RFID Transponder Reader

User Manual

(Model: 88-157-101)

FCC ID: S44RF88157101

DOCUMENT INFORMATION			
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UNISON

IMPORTANT NOTES:

- 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.

- Any changes or modifications not expressly approved by the party responsible for compliance could void the authority to operate equipment.

⚠ CAUTION:

01. Read and understand all safety and operating instructions before installing and operating the device.
02. This instruction is designed for specially trained personnel. This device is NOT intended for use by the "general population" in an uncontrolled environment. Installation, operation and error handling the device shall be carried out by specially trained personnel only.
03. The device cannot be sold retail ,to the general public or by mail order. It must be sold to dealers.
04. Install in accordance with the manufacturer's instructions only.
05. This product is designed to be mounted and operated in an industrial environment as a built-in-device only. It is not designed to be used as a stand-alone or a portable device or in a non-industrial environment, such as a household, vehicle or open-air environment.
06. This manual is designed for specially trained personnel only. This device must be installed and maintained by the manufacturer or its specially trained representatives. Intervention or error handling not expressively approved in this manual must be carried out by the manufacturer's personnel only. If you are unsure about the qualifications that are actually required, contact the manufacturer.
    - *Unqualified interventions may result in personal injury or damage to the device!*
07. Do not connect the device to any kind of power supply such as a standard household power supply. The device should be connected to a power supply of the type described in these instructions only.
08. When you disconnect a cable, pull on its conductor and not on the cable itself. Keep the connector evenly aligned to avoid bending any connector pins. When you connect a cable, ensure that the connector pins are positioned correctly.

09. Never over bend the antenna cable or expose it to mechanical loads.
10. When replacement parts are required, use the replacement parts specified by the manufacturer only. Unauthorized substitutions may result in fire, electric shock, or other hazards.
11. 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.
12. Never locate the antenna so that it is very close to or touching parts of the body while transmitting.

TABLE OF CONTENT

FIGURES

TABLES

1. INTRODUCTION

The history of RFID technology could be retraced to early 20th century which is involving the study of radio wave generation and transmission. The RFID became reality from 1970's, many developers、inventors、companies、academic institutions and Lab are all actively working on RFID. In the past thirty years, the electronic technique and integrated circuit development were promoted in tenfold speed. It has gradually driven the RFID technology to commercial and practical applications.

The characteristic of RFID depends on the operating frequency. Unison RFID Reader works in LF (Low Frequency) range of 134.2 kHz and 125kHz. It uses inductive coupling and FSK (Frequency Shift Keying) technologies to transmit data between reader and tag. Non-contact communication reduces the abrasion of tag, and the read/write do not restrict within line of sight. In addition, the passive tag is energy by reader, no battery needed during operation. The cost of tag is reduced substantially.

The response time of reader is within hundreds of millisecond, which is dependent on the data transmission. The reader controller provides standard serial port and Ethernet port (*not support yet*) for host connection, most field applications can easily integrate the reader with those standard ports.

This manual describes the system specification and operation, as well as the procedure of installation and maintenance. It recommends user to operate reader after reading this document.

2. PRODUCT DESCRIPTION

2.1. OVERVIEW

With safe、reliable、low cost requirements, UNISON RFID Reader is specifically designed for semiconductor and TFT-LCD industry material tracking system by using low frequency RFID technology. Take semiconductor FAB as an example, the integration of RFID reader and machine load port can let EAP or MCS to track the cassette/carrier location in the FAB. CIM system can also take advantage of rich tag information to achieve more efficient automation management.

UNISOSN RFID Reader is composed of reader controller and reader antenna. The RS232 (SECS I/II) and Ethernet (HSMS) communication ports provide system integration for semiconductor industry. The tag (transponder) specification is TI® ‘s 134.2kHz low frequency solution, it is the most popular used RFID tag in 300mm FAB. UNISON RFID Reader is compliant with TI® ‘s LF transponder. Following figure illustrate a typical single-wired application with process tool. The RFID reader controller and antenna are installed in tool load port, and communicate with tool host by RS232 connection (ASCII or SECS). The lot tracking become more easy and efficient for automation system.

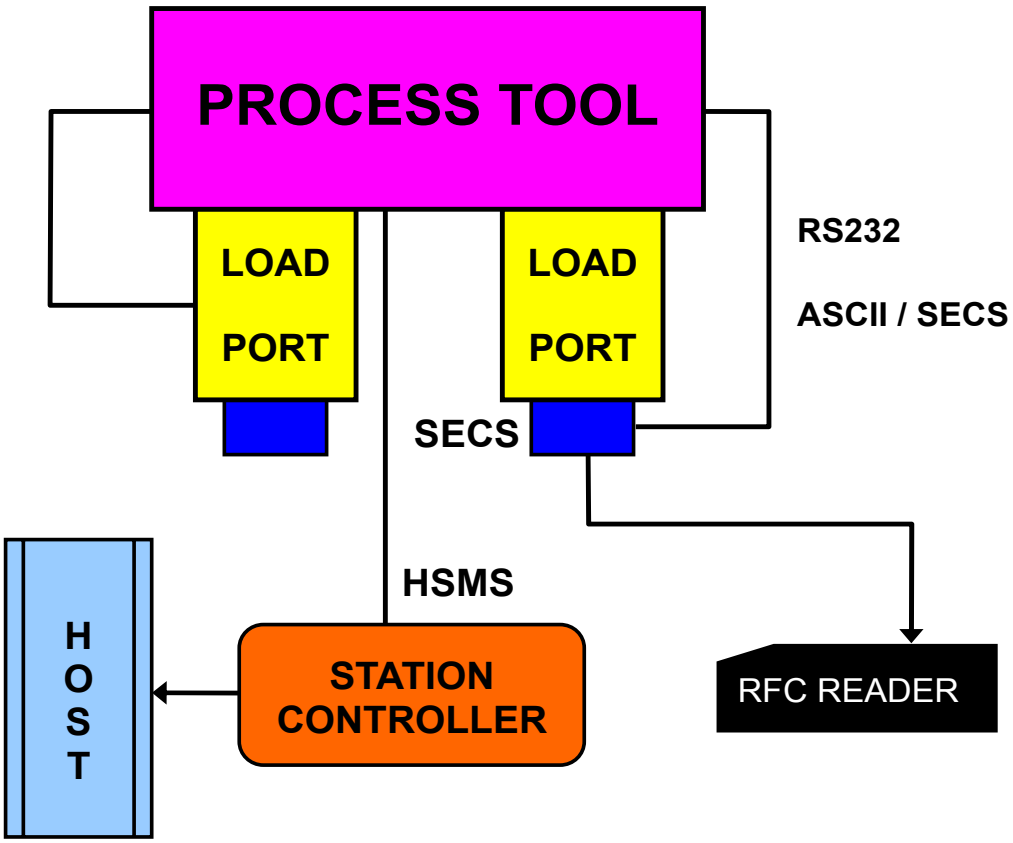


Figure 2-1. System Integration Architecture

2.2. LAYOUT

The housing material of UNISON RFID Reader is made by A.B.S. which is used in electrical device and will not impact the FAB cleanness. All connectors and switch are designed at controller flank, and operation panel locate at top side. It make user easily to use it. The appearance and layout are described as follow.

<1>. Operation Panel :

Figure 2-2. Reader operation panel

<2>. Flank connectors :

(*not support yet*)

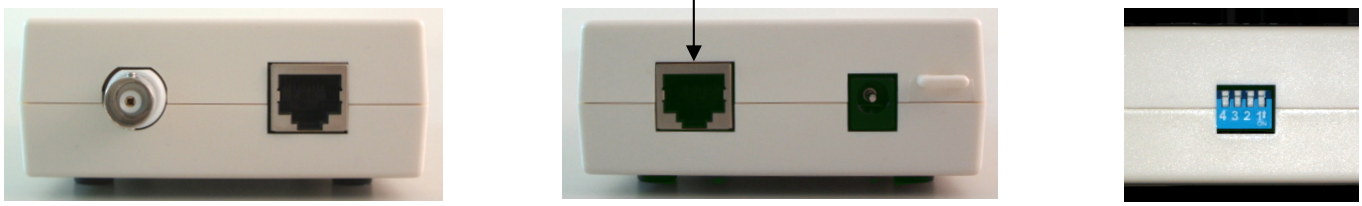


Figure 2-3. Reader flank connectors

<3>. Antenna :

⚠ Never over bend the antenna cable or expose it to mechanical loads.

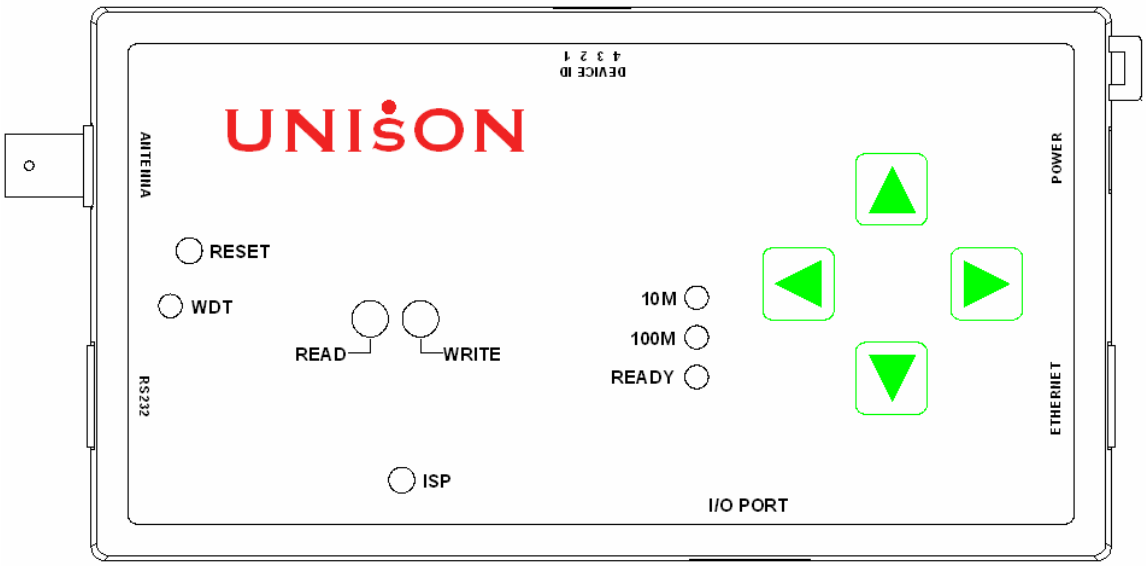
The antenna design and RFID reader controller design are physically separated, and can connect them by common interface. Based on TI® ‘s glass type transponder, UNISON RFID Reader use the induction coil which is wired and packaged as stick type. Follow pictures show their appearance.

Overall Antenna BNC Connector

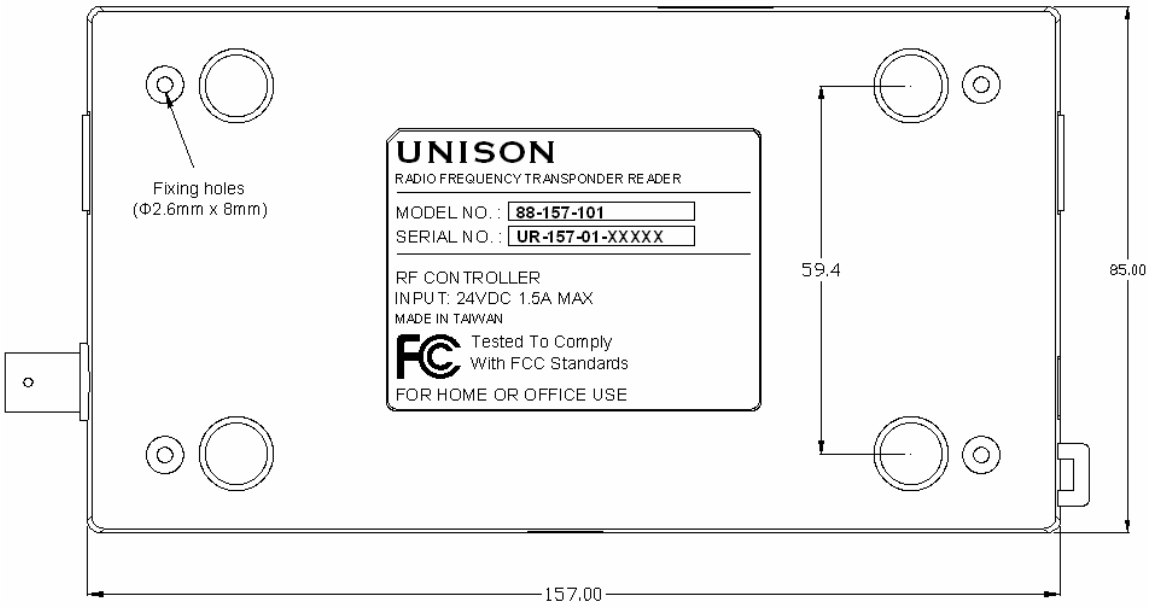
Figure 2-4. Stick type antenna

<4>. Size

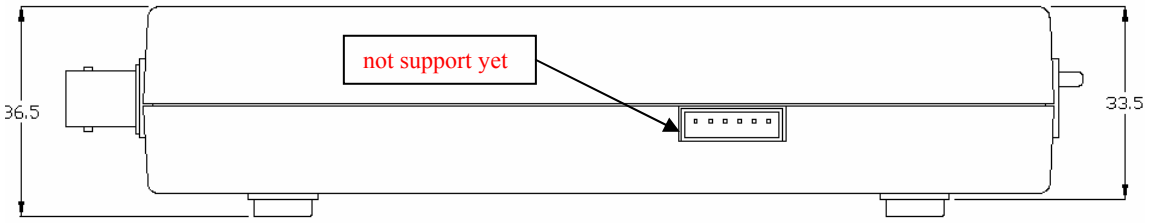
Standard version of Reader size (product number 88-157-XXX) is listed below,



TOP VIEW



BACK VIEW



SIDE VIEW

Figure 2-5. Reader appearance size

Antenna size

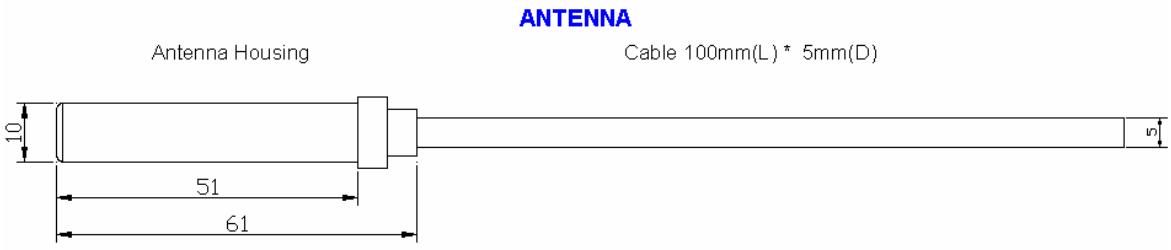


Figure 2-6. Stick type antenna dimension

The description of UNISION RFID Reader functions are referred to section 2.3.

2.3. FUNCTION

Figure 2-7 indicate all the functions on the RFID reader controller. This section will describe those functions in details.

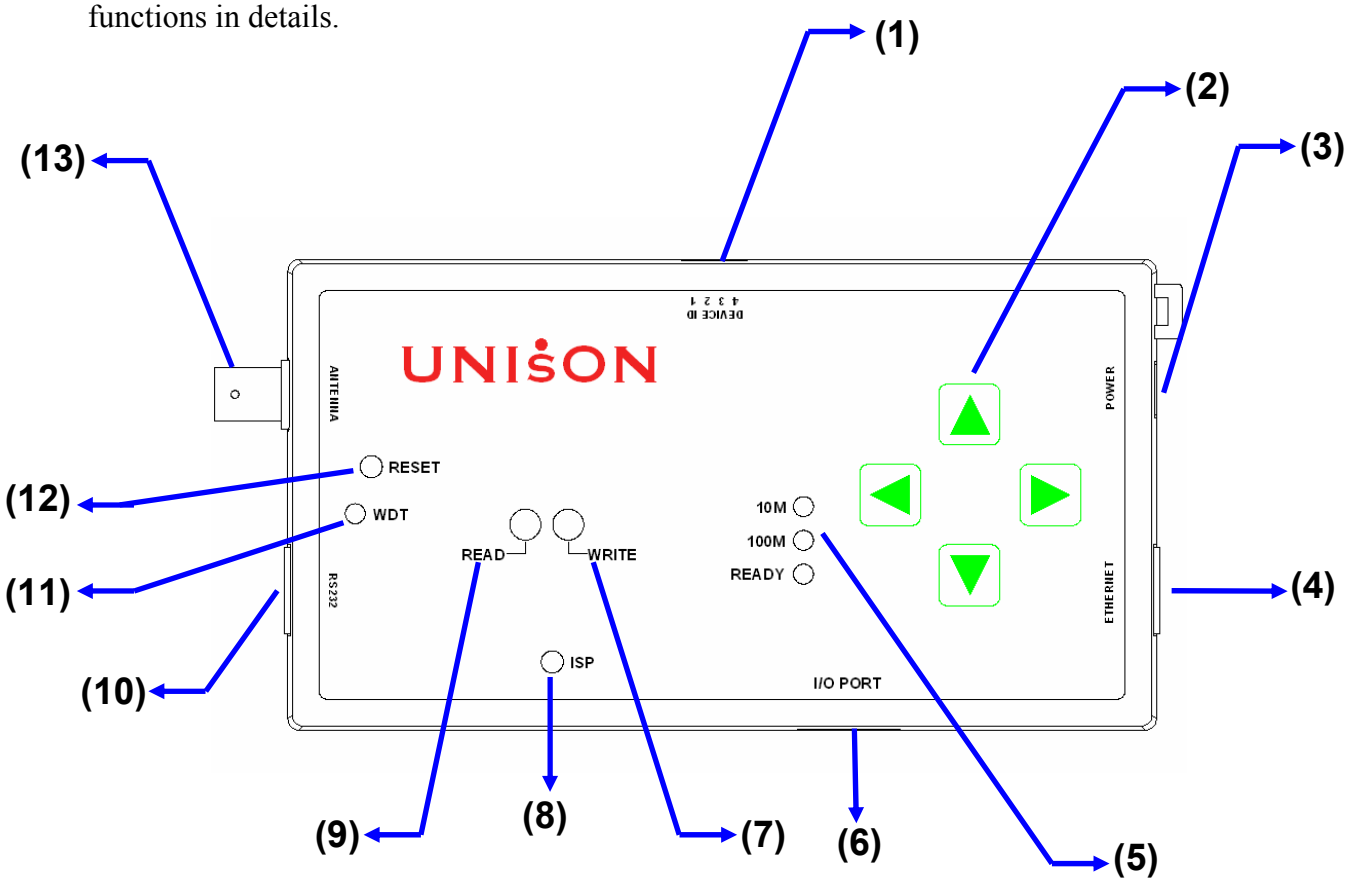


Figure 2-7. RFID reader controller layout

1. DIP Switch

To set RFID reader controller‘ s device ID. Host controller can identify the connected readers by this ID number. The range is from 0 ~ 7, and totally eight devices are available in one host link. After set the DIP switch, it needs to reset reader controller to take effect. The DIP switch and device ID mapping is shown in **Fig 2-8**.

DIP Switch	Device ID
All Down	0
1 up	1
2 up	2
1、2 up	3
3 up	4
1、3 up	5
2、3 up	6
1、2、3 up	7

Figure 2-8. DIP switch setting

2. Select Button

A. Reserve for selection input when connecting external display device such as LCD.

B. Push UP and DOWN buttons simultaneously, system will run internal test once, and will write string "0000000000000000" (*only for multi page tag*) to tag MID if successfully.

3. Power Input

24V , 0.5A DC input

4. HSMS Interface Connector (not apply to 88-157-101)

Reserve for Semi standard HSMS interface

5. Ethernet Indicator (not apply to 88-157-101)

Ethernet speed and status indicators. "10M/100M" indicates HSMS port current speed, and "READY" indicates the HSMS port is ready or not.

6. I/O Port (not apply to 88-157-101)

There are four input/output contact points can be used to integrate with external device. It provides user the additional control functions such as external trigger. The pin assignment is defined as in Figure 2-9.

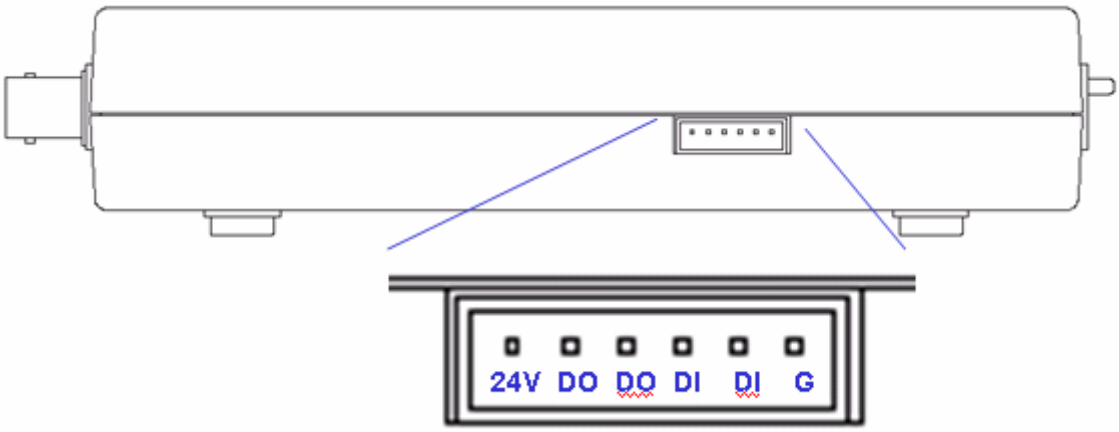


Figure 2-9. I/O connector pin assignment (*not support yet*)

7. WRITE Indicator

Used to indicate the executing command is "write". When command start to execute, the light of indicator turn to green. Green color will be turned off if the command is executed

successfully. Otherwise, if the command execution is failed, the light of indicator will turn to red, it will not turn off until next command is executed.

8. ISP Button

In System Programming function button. Technician can update firmware through RS232 port by enabling this button.

9. READ Indicator

Used to indicate the executing command is "read". When command start to execute, the light of indicator turn to green. Green color will be turned off if the command is executed successfully. Otherwise, if the command execution is failed, the light of indicator will turn to red, it will not turn off until next command is executed.

10. RS232 Interface Connector

Serial port interface to support Semi standard SECS I/II protocol.

11. Watch Dog Timer Indicator

Used to indicate the system health. The red light will be flashing after successfully initialization.

12. RESET Button

Reset reader controller CPU. Usually used to restart controller after upgrade firmware.

13. Antenna Connector

Standard BNC connector to connect antenna and reader.

2.4. SPECIFICATION

UNISON RFID Reader system specification and compliant standard are listed in Table 2-1 and Table 2-2.

Table 2-1. RFID Reader System Specification

Item	Name		Specification
1	RF working frequency		134.2 KHz
2	Tag chip provider		TI®
3	Detect Range	Read	10mm ~ 85mm
		Write	10mm ~ 65mm
4	Memory size	MID	16 bytes / 2 pages(MPT) , 8 bytes / 1 page(SPT)
		DATA	120 bytes / 15 pages(MPT)

5	Working duration time	MID	max. bytes : Read 0.15 sec ; Write 0.68 sec
		DATA	max. bytes : Read 2 sec ; Write 6 sec
6	External power		120/240V 50/60 Hz DC 24V 0.5A
7	Working Humidity		20% ~ 80%RH
8	Working Temperature		0℃ ~ +55℃ / 32℉ ~ 131℉
9	Communication		SECS I/II、ASCII、HSMS(in roadmap)
10	Serial port baud rate		9600 , N , 8 , 1
11	Antenna Connector Type		BNC male
12	RS232、Ethernet Connector		RJ45
13	RS232 host Connector		9 pin female
14	I/O connector		0.98” pitch, 6 pins male, disconnectable
15	Weight (without antenna)		230g
16	Reader size		157mm x 85mm x 33.5mm (L x W x H)

Table 2-2. RFID Reader Standard Compliant

Item	Name	Description
1	SEMI E15.1	Specification for Tool Load Port
2	SEMI E99 , E99.1	Specification for Carrier ID Reader/Writer

2.5. LOAD PORT INTEGRATION

The most common application of RFID reader in Semiconductor and TFT-LCD industry is to integrate with equipment load port to track cassette/FOUP move-in and move-out. Table 2-3 lists the mapping for RFID reader and load port vendor.

Table 2-3. Kits P/Ns for different Load Ports

Description	Kit N/O
TDK® Front Load	UT-0010-01
ASYST® Front Load (S2,S3)	UT-0020-01
ASYST® IsoPort	UT-0020-02
Brooks® Load Port	UT-0030-01
AMAT® Load Port	UT-0040-01
TEL® Load Port	UT-0050-01
Kaijo® Load Port	UT0060-01
8” SMIF FAB (SMIF I/O)	UT-0080-01
8” Bare cassette	UT-0090-01

3. SECS OPERATION

3.1. INTRODUCTION

⚠ **This manual is designed for specially trained personnel only. This device must be installed and maintained by the manufacturer or its specially trained representatives.**

⚠ **Unqualified interventions may result in personal injury or damage to the device!**

SEMI Equipment Communications Standard is a coordinated pair of standards for the semiconductor industry that defines a serial communications interface between equipment and a host. SECS-I (SEMI E4-91) defines the transfer of binary messages through an RS-232 link communication. SECS-II (SEMI E5-95) is designed to use SECS-I, and it defines the high level data structures of message.

SECS II message are organized into “stream” and “function”. “Stream” represents the category of activities, it is identified by a 7 bits code (0~127). “Function” represents the use of that activity, it is identified as an 8 bits code (0~255). SECS II message data structures are composed of entities called items and list of items, those data will be processed by SECS driver and sent between equipment and host. For application user, the message format and definition are most important, they will be described in section 3.2.

SEMI E99 is another standard to define the usage of RFID reader in FABs. All related carrier ID products must be compliant to this standard to avoid integration problem. The E99 compliance topic is described in section 3.3.

Some specific machine or equipment does not support SECS protocol. This situation can be solved alternatively to use ASCII command string by RS232 serial port. Chapter 4 will describe the ASCII command mode communication.

3.2. SECS II MESSAGE

3.2.1. Message Set

The SECS communication protocol between RFID reader and equipment host is defined in SEMI E99. There are three Streams and fifteen common used Functions. Table 3-1 summaries those streams and functions.

Table 3-1. SECS Stream Function list

Stream	Function		Direction	Description
	Primary	Secondary		
1	1	2	H → R	Are you there

18	1	2	H → R	Query system state
	3	4	H → R	Set system state
	5	6	H → R	Read data
	7	8	H → R	Write data
	9	10	H → R	Read MID
	11	12	H → R	Write MID
	13	14	H → R	Change State
	73	-	H → R	Initialize system
	71	-	H ← R	Power On status
9	1	-	H ← R	unrecognized device ID
	3	-	H ← R	unrecognized stream
	5	-	H ← R	unrecognized function
	7		H ← R	SECS format error
	9	-	H ← R	transaction time out

3.2.2. Message Set Format

According to the definition of Stream and Function, the SECS II message format samples are list as follow:

1. **S1F1** Are You There

   Header only

2. **S1F2** Are You There reply

```
<L2
        < A[20] >                    //model no.
        < A[8] >                     //software version
>
```

3. **S18F1** Query System State

```
<L1

        <A[00~07]>                   //Device ID

>
```

4. **S18F2** Query System State reply

```
< L3
        < A [00~07]>                 //DeviceID
        < A [XX] >                   //Return code
        <L4
                < A [XX] >           //PM information
                < A [1~8] >          //Alarm status
                < A [XXXX] >         //Operation state
                < A [XXXX] >         //Head status
        >
>
```

5. S18F3 Set System State

```
<L2
        <A[00~07]>                          //Device ID
        <A[00~01]>                          //setting value
>
```

6. S18F4 Set System State reply

```
< L3
        < A [0~7]>                          //DeviceID
        < A [XX] >                          //Return code
        <L4
                < A [XX] >                  //PM information
                < A [1~8] >                 //Alarm status
                < A [XXXX] >                //Operation state
                < A [XXXX] >                //Head status
        >
>
```

7. S18F5 Read Data

```
<L3
        < A[00~07] >                        // DeviceID
        < A [0~119] >                       // Start offset address
        < A [ReadNo.] >                     // Number of bytes to read
>
```

8. S18F6 Read Data reply

```
< L4
        < A[00~07] >                        //Device ID
        < A[XX] >                           //Return code
        < A [Data string] >                 //Return Data string
        <L4
                < A [XX] >                  //PM information
                < A [1~8] >                 //Alarm status
                < A [XXXX] >                //Operation state
                < A [XXXX] >                //Head status
        >
>
```

9. S18F7 Write Data

```
< L4
        < A [00~07] >                       //DeviceID
        < A [0~119] >                       //Start offset address
        < A [1~120] >                       //bytes to write
        < A [String to write] >             //Data to write
>
```

10. S18F8 Write Data reply

```
< L3
```

```
< A [00~07] >                    //DeviceID
< A [XX] >                       //Return Code
<L4
        < A [XX] >               //PM information
        < A [1~8] >              //Alarm status
        < A [XXXX] >             //Operation state
        < A [XXXX] >             //Head status
>
>
```

11. S18F9 Read MID

```
< A [00~07] >                    //DeviceID
```

12. S18F10 Read MID reply

```
< L3
< A [00~07] >                    //DeviceID
< A [XX] >                       //Return code
< A [MID string]>                //Return MID, max 16 bytes
<L4
        < A [XX] >               //PM information
        < A [1~8] >              //Alarm status
        < A [XXXX] >             //Operation state
        < A [XXXX] >             //Head status
>
>
```

13. S18F11 Write MID

```
< L3
< A [00~07]>                     //DeviceID
< A [String to write] >          //String to write
<L4
        < A [XX] >
        < A [1~8] >
        < A [XXXX] >
        < A [XXXX] >
>
>
```

14. S18F12 Write MID reply

```
< L3
< A [00~07] >                    //DeviceID
< A [XX] >                       //Return Code
<L4
        < A [XX] >               //PM information
        < A [1~8] >              //Alarm status
        < A [XXXX] >             //Operation state
        < A [XXXX] >             //Head status
>
>
```

15. S18F13 Change State

```
<L2

<A[00~07]>                       //Device ID
```

```
        <A[00~01]>                          //Operation State :
                                            //      ”00” operating
                                            //      ”01” maintenance
    >
```

16. S18F14 Change State reply

```
    < L3
        < A [00~07]>                        //DeviceID
        < A [XX] >                          //Return code
        <L4
            < A [XX] >                      //PM information
            < A [1~8] >                     //Alarm status
            < A [XXXX] >                    //Operation state :
                                            //      ”IDLE” operating
                                            //      ”MANT” maintenance
            < A [XXXX] >                    //Head status
        >
    >
```

17. S18F71 Power On status

```
    <L4
        < A[00~07] >                        //Device ID
        < A[XX] >                           //Return code
        < A[XX] >                           //EventReport ID
                                            //      01: pod arrive
                                            //      02: pod remove
                                            //      05: power on
        <L2                                 //only in “pod arrive” event
            < ‘AutoReadData’ >              //fixed string
            < A [MID string] >              //Return MID, max 16 bytes
        >
    >
```

18. S18F73 Initialize system

Header only

19. S9F1 Unrecognized Device ID

```
    <L2
        < A [00~07]>
        < A ‘UD’ >                          //unrecognized DeviceID
    >
```

20. S9F3 Unrecognized Stream

```
    <L2
        < A [00~07]>
        < A ‘US’ >                          //unrecognized Stream
    >
```

21. S9F5 Unrecognized Function

```
    <L2
```

```
        < A [00~07]>
        < A 'UF' >                          //unrecognized function
    >
```

22. S9F7 SECS format error

```
    <L2
        < A [00~07]>
        < A 'FE' >                          //SECS format error
    >
```

23. S9F9 Transaction Time Out

```
    <L2
        < A [00~07]>
        < A 'T2' >                          //Transaction Time Out
    >
```

The return codes of UNISON RFID Reader in SECS II message string are summarized in Table 3-2. Application program can acquire those codes to process event routine.

Table 3-2. SECS-II Return Code

Item	Name	Description
1	**NO**	Normal Operation
2	**CE**	Communication Error，no transponder appeared or transponder does not response
3	**24**	CRC check error for transponder response
4	**TE**	Timing Error
5	**FE**	SECS message item number does not match.
6	**05**	Data length not correct in item（offset or read/write bytes）
7	**04**	Written MID data is too long (over16 bytes)
8	**19**	SECS message format are not correct from host
9	**SM**	System state Mismatch，can not read/write (E99)
10	**EF**	Execute Fail，can not write the setting value when try to set system state
11	**DE**	Data error，the written values is not 0x00 nor 0x01 when try to set system state
12	**IC**	Illegal Character，which is not allowed in MID
13	**TM**	Tag Type Mismatch，the write/read data length exceed 8 bytes of single page tag
14	**UD**	Unknow device ID
15	**US**	Unknow stream
16	**UF**	Unknow function

3.3. INTRODUCTION TO SEMI E99

SEMI E99 normalizes the functionality of Carrier ID Reader/Writer (CIDRW), to provide a common specification for concepts、behavior and services of CIDRW. In order to be compliant with E99, RFID reader provider should implement complete state、transition and services. Those are described in details in E99 and E99.1 document which are published by SEMI org.

The term “CIDRW” is the “RFID reader” in this manual, and “Read/Write Head” is corresponding to “antenna”. Actually UNISON RFID Reader is the CIDRW Single Head in E99’s definition.

3.3.1. State Model and Transition

The state and state transition define the characteristics and behavior of RFID reader. Those definitions can make upstream controller to understand how system is operating. Figure 3-1 and Table 3-3 explain the meanings of state and transition.

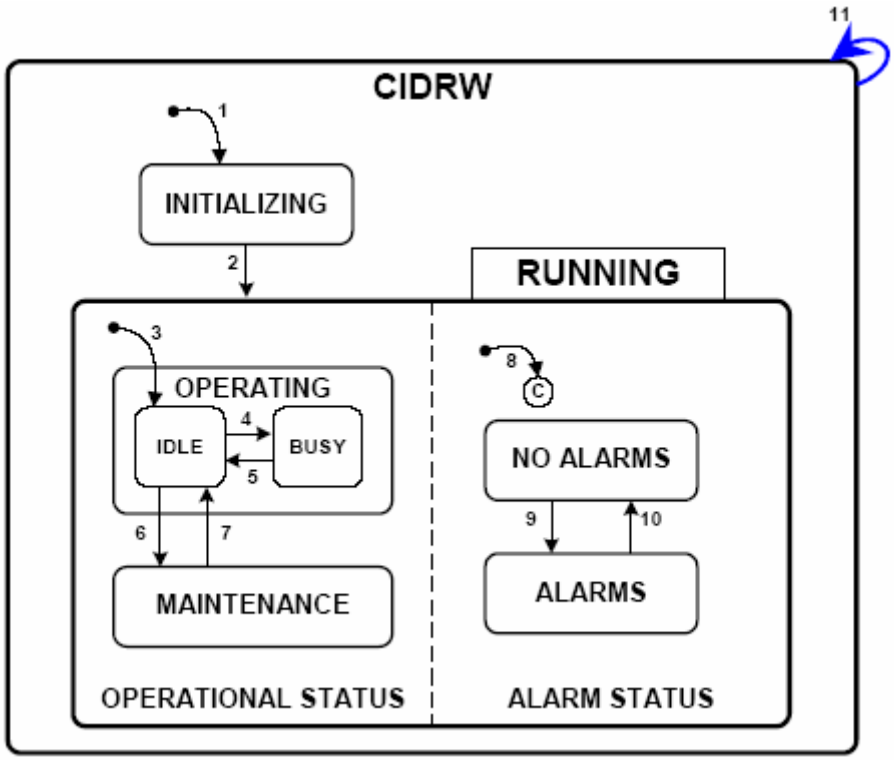


Figure 3-1. CIDRW State Model Diagram

Table 3-3. CIDRW State Transitions

#	Previous State	Trigger	New State	Actions	Comment
1	(Any)	Power up or reset	INITIALIZING	Initialize hardware and software components	Default entry on power up
2	INITIALIZING	Initialization is completed	RUNNING	None	The CIDRW is now able to communicate
3	INITIALIZING	Default entry into OPERATING	IDLE	None	Internal
4	IDLE	A service request to read or write or perform diagnostics is received	BUSY	None	
5	BUSY	All services requests that affect the state of the hardware are completed	IDLE	None	

6	IDLE	A user selects the MAINTENANCE state and all heads are idle	MAINTENANCE	None	The upstream controller may send a request or the operator may set a switch to select the OPERATING or the MAINTENANCE state. Maintenance and setup activities may now be performed.
7	MAINTENANCE	A user selects the OPERATING state and all heads are idle.	IDLE	None	The upstream controller may send a request or the operator may set a switch to select the OPERATING or the MAINTENANCE state. Normal operating activities may now be performed.
8	INITIALIZING	Default entry into ALARM STATUS	ALARMS or NO ALARMS	None	
9	NO ALARMS	An alarm condition is detected.	ALARMS	None	
10	ALARMS	All alarm conditions have cleared	NO ALARMS	None	
11	(Any)	A reset service request is received.	CIDRW	None	

3.3.2. Services

"Services" mean the "function" which are supported by RFID reader. To be compliant with this standard, the RFID reader shall support all services which are indicated as required in Table 3-4. In practice, the corresponding SECS II stream functions are also given. The compliance can be achieved by implementing the defined SECS protocol.

Table 3-4. Compliant Services List

Service Name	Description	Stream,Function
Fundamental Requirements		
Get Attributes	Get specified information about the CIDRW	S18,F1/F2
Get Status	Get the current status of the CIDRW	S18,F13/F14
Read ID	Read ID	S18,F9/F10
Requirement for Reader/Writer		
Read Data	Read back data written previously (not applicable to read-only devices)	S18,F5/F6
Write Data	Write data (not applicable to read-only devices)	S18,F7/F8
Optional capabilities		
Change State	Change to MAINTENANCE state or OPERATING state. This is required if the device supports the optional WriteID service.	S18,F13/F14
Perform Diagnostics	Perform diagnostic tests	S18,F13/F14
Reset	Reset CIDRW hardware and software	S18,F13/F14
Set attributes	Write specified information	S18,F3/F4
Write ID	Write ID field (device must also support Change State service)	S18,F11/F12

3.3.3. Service Operability

SEMI E99 also defines the services operability under some CIDRW state. The valid services per state are shown in Table 3-5.

Table 3-5. Valid Services per State

	Service									
	Write ID	*Write Data*	*Set attributes*	*Reset*	*Read ID*	*Read Data*	*Perform Diagnostics*	*Get Status*	*Get attributes*	*Change State*
CIDRW State										
INITIALIZING										
OPERATING		X	X	X	X	X	X	X	X	X
MAINTENANCE	X		X	X	X		X	X	X	X

4. ASCII OPERATION

Besides standard SEMI SECS I/II communication protocol, UNISON RFID Reader also support ASCII command mode through RS232 port. It means host controller can communicate with UNISON RFID Reader ether by SECS protocol or formatted ASCII string commands.

ASCII commands are categorized to host side and reader side. Section 4.1 and 4.2 will introduce the commands usage.

4.1. HOST COMMAND FORMAT

Host command string format:

~xx cmd data1 data2 data3*

Fields description

Table 4-1. ASCII host command format

Item	Code	Description
1	~	Start of command string
2	Xx	The device ID, range from 00 ~07, two digits are required
3	Cmd	Command name, which is listed in Table 4-2.
4	data1/data2/data3	Parameters for command
5	*	End of command string

Host commands list

Table 4-2. ASCII host command list

Item	Command	Format	Parameter String
1	Are you there	~xx RU*	
2	Read MID	~xx RMID*	
3	Write MID	~xx WMID MIDstring*	MIDstring: max16bytes
4	Read DATA	~xx RDAT startoffset datalength*	Startoffset:000~119 Datalength: 001~120
5	Write DATA	~xx WDAT startoffset datalength datastring*	Startoffset:000~119 Datalength:001~120
6	Write State	~xx WS yy*	yy: 00 operation mode yy: 01 maintenance mode
7	Read State	~xx RS*	

4.2. READER COMMAND FORMAT

RFID reader reply command string format:

~xx cmdR rc data*

Fields description

Table 4-3. ASCII reader command format

Item	Code	Description
1	**~**	Start of command string
2	**xx**	The device ID, range from 00 ~07, two digits are required
3	**cmdR**	The reply command name, which is listed in Table 4-4. “R” stands for “Reply”
4	**rc**	Return code
5	**data**	Parameters for the reply command
6	*****	End of command string

Reader commands list:

Table 4-4. ASCII reader command list

Item	Command	Format	Parameter String
1	Are you there	~xx RUR softver*	
2	Read MID	~xx RMIDR rc MIDstring*	
3	Write MID	~xx WMIDR rc*	MIDstring: max16bytes
4	Read DATA	~xx RDATR rc datastring*	Startoffset:000~119 Datalength: 001~120
5	Write DATA	~xx WDATR rc*	Startoffset:000~119 Datalength:001~120
6	Write State	~xx WSR rc*	
7	Read State	~xx RSR rc*	
8	Unknow command	~xx UNCMD*	

5. SETUP

5.1. INSTALLATION PROCEDURE

⚠ **Only install and operate this equipment if it is in perfect condition and with reference to this manual. Do not use the equipment if it is damaged.**

⚠ **This device is designed for use in an indoor industrial environment only. Installation is only permitted in an environmental indoor.**

⚠ **The device should not be used in the immediate vicinity of electrical units (such as medical units, monitors, telephones, televisions and energy-saver lamps), magnetic data carriers, or metallic objects. This could result in reduced reading/writing ranges.**

⚠ **Do not install or use this device in or near water. Never spill liquids of any kind onto the device.**

⚠ **Do not position the device in a location where it can suffer from vibration or shock.**

⚠ **When installing the device, take extreme care not to encounter such circuits as they can cause serious injury or death.**

⚠ **Never expose the device to intense changes in temperature, otherwise condensation can develop inside the device and cause damages.**

⚠ **Ensure the installation location complies with FCC requirements for human exposure to radio frequency.**

⚠ **The installation shall be carried out by specially trained personnel only. If you are uncertain about the qualification, contact the manufacturer**.

☞ *Operating the device without special skills can result in damage to the reader and/or connected devices!*

⚠ **This product is designed to be mounted and operated in an industrial environment as a built-in-device only. It is not designed to be used as a stand-alone or a portable device or in a non-industrial environment, such as a household, vehicle or open-air environment.**

A. Unpacking

Open the package, inspect the RFID reader controller and accessories including power adaptor、RS232 Cable、Antenna and Cable.

B. Mounting UNISON RFID Reader

Mount RFID reader controller to equipment or supporter by the hook which is beside the controller. Please refer to section 2.2. (Mounting brackets are supplied by equipment dealer)

C. Mount Antenna

If stick type antenna is used, the antenna holder should be set up in somewhere first. Stick antenna then is inserted to holder and fixed well. The distance between antenna holder and RFID Reader controller can not exceed 1 meter of cable length.

D. Connect Antenna

Connect antenna cable BNC connector to RFID reader controller, and arrange the cable. Be careful not to drag hard the antenna cable to avoid impacting signal transfer.

E. Connect RS232 connector

Connect RS232 cable RJ-45 connector to RFID reader controller, and arrange the cable.

F. Connect Power Adaptor

Finally connect the power adaptor to RFID reader controller.

5.2. INITIAL TEST PROCEDURE

A. Switch the DIPs on RFID reader controller to set Device ID.

B. Connect RS232 9 pins connector to equipment host or PC.

C. After connecting all cables then power on RFID reader controller.

D. Start up equipment host or PC's application such as WinSECS.

E. Push "UP" and "DOWN" buttons simultaneously to do self test. RFID reader will read MID data first and then write into "0000000000000000" (*only for multi page tag*) data. During the self test, the Read/Write indicator will light up once in order

F. From host side, check the MID data "0000000000000000" are written to tag correctly.

G. Turn off RFID reader controller power, and then turn on again.

H. After RFID reader controller complete initialization, controller will send **S18F71** message to notify host the system is ready. If the working voltage exceeds the range of 5V±10%, the controller will host and stop working.

I. From host side, check if host receives **S18F71** message or not.

J. From host side, test another SECS Stream Functions.

6. TROUBLE SHOOTING

6.1. ERROR INDICATOR

6.1.1. Watch Dog Timer

It is used to indicate the system is in normal operation or not. The red light will be flashing after successfully initialization

6.1.2. Read/Write indicator

They are used to indicate the executing command is “read” or “write”. When command start to execute, the light of indicator turn to green. Green color will be turned off if the command is executed successfully. Otherwise, if the command execution is failed, the light of indicator will turn to red, it will not turn off until next command is executed

6.2. ERROR RECOVERY

When abnormal condition occurs, first step is to check the Watch Dog Timer Indicator to justify the abnormal condition is caused by RFID reader controller itself or communication problem.If the Watch Dog Timer Indicator does not flash, it means RFID reader controller encounter some troblem. To confirm this, power off controller and restart again (refer to section 5.2). If it still dose not work, the best way is to change it and call support service. If the Watch Dog Timer Indicator is still flashing, it means the abnormal condition may be caused by communication. Please check the cable wire, and do communication test once again from host.

Please note, do not reset RFID reader controller CPU by yourself. The procedure should be done by technical support.

7. ACCESSORIES

7.1. RS232

⚠ **When you disconnect a cable, pull on its conductor and not on the cable itself. Keep the connector evenly aligned to avoid bending any connector pins. When you connect a cable, ensure that the connector pins are positioned correctly.**

⚠ **Before removing or inserting components, disconnect the power supply.**

Table 7-1-1. RS232 Cable Spec (88-CBL-232-L5)

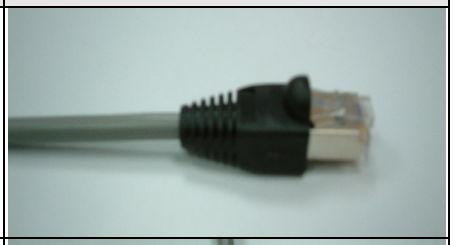
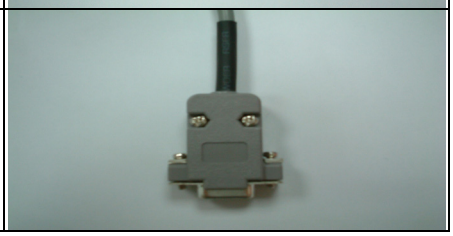
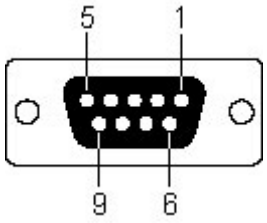
Item	Component	Spec Description	Picture
1	**RJ45 Plug**	RJ45 STP PLUG 50u", PC material	
2	**RS232 Cable**	STP Cat.5, 4P8C, PVC material	

Table 7-1-2. RS232 pin definition

Pin No.	Signal	RS-232 9 Pin Female Connector
1	NC	
2	TxD	
3	RxD	
4	NC	
5	GND	
6	NC	
7	NC	
8	NC	
9	NC	

7.2. ANTENNA

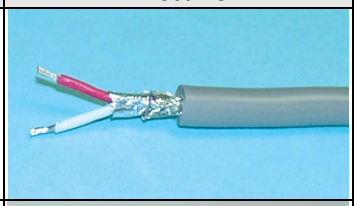
⚠ **The device should not be used in the immediate vicinity of electrical units (such as medical units, monitors, telephones, televisions and energy-saver lamps), magnetic data carriers, or metallic objects. This could result in reduced reading/writing ranges.**

⚠ **Never over bend the antenna cable or expose it to mechanical loads.**

⚠ **Never locate the antenna so that it is very close to or touching parts of the body while transmitting.**

⚠ **Do NOT operate this device without a proper antenna attached. Proper antennas are antennas supplied by the manufacturer and listed in section „Accessories".**

Table 7-2. Antenna Cable Spec (88-ANT-RD-L1)

Item	Component	Spec Description	Picture
1	**Cable**	UL2464 two layer shield computer cable (aluminum foil + copper mesh), 2C/1P, 1m in length, PVC material	
2	**BNC Connector**	BNC Male 180degree 50Ω connector, 36mm in length and 14.5mm in outer diameter	
3	**Housing**	Antenna Housing, POM material	
			

The readout diagram of antenna represents the detectable area for transponder (TI®, herein).

Figure 7-1 shows the typical readout diagram of stick type respectively.

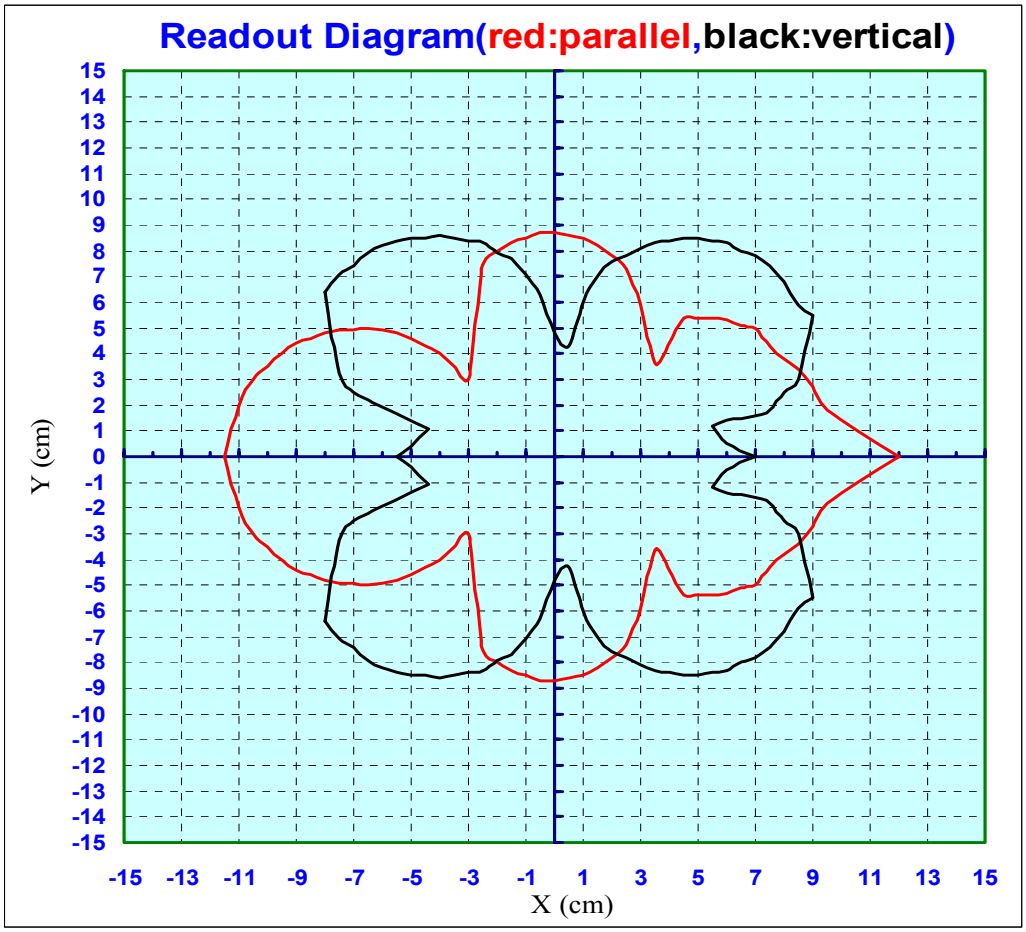


Figure 7-1. Stick type antenna readout diagram

7.3. POWER ADAPTER

⚠ **Do not connect the device to any kind of power supply such as a standard household power supply. The device should be connected to a power supply of the type described in these instructions only.**

Table 7-3. Switching Power Adaptor (88-PWR-240DF)

Item	Component	Spec Description	
1	AC to DC Converter	Input 100-240VAC 50-60Hz Output 24V 0.8A Safety Approval: FCC / CE / CUL / PSE / BSMI	

8. ERVICE INFORMATION

This product is developed and manufactured by UNISON Technology, Inc. ABON-TECH INTERNATIONAL CORP is the product agent for Sales and Service

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