MAINTENANCE AND REPAIR MANUAL

TA - 7650C

JOTRON

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Abbreviations and definitions

ALARM
Message by which the unit signals the occurrence of an event. The alarm is indicated by an audible tone and/or a message (or icon) on the display.

APM
Audio and PTT Modem. The APM is designed for use in applications, which requires long distance control of radios through a 4 or 2 wire leased lines. The modems use in-band signaling for transfer of PTT and Squelch, and FSK data for transfer of alarms and Main/Standby selection.

ARC
With Audio Remote Control it is possible to extend the audio and PTT signals for a transmitter/receiver combination consisting of one main and one standby transceiver.
One or two line pair is used for each transceiver and contains both PTT and audio in both directions.

BAUD
Transmission rate unit of measurement for binary coded data (bit per second).

BIT
Short form of Binary Digit. The smallest element of data in a binary-coded value.

BITE
Built In Test Equipment

bps
Bits Per Second.

DRC
Data Remote Control. With the DRC unit functions like frequency settings, BITE etc. are extended to a remote panel. The DRC unit requires 1 separate line pair that is connected to the serial interface of the radio. Several DRC units may share the same line. All functions in the transmitter can be controlled from the DRC.

DSP
Digital Signal Processor

FbA, FbB, FbC
Functional buttons to maneuver in the menus, located at the front of the equipment.

FSK
Frequency Shift Keying

ICAO
International Civil Aviation Organization

IEC
International Electro-technical Commission.

INTERFACE
Electronic circuits that permit the passage of data between different types of devices.

ITU
International Telecommunication Union.

LAN
Local Area Network

I.ED
Light Emitting Diode.

ORC
Operators Remote Control. With the ORC it is possible to select frequencies, which are stored in the channel memory of the radio. To ease the operation, channel names can be used for each frequency. The ORC requires a separate line pair that is connected to the serial interface of the radio. Several ORC units may share the same line.

PA
Power Amplifier

PSU
Power Supply Unit. Separate unit to power the equipment.

PTT
Push To Talk

RESET
To return stored values to either the default value or zero in memory.

RF
Radio Frequency

R/O
Read only

R/W
Read and Write

SIGNAL- TO-NOISE RATIO (S/N)
Quantitative relationship between the useful and non-useful part of the received signal. A high S/N indicates a good receiving condition.

S/N
See SIGNAL- TO-NOISE RATIO

SNMP
Simple Network Management Protocol
This equipment is defined as an AGENT in an SNMP system.

SOFTWARE
Values programmed and preloaded into memory. The values represent a permanent set of instructions for running the automatic functions (computations) of the unit.

UHF
Ultra High Frequency; A set of frequencies in the upper MHz region.

VHF
Very High Frequency; A set of frequencies in the lower MHz region.

VSWR
Voltage Standing Wave Ratio.

Amendment Record

AMENDMENT NO.	INCORP. BY	DATE	PAGE(S)	VERSION	REASON FOR CHANGE
1	ES	21.05.10	26	PA	New release
2	ES	26.05.10	26	A	Inserted stock no
3					
4					
5					
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The information in this book has been carefully checked and is believed to be accurate. However, no responsibility is assumed for inaccuracies.
Jotron AS reserves the right to make changes without further notice to any products or modules described herein to improve reliability, function or design. Jotron AS does not assume any liability arising out of the application or use of the described product.

SAFETY INSTRUCTIONS

CAUTION!
This equipment contains CMOS integrated circuits. Observe handling precautions to avoid static discharges which may damage these devices.

WARNING!
Some RF semiconductor devices used in this equipment may contain Beryllium Oxide. If inhaled, dust from this oxide can be toxic. No danger will arise from normal handling but no attempt should be made to tamper with these devices. On no account must these transistors be destroyed or discarded with industrial or domestic waste, but should be returned to the manufacturers for subsequent disposal.

1. **Do not place liquid-filled containers on top of the equipment.**

2. **Immediately turn off the power if water or other liquid leaks into the equipment.**
   Continued use of the equipment can cause fire or electrical shock.
   Contact Jotron AS for service.

3. **Immediately turn off the power if the equipment is emitting smoke or fire.**

4. **Do not operate the equipment with wet hands.**

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1 MAINTENANCE AND TROUBLESHOOTING

1.1 Environmental check

Once a year:

1. Turn OFF the unit.
2. Disconnect all plugs.
3. Clean all metal surfaces using a humid rag to remove dirt and dust.
4. Clean the knobs and connectors.
5. Clean the loudspeaker cover.
6. Connect all plugs.
7. Turn ON the unit.

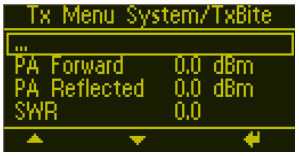
1.2 Alarm reading

If for some reason the “AL” light lit red and the display show one of these conditions, please check TX BITE menu chapter 1.3 for abnormal readings.

Display text:	Possible reason:	Module or Board
Alarm	Failure on the PA module	PA module
Mod	Failure on the Modulation module	Modulation module
Front	Failure on the Front Module	Front module
Main	Failure on the Main Module	Main module
Ethernet	Failure communicating with the ethernet_PHY	Main board
Codec	Failure communicating with the codec	Main board
Spi	Failure on the spi bus	Main board
Front	Failure communicating with the front module	Main board
Remexp	Failure communicating with the rem expander	Main board
Biteadc	Failure communicating with the bite adc	Main board
Dsp	Internal DSP failure	Main board
txSpare	Spare	Spare

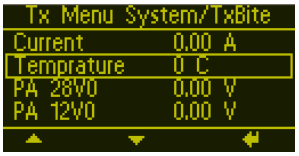
1.3 TX Bite menu

To check the BITE alarm conditions, please see chapter 1.3.1 .



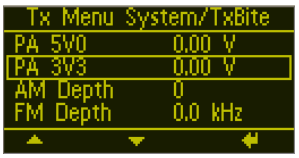
PA Module:Forward power in 1/10 dBm (472 =47dBm)
PA Module:Reflected power in 1/10 dBm (12 =1dBm)
PA Module:Calculated SWR in 1/10 (15 =1:1)

FbA FbB



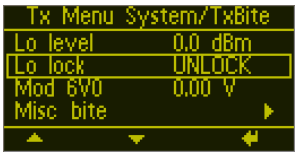
PA Module:Current consumption in milliAmps (mA)
PA Module:Temperature in degrees Celcius (°C)
PA Module:+28V DC voltage in milliVolts (mV)
PA Module:+12V DC voltage in milliVolts (mV)

FbA FbB

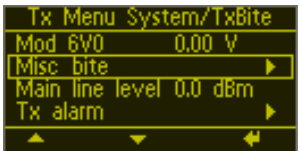


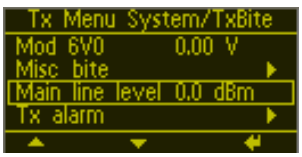
PA Module:+5V DC voltage in milliVolts (mV)
PA Module:+3V3 DC voltage in milliVolts (mV)
PA Module:AM depth (modulation) in %
PA Module:FM deviation in kHz*10 (50=+/-5.0 kHz)

FbA FbB



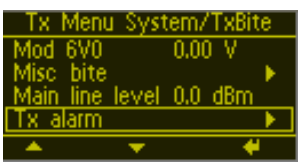
Modulation Module:LO level in 1/10 dBm (100 =10dBm)
Modulation Module:LO Locked (1) or unlocked (2) - Locked is normal
Modulation Module:+6V voltage in milliVolts (mV)





Main Module:Line level output in 1/10 dBm (-100 =-10dBm)

FbA FbB



Push FbC to enter RX Alarm.

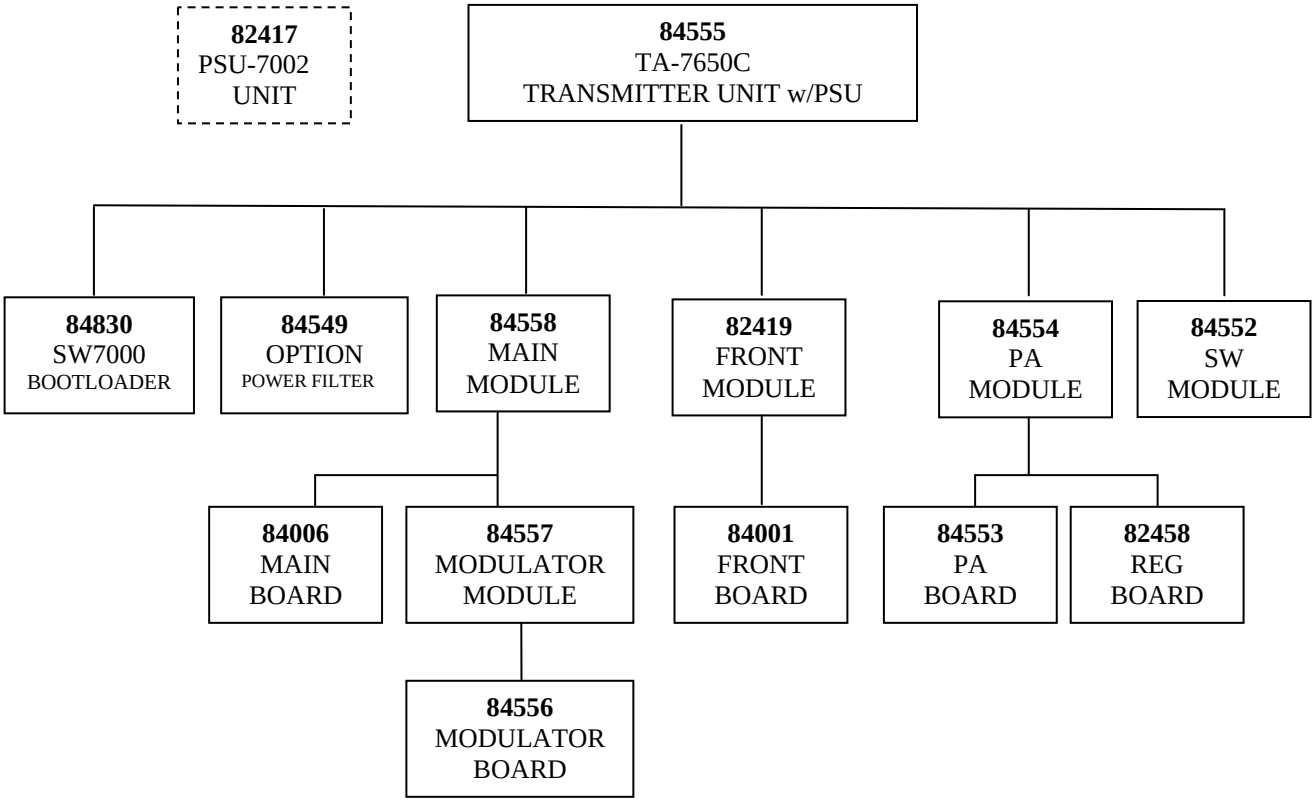
1.3.1 BITE alarm condition

PARAMETER:	Alarm criteria			Condition:	Module:
	Min	Max	Unit		
PA_3V3	2.9	3.6	V		PA
PA_5V	4.5	5.5	V		PA
PA_12V	11	12.8	V		PA
PA_28V	20	29	V		PA
PA_CUR	0	10	A	PA current drain	PA
MOD_6V	5.0	7.0	V		Modulator
MOD_LD_L01	Digital 3v3		-	3.3V Logic – alarm if unlocked	Modulator
PA_TEMP	-25	+85	°C	PA temperature	PA
MOD_LEVEL_L01	-20	8	dBm		Modulator
PA_5VN	-6.2	-4.0	V		PA
PA_SWR	NA	NA	-	Calculated SWR	Main

2 TECHNICAL DESCRIPTION TA-7650C

The transmitter TA-7650C is described in this manual.

2.1 Introduction



The TA-7650C transmitter unit consists of five modules and five boards:

- Main module
- Main board
- Front module
- Front board
- PA module
- PA board
- Reg. board
- Modulator module
- Modulator board
- Software module

2.2 Main module

The main module consists of the main board and the modulator module.
The modulator module is plugged into the main module.

2.2.1 Main board

The main board consists of DSP section, Audio section, DAC/ADC interface, BITE interface, I/O interface, Ethernet controller and memory section.

2.2.1.1 DSP

The heart of the board is a digital signal processor (DSP-IC42) running firmware for all interactions with it's peripherals. The DSP has implemented functionality to:

- Modulate a given input signal with AM and D8PSK, and generate I/Q baseband data.
- Interface with the Audio Codec responsible for converting audio signals and BITE measurements.
- Interface with the D/A converters converting baseband signals to RF/IF
- Interface with the A/D converters converting the demodulated output signal from analog to digital.
- Implement an adaptive linearization loop for improving Power Amplifier (PA) performance
- Interact with the ethernet controller for external control and data exchange
- Implement a user interface, interact with user actions and provide visual feedback through display and LED's.

2.2.1.2 Audio

The audio codec(IC 13) will receive and transmit digital audio data from/to the DSP. The audio codec itself will be responsible for:

- Amplifying, mixing and converting microphone signals to digital codes
- Amplifying, mixing and converting analogue input line(s) to digital codes
- Conduct analogue BITE measurements and convert these to digital values

The audio from the audio codec is routed to an audio amplifier (IC 38 –Monitor, IC11-Headphone)

2.2.1.3 Baseband DACs

A dual DAC(IC 17) will interface with the DSP. This DAC will :

- Perform high-quality DA conversion of the digital signal to analog I/Q-signal
- Provide a good match between the I/Q channels.

2.2.1.4 PA Feedback ADC

Two ADC's will demodulated output signal. The output of this will be fed into the DSP, which in turn will use this data for adaptive pre-distortion of the PA and output signal for monitoring purposes.

2.2.1.5 BITE interface

The BITE interface consists of a A/D converter (IC 8) with 12 analog channels, reading analog measurements from all modules. It communicates with the DSP on a SPI bus.

2.2.1.6 I/O interface

The I/O expander (IC12) provides the board with sufficient digital I/O lines for external and internal interfaces. It communicates with the DSP on a SPI bus. All external interfaces are passed through either relays or optocouplers for good immunity.
As part of the external interface, an RS232 (IC 34) and an RS485 (IC33) bus is provided

2.2.1.7 Ethernet controller

To simplify external communication, an on-board ethernet controller is implemented. This is responsible for:

- MAC/PHY layer interaction with LAN (IC 44).
- Communication with DSP through memory bus.

2.2.1.8 Memory

The DSP needs external memory banks to work. The board is equipped with 32Mbit Flash (IC 1) and 128Mbit SDRAM (IC 3).

2.3 Front module

The front module consists of the front board and the front panel.

2.3.1 Front board

The front board contains the Graphical OLED display and the push buttons visible on the front panel. The display is controlled trough the SPI bus. The push buttons and LED's are interfaced to an I/O expander (IC 1). The expander communicates with the DSP through the SPI bus.
The Front board is connected directly to the TX main board trough connector PL1.

2.4 PA module

The PA module consists of the PA board with cooling profile and fans. It also contains the Regulator board and rear wall with connectors.

2.4.1 PA board

RF amplifier:
The signal from the Modulator module, located on the TX main board, enters trough PL1. The signal is buffered by transistor Q15 to achieve a good matching of the output of the modulator.

The signal then the first amplifier, Q6. Q6 is autobiased by the circuit consisting of Q3 and Q1. The gain in this stage is also adjustable by altering the bias of D1. This is part of the overall gain control in the PA.

Then the signal is amplified further in the pre-driver, Q6. This is a MOSFET type transistor, and it is auto-biased by Q2 and Q4. The output is taken trough a 4:1 impedance transformer and fed to the input of the driver transistor Q8. Q108 is also of MOSFET type.

Q8 drives the output stage Q5 trough a single ended 4:1 impedance transformer, and a 9:1 balanced impedance transformer. Q111 is a “gemini” transistor set which operates as a push-pull amplifier. The output is impedance transformed and converted to single ended by transformer T2.

All RF stages are enclosed in a shielded box to avoid excessive RF interference on the surrounding circuitry.

PIN switch

From the output of the power amplifier the signal is fed to the T/R switch which is realised by using PIN diodes. In transmit mode D7 and D6 are forward biased, and the RF then passes through D7 and trough the antenna filter. In receive mode both D6 and D7 are unbiased, and the antenna signal flows through the directional coupler and antenna-filter, trough L6 and out on the Rx port PL5.

Antenna filter and directional coupler

In transmit mode, after passing trough the T/R switch the output signal passes trough the lowpass filter consisting of L7/L8/L9/L10/L11 and C67/C68/C69/C70/C71/C72. The low pass filter ensures excellent attenuation of the harmonics from the output stage.

A directional coupler is the last element in the signal path. It plays a vital role in the modulation process, and is a critical part for obtaining good modulation characteristics. Both forward and reflected power is detected in the directional coupler. D9 rectifies the reflected power and this voltage is used in the BITE and to detect poor impedance matching of the output. The detected forward power is passed trough the attenuator consisting of R81, R82 and R83 and passed to the modulator module through PL7, where it is demodulated by the quadrature demodulator (se modulator module).

Voltage regulators and control circuits

IC1 is the fan control circuit. It reads the voltage from temperature sensor IC4. IC4 senses the temperature of the cooling tunnel and the speed of the fan is regulated according to the measured temperature. The fan starts at approx. 40°C.

The main supply for the RF amplifier is regulated with IC17B and Q9. Q9 is a very low

on-resistance MOSFET and acts as a switch when the input voltage goes below the wanted output voltage. IC6 supplies approx. 35V, (input voltage + 8.2V) to the main regulator circuit.

The relay RL1 is the main powerswitch and also acts as a reverse polarity protection because of D4.

Current measurement is done with IC2. There is also a current limiter (IC5B), which reduces supply voltage if current consumption is too high.

IC8 generates -5VDC for the TX main board.

2.4.2 Regulator board

This board accepts 21.6 - 31.2VDC input voltage.
The DC voltage is converted to +3.3VDC, +5VDC and +12VDC by switchmode regulators IC1, IC2 and IC5. All regulator outputs are filtered to prevent noise from interfering on the Modulator board and TX Main board.

The microcontroller IC4 controls the powerup of the regulators, and controls ON switching of the equipment via the power relay on the PA board.. It also stores the current powerstate in the internal EEprom, so that it remembers if the unit was switched on after a power failure.

2.5 Modulator module

The Modulator module consists of the RF frontend board and a shielding box
The Modulator module is plugged directly into the Main board.

2.5.1 Modulator board

The Modulator board can be divided into four main sections:

- I/Q modulator
- I/Q demodulator
- Synthesiser

I/Q modulator
IC4 is a I/Q modulator and the output signal is controlled by the I/Q input signals from the Main board. The signals are filtered are filtered by LC filters on the inputs. The output signal is filtered by a tracking filter to improve wideband noise.

IC5 is a powerdetector and measures the output level of the modulator. It is used to tune the trackingfilter and is also a part of the BITE.

I/Q demodulator
IC2 is the demodulator and demodulates the signal from the directional coupler on the PA board. It plays a vital part of the control loop of the transmitter. The demodulated signal is

prosessed in the DSP on the mainboard, and the I/Q signals to the modulator are modified accordingly.

Synthesizer
The VCO is operating at 2 times the output frequency. Q4 is the oscillator transistor and the frequency is controlled by varicaps D1and D2. The VCO have a separate regulated supply to get as low noise as possible on the output signal. The signal is then split up in three parts. On signal is going to the divider IC1 which supplies the modulator LO signal. The VCO signal is also supplied directly to the demodulator which operates on the double frequency. A part of the LO signal is also fed to the synthesizer IC3. The synthesizer is controlled from the main board via the SPI bus.
Reference input is taken from the system clock located on the main board.

2.6 Software module

The Software module contains all necessary software to make the TA-7650C transmitter unit functional.

2.7 PSU-7002 Power supply Unit

The PSU converts an AC input voltage between 105VAC and 250VAC to a 28V regulated DC voltage to support the 7000 series transmitters.
The maximum load is 280VA.
If both the AC and DC power supply connection is made to the PSU, it will automatically switch to the DC backup supply in case the main AC supply fails.

2.8 Remote Data Interface

The data on the RS-232/RS-485 bus is transferred both ways with a data rate of 1200 b/s, using 9 bit data format, and 1 stop bit.
The data on the LAN connection uses SNMP protocol.

3 DIAGRAMS

3.1 TA-7650C transmitter unit

Block diagram TA-7650C	BD-84555
Circuit diagram, Main board part 1	E-84006-1
Circuit diagram, Main board part 2	E-84006-2
Circuit diagram, Main board part 3	E-84006-3
Circuit diagram, Main board part 4	E-84006-4
Circuit diagram, Main board part 5	E-84006-5
Circuit diagram, Main board part 6	E-84006-6
Circuit diagram, Main board part 7	E-84006-7
Circuit diagram, Main board part 8	E-84006-8
Circuit diagram, Main board part 9	E-84006-9
Place plan, Main board part 1	KP-84006-1
Place plan, Main board part 2	KP-84006-2
Circuit diagram, PA board part 1	E-84553-1
Circuit diagram, PA board part 2	E-84553-2
Circuit diagram, PA board part 3	E-84553-3
Place plan, PA board, part 1	KP-84553-1
Place plan, PA board part 2	KP-84553-2
Circuit diagram,Reg board	E-82458-1
Place plan, Reg board	KP-82458-1
Circuit diagram, Front board part 1	E-84001-1
Place plan, Front board part 1	KP-84001-1
Place plan, Front board part 2	KP-84001-2
Circuit diagram, Modulator board part 1	E-84556-1
Circuit diagram, Modulator board part 2	E-84556-2
Circuit diagram, Modulator board part 3	E-84556-3
Place plan, Modulator board, part 1	KP-84556-1
Place plan, Modulator board part 2	KP-84556-2

4 PARTS LIST

Bill Of Material (BOM)

Transmitter Unit	BOM-84555
Front module	BOM-82419
Front board	BOM-84001
PA module	BOM-84554
PA board	BOM-84553
Reg. Board	BOM-82458
Main module	BOM-84558
Main board	BOM-84006
Modulator module	BOM-84557
Modulator board	BOM-84556

5 APPENDIX

5.1 PSU-7002 bill of materials

The PSU-7002 consists of a traded power supply, PBNO0311, from Powerbox A/S.
The PBNO0311 consists of LEP240F-36 from Cosel.

参 考 資 料

COSEL

LEP240F-36 P A R T S L I S T

NO.	PARTS NO.	N A M E	T Y P E	MANUFACTURER	Q'ty
1	C101	METALLIZED FILM CAPACITOR	RE104-C3.5	OKAYA ELECTRIC INDUSTRIES	1
2	C102	METALLIZED FILM CAPACITOR	RE684	OKAYA ELECTRIC INDUSTRIES	1
3	C103	METALLIZED FILM CAPACITOR	ECQE4155Y105	MATSUSHITA ELECTRIC INDUSTRIAL	1
4	C104	METALLIZED FILM CAPACITOR	ECQE4155Y105	MATSUSHITA ELECTRIC INDUSTRIAL	1
5	C105	CERAMIC CAPACITOR	DE0807E102M	MURATA MFG CO.,LTD.	1
6	C106	CERAMIC CAPACITOR	DE1207-E332M	MURATA MFG CO.,LTD.	1
7	C107	CERAMIC CAPACITOR	DE0807E102M	MURATA MFG CO.,LTD.	1
8	C108	CERAMIC CAPACITOR	GRM40CH222J50	MURATA MFG CO.,LTD.	1
9	C109	CERAMIC CAPACITOR	GRM42-6R105K25	MURATA MFG CO.,LTD.	1
10	C110	CERAMIC CAPACITOR	GRM40034R104K50	MURATA MFG CO.,LTD.	1
11	C111	ELECTROLYTIC CAPACITOR	KMY50VB-100	NIPPON CHEMI-CON CORP.	1
12	C112	CERAMIC CAPACITOR	GRM40034R104K50	MURATA MFG CO.,LTD.	1
13	C113	CERAMIC CAPACITOR	GRM40034R104K50	MURATA MFG CO.,LTD.	1
14	C114	CERAMIC CAPACITOR	GRM40CH221J200	MURATA MFG CO.,LTD.	1
15	C115	CERAMIC CAPACITOR	GRM40CH471J50	MURATA MFG CO.,LTD.	1
16	C116	CERAMIC CAPACITOR	GRM40R474K25	MURATA MFG CO.,LTD.	1
17	C117	CERAMIC CAPACITOR	GRM40034R104K50	MURATA MFG CO.,LTD.	1
18	C118	CERAMIC CAPACITOR	GRM40034R104K50	MURATA MFG CO.,LTD.	1
19	C119	ELECTROLYTIC CAPACITOR	LGUW6121MHLFEK	NICHICON CORP.	1
20	C120	ELECTROLYTIC CAPACITOR	LGUW6121MHLFEK	NICHICON CORP.	1
21	C121	CERAMIC CAPACITOR	GHM1030R102K630	MURATA MFG CO.,LTD.	1
22	C122	CERAMIC CAPACITOR	GHM1030R102K630	MURATA MFG CO.,LTD.	1
23	C123	CERAMIC CAPACITOR	GHM1030R102K630	MURATA MFG CO.,LTD.	1
24	C124	CERAMIC CAPACITOR	GHM1030R102K630	MURATA MFG CO.,LTD.	1
25	C131	CERAMIC CAPACITOR	GRM40X7R103K100	MURATA MFG CO.,LTD.	1
26	C151	CERAMIC CAPACITOR	GRM42-6X7R474K50	MURATA MFG CO.,LTD.	1
27	C152	CERAMIC CAPACITOR	GRM40034R104K50	MURATA MFG CO.,LTD.	1
28	C170	CERAMIC CAPACITOR	GRM40034R104K50	MURATA MFG CO.,LTD.	1
29	C201	ELECTROLYTIC CAPACITOR	UPB1H100M	NICHICON CORP.	1
30	C202	CERAMIC CAPACITOR	GRM42-6X7R474K50	MURATA MFG CO.,LTD.	1
31	C203	CERAMIC CAPACITOR	GRM40CH471J50	MURATA MFG CO.,LTD.	1
32	C204	CERAMIC CAPACITOR	GRM42-6R105K25	MURATA MFG CO.,LTD.	1
33	C205	CERAMIC CAPACITOR	GRM40CH222J50	MURATA MFG CO.,LTD.	1
34	C206	CERAMIC CAPACITOR	GRM40X7R103K100	MURATA MFG CO.,LTD.	1
35	C208	CERAMIC CAPACITOR	CF316CH101J630	KYOCERA CORP.	1
36	C211	CERAMIC CAPACITOR	CF316CH101J630	KYOCERA CORP.	1
37	C212	CERAMIC CAPACITOR	CF316CH101J630	KYOCERA CORP.	1
38	C231	CERAMIC CAPACITOR	GRM40034R104K50	MURATA MFG CO.,LTD.	1
39	C232	CERAMIC CAPACITOR	GRM40034R104K50	MURATA MFG CO.,LTD.	1
40	C233	ELECTROLYTIC CAPACITOR	KMY50VB-100	NIPPON CHEMI-CON CORP.	1
41	C234	CERAMIC CAPACITOR	GRM40CH222J50	MURATA MFG CO.,LTD.	1
42	C235	CERAMIC CAPACITOR	GRM40CH222J50	MURATA MFG CO.,LTD.	1
43	C251	CERAMIC CAPACITOR	GRM40CH222J50	MURATA MFG CO.,LTD.	1
44	C252	CERAMIC CAPACITOR	GRM40CH222J50	MURATA MFG CO.,LTD.	1
45	C501	CERAMIC CAPACITOR	CF316W5R681K630AT	KYOCERA CORP.	1
46	C502	CERAMIC CAPACITOR	CF316W5R681K630AT	KYOCERA CORP.	1
47	C505	CERAMIC CAPACITOR	GHM1030R102K630	MURATA MFG CO.,LTD.	1
48	C506	CERAMIC CAPACITOR	GHM1030R102K630	MURATA MFG CO.,LTD.	1
49	C507	ELECTROLYTIC CAPACITOR	UPW1H681MHH	NICHICON CORP.	1
50	C508	ELECTROLYTIC CAPACITOR	UPW1H681MHH	NICHICON CORP.	1
---01/06---			Model Code	083592	

参 考 資 料

COSEL

LEP240F-36 PARTS LIST

NO.	PARTS NO.	NAME	TYPE	MANUFACTURER	Q'ty
1	C510	CERAMIC CAPACITOR	GRM42-6R224K25	MURATA MFG CO.,LTD.	1
2	C513	METALLIZED FILM CAPACITOR	RE223	OKAYA ELECTRIC INDUSTRIES	1
3	C515	CERAMIC CAPACITOR	GHM1030R102K630	MURATA MFG CO.,LTD.	1
4	C516	CERAMIC CAPACITOR	GHM1030R102K630	MURATA MFG CO.,LTD.	1
5	CN1		B3P5-VH	JAPAN SOLDERLESS TERMINAL	1
6	CN2		B8P-VH	JAPAN SOLDERLESS TERMINAL	1
7	D103	DIODE	1SS355	ROHM CO.,LTD.	1
8	D104	DIODE	1SS355	ROHM CO.,LTD.	1
9	D105	DIODE	1SS355	ROHM CO.,LTD.	1
10	D106	DIODE	1SS355	ROHM CO.,LTD.	1
11	D107	DIODE	1SS355	ROHM CO.,LTD.	1
12	D108	DIODE	EP10QY03		1
13	D109	DIODE	U1JC44	TOSHIBA CORP.	1
14	D110	DIODE	U1JC44	TOSHIBA CORP.	1
15	D151	DIODE	1SS355	ROHM CO.,LTD.	1
16	D152	DIODE	1SS355	ROHM CO.,LTD.	1
17	D201	DIODE	1SS355	ROHM CO.,LTD.	1
18	D202	DIODE	1SS355	ROHM CO.,LTD.	1
19	D203	DIODE	EP10QY03		1
20	D204	DIODE	U1JC44	TOSHIBA CORP.	1
21	D205	DIODE	1SS355	ROHM CO.,LTD.	1
22	D230	DIODE	1SS355	ROHM CO.,LTD.	1
23	D231	DIODE	1SS355	ROHM CO.,LTD.	1
24	D232	DIODE	1SS367	TOSHIBA CORP.	1
25	D233	DIODE	M1FP3	SHINDENGEN ELECTRIC MFG	1
26	D251	DIODE	1SS355	ROHM CO.,LTD.	1
27	F101	FUSE	215 10	LITTELFUSE INC.	1
28	IC101	IC	FA5502M	FUJI ELECTRIC CO.,LTD.	1
29	IC201	IC	M51995AFP	MITSUBISHI ELECTRIC CORP.	1
30	IC231	IC	UPC1944T	NEC CORP.	1
31	IC501	IC	UPC1093T	NEC CORP.	1
32	J101	CHIP RESISTOR	HPCR1/8 CJ	HOKURIKU ELECTRIC IND.	1
33	J102	CHIP RESISTOR	HPCR1/8 CJ	HOKURIKU ELECTRIC IND.	1
34	J103	CHIP RESISTOR	HPCR1/8 CJ	HOKURIKU ELECTRIC IND.	1
35	J104	CHIP RESISTOR	HPCR1/8 CJ	HOKURIKU ELECTRIC IND.	1
36	J105	CHIP RESISTOR	HPCR1/8 CJ	HOKURIKU ELECTRIC IND.	1
37	J111		J1/4ZT52A	KOA CORP.	1
38	J112		J1/4ZT52A	KOA CORP.	1
39	J201	CHIP RESISTOR	HPCR1/8 CJ	HOKURIKU ELECTRIC IND.	1
40	J202	CHIP RESISTOR	HPCR1/8 CJ	HOKURIKU ELECTRIC IND.	1
41	J203	CHIP RESISTOR	HPCR1/8 CJ	HOKURIKU ELECTRIC IND.	1
42	J204	CHIP RESISTOR	HPCR1/8 CJ	HOKURIKU ELECTRIC IND.	1
43	J503	CHIP RESISTOR	HPCR1/8 CJ	HOKURIKU ELECTRIC IND.	1
44	L101	INDUCTOR	SS35V35047	TOKIN CORP.	1
45	L102	INDUCTOR	SS35V35047	TOKIN CORP.	1
46	L103	CHOKE COIL	LB225380C		1
47	L110		N2012Z260	TOKIN CORP.	1
48	L111		N2012Z260	TOKIN CORP.	1
49	L501	FERRITE BEADS	DL-7H 0P4-2-2H	HITACHI FERRITE ELECTRONICS, LTD	1
50	L502	FERRITE BEADS	DL-7H 0P4-2-2H	HITACHI FERRITE ELECTRONICS, LTD	1
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参 考 資 料

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LEP240F-36 P A R T S L I S T

NO.	PARTS NO.	N A M E	T Y P E	MANUFACTURER	Q'ty
1	L503	FERRITE BEADS	DL-7H OP4-2-2H	HITACHI FERRITE ELECTRONICS, LTD	1
2	L504	FERRITE BEADS	DL-7H OP4-2-2H	HITACHI FERRITE ELECTRONICS, LTD	1
3	L507	CHOKE COIL	AC11	NIPPON CHEMI-CON CORP.	1
4	PC201	PHOTOCOUPLER	PS2561L1-1	NEC CORP.	1
5	PC202	PHOTOCOUPLER	PS2561L1-1	NEC CORP.	1
6	R101	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
7	R102	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
8	R103	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
9	R104	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
10	R105	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
11	R106	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
12	R107	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
13	R108	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
14	R109	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
15	R110	CHIP RESISTOR	HPCR1/8 302G	HOKURIKU ELECTRIC IND.	1
16	R111	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
17	R112	CHIP RESISTOR	HPCR1/8 433G	HOKURIKU ELECTRIC IND.	1
18	R113	CHIP RESISTOR	HPCR1/8 273G	HOKURIKU ELECTRIC IND.	1
19	R114	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
20	R115	CHIP RESISTOR	HPCR1/8 103G	HOKURIKU ELECTRIC IND.	1
21	R116	CHIP RESISTOR	HPCR1/8 473G	HOKURIKU ELECTRIC IND.	1
22	R117	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
23	R118	CHIP RESISTOR	HPCR1/8 473G	HOKURIKU ELECTRIC IND.	1
24	R119	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
25	R120	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
26	R121	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
27	R122	METAL OXIDE RESISTOR	RSS1/2 471J	KOA CORP.	1
28	R123	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
29	R124	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
30	R125	CHIP RESISTOR	CR1/24R7J	HOKURIKU ELECTRIC IND.	1
31	R126	CHIP RESISTOR	CR1/2470JE	HOKURIKU ELECTRIC IND.	1
32	R127	CHIP RESISTOR	HPCR1/8 203G	HOKURIKU ELECTRIC IND.	1
33	R128	CHIP RESISTOR	HPCR1/8 474G	HOKURIKU ELECTRIC IND.	1
34	R129	CHIP RESISTOR	HPCR1/8 105G	HOKURIKU ELECTRIC IND.	1
35	R130	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
36	R131	CHIP RESISTOR	HPCR1/8 623G	HOKURIKU ELECTRIC IND.	1
37	R132	CHIP RESISTOR	HPCR1/8 470G	HOKURIKU ELECTRIC IND.	1
38	R133	CHIP RESISTOR	HPCR1/8 103G	HOKURIKU ELECTRIC IND.	1
39	R134	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
40	R135	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
41	R136	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
42	R137	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
43	R138	CHIP RESISTOR	HPCR1/8 1581F	HOKURIKU ELECTRIC IND.	1
44	R139	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
45	R140	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
46	R141	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
47	R142	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
48	R143	CHIP RESISTOR	HPCR1/8 1581F	HOKURIKU ELECTRIC IND.	1
49	R144		BPR58L370.05J	KOA CORP.	1
50	R146	CHIP RESISTOR	HPCR1/8 150G	HOKURIKU ELECTRIC IND.	1
---03/06---			Model Code	083592	

参 考 資 料

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LEP240F-36 PARTS LIST

NO.	PARTS NO.	NAME	TYPE	MANUFACTURER	Q'ty
1	R147	CHIP RESISTOR	HPCR1/8 102G	HOKURIKU ELECTRIC IND.	1
2	R148	CHIP RESISTOR	CR1/2100J	HOKURIKU ELECTRIC IND.	1
3	R149	CHIP RESISTOR	CR1/2100J	HOKURIKU ELECTRIC IND.	1
4	R151	CEMENT FILLED RESISTOR	F5K-4R7J14	ANZEN DENGU CO.,LTD	1
5	R152	CEMENT FILLED RESISTOR	F5K-4R7J14	ANZEN DENGU CO.,LTD	1
6	R153	CHIP RESISTOR	HPCR1/8 103G	HOKURIKU ELECTRIC IND.	1
7	R156	CHIP RESISTOR	CR1/24R7J	HOKURIKU ELECTRIC IND.	1
8	R170	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
9	R171	CHIP RESISTOR	HPCR1/8 563G	HOKURIKU ELECTRIC IND.	1
10	R201	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
11	R202	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
12	R203	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
13	R204	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
14	R205	CHIP RESISTOR	HPCR1/8 473G	HOKURIKU ELECTRIC IND.	1
15	R206	CHIP RESISTOR	CR1/22R2J	HOKURIKU ELECTRIC IND.	1
16	R207	CHIP RESISTOR	HPCR1/8 223G	HOKURIKU ELECTRIC IND.	1
17	R208	CHIP RESISTOR	HPCR1/8 822G	HOKURIKU ELECTRIC IND.	1
18	R209	CHIP RESISTOR	CR1/2330J	HOKURIKU ELECTRIC IND.	1
19	R210	CHIP RESISTOR	CR1/2220J	HOKURIKU ELECTRIC IND.	1
20	R211	CHIP RESISTOR	HPCR1/8 332G	HOKURIKU ELECTRIC IND.	1
21	R212	CHIP RESISTOR	HPCR1/8 103G	HOKURIKU ELECTRIC IND.	1
22	R213	CHIP RESISTOR	CR1/24R7J	HOKURIKU ELECTRIC IND.	1
23	R214	METAL OXIDE RESISTOR	RSS1 220J	KOA CORP.	1
24	R215	CHIP RESISTOR	LCR1/2R10G	HOKURIKU ELECTRIC IND.	1
25	R216	CHIP RESISTOR	HPCR1/8 680G	HOKURIKU ELECTRIC IND.	1
26	R217	CHIP RESISTOR	HPCR1/8 181G	HOKURIKU ELECTRIC IND.	1
27	R218	CHIP RESISTOR	HPCR1/8 472G	HOKURIKU ELECTRIC IND.	1
28	R219	CHIP RESISTOR	HPCR1/8 330G	HOKURIKU ELECTRIC IND.	1
29	R220	CHIP RESISTOR	LCR1/2R10G	HOKURIKU ELECTRIC IND.	1
30	R231	CHIP RESISTOR	HPCR1/8 102G	HOKURIKU ELECTRIC IND.	1
31	R232	CHIP RESISTOR	HPCR1/8 102G	HOKURIKU ELECTRIC IND.	1
32	R233	CHIP RESISTOR	HPCR1/8 104G	HOKURIKU ELECTRIC IND.	1
33	R234	CHIP RESISTOR	HPCR1/8 473G	HOKURIKU ELECTRIC IND.	1
34	R235	CHIP RESISTOR	HPCR1/8 472G	HOKURIKU ELECTRIC IND.	1
35	R236	CHIP RESISTOR	HPCR1/8 392G	HOKURIKU ELECTRIC IND.	1
36	R237	CHIP RESISTOR	HPCR1/8 821G	HOKURIKU ELECTRIC IND.	1
37	R238	CHIP RESISTOR	HPCR1/8 221G	HOKURIKU ELECTRIC IND.	1
38	R239	CHIP RESISTOR	HPCR1/8 103G	HOKURIKU ELECTRIC IND.	1
39	R240		BPR38L370.47J	KOA CORP.	1
40	R241	CHIP RESISTOR	HPCR1/8 220G	HOKURIKU ELECTRIC IND.	1
41	R242	CHIP RESISTOR	HPCR1/8 220G	HOKURIKU ELECTRIC IND.	1
42	R243	CHIP RESISTOR	HPCR1/8 203G	HOKURIKU ELECTRIC IND.	1
43	R251	CHIP RESISTOR	HPCR1/8 432G	HOKURIKU ELECTRIC IND.	1
44	R252	CHIP RESISTOR	HPCR1/8 101G	HOKURIKU ELECTRIC IND.	1
45	R254	CHIP RESISTOR	HPCR1/8 181G	HOKURIKU ELECTRIC IND.	1
46	R501	CHIP RESISTOR	HPCR1/8 221G	HOKURIKU ELECTRIC IND.	1
47	R502	CHIP RESISTOR	HPCR1/8 102G	HOKURIKU ELECTRIC IND.	1
48	R503	CHIP RESISTOR	CR1/2471J	HOKURIKU ELECTRIC IND.	1
49	R504	CHIP RESISTOR	HPCR1/8 102G	HOKURIKU ELECTRIC IND.	1
50	R505	CHIP RESISTOR	HPCR1/8 472G	HOKURIKU ELECTRIC IND.	1
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参 考 資 料

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LEP240F-36 P A R T S L I S T

NO.	PARTS NO.	N A M E	T Y P E	MANUFACTURER	Q'ty
1	R506	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
2	R507	CHIP RESISTOR	HPCR1/8 102G	HOKURIKU ELECTRIC IND.	1
3	R509	CHIP RESISTOR	CR1/2471J	HOKURIKU ELECTRIC IND.	1
4	R510	CHIP RESISTOR	CR1/24R7J	HOKURIKU ELECTRIC IND.	1
5	R511	CHIP RESISTOR	CR1/24R7J	HOKURIKU ELECTRIC IND.	1
6	R512	CHIP RESISTOR	CR1/2470JE	HOKURIKU ELECTRIC IND.	1
7	R513	CHIP RESISTOR	CR1/2470JE	HOKURIKU ELECTRIC IND.	1
8	R514	CHIP RESISTOR	CR1/2470JE	HOKURIKU ELECTRIC IND.	1
9	R515	CHIP RESISTOR	CR1/2470JE	HOKURIKU ELECTRIC IND.	1
10	R521	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
11	R522	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
12	R523	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
13	R524	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
14	R525	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
15	R526	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
16	R527	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
17	R528	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
18	R529	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
19	R530	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
20	R531	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
21	R532	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
22	R533	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
23	R534	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
24	R535	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
25	R536	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
26	R537	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
27	R538	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
28	R539	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
29	R540	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
30	R543	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
31	R544	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
32	R545	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
33	R546	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
34	R547	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
35	R548	CHIP RESISTOR	HPCR1/8 163G	HOKURIKU ELECTRIC IND.	1
36	SCR151	SCR	SF25JZ51	TOSHIBA CORP.	1
37	SS101	DIODE	D15XB60	SHINDENGEN ELECTRIC MFG	1
38	SS102	DIODE	FCU10A60		1
39	SS501	DIODE	ESAD92M-03	FUJI ELECTRIC CO.,LTD.	1
40	SS502	DIODE	ESAD92M-03	FUJI ELECTRIC CO.,LTD.	1
41	T201	TRANSFORMER	LP24136T		1
42	TR101	TRANSISTOR	2SC4639-6	SANYO ELECTRIC CO.,LTD.	1
43	TR102	TRANSISTOR	2SA1781-6	SANYO ELECTRIC CO.,LTD.	1
44	TR103	FET	2SK1821-01	FUJI ELECTRIC CO.,LTD.	1
45	TR104	TRANSISTOR	2SC4639-6	SANYO ELECTRIC CO.,LTD.	1
46	TR105	FET	2SK2372	NEC CORP.	1
47	TR106	TRANSISTOR	2SD1624S		1
48	TR107	TRANSISTOR	2SB1124S		1
49	TR108	FET	2SK2372	NEC CORP.	1
50	TR201	FET	2SK2611	TOSHIBA CORP.	1
		---05/06---	Model Code	083592	

参考資料

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LEP240F-36 PARTS LIST

NO.	PARTS NO.	NAME	TYPE	MANUFACTURER	Q'ty
1	TR231	TRANSISTOR	2SC4639-6	SANYO ELECTRIC CO., LTD.	1
2	TR232	TRANSISTOR	2SC4639-6	SANYO ELECTRIC CO., LTD.	1
3	VR201	VARIABLE RESISTOR	VG047TL1B102	HOKURIKU ELECTRIC IND.	1
4	VR501	VARIABLE RESISTOR	VG047TL1B102	HOKURIKU ELECTRIC IND.	1
5	ZD101	ZENER DIODE	HZU10B2	HITACHI LTD.	1
6	ZD102	ZENER DIODE	HZU27B	HITACHI LTD.	1
7	ZD103	ZENER DIODE	HZU15B2	HITACHI LTD.	1
8	ZD104	ZENER DIODE	HZU27B	HITACHI LTD.	1
9	ZD231	ZENER DIODE	HZU7.5B2	HITACHI LTD.	1
10	ZD232	ZENER DIODE	HZU12B2	HITACHI LTD.	1
11	ZD251	ZENER DIODE	HZU5.1B2	HITACHI LTD.	1
12	ZD501	ZENER DIODE	HZU15B2	HITACHI LTD.	1
13	ZD502	ZENER DIODE	HZU30B	HITACHI LTD.	1
14	ZD503	ZENER DIODE	RD15FM	NEC CORP.	1

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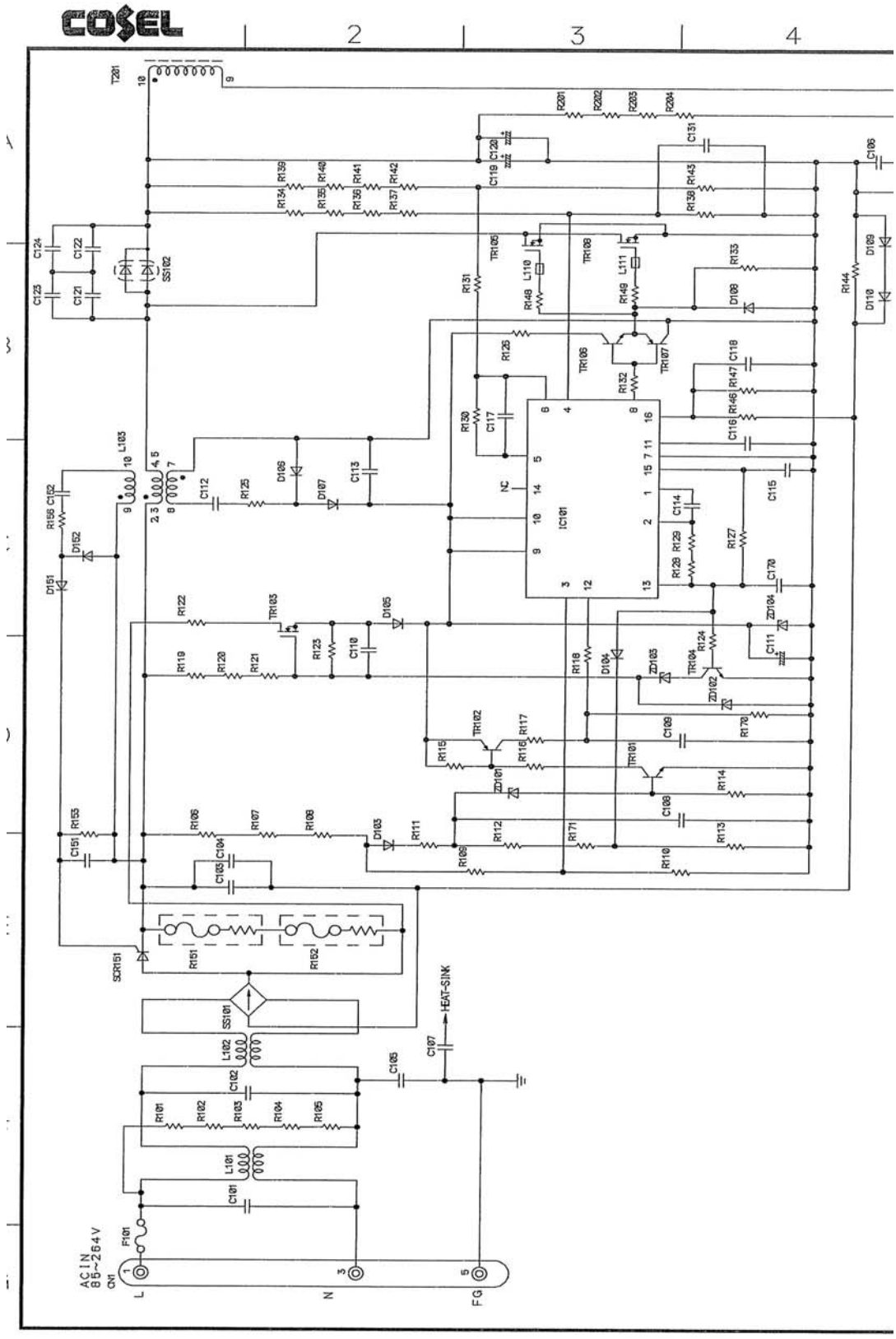
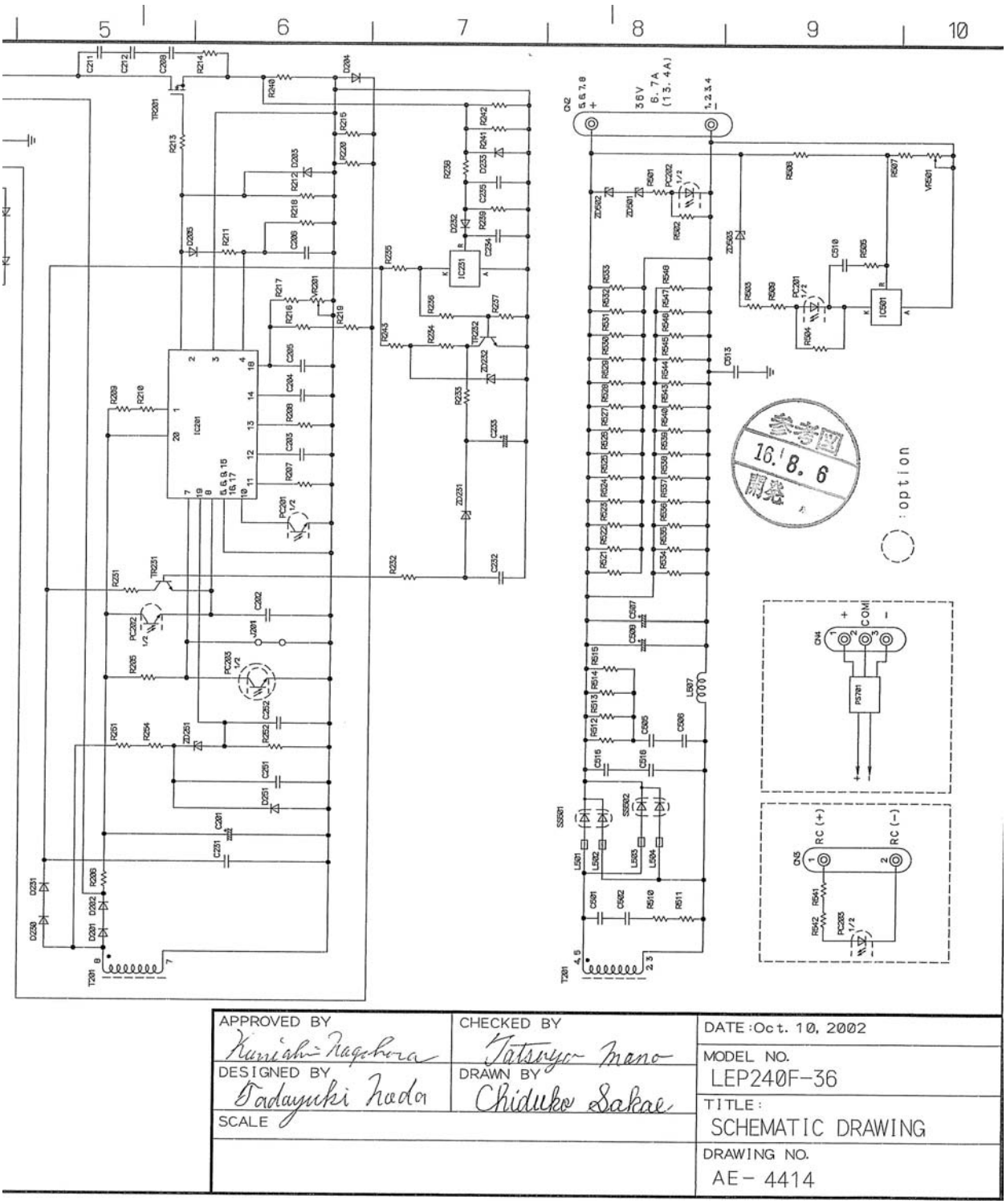
5.2 PSU-7002 diagram 1of 2



5.2.1 PSU-7002 diagram 2of 2



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