FM700 OEM Scan Engine

Integration Guide

About This Integration Guide

Please read all the content of the user guide carefully to use the products safely and effectively.

You are advised of keeping it properly for your using reference.

Disclaimer

Please do not dismantle the product or tear up the seal on it, otherwise we won't provide

warranty or replacement service.

The pictures in this user guide are for reference only. If there are any pictures which not match the

actual product, please take actual products as the standard. Updated information is subject to

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Table of Content

Version	Description	Date
V1.0.1	Initial Release	2021-7-12
V1.2	Description Modified	2021-09-26

Chapter 1 About the Manual

Introduction

Combined advanced decode algorithm and excellent hardware design, FM700 simply any scanning for 1D or 2D codes.

Decode Capacities

1D	(Codabar), (Code 39), (Code 32), (Interleaved 2 of 5), (Industrial 2 of 5), (Matrix 2 of 5), (Code 93), (Code 11), (Code 128), (GS1-128), (ISBT 128), (UPC-A), (UPC-E), (EAN/JAN-8), (EAN/JAN-13), (GS1 DataBar(RSS14)), (Standard 2 of 5), (Qlessey), (Msiplessey)
2D	(PDF417), (Micro PDF417), (QR Code), (Micro QR), (Data Matrix), (Hanxi code)

Chapter Introduction

《Chapter 1 Introduction》	Introduce the scanner.
《Chapter 2 Installation》	Describes how to install the engine, including installation information, housing design, optical, grounding, ESD, and environmental considerations.
《Chapter 3 Electrical Specification》	Includes the electrical characteristics for the engine and timing sequences.
《Chapter 4 Interface 》	Includes interface pinout and connector specifications.

Chapter 1 About FM700

1.1 Introduction

The FM700 is an area image scanner for barcode reading. It includes four illumination LEDs, four Good Read LEDs, one 12-pin FPC connector and two 8-pin box connectors(for USB, RS232, TTL, RS485, Wiegand interfaces).

The FM700 contains：

- 1 Cmos sensor
- 4 Illumination LED
- 4 Indicator LED

Figure **1-1** System Block Diagram：
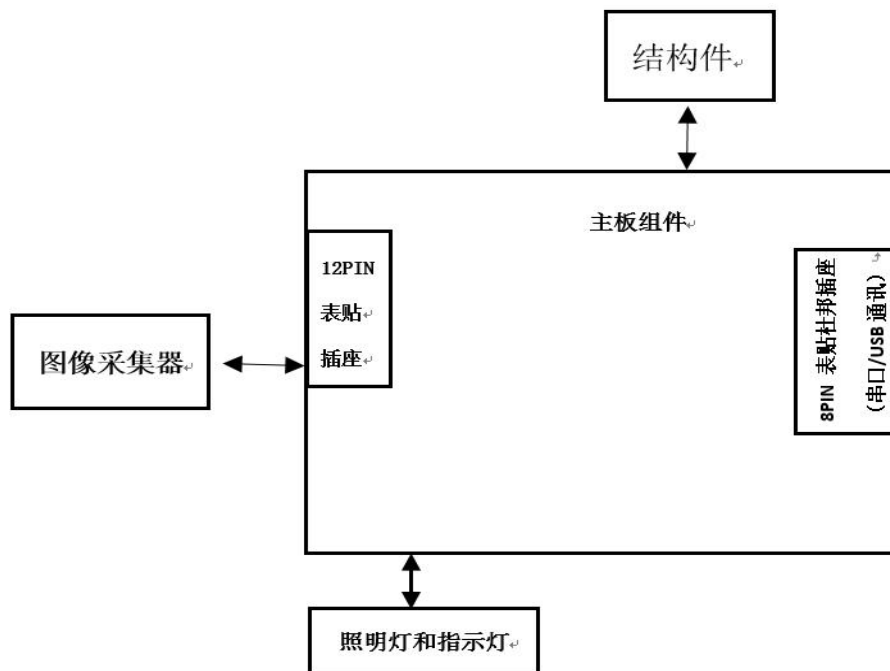
1.2 Illumination

The FM700 has four LEDs for supplementary lighting, making it possible to scan barcodes even in complete darkness. The illumination can be turned On or Off.

1.3 Good Read LED

There are 4 LEDs for Good Read notification. During scanning, and once the FM700 decodes, the green LED will be on. The Good Read LED can be turn on or turn off though scanning program barcode and the time duration of notification can be programmed though serial command or program code barcode. For more detail, please refer to user program manual.

Chapter 2 Installation

2.1 Introduction

This chapter provides information about installing the FM700, including physical and electrical information, considerations, and recommended FM700 window properties.

△！ Warning: Do not touch the imaging lens when installing the scanner and avoid the thumbprint remaining on the lens.

△！ Warning: Be careful not to touch the lighting LED during handling. Improper handling can damage LED and lenses.

2.2 General Requirements

ESD

The FM700 has been designed to protect against static electricity, but due to module volume limitations, the static protection of some signals with the client interface cannot be handled in place, such as the use of the scene on the static protection level requirements are higher, the customer needs to consider the static protection design on the relevant interface. The module uses anti-static packaging, but in the process of unsealing and use still need to pay attention to anti-static measures, such as the use of ground wristbands and other measures.

Dust-proof and anti-fouling

The FM700 must be sufficiently sealed during storage and use to prevent dust, particles or other contaminants from gathering and sticking to components such as lenses, circuit boards, LEDs, etc. Dust particles or contaminants can degrade engine performance and even affect engine use.

Environment

The normal use of the FM700 is subject to the environmental requirements in the table below.

Table 2-1:

Operating Temperature	-40℃ to 70℃
Storage Temperature	-40℃ to 75℃
Humidity	5% ~95% （Non-Condesing）

Heat dissipation

Embedding the FM700 in any product requires heat dissipation design. There are several high-power devices (e.g. CPU, CIS, LEDs, DC/DC, etc.) on the FM700, reading the scanner that emit a lot of heat when working continuously. The local temperature rise of the FM700 may increase when working continuously at full speed. When the ambient temperature is high, the image noise of the image sensor will be increased, the image quality will be reduced, and the reading performance will be affected.

When integrating applications, the power consumption and heat of the FM700 can be reduced as follows:

- Avoid using LEDs for long periods of time in a continuous mode of operation.
- Designed to reserve space for the FM700 to form natural or forced currents.
- Avoid tightly wrapping the FM700 with insulation such as rubber.

Optical

Do not expose the external optics of the FM700 to any external forces.

Do not pinch an external optical component of the engine by hand, which may cause too much stress at the mechanical connector, which may cause its fixing components to fail, such as a broken device or a broken cable.

2.3 FM700 Dimension（ ：mm）
 Front View

Side View

26

9.2

52.9

43.1

64.8

58

51

26

9.2

52.9

44

61

4-∅3.5

43.1
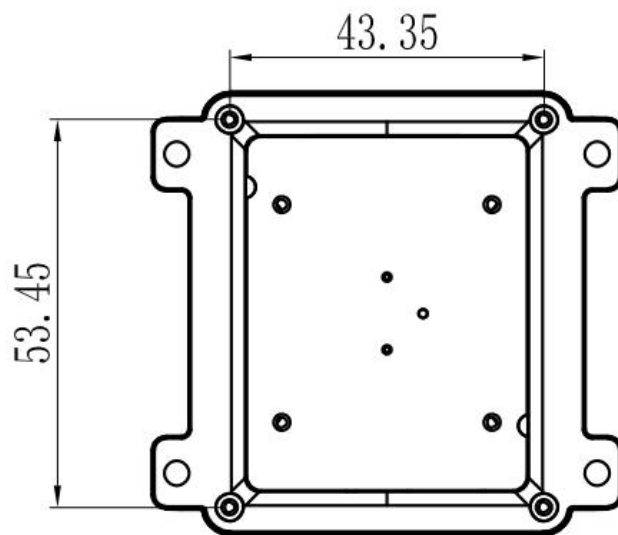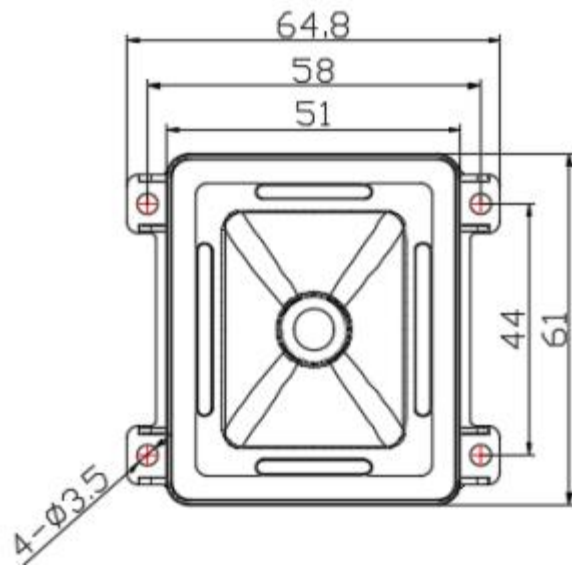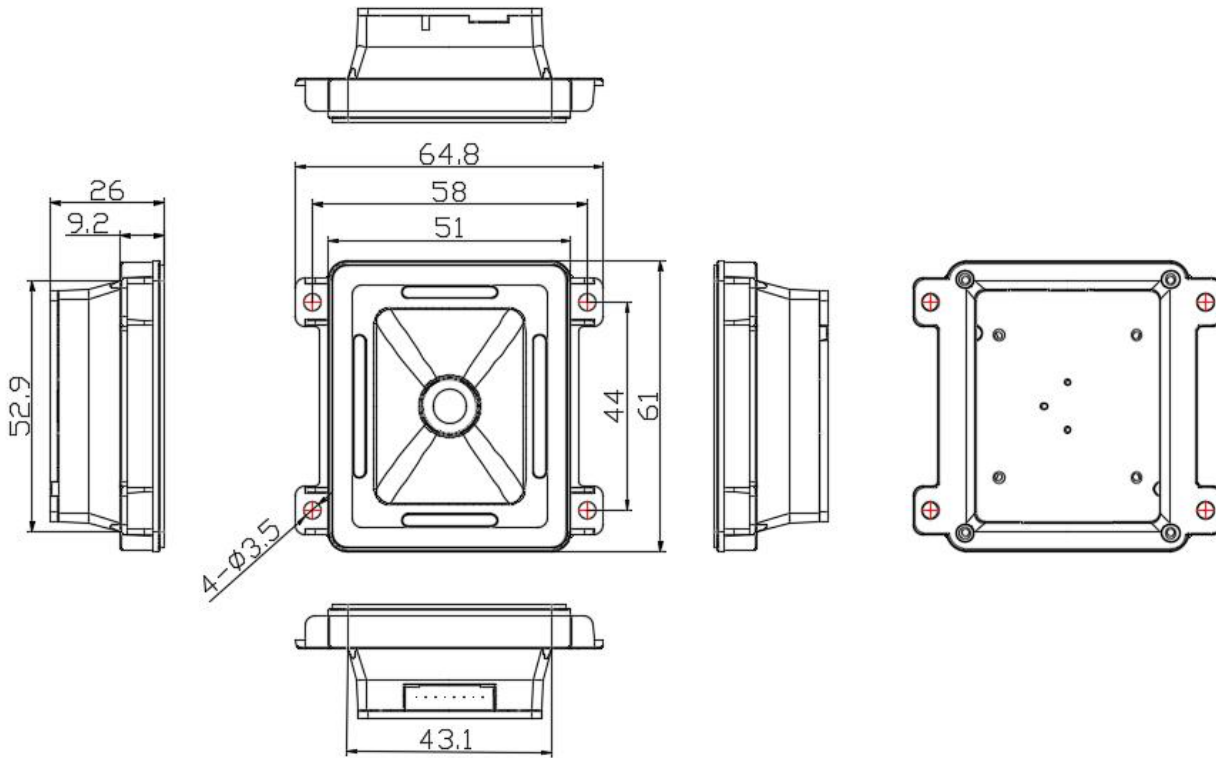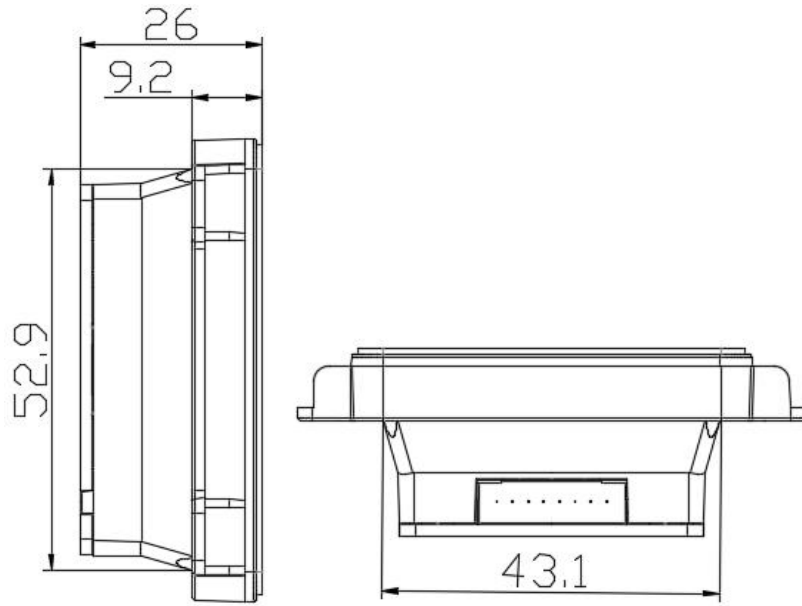
2.4 External Design

Note: Optical analysis of the housing design ensures optimum scanning or imaging performance.

Design the engine housing so that the aiming and lighting systems do not reflect internally. Reflections from windows or shells can cause problems. For special window tilt angles, these reflections bounce from the top or bottom of the housing and reach the engine. Do not place bright objects around the engine to prevent the tilted window from being reflected into the engine's field of view and appearing in the captured image. Consider using a black matte material inside the bezel or housing.

2.5 Optically relevant

2.5.1 Window positioning

The window is a transparent medium mounted in front of the FM700 scanner that separates the inside and outside of the product and preserves the light path for the scanner to read the barcode. The window should be placed so that the illumination beam and aim beam are ejaculed as far as possible and to prevent reflections from entering the engine. If the lighting beam is reflected into the engine, the engine's readability performance is reduced.

The window should be installed as close as possible to the front of the FM700, and a-0mm.。
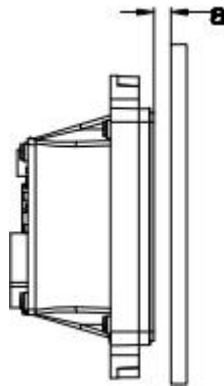
图 2-4

2.5.2 Window material and color

Window material must be clear. Use only cell-cast plastics or optical glass. PMMA, ADC and chemically tempered glass are recommended. Window material selected for the engine should meet or exceed the specifications specified in Table 2-2.

• PMMA (Cell-cast acrylic): When fabricated by cell-casting, has very good optical quality and low initial cost, but surface must be protected from the environment due to its susceptibility to attack by chemcials, mechanical stresses, and UV light. Reasonably good impact resistance. This material can be laser-cut into odd shapes and ultrasonically welded. • ADC (CR-39): A thermal-setting plastic produced by the cell-casting process. Excellent chemical and environmental resistance. Quite good surface hardness, and therefore does not have to be hard-coated. Reasonably good impact resistance. This material cannot be ultrasonically welded. • Chemically tempered glass: Glass is a hard material which provides excellent scratch and abrasion resistance. But unannealed glass is brittle. Increased flexibility strength with minimal optical distortion requires chemical tempering. 9 Glass is hard to be cut into odd shapes and cannot be ultrasonically welded.

Sheet 2-2：

Specification	Description
Thickness	0.8-2.0mm
Wavefront Distortion	PV maximum: 0.2λ RMS maximum: 0.04λ
Clear Aperture	1.0mm to edges
Surface Quality	60-20 scratch/dig

Pay extra attention to the wavefront distortion when using plastic materials. Colored windows are not recommended if the engine is used to scan barcodes on moving objects.

2.6 Coatings and Scratch Resistance

2.6.1 Anti-reflection coatings:

Anti-reflection (AR) coatings can be applied to window surfaces to reduce reflected light from the window back into the engine. But they are expensive and have poor abrasion/scratch resistance.

2.6.2 Polysiloxane coatings:

Polysiloxane coatings can be applied to plastic surfaces to increase the surfaces' abrasion and scratch resistance.

Scratch on the window can greatly reduce the performance of the FM700. It is suggested to use abrasion resistant window material or coating.

2.7 Window Size

The window must not block the field of view and should be sized to accommodate the aiming and illumination envelopes shown below.

Horizontal:

74°

水平视角角度

Vertical:

65°

垂直视角角度
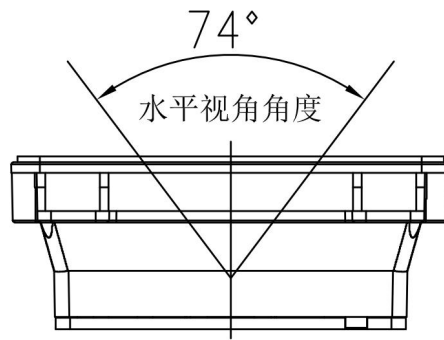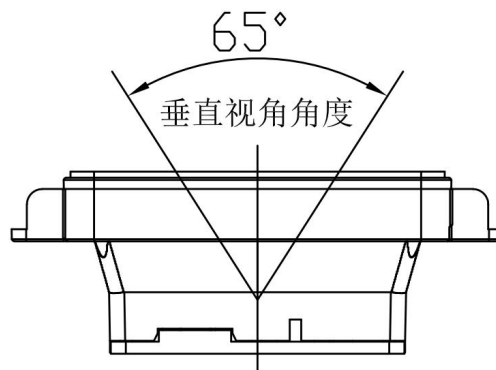
2.8 Ambient Light

The FM700 shows better performance with ambient light. However, high-frequency pulsed light can result in performance degradation. 。

2.9 Eye Safety

The FM700 has no lasers. It uses LEDs to produce illumination beam. The LEDs are bright, but testing has been done to demonstrate that the engine is safe for its intended application under normal usage conditions. However, the user should avoid looking into the beam.

Chapter 3 Electrical Specifications

3.1 Power Supply

Do not power up the FM700 until it is properly connected. Be sure the power is cut off before connecting a cable to or disconnecting a cable from the host interface connector. Hot-plugging could damage the engine. Make sure that the FFC cable is horizontally inserted into the connector when connecting the engine's 12-pin connector to the host. Improper cable installation or unstable power supply or sharp voltage drops or unreasonably short interval between power-ons may lead to unstable performance of the engine. Do not resupply the power immediately after cutting it off.

3.2 Ripple Noise

To ensure the image quality and engine performance, a power supply with low ripple noise is needed.

3.3 DC Characteristics

3.3.1 Operating Voltage / Current

Sheet 3-1（T=23℃）

Parametr	Description	Minimum	Typical	Maximum	Unit
Operating Voltage	VIN (12-pin FPC Connector)	4.8	5	20	V
	VIN (4-pin Box Connector)	4.8	5	20	V
Current (@5.0V)	Operating Current	-	210	250	mA
	Idle Current		120		mA

3.3.2 I/O Voltage

Sheet 3-2

VDD=3.3V, VSS=0V, T=23℃

Parameter	Minimum	Maximum	Unit
VIL	-0.3	0.7	V
VIH	2.0	3.6	V
VOL	-	0.45	V
VOH	1.35	-	V

3.4 Timing Sequence

Power Up and Power Down Timing Sequence
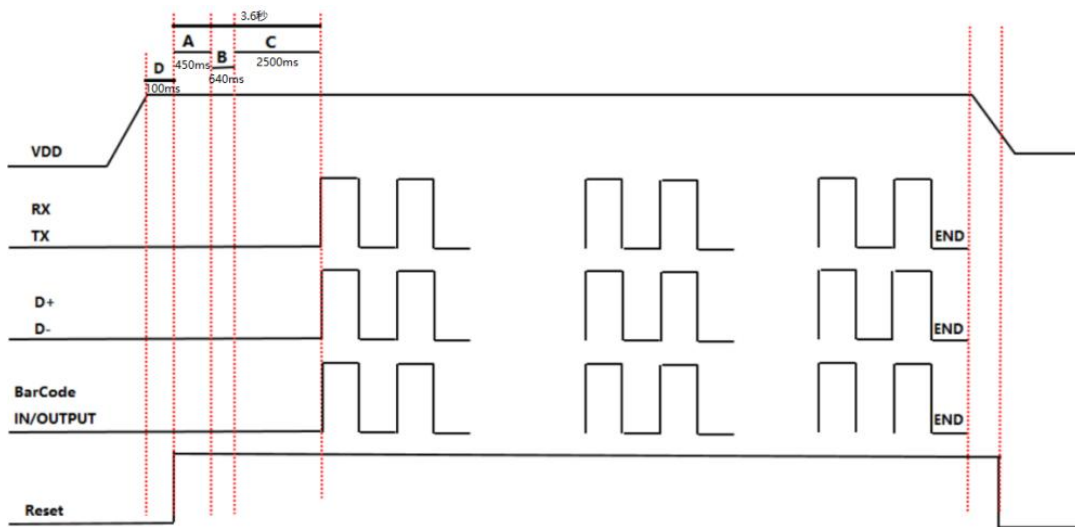
图 3-2 上下电工作时序

1. In the diagram above, it takes A+B+C (about 3600ms) for the engine to power up: A is bootloader execution time (450s), B is kernel boot time (640ms) and C is decoding chip initialization time(2500ms).
   2. D is reset time (100ms). If the Reset signal is not operated when powered on, the startup time should be calculated after VCC_3V3 reaches 3.3V.
   3. In end of the above diagrm shows the time of all voltage drops of the module, that is, when the communication stops, the level signals are all low. At the next power-on, in order to ensure that the voltage is completely reduced and the level of each interface is low, the power input can be turned on again after an interval of at least 2s.

4. Chapter 4 Interfaces

4.1 Interface Pinouts

The physical interface of the FM700 consists of a 12-pin FPC connector and two 8-pin box connectors:。

·12-pin FPC connector can be used as TTL-232 interface or USB interface.
One 8-pin box connector can be used as standard USB interface and the other as RS-232 interface
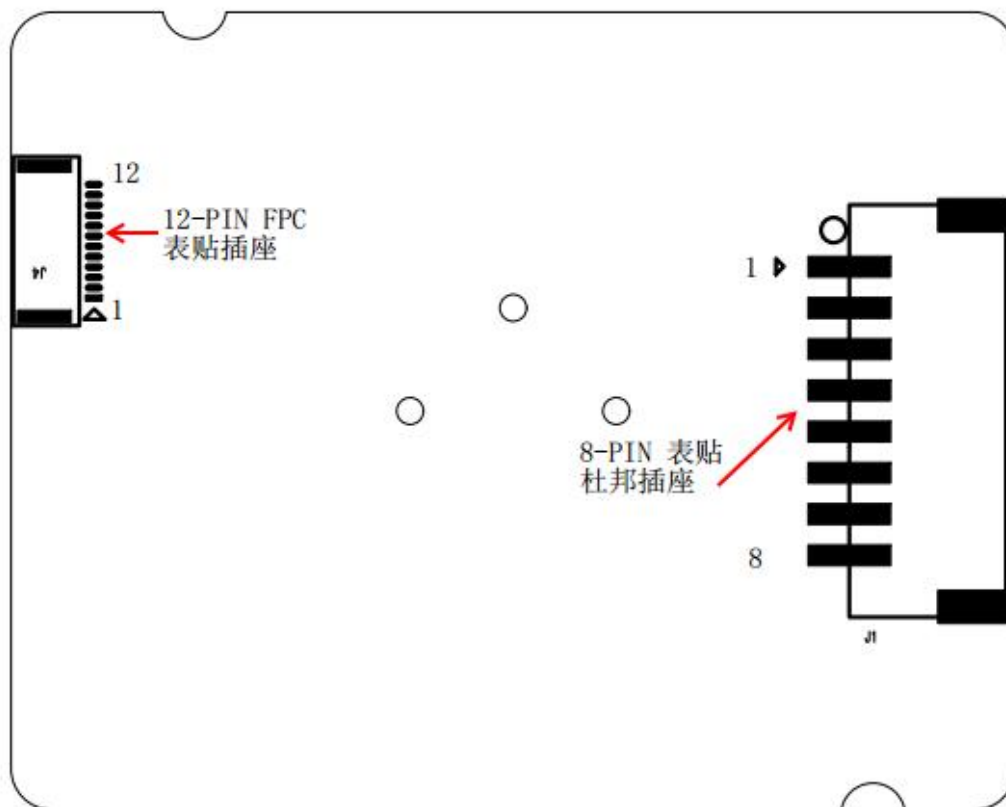
4.2 FM700 Interfaces Pinouts

4.2.1 12-pin FPC Connector

PIN#	Signal Name	I/O	Function	Remark
1	WG-DATA0	O	Wiegand data 0	
2	DLED	O	Good Read LED Output	
3	NC		Reserved	
4	Buzz	O	Beeper Output	
5	FLED-PWM	O	LED Output	
6	WG-DATA1	O	Wiegand data 1	
7	GND		Power Supply Ground	
8	USB-D+	I/O	USB D+ Signal	
9	USB-D--	I/O	USB D- Signal	
10	RS232-RXD/TTL-232-RXD/RS485B-	I	RS232 receive data/TTL232 receive data/ RS485 data B	
11	RS232-TXD/TTL-232-TXD/RS485A-	O	RS232-TXD/TTL-232-TXD/RS485A-	
12	POW_IN	-	5V Power Supply	

4.2.2 8-PIN Box Connector

PIN#	Signal	I/O	Function
1	POW_IN		5V Power Supply Input
2	GND		Power Supply Ground
3	RS232-RXD/TTL-232-RXD/RS485B-	I	RS232-RXD/TTL-232-RXD/RS485B-
4	RS232-TXD/TTL-232-TXD/RS485A-	O-	RS232-TXD/TTL-232-TXD/RS485A-
5	USB_D+	I/O	USB_D+ Signal
6	USB_D-	I/O	USB_D- Signal
7	WG_DATA1	O	Wiegand 1
8	WG-DATA0	O	Wiegand 0

Notice：FM700 serial is RS232 electric level.

Connector/Cable Specifications (Unit: mm)

12-pin FPC connector and two 8-pin box connectors.

4.2.3 12-PIN FPC Connector

1.Material
  1.1: Housing: PA46 UL94−V0 Color:Nature.
  1.2: Contact: C5191−H T=0.20±0.01.
  1.3: LEG: C2680−H T=0.25±0.01.
2.Plating
  2.1: Contact: Gold flash over Nickel.
  2.2: LEG: Gold flash over Nickel.
3.Rating:
  3.1: Operating Voltage: 50V AC/DC.
  3.2: Current Rating: 0.5A AC/DC.
  3.3: Operating Temperature:−40°C~+80°C.
4.Mark"▽"is the important dimension
5.Pater Number:
FPC0511−XXRL−TAG
  PLATING:GF
  PACKAGING
  TA−EMBOSSED TAPE
  TU−TUBE
  RIGHT ANGLE(DOUBLE−FACE CONTACT)
  NO.OF CONTACTS
  SERIE NUMBER
  PITCH=0.5MM
  FPC SERIES

PORT NO	A	B	D	PORT NO	A	B	D
04P	4.10	3.25	2.60	25P	14.60	13.75	13.10
05P	4.60	3.75	3.10	26P	15.10	14.25	13.60
06P	5.10	4.25	3.60	27P	15.60	14.75	14.10
07P	5.60	4.75	4.10	28P	16.10	15.25	14.60
08P	6.10	5.25	4.60	29P	16.60	15.75	15.10
09P	6.60	5.75	5.10	30P	17.10	16.25	15.60
10P	7.10	6.25	5.60	31P	17.60	16.75	16.10
11P	7.60	6.75	6.10	32P	18.10	17.25	16.60
12P	8.10	7.25	6.60	33P	18.60	17.75	17.10
13P	8.60	7.75	7.10	34P	19.10	18.25	17.60
14P	9.10	8.25	7.60	35P	19.60	18.75	18.10
15P	9.60	8.75	8.10	36P	20.10	19.25	18.60
16P	10.10	9.25	8.60	37P	20.60	19.75	19.10
17P	10.60	9.75	9.10	38P	21.10	20.25	19.60
18P	11.10	10.25	9.60	39P	21.60	20.75	20.10
19P	11.60	10.75	10.10	40P	22.10	21.25	20.60
20P	12.10	11.25	10.60	41P	22.60	21.75	21.10
21P	12.60	11.75	11.10	42P	23.10	22.25	21.60
22P	13.10	12.25	11.60	43P	23.60	22.75	22.10
23P	13.60	12.75	12.10	44P	24.10	23.25	22.60
24P	14.10	13.25	12.60	45P	24.60	23.75	23.10

C=0.50X(N−1)
N−0.20±0.01
0.500Pitch
C2 C1 C2 C1 C2 C1 C2 C1 C2 C1 C2 C1 PIN 1
注意:C2为短端, C1为长端.
SECTION X−X
0.75±0.03
3.55±0.03
4.10±0.05
1.25±0.05
MAX0.10MM
Recommend P.C.B Layout
2.60 2.40 0.80 0.60 0.50 C=0.50X(N−1) PIN 1 0.35
SECTION Y−Y SECTION Z−Z
2.40 1.60 1.30 3.35 3.65
1.000 1.200
D±0.05

TOLERANCE UNLESS SPECIFIED		DATE:4/15'11	DAR.BY:	MATERIAL: ___		
LINEAR	ANGLE					
.X ±0.35	X° XX	SCALE: 1:1	CHK.BY:	FINISH: ___		
.XX ±0.15	.X° ±2°				TITLE: FPC0.5Pitch1.2H 无锁 双接触点	REV.
.XXX ±0.05	.XX° XX	UNIT: mm	APP.BY:	PART NO: ___	DWG NO. FPC0511−xxRL−TAx	B

Figure 4-2

4.2.4 8-PIN RS232 Box Connector

SPECIFICATION
1 Contact resistance: ≤10mΩ
2 Insulation resistance: ≥1000MΩ
3 Rated voltage: 100 V AC DC
4 Rated current: 2.0 A AC DC
5 Withstand Voltage: 800V AC/minute
6 Temperature Range:-40℃～ +105℃

ORDER INFORMATION:

A2001AWR-**-F2MA-*

PART No.
No. OF CIRCUITS:
02～16
PLASTIC MATERIAL:
C1M=PA6T
F2M=LCP

PACKAGING:
R=REEL
G=TUBE
PLATING:
A=Tin-plated
C=Gold-plated
B=Sn=GOLD

Circuits	Dimensions(mm)		
	A	B	C
02	2.00	4.80	8.00
03	4.00	6.80	10.00
04	6.00	8.80	12.00
05	8.00	10.80	14.00
06	10.00	12.80	16.00
07	12.00	14.80	18.00
08	14.00	16.80	20.00
09	16.00	18.80	22.00
10	18.00	20.80	24.00
11	20.00	22.80	26.00
12	22.00	24.80	28.00
13	24.00	26.80	30.00
14	26.00	28.80	32.00
15	28.00	30.80	34.00
16	30.00	32.80	36.00

SUGGESTED PCB LAYOUT
(COMPONENT SIDE)

REV. | ECN. NO. | DESCRIPTION | APPD.
NEW RELEASE

RoHS Compliant

Circuit 1

Tolerance	Model Name: 2.00mm PITCH 90° WAFER-SMT TYPE	Drawn:汪微微2013.01.01
X.X ±0.30	Model No: A2001AWR-**-F2MA-*	
X.XX ±0.20		Checked: 张 碧
X.XXX ±0.10	SCALE:FULL	REVISION:B/0
Angle ±3.0°		

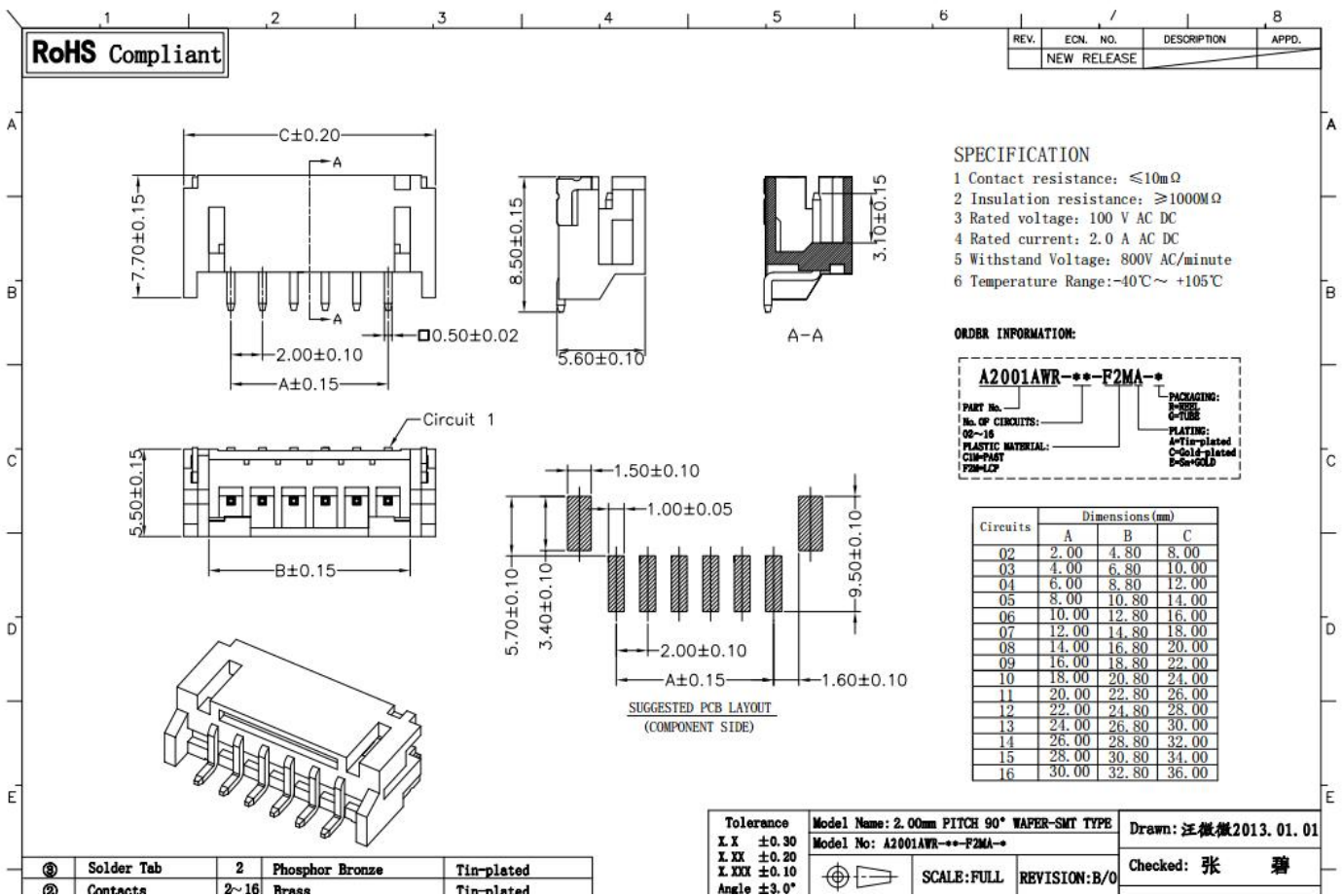| ③	Solder Tab	2	Phosphor Bronze	Tin-plated
②	Contacts	2~16	Brass	Tin-plated

Figure 4-3

17

4.2.4 12-PIN FPC

A 12-pin cable can be used to connect the engine's 12-pin FPC connector to a host device.
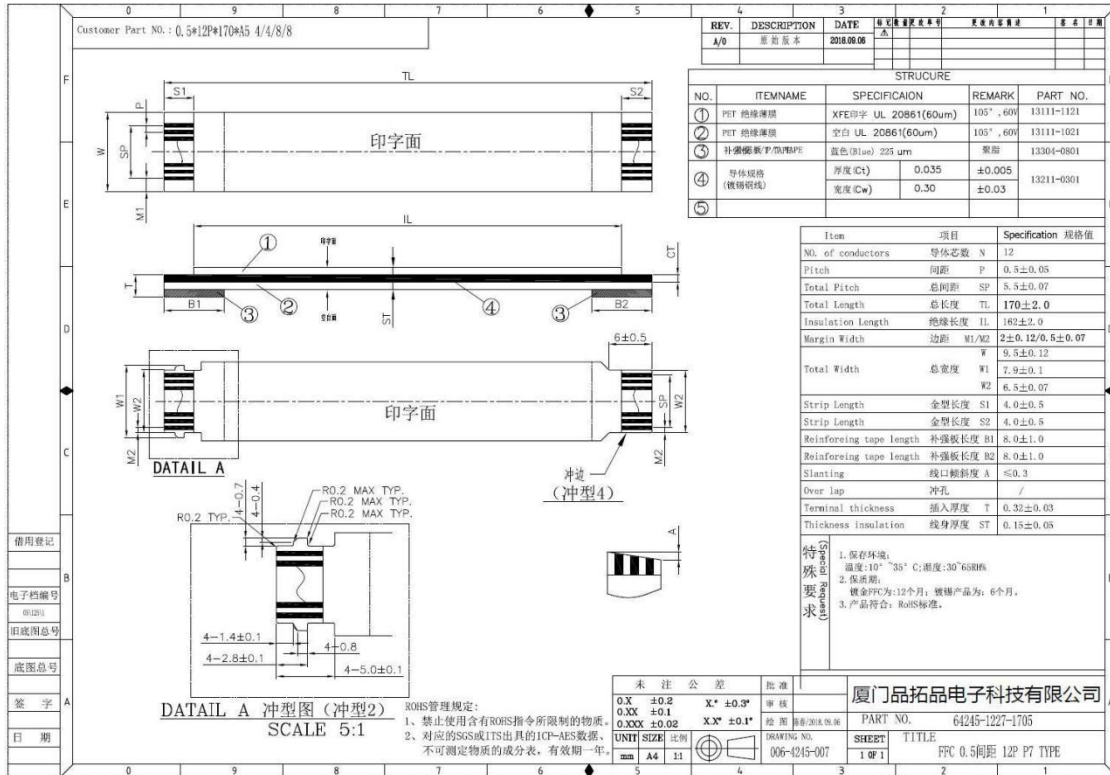

Figure 4-4

4.2.5 8-PIN USB box cable
A 8-pin female cable can be used to connect the engine's 8-pin box connector (male) to a host device
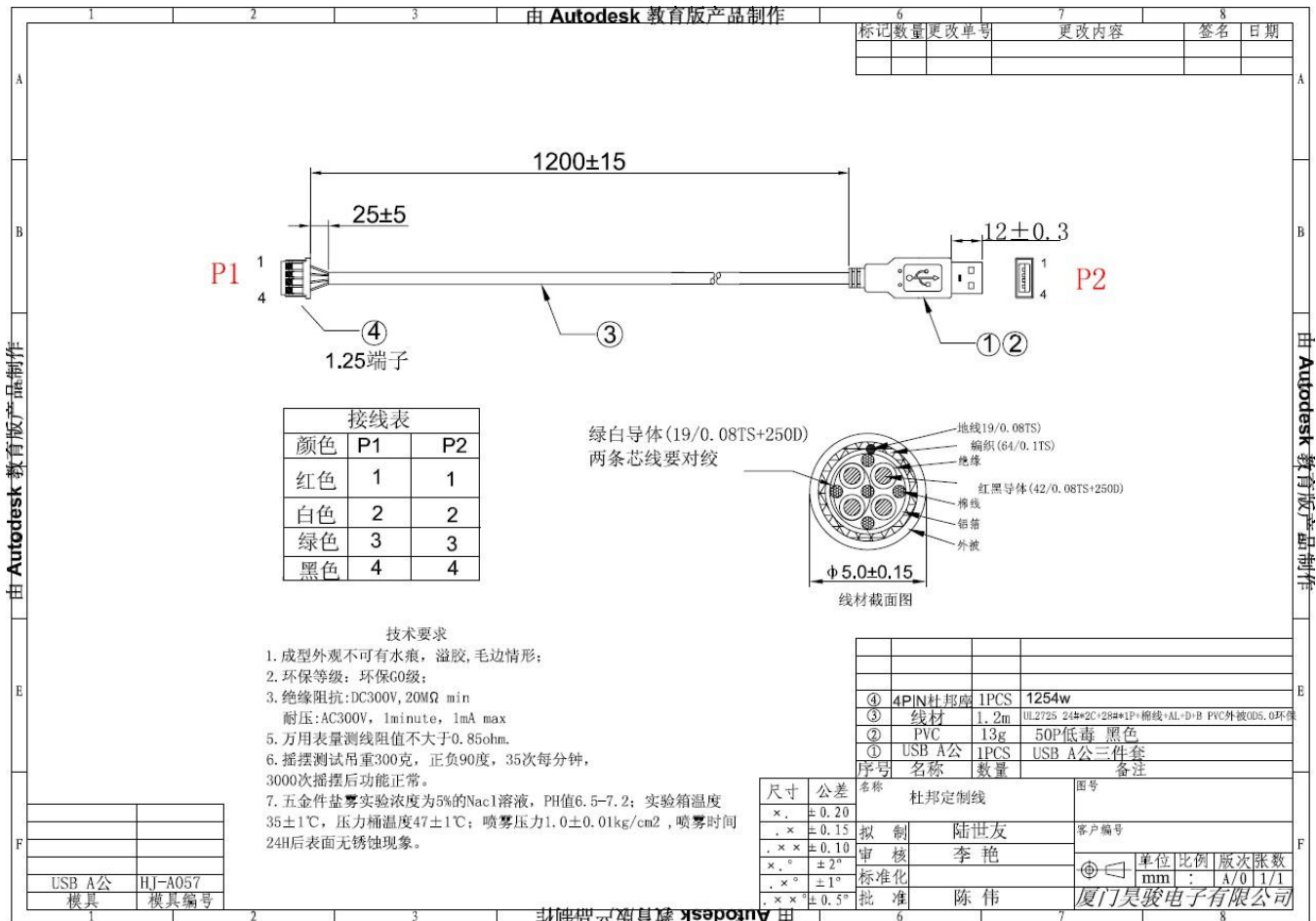

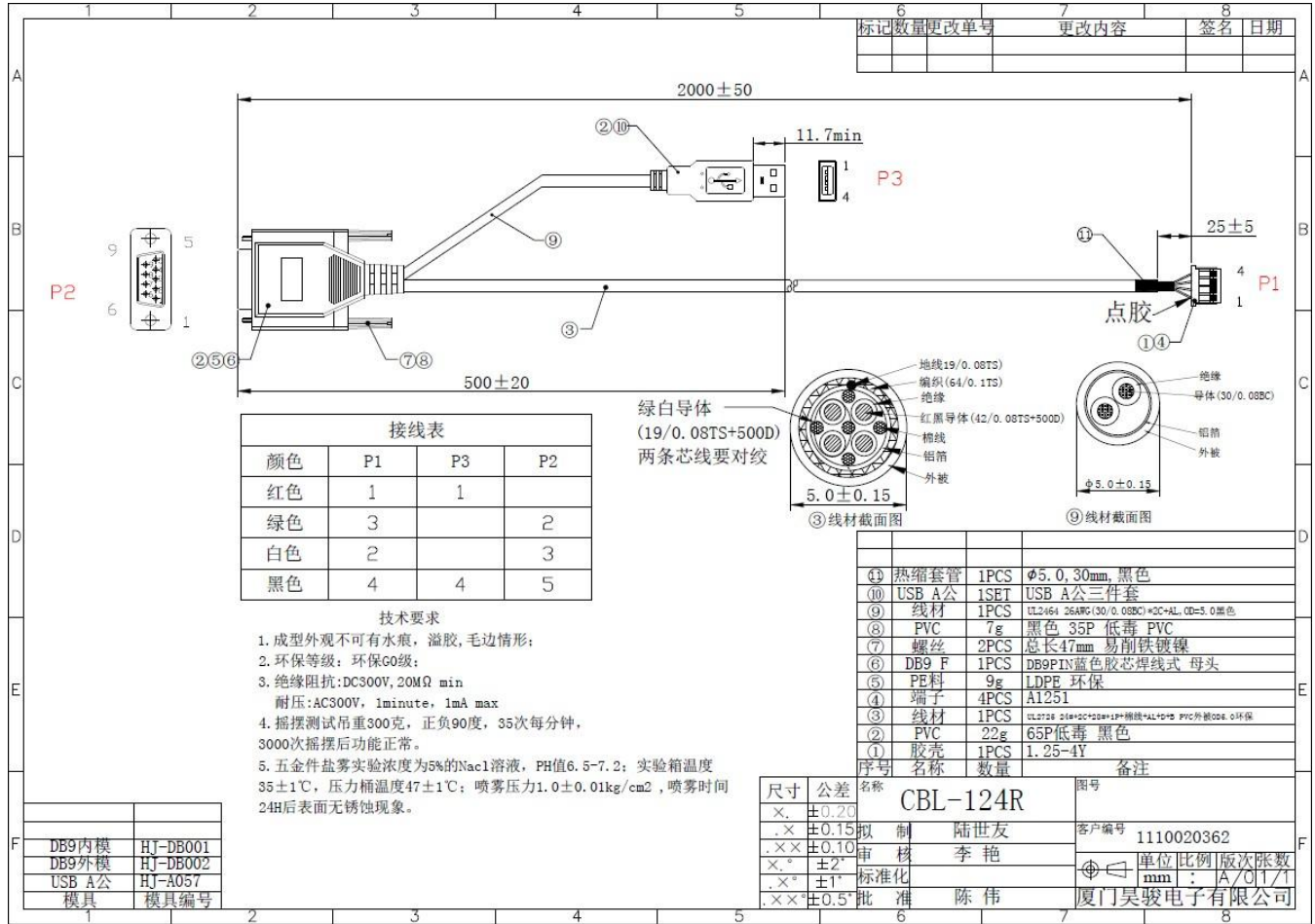Figure 4-5

4.2.6 8-PIN RS-232 Box Cable

Figure 4-6