



# ***Embedded Display System***

## ***With***

## ***CAN Bus***

### ***Product Information***

**MODEL NO. : E070W1D1-4 V.3x**

***Date : 2023/07/11      Revision. 0.1***

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**Note :**

This product specification is subject to change without any notice.  
Please contact PowerView customer technical service department,  
[faeservice@powerview.com.tw](mailto:faeservice@powerview.com.tw), or your local service agents for the  
latest product information and updates of product specification.



## Records of Revision

| Date      | Rev. No. | Summary           | Page |
|-----------|----------|-------------------|------|
| 2023/7/11 | 0.1      | Tentative Version | -    |



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## 1.0 Handling Precaution

- 1.) Handle with care. Pay attention not to press or scratch the surface of the system screen, especially the polarizer. Do not twist or bend the whole module or any part of the system kit. It may cause un-recoverable damages to the system.
- 2.) Do not drop or bump the system kit since the LCD display of the system contains fragile glass components. Breakage of this portion might cause leakage of the liquid crystal sealed inside the displays. Do not touch the liquid crystal liquid in case of leakage. Flush with massive water immediately in case of contact with your skin with liquid crystal fluid and call for doctor for immediate medical treatment.
- 3.) Be sure to turn off power supply while plug or un-plug the power input connector.
- 4.) Clean up the polarizer only with soft solvent if necessary. The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, toluene, Ethyl acid or Methyl chloride. It will permanently damage the polarizer due to chemical reaction.
- 5.) Wipe off fluid drop immediately to prevent from possible discoloration or spots on the polarizer.
- 6.) Do not twist nor bend the system structure, even momentarily. Bending or twisting torque may likely damage the internal components of the system.
- 7.) Protect the system from static environment to prevent from damage to the CMOS gate array IC.



## 2.0 General Description

E070W1D1-4 V.3x is a very compact, highly integrated ARM9 embedded system that is consist of the following components.

1. 7" TFT-LCD Panel (800x480 WVGA)
2. Projective Capacitive (PCAP) Touch Screen
3. Embedded Solution with ARM9 based CPU
4. Built-in 64MB SDRAM and 128MB Flash Memory
5. Linux Kernel Version 3.10.102
6. Wireless Solution Embedded – 2G/3G/4G/Bluetooth/WIFI/RFID/GPS for data transfer
7. Communication: CAN bus\*2, RS232\*1, USB\*1 (RS485 as optional)
8. Auto DIM, ACC
9. IP-65 Plastic Housing
10. Wide power range: 6V~55V
11. Support 5W heater function for

E070W1D1-4 V.3x is a complete all-in-one embedded system that provides a ready-to-use environment for customers with a variety of applications. Its compact, power-saving computing circuitry and slim LCD modules make the whole system very suitable for portable, diagnostic and HMI (Human Machine Interface) applications. Its housing design also meets IP-65 standard that enables users to operate this monitor in various environment. With its industrial standard function-ready and built-in PowerView owned OS software, E070W1D1-4 V.3x provides an easy-to-use, robust, installation-ready and risk-less environment for all users. Customers can concentrate their major engineering resources on the application software development for specific application.

In addition, another special merit of E070W1D1-4 V.3x is its true digital TFT LCD display. With 7" in diagonal size, 800x480 resolution, and 800nits (typ.) sunlight readable brightness, it's very vivid, eye-catching and crystal clear screen can perfectly present excellent pictures, icons, user interface on its 15:9 wide screen. Everything needed for a computing display is already built into a compact and complete module and ready for immediate installation upon arrival.

The platform of E070W1D1-4 V.3x also reserves high flexibilities to adopt future expansions of several different industrial interfaces without changing its original form factor. This merit can minimize the reinvestments of capital and engineering efforts in remaking mechanical tooling for specification changes.

Its Linux based operating system enable customers to develop their own application software on an open platform to minimize the heavy investments, in terms of time and engineering resources, into the system.



There is a graphic drawing utility available, which is developed by PowerView to let customer control this embedded system by using the ASCII command code via RS232 interface. With the help of this graphic utility, customer can easily develop their own application software without the complex programming skill which usually is needed by the other embedded systems on the market.

## 2.1 General Applications

- Portable Devices, Compact Diagnostic Tools, Surveillance and Monitoring Equipment, Control and HMI Terminals.

\* This product needs to be installed by professional person and the place will be different by the type of the car. End user is not allowed to install the product.

## 2.2 Main Features

- Built-in Sunlight Readable Brightness Digital 7" WVGA LCD
- Projective Capacitive (PCAP) Touch Screen
- Embedded ARM9 MCU Engine
- Built-in 64MB SDRAM and 128MB Flash Memory
- Linux Kernel Version 3.10.102
- Versatile I/O functions
- All-IN-ONE unit with Single DC power Supply Input
- Ultra Wide Input Voltage Range +6VDC ~ +55VDC
- LTE module, supporting multi-bands LTE-FDD, W-CDMA, CDMA-
- Bluetooth 4.1, supporting Dual-Mode(Bluetooth and Bluetooth LE)
- WIFI IEEE 802.11b/g/n
- RFID module (125KHz)
- GPS module, supporting GPS
- IP-65 module connectors, adopted with Deutsch DT04-12PA 12 way Connector
- Build-in battery, support sleep mode
- Build-in RTC function
- Build-in Defrost heater & Battery heater
- Support external Wiegand26 card read



## 2.3 General Information

### 2.3.1 System & Display Characteristics

| Item                          | Specification                       | Note                               |
|-------------------------------|-------------------------------------|------------------------------------|
| CPU Processor                 | ARM9 MCU                            | -                                  |
| OS                            | Linux 3.10.102                      |                                    |
| Flash Memory                  | 128 MB                              |                                    |
| SDRAM                         | 64 MB                               |                                    |
| Communication I/F<br>*Note(1) | RS232 x 1                           | support QSerialPort                |
|                               | CAN Bus 2.0B x 2 with termination   | support Socket CAN and QSerialBus  |
|                               | USB1.1 Client x 1(for f/w upload)   | support F/W program and RamDisk    |
|                               | LTE Cat.1                           |                                    |
|                               | GPS                                 | support NMEA command               |
|                               | Bluetooth4.1                        |                                    |
|                               | RFID (125KHz)                       | support QSerialPort                |
|                               | WIFI IEEE 802.11b/g/n               |                                    |
| Peripherals                   | RTC                                 |                                    |
|                               | Light Sensor                        | support sysfs, QAmbientLightSensor |
|                               | 3D Accelerometer                    | support sysfs, QAccelerometer      |
| User interface                | Keypad (5 keys) + PCAP Touch        | support QKeyEvent/QTouchEvent      |
| DC power input                | +6V~+55V                            |                                    |
| Protection                    | IP65                                |                                    |
| IO Connector                  | Deutsch DT04-12PA 12 way Compatible |                                    |
| Audio Alarm                   | Internal buzzer                     |                                    |
| Defrost heater input          | +12V±10%(5W), Auto shutdown at 35℃  |                                    |

Note (1): Customer's program code could be updated via the USB client port. .



### 2.3.2 Display Unit:

| Item              | Specification                 | Unit   | Note        |
|-------------------|-------------------------------|--------|-------------|
| Display Type      | a-Si TFT LCD 7" Active Matrix | inch   | Wide 15:9   |
| Active Area       | 152.4(H) x 91.44(V)           | mm     | -           |
| Number of Pixels  | 800(H) x 480RGB(V)            | pixel  | WVGA        |
| Pixel Arrangement | RGB Vertical Stripe           | -      | -           |
| Brightness        | 720                           | nits   | After Touch |
| Viewing Angle     | 140/120                       | degree | 6 o'clock   |
| Display Mode      | Normally White                | -      | -           |
| Color Depth       | 16.7M Colors                  | -      |             |

Note (1): Customer's program code could be updated via the USB client port. .

### 2.3.3 Mechanical Dimensions

| Item      |            | Typ.   | Unit | Note                        |
|-----------|------------|--------|------|-----------------------------|
| Dimension | Horizontal | 186.5  | mm   | ±0.5                        |
|           | Vertical   | 126.5  |      | ±0.5                        |
|           | Depth      | (33.3) |      | Main Body, (1)              |
|           | Depth      | (56.3) |      | Incl. CN Receptacle Housing |
| Weight    |            | (650)  | g    | ±10g(temp)                  |

Note (1): This depth exists excluding the compatible connector housing of the Deutsch Connector DT04-12xx series. Please refer the drawing of "Outline Dimensions" section.



### 3.0 Absolute Maximum Ratings

#### 3.1 Absolute Ratings of Environment Requirement

| Item                                           | Symbol | Min. | Max. | Unit | Note |
|------------------------------------------------|--------|------|------|------|------|
| Storage Temperature                            | Tstg   | -30  | +80  | °C   | (1)  |
| Operation Temperature<br>(Ambient Temperature) | Topr   | -20  | +70  | °C   | (1)  |

Note (1): Temperature and relative humidity range are shown in the figure below.

95% RH Max. (40° C > Ta)

Maximum wet – bulb temperature at 39°C or less. No condensation.

#### 3.2 Electrical Absolute Ratings (Entire Embedded Module)

| Item                 | SYMBOL          | MIN | MAX | UNIT | NOTE    |
|----------------------|-----------------|-----|-----|------|---------|
| Power Supply Voltage | V <sub>DD</sub> | -60 | 60  | V    | (1),(2) |

Note (1): Within operating temperature

Note (2): Permanent damage to the device may occur if maximum values are exceeded.

Functional operation should be restricted to the conditions described under normal operating conditions.



## 4.0 Optical Characteristics of Display

The following items are measured under stable conditions in a dark room or equivalent state.

\* Measuring Equipment: BM-5A, CA-110.

( $V_{DD}=1.2V$ ,  $T_a=25\pm 2^{\circ}C$ )

| Item                     |         | Symbol     | Condition                                         | Min. | Typ. | Max. | Unit              | Note            |
|--------------------------|---------|------------|---------------------------------------------------|------|------|------|-------------------|-----------------|
| Contrast Ratio           |         | CR         | $\Phi=0$<br>$\theta=0$<br>Viewing<br>Normal Angle |      | 500  | -    |                   | (1),<br>(2),(4) |
| Response<br>Time at 25°C | Rising  | Tr         |                                                   | -    | 10   | 20   | ms                | (3)             |
|                          | Falling | Tf         |                                                   | -    | 15   | 30   |                   |                 |
| Luminance                |         | $Y_L$      |                                                   | 630  | 720  | -    | cd/m <sup>2</sup> | (1),<br>(2),(6) |
| Viewing<br>Angle         | Hor.    | $\theta_L$ | CR $\geq 10$<br>(at center<br>point)              | 60   | 70   | -    | Degree            | (2),(5)         |
|                          |         | $\theta_R$ |                                                   | 60   | 70   | -    |                   |                 |
|                          | Ver.    | $\phi_H$   |                                                   | 40   | 50   | -    |                   |                 |
|                          |         | $\phi_L$   |                                                   | 60   | 70   | -    |                   |                 |

Note (1): Test Condition

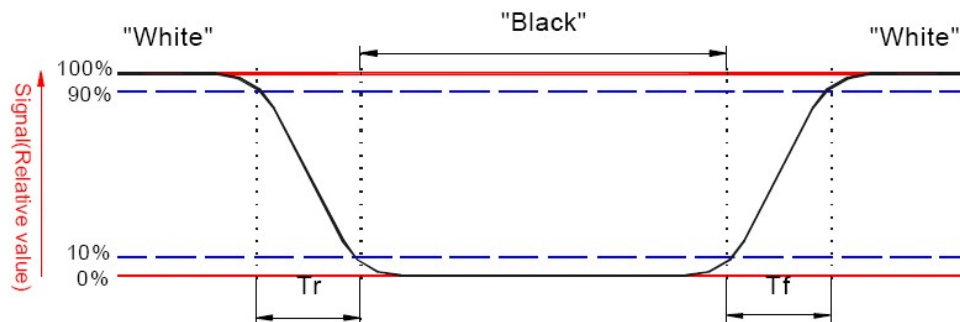
- Ambient Temperature =25°C and test in the dark room.

Note (2): To be measured on the center area of panel with a viewing cone of 1° by Topcon

Luminance Meter BM-5A, after 10 minutes operation.

Note (3): Definition of response time:

The output signals of photo detector are measured when the input signals are changed from “black” to “white”(falling time) and from “white” to “black”(rising time), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.



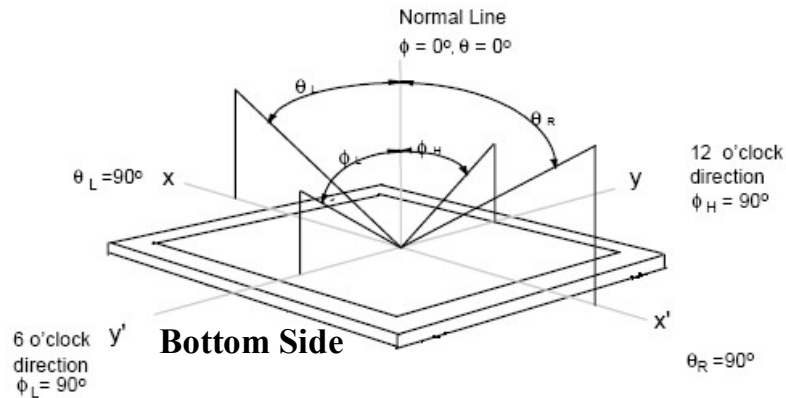


Note (4): Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector output when LCD is at "Black" state}}$$

Note (5): Definition of viewing angle, Refer to figure as below.



Note (6): Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.



## 5.0 Electrical Characteristics

### 5.1 DC Characteristics (Entire Embedded System)

| Item                            | Symbol         | Min. | Typ. | Max. | Unit              | Note          |
|---------------------------------|----------------|------|------|------|-------------------|---------------|
| Supply Voltage                  | $V_{DD}$       | 6    | 12   | 55   | V                 |               |
|                                 | $I_{DD}$       | -    | 400  |      | mA                | (1)           |
|                                 | $I_{DD}$       |      | 1.5  | 2    | A                 | (2)           |
| Permissive Input Ripple Voltage | $V_{RF}$       | -    | -    | 100  | mV <sub>P-P</sub> | $V_{DD}=+12V$ |
| Wiegand power output            | $V_{wiegand}$  | 10.8 | 12   | 13.2 | V                 |               |
| USB power input                 | $V_{USB}$      | 4.5  | 5.0  | 5.5  | V                 |               |
| Heater Power                    | $V_{Heater}$   | 10.8 | 12   | 13.2 | V                 | (3),(4)       |
|                                 | $I_{Heater}$   | -    | 5    | -    | W                 |               |
|                                 | $T_{Shutdown}$ | 30   | 35   | 40   | °C                |               |

Note (1):  $V_{DD}=12V$  Without RS232 or CAN2.0B device connected. (LCD is attached, with the maximum brightness). Battery is full charged.

Note (2):  $V_{DD}=12V$ , Battery Fast-Charge, RF(LTE) Function on

Note (3): The power 5W is defined under 12V input voltage.

Note (4): Heater will force to shut down by internal temperature sensor.

### 5.2 AC Characteristics (Entire Embedded System)

| Item        | Symbol      | Min. | Typ. | Max.  | Unit | Note           |
|-------------|-------------|------|------|-------|------|----------------|
| RFID        | $F_{RFID}$  | 120  | 125  | 135   | KHz  | ASK modulation |
| Power off   | $T_{Off}$   | 3.5  | 4    | 4.5   | H    | (1)            |
| RS232 Speed | $F_{RS232}$ | -    | -    | 115.2 | Kbps |                |
| CAN1 Speed  | $F_{CAN1}$  | -    | -    | 500   | Kbps |                |
| CAN2 Speed  | $F_{CAN2}$  | -    | -    | 1000  | Kbps |                |

Note (1): System turn off internal power from sleep mode.

### 5.3 RF Support(UMST/LTE)

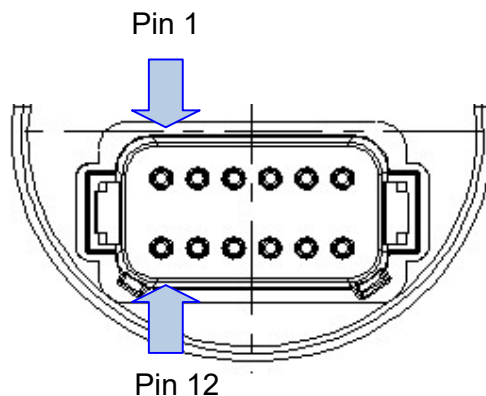
| Module          | Band                         |
|-----------------|------------------------------|
| E070W1D1-4 V.1A | LTE:B1/B3/B8/B28             |
|                 | 3G:2100MHz/900MHz            |
| E070W1D1-4 V.1E | LTE Cat1: B7/B20             |
|                 | UMTS: 2100MHz/900MHz         |
| E070W1D1-4 V.1U | LTE Cat1: B2/B4/B12          |
|                 | UMTS: 850MHz/1700MHz/1900MHz |

## 5.4 Input Terminal Pin Assignment

### 5.4.1 Main Interface:

Rear Connector : Deutsch 12-pin DT04-12PA or equivalent

| Pin # | Function  | Specification                      |
|-------|-----------|------------------------------------|
| 1     | GND       | System Ground/programming          |
| 2     | +PWR      | Positive V in = +6~55V DC          |
| 3     | USB +5v   | Programming                        |
| 4     | USB_CN    | Programming                        |
| 5     | USB_CP    | Programming                        |
| 6     | +12V      | Heater power input                 |
| 7     | CAN1_Low  | Capable of 500kbps                 |
| 8     | CAN1_High | Capable of 500kbps                 |
| 9     | CAN2_Low  | Capable of 1Mbps(With Termination) |
| 10    | CAN2_High | Capable of 1Mbps(With Termination) |
| 11    | RS232 Tx  | Debugging + Programming            |
| 12    | RS232 Rx  | Debugging + Programming            |



Real view

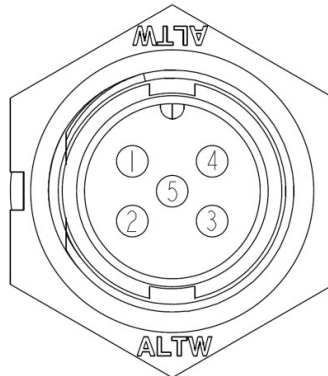


#### 5.4.2 Wiegand Card Reader:

Rear Connector : ABD-05PMMS-LC7001

Match Connector : BD-05BFFM-LL7AXX

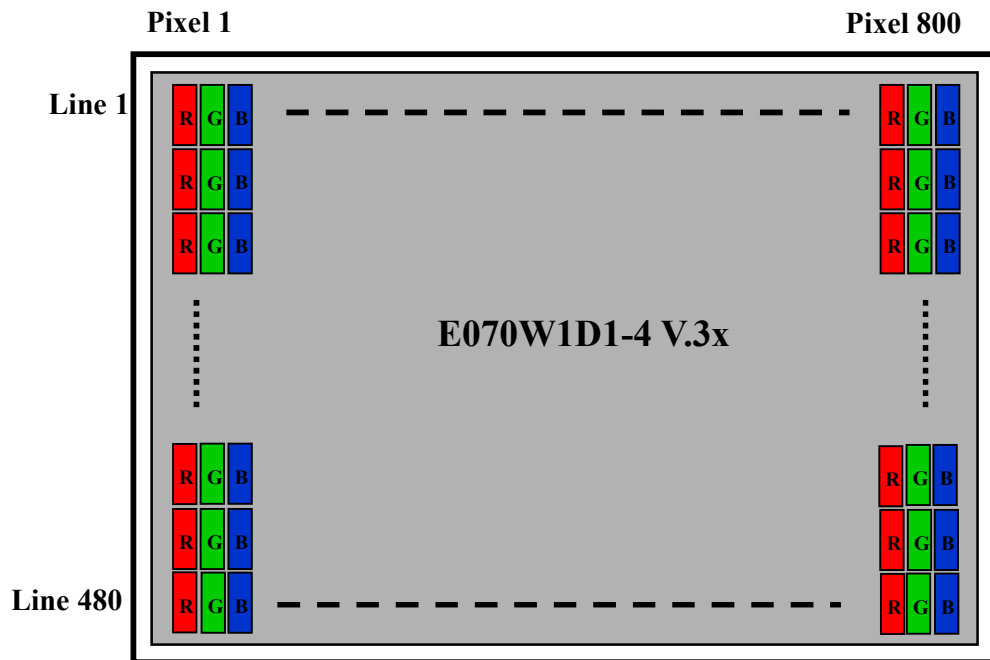
| Pin # | Function   | Specification             |
|-------|------------|---------------------------|
| 1     | 12V        | Internal 12V power output |
| 2     | Wiegand D1 | D1 of card reader         |
| 3     | GND        | Power ground              |
| 4     | LED Ctrl   | LED control               |
| 5     | Wiegand D0 | D0 of card reader         |



Real view

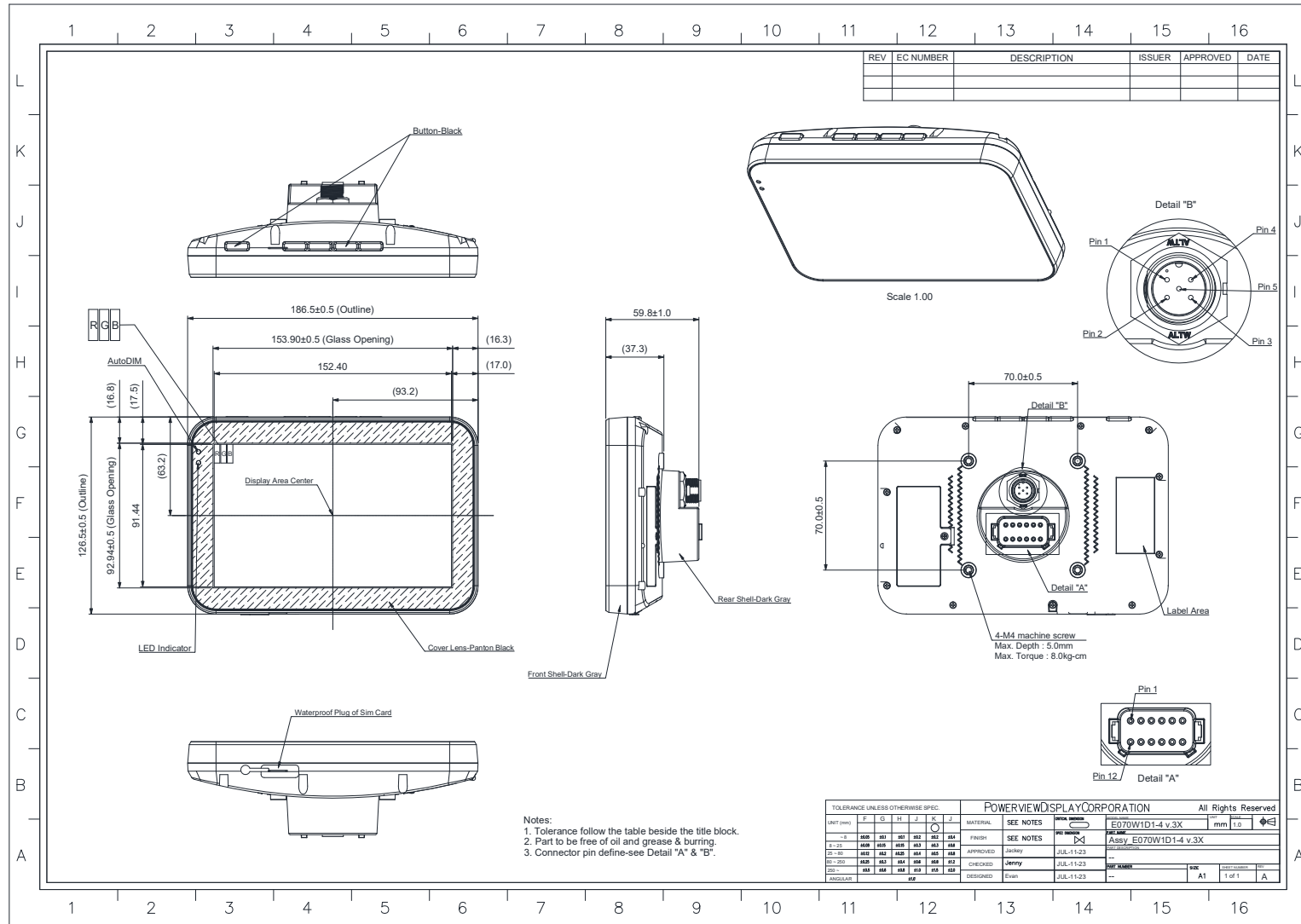


## 5.5 Display Pixel Format





## 6.0 Outline Dimensions





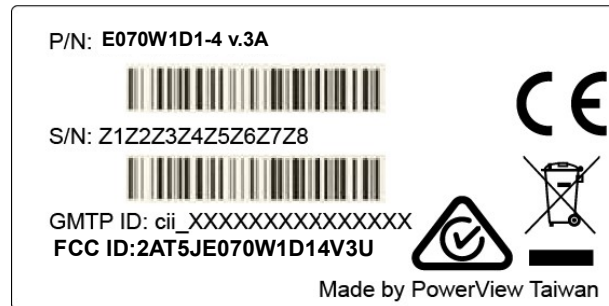
## 7.0 Labeling, Packaging & Others

### 7.1 Labeling

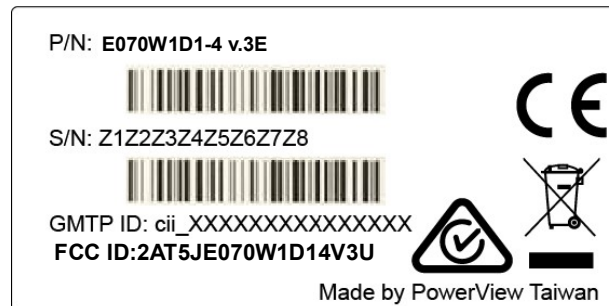
FCC certification:



RCM certification:



CE certification:



|           |                                |
|-----------|--------------------------------|
| Z1        | Assembly Plant                 |
| Z2        | Manufacturing Year. last digit |
| Z3        | Manufacturing Month            |
| Z4        | Manufacturing Date             |
| Z5        | Product Category               |
| Z6Z7Z8    | Production Sequence No.        |
| xxxxxxxxx | GMTP ID                        |



## 7.2 Packaging

TBD



## 8.0 General Notice

### 8.1 Reliability Test Items

| No. | Test Items                         | Conditions                                                                                                                                                      | Remark                                         |
|-----|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| 1   | High Temperature Storage           | Ta= + 80℃ 240 Hrs                                                                                                                                               |                                                |
| 2   | Low Temperature Storage            | Ta= - 30℃ 240 Hrs                                                                                                                                               |                                                |
| 3   | High Temperature Operation         | Ta= + 70℃ 240 Hrs                                                                                                                                               |                                                |
| 4   | Low Temperature Operation          | Ta= - 30℃ 240 Hrs                                                                                                                                               |                                                |
| 5   | High Temperature and High Humidity | Ta= 50℃, 80%RH 240 Hrs                                                                                                                                          | Operation                                      |
| 6   | Heat Shock                         | -30~80℃/100 cycles 1Hr/cycle                                                                                                                                    | Non-operation                                  |
| 7   | Electrostatic discharge            | Contact = ± 4 kV, Class B<br>Air = ± 8 kV, Class B                                                                                                              | Non-operation                                  |
| 8   | Vibration                          | Frequency range : 8~33.3 Hz<br>Stroke : 1.3mm<br>Sweep : 2.9G, 33.3~400Hz<br>Cycle : 15 minutes<br>2 hours for each direction of X,Z<br>4 hours for Y direction | Non-Operation                                  |
| 9   | Mechanical Shock                   | 100G, 6ms, ±X±Y±Z<br>3 times for each direction                                                                                                                 | JIS C7021, A-7<br>Condition C<br>Non-Operation |
| 10  | Vibration (with carton)            | Random vibration :<br>0.015G <sup>2</sup> /Hz from 5~200Hz<br>-6dB/octave from 200~500Hz                                                                        | IEC 68- 2-34                                   |
| 11  | Drop (with carton)                 | Height : 60 cm<br>1 corner, 3 edges, 6 surfaces                                                                                                                 | JIS Z0202                                      |

Note (1): Ta: Ambient temperature.

Note (2): In the standard conditions, there is not display function NG issue occurred. All the cosmetic specification is judged before the reliability stress.



## 9.0 Storage, Operation & Others

- a) Do not leave the panel in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35°C and relative humidity of less than 70%.
- b) Do not store the TFT-LCD module in direct sunlight.
- c) The module shall be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during the store.
- d) Do not connect or disconnect the module in the "Power On" condition.
- e) Power supply should always be turned on/off by the item 3.2 "Electrical Absolute Ratings"
- f) The liquid-crystal is deteriorated by ultraviolet rays. Do not leave it in direct sunlight and strong ultraviolet rays for many hours.
- g) Avoid condensation of water. It may result in improper operation or disconnection of electrode.
- h) Do not exceed the absolute maximum rating value. (The supply voltage, input signal voltage, environment, and so on). Otherwise the panel may be damaged.
- i) If the panel displays the same pattern continuously for a long period of time, it can be the situation when the image "Sticks" to the screen.
- j) If the module has its circuitry FPC with it, please handle it carefully and prevent the FPC to be stressed.



## 10.0 Certification:

### 10.1 E070W1D1-4 V.3A: RCM Certification

| Item            | Band             | Standard                      |
|-----------------|------------------|-------------------------------|
| LTE + WCDMA     | B1,B3,B8,B28     | AS/CA S042                    |
| UMTS            | 2100MHz,900MHz   |                               |
| BT              | BT4.0 V2.1.1     | AS/NZS 4268                   |
| RFID            | 125KHz           | AS/NZS 4268                   |
| WIFI            | IEEE 802.11b/g/n | AS/NZS 4268                   |
| EMI             |                  | AS/NZS CISPR32                |
| Safety/ MPE SAR |                  | AS/NZS 62368-1, AS/NZS 2772.2 |

### 10.2 E070W1D1-4 V.3E: CE Certification

| Item            | Band             | Standard                    |
|-----------------|------------------|-----------------------------|
| LTE             | B7,B20           | EN301908-1,EN301489-1-52    |
| UMTS            | 2100MHz,900MHz   |                             |
| BT              | BT4.0 V2.1.1     | EN300328,EN301489-1-17      |
| RFID            | 125KHz           | EN300330,EN301489-1-3       |
| GNSS            | GPS              | EN303413,EN301489-1-19      |
| Safety/ MPE SAR |                  | EN62368-1, EN50385/ EN62311 |
| WIFI            | IEEE 802.11b/g/n | EN300328,EN301489-1-17      |

### 10.3 E070W1D1-4 V.3U: FCC Certification

| Item    | Band                   | Standard                 |
|---------|------------------------|--------------------------|
| LTE     | B2,B4,B12              | Part 22, 24, 27          |
| UMTS    | 850MHz,1700MHz,1900MHz |                          |
| BT      | BT4.0 V2.1.1           | Part 15C                 |
| RFID    | 125KHz                 | Part 15C                 |
| EMI     |                        | Part 15B                 |
| MPE SAR |                        | Part 2.1091 &Part 2.1093 |
| WIFI    | IEEE 802.11b/g/n       | Part 15C                 |



## ● Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- . Reorient or relocate the receiving antenna.
- . Increase the separation between the equipment and receiver.
- . Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- . Consult the dealer or an experienced radio/TV technician for help.

**FCC Caution:** To assure continued compliance, any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. (Example - use only shielded interface cables when connecting to computer or peripheral devices).

## ***FCC Radiation Exposure Statement***

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

The antennas used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.



## 11.0 Inspection Specifications

### 11.1 Purpose

This Inspection Specifications are to define the TFT-LCD Modules (hereinafter called "Modules") inspection standard for customer applying in the incoming receiving process.

### 11.2 Scope:

Specifications contain

- Display Quality Evaluation
- Mechanics Specification

### 11.3 Liability

#### Inspection Deadline

The buyer (Customer) should inspect the modules within fifteen (15) calendar days after delivery.

#### Notification of Rejection

The customer may propose to reject one or more lots as the modules fail to meet the AQL (Acceptable Quality Level). In that case, the customer should notify PowerView in either documents or mail.

#### Notification Deadline

The customer should inform PowerView within 3 working days upon finishing inspection. If the Customer fails to inform PowerView, the right to reject will be lifted.

### 11.4 Sampling Plan

Unless there is other agreement, sampling plan for incoming inspection should follow MIL-STD-105E.

#### Lot size:

Quantity per shipment as one lot (different model as different lot .)

#### Sampling type:

Normal inspection, single sampling.

#### Sampling level:

Level II.

#### AQL:

Acceptable Quality Level

Major defect: AQL=1.0

Minor defect: AQL=2.5



## 11.5 Panel Inspection Condition

### Environment

Room Temperature:  $25 \pm 5^{\circ}\text{C}$ .

Humidity :  $65 \pm 5\%$  RH.

Illumination : 300 ~ 700 Lux.

### Inspection instruments

Pattern generator

VG-828 or equivalent model.

Video board: PowerView video board or equivalent. The output of the signal should comply with the specification provided by PowerView.

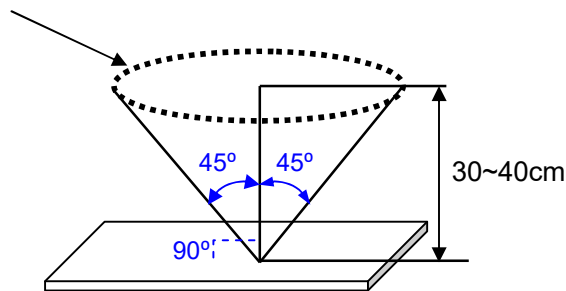
Luminance colorimeter: Topcon BM-7 or equivalent model

### Inspection Distance

$35 \pm 5$  cm

### Inspection Angle:

Eye position



## 11.6 Classification of Defects

Defects are classified as major defects and minor defects according to the degree of defectiveness defined herein.

### Major defects:

A major defect is a defect that is likely to result in failure, or to reduce materially the usability of the product for its intended purpose.

### Minor defects:

A minor defect is either a defect that is not likely to reduce materially the usability of the product for its intended application, or a departure from an intended purpose with little bearing on the effective use or operation of the product.

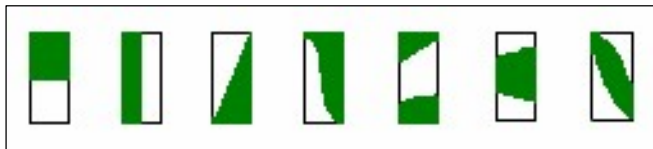


### 11.6.1 Electrical inspection specification

| Inspection tem                            | Specification                                         | Judge Criterion |       |
|-------------------------------------------|-------------------------------------------------------|-----------------|-------|
|                                           |                                                       | Major           | Minor |
| Line defect                               | Can't be seen.                                        | ●               |       |
| Bright dots                               | $\leq 1$ dots (Note1,2,3)                             |                 | ●     |
| Dark dots                                 | $\leq 5$ dots (Note1,2,3)                             |                 | ●     |
| Total dots defect                         | $\leq 5$ dots (Note1,2,3)                             |                 | ●     |
| Display non-uniformity or Mura (Note 4,5) | Use of ND filter or judged by equivalent limit sample |                 | ●     |

Note (1): For bright dot defect, bright area should be larger than 1/2 area of a sub-pixel to be count as 1 dot defect. A dot defect that is smaller than the defined dot defect will be treated as small bright dot.

\*The drawing of 1/2 area sub-pixel definition: The 1/2 area sub-pixel can be defined as below one or more of specific shapes.



All bright dot defects should not be noticeable by observer under specified inspection environment , Please refer to Section 10.5.

Note (2): Adjacent-dot defect (refer to picture, dot 1,2,...,8 around A are all A's adjacent dots) should be inspected under the same display pattern in any one of White/Black/Green/Blue/Red/Monotone Gray pattern.

|   |   |   |
|---|---|---|
| 1 | 2 | 3 |
| 4 | A | 5 |
| 6 | 7 | 8 |



Note (3): Adjacent-dot defect should be observed under any one of white/Black/Green/Blue/Red pattern. 1 pair of bright dots equals 2 dots.

**\*Inspection patterns:**

Standard inspection patterns of dot defect are listed below. PowerView uses these patterns as standard criteria for judging dot defect. Please inform PowerView if any other pattern is to be used to examine dot defect.

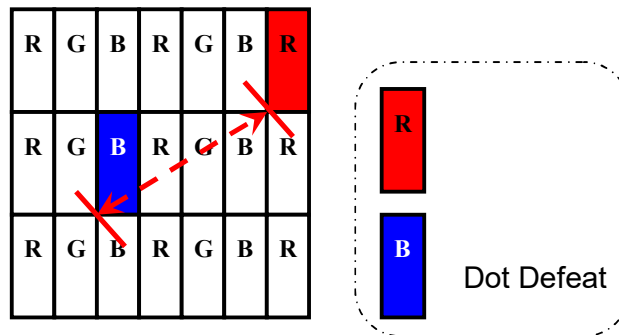
| Test Pattern            | Defect                     |
|-------------------------|----------------------------|
| Black                   | For white dot(s)           |
| White                   | For black dot(s)           |
| Monotone Red/Green/Blue | For black and white dot(s) |

Note (4): The general mura symptoms has to be judged using 2% ND Filter.

Note (5): The inspection method of ND Filter - holding ND filter in front of the panel around 1 cm and examine the panel from 35±5 cm in the front view for 3 seconds.

Note (6): Definition of distance between dots as following illustrations.

**Distance between defect dots:**





### 11.6.2 Appearance inspection specification

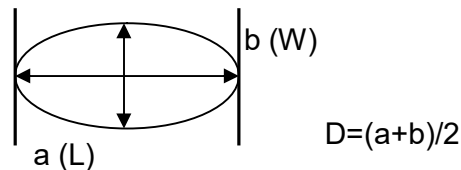
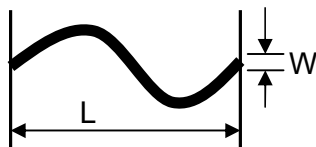
| Judged area            | Judged item                               |          | Inspection specification                                                                         |             | Judge Criterion |       |
|------------------------|-------------------------------------------|----------|--------------------------------------------------------------------------------------------------|-------------|-----------------|-------|
|                        |                                           |          |                                                                                                  |             | Major           | Minor |
| Active area            | Particles, Scratch and Bubbles in display | Circular | Average diameter: D(mm)                                                                          | Numbers     |                 | ●     |
|                        |                                           |          | $D \leq 0.3$                                                                                     | Disregarded |                 |       |
|                        |                                           |          | $0.3 < D \leq 0.5$                                                                               | $N \leq 5$  |                 |       |
|                        |                                           |          | $0.5 < D$                                                                                        | Not allowed |                 |       |
|                        |                                           | Linear   | Width: W(mm); Length: L(mm)                                                                      | Numbers     |                 | ●     |
|                        |                                           |          | $W \leq 0.1$                                                                                     | Disregarded |                 |       |
|                        |                                           |          | $0.5 < L \leq 5.0$<br>$0.1 < W \leq 0.2$                                                         | $N \leq 5$  |                 |       |
|                        |                                           |          | $5.0 < L$<br>$0.2 < W$                                                                           | Not allowed |                 |       |
| Bezel                  | Scratch                                   |          | No harm                                                                                          |             |                 | ●     |
|                        | Dirt                                      |          |                                                                                                  |             |                 | ●     |
|                        | Wrap                                      |          | No dangerous                                                                                     |             |                 | ●     |
|                        | Sunken                                    |          | No harm                                                                                          |             |                 | ●     |
| Label (S/N, B/L, WEEK) | No label                                  |          | Not Allowed                                                                                      |             | ●               |       |
|                        | Overlap Label (triple)                    |          |                                                                                                  |             |                 | ●     |
|                        | Invert label                              |          |                                                                                                  |             |                 | ●     |
|                        | Broken                                    |          |                                                                                                  |             |                 | ●     |
|                        | Dirt                                      |          | Word can be read.                                                                                |             |                 | ●     |
|                        | Not clear                                 |          |                                                                                                  |             |                 | ●     |
|                        | Word out of shape                         |          |                                                                                                  |             |                 | ●     |
|                        | Mistake                                   |          | Not Allowed                                                                                      |             |                 | ●     |
|                        | Position                                  |          | Be attached on right position as defined in drawing                                              |             |                 | ●     |
| Screw                  | Not enough (Q'ty)                         |          | Not Allowed                                                                                      |             | ●               |       |
|                        | float                                     |          | Not Allowed                                                                                      |             |                 | ●     |
|                        | Limp                                      |          | Grounding OK                                                                                     |             |                 | ●     |
| Solder                 | Appearance                                |          | Can't see the abnormal color, shape, hurt, dirt. Limited sample would be prepared, if necessary. |             | ●               |       |
| Connector              | Connection status                         |          | No correct connection                                                                            |             | ●               |       |
| FPC/FFC                | Broken                                    |          | Not Allowed                                                                                      |             | ●               |       |



Note (1): Extraneous substances which can be wiped out, such as fingerprint and particles are not considered as a defect.

Note (2): Defects on the Black Matrix are not considered as a defect. When  $L \geq 2W$ , defect count as liner defect.

Note (3): To verify whether the responsibility of following defects are caused by PowerView, the IQC checks as requested on above items before mass production such as the polarizer scratch, mura, glass broken, ...etc.



## 11.7 Limited Warranty

PowerView represents and warrants that all Modules shall (i) conform to the specifications set forth in Article 10.5, 10.6 hereof and (ii) be free from any defects in material and workmanship for 12 month(s) after Customer's acceptance or deemed acceptance. PowerView will replace, rework or refund the defective or non-conforming Modules; Provided that Customer (i) promptly informs Supplier of the defects or non-conformities within the warranty period, (ii) comply with the specifications and conditions hereunder and (iii) comply with PowerView's procedure for Modules replace, rework and return. The warranty period for the Modules replaced or reworked shall be the remaining term for such Modules.

THE WARRANTIES AND REMEDIES SET FORTH ABOVE ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, TERMS OR CONDITIONS, EXPRESS OR IMPLIED, EITHER IN FACT OR BY OPERATION OF LAW, STATUTORY OR OTHERWISE, INCLUDING WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ALL OF WHICH ARE EXPRESSLY DISCLAIMED. PowerView'S WARRANTIES HEREIN APPLY ONLY TO CUSTOMER AND ARE NOT TO BE EXTENDED TO ANY THIRD PARTY.

## 11.8 Governing Law

This Agreement shall be governed and construed in accordance with the laws of TAIWAN, the Republic of China. Both parties agree to submit any dispute, which cannot be amicably resolved, to Hsinchu District Court for the first instance.