To all our customers

Regarding the change of names mentioned in the document, such as Mitsubishi Electric and Mitsubishi XX, to Renesas Technology Corp.

The semiconductor operations of Hitachi and Mitsubishi Electric were transferred to Renesas Technology Corporation on April 1st 2003. These operations include microcomputer, logic, analog and discrete devices, and memory chips other than DRAMs (flash memory, SRAMs etc.) Accordingly, although Mitsubishi Electric, Mitsubishi Electric Corporation, Mitsubishi Semiconductors, and other Mitsubishi brand names are mentioned in the document, these names have in fact all been changed to Renesas Technology Corp. Thank you for your understanding. Except for our corporate trademark, logo and corporate statement, no changes whatsoever have been made to the contents of the document, and these changes do not constitute any alteration to the contents of the document itself.

Note : Mitsubishi Electric will continue the business operations of high frequency & optical devices and power devices.

Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

RENESAS
Renesas Technology Corp.

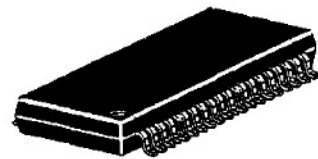## AUTOMATIC ADJUSTMENT CD PREAMPLIFIER SERVO CONTROLLER

DESCRIPTION

The M62475FP is an IC that contains preamplifier/servo amplifier necessary for optical pickup servo control for CD player.

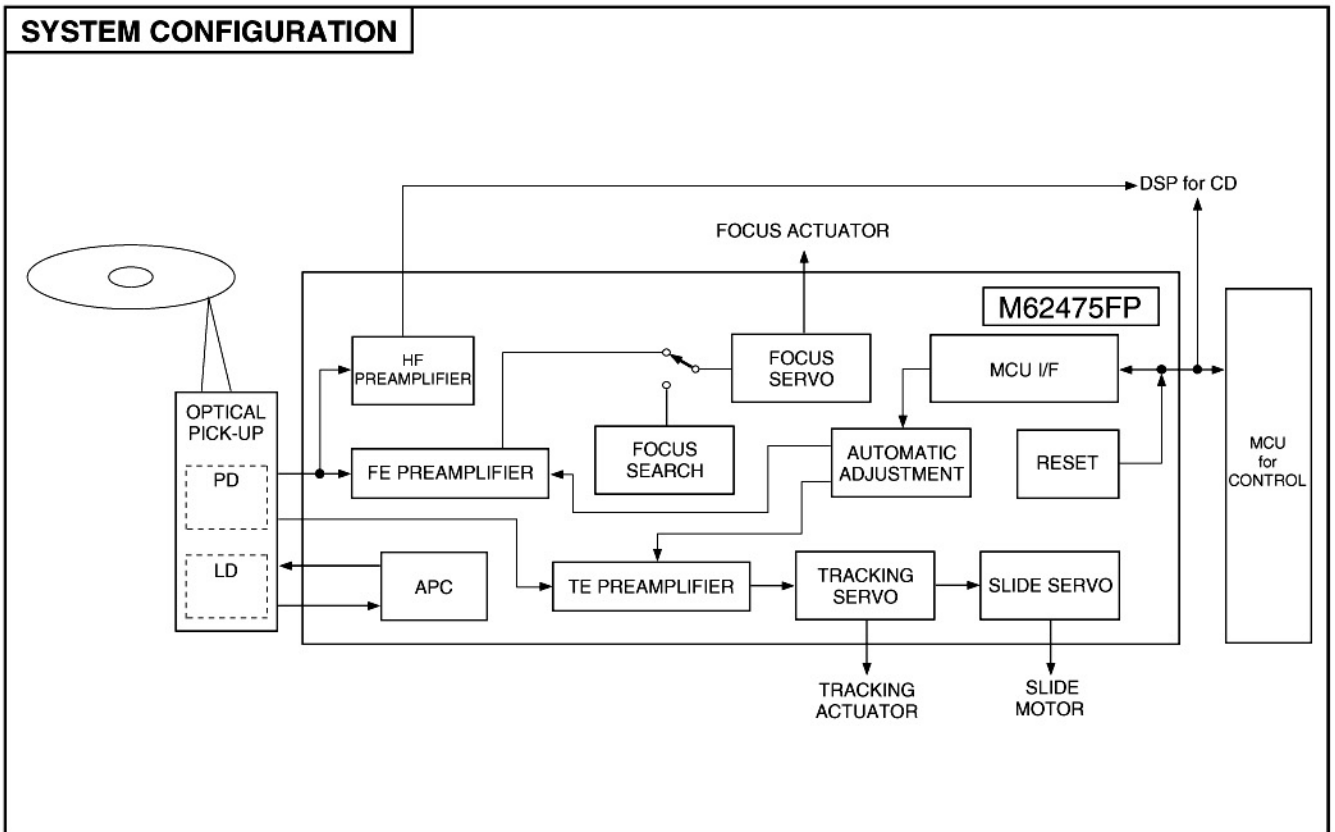This IC also supports automatic adjustment with microcomputer control.

FEATURES

■ Pickup servo control can consist of the M62475FP only

■ Supporting 3-beam system

■ Built-in serial data command interface with MCU to reduce load on MCU

■ Built-in circuit for automatically adjusting tracking balance, tracking/focus gain

■ Built-in internal self reset circuit

Outline 42P2R-A
0.8 mm pitch 450 mil SSOP
(8.4 mmX17.5 mmX2.0 mm)
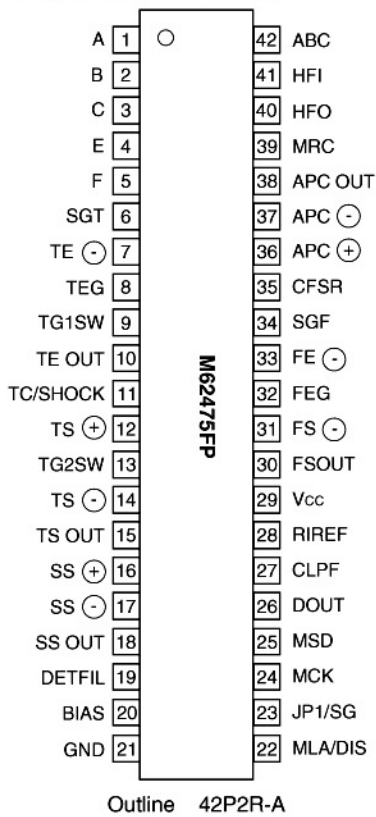
RECOMMENDED OPERATING CONDITIONS

Supply voltage range..Vcc=4.5 to 5.5V
Rated supply voltage.. Vcc=5V

SYSTEM CONFIGURATION

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AUTOMATIC ADJUSTMENT CD PREAMPLIFIER SERVO CONTROLLER

PIN CONFIGURATION (TOP VIEW)

Pin	Name		Pin	Name
A	1		42	ABC
B	2		41	HFI
C	3		40	HFO
E	4		39	MRC
F	5		38	APC OUT
SGT	6		37	APC (−)
TE (−)	7		36	APC (+)
TEG	8		35	CFSR
TG1SW	9		34	SGF
TE OUT	10		33	FE (−)
TC/SHOCK	11		32	FEG
TS (+)	12		31	FS (−)
TG2SW	13		30	FSOUT
TS (−)	14		29	Vcc
TS OUT	15		28	RIREF
SS (+)	16		27	CLPF
SS (−)	17		26	DOUT
SS OUT	18		25	MSD
DETFIL	19		24	MCK
BIAS	20		23	JP1/SG
GND	21		22	MLA/DIS

M62475FP

Outline   42P2R-A

BUILT-IN FUNCTION
- IV amplifier
- HF amplifier:HF (High Frequency Amp.)
- Focus Error Amplifier:FE (Focus Error Amp.)
- Focus Servo Amplifier:FS (Focus Servo Amp.)
- Tracking Error Amplifier:TE (Tracking Error Amp.)
- Tracking Servo Amplifier:TS (Tracking Servo Amp.)
- Sledge Motor Servo Amplifier:SS (Sledge Servo Amp.)
- Switching Circuit for Jump Brake:
  TG1SW, TG2SW (Tracking Gain SW)
  JF SW, JR SW (Jump Forward/Reverse SW)
  SF SW, SR SW (Sledge Forward/Reverse SW)
- Focus Search Circuit
  Search Signal Generator
  FSOK Detector
- Track Cross Detector: TC Det (Track Cross Detector)
- Shock Detector: SC Det (Shock Detector)
- Logic Controller:
  Serial Data Command Interface
  Jump, Brake, Focus Search Control
  Adjustment Control
- Vcc/2 generation circuit
- Auto Laser Power Control: APC (Automatic laser Power Control)
- HF Bottom Level Detector
- MR Detector
- Automatic Adjustment Circuit
  Tracking balance adjustment circuit
  Tracking gain adjustment circuit
  Focus gain adjustment circuit
  Gain adjustment signal generation and phase detection circuit

IC INTERNAL BLOCK DIAGRAM

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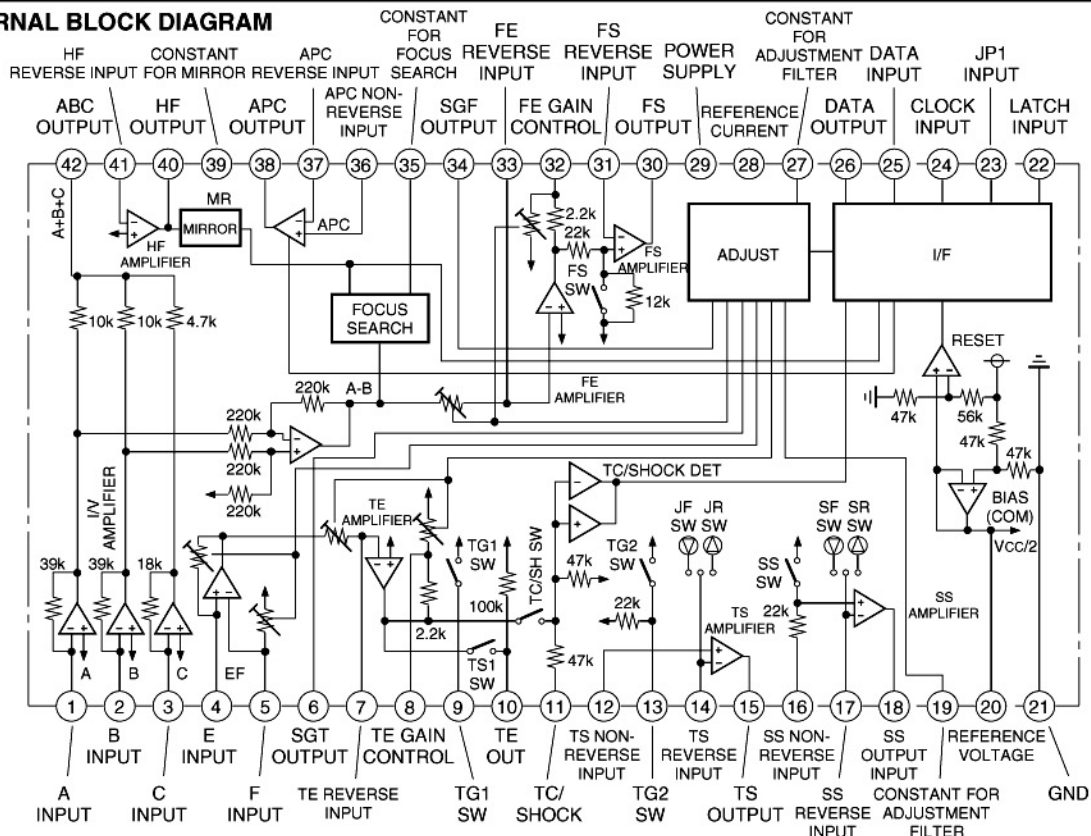
AUTOMATIC ADJUSTMENT CD PREAMPLIFIER SERVO CONTROLLER

PIN DESCRIPTION

Pin No.	Symbol	Function
1	A	I-V amplifier A input
2	B	I-V amplifier B input
3	C	I-V amplifier C input
4	E	I-V amplifier E input
5	F	I-V amplifier F input
6	SGT	Tracking servo signal output
7	TE (-)	TE amplifier reverse input
8	TEG	TE amplifier gain control
9	TG1 SW	Tracking gain select switch 1
10	TE OUT	TE amplifier output
11	TC/SHOCK	Tracking cross/shock detector input
12	TS (+)	TS amplifier non-reverse input
13	TG2 SW	Tracking gain select switch 2
14	TS (-)	TS amplifier reverse input
15	TS OUT	TS amplifier output
16	SS (+)	SS non-reverse input
17	SS (-)	SS amplifier reverse input
18	SS OUT	SS output
19	DET FIL	Detector filter for gain adjustment
20	BIAS	Vcc/2 voltage output
21	GND	Ground
22	MLA/DIS	Latch of serial data from microcomputer to servo IC/discharge of LPF for automatic adjustment
23	JP1/SG	Control signal of 1 track jump brake pluse/Input of gain adjustment clock
24	MCK	Serial data transfer clock from microcomputer to servo IC
25	MSD	Microcomputer serial data
26	DOUT	Output of data to microcomputer
27	CLPF	Connects capacitor for determining the constant for automatic adjustment LPF
28	IREF	Connects resistance for setting current value of reference supply current
29	Vcc	Power supply
30	FSOUT	FS amplifier output
31	FS (-)	FS amplifier reverse input
32	FEG	FE amplifier gain control
33	FE (-)	FE amplifier reverse input
34	SGF	Focus servo signal output
35	CFSR	Connects the capacitor to determine the constant for focus search waveform
36	APC (+)	APC amplifier non-reverse input
37	APC (-)	APC amplifier reverse input
38	APC OUT	APC amplifier output
39	MRC	Constant for mirror
40	HF OUT	HF amplifier output
41	HF (-)	HF amplifier reverse input
42	ABC	IV amplifier (A+B+C) output

ABSOLUTE MAXIMUM RATINGS (Ta=25°C, unless otherwise noted)

Symbol	Parameter	Ratings	Unit
V_{CC}	Supply voltage	5	V
V_I	Input voltage	0 to V_{CC}	V
P_d	Power dissipation	750	mV
K_θ	Thermal derating (Ta 25°C)	7.5	mW/°C
T_{opr}	Operating ambient temperature	-20 to +75	°C
T_{stg}	Storage temperature	-40 to +125	°C

AUTOMATIC ADJUSTMENT CD PREAMPLIFIER SERVO CONTROLLER

ELECTRICAL CHARACTERISTICS (Ta=25˚C, Vcc=5V, f=1kHz, CBA=100, unless otherwise noted)

Block	Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
—	Icc	Circuit current	With no signal provided, after reset	20.0	30.0	40.0	mA
	V_{REF}	Reference voltage	With no signal provided, after reset	2.4	2.5	2.6	V
HF	G_{VHFAB}	Gain (input A/B)	f=500kHz,Vi=0.5V_P-P	3.1	5.1	7.1	dB
	G_{VHFC}	Gain (input C)	f=500kHz,Vi=0.5V_P-P	9.7	11.7	13.7	dB
	f_{HF}	Frequency characteristics	Vi=0.5V_P-P	1.4	2.0	—	MHz
	V_{HHF}	Output voltage "H"	Vi=4.0V	3.5	4.0	—	V
	V_{LHF}	Output voltage "L"	Vi=1.0V	—	1.0	1.5	V
	V_{OSHF}	Output offset	VREF reference	-60	0	+60	mV
FS OK	V_{TFK}	FSOK level	VREF reference	-0.22	-0.16	-0.10	V
MR	R_{MN}	Ratio (normal)	"Shock" mode	0.35	0.45	0.55	—
	R_{MJ}	Ratio (jump)	"Brake" mode	0.46	0.56	0.66	—
	f_{MR}	Frequency characteristics	"Shock" mode	20	30	—	kHz
APC	G_{VAP}	Gain	Vi=20mVrms	25	27	29	dB
	A_{TTAP}	Attenuation (APC OFF)	Comparison with G_{VAP}	60	—	—	dB
	V_{HAP}	Output voltage "H"	Vi=4.0V	4.0	—	—	V
	V_{LAP}	Output voltage "L"	Vi=1.0V	—	—	1.0	V
	V_{OSAP}	Input offset	VREF reference	-10	0	+10	mV
FE	G_{VFE}	Gain	Vi=10mVrms	2	4	6	dB
	V_{HFE}	Output voltage "H"	Vi=4.0V	3.5	4.0	—	V
	V_{LFE}	Output voltage "L"	Vi=1.0V	—	1.0	1.5	V
	B_{ALFE}	Balance	Comparison with G_{VFE}	-2	0	+2	%
FS	G_{VFS}	Gain	Vi=50mVrms	19.3	21.3	23.3	dB
	A_{TTFS}	Attenuation (FS OFF)	Comparison with G_{VFS}	60	—	—	dB
	V_{HFS}	Output voltage "H"	Vi=4.0V	3.5	4.0	—	V
	V_{LFS}	Output voltage "L"	Vi=1.0V	—	1.0	1.5	V
	V_{OSFS}	Output offset	VREF reference	-50	0	+50	mV
FSR	V_{FSR} (+)	Focus search (+) voltage	VREF reference, pin ㉟	+0.6	+0.8	+1.0	V
	V_{FSR} (-)	Focus search (-) voltage	VREF reference, pin ㉟	-1.0	-0.8	-0.6	V
	V_{FZC}	Focus zero cross voltage	VREF reference	-0.22	-0.16	-0.10	V
TE	G_{VTE}	Gain	Vi=50mVrms	7.0	9.0	11.0	dB
	V_{HTE}	Output voltage "H"	Vi=4.0V	3.5	4.0	—	V
	V_{LTE}	Output voltage "L"	Vi=1.0V	—	1.0	1.5	V
	V_{OSTE}	Output offset	VREF reference	-25	0	+25	mV
	B_{ALTE}	Track balance	VREF reference	-1.5	+1.5	+4.5	%
TS	G_{VTS}	Gain	Vi=50mVrms	-0.6	1.4	3.4	dB
	A_{TTTS}	Attenuation (TS OFF)	Comparison with G_{VTS}	60	—	—	dB
	V_{HTS}	Output voltage "H"	Vi=4.0V	3.5	4.0	—	V
	V_{LTS}	Output voltage "L"	Vi=1.0V	—	1.0	1.5	V
	V_{OSTS}	Output offset	VREF reference	-25	0	+25	mV

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AUTOMATIC ADJUSTMENT CD PREAMPLIFIER SERVO CONTROLLER

ELECTRICAL CHARACTERISTICS (Ta=25˚C, Vcc=5V, f=1kHz, CBA=100, unless otherwise noted) (cont.)

Block	Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
—	V_{JF}	Jump voltage (forward)	"JF" mode, VREF reference	+0.10	+0.15	+0.20	V
	V_{JR}	Jump voltage (reverse)	"JR" mode, VREF reference	-0.20	-0.15	-0.10	V
TC	V_{TC} ⊕	Track cross ⊕ voltage	"Brake" mode, VREF reference	+42.5	+62.5	+82.5	mV
	V_{TC} ⊖	Track cross ⊖ voltage	"Brake" mode, VREF reference	-42.5	-62.5	82.5	mV
SHOCK	V_{SH} ⊕	Shock ⊕ voltage	"Shock" mode, VREF reference	+110	+140	+170	mV
	V_{SH} ⊖	Shock ⊖ voltage	"Shock" mode, VREF reference	-170	-140	-110	mV
TG	A_{TG1ON}	Attenuation (TG1 ON)	"Shock" mode, VREF reference	10	20	—	dB
	A_{TG1OFF}	Attenuation (TG1 OFF)	"Shock" mode, VREF reference	0	—	2	dB
	A_{TG2ON}	Attenuation (TG2 ON)	"Shock" mode, VREF reference	10	20	—	dB
	A_{TG2OFF}	Attenuation (TG2 OFF)	"Shock" mode, VREF reference	0	—	2	dB
SS	G_{VTS}	Gain	Vi=50mVrms	10	12	14	dB
	A_{TTSS}	Attenuation (SS OFF)	Comparison with Gvss	60	—	—	dB
	V_{HSS}	Output voltage "H"	Vi=4.0V	3.5	4.0	—	V
	V_{LSS}	Output voltage "L"	Vi=1.0V	—	1.0	1.5	V
	V_{OSSS}	Output offset voltage	VREF reference	-25	0	+25	mV
	V_{SF}	Slide voltage (forward)	"SF" mode, VREF reference	+0.65	+0.95	+1.25	V
	V_{SR}	Slide voltage (reverse)	"SR" mode, VREF reference	-1.25	-0.95	-0.65	V
RESET	V_{RST}	Reset voltage	Pin ⑳	2.1	2.3	2.5	V
	V_{ORST}	Output voltage	Pin ㊱, after RESET	3.5	4.5	—	V
ADJ	$G_{VFE(max)}$	Max. gain (FE)	Focus gain" mode CBA=111	3.5	5.5	7.5	dB
	$G_{VFE(min)}$	Min. gain (FE)	"Focus gain" mode CBA=000	-3.5	-1.5	0.5	dB
	$G_{VTE(max)}$	Max. gain (TE)	"Track gain" mode CBA=111	19	21	23	dB
	$G_{VTE(min)}$	Min. gain (TE)	"Track gain" mode CBA=000	12	14	16	dB
	$B_{ALTE(max)}$	Max. balance (TE)	"Track balance" mode CBA=111	8.0	11.0	14.0	%
	$B_{ALTE(min)}$	Min. balance (TE)	"Track balance" mode CBA=000	-12.8	-9.8	-6.8	%
	V_{PhFE} ⊕	Phase difference ⊕ voltage	"Focus gain" mode phase difference (90+30)˚	3.1	3.3	3.5	V
	V_{PhFE} ⊖	Phase difference ⊖ voltage	"Focus gain" mode phase difference (90-30)˚	1.5	1.7	1.9	V
	V_{PhTE} ⊕	Phase difference ⊕ voltage	"Track gain" mode phase difference (90+30)˚	3.1	3.3	3.5	V
	V_{PhTE} ⊖	Phase difference ⊖ voltage	"Track gain" mode phase difference (90-30)˚	1.5	1.7	1.9	V
	V_{BAL} ⊕	Balance ⊕ voltage	"Track balance" mode +0.5V offset	2.8	3.0	3.2	V
	V_{BAL} ⊖	Balance ⊖ voltage	"Track balance" mode -0.5V offset	1.8	2.0	2.2	V
CMP	G_{LADJ}	Phase detection exit low pass filter gain	C (Pin ⑲)=680pF	-5	-3	-1	dB
	V_{thc} ⊕	Comparator level ⊕	VREF reference	0	—	+50	mV
	V_{thc} ⊖	Comparator level ⊖	VREF reference	-50	—	0	mV
	G_{LC}	Low pass filter gain	C (Pin ㉗)=2.2nF	-5	-3	-1	dB
SG	V_{SGF} ⊕	SGF ⊕ output voltage	Pin ㉞, VREF reference	0.6	0.7	0.8	V
	V_{SGF} ⊖	SGF ⊖ output voltage	Pin ㉞, VREF reference	-0.8	-0.7	-0.6	V
	V_{SGT} ⊕	SGT ⊕ output voltage	Pin ⑥, VREF reference	0.6	0.7	0.8	V
	V_{SGT} ⊖	SGT ⊖ output voltage	Pin ⑥, VREF reference	-0.8	-0.7	-0.6	V

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AUTOMATIC ADJUSTMENT CD PREAMPLIFIER SERVO CONTROLLER

FUNCTION DESCRIPTION

Setting Built-in Constant Current Source Current Value

The current value of Tracking Servo (TS) and Sledge Servo (SS) constant current can be set with resistance value Rx connected between pin ㉘ and Vcc.

If the absolute values for TS and SS constant source current values are assumed to be I (JF, JR) and I (SF, SR), respectively, they are set as follows.
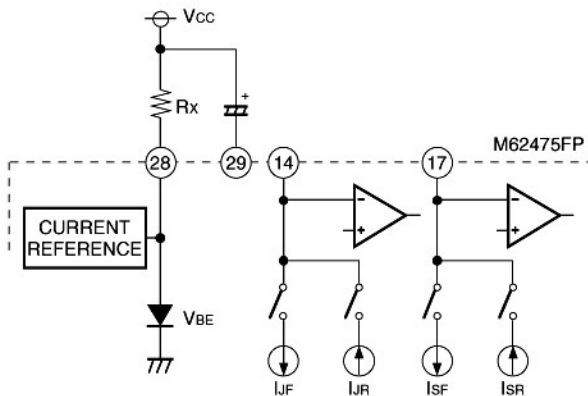
$$I_{(JF, JR)} = \frac{1}{8} \cdot \frac{Vcc - V_{㉘}}{Rx}$$

$$I_{(SF, SR)} = \frac{1}{4} \cdot \frac{Vcc - V_{㉘}}{Rx}$$

Where, $V_{㉘}$ is the voltage of pin ㉘. If the voltage of pin ㉑ (GND) is assumed to be $V_{㉑}$, $V_{㉘}$ can be found by the following formula.

$$V_{㉘} = V_{㉑} + V_{BE} \quad (V_{BE} \fallingdotseq 0.7V \text{ standard})$$

EQUIVALENT CIRCUIT

CONSTANT CURRENT SOURCE BLOCK DIAGRAM

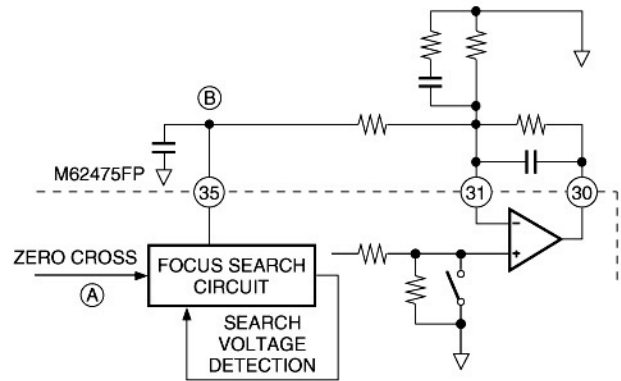## FZC OPERATION TIMING CHART

FSR Detector

When the focus search is performed, the focus search direction is automatically switched.

The focus search always starts from the ⊕ side. The polarity (⊕ / ⊖ direction) internal logic signal of the focus search voltage is used for control and switching.

FZC detection is effective only in a direction.
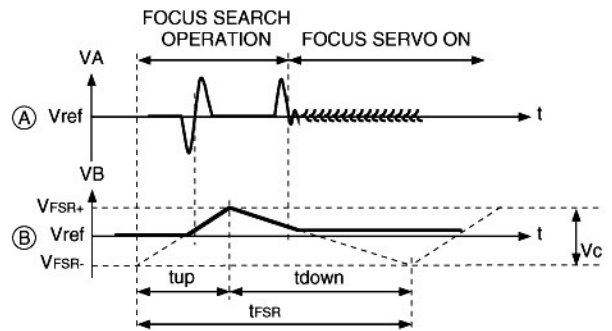
Setting FSR time t_{FSR} (C_{FSR} setting)

$$t_{FSR} = \frac{C_{FSR}}{I_{FSR}}$$

C_{FSR}:CFSR pin ㉟ external capacitor

I_{FSR}:Focus search current

At time of rising:110μA

At time of falling:60μA

FSR Vth± Voltage setting

Vth+:Vref+0.7V

Vth-:Vref-0.7V

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AUTOMATIC ADJUSTMENT FUNCTION

The IC is capable of automatically adjusting the three places of tracking balance, tracking gain and focus gain.

TRACKING BALANCE ADJUSTMENT

The input resistance of the I/V conversion amplifier connected to E and F pickups and the 8-step adjustment resistance built in a feedback resistance are switched for the adjustment. The adjustment precision is approximately 3% by the step.

The automatic adjustment operation enters an oscillation signal from the automatic adjustment signal generator of MCU into a servo loop to forcibly make the beam cross the track. When this is the case, the output voltage of I/V conversion amplifier is integrated. If the E and F output signals are well balanced and are the same, an error voltage is not generated in the output voltage after this integration and a reference voltage is obtained. If they are not balanced, a voltage of a DC component is generated. The result of having compared this output voltage and the reference voltage is converted into a logical level and is then output to the monitor terminal. The MCU is used for control and the result is judged. According to the result, the adjustment resistance of the I/V conversion amplifier is sequentially switched step by step for the adjustment in the direction of reversing the current logical result. At the time when the result has been reversed, the error is judged to be put within a one-step error and the adjustment is complete.

TRACKING FOCUS GAIN ADJUSTMENT

The input resistance of the tracking focus error amplifier and the 8-step adjustment resistance built in a feedback resistance are switched for the adjustment. The adjustment precision is approximately 1 dB by the step.

The adjustment operation enters an oscillation signal with the output gain of -3 dB in a servo loop from the automatic adjustment signal generator of MCU into a servo loop to forcibly generate a gap in the track and focus. A waveform adjusted signal of the generated tracking focus error signal and the MCU oscillation signal are collated with each other with respect to the phase and is then integrated to convert the phase difference into the voltage. The result of having compared this output voltage and the reference voltage is converted into a logical level and is then output to the monitor terminal. The MCU is used for control and the result is judged. According to the result, the input resistance of the amplifier is sequentially switched step by step in feedback resistance for the adjustment in the direction of reversing the current logical result. At the time when the result has been reversed, the error is judged to be put within a one-step error and the adjustment is complete.

EQUIVALENT CIRCUIT (Tracking Balance)
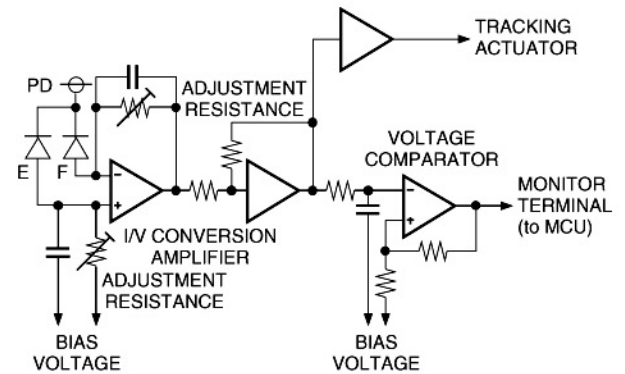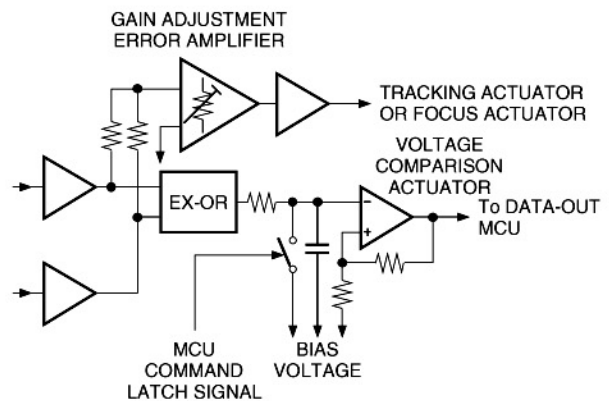

EQUIVALENT CIRCUIT (Tracking Focus Gain)

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AUTOMATIC ADJUSTMENT FLOWCHART

BASIC ROUTINE

Serial data command: XXOOOCBA (XX is specified according to the adjustment command.)

```
                        START
                          │
                 Initialization for XX
                          │
          ┌───────────────┤
          │        ◇ DATA OUT=0 ◇──NO──┐
          │           YES              │
          │            │               │
   ┌──────┤            │               ├──────┐
   │  ◇ CBA > 0 ◇──NO         ◇ CBA < 7 ◇──NO │
   │     YES                     YES           │
   │      │                       │            │
   │ Setting of CBA←CBA-1   Setting of CBA←CBA+1│
   │      │                       │            │
   │ ◇ DATA OUT=1 ◇──NO    ◇ DATA OUT=0 ◇──NO  │
   │     YES                     YES           │
   │      │                       │            │
   │ Setting of CBA←CBA+1   Setting of CBA←CBA-1│
   │      │                       │            │
   └──────┴───────────────────────┴────────────┘
                          │
                        END
```
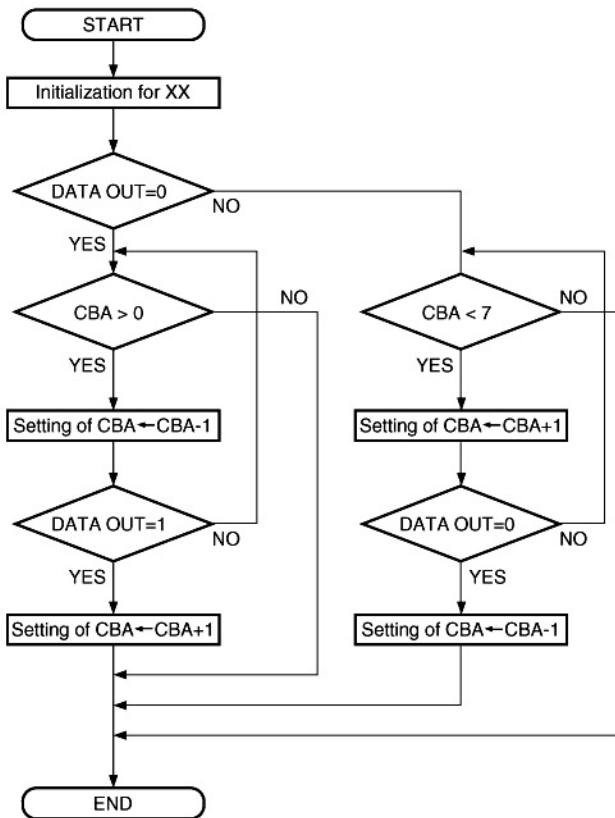
AUTOMATIC ADJUSTMENT EXAMPLE

CLPF PIN ㉗ Vthc+ / Vref / Vthc-

DOUT PIN ㉖   0

MCU CHECK POINT

ADJ COMMAND   CBA=4   5   6   7   6

END OF ADJUSTMENT

CLPF PIN ㉗ Vthc+ / Vref / Vthc-

DOUT PIN ㉖   0

MCU CHECK POINT

ADJ COMMAND   CBA=4   5   6   5

END OF ADJUSTMENT

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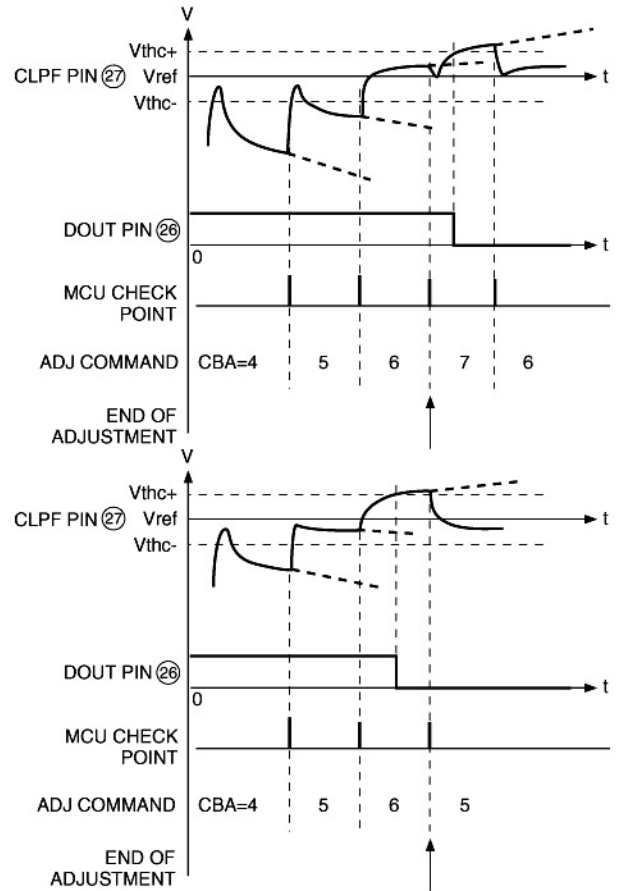
AUTOMATIC ADJUSTMENT CD PREAMPLIFIER SERVO CONTROLLER

SERIAL COMMAND FUNCTION

An 8-bit shift register is installed in the logic controller to convert (decode) serial data (MSD pin ㉕) from the microcomputer into a command for the servo IC.

FUNCTION DESCRIPTION of Data-IN

Of the 8-bit data, high order 4 bits (D7 to D4) is used to select a command mode and low-order 4 bits (D3 to D0) are used to set (instruct) the command status.

Commands in the same mode can be given concurrently with data transferred once. They are held until new data is entered. Therefore, the command status is held if another mode is selected.

SERIAL COMMAND FUNCTION TABLE

Command Name	MSD pin ㉕ input								Data out pin output
	Mode selection				Command status setting				
	D7	D6	D5	D4	D3	D2	D1	D0	
SERVO	0	0	Focus	Brake /Shock	Track		Sledge		FSOK/TC
Track balance	0	1	—	—	—	C	B	A	ADJ
Track Gain	1	0	—	—	—	C	B	A	ADJ
Focus Gain	1	1	—	—	—	C	B	A	ADJ

Note 1. Output from DOUT pins ㉕ is automatically switched by selecting each mode.
   2. The status in the Servo Mode is set with two bits for each of command Track (D3,D2) and sledge(D1,D0).

COMMAND FUNCTION TABLE

Command	Mode	Data				Function	
FS ON	Focus	D5		1 ON		• APC amplifier ON • Focus search start to servo ON (PS SW="OPEN")	
				0 OFF		• APC amplifier OFF • Focus servo OFF (FS SW = "CLOSE")	
Brake	Track1	D4		1		Jump brake (jump setting) operation Opens/closes TSSW.	
Shock				0		Controls SW 'TG SW' for track gain switching.	
Track	Track2	D3	D2				
		0	0	TS OFF	Track servo OFF	For TSSW, JF SW, and JR SW, refer to 'TRACK Function Table'.	
		0	1	JR	Reverse jump		
		1	0	JF	Forward jump		
		1	1	TS ON	Track servo ON		
Sledge		D3	D2				
		0	0	SS OFF	Sledge servo OFF	For SS SW, SF SW, and SR SW, refer to 'TRACK Function Table'.	
		0	1	SR	Reverse sledge		
		1	0	SF	Forward sledge		
		1	1	SS ON	Sledge servo ON		

AUTOMATIC ADJUSTMENT CD PREAMPLIFIER SERVO CONTROLLER

SERIAL DATA (MSD) TRANSFER METHOD

Data is transferred with LSB first and the MLA signal is sent to execute the command.

SERIAL DATA INPUT TIMING CHART
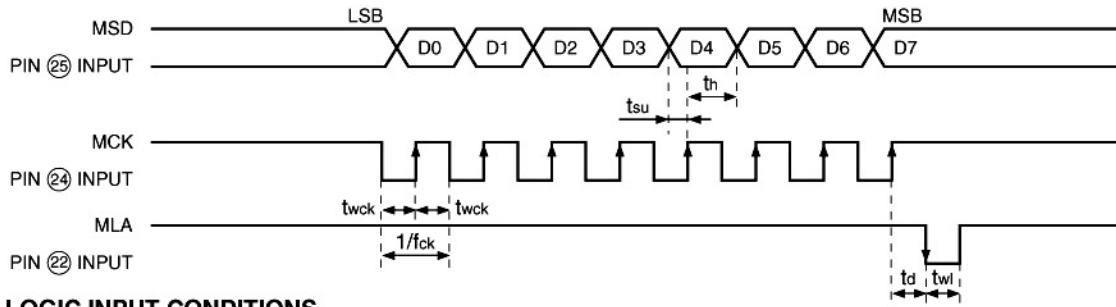
LOGIC INPUT CONDITIONS

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
f_{ck}	Clock frequency		—	100	200	kHz
t_{wck}	Clock pulse width		2.5	5	—	μs
t_{su}	Setup time		0.1	0.2	—	μs
t_h	Hold time		2.5	5	—	μs
t_d	Delay time		2.5	5	—	μs
t_{wl}	Latch pulse width		1	5	—	μs

BRAKE

Setting the break command to "1" performs the jump brake operation to improve the jump setting capability after the track jump.

Jump Brake Operation

● The track servo loop is set to OFF with TC="↓" (at the falling edge of TCDet output) when MR is 1.

● The track servo loop is set to ON with TC="↓" (at the falling edge of TCDet) when MR is 0.

● Jump Brake True Value List (Effective in the TS ON mode)

INPUT		OUTPUT
MIRROR	TC Det	TS SW status
1 ("Mirror")		OPEN (track servo OFF)
0 ("Track")		CLOSE (track servo ON)

Note 3. TC/SHSW "CLOSE", TG SW "OPEN"
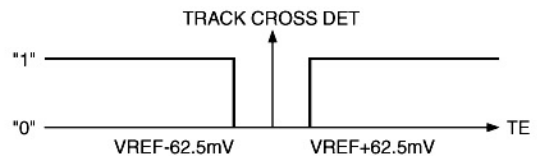
SHOCK

With the SHOCK command set to "1", the shock operation is carried out to switch the track gain at time of shock.

Jump Brake Operation

● With SHOCK detect=1, the track gain is placed in the shock mode.

● With SHOCK Det=0, the track gain is placed in the normal mode.

● Shock True Value List (Effective in the TS ON mode)

INPUT	OUTPUT
SHOCK Det	TG SW status
1 ("SHOCK")	OPEN (Shock mode)
0 ("NORMAL")	CLOSE (Normal mode)

Note 4. TC/SH SW "OPEN"
  5. V^+ and V^- are set with external constant.

RENESAS
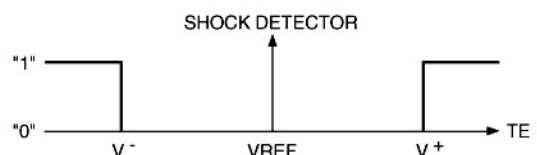
AUTOMATIC ADJUSTMENT CD PREAMPLIFIER SERVO CONTROLLER

TRACK FUNCTION TABLE

INPUT			OUTPUT (SW Status)		
COMMAND	DATA				
	D3	D2	TS SW	JF SW	JR SW
TS OFF	0	0	OPEN (Servo OFF)	OFF	OFF
JR	0	1	OPEN (Servo OFF)	OFF	ON
JF	1	0	OPEN (Servo OFF)	ON	OFF
TS ON	1	1	CLOSE (Servo ON)	OFF	OFF

SLEDGE FUNCTION LIST

INPUT			OUTPUT (SW status)		
COMMAND	DATA				
	D1	D0	TS SW	SF SW	JR SW
SS OFF	0	0	CLOSE (Sledge OFF)	OFF	OFF
SR	0	1	CLOSE (Sledge OFF)	OFF	ON
SF	1	0	CLOSE (Sledge OFF)	ON	OFF
SS ON	1	1	OPEN (Sledge ON)	OFF	OFF

DIRECT COMMAND FUNCTION

JP1 signal

When a 1-track jump takes place, serial data to be transferred twice can be omitted to control the amount of delay in processing time.

JP1 is generally set to "1". When JP1 is set to "0" with TC (Data out) signal set to "1", the logic controller automatically reverses the jump polarity (JF to JR or JR to JF).

When a jump is complete (after fixed time Ta), switching JP1 from "0" to "1" can automatically terminate JF and JR to select the TR ON/SSON status.

Signal Waveform with a jump

RENESAS
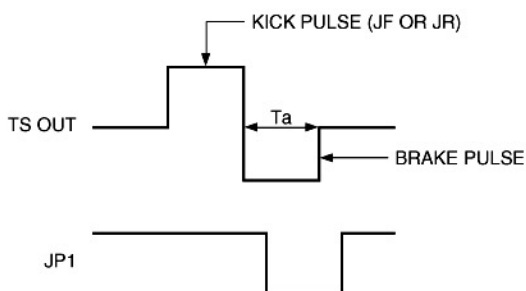
AUTOMATIC ADJUSTMENT CD PREAMPLIFIER SERVO CONTROLLER

JP1 SIGNAL TRUE VALUE LIST

JP1 (INPUT)	TRACK mode							
	TRACK (D3, D2)				SLEDGE (D3, D2)			
	00	11	10	01	00	11	10	01
1	TSOFF	TS ON	JF	JR	SS OFF	SS ON	SF	SR
1 → 0	TSOFF	TS ON	JR	JF	SS OFF	SS ON	SR	SF
0 → 1	TSOFF	TS ON	JF	JR	SS OFF	SS ON	SF	SR

LOGIC OUTPUT FUNCTION

Data out

Data out output is switched according to the serial command (D6, D7="0", "0") mode (see the serial command function list).

The output corresponding to the serial command mode sent last is given.

Data Out Output Corresponding List

	Data out signal name	Serial command mode (input)
(1)	FSOK	FOCUS (0010XXXX)
(2)	TC	TRACK (0001XXXX)

(1) FS ON

With FS SW=OPEN (servo ON), FSOK "0" is output.

FSOK TRUE VALUE LIST

Input	Output
FF SW status	FSOK
CLOSE (Servo OFF)	1
CLOSE (Servo ON)	0

While FS OK is set to "1", TS SW is open (servo OFF) and SS SW is open regardless of the command status.

(2) TC

The TC signal that latches the MR signal at the edge (falling edge) of TCDet output is output.

TC TRUE VALUE LIST

Input		Output
MR	TC Det	TC
"1"Mirror	⌐↓	1
"0"Track	⌐↓	0

MR signal detector

Detects an envelope of the HF signal and sends data to the internal logic controller.

AUTOMATIC ADJUSTMENT CD PREAMPLIFIER SERVO CONTROLLER

CONTROL METHOD FLOWCHART EXAMPLE

Note: Since this description applies to an example on the item related to the servo, take into account the entire system when using this. In addition, pay attention to the simplification/reduction of actions in abnormal status.

① POWER_RESET   :Processing with power turned on
② DISC_START   :Disk start processing
③ BALANCE_ADJ   :Track balance processing
④ TRACK_ADJ   :Track gain adjustment
⑤ FOCUS_ADJ   :Focus gain adjustment
⑥ ADJUST   :Adjustment routine
⑦ SE_OUT   :Adjustment signal output routine
⑧ Jump control
  8-1. SINGLE_JUMP
  8-2. SHORT_JUMP
  8-3. MID_JUMP
  8-4. LONG_JUMP

① POWER_RESET
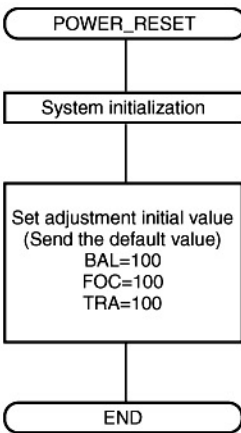
Note: BAL : Track balance
  FOC : Focus gain
  TRA : Track gain

② DISC_START
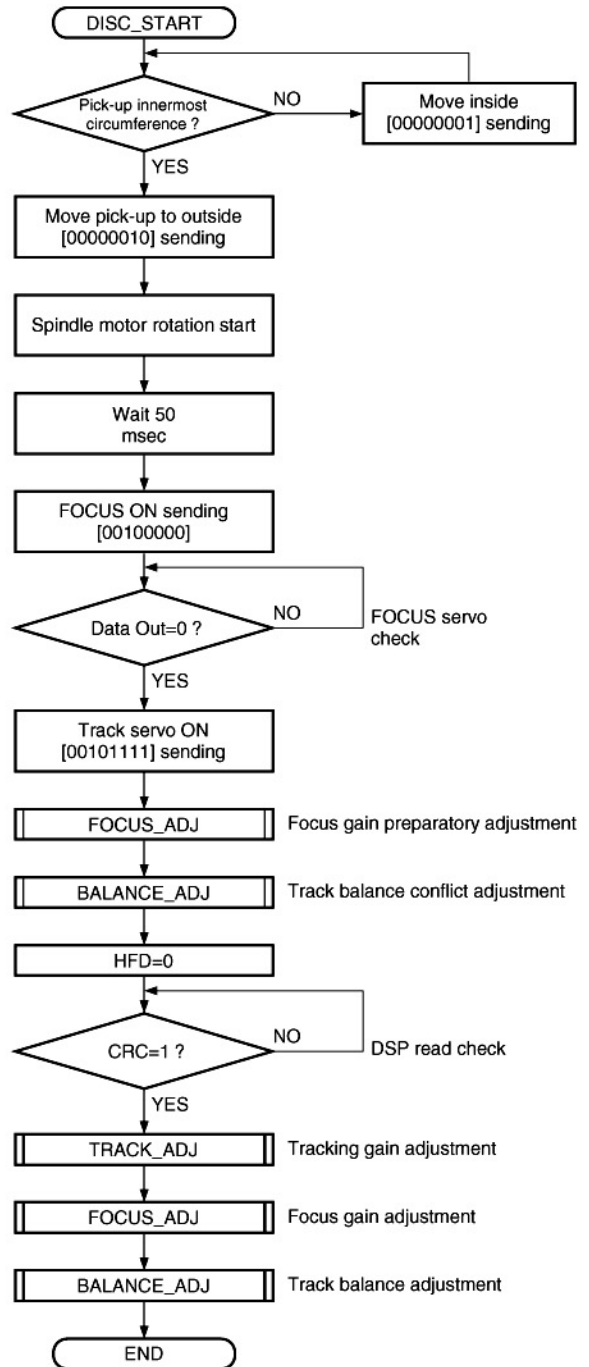
Note: Pick-up servo operation preparatory completion. For example, reading TOC requires to move pick-up to the innermost circumference.

AUTOMATIC ADJUSTMENT CD PREAMPLIFIER SERVO CONTROLLER

③ **BALANCE_ADJ**

```
        ( BALANCE_ADJ )
              │
         ┌─────────┐
         │  HFD=1  │
         └─────────┘
              │
         ┌─────────┐
         │  ZZ=01  │
         │ CBA=BAL │
         └─────────┘
              │
         ┌─────────┐
         ║ ADJUST  ║
         └─────────┘
              │
         ┌─────────┐
         │ BAL=CBA │
         └─────────┘
              │
         ┌─────────┐
         │  HFD=0  │
         └─────────┘
              │
          (  END  )
```

④ **TRACK_ADJ**

```
        ( TRACK_ADJ )
              │
         ┌─────────┐
         │  ZZ=10  │
         │ CBA=TRA │
         └─────────┘
              │
         ┌─────────┐
         ║ ADJUST  ║
         └─────────┘
              │
         ┌─────────┐
         │ TRA=CBA │
         └─────────┘
              │
          (  END  )
```

⑤ **FOCUS_ADJ**

```
        ( FOCUS_ADJ )
              │
         ┌─────────┐
         │  ZZ=11  │
         │ CBA=FOC │
         └─────────┘
              │
         ┌─────────┐
         ║ ADJUST  ║
         └─────────┘
              │
         ┌─────────┐
         │ FOC=CBA │
         └─────────┘
              │
          (  END  )
```

⑥ **ADJUST**

```
        ( ADJUST )
            │
      ┌──────────┐
      │   T=50   │
      └──────────┘
            │
      ┌──────────┐
      ║ SG_OUT   ║
      └──────────┘
            │
      ┌──────────┐
      │   T=25   │
      └──────────┘
            │
      ╱ Data Out=0 ? ╲──── NO ────┐
      ╲             ╱             │
            │ YES                 │
   ┌────────┴────────┐            │
   │                 │            │
 ╱CBA>0?╲─NO─┐    ╱CBA<7?╲─NO──┐  │
 ╲      ╱    │    ╲      ╱     │  │
   │YES      │      │YES       │  │
 ┌────────┐  │   ┌────────┐    │  │
 │CBA=CBA-1│ │   │CBA=CBA+1│   │  │
 └────────┘  │   └────────┘    │  │
   │         │      │          │  │
 ║SG_OUT ║   │   ║SG_OUT ║     │  │
   │         │      │          │  │
 ╱DataOut=1╲─NO    ╱DataOut=0╲─NO │
 ╲        ╱ │     ╲         ╱  │  │
   │YES     │       │YES       │  │
 ┌────────┐ │    ┌────────┐    │  │
 │CBA=CBA+1│ │    │CBA=CBA-1│   │  │
 └────────┘ │    └────────┘    │  │
     └──────┴───────┴──────────┘  │
            │                      │
      ┌────────────┐               │
      │Send [ZZ000CBA]│◄───────────┘
      └────────────┘
            │
         (  END  )
```

⑦ **SG_OUT**

```
        ( SG_OUT )
            │
   ┌──────────────────┐
   │ Send [ZZ000CBA]  │
   │  No latch signal │
   └──────────────────┘
            │
   ┌──────────────────────────┐
   │Hold "L" for T msec latch signal│  (For T msec LPF capacitor discharge)
   └──────────────────────────┘
            │
      ╱ ZZ=11 ╲──── NO ────┐
      ╲       ╱            │
         │ YES         ╱ ZZ=10 ╲──── NO ──┐
         │             ╲       ╱          │
         │                │ YES            │
   ┌──────────┐      ┌──────────┐    ┌──────────┐
   │   JP1    │      │   JP1    │    │   JP1    │
   │1300 Hz output│  │1800 Hz output│ │ 80 Hz output│
   │for 160 msec │  │for 160 msec │  │for 160 msec │
   └──────────┘      └──────────┘    └──────────┘
         │                │               │
         └────────────────┴───────────────┘
            │
         (  END  )
```

Note: Set the frequency of the adjustment signal according to the system.

RENESAS

AUTOMATIC ADJUSTMENT CD PREAMPLIFIER SERVO CONTROLLER

⑧ **Jump control**

The jump control is divided into the following four types according to the track count.

Type	N: Track count (standard)
8-1. SINGLE_JUMP	1 to 5
8-2. SHORT_JUMP	6 to 16
8-3. MID_JUMP	to 100
8-4. LONG_JUMP	to 1000

(Note) Put the check routing of the HFD status in a program. Read the main routine and sub-codes for check, regardless the jump control.
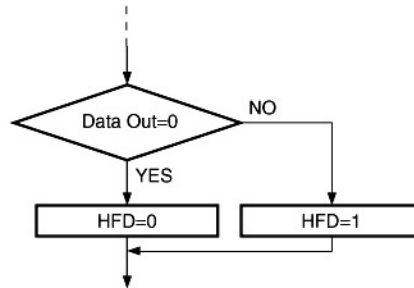
8-1. SINGLE_JUMP
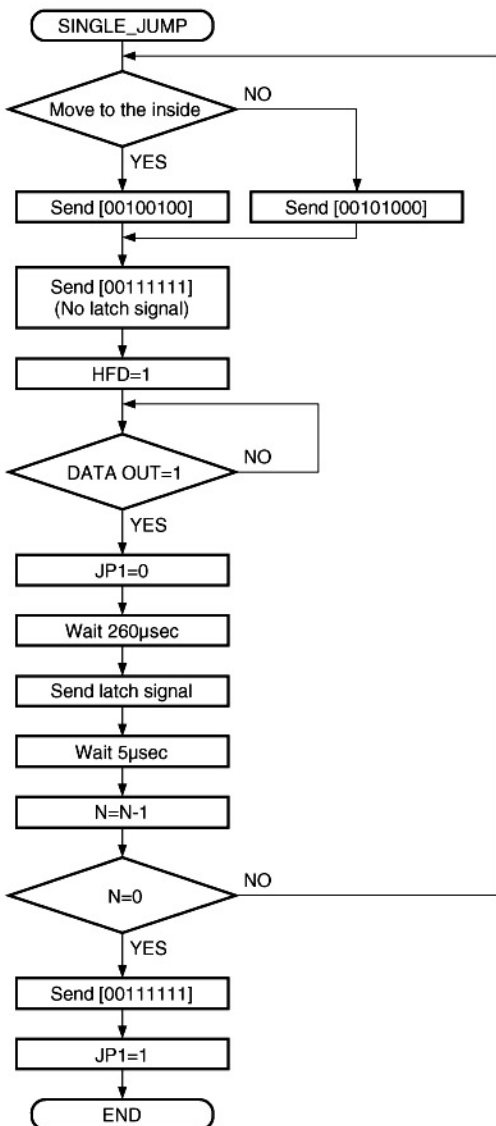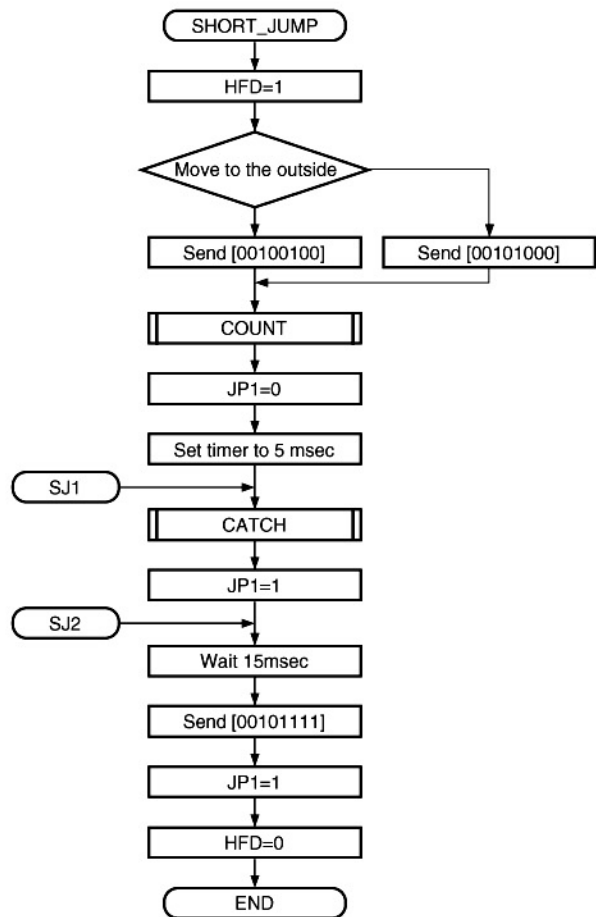
8-2. SHORT_JUMP

RENESAS

COUNT

```
      ( COUNT )
          |
    [ NBY2=N/2 ]
          |
 [ Set timer to 5 msec ]
          |
          v
    < DATA OUT=1 > --NO--> [ NBY2=N/2 ]
          | YES                  |
          v                      v
    < Time over >          < NBY2 > 0 > --NO-->
       |  NO  |  YES             | YES        |
                                 v            |
                           < DATA OUT=1 >     |
                              | YES           |
                              v               |
                           < Time over > --NO--
                              | YES
                              v
                          ( END )
```

CATCH

```
      ( CATCH )
          |
  [ Send [00111111]
    (No latch signal) ]
          |
      [ JP1=0 ]
          |
          v
  [ LC=180µsec/ (Loop time)
    LOOPN=LC ]
          |
          v
    < DATA OUT=1 > --NO--> [ LC=LOOPN ]
          | YES                  |
          v                      v
    < Time over ? >        < DATA OUT=1 > --NO-->
       | NO  | YES              | YES           |
             v                  v               |
       [ LC=LC-1 ]        < Time over ? > --NO-->
             |                  | YES           |
             v                  v               |
         < LC=0 > --NO--  [ LC=LC-1 ]           |
             | YES              |               |
                               v                |
                           < LC=0 > --NO--------
                              | YES
                              v
                   [ Send latch pulse ]
                              |
                          ( END )
```

8-3. MID_JUMP

```
┌──────────────┐
│   MID_JUMP   │
└──────┬───────┘
       ↓
┌──────────────┐
│    JP1=1     │
└──────┬───────┘
       ↓
   ╱────────╲            NO
  ╱  Move to  ╲──────────────┐
  ╲ the outside╱             │
   ╲────────╱                │
       │ YES                 │
       ↓                     ↓
┌──────────────┐     ┌──────────────────┐
│Send [00111010]│     │ Send [00110101]  │
└──────┬───────┘     └────────┬─────────┘
       │←───────────────────── 
       ↓
┌──────────────┐
│  Wait 4msec  │
└──────┬───────┘
       ↓
┌──────────────┐
│    HFD=1     │
└──────┬───────┘
       ↓
┌──────────────┐
│    JP1=0     │
└──────┬───────┘
       ↓
┌──────────────────┐
│Set timer to 8 msec│
└──────┬───────────┘
       ↓
┌──────────────┐
║   CATCH      ║
└──────┬───────┘
       ↓
┌──────────────┐
│     SJ2      │   (Jump to the
└──────────────┘    SHORT_JUMP label)
```

8-4. LONG_JUMP

```
┌──────────────┐
│  LONG_JUMP   │
└──────┬───────┘
       ↓
   ╱────────╲            NO
  ╱  Move to  ╲──────────────┐
  ╲ the outside╱             │
   ╲────────╱                │
       │ YES                 │
       ↓                     ↓
┌──────────────┐     ┌──────────────────┐
│Send [00111010]│     │ Send [00110101]  │
└──────┬───────┘     └────────┬─────────┘
       │←───────────────────── 
       ↓
┌──────────────┐
│    HFD=1     │
└──────┬───────┘
       ↓
┌──────────────┐
│ Wait 150msec │
└──────┬───────┘
       ↓
┌──────────────┐
│Send [00111000]│
└──────┬───────┘
       ↓
┌──────────────┐
│ Wait 30msec  │
└──────┬───────┘
       ↓
┌────────────────────┐
║Set the timer to 120 msec║
└──────┬─────────────┘
       ↓
┌──────────────┐
│     SJ2      │   (Jump to the
└──────────────┘    SHORT_JUMP label)
```
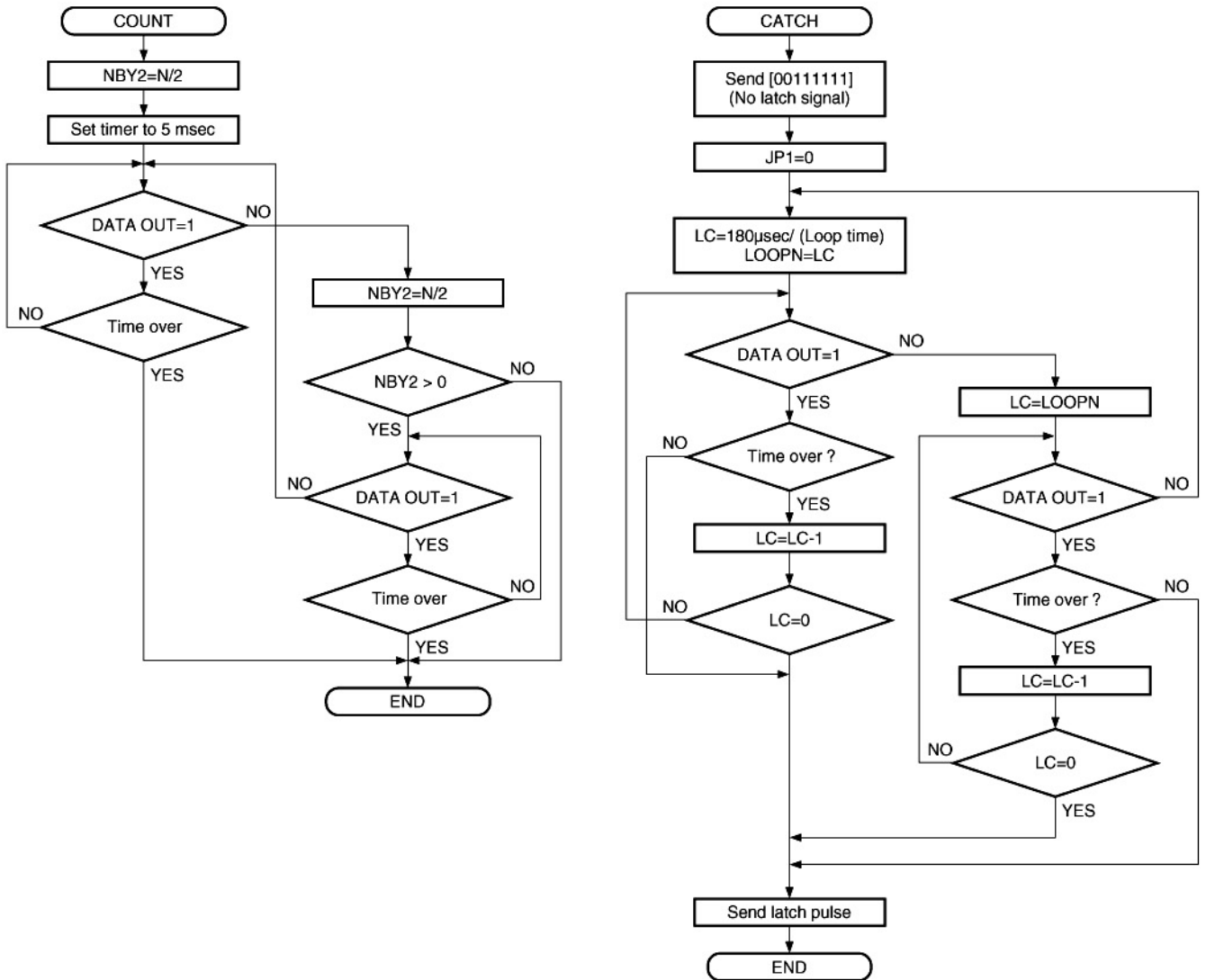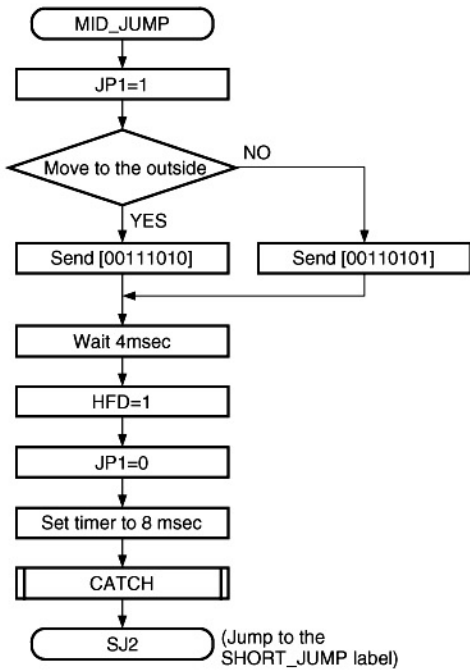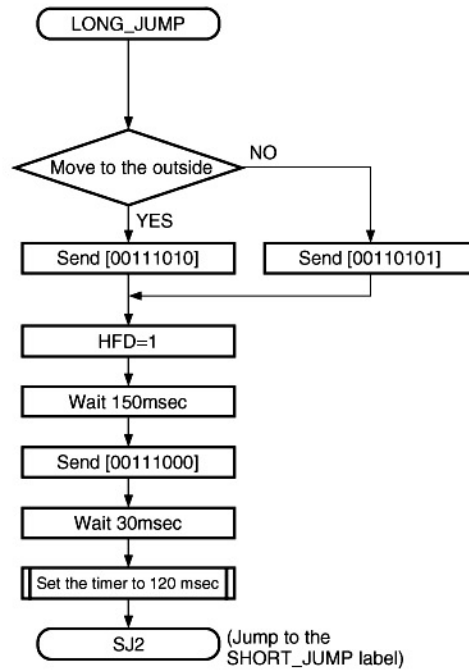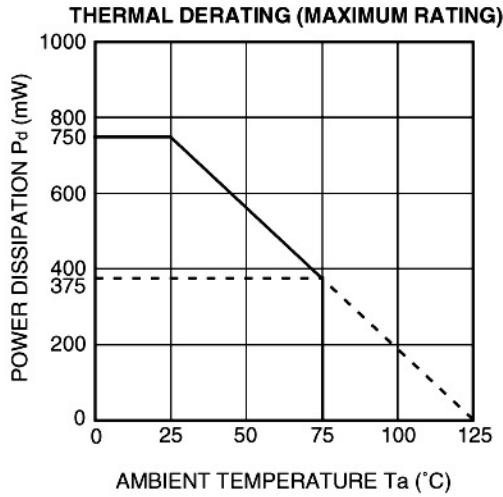
TEST CIRCUIT

Units Resistance : Ω
Capacitance : F

RENESAS
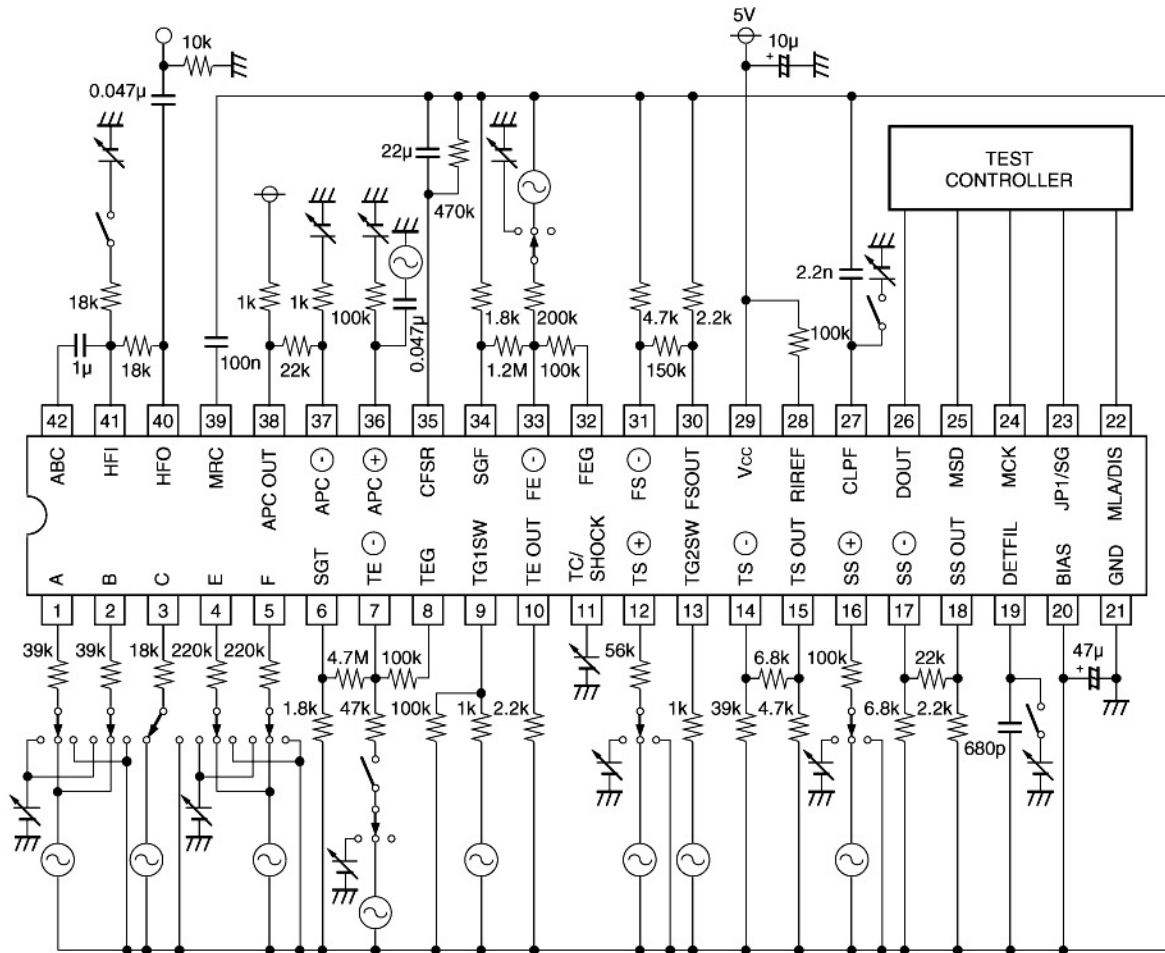
AUTOMATIC ADJUSTMENT CD PREAMPLIFIER SERVO CONTROLLER

TYPICAL CHARACTERISTICS

THERMAL DERATING (MAXIMUM RATING)

APPLICATION EXAMPLE

Units   Resistance: Ω
         Capacitance: F