SERVICE MANUAL

HIGH-RESOLUTION DISPLAY MONITOR

MODEL: FFF8705

MITSUBISHI ELECTRIC CORPORATION

SEP. 1995

CBB–S5598

X-RADIATION WARNING

The surface of picture tube may generate X-Radiation.
Precaution during servicing, and if possible use of a lead apron or metal for shielding is recommended. To avoid possible exposure to X-Radiation and electrical shock hazard, the high voltage compartment and the picture tube shield must be kept in place whenever the chassis is in operation.
When replacing picture tube use only designated replacement part since it is a critical component with regard to X-Radiation as noted above.

CRITICAL COMPONENT REPLACEMENT WARNING

- The components marked "⚠" are critical components for X-ray radiation. When replacing these parts, use exactly the same one indicated in parts list.
- Please do not remove the seal of sealed potentiometer.
- The components stated below are no field serviceable parts. If broken, please contact with qualified personnel of Mitsubishi Electric Corp. or the distributor which indicated on name plate.

  VR506 (HV-ADJ), VR504 (HV-LIMIT), T502 (FBT)

CONTENTS

1. Specification

1.1 CRT

Size	41 cm (17")
Deflection angle	90 degree
Electron gun	In-line type
Focusing method	Electro-static
Focus compensation	Dynamic beam forming
Convergence method	Magnetic
Stripe spacing	0.26 mm
Array	Dot pitch
Phosphor type	P22
Mask type	Invar shadow mask
Phosphor persistence	Medium short
Implosion protection	Tension band
Face plate	Anti reflection & Antistatic coating
Transmission	Tint (about 46 %)

1.2 Deflection

Horizontal deflection	30~82 kHz
Vertical deflection	50~130 Hz

1.3 Signal input

Video input signal	R. G. B Analog
Sync. input signal	
	Composite sync with Green video
	Composite sync Negative
	HD/VD Positive/Negative
Video input impedance	75Ω to GND
Sync input impedance	2kΩ to GND
Signal level	Video signal with sync
	Video signal 0.7 Vp-p (std)
	Sync signal 0.3 Vp-p (std)
Sync signal (at negative signal)	
	4.0 Vp-p (std)
	(2.5-5 Vp-p Available)

1.4 Display resolution

1280 dots x 1024 lines (typ.)

1.5 Display size

Horizontal	300 mm (typ.)
Vertical	225 mm(typ.)

1.6 Misconvergence

Center area	0.30 mm (max.)
Another area	0.45 mm (max.)

1.7 Brightness

	100cd/m2 (typ.) / 30Ft-L (Screen Center)
Brightness control	Click-center position
Contrast control	Max. position
Video signal	Full size raster

1.8 User controls

Power switch	Power ON indicator
Degauss switch	OSD off button
Reset button	
Adjustment buttons	
Adjustment item select buttons	

1.9 Connector

Power input	3P IEC PLUG
Signal input	Shrink D-Sub 15P

1.10 Environmental Conditions

Temperature	Operating 0°C ~ 35°C
Storage	-20°C ~ 60°C at 95%RH (max.)
Relative humidity	Operating 10% ~ 95%RH (without condensation)

1.11 Power supply

Input voltage	100 ~ 120/200 ~ 240 V AC± 10% 50/60 Hz (Automatically)

1.12 Power consumptionnormirtal

125 W

1.13 Dimension

410 mm (W) x 406 mm (H) x 425 mm (D)
(Including T/S stand)

1.14 Weight

Approx. 21.5 kg

1.15 Regulation

Safety	UL/CSA	TUV-GS
	NOM	NEMKO
	SEMCO	FIMKO
	GOST	
EMI	FCC-A	CE-MARKING,
	DOC-B	VCCI-II
X-RAY	DHHS	RöV
	HWC	
ELF/VLF	MPR-II	
	TUV-ERGO (ISO9241)	
POWER-MANAG	NUTEK	

1.16 Preset timing

Refer to Table 5..

2. Circuit description

2.1 General

This display monitor is composed of eight blocks as shown in BLOCK DIAGRAM (Schematics).

(a) Power supply block (PCB-MAIN)
(b) Control block (PCB-SET)
(c) Deflection block (PCB-MAIN)
(d) Video block (PCB-SET)
(e) Vertical deflection block (PCB-VERT)

Every blocks will be explained in detail in following chapters. In this chapter, the auto-tracking function will be explained generally.
Input sync. signals whose horizontal scanning frequency of 30kHz-82kHz and vertical scanning frequency of 50Hz-130Hz can be automatically locked on without adjusting H-HOLD/V-HOLD.
This automatic lock on function is performed by the circuits in PCB-SET.

To maintain optimum operation of circuits over wide frequency range, some elements in circuits are switched according to horizontal frequency of input sync. signal. The circuit in PCB-SET counts the frequency of input sync signals, and generates control signals.
PCB-SET also maintains the other control signals to adjust picture sizes, positions, etc. electronically.

2.2 Power supply block

2.2.1. General

(1) Dual input voltage 100 ~ 120 VAC and 220 ~ 240 VAC (automatically) are supported.
(2) The output lines of this power supply are shown in Table 1. with their main loads.
(3) The power supply works as switched mode operation with RCC (Ringing Choke Converter) configu ration. Output voltages are regulated by 3 of primary circuit feed back signal through photo coupler (IC904). The switching frequency is corresponding to load currents.
The 60V-175V line is regulated by the DC chopper method from 200V line whose switching fre quency is corresponding to H-Sync input.

Output line	Mainload
6.3V	CRT heater
24V	H/V deflection IC, H-Drive
27V	V-Deflection
5V	CPU
12V	Video circuit, Control
70V	Video circuit
200V	Video circuit, HV circuit
-12V	DAC Pre-Amp for S-PCC circuit for R, G, B-Gain

Table 1.

2.2.2 Rectify and filter circuit

(1) The AC input voltage is rectified by the diode bridge in IC901.
The rectified voltage is filtered by charging C905.
(2) The resistor R906 is to suppress the inrush current after powering on. After the capacitor C906 is charged, the thyristor THY (in IC901) is on to by-pass R906.

2.2.3 Degauss circuit (in PCB-MAIN)

(1) This monitor is provided the auto and manual degauss function.

(2) The auto-degauss circuit is operated as follows after started up the micro computer. The degauss signal from micro computer turns on Q553, and then RY901 operates degauss circuit during approx. 3 sec so that the degauss current could flow to the degauss coil via RP901.

(3) The manual degauss circuit works during approx. 3 sec which is controlled by the degauss signal from micro computer (when pushing the degauss switch).

2.2.4 Primary circuit

(1) Main DC power supple of this monitor consists of RCC (Ringing Choke Convertor).
When the power switch is turned on, triggering current is fed through R910 and Q908 to flow the collector current of Tr 1 in IC902 which is a main switching transistor.
An error amp. IC951 detects an output voltage and makes a feed back to primary circuit via photo-coupler IC904.

(2) When Tr 1 switch off, the energy which is stored in primary winding T901 transfers to secondary circuit. When all stored energy is discharged, the voltage of each coil is reversed and Tr 1 (main switch transistor in IC902) switches on.
The base current of Tr 1 is supplied by the discharge of C915.

(3) Photo-coupler IC904 controls input current to F/B of IC902 and changes the turn on thresh time by which on time of Tr 1 is controlled.

(4) R916 and R920 are the resistors to detect overcurrent.

(5) This monitor has a power management function, depends on sync. signal input. The monitor has 4 modes to save power consumption.

MODE	H-SYNC	V-SYNC	STATUS
Normal	ON	ON	-
Stand-by	OFF	ON	No video
Suspend	ON	OFF	heater on
Complete-off	OFF	OFF	heater off

Each mode's power consumption and LED indication of contrast and bright is as follows.

MODE	Power	LED indication
Normal	125 W	-
Stand-by	100 W	1.0 sec blink
Suspend	15 W	3.0 sec blink
Complete-off	8 W	3.0 sec blink

2.2.5 Secondary circuit (in PCB-MAIN)

(1) In this paragraph chopper circuit which is applied for auto-scanning circuit will be explained.

(2) Chopper circuit mainly consists of L512, IC707 and Q534.
The output voltage +B is regulated by Q534 on PCB-MAIN in terms of PWM control to change the horizontal display size. The output from 9 pin of IC707 is pulse wave whose on-duty is followed by feed-back signal to pi 2 of IC707 from the collector of Q709 in order to change +B.
The increase or decrease command of B4-Adj and B4-OSC coming from MPU goes to gate array IC102 on PCB-SET and then into pin 2 of IC707 as B4-Adj and B4-OSC signal through IC107 and IC704.

2.3 Control block

2.3.1 General

The CONTROL BLOCK is on PCB-SET. Figure 1. shows the block diagram of PCB-SET.

(1) PCB-SET has one CPU IC101 and IC102 is a gate array which also includes AD/DT latch, frequency counter, SIO, LED driver, sync polarity detector, etc. one nonvolatile memory IC106, and other control ICs.
The input signal for PCB-SET are fed from FRONT SW, horizontal and vertical sync. signals.

(2) Based on above signals, IC101 reads out data like as screen size, screen position etc., which are stored in IC106, and stores into RAM in IC101. IC101 provides the horizontal deflection control signals like as AFC constant and Cs switching which are stored in ROM on IC101.
(3) IC101 has D/A converter. Inside D/A converter controls brightness, contrast, H, V-size, H, V-phase, RGB-gain, PCC-AMP, PCC-phase, H-free run frequency, DBF and +B adjustment.
(4) KO0~KO2 and KI0~KI2 are corresponding to each button on the front panel as Figure 2.
(5) IC701 is a AFC controller. Output pulse is fed into the gate of Q502 on PCB-MAIN.
(6) IC707 is a +B controller. The gate input of the Q534 (PCB-MAIN) is generated by IC707.
(7) Contrast control signal is fed into IC200 on PCB-SET. RGB gain control signals are also fed into IC200.
(8) IC104 works as sync.separation circuit. Sync. signal with green video will be sliced out to H-V composite signal.

Dynamic PWM is output from 24 pin of IC102. This PWM is integrated by IC108 and IC108 generates combined parabolic and saw tooth waveform to compensate PCC and KSTN distortion.

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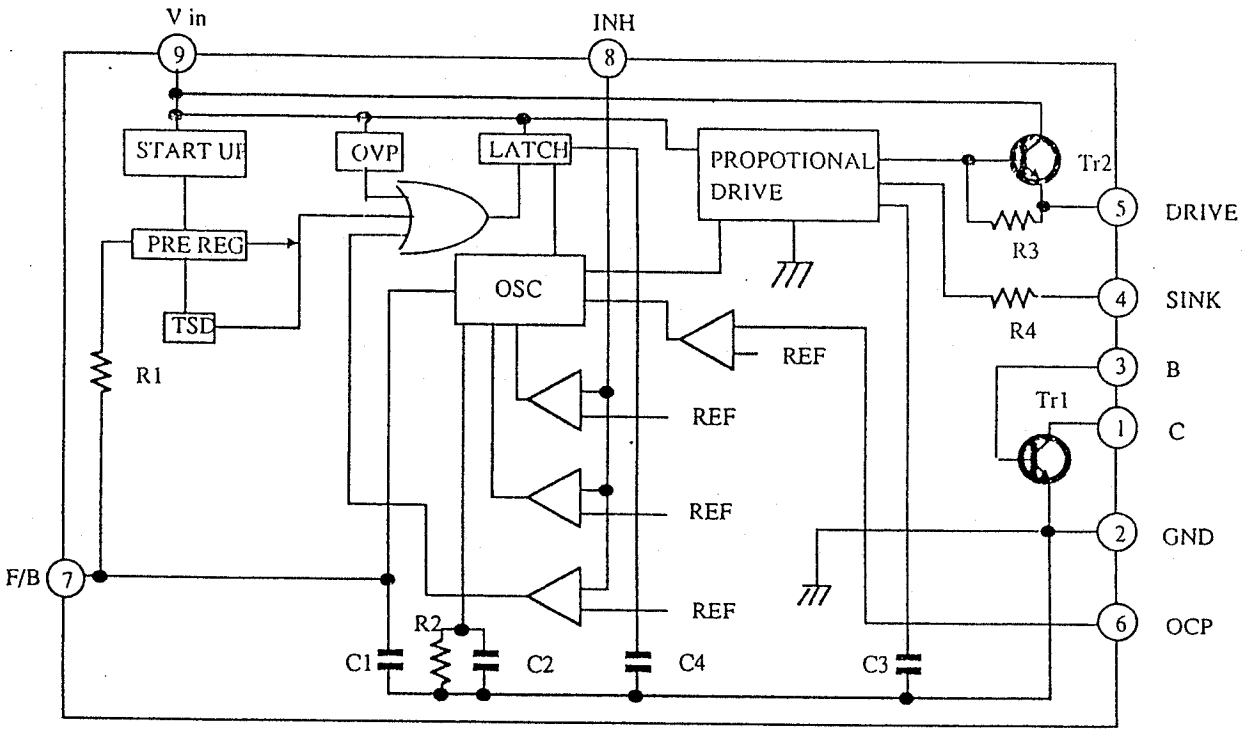
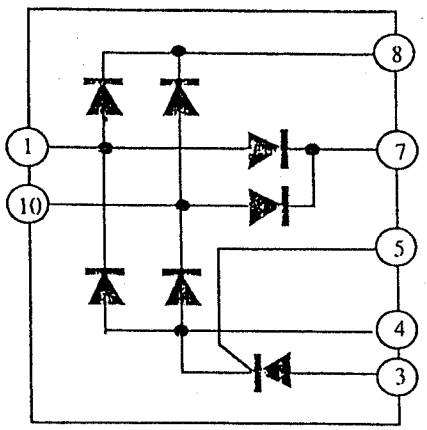
IC902 STR-S6707



IC901 MJ2400



IC951 SE140N

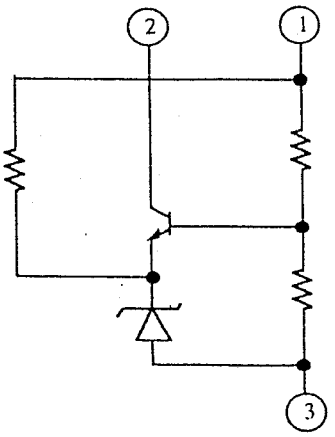


Figure 1.

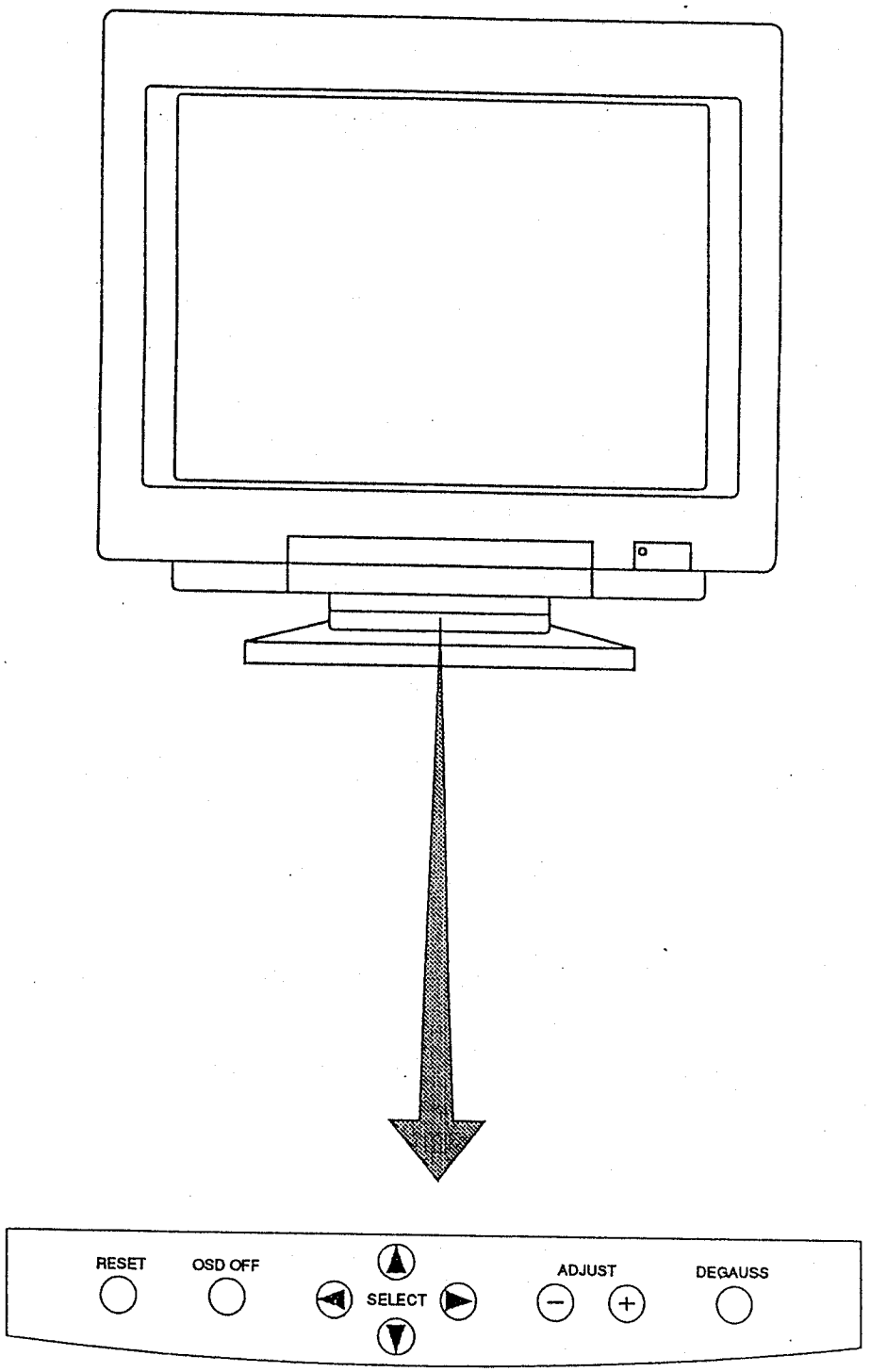


Figure 2. User controls

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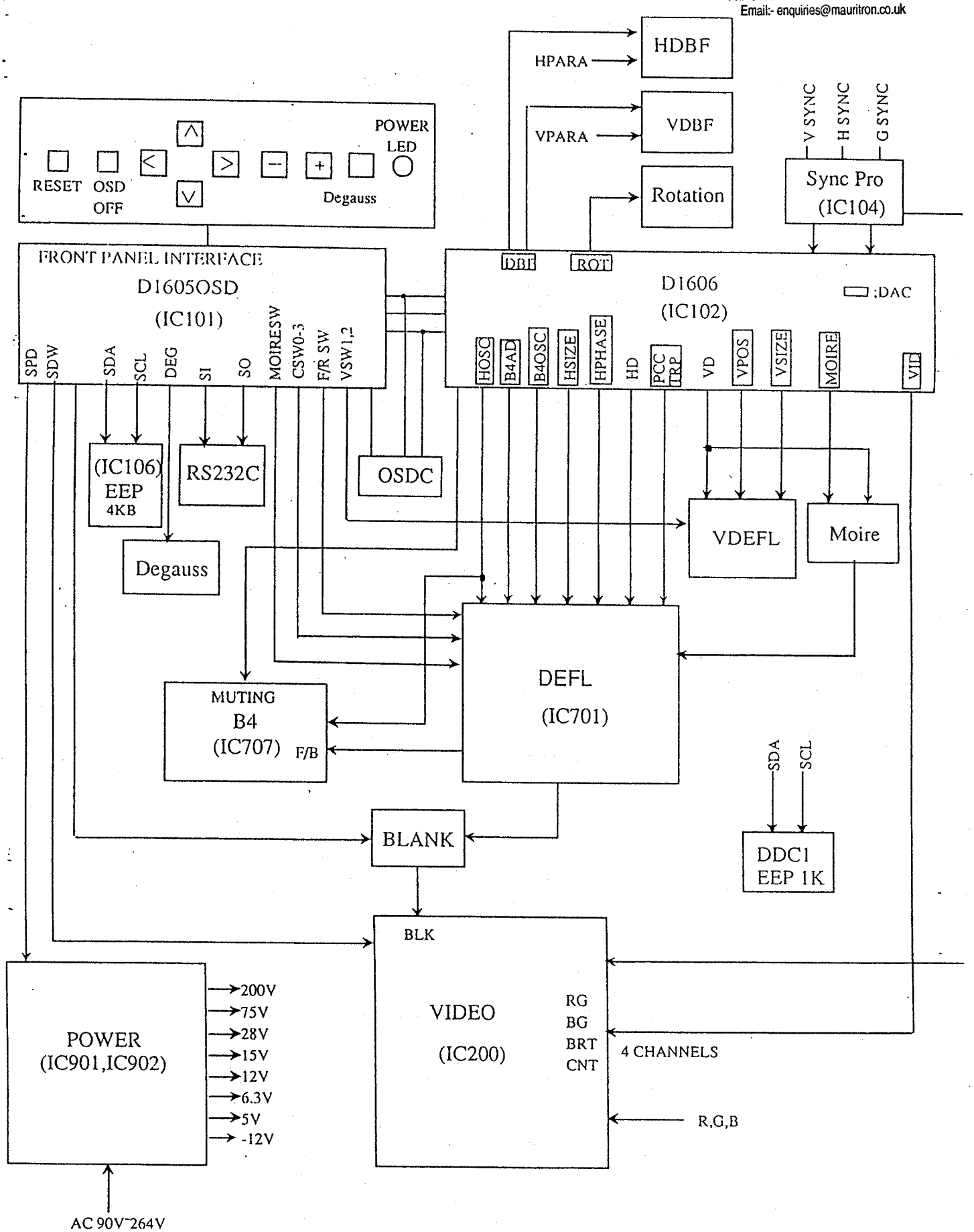

Figure 3. Block diagram

Pin Assignment of SD7811C

D1605 OSD

No	Name	Remark	No	Name	Remark
1	BUNIN	P10	21	VERT	P20
2	KO0	P11	22	SCLE	P21
3	KO1	P12	23	SDAE	P22
4	KO2	P13	24	LOADA	P23
5	KI0	P14	25	LED1	P24
6	KI1	P15	26	FRN	P25
7	KI2	P16	27	SCDW	P26
8	DEG	P17	28	POLB	P27
9	RESET		29	NC	PSEN
10	DATA0	RXD	30	NC	ALE
11	DCLK	TX0	31	PH	VDD
12	FDET	INT0	32	SO	P07
13	INT	INT1	33	SI	P06
14	LOADB	P34	34	CSW2	P05
15	BLANK	P35	35	CSW1	P04
16	VSW1	P36	36	CSW0	P03
17	VSW2	P37	37	PS3	P02
18	X2	XTAL2	38	PS2	P01
19	X1	XTAL1	39	CSW3	P00
20	GND	VSS	40	5V	VCC

D1606 OSD

No	Name	Remark	No	Name	Remark
1	VPOS	SDAC6	21	HSYNC	
2	VSIZE	SDAC7	22	VSYNC	
3	HPHASE	SDAC8	23	VDET	
4	HSIZE	SDAC9	24	PCC	DDAC1
5	CNT	SDAC10	25	DBFV	DDAC2
6	BRT	SDAC11	26	DBFH	DDAC4
7	RG	SDAC12	27	B4AD	SDAC1
8	BG	SDAC13	28	HOSC	SDAC2
9	FDET		29	B4OSC	SDAC3
10	DATA		30	ROT	SDAC4
11	CLK		31	MOIRE	SDAC5
12	INT		32	5V	VCC
13	DCLK				
14	LOAD				
15	RESET				
16	GND	VCC			
17	HIN				
18	HREF				
19	VIN				
20	VREF				

2.3.2 Control function

(1) Maximum timing number : 20 timings

There are 20 timings preset at factory which are shown in Table 5.

(2) To distinguish a timing, at least one of following conditions are necessary.

(a) $|fH' - fH| > 0.1$ kHz

(b) $|fV' - fV| > 0.1$ Hz

(3) In following conditions, the deflection circuit will be shut off to protect output transistor in the deflection circuit.

(a) Out of horizontal frequency range from 29.0kHz~86.0kHz and / or out of vertical frequency range 48.8Hz~150Hz.

(b) No H or V sync. signal.

(4) Each 20 timings has one common data for R, B-BIAS and GAIN, DBF-H, DBF-V, CONTRAST, BRIGHT, ROTATION and MOIRE.

(5) Select buttons function

(a) Item select shift to right / left

(b) Page select shift to up / down

(6) Select the brightness by OSD

When +/- buttons are pushed at the same time, the brightness becomes a middle level of bright ness set at factory.

(7) Select the contrast by OSD

When +/- buttons are pushed at the same time, the contrast becomes a maximum level of contrast set at factory.

(8) Reset function

When pushing the reset button on the front panel in case of normal mode, the all factory adjust ment items that may have been overwritten by the user are restored.

2.3.3 Adjustment mode

There are 3 adjustment modes in this monitor.

(a) Normal mode

(b) Factory mode

(c) Remote mode

(a) Normal mode

The normal mode is opened for the general end user operation and is available to adjust the raster size, position, PCC-AMP, color-select, brightness and contrast by the adjustment buttons on the front panel.

OSD shows adjustment items and data as attached Figure 4.

The adjusted picture conditions are automatically memorized into EEPROM (During pushing the adjust button, picture conditions change in terms that data on CPU RAM and DAC output data are changed. All CPU RAM data are written into EEPROM just after the adjust button is re-leased.).

(b) Factory mode

The factory mode has some additional items from the normal mode, which are different adjust-ment items by the way to enable factory mode.

To enable factory mode by the front panel

(1) Power on while pushing and holding degauss button.

(2) OSD shows as attached Figure 4.

(3) Data is adjusted to 5.

(4) Push select button [▷], then becomes the factory mode.

(5) Select the factory mode page by select up or down button, adjust data to 10 by adjust + or - button and push select button [▷], then becomes the normal mode.

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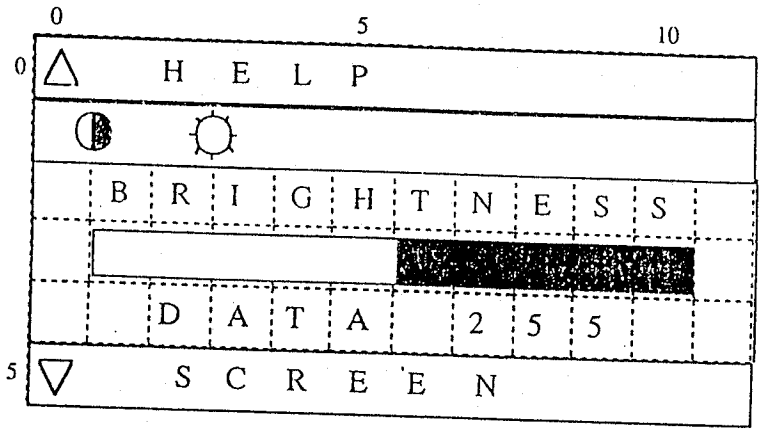
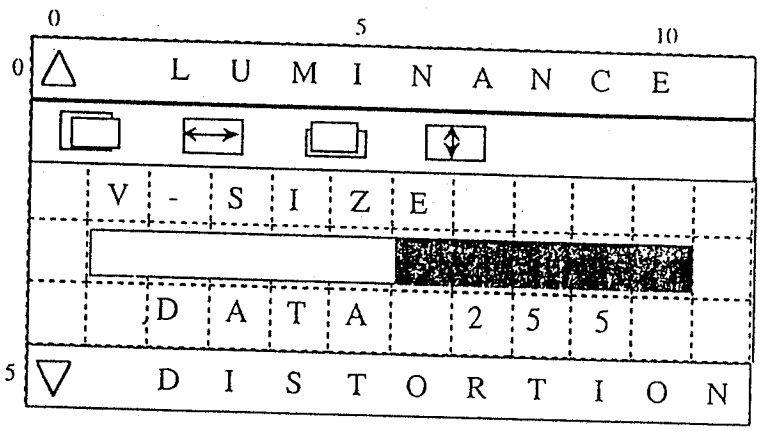
Figure 4. On screen display

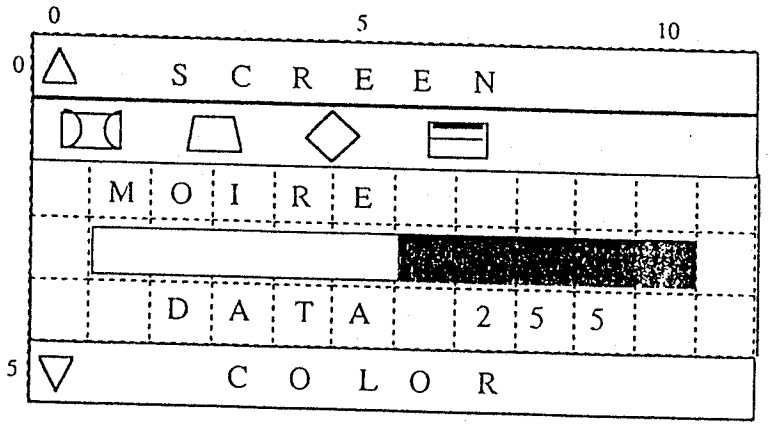
1-(1) LUMINANCE



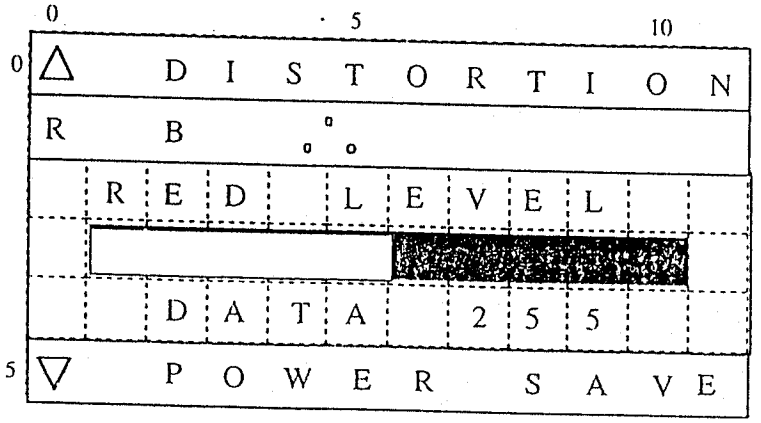
1-(2) SCREEN



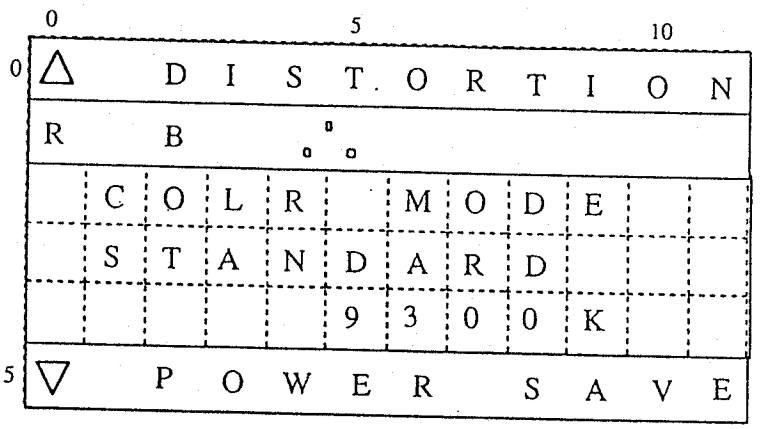
1-(3) DISTORTION



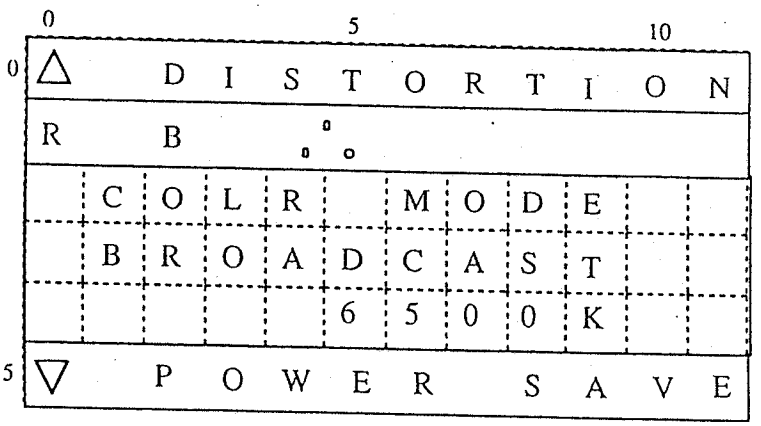
1-(4) COLOR



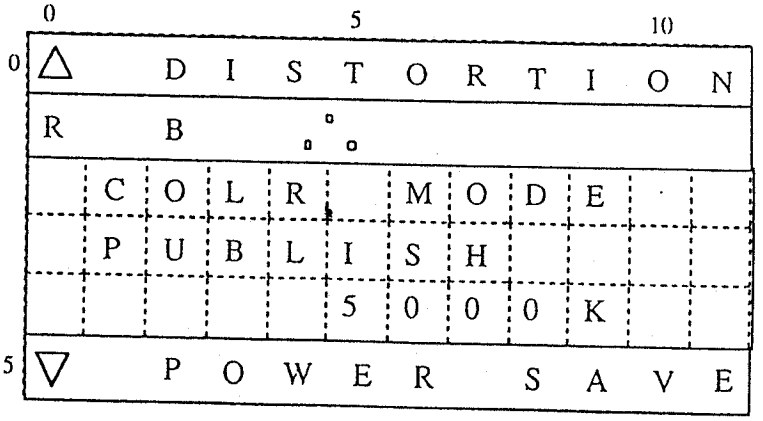
1-(5)



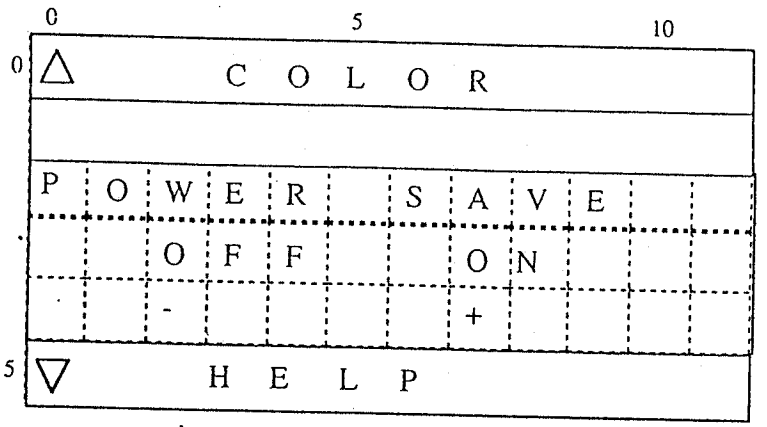
1-(6)



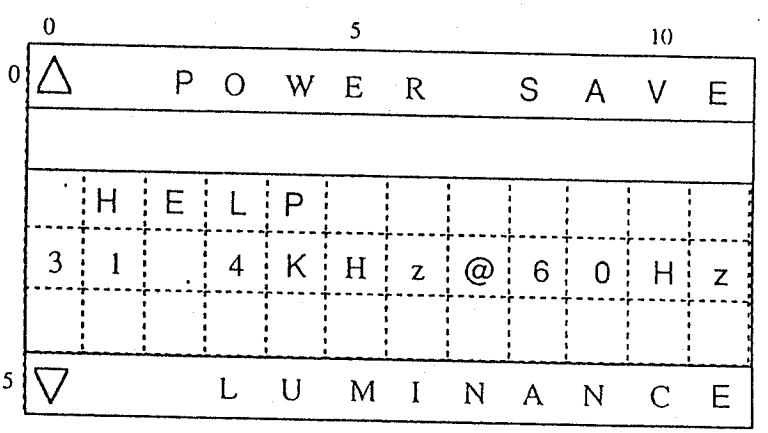
1-(7)



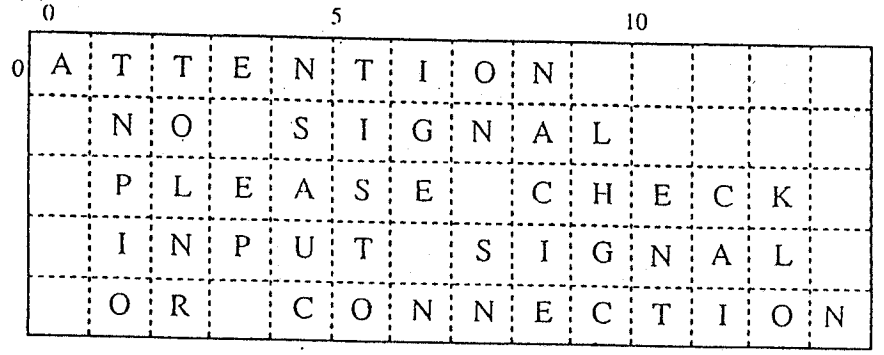
1-(8) POWER SAVE



1-(9) HELP

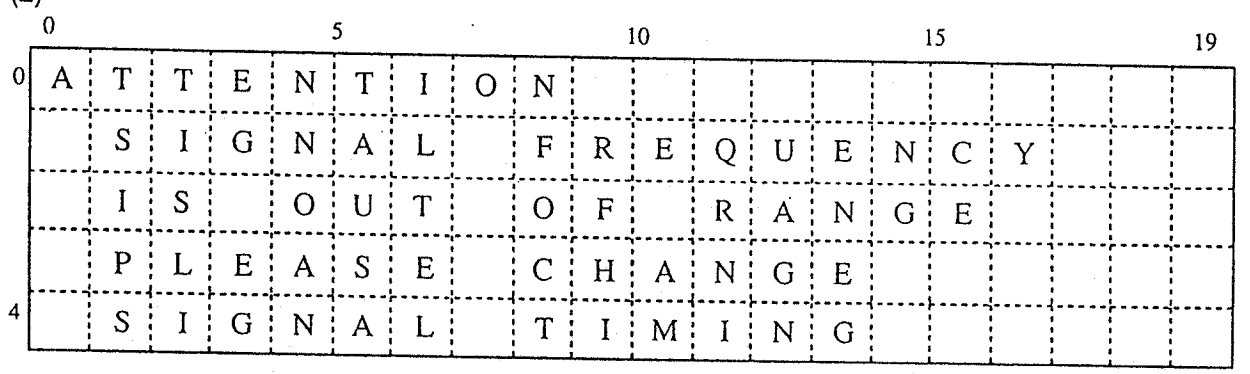


2-(1)



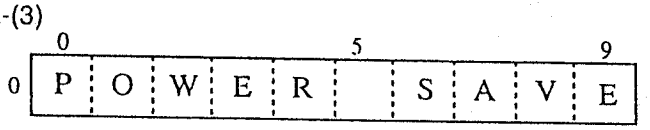
When Nosync and Select Burn. or When Nosync and Select DPMS, Above is displayed 60sec before DPMS is Working.

2-(2)



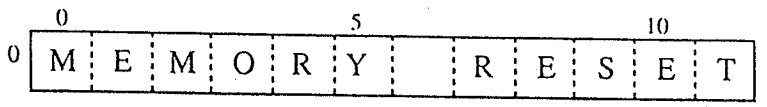
When Out of Range Signal is comming

2-(3)



When Nosync and Select,DPMS Above is displayed 10sec, after 2-(1) is displayed.

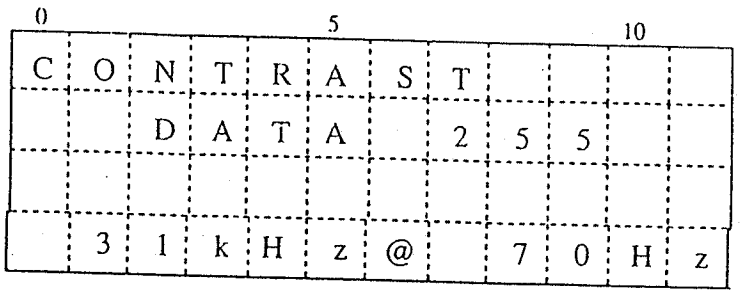
2-(4)



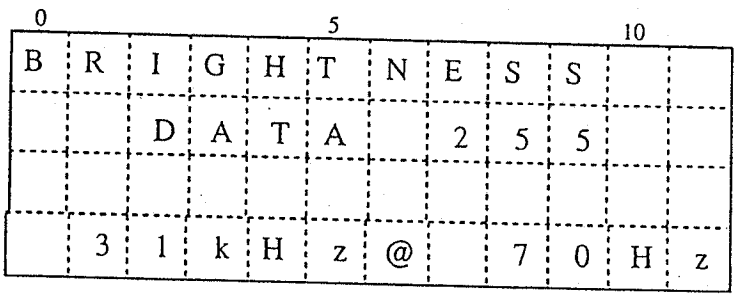
When Memory reset

3 Factory mode

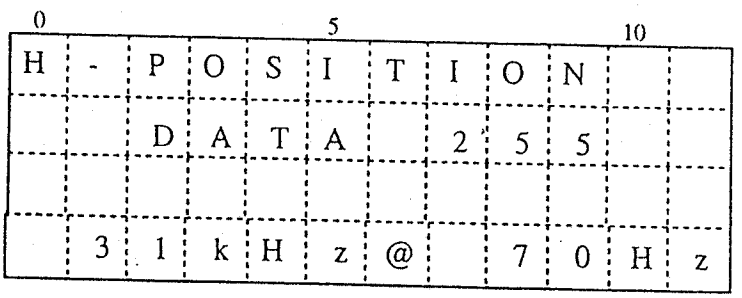
3-(1) Contrast



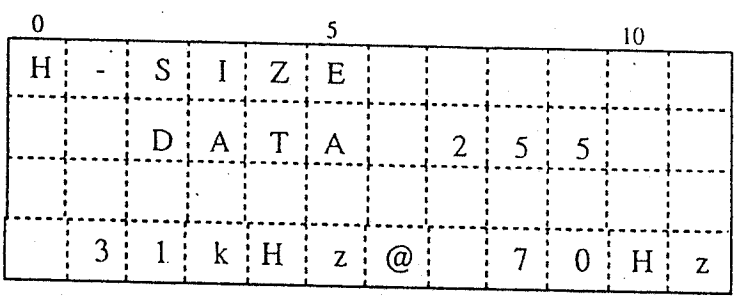
3-(2) Brightness



3-(3) H-position



3-(4) H-size



3-(5) V-position

0					5					10	
V	-	P	O	S	I	T	I	O	N		
		D	A	T	A		2	5	5		
	3	l	k	H	z	@		7	0	H	z

3-(6) V-size

0					5					10	
V	-	S	I	Z	E						
		D	A	T	A		2	5	5		
	3	l	k	H	z	@		7	0	H	z

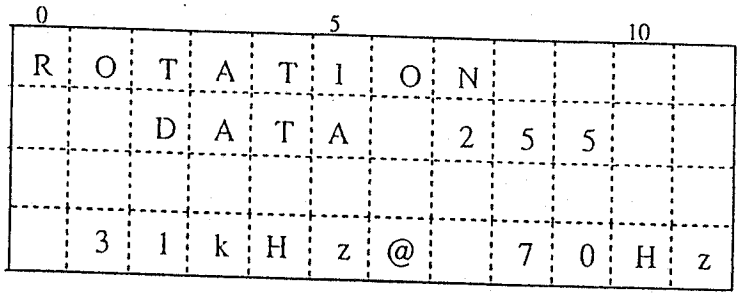
3-(7) Side-Bow

0					5					10	
S	I	D	E	-	B	O	W				
		D	A	T	A		2	5	5		
	3	l	k	H	z	@		7	0	H	z

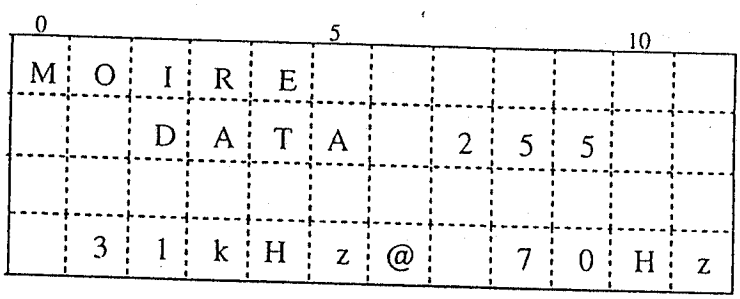
3-(8) Keystone

0					5					10	
K	E	Y	S	T	O	N	E				
		D	A	T	A		2	5	5		
	3	l	k	H	z	@		7	0	H	z

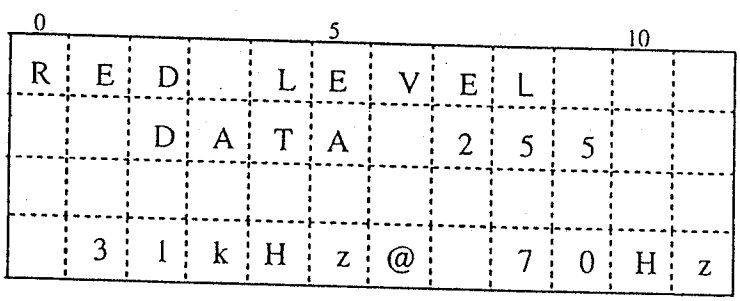
3-(9) Rotation



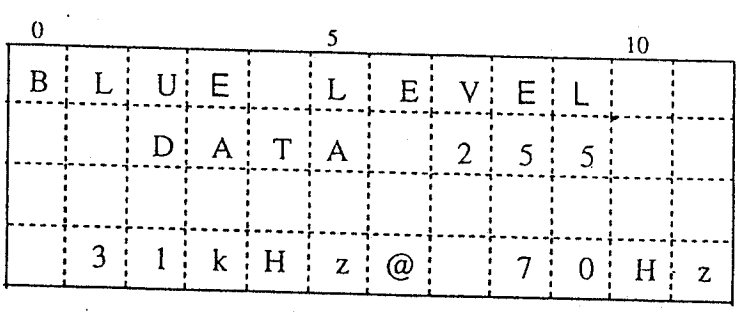
3-(10) Moire



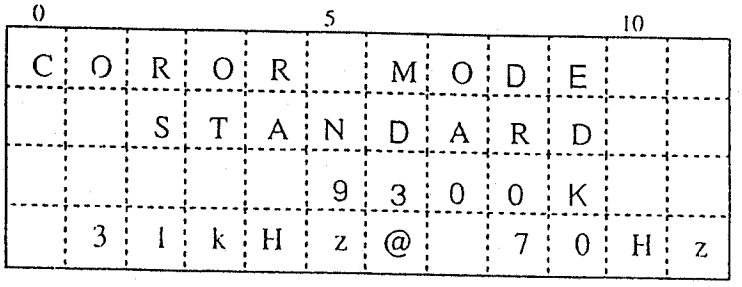
3-(11) Red Level



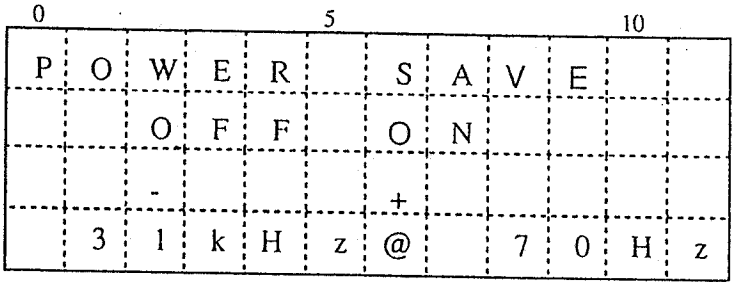
3-(12) Blue Level



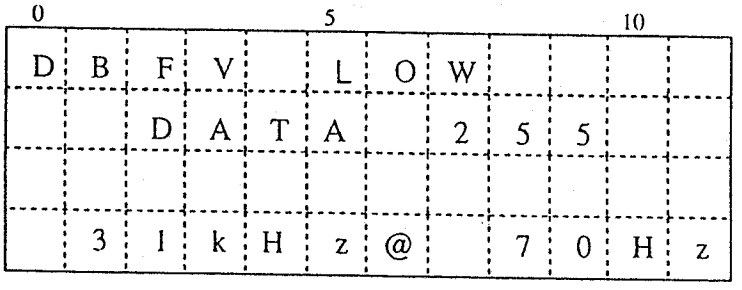
3-(13) Coror Mode



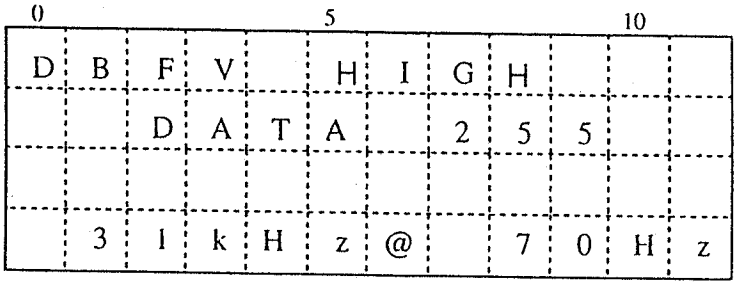
3-(14) DPMS



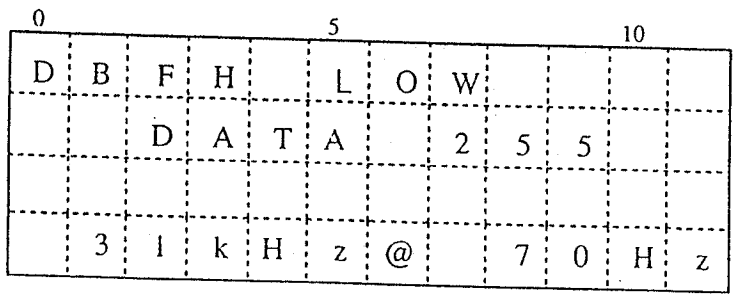
3-(15) DBFV-Low



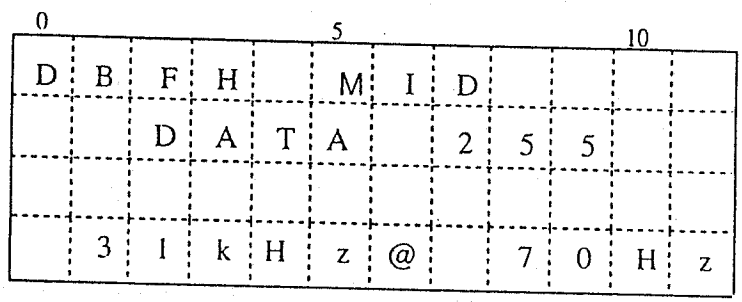
3-(16) DBFV-High



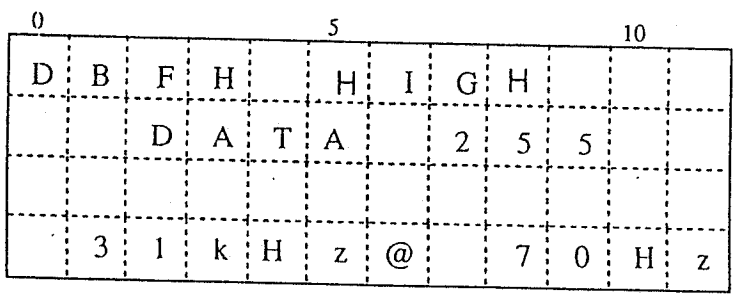
3-(17) DBFH-Low



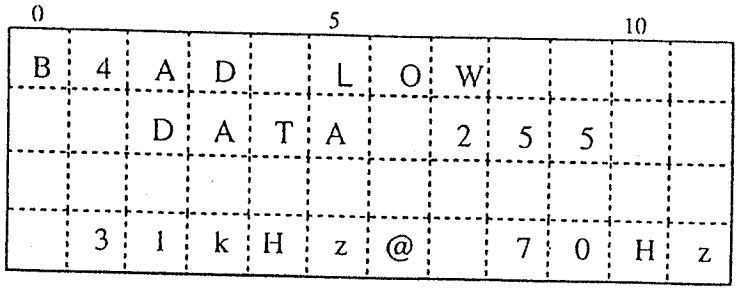
3-(18) DBFH-Mid



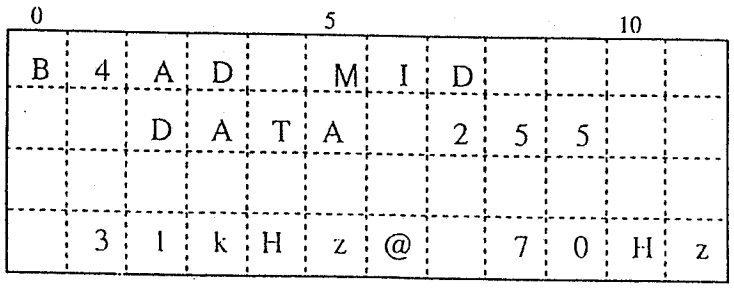
3-(19) DBFH-High



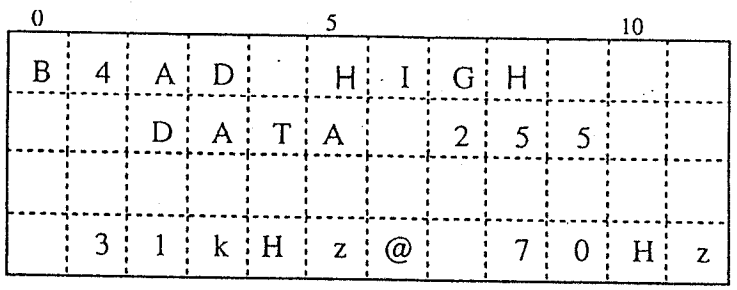
3-(20) B4AD-LOW



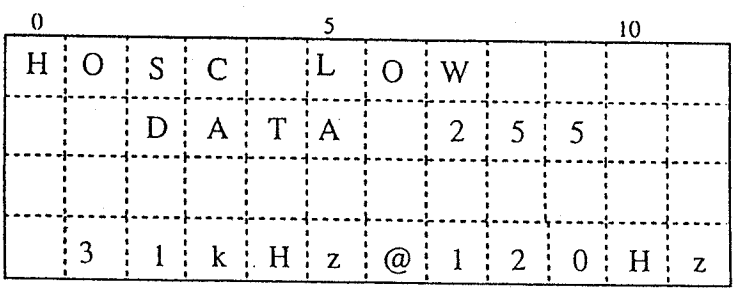
3-(21) B4AD-MID



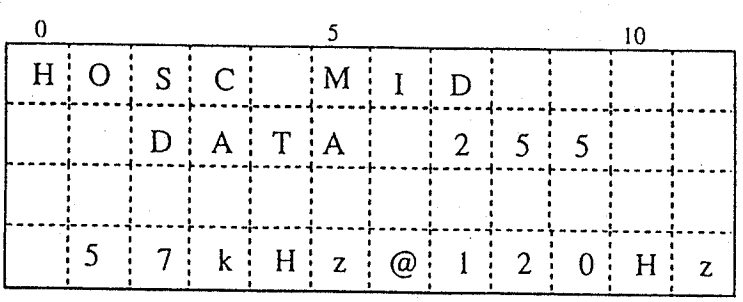
3-(22) B4AD-HIGH



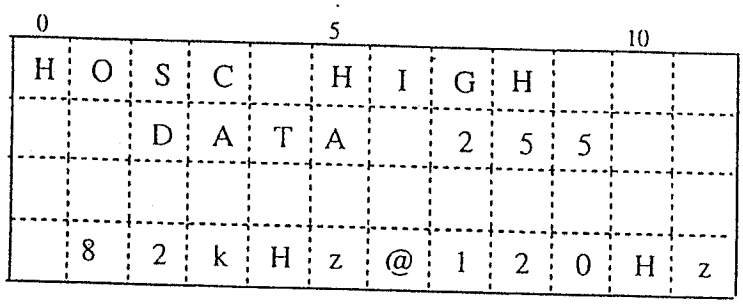
3-(23) HOSC-LOW



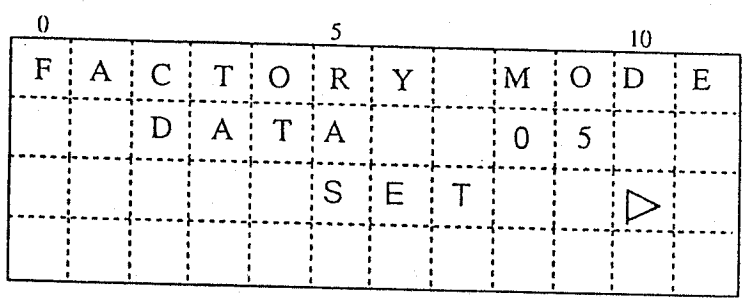
3-(24) HOSC-MID



3-(25) HOSC-HIGH



3-(26) CONTROL FACTORY MODE



2.4 Deflection block

Deflection block consists of horizontal deflection, and high voltage circuit, high voltage safety circuit, vertical deflection, side distortion correction and dynamic beam focus circuit.

2.4.1 Horizontal deflection and high voltage circuit

(1) The circuit description is shown in Figure 5..

(2) The horizontal deflection circuit is a diode modulation type.
Q503 is the deflection output transistor. T501 is a drive transistor. Q502 is a drive switching transistor. Drive condition is controlled by Q501.

(3) Screen control VR is usually equipped on FBT.
However this monitor is different. Screen voltage is generated from flyback pulse. D511 rectifies the flyback pulse. Q514 and Q515 drive G2 voltage, controlled by VR505 (SCREEN). IC501 is a operational amplifier working as dumper against G2 oscillation.

(4) C516, C514 and C515 are resonant capacitors.
Q513 is controller of resonant capacitor. Q513 works to stabilize high voltage. Q513 is on during approx. 1/6 of flyback period. IF Q513 is on, resonant capacitor will be larger than it during Q513 is off. The larger resonant capacitor, the lower high voltage. On period is controlled to keep the high voltage steady. High voltage detected by R559 is fed to IC501, then via IC708, Q5A2 and Q5A3. The gate pulse is fed in Q501 to drive Q503.

(5) The Cs is controlled according to frequency of horizontal sync. input (fH). Basically the lower fH needs the larger Cs. Q505, Q506, Q507 and Q517 are switched depends on fH as follows.

30	~	33 kHz	Q505 ~ Q507 and Q517 are on.
33	~	42.5 kHz	Q506 and Q507 are on.
42.5	~	52 kHz	Q505, Q506 and Q517 are on.
52	~	59.5 kHz	Q506 and Q517 are on.
59.5	~	70 kHz	Q506 is on.
70	~	80.5 kHz	Q517 is on.
80.5kHz ~			All is off.

(6) +B voltage to FBT is controlled by Q534. IC707 is PWM controller. Q534 gate is chopped by IC707 pin 9 output via Q705 and Q706. VR503 is for +B setting. +B feed back voltage is fed to IC707 pin 2 with output of Q709. CPU controls +B through IC703, IC704 and Q709 to maintain constant high voltage.

(7) PCC and horizontal width are controlled by CPU. The parabolic wave is mode by the IC102, Q104 and IC108 on PCB-SET. This parabolic is gain controlled by 108. This signal and the horizontal width control signal are fed to IC502 to add. The output of IC502 is fed to Q511 and Q512 to control potential at the capacitor C518, C519 and C555.

(8) L505 is a linearity coil. Under 33kHz and between 42.5 and 52 kHz RY501 is off to maintain horizontal linearity. RY501 is a electric switch controlled by CPU.

(9) Q536 and Q537 work as current driver to control horizontal raster positioning. Horizontal raster centering can be adjusted by VR503.

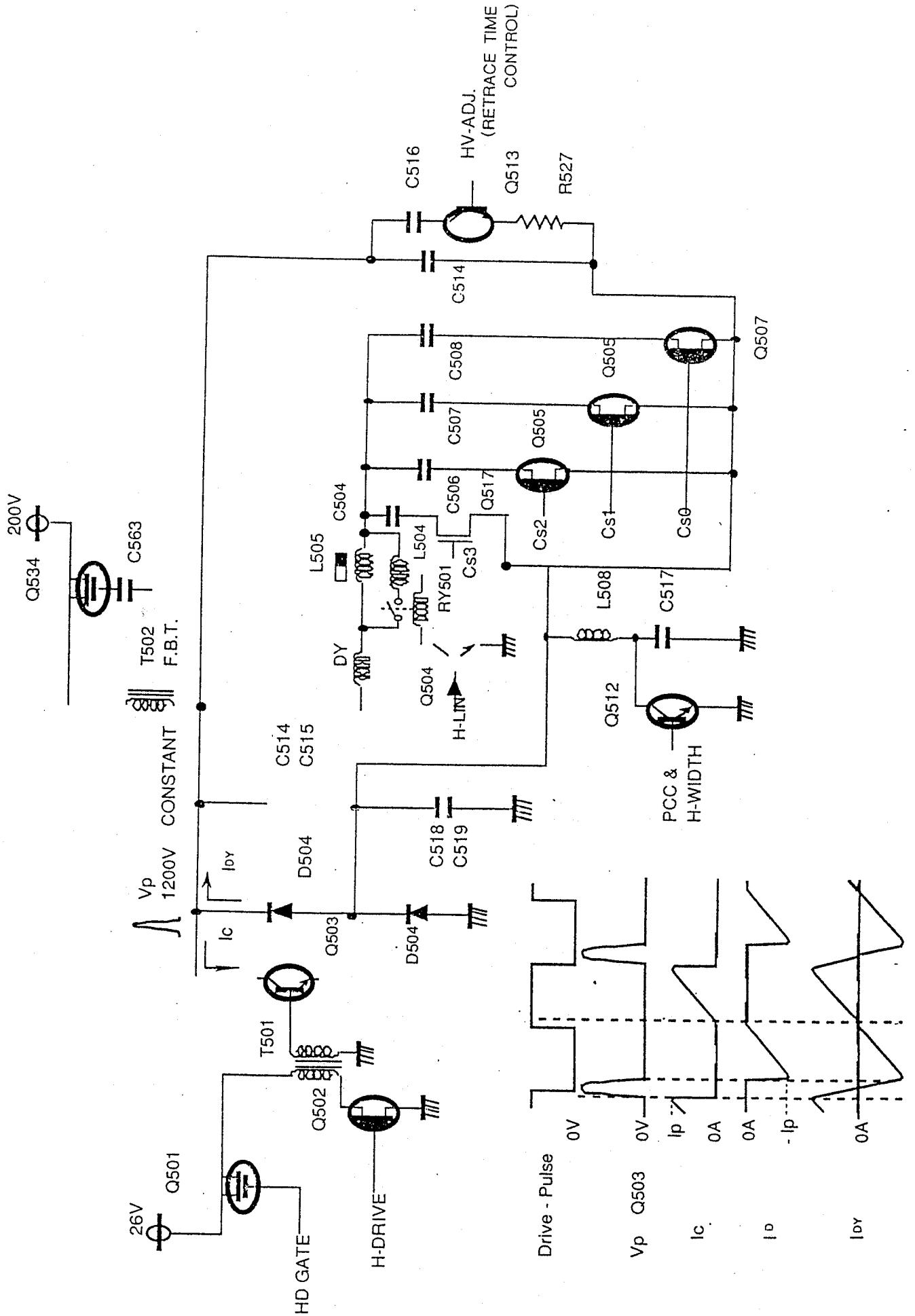


Figure 5. Principle of horizontal deflection

2.4.2 High voltage safety circuit

Safety circuits described below are equipped to prevent abnormal increase of the high voltage that may cause a X-radiation of harmful level. No modification should be applied to the high voltage supply and safety circuits.

The safety circuit works as the over voltage protector for a high voltage. Excessive high voltage is detected by R558 which is fed to Hold-Down circuit. In the case of high voltage exceeds 29KV, D520 on PCB-MAIN will be on. This limit voltage has been set by VR504.

Voltage across R554 is fed into gate of thyristor Q956 on PCB-MAIN.

Q956 is on then Q952 is on. If Q952 is on, power will be suspended mode. On suspended mode CPU in IC101 and CRT heater is on. Other circuits will be off. High voltage protector also works when CRT beam current will be too high. R560 and R561 detect over beam current. Then Q519 will be on. D519 will drive the gate of Q956.

2.4.3 Vertical deflection circuit

The vertical deflection is performed by one IC and some components on PCB-VERT.

The oscillating frequency is controlled by IC701 on PCB-SET.

The vertical size is controlled by IC102 pin 2 and analog sw IC402. V-linearity is also controlled by IC402. V-positioning is controlled by IC102 pin 1. Q405, Q404 and Q403 work as the current driver of V-positioning.

In the case of DY has ROTATION coil, Q717 and Q718 will work as rotation coil driver.

2.4.4 Dynamic beam focus

In order to get best focus condition on the entire screen, the dynamic modulated focus voltage is supplied to FOCUS (D) connector in addition to static focus voltage. This modulated voltage is fed into DFOCUS via capacitor in the FBT after amplified by Q527 and Q528.

The modulated signal is combined with horizontal and vertical parabolic waves at Q531. The source of these parabolic waves are outputs of 25 pin and 26 pin of IC102.

2.5 Video block

2.5.1 Video amplifier

(1) The circuits of video amplifier are in PCB-VIDEO.

(2) There are three video amps for RGB input which have identical circuit configuration. For simplification, the green-channel amp. will be explained in this chapter.

(3) This amplifier is composed of the pre-amplifier section and the main-amplifier section. The video signal (0.7Vp-p STD) is amplified to approx. 2Vp-p in the pre-amplifier section and is amplified again to approx. 40Vp-p during the main-amplifier section.

(4) The input signal is fed to 10 pin of IC200 via C2G0. The gain of IC200 is controlled by the DC voltage of 21 pin. The higher voltage of 13 pin makes the gain of IC200 larger. This IC also provides the function of the black level clamp. The clamp pulse which is added at the back-porch duration of video signal is fed to 14 pin. The voltage level of 15 pin is fixed, which is a control of brightness for RGB signal.

(5) The output signal of IC200 is connected to the main-amplifier (cascade connection of Q6G0 and Q6G1) via emitter follower Q2G0.

(6) The output of the main-amplifier (Q6G0 and Q6G1) is fed into the push-pull emitter follower Q6G2 and Q6G3.

(7) To display a pure white image on screen, both the DC level and the amplitude of video output signal should be adjusted as the 3 guns characteristics of CRT's are not identical. The DC level of cathode can be adjusted by R6R0 (R-BIAS), VR6G0 (G-BIAS) and VR6B0 (B-BIAS).

2.5.2 Sync separation circuit

(1) This monitor can be synchronized under following conditions.
  (a) Composite sync signal on green video
  (b) Composite sync signal (negative going)
  (c) Horizontal sync./vertical sync signals (positive or negative going)

(2) The sync separation circuit provides following functions.
  (a) Separating the composite sync signal from the green video signal
  (b) Amplifying the composite sync signal level to TTL level
  (c) Separating the horizontal and vertical sync signal from the composite sync signal

(3) This sync separation circuit is controlled by IC104 on PCB-SET. The horizontal sync signal is input to 6 pin of IC104. And the output of horizontal sync is fed from 14 pin of IC104 to 1 pin of IC701 on PCB-SET.
  Vertical sync signal is input to 8 pin of IC104. The output of vertical sync is fed from 13 pin of IC104 to 30 pin of IC701 on PCB-SET.
  Clamp pulse is fed from 17 pin of IC104 to 14 pin of IC200 on PCB-SET.
  Sync on green signal is fed into IC104 to slice the composite sync out.

2.5.3 Blanking circuit

(1) The blanking circuit and the bright control circuit are in PCB-MAIN.

(2) The blanking pulse generated by Q524, Q525 and Q523 in PCB-MAIN is fed to PCB-CRT.
  The blanking pulse is approx. 24Vp-p negative going pulse.
  This pulse is connected to G1 of CRT via the coupling capacity C543 on PCB-MAIN.
  The blanking action is realized so that the voltage of G1 is kept in the negative potential during the blanking period.

(3) The brightness control is performed by adjusting the voltage of G1.
  The brightness control is controlled by the output of IC102 pin 6 on PCB-SET.

2.5.4 OSD circuit

(1) OSD IC is IC105 controlled by IC101.

(2)13, 14 and 15 pin of IC105 generate the OSD signals and 12 pin of IC105 generates the OSD blanking signal.

(3) Q6R5, Q6G5 and Q6B5 are the video mixer for OSD signal and video signal.

(4) Q2R2, Q2G2 and Q2B2 are the video signal blanking at period of OSD.

3. Adjustment procedure

3.1 Application

This describes the adjustment and overhaul for HR monitor of FFF87** series.

3.2 Range of adjustment and overhaul

This describes that it is enable to be over all-adjustment. Adjust and confirm according to the needs of overhaul.

Type	Model name	Reference
1	FFF8705 series	

3.3 Equipments

1)	Signal generator A	Mitsubishi MIN-600 or equivalent.
2)	Signal generator	BAstrodesign VG819 or equivalent.
3)	DC voltage meter1	50 class 0.5 or Digital voltage meter
4)	High voltage meter	30KV range class 0.5
5)	Luminance meter	Minolta color analyzer CA-100 or equivalent
6)	AC voltage meter	150V/300V class 0.5
7)	Oscilloscope	100MHz band width above
8)	Voltage convertor	Adjustment range over AC260V
9)	Double scale rule	rfor size adjustment, distortion measurement
10)	insulation resistance tester	Yokogawa TYPE3213 or equivalent
11)	Withstanding voltage tester	Kikusui MODEL865A oar equivalent
12)	Frequency counter	Iwatsu SC-7101 or equivalent
13)	Digital power meter	Hioki MODEL 3183 or equivalent

3.4 PREPARATION AND INSPECTION

1) Monitor must be assembled.
2) PWB must have no crack,break and remarkable stain.
3) Components for PWB shall be no remarkable lift up, slanting and in contact with another components.
4) All connectors, recaptacle pins must be clamped firmly and fully inserted.
5) CRT socket must rest fully into CRT neck. Anode Cap must be properly clicked into CRT Anode.
6) Lead wires must not be pressed against any edge of metal parts.
7) Lead wires must not be in contact with high temperature components, e.g. R-Metal,R-Cement,etc.
8) Metal parts must have no scratch, unacceptable stain and no dent or bend.
9) CRT face must have no scratch or black spot by visual check.
10) All variable potentiometer can adjust smoothly.
11) Initial condition of each variable potentiometers and switchs must be set following position.

(A) centre position

PWB-MAIN	VR501 (H-DRIVE-LOW), VR503 (H-CENT)
PWB-SET	VR701 (H-SAW), VR702 (H-DRIVE-HI)
PWB-VERT	VR211 (G1) , VR401 (V-LIN)

(B) fully counterclockwise position

PWB-MAIN	VR504 (X-PRO), VR505 (SCREEN), VR506 (HV-ADJ)
	VR507 (HS-ADJ) for only ITEM1
FLYBACK TRANS	FOCUS 1, FOCUS 2
PWB-CRT	VR6B0 (B-CUT-OFF), VR6G0 (G-CUT-OFF), VR6R0 (R-CUT-OFF)

(C)switches position

PWB-MAIN	SW501 (H-CENT) VR503 side
PWB-SET	SW201 (S on G SW) Upper position, SW701 (F/R SW) Left position

12) Adjustment mode

There are 3 adjustment mode in this monitor.

(a) User mode
(b) Factory mode
(c) Remote mode

(a) User mode

The user mode is opened for the general end user operation and is available to adjust contrast, brightness, the raster size, position, side-bow, keystone, color-select, color-adjustment, rotation and moire by the adjustment buttons on the front panel and information of on screen display.

Continuous pressing of the adjustment button changes data in CPU RAM and DAC output data.
(Picture conditions changed accordingly to these adjustment.)
When release, all CPU RAM data is written into EEPROM.

When input preset timing, pressing "RESET" button on any menus except "COLOR" menu will restore the default geometry, also pressing "RESET" button on "COLOR" menu will restore selected default color.
Default geometry defined as horizontal position, horizontal size, vertical position, vertical size, side-bow and keystone.

Figure 6. OSD format at user mode

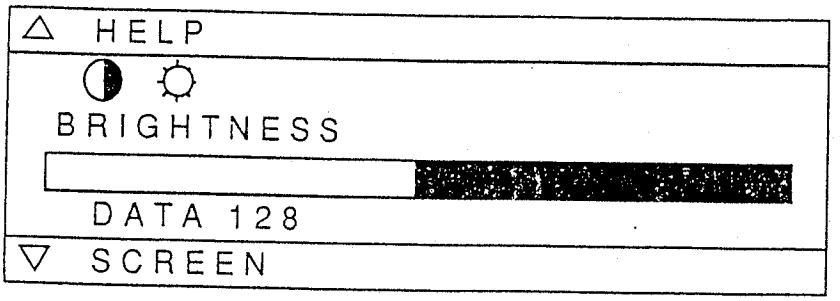


Table 2. Table for user adjustment items

No.	Page	ITEM	Remark
1	LUMINANCE	CONTRAST	
		BRIGHTNESS	
2	SCREEN	H-POSITION	
		H-SIZE	
		V-POSITION	
		V-SIZE	
3	DISTORTION	SIDE-BOW	
		KEYSTONE	
		ROTATION	
		MOIRE	
4	COLOR	RED-LEVEL	
		BULE-LEVEL	
		COLOR MODE	Standard / Broadcast / Publish
5	POWER SAVE	—	Power management on / off
6	HELP	—	show inputed signal frequency

(b) Factory mode

The factory mode has some additional items from normal mode.
These items are accessible when factory mode is enabled.

To enable factory mode by front panel

1) Power off the monitor.
2) Press and hold the degauss button while power on the monitor.
3) Press ADJUST -"-" button once to set the level to "255".
4) Press ADJUST -"+" button to set the level to "5".
5) Press the right arrow (⇒) button once.
   The factory mode is maintained unless disable procedure is done.

To exit factory mode by front panel

1) Select the factory mode OSD.
2) Press ADJUST -"+" button to set the level is "10".
3) Press the right arrow (⇒) button once.

Figure 7. OSD format at factory mode

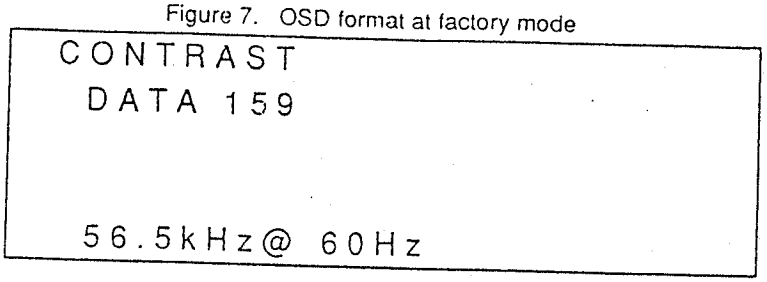


Table 3. Table for factory adjustment items

No.	ITEM	Remark
1	CONTRAST	
2	BRIGHTNESS	
3	H-POSITION	
4	H-SIZE	
5	V-POSITION	
6	V-SIZE	
7	SIDE-BOW	
8	KEYSTONE	
9	ROTATION	
10	MOIRE	
11	RED-LEVEL	
12	BLUE-LEVEL	
13	COLOR MODE	Standard / Broadcast / Publish
14	POWER SAVE	Power management on / off
15	DBFV	DBFV-High / -Low
16	DBFH	DBFH-High / Mid / Low
17	B4AD	B4AD-high / Mid / Low
18	HOSC	HOSC-High / Mid / Low
19	FACTORY MODE	enter / exit

(c) Remote mode

The remote mode has the same number of adjustment items as in the factory mode. When connect to auto adjustment machine accesed through a RS232C cable from a remote PC, monitor automaticaly change to this mode.

The remote mode has some additional items from factory mode, which are different adjustment items COMP PIN, COMP KEY, C BOW.

3.5 ADJUSTMENT

Magnetic field shall be as follows.

horizontal magnetic field : 0.0mT

Vertical magnetic field for Northern hemisphere : +0.04mT
for Equator : -0.01mT
for Southern hemisphere : -0.055mT

Unless otherwise specified herein. Input voltage shall be as follows.

AC120V (60Hz)

Following procedure must be in the factory mode.

3.5.1 Rough Adjustment

3.5.1.1 Backraster luminance

1) Input T7 (31.5kHz) frame signal.
2) Adjust VR505 (SC-ADJ) to set the backraster to moderate luminance.

3.5.1.2 Conformation of Vertical Free Running Freqency

1) Input T22 (fv=50Hz) full white signal.
3) Ensure that picture is stable.

3.5.1.3 Horizontal free running frequency adjustment

1) Clip frequency counter probe on the red lead wire across PWB-MAIN to horizontal deflection yoke.
2) Set SW701 to right position (free running position).
3) Input T7 (31.5kHz) frame signal.
4) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "HOSC". (OSD indicate "HOSC-LOW")
5) Adjust horizontal free running frequency to 31.47kHz ± 0.2kHz by pressing ADJUST-"+" and -"-" .
6) Input T11 (56.5kHz) frame signal. (OSD indicate "HOSC-MID")
7) Adjust horizontal free running frequency to 56.5kHz ± 0.2kHz by pressing ADJUST-"+" and -"-" .
8) Input T21 (82.5kHz) frame signal. (OSD indicate "HOSC-HIGH")
9) Adjust horizontal free running frequency to 82.5kHz ± 0.2kHz by pressing ADJUST-"+" and -"-" .
10) Set SW701 to left positon (normal position).

3.5.1.4 Saw tooth wave form amplitude adjustment

1) Connect prove of oscilloscope across TP-SAW it's located on the PWB-VIDEO/CONT and chassis GND.
2) Input T7 (31.5kHz) frame signal.
3) Adjust VR701 to get 2.4 ± 0.1Vp-p.

3.5.1.5 +B adjustment

1) Connect DC voltmeter across J510 #3 pin it's located on PWB-MAIN and chassis GND.
2) Input T21 (82.5kHz) frame signal.
3) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "B4AD". (OSD indicate "B4AD-HIGH")
4) Adjust +B voltage to 170V ± 0.5V by pressing ADJUST-"+" and -"-" .
5) Input T11 (56.5kHz) frame signal. (OSD indicate "B4AD-MID")
6) Adjust +B voltage to 113V ± 0.5V by pressing ADJUST-"+" and -"-" .
7) Input T7 (31.5kHz) frame signal. (OSD indicate "B4AD-LOW")
8) Adjust +B voltage to 60V ± 0.5V by pressing ADJUST-"+" and -"-" .

3.5.1.6 H-DRIVE adjustment

1) Connect DC voltmeter across J510 #1 and #3 pin it's located on PWB-MAIN.
2) Input T7 (31.5kHz) reverse cross hacth signal.
3) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "H-SIZE".
4) Adjust H-SIZE to approximately 300mm by pressing ADJUST-"+" and -"-".
5) Adjust VR501 (H-DRIVE-LOW) to get a minimum DC voltage indication and read the indicated value.
6) Input T14 (82kHz) reverse cross hacth signal.
7) Adjust H-SIZE to approximately 320mm by pressing ADJUST-"+" and -"-".
9) Adjust VR702 (H-DRIVE-HI) to get a minimum DC voltage indication.
10) Input T7 (31.5kHz) revers cross hacth signal.
11) Read the indicated value.
12) Diffrence between 5) and 11) must be less than 0.1mV. If more than 0.1mV adjust again from 2) ~.

3.5.1.7 Rotation adjustment

1) Input T7 (31.5kHz) revers cross hacth signal.
2) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "ROTATION".
3) Adjust ROTATION to confirm circuit performance by pressing ADJUST-"+" and adjust back to level "128".

3.5.1.8 Confimation of Video Circuit

1) Input T7 (31.5kHz) Color Bar signal.
2) Confim Color Bar sequence.

3.5.1.9 Preparation of Raster Aging

1) Input T7 (31.5kHz) full white signal.
2) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "POWER SAVE".
3) Press ADJUST-"-" to set power management to disable.
4) Remove signal and adjust VR505 (SC-ADJ) to get raster agimg condition.

3.5.2 Adjustment

3.5.2.1 Saw tooth wave form amplitude adjustment

1) Connect prove of oscilloscope across TP-SAW it's located on the PWB-VIDEO/CONT and chassis GND.
2) Input T7 (31.5kHz) frame signal.
3) Adjust VR701 to get 2.4 ± 0.1Vp-p and marking shall be painted on the cap of VR701.

3.5.2.2 Horizontal free running frequency adjustment

1) Clip frequency counter probe on the red lead wire across PWB-MAIN to horizontal deflection yoke.
2) Set SW701 to right position (free running position).
3) Input T7 (31.5kHz) frame signal.
4) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "HOSC". (OSD indicate "HOSC-LOW")
5) Adjust horizontal free running frequency to 31.47kHz ± 0.15kHz by pressing ADJUST-"+" and -"-" .
6) Input T11 (56.5kHz) frame signal. (OSD indicate "HOSC-MID")
7) Adjust horizontal free running frequency to 56.5kHz ± 0.15kHz by pressing ADJUST-"+" and -"-" .
8) Input T21 (82.5kHz) frame signal. (OSD indicate "HOSC-HIGH")
9) Adjust horizontal free running frequency to 82.5kHz ± 0.15kHz by pressing ADJUST-"+" and -"-" .
10) Set SW701 to left positon (normal position).

3.5.2.3 High voltage and High voltage protector adjustment

1) Connect high voltagemeter across the CRT anode and chassis GND.
2) Connect DC voltmeter across J510 #3 pin it's located on PWB-MAIN and chassis GND.
3) Connect DC volt meter across TP-PRO located on PWB-MAIN and chassis GND.
4) Set VR506 (HV-ADJ) fully CCW position.
5) Input T21 (82.5kHz) frame signal.
6) Confirm H-SIZE approximately 300mm.
7) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "B4AD". (OSD indicate "B4AD-HIGH")
8) Adjust +B voltage to 170V ± 0.5V by pressing ADJUST-"+" and -"-".
9) Input T11 (56.5kHz) frame signal. (OSD indicate "B4AD-MID")
10) Adjust +B voltage to 113V ± 0.5V by pressing ADJUST-"+" and -"-".
11) Input T7 (31.5kHz) frame signal. (OSD indicate "B4AD-LOW")
12) Adjust +B voltage to 60V ± 0.5V by pressing ADJUST-"+" and -"-" .
13) Set VR505(SCREEN) fully CCW position.
14) Input T7 (31.5kHz) frame signal.
15) Adjust VR506 (HV-ADJ) slowly to CW and set high voltage 26.5kV ± 0.2kV.
16) Adjust VR504(HV-LIMIT) slowly to CW and set TP-PRO to GND voltage 5.95V ± 0.05V.
17) Set VR506 (HV-ADJ) fully CCW position.
18) Read high voltage value.
19) Adjust VR506(HV-ADJ) to CW and set high voltage +0.4kV increased.
20) Ensure that high voltage less than 26.3kV.
21) Input T11 (56.5kHz) frame signal
22) Ensure that high voltage is less than 26.3kV.
23) Apply DC18V across TP-PRO to GND through the 1kΩ.
24) Confirm high voltage become 0V.
25) Check high voltage limiter never work after power off and on more than 3 times.
26) Cover VR504, VR506 by the DHHS-CAP and fix it by using TSE3940 glue.

3.5.2.4 Horizontal raster position

1) Input T4 (82kHz) no video signal.
2) Adjust VR505(SCREEN) on PWB-MAIN until dim back-raster appears.
3) Set SW501(H-SENT SW) and VR503(H-CENT) to get raser position approximatery at the center of CRT.

3.5.2.5 Horizontal width

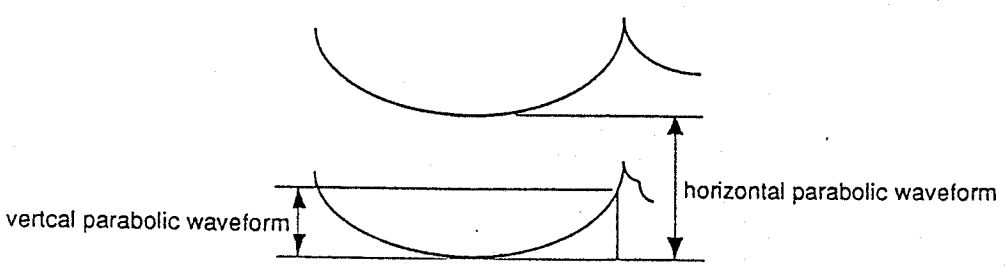
1) Input T4 (80kHz) full white signal.
2) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "H-SIZE".
3) Set horizontal size to minimun by pressing ADJUST-"-".
4) Confirm horizontal size is less than 295mm. If horizontal size is more than 295mm, adjust VR507(HS-ADJ) to get 293 ± 2mm.
5) Set horizontal size to approximately 300mm by pressing ADJUST-"+".

3.5.2.6 H-DRIVE adjustment

1) Connect DC voltmeter across J510 #1 and #3 pin it's located on PWB-MAIN.
2) Input T7 (31.5kHz) reverse cross hacth signal.
3) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "H-SIZE".
4) Adjust H-SIZE to approximately 300mm by pressing ADJUST-"+" and -"-".
5) Adjust VR501 (H-DRIVE-LOW) to get a minimum DC voltage indication and read the indicated value.
6) Input T14 (82kHz) reverse cross hacth signal.
7) Adjust H-SIZE to approximately 320mm by pressing ADJUST-"+" and -"-".
9) Adjust VR702 (H-DRIVE-HI) to get a minimum DC voltage indication.
10) Input T7 (31.5kHz) revers cross hacth signal.
11) Read the indicated value.
12) Diffrence between 5) and 11) must be less than 0.1mV. If more than 0.1mV adjust again from 2) ~.

3.5.2.7 Sub focus adjustment

1) Connect oscillo-scope across TP-DBF to GND on PWB-MAIN.
2) Input T7 (31.5kHz) frame signal.
3) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "DBFH". (OSD indicate "DBFH-LOW")
4) Adjust horizontal parabolic waveform to get 250V ± 10V by pressing ADJUST-"+" and -"-".
5) Input T11 (56.5kHz) frame signal. (OSD indicate "DBFH-MID")
6) Adjust horizontal parabolic waveform to get 300V ± 10V by pressing ADJUST-"+" and -"-".
7) Input T21 (82.5kHz) frame signal. (OSD indicate "DBFH-HIGH")
8) Adjust horizontal parabolic waveform to get 300V ± 10V by pressing ADJUST-"+" and -"-".
9) Input T22 (fv = 50Hz) frame signal.
10) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "V-SIZE".
11) Adjust vertical size to approximately 225mm by pressing ADJUST-"+" and -"-".
12) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "DBFV". (OSD indicate "DBFV-LOW")
13) Adjust vertcal parabolic waveform to get 210V ± 10V by pressing ADJUST-"+" and -"-".
12) Input T23 (fv = 130Hz) frame signal.
10) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "V-SIZE".
11) Adjust vertical size to approximately 185mm by pressing ADJUST-"+" and -"-".
12) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "DBFV". (OSD indicate "DBFV-HIGH")
13) Adjust vertcal parabolic waveform to get 95V ±10V by pressing ADJUST-"+" and -"-".



3.5.2.8 Vertical linearity

1) Input T11 (56.5kHz) cross hacth signal.
2) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "V-SIZE".
3) Adjust vertical size to get approximately 225mm by pressing ADJUST-"+" and -"-".
4) Adjust VR401 (V-LIN) to get diffrence between top and bottom is less than 1mm.

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3.5.2.9 Vertical size and position

Adjust for all preset timing at factory mode.

1) Input full white signal.
2) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "V-SIZE".
3) Adjust vertical size to get 225mm ± 4mm by pressing ADJUST-"+" and -"-".
4) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "V-POSITION".
5) Adjust vertical position to get the deffrence is less than 3mm by pressing ADJUST-"+" and -"-".

3.5.2.10 Side bow and Keystone

Adjust for all preset timing at factory mode.

1) Input full white signal.
2) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "SIDE-BOW".
3) Adjust side pin cushion to get approximately 0mm by pressing ADJUST-"+" and -"-".
4) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "KEYSTONE".
5) Adjust keystone to get approximately 0mm by pressing ADJUST-"+" and -"-".

3.5.2.11 Horizontal size and phase

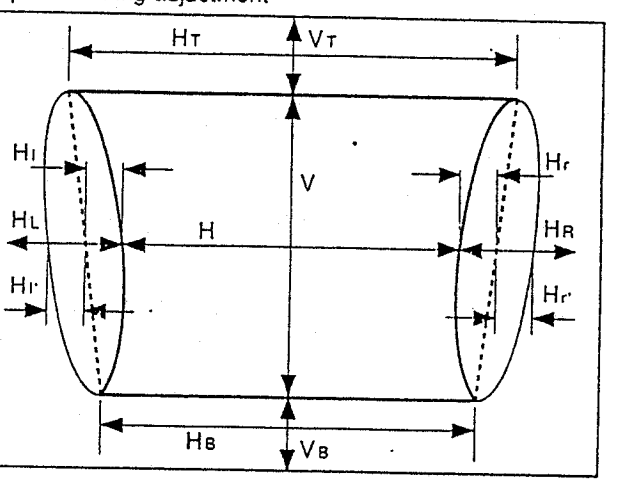
Adjust for all preset timing at factory mode.

1) Input full white signal.
2) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "H-SIZE".
3) Adjust horizontal size to get 300mm ± 4mm by pressing ADJUST-"+" and -"-" .
4) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "H-POSITION".
5) Adjust horizontal position to get the deffrence is less than 3mm by pressing ADJUST-"+" and -"-" .

Detail specification of 5-2-9 ~ 5-2-11 is shown in Table 4.

Table 4. Specification for preset timing adjustment

Item	Specification Unit : mm	ITEM 1	
		*	**
V-SIZE	V = 225±	6	8
V-POSITION	I VT - VB I <	6	6
H-SIZE	H = 300±	6	8
H-POSITION	I HL - HR I <	6	8
SIDE-BOW	Hl, Hr <	1	1
	I Hl', - Hr' <	0	0
KEYSTONE	I HT - HB I <	2	2



3.5.2.12 Horizontal phase adjustment for 80kHz for ITEM 1 only

1) Input T4 (80kHz) full white signal.
2) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "H-POSITION".
3) Adjust horizontal position to get centre of back raster by pressing ADJUST-"+" and -"-".
4) Ensure that horizontal position is less than 3mm.

3.5.2.13 Rotation

1) Input T11 (56.5kHz) full white signal.
2) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "ROTATION".
3) Ensure that rotation level is "128" (centre).
4) Make sure that raster rotation is less than 1.5mm.
5) Press ADJUST-"+" and -"-" to get the raster rotation is less than 1.0mm.
6) Ensure that rotation level is within "90 ~ 165".

3.5.2.14 CRT cut off adjustment

1) Set VR6B0 (B-BIAS), VR6G0 (G-BIAS), VR6R0 (R-BIAS) fully counter clockwise.
2) Input T11 (56.5kHz) no video signal.
3) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "CONTRAST".
4) Press ADJUST-"+" or -"-" button once to get center brightness.
5) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "BRIGHTNESS".
6) Ensure that brightness level is "128" (centre).

7) Connect digital voltmeter to the test point TP-SC on the PWB-CRT.
8) Adjust VR505 (SCREEN) on PWB-MAIN G2 to get 750V ± 5V
9) Set VR211 (G1) on PWB-VIDEO to get dim raster (0.5 ~ 1 cd/m2).
10) Adjust VR6B0 (B-BIAS), VR6G0 (G-BIAS), VR6R0 (R-BIAS) to get color coordinationX=0.283 ± 0.005, Y=0.297 ± 0.005.
11) Adjust VR211 (G1) to get a dim raster 0.3 ± 0.05cd/m2.
12) Ensure that color coordination is X=0.283 ± 0.005, Y=0.297 ± 0.005. If out of specification, go to step 10) to adjust.

3.5.2.15 Brightness and white balance

Adjustment for standerd color

1) Input T11 (56.5kHz) green window signal. (approximatry 80 x 80 mm)
2) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "COLOR MODE".
3) Press ADJUST-"+" and -"-" to select the OSD to "STANDERD".
4) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "CONTRAST".
5) Press ADJUST-"+" or -"-" button once to get center brightness.
6) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "BRIGHTNESS".
7) Ensure that brightness level is "128" (centre).
8) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "CONTRAST".
9) Adjust green window luminance to get 100 ± 1cd/m2 by pressing ADJUST-"+" and -"-" .
10) Input T11 (56.5kHz) white window signal. (approximatry 80 x 80 mm)
11) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "RED-LEVEL" or "BLUE-LEVEL".
12) Adjust RED-LEVEL and BLUE-LEVEL to get color coordination X=0.283 ± 0.01, Y=0.297 ± 0.01 by pressing ADJUST-"+" and -"-" .
13) Make sure that brigtness is 100 ~ 130cd/m2 at full white pattern.

Adjustment for broadcast color

1) Input T11 (56.5kHz) green window signal. (approximatry 80 x 80 mm)
2) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "COLOR MODE".
3) Press ADJUST-"+" and -"-" to select the OSD to "BROADCAST".
4) Input T11 (56.5kHz) white window signal. (approximatry 80 x 80 mm)
5) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "RED-LEVEL" or "BLUE-LEVEL".
6) Adjust RED-LEVEL and BLUE-LEVEL to get color coordination X=0.313 ± 0.01, Y=0.329 ± 0.01 by pressing ADJUST-"+" and -"-" .

Adjustment for broadcast color

1) Input T11 (56.5kHz) green window signal. (approximatry 80 x 80 mm)
2) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "COLOR MODE".
3) Press ADJUST-"+" and -"-" to select the OSD to "PUBLISH".
4) Input T11 (56.5kHz) white window signal. (approximatry 80 x 80 mm)
5) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "RED-LEVEL" or "BLUE-LEVEL".
6) Adjust RED-LEVEL and BLUE-LEVEL to get color coordination X=0.336 ± 0.01, Y=0.352 ± 0.01 by pressing ADJUST-"+" and -"-" .

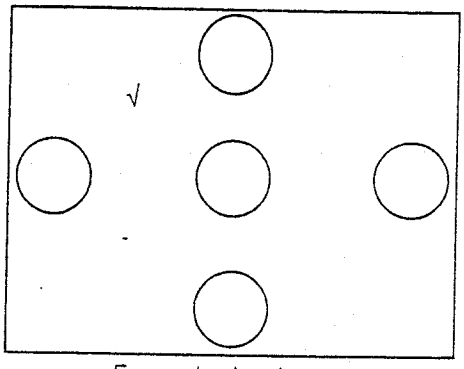
3.5.2.16 Color tracking

1) Set the monitor to user mode by using procedure item 4.3.
2) Input T11 (56.5kHz) white window signal. (approximatry 80 x 80 mm)
3) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "LUMINANCE".
4) Press SELECT-L (⇐) and -R (⇒) to select the OSD to "CONTRAST".
5) Set contrast to maximun by pressing ADJUST-"+".
6) Read color coordination (X, Y).
7) Set luminance 30cd/m2 by pressing ADJUST-"-".
8) Color coordination (X, Y) must be within ± 0.015 from the maxinum contrast condition.
5) Set back contrast to maximun by pressing ADJUST-"+".

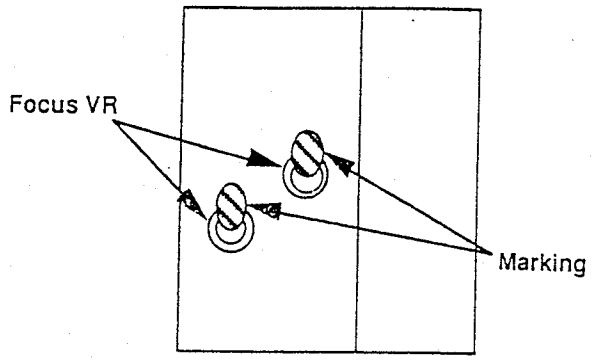
3.5.2.17 Focus adjustment

1) Input T12 (74.6kHz) white "H" characters signal.
2) Ensure that contrast is maxinum and brightness is centre.
3) Adjust the FOCUS 1 and FOCUS 2 on the flyback transformer to get best focus on the entire screen.
4) After adjustment, the marking must be paint on the FOSUS 1 and FOCUS 2 VRs to indicate the adjustment position.

Note 1) Adjust FOCUS-1 to get best focus centre of horizontal line
2) Adjust FOCUS-2 to get best focus both side of vertical line
3) "√" is check point for confirmation.



Focus check point



Flyback trans

3.5.2.18 DDC data store
1) Use the jig to store EDID data to IC103.
2) Verify the sotred data.

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Table 5. Adjustment timing table

No.	Fh	Fv	Model	
			ITEM 1	Remark
T1	37.5kHz	75.0Hz	※※	640X480
T2	46.9kHz	75.0Hz	※※	800X600
T3	60.0kHz	75.0Hz	※※	1024X768
T4	80.0kHz	75.0Hz	※※	VESA1280X1024
T5	31.5kHz	70.1Hz		640X350
T6		70.1Hz		640X400
T7		59.8Hz		640X480
T8	37.9kHz	60.3Hz	※※	VESA800X600
T9	48.1kHz	72.2Hz	※※	VESA800X600
T10	48.4kHz	60.0Hz	※	VESA1024X768
T11	56.5kHz	70.1Hz	※	VESA1024X768
T12	74.6kHz	70.0Hz	※※	1280X1024
T13	64.0kHz	59.9Hz	※※	1280X1024
T14	82.0kHz	66.0Hz		1600X1200
T15	37.9kHz	72.8Hz		640x480
T16	67.9kHz	84.0Hz		1024x768
T17	53.3kHz	84.0Hz		800x600
T18	42.9kHz	84.0Hz		640x480
T19	37.9kHz	84.3Hz		640x400
T20	35.2kHz	56.3Hz		800x600
T24	35.0kHz	66.6Hz	※※	640x480 Mac II
T25	68.7kHz	75.0Hz	※※	1152x870 Apple21
T26	31.5kHz	70.0Hz	※	640x350
T27	31.5kHz	70.0Hz	※	640x400
T28	31.5kHz	59.9Hz	※	640x480

※ mark is 1'st group of preset timing. ※※ mark is 2'nd group of preset timing

3.6 INSPECTION

Unless otherwise specified herein.

Input voltage and magnetic field shall be follow adjustment condition (item 2).

3.6.1 PWB, Structure and Appearance

Above item check must be done according to item 3.4.

3.6.2 Electrical performance

Electrcal performance check must be done in user mode with contrast maximum and brightness at center.

3.6.2.1 Line regulation check

Vary the line voltage AC100 ~ 140V, AC180 ~ 260V smoothly and abruptly, no change in picture performance.

3.6.2.2 Power line frequency interference

Vary input line frequency 45Hz ~ 66Hz, observed from 50cm away from the monitor screen, there must not have jitter or picture waving.

If necessary, limit sample must be prepared as reference.

3.6.2.3 AC isolation test

Apply AC1500V for 2 second across live to ground, and neutral to ground must not have abnormal condition.

Equipment cut-off current setting must be 20mA.

3.6.2.4 solation resistance

Apply DC500V across live to ground, and neutral to ground, the isolation resistance must be greater than 10MΩ.

3.6.2.5 Degauss circuit confirmation

When press degauss botton once on the front panel, confirm the picture waving few seconds and ensure the screen is fully degauss.

3.6.2.6Focus

Focus at all points on the screen must be sharp and even throughout the screen.

3.6.2.7 Luminance uniformity

Display full white pattern, the difference in luminance between centre and four corners must be less than 25%.

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3.6.2.8 Centre click operation

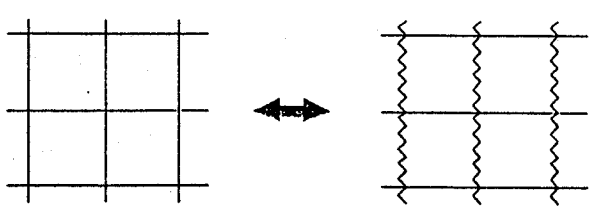
1) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "LUMINANCE".
2) Press SELECT-L (⇐) and -R (⇒) to select the OSD to "CONTRAST".
3) Press ADJUST-"-" to adjust contrast moderte level.
4) Press ADJUST-"+" and ADJUST-"-" at same time.
5) Esure that contrast level reset to level "255" (maximum).
7) Press SELECT-L (⇐) and -R (⇒) to select the OSD to "BRIGHTNESS".
8) Press ADJUST-"+" or ADJUST-"-" to adjust brightness moderte level.
9) Press ADJUST-"+" and ADJUST-"-" at same time.
10) Esure that brightness level reset to level "128" (centre).

3.6.2.9 Confirmation for power management

1) Power off the monitor.
2) Set AC input voltage to 240V and connect power meter.
3) Press and hold the degauss button while power on the monitor.
4) Press ADJUST-"-" once to set the level to "255".
5) Press ADJUST-"+" to set the level to "5".
6) Press the right arrow (⇒) button once to enable factory mode.
7) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "POWER SAVE".
8) Press ADJUST-"+" to activate power saving function.
9) Stand-by status.
9-1) Remove H-Sync.
9-2) Observe power LED is blinking at interval of approximately 3 second.
9-3) Observe power meter reads less than 80W.
9-4) Connect H-Sync.
9-5) Observe monitor in normal operation.
10) Suspend status.
10-1) Remove V-Sync.
10-2) Observe power LED is blinking at interval of approximately 3 second.
10-3) Observe power meter reads less than 15W.
10-4) Connect V-Sync.
10-5) Observe monitor in normal operation.
11) Complete off status.
11-1) Remove H-Sync. and V-Sync.
11-2) Observe power LED is blinking at interval of approximately 3 second.
11-3) Observe power meter reads less than 8W.
11-4) Connect H-Sync. and V-Sync.
11-5) Observe monitor in normal operation.
12) Select the factory mode OSD.
13) Press ADJUST-"+" to set the level is "10".
14) Press the right arrow (⇒) button once to exit factory mode.

3.6.2.10 Confirmation for moire canceller.

1) Input T11 (56.5kHz) cross-hatch signal.
2) Press SELECT-U (⇑) and -D (⇓) to select the OSD to "DISTORTION".
3) Press SELECT-L (⇐) and -R (⇒) to select the OSD to "MOIRE".
4) Press ADJUST-"+".
5) Ensure that performance of moire canceller circuit. (refer below figure)
6) Press ADJUST-"-" to set back to minimum.



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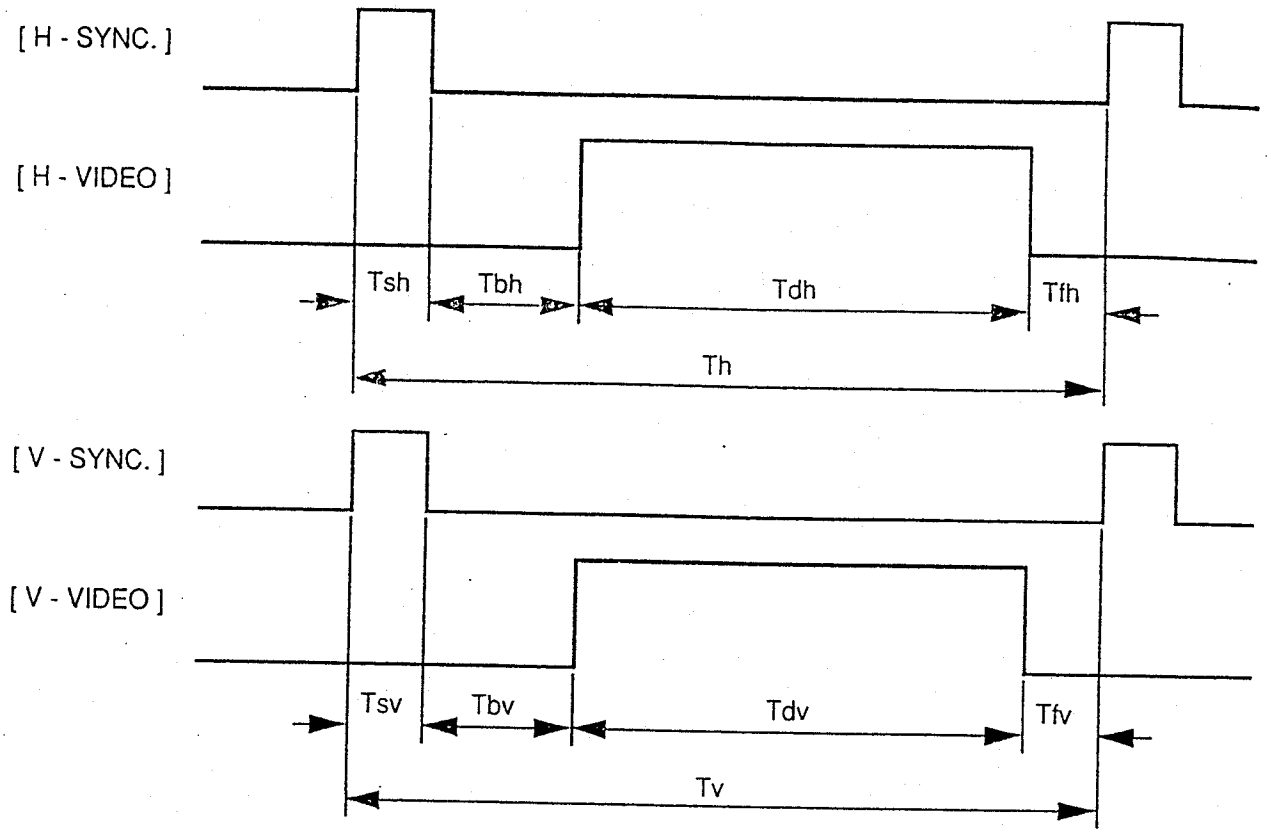
3.7 TIMING CHART



T1, Fh = 37.500kHz, Fv = 75.000Hz (640 x 480)

Horizontal period	(Th)	-----26.666µSec.		Vertical period	(Tv)	-----13.333mSec.
Horizontal sync. puls	(Tsh)	----- 2.032µSec.		Vertical sync. puls	(Tsv)	----- 0.080mSec.
Horizontal front porch	(Tfh)	----- 0.508µSec.		Vertical front porch	(Tfv)	----- 0.027mSec.
Horizontal back porch	(Tbh)	----- 3.809µSec.		Vertical back porch	(Tbv)	----- 0.426mSec.
Horizontal video area	(Tdh)	-----20.317µSec.		Vertical video area	(Tdv)	-----12.800mSec.

Sync signal Separate Horizontal : Negative
Vertical : Negative

T2, Fh = 46.875kHz, Fv = 75.000Hz (800 x 600)

Horizontal period	(Th)	-----21.333µSec.		Vertical period	(Tv)	-----13.333mSec.
Horizontal sync. puls	(Tsh)	----- 1.616µSec.		Vertical sync. puls	(Tsv)	----- 0.064mSec.
Horizontal front porch	(Tfh)	----- 0.323µSec.		Vertical front porch	(Tfv)	----- 0.021mSec.
Horizontal back porch	(Tbh)	----- 3.232µSec.		Vertical back porch	(Tbv)	----- 0.448mSec.
Horizontal video area	(Tdh)	-----16.162µSec.		Vertical video area	(Tdv)	-----12.800mSec.

Sync signal Separate Horizontal : Positive
Vertical : Positive

T3, Fh = 60.023kHz, Fv = 75.029Hz (1024 x 768)

Horizontal period	(Th)	-----16.660µSec.		Vertical period	(Tv)	-----13.328mSec.
Horizontal sync. puls	(Tsh)	----- 1.219µSec.		Vertical sync. puls	(Tsv)	----- 0.050mSec.
Horizontal front porch	(Tfh)	----- 0.203µSec.		Vertical front porch	(Tfv)	----- 0.017mSec.
Horizontal back porch	(Tbh)	----- 2.235µSec.		Vertical back porch	(Tbv)	----- 0.466mSec.
Horizontal video area	(Tdh)	-----13.003µSec.		Vertical video area	(Tdv)	-----12.795mSec.

Sync signal Separate Horizontal : Positive
Vertical : Positive

T4, Fh = 79.976kHz, Fv = 75.025Hz (VESA 1280 x 1024)

Horizontal period	(Th)	-----12.504µSec.	Vertical period	(Tv)	-----13.329mSec.
Horizontal sync. puls	(Tsh)	----- 1.067µSec.	Vertical sync. puls	(Tsv)	----- 0.038mSec.
Horizontal front porch	(Tfh)	----- 0.119µSec.	Vertical front porch	(Tfv)	----- 0.013mSec.
Horizontal back porch	(Tbh)	----- 1.837µSec.	Vertical back porch	(Tbv)	----- 0.474mSec.
Horizontal video area	(Tdh)	----- 9.481µSec.	Vertical video area	(Tdv)	-----12.804mSec.

Sync signal Separate Horizontal : Positive
Vertical : Positive

T5, Fh = 31.469kHz, Fv = 70.087Hz (640 x 350)

Horizontal period	(Th)	-----31.777µSec.	Vertical period	(Tv)	-----14.268mSec.
Horizontal sync. puls	(Tsh)	----- 3.813µSec.	Vertical sync. puls	(Tsv)	----- 0.064mSec.
Horizontal front porch	(Tfh)	----- 0.636µSec.	Vertical front porch	(Tfv)	----- 0.985mSec.
Horizontal back porch	(Tbh)	----- 1.906µSec.	Vertical back porch	(Tbv)	----- 1.715mSec.
Horizontal video area	(Tdh)	-----25.422µSec.	Vertical video area	(Tdv)	-----11.504mSec.

Sync signal Separate Horizontal : Positive
Vertical : Negative

T6, Fh = 31.468kHz, Fv = 70.085Hz (720 x 400)

Horizontal period	(Th)	-----31.778µSec.	Vertical period	(Tv)	-----14.268mSec.
Horizontal sync. puls	(Tsh)	----- 3.813µSec.	Vertical sync. puls	(Tsv)	----- 0.064mSec.
Horizontal front porch	(Tfh)	----- 0.318µSec.	Vertical front porch	(Tfv)	----- 0.413mSec.
Horizontal back porch	(Tbh)	----- 2.224µSec.	Vertical back porch	(Tbv)	----- 1.080mSec.
Horizontal video area	(Tdh)	-----25.423µSec.	Vertical video area	(Tdv)	-----12.711mSec.

Sync signal Separate Horizontal : Negative
Vertical : Positive

T7, Fh = 31.406kHz, Fv = 59.821Hz (640 x 480)

Horizontal period	(Th)	-----31.841µSec.	Vertical period	(Tv)	-----16.717mSec.
Horizontal sync. puls	(Tsh)	----- 3.821µSec.	Vertical sync. puls	(Tsv)	----- 0.064mSec.
Horizontal front porch	(Tfh)	----- 0.637µSec.	Vertical front porch	(Tfv)	----- 0.350mSec.
Horizontal back porch	(Tbh)	----- 1.910µSec.	Vertical back porch	(Tbv)	----- 1.019mSec.
Horizontal video area	(Tdh)	-----25.473µSec.	Vertical video area	(Tdv)	-----15.284mSec.

Sync signal Separate Horizontal : Negative
Vertical : Negative

T8, Fh = 37.879kHz, Fv = 60.317Hz (VESA 800 x 600)

Horizontal period	(Th)	-----26.400µSec.	Vertical period	(Tv)	-----16.579mSec.
Horizontal sync. puls	(Tsh)	----- 3.200µSec.	Vertical sync. puls	(Tsv)	----- 0.106mSec.
Horizontal front porch	(Tfh)	----- 1.000µSec.	Vertical front porch	(Tfv)	----- 0.026mSec.
Horizontal back porch	(Tbh)	----- 2.200µSec.	Vertical back porch	(Tbv)	----- 0.607mSec.
Horizontal video area	(Tdh)	-----20.000µSec.	Vertical video area	(Tdv)	-----15.840mSec.

Sync signal Separate Horizontal : Positive
Vertical : Positive

T9, Fh = 48.077kHz, Fv = 72.188Hz (VESA 800 x 600)

Horizontal period	(Th)	-----20.800µSec.	Vertical period	(Tv)	-----13.853mSec.
Horizontal sync. puls	(Tsh)	----- 2.400µSec.	Vertical sync. puls	(Tsv)	----- 0.125mSec.
Horizontal front porch	(Tfh)	----- 1.120µSec.	Vertical front porch	(Tfv)	----- 0.770mSec.
Horizontal back porch	(Tbh)	----- 1.280µSec.	Vertical back porch	(Tbv)	----- 0.478mSec.
Horizontal video area	(Tdh)	-----16.000µSec.	Vertical video area	(Tdv)	-----12.480mSec.

Sync signal Separate Horizontal : Positive
Vertical : Positive

T10, Fh = 48.363kHz, Fv = 60.004Hz (VESA 1024 x 768)

Horizontal period	(Th)	-----20.677µSec.	Vertical period	(Tv)	-----16.667mSec.
Horizontal sync. puls	(Tsh)	----- 2.092µSec.	Vertical sync. puls	(Tsv)	----- 0.124mSec.
Horizontal front porch	(Tfh)	----- 0.369µSec.	Vertical front porch	(Tfv)	----- 0.062mSec.
Horizontal back porch	(Tbh)	----- 2.462µSec.	Vertical back porch	(Tbv)	----- 0.601mSec.
Horizontal video area	(Tdh)	-----15.754µSec.	Vertical video area	(Tdv)	-----15.880mSec.

Sync signal Separate Horizontal : Negative
Vertical : Negative

T11, Fh = 56.476kHz, Fv = 70.069Hz (VESA 1024 x 768)

Horizontal period	(Th)	-----17.707µSec.	Vertical period	(Tv)	-----14.272mSec.
Horizontal sync. puls	(Tsh)	----- 1.813µSec.	Vertical sync. puls	(Tsv)	----- 0.106mSec.
Horizontal front porch	(Tfh)	----- 0.320µSec.	Vertical front porch	(Tfv)	----- 0.053mSec.
Horizontal back porch	(Tbh)	----- 1.921µSec.	Vertical back porch	(Tbv)	----- 0.514mSec.
Horizontal video area	(Tdh)	-----13.653µSec.	Vertical video area	(Tdv)	-----13.599mSec.

Sync signal Separate Horizontal : Negative
Vertical : Negative

T12, Fh = 74.645kHz, Fv = 70.023Hz (1280 x 1024)

Horizontal period	(Th)	-----13.397µSec.	Vertical period	(Tv)	-----14.281mSec.
Horizontal sync. puls	(Tsh)	----- 0.889µSec.	Vertical sync. puls	(Tsv)	----- 0.067mSec.
Horizontal front porch	(Tfh)	----- 0.635µSec.	Vertical front porch	(Tfv)	----- 0.013mSec.
Horizontal back porch	(Tbh)	----- 1.714µSec.	Vertical back porch	(Tbv)	----- 0.483mSec.
Horizontal video area	(Tdh)	-----10.159µSec.	Vertical video area	(Tdv)	-----13.718mSec.

Sync signal Separate Horizontal : Positive
Vertical : Positive

T13, Fh = 63.953kHz, Fv = 59.937Hz (1280 x 1024)

Horizontal period	(Th)	-----15.636µSec.	Vertical period	(Tv)	-----16.684mSec.
Horizontal sync. puls	(Tsh)	----- 1.018µSec.	Vertical sync. puls	(Tsv)	----- 0.078mSec.
Horizontal front porch	(Tfh)	----- 0.727µSec.	Vertical front porch	(Tfv)	----- 0.016mSec.
Horizontal back porch	(Tbh)	----- 2.255µSec.	Vertical back porch	(Tbv)	----- 0.578mSec.
Horizontal video area	(Tdh)	-----11.636µSec.	Vertical video area	(Tdv)	-----16.012mSec.

Sync signal Separate Horizontal : Negative
Vertical : Negative

T14, Fh = 81.967kHz, Fv = 65.996Hz (1600 x 1200)

Horizontal period	(Th)	-----12.200µSec.	Vertical period	(Tv)	-----15.152mSec.
Horizontal sync. puls	(Tsh)	----- 1.443µSec.	Vertical sync. puls	(Tsv)	----- 0.122mSec.
Horizontal front porch	(Tfh)	----- 0.541µSec.	Vertical front porch	(Tfv)	----- 0.073mSec.
Horizontal back porch	(Tbh)	----- 1.200µSec.	Vertical back porch	(Tbv)	----- 0.317mSec.
Horizontal video area	(Tdh)	----- 9.016µSec.	Vertical video area	(Tdv)	-----14.640mSec.

Sync signal Separate Horizontal : Positive
Vertical : Positive

T15, Fh = 37.861kHz, Fv = 72.809Hz (640 x 480)

Horizontal period	(Th)	-----26.412µSec.	Vertical period	(Tv)	-----13.735mSec.
Horizontal sync. puls	(Tsh)	----- 1.270µSec.	Vertical sync. puls	(Tsv)	----- 0.079mSec.
Horizontal front porch	(Tfh)	----- 0.508µSec.	Vertical front porch	(Tfv)	----- 0.026mSec.
Horizontal back porch	(Tbh)	----- 4.317µSec.	Vertical back porch	(Tbv)	----- 0.952mSec.
Horizontal video area	(Tdh)	-----20.317µSec.	Vertical video area	(Tdv)	-----12.678mSec.

Sync signal Separate Horizontal : Negative
Vertical : Negative

T16, Fh = 67.888kHz, Fv = 84.020Hz (1024 x 768)

Horizontal period	(Th)	-----14.730µSec.	Vertical period	(Tv)	-----11.902mSec.
Horizontal sync. puls	(Tsh)	----- 1.016µSec.	Vertical sync. puls	(Tsv)	----- 0.044mSec.
Horizontal front porch	(Tfh)	----- 0.254µSec.	Vertical front porch	(Tfv)	----- 0.015mSec.
Horizontal back porch	(Tbh)	----- 2.624µSec.	Vertical back porch	(Tbv)	----- 0.530mSec.
Horizontal video area	(Tdh)	-----10.836µSec.	Vertical video area	(Tdv)	-----11.313mSec.

Sync signal Separate Horizontal : Positive
Vertical : Positive

T17, Fh = 53.267kHz, Fv = 84.017Hz (800 x 600)

Horizontal period	(Th)	-----18.773µSec.	Vertical period	(Tv)	-----11.902mSec.
Horizontal sync. puls	(Tsh)	----- 1.138µSec.	Vertical sync. puls	(Tsv)	----- 0.056mSec.
Horizontal front porch	(Tfh)	----- 0.427µSec.	Vertical front porch	(Tfv)	----- 0.019mSec.
Horizontal back porch	(Tbh)	----- 2.986µSec.	Vertical back porch	(Tbv)	----- 0.563mSec.
Horizontal video area	(Tdh)	-----14.222µSec.	Vertical video area	(Tdv)	-----11.264mSec.

Sync signal Separate Horizontal : Positive
Vertical : Positive

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T18, Fh = 42.857kHz, Fv = 84.034Hz (640 x 480)

Horizontal period	(Th)	-----23.333µSec.	Vertical period	(Tv)	-----11.900mSec.
Horizontal sync. puls	(Tsh)	----- 1.111µSec.	Vertical sync. puls	(Tsv)	----- 0.070mSec.
Horizontal front porch	(Tfh)	----- 0.667µSec.	Vertical front porch	(Tfv)	----- 0.023mSec.
Horizontal back porch	(Tbh)	----- 3.777µSec.	Vertical back porch	(Tbv)	----- 0:607mSec.
Horizontal video area	(Tdh)	-----17.778µSec.	Vertical video area	(Tdv)	-----11.200mSec.

Sync signal Separate Horizontal : Negative
Vertical : Negative

T19, Fh = 37.927kHz, Fv = 84.283Hz (640 x 400)

Horizontal period	(Th)	-----26.366µSec.	Vertical period	(Tv)	-----11.865mSec.
Horizontal sync. puls	(Tsh)	----- 1.268µSec.	Vertical sync. puls	(Tsv)	----- 0.079mSec.
Horizontal front porch	(Tfh)	----- 0.761µSec.	Vertical front porch	(Tfv)	----- 0.237mSec.
Horizontal back porch	(Tbh)	----- 4.055µSec.	Vertical back porch	(Tbv)	----- 1.003mSec.
Horizontal video area	(Tdh)	-----20.282µSec.	Vertical video area	(Tdv)	-----10.546mSec.

Sync signal Separate Horizontal : Negative
Vertical : Positive

T20, Fh = 35.156kHz, Fv = 56.250Hz (800 x 600)

Horizontal period	(Th)	-----28.444µSec.	Vertical period	(Tv)	-----17.778mSec.
Horizontal sync. puls	(Tsh)	----- 2.000µSec.	Vertical sync. puls	(Tsv)	----- 0.057mSec.
Horizontal front porch	(Tfh)	----- 0.667µSec.	Vertical front porch	(Tfv)	----- 0.028mSec.
Horizontal back porch	(Tbh)	----- 3.555µSec.	Vertical back porch	(Tbv)	----- 0.626mSec.
Horizontal video area	(Tdh)	-----22.222µSec.	Vertical video area	(Tdv)	-----17.067mSec.

Sync signal Separate Horizontal : Positive
Vertical : Positive

T21, Fh = 82.508kHz, Fv = 65.998Hz

Horizontal period	(Th)	-----12.120µSec.	Vertical period	(Tv)	-----15.152mSec.
Horizontal sync. puls	(Tsh)	----- 1.430µSec.	Vertical sync. puls	(Tsv)	----- 0.122mSec.
Horizontal front porch	(Tfh)	----- 0.538µSec.	Vertical front porch	(Tfv)	----- 0.073mSec.
Horizontal back porch	(Tbh)	----- 1.192µSec.	Vertical back porch	(Tbv)	----- 0.317mSec.
Horizontal video area	(Tdh)	----- 8.960µSec.	Vertical video area	(Tdv)	-----14.640mSec.

Sync signal Separate Horizontal : Negative
Vertical : Negative

T22, Fh = 31.406kHz, Fv = 50.411Hz

Horizontal period	(Th)	-----31.841μSec.	Vertical period	(Tv)	-----19.837mSec.
Horizontal sync. puls	(Tsh)	----- 3.821μSec.	Vertical sync. puls	(Tsv)	----- 0.095mSec.
Horizontal front porch	(Tfh)	----- 0.637μSec.	Vertical front porch	(Tfv)	----- 2.326mSec.
Horizontal back porch	(Tbh)	----- 1.910μSec.	Vertical back porch	(Tbv)	----- 2.610mSec.
Horizontal video area	(Tdh)	-----25.473μSec.	Vertical video area	(Tdv)	-----14.806mSec.

Sync signal Separate Horizontal : Negative
Vertical : Negative

T23, Fh = 85.034kHz, Fv = 130.021Hz

Horizontal period	(Th)	-----11.760μSec.	Vertical period	(Tv)	----- 7.691mSec.
Horizontal sync. puls	(Tsh)	----- 1.391μSec.	Vertical sync. puls	(Tsv)	----- 0.059mSec.
Horizontal front porch	(Tfh)	----- 0.521μSec.	Vertical front porch	(Tfv)	----- 0.164mSec.
Horizontal back porch	(Tbh)	----- 1.158μSec.	Vertical back porch	(Tbv)	----- 0.353mSec.
Horizontal video area	(Tdh)	----- 8.690μSec.	Vertical video area	(Tdv)	----- 7.115mSec.

Sync signal Separate Horizontal : Negative
Vertical : Negative

T24, Fh = 35.000kHz, Fv = 66.667Hz (640 x 480)

Horizontal period	(Th)	-----28.571μSec.	Vertical period	(Tv)	-----15.000mSec.
Horizontal sync. puls	(Tsh)	----- 2.116μSec.	Vertical sync. puls	(Tsv)	----- 0.086mSec.
Horizontal front porch	(Tfh)	----- 2.116μSec.	Vertical front porch	(Tfv)	----- 0.086mSec.
Horizontal back porch	(Tbh)	----- 3.175μSec.	Vertical back porch	(Tbv)	----- 1.114mSec.
Horizontal video area	(Tdh)	-----21.164μSec.	Vertical video area	(Tdv)	-----13.714mSec.

Sync signal Composite : Negative

T25, Fh = 68.681kHz, Fv = 75.064Hz (1152 x 870)

Horizontal period	(Th)	-----14.560μSec.	Vertical period	(Tv)	-----13.322mSec.
Horizontal sync. puls	(Tsh)	----- 1.280μSec.	Vertical sync. puls	(Tsv)	----- 0.044mSec.
Horizontal front porch	(Tfh)	----- 0.440μSec.	Vertical front porch	(Tfv)	----- 0.043mSec.
Horizontal back porch	(Tbh)	----- 1.320μSec.	Vertical back porch	(Tbv)	----- 0.568mSec.
Horizontal video area	(Tdh)	-----11.520μSec.	Vertical video area	(Tdv)	-----12.667mSec.

Sync signal Sync on Green

T26, Fh = 31.468kHz, Fv = 70.087Hz (640 x 350)

Horizontal period	(Th)	-----31.778μSec.	Vertical period	(Tv)	-----14.268mSec.
Horizontal sync. puls	(Tsh)	----- 3.813μSec.	Vertical sync. puls	(Tsv)	----- 0.064mSec.
Horizontal front porch	(Tfh)	----- 0.636μSec.	Vertical front porch	(Tfv)	----- 1.176mSec.
Horizontal back porch	(Tbh)	----- 1.907μSec.	Vertical back porch	(Tbv)	----- 1.906mSec.
Horizontal video area	(Tdh)	-----25.422μSec.	Vertical video area	(Tdv)	-----11.122mSec.

Sync signal Separate Horizontal : Positive
Vertical : Negative

T27, Fh = 31.468kHz, Fv = 70.087Hz (640 x 400)

Horizontal period	(Th)	-----31.778μSec.	Vertical period	(Tv)	-----14.268mSec.
Horizontal sync. puls	(Tsh)	----- 3.813μSec.	Vertical sync. puls	(Tsv)	----- 0.064mSec.
Horizontal front porch	(Tfh)	----- 0.636μSec.	Vertical front porch	(Tfv)	----- 0.381mSec.
Horizontal back porch	(Tbh)	----- 1.907μSec.	Vertical back porch	(Tbv)	----- 1.112mSec.
Horizontal video area	(Tdh)	-----25.422μSec.	Vertical video area	(Tdv)	-----12.711mSec.

Sync signal Separate Horizontal : Negative
Vertical : Positive

T28, Fh = 31.468kHz, Fv = 59.941Hz (640 x 480)

Horizontal period	(Th)	-----31.778µSec.	Vertical period	(Tv)	-----16.683mSec.
Horizontal sync. puls	(Tsh)	----- 3.813µSec.	Vertical sync. puls	(Tsv)	----- 0.064mSec.
Horizontal front porch	(Tfh)	----- 0.636µSec.	Vertical front porch	(Tfv)	----- 0.318mSec.
Horizontal back porch	(Tbh)	----- 1.907µSec.	Vertical back porch	(Tbv)	----- 1.048mSec.
Horizontal video area	(Tdh)	-----25.422µSec.	Vertical video area	(Tdv)	-----15.253mSec.

Sync signal Separate Horizontal : Negative
Vertical : Negative

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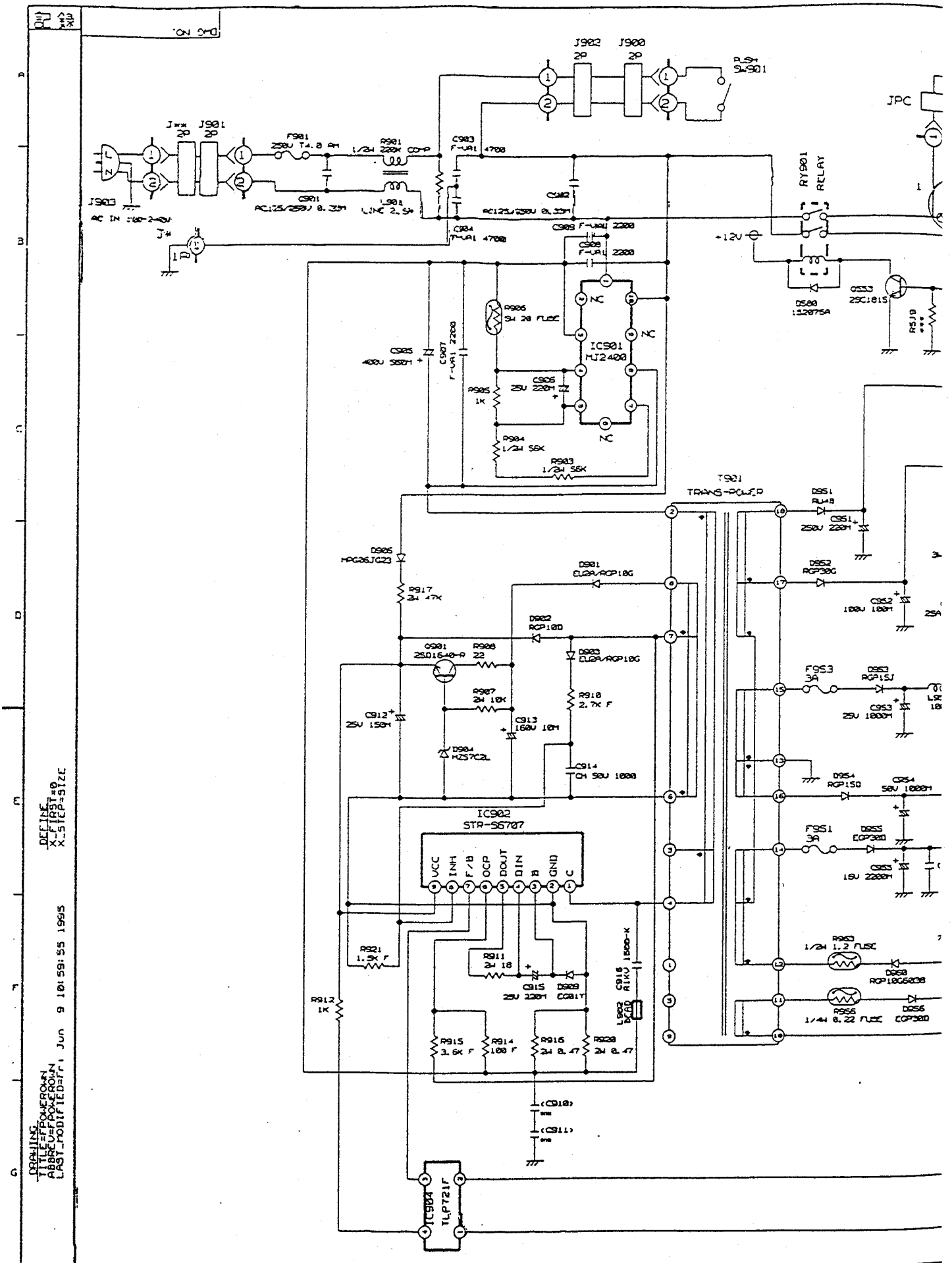

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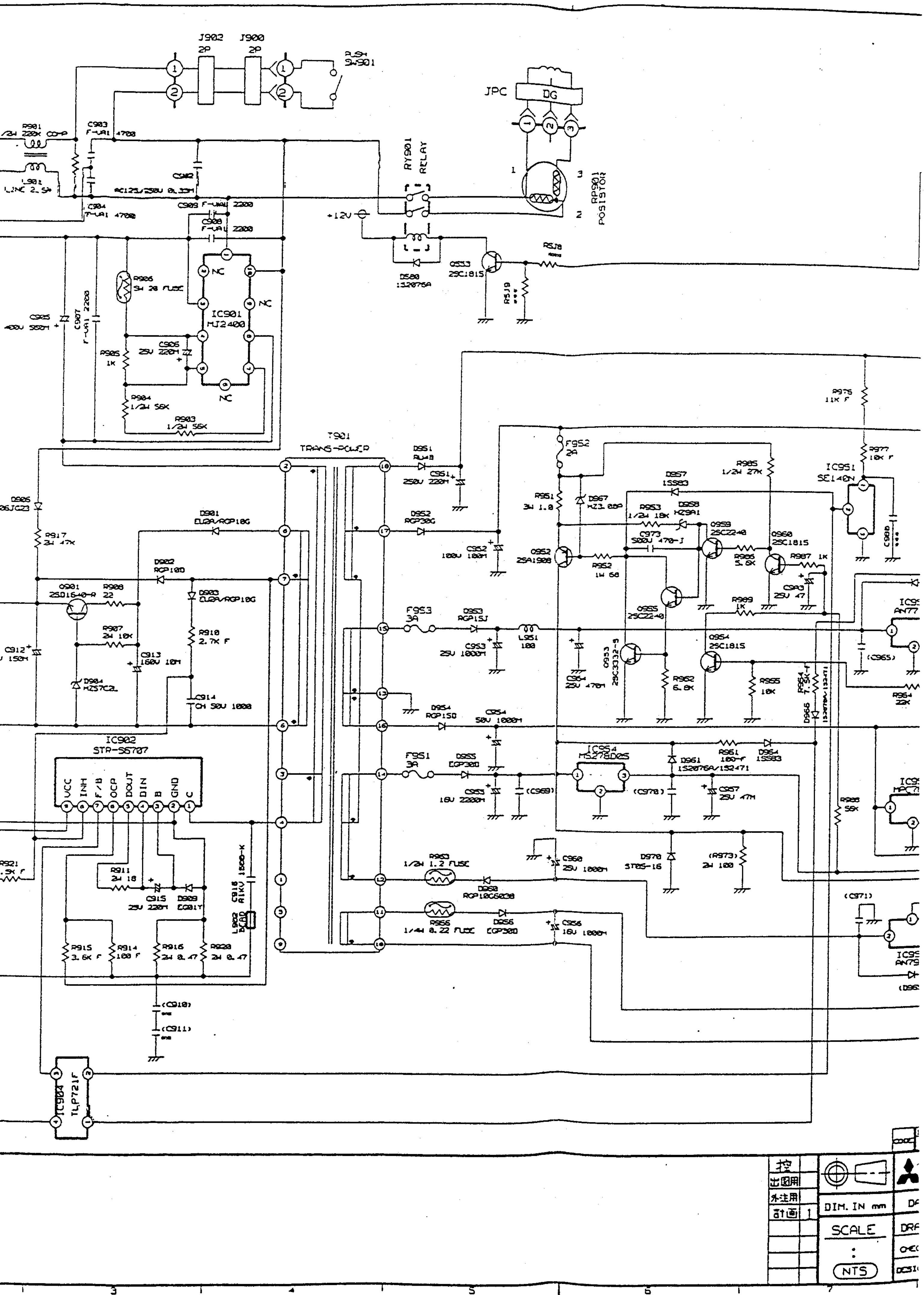
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C904 F-UA1 4700
C909 F-UA1 2200
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RY901 RELAY
RP901 POSISTOR
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D580 1S2076A
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R519
R906 5W 20 FUSE
C905 400V 560M
C907 F-UA1 2200
IC901 MJ2400
NC
C906 25V 220M
R905 1K
R904 1/2W 56K
R903 1/2W 56K
T901 TRANS-POWER
D905 06JGZ3
R917 2W 47K
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D903 EU2A/RGP10G
Q901 2SD1640-R
R908 22
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C913 160V 10M
D904 HZS7C2L
C914 CH 50V 1000
IC902 STR-S6707
VCC INH F/B OCP DOUT DIN B GND C
R911 2W 10
C915 25V 220M
D909 EG01Y
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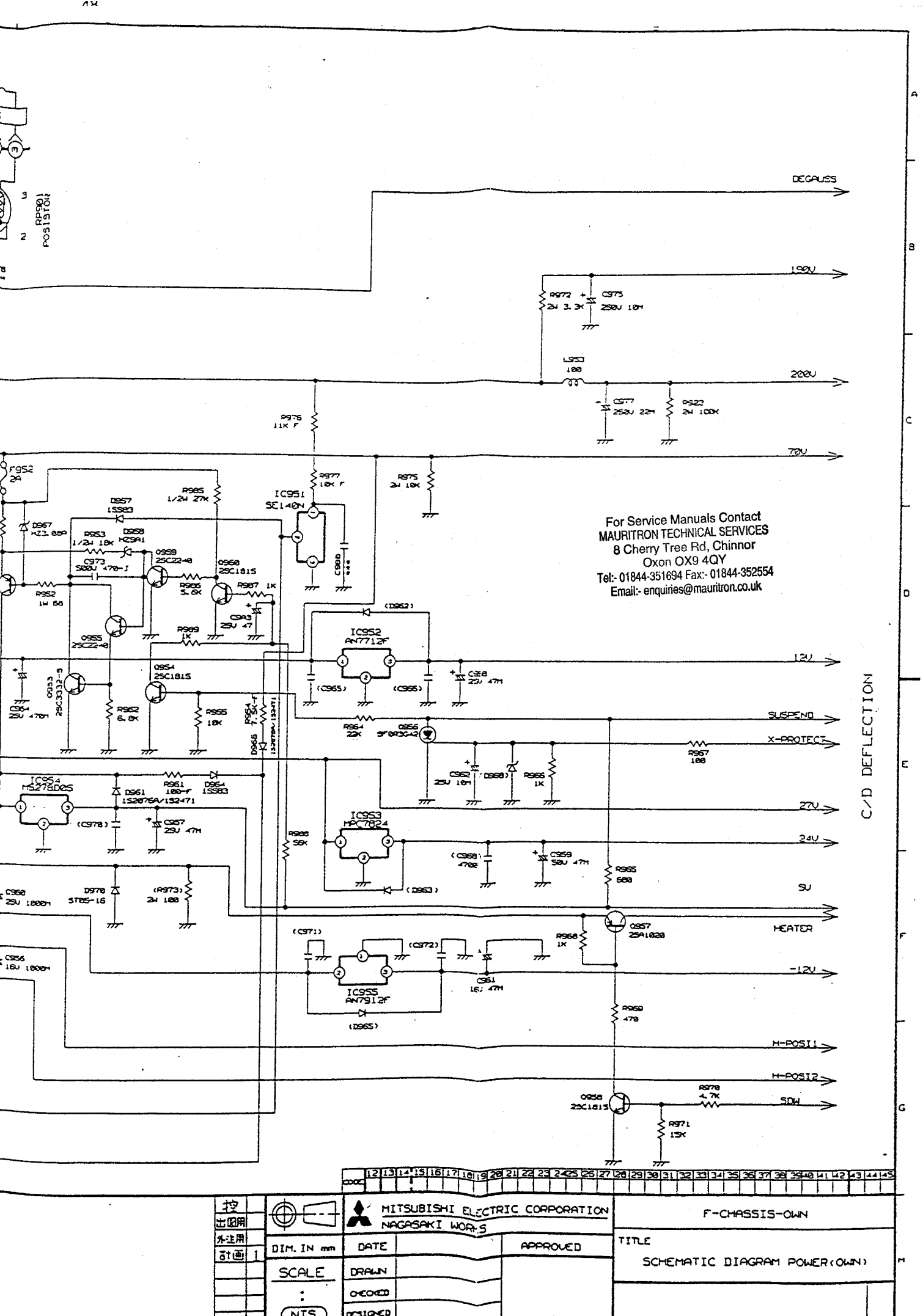
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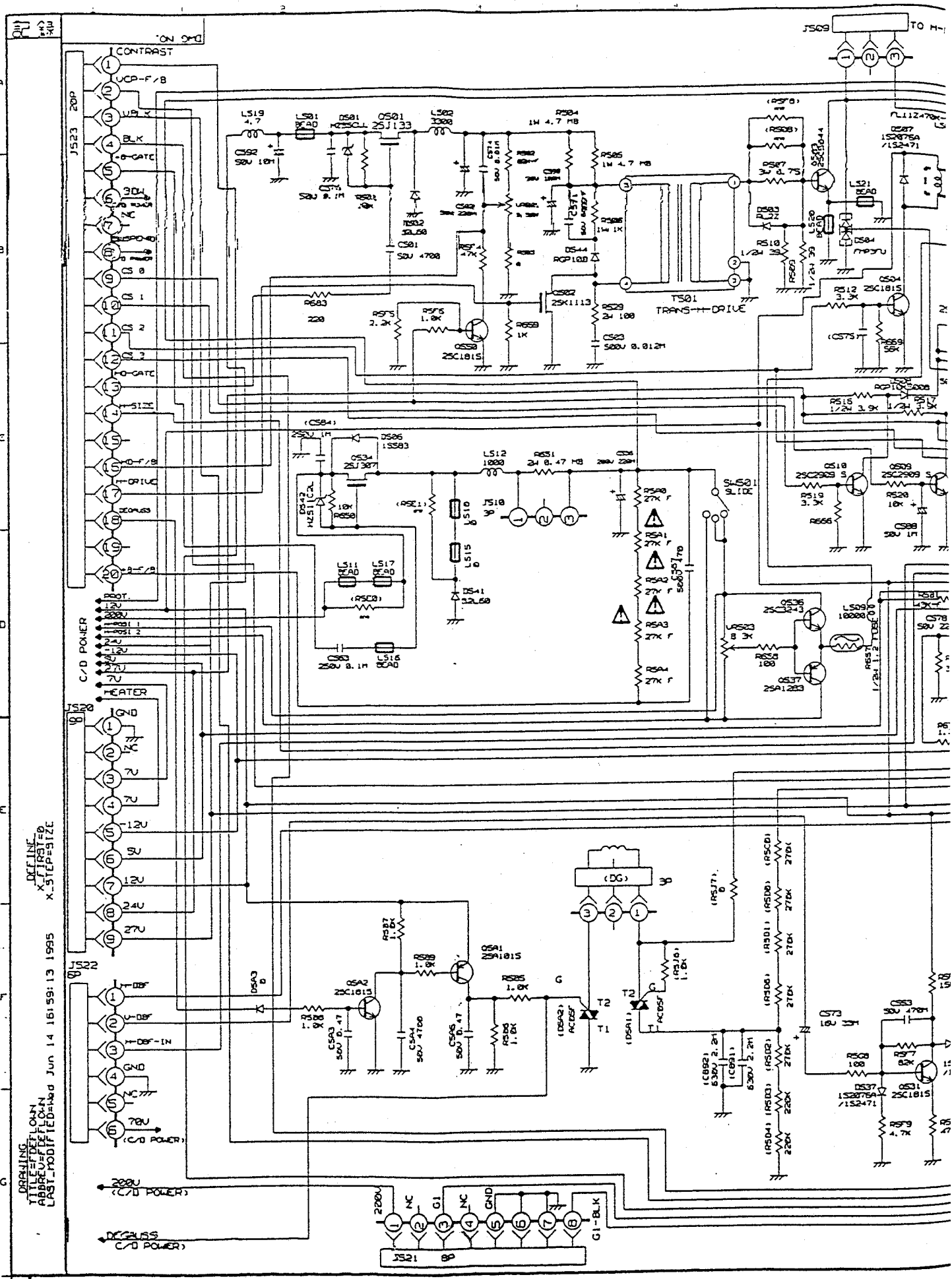

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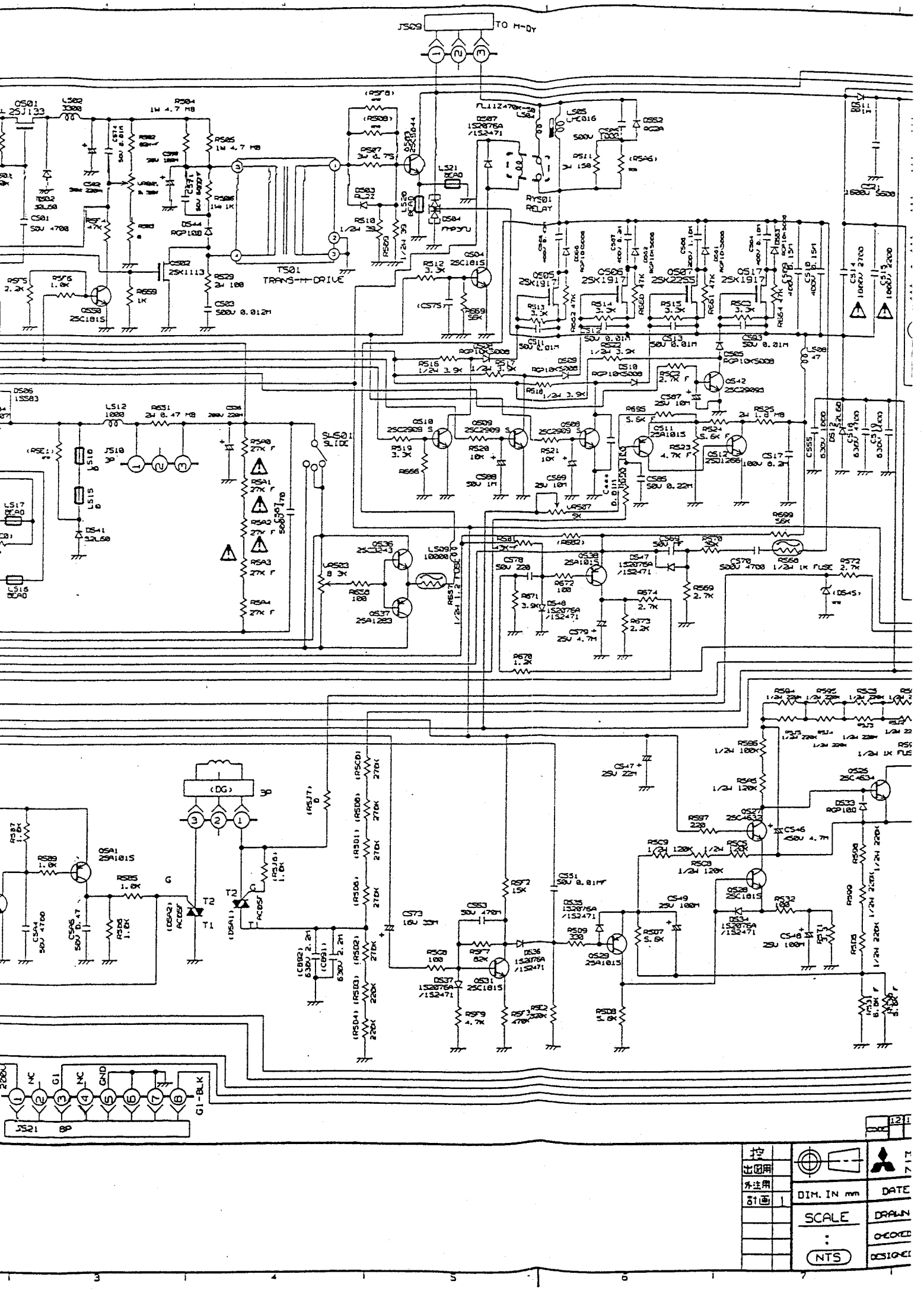
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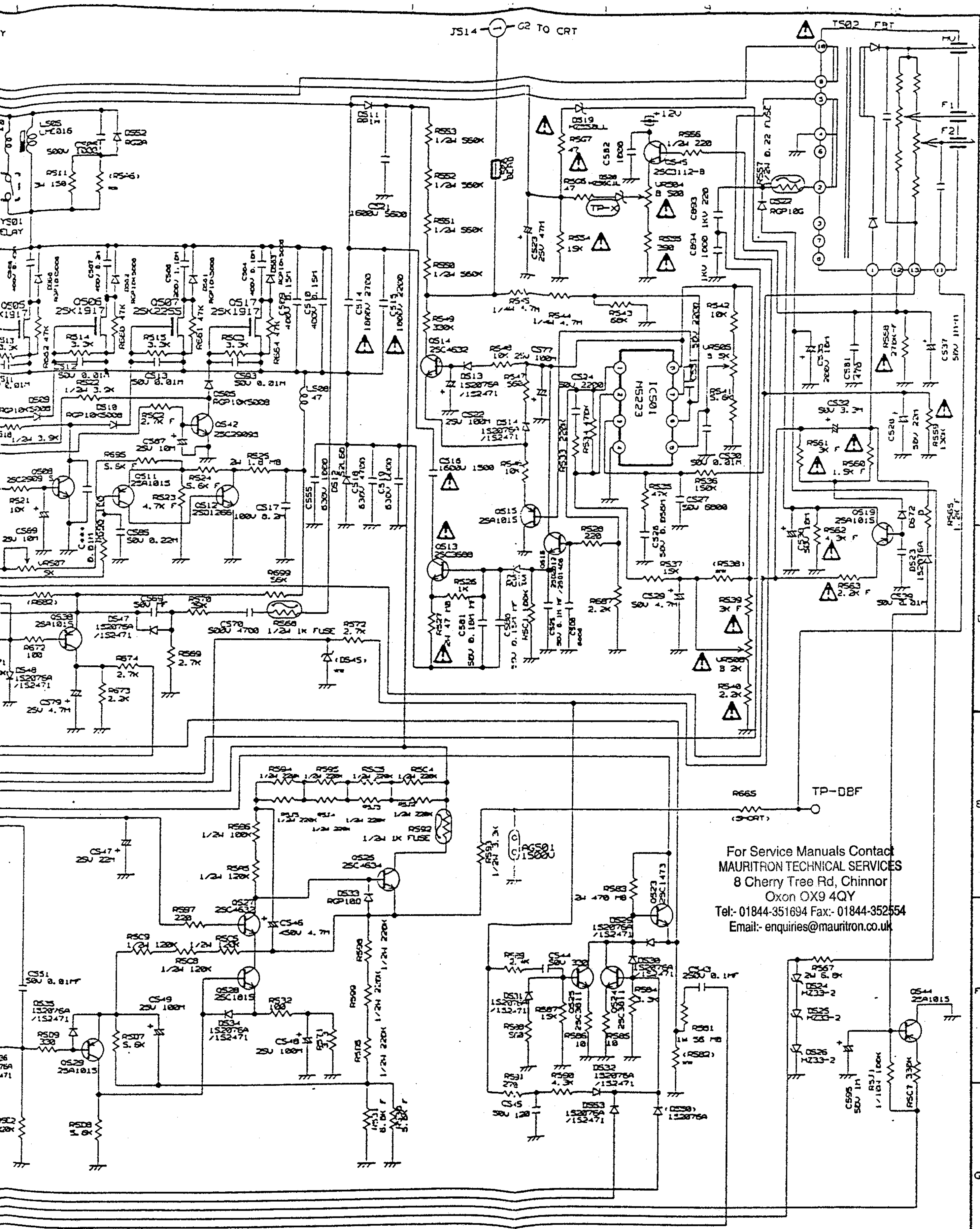

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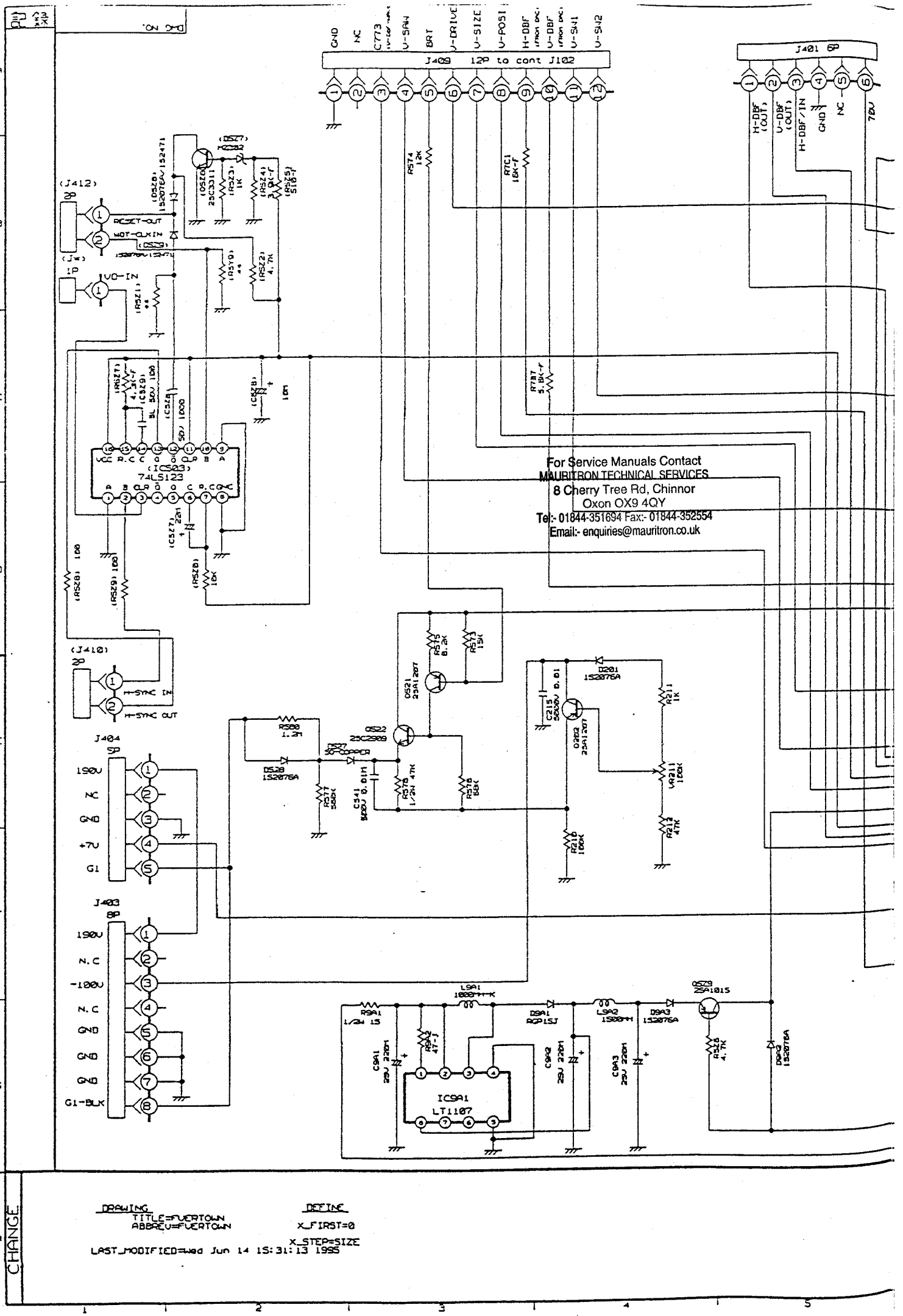

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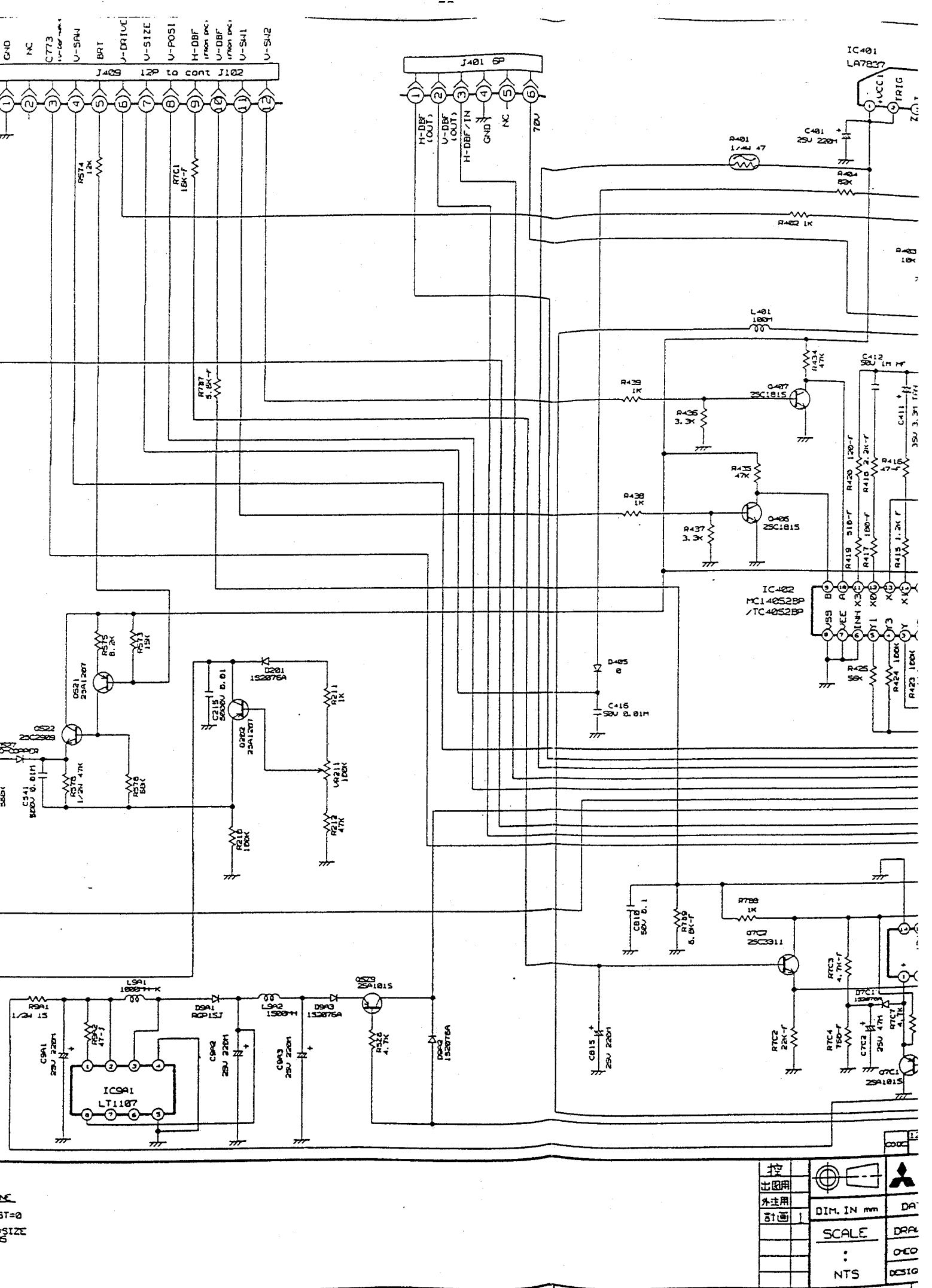
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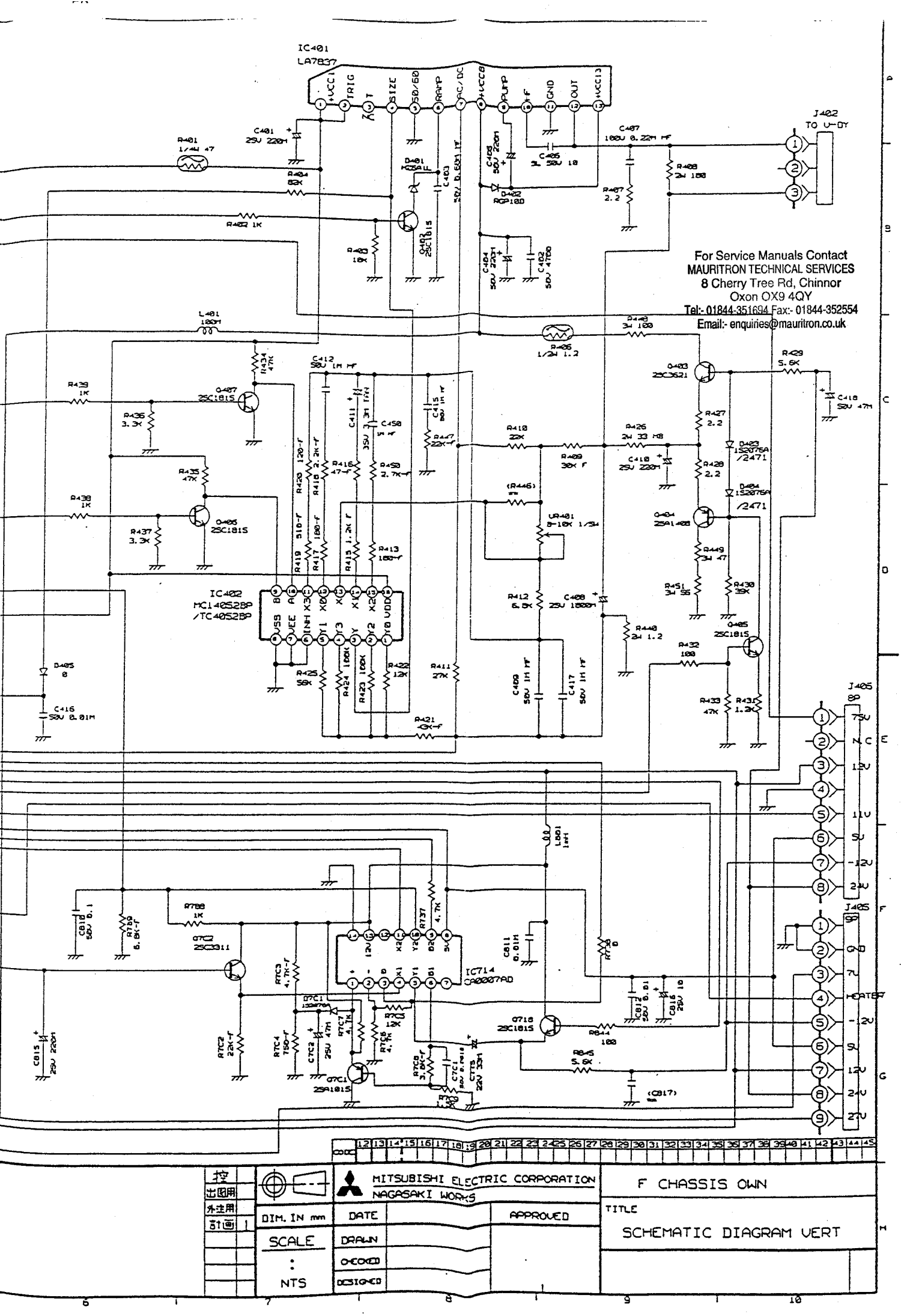
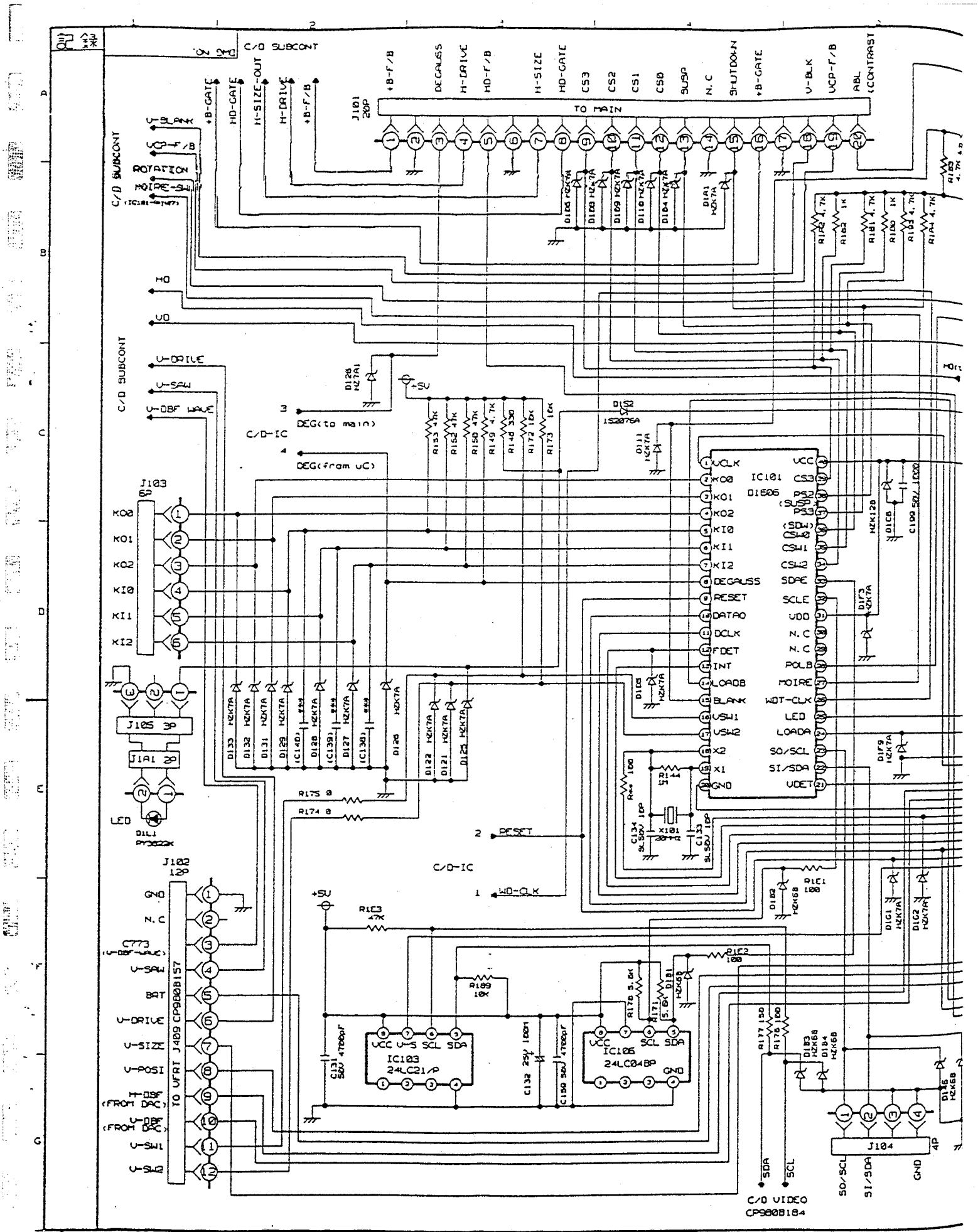
NTS


IC401
LA7837
+VCC1
TRIG
SIZE
50/60
RAMP
AC/DC
+VCC8
PUMP
H-F
GND
OUT
+VCC13
J402
TO V-DY
For Service Manuals Contact
MAURITRON TECHNICAL SERVICES
8 Cherry Tree Rd, Chinnor
Oxon OX9 4QY
Tel:- 01844-351694 Fax:- 01844-352554
Email:- enquiries@mauritron.co.uk
IC402
MC14052BP
/TC4052BP
IC714
CA0007AD
J405
J406
MITSUBISHI ELECTRIC CORPORATION
NAGASAKI WORKS
F CHASSIS OWN
SCHEMATIC DIAGRAM VERT
DIM. IN mm
SCALE
NTS
DATE
APPROVED
DRAWN
CHECKED
DESIGNED



DRAWING

TITLE=FCONSUBDWN
ABBREV=FCONSUBDWN
LAST_MODIFIED=Wed Jun 14 16:47:26 1995

DEFINE

X_FIRST=0
X_STEP=SIZE

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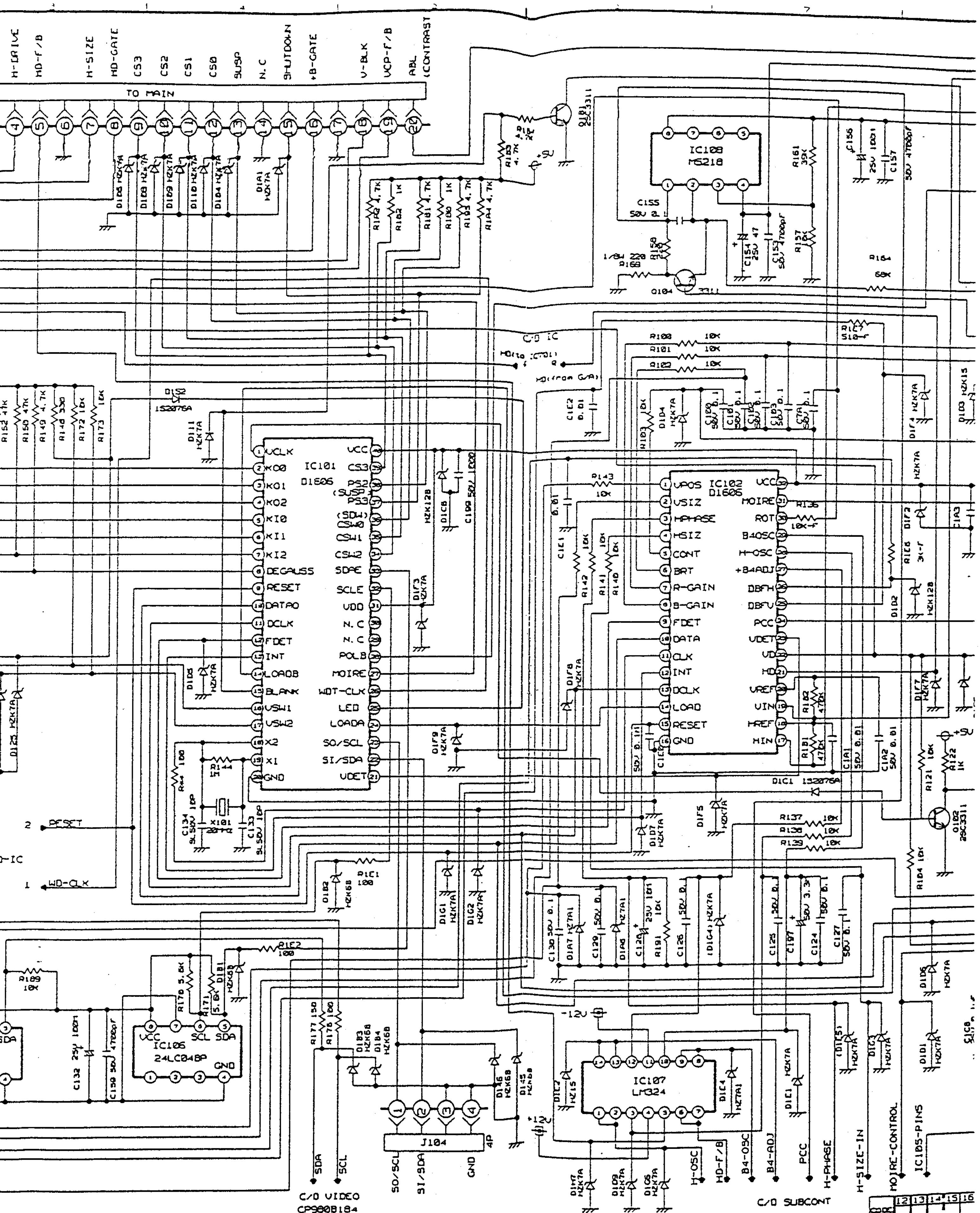
Email:- enquiries@mauritron.co.uk



MITSUBIS
NAGASAKI

DIM. IN mm

SCALE

:

NTS

DATE

DRAWN

CHECKED

DESIGNED

DEFINE

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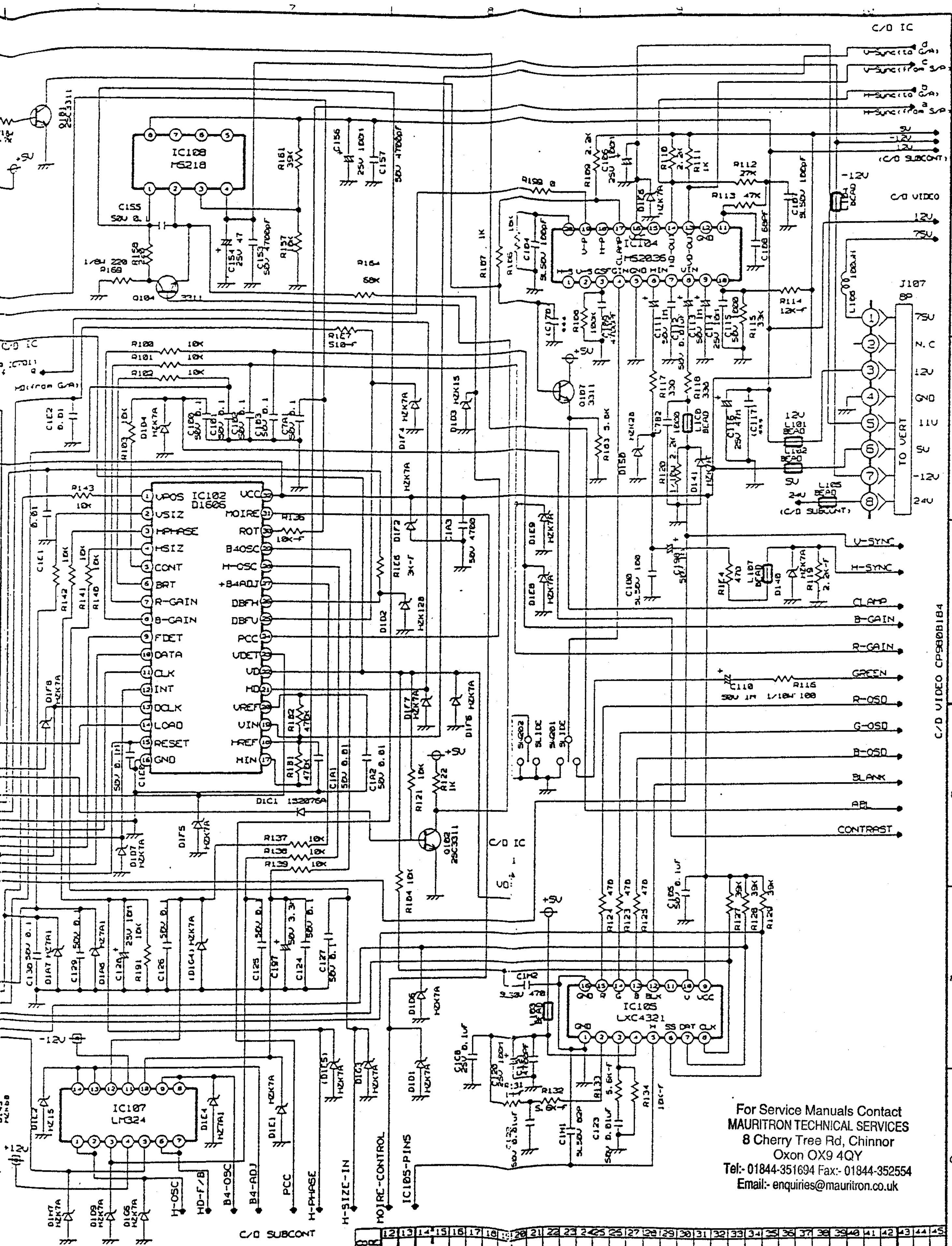
X_STEP=SIZE

1995



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Email:- enquiries@mauritron.co.uk

MITSUBISHI ELECTRIC CORPORATION
NAGASAKI WORKS

F CHASSIS OWN

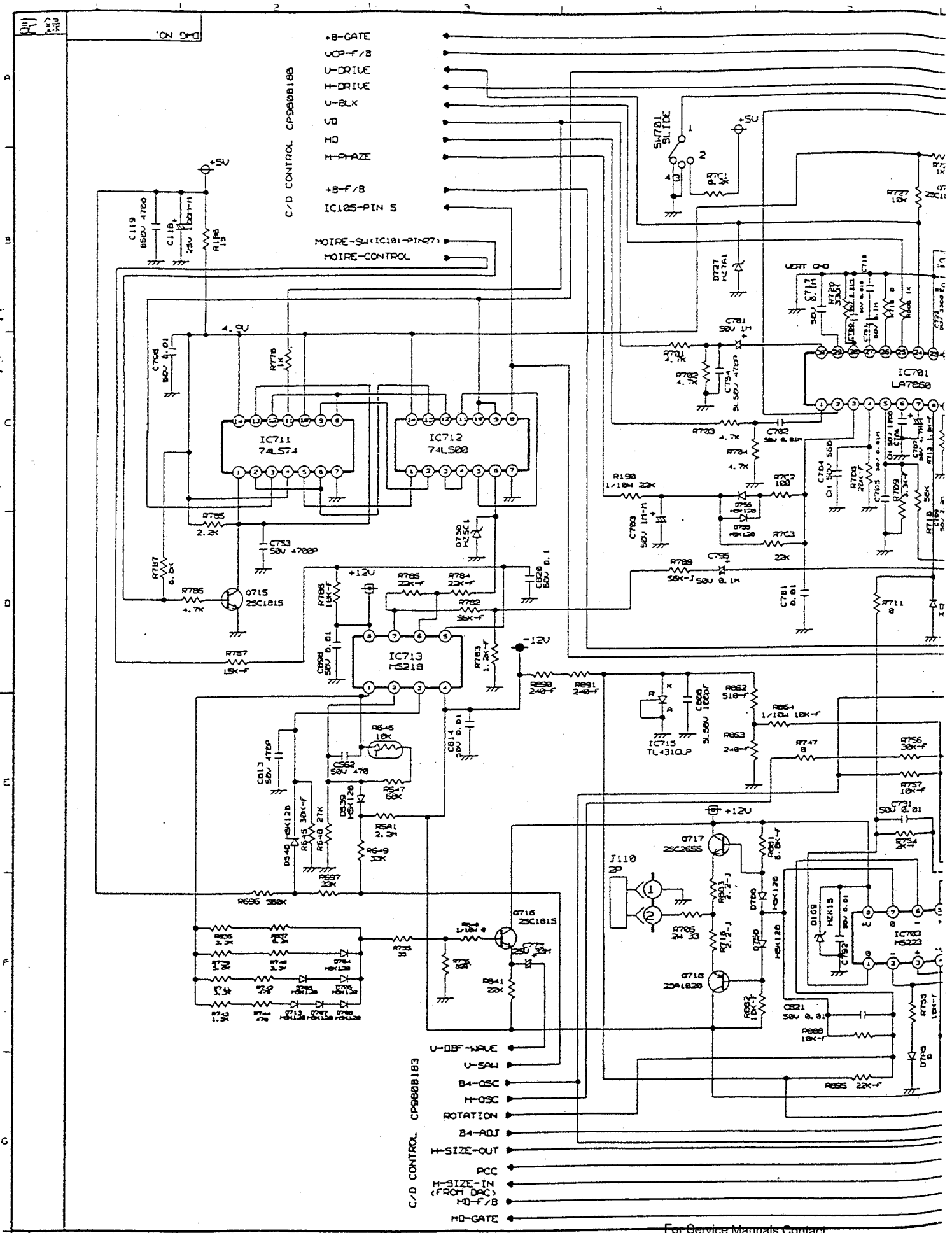
TITLE
SCHEMATIC DIAGRAM CONTROL

DIM. IN mm

SCALE : NTS

DATE
DRAWN
CHECKED
DESIGNED
APPROVED

1/1



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LAST_MODIFIED=Wed Jun 14 16:29:08 1995

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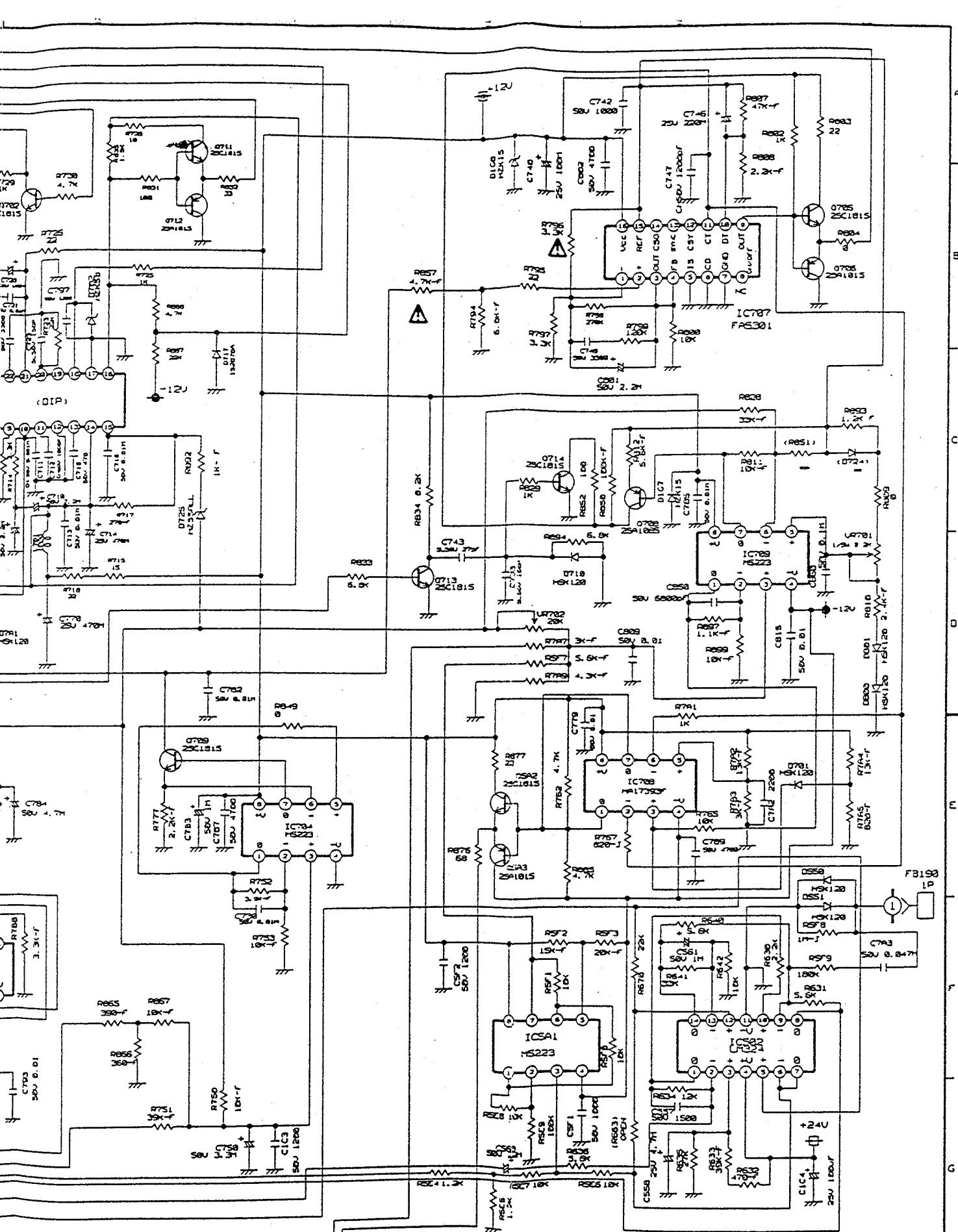
Email:- enquiries@mauritron.co.uk

IC701
LA7850
(DIP)
IC712
74LS00
IC713
MS218
IC715
TL431CLP
IC784
MS223
IC783
MS223
J110
2P
SW701
SLIDE
-12V
+12V
+5V
V-DRF-WAVE
V-SAW
B4-OSC
H-OSC
ROTATION
B4-ADJ
H-SIZE-OUT
PCC
H-SIZE-IN
(FROM DAC)
HD-F/B
HD-GATE
C/D CONTROL CPS80B183
DIM. IN mm
SCALE
NTS



設計	MITSUBISHI ELECTRIC CORPORATION NAGASAKI WORKS		F CHASSIS OWN
比例用			
外注用			
引回 1	DIM. IN mm	DATE	APPROVED
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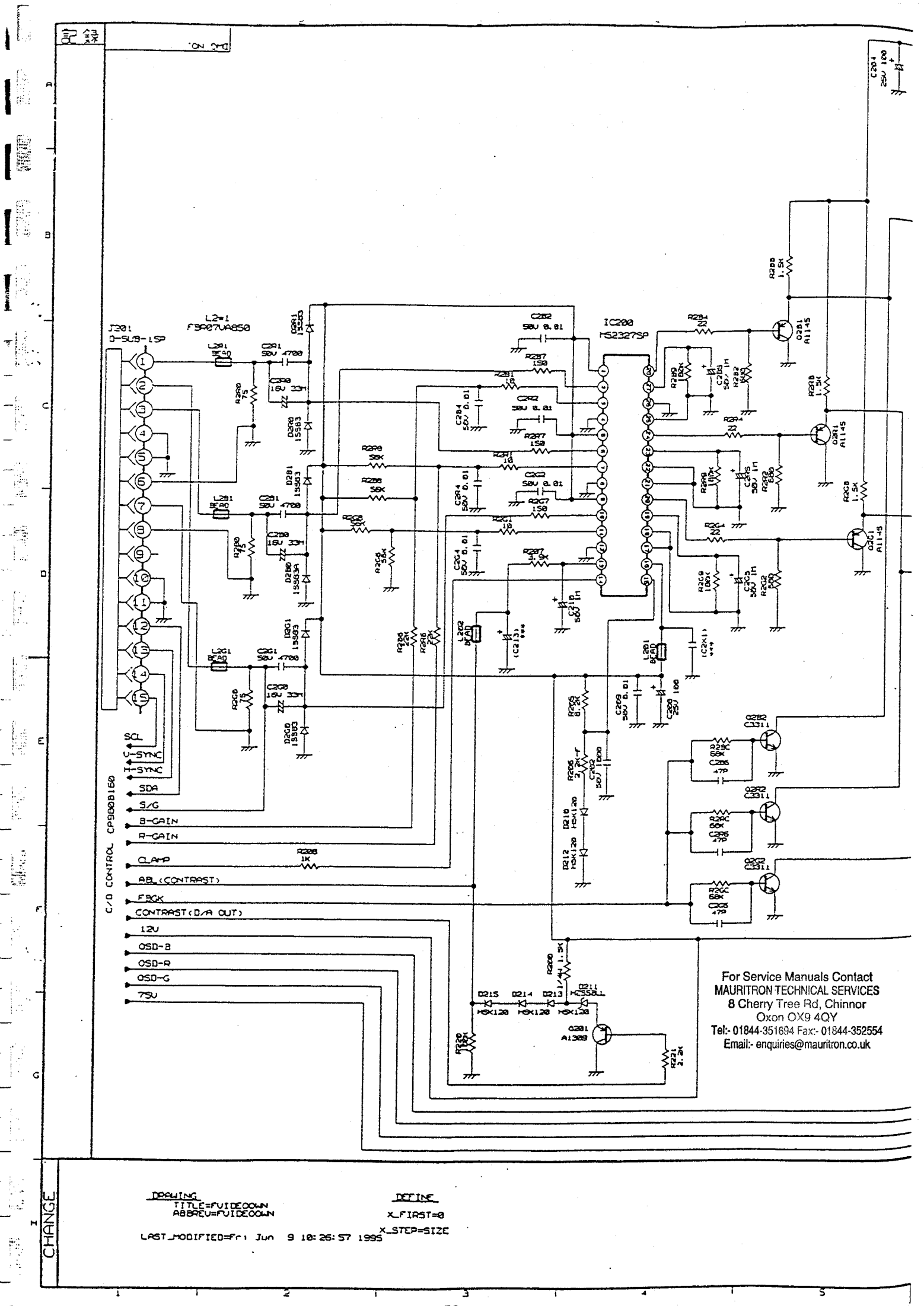
		CHECKED	
		DESIGNED	



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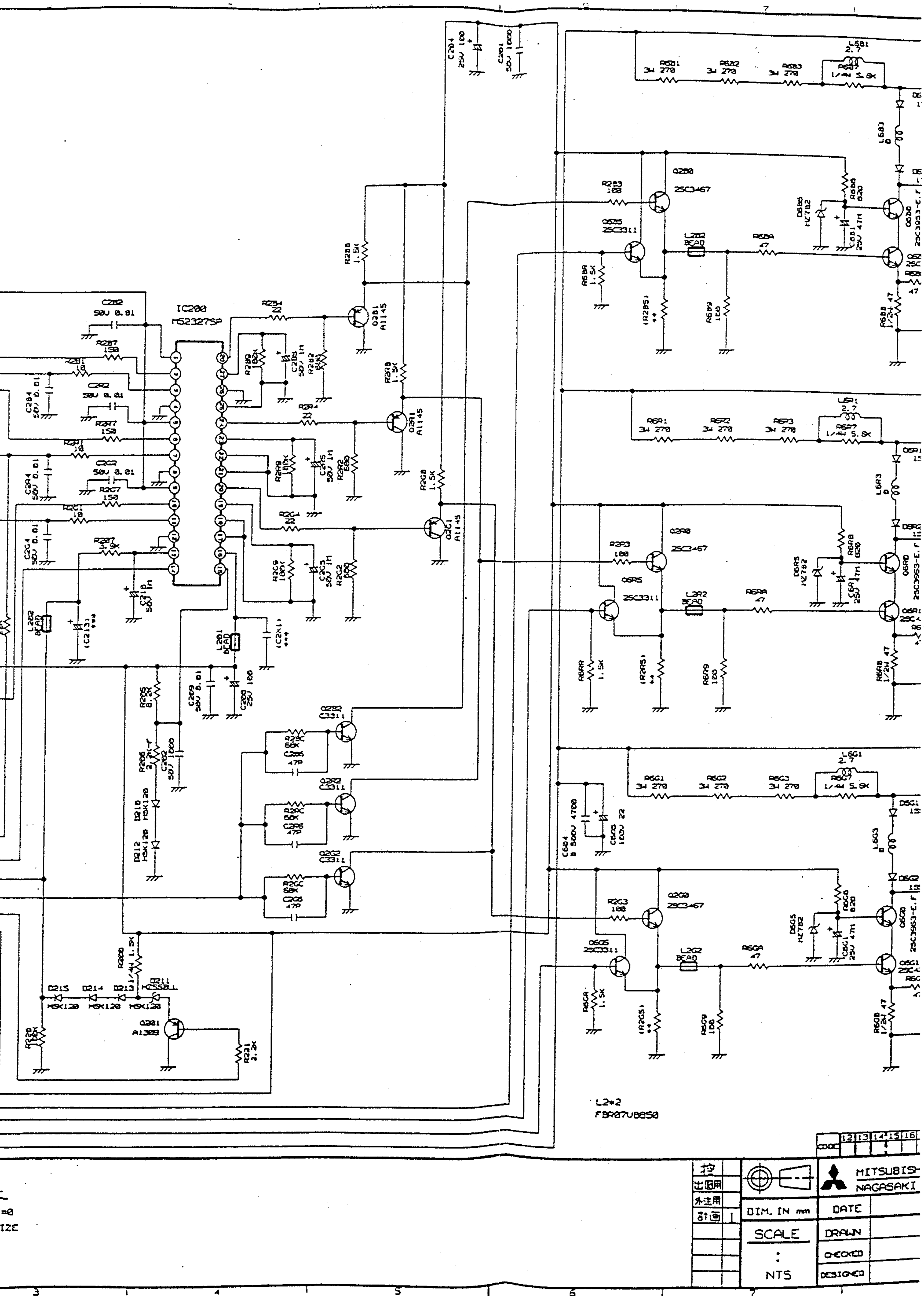
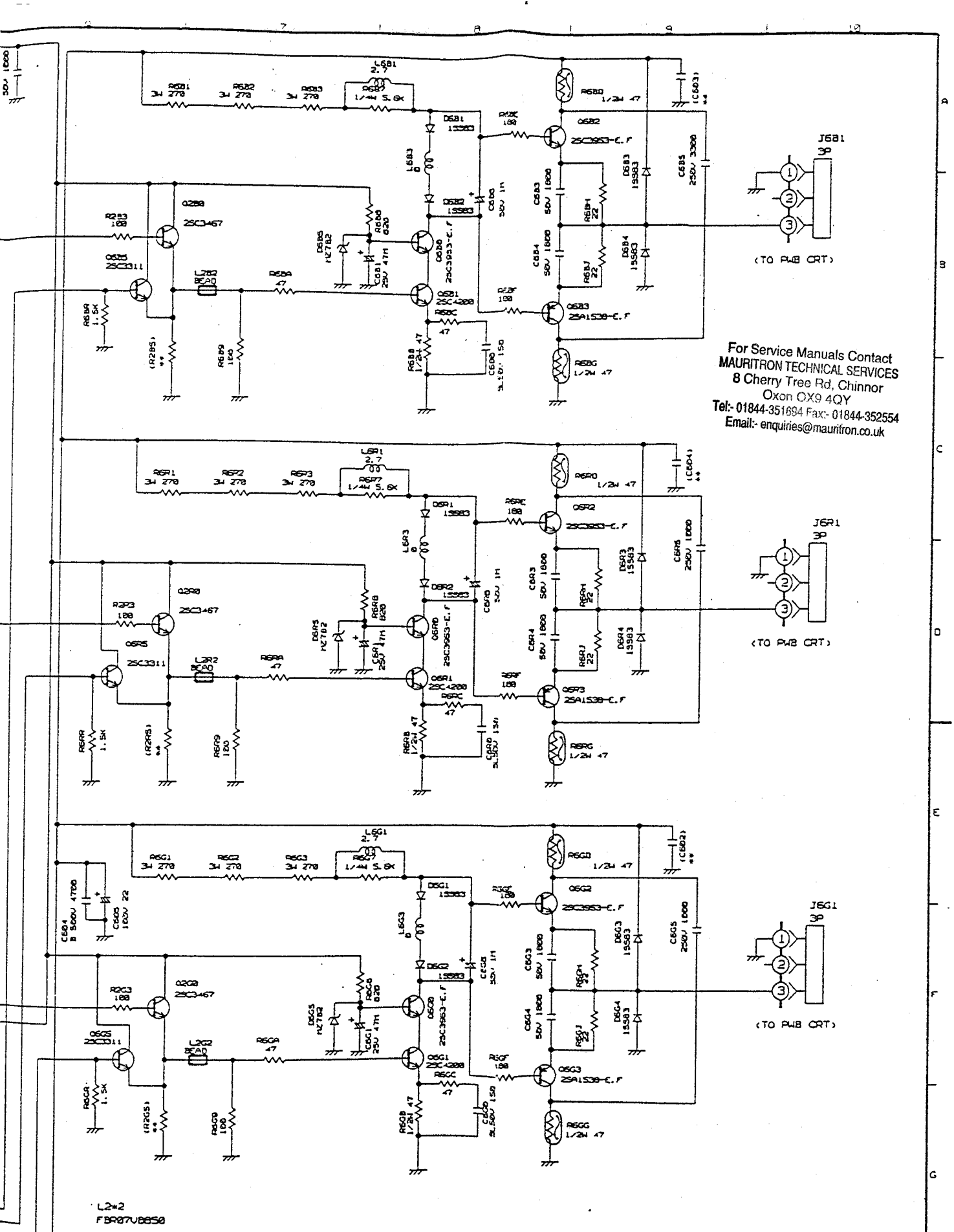

IC200
M52327SP
C282 50V 0.01
R287 150
R281 10
C284 50V 0.01
R284 22
R283 100
R288 1.5K
Q281 A1145
Q2R1 A1145
Q2G1 A1145
Q280 2SC3467
Q285 2SC3311
Q2R0 2SC3467
Q2R5 2SC3311
Q2G0 2SC3467
Q2G5 2SC3311
Q282 C3311
Q2R2 C3311
Q2G2 C3311
Q201 A1309
L282 BEAD
L2R2 BEAD
L2G2 BEAD
L202 BEAD
L201 BEAD
C204 25V 100
C201 50V 1000
C209 50V 0.01
C208 25V 100
C202 50V 1000
C210 50V 1M
C604 B 500V 4700
C605 100V 22
R205 8.2K
R206 2.2K-F
R207 3.9K
R200 1/4W 1.5K
R220 18K
R221 2.2K
D210 MSX120
D212 MSX120
D211 MZ558LL
D213 MSX120
D214 MSX120
D215 MSX120
R681 3W 270
R682 3W 270
R683 3W 270
R687 1/4W 5.6K
L681 2.7
R6R1 3W 270
R6R2 3W 270
R6R3 3W 270
R6R7 1/4W 5.6K
L6R1 2.7
R6G1 3W 270
R6G2 3W 270
R6G3 3W 270
R6G7 1/4W 5.6K
L6G1 2.7
D685 MZ7B2
D6R5 MZ7B2
D6G5 MZ7B2
2SC3953-E.F
L2*2
FBR07VB850
MITSUBISHI
NAGASAKI
DIM. IN mm
DATE
SCALE
NTS
DRAWN
CHECKED
DESIGNED



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MITSUBISHI ELECTRIC CORPORATION NAGASAKI WORKS			F CHASSIS OWN
DIM. IN mm	DATE	APPROVED	TITLE: SCHEMATIC DIAGRAM VIDEO
SCALE : NTS	DRAWN		
	CHECKED		
	DESIGNED		1/1

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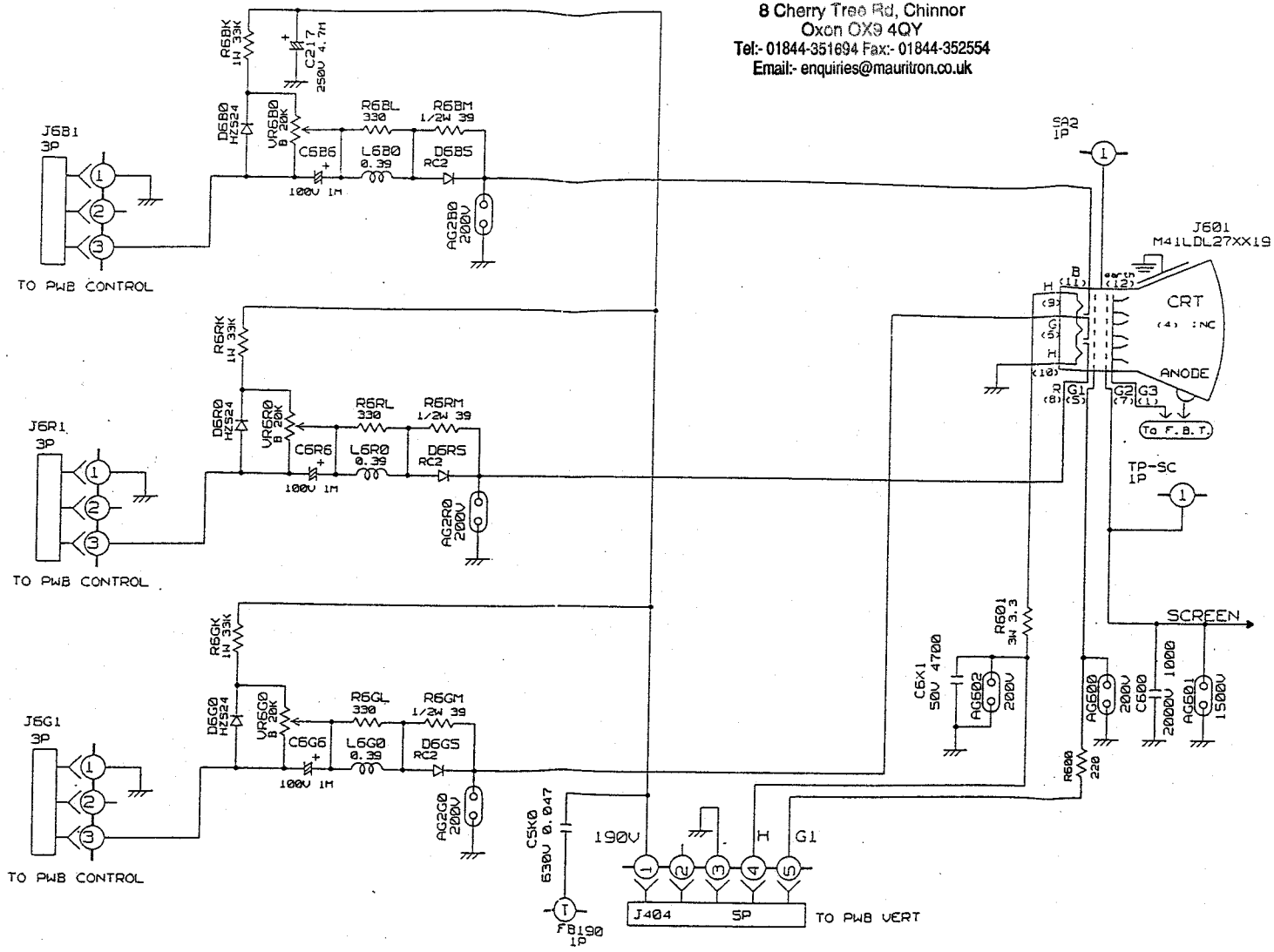

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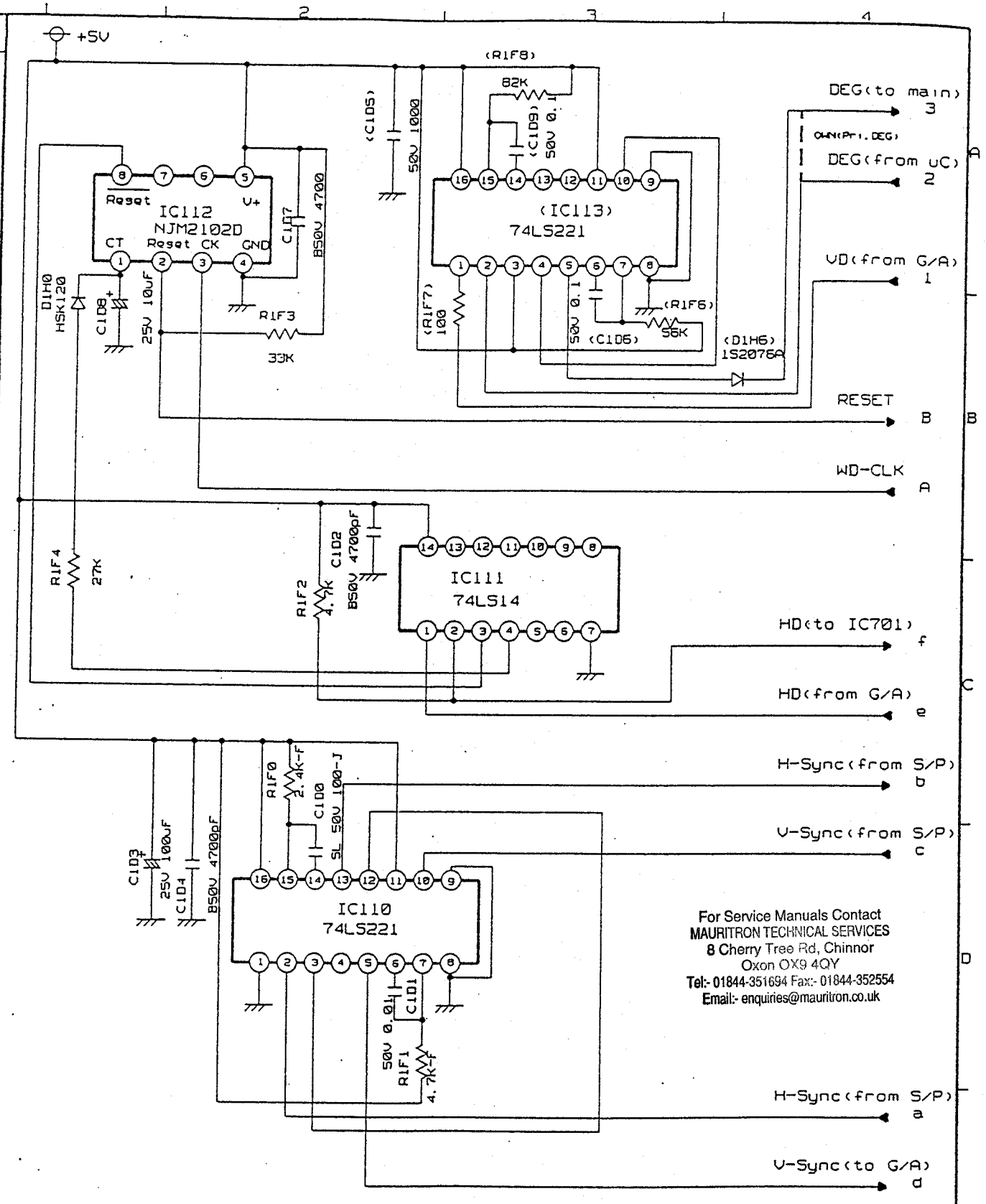
CHANGE	控 出図用 外注用 計画 1	DIM. IN mm SCALE : NTS	DATE / DRAWN / CHECKED / DESIGNED APPROVED

CODE 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45



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CHANGE

DRAWING

TITLE=FIC
ABBREV=FIC
LAST_MODIFIED=Fri Jun 9 10:53:03 1995

DEFINE

X_FIRST=0
X_STEP=SIZE

CODE 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45

MITSUBISHI ELECTRIC CORPORATION
NAGASAKI WORKS

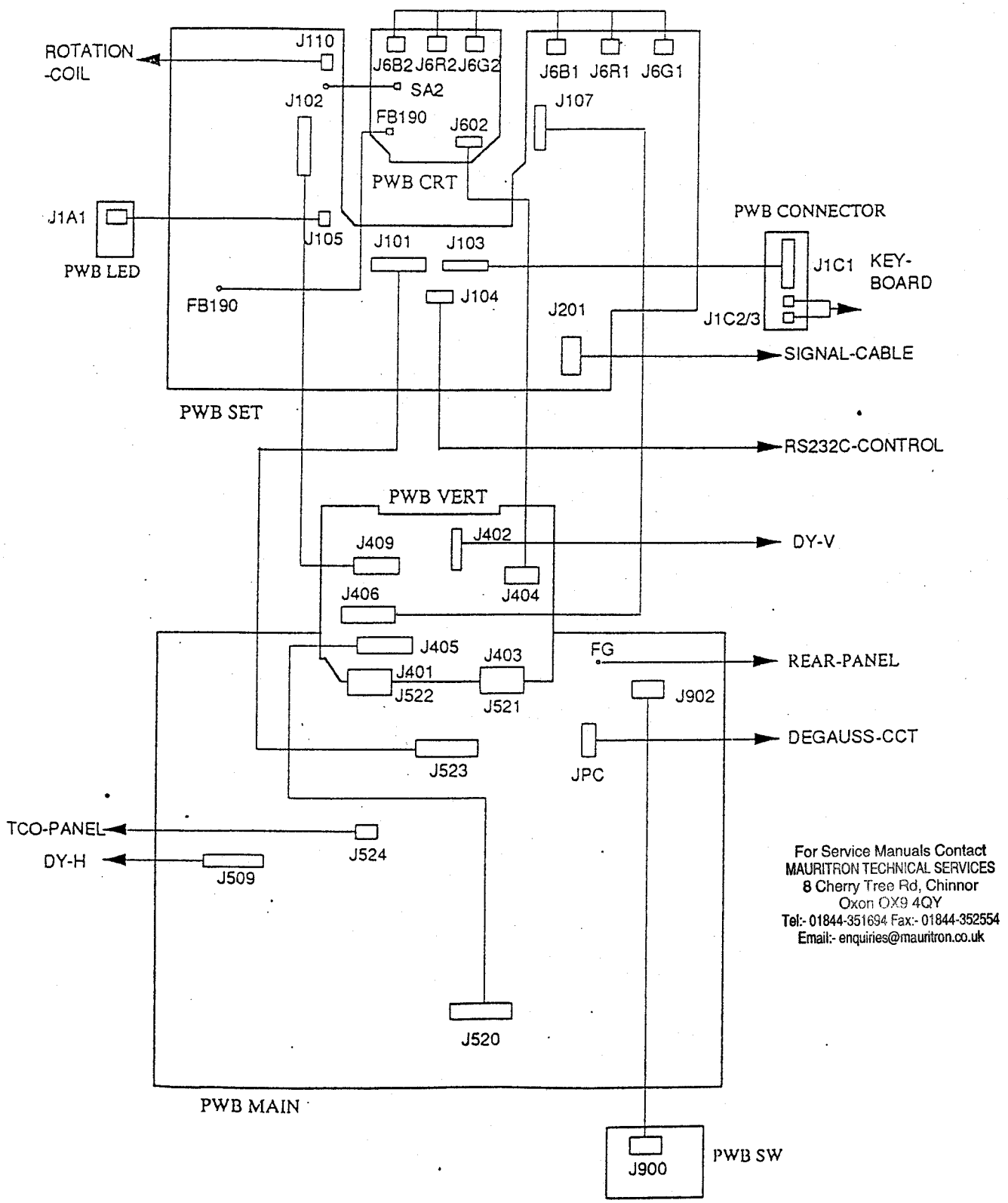
F CHASSIS OWN

SCHEMATIC DIAGRAM IC

DIM. IN mm | DRAWN | APPROVED

SCALE NTS : | CHECKED

5. PCB layout



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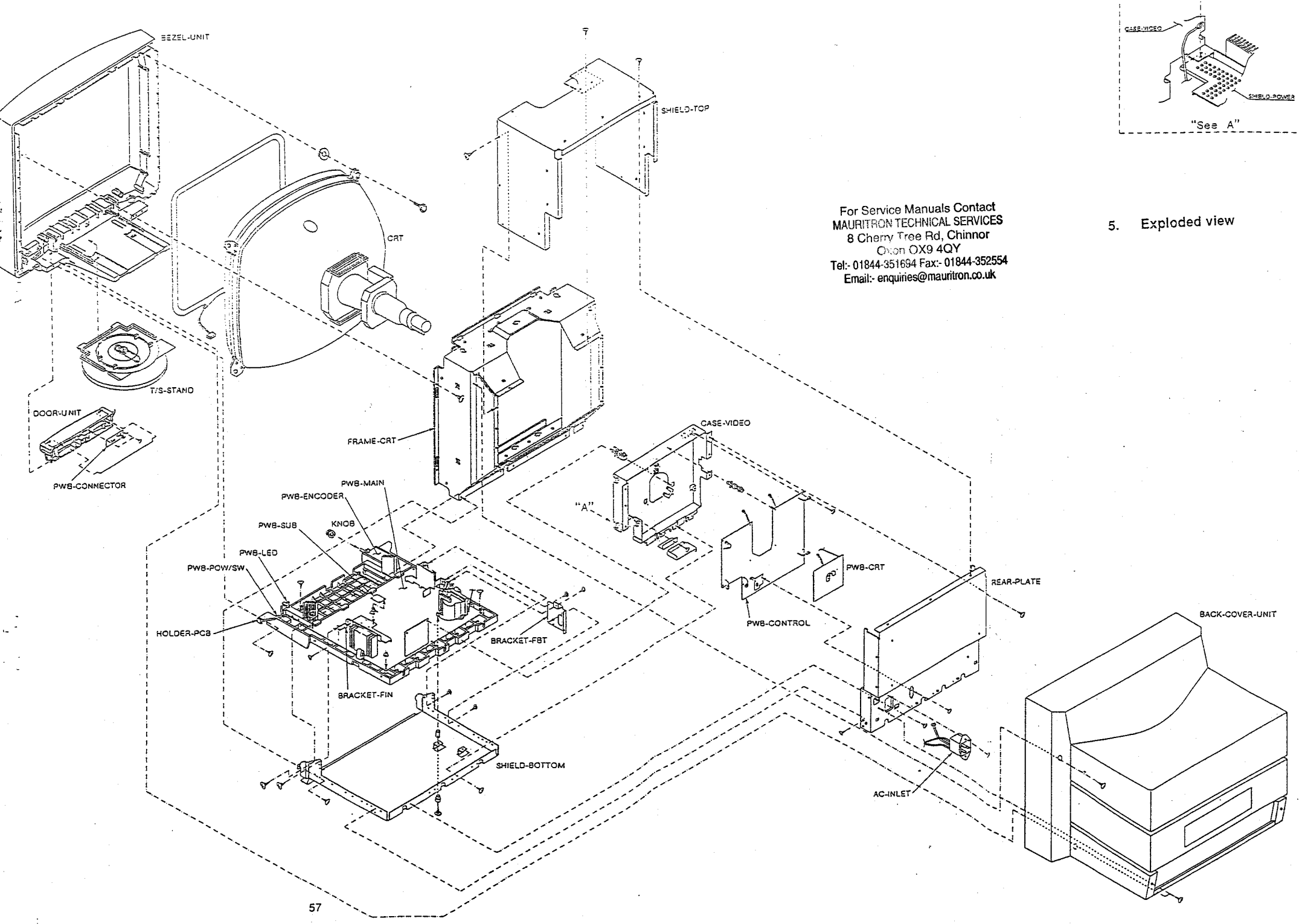

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5. Exploded view