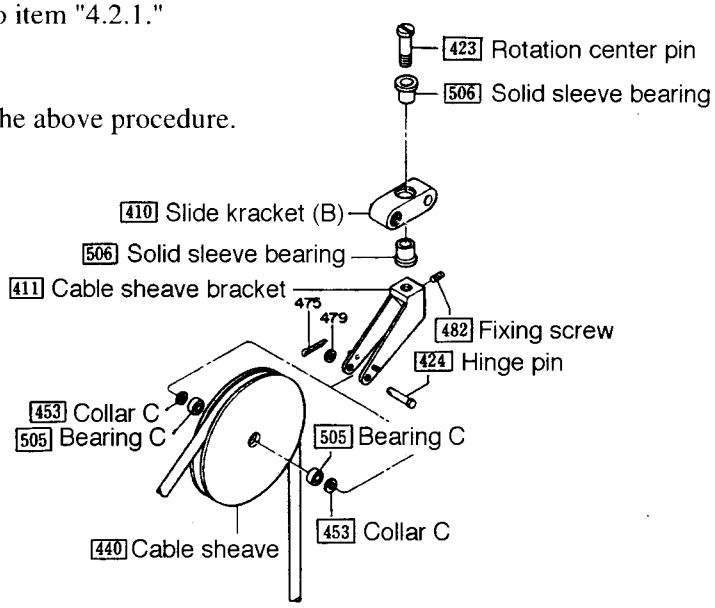


Fig. 4.5 How to replace the slide bracket

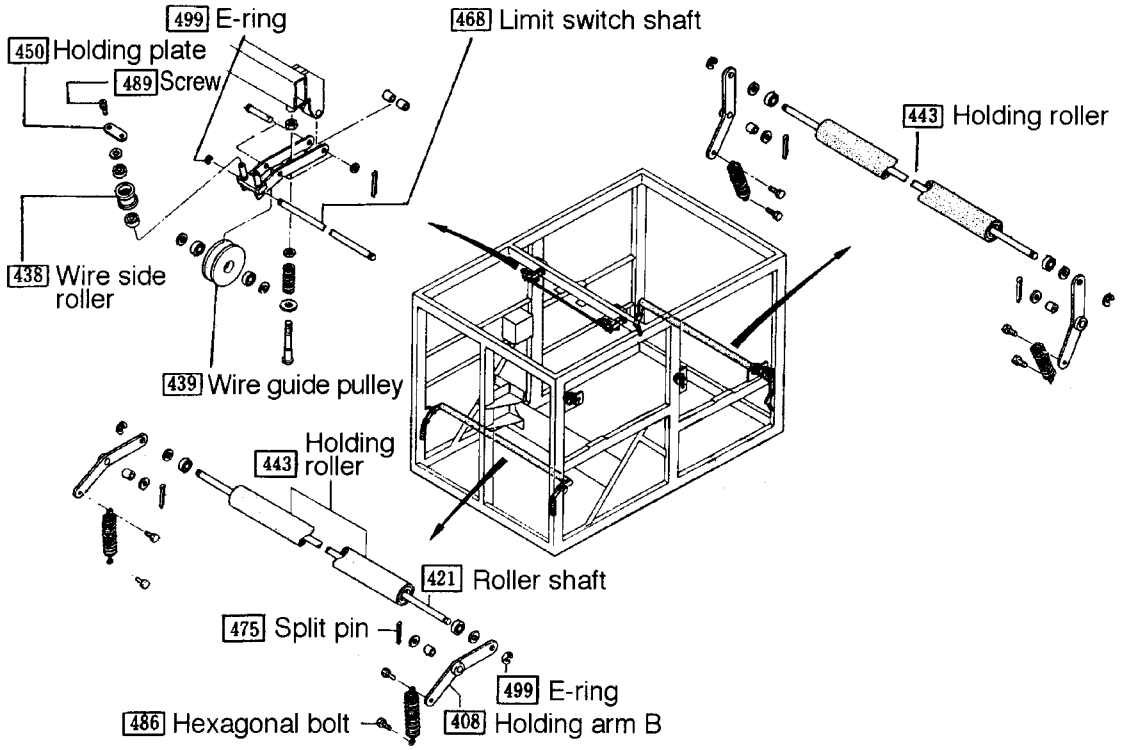


Fig. 4.6 How to replace the wire side roller, wire guide pulley and holding roller

4.2.9 How to replace the wire sheave

(1) Remove the limit switch shaft, after replacement of E-ring.
(2) Replace the wire sheave and bearing with new ones.
(3) Assemble them by reversing the above procedure.

4.2.10 How to replace the holding roller

(1) Remove the hexagonal bolt.
(2) Remove the split pin.
(3) Remove the E-ring from roller shaft.
(4) Replace the roller shaft and bearing with new ones.
(5) Assemble them by reversing the above procedure.

4.2.11 How to replace the wire side roller

(1) Remove the screw shaft cover (B) by referring to item 4.2.1.
(2) Remove the screw, holding plate, collar (C), and wire side roller in that order.
(2) Replace the wire side roller and bearing with new ones.
(3) Assemble them by reversing the above procedure.

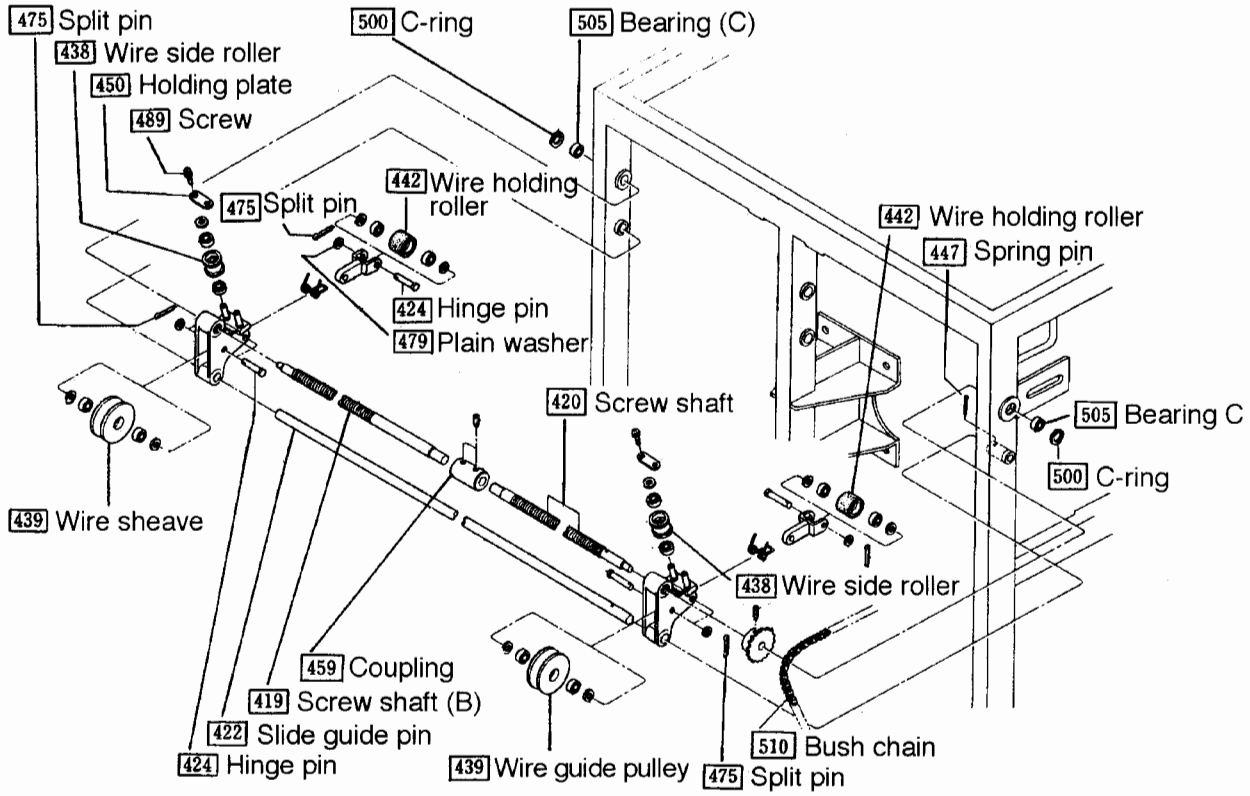


Fig. 4.7 How to replace wire side roller, wire holding roller, screw shaft (A) screw shaft (B), wire sheave and guide pin.

4.2.12 How to replace the wire holding roller

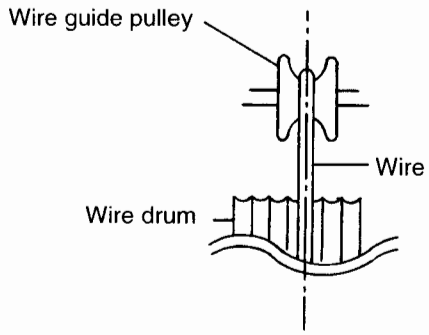
(1) Remove the screw shaft cover (B) by referring to item 4.2.1.
(2) Fix the wire rope end to wire drum by using tape or the like so that the wire rope will not be slack.
(3) Remove the split pin, take out hinge pin, then remove the wire holding roller assembly.
(4) Replace the wire holding roller and bearing with new ones.
(5) Assemble them by reversing the above procedure.

4.2.13 How to replace the screw shaft (B) and screw shaft (C)

(1) Remove the screw shaft cover (B) by referring to item 4.2.1.
(2) Remove the bush chain.
(3) Loosen the fixing screw of coupling
(4) Remove the C-ring from both sides of the screw shaft.
(5) Remove the sprocket (C) after moving two screw shafts in the direction of screw shaft (B).
(6) Remove the screw shaft, then replace it with new one.
(7) Assemble them by reversing the above procedure.

4.2.14 How to replace the wire guide pulley

(1) Remove the screw shaft cover (B) by referring to item 4.2.1.
(2) Remove the split pin, take out hinge pin, then remove the wire guide pulley and bearing.
(3) Assemble them by reversing the above procedure.
(4) After assembling, align the wire to be fitted in the center of the wire guide pulley and the wire drum groove.



4.2.15 How to replace the slide guide pin

(1) Remove the screw shaft cover (B) by referring to item 4.2.1
(2) Remove the split pin, take out the slide guide pin.
(3) Assemble them by reversing the above procedure.

4.2.16 How to replace the slide bracket (A)

(1) Remove the screw shaft cover (B) by referring to item 4.2.1.
(2) Remove the slide bracket (A) from the screw shaft and slide guide pin.
(3) Assemble them by reversing the above procedure.

4.2.17 How to replace the wire drums (A) and (B)

(1) Fix the end of the wire rope onto the wire drum by using a strip of PVC tape.
(2) Remove the motor cover by referring to item 4.2.1 "How to remove the winch cover."
(3) Remove the roller chain by referring to item 4.2.2 "How to replace the chain."
(4) Remove the bush chain (A) by referring to item 4.2.2
(5) Rotate the slide bracket after removing the slide guide pin.
(6) Remove the bearing case, gear (A) and the depth detector case.
(7) Remove the wire drums (A) and (B), and motor upward after removing four hexagonal bolt.
(8) Remove the spring pin, the wire drum from the motor gear box, and then the replace it with new one.
(9) Insert the wire drum pin into the wire drum, and then insert the motor gear shaft into the wire drum.
(10) After assembling the replaced wire drum and the gear box, make a hole for slip ring pin by using a drill of 5.0 mm in diameter.
(11) Assemble them by reversing the above procedure.

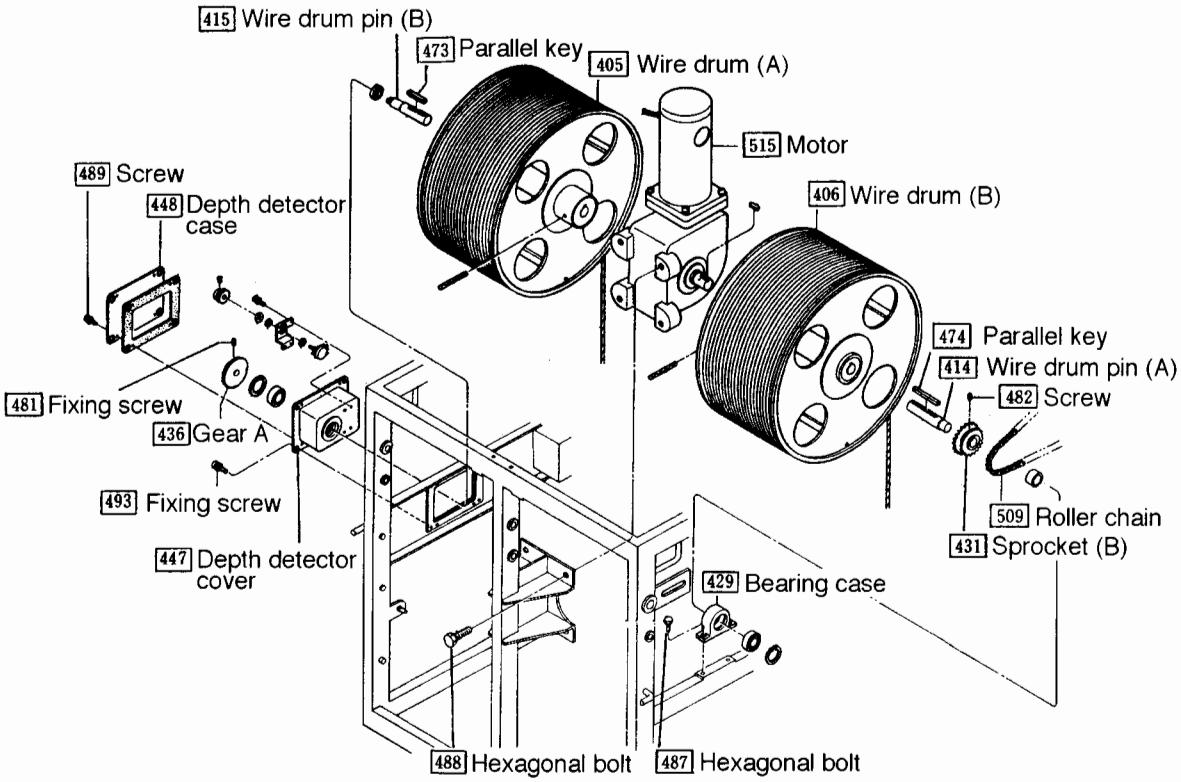


Fig. 4.8 Replacement of the wire drums (A) and (b)

4.2.18 How to replace the cable drum

(1) Remove the roller chain
(2) Remove the cable by pulling it toward you by referring to item 4.2.2.
(3) Remove the bush chain (B) by referring to item 4.2.2.
(4) Remove the slip ring without breaking contact.
(5) Remove the slip ring and bearing case.
(6) Remove the cable drum upward.
(7) Pull out the cable drum pins (A) and (B) into the cable drum.
(8) Insert new cable drum pins (A) and (B) into the cable drum.
(9) Assemble by reversing the above procedure.

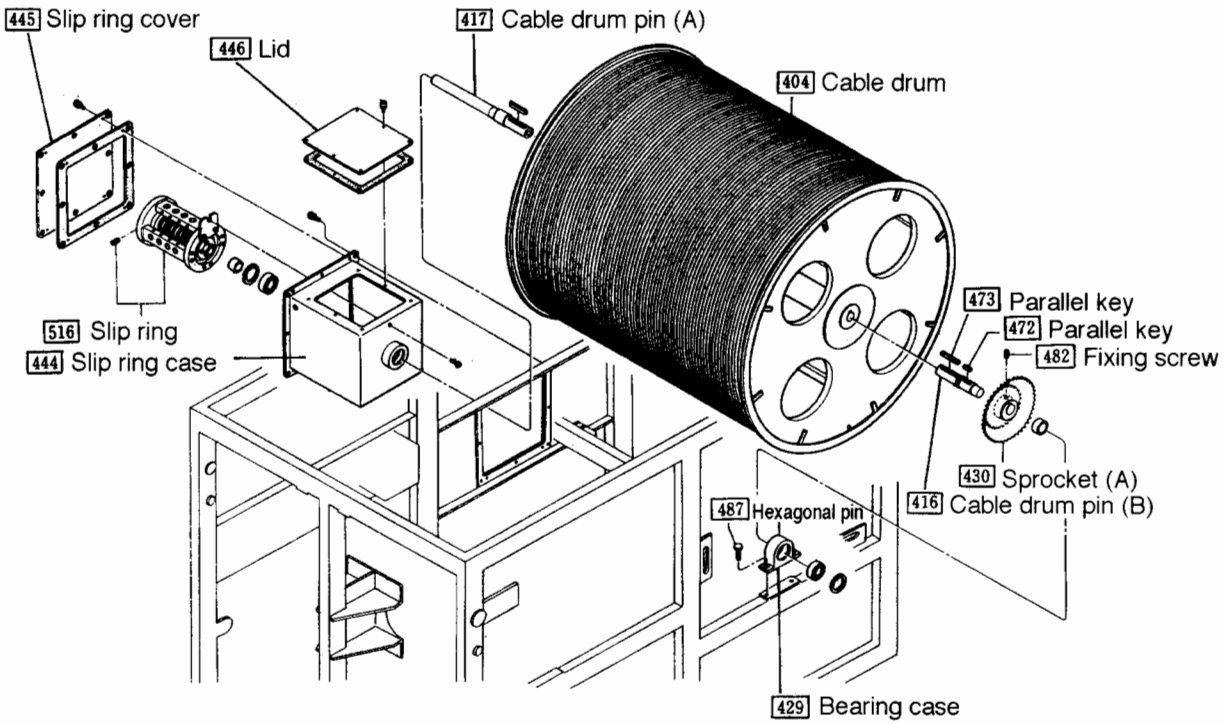
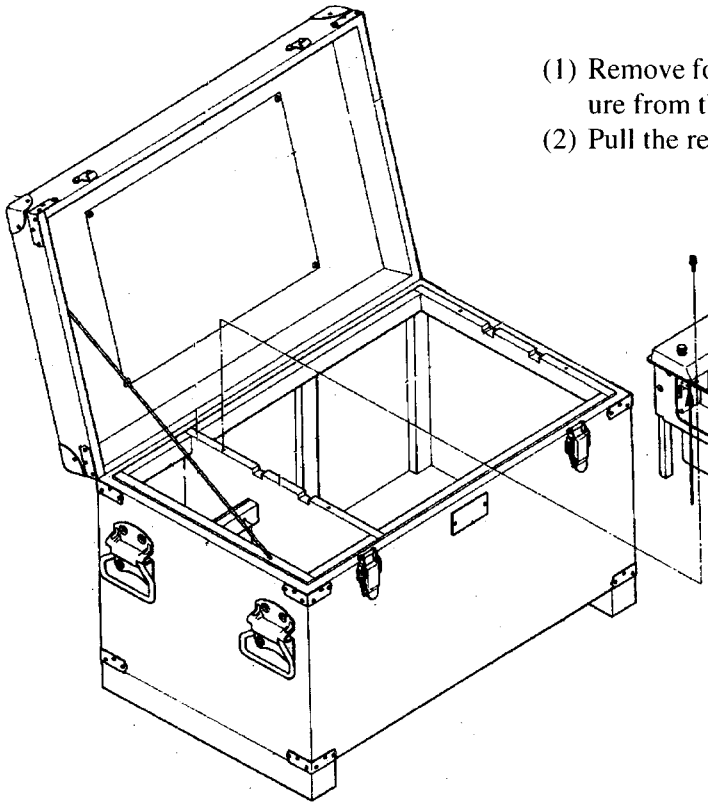


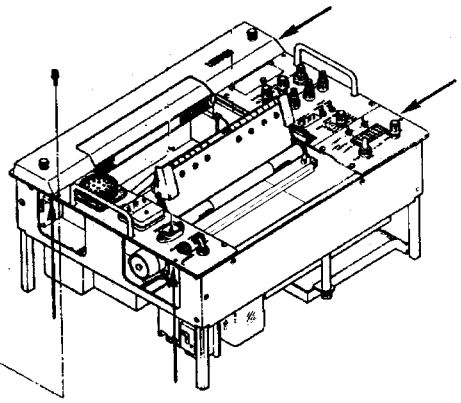
Fig. 4.9 How to replace the cable drum

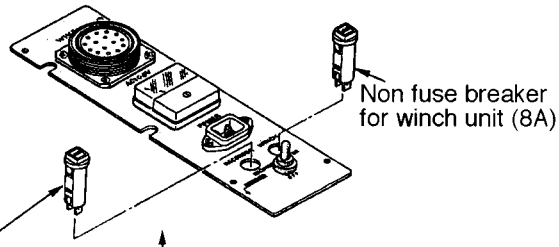
4.3 Exchange Methods of Recorder Parts

4.3.1 How to remove the recorder from the wooden box.



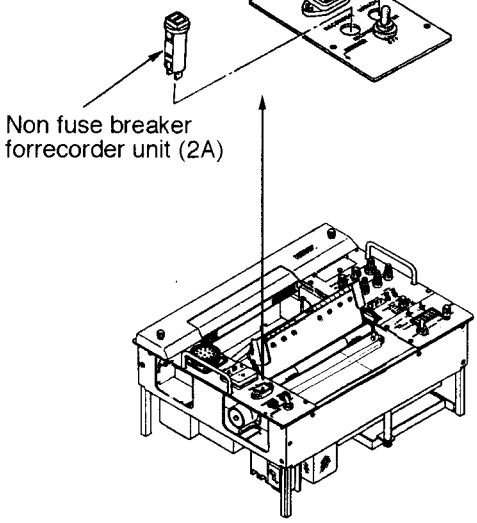
(1) Remove four screws indicated by arrows in the upper figure from the control panel of the recorder unit.
(2) Pull the recorder upward.





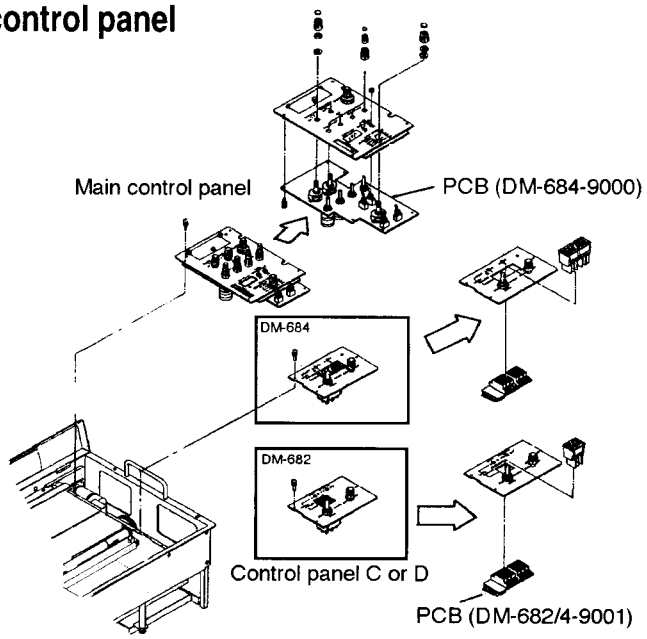
4.3.2 How to replace the non fuse breaker

(1) Remove four screws indicated by arrows in the upper figure from the control panel of the recorder unit.
(2) Remove the faston receptacles of the non fuse breaker.
(3) Release the latched non fuse breaker from bracket of the panel.
(4) Mount a new non fuse breaker by reversing the above procedure.



4.3.3 How to replace the PCB (DM-684-9000) for control panel

(1) Remove control panel by removing two nuts fixing small type toggle switch on the control panel.
(2) Remove main control panel after disconnection connectors (CN17, CN18, CN19, and CN21)
(3) Remove nuts fixing controls and switches on the main control panel.
(4) Remove PCB (DM-684-9000) from the main control panel.
(5) Replace it with new one by reversing the above procedure.



4.3.4 How to replace the WIDTH MARKER (WIDTH) switch

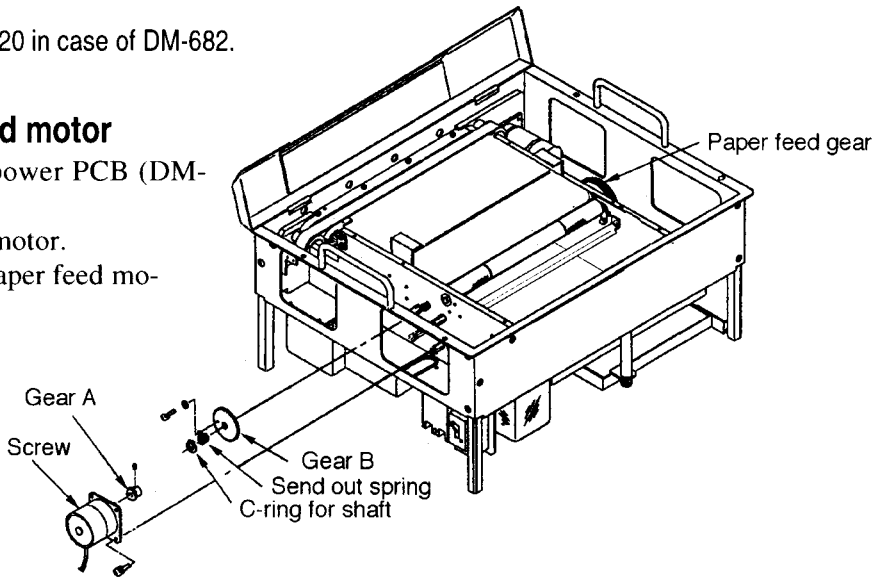
(1) Remove the control panel
(2) Remove the PCB (DM-682/4-9001) from the WIDTH MARKER (WIDTH) switch.
(3) Remove the WIDTH MARKER (WIDTH) switch from the control panel.
(4) Replace it with new one by the reversing the above procedure.

Note: Insert it into the left hand connector CN20 in case of DM-682.

4.3.5 How to replace the paper feed motor

(1) Remove the connector CN11 from power PCB (DM-684-PS-6000).
(2) Remove the screw fixing paper feed motor.
(3) Remove Gear (A) from the shaft of paper feed motor.
(4) Replace the motor with new one.
(5) Assemble by reversing the above procedure.

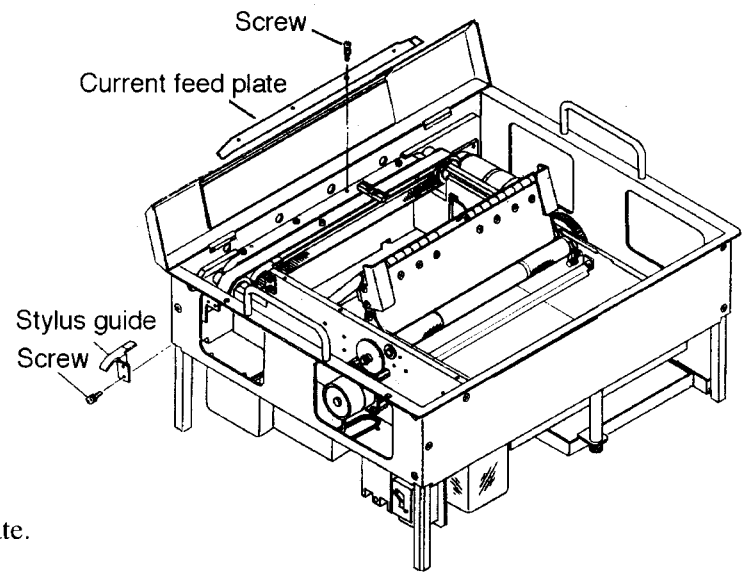
Note: After replacement, make sure the paper is fed at the speed set by the PAPER SPEED switch on the main control panel.



4.3.6 How to replace the send out spring

(1) Remove the paper feed motor.
(2) Remove the C-ring for shaft.
(3) Pull out the Gear (B) assembly.
(4) Pull out the send out spring from the gear (B) after removing screw.
(5) Replace the send out spring with new one.
(6) Assemble by reversing the above procedure.

Note: After replacement, rotate the paper feed gear to make sure it rotates in the direction of the arrow only.



4.3.7 How to replace the current feed plate

(1) Remove the signal cable from the current feed plate.
(2) Remove four screws fixing the current feed plate.
(3) Replace the current feed plate with new one.
(4) Assemble by reversing the above procedure.

Note: After replacement, make sure the current feed plate and chassis are not shorted.

4.3.8 How to replace the stylus

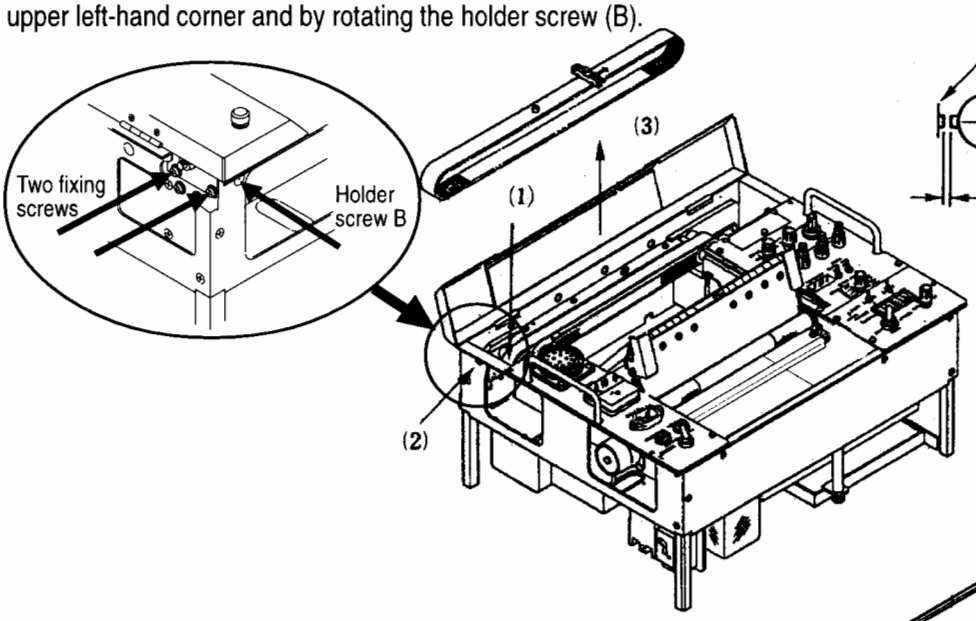
(1) Remove the screws that fasten the stylus guide from the stylus guide.
(2) Replace the stylus guide with a new one.
(3) Fix the stylus guide with the screws removed in step (1).

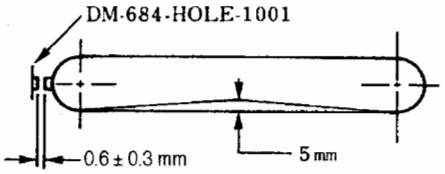
Note: After replacement, rotate the recording belt manually to make sure the recording stylus comes through the stylus guide and runs on the recording paper properly.

4.3.9 How to replace the recording belt

(1) Loosen two screws on the upper left-hand corner.
(2) Loosen the holder screw B (2).
(3) Remove the recording belt (3).
(4) Replace the recording belt, and then assemble by reversing the above procedure.
(5) Confirm that the magnet does not touch the belt timing PCB by rotating the recording belt clockwise manually.

Note: Do not apply excessive tension to the recording belt. Tension can be adjusted by slight fastening two screws on the upper left-hand corner and by rotating the holder screw (B).





Note: Adjust the tension of recording belt by pressing it upward so that the clearance will be about 5 mm.

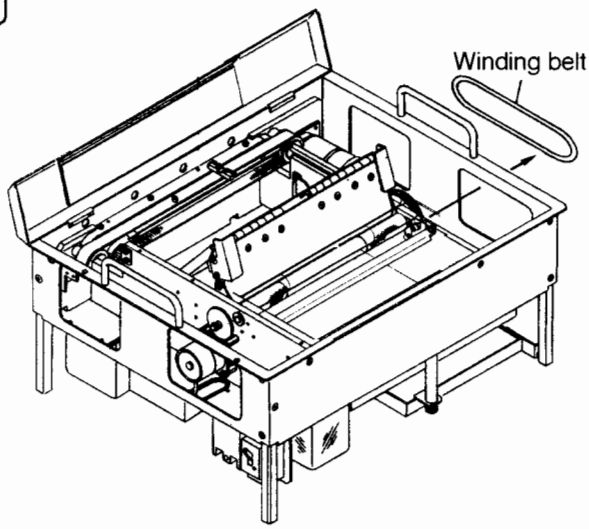
4.3.10 How to replace the winding belt

This procedure is applicable to the following equipments that use the timing belt.

DM-682: Ser. No. 682647 and before

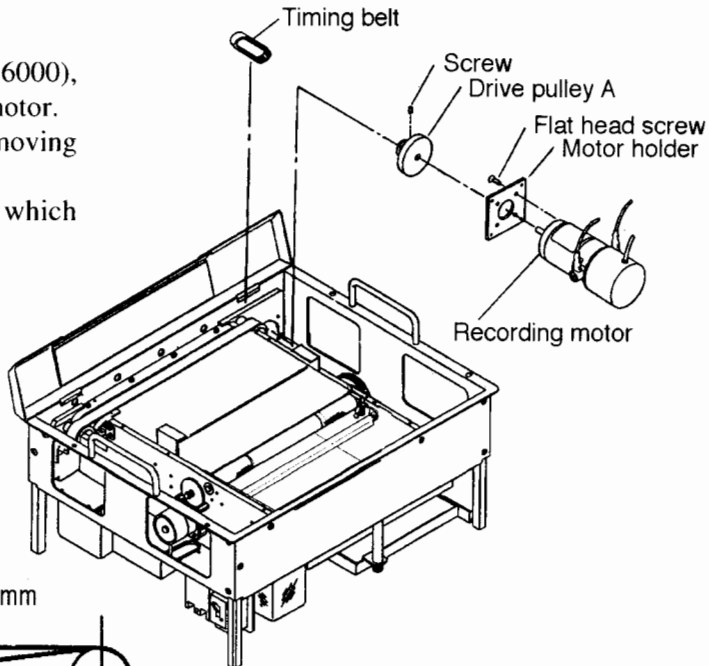
DM-684: Ser. No. 684391 and before

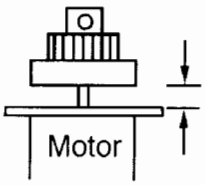
(1) Remove the main control panel.
(2) Remove the winding belt from the pulley.
(3) Replace it with new one.
(4) Attach the main control panel as it was.



4.3.11 How to replace the recording motor

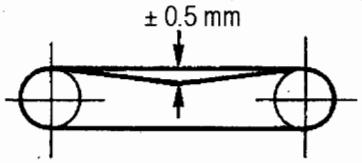
(1) Remove the connector CN12 on PCB (DM-684-PS6000), and then disconnect the cable from the recording motor.
(2) Remove the recording motor and timing belt by removing four fixing screws.
(3) Remove the pulley A by removing a fixing screw which fixes pulley A to the recording motor.





Clearance between drive pulley A and motor holder should be 2 mm.

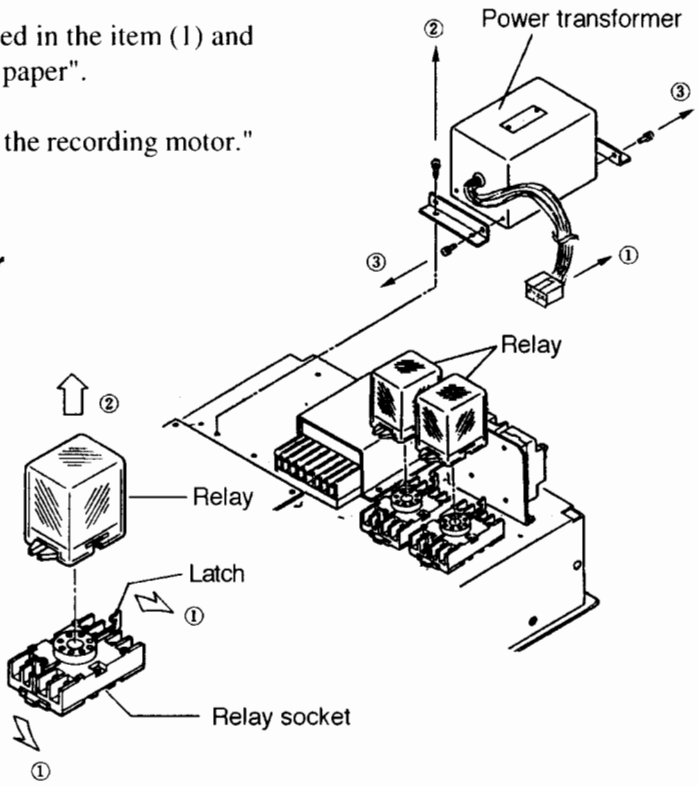
Run the motor and adjust the belt displacement to be within +/-0.5 mm by rotating the holder screw (B).



(4) Remove the recording motor from motor holder by removing four screws which fixes motor holder.
(5) Replace the recording motor with new one by the reverse procedure.
(6) Adjust the recording motor by reversing the above procedure.

4.3.12 How to replace the timing belt

(1) Remove the timing belt by the procedures described in the item (1) and (2) of para. 4.3.11 "How to replace the recording paper".
(2) Replace it with new one.
(3) Adjust by referring to item 4.3.11 "How to replace the recording motor."



4.3.13 How to replace the power transformer

(1) Disconnect the connector CN8 from PCB DM-684-PS6000 in the recorder unit.
(2) Remove the screws that attach the transformer to the chassis.
(3) Remove the screws fixing the transformer and angle.
(4) Mount a new transformer by reversing the above procedure.
(5) Confirm that each voltage applied to check points on PCB DM-684-PS6000 is normal.

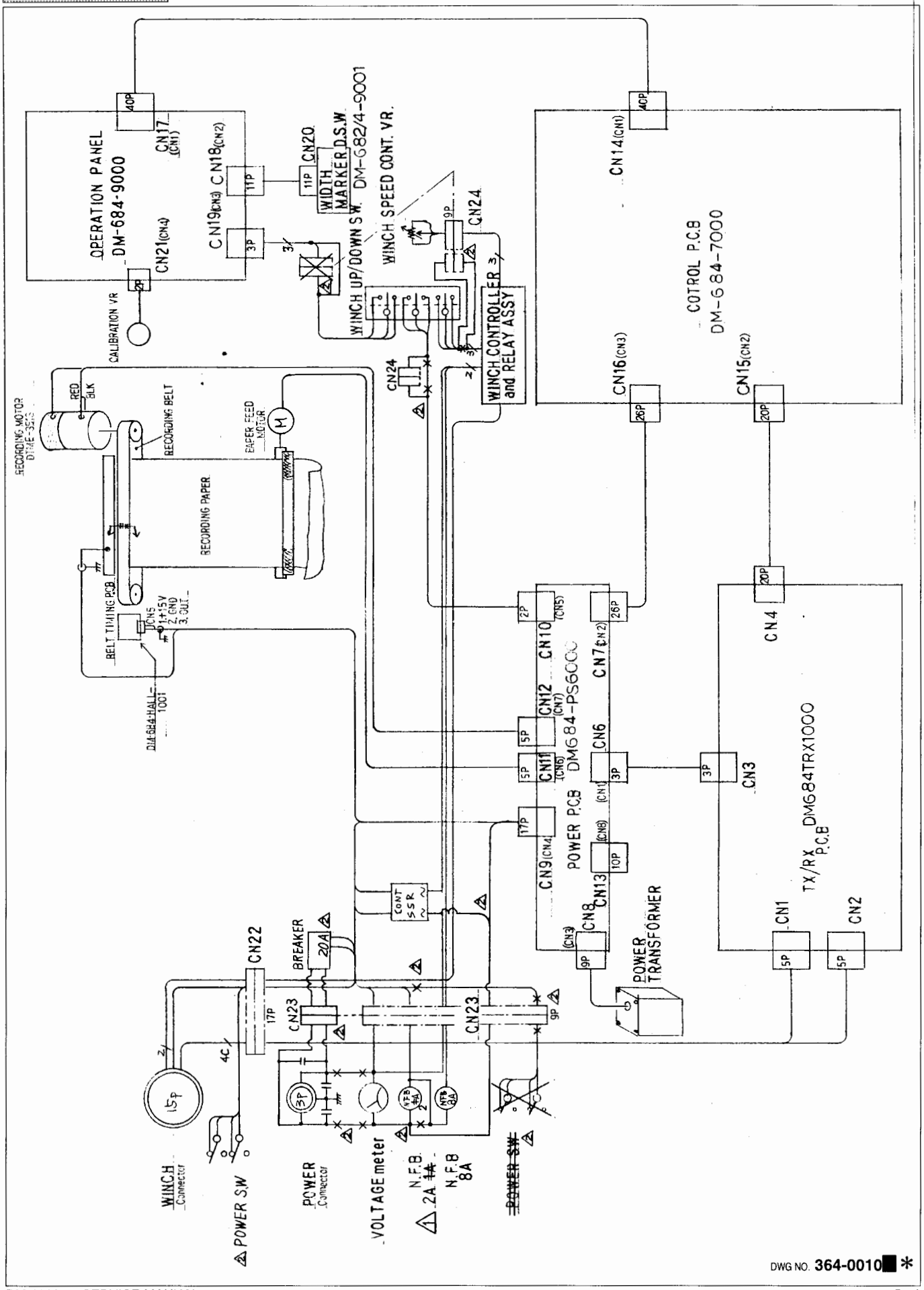
4.3.14 How to replace the relay

(1) Release the latch on the relay socket.
(2) Remove the relay from the relay socket.
(3) Install a new relay and reset the latch.

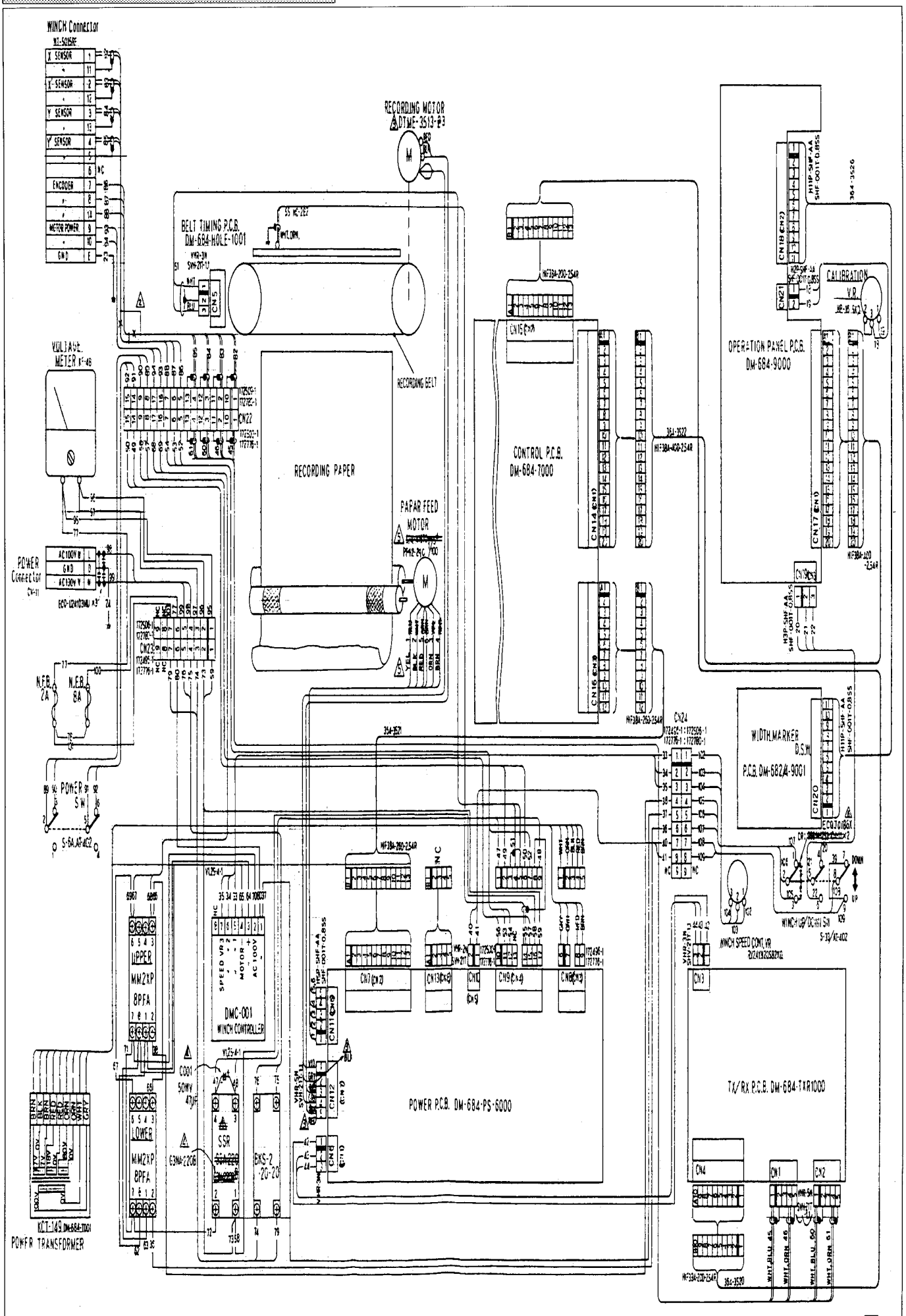
5 Circuit diagrams

5.1 Circuit diagrams

Block diagram

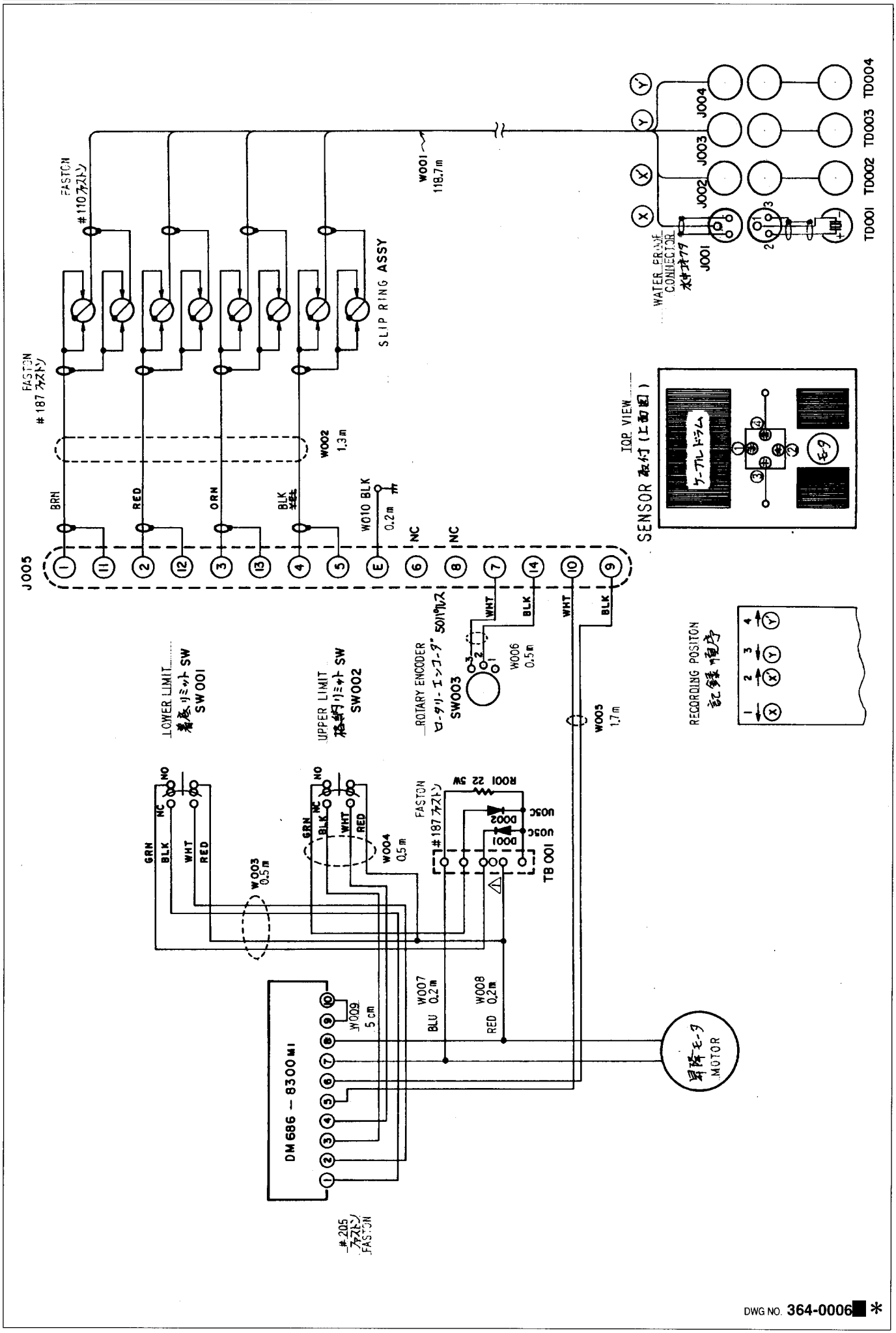


Wiring diagram : Recorder unit



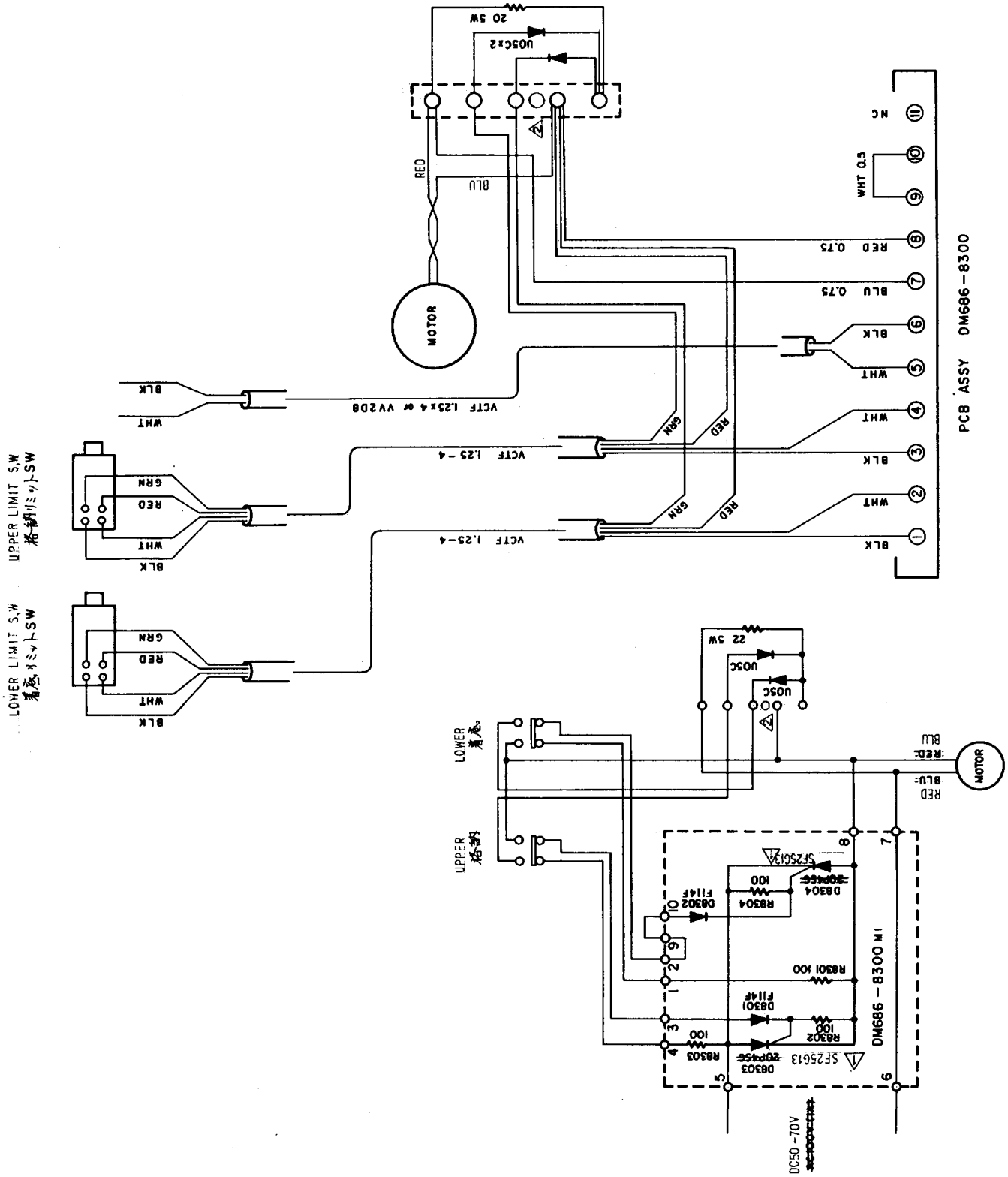
DWG NO. **364-0011■ ***

Wiring diagram : Winch unit (1/2)



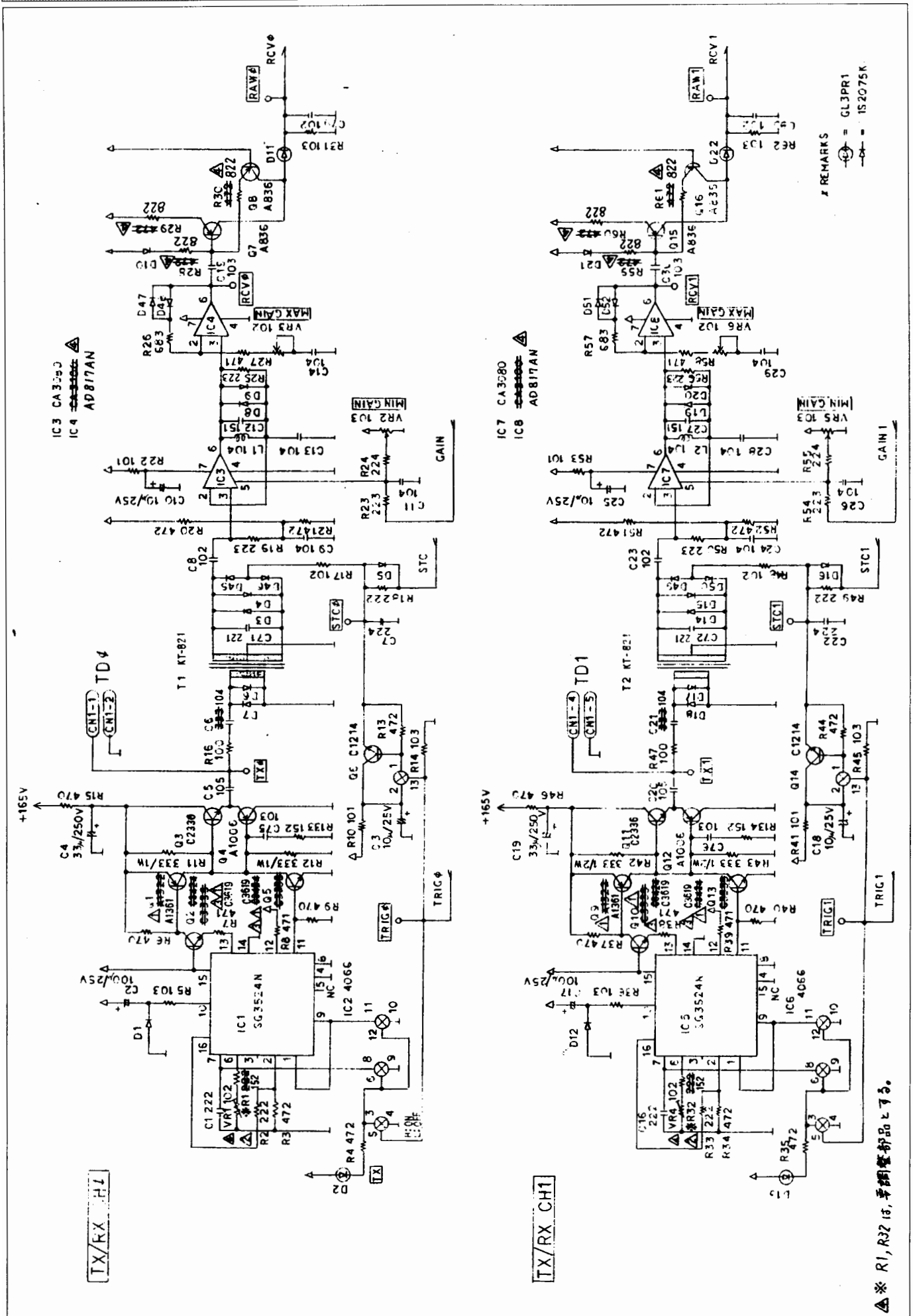
DWG NO. 364-0006■ *

Wiring diagram : Winch unit (2/2)

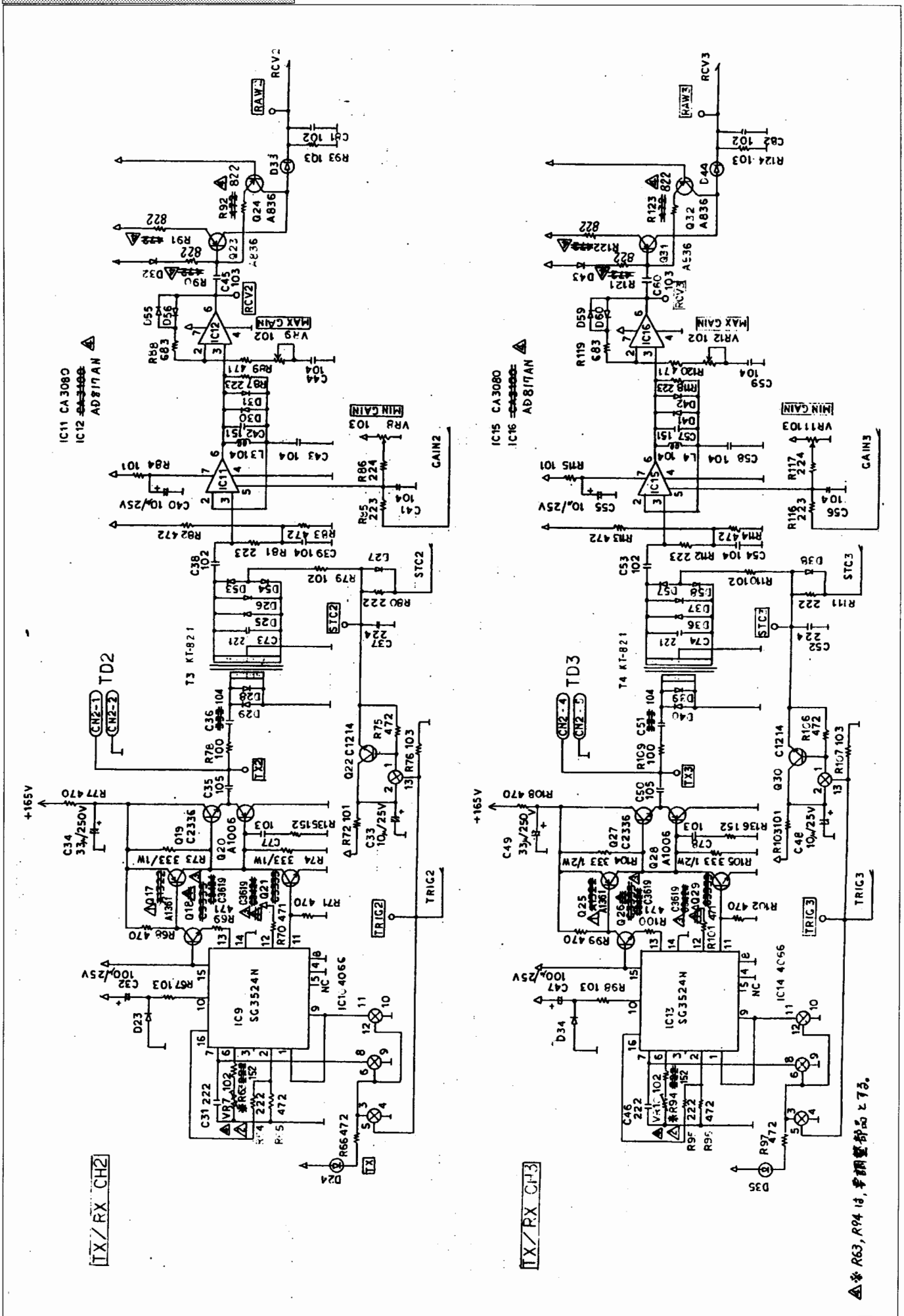


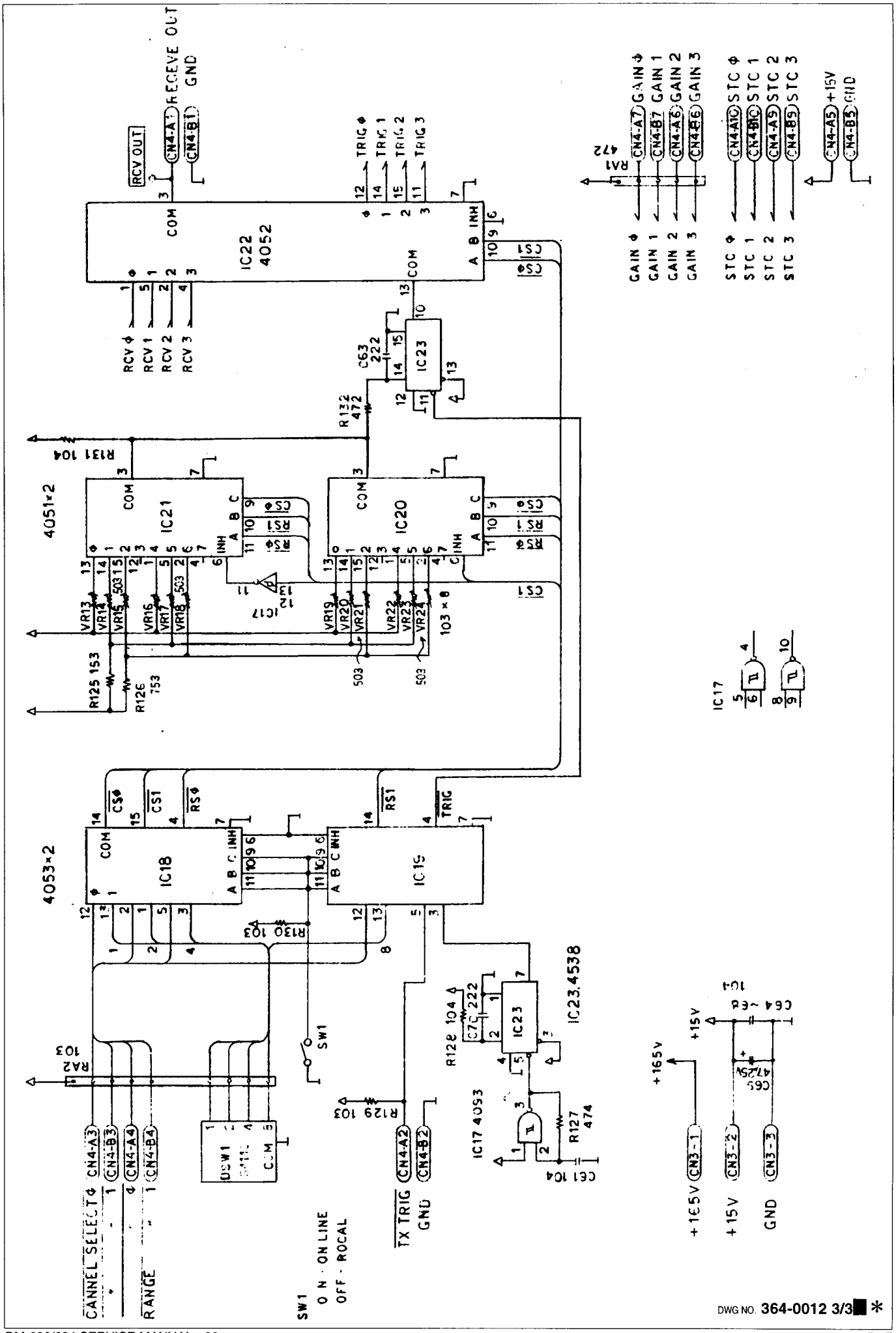
DWG NO. 364-0007■ *

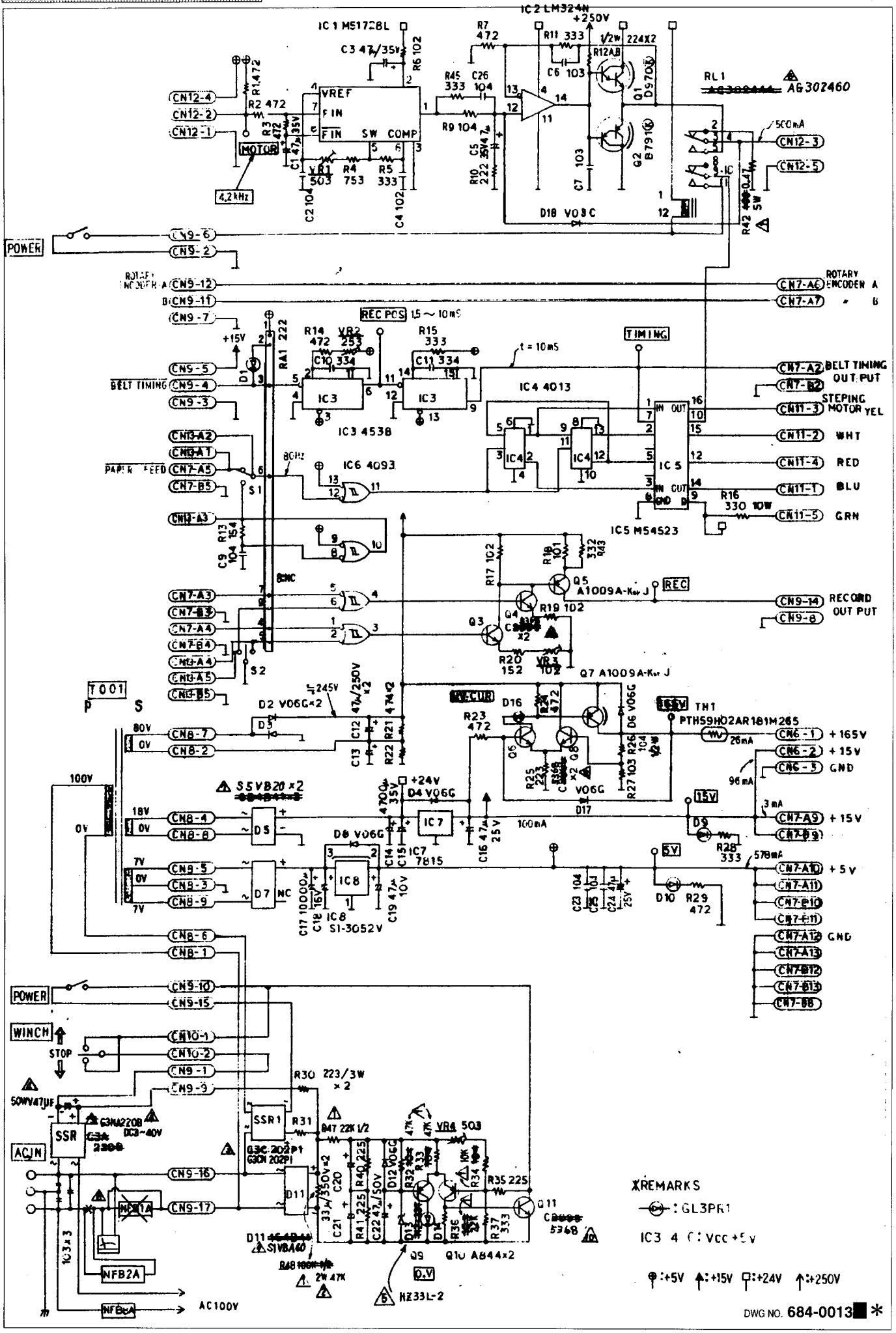
DM684-TRX-1000■ (1/3)

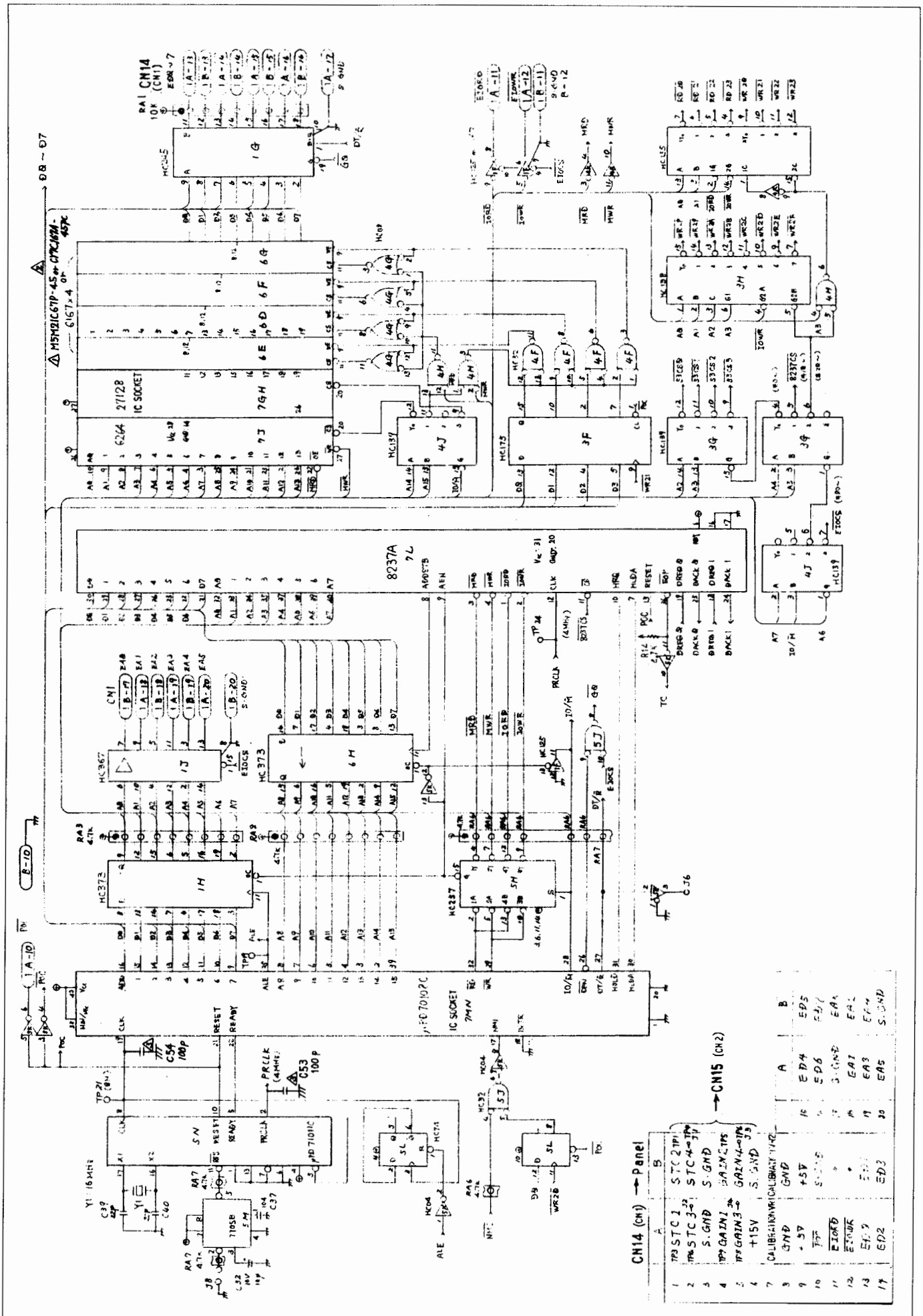


※ R1, R32 は、手調整部品とする。

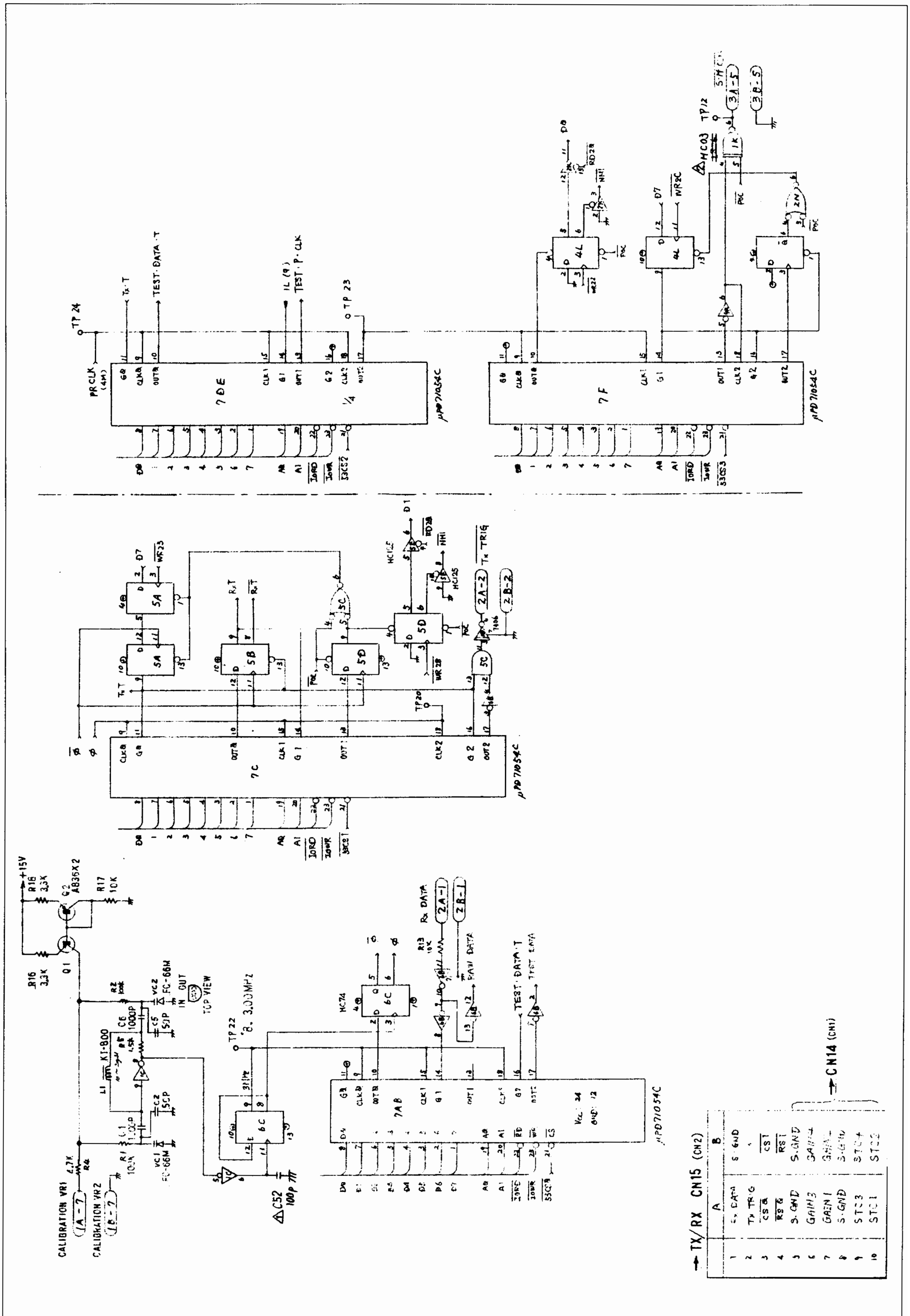

TX/RX CH2
TX/RX CH3
TD2
TD3
IC11 CA3080
IC12 AD817AN
IC15 CA3080
IC16 AD817AN
IC9 SG3524N
IC13 SG3524N
IC10 4066
IC14 4066
+16.5V
MAX GAIN
MIN GAIN
GAIN2
GAIN3
TRIG2
TRIG3
RCV2
RCV3
TX2
TX3
STC2
STC3
T3 KT-821
T4 KT-821
DWG NO. 364-0012 2/3■ *


RECEIVE OUT
GND
RCV OUT
CN4-A1
CN4-B1
IC22
4052
COM
A B INH
TRIG Φ
TRIG 1
TRIG 2
TRIG 3
RCV Φ
RCV 1
RCV 2
RCV 3
RA1
472
GAIN Φ
GAIN 1
GAIN 2
GAIN 3
CN4-A7
CN4-B7
CN4-A6
CN4-B6
STC Φ
STC 1
STC 2
STC 3
CN4-A8
CN4-B8
CN4-A9
CN4-B9
+15V
GND
CN4-A5
CN4-B5
C63
222
IC23
R132
472
R131 104
4051×2
IC21
IC20
A B C INH
VR13
VR14
VR15
VR16
VR17
VR18
VR19
VR20
VR21
VR22
VR23
VR24
503
103 × 8
R125 153
R126
753
IC17
4053×2
IC18
IC19
CS Φ
CS1
RS Φ
RS1
TRIG
R130 103
SW1
RA2
103
CANNEL SELECT Φ
RANGE
CN4-A3
CN4-B3
CN4-A4
CN4-B4
DSW1
COM
R129 103
TX TRIG
GND
CN4-A2
CN4-B2
IC17 4093
R127
474
C61 104
IC23.4538
R128 104
C62
222
+16.5V
+15V
CN3-1
CN3-2
CN3-3
C64
SW1
O N : ON LINE
OFF : ROCAL
DWG NO. 364-0012 3/3■ *

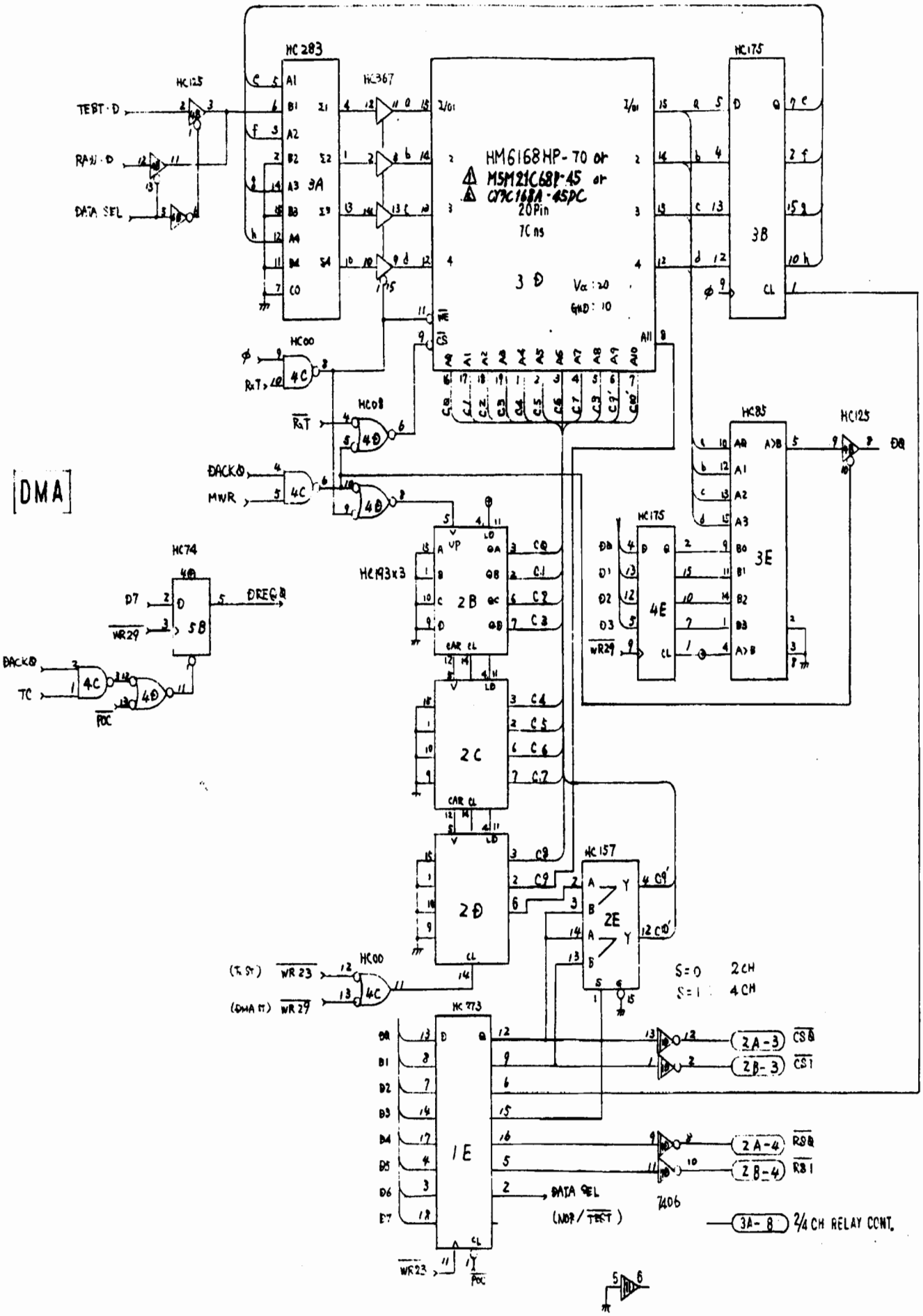

IC1 MS1728L
IC2 LM324N
+250V
RL1
AG302460
POWER
ROTARY ENCODER A
B
REC POS 1.5 ~ 10mS
TIMING
t = 10mS
IC3 4538
IC4 4013
IC5 MS4523
IC6 4093
BELT TIMING
BELT TIMING OUT PUT
STEPING MOTOR YEL
WHT
RED
BLU
GRN
PAPER FEED
RECORD OUT PUT
REC
T001
P
S
80V
0V
18V
7V
100V
+24V
IC7 7815
IC8 S1-3052V
+165V
+15V
GND
+5V
WINCH
STOP
SSR
AC IN
AC100V
NFB2A
REMARKS
IC3 4 8 : Vcc +5V
DWG NO. 684-0013■ *

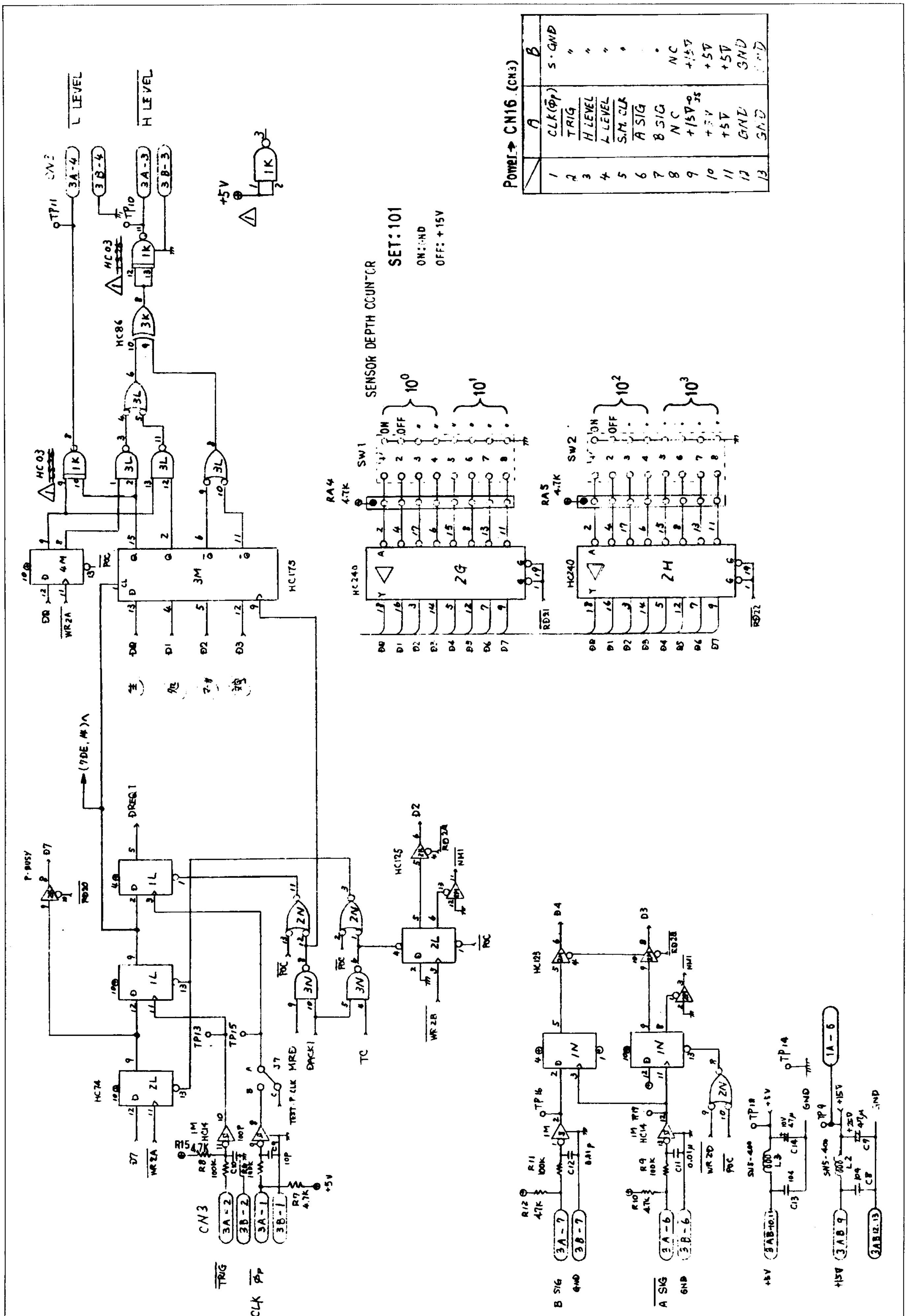


DWG NO. **684-0014 1/4** *

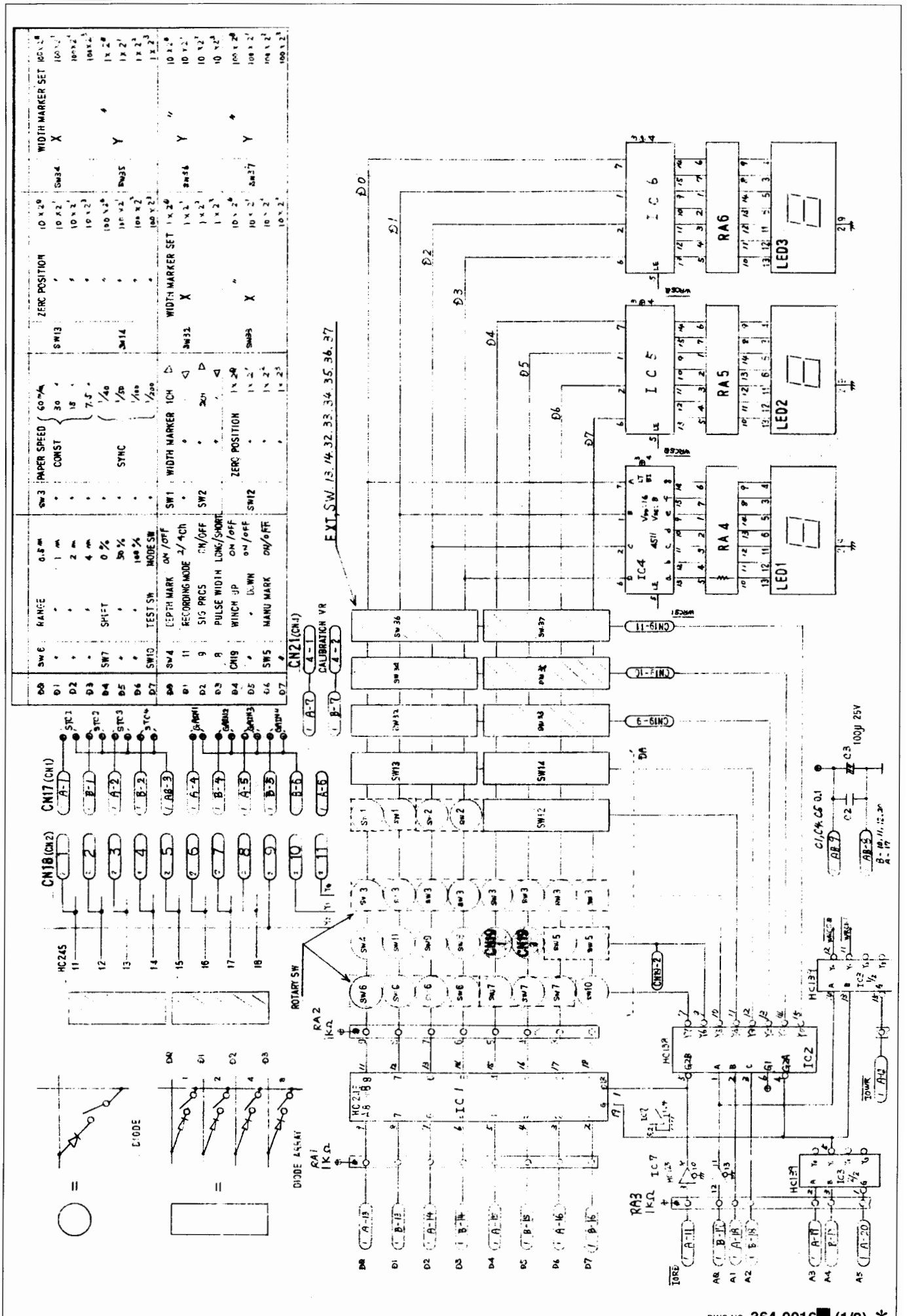


DWG NO. 684-0014 2/4 *

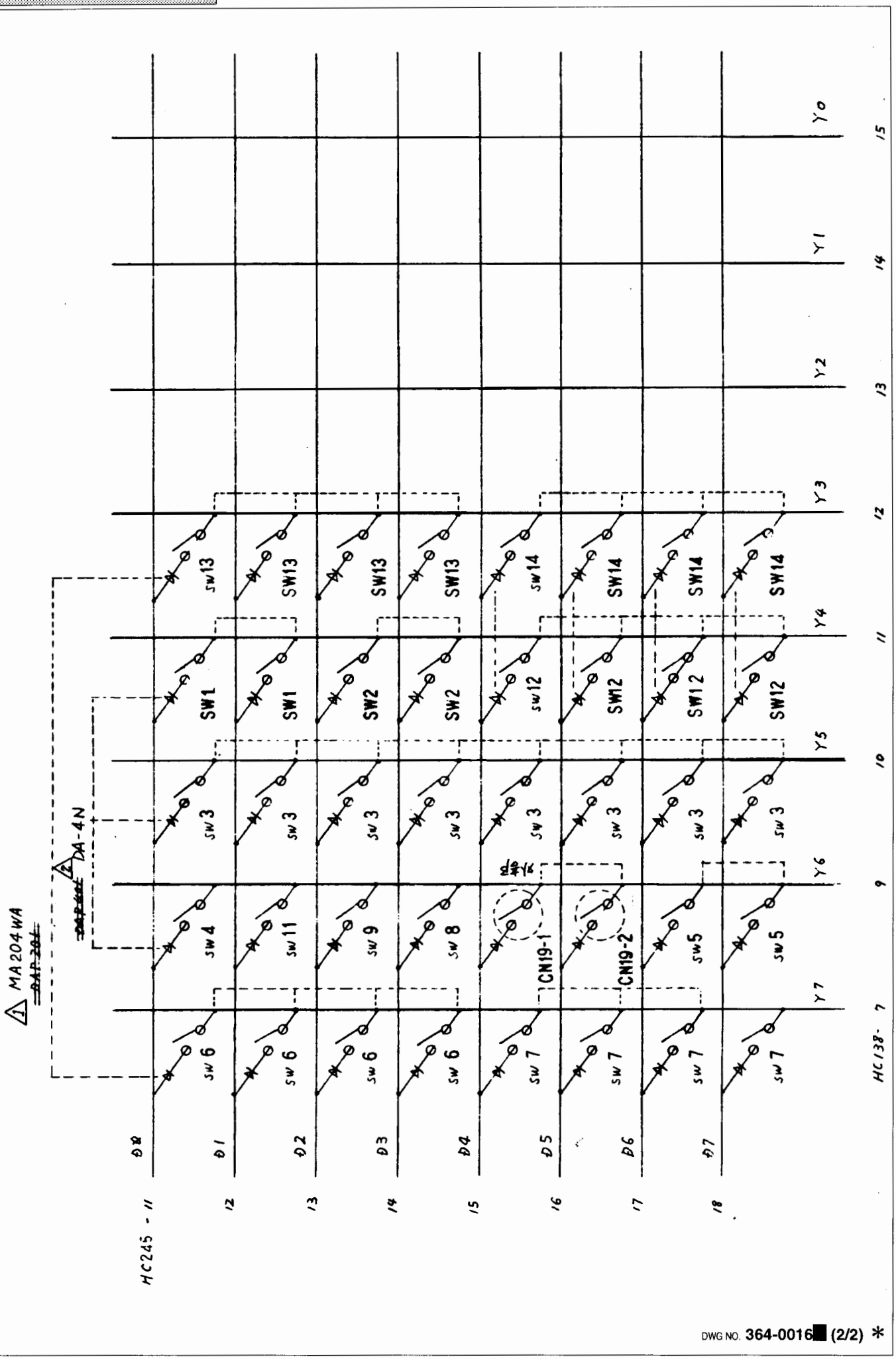

[DMA]
HC283
HC367
HC175
HC125
HC00
HC08
HC74
HC85
HC193x3
HC157
HC373
HM6168HP-70 or
M5M21C681-45 or
CY7C168A-45PC
20Pin
70ns
3D
3B
3E
4E
2B
2C
2D
2E
1E
5B
TEBT·D
RAM·D
DATA SEL
RxT
DACKO
MWR
TC
POC
D7
WR29
DREGO
WR23
(T.ST)
(DMA rr)
S=0 2CH
S=1 4CH
2A-3 CSO
2B-3 CS1
2A-4 RSO
2B-4 RS1
DATA SEL
(MDF/TEST)
3A-8 2/4CH RELAY CONT.
7406
DWG NO. 684-0014 3/4 *



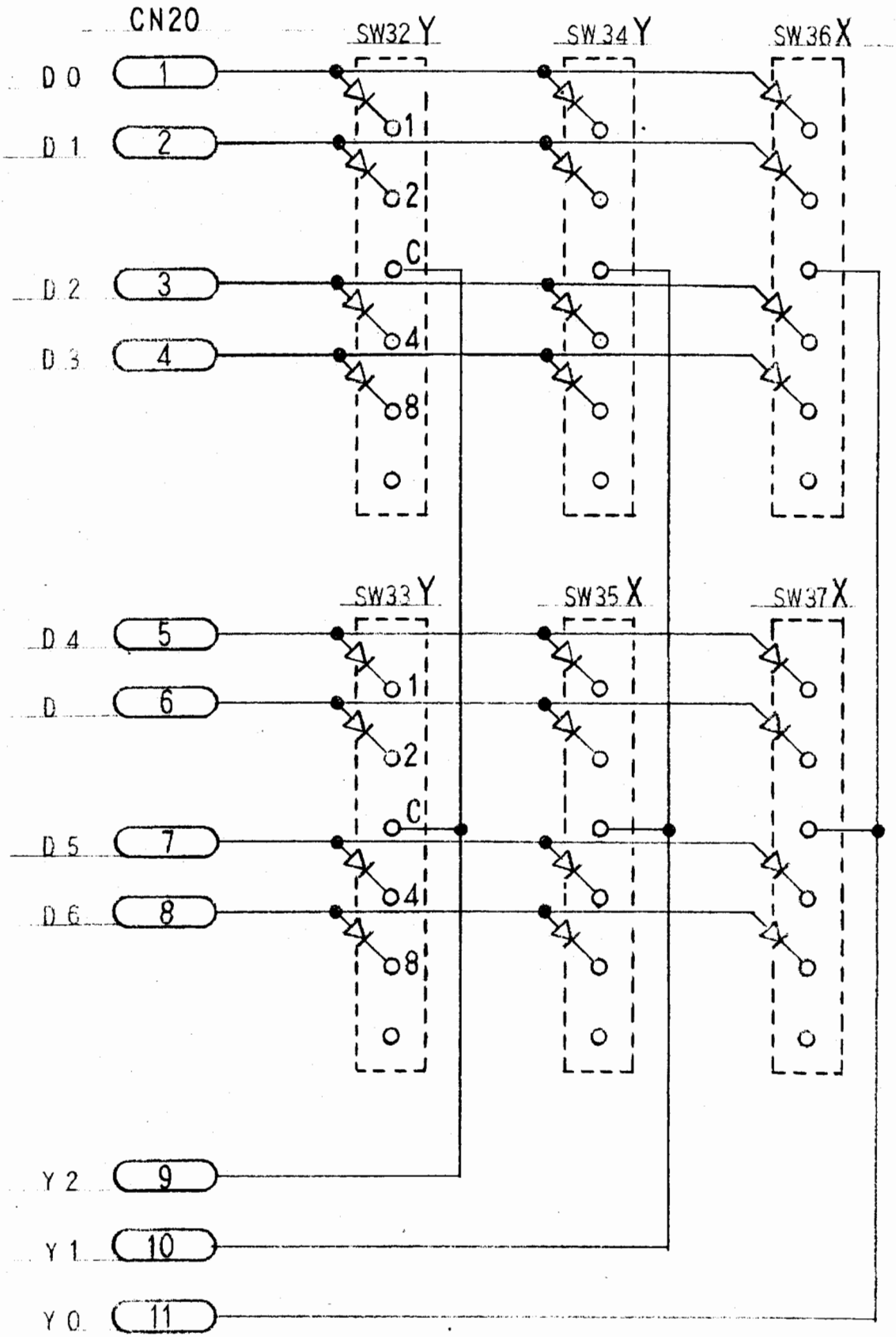
DWG NO. 684-0014 4/4 *



DWG NO. **364-0016■ (1/2)** *



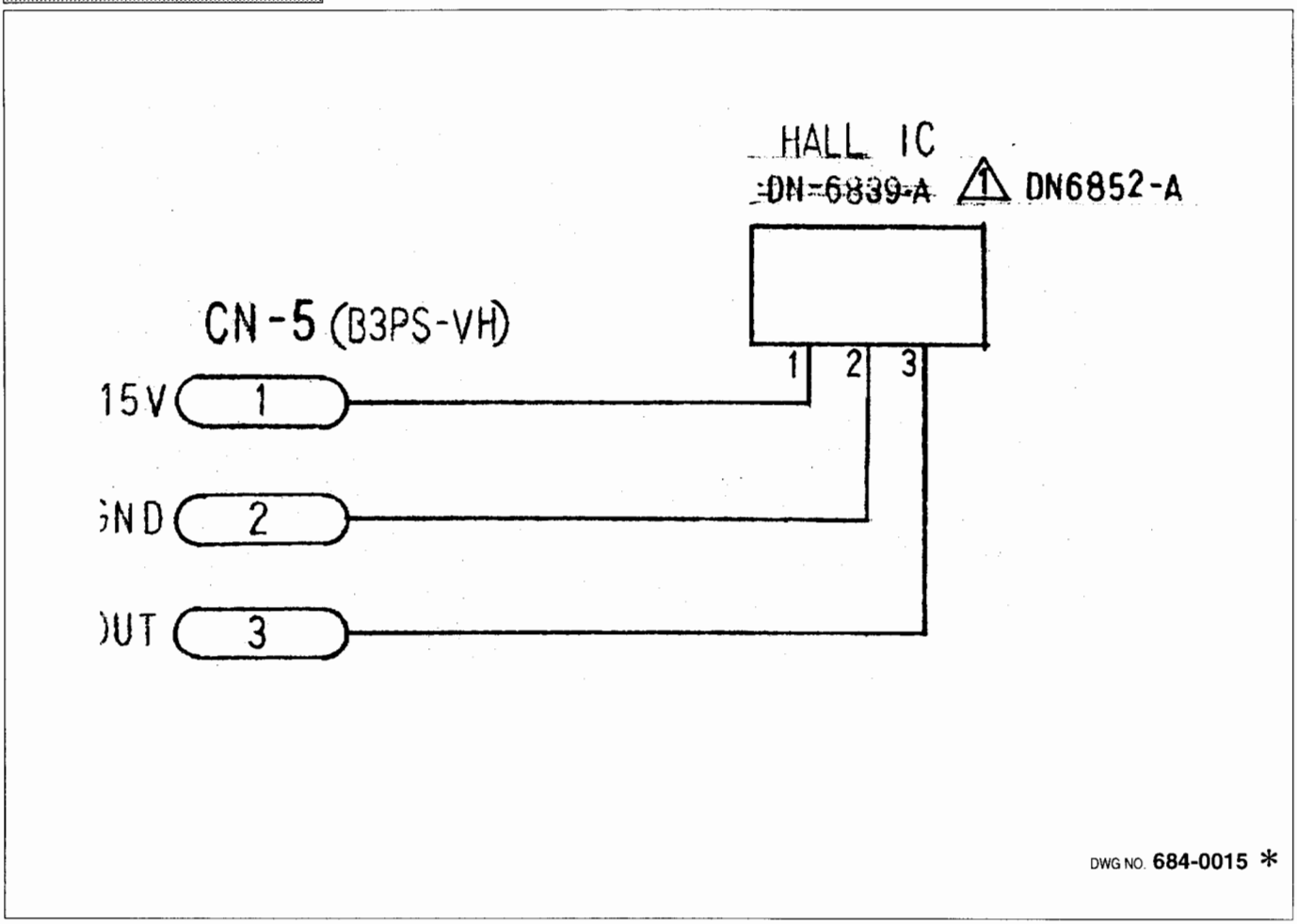
DWG NO. 364-0016■ (2/2) *



⚠DA-4N
Diode: ~~DAP401~~ x 8
SW(Connector): DAC-062x6

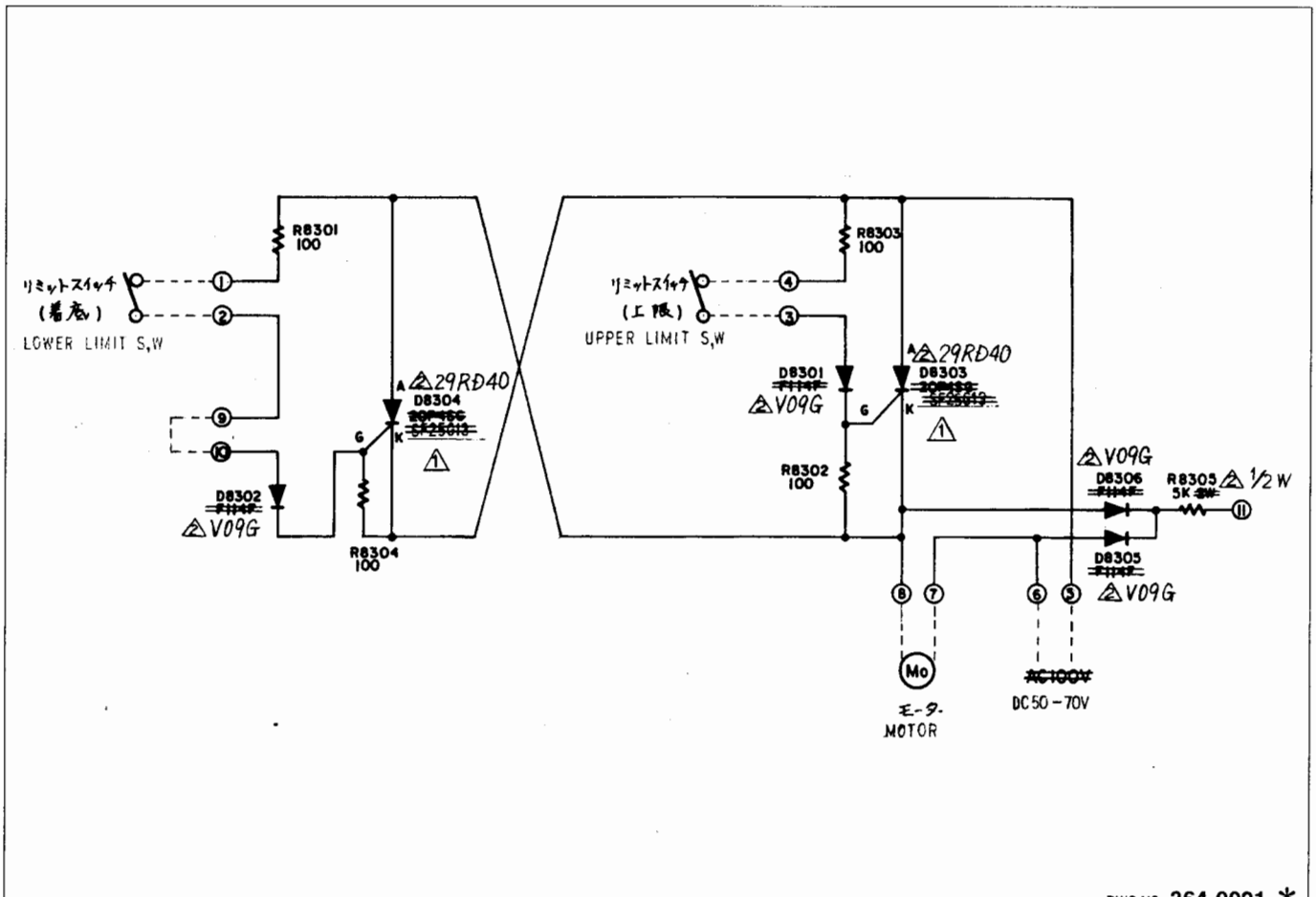
DWG NO. **364-0017** *

DM684-HALL-1001

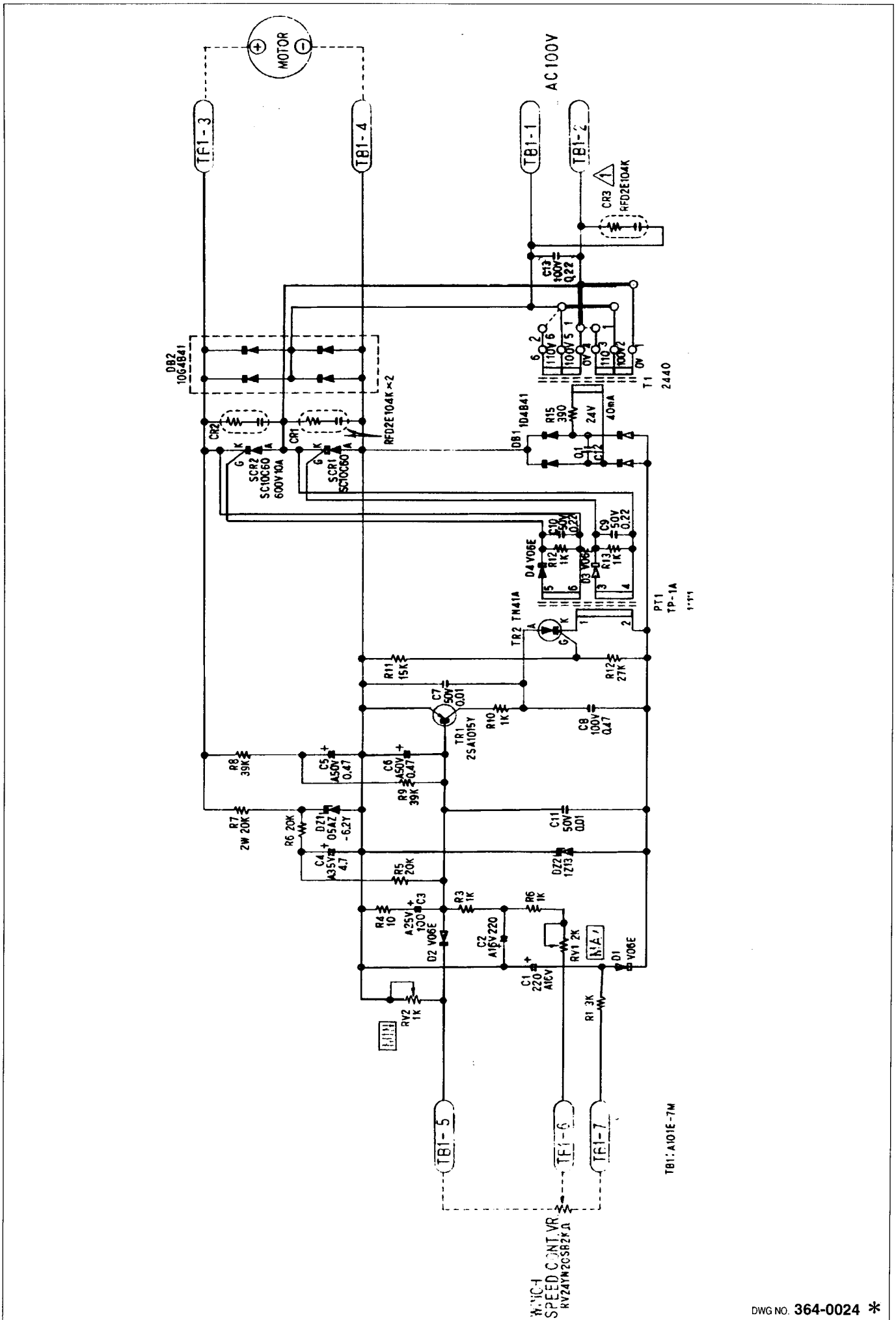


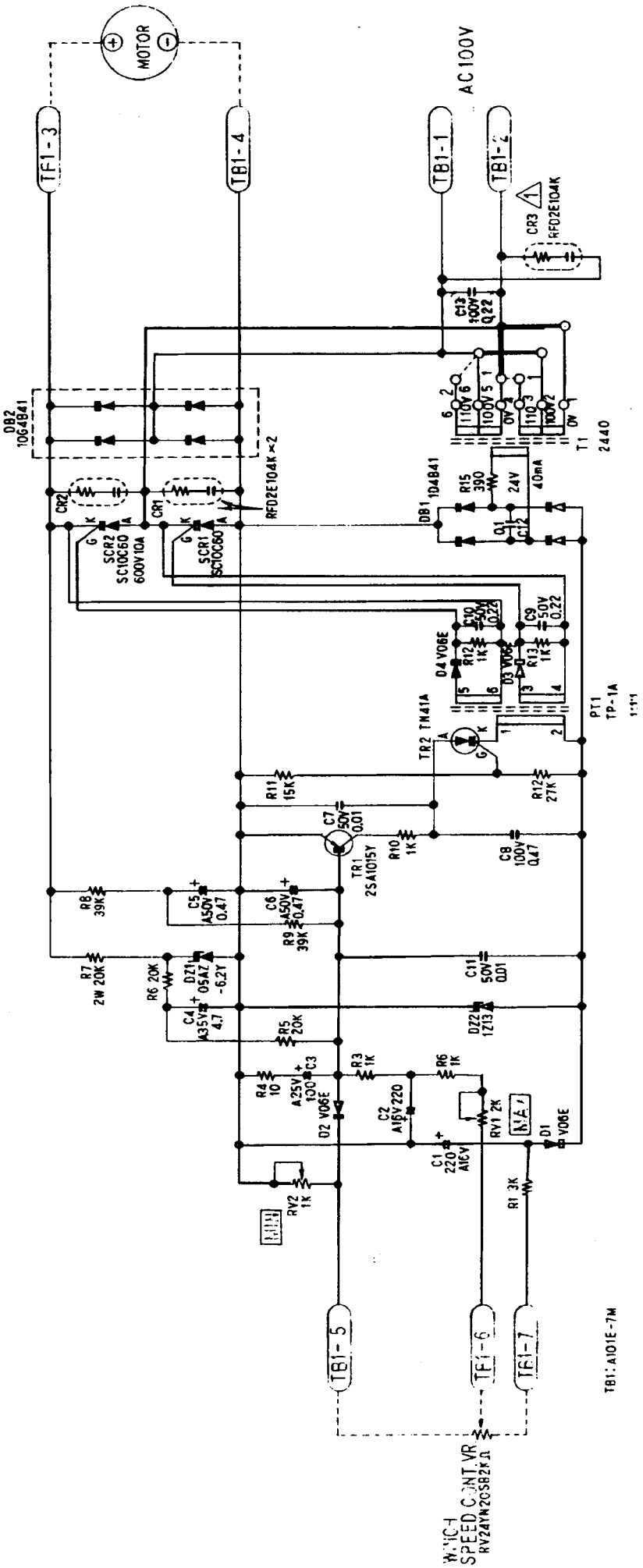
DWG NO. **684-0015** *

DM686-8300



DWG NO. **364-0021** *

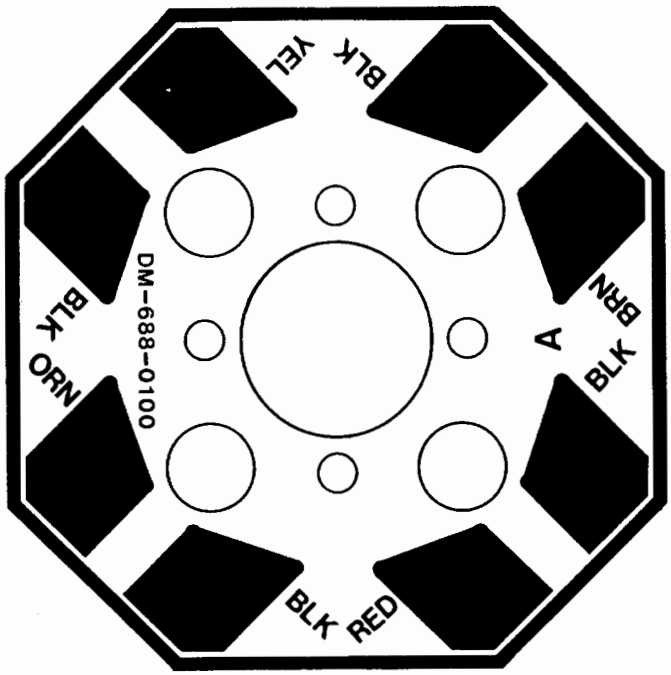

MOTOR
AC 100V
TB1-1
TB1-2
TB1-3
TB1-4
TB1-5
TB1-6
TB1-7
CR3
RFD2E104K
CR1
CR2
RFD2E104K ×2
SCR1
SCR2
SC10C60
600V 10A
DB1 1D4841
DB2 1D64B41
T1 2440
Q1
R15 390
24V
40mA
C13 100V 0.22
C9 50V 0.22
C10 50V 0.22
D4 V06E
D3 V06E
R12 1K
R13 1K
PT1
TP-1A
TR2 TN41A
R11 15K
R12 27K
C7 50V 0.01
TR1 2SA1015Y
R10 1K
C8 100V 0.47
R8 39K
C5 A50V 0.47
C6 A50V 0.47
R9 39K
R7 2W 20K
R6 20K
DZ1 05AZ - 6.2Y
C4 A35V 4.7
R5 20K
DZ2 1213
C11 50V 0.01
R4 10
A25V 100 C3
R3 1K
R6 1K
D2 V06E
C2 A16V 220
RV1 2K
D1 V06E
C1 220 A16V
RV2 1K
R1 3K
TB1:A101E-7M
SPEED CONT.VR
RV24YN20S B2K Ω
DWG NO. 364-0024 *



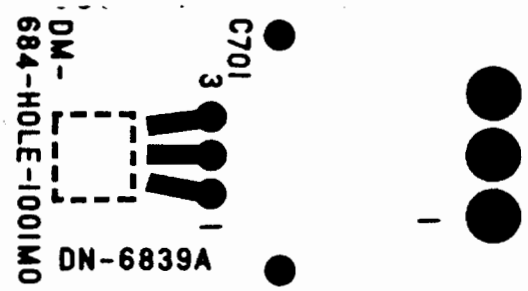
DWG NO. **C19CGB0010** *

5.2 Parts location

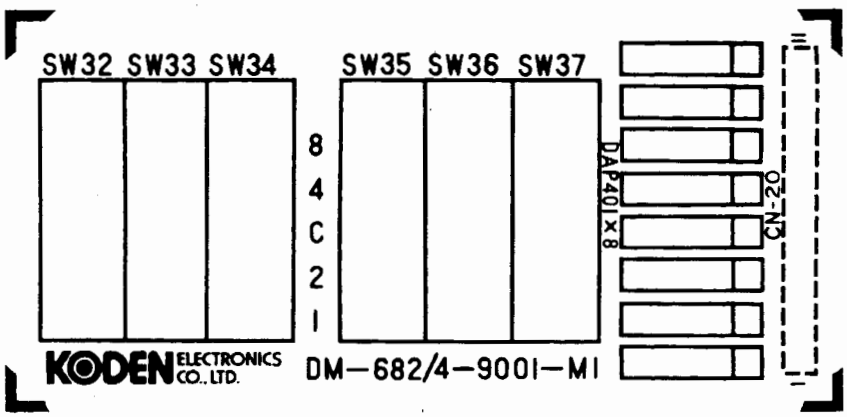
DM688-0100

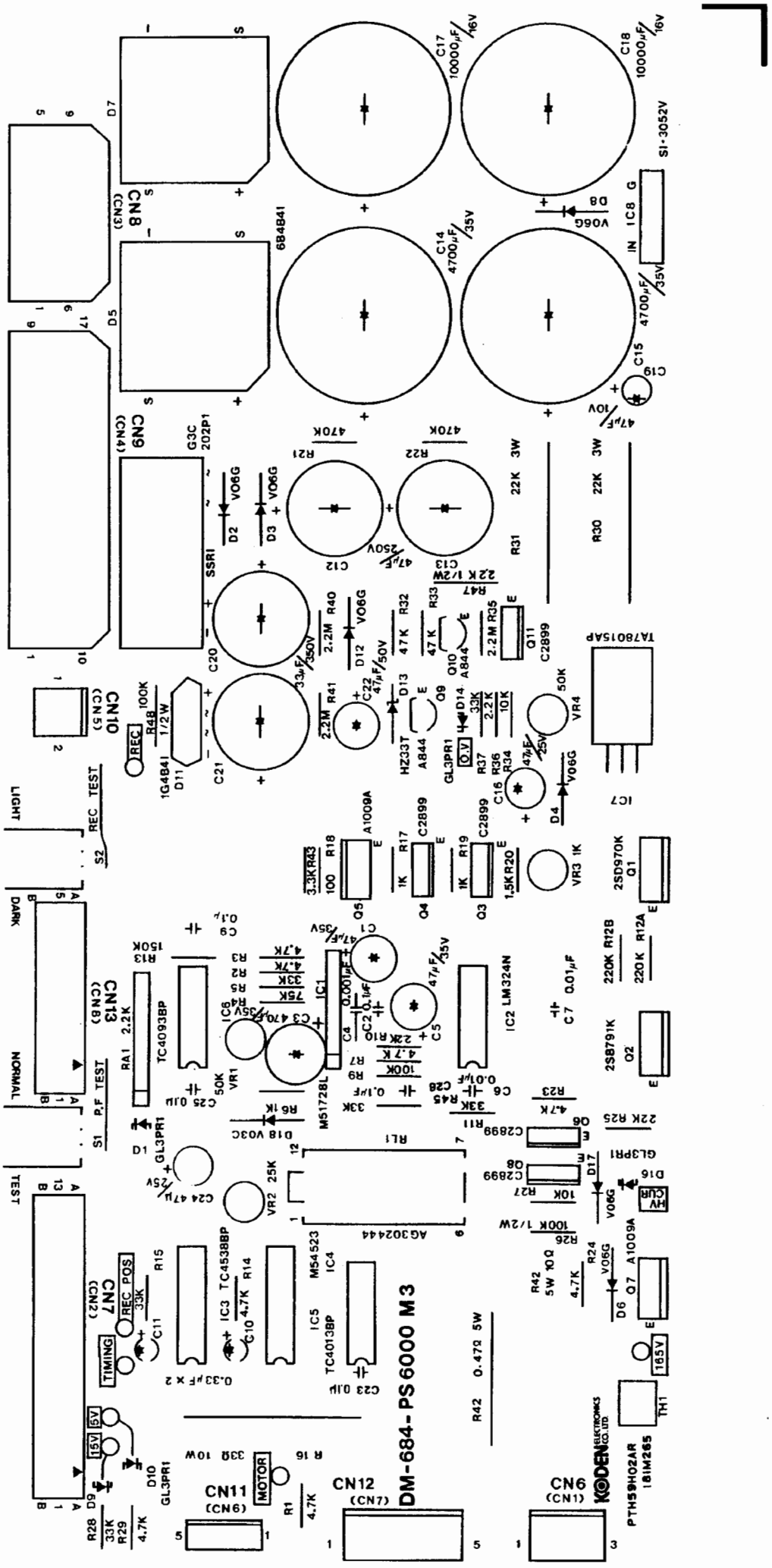


DM684-HOLE-1001M0



DM682/4-9001-M1




DM-684-PS6000 M3
684841
CN8 (CN3)
CN9 (CN4)
CN10 (CN5)
CN13 (CN8)
CN7 (CN2)
CN11 (CN6)
CN12 (CN7)
CN6 (CN1)
S1 P.F TEST
S2 REC TEST
NORMAL
DARK
LIGHT
TEST
TIMING
REC POS
MOTOR
REC
IC1 M51728L
IC2 LM324N
IC3 TC4538BP
IC4 M54523
IC5 TC4013BP
IC6 TC4093BP
IC7 TA78015AP
RL1 AG3024-4
TH1 PTH59H02AR 181M265
KODEN ELECTRONICS CO.,LTD
SI-3052V
C17 10000μF/16V
C18 10000μF/16V
C14 4700μF/35V
C15 4700μF/35V
C19 47μF/10V
C12 47μF/250V
C13 47μF/250V
C20 33μF/350V
C21 33μF/350V
C22 47μF/50V
C1 47μF/35V
C5 47μF/35V
C24 47μF/25V
C16 47μF/25V
R47 2.2K 1/2W
R48 100K 1/2W
R42 5W 0.47Ω
R1 4.7K
R16 33Ω 10W
R28 33K
R29 4.7K
R31 22K 3W
R30 22K 3W
R21 470K
R22 470K
R13 150K
R12B 220K
R12A 220K
R23 4.7K
R25 22K
R26 100K 1/2W
R27 10K
R24 4.7K
R42 5W 100
R18 100
R43 3.3K
R17 1K
R19 1K
R20 1.5K
R34 10K
R36 2.2K
R37 33K
R35 2.2M
R33 47K
R32 47K
R40 2.2M
R41 2.2M
R11 33K
R45 33K
R10 22K
R9 100K
R7 4.7K
R8 75K
R5 43K
R4 4.7K
R3 4.7K
R2 4.7K
R14 4.7K
R15 33K
RA1 2.2K
VR1 50K
VR2 25K
VR3 1K
VR4 50K
C23 0.1μ
C25 0.1μ
C26 0.1μF
C27 0.1μF
C28 0.01μF
C7 0.01μF
C2 0.1μF
C4 0.001μF
C9 0.1μ
C10 0.33μF x 2
C11
C3 470μF/35V
D1 GL3PR1
D2 V06G
D3 V06G
D4 V06G
D5
D6 V06G
D7
D8 V06G
D9 GL3PR1
D10 GL3PR1
D11 1G4B41
D12 V06G
D13 HZ33T
D14 GL3PR1
D16 GL3PR1
D17 V06G
D18 V03C
Q1 2SD970K
Q2 2SB791K
Q3 C2899
Q4 C2899
Q5 A1009A
Q6 C2899
Q7 A1009A
Q8 C2899
Q9 A844
Q10 A844
Q11 C2899
IN IC8 G
OUT
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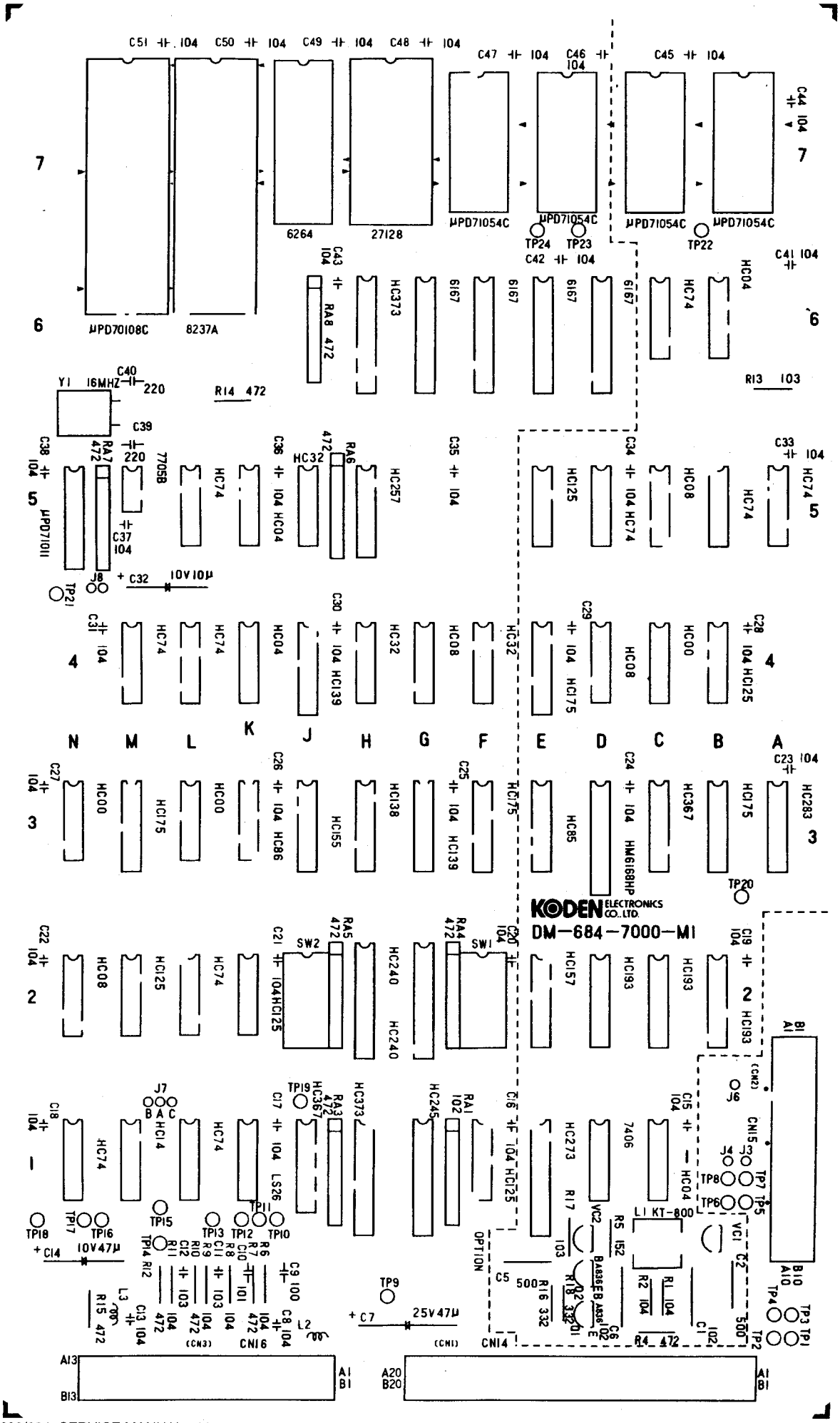
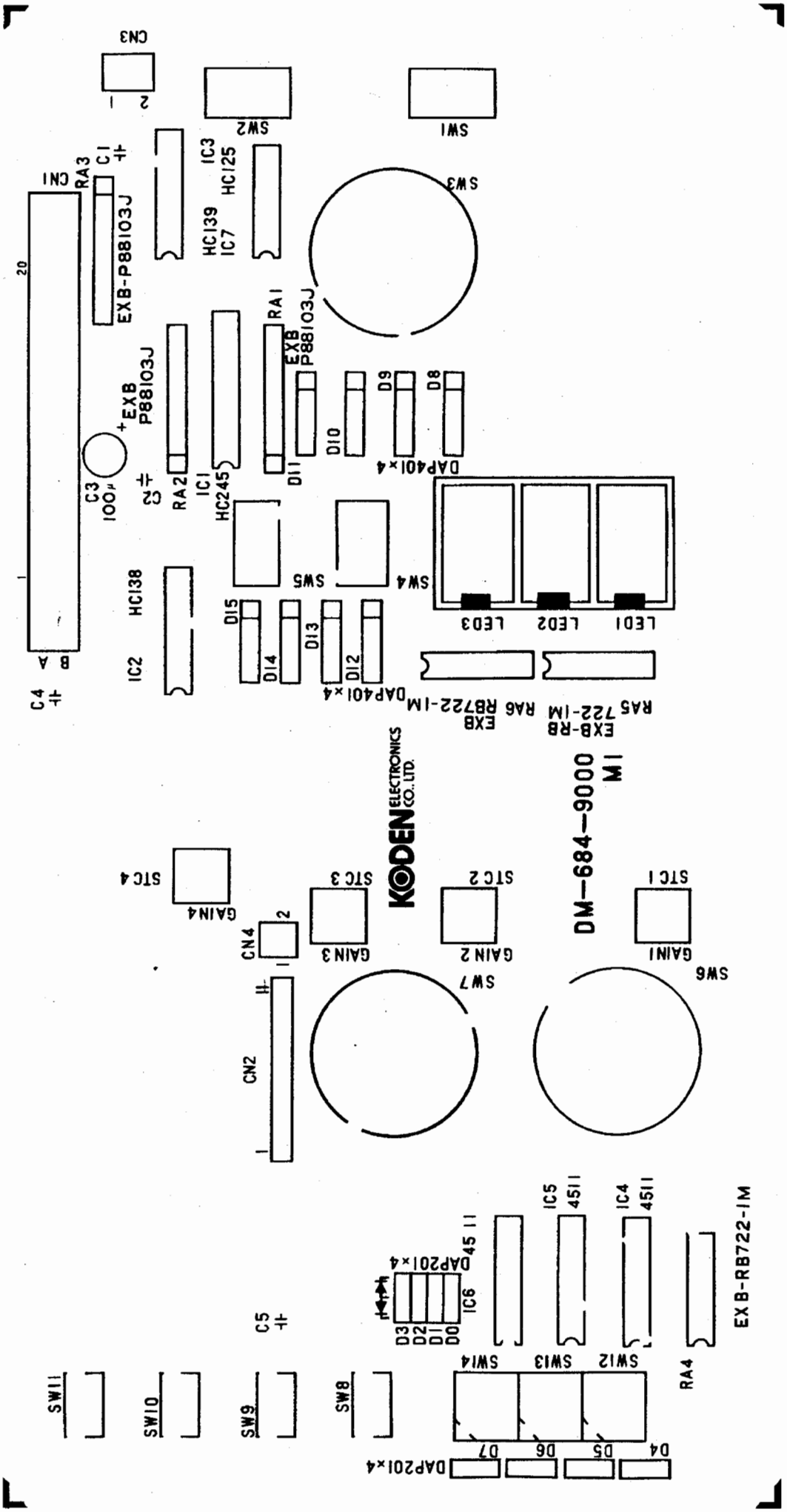

KODEN ELECTRONICS CO.,LTD.
DM-684-7000-M1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SW1
CN1
RA3
C1
IC3
HC125
HC139
IC7
SW3
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RA1
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D9
D8
D10
D11
DAP401×4
EXB P88103J
C3 100μ
C2
RA2
IC1
HC245
HC138
IC2
SW5
SW4
D15
D14
D13
D12
DAP401×4
LED3
LED2
LED1
EXB-RB722-1M
RA5 RA6
C4
KODEN ELECTRONICS CO.,LTD.
DM-684-9000 M1
STC4
STC3
STC2
STC1
GAIN4
GAIN3
GAIN2
GAIN1
CN4
CN2
SW7
SW6
C5
DAP201×4
D3
D2
D1
D0
IC6
IC5 4511
IC4 4511
EXB-RB722-1M
RA4
SW14
SW13
SW12
SW11
SW10
SW9
SW8
DAP201×4
D7
D6
D5
D4

6. Parts list

6.1 Mechanical parts

Recorder unit (Exploded view, drawing No.682-2321)

Symbol	Code	Name	Description	Specifications
1	80306604	Alminum case	C19MB12014	
2	41370020	Power transformer	DMT-001/002 AC110/220V	
2	41370030	Power transformer	DMT-003 AC440V	
3				
4	77415036	Stainless plain type top plating	B-1078-14	
5		Corner metal fitting		
6	63500051	Recording unit		
7			OC4x20B	
8	87500041	Recording bearing 1	682-1204-9	
9	72660013	Recording paper	DMP-250 A3-500	
10	93070100	Operation instruction	DMR-682 operation manual, Japanese	
10	93070110	Operation instruction	DMR-682 operation manual, English	
11	82715682	Main name plate	682-1476	
11	82715684	Main name plate	682-1477	
12	82791649	KODEN sticker	686-4009	
13	85710194	Vinyl cover	682-2311	
14	70403110	F type planer handle	THA-6 (with black painting)	
15	70190080	Stainless catch clip	TL-11H	
16		Coner metal fitting		
17	79046100	Nylon string	4ø x 700L	
18	82221174	Cushion	682-1399	
19	82723010	Name plate	682-1478 M1	
20	85710070	Storage bag for DM	682-1482 M1	
21	75144135	Pan head screw	PSM6x35B	
22	80607410	Plate	682-1405	
23	71411124	Belt	682-2316	

Recorder unit (Exploded view, drawing No.682-2322)

Symbol	Code	Name	Description	Specifications
1	80701707	Fixing metal plating	682-1483M1-Z4	
2	61500060	P.C.B. assy.	DM684-7000M1	
3	75091238	Pan head screw	PWSM4x8B	
4	82900333	Metal fitting	682-1380-Z4	
5	75091238	Pan head screw	PWSM4x8B	
6	76900563	Knurled screw	With 682-1363 M1-N1 buff	
7	77191102	Washer	W5B	
8	83502194	Stand-off	With 682-1365 M1-Z4	
9	75091200	Pan head screw	PSM5x12B	
10	61500070	P.C.B. assy.	DM684-PS-6000M3	
11	61500080	P.C.B. assy.	DM684-TRX-1000M2	
12	70403160	Stay for front cap (right)	TM-53-R	
13	75091154	Flat head screw	OC3x6B	
14	83502214	Stand-off	With 682-1356M2-04	
15	77302173	Pin with metal plating	682-1379-Z4	
16	77191040	Thrust washer	STW-FT60-0.5	
17	75091101	Flat head washer	F4x10B	
18	79031303	Adjustable bush	KG024	
19	63500151	Power transformer assy.	364-3523	
20	83202313	Angle C metal plating	682-1316-Z4	
21	75091198	Screw and washer assy.	PSM4x8B	
22	59510025	Speed controller	DMC-001 (with volumn)	
23	75091285	Pan head screw	P2WSM4x8B	
24	83202303	Angle B metal plating	682-1315-Z4	
25	57988160	Solid state relay	G3NA-220B(DC5-40V)	
26	56181111	Circuit breaker	BKS-2-20-20	
27	75091235	Pan head screw	PWSM4x25B	
28	57423501	Relay socket	8PF (for MM2P)	
29	57936123	Relay	MM-2XP AC100V	
30	75091188	Pan head screw	PSM4x20B	

Recorder unit (Exploded view, drawing No.682-2323)

Symbol	Code	Name	Description	Specifications
1	80111392	Chassis painting	682-1421M4-01(K-3)FT	
2	80535043	Substrate A metal plating	682-1302M2-04	
3	80535053	Substrate B metal plating	682-1303M5-04	
4	80535063	Substrate C metal plating	682-1304M4-04	
5	75091106	Flat head screw	F4x15B	
6	75091106	Flat head screw	F4x15B	
7	75091230	Pan head screw	PWSM4x12B	
8	80524023	Holding metal plating	682-1390-04	
9	75091187	Panh head screw	PSM4x18B	
10	80531323	Resistance welding metal plating	682-1318 M2-CR31 buff	
11	75091181	Pan head screw	PSM3x8B	
12	80542124	Guide board	682-1369M1	
13	75091097	Flat head screw	F3x8B	
14	75862015	Set screw	S3x5U	
15	83206233	Holder metal plating	682-1312-Z4	
16	75091283	Pan head screw	2WSM4x10B	
17	80932564	Paper presser board	682-1320M1- buff finishing	
18	75091017	Bind machine screw	BD3x6B	
19	77191091	Washer	W3B	
20	83241173	Holding metal plating	682-1321-Z4	
21	75091115	Flat head screw	F4x8B	
22	77191060	Spring washer	SW4B	
23	76091043	Nut	N4B	
24	77411004	Spring top plating	TH-63-SUS	
25	77191122	Washer	2W4B	
26	75272726	Bind machine screw	BD4x15B	
27	84701204	Pulley B	682-1373M1(Z=26)	
28	75091410	Set screw	S3x3U	
29	77047149	Thrust washer	STW-FT80-0.5	
30	75091172	Pan head screw	PSM3x10B	
31	83206244	Bearing holder	With 682-1347 M1-04	
32	83946091	Insulating ring	682-1396	
33	77601060	Bearing	608ZZ 5 class with PS2	
34	82101274	Spacer	682-1348M1-06	
35	83621114	Shaft B	682-1331M1-06	
36	77192037	C type retainer ring for shaft	STW-8	
37	84701214	Pulley C	682-1374M1(Z=53)	
38	75862715	Set screw	S4x5U	
39	76091051	Nut	N6B	
40	77191068	Spring washer	SW6B	
41	77191129	Washer	2W6B	
42	84555053	Slider metal plating	682-1355M1-04	
43	75192726	Pan head screw	2WSM4x15B	
44	87500030	Recording belt assy.	682-1203-7	
45	77192015	E ring	E4U (JISB2805)	
46	76900514	Holder screw B	682-1340M1-06	
47	83621104	Shaft A	682-1330 06	
48	77165047	C type retainer ring for hole	RTW-22	
49	84701224	Pulley D	682-1375M1(Z=53)	
50	75091198	Pan head screw	PSM4x8B	
51	83206214	Holder (left)	682-1310-1M2-06	
52	83206224	Holder (right)	682-1310-2M2-06	
53	77500013	Spring B (left)	682-1382-1M3	
54	77500014	Spring B (right)	682-1382-2M3	
55	70102012	Flexision catch	TL-34	
56	75091179	Pan head screw	PSM3x6B	
57	82900323	L angle metal plating	682-1328M2-04	
58	76900533	Board nut metal plating	682-1392-Z4	
59	61500030	P.C.B. assy.	DM684-HOLE-1001	
60	77191086	Washer	W2.6B	
61	75141617	Pan head screw	PSM2.6x6B	
62	71411022	Timing belt	MM-91-6.4	
63	84701194	Pulley A	682-1372M2(Z=26)	
64	83206203	Motor holder metal plating	682-1313-Z4	
65	63500111	Recording motor assy.	364-3524	
66	75141017	Pan head screw	PSM2x6B	
67	82222154	Dust protective pat	682-1314	
68	83585024	Stand-off	With 682-1364 Z4	

Recorder unit (Exploded view, drawing No.682-2324)

Symbol	Code	Name	Description	Specifications
1	80526254	Recording board A	682-1306 M3-06	
2	77402224	Top plating processing	682-1388	
3	76900523	Board nutmetal plating	682-1391-Z4	
4	75091115	Flat head screw	F4x8B	
5	84901114	Roller	With 682-1344 M2-04	
6	77192015	E ring	E4U	
7	76900504	Holder screw A	682-1339M1-06	
8	83942050	Roller	682-1367	
9	76091038	Nut	N3B	
10	77191055	Spring washer	SW3B	
11	80526264	Recording board B	682-1307 M2-06	
12	83214024	Handle (left)	682-1308-1M2-06	
13	75091113	Flat head screw	F4x6B	
14	70102012	Flexision cathc	TL-34	
15	75141017	Pan head screw	PSM2x6B	
16	83214034	Handle (right)	682-1308-2M2-06	
17	83226584	Cutter	682-2312 M1	
18	83241154	Holding board (left)	682-1309-1M1-06	
19	83241164	Holding board (right)	682-1309-2M1-06	
20	77506167	Installation arm metal plating	682-1484 M2-CR31 buff	
21	75091179	Pan head screw	PSM3x6B	
22	Missing number			
23	Missing number			
24	Missing number			
25	Missing number			
26	77601080	Ball bearing	MF148ZZS	
27	77047149	Thrust washer	STW-FT80-0.5	
28	84901094	Paper feed roller	With 682-1342 M1-04	
29	75862015	Set screw	S3x5U	
30	77191120	Washer	2W3B	
31	77192037	C type retaining ring for shaft	STW-8	
32	77500015	Spring C	682-1383 M2	
33	83625164	Gear B	682-1358M1-06	
34	83621124	Shaft C	682-1332M2-06	
35	77601050	Bearing	F608ZZ 5 class with PS2	
36	83621134	Shaft D	682-1333M2-06	
37	84701174	Pulley A	With 682-1345M1 04	
38	75091410	Set screw	S3x3U	
39	Missing number			
40	77165043	C type retaining ring for shaft	STW-6	
41	77191040	Thrust washer	STW-FT60-0.5	
42	83621154	Shaft F	682-1335M2-06	
43	82300114	Bush	With 682-1352M1 06	
44	84901104	paper presser roller	With 682-1343 M2-04	
45	63500121	Paper feed motor assy.	364-3525	
46	83625144	Gear A	682-1357M1	
47	Missing number			
48	Missing number			
49	75091101	Flat head screw	F4x10B	
50	77500011	Spring A (left)	682-1381-1M1	
51	84402314	Color	682-1349 06	
52	75091106	Flat head screw	F4x15B	
53	77500012	Spring A (right)	682-1381-2M1	

Recorder unit (Exploded view, drawing No.682-2324-1)

Symbol	Code	Name	Description	Specifications
1	80526254	Recording board A	682-1306 M3-06	
2	77402224	Top plating processing	682-1388	
3	76900523	Board nut metal plating	682-1391-Z4	
4	75091115	Flat head screw	F4x8B	
5	84901114	Roller	With 682-1344 M2-04	
6	77192015	E ring	E4U	
7	76900504	Holder screw A	682-1339M1-06	
8	83942050	Roller	682-1367	
9	76091038	Nut	N3B	
10	77191055	Spring washer	SW3B	
11	80526264	Recording board B	682-1307 M2-06	

Symbol	Code	Name	Description	Specifications
12	83214024	Handle (left)	682-1308-1M2-06	
13	75091113	Flat head screw	F4x6B	
14	70102012	Flexision catch	TL-34	
15	75141017	Pan head screw	PSM2x6B	
16	83214034	Handle (right)	682-1308-2M2-06	
17	83226584	Cutter	682-2312 M1	
18	83241154	Holding board (left)	682-1309-1M1-06	
19	83241164	Holding board (right)	682-1309-2M1-06	
20	77506167	Installation arm metal plating	682-1484 M2-CR31 buff	
21	75091179	Pan head screw	PSM3x6B	
22	83206214	Holder (left)	682-1310-1M2-06	
23	83206224	Holder (right)	682-1310-2M2-06	
24	77500013	Spring B (left)	682-1382-1M3	
25	77500014	Spring B (right)	682-1382-2M3	
26	77601080	Ball bearing	MF148ZZS	
27	77047149	Thrust washer	STW-FT80-0.5	
28	84901094	Paper feed roller	With 682-1342 M1-04	
29	75862015	Set screw	S3x5U	
30	77191120	Washer	2W3B	
31	77192037	C type retaining ring for shaft	STW-8	
32	77500015	Spring C	682-1383 M2	
33	83625164	Gear B	682-1358M1-06	
34	83621124	Shaft C	682-1332M2-06	
35	77601050	Bearing	F608ZZ 5 class with PS2	
36	83621134	Shaft D	682-1333M2-06	
37	84701174	Pulley A	With 682-1345M1 04	
38	75091410	Set screw	S3x3U	
39	70271006	O-ring	G-60 Nitryl rubber	
40	77165043	C type retaining ring for shaft	STW-6	
41	77191040	Thrust washer	STW-FT60-0.5	
42	83621154	Shaft F	682-1335M2-06	
43	82300114	Bush	With 682-1352M1 06	
44	84901104	Paper presser roller	With 682-1343 M2-04	
45	63500121	Paper feed motor assy.	364-3525	
46	83625144	Gear A	682-1357M1	
47	83585024	Stand-off	With 682-1364 Z4	
48	77191060	Spring washer	SW4B	
49	75091101	Flat head screw	F4x10B	
50	77500011	Spring A (left)	682-1381-1M1	
51	84402314	Color	682-1349 06	
52	75091106	Flat head screw	F4x15B	
53	77500012	Spring A (right)	682-1381-2M1	
54	83625174	Gear F	682-1361 06	
55	84501114	Bearing	682-1353 M1-06	
56	75091181	Pan head screw	PSM3x8B	
57	83621144	Shaft E	682-1334M3-06	
58	84701184	Pulley B	With 682-1346 04	
59	75091064	Flat head tapping screw	F2CT3X6U	
60	83621084	Holder shaft A	682-1337M1-06	
61	84590099	Recording paper bearing	760-1179	
62	77590151	Board spring	760-1173 N3	
63	75091269	Pan head tapping screw	P2CT3X10U	
64	83621073	Spool shaft	With 682-1354 04	
65	83621094	Holder shaft B	682-1338 M3-06	
66	83625154	Gear E	682-1360 M1-06	

Recorder unit (Exploded view, drawing No.682-2325)

Symbol	Code	Name	Description	Specifications
1	85111030	Current feed stylus	DMS-002 (682-1378-2M2)	
2	85111020	Recording stylus	DMS-001 (682-1378-1M2)	
3	77302164	Shaft	682-1341 06	
4	83942040	Beam holder	682-1368 M2	
5	77392006	Eyelet	H1.6X3B	
6	58301921	Magnet	LM-19 LM3X3 (with S pole mark)	
7	70211080	magnet holder	682-1389	
8	71411030	With belt processing	682-1376M2 (371MXL)	

Recorder unit (Exploded view, drawing No.682-2326)

Symbol	Code	Name	Description	Specifications
1	81503202	Panel A painting metal plating included	682-1459M1-05(K-3)FT	
2	75091159	Flat head screw	OC4x12B OC4x18B	
3	57167415	Connector	NT-5015-RF	
4		Seal	682-2313-2	
5	58810001	Meter panel	KF48 model A type AC0V—150V	
6	77240204	Side lag	B4	
7	75091179	Pan head screw	PSM3x6B	
8	Missing number			
9	57296006	3p inlet	CM-11 (C245)	
10	75091181	Pan head screw	PSM3x8B PSM3x12B	
11	56184110	Circuit breaker	NRF-110-2A	
12	56184112	Circuit breaker	NRF-110-8A	
13	57590221	Cap water-proof	AT-402A	
14	57511106	Switch toggle	S-6A	
15	81503201	Panel A printing (English)	682-1487-C	
16	81503206	Panel A printing (Japanese)	682-1492-C	

Recorder unit (Exploded view, drawing No.682-2327)

Symbol	Code	Name	Description	Specifications
	63500061	Right-hand panel BLK	682-2324	
1	81503212	Panel B painting metal plating included	682-1460 05-(K-3)FT)	
2	83923120	Filter	682-1371M1	
3	61500020	P.C.B assy.	DM684-9000M1 DM682	
4	75091238	Round machine screw	PWSM4x8B	
5	80204082	Cover painting metal plating included	682-1427M1-05(K-3)RT	
6	81525030	Sub-panel, Japanese version printing	682-1417 M1	
7	80301373	Case metal plating	682-1387-04	
8	75141013	Round machine screw	PSM2x4B	
9	77506174	Holding spring	682-1386M1	
10	75091044	Plain head screw	FF2X3B	
11	76012020	Stepped knurled screw	M3X8B	
12	77191055	Round machine screw	SW3B	
13	57590401	Cap	040-302 (black)	
14	70401123	Tab	023-342	
15	Missing number			
16	70401141	Tab cap	040-102	
17	70401131	Tab	021-212	
18	70401135	Tab	021-342	
19	81503216	Panel B (Japanese) printing	682-1493-C	
20		Panel B (English)	682-1488-C	
21	71510301	Analog dial	D-12	
22	55539873	Potentiometer	HP-16	
23	57554653	Switch rotary	SRRM-34 4545052	
24	57554652	Switch rotary	SRRM-43 4545053	
25	55583373	Resistor variable (double)	RV24YD40RA5K ohm shaft 6	
26	57554650	Switch rotary	SRRM-18 4545051	
27	57510408	Switch toggle AT-415 white	M-2018-P-2W	
28	57510120	Switch toggle AT-415 white	M-2012-P-2W	
29	57510306	Switch toggle AT-415 white	M-2015-P-2W	
30	81525040	Sub-panel (English)	682-1418-C	

Recorder unit (Exploded view, drawing No.682-2328)

Symbol	Code	Name	Description	Specifications
	63500131	Right-hand panel assy.	682-2325	
1	81503232	Panel D	682-1462	
2	57590221	Cap water-proof	AT-402A	
3	57511233	Switch toggle	S-33	
4	57590401	Cap	040-302 (black)	
5	70401123	Tab	023-342	
6	70291020	Fixing plate	COM-1177	
7	55583373	Resistor variable (double)	RV24YD40RA5K	
8	57542501	Switch digital	DFCN-031B	
9	81503222	Panel D	682-1461	
10	57542501	Switch digital	DFCN-031B	
11	61500020	P.C.B. assy.	DM684-9000M1 DM682	
12	81503236	Panel D (Japanese)	682-1495-C	

Symbol	Code	Name	Description	Specifications
13	81503231	Panel D (English)	682-1490-C	
14	81503226	Panel C (Japanese) printing	682-1494-C	
15	81503221	Panel C (English)	682-1489-C	
16		Seal	682-2313-1	

Recorder unit (Exploded view, drawing No.682-2329)

Symbol	Code	Name	Description	Specifications
1	63500071	Power control panel	682-2326	
2	75091238	Pan head screw	PWSM4x8B	
3	63500051	Main control panel (Right hand panel)	682-2327	
4	P6700022	Main control panel (Panel C)	682-2328	
5	P6700021	Main control panel (Panel D)	682-2328	
6	80203081	Cover printing	682-1464M2(682-1463)	
7	83923060	Cover	682-1467 M1	
8	83950000	Panel	682-1468M2	
9	77191120	Washer	2W3B	
10	77191055	Spring washer	SW3B	
11	76091038	Nut	N3B	
12	70401038	Screw with tab	TL-233-5	
13	77191102	Washer	W5B	
14	70102030	Magnet catch	TL-107-1	
15	76900533	Boar nut metal plating	682-1392-Z4	
16	75091115	Flat head screw	F4x8B	
17	77402236	Top plating processing	682-1384	
18	76900543	Board nut metal plating	682-1317-Z4	
19	75091143	Flat head screw	OC2.6x6B	
20	75091059	Flat head screw	F2.6x6B	
21	70403109	Stainless panel handle	THA-31-SUS-6 (tap leg)	
22	75091200	Pan head screw	PSM5x12B	
23	82920443	Angle metal plating	682-2310.1M1-04	
24	82920453	Angle metal plating	682-2310.2M1-04	
25	77191102	Washer	W5B	
26	77191065	Spring washer	SW5B	
27	76091047	Nut	N5B	
28	75091227	Pan head screw	PWSM3x8B	

Recorder unit (Exploded view, drawing No.682-2330)

Symbol	Code	Name	Description	Specifications
1	80703151	Fixing plate, English version printing	682-1472 M1 (1474M2)	
2	83411193	Stay	With 682-1471 Z4	
3	75091115	Flat head screw	F4X8B	
4	75091228	Screw and washer assy.	PWSM4X10B	
5	83202272	Angle painting	682-1474M2(1470M2)5G	
6	70492027	Panel handle, tap leg	THA-31-SUS-2	
7	75091181	Screw and washer assy.	PSM3X8B	
8	57167310	Connector	NJW-243-RM	
9	75091182	Screw and washer assy.	PSM4X10B	
10	79031602	Cable gland	PG-11	
11	35061806	Cable assy.	CW-71 (364-3535)	
12	56401553	Transformer	KCT-153/154	
10	79031702	Cable gland	NSL-9	
12	56401553	Transformer	KCT-153/154	
13	75091381	Pan head screw	P6X15B	
14	77191129	Plain washer (board)	2W6B	
15	77191068	Spring washer	SW6B	
16	76091051	Hexagonal nut	N6B	
17	76122723	Round wood screw	RW4.1X13U	
18	75091183	Screw and washer assy.	PSM4X12B	

Recorder unit (Exploded view, drawing No.682-2330-1)

Symbol	Code	Name	Description	Specifications
1	80703541	Fixing plate, English version printing	C19MC13010	
2	83411193	Stay	With 682-1471 Z4	
3	75091115	Flat head screw	F4X8B	
4	75091228	Screw and washer assy.	PWSM4X10B	
5	83202272	Angle painting	682-1474M2(1470M2)5G	
6	70402040	Handle	THA-212-3	

Symbol	Code	Name	Description	Specifications
7	75091181	Screw and washer assy.	PSM3X8B	
8	57167310	Connector	NJW-243-RM	
9	75431522	Flat head screw	F2.5x8B	
10	79031602	Cable gland	PG-11	
11	35061806	Cable assy.	CW-71 (364-3535)	
12	56401553	Transformer	KCT-153/154	
10	79031702	Cable gland	NSL-9	
12	56401553	Transformer	KCT-153/154	
13	75091381	Pan head screw	P6X15B	
14	77191129	Plain washer (board)	2W6B	
15	77191068	Spring washer	SW6B	
16	76091051	Hexagonal nut	N6B	
17	76122723	Tapping screw	RW4.1X13U	
18	75091183	Screw and washer assy.	PSM4X12B	
19	56182146	Breaker	BS2021	
20	82916974	Angle	C19MB14010	

Winch unit (Exploded view, drawing No.682-2351-1)

Symbol	Code	Name	Description	Specifications
1	80230350	Chain cover	DM688-462	
2	75162020	Hexagon bolt	B3x8U SW HW	
3	83206290	Handle	DM688-467 M2	
4		Plain washer	2W10S	
5	77313030	Sprit pin	STP3.2X30S	
6	81401160	Frame body	DM688-401 M3	
7	80230330	Screw cover (A)	DM688-460	
8				
9	80230340	Screw cover (B)	DM688-461 M1	
10	72300030	Square bar	DM688-466 M2	
11	75424145	Flat head screw	F6X80S	
12	57166615	Connector plug (bending type)	NT-5015-CRM	
13				
14	57509811	Switch limit	AZ8107	
15	75092117	Hexagon socket head cap screw	CB4x15U	
16		Hexagon socket head cap screw	CB4x30U	
17				
18	75092050	Hexagonal bolt	B5x10U	
19		Pan head screw	WSM3x8U	
20	82722029	Winch direction indicating name plate	B364-8013M1	
21	80552420	Motor cover	DM688-402-1M2	
22	80552421	Motor cover	DM688-402-2M1	
23		Terminal block	KH4101-6P(187)	
24	83590301	Shore	With 686-6012 N3	
25	63990161	P.C.B. assy.	DM686-8300M1	
26				
27	70402030	Knob	THA-31SUS-5	
28	75092073	Hexagonal bolt	B6x35U	
29	75092051	Tooth washer	OTW6U	
30	75092051	Hexagonal bolt	B5x12U	
31	77191067	Spring washer	SW5U	
32	77191130	Plain washer	2W6U	
33	76091053	Nut	N6U	
34	77191070	Spring washer	SW6U	
35	77012217	Butterfly nut	2WN6U	

Winch unit (Exploded view, drawing No.682-2352)

Symbol	Code	Name	Description	Specifications
1	75091210	Pan head screw	PSM3x8U	
2	80600020	Presser plate	DM688-450 M1	
3	84402340	Color (C)	DM688-453 M1	
4		Bearing	MB0607DU	
5	84901150	Wire side roller	DM688-438 M1	
6	77302200	Hinge pin	DM688-424 M1	
7	76091053	Hexagonal nut	N6U	
8	77192015	E ring	E4U (JISB2805)	
9	83221070	Wire sheave bracket	DM688-412 M1 1 set at right and left	
10	77191130	Washer	2W6U	
11	77313020	Sprit pin	STP2x30S	
12	83621200	Limit switch shaft	DM688-468 M2	
13	77601110	Bearing	SS6-15ZZ	
14	84901160	Wire sheave	DM688-439	
15	77500033	Limit spring	DM688-458	
16	77191131	Washer	2W8U	
17	76900580	Wire sheave block pin	DM688-428M1	
18	83441060	Presser arm (B) for presser roller	DM688-408 M1	
19	71430011	DU bush	MB0607-12DU (with collar)	
20	84901200	Presser roller	DM688-443 M1	
21	83621190	Roller shaft	DM688-421 M1	
22	77500030	Presser spring	DM688-455	
23	75092050	Hexagonal bolt	B5X10U	
24	77165009	C type retaining ring	SC9S	
25	77601100	Bearing	SS10-19ZZ	
26	84800110	Chain sprocket (F)	DM688-435 M1	
27	71430020	Bush. chain (B)	DM688-511 RS25 1.22M	
28	83630550	Chain tensioner pin	DM688-413 M1	
29	77191083	Plain washer	W10U	
29	77191045	Spring washer	SW10U	
29	76091030	Hexagonal nut	N10U	With OS coat

Winch unit (Exploded view, drawing No.682-2353)

Symbol	Code	Name	Description	Specifications
2	80600020	Presser plate	DM688-450 M1	
3	84402340	Color (C)	DM688-453 M1	
4	77601110	Bearing	SS6-15ZZ	
5	84901150	Wire side roller	DM688-438 M1	
6	77313020	Sprit pin	STP2X30S	
7	77191130	Washer	2W6U	
8	83221040	Slide bracket (A)	DM688-409 M1	
9	77302200	Hinge pin	DM688-424 M1	
10	83441050	Presser arm (A) wire presser roller	DM688-407 M2	
11	77500031	Wire presser spring	DM688-456	
12	77601110	Bearing	SS6-15ZZ	
13	84901160	Wire sheave	DM688-439	
14	71430011	DU bush	MB0607-12DU (with collar)	
15	84901190	Wire presser roller	DM688-442 M1	
16	83621170	Screw shaft (B)	DM688-419 M1	
17	83621180	Screw shaft (C)	DM688-420 M2	
18	83631050	Coupling	DM688-459 M1	
19	75873422	Hexagon socket head cap screw	S5X10S	
20	83630600	Slide guide pin	DM688-422 M1	
21	84800080	Sprocket (C)	DM688-432 M2	
22	71430010	Bush.chain (A)	DM688-510 RS25 0.71M	
23	77165016	C type retaining ring	RC16S	
24	77393023	Spring pin	SP3X20U	

Winch unit (Exploded view, drawing No.682-2354)

Symbol	Code	Name	Description	Specifications
1		Hexagonal bolt	B3x8U SW HW	
2	80552450	Progress detecting section cover	DM688-448 M2	
3	70213130	Packing (A) progress detecting section	DM688-463 M2	
4	75091423	Hexagon socket head cap screw	S4X6S	
5	84800130	Gear (B)	DM688-437 M1	
6	83110190	Rotary encoder bracket	DM688-449 M1	
7	53303110	Rotary encoder	EWTXA1S2050B	
8	84800120	Gear (A)	DM688-436 M1	
9	77165032	C type retaining ring	RC32S	
10	77601090	Bearing	#6002ZZ	
11	75092050	Hexagonal bolt	B5x10U SW HW	
12	80301600	Progress detecting section case	DM688-447 M2	
13	84402330	Color (B)	DM688-452 M1	
14	84641054	Balance key (crosscut)	DM688-473 S45C 5X5X40L	
15	83630570	Wire drum pin (B)	DM688-415 M1	
16	84901130	Wire drum (A)	DM688-405 M3	
17	56207015	Motor lifter	DTM-G6075	
18	87500087	Gear box only	MM60A8-M-180G	
19	84641044	Balance key (crosscut)	DM688-472 S45C 5X5X15L	
20	84901140	Wire drum (B)	DM688-406 M3	
21	77312030	Spring pin	SP5X60S	
22	56806001	Wire rope Z side	DM688-512 SB-150 110M	
23	84641064	Balance key	DM688-474 5X5X60L	
24		Hexagon socket head cap screw	S5x8	
25	83630560	Wire drum pin (A)	DM688-414 M1	
26	84800070	Sprocket (B)	DM688-431 M1	
27	71430000	Rollor chain	DM688-509 RS35 1.41M	
28	84402320	Color (A)	DM688-451 M1	
29	83221080	Bearing case	DM688-429	
30	75092063	Hexagonal bolt	B6x15U	
31	75092006	Hexagonal bolt	B10X30U	

Winch unit (Exploded view, drawing No.682-2355)

Symbol	Code	Name	Description	Specifications
1	76091046	Hexagonal nut	N4U	
2		Hexagonal bolt	WSM4x8U	
3	77500041	Spring	DM688-551-1	
3	77500052	Spring	DM688-551-2	
4	83441070	Arm	DM688-550-1	
4	83441080	Arm	DM688-550-2	
5		Pan head screw	PSM5x8U	
6	83502380	Stopper pin	DM688-426	
7		Hexagon socket head cap screw	S5x8U	
8	84402340	Color (C)	DM688-453 M1	
9	71430011	DU bush	MB0607-12DU (with collar)	
10	84901170	Cord sheave	DM688-440 M1	
11	83221060	Cord sheave bracket	DM688-411 M1	
12	77500032	Non-mirror-image cord tension spring	DM688-457 M1	
13	77313020	Sprit pin	STP2X30S	
14	77302210	Tension arm pin	DM688-425 M1	
15	83502390	Cord tension pin	DM688-427	
16	84901180	Cord tension roller	DM688-441	
17	76900590	Rotation center pin	DM688-423 M1	
18	77601120	Bearing	ARF1015LD Luron	
19	77165016	C type retaining ring	RC16S	
20	77601110	Bearing	SS6-15ZZ	
21	83630600	Slide guide pin	DM688-422 M1	
22	83621160	Screw shaft (A)	DM688-418 M2	
23	77313030	Sprit pin	STP3.2X30S	
24	83221050	Slide bracket (B)	DM688-410 M1	
25	75873422	Hexagon socket head cap screw	S5X10S	
26	84800090	sprocket (D)	DM688-433 M2	
27	77191107	Washer	W6S	
28	77302200	Hinge pin	DM688-424 M1	
29	56813900	Cable	HC-ESV-4X16/0.12 120M mono	

Winch unit (Exploded view, drawing No.682-2356)

Symbol	Code	Name	Description	Specifications
1		Hexagonal bolt	B3x8U	
2	80552430	Slip ring cover	DM688-445 M2	
3	70213131	Packing (B) slip ring cover	DM688-464 M2	
4	87501003	Slip ring unit assembly	364-3504	
5	84402350	Color (D)	DM688-454 M1	
6	77165032	C type retaining ring	RC32S	
7	77601090	Bearing	#6002ZZ	
8	75092050	Hexagonal bolt	B5x10U	
9	80301590	Slip ring case	DM688-444 M3	
10	75222729	Pan head screw	PWSM4x20U	
11	80552440	Slip ring upper cap	DM688-446 M1	
12	70213132	Packing (C) slip ring upper cap	DM688-465 M1	
13	83630590	Cord drum pin (B)	DM688-417 M1	
14	84641054	Balance key (crosscut)	DM688-473 S45C 5X5X40L	
15	84901120	Cord drum	DM688-404 M2	
16	84641044	Balance key (crosscut)	DM688-472 S45C 5X5X15L	
18	83630580	Cord drum pin (A)	DM688-416 M1	
19	84800060	Sprocket (A)	DM688-430 M1	
20	84402320	Color (A)	DM688-451 M1	
21	83221080	Bearing case	DM688-429	
22	75092063	Hexagonal bolt	B6x15U	

Winch unit (Exploded view, drawing No.682-2357)

Symbol	Code	Name	Description	Specifications
1	83204054	Hanger	DM688-519-01M2	
2	83204044	Swing angle	DM688-519-2	
3	79033205	Nylon clip	HP-5N for 7 pi	
4	75042722	Pan head screw	P4X10U	
5	77191064	Spring washer	SW4U	
6	77191125	Plain washer (board)	2W4U	
7	83502444	Color	DM688-519-07M2	
8	75092005	Hexagonal bolt	B10X25U	
9	77191083	Plain washer	W10U	
10	77191045	Spring washer	SW10U	
11	75092063	Hexagonal bolt	B6X15U	
12	77191070	Spring washer	SW6U	
13	83502454	Joint	DM688-519-13	
14	83201974	Wire, fixing metal fitting 1	DM688-519-14-1	
14	83201984	Wire, fixing metal fitting 2	DM688-519-14-2	
15	77312040	Spring pin	SP3X16U	
16	83942093	Washer	DM688-519-16	
17	80501964	Roof	DM688-519-17	
18	80510094	Side plate B	DM688-519-19	
19	80510084	Side plate A	DM688-519-18	
20	75092052	Hexagonal bolt	B5X15U	
21	77191067	Spring washer	SW5U	
22	75432722	Flat head screw	F4X10U	
23	83502464	Weight	DM688-519-23	
24	83502474	Spacer	DM688-519-24	
25	70291244	Sponge 1	686-3012	
26	70293257	Sponge 3	686-6017	
27	70291246	Cork board	686-3014	
28	63500171	Sensor	Sensor for DMW-001	
28	58502021	Transducer	NGM-50-88A (with connector cable)	
29	57298205	Locking sleeve	GL-20G401	
30	76091030	Hexagonal nut	N10U With OS cort	
31	57291003	Connector water-proof	GL-20G3P-M	

6.2 Electorical Parts

Recorder unit

P. C. board assembly DM-682/684-9001M1

Symbol			Code	Name	Specifications	Description
DA911	-	DA918	50311194	Diode	DA-4N	
			57298506	Connector	DAC-062	
CN20			57231011	Post with connector base	BS11P-SHF-1AA	

DM-682/684 Left panel

Symbol	Code	Name	Specifications	Description
	56184110	Circuit breaker	NRF-110-2A	
	56184112	Circuit breaker	NRF-110-8A	
	58810001	Meter panel	KF48 model A type AC0V—150V	
	57511106	Switch toggle	S-6A	
	57296006	3P inlet	CM-11 [C245]	
	57167415	Connector	NT-5015-RF	
	57590221	Cap water-proof	AT-402A	
	79041101	Fixture with self-adhesive tape	ABMM-A	
	57260608	Connector cap housing	172506-1	
	57270704	Connector receptacle contact	172780-1	
	57260619	Connector cap housing	172509-1	
	52650301	Capacitor mylar	ECQU2A103MU	

DM-682 Right panel

Symbol	Code	Name	Specifications	Description
	57542501	Switch digital	DFCN-031B	
	57511233	Switch toggle	S-33	
	57590221	Cap water-proof	AT-402A	
	53190002	Surge absorption CR	ECQJ0186X	
	55514243	Resistor variable	RV24YN20SB2K	2K
	57542505	End plate	DFCW-2-B	
	70401123	Tab	023-342	
	57590401	Cap	040-302[black]	
	57260608	Connector cap housing	172506-1	
	57270704	Connector reception contact	172780-1	
	79041201	AN band	08432 [L=100M/M]	
	61500020	P.C.B. assy.	DM684-9000M1(A)	For DM682
	61500050	P.C.B. assy.	DM682/4-9001M1	

DM-684 Right panel

Symbol	Code	Name	Specifications	Description
	57542501	Switch digital	DFCN-031B	
	57511233	Switch toggle	S-33	
	57590221	Cap water-proof	AT-402A	
	53190002	CR for surge absorption	ECQJ0186X	
	55514243	Resistor variable	RV24YN20SB2K	2K
	57542505	End plate	DFCW-2-B	
	70401123	Tab	023-342	
	57590401	Cap	040-302[black]	
	57260608	Connector cap housing	172506-1	
	57270704	Connector reception contact	172780-1	
	79041201	AN band	08432 [L=100M/M]	
	61500040	P.C.B. assy.	DM684-9000M1(B)	For DM684
	61500050	P.C.B. assy.	DM682/4-9001M1	

P. C. board assembly DM-684-0100

Symbol	Code	Name	Specifications	Description
	57298261	Faston tab	22006	

P. C. board assembly DM-684-7000M1

Symbol	Code	Name	Specifications	Description
7GH	67500004	Written ROM	KM-429D	
Q1 Q2	50101120	Transistor	2SA836-D	
CV1 CV2	50341042	Diode burr cap	FC66M-009	
1G	50542245	IC	TC74HC245AP	
3G 4J	50542139	IC	TC74HC139AP	
3H	50542138	IC	TC74HC138AP	
3J	50542155	IC	TC74HC155AP	
3B 4E 3F 3M	50542175	IC	TC74HC175AP	
2G 2H	50542240	IC	TC74HC240AP	
5L 6C 5A 5D 5B	50542074	IC	TC74HC74AP	
4L 2L 1L 4M 1N				
1F 5E 2K 4B 2M	50542125	IC	TC74HC125AP	
5K 4K 6B 1C	50542004	IC	TC74HC04AP	
5J 4H 4F	50542032	IC	TC74HC32AP	
4D 4G 5C 2N	50542008	IC	TC74HC08AP	
4C 3N 3L	50542000	IC	TC74HC00AP	
3K	50542086	IC	TC74HC86AP	
1M	50542014	IC	TC74HC14AP	
1D	50405006	IC	SN7406N	
1K	50542003	IC	TC74HC03AP	
5M	50905017	IC linear	TL7705CP-B	
5N	50794008	IC	UPD71011C	
7MN	50794009	IC	UPD70108C	
7AB 7C 7D 7F	50794004	IC	UPD71054C	
7L	50794030	IC	UPD8237A	
7J	50761486	IC SRAM	HM6264BLP-10L	
6E 6D 6F 6G	50769085	IC	CY7C167A-45PC	
1H 6H	50542373	IC	TC74HC373AP	
5H	50542257	IC	TC74HC257AP	
1J 3C	50542367	IC	TC74HC367AP	
2E	50542157	IC	TC74HC157AP	
3D	50769086	IC	CY7C168A-45PC	
2B 2C 2D	50542193	IC	TC74HC193AP	
3A	50542283	IC	TC74HC283AP	
3E	50542085	IC	TC74HC85AP	
1E	50542273	IC	TC74HC273AP	
C14	51326647	Capacitor chemical	TVX1A470MAA	47μF 10V
C32	51327610	Capacitor chemical	TVX1E100MAA	10μF 25V
C7	51327647	Capacitor chemical	TVX1E470MAA	47μF 25V
C11 C12	52259310	Capacitor ceramic	RPE132F103Z50	0.01μF 50V
C9 C10	52221010	Capacitor ceramic	ECCF1H100D	10PF 50V
C39 C40	52266022	Capacitor ceramic	ECCF1H220JC	22PF 50V
C8 C13 C15 C16 C17	52259410	Capacitor ceramic	RPE132F104Z50	0.1μF 50V
C18 C19 C20 C21 C22				
C23 C24 C25 C26 C27				
C28 C29 C30 C31 C33				
C34 C35 C36 C37 C38				
C41 C42 C43 C44 C45				
C46 C47 C48 C49 C50				
C51				
Y1	53421052	XTAL	HC18/U 16.000MHZ	20PF
C2 C5	52266047	Capacitor ceramic	ECCF1H470JC4	47PF 50V
C1 C6	52227210	Capacitor ceramic	ECKF1H102KB	1000PF 50V
C52 C53 C54	52227110	Capacitor ceramic	ECKF1H101KB	100PF 50V
R5	54012415	Resistor	ERD25TJ152	1.5K 1/4W
R7 R12 R10 R4 R14	54012447	Resistor	ERD25TJ472	4.7K 1/4W
R15				
R13 R17	54012510	Resistor	ERD25TJ103	10K 1/4W
R1 R2 R6 R8 R9	54012610	Resistor	ERD25TJ104	100K 1/4W
R11				
R16 R18	54012433	Resistor	ERD25TJ332	3.3K 1/4W

Symbol	Code	Name	Specifications	Description
RA1	55055510	Resistor array	EXBF9E103J	10K
RA3 RA4 RA5 RA6 RA7 RA8	55055447	Resistor array	EXBF9E472J	4.7K
L2 L3	56323051	Coil SN	SN-5-400	
L1	56358000	Coil	KT800	
TP1 - TP24	57011111	Terminal check	LC-1-S	
CN14	57221840	Connector	HIF3BA-40PA-2.54DSA	
CN15	57221820	Connector	HIF3BA-20PA-2.54DSA	
CN16	57221826	Connector	HIF3BA-26PA-2.54DSA	
SW1 Switch 2	57502418	Switch DIP	A6B-8101[A62-08 with cover]	
7MN	57404740	Socket IC	IC30-4006-G4	
7GH	57404728	Socket IC	IC30-2806-G4	

P. C. board assembly DM-684-8300M1

Symbol	Code	Name	Specifications	Description
D8301 D8302 D8305	50310251	Diode	V09G	
D8306	50310251	Diode	V09G	
D8303 D8304	50331440	Thyrister	29RD40[with 6 accessory]	
R8301 R8302 R8303	54603310	Resistor	ERD50TJ101	100 1/2W
R8304	54603310	Resistor	ERD50TJ101	100 1/2W
R8305	54413451	Resistor	ERG12ANJ512	5.1K 1/2W
	57272631	Faston tab	60284-2	
	83390149	Cooling wheel	With 686-6011 04	
	83590301	Shore	With 686-6012 N3	

P. C. board assembly DM-684-9001M1-A

Symbol	Code	Name	Specifications	Description
2W2	57510120	Switch toggle	AT-415 with white cap	M-2012-P-2W
LED1 LED2 LED3	50211141	LED	TLR346T	
LED1 LED2 LED3	57404111	Socket IC	IC-09-9 #2	
D8 D9 D10 D11 D12 D13 D14 D15	50311194	Diode	DA-4N	
D0 D1 D2 D3 D4 D5 D6 D7	50306030	Diode array	MA204WA-[TA]	
IC4 IC5 IC6	50582011	IC	TC4511BP[N]	
IC7	50542125	IC	TC74HC125AP	
IC2	50542138	IC	TC74HC138AP	
IC3	50542139	IC	TC74HC139AP	
IC1	50542245	IC	TC74HC245AP	
C3	51213710	Capacitor chemi-con	ECA1EM101	100μF 25V
C1 C2 C4 C5	52259410	Capacitor ceramic	RPE132F104Z50	0.1μF 50V
RA1 RA2 RA3	55015510	Resistor array	EXBP88103J	10K
RA4 RA5 RA6	55193622	Resistor array	899-3-R220	
GAIN/STC1 GAIN/STC2	55583373	Resistor variable (double)	RV24YD40RA5K ohm shaft 6	A 5K
GAIN/STC3 GAIN/STC4	55583373	Resistor variable (double)	RV24YD40RA5K ohm shaft 6	A 5K
CN21(CN4)	99800409	Post with connector base	B2P-SHF-1AA	
CN19(CN3)	99800410	Post with connector base	B3P-SHF-1AA	
CN18(CN2)	99800412	Post with connector base	B11P-SHF-1AA	
CN17(CN1)	57221840	Connector	HIF3BA-40PA-2.54DSA	
SW12SW13SW14	57544130	Switch digital rotary code	S-2110	
SW8 SW9 SW10	57519212	Switch	AS-12AB	
SW4	57510120	Switch toggle	AT-415 with white cap	M-2012-P-2W
SW1	57510408	Switch toggle	AT-415 with white cap	M-2018-P-2W
SW5	57510306	Switch toggle	AT-415 with white cap	M-2015-P-2W
SW7	57554652	Switch rotary	SRRM-43 4545053	
SW6	57554653	Switch rotary	SRRM-34 4545052	
SW3	57554650	Switch rotary	SRRM-18 4545051	
GAIN/STC1 GAIN/STC2	70291020	Fixed plate	COM-1177	
GAIN/STC3 GAIN/STC4	70291020	Fixed plate	COM-1177	

P. C. board assembly DM-684-9001M1-B

Symbol	Code	Name	Specifications	Description
	61500042	P.C.B. sub assy.	DM684-9000M1 DM684	
2W2	57510408	Switch toggle	AT-415 with white cap	M-2018-P-2W
LED1 LED2 LED3	50211141	LED	TLR346T	
LED1 LED2 LED3	57404111	Socket IC	IC-09-9 #2	
D8 D9 D10 D11 D12	50311194	Diode	DA-4N	
D13 D14 D15				
D0 D1 D2 D3 D4	50306030	Diode array	MA204WA-[TA]	
D5 D6 D7				
IC4 IC5 IC6	50582011	IC	TC4511BP[N]	
IC7	50542125	IC	TC74HC125AP	
IC2	50542138	IC	TC74HC138AP	
IC3	50542139	IC	TC74HC139AP	
IC1	50542245	IC	TC74HC245AP	
C3	51213710	Capacitor chemi-con	ECA1EM101	100µF 25V
C1 C2 C4 C5	52259410	Capacitor ceramic	RPE132F104Z50	0.1µF 50V
RA1 RA2 RA3	55015510	Resistor array	EXBP88103J	10K
RA4 RA5 RA6	55193622	Resistor array	899-3-R220	
GAIN/STC1 GAIN/STC2	55583373	Resistor variable (double)	RV24YD40RA5K ohm shaft 6	A 5K
GAIN/STC3 GAIN/STC4	55583373	Resistor variable (double)	RV24YD40RA5K ohm shaft 6	A 5K
CN21(CN4)	99800409	Post with connector base	B2P-SHF-1AA	
CN19(CN3)	99800410	Post with connector base	B3P-SHF-1AA	
CN18(CN2)	99800412	Post with connector base	B11P-SHF-1AA	
CN17(CN1)	57221840	Connector	HIF3BA-40PA-2.54DSA	
SW12SW13SW14	57544130	Switch digital rotary code	S-2110	
SW8 SW9 SW10	57519212	Switch	AS-12AB	
SW4	57510120	Switch toggle with white cap	M-2012-P-2W	
SW1	57510408	Switch toggle	AT-415 with white cap	M-2018-P-2W
SW5	57510306	Switch toggle	T-415 with white cap	M-2015-P-2W
SW7	57554652	Switch rotary	SRRM-43 4545053	
SW6	57554653	Switch rotary	SRRM-34 4545052	
SW3	57554650	Switch rotary	SRRM-18 4545051	
GAIN/STC1 GAIN/STC2	70291020	Fixed plate	COM-1177	
GAIN/STC3 GAIN/STC4	70291020	Fixed plate	COM-1177	

P. C. board assembly DM-684-HOLE-1001

Symbol	Code	Name	Specifications	Description
	50899410	IC	DN6852-A	
	57232303	Post with connector base	B3PS-VH	

P. C. board assembly DM-684-PS6000M1

Symbol	Code	Name	Specifications	Description
Q9 Q10	50101131	Transistor	2SA844C	
Q5 Q7	50101202	Transistor	2SA1009A K	
Q2	50102068	Transistor	2SB791K	
Q3 Q4 Q6 Q8 Q11	50103481	Transistor	2SC2899	
Q1	50104150	Transistor	2SD970K	
D1 D9 D10 D14 D16	50211131	LED	GL-3PR8	
D2 D3 D4 D6 D8	50310232	Diode	V06G[1S2082]	
D12 D17				
D13	50324332	Diode zener	HZ33-2L	
D5 D7	50304057	Diode bridge	S5VB20	
D11	50304016	Diode bridge	S1VBA60	
IC1	50993112	IC	M51728L	
IC2	50918004	IC OPAMP	LM324N	
IC3	50582038	IC	TC4538BP[N]	
IC4	50482013	IC	TC4013BP	
IC5	50107116	Transistor array	M54523P	
IC6	50482093	IC	TC4093BP[N]	
IC7	50952096	IC	TA7815S	
IC8	50980142	IC regulator 3T	SI-3052V[with accesarry]	
	70511302	Insulating plate	S-34	
	70511301	Transistor insulating plate	S-18	
	70521103	Insulating bush	B-24 [25K]	

Symbol					Code	Name	Specifications	Description
C1	C5				51216647	Capacitor chemi-con	ECA1HM470	47μF 50V
C12	C13				51223647	Capacitor chemi-con	ECA2VM470	47μF 350V
C14	C15				51154847	Capacitor chemi-con	ECES1VV472S	4700μF 35V
C17	C18				51145820	Capacitor chemi-con	ECOS1CP103BB	
C16	C19	C24			51213647	Capacitor chemi-con	ECA1EM470	47μF 25V
C20	C21				51223634	Capacitor chemi-con	ECA2VM330	33μF 350V
C22					51216647	Capacitor chemi-con	ECA1HM470	47μF 50V
C3					51214747	Capacitor chemi-con	ECA1VM471	470μF 35V
C6	C7				52530310	Capacitor mylar	ECQM1H103KZ	0.01μF 50V
C2	C9	C25	C26		52259410	Capacitor ceramic	RPE132F104Z50	0.1μF 50V
C4					52523210	Capacitor mylar	ECQP1102JZ	0.001μF 100V
C10	C11				51614433	Capacitor tantalum	ECSF1VE334	0.33μF 35V
R18					54012310	Resistor	ERD25TJ101	100 1/4W
R6	R17	R19			54012410	Resistor	ERD25TJ102	1K 1/4W
R27	R34				54012510	Resistor	ERD25TJ103	10K 1/4W
R9					54012610	Resistor	ERD25TJ104	100K 1/4W
R25					54012522	Resistor	ERD25TJ223	22K 1/4W
R10	R36				54012422	Resistor	ERD25TJ222	2.2K 1/4W
R35	R40	R41			54012722	Resistor	ERD25TJ225	2.2M 1/4W
R43					54012433	Resistor	ERD25TJ332	3.3K 1/4W
R5	R11	R15	R28	R37	54012533	Resistor	ERD25TJ333	33K 1/4W
R45								
R1	R2	R3	R7	R14	54012447	Resistor	ERD25TJ472	4.7K 1/4W
R23	R24	R29						
R21	R22				54012647	Resistor	ERD25TJ474	470K 1/4W
R4					54012575	Resistor	ERD25TJ753	75K 1/4W
R16					54850233	Resistor cement	ERF10ZXJ330	33 10W
R30	R31				54816522	Resistor	ERG3CJ223	22K 3W
R13					54012615	Resistor	ERD25TJ154	150K 1/4W
R20					54012415	Resistor	ERD25TJ152	1.5K 1/4W
R42					54857047	Resistor cement	ERF5AKR47	0.47 5W
RA1					55083422	Resistor array	M09-1-2.2KJ	2.2K
VR1	VR4				55411574	Resistor variable	RJ-6P503	50K
VR3					55411513	Resistor variable	RJ-6P102	1K
VR2					55411554	Resistor variable	RJ-6P253	25K
TH1					50332103	Ceramistor	PTH59H02AR181M265	
SSR1					57988057	Relay solid state	G3CN-202P1	
RL1					57925242	Relay	AG302460[S2EB-24V]	
S1					57512803	Switch toggle	A-12AH	
S2					57512908	Switch toggle	A-18AH	
165V	5V	15V	TIMING		57011102	Terminal check	LC-2-S[ORANGE]	
REC/POS		REC	MOTOR		57011102	Terminal check	LC-2-S[ORANGE]	
CN6					99800413	Post with connector base	B3P-VH	
CN7					57221826	Connector	HIF3BA-26PA-2.54DSA	
CN8					57260709	Connector	172035-1	
CN9					57260717	Connector	171363-1	
CN10					57231302	Post with connector base	B2P-VH	
CN11					99800411	Post with connector base	B5P-SHF-1AA	
CN12					57231305	Post with connector base	B5P-VH	
CN13					57221810	Connector	HIF3BA-10PA-2.54DSA	
					83301183	Heat-sink metal plating	349-2101 M2-05	
D18					50310211	Diode	V03C[1S1948]	
R12A	R12B				54603622	Resistor	ERD50TJ224	220K 1/2W
R26					54603610	Resistor	ERD50TJ104	100K 1/2W
R32	R33				54012547	Resistor	ERD25TJ473	47K 1/4W
R47					54603522	Resistor	ERD50TJ223	22K 1/2W
R48					54415547	Resistor	ERG2ANJ473	47K 2W

P. C. board assembly DM-684-TRX1000M2

Symbol	Code	Name	Specifications	Description
Q7 Q8 Q15 Q16 Q23 Q24 Q31 Q32	50101120	Transistor	2SA836-D	
Q4 Q!2 Q20 Q28	50101192	Transistor	2SA1006	
Q1 Q9 Q17 Q25	50101279	Transistor	2SA1361	
Q6 Q14 Q22 Q30	50103270	Transistor	2SC1214B	
Q3 Q11 Q19 Q27	50103422	Transistor	2SC2336	
Q2 Q5 Q10 Q13 Q18 Q21 Q26 Q29	50103022	Transistor	2SC3619	
D1 D3 D4 D5 D8 D9 D10 D12 D14 D15 D16 D19 D20 D21 D23 D25 D26 D27 D30 D31 D32 D34 D36 D37 D38 D41 D42 D43 D45 D46 D47 D48 D49 D50 D51	50310761	Diode	1S2075K	
D52 D53 D54 D55 D56 D57 D58 D59 D60	50310761	Diode	1S2075K	
D2 D11 D13 D22 D24 D33 D35 D44	50211131	LED	GL-3PR8	
D6 D7 D17 D18 D28 D29 D39 D40	50310766	Diode	1S2473	
IC1 IC5 IC9 IC13	50675001	IC	SG3524N	
IC3 IC7 IC11 IC15	50919902	IC	CA3080E	
IC4 IC8 IC12 IC16	50919117	IC OPAMP	AD817AN	
IC20 IC21	50482051	IC	TC4051BP[N]	
IC22	50482052	IC	TC4052BP[N]	
IC18 IC19	50482053	IC	TC4053BP	
IC2 IC6 IC10 IC14	50482066	IC	TC4066BP	
IC17	50482093	IC	TC4093BP[N]	
IC23	50582038	IC	TC4538BP[N]	
C2 C17 C32 C47	51213710	Capacitor chemi-con	ECA1EM101	100µF 25V
C3 C10 C18 C25 C33 C40 C48 C55	51216610	Capacitor chemi-con	ECA1HM100	10µF 50V
C4 C19 C34 C49	51222633	Capacitor chemi-con	ECA2EM330	33µF 250V
C69	51213647	Capacitor chemi-con	ECA1EM470	47µF 25V
C63 C70	52530222	Capacitor mylar	ECQM1H222KZ	2200PF 50V
C5 C20 C35 C50	52687510	Capacitor mylar	MMH-2G-105K	
C6 C21 C36 C51	52687410	Capacitor mylar	MMH-2G-104K	
C9 C11 C13 C14 C24 C26 C28 C29 C39 C41 C43 C44 C54 C56 C58 C59 C61 C64 C65 C66 C67 C68	52259410	Capacitor ceramic	RPE132F104Z50	0.1µF 50V
C7 C22 C37 C52	52256413	Capacitor ceramic	RPE132F224Z50	
C15 C30 C45 C60 C75 C76 C77 C78	52238311	Capacitor ceramic	ECFF1H103KB	0.01µF 50V
C12 C27 C42 C57	52269112	Capacitor ceramic	ECCF1H121JS	120PF 50V
C8 C23 C38 C53 C79 C80 C81 C82	52227210	Capacitor ceramic	ECKF1H102KB	1000PF 50V
R5 R14 R31 R36 R45 R62 R67 R76 R93 R98 R107 R124 R129 R130	54012510	Resistor	ERD25TJ103	10K 1/4W
R16 R47 R78 R109	54012210	Resistor	ERD25TJ100	10 1/4W
R6 R9 R15 R37 R40 R46 R68 R71 R77 R99 R102 R108	54012247	Resistor	ERD25TJ470	47 1/4W
R10 R21 R41 R53 R72 R84 R103 R115	54012310	Resistor	ERD25TJ101	100 1/4W
R7 R8 R27 R38 R39 R58 R69 R70 R89 R100 R101 R120	54012347	Resistor	ERD25TJ471	470 1/4W
R17 R48 R79 R110	54012410	Resistor	ERD25TJ102	1K 1/4W
R133 R134 R135 R136	54012415	Resistor	ERD25TJ152	1.5K 1/4W
R2 R18 R33 R49 R64 R80 R95 R111	54012422	Resistor	ERD25TJ222	2.2K 1/4W

Symbol	Code	Name	Specifications	Description
R3 R4 R13 R19 R20 R21 R34 R35 R44 R50 R51 R52 R65 R66 R75 R81 R82 R83 R96 R97 R106 R112 R113 R114 R132	54012447	Resistor	ERD25TJ472	4.7K 1/4W
R23 R25 R54 R56 R85 R87 R116 R118	54012522	Resistor	ERD25TJ223	22K 1/4W
R126	54012575	Resistor	ERD25TJ753	75K 1/4W
R128 R131	54012610	Resistor	ERD25TJ104	100K 1/4W
R24 R55 R86 R117	54012622	Resistor	ERD25TJ224	220K 1/4W
R127	54012647	Resistor	ERD25TJ474	470K 1/4W
R26 R57 R88 R119	54603568	Resistor	ERD50TJ683	68K 1/2W
R11 R12 R42 R43 R73 R104 R105	54414533	Resistor	ERG1ANJ333	33K 1W
R125	54012515	Resistor	ERD25TJ153	15K 1/4W
VR1 VR4 VR7 VR10	55411513	Resistor variable	RJ-6P102	1K
VR3 VR6 VR9 VR12	55411543	Resistor variable	RJ-6P202	2K
VR2 VR5 VR8 VR11 VR13 VR14 VR16 VR17 VR19 VR20 VR22 VR23	55411514	Resistor variable	RJ-6P103	10K
VR15 VR18 VR21 VR24	55411574	Resistor variable	RJ-6P503	50K
RA1	55055447	Resistor array	EXBF9E472J	4.7K
RA2	55083510	Resistor array	M09-1-R10K	10K
L1 L2 L3 L4	56316505	Radial lead inductor	LHL10NB104J	
T1 T2 T3 T4	56358210	Coil	KT821	
STC0 STC1 STC2 STC3 TX0 TX1 TX2 TX3 RAW0 RAW1 RAW2 RAW3 TRG0 TRG1 TRG2 TRG3 RCV0 RCV1 RCV2 RCV3 RCV/OUT X	57011102	Terminal check	LC-2-S[ORANGE]	
CN1 CN2	57231305	Post with connector base	B5P-VH	
CN3	99800413	Post with connector base	B3P-VH	
CN4	57221820	Connector	HIF3BA-20PA-2.54DSA	
DSW1	57544121	Switch digital rotary code	S-1110	
SW1	57512803	Switch toggle	A-12AH	
Q3 Q4 Q11 Q12 Q19 Q20 Q27 Q28	75091220	Screw and washer assy.	PWSM3X10B	
Q3 Q4 Q11 Q12 Q19 Q20 Q27 Q28	76091038	Hexagonal nut	N3B	
Q3 Q4 Q11 Q12 Q19 Q20 Q27 Q28	70521619	Accessory	W-9	
C71 C72 C73 C74	52227122	Capacitor ceramic	ECKF1H221KB	220PF 50V
C1 C16 C31 C46	52520222	Capacitor mylar	ECQP1H222JZ	2200PF 50V
R28 R29 R30 R59 R60 R61 R90 R91 R92 R121 R122 R123	54012482	Resistor	ERD25TJ822	8.2K 1/4W
R1 R32 R63 R94	54012420	Resistor	ERD25TJ202	2K 1/4W

DMT-001/002

Symbol	Code	Name	Specifications	Description
	57167310	Connector	NJW-243-RM	
	79031702	Cable assy.	NSL-9	
	56401553	Transformer	KCT-153/154	
	80607410	Plate	682-1405	
	79065301	Shield cap	313020-08 gray	
	57014514	Crimp-style terminal	V1.25-3.5-1	
	79065302	Shield cap	314428-08 gray	
	35061806	Cable assy.	CW-71 [364-3535]	
	56182146	Circuit breaker	BS2021	
	57012050	Flat crimp-style terminal	PRE-125T[C]	

DMT-003

Symbol	Code	Name	Specifications	Description
	57167310	Connector	NJW-243-RM	
	79031702	Cable assy.	NSL-9	
	56401555	Transformer	KCT-155	
	79065301	Shield cap	313020-08 gray	
	57014514	Crimp-style terminal	V1.25-3.5-1	
	79065302	Shield cap	314428-08 gray	
	35061806	Cable assy.	CW-71 [364-3535]	

P. C. board assembly Chassis

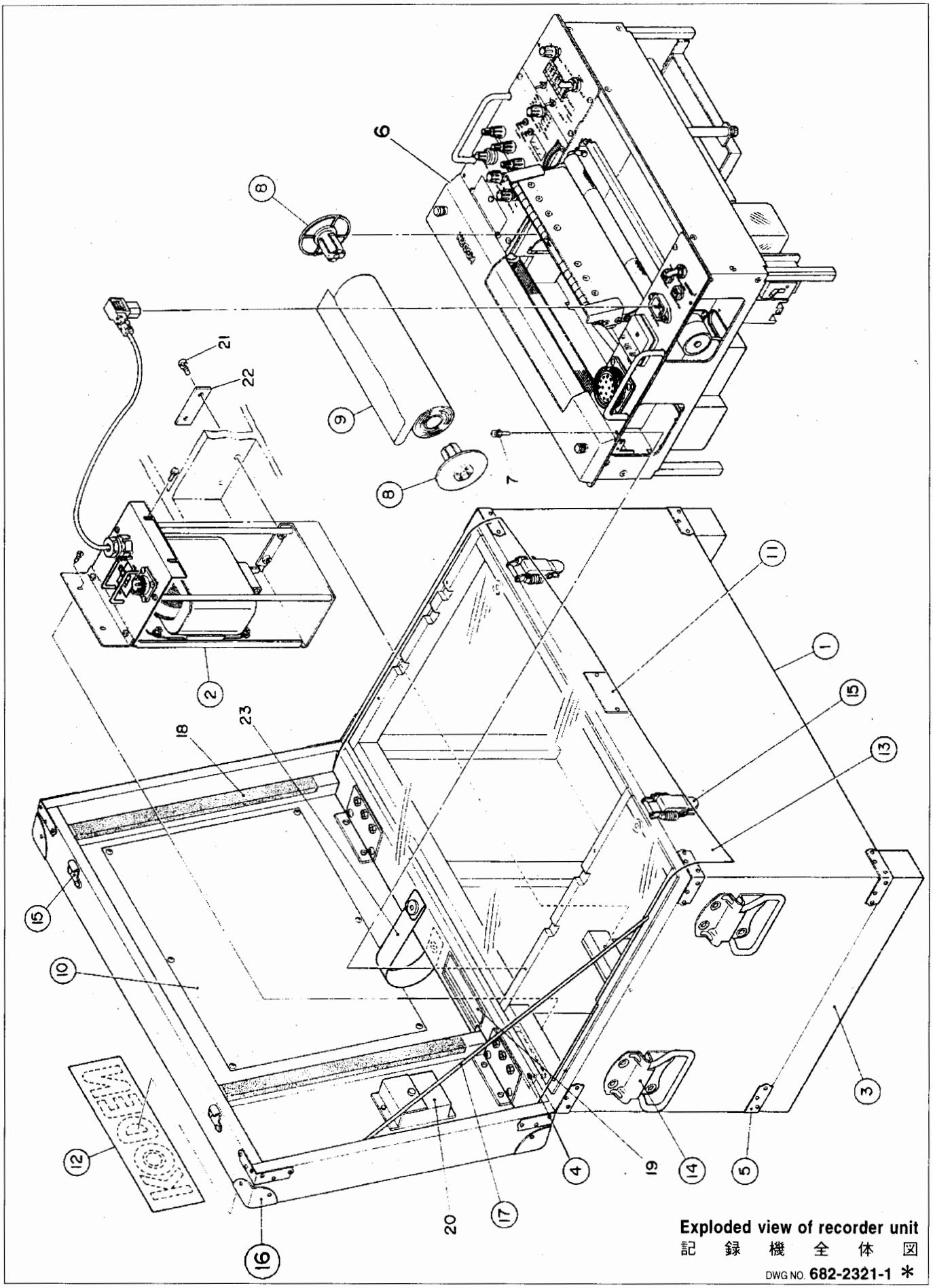
Symbol	Code	Name	Specifications	Description
	56410061	Transformer power	DM684-KCT-149[T001]	
	57260610	Connector plug housing	172496-1	
	57270621	Connector receptacle contact	172776-1	
	61500060	P.C.B. assy. with ROM	DM684-7000M1	
	61500070	P.C.B. assy.	DM684-PS-6000M3	
	61500080	P.C.B. assy.	DM684-TRX-1000M2	
	P5700051	E-BLK	DMR-682/684 chassis.E	
	56181111	Circuit breaker	BKS-2-20-20	
	57988155	Relay	G3NA-220B	DC5-24V
	57936123	Relay	MM-2XP AC100V	
	57423501	Socket relay	8PF[for MM2P]	
	59510025	Speed controller	DMC-001 [with volumn][CSC-110]	
	57014514	Crimp-style terminal	V1.25-3.5-1	
	51416647	Capacitor chemi-con	ECEA1HN470S	47μF 50V
	57014541	Crimp-style terminal	V1.25-4-1	

Winch unit

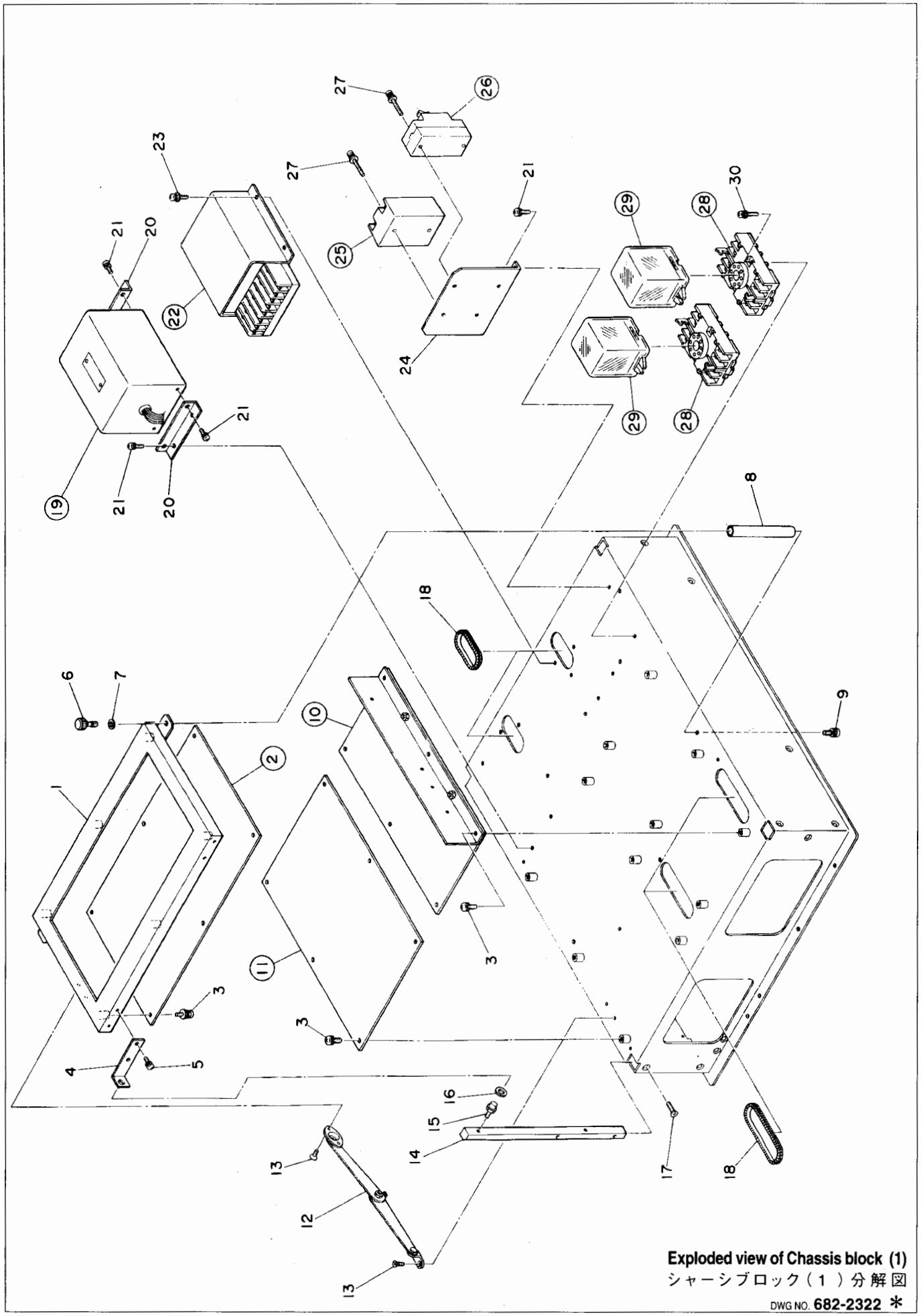
Symbol	Code	Name	Specifications	Description
D001 D002	50310112	Diode	U05C	
R001	54857222	Resistor cement	ERF5AK220	22 5W
	79033205	Nylon clamp	NK-5N	
Wire	57016211	Crimp-style terminal (bare connection)	P-5.5	
	79035110	Tie lap	TY-25MX	
J001 J002 J003 J004	57291104	Connector water-proof	GL-20G3S-F-2	
J001 J002 J003 J004	57298206	Locking sleeve	GL-20G402	
	87501003	Slip ring unit	364-3504	
W001	57272413	Faston receptacle	170048-2	
D001 D002 R001 W002 W003 W007 W008	57272318	Faston receptacle	170038-2	
W001	79043201	Insulating sleeve	234015-09	
D001 D002 R001 W002 W003 W007 W008	79043203	Insulating sleeve	235825-09	
	56207015	Moter lifter	DTM-G6075	KCB-12
SW003	53303110	Rotary encoder	EWTXA1S2050B	
SW001 SW002	57509811	Switch limit	AZ8107	
W002	56833100	Cable	HC-ESV-4X16/0.12[H-8872B]	
003 W004	56860100	Round code	VCTF-1.25É≥-4 core	
W003 W004	57014531	Crimp-style terminal	V1.25-3-1	
W003 W004 W005 W007 W008 W009	57021511	Faston sleeve	236525-09	
W003 W004 W005 W007 W008	57272211	Faston receptacle	170182-2	
W005 W006	56870100	Cable	VV-2D8	
	56870100	CABLE	VV-2D8	
W010 W011	57014541	Crimp-style terminal	V1.25-4-1	
	70190014	Grommet	CSG-016	
	70190059	Code lock	NC-1	
	70190069	Blush type fixture	PM2H25	
	70292031	Grommet G type	G-82	
TB001	57008606	Terminal block	KH4101-6P[187]	
J005	57166615	Connector plug	NT-5015-CRM	
W001	56813900	Cable	HC-ESV-4X16/0.12 120M mono	KCW-31
	99802621	P.C.B. assy.	DM686-8300M1	
J005	79065301	Shield cap	313020-08 gray	
W011	57014561	Terminal	V1.25-6-1	
	63500171	Sensor unit assy.	Sensor unit assy.	

6.3 分解図 /Exploded view

記録機 (1) /Recorder unit (1)



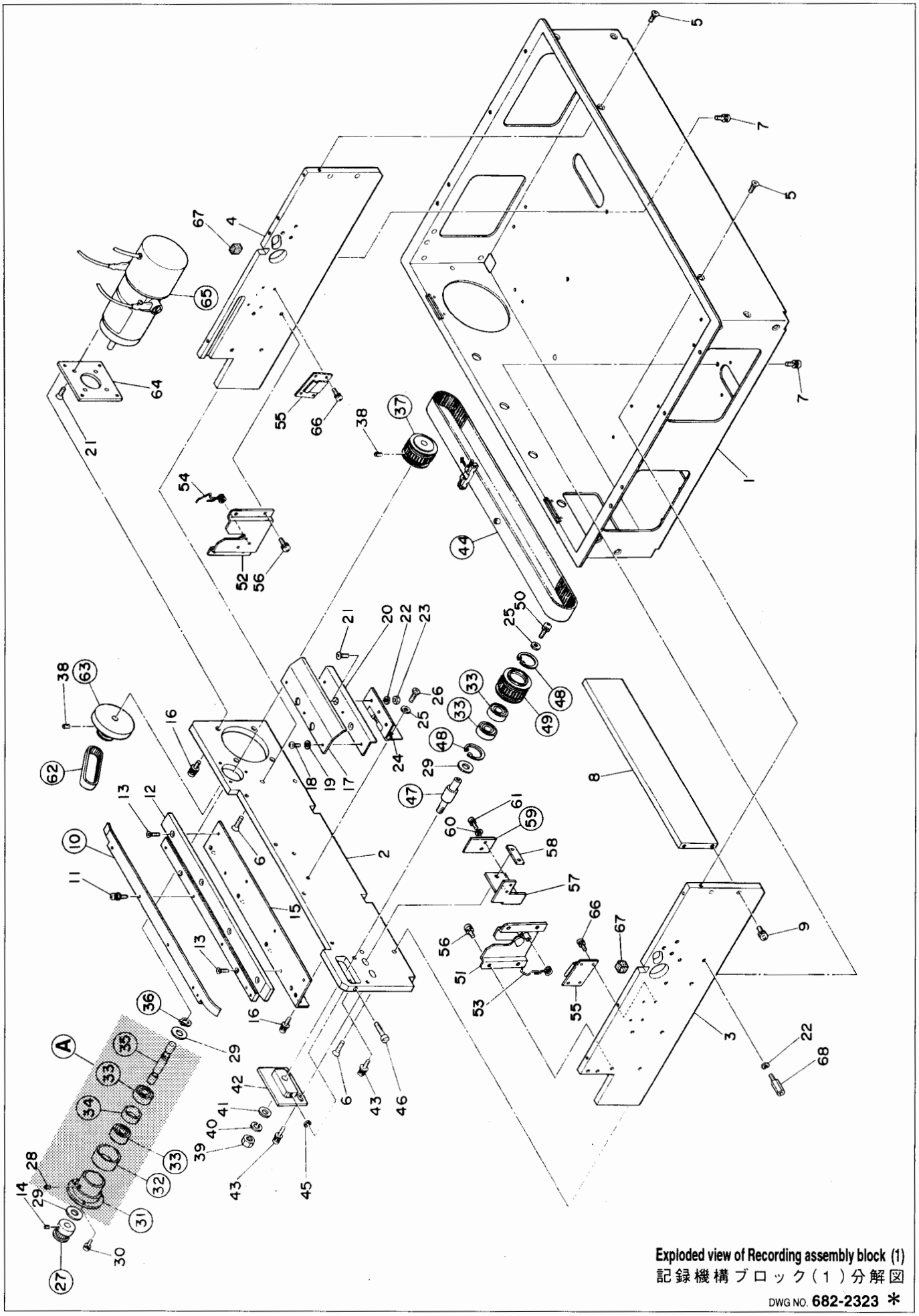
Exploded view of recorder unit
記 録 機 全 体 図
DWG NO. **682-2321-1** *



Exploded view of Chassis block (1)
シャーシブロック（１）分解図

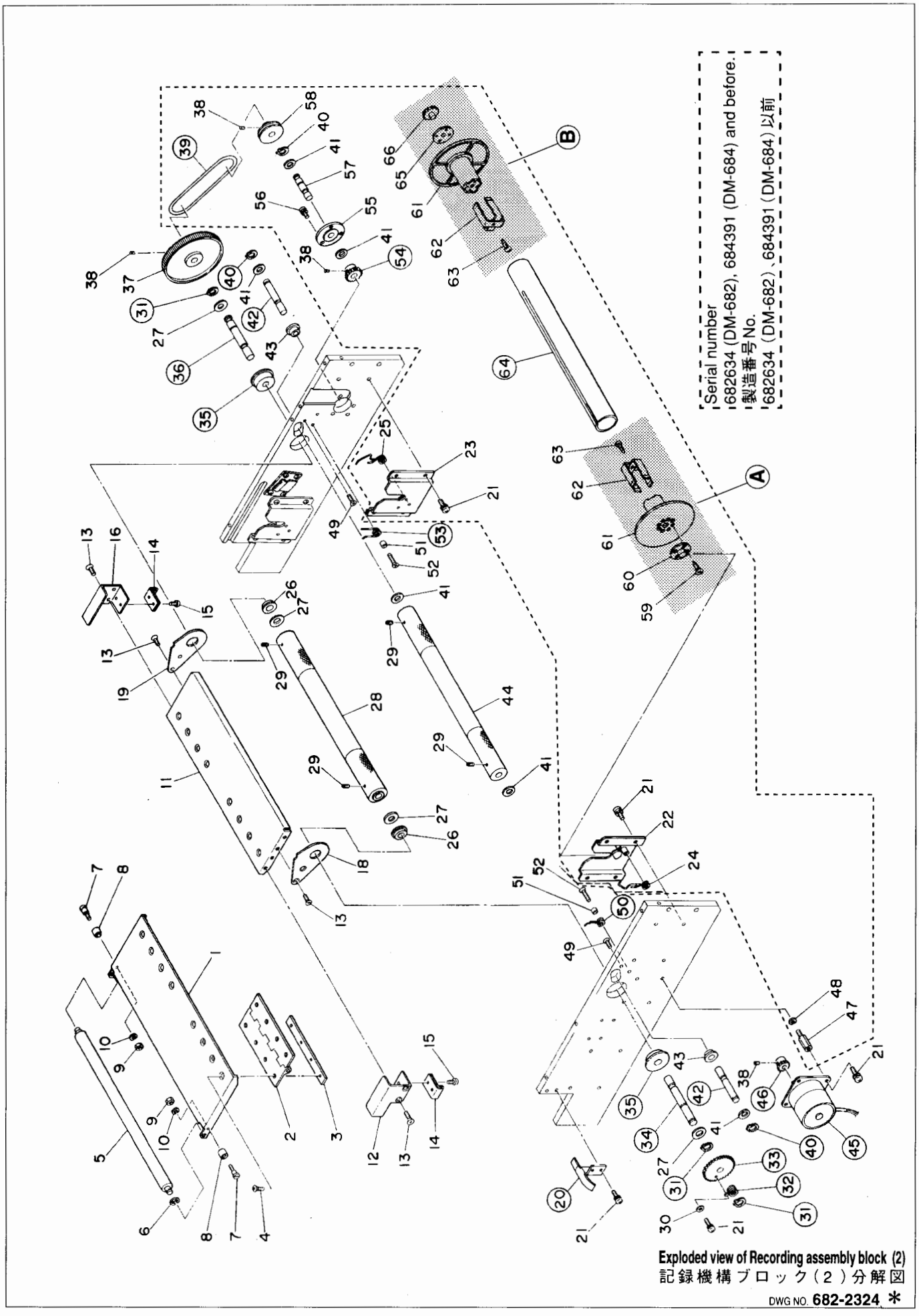
DWG NO. **682-2322** *

記録機 (3) /Recorder unit (3)



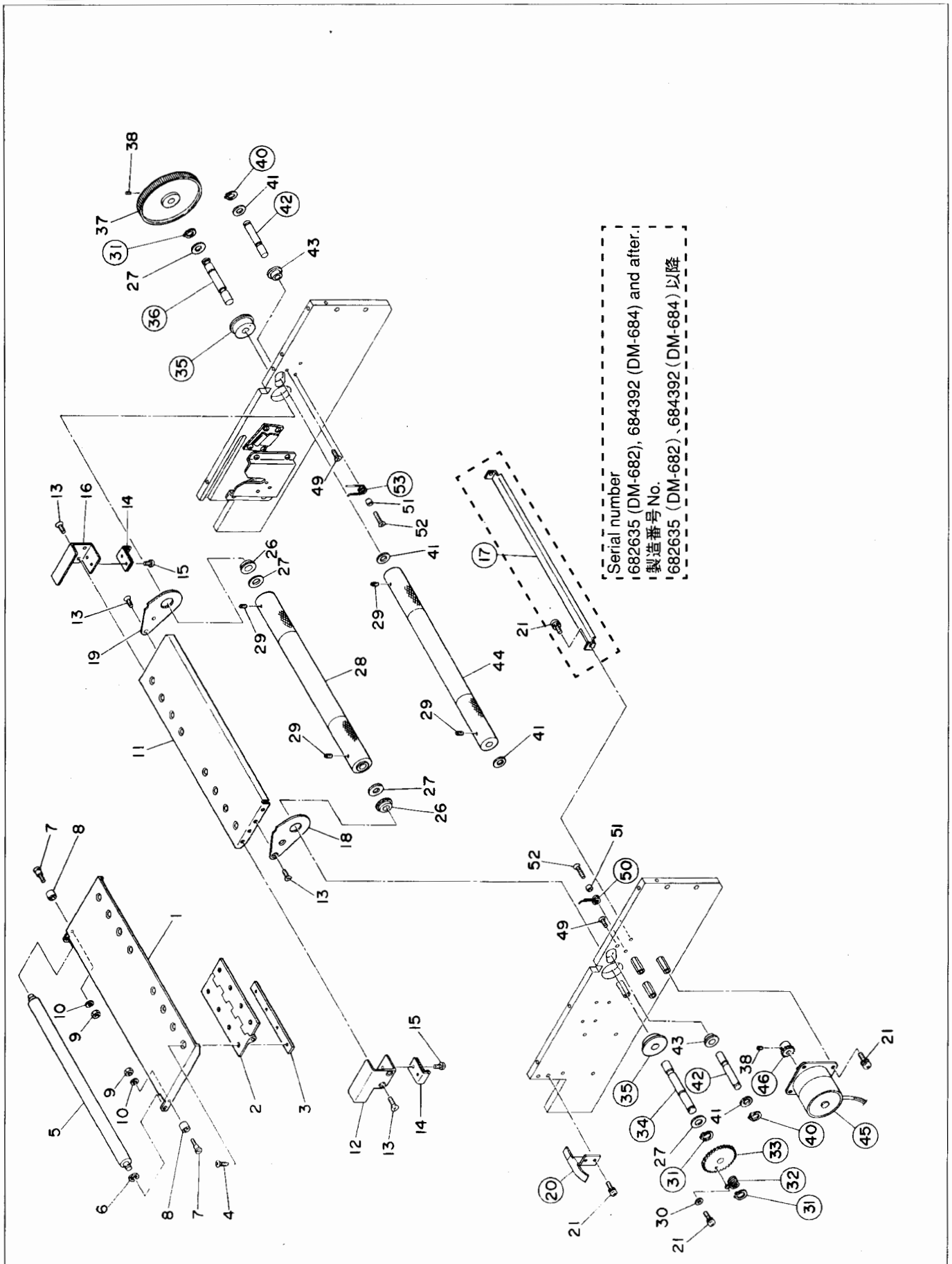
Exploded view of Recording assembly block (1)
記録機構ブロック（1）分解図

DWG NO. **682-2323** *



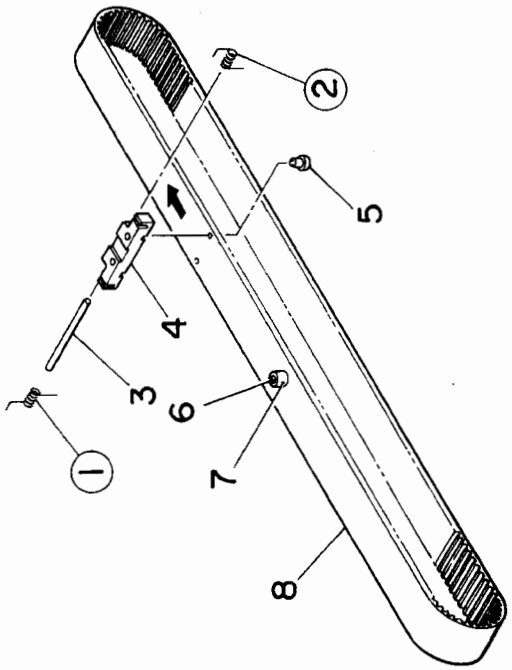
Exploded view of Recording assembly block (2)
記録機構ブロック(2)分解図

DWG NO. **682-2324** *



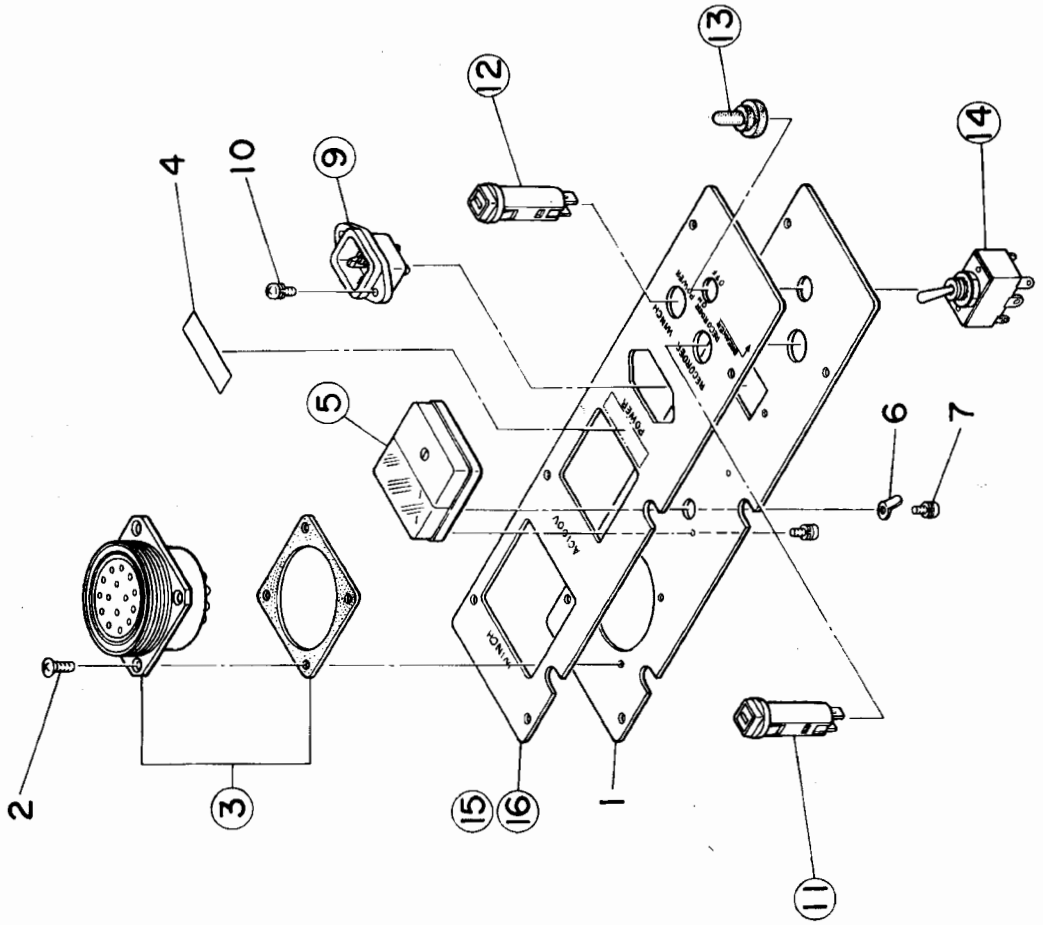
Exploded view of Recording assembly block (2)
記録機構ブロック (2) 分解図

DWG NO. **682-2324-1** *



Exploded view of Recording belt
記 録 ベ ル ト 分 解 図

DWG NO. **682-2325 ***



Exploded view of Left hand panel
左パネルブロック分解図
DWG NO. **682-2326** *