

To : \_\_\_\_\_

Specifications of INVERTER for FUJITSU LCD module

**FLC V -13**

Approval
Date :  By :

This Product is designed, developed and manufactured as contemplated for general use, including without limitation, general office use, personal use, household use, and ordinary industrial use, but is not designed, developed and manufactured as contemplated for use accompanying fatal risks or dangers that, unless extremely high safety is secured, could lead directly to death, personal injury, severe physical damage or other loss (hereinafter "High Safety Required Use"), including without limitation, nuclear reaction control in nuclear facility, aircraft flight control, air traffic control, mass transport control, medical life support system, missile launch control in weapon system. If customer's product possibly falls under the category of High Safety Required Use, please consult with our sales representatives in charge before such use. In addition, Fujitsu shall not be liable against the Customer and/or any third party for any claims or damages arising in connection with the High Safety Required Use of the Product without permission.

Specification No. : Tech Bes LCD-00105

Issue Date : Feb. 4, 2002

Issued by :   
\_\_\_\_\_  
T. Naka

Director  
LCD Design Dep.  
LCD Technology Div.  
LCD Group

**FUJITSU LIMITED**

### REVISION HISTORY

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Revision	Date	Prepared	Checked			Approved	Summary
01A	Feb. 4, 2002	E.Nitto	M.Fujita	K.Tanaka		T.Naka	1st edition

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FLCV-13

Tech Bes LCD-00105

CUST.

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DESIG.	20020204	Nitto	CHECK	Miyahara	Fujita	APPR.	Tanaka	

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### 1. APPLICATIONS

This specification is applied to the INVERTER unit suited for TFT-LCD unit shown on Table 1-1.

Table 1-1 Applied Model Number

No.	Model Number	Product Drawing Number	Remark
1	FLC48SXC8V-XXX	NA19020-C9XX	48cm (19-inch) SXGA
2			
3			

### 2. PRODUCT NAME AND MODEL NUMBER

- 2-1 Product Name : INVERTER
- 2-2 Model Name : FLCV-13
- 2-3 Product Drawing Number : NA19002-4235

### 3. OVERVIEW

This inverter unit can drive four Cold Cathode Fluorescent Lamps (CCFLs) of the backlight. This inverter can control ON and OFF, and the brightness of CCFL by external signals. The power supply of this inverter unit is +12V DC.

The block diagram is shown in the attached figure-1.

### 4. ABSOLUTE MAXIMUM RATINGS

Table 4-1 shows the absolute maximum ratings.

Table 4-1 Absolute Maximum Ratings

Item	Symbol	Condition	MIN.	MAX.	Unit	
Supply Voltage	Vin		-0.3	14.0	V	
Temperature	Operation	Top	Ha≤90%RH	-5	55	°C
	Storage	Tstg	Ha≤95%RH	-25	80	°C
Humidity	Operation	Hop	Ta=0~55°C	10	90	%RH
	Storage	Hstg	Ta=-20~80°C	5	95	%RH
ON/OFF Control Voltage	Vcnt		-0.3	Vin	V	
Brightness Control Voltage	Vvr		-0.3	4.0	V	

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DATE

					FLCV-13	
					Tech Bes LCD-00105	
					CUST.	
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					2 /	

### 5. RECOMMENDED OPERATING CONDITIONS

Table 5-1 shows the recommended operating conditions.

Table 5-1 Recommended Operating Conditions

Item		Symbol	MIN.	TYP.	MAX.	Unit	Remark
Supply Voltage		Vin	11.4	12.0	12.6	V	
Temperature	Operation	To	0		50	°C	
	Storage	Ts	-20		60	°C	
Humidity	Operation	Ho	20		85	RH	No condensation
	Storage	Hs	5		85	RH	
ON and OFF Control Voltage	ON	Vcnt	0	---	0.8	V	
	OFF	Vcnt	2.1	---	Vin	V	
Brightness Control Voltage		Vvr	0	---	3.5	V	*1
Power supply capacity (User side)		Iin	4	---	---	A	*2

\*1 Brightness is maximum for Vvr=0V. Brightness is minimum for Vvr=3.5V.

\*2 Minimum 4.0 ampere current is required for meltdown of fuse when abnormal circumstance has happened.

### 6. MECHANICAL SPECIFICATIONS

#### 6-1 Overview

Table 6-1 shows the mechanical specifications Table 6-1 shows the mechanical specifications.

Table 6-1 Mechanical specifications

Item	Specifications	Unit	Remark
Demention	207×67×11.6mm(Typ)	mm	
Weight	105(Typ)	g	

#### 6-2 Structure and Dimension

See the attached figure-3.

#### 6-3 FG-SG

Short circuited.

#### 6-4 Recommended mounting condition

See the attached figure-4.

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DATE

						FLCV-13	
						Tech Bes LCD-00105	
						CUST.	
EDIT	DATE	DESIG.	CHECK	APPR.	DESCRIPTION		
DESIG.			CHECK		FUJITSU LIMITED		
						3 /	

## 7. ELECTRICAL SPECIFICATIONS

Table 7-1 shows the electrical specifications.

Unless otherwise specified, typical LCD unit (or equivalent impedance : 100k $\Omega$ /(8.18pF) is connected to individual output pin. The power supply is +12V DC. Vcnt=0V. It is measured after 20 minutes from lighting on.

Table 7-1 Electrical Specifications

Item		Symbol	Condition	MIN.	TYP.	MAX.	Unit	Note
Supply Current	Max Brightness	Iin	Vvr=0V	1.9	2.2	2.5	A	
Lighting Frequency		fr	Vvr=0V	40	50	60	kHz	*1
Tube current		Iout	Vvr=0V	6.0	7.0	8.0.	mArms	*2
Output voltage without load		Vt1	Vvr=0V	1670	1750	1850	Vrms	*3
		Vt2	Vin=12.6V, Vvr=0V	---	---	1940		
		Vt3	Vin=11.4V, Vvr=0V	1580	---	---		
Brightness control characteristics	Max brightness	Vvr1	Vvr=0V	100			%	
	Min brightness	Vvr2	Vvr=3.5V	---	20	---	%	*4
	Threshold voltage	Vvrt		---	0.5	---	V	*5
Brightness control Frequency		fc		---	280	---	Hz	*6
Open detection		Iop		---	0.2	---	mArms	*7

\*1. Same frequency for CN2 and CN3, CN4 and CN5.

\*2. Tube current means the current that flows into one tube. (or tube equivalent impedance)

\*3. Transformer output.

\*4. The ratio of brightness compared to the brightness of 100%.

\*5. Brightness begins to dim at that Vvrt value.

\*6. Basic oscillation frequency of duty brightness control.

\*7. Open detection for each CCFL, and detection makes the output of same group of CCFL off.

It returns to normal state automatically by the power off and on.

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						Tech Bes LCD-00105		
						CUST.		
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DESIG.			CHECK		FUJITSU LIMITED			
						4 /		

**8. INTERFACE CONNECTOR**

Table 8-1 and 8-2 show pin assignment and function of interface connector.

Table 8-1 Input Signals [CN1:53261-0890 (Molex)]

PinNo.	Name	Function	Remark
1	Vin	Power Supply (+12V)	
2	Vin	Power Supply (+12V)	
3	Vin	Power Supply (+12V)	
4	GND	Ground	
5	GND	Ground	
6	GND	Ground	
7	Vcnt	ON and OFF Control Voltage	CCFL is <b>on</b> for Vcnt=Low. CCFL is <b>off</b> for Vcnt=High or Open
8	Vvr	Brightness Control Voltage	Brightness is <b>maximum</b> for Vvr=0.0V. CCFL is <b>off</b> for Vcnt=High or Open

User's Connector

HOUSING : 51021-0800 (Molex)

TERMINAL : 50058-8\*00 or 50079-8\*00 (Molex)

Table 8-2 Output Signals [CN2,3,4,5 : SM02(8.0)B-BHS-1-TB (JST)]

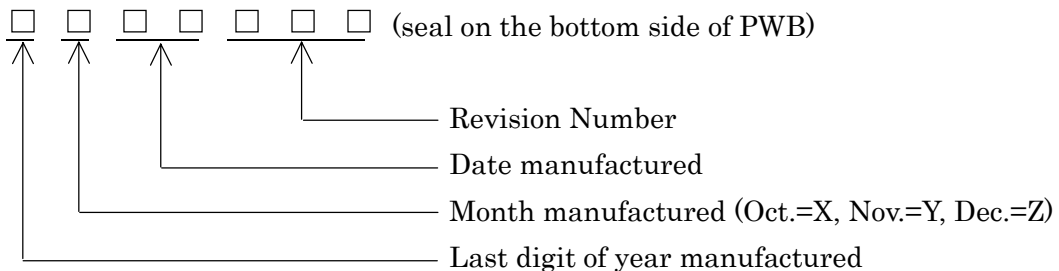
PinNo.	Name	Function
1	Vout-Hi	Power supply for CCFL (High)
2	N.C.	Open
3	Vout-Lo	Power supply for CCFL (Low)

**9. MARKING**

This module has the following markings.

(1) Module Number : FLCV-13 (silkscreen marking on the top side of PWB)

(2) Manufacturing Number and Revision Number :



(3) Company Name : FUJITSU LIMITED (silkscreen marking on the top side of PWB)

(4) Warning :

CAUTION HIGH VOLTAGE (silkscreen marking on the top side of PWB)

UL number (silkscreen marking on the top side of PWB)

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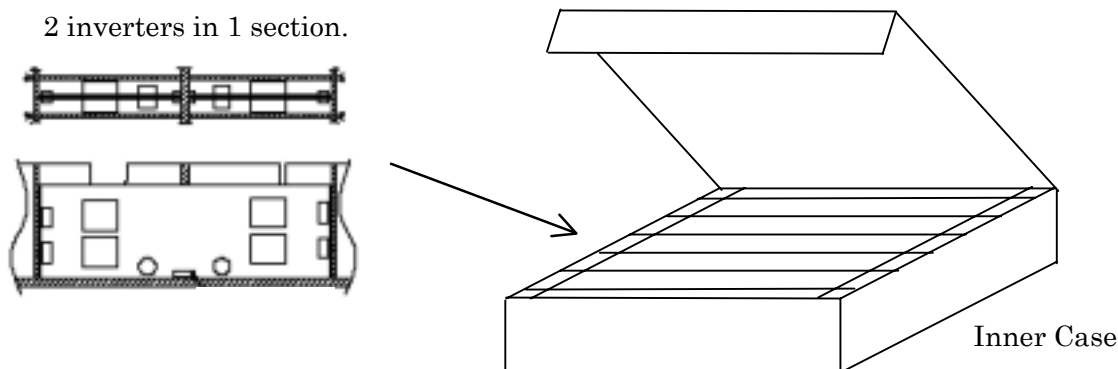
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						Tech Bes LCD-00105	
						CUST.	
EDIT	DATE	DESIG.	CHECK	APPR.	DESCRIPTION		
DESIG.			CHECK		FUJITSU LIMITED		
						5 /	

### 10. PACKAGING

Inverters are accommodated in the inner case which has capacity of maximum 10. Then, they are packed in the outer carton (corrugated carton) and shipped. (See Fig. 11)  
 The size of the outer carton is not specified because it depends on the quantity of the shipping inverters. In case the number of inverter is less than 10, the inverter may be packed individually in the antistatic material without using the inner case.

[Inner box]    -Size        : 250×170×90mm  
                   -Material    : corrugated carton

Fig.11 Packaging (Inner case)



### 11. WARRANTY

The warranty period is one year from the manufactured date. Fujitsu shall repair or provide new product free of charge in case of product failure during this period due to the causes other than the intentional acts of damage or negligence by user.

### 12. PRECAUTIONS

**This inverter module generates a high voltage, and incorrect operations may cause electric shock, smoke, or fire.**

Please adhere to the following precautions to secure high reliability and safety.

#### 12-1 Fail safe design

Inverter has an inherent chance of failure. Customers must protect against accident into injury or death, fire accident or social loss from such failures by incorporating safety design measures into your facility and equipment such as redundancy, fire protection, and prevention of over-current or other abnormal operating conditions.

#### 12-2 Condition for use

- (1) This product is not intended to be used for the equipment which requires extremely high reliability, such as aerospace equipment, nuclear control system, and medical equipment for life support.

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						FLCV-13	
						Tech Bes LCD-00105	
						CUST.	
EDIT	DATE	DESIG.	CHECK	APPR.	DESCRIPTION		
DESIG.			CHECK		FUJITSU LIMITED		
						6 /	

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- (2) Please keep the inverter out of water drop and dust because it may give any trouble. Avoid using the inverter which shows evidence of accretion of water drop and dust.
- (3) Do not store this product in an environment of dust or corrosive gas (salt, acid, alkali etc.).
- (4) Be sure to use this product under recommended operating conditions specified in section5. Do not use this product over absolute maximum ratings specified in section4.

A

**12-3 Mounting**

B

- (1) When designing equipment, high voltage part of inverter, that is the wiring between transformer and output connector, must keep the distance of 4mm or more from any other conductive materials. If there are any conductive materials around the inverter, we recommend to insert insulator.
- (2) Do not bundle the high side and the low side of the cable between the output connector and the lamp not to increase leakage current which does not contribute to light generation. Do not twist the cable.
- (3) Make sure that foreign particles do not get into the module to prevent malfunction caused by short-circuit of high voltage part of inverter.

B

**12-4 Protective circuit**

C

- (1) This product has built-in fuse to prevent from smoking or firing caused by over current. To make sure this operation, use the power supply with capacity of more than twice of rated current.

C

**12-5 Handling**

D

- (1) Be careful of electric shock, for there stays a high voltage in the internal circuit. Turn off the power supply before pushing in and pulling out the input or output connectors.
- (2) Do not touch the exposed part of the transformer on the inverter. It may cause electric shock.
- (3) Excessive mechanical force to the electric parts and printed circuit board of the inverter may become the cause of any trouble such as pattern exfoliation. Handle this inverter carefully.
- (4) Please don't give any shock to the transformer of the inverter or don't hurt the signal cable. Even rare short-circuit may become the cause of smoke or fire.
- (5) Do not stack the inverters.

D

**12-6 Indication**

- (1) There is no indication to warn you about the high voltage. Make sure that only authorized technician should handle the inverter.  
If the equipment is designed so that the inverter is possibly touched by outsider, it is requested to indicate warnings clearly for fear of electric shock or burns.

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DOCUMENT CONTROL SECTION

DATE

F

						FLCV-13	
						Tech Bes LCD-00105	
						CUST.	
EDIT	DATE	DESIG.	CHECK	APPR.	DESCRIPTION		
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						7 /	



**13. PRECAUTION FOR USE**

This Product is designed, developed and manufactured as contemplated for general use, including without limitation, general office use, personal use, household use, and ordinary industrial use, but is not designed, developed and manufactured as contemplated for use accompanying fatal risks or dangers that, unless extremely high safety is secured, could lead directly to death, personal injury, severe physical damage or other loss (hereinafter "High Safety Required Use"), including without limitation, nuclear reaction control in nuclear facility, aircraft flight control, air traffic control, mass transport control, medical life support system, missile launch control in weapon system. If customer's product possibly falls under the category of High Safety Required Use, please consult with our sales representatives in charge before such use. In addition, Fujitsu shall not be liable against the Customer and/or any third party for any claims or damages arising in connection with the High Safety Required Use of the Product without permission.

**14. MISCELLANEOUS**

Specifications of this product are subject to change. In such cases, both parties shall discuss together preceding the change.  
 Both parties shall discuss together and make the best effort to reach agreement in case of rising of any doubt to the contents of the specifications and any subject not referred to in this specification.

**15. ATTACHED FIGURES**

- Attached figure-1 : Block diagram
- figure-2 : Test circuit
- figure-3 : Outline drawing
- figure-4 : Recommended mounting condition

DOCUMENT CONTROL SECTION
DATE

						FLCV-13	
						Tech Bes LCD-00105	
						CUST.	
EDIT	DATE	DESIG.	CHECK	APPR.	DESCRIPTION		
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						8 /	

Fig-1:Block diagram

A

Power supply

Lighting control

Brightness control

C

D

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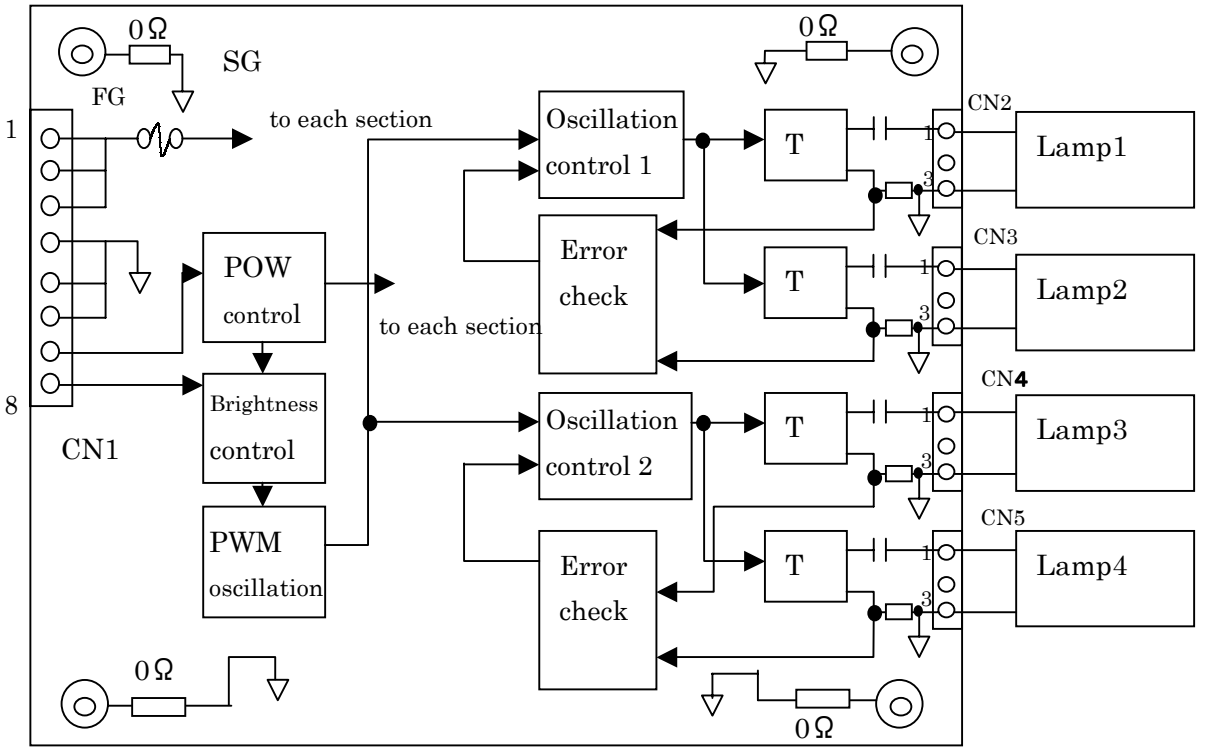
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					FLCV-13	
					Tech Bes LCD-00105	
					CUST.	
EDIT	DATE	DESIG.	CHECK	APPR.	DESCRIPTION	
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Fig-2 Test circuit

Fig A : Measurement circuit for supply current, oscillation frequency, and lamp current

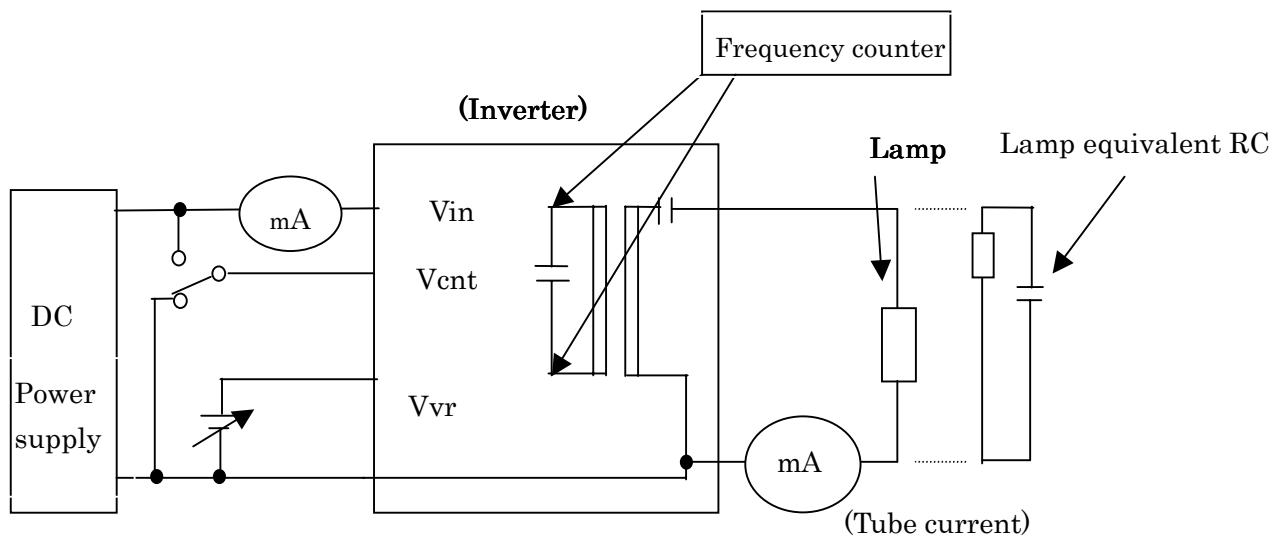
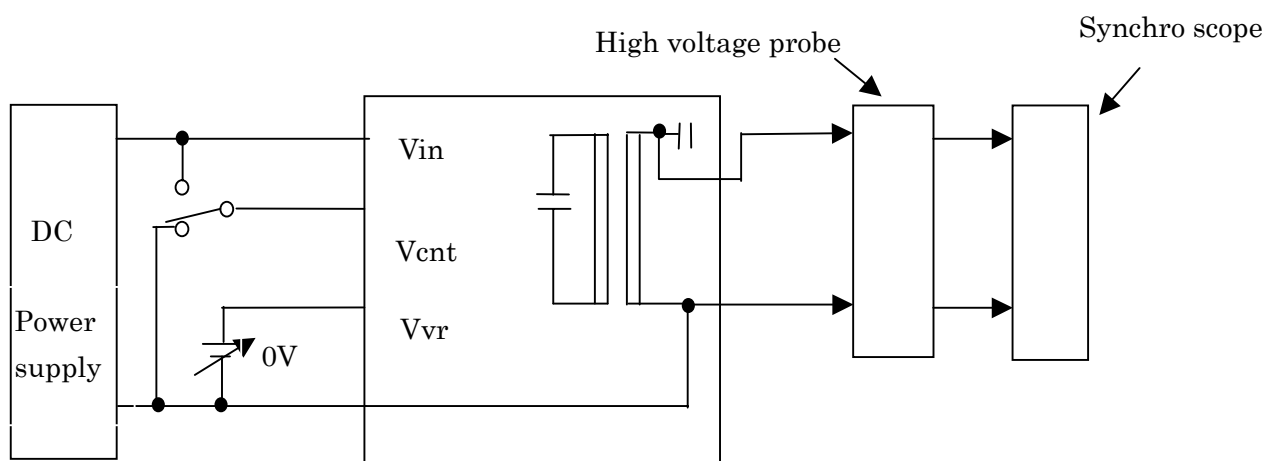


Fig B : Measurement circuit of output voltage without load



High voltage probe : Tektronix P6015A or equivalent

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DATE

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						Tech Bes LCD-00105	
						CUST.	
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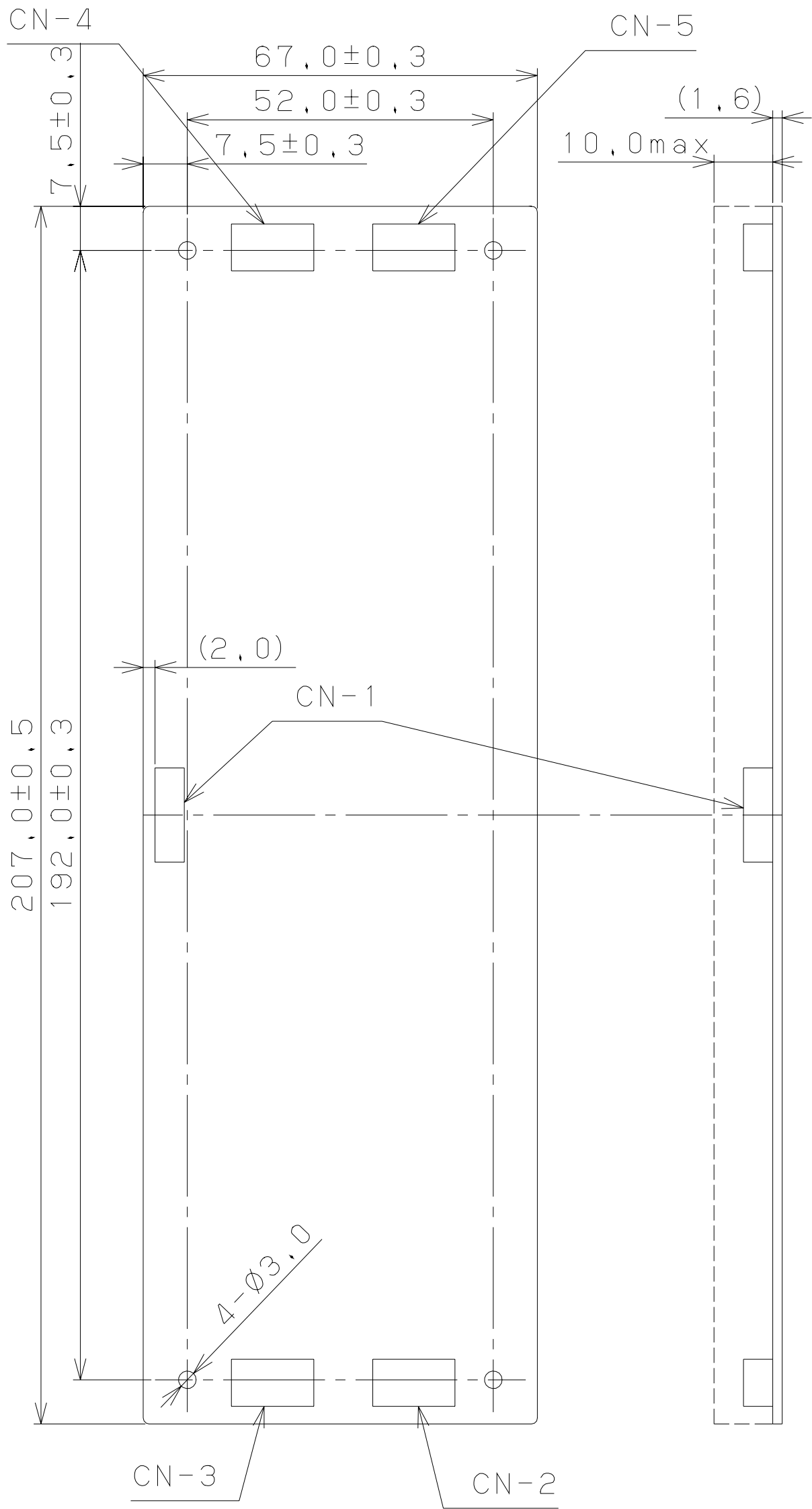
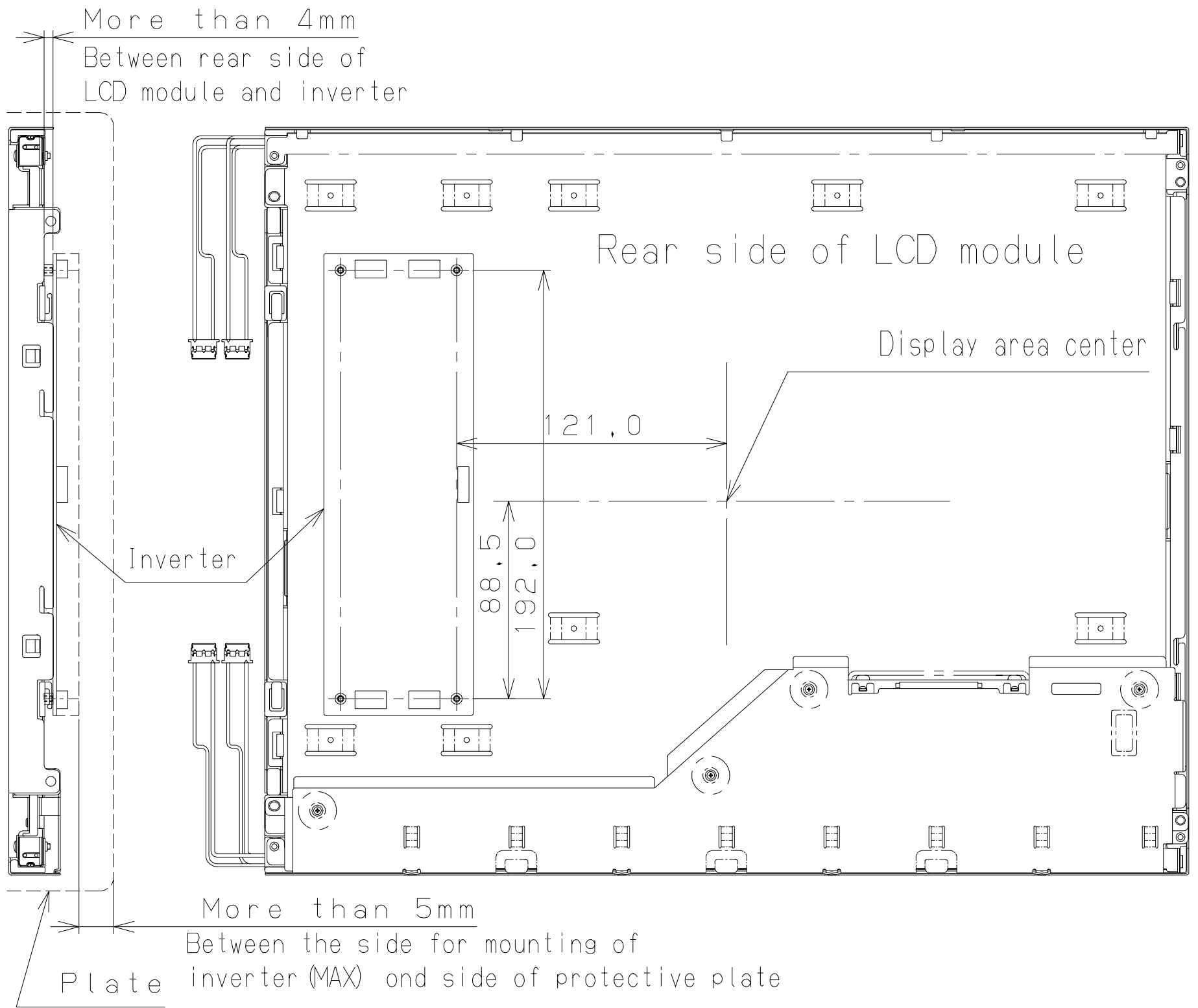


Fig-3 Outline drawing

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# Fig-4 Recommended mounting condition



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