

### FEATURES

- Display Diagonal: 4.7"
- Display Format: 320 × 240
- Overall Dimensions:  
147 (W) × 112 (H) × 25 (D) mm
- Active Area: 96 (W) × 72 (H) mm
- Dot Pitch: .30 (W) × .30 (H) mm

### DESCRIPTION

The SHARP EL display unit consists of a thin film EL panel, high voltage MOS-ICs for panel driving, and a display control circuit. By supplying eleven input signals of CMOS level and two DC power supplies of +5 V and +12 V, arbitrary graphs and characters can be displayed.

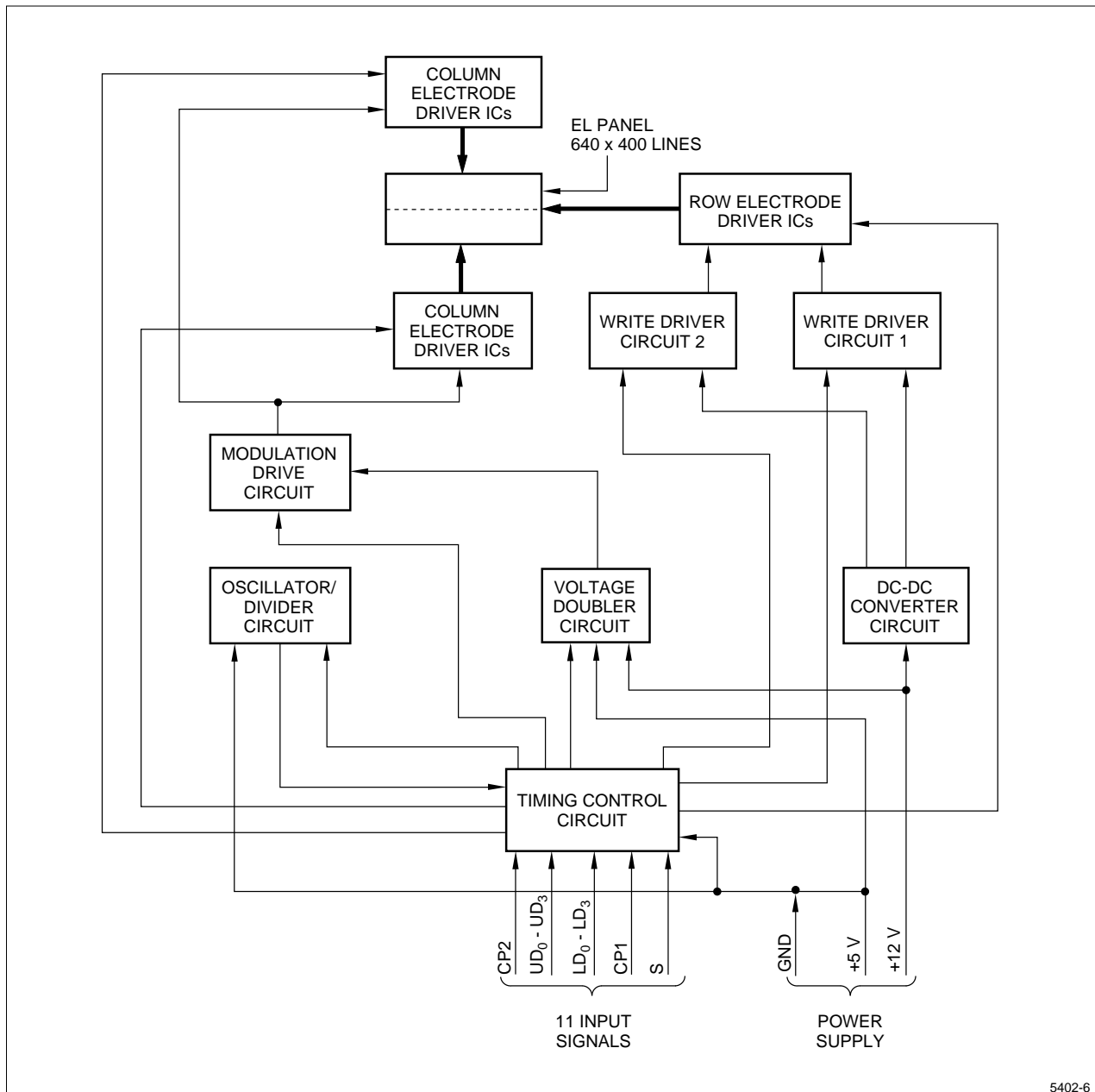


Figure 1. LJ64H034 Block Diagram

## MECHANICAL SPECIFICATIONS

| PARAMETER                   |             | SPECIFICATIONS                      | UNIT | NOTES |
|-----------------------------|-------------|-------------------------------------|------|-------|
| Outline Dimensions          | Main Unit   | 246 (W) × 175 (H) × 18.0 (D) (20.0) | mm   | 1     |
|                             | DC-DC Conv. | 158 (W) × 30 (H) × 17.0 (D)         |      |       |
| Number of Matrix Electrodes |             | 640 (W) × 400 (H)                   | –    | –     |
| Effective Display Area      |             | 191.9 (W) × 119.9 (H)               | mm   | –     |
| Dot Pitch                   |             | 0.3 (W) × 0.3 (H)                   | mm   | –     |
| Dot Pitch Ratio             |             | 1 (W) ÷ 1 (H)                       | –    | –     |
| Dot Size                    |             | 0.22 (W) × 0.22 (H)                 | mm   | –     |
| Weight                      | Main Unit   | 565 (600)                           | g    | 1     |
|                             | DC-DC Conv. | 35                                  |      |       |

### NOTE:

1. With mounted DC-DC converter board. Details of outline dimensions are shown in the Outline Dimensions diagram.

## ABSOLUTE MAXIMUM RATINGS ( $t_A = 25^\circ\text{C}$ )

| SYMBOL   | PARAMETER                    | RATING      | UNIT |
|----------|------------------------------|-------------|------|
| $V_{IH}$ | Interface Signal (Logic 'H') | $V_L + 0.5$ | V    |
| $V_{IL}$ | Interface Signal (Logic 'L') | –0.5        |      |
| $V_L$    | Supply Voltage (Logic)       | +7          |      |
| $V_D$    | Supply Voltage (Panel Drive) | +14         |      |

## ENVIRONMENTAL CONDITIONS

| PARAMETER           | Tstg  |       | Topr |       | CONDITION       | NOTES         |
|---------------------|-------|-------|------|-------|-----------------|---------------|
|                     | MIN   | MAX   | MIN  | MAX   |                 |               |
| Ambient Temperature | –40°C | +80°C | –5°C | +55°C | –               | 1             |
| Humidity            | –     |       | –    |       | No condensation | 2             |
| Vibration           | –     |       | –    |       | No operating    | 3 (Tstg only) |
| Shock               | –     |       | –    |       | No operating    | 4 (Tstg only) |

### NOTES:

1. Survival: –20°C to +65°C. No permanent damage will occur.
2.  $t_A \leq 40^\circ\text{C}$  . . . 95% RH maximum.  
 $t_A > 40^\circ\text{C}$  . . . Absolute humidity shall be less than  $t_A = 40^\circ\text{C}/95\%$  RH.
3. 5 to 55 Hz Frequency range: Sweep time: 15 minutes each axis. Dwell at resonance: 10 minutes each resonance. Peak-to-peak amplitude: 3.17 mm over 5 to 10 Hz range, 1.52 mm over 10 to 25 Hz range, 0.38 mm over 25 to 55 Hz range.  
55 to 500 Hz Frequency range: Sweep time: 120 minutes each axis. Dwell at resonance: 30 minutes each resonance. Peak-to-peak amplitude: 30 m/s<sup>2</sup> peak acceleration.
4. Acceleration: 491 m/s<sup>2</sup> (50g). Pulse width: 11 ms. 3 times for each direction of  $\pm X/\pm Y/\pm Z$ . (9.806 65 m/s<sup>2</sup> = 1G)

**ELECTRICAL CHARACTERISTICS (t<sub>A</sub> = 25°C, Frame Frequency = 120 Hz)**

| SYMBOL         | PARAMETER   | MIN   | TYP   | MAX   | UNIT | NOTES |
|----------------|---|-------|-------|-------|------|-------|
| V <sub>L</sub> | Supply Voltage (Logic)                                      | +4.75 | +5.0  | +5.25 | V    | –     |
| I <sub>L</sub> | Supply Current (Logic, V <sub>L</sub> = +5 V)               | 30    | –     | 300   | mA   | –     |
| V <sub>D</sub> | Supply Voltage (Panel Drive)                                | +11.4 | +12.0 | +12.6 | V    | –     |
| I <sub>D</sub> | Supply Current (Panel Drive, V <sub>D</sub> = +12 V)        | –     | –     | 1300  | mA   | 1     |
| P <sub>T</sub> | Total Power (V <sub>L</sub> = +5 V, V <sub>D</sub> = +12 V) | –     | –     | –     | W    | –     |

**NOTE:**

- 10 mA in condition with no signals nor V<sub>L</sub> supplying.

**OPTICAL CHARACTERISTICS (t<sub>A</sub> = 25°C Frame Frequency = 120 Hz)**

| SYMBOL            | PARAMETER                 | CONDITION           | MIN         | TYP         | MAX          | UNIT                       | NOTES |
|-------------------|---------------------------|---------------------|-------------|-------------|--------------|----------------------------|-------|
| L <sub>ON</sub>   | Luminance                 | All Dots Lit        | 137<br>(40) | 200<br>(60) | –            | cd/m <sup>2</sup><br>(f-L) | 1     |
| L <sub>OFF</sub>  | OFF Luminance             | All Dots Turned Off | –           | –           | 3.4<br>(1.0) | cd/m <sup>2</sup><br>(f-L) |       |
| ΔL <sub>DIS</sub> | Luminance Distribution    | All Dots Lit        | –           | –           | 35           | %                          |       |
| –                 | Fill Factor               | –                   | –           | 0.54        | –            | –                          | 2     |
| ΔL <sub>SD</sub>  | Shadowing Characteristics | Fixed Pattern       | –           | –           | –            | %                          | 3     |
| –                 | Viewing Angle             | –                   | –           | 160         | –            | degrees                    | –     |

**NOTES:**

- Average luminance measured at the dots in circular windows (R<sub>1</sub> to R<sub>5</sub>) shown in Figure 2. (Circular window diameter: ø13 mm). The following formula defines the luminance distribution:

$$\Delta L_{DIS} = \left(1 - \frac{L_{MIN}}{L_{MAX}}\right) \times 100 (\%)$$

where L<sub>MAX</sub> is the maximum luminance and L<sub>MIN</sub> is the minimum luminance taken at the five locations shown in Figure 2.

- The ratio of the emission area to the display area. SHARP's Electro-Luminescent has comparatively high fill factor; therefore, the visibility of display is excellent.
- Shadowing characteristics means the variation of luminance according to the number of dots lit on a scanning line. Thanks to the addition of the shadowing compensation circuit, the display quality of SHARP's Electro-Luminescent is improved.

The following formula defines the shadowing characteristics:

$$\Delta L_{SD} = \left(\frac{L_N}{L_L} - 1\right) \times 100 (\%)$$

where L<sub>L</sub> is the luminance at R<sub>6</sub>, L<sub>N</sub> at R<sub>7</sub>.

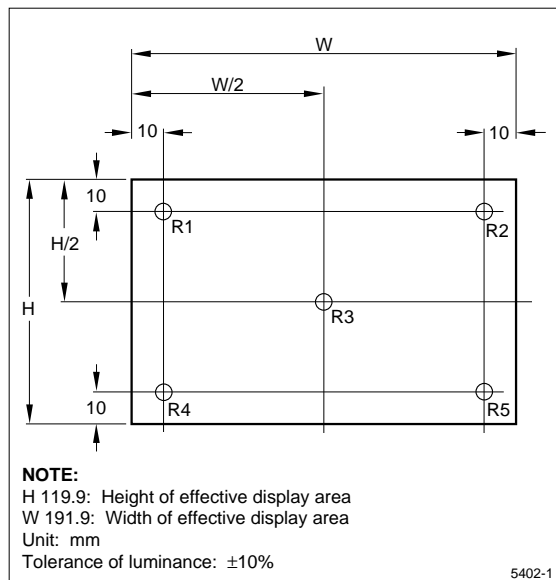


Figure 2.

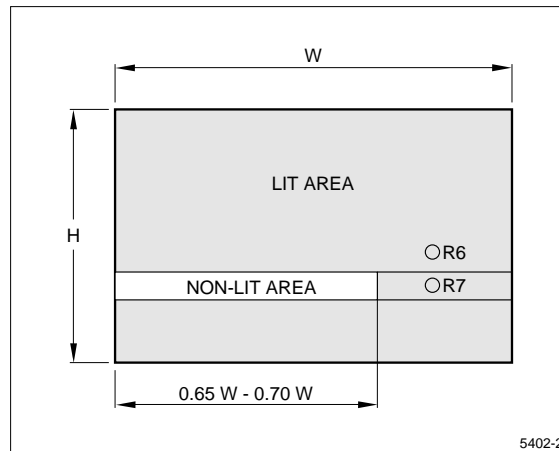


Figure 3.

## TIMING CHARACTERISTICS

### Input Signals

This unit is driven by line-at-a-time scanning method with following 11 CMOS level input signals.

| SYMBOL                           | PARAMETER               | DESCRIPTION  |   |
|----------------------------------|-------------------------|--|---|
| CP2                              | Data Input Clock Signal | Clock signal for inputting the display data into the EL unit.  |   |
| UD <sub>0</sub> -UD <sub>3</sub> | Display Data Signal     | Data signal for the upper part of display.   | The signals are sampled at every falling edge of the data input clock signal.<br>The display is 'ON' while the logic is 'H' and 'OFF' while the logic is 'L.' |
| LD <sub>0</sub> -LD <sub>3</sub> |                         | Data signal for the lower part of display.   |   |
| CP1                              | Input Data Latch Signal | This signal controls the 'timing of line-at-a-time scanning' and the 'latch timing of the data side shift register on falling edge.'           |   |
| S                                | Scan Start-Up Signal    | This signal controls frame frequency. The contents of the display data signal are displayed on the first line by combination with this signal. |   |

### Timing Characteristics of Input Signals (t<sub>a</sub> = 25°C)

| SYMBOL                          | PARAMETER                             | MIN | TYP | MAX             | UNIT | NOTES |
|---------------------------------|---------------------------------------|-----|-----|-----------------|------|-------|
| 1/t <sub>FRM</sub>              | Frame Frequency                       | 60  | –   | 120             | Hz   | –     |
| t <sub>CP2</sub>                | CP2 Clock Cycle                       | 182 | –   | –               | ns   | –     |
| t <sub>CWH</sub>                | High Level Clock Width                | 60  | –   | –               | ns   | –     |
| t <sub>CWL</sub>                | Low Level Clock Width                 | 60  | –   | –               | ns   | –     |
| t <sub>CP1</sub>                | CP1 Clock Cycle                       | 40  | –   | –               | μs   | –     |
| t <sub>LWH</sub>                | High Level Latch Clock Width          | 60  | –   | –               | ns   | –     |
| t <sub>SU</sub>                 | Data Setup Time                       | 50  | –   | –               | ns   | –     |
| t <sub>H</sub>                  | Data Hold Time                        | 40  | –   | –               | ns   | –     |
| t <sub>S21</sub>                | CP1 ↑ Clock Allowance Time from CP2 ↓ | 0   | –   | –               | ns   | –     |
| t <sub>S12</sub>                | CP2 ↓ Clock Allowance Time from CP1 ↓ | 200 | –   | –               | ns   | –     |
| t <sub>R</sub> , t <sub>F</sub> | Clock Rise/Fall Time                  | –   | –   | t <sub>RF</sub> | ns   | 1     |

#### NOTE:

1.  $t_{RF} = (t_{CP2} - t_{CWH} - t_{CWL})/2 \leq 30 \text{ ns}$

The vertical blanking time ( $T_{FRM} - T_{CP1} \times 200$ ) shall be minimized to avoid the flickering lines around the center of the display. (Around 200th and 201st vertical line).

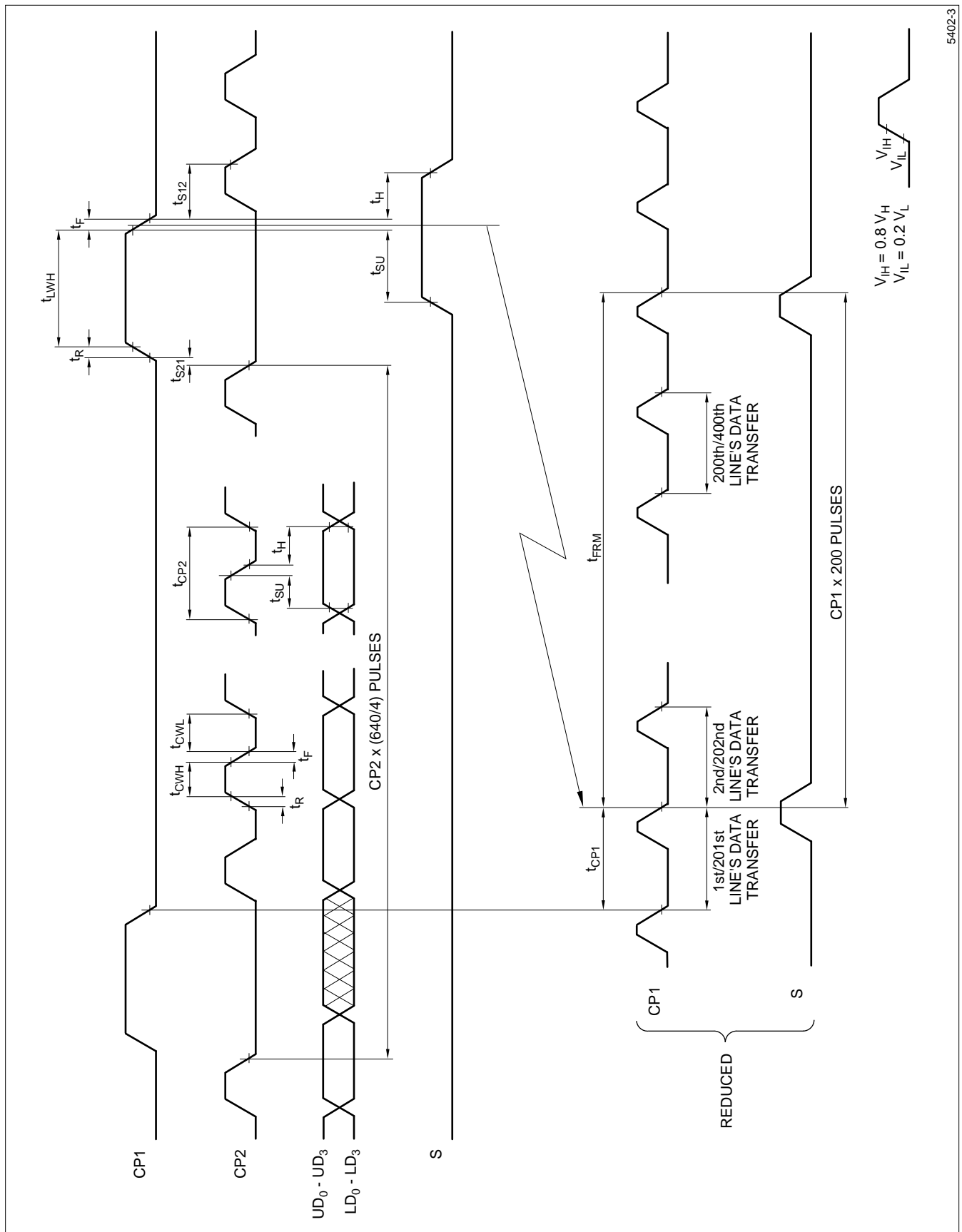
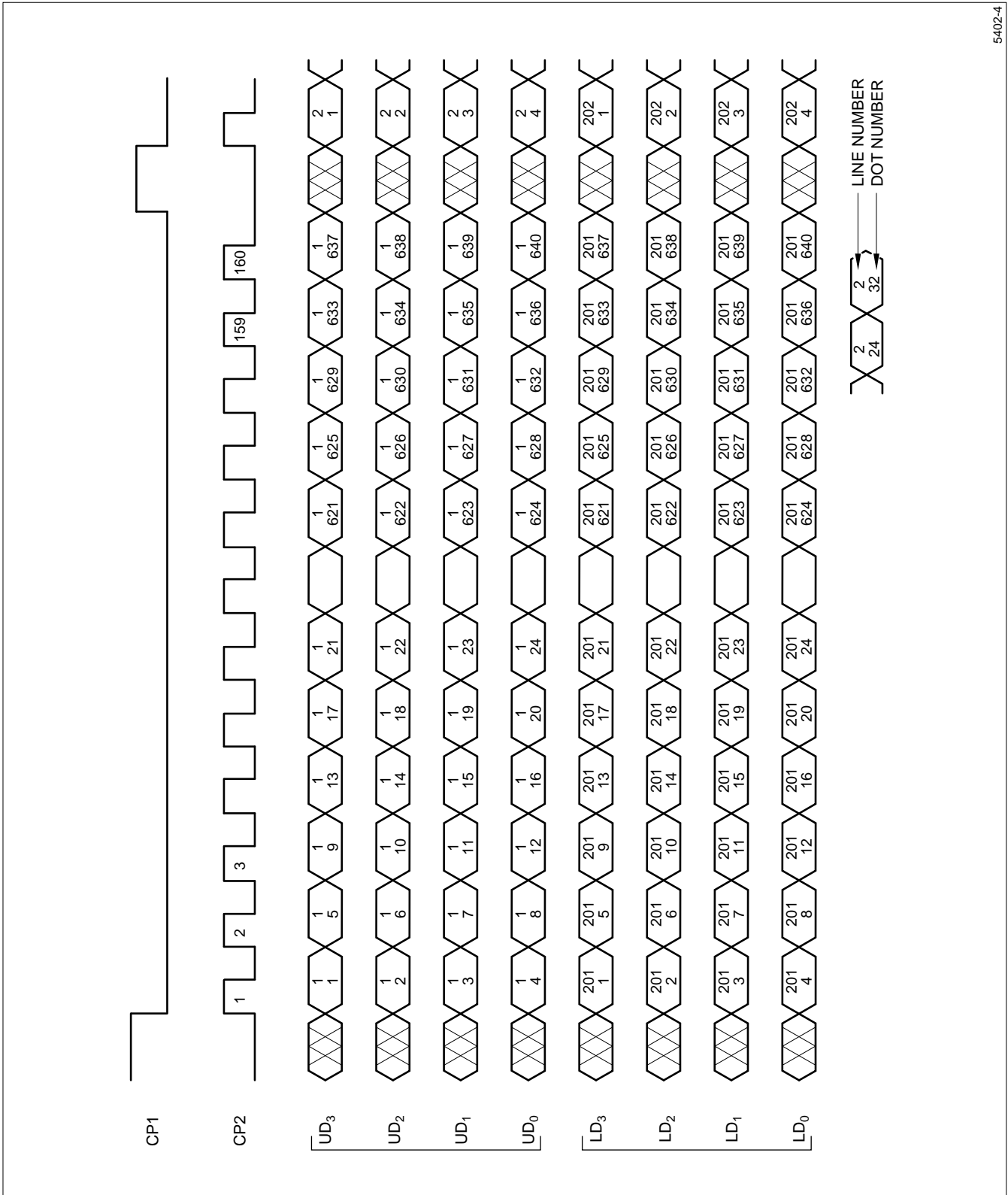


Figure 4. Input Signals Timing Chart



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Figure 5. Data Transmission Timing

Transmission Data and Relative Position on Panel

| LINE ↓ | DOT →   |         |         |           | 639       | 640       |
|--------|---------|---------|---------|-----------|-----------|-----------|
|        | 1       | 2       | 3       |           |           |           |
| UD     | 1       | 1 - 1   | 1 - 2   | 1 - 3     | 1 - 639   | 1 - 640   |
|        | 2       | 2 - 1   | 2 - 2   | 2 - 3     | 2 - 639   | 2 - 640   |
|        | 3       | 3 - 1   | 3 - 2   | 3 - 3     | 3 - 639   | 3 - 640   |
|        | •       | _____   | _____   | _____     | _____     | _____     |
|        | •       | _____   | _____   | _____     | _____     | _____     |
|        | •       | _____   | _____   | _____     | _____     | _____     |
| LD     | 199     | 199 - 1 | 199 - 2 | 199 - 3   | 199 - 639 | 199 - 640 |
|        | 200     | 200 - 1 | 200 - 2 | 200 - 3   | 200 - 639 | 200 - 640 |
|        | 201     | 201 - 1 | 201 - 2 | 201 - 3   | 201 - 639 | 201 - 640 |
|        | 202     | 202 - 1 | 202 - 2 | 202 - 3   | 202 - 639 | 202 - 640 |
|        | 203     |         |         |           | 203 - 639 | 203 - 640 |
|        | •       | _____   | _____   | _____     | _____     | _____     |
| LD     | •       | _____   | _____   | _____     | _____     | _____     |
|        | •       | _____   | _____   | _____     | _____     | _____     |
|        | •       | _____   | _____   | _____     | _____     | _____     |
|        | 399     | 399 - 1 | 399 - 2 | 399 - 3   | 399 - 639 | 399 - 640 |
| 400    | 400 - 1 | 400 - 2 | 400 - 3 | 400 - 639 | 400 - 640 |           |

## INTERFACE SIGNALS AND POWER SUPPLY CONNECTORS

### Assignment of Pins of Connector CN5

| NUMBER | SIGNAL | NUMBER | SIGNAL |
|--------|--------|--------|--------|
| 1      | UD1    | 2      | UD0    |
| 3      | UD3    | 4      | UD2    |
| 5      | LD1    | 6      | LD0    |
| 7      | LD3    | 8      | LD2    |
| 9      | CP2    | 10     | GND    |
| 11     | CP1    | 12     | GND    |
| 13     | S      | 14     | GND    |
| 15     | GND    | 16     | GND    |
| 17     | +5 V   | 18     | +5 V   |
| 19     | +12 V  | 20     | +12 V  |

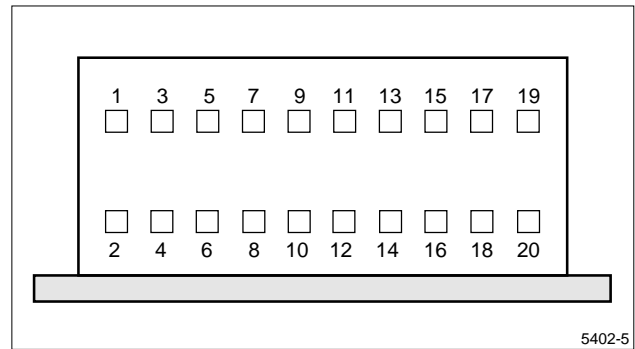


Figure 6. Arrangement of Pins of Connector CN5

### Connectors

| DESCRIPTION                    | MODEL NUMBER                              | MANUFACTURER        |
|--------------------------------|---|---------------------|
| Unit-Side Pin Header           | DF11-20DP-2DS or equivalents              | Hirose Electric Co. |
| Fitting Socket (Crimp Contact) | DF120-1DS-2C or equivalents (DF11-2428SC) |                     |

#### NOTES:

1. The length of the cable shall not exceed 50 cm.
2. This unit is not supplied with the fitting socket and the cable.



## DC/DC CONVERTER BOARD

The DC/DC converter board of the EL unit is detachable for lower profile (20 - 18 mm). The detachment can be made with the screws (A) shown in the Outline Dimensions diagram.

### Precautions For Detaching DC/DC Converter Board

- The unit shall not be operated during the procedure with due care of ESD.
- The DC/DC converter board is hazardous with its output +250 DC and -200 VDC. Handle with care when the board is installed into host system.
- The cable shown in Figure 7b is attached between the main controller board and DC/DC converter board (Figure 7a). If an extension is required, the total length of the extended cable shall be not longer than 200 mm.
- The output voltage of the DC/DC converter board is factory preset for the optimum value to match the individual panel characteristics. Make sure the coupling of the DC/DC converter board and its host EL unit is maintained.

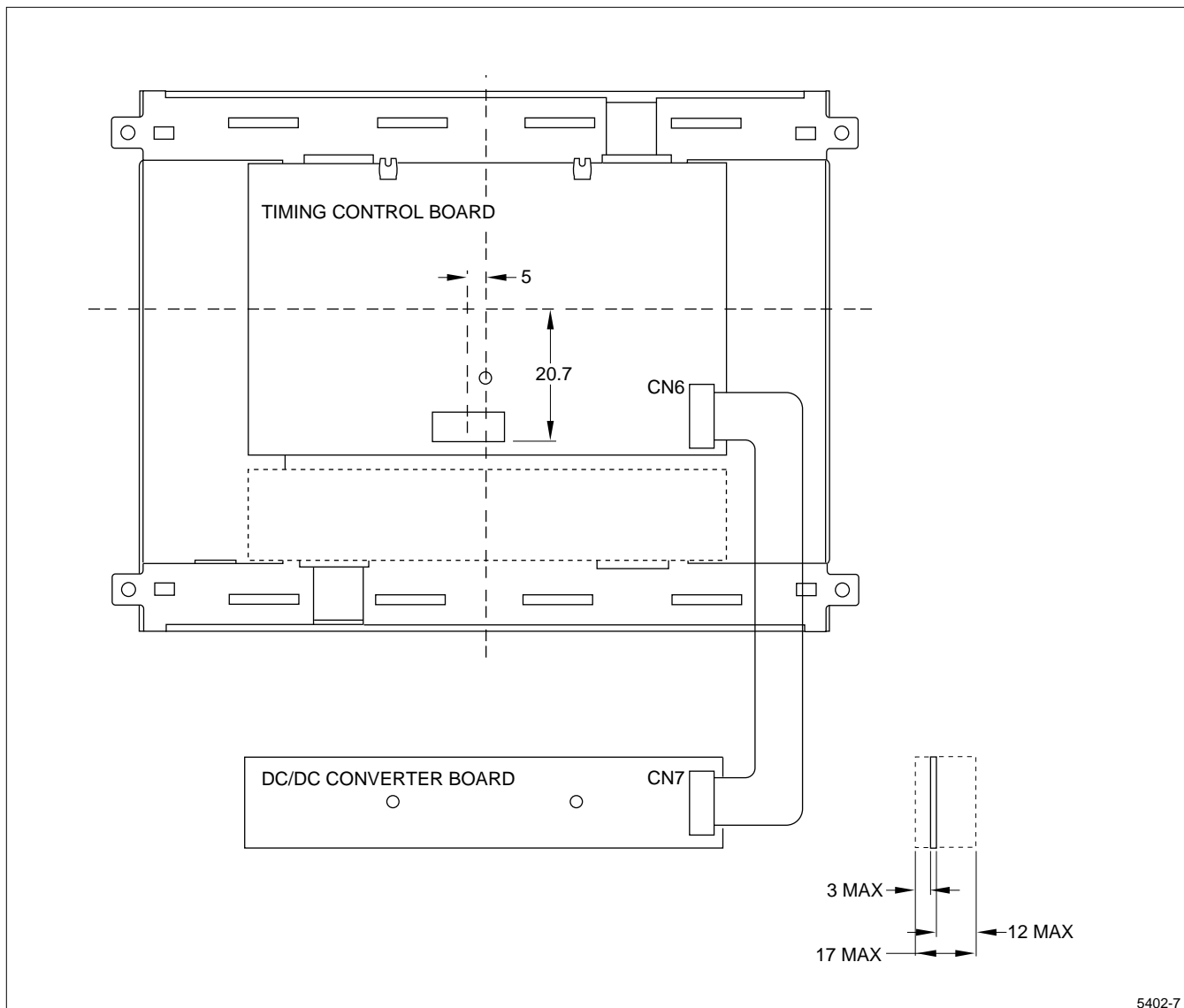


Figure 7. DC/DC Converter Board

## HANDLING INSTRUCTIONS

- Handle the unit carefully to avoid ESD. The operator and surroundings must be protected against ESD. Hold the mounting arms of 4 corners of the unit when you handle it.
- Since the Electro-Luminescent panel is made of glass, care shall be taken to avoid breakage caused by dropping or bumping it.
- The display control board shall not be removed nor shall the unit be disassembled. ICs mounted on the unit shall never be touched by fingers/hands to prevent damage due to static electricity.

## PRECAUTIONS

- The unit shall be operated within the rated operating conditions specified in this literature. When you mount the unit on your product, design your product to give the unit adequate ventilation.
- Operation of the unit at high temperature with high humidity shall be strictly avoided. Dew on the connector or on the circuits will cause malfunction, which can lead to damage to the unit.
- The display control board on the rear side of the unit shall never be touched while in operation. It generates AC pulse of approximately 200 V.
- To avoid the image retention caused by the luminance change due to time lapse, and to increase the panel life, please design to avoid displaying a fixed pattern for a prolonged time and try to use all parts of the viewing area evenly. Also, it is recommended that the unit be used at the lowest ambient temperature possible because temperature contributes to acceleration of the luminance change due to time lapse.

## SCHEME OF THE SIGNAL INPUT BLOCK

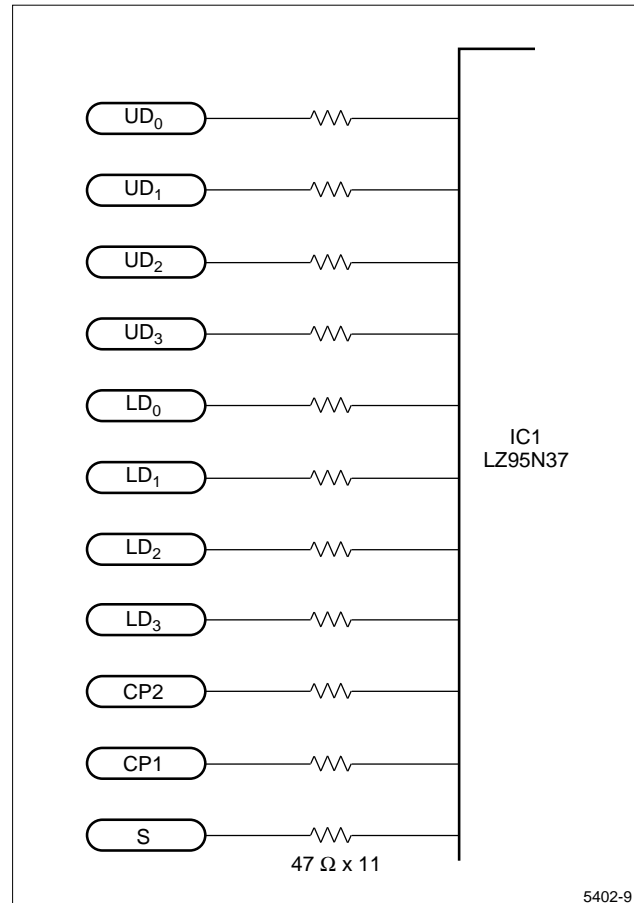


Figure 8. Signal Input Block

## POWER SUPPLY INPUT CIRCUIT

### Over Current Protection

This unit uses fuses in the power supply input circuit to protect against over current in the internal circuit. Fuse may also blow if the specifications are not adhered to or in the event of a short circuit.

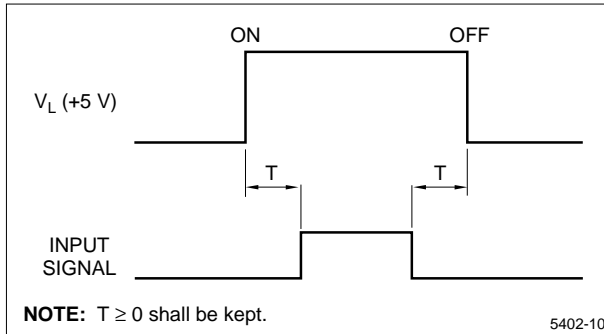


Figure 9. Power On/Off Sequence

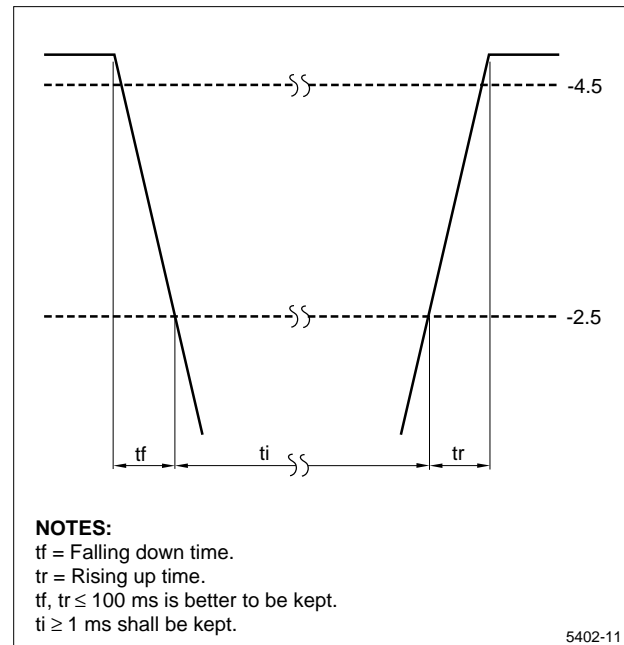


Figure 10. Rise Time/Fall Time

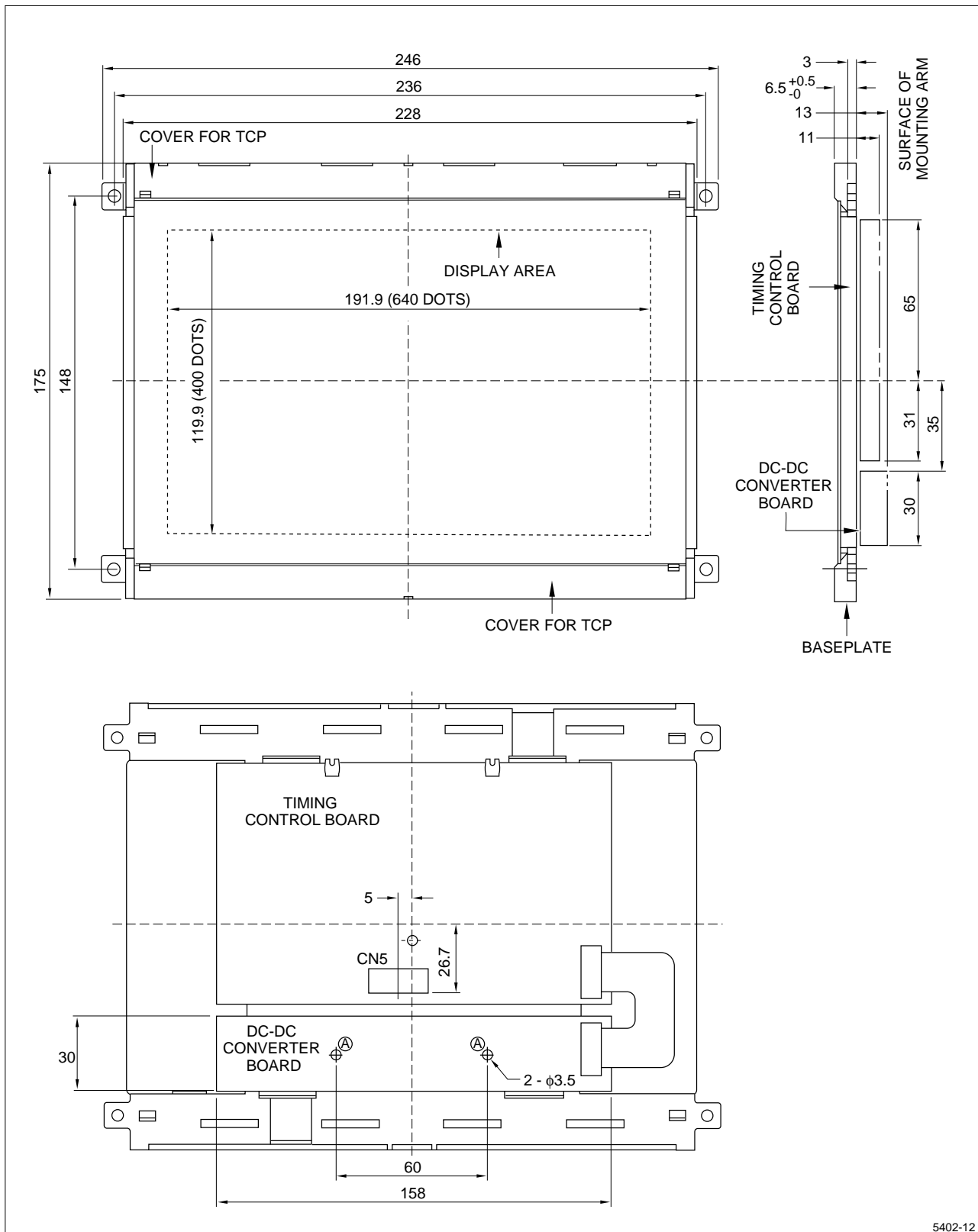
### Fuse Specifications

| PART NUMBER | MODEL NUMBER                 | MELT TYPE          | MANUFACTURER | AUTHORIZATION STANDARD | NOTE |
|-------------|------------------------------|--------------------|--------------|------------------------|------|
| F 1         | SSFR AF003<br>or equivalents | Quick Melt<br>Down | S.O.C.       | UL, CSA                | 1    |
| F 2         |                              |                    |              |                        |      |
| F3          |                              |                    |              |                        |      |

**NOTE:**

- Fuses are not open in the case current capacity of power supply is small. Fuses are open by surge current in case current capacity of power supply is big or supply power to the unit uses relays. In consequence, please thoroughly investigate the unit.

OUTLINE DIMENSIONS



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