SX-582

Embedded Intelligent Module
with Evaluation Board

Developer's Reference

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140-20139-100A

Contents

Figures

Tables

About This Reference Guide

This reference guide provides detailed specifications, diagrams and additional information required to integrate the SX-582 embedded intelligent module in a product. The intended audiences are the developers and engineers responsible for the integration of the module in another product.

Safety Precautions

- To prevent damage to the SX-582 module's electronic circuit components, follow established ESD practices and procedures for handling static-sensitive devices. All ESD-sensitive components must be stored and shipped in ESD-conductive bags or bubble-wrap and labeled as such using the standardized ESD adhesive warning label.
- Ethernet electrical wiring must be at least 6 feet from bare power wiring or lightning rods and associated wires, and at least 6 inches from other types of wire (antenna wires, doorbell wires, wires from transformers to neon signs), steam or hot water pipes, and heating devices.
- Protectors and grounding wire placed by the service provider must not be connected to, removed, or modified by the customer.

Emissions Disclaimer

Final emission certification per FCC, CE and other agency requirements are the responsibility of the OEM using any printed circuit assemblies or other items described in this developer's kit in their packaged product.

Chapter 1
Introduction

The SX-582 embedded intelligent module provides a complete solution for integrating wireless networking technology into virtually any OEM product that has an RS-232 or UART serial port. It has a main printed circuit board that contains a processor, memory, flash memory, three (3) serial ports (one dedicated for use as a console) plus a USB V2.0 host port and an SPI port.
Dual 2.4GHz/5GHz operation is supported and the dimension is 55.0 x 30.0 x 9.25 mm.

The SX-582-6900 Evaluation daughter card is available to expedite the development process. This board includes an RJ45 Ethernet connector, three 9-pin serial connectors, one USB connector, header connectors for all major I/O, power supply, antenna, cables, and software.
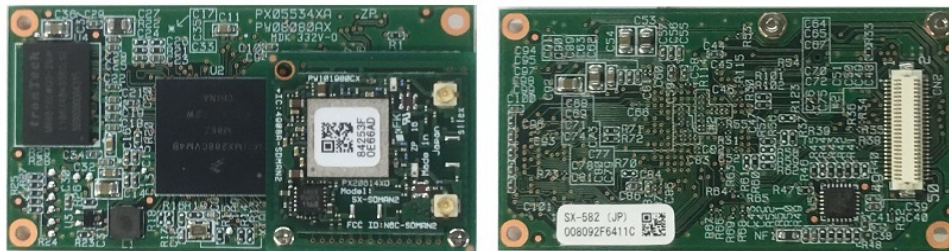
Figure 1 SX-582 top and bottom view

Chapter 2
Installing the Evaluation Daughter Card

The SX-582-6900 Evaluation daughter card is designed to help you in the development of the necessary hardware and software required to use the SX-582 module. It includes I/O connectors, cables, and power supply in an easy-to-use package. The SX-582 Module is installed in the Evaluation daughter card as shown in Figure 2.
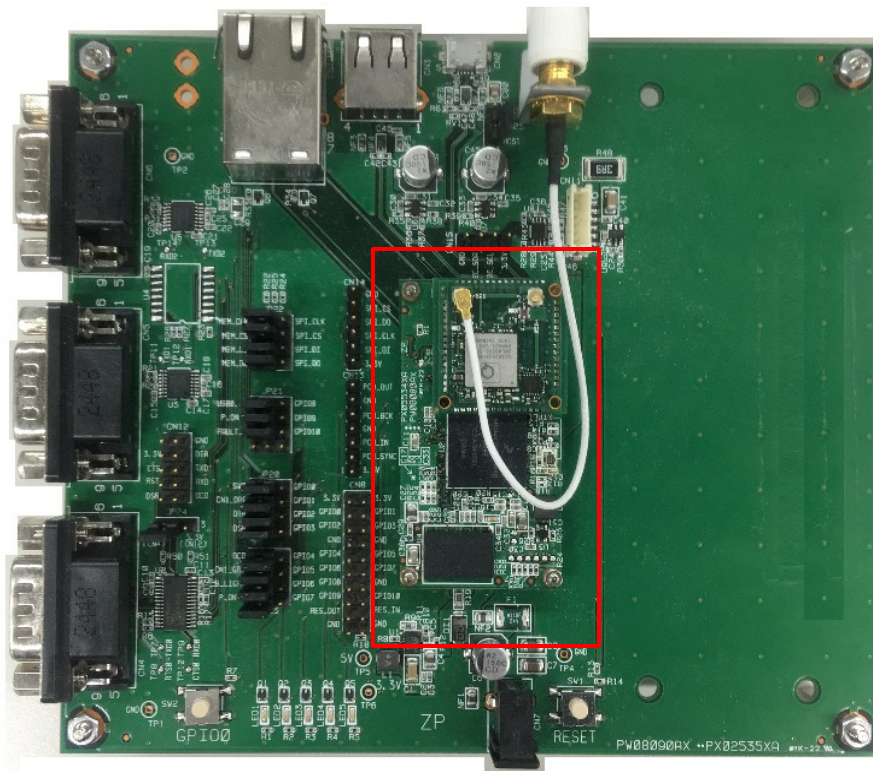
Figure 2 SX-582 Module in Evaluation Daughter Card

The Evaluation daughter card makes it easy to connect to the SX-582 for test and development by providing the following:

- Three 9-pin connectors (CN4,5,6) and one 10-pin header (CN12) for connecting the SX-582 serial ports
- One 20-pin header for connecting GPIO's, power and ground (CN8)
- One RJ45 Ethernet connector (CN1)
- One power jack (CN7)
- 2 LEDs for displaying the power and network status (LED6,7)
- 5 LEDs for monitoring the GPIO signals (LED1,2,3,4,5)
- One Test Button for printing configuration data and resetting the unit to factory defaults (SW2)
- Three 12-pin header (JP20,21,23) for selecting GPIOs and one 12-pin header (JP22) for selecting SPIs.

The locations of the major Evaluation daughter card connectors and headers are shown in the diagram below.
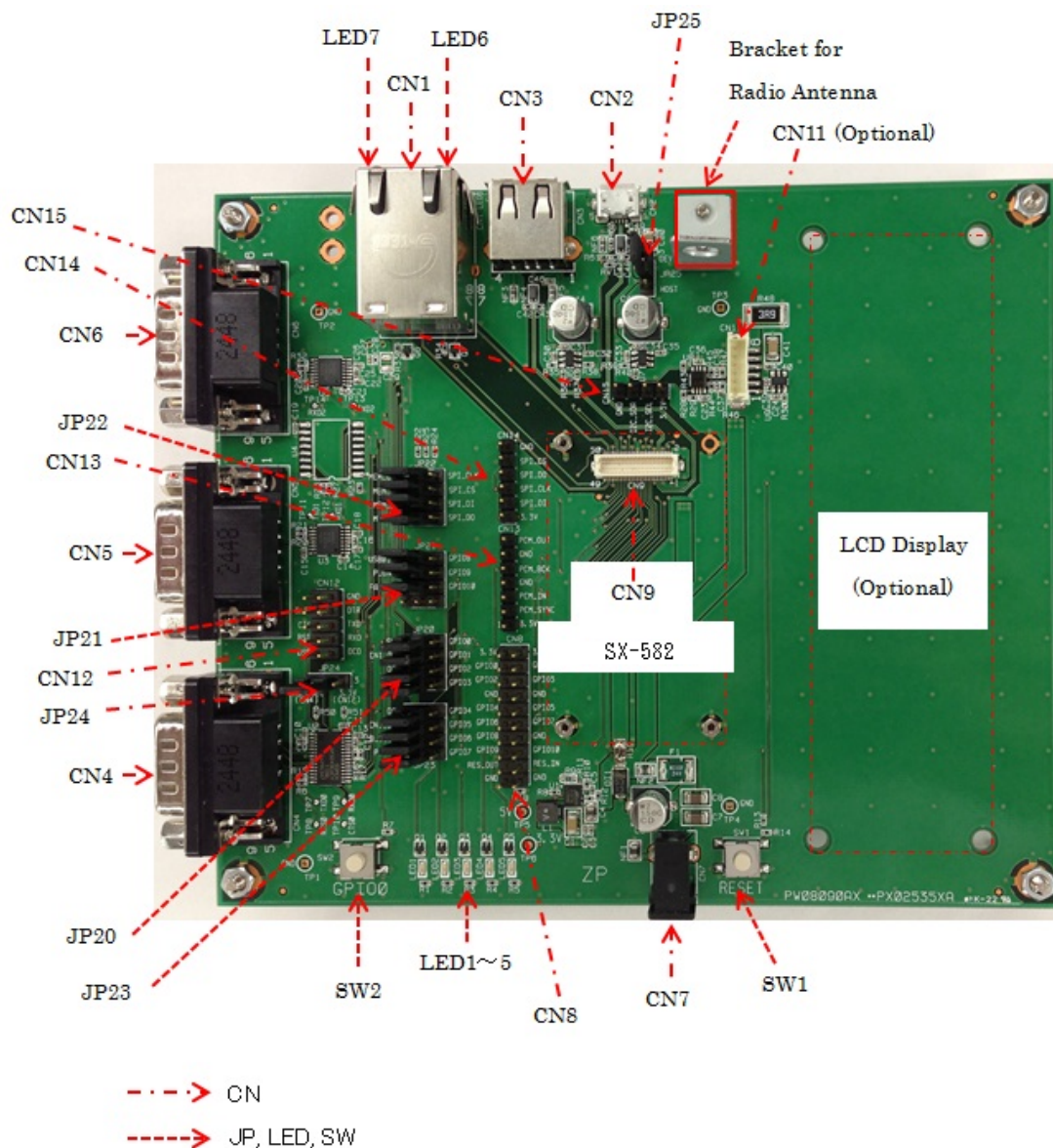
Figure 3 Major connectors in Evaluation daughter card

Verify Development Kit Contents

The SX-582 Evaluation Module Development Kit consists of the components listed in Table 1. Please ensure that all materials listed are present and free from visible damage or defects before proceeding. If anything appears to be missing or damaged, please contact Silex.

Table 1 Development Kit Contents

Description
EVK Board
SX-582
Dual band Antenna
Power supply
RS232 cross cable (1.5m)
LAN cable (2.0m)
USB Cable with Ferrite Core (1.0m)

Connecting the Evaluation Daughter Card to PC

To connect the SX-582-6900 Evaluation daughter card to your PC:

1. Connect one serial null-modem cable from the Serial Port (CN6) DB-9 connector on the Evaluation daughter card to a serial port on a personal computer or laptop (the computer's serial port must be set to 115.2Kbps, no parity, no flow control, and 8-bit character size). The PC or laptop acts as a console port for command line configuration and monitoring. (CN6 is the Linux console which provides access to the on board Linux system, while CN5 is connected to the configuration application, and is connected to the console configuration task. Linux functions are not available from CN5.)

2. If you want to use an Ethernet LAN connection for the initial configuration of the SX-582, plug a category 5 Ethernet cable into the RJ-45 jack. The Ethernet interface has Auto-MDI/MDIX that automatically detects and configures itself for either a straight-thru or crossover Ethernet cable.

Monitoring Module Status

You can monitor the module status using the Status LED (Orange) on the Evaluation daughter card. Table 2 defines the default functions of the LED status indicators.

Table 2 Status Monitors

Function	State	Status
SLED	On	The network connection is active (wired/wireless).
	Off	The network connection is not active.
	Blinking	Firmware update is in progress **(Important:** *Do not power off the module during the update process)*

OEM Interface

The OEM interface is a 50-pin header (CN9) that is used to connect the SX-582 module to the SX-582-6900 Evaluation daughter card. It will also serve as the primary means of communications between the SX-582 and your OEM device (refer to Chapter 5 for information on using this header to connect with your device).

Table 3 shows the OEM interface pinout for the Evaluation daughter card. Please note that the OEM interface signals are not directly accessible from the OEM header when the Evaluation daughter card is used. Rather, these signals are available through convenient connectors on the Evaluation daughter card, such as the CN8, CN12, CN13, CN14, CN15 and the 9-pin serial connectors. These connectors are described later in this chapter.

All input and output signals, except the differential signals, are 0 to 3.3 V logic signals.

Table 3 OEM Interface Pinout

PIN	SIGNAL	I/O	FUNCTION	PIN	SIGNAL	I/O	FUNCTION
1	5.0V		power	2	5.0V		power
3	5.0V		power	4	GPIO0	I/O(PU1)	GPIO0
5	RESET_I	I(PU2)	Reset Input to SX-582	6	RESET_O	O(PD1)	Reset Output to SX-582
7	GND		ground	8	GND		ground
9	DP0	I/O	USB0 D+	10	DN1	I/O	USB1 D-
11	DN0	I/O	USB0 D-	12	DP1	I/O	USB1 D+
13	GND		ground	14	GND		ground
15	PCM_IN	I	PCM interface Input Data	16	PCM_OUT	O	PCM interface Output Data
17	PCM_BCK	I/O	PCM interface Bit Clock	18	GPIO1	I/O(PU1)	GPIO1
19	PCM_SYNC	I/O	PCM interface Sync Control	20	GPIO3	I/O(PU1)	GPIO3
21	GPIO2	I/O(PU1)	GPIO2	22	GPIO5	I/O(PU1)	GPIO5

PIN	SIGNAL	I/O	FUNCTION	PIN	SIGNAL	I/O	FUNCTION
23	GPIO4	I/O(PU1)	GPIO4	24	GPIO7	I/O(PU1)	GPIO7
25	GPIO6	I/O(PU1)	GPIO6	26	GND		ground
27	GPIO8	I/O(PU1)	GPIO8	28	U_TXD0	O	UART0 TXD
29	GPIO9	I/O(PU1)	GPIO9	30	U_CTS#0	I(PU1)	UART0 CTS
31	U_TXD1	O	UART1 TXD	32	U_RTS#0	O	UART0 RTS
33	U_RXD1	I(PU1)	UART1 RXD	34	U_RXD0	I(PU1)	UART0 RXD
35	SPI_DI	O	SPI Data In	36	U_TXD2	O	UART2 TXD
37	SPI_DO	I(PU1)	SPI Data Out	38	U_RXD2	I(PU1)	UART2 RXD
39	SPI_CS#	O	SPI Chip Select (0:Active)	40	SCL	I/O(PU1)	I2C SCL
41	SPI_CLK	O	SPI Clock	42	SDA	I/O(PU1)	I2C SDA
43	GND		ground	44	GND		ground
45	TX_P	O	Ethernet TX+	46	RX_P	I	Ethernet RX+
47	TX_M	O	Ethernet TX-	48	RX_M	I	Ethernet RX-
49	CT		Connected to Center Tap	50	GPIO10	I/O(PU1)	User Defined GPIO

NOTE:
RESET_I, RESET_O, GPIO, UART (0,1,2), SPI,I2C :   3.3V Input/Output
I/O(PU1), O(PU1): Pull up with 3.3V 10kΩ to SX-582 side
O(PU2): Pull up with 3.3V 470Ω to SX-582 side
I(PD1): Pull down with 3.3V 10kΩ to SX-582 side

Electrical Characteristics

The power requirements, port pinouts, GPIO characteristics, cable connections and wireless operational modes are described below.

Power Input

Power to the SX-582 Module and the SX-582-6900 Evaluation daughter card is supplied through the power jack, located at CN7, at 5V±5%. Use the included power supply.

Serial Ports

Standard serial RS-232 signals are available on the DB-9 male connectors CN4, CN5 and CN6 for Serial Ports 1, 2 and 3 (Serial Port 3 is the Linux console which provides access to the on board Linux system, while Serial Port 2 is connected to the configuration application, and is connected to the console configuration task. Linux functions are not available from Serial Port 2.) Serial Port 1 includes the RTS and CTS modem signals for hardware flow control, and can also support DCD, DTR, and DSR by setting the appropriate jumpers on the JP20 and JP23 header (see the *Using the GPIO Special Functions* section later in this chapter). Serial Port 3 does not support any modem signals, and is fixed for operation at 115.2Kbps, no parity, no flow control, and 8-bit character size.

Table 4 DB-9 Pinouts for RS-232 Mode

DB-9	RS-232 Signal	Type
1	DCD	Input Enabled via JP23 header (Serial Port 1 only)
2	RXD	Input
3	TXD	Output
4	DTR	Output Enabled via JP20 header (Serial Port 1 only)
5	Ground	
6	DSR	Input Enabled via JP20 header (Serial Port 1 only)
7	RTS	Output (Supported on Serial Port 1 only)
8	CTS	Input (Supported on Serial Port 1 only)
9	NC	

Serial Port 1 can also be accessed using logic signals via a 10-pin header located at CN12. If you want to use this header, you must place a jumper on 3.3V header (CN12) at JP24 to disable the RS-232 transceiver. The pinouts are as follows:

Table 5 Logical Serial Port 1 (CN10) Signal Descriptions

Pin	Signal	Input/Output	Pin	Signal	Input/Output
1	DCD	Input Enabled via JP24 header	2	DSR	Input Enabled via JP24 header
3	RXD	Input	4	RTS	Output
5	TXD	Output	6	CTS	Input
7	DTR	Output Enabled via JP24 header	8	3.3V	
9	GND		10	No Connect	

All signals are 0 to 3.3 V logic signals.

Note that Serial Port 3 is dedicated for use as Linux console commands. Serial port 3 is always set for operation at 115.2Kbps, 8 bit character size, no parity, and no flow control.

Serial Port 2 is set by default for console operation at 115.2Kbps, 8-bit characters, no parity, and no flow control. This port can be set as a second I/O port using the SET PORT S2 CONSOLE DISABLE console command.

RS-232 Cable

The supplied DB-9 female-to-female null modem cable is wired as shown below. The pinouts are compatible with a standard PC 9-pin serial connector, so this cable can be used to directly connect a PC to Serial Port 3 for use as a console terminal to configure the SX-582. It can also be used to connect many types of OEM serial devices to Serial Port 1 or Serial Port 2, provided that these devices use PC compatible 9-pin connectors.

Table 6 RS-232 Cable Pinout Description

Pin	Description
1	DCD (Data Carrier Detect) Input*
2	RxD (Receive Data) Input
3	TxD (Transmit Data) Output
4	DTR (Data Terminal Ready) Output*
5	Ground
6	DSR (Data Set Ready) Input*
7	RTS (Request To Send) Output*
8	CTS (Clear To Send) Input*

NOTE:
Serial Port 1 (CN4) supports all signals. Serial Port 2 (CN5) and Port 3 (CN6) do not support flow control signals.

Using the GPIO Special Functions

Five of the General Purpose I/Os (GPIOs) can be configured for either user-defined operations or for GPIO for special functions. These special functions are summarized in the following table:

Table 7 GPIO Special Functions

Silex	I.MX28	I/O	Description
GPIO0/TEST_N	GPIO0_0	I	Silex Function: configuration switch
GPIO1/SLED	GPIO0_1	O	Silex Function: Status LED
GPIO2/UART0_DTR	GPIO0_2	O	Silex Function: UART0 DTR signal
GPIO3/UART0_DSR	GPIO0_3	I	Silex Function: UART0 DSR signal
GPIO4/UART0_DCD	GPIO0_4	I	Silex Function: UART0 DCD signal

The special functions of GPIO are enabled by JP20, JP23 and JP21 headers. See the table below for details on each function of JP20, JP23 and JP21. These special functions are assigned to JP20' 1-4 bits and JP23' 1 bit. By shorting the left two headers on each bit, the special functions are enabled. If the right two headers are shorted, they can be used as normal GPIOs.

> **NOTE:**
> **For JP23 2-4 bits and JP21 1-3 bits, always short the right two headers.**
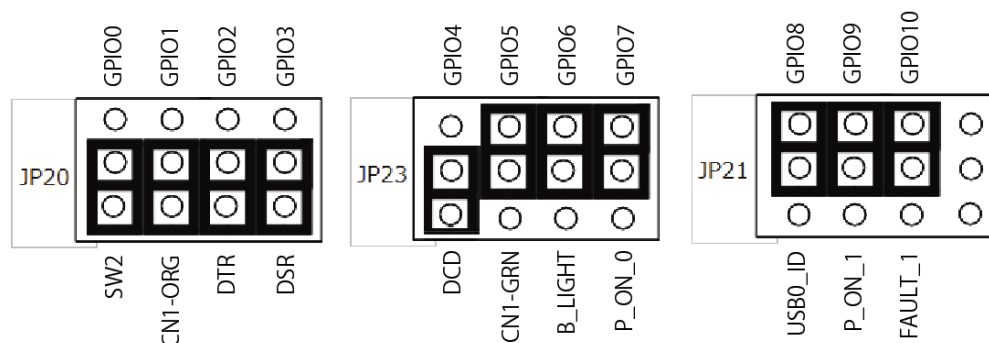
Figure 4 GPIO Special Functions Jumpers (Example Configuration)

The GPIOs are accessed via header CN8. You can set and read the GPIO state as described in Chapter 6 of this manual.

I/O Header

CN8 is an interface for connecting to GPIO signal while CN14 is for connecting SPI signal. CN12 is a port for connecting Serial Port 3. CN12 provides a direct way of connecting to the SX-582 console interface using 3.3V logic levels rather than the DB-9 RS-232 connector.

The GPIOs, located on CN8, can be used for controlling or monitoring OEM functions. External pull-ups are recommended for customization.

Table 8 I/O Header

CN8:

Pin No.	Signal	I/O	Function	Pin No.	Signal	I/O	Function
1	3.3V	-	Power	2	3.3V	-	Power
3	H_GPIO0	I/O	User defined I/O pin Bitset JP20 to C side	4	H_GPIO1	I/O	User defined I/O pin Bitset JP20 to C side
5	H_GPIO2	I/O	User defined I/O pin Bitset JP20 to C side	6	H_GPIO3	I/O	User defined I/O pin Bitset JP20 to C side
7	GND	-	Ground	8	GND	-	Ground
9	H_GPIO4	I/O	User defined I/O pin Bitset JP20 to C side	10	H_GPIO5	I/O	User defined I/O pin Bitset JP20 to C side
11	H_GPIO6	I/O	User defined I/O pin Bitset JP20 to C side	12	H_GPIO7	I/O	User defined I/O pin Bitset JP20 to C side
13	H_GPIO8	I/O	User defined I/O pin Bitset JP20 to C side	14	GND	-	Ground
15	H_GPIO9	I/O	User defined I/O pin Bitset JP20 to C side	16	H_GPIO10	I/O	User defined I/O pin Bitset JP20 to C side
17	RESET_O	O	Reset Output 0: Reset Active	18	RESET_I	I	Open Drain 0: Reset Active
19	GND	-	Ground	20	GND	-	Ground

All signals: 3.3V level

CN12:

Pin No.	Signal	I/O	Function	Pin No.	Signal	I/O	Function
1	DCD	I	DCD (flow control)	2	DSR	I	DSR (flow control)
3	RXD	I	RXD	4	RTS	O	RTS (flow control)
5	TXD	O	TXD	6	CTS	I	CTS (flow control)
7	DTR	O	DTR (flow control)	8	3.3V	-	Power
9	GND	-	Ground	10	NC	-	-

CN14:

Pin No.	Signal	I/O	Function	Pin No.	Signal	I/O	Function
1	3.3V	-	Power	2	SPI_DI	O	SPI DI
3	SPI_CLK	O	SPI Clock	4	SPI_DO	I	SPI DO
5	SPI_CSn	O	SPI Chip Select(0: Active)	6	GND	-	Ground

All signals: 3.3V level

As discussed in the previous section, GPIOs 0 through 4 are set by default for special functions such as modem controls. To use GPIOs 0 through 4 as normal GPIOs, you must place a jumper between JP20 and JP23 for the specific GPIO as described in the previous section.

Table 9 General Purpose I/O Signal Descriptions

Silex	i.MX28	I/O	Special Function
GPIO0/TEST_N	GPIO0_0	I	Silex Function: configuration switch
GPIO1/SLED	GPIO0_1	O	Silex Function: Status LED
GPIO2/UART0_DTR	GPIO0_2	O	Silex Function: UART0 DTR signal
GPIO3/UART0_DSR	GPIO0_3	I	Silex Function: UART0 DSR signal
GPIO4/UART0_DCD	GPIO0_4	I	Silex Function: UART0 DCD signal
GPIO5	GPIO0_5	I	GPIO
GPIO6	GPIO0_6	I	GPIO
GPIO7	GPIO0_7	I	GPIO
GPIO8	GPIO0_20	I	GPIO
GPIO9	GPIO0_21	I	GPIO

USB Host Port

The USB V2.0 host port, located on CN3 and CN2, can be used to connect standard Full Speed (12Mbps) or Low Speed (1.5Mbps) USB devices. High Speed (480Mbps) devices are supported.

> **NOTE:**
> **To support specific USB devices, the firmware of SX-582 needs to be customized. In such a case, please contact Silex.**

Ethernet Port

The Ethernet port, located on CN1, can be used for configuring and testing the SX-582. Ethernet provides an easier way to do the initial setup and configuration of the SX-582, because you do not have to worry about wireless security configuration parameters. Operation of the SX-582 through this port is identical to wireless operation, except that wireless security is not supported.

Additional OEM Interface Signals

The SWITCH signal (GPIO0_0) is connected to a momentary push button switch (Test Button:SW2) on the Evaluation daughter card and is in the normally open position. Depressing the switch causes a short to ground. A 4.7 K-ohm pull-up resistor to +3.3 VDC is connected. The module's processor monitors this signal. The Test Button is normally used to reset the SX-582 to its default configuration (button held down for more than 5 seconds).

Serial Peripheral Interface

The four SPI signals are accessible using the I/O header CN14. The SPI MOSI, SPI MISO, and SPI Clock signals are routed to the CN14 header.

OEM Interface Electrical Characteristics

Table 10 OEM Signal Parameter Descriptions

Item	Specification			Unit	Note
	Min.	Typ.	Max.		
Input Voltage High (VIH)	2.0	-	-	V	
Input Voltage Low (VIL)	-	-	0.8	V	
Output Voltage High (VOH)	VDDIO ×0.8	-	-	V	
Output Voltage Low (VOL)	-	-	0.4	V	
Output Source Current	-5.0	-	-	mA	Pin Drive Strength is Low (default) *
GPIO (IOH)	-9.5	-	-	mA	Pin Drive Strength is Medium *
	-11.4			mA	Pin Drive Strength is High *
Output Sink Current	3.8	-	-	mA	Pin Drive Strength is Low (default) *
GPIO (IOH)	7.7	-	-	mA	Pin Drive Strength is Medium *
	9.0			mA	Pin Drive Strength is High *

Chapter 3
Configuring the SX-582

> **IMPORTANT:**
> **This chapter assumes that you are either using the SX-582-6900 Evaluation daughter card or that you have made the appropriate connections to the SX-582 module OEM Header. Refer to Chapter 2 and Chapter 5 for information on connecting to the SX-582 hardware.**

This chapter describes the methods for configuring the basic settings of the SX-582, including the IP address, serial port settings, and wireless security. The SX-582 also has an extensive range of advanced configuration capabilities that are described in Chapter 6, Appendix A, and Appendix B. The SX-582 configuration should be done by a network administrator or another person with technical knowledge of TCP/IP networking and serial communications.

Basic Configuration Requirements

In order to use the SX-582, the following basic parameters must be configured:

TCP/IP Settings:
- IP Address
- Subnet Mask
- Router Address

> ```
> NOTE:
> The TCP/IP settings can be automatically configured using DHCP.
> ```

Wireless Configuration Settings:
- SSID
- Operating Mode (*Infra.* or *Access Point*)
- Channel (required only if using *Access Point* mode)

Security Settings:
- Wireless Encryption Mode (WPA2, WPA, WPA2-WPA, WEP)
- Wireless Encryption Settings
- Wireless Authentication Mode (WPA-PSK, Open System, Shared Key, TTLS, TLS, LEAP, PEAP, EAP-FAST)
- Authentication Settings

```
NOTE:
There are numerous possible encryption and authentication settings, and every network can have different
settings. Please refer to Appendix A for a detailed summary of these settings.
```

Serial Port Settings (must match the settings of the attached serial device):
- Baud Rate (Speed)
- Parity
- Character Size
- Flow Control

In addition to the above parameters, the SX-582 allows you to configure numerous other capabilities. These other capabilities provide you with the unparalleled flexibility to use the SX-582 on virtually any 802.11a/b/g/n network with virtually any RS-232 serial device.

Initial Wireless Setup

```
NOTE:
Skip this section if you are using the Ethernet port for the configuration process, or if you are using a terminal
connected to one of the serial ports on the SX-582.
```

Following explains how to configure the SX-582 module using a LAN port of the SX-582-6900 Evaluation daughter card.

1. Turn on the PC after connecting the SX-582-6900 Evaluation daughter card to the PC using a network cable.

2. Take notes of the current IP address of the PC and temporarily change it to the address below.

   - IP address: 169.254.111.100

3. Turn on the SX-582-6900 Evaluation daughter card. Access the internal Web page of the SX-582 module by entering the default IP address (169.254.111.111) to the address bar of your Web browser or by using SX-Finder utility (SX-582 module discovery utility).

   a. Login password is "access".

   b. Enable the DHCP setting on the SX-582 module for IP address resolution or manually configure a static address to the SX-582 module.

   c. Configure the necessary wireless settings (e.g. SSID, authentication mode, encryption mode, etc.).

   d. Configure the serial port setting appropriate for the device you want to connect.

4. Disconnect a network cable from the SX-582-6900 Evaluation daughter card and restart the SX-582 module to take effect of the change. Do not forget to reset your PC' address to the previous one.

Configuration Methods

There are two ways to configure the SX-582:

- *Internal Web Pages (HTTP).* You can use any standard web browser to access the SX-582 internal web pages. These web pages provide an easy-to-use graphical interface for configuring the SX-582. If you do not know the IP address of the target unit, use the SX-Finder utility (SX-582 discovery utility) to gain access the internal Web page.

- *Internal Command Console.* The internal command console provides a sophisticated command line interface for advanced users to configure the SX-582. It can be accessed by connecting a serial cable to serial port 2 or serial port 3 (serial port 1 can also be used to access the internal command console by defining a console mode string as described in Chapters 4 and 6). Once the IP address and wireless network settings have been configured, the internal command console can also be accessed via TELNET, or the internal web pages.

Configuring the SX-582 using each of the above methods is described in the following sections of this chapter.

Using a Web Browser to Configure the SX-582

If you do not know the IP address of the target SX-582, use the "SX-Finder" utility (SX-582 module discovery utility). The SX-Finder utility can be downloaded from our website (www.silexamerica.com/). If you power on the SX-582 and then start SX-Finder, the available SX-582 units will be displayed in the main window of SX-Finder. Select the SX-582 that you wish to configure and click the **Configure** button. The web browser will run and the internal web page for the unit will be displayed. Follow the steps below for details:

IMPORTANT:
You must click the *Submit button* when you have finished configuring an internal web page. If you do not do this, your changes will not be saved.
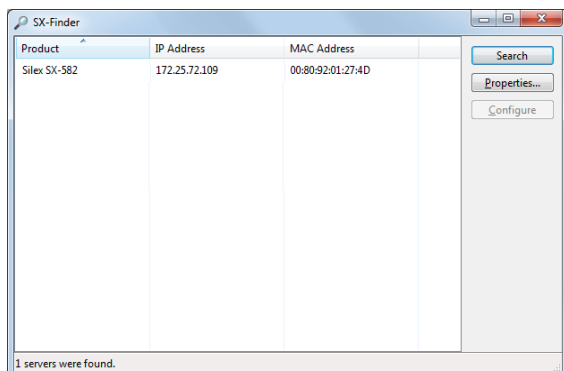
1. Power on the SX-582 and then start SX-Finder. The available SX-582 units will be displayed in the main window of SX-Finder.
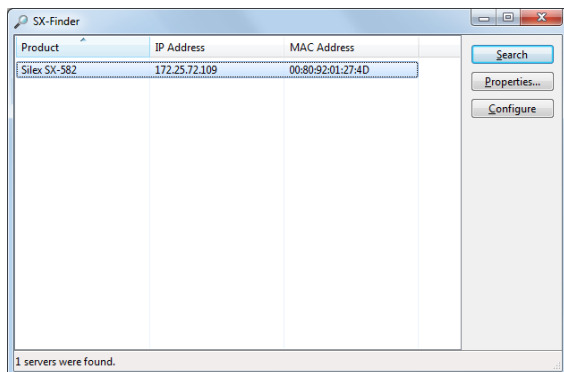
2. Select the SX-582 that you wish to configure and click the *Configure* button. The web browser will run and the internal web page for the unit will be displayed.
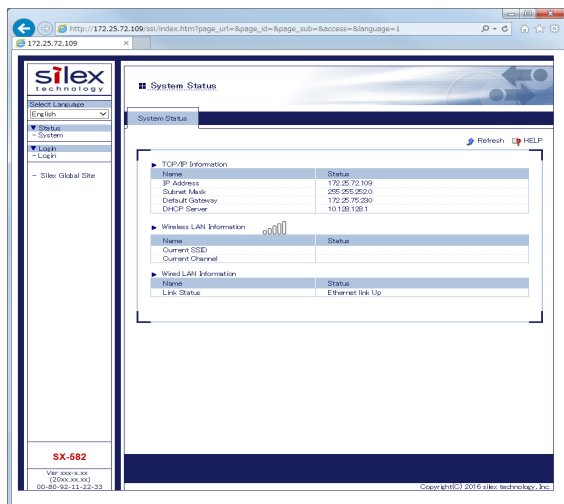
3. When you have connected to the SX-582, you will get the *System Status* page. Click *Login* on the left side of the screen.
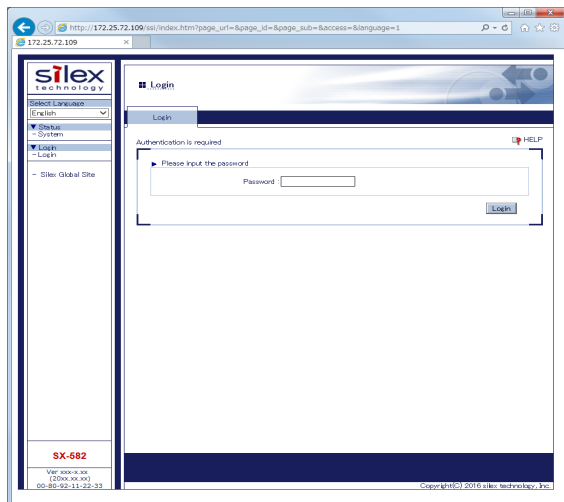
4. Enter the password for the unit and click *Login*. The default password is *access*.

140-20139-100A
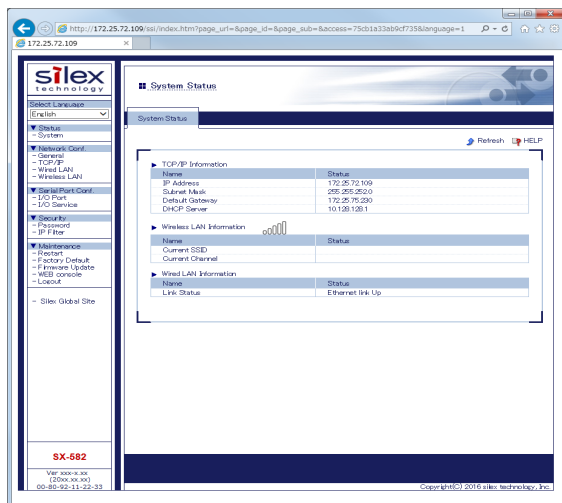
5. You will return to the *System Status* page, but new options will be listed on the left side of the screen. Click on *TCP/IP*.
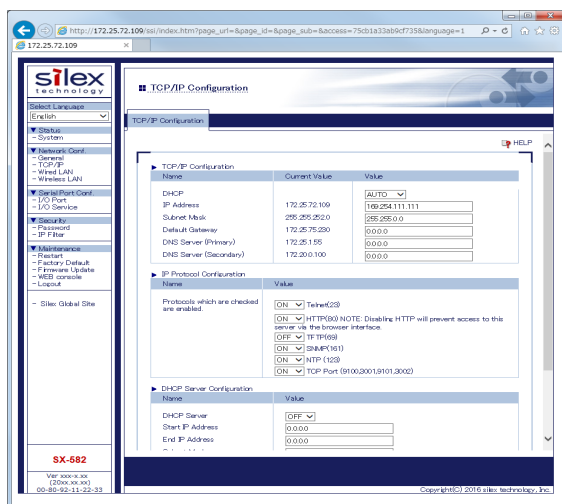
6. If you used DHCP, verify that the IP address is correctly set. If you used the default 169.254.111.111 IP address, you should change it to a new valid IP address to prevent an address conflict with other units. If necessary, change the Subnet Mask and Gateway. It is generally not necessary to change the other parameters on this page (refer to Chapter 6 for advanced configuration information.

   Note that on-line help information is available on every configuration page.

   Click the *Submit* button at the bottom of the window (you may need to scroll) to save your changes.
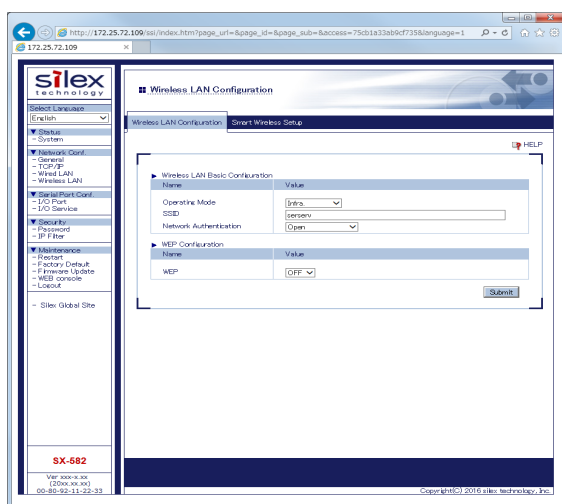
7. Click *Wireless LAN* on the left side of the screen to configure the 802.11a/b/g/n wireless settings. The SX-582 settings must be configured with the wireless configuration and security parameters required to allow the SX-582 to communicate over your wireless network (check with your network administrator if you do not know these parameters).

   • Select either *Infra.* (if you want to connect via an access point) or *Access Point* for wireless mode.
   • Enter the SSID for your network
   • If you use *Access Point*, select the RF channel (this is not required for *Infrastructure*).

   Select the appropriate network authentication and encryption modes and enter the required settings (check with your network

administrator for the proper settings if you do not know them). Appendix A lists the possible encryption settings.

Click the *Submit* button at the bottom of the window (you may need to scroll) to save your changes.

Now click *I/O Port* on the left side of the screen to configure the serial ports, and then click either *S1* to configure Serial Port 1 or *S2* to configure Serial Port 2.

8. Configure the serial port settings so that they match the settings on your device. For example, if your device is set for 9600bps, odd parity, and XON/XOFF flow control, you must change the settings on the SX-582 to these settings.

Click the *Submit* button at the bottom of the window (you may need to scroll) to save your changes.
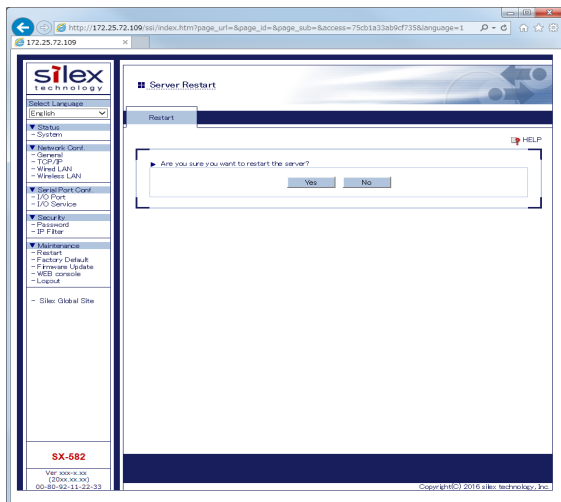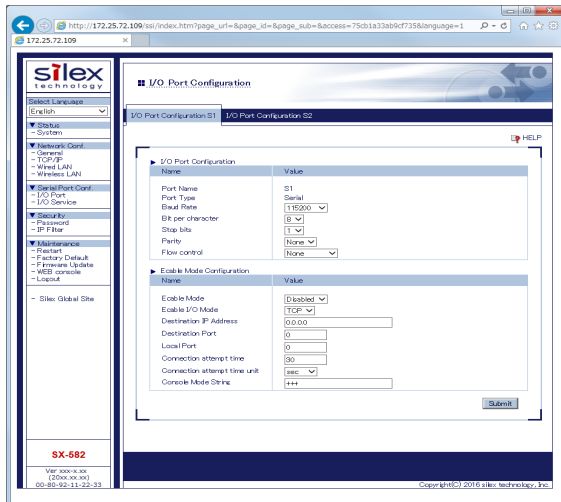
9. When you have finished with all your configuration changes, you must restart the SX-582 for these changes to take effect.

To restart the SX-582, click *Restart* on the left side of the screen and click *Yes* in the page displayed.

You can skip the remainder of this chapter.

140-20139-100A

Using the Internal Command Console to Configure the SX-582

NOTE:
You may skip this section if you have completely configured the SX-582 using the SX-582 Internal Web Pages.

The Internal Command Console is a command line oriented method for configuring the SX-582. It provides more comprehensive capabilities than the Internal Web Pages, but is not as easy to use. Advanced users may prefer to use this method because it is concise, fast, and powerful.

To use the Internal Command Console:

1. The simplest way to access the Internal Command Console is via a terminal (for example, a Windows PC running the HyperTerminal Accessory program) connected to serial port 2 or 3. If you are using the SX-582-6900 Evaluation daughter card, the included serial cable can be used for this purpose. If you are not using the Evaluation daughter card, then you must provide the appropriate cable to connect pins 28, 34, and one of the ground pins on the OEM header to the terminal (transmit data on the SX-582 must connect to receive data on the terminal, and vice versa The terminal must be set for 115.2Kbps, 8-bit characters, no parity, and no flow control.

2. If you are connected to Serial Port 3, you will see some information about the firmware versions and copyright notices displayed on the terminal (skip to the next step if you are connected to Serial Port 2). Enter *admin* when you get the *login:* prompt, and then enter the password *access*.

3. When you see the *Local>* prompt, you can enter commands (note that this command may take up to 30 seconds to appear if you are using Serial Port 2). The SX-582 is set by default to use DHCP to obtain the IP address automatically. If you want to set the IP address manually, enter the following commands:
   SET IP METHOD STATIC
   SET IP ADDRESS *aa.bb.cc.dd*
   SET IP SUBNET *aa.bb.cc.dd*
   SET IP ROUTER *aa.bb.cc.dd*

   where *aa.bb.cc.dd* is the IP address of the SX-582. You can use the command SHOW IP to verify the IP address settings.

4. Enter the basic wireless settings as follows:

SET NW SSID <name>	*[where <name> is the SSID for your network]*
SET NW MODE <mode>	*[where <mode> is INFRASTRUCTURE or AP]*
SET NW CHANNEL n	*[where n is number of channel; this is required only for AccessPoint mode]*

5. Use the appropriate SET NW command to set wireless encryption mode and authentication type (check with your network administrator for the proper settings if you do not know them):

SET NW ENC <mode>	*[sets encryption mode, where <mode> is WPA, WPA2, 128, or WPA2-WPA]*
SET NW AUTHTYPE <type>	*[sets authentication type, where <type> is OPEN, TTLS, PEAP, PSK, LEAP, TLS, or FAST].*

   For WPA2-PSK or WPA, enter the command:

SET NW WPAPSK <psk>   *[sets pre-shared key for WPA2 or WPA, where <psk> is the key]*

For WEP 128, use the following commands:

SET NW KEY# *n*   *[sets the number of the WEP key that will be used as the transmit key, where n=1 to 4; default value is 1]*
SET NW KEYVAL <key>   *[sets WEP key, where <key> is 26 hex characters]*

Configuring 802.1X EAP authentication can be complex. Please refer to Appendix A and/or Appendix B for details of the required commands.

6. To set the serial ports, enter the following commands (If you are configuring Serial Port 2, substitute the port name S2 instead of S1):

SET PORT S1 SPEED <baudrate>   *[where <baudrate> is 300 to 3000000]*
SET PORT S1 PARITY <parity>   *[where <parity> is ODD, EVEN, MARK, or SPACE]*
SET PORT S1 CH <databits>   *[where <databits> is 7 or 8]*
SET PORT S1 FLOW <flowcontrol>   *[where <flowcontrol> is NONE, XON/XOFF, CTS, or DSR]*

NOTE:
Serial Port 2 parameters cannot be changed when it is in the console mode. This is the default mode for Serial Port 2.

The console commands are summarized in Appendix B of this manual.

7. When you have finished entering commands type:

INIT
EXIT

These commands will save the configuration and restart the unit. You are now ready to use the SX-582.

IMPORTANT:
The console EXIT or SAVE command must always be used in order to save the changes you made with the internal Command Console.

---

8. After an IP address and wireless network settings are configured in the SX-582, you can also access the Internal Command Console using TELNET:

- From the Windows Command Prompt (MS-DOS Prompt), Mac OS X Terminal Utility, or UNIX/Linux command line, enter the command:

  telnet *aa.bb.cc.dd*

  where aa.bb.cc.dd is the IP address of the SX-582. Enter *admin* when you get the *login:* prompt, and then enter the password *access*. When you get the *Local>* prompt, you are ready to enter console commands.

Chapter 4
Using the SX-582 with Your Application

The SX-582 includes a number of capabilities that enable it to be used in a wide range of applications. These capabilities include:

1. Linux programmability
2. User interface customization
3. Raw TCP connection
4. RFC2217
5. ECable Mode
6. Print Server mode
7. Console mode switching

These capabilities are described in the following sections.

Linux Programmability

The SX-582 runs a full implementation of the Linux operating system, so it can be programmed for a variety of applications using standard Linux tools. To access the Linux operating system, connect to the SX-582 directly through Serial Port 3. Enter the user name *root* in response to the *login:* prompt, and then enter the password to get the Linux # prompt (by default no password is set).

Both the admin password and the root password can be changed via the Linux shell *passwd* command.

IMPORTANT:
Root privileges provide total access to the Linux operating system. Because of the possibility of modifying or deleting critical SX-582 system files, only knowledgeable Linux programmers should use this capability.

Customizing the SX-582 User Interface

The SX-582 user interface can be customized to include your company's name or other information. The 3-character OEM code used in the SX-582 server name and service names can be changed from the default code **SDS** to a user-defined code. For example, by changing the OEM code to XYZ, the default server name **SDS000345** would become **XYZ000345**. To make these changes, enter the following commands using the internal command console:

SET OEM *code*	where *code* is the desired 3-character OEM code
SET DEFAULT	[note that this resets the entire SX-582 configuration back to the factory defaults]
SET SERVER DESC *description*	where *description* is any string up to 32 characters in length [note that spaces are OK in the description and no quotation marks are necessary]
INIT	[restarts the SX-582 when the user exits the console]
EXIT	[exits the console]

IMPORTANT:
This user interface customization must be done *before* making any other configuration changes, because the SET OEM command requires that the SX-582 be reset to the factory default configuration.

Raw TCP connection

You can communicate directly from your application program to the SX-582 using a raw TCP connection. This is done by opening a TCP port on the SX-582 and then sending and receiving data to this port via a socket or equivalent API.

If you are using a raw TCP connection, the default TCP port number is either 9100 or 3001 for Serial Port 1 or 9101 or 3002 for Serial Port 2. In factory defaults, any or all port numbers of Serial Port 1 can be used.

> **NOTE:**
> By defaults, Serial Port 2 cannot be used for a raw TCP connection. You need to switch the SX-582 module to the serial server mode using **SET PORT S2 Console** command.

If you want to be able to access your device's modem control signals from your computer system, then the TCP port number is 9200 for Serial Port 1 or 9201 for Serial Port 2 (these sockets provide RFC 2217 support). You can change the port number, if desired, by modifying one of the SX-582 services. To change the TCP port number:

1. Connect to the SX-582 with a web browser (see chapter 3 for instructions on doing this);

2. After you have logged in, click *I/O Services* on the left side of the page.

3. Click on the service name that you want to change (any one of the services is OK, provided that you are not using the existing TCP port number of that service for a different application).

4. Change the *Raw TCP Port* to the desired number (must be greater than 1023).

5. Click *Submit* to save your change.

You can test this connection by using the TELNET utility from the Windows Command Prompt (MS-DOS prompt), Mac OS X Terminal Utility, or UNIX/Linux command line as follows:

    telnet *ipaddress portnumber*

where i*paddress* is the IP address of the SX-582 and *portnumber* is the SX-582 TCP port number. For example:

    telnet 192.168.5.53 9100

In this example, if you have a serial printer or other device capable of displaying ASCII characters connected to the SX-582 Serial Port 1, then every character you type should be printed on that serial device. Buffered serial devices may need you to type a control character such as a form feed (CONTROL-L) before the characters are printed.

RFC 2217 Remote Modem Control Support

RFC 2217 allows you to access your device's modem control signals over the network. It is especially useful for migrating applications that use modem controls from a direct serial connection to a serial device server network connection. You can utilize RFC 2217 by connecting to TCP port 9200 (for Serial Port 1) or port 9201 (for Serial Port 2) from your application program.

ECable Mode

Normally, it is up the computer to initiate a connection to the SX-582. For some applications, it is desirable for the SX-582 to initiate the connection to the computer. The SX-582 supports this capability through its ECable feature.

To set E-Cable mode, use a web browser to access the SX-582 internal web pages (see chapter 3 for instructions on using the internal web pages). After you have logged in, click *I/O Port* on the left side of the screen.
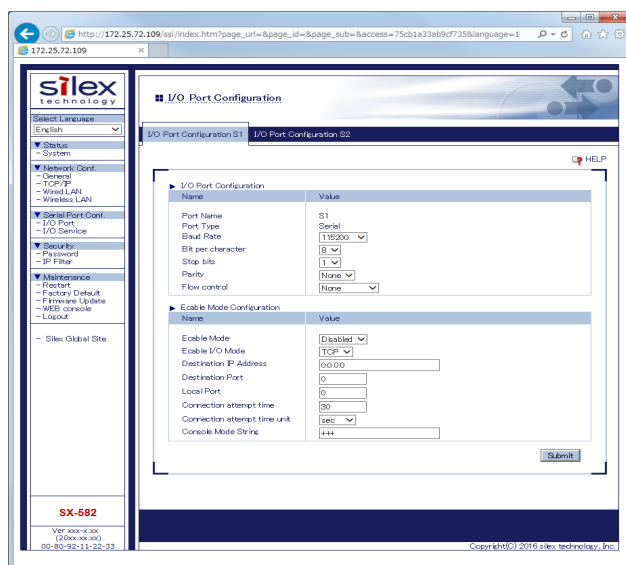
Figure 5 I/O Port Configuration Window

You can now enable ECable mode and set the required parameters.

1. Select the S1 port.

2. Enable ECable mode by clicking the radio button.

3. Enter the address (Destination Address) of the computer or other device that will be communicating with the SX-582)

4. Enter the TCP port number (Destination Port) used by the destination device for communicating with the SX-582 (must be greater than 1024).

5. If desired, change the ECable Connection Attempt Time. This specifies the time interval between connection attempts. For example, by default the SX-582 will try once every 30 seconds to make a connection to the destination device; if it fails to make this connection, it will wait 30 seconds before attempting again. Changing this interval will reduce or increase the amount of network traffic.

6. It is also possible to use UDP instead of TCP for communicating to and from the SX-582. If you wish to use UDP, then in addition to the steps above:
    a. Select UDP as ECable I/O Mode.

b. Enter the UDP port number (Destination Port) used by the destination device to communicate with the SX-582. This number must be a valid port on the destination device (check the documentation for that device to determine the valid port numbers). If the Destination Port number is zero, the SX-582 will not send any data to the remote host.

c. Enter the UDP port number (Local Port) used by the SX-582 to communicate with the destination device. This number must be greater than 1024, but is otherwise arbitrary. If the local port number is zero, the SX-582 will not receive any data for the serial port.

Print Server Mode

You can use the SX-582 as a standard TCP/IP print server, which is very useful if you are connecting the SX-582 to a serial printer. The SX-582 supports the following standards:

- *lpr/lpd*. This is one of the most popular ways to print on a TCP/IP network. Check your computer's documentation to determine how to set up an lpr print queue. Usually this simply involves specifying the IP address of the SX-582 as the printer's address or host name. Some implementations require a queue name; this name is the name of any of the SX-582 services. To see the names of the SX-582 services, connect to the SX-582 with a web browser (see chapter 3 for instructions on doing this); after you have logged in, click I/O Services on the left side of the page. Note that if you are printing to Serial Port 2 (S2), you *must* specify an S2 service (for example, SDS057333_S2_A) as the queue name.

- *Port 9100*. This method is used to set up a Windows Standard TCP/IP port or for compatibility with software that supports the HP JetDirect Print Server (for example, HP Web JetAdmin). To use this capability on Windows with the *Add Printer Wizard*, specify that you want to use a **Local printer attached to this computer** (not a network printer), and then select **Create a new port**, specifying **Standard TCP/IP Port** as the type of port.

    Note that if you are printing to Serial Port 2 (S2) instead of Serial Port 1 (S1), the TCP port number is 9101. It is also possible to change the TCP port number from the default 9100 for compatibility with other printer manufacturer's software. To do this, refer to the instructions in the *Raw TCP Connection* section of this chapter.

Console Mode Switching

The SX-582 allows you to dynamically switch the operation of Serial Port 1 or Serial Port 2 from normal mode to console mode. This allows your device to control the operation of the SX-582 by sending console commands (see chapter 6 and Appendix B for a description of the console commands).

To switch the serial port to console mode, you must first define a console mode string. When the SX-582 receives this string on the serial port, it will automatically switch the port to console mode. To define the console mode string, use a web browser to access the SX-582 internal web pages. After you log in, **click I/O Port,** and then select the desired port (S1 for Serial Port 1 or S2 for Serial Port 2). When you get the **I/O Port Settings** page, enter any desired character string (for example, ++++) as the **Console Mode String**. Click **Submit** to save your string, and then restart the SX-582 to make the change take effect.

Alternatively, you can define the console mode string using the console command as shown in the following example:

       SET PORT S1 CONSTR ++++

Once you are connected in console mode, you can send any of the console commands listed in Chapter 6. Be sure to terminate each console command with a carriage return (ASCII 13) or linefeed (ASCII 10) character.

When you are finished using the console, you can return to the normal port operation by sending the command EXIT followed by a return or linefeed character.

Access Point Mode

In Access Point mode, the SX-582 module will run as a host device in a wireless network.

> **NOTE:**
> - SX-582(WWR) World Wide model does not support Access Point mode.

Wireless Standard

Details
IEEE 802.11 a/b/g/n

Channel

	Details	
2.4 GHz band	US	1 ~ 11 ch
	JP/DE	1 ~ 13 ch
5 GHz band	JP/DE	36/40/44/48 ch (W52)
	US	36/40/44/48 ch (W52)
		149/153/157/161/165 ch (W58)

- The SX-582 module does not support detection of the radar wave which is required for DFS process. Therefore, when running in Access Point mode, the frequency bands (W53/W56) needed for DFS process is not supported.

Channel Band Width
The channel band width changes depending on the operating status.

40MHz band

When running in 802.11na, the SX-582 module will run in 40MHz band.
The following is the combination of Primary/Secondary channels for 40MHz band:

Primary Channel	36	40	44	48	149	153	157	161	165
Secondary Channel	40	36	48	44	153	149	161	157	╱

- When set to 165ch, 20 MHz band will be used.
- When other APs are not running on Primary Channel but running on Secondary Channel, the SX-582 module will use Secondary Channel.

20MHz band

When running in the wireless standards other than 802.11na, the SX-582 module will run in 20MHz channel band.

- HT40 (40MHz channel width) is not supported in 2.4GHz.

140-20139-100A

Supported Authentication/Encryption Mode
When running in the Access Point mode, the SX-582 module supports combination of the following authentication and encryption modes.

Authentication	Encryption
OPEN	None
WPA-Personal	AUTO/TKIP
WPA2-Personal	AES

- WEP encryption is not supported.
- WPA-Enterprise/ WPA2-Enterprise /802.1x are not supported.
- When TKIP is used for encryption, the SX-582 module will run in IEEE 802.11a or IEEE 802.11g. When AUTO is used, those client devices linked in TKIP will use IEEE 802.11a or IEEE 802.11g, and those linked in AES will use IEEE 802.11n.

How to Enable the Access Point Mode
To run the SX-582 module in Access Point mode, change the wireless setting using the Web page or internal configuration console.

By using the Web page:

1. Log into the Web page of the SX-582 module. (For details on how to access the Web page, refer to **Chapter 3**.) Click **Wireless LAN** from the left menu and select *Access Point* for **Operating Mode** in the page displayed.

2. Configure the SSID, channel, authentication/encryption modes for your wireless network.

3. Click **Submit** to save the changes. The setting will not take effect unless you restart the SX-570/580 module. To restart, click **Restart** from the left menu and click **Yes**.

By using the internal console commands:

1. Access the internal command console of the SX-582 module. (For details on how to access the internal command console, refer to **Chapter 3**.)

2. To configure the wireless settings, execute the commands below.

```
SET NW MODE <mode>       [Specify the AP for <mode>]
SET NW SSID <name>       [Specify the SSID for a network]
SET NW CHANNEL n         [Specify the channel number]
SET NW ENC <mode>        [Set the encryption mode.
                          Specify Disable, WPA, WPA2 or WPA2-WPA for
                          <mode>]
SET NW AUTHTYPE <type>   [Set the authentication mode.
                          Specify OPEN or PSK for <type>]
```

3. When finished, execute the commands below to terminate the command console.

```
INIT
EXIT
```

After these commands are executed, the setting will be saved and the SX-582 module will be restarted. When the restart is completed, the SX-582 module can be used in your environment.

Bridge Mode

Bridge Mode supports 2 modes; Single Client Mode and Multi-Client Mode.

[Single Client Mode]
Single Client Mode is a function to share a single device over wireless network after it is connected to wired LAN port of Evaluation daughter card.
For the MAC Address used in a wireless network, the source address of the packets received first on the wired LAN port will be used. This allows the connected device to be seen as if it is directly connected to a wireless network.

Also, it is possible to fix the MAC Address used for the wireless network (Bridge Static Client Address). Because of this, the SX-582 module can be started in the bridge mode without receiving the packets. When this feature is enabled, only devices with the registered MAC Address can be connected.

[Multi-Client Mode]
Multi-Client Mode is a function to share plural devices over wireless network after they are connected to wired LAN port of Evaluation daughter card via HUB. For wireless LAN connection, MAC address of the SX-582 module is used. In Multi-Client mode, up to 16 devices can be connected to wireless network.

NOTE:
When running in the Bride Mode, there are the following restrictions:
- Access to the SX-582 module is limited to those on a wired LAN port.
- It is not allowed to use the devices with several MAC Addresses (e.g. devices with a load balancing feature, etc).

There are following restrictions for Single Client Mode.
- It is impossible to connect two or more devices using a HUB.

There are following restrictions for Multi-Client Mode.
- Only TCP/IP(IPv4, IPv6) communication is supported. Communication of other protocol is not supported.
- Bridge function is not available for following IPv6 packets.
  - Inverse Neighbor Advertisement (only one-way communication from wired LAN to wireless LAN is supported.)
  - Fragment Header (transfer as-is)
  - Authentication Header (transfer as-is)
  - Encapsulating Security Payload (transfer as-is)

How to Enable the Bridge Mode
To use the Bridge Mode, change the following three settings by using the Web page or internal command console of the SX-582 module.

- ・Bridge Mode
- ・IP Address
- ・Wireless LAN setting

By using the Web page:

1. Log into the Web page of the SX-582 module. (For details on how to access the Web page, refer to **Chapter 3**.)

2. Click **General** from the left menu.

    When using Single Client Mode:

    Select **Enable** for **Bridge Mode** in the page displayed.
    To fix the MAC Address, select **ON** for **Bridge Static Client Address** and set the MAC Address of the device to be connected to the wired LAN port for **Clone MAC Address**.
    Click **Submit** to save the changes.

    When using Multi-Client Mode:

    Select **Multi** for **Bridge Mode** in the page displayed.
    Select **ON** for **Device Filter** and set the MAC Address of the device to be connected to the wired LAN port for **Network Device Address**.
    Click **Submit** to save the changes.

3. To configure the IP Address, click **TCP/IP** from the left menu.
    When running in the Bridge Mode, communication with the SX-582 module is limited to those on the wired LAN port. If you need to access the SX-582 module when running in Bridge Mode, set the IP Address that can be communicated from the connected device.
    Click **Submit** to save the changes.

4. To configure the wireless settings, click **Wireless LAN** from the left menu.
    Configure the SSID and authentication/encryption modes for your wireless network.
    Click **Submit** to save the changes.

5. Restart the SX-582 module to take effect of the changes. To restart, click **Restart** from the left menu and click **Yes**.

By using the internal console commands:

1. Access the internal command console of the SX-582 module. (For details on how to access the internal command console, refer to **Chapter 3**.)

2. To set the Bridge Mode, execute the commands below.

   When using Single Client Mode:

   ```
   SET NW BRIDGE <Mul/En/Dis>    [Specify En to set the bridge mode]
   SET NW BRSTATIC <En/Dis>      [Turn ON/OFF the bridge static client
                                  address]
   SET NW BRCLADDR <mac addr>    [Set the clone MAC address]
   ```

   When using Multi-Client Mode:

   ```
   SET NW BRIDGE <Mul/En/Dis>              [Specify Mul to set the bridge
                                            mode]
   SET NW BRFILTER <En/Dis>                [Enable/Disable device filter]
   SET NW BRFILTERADDR <num> <mac addr> [Bridge MAC address filter setting]
   ```

3. To configure the IP Address, execute the commands below.

   ```
   SET IP METHOD <AUTO|DHCP|STATIC>  [Set the method to obtain IP Address]
   SET IP ADDRESS <ip address>       [Set the IP Address]
   SET IP SUBNET <subnet mask>       [Set the subnet mask]
   SET IP Router <default gateway>   [Set the default gateway]
   ```

4. To configure the wireless settings, execute the commands below.

   ```
   SET NW SSID <name>        [Set the SSID]
   SET NW MODE <mode>        [Set the operating mode (Infrastructure only)]
   SET NW ENC <mode>         [Set the encryption mode]
   SET NW AUTHTYPE <type>    [Set the authentication mode]
   ```

5. When finished, execute the commands below to terminate the command console.

   ```
   INIT
   EXIT
   ```

After these commands are executed, the setting will be saved and the SX-582 module will be restarted. When the restart is completed, the SX-582 module can be used in your environment.

Smart Wireless Setup

The SX-582 module supports the easy wireless configuration feature, Smart Wireless Setup.
If Smart Wireless Setup is used, the wireless security setting can easily be configured when your network device supports WPS (Wi-Fi Protected Setup).
The Smart Wireless Setup of the SX-582 has the features corresponding to WPS2.0.

How to Start Configuration Using WPS
The method to start the Smart Wireless Setup differs depending on the operating mode of the SX-582 module. Also, there are two ways of executing the Smart Wireless Setup; one way is using the Web page and the other way is using the internal console commands.
In this section, how to start WPS using the internal console commands is explained.
When the SX-582 module is running in an operating mode other than Access Point mode:

When the SX-582 module is running in an operating mode other than Access Point mode (e.g. wired LAN mode or wireless station (*Infrastructure*) mode), connect the SX-582 module to an Access Point on your network.

NOTE:
When using Smart Wireless Setup while the SX-582 module is running as a wireless station, there are the following restrictions:
- When the Bridge Mode is enabled while Bridge Static Client Address is disabled (OFF), the network device needs to be connected to a wired LAN port.
- Smart Wireless Setup does not work when the Access Point is running in a stealth mode.

Authentication	Encryption	Manual Configuration	Smart Wireless Setup
Open	None	∠	∠
	WEP(128bit)	∠	-
WPA-Personal	TKIP	∠	∠(*1)
	AES	-	∠(*1)
	AUTO	∠	∠(*1)
WPA2-Personal	TKIP	-	∠(*2)
	AES	∠	∠
	AUTO	-	∠(*2)
WPA/WPA2-Personal	TKIP	-	∠(*3)
	AES	-	∠(*4)
	AUTO	-	∠(*3)
802.1x	WEP(128bit)	∠	-
WPA-Enterprise	TKIP	∠	-
	AES	-	-
	AUTO	∠	-
WPA2-Enterprise	TKIP	-	-
	AES	∠	-
	AUTO	-	-

Authentication	Encryption	Manual Configuration	Smart Wireless Setup
WPA/WPA2-Enterprise	TKIP	-	-
	AES	-	-
	AUTO	-	-

* The Smart Wireless Setup supports some combinations of authentication/encryption modes which cannot be configured manually. (See above table for the supported combination.)
After succeeded in Smart Wireless Setup, the SX-582 module will start to run with the obtained setting and it will be saved into the SX-582 module, however, regarding the combinations of authentication/encryption modes that cannot be configured manually, a value different from the obtained setting will be saved.

  If either one of SSID/Authentication/Encryption/Pre-Shared Key is changed manually, configuration obtained by Smart Wireless Setup will be released and the SX-582 module will start to run with the values being saved as the product setting.
  The notices below (*1 and *2) show the combination that should cause this action.

(*1) If WPA-Personal setting is obtained from Registrar, the SX-582 module will run with WPA/WPA2-Personal + TKIP/AES. As for the product configuration, WPA2-Personal TKIP/AES is saved.

(*2) If WPA2-Personal TKIP or AUTO setting is obtained from Registrar, the SX-582 module will run with WPA2-Personal + TKIP/AES. As for the product configuration, WPA2-Personal AES is saved.

(*3) If WPA/WPA2-Personal TKIP or AUTO setting is obtained from Registrar, the SX-582 module will run with WPA2-Personal + TKIP/AES. As for the product configuration, WPA2-Personal AES is saved.

(*4) If WPA/WPA2-Personal AES setting is obtained from Registrar, the SX-582 module will run with WPA2-Personal + AES. As for the product configuration, WPA2-Personal AES is saved.

Push Button Method(PBC)

This is an easy configuration method using the push button on the Access Point.

1. Power on the Access Point that supports WPS.

2. Power on the SX-582 module in an operating mode other than Access Point mode and access the internal command console. (For details on how to access the internal command console, refer to **Chapter 3**.)

3. Execute WPS-PBC from the Access Point side. (For details, see the operating manual that came with your Access Point.)

4. Execute the command below at the command console.

```
SET NW SWSPBC        [Execute the PBC method]
```

  If the SX-582 module has been running in a wired LAN mode, remove a network cable and restart it after this configuration is completed. The SX-582 module will start to run in a wireless mode after the restart.

NOTE:
- The PBC process will be timed out in 120sec.
- If the SX-582 module has detected two or more Access Points waiting for connection during PBC, overlap error will occur.

PIN Code Method(PIN)

This is a secure configuration method that can identify the Access Point using the 8-digit identification code called PIN code.

1. Power on the Access Point that supports WPS.

2. Power on the SX-582 module in an operating mode other than Access Point mode and access the internal command console. (For details on how to access the internal command console, refer to **Chapter 3**.)

3. Execute the commands below at the command console.

   ```
   SET NW SWSPINCODE        [Issue the PIN code]
   SH NW SWSPINCODE         [See the current PIN code]
   SET NW SWSPIN            [Execute PIN method]
   ```

4. Enter the PIN code of the SX-582 module at your Access Point and execute the PIN method. (For details, see the operating manual that came with your Access Point.)

   If the SX-582 module has been running in a wired LAN mode, remove a network cable and restart it after this configuration is completed. The SX-582 module will start to run in a wireless mode after the restart.

NOTE:
- The PIN process will be timed out in 120sec.

When the SX-582 module is running in Access Point mode:

When the SX-582 module is running in Access Point mode, wireless client devices on the network will be connected to the SX-582 module.

NOTE:
When using Smart Wireless Setup while the SX-582 module is running in Access Point mode, there are the following restrictions:
- Smart Wireless Setup does not work when the authentication mode is WPA-Personal.

Authentication	Encryption	Manual Configuration	Smart Wireless Setup
Open	None	⌖	⌖
	WEP(128bit)	-	-
WPA-Personal	TKIP	⌖	-
	AES	-	-
	AUTO	⌖	-
WPA2-Personal	TKIP	-	-
	AES	⌖	⌖
	AUTO	-	-
802.1x	WEP(128bit)	-	-
WPA-Enterprise	TKIP	-	-
	AES	-	-
	AUTO	-	-
WPA2-Enterprise	TKIP	-	-
	AES	-	-
	AUTO	-	-

* When the SX-582 module is running in WPA-Personal, the Smart Wireless Setup feature cannot be used.

How to configure from the external registrar

If the SX-582 module has no settings configured as smart wireless setup information (in this case, the status message is shown as "un-configured" in the Smart Wireless Setup tab of the Web page), the SX-582 module can be configured using the external registrar.
For configuration from the external registrar, 8-digit PIN code is used.
For details, refer to the operating manual that came with the external registrar.

Push Button Method (PBC)

This is an easy configuration method using the push button on the wireless client device.

1. Power on the wireless client device that supports WPS.

2. Power on the SX-582 module in Access Point mode and access the internal command console. (For details on how to access the internal command console, refer to **Chapter 3**.)

3. Execute WPS-PBC from the wireless client device side. (For details, see the operating manual that came with your client device.)

4. Execute the command below at the command console.

```
SET NW APSWSPBC        [Execute the PBC method ]
```

> **NOTE:**
> **- The PBC process will be timed out in 120sec.**
> **- If the SX-582 module has detected two or more client devices waiting for connection during PBC, overlap error will occur.**

PIN Code Method(PIN)

This is a secure configuration method that can identify the wireless client devices using the 8-digit identification code called PIN code.

1. Power on the wireless client device that supports WPS.

2. Power on the SX-582 module in Access Point mode and access the internal command console. (For details on how to access the internal command console, refer to **Chapter 3**.)

3. Check the PIN code of the wireless client device and execute the WPS-PIN. (For details, see the operating manual that came with your client device.)

4. Execute the command below at the command console.

```
SET NW APSWSPIN <Enrollee's PIN code>   [Execute the PIN method by
                                         entering the PIN code of
                                         wireless client device]
```

Chapter 5
Interfacing the SX-582 to the OEM Device

In order to connect the SX-582 module to your device, you will need to provide either a custom daughter card or a special cable. Both of these solutions will require a 50-pin female connector on one side, with the appropriate connector(s) for connecting to your device's circuitry on the other side. The custom daughter card is generally a superior solution because it provides better mechanical connections for greater overall system reliability.

A good model for a custom daughter card is the Silex SX-582-6900 Evaluation daughter card (see chapter 2 for a discussion of the Evaluation daughter card). To assist you in the design of your daughter card, we have included the schematics of the Evaluation daughter card in the following pages.

The major design considerations for the SX-582 are as follows:
- *50-pin OEM Header*. This is the primary mechanism for communications between the OEM device and the SX-582. This section describes the pinout and the mechanical considerations.
- *Antenna Connectors.* The two U.FL connectors can be used to connect a variety of antennas.
- *General Purpose I/O (GPIO).* The GPIOs can be used for a variety of purposes.

Each of these design considerations is covered in the following sections of this chapter.

SX-582 Evaluation Daughter Card Schematics

< SX-570/582 I/F >

< 3.3V Power >

< Power Input >
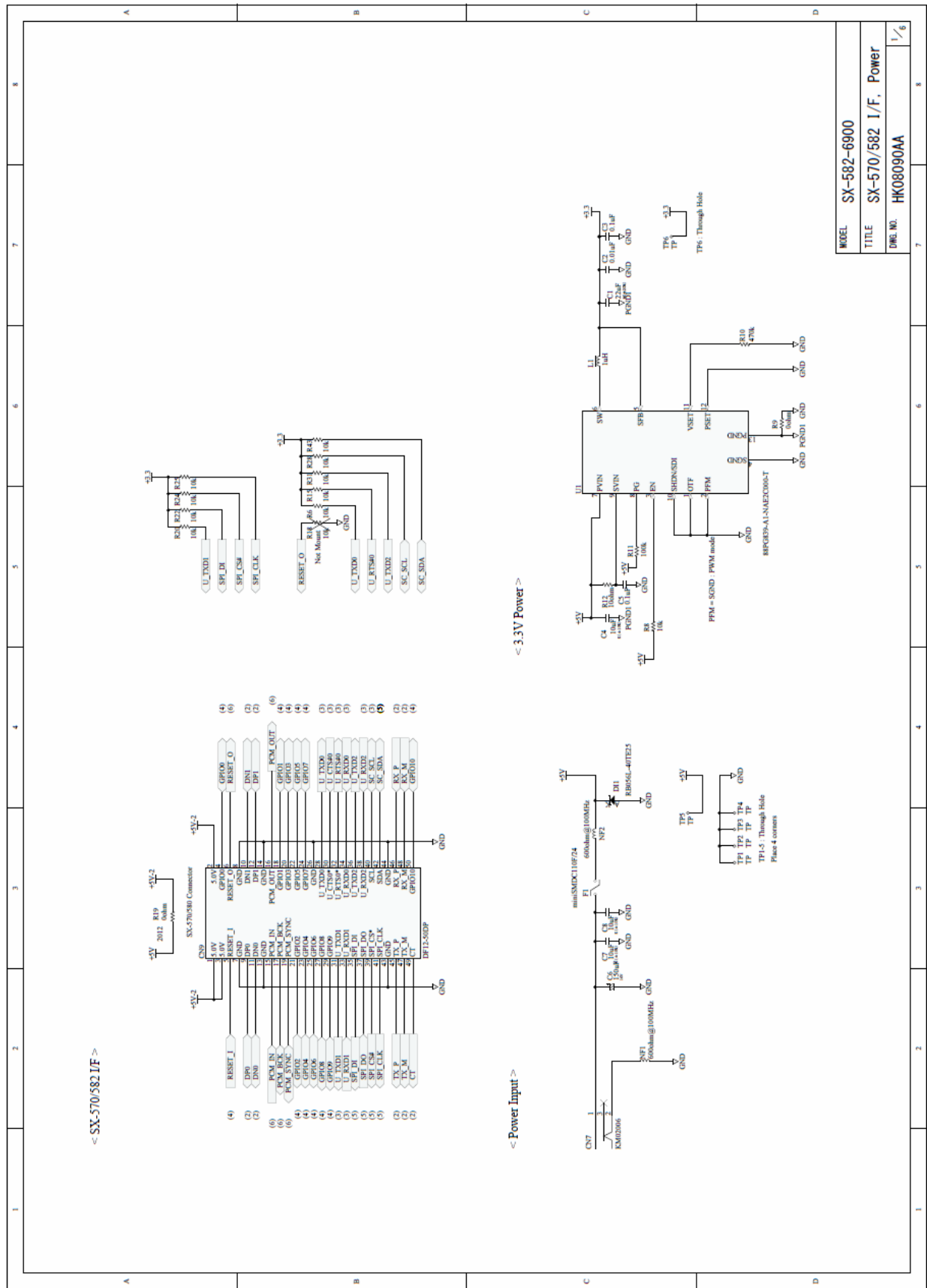
MODEL	SX-582-6900
TITLE	SX-570/582 I/F, Power
DWG. NO.	HK08090AA

43

140-20139-100A
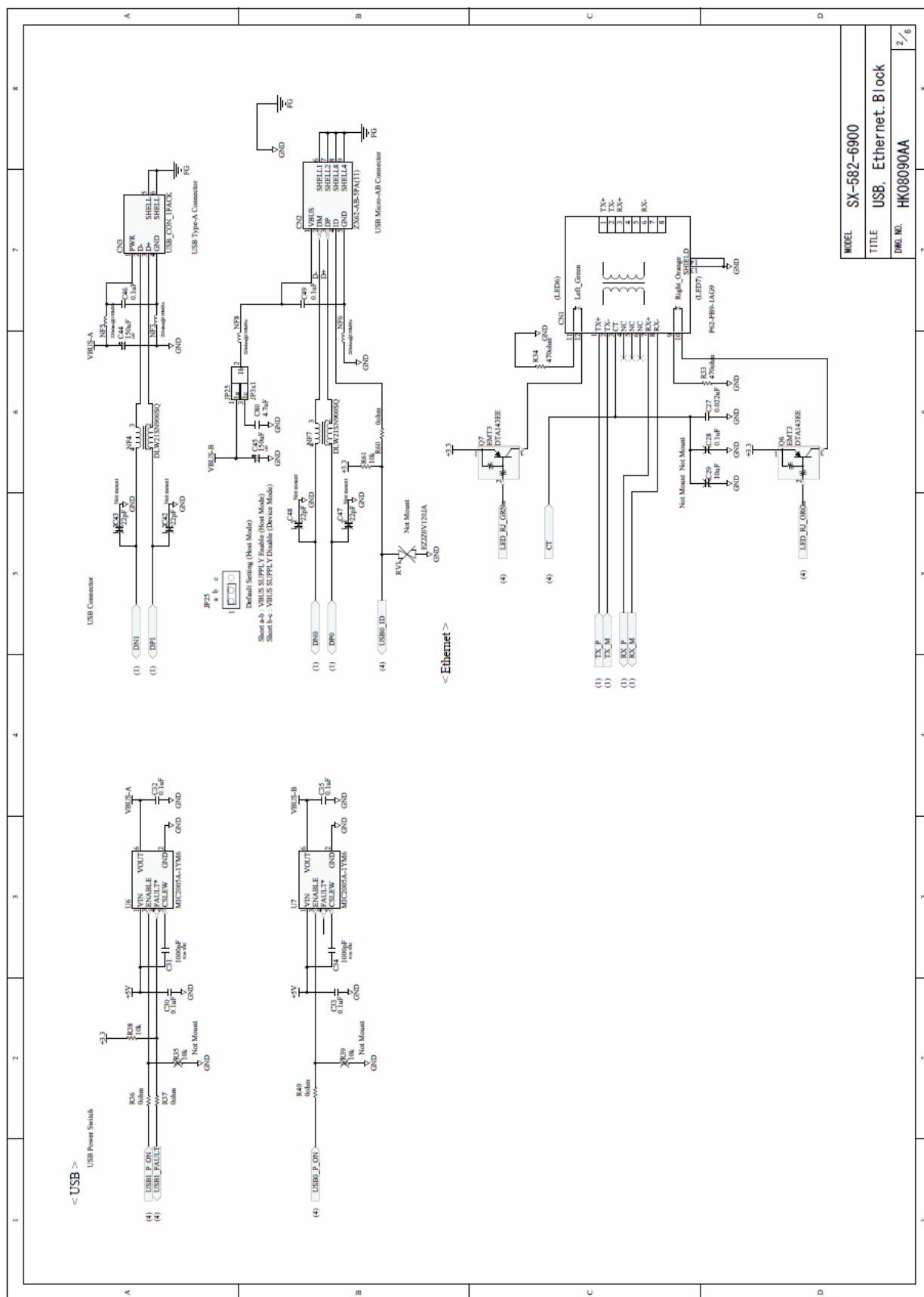
SX-582 Evaluation Daughter Card Schematics

SX-582 Evaluation Daughter Card Schematics

MODEL: SX-582-6900
TITLE: RS-232C.Block
DWG. NO.: HK08090AA

45
140-20139-100A

SX-582 Evaluation Daughter Card Schematics

< SPI Memory >

< SPI I/F >

< LCD I/F >

< I2C I/F >

SPI Device

SPI-Serial EEPROM

MODEL	SX-582-6900
TITLE	SPI, I2C. Block
DWG. NO.	HK08090AA

5/6

47

SX-582 Evaluation Daughter Card Schematics

MODEL	SX-582-6900
TITLE	I/O Connector. Block
DWG. NO.	HK08090AA
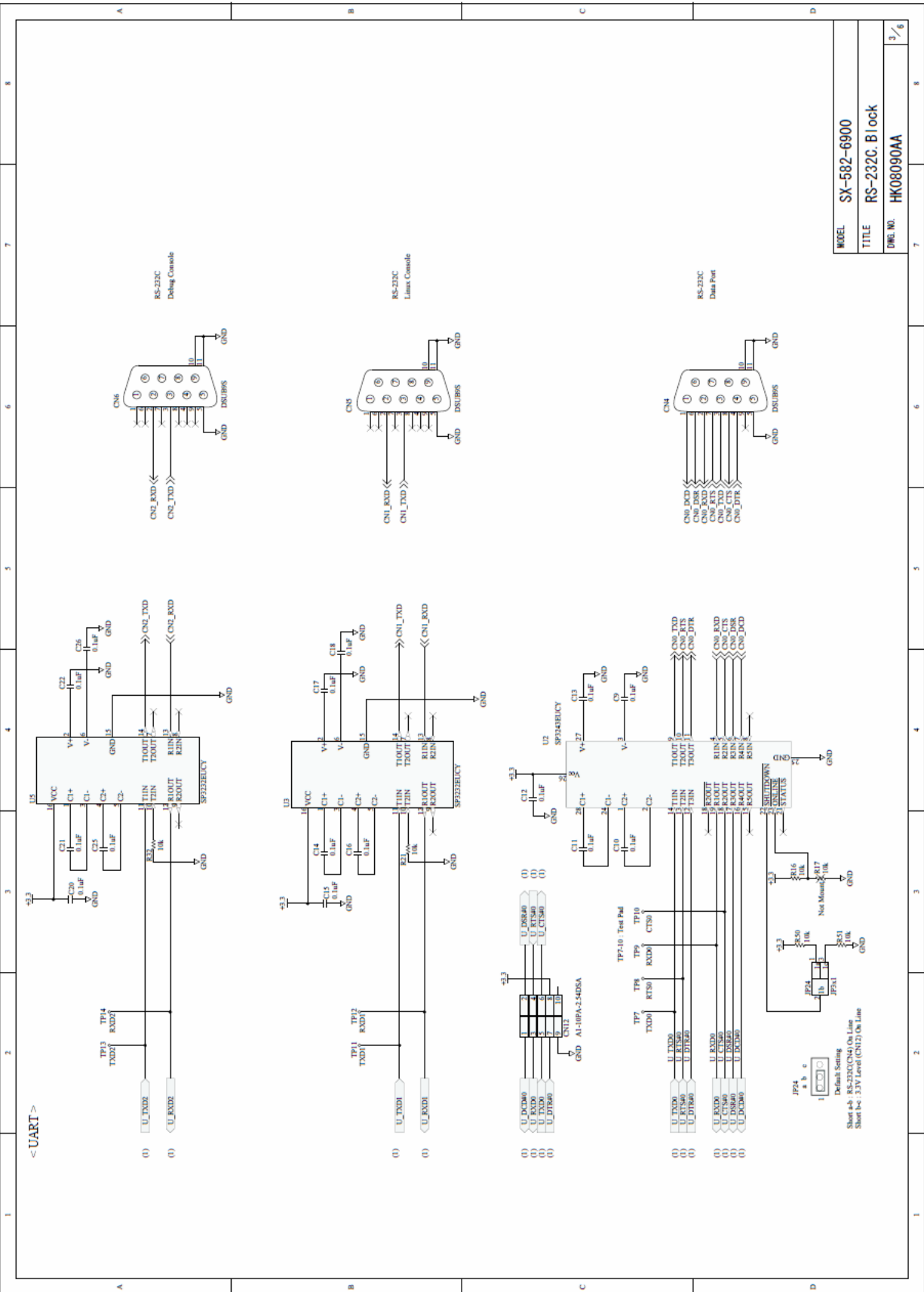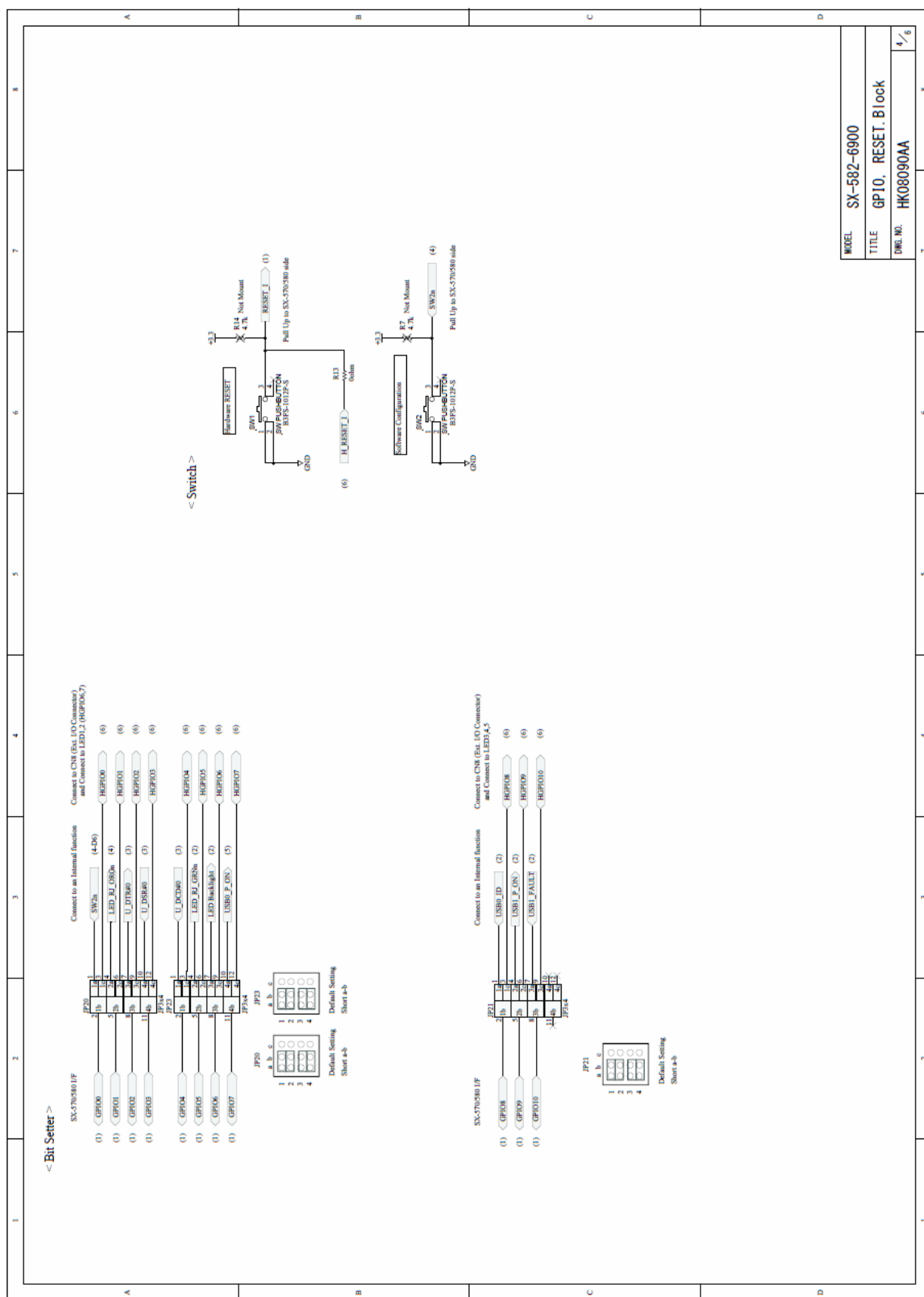
OEM Interface

The OEM Interface (CN9) is the primary method for communications between the SX-582 and your device. It is a 50-pin header that includes the necessary pins for serial data I/O, GPIO, and power.

Table 11 describes the OEM interface pinout for the SX-582 module.

Table 11 OEM Interface Pinout

PIN	SIGNAL	I/O	FUNCTION	PIN	SIGNAL	I/O	FUNCTION
1	5.0V		power	2	5.0V		power
3	5.0V		power	4	GPIO0	I/O(PU1)	GPIO0
5	RESET_I	I(PU2)	Reset Input to SX-582	6	RESET_O	O(PD1)	Reset Output to SX-582
7	GND		ground	8	GND		ground
9	DP0	I/O	USB0 D+	10	DN1	I/O	USB1 D-
11	DN0	I/O	USB0 D-	12	DP1	I/O	USB1 D+
13	GND		ground	14	GND		ground
15	PCM_IN	I	PCM interface Input Data	16	PCM_OUT	O	PCM interface Output Data
17	PCM_BCK	I/O	PCM interface Bit Clock	18	GPIO1	I/O(PU1)	GPIO1
19	PCM_SYNC	I/O	PCM interface Sync Control	20	GPIO3	I/O(PU1)	GPIO3
21	GPIO2	I/O(PU1)	GPIO2	22	GPIO5	I/O(PU1)	GPIO5
23	GPIO4	I/O(PU1)	GPIO4	24	GPIO7	I/O(PU1)	GPIO7
25	GPIO6	I/O(PU1)	GPIO6	26	GND		ground
27	GPIO8	I/O(PU1)	GPIO8	28	U_TXD0	O	UART0 TXD
29	GPIO9	I/O(PU1)	GPIO9	30	U_CTS#0	I(PU1)	UART0 CTS
31	U_TXD1	O	UART1 TXD	32	U_RTS#0	O	UART0 RTS
33	U_RXD1	I(PU1)	UART1 RXD	34	U_RXD0	I(PU1)	UART0 RXD
35	SPI_DI	O	SPI Data In	36	U_TXD2	O	UART2 TXD
37	SPI_DO	I(PU1)	SPI Data Out	38	U_RXD2	I(PU1)	UART2 RXD
39	SPI_CS#	O	SPI Chip Select (0:Active)	40	SCL	I/O(PU1)	I2C SCL
41	SPI_CLK	O	SPI Clock	42	SDA	I/O(PU1)	I2C SDA
43	GND		ground	44	GND		ground
45	TX_P	O	Ethernet TX+	46	RX_P	I	Ethernet RX+
47	TX_M	O	Ethernet TX-	48	RX_M	I	Ethernet RX-
49	CT		Connected to Center Tap	50	GPIO10	I/O(PU1)	User Defined GPIO

The SX-582 module uses the 50-pin receptacle with metal fitting and boss made by Hirose (part number **DF12-50DS-0.5V(86)**). This receptacle will work with the following mating female headers:

Hirose part number: **DF12(4.0)-50DP-0.5V(86)**

Installing the SX-582

> **IMPORTANT:**
> **In order to prevent flexing of the SX-582 boards during the installation process, you must use spacers. Because of the wide range of possible OEM daughter card connectors and other design issues, you must provide the three spacers that go between the SX-582 base module board and your daughter card.**

The spacers are installed with the SX-582 WLAN model as shown below:
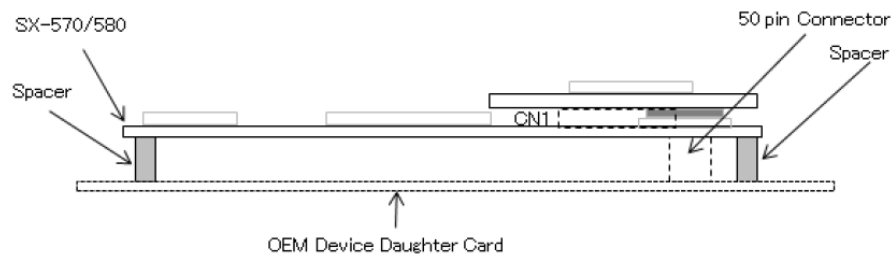
Figure 6 Using spacers with SX-582 WLAN model

Do not over-tighten the screws during the installation procedure. Although the spacers provide protection against flexing, they can compress or break if too much torque is applied.

> **IMPORTANT:**
> **Silex does not recommend soldering the SX-582 directly to your device's daughter card. Soldering the SX-582 *will violate the standard warranty*. If you must solder the SX-582, please contact Silex Technical Support at 866-765-8761 (U.S. toll-**
> **free) or +1-801-748-1199, or e-mail us at** support@silexamerica.com

Antenna Connectors

The SX-582 Module has two SMT Ultra-miniature coaxial connectors (U.FL/I-PEX).
When only one antenna is used, connect it to the secondary antenna connector.
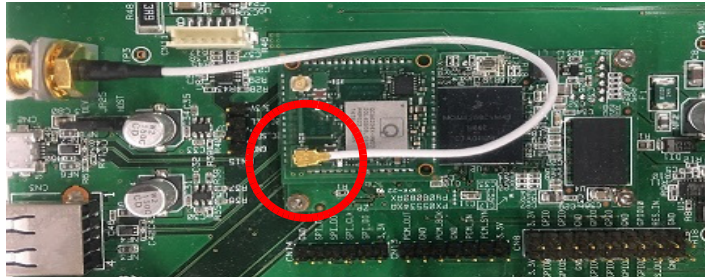
> **NOTE:**
> - SX-582 does not support a diversity antenna.

General Purpose I/O Interface

Table 12 details the GPIO interface.

Table 12 GPIO Interface

Silex	i.MX28	I/O	Drive hi/lo (mA)	Silex function Description (levels are 3.3V DC)
GPIO0/TEST_N	GPIO0_0	I	-5/3.8	Input: PUSHBUTTON SWITCH 1 = off, 0 = Switch depressed
GPIO1/SLED	GPIO0_1	O	-5/3.8	Output: STATUS LED 1 = off, 0 = illuminated
GPIO2/UART0_DTR	GPIO0_2	I/O	-5/3.8	Output: UART0 DTR signal
GPIO3/UART0_DSR	GPIO0_3	I/O	-5/3.8	Input: UART0 DSR signal
GPIO4/UART0_DCD	GPIO0_4	I/O	-5/3.8	Input: UART0 DCD signal
GPIO5	GPIO0_5	I/O	-5/3.8	
GPIO6	GPIO0_6	I/O	-5/3.8	
GPIO7	GPIO0_7	I/O	-5/3.8	
GPIO8	GPIO0_20	I/O	-5/3.8	
GPIO9	GPIO0_21	I/O	-5/3.8	
GPIO10	GPIO1_24	I/O	-5/3.8	
RESETO	GPIO3_28	O	-5/3.8	PHY Reset, active low
PHY_INT*	GPIO3_29	I		Ethernet PHY interrupt, active low

The special function capability of each GPIO can be enabled using the SET GPIO SPEC or SET GPIO
SPECM command as detailed in the Advanced Configuration chapter of this manual.

Chapter 6
Advanced Configuration

The SX-582 module is equipped with a default configuration that works with most serial-to-Ethernet connections. You can modify the settings to suit your installation requirements.
The web browser interface is the recommended method for setting advanced configuration parameters.

Factory Default Settings

Table 13 displays the configuration parameter descriptions and settings with the default settings indicated in a separate column.

Table 13 Factory Default Settings

Parameter	Description	Settings	Default Setting
Character	Bits per character	7, 8	8
Flow	Flow control	None, Xon, Xoff, CTS/RTS	None
Parity	Parity	None, Even, Odd, Mark, Space	None
Speed	Baud rate of bits per second	300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600, 3000000	115200
Stop	Stop bits per character	1, 2	1
Mode	Line mode or serial port protocol	232, Disabled	232
Ecable	ECable mode for TCP connections	Enable, Disable	Disable
Ecaddr	ECable destination IP address	Set by user	N/A
Econn	ECable connection attempt time	1-255 seconds	30 seconds
Ecport	ECable destination TCP port number	Set by user	N/A
Eclport	ECable destination local IP port number (required for E-Cable UDP mode only)	Set by user	N/A

Parameter	Description	Settings	Default Setting
Ectmmsec	Cable connection time resolution	Enable, Disable	Disable
Ecudp	ECable UDP mode	Enable, Disable	Disable

Restoring Factory Default Settings

The factory default settings can be restored at any time. If you are using the SX-582-6900
Evaluation daughter card, hold down the test button (SW2) for more than five seconds. If you are
not using the evaluation board, drive GPIO0 on the OEM header low (4.7 K-ohm pull-up resistor
connected to
+3.3VDC) for more than five seconds.

Modifying TCP/IP Settings

You can modify the TCP/IP settings using the web browser interface or the SX-582 module's
internal configuration console.

To modify TCP/IP settings:
1.   Access the web page of SX-582 and click **TCP/IP** on the left menu. The TCP/IP configuration window
will appear.
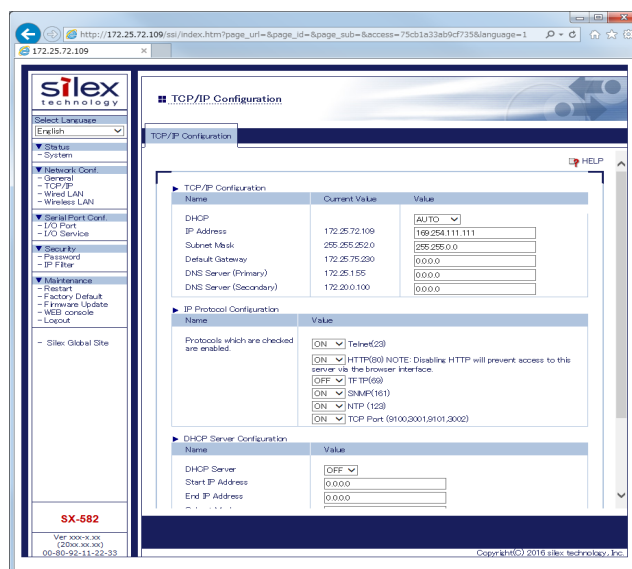
Figure 7 TCP/IP Configuration Window

2. Verify the settings, as defined in Table 14.

Table 14 TCP/IP Settings

Parameter	Setting
DHCP	Sets an IP address configuration method by selecting from **DHCP** (obtaining from the DHCP server), **STATIC** (assigning a static IP address manually) or **AUTO** (try to find a DHCP server first, use Static settings if DHCP fails). To assign an IP address using DHCP, a DHCP server must be running in your subnetwork.
IP Address	Sets an IP address. The value must be 4 numbers separated by dots and expressed in the format [xxx.xxx.xxx.xxx].
Subnet Mask	Sets the address of the subnet mask. The subnet mask must follow the format XXX.XXX.XXX.XXX, where each XXX is a number between 0 and 255. The default subnet mask is 255.255.0.0.
Default Gateway	Sets the default gateway, if your network is attached to other networks.
DNS Server (Primary/Secondary)	Sets the Primary/Secondary DNS server address when it is necessary.

3. To change the Telnet/HTTP password, click *Password* on the left menu. The Password configuration window will appear.
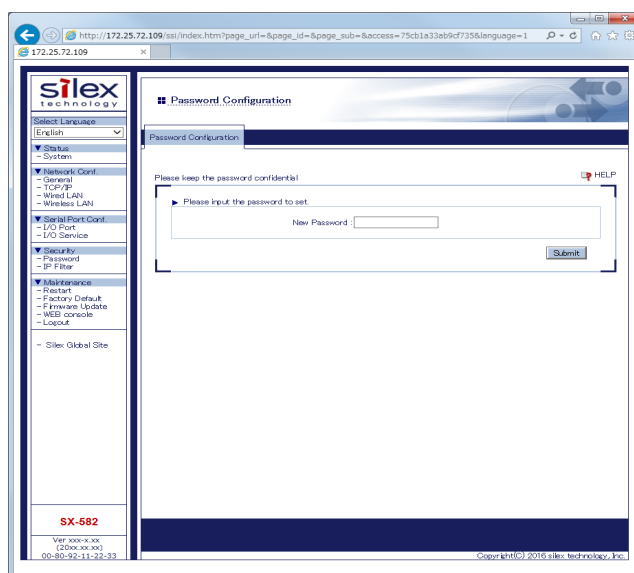
Figure 8 Password Configuration Window

Type the new password in the *New Password* field and click *Submit* to change the password.

Configuring the General Purpose I/O (GPIO) Lines

The SX-582 module has eleven General Purpose I/O (GPIO) lines available for use on the OEM interface connector. These GPIO lines are individually programmable for input, output, or special purpose. By default, five of the GPIO lines are configured for special purpose use.

The GPIO direction, is configured from the Internal Configuration Console interface.
The following tables describe the GPIO Commands.

Table 15 GPIO General Commands	
Command	**Description**
SET GPIO DIR [IN|OUT] <gpio-num> <gpio-num> = {0-10}	Sets GPIO signal to be an input or an output. The setting only takes effect if the GPIO signal is not selected for special function operation. <gpio-num> must be in the range 0-10. NOTE: The direction bit configuration is not changed by a configuration reset to default.
SHOW GPIO DIR	Shows current setting of the GPIO direction configuration.

Example:

```
GPIO Direction
--------------
0 [SPCL]
1 [SPCL]
2 [SPCL]
3 [SPCL]
4 [SPCL]
5 [IN]
6 [IN]
7 [IN]
8 [IN]
9 [IN]
10 [IN]

Local> set gpio dir out 5

Local> sh gpio dir

GPIO Direction
--------------
0 [SPCL]
1 [SPCL]
2 [SPCL]
3 [SPCL]
4 [SPCL]
5 [OUT]
6 [IN]
7 [IN]
8 [IN]
9 [IN]
10 [IN]
```

Table 15 GPIO General Commands	
Command	**Description**

SET GPIO DIRM <bit-mask>	Sets all direction control bits, where <bit-mask> is a 16 bit mask expressed as up to 4 hex digits. This value should be in the range 000-3FF. The mask is encoded as follows:
	
	`10  ...        0`
	`GPIO10 ... GPIO0`
	
	A value of 1 sets the corresponding GPIO line to be an output. A value of 0 sets the GPIO line to be an input. For example, a hex value of 80 sets GPIO8 as an output, all other GPIO signals are input.
	
	NOTE: The direction bit configuration is not changed by a configuration reset to default.

SHOW GPIO DIRM <bit-mask>	Shows all direction control bits

Example:
 	
`    Local> sh gpio dirm`
`    GPIO direction mask=20`	

SET GPIO SPECIAL [EN | DIS]	Sets a single special function control bit. This command enables or disables the special function of the GPIO signal specified. <gpio-num> must be in the range of 1-5. The special functions are as follows: GPIO_0 Pushbutton input GPIO_1 Status LED GPIO_2 DTR0 (Serial Port 1 DTR output) GPIO_3 DSR0 (Serial Port 1 DSR input) GPIO_4 DCD0 (Serial Port 1 DCD input) NOTE: The special function bit configuration is not changed by a configuration reset to default.
SHOW GPIO SPECIAL	Shows the current setting of the GPIO special function configuration.

Table 15 GPIO General Commands

Command	Description
Example: ``` Local> sh gpio special GPIO Special Functions ---------------------- GPIO #0 is special GPIO #1 is special GPIO #2 is special GPIO #3 is special GPIO #4 is special GPIO #5 is normal GPIO #6 is normal GPIO #7 is normal GPIO #8 is normal GPIO #9 is normal GPIO #10 is normal ```	
SET GPIO SPECM <bit-mask>	Sets all special function control bits. <bit-mask> is a 16-bit mask expressed as 4 hex digits. This value should be in the range 0000-001F. The mask is encoded as follows: ``` 7 6 5 4 3 2 1 0 GPIO4 GPIO3 GPIO2 GPIO1 GPIO0 ``` A value of 1 enables the special function on the corresponding GPIO signal, a value of 0 disables the special function. For example, a hex value of 08 sets GPIO3 for a special function, all other GPIO signals for general use. NOTE: The special function bit configuration is not changed by a configuration reset to default. This command has no effect on GPIO 5-10, which do not have special functions.
SHOW GPIO SPECM	Shows GPIO special functions control bits as a mask value.
Example: ``` Local> sh gpio specm GPIO special function mask = 1f ```	

Table 16 GPIO Data Commands	
Command	**Description**
SET GPIO DATA <bit-mask>	Sets all the data out control bits.

	<bit-mask> is an 11 bit mask expressed as up to 4 hex digits. This value should be in the range 00-3FF. The mask is encoded as follows:
	
	`10  ...        0`
	`GPIO10 ... GPIO0`
	
	Each GPIO output bit is set to the corresponding value in the mask. If a GPIO signal is set as an input, the value has no effect. If a GPIO signal is set for a special function, the bit value given is ignored. For example, a hex value of 80 sets GPIO7 to a 1 (high), all other GPIO signals to low, except those set as special functions.
	
	NOTE: The default output bit value on power up or reset is 0 for all GPIO output signals.

SHOW GPIO DATA	Shows the current state of the GPIO input signals.

Example:
 	
`    Local> sh gpio data`
 	
`    GPIO Data In`
`    -------------`
`    GPIO #0 [1]`
`    GPIO #1 [0]`
`    GPIO #2 [0]`
`    GPIO #3 [1]`
`    GPIO #4 [1]`
`    GPIO #6 [1]`
`    GPIO #7 [1]`
`    GPIO #8 [1]`
`    GPIO #9 [1]`
`    GPIO #10 [1]`
 	
`    GPIO Data Out`
`    -------------`
`    GPIO #5 [0]`	

Chapter 7
Product Specifications

Table 17 Product Specifications

Component	Specifications
Model	SX-582 module
Dimensions	55 x 30 x 9.25 mm (2.17 x 1.18 x 0.36 inches)
Processor	Freescale MCIMX280CVM4B
RAM Memory	64 Mbytes DDR2 SDRAM
Operating Voltage	5 VDC
Processor Speed	454 MHz at full power
Radio/Baseband	Qualcomm Atheros AR6234
Ethernet	10/100 Mbps Ethernet MAC+PHY
Interfaces Supported	Serial: 3 x UART (RS-232 w/ external transceivers); one port is dedicated as a console port USB 2.0 (480MHz) OTG x 1 USB 2.0 (480MHz) Host x 1 Serial Peripheral Interface (up to 45MHz) IIC (requires user-written driver and support chip)

Table 18 Radio Specifications

Parameter	Specifications
Radio Emission Type	IEEE 802.11 a, b, g, n, e, h, i
Operating Frequency	2.412 GHz ~ 2.472 GHz (11b, 11g, 11ng) 5.180 GHz ~ 5.825 GHz (11a, 11na)
Data Modulation Type	IEEE802.11b : DSSS(CCK,DQPSK,DBPSK) IEEE802.11g/ng : DSSS-OFDM (64QAM,16QAM,QPSK,BPSK) IEEE802.11a/na : OFDM(64QAM,16QAM,QPSK,BPSK)

Table 18 Radio Specifications	
Parameter	**Specifications**

Channel Number	(US)
	 2.4GHz : 1-11ch
	 5GHz : (W52) 36, 40, 44, 48ch
	           (W53) 52, 56, 60, 64ch
	           (W56) 100, 104, 108, 112, 116, 132, 136, 140ch
	           (W58) 149, 153, 157, 161, 165ch
	
	(JP/DE)
	 2.4GHz : 1-13ch
	 5GHz : (W52) 36, 40, 44, 48ch
	           (W53) 52, 56, 60, 64ch
	           (W56) 100, 104, 108, 112, 116, 120, 124, 128, 132, 136,
	                   140ch
	
	* Channels 52-64 and 100-140 can be used only when running in Infrastructure(station) mode.

Data Rate	IEEE802.11a
	 6M / 9M / 12M / 18M / 24M / 36M / 48M / 54M (Auto-sensing)
	IEEE802.11b
	 1M / 2M / 5.5M / 11M (Auto-sensing)
	IEEE802.11g
	 6M / 9M / 12M / 18M / 24M / 36M / 48M / 54M (Auto-sensing)
	IEEE802.11n
	 20MHz : 6.5M / 7.2M / 13M / 14.4M / 19.5M / 21.7M / 26M / 28.9M /
	         39M / 43.3M / 52M / 57.8M / 58.5M / 65M / 72.2M (Auto-sensing)
	 40MHz(5GHz only) :
	         13.5M / 15M / 27M / 30M / 40.5M / 45M / 54M / 60M / 81M /
	         90M / 108M / 120M / 121.5M / 135M / 150M (Auto-sensing)

Security	WEP64/128, WPA-PSK/WPA2-PSK, WPA-EAP/WPA2-EAP(LEAP / PEAP / TLS / TTLS / EAP-FAST)
Media Access Protocol	Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) with ACK architecture, 32 bits MAC-layer.
Antenna Connector Type	2 U.FL connectors
Operating Voltage	3.3 VDC
Bus Interface	SDIO

TCP Port Connections

The SX-582 module supports port connections over TCP/IP using raw TCP ports as well as Telnet based RFC2217 compliant ports. Table 19 describes the TCP ports allocations.

Table 19 TCP Port Connections

Port	Destination Device
3001	RS-232 Serial Port 1 (S1)
9100	RS-232 Serial Port 1 (S1)
9200	RFC 2217 Serial Port 1 (S1)
3002	RS-232 Serial Port 2 (S2) *
9101	RS-232 Serial Port 2 (S2) *
9201	RFC 2217 Serial Port 2 (S2) *

NOTE:
By defaults, Serial Port 2 cannot be used for a raw TCP connection. You need to switch the SX-582 module to the serial server mode using **SET PORT S2 Console** command.

Appendix A
Wireless Security Configuration

There are numerous possible security settings. It is therefore important that you verify the appropriate settings with your network administrator. If you enter the settings incorrectly, the SX-582 will not be able to communicate on your network. The following table summarizes the wireless settings required for each encryption mode and authentication type:

Table 20 List of security settings can be configured from the web

Network Authentication	Encryption	Authentication
Open	None / WEP	None
WPA-Personal	AUTO / TKIP	WPA Pre-Shared Key
WPA2-Personal	AES	WPA Pre-Shared Key
802.1X	None / WEP	LEAP/EAP-TLS/EAP-TTLS/PEAP/EAP-FAST
WPA-Enterprise	AUTO / TKIP	LEAP/EAP-TLS/EAP-TTLS/PEAP/EAP-FAST
WPA2-Enterprise	AES	LEAP/EAP-TLS/EAP-TTLS/PEAP/EAP-FAST

The SX-582 wireless configuration web page automatically navigates through the security setting combination.

1. Select Operating Mode (Access Point or Infra.)

2. Select Network Authentication mode. For details, refer to "Network Authentication" in next page.

> **NOTE!**
> **- When Access Point mode is selected, it is impossible to select 802.1X, WPA-Enterprise and WPA2-Enterprise, since Enterprise is disabled.**

3. Select encryption mode. For "Open" and "802.1X" mode, None or WEP can be selected. For WPA-Personal and WPA-Enterprise mode, AUTO or TKIP can be selected. For WPA2-Personal and WPA2-Enterprise mode, AES is only encryption can be selected.

4. Enter encryption key if you choose WEP. WEP key must be configured as 26 character hexadecimal string.

5. Enter WPA Pre-Shared Key (also known as passphrase) if you choose WPA/WPA-Personal. PSK is 8 to 64 character ASCII string.

6. Configure EAP mode if you choose 802.1X or WPA/WPA2-Enterprise. Refer to EAP descriptions below for detail.

Network Authentication
You can choose following Authentication modes with *Infrastructure* mode. Authentication mode must be the same as that of Access Point you want to connect.

- *Open:* Allows all access without authentication. For encryption mode, WEP can be used.
- *WPA-Personal/WPA2-Personal:* Uses PSK for network authentication. For encryption mode, AUTO/TKIP/AES can be selected. The encryption key will be generated by communicating with the Access Point using a Pre-Shared key.
- *802.1X:* Uses EAP for network authentication. For encryption mode, WEP can be used.
- *WPA-Enterprise/WPA2-Enterprise*: Uses EAP for network authentication. For encryption mode, AUTO/TKIP/AES can be selected.

On console command, SET NW AUTH and SET NW ENC are equivalent to the Network Authentication on WEB configuration. However the security categorization is different between web and console. The tables below show the console AUTH / ENC settings and corresponding web configuration.

Table 21 Console AUTH parameter and corresponding web configuration

console AUTH	web configuration
OPEN	Open
TLS	802.1X/WPA-Enterprise/WPA2-Enterprise
EAP-FAST	802.1X/WPA-Enterprise/WPA2-Enterprise
TTLS	802.1X/WPA-Enterprise/WPA2-Enterprise
LEAP	802.1X/WPA-Enterprise/WPA2-Enterprise
PEAP	802.1X/WPA-Enterprise/WPA2-Enterprise
PSK	WPA-Personal/WPA2-Personal

Table 22 Console ENC parameter and corresponding web configuration

console ENC	web configuration
DI	None (WEP OFF)
128	WEP (WEP ON)
WPA	WPA-Personal/WPA-Enterprise + TKIP
WPA2	WPA2-Personal/WPA2-Enterprise + AES
WPA2-WPA	WPA-Personal/WPA-Enterprise + AUTO

WEP Key Index
This parameter selects which of the four possible WEP keys will be used as the transmit key (the first key is the default). Select the desired key number from the pull down menu on the *Wireless LAN Configuration* screen in the SX-582 internal web pages, or use the console command SET NW KEY# *n*, where n is 1, 2, 3, or 4.

WEP Key Value
Up to four keys can be entered if you are using WEP security. The value of the keys must be entered as 26 characters of hexadecimal string (for example, 0123456789ABCDEF0123456789. This is just an example - DO NOT use it for real operation). You have to configure the WEP key which matches with your Access Point configuration.
Enter the desired key value(s) on the *Wireless LAN Configuration* screen in the SX-582 internal web pages, or use the console command SET NW KEYVAL <key>, where <key> is 26 hex digits for WEP128. Note that already configured WEP key is shown as "***" on the web.

WPA Encryption Mode
This parameter sets the type of encryption mode to be used with WPA/WPA2 authentication. Select the desired encryption mode from AUTO/TKIP for WPA. If your Access Point is configured to WPA-AES (or WPA-CCMP, which is essentially the same meaning), please select "AUTO". For WPA2, encryption mode is fixed to AES.

WPA Pre-Shared Key

If you choose WPA/WPA2-Personal, Pre-Shared Key (PSK) must be configured. The PSK can be specified as 64 character length hexadecimal string, or as 8 to 64 characters variable length ASCII string (Passphrase). In the latter case, the encryption key is generated from the passphrase. In either case, the PSK or Passphrase must match the configuration of the Access Point to which you want to connect. The Pre-Shared key value can be configured from the *Wireless LAN Configuration* screen in the SX-582 internal web pages, or use the console command SET NW WPAPSK <psk>, where <psk> is the key. Note that already configured WPA PSK is shown as "****" on the web.

EAP Authentication Mode
When you choose either 802.1X, WPA-Enterprise or WPA2-Enterprise, EAP Authentication must be configured. SX-582 supports LEAP, EAP-TLS, EAP-TTLS, PEAP and EAP-FAST. EAP mode can be selected from *Wireless LAN Configuration* screen in the SX-582 internal web pages or the console command, SET NW AUTH can be used as described in table A-2.

EAP User Name
This parameter is the logon user ID that the SX-582 uses to authenticate to the 802.1x-enabled network. The user ID and password must be in the authentication server database. The default user ID is 'anonymous'. Enter the user ID on the *Wireless LAN Configuration* screen in the SX-582 internal web pages, or use the console command SET NW ID <user id>, where <user id> is the user ID (the realm can included in the user id with the separator "@").

Realm
A realm defines a grouping of users. If a realm is required for your network, it is separated from the user ID by a '@' character. A realm makes it easier to segregate user groups into independently administered databases, to apply policies on a user group basis, and to establish roaming agreements. The default realm if not specified is 'anonymous'. Enter the realm on the *Wireless LAN Configuration* screen in the SX-582 internal web pages, or use the console command SET NW REALM <realm>, where <realm> is the name of the realm.

EAP Password
This parameter is the logon password that the server uses to authenticate to the 802.1x-enabled network, except EAP-TLS. The user ID and password must be in the authentication server database. The password may be a text string, or a string of hex bytes. Enter the password on the *Wireless LAN Configuration* screen in the SX-582 internal web pages, or use the console command SET NW PW <password>, where <password> is the password (default value is *anonymous*). Note that already configured EAP Password is shown as "****" on the web.

Inner Authentication
This parameter determines how the server authenticates itself to the 802.1x-enabled network with EAP-TTLS, after an 802.1x session is established. The default is PAP; MSCHAPv2 is the alternative protocol. Select the desired protocol on the *Wireless LAN Configuration* screen in the SX-582 internal web pages, or use the console command SET NW INAP <password>, where <password> is PAP or MSCHAP_V2. Note that it is shown on web as "MSCHAPv2" but the console parameter is "MSCHAP_V2".

CA Certificate
A CA (Certification Authority) certificate is used with EAP-TLS, EAP-TTLS, EAP-PEAP and EAP-FAST. Loading the CA certificate ensures that the SX-582 is connecting to an approved Access Point (i.e. not a rogue Access Point). A CA certificate is generated by the network administrator in order to configure an Authentication Server (also known as a RADIUS). You can upload the CA Certificate using the *Wireless LAN Configuration* screen in the SX-582 internal web pages. The SX-582 accepts certificates in PEM format only.

Client Certificate
A Client certificate is used with EAP-TLS to authenticate the SX-582 to the network infrastructure. It is functionally similar to the EAP password, and that is why EAP-TLS does not require EAP password. Similarly to the CA Certificate, the Client Certificate usually generated by the network administrator, as well as the corresponding Secret Key File.
You can upload the Client Certificate using the *Wireless LAN Configuration* screen in the SX-582 internal web pages. The SX-582 accepts certificates in PEM format only.

Client Certificate Secret Key File
The Secret Key must match the Client Certificate. Both are generated together and must be configured together.
You can upload the Client Certificate Secret Key using the *Wireless LAN Configuration* screen in the SX-582 internal web pages. The SX-582 accepts the Secret Key file in PEM format only. Unlike the certificate, the Secret Key File is encrypted and protected by a password so the password also must be provided.

Self Signed Certificate
Instead of uploading an externally generated certificate and private key, the SX-582 can create a Self Signed Certificate and corresponding private key for use in authentication operations. A Self Signed Certificate is internally generated by SX-582 itself, and thus it is easier to maintain but considered to be less secure than importing an externally generated Client Certificate, because it is not digitally signed by a Certificate Authority.
If you want to use self signed certificate, push "Generate Certificate…" button on *Wireless LAN Configuration* screen in the SX-582 internal web pages. It will open a new screen to create certificate. There is several information you can specify;

- **Certificate Common Name**
- **Organization name**
- **Organization unit**
- **City name**
- **State name**
- **Country name**
- **Key Size (1024, 2048)**

The "Submit" button will generate the Self-Signed Certificate and redisplay the *Wireless LAN Configuration* screen. Note that previous changes will be lost if you have not pushed the "Submit" button on Wireless LAN Configuration.
You can download the Client Certificate file by "Download" button on *Wireless LAN Configuration* screen.

Appendix B
Console Commands

1. Introduction and command console access information

The Silex technology SX-582 embedded servers support a sophisticated command-line oriented console for configuration and management. The console includes some features that are not available through other configuration methods. The console can be accessed via TELNET, the server's serial data port, the server's dedicated configuration console port, the server's Linux console port using the 'console' utility, or through the console page on the internal web server. The general configuration procedure is the same regardless of which method is used, unless specifically noted.
The general configuration procedure is the same, regardless of which method is used.

In the descriptions below, the capitalized portions of commands indicates the minimum portion of the command token that must be entered for the command to be recognized.

The console accepts multiple commands for some functions. The following can be used interchangeably:

SEt, DEFine, CHange   Set a value
DEl, CLear, PUrge   Remove a value

2. Network Commands

This group of commands configures network parameters.

2.1   SH NW

Displays summary network information

sample output:
```
Local> SH NW

WiFi Mode = INFRASTRUCTURE
WiFi SSID: SQRT

Current rate  = 72 Mbps
WiFi FW Ver = Host 31010233, Radio 30000582
Authentication type= OPEN SYSTEM

Encryption is Disabled
AP MAC Address = 64 AE 0C 01 86 C0
Signal Quality = Excellent (100%)
Connected to SSID SQRT on channel 3
```

2.2   SET NW CHannel

Sets a wireless channel to use for *Access Point* mode.

```
SET NW CHannel n
```

The default channel number is 11.

NOTE:
The actual channels available depends on the radio installed in the unit and the current mode of operation.
This value is used in *Access Point* mode. It is ignored in *Infrastructure* mode.

SH NW CHannel displays the currently configured channel number.

2.3   SET NW DISCONN

This command sets the wireless disconnect timer setting.

```
SET NW DISCONN nn
```

nn is a time period in seconds. The range for nn is 0-255.
The factory default value is 4 seconds.

When the radio loses connection to the AP, it attempts to re-establish the connection for the specified time (in seconds) before it sends a disconnect message to the SX-570 controller. If the timer value is set to zero, autonomous roaming is disconnected and the radio will not automatically scan for a new suitable AP to which to connect.

SH NW DISCONN shows the currently configured disconnect timer setting.

2.4   SET NW MOde

Sets wireless LAN mode

```
SET NW MOde   [Infrastructure | AP]
```

The default mode is *Infrastructure*.

SH NW MODE will display the current wireless mode.

2.5   SET NW RADio

Sets the wireless LAN Radio Mode

```
SET NW RADio   [ 802.11a-n | 802.11b-g-n | 802.11a-b-g-n]
```

The radio can be configured to use all frequencies, or only the 2.4GHz frequencies (802.11b-g-n) or only the 5GHz frequencies (802.11a-n). The default value is 802.11a-b-g-n.

Note. This command is not supported in access point mode.

SH NW RADio will display the currently configured radio mode.

2.6   SH NW RATE

Shows the current wireless link rate.

```
SET NW RAdio    <mode>

Current rate  = 72 Mbps
```

This is an instantaneous value subject to change.

2.7   SET NW RTS

Sets WLAN RTS threshold

```
SET NW RTS     n
     n = 0-1500   (default = 0)
```

This sets the packet size at which the 802.11 RTS handshake is used for transmission.
If the value is set to zero, the 802.11 RTS handshake is disabled.

SH NW RTS will display the currently configured value.

2.8   SH NW SQ

Displays the current signal quality seen on a wireless network link.

```
sample output:
Local> SH NW SQ

Signal Quality  = 97
Signal Strength = -57
Noise Level     = -96
```

The Signal Quality value is a scaled value from 0 to 100 indicating the relative strength of the wireless link. The Signal Strength values is the current RSSI value computed for the connection.
When communication is lost from the connected AP, it takes approximately 1.5 sec to confirm that AP does not exist any longer. Therefore, the Signal Quality will become '0' in 1.5 sec.

2.9   SET NW SSid

Sets the target wireless LAN SSID

```
SET NW SSid    <name>
     User defined    (default = printer)
```

2.10   DEL NW SSid

Sets the wireless LAN SSID to the null sting

```
DEL NW SSid
```

3. Wireless Network Security Commands

This group of commands configures wireless network security parameters

3.1   SET NW AUTHtype

Sets WLAN Authentication type

```
SET NW AUTHtype [OPEN  | TLS | TTLS | LEAP | PEAP | EAP-FAST | PSK]
```

The default setting is Open System.
Access Point mode can use only OPEN and PSK.

SH NW AUTHtype will show the currently configured value.

3.2   DEL NW CERTS

Removes any authentication certificates that have been loaded into the module.

```
DEL NW CERTS
```

Deletes any host certificates or client certificate/private keys currently configured on the module.
This includes dynamically provision EAP-FAST PACs. This returns the certificate settings to the factory
default condition (nothing present).

3.3   SET NW ENC

Sets the wireless LAN Encryption Mode.

```
SET NW ENC  [DISable | 128 | WPA | WPA2 | WPA2-WPA  ]
```

Supported modes are DISabled (none) 128 (128bit WEP), WPA (TKIP) and WPA2 (AES).
WPA2-WPA mode supports either AES or TKIP encryption in WPA systems.
The default setting is Disabled (no encryption).
Access Point mode cannot use 128.

SH NW ENC will show the currently configured encryption mode.

3.4   SET NW ID

Sets Authentication User ID This may include the realm, separated by a '@' character.

```
SET NW ID   <user id>
```

The default user ID is "anonymous".
Note: The default realm is a null (blank) string

SH NW ID will show the currently configured value.

3.5   SH NW WLLIST

Display wireless LAN networks visible to the module. Only access points which are broadcasting their SSID will be displayed. 'Hidden' access points will not be visible.

Local> SH NW WLLIST

```
"OFFICE-2F"    00:80:92:01:02:03 -40  1   11ng  AP     WPA2-PSK AES
"MeetingRoom1" 00:80:92:04:05:06 -82  13  11ng  AP     WPA-EAP  TKIP
"Suzuki"       00:80:92:07:08:09 -53  6   11ng  Ad-Hoc OPEN     NONE
"DiningHall"   00:80:92:0A:0B:0C -63  11  11g   AP     WPA2-PSK TKIP/AES
```

3.6   SET NW KEY#

Selects WLAN WEP key entry

```
SET NW KEY#    n
    n = 1-4    (default = 1)
```

3.7   SET NW KEYNUM

Selects WLAN WEP key entry (same as SET NW KEY#)

```
SET NW KEYNUM    n
    n = 1-4    (default = 1)
```

3.8   SET NW KEYVAL

Sets the currently selected WLAN WEP key entry to the hex value given.

```
SET NW KEYVAL <key>
      key = 26 hex characters (default=<null>)
```

3.9   SET NW PW

Sets the password used for the 802.1x EAP authentication, if enabled.

```
SET NW PW   <password>
      (default = anonymous)
```

3.10   SET NW PEAPGTC

Test command to force PEAP to use GTC in phase 2 of the authentication handshake.

```
SET NW PEAPGTC [ENable | DISable]
```

The default value is DISable.
This command is only valid if the authentication type is set to PEAP. This is intended for protocol testing, and should generally be left disabled for normal operation.

SH NW PEAPGTC will display the current setting of this configuration item.

3.11   SET NW PEAPMSchap

Test command to force PEAP to use MSCHAP in phase 2 of the authentication handshake.

```
SET NW PEAPMSchap [ENable | DISable]
```

The default value is DISable.
This command is only valid if the authentication type is set to PEAP. This is intended for protocol testing, and should generally be left disabled for normal operation.

SH NW PEAPMSchap will display the current setting of this configuration item.

3.12 SET NW PEAPV0

Test command to force PEAP to use the version 0 protocol.

```
SET NW PEAPV0 [ENable | DISable]
```

The default value is DISable.
This command is only valid if the authentication type is set to PEAP. This is intended for protocol testing, and should generally be left disabled for normal operation.

SH NW PEAPV0 will display the current setting of this configuration item.

3.13 SET NW PKPASS

Sets the password for a private key password file to be loaded into the unit.

```
SET NW PKPASS <passphrase>
      (default = null string)
```

This value must be set before the key file is loaded, or the file will not be able to be decrypted properly.

3.14 SET NW REALM

Sets the realm portion of the 802.1x EAP authentication ID

```
SET NW REALM   <realm>
```

The default realm is the null string.
This may also be set with the ID command by appending the realm after a '@' character.

SH NW REALM will display the currently configured ID realm.

3.15 SET NW SSCCITY

Sets the city location for a self signed certificate to be generated.

```
SET NW SSCCITY <city string>
      (default = Salt Lake City)
```

NOTE: This value is volatile, it will be lost when the unit is reset or power cycled.

3.16   SET NW SSCCOMNAME

Sets the common name for a self signed certificate to be generated.

```
SET NW SSCCOMNAME <common name string>
        (default = MACaabbccddeeff, where aabbccddeeff is the MAC address of the unit)
```

NOTE: This value is volatile, it will be lost when the unit is reset or power cycled.

3.17   SET NW SSCCOUNTRY

Sets the country location for a self signed certificate to be generated.

```
SET NW SSCCOUNTRY <country string>
      (default = US)
```

NOTE: This value is volatile, it will be lost when the unit is reset or power cycled.

3.18   SET NW SSCGEN

Generate a self signed certificate using the current SSC parameters.

```
SET NW SSCGEN
```

The certificate and associated private key will be stored as the active client key and certificate for this unit. Any previous private key and local certificate will be deleted by this action.

3.19   SET NW SSCKEYSIZE

Sets the key size (in bits) for a self signed certificate to be generated.

```
SET NW SSCKEYSIZE  n
      (default = 1024)
```

The value must be 1024 or 2048.
NOTE: This value is volatile, it will be lost when the unit is reset or power cycled.

3.20   SET NW SSCORGNAME

Sets the organization name for a self signed certificate to be generated.

```
SET NW SSCORGNAME <organization name string>
      (default = silex technology america)
```

NOTE: This value is volatile, it will be lost when the unit is reset or power cycled.

3.21   SET NW SSCORGUNIT

Sets the organizational unit for a self signed certificate to be generated.

```
SET NW SSCORGUNIT  <organizational unit string>
      (default = silex)
```

NOTE: This value is volatile, it will be lost when the unit is reset or power cycled.

3.22   SET NW SSCSTATE

Sets the state location for a self signed certificate to be generated.

```
SET NW SSCSTATE <state string>
      (default = UT)
```

NOTE: This value is volatile, it will be lost when the unit is reset or power cycled.

3.23   SET NW WPAPSK

Sets the WPA PSK pass phrase or hex key.

```
SET NW WPAPSK <key>
```

This value is only used if the authentication mode is WPA-PSK. The argument to this command is either a pass phrase of 8-63 characters, or exactly 64 hex characters representing the 256 bit PSK value.

4. Wireless Network Roaming Control

4.1   SET NW BGSCAN

Sets wireless background scan interval in seconds

```
SET NW BGSCAN <seconds>
           (default = 60)
```

>   SH NW BGSCAN will display the currently configured background scan interval.

4.2   SET RM

Enable or disable custom roaming control.

```
SET RM [ENable | DISable ]
           (default = DISable)
```

SH RM will display the current custom roaming parameter settings.

4.3   SET RM SCAN NORM

Sets normal wireless background scan interval in seconds

```
SET RM SCAN NORM <seconds>
```

This value is only valid if custom roaming is enabled. This defines the background scan interval when the current connection has normal receive quality, above the low threshold defined.

4.4   SET RM SCAN LOW

Sets low quality link background scan interval in seconds

```
SET RM SCAN LOW <seconds>
```

This value is only valid if custom roaming is enabled. This defines the background scan interval when the current connection has low receive quality, below the low threshold and above the critical threshold defined.

4.5   SET RM THRESH LOW

Sets the value for defining a low connection strength

```
SET RM THResh LOW <RSSI>
```

This value is only valid if custom roaming is enabled.   This defines the level at which a connection is considered low quality. The <RSSI> value can be a negative value greater than -95, in which case it represents an absolute RSSI value as seen by the radio. The <RSSI> value can also be a positive value, in which case it is interpreted as the distance above the noise floor – absolute low value = noise_floor + <RSSI>.

4.6   SET RM THRESH CRITical

Sets the value for defining a critically low connection strength

```
SET RM THResh CRITical <RSSI>
```

This value is only valid if custom roaming is enabled.   This defines the level at which a connection is considered critically low quality. The <RSSI> value can be a negative value greater than -95, in which case it represents an absolute RSSI value as seen by the radio. The <RSSI> value can also be a positive value, in which case it is interpreted as the distance above the noise floor – absolute low value = noise_floor + <RSSI>.

5. Wireless to Ethernet Client Bridging Configuration

5.1 SET NW BRACCess

Enables or disables access to the configuration via the wired Ethernet interface in bridge mode.

```
SET NW BRACC [ENable | DISable ]
```

The default setting is enabled.
If enabled, the attached client device can access the configuration functions, such as the console, the telnet or web interface, via the Ethernet interface when bridging is enabled. If disabled, this access is not available.

5.2 SET NW BRCLADDR

Sets the MAC address to use for static bridge mode.

SET NW BRCLADDR <MAC address>

The default value is 00-00-00-00-00-00.
In static bridge mode, the address given is used as the radio MAC address for the wireless interface. It auto mode, this value is ignore.

<MAC address> may be in the format aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff.

SH NW BRCLADDR will show the currently configured static bridge MAC address.

5.3 SET NW BRIDGE

Sets the Bridge Mode.

```
SET NW BRIDGE [MULti | ENable | DISable ]
```

To use Multi-Client Mode, set **MULti**.
To use Single Client Mode, set **ENable**.
When the Bridge Mode is not used, set **DISable**.
The default value is disabled.

5.4   SH NW BRIDGE

Displays information about the current bridge configuration.

```
Local> SH NW BRIDGE
Bridge mode is disabled.
```

5.5   SET NW BRSTATIC

Enables or disables the static MAC bridge mode of operation.

```
SET NW BRSTATIC [ENable | DISable ]
```

The default setting is disabled.
If enabled, the wireless interface uses the client MAC address configured (see SET NW BRCLADDR). If disabled, the wireless interface waits for a packet to be received from the wired interface, and uses that as the source MAC address of packet.

5.6   SH NW BRFILTER

Shows the current setting for Multi-Client bridge connection filter.

```
Local> SH NW BRFILTER
Bridge Device Filter Disabled.
```

5.7   SET NW BRFILTER

Enables or disable the Multi-Client bridge connection filter.

```
SET NW BRFILTER [ ENable | DISable ]
```

5.8   SET NW BRFILTERADDR

Registers the address of devices not to be connected to wireless LAN when the device filter is set to **Enable**.

```
SET NW BRFILTERADDR <NUM> <MAC address>
```

<NUM>: Specify the index (0-15).
        Up to 16 addresses can be registered.

When the device filter is set to Disable:
- All devices will be connected to wireless LAN when they are connected to wired LAN port of Evaluation
  daughter card via HUB.
- IEEE802.11X device authentication cannot be used.

<MAC address> may be in the format aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff.
        When 00-00-00-00-00-00 is set, the filter is disabled.

5.9   SH NW BRFILTERADDR

Shows the addresses of registered devices.

```
Local> SH NW BRFILTERADDR

aa-bb-cc-dd-ee-ff
aa-bb-cc-dd-ee-ff
aa-bb-cc-dd-ee-ff
aa-bb-cc-dd-ee-ff
aa-bb-cc-dd-ee-ff
aa-bb-cc-dd-ee-ff
aa-bb-cc-dd-ee-ff
aa-bb-cc-dd-ee-ff
aa-bb-cc-dd-ee-ff
aa-bb-cc-dd-ee-ff
aa-bb-cc-dd-ee-ff
aa-bb-cc-dd-ee-ff
aa-bb-cc-dd-ee-ff
aa-bb-cc-dd-ee-ff
aa-bb-cc-dd-ee-ff
aa-bb-cc-dd-ee-ff
```

"aa-bb-cc-dd-ee-ff" is the address of registered device.
Up to 16 addresses can be displayed. Only the registered addresses will be displayed. For those not
registered, 00-00-00-00-00-00 will be displayed.

6. Smart Wireless Setup

6.1   Smart Wireless Setup for station.

6.1.1   SET NW SWSPINCODE

Generate PINCODE Value

```
SET NW SWSPINCODE
```

The PIN code value generates a random value automatically.

SH NW SWSPINCODE will display the currently configured value.

6.1.2   SET NW SWSPBC

Execute PBC method

```
SET NW SWSPBC
```

6.1.3   SET NW SWSPBC NOWAIT

Execute PBC method, and not wait for completion.

```
SET NW SWSPBC NOWAIT
```

6.1.4   SET NW SWSPIN

Execute PIN method

```
SET NW SWSPIN
```

6.2   Smart Wireless Setup for AP

6.2.1   SET NW SWSPINCODE

Generate PINCODE Value

```
SET NW SWSPINCODE
```

The PIN code value generates a random value automatically.

6.2.2   SET NW APSWSPBC

Execute PBC method in Access Point mode.

```
SET NW APSWSPBC
```

6.2.3   SET NW APSWSPBC NOWAIT

Execute PBC method in Access Point mode, and not wait for completion.

```
SET NW APSWSPBC NOWAIT
```

6.2.4   SET NW APSWSPIN

Execute PBC method in Access Point mode.

```
SET NW APSWSPIN < Enrollee's PIN code >
```

6.2.5   SET NW APSWSCCAncel

Cancel Configured Status.

```
SET NW APSWSCCAncel
```

6.2.6   SH NW APSWSCSTatus

Display Configured Status.

```
SH NW APSWSCSTatus
```

7. Port Commands

7.1　Serial Port Commands

In the following commands, S1 is used as a stand in for any available serial port. If S2 is enabled for data port usage, it can also be used instead. If a command is port specific, it will be so noted.

7.1.1　SH PORT

Shows Port parameters

sample output:
```
Local> SH PORT

Port     Q-Size     Type       Attributes
 *S1          0     serial     115200 N 8 1 XON/XOFF RS232
```

7.1.2　SET PORT S1 CH

Sets the size of a character on the serial port

```
SET PORT S1 CHarsize [7 | 8]
     (default = 8)
```

7.1.3　SET PORT S2 COnsole

Enable or disable console mode on serial port 2

```
SET PORT S2 CONsole [ENable | DISable]
```

The default is enabled. This command is only valid on serial port 2.

7.1.4   SET PORT S1 CONSTR

This command sets the console mode string for the unit. If the serial port is in Trap mode, then if the string defined by this command is seen in the serial port input stream, then the serial port will enter console mode. In this mode, data from the serial port is sent to an instance of the configuration console task, and output from the configuration task is sent to the serial port. This allows the data serial port to be used to configure the unit.   If no string is defined, then this feature is disabled, and the data serial port cannot be used for configuration. The maximum length of the string is 31 bytes.

If non printing characters are desired in the string, then the value should be prefixed with "\x" and each byte should be defined with two hex characters. The binary equivalent of the two hex characters will be used when scanning the input for a match.

The value given does not take effect until the unit is reset. The default value of this string depends upon the particular product.

```
SET PORT S1 CONSTR
          This version of the command clears the string definition.

SET PORT S1 CONSTR +++
          This version of the commands sets the console mode string
          to "+++".

SET PORT S1 CONSTR \x1B1B
          The version of the command sets the console mode string to be
          two successive escape characters.
```

7.1.5   SH PORT S1 CONSTR

Show the current value of the console mode string for the unit.

If non printing characters are contained in the string, the string will be displayed prefixed with "\x" and each byte will be displayed as two hex characters.   If nothing is displayed, the console mode string is not currently defined.

```
Local> SET PORT S1 CONSTR
 +++

Local> SET PORT S1 CONSTR
\x1B1B
```

7.1.6   SET PORT S1 DTR

Set the DTR mode on serial port 1

```
SET PORT S1 DTR [CONN | HI | LOW]
```

If GPIO2 is set for special function, it drives the DTR0 signal on serial port 1. This command configures how the pin is to be driven.
If set to CONN, the pin will be set high if there is an active network link, and low if the network link is done.
If set to HI, the DTR signal will be set high.
If set to LOW, the DTR signal will be set low.
If GPIO2 is set as a GPIO pin, this value has no effect.
This command is only valid on serial port 1.

7.1.7   SET PORT S1 FLOW

Set serial port flow control to NONE, XON/XOFF, or CTS

```
SET PORT S1 FLOW [ NOne | XOn-xoff | CTS ]
      (default = None)
```

7.1.8   CLEAR PORT S1 JOB

This command aborts the currently active job on the port specified.

```
CL PORT S1 JOB
```

If the remote host is still connected, any further data received will be discarded.

7.1.9   SET PORT S1 LATENCY

Sets serial port latency value in milliseconds.

```
SET PORT S1 LAT <ms>
      (default = 25ms)
```

If non-zero, when characters are received on the serial port, the driver waits this many milliseconds more to see if additional characters will be received before sending the data to the network.

SH PORT S1 LATency will display the currently configured value.

7.1.10   SET PORT S1 PARITY

Set serial port parity to NONE, EVEN, ODD

```
SET PORT S1 Parity <parity>
      (Default = None)
```

7.1.11   SET PORT S1 SPeed

Sets serial port baud rate.

```
SET PORT S1 SPEED <baudrate>
      (default = 115200)
```

Options for <baudrate> are 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600 and 3000000.

7.1.12   SH PORT S1 STAtus

Shows status information about the serial port

```
Local> SH PORT S1 STAT

 Port   S1  status = On-line

Serial Device


3 bytes transmitted, 0 bytes received
0 framing errors, 0 parity errors, 0 overrun errors, 0 buffer overruns, 0 breaks
```

7.1.13   SET PORT S1 STOP

Sets serial port stop bits per character.

```
SET PORT S1 STOP [1 | 2]
      (default = 1)
```

7.2   ECable Port Commands

For products that support the silex E-Cable application, which provides automatic connection between the port and a remote host, the following commands are available.

7.2.1   SET PORT S1 ECABLE

Enable or disable E-Cable operation.

```
SET PORT S1 ECABLE [ENable | DISable]
        (default = DISabled)
```

7.2.2   SH PORT S1 ECABLE

Show the current E-Cable settings.

```
Local> SH PORT S1 ECABLE

E-Cable mode TCP
 E-Cable destination 192.168.5.28:3000
 Attempt connection every 5 seconds
E-Cable TCP connection is Down
```

7.2.3   SET PORT S1 ECADDR

Set primary E-Cable destination IP address.

```
SET PORT S1 ECADDR  <dest-addr>
        (default = 0.0.0.0)
```

This is the primary network address of the target host for data received on the I/O port.
The address may be entered as an IP address, or, if DNS is enabled on TCP mode, as a symbolic host address.
If set to zero, no data will be sent.

7.2.4   SET PORT S1 ECCONN

This parameter applies only in TCP mode. If the TCP connection is broken, or cannot be established, this parameter defines the time to wait before attempting to re-establish the connection.   The time units depend on the ECTMMSEC parameter below. The valid range is 1-255.

```
SET PORT S1 ECCONN n
        (default = 30)
```

7.2.5   SET PORT S1 ECLPORT

This parameter applies only in UDP mode. This is the port number of the local UDP port on the server to which remote hosts can send data intended for the I/O port. Only data from hosts whose IP address is configured as the primary or one of the optional secondary addresses will be accepted and passed to the I/O port – unless the primary and all secondary addresses are zero, in which case data from any host will be accepted. A port number of zero will disable reception.

```
SET PORT S1 ECLPORT n
      (default = n)
```

7.2.6   SET PORT S1 ECNHOST

This parameter applies only in UDP mode. This value sets the maximum number of remote hosts to which data can be sent, and from which data will be accepted.   If the value is changed, all currently configured secondary host information will be erased. The valid range is 1-255.

```
SET PORT S1 ECNHOST n
      (default = 1)
```

7.2.7   SET PORT S1 ECPORT

Set primary E-Cable port address.   Along with the primary IP address, this defines the remote destination for data received on the I/O port. If zero, no data will be sent.

```
SET PORT S1 ECPORT n
      (default = 0)
```

7.2.8   SET PORT S1 ECRADDR

This parameter applies only in UDP mode. This sets the primary or a secondary E-Cable destination IP address. This is the network address of the target host for data received on the I/O port. If zero, no data will be sent. If the index value is zero, the primary address is set (same as the ECADDR parameter). If not zero, the valid range is 1:(n-1), where n is the ECHNOST value configured. If n is one only the primary address can be set.

```
SET PORT S1 ECRADDR index a.b.c.d
      (default = 0.0.0.0)
```

7.2.9   SET PORT S1 ECRPORT

This parameter applies only in UDP mode. This sets the primary or a secondary E-Cable destination port number. Along with the corresponding network address this defines the destination for data received on the I/O port. If zero, no data will be sent. If the index value is zero, the primary port is set (same as the ECPORT parameter). If not zero, the valid range is 1:(n-1), where n is the ECHNOST value configured. If n is one only the primary port can be set.

```
SET PORT S1 ECRPORT index n
      (default = 0)
```

7.2.10   SET PORT S1 ECTMMSEC

This parameter applies only in TCP mode. This determines the units for the connection timer set with the ECCONN parameter. If enabled, the timer is in units of 10 milliseconds (20-2550 msec). If disabled, the timer is in units of seconds (1-255 seconds).

```
SET PORT S1 ECTMMSEC [ENable | DISable]
      (default = DISable)
```

7.2.11   SET PORT S1 ECUDP

Enable or disable E-Cable UDP operation. If disabled, TCP is used for network I/O. If enabled UDP is used.

```
SET PORT S1 ECUDP [ENable | DISable]
      (default = DISabled)
```

7.3   SH SERVEr QUEue

Displays the I/O job queue for each port.

```
Local> SH SERVEr QUE


Port S1 status = On-line
  #   Type    Source
 The queue is empty
```

8. Server Information Commands

8.1   SH SERIAL

Displays the serial number of the unit

sample output:
```
Serial number is 9047595
```

8.2   SH SERVEr

Shows Server parameters

```
Local> SH SERVer

Silex SX-582  Serial # 2000560

Address: 00-80-92-01-29-F3      Name: SDS1E86B0     Number: 0

Identification:  Network Serial Server


Enabled Characteristics:

Ethernet link Down
```

8.3   SH SERVEr CO

Shows Server network statistics

```
        Local > SH SERVEr CO
```

sample output:
```
Seconds Since Zeroed:          163   Frames Sent, 1 Collision:       26
Bytes Received:              72950   Frames Sent, 2+ Collision:       5
Bytes Sent:                  18726   Send Failures:                   0
Frames Received:               752   Send Failure Reasons:            0
Frames Sent:                   181   Receive Failures:              503
Multicast Bytes Rcv'd:       64474   Receive Failure Reasons:         1
Multicast Bytes Sent:         2406   Unrecognized Destination:        0
Multicast Frames Rcv'd:        626   Data Overrun:                    0
Multicast Frames Sent:          11   User Buffer Unavailable:         0
Frames Sent, Deferred:        2014   System Buffer Unavailable:       1
```

8.4   SET SERVEr DEscription

Sets the server description string

```
SET SERVEr  DEscription   <description-string>
```

8.5   SH SERVEr FWVER

Shows the firmware version string

```
Local> SH SERVEr FWVER

BB3-1.09t (2012.05.22)
```

This command shows just the firmware version string, without the additional information shown by SH VERsion.

8.6   SH SERVEr MODEL

Shows Server model name

```
Local> SH SERVEr MODEL

SX-582
```

This shows the server model name, without the other information displayed by SH SERVER.

8.7   SET SERVEr NAme

 Sets server node name

```
Local> SET SERVEr  NAme   <name>
      (default = "SDS_xxxxxx", where xxxxxx are the last 6 hex digits of the MAC
      address)
```

8.8   SH SERVEr STAtistics

Shows information about print jobs received.

```
Local> SH SERVEr STA

LPD Statistics:
Currently 0 jobs are waiting for the peripheral
0 connections have been made
0 data files have been printed
0 data bytes have been printed
0 control files have been received
0 print job commands have been received
```

8.9   SH SNMP

Shows the state of the SNMP protocol enable

sample output:
```
Local> SH SNMP

SNMP is Enabled
```

8.10   SET SNMP CONtact

Set system contact string

```
SET SNMP CONtact  <string>
      (default = <null>)
```

8.11   SET SNMP GETCOMM

Get Community Name

```
SET SNMP GETCOMM  <string>
      (default = "public")
```

8.12   SET SNMP LOCation

Set the system location string

```
SET SNMP LOCation <string>
      (default = <null>)
```

8.13   SET SNMP SETCOMM1

Set Community 1 Name

```
SET SNMP SETCOMM1 <string>
      (default = "internal?")
```

8.14   SH VErsion

Shows the print server's firmware version

```
Local> SH VER

Silex SX-582
Firmware Ver. BB3-1.09t (2012.05.22)
Boot Ver. 1.2
64Mbit Flash

Protocols supported:
   SNMP TCP/IP
   DHCP
```

8.15   Zero

Clears and resets the network statistic counters

9. Service Commands

Logical I/O services are associated with each physical port. I/O is routed through the service, which may perform modifications on the data stream based on its settings.

9.1 SH SERVI

Show service configuration.

```
Local> SH SERVI

  # Service                        Port FIL BOT EOT DEL OPT   PROT
 * 1 SDS1E86B0_S1_A                S1    0   1   1   0  B     IP
   2 SDS1E86B0_S1_B                S1    0   1   1   0  B     IP
```

The '*' indicates the default service for the I/O port.

9.2 SET SERVI <service name> BOT

Set beginning of transmission (BOT) string index for service

```
SET SERVI <service name> BOT   nn
```

The string indicated will be sent at the beginning of a connection to the service indicated.
The default is the NULL string.

9.3 SET SERVI <service name> EOT

Set end of transmission (EOT) string index for service

```
SET SERVI <service name> EOT   nn
```

The string indicated will be sent at the end of a connection to the service indicated.
The default is the NULL string.

9.4   SH SERVI STRings [string_num]

Defines the BOT and EOT strings used in services. If string_num is provided then the specific string definition and expansion is displayed. If string_num is not provided, then all string definitions (but not their expansions) are displayed.

sample output:
```
Local> SH SERVI STR 10

10: \FF\04\FF\05\FF\06\FF\08
```

9.5   SET SERVI <service name> FIlter

Set filter index for service

```
SET SERVI <service name> FIlter  nn
```

SH FILter shows the available filters on the unit.

9.6   SH SERVI FILters

Shows filter settings

```
Local> SH SERVI FIL

  #  Service Name                      Filter
  1 SDS1E86B0_S1_A                    0: No Filter
  2 SDS1E86B0_S1_B                    0: No Filter
```

9.7   SET SERVI <service name> FMS

Set filter 1 (text replacement filter) match string index. If the index is zero, the default string of <LF> (line feed) is used.

```
SET SERVI <service name> FRM  nn
      (default = 0 )
```

9.8   SET SERVI <service name> FRS

Set filter 1 (text replacement filter) replace string index. If the index is zero, the default string of <CRLF> (carriage return-line feed) is used.

```
SET SERVI <service name> FRS  nn
      (default = 0 )
```

9.9   SET SERVI <service name> IP

Enable or disable all IP based jobs (lpd, raw tcp, etc.) on the service.

```
SET SERVI <service name> IP  [ENable | DISable]
      (default = enabled for service 1 and 2, disabled for all others)
```

9.10   SET SERVI <service name> NAme

Change the service name

```
SET SERVI <service name> NAme  <newname>
```

9.11   SET SERVI <service name> POrt

Set the output port associated with a service.

```
SET SERVI <service name> POrt   <portname>
      (default = "S1")
```

9.12   SET SERVI <service name> PRIority

Set priority for service if multiple service try to transmit data at the same time. Higher priority services are serviced first.

```
SET SERVI <service name> PRIority nn
      (default = 10)
```

9.13   SH SERVI PRI [service_num]

This shows the priority of a specific service. If service_num is not provided, the priority of all services is listed.

9.14   SET SERVI <service name> QUEue

If enabled, and if a raw TCP port is defined, the server will queue jobs sent to that port. If disabled, jobs will be rejected if the server is currently busy with another job.

```
SET SERVI <service name> QUEUE [ENable | DISable]
     (default = disabled)
```

9.15   SET SERVI <service name> RECeive

Set receive only mode for a service. This option is rarely required, but some host applications do not operate properly if data is received back from the serial device.

```
SET SERVI <service name> RECeive  [ENable | DISable]
     (default = disabled)
```

9.16   SET SERVI <service name> TCP

Set raw TCP port for service. If port number is zero, raw TCP is disabled on that service.

```
SET SERVI <service name> TCP  nn
     (default = 9100 for service 1, 3001 for service 2)
```

9.17   SH SERVI SUMmary [service_num]

Shows the basic parameters for a specific service. If service_num is not provided, parameters for all services are displayed.

Note: The command SH SERVI is equivalent to SHOW SERVI SUM

10. String Commands

These commands configure strings used with services and service filters.

10.1   SET STRing

Set service string table entry.

```
SET STRing <string #> "value"
```

Hex values can be entered as two hex digits in the string with the prefix '\'.   One string can reference another string with two binary characters. The first is \FF, and the second is the string index of the referenced string.

Note: String 1-11 cannot be set or changed.

10.2   CL STRing

Clears the service string table entry.

```
CL STRing <string #>
```

10.3   SH STRing [string_num]

Defines the BOT and EOT strings used in services If string_num is provided then the specific string definition and expansion is displayed. If string_num is not provided, then all string definitions (but not their expansions) are displayed.

sample output:
```
Local> SH STR

1:
2: \1BE
3: \04
4: \1B%-12345X
5: @PJL
6: ENTER LANGUAGE=
7: PCL\0A
8: POSTSCRIPT\0A
9: \FF\04\FF\05\FF\06\FF\07
10: \FF\04\FF\05\FF\06\FF\08
11: \0C
```

10.4 SH FILters

Shows the available filters which can be used to modify a job stream.

sample output:
```
Local> SH FIL
#     Filter
  0    No Filter
  1    Text Substitution
  3    Text to PostScript
  4    PostScript Tagged Binary
```

11. TCP/IP Commands

11.1   SH IP

Display TCP/IP settings

```
Local> SH IP

IP is enabled
Boot method   DHCP
IP address    192.168.5.40          (192.168.5.235)
Subnet Mask   255.255.255.0         (255.255.255.0)
IP gateway    192.168.5.1           (0.0.0.0)
Boot tries    3
Timeout       1 min
Keepalive     1 min

 Service                          Port  TCP port
 SDS1E86B0_S1_A                   S1     9100
 SDS1E86B0_S1_B                   S1     3001
```

11.2   SET IP ACcess

Allow or disallow access to a block of remote addresses

```
SET IP ACcess [ENable │ DISable │ ALL] aa.bb.cc.dd ee.ff.gg.hh
```

This command modifies the IP access list. If ALL is selected, the access list is cleared and all hosts are allowed access.
If ENable is selected, then an entry for the range given by the two IP addresses is added to the list. Only hosts with an IP address within the range of one of the entries in the access list are allowed to connect to the unit.
If DIsable is selected, if the two addresses match the range values of an entry in the access list, that entry is removed and hosts in that range will no longer be allowed access to the unit, unless another entry allows it.

SH IP ACcess or SH IP RANge will display the current access list settings.

11.3   SET IP ADdress

Set server IP address

```
SET IP ADdress aa.bb.cc.dd
```

If the IP address acquisition method is static, this command sets the IP address to be used. This is also
the fall back address for Auto mode, if a DHCP address is not received.
The default address is 169.254.111.111.

11.4   SET IP BAnner

Enable or disable printing of job banner on LPD jobs

```
SET IP BAnner [ENable | DISable]
      (default = disable)
```

11.5   SET IP BOot

Number of times to try DHCP to acquire an address.

```
SET IP BOot   n
      (default = 3)
```

In Auto mode, the DHCP client will attempt the number of times specified to acquire an IP address. If it
does not succeed after that number of times, the module will initialize with the fallback static IP address
(SET IP ADdress) configured.

11.6   SET IP DISable

Disable IP based configuration and serial I/O protocols

```
SET IP DISable
      (default = enable)
```

This command will render the unit more or less inaccessible. The system IP stack will still come up and
respond to pings, but network to serial I/O applications and configuration applications will be unavailable.

11.7   SET IP ENable

Enable IP based protocols

```
SET IP [ENable | DISable]
     (default = enable)
```

Sets the unit for normal operation.

11.8   SET IP FTIme

If enabled, the IP timeout is measured in seconds. If disable, the IP timeout is in minutes.

```
SET IP FTIme    [ENable | DISable]
     (default = disable)
```


11.9   SET IP HTTP

Enable or disable the HTTP protocol

```
SET IP HTTP    [ENable | DISable]
     (default = enable)
```


11.10 SET IP KEepalive

Set interval at which gratuitous ARP packets are sent in minutes.

```
SET IP KEepalive n
     (default = 5 min)
```


11.11 SET IP LPD

Enable or disable the LPD protocol

```
SET IP LPD    [ENable | DISable]
     (default = enable)
```

11.12 SET IP MEthod

Set method of getting IP address

```
SET IP MEthod    [ AUTO  | DHCP | STATIC ]
      (default = AUTO)
```

DHCP will wait to acquire an address via DHCP.
STATIC will bring the IP stack up immediately with the configured IP static address.
AUTO will attempt to get an address via DHCP, but if it fails it will use the configured static IP address.

11.13 SET IP NTP

Enable or disable the NTP protocol

```
SET IP NTP    [ENable | DISable]
      (default = enable)
```

11.14 SET IP PRObe

Enable or disable TCP connection probes (TCP Keepalive packets)

```
SET IP PRObe  [ENable | DISable]
      (default = disable)
```

11.15 SET IP REtry

Enable or disable LPD retry on incomplete job

```
SET IP REtry  [ENable | DISable]
      (default = disable)
```

11.16 SET IP ROuter

Set the default router address

```
SET IP ROuter    aa.bb.cc.dd
      (default = 0.0.0.0)
```

SET IP GAteway is an optional command which performs the same function.

11.17 SET IP STATus

Sets user defined IP status string

```
SET IP STATus <status-string>
```

This command defines an arbitrary string. If defined, the string will be appended to LPD status request responses.

SH IP STATus will display the current status string.

11.18 SET IP SUbnet

Set the IP subnet mask

```
SET IP SUbnet    aa.bb.cc.dd
      (default = 0.0.0.0)
```

11.19 SET IP TCP

Enable or disable the raw TCP (9100) protocol

```
SET IP TCP    [ENable | DISable]
      (default = enable)
```

11.20 SET IP TELnet

Enable or disable the TELNET protocol

```
SET IP TELnet [ENable | DISable]
      (default = enable)
```

11.21 SET IP TFTP

Enable or disable the TFTP protocol

```
SET IP TFTP   [ENable | DISable ]
      (default = disable)
```

11.22 SET IP TImeout

Set TCP Inactivity timeout.

```
SET IP TImeout   n
     (default = 1 minute)
```

This command sets inactivity timeout for IP to I/O port transfers via raw TCP, RFC2217, or LPD. If no data is received within the time specified, the connection will be closed and the port released to accept new connections.
If fast timeout (SET IP FTIme) is enabled, the value given is in seconds, otherwise it is defined in minutes.

11.23 SET IP WIndow

Set TCP maximum window size in bytes

```
SET IP WIndow    nn
     (default = 10240)
```

SH IP WIndow will display the currently configured value.

12. DNS Commands

12.1 SH DNS

Display current DNS configuration settings

```
Local> SH DNS

DNS is Enabled
Domain name:
Primary DNS server:    0.0.0.0
Secondary DNS server:  0.0.0.0
```

12.2 SET DNS DISable

Disable DNS support

```
SET DNS DISable
```

12.3 SET DNS DOMain

Set the desired DNS domain string

```
SET DNS DOMain <domain-name>
```

12.4 SET DNS ENable

ENable DNS support

```
SET DNS ENable
```

12.5 SET DNS PRImary

Set the IP address for the primary DNS server to reference.

SET DNS PRImary a.b.c.d

12.6 SET DNS SECondary

Set the IP address for the secondary DNS server to reference.

```
SET DNS SECondary a.b.c.d
```

13. DHCP Server Commands

13.1   SET DHCPS

Enables or Disables the DHCP server function.

```
SET DHCPS   [ ENable | DISable ]
```

The default value is disabled.

13.2   SH DHCPS

Displays information about the current DHCP server configuration.
```
Local> SH DHCPS
```

```
DHCP Server is Disabled
```

13.3   SET DHCPS Address

Set the range of IP address for lease.

```
SET DHCPS Address   aa.bb.cc.dd ee.ff.gg.hh
```

13.4   SET DHCPS SUbnet

Set the IP subnet mask for lease.

```
SET DHCPS SUbnet   aa.bb.cc.dd
```

13.5   SET DHCPS ROuter

Set the default router address for lease.

```
SET DHCPS ROuter   aa.bb.cc.dd
```

13.6   SET DHCPS LEase

Set the lease time of IP address.

```
SET DHCPS LEase   dd hh:mm
```

14. GPIO Control

The SX-582 have 11 GPIO signals available, numbered 0-10. Refer to the product specification for details of the GPIO definitions and available functions.

14.1   SET GPIO DIR

Set a single GPIO direction control

```
SET GPIO DIR [IN | OUT] <gpio-number>
```

This command sets an individual GPIO pin to be an input or an output pin. This setting is ignored for pins set for special function mode, the special function determines the pin direction.

NOTE: the direction bit configuration is not changed by a configuration reset to default.

14.2   SH GPIO DIR

Display GPIO direction configuration

```
Local> SH GPIO DIR

GPIO Direction
--------------
0 [SPCL]
1 [SPCL]
2 [OUT]
3 [OUT]
4 [OUT]
5 [OUT]
6 [OUT]
7 [OUT]
8 [OUT]
9 [OUT]
10 [OUT]
```

14.3   SET GPIO DIRM

Sets all direction control bits

```
SET GPIO DIRM    <bit-mask>
```

<bit-mask> is an 11 bit mask expressed as 3 hex digits. This value should be in the range 00-7FF. The mask is encoded as follows:

10	9	8	7	6	5	4	3	2	1	0
GPIO10	GPIO9	GPIO8	GPIO7	GPIO6	GPIO5	GPIO4	GPIO3	GPIO2	GPIO1	GPIO0

A value of 1 sets the corresponding GPIO line to be an output. A value of 0 sets the GPIO line to be an input. For example, a hex value of 80 sets GPIO7 as an output, all other GPIO signals are inputs.   The direction is not affected for any bits configured for a special function.

NOTE: the direction bit configuration is not changed by a configuration reset to default.

14.4   SH GPIO DIRM

Shows all direction control bits

```
Local> SH GPIO DIRM

GPIO direction mask=7fc
```

14.5   SET GPIO SPECial

Sets a single special function control bit.

```
SET GPIO SPECial [EN | DIS]  <gpio-num>
```

This command enables or disables the special function of the GPIO signal specified. See the product specification for the special functions, if any, associated with each GPIO pin.
<gpio-num> must be in the range 0-10.

NOTE: the special function bit configuration is not changed by a configuration reset to default.

14.6   SH GPIO SPECial

Shows the current setting of the GPIO special function configuration

```
Local> SH GPIO SPECial

GPIO Special Functions
----------------------
GPIO #0 is special
GPIO #1 is special
GPIO #2 is normal
GPIO #3 is normal
GPIO #4 is normal
GPIO #5 is normal
GPIO #6 is normal
GPIO #7 is normal
GPIO #8 is normal
GPIO #9 is normal
GPIO #10 is normal
```

14.7   SET GPIO SPECM

Sets all special functions control bits

```
SET GPIO SPECM   <bit-mask>
```

<bit-mask> is an 11 bit mask expressed as 3 hex digits. This value should be in the range 00-7FF. The mask is encoded as follows:

10	9	8	7	6	5	4	3	2	1	0
GPIO10	GPIO9	GPIO8	GPIO7	GPIO6	GPIO5	GPIO4	GPIO3	GPIO2	GPIO1	GPIO0

A value of 1 enables the special function on the corresponding GPIO signal, a value of 0 disables the special function. For example, a hex value of 80 sets GPIO7 for special function, all other GPIO signals for general use.

NOTE: the special function bit configuration is not changed by a configuration reset to default.

14.8   SHow GPIO SPECM

Shows GPIO special functions control bits as a mask value

```
Local> SH GPIO SPECM

GPIO special function mask = 03
```

14.9   SET GPIO DATA

Sets all data out control bits

```
SET GPIO DATA    <bit-mask>
```

<bit-mask> is an 11 bit mask expressed as 3 hex digits. This value should be in the range 00-7FF. The mask is encoded as follows:

10	9	8	7	6	5	4	3	2	1	0
GPIO10	GPIO9	GPIO8	GPIO7	GPIO6	GPIO5	GPIO4	GPIO3	GPIO2	GPIO1	GPIO0

Each GPIO output bit is set to the corresponding value in the mask. If a GPIO signal is set as an input, the value is set but has no effect. If a GPIO signal is set for a special function, the bit value given is ignored. For example, a hex value of 80 sets the GPIO7 to a 1 (high), all other GPIO signals to 0 (low), except those set as special functions.

NOTE: the default output bit value on power up or reset is 0 for all GPIO signals.

14.10 SHow GPIO DATA

Shows the current state of the GPIO signals.

```
Local> SH GPIO DATA

GPIO Data In
--------------
GPIO #0 [1]
GPIO #1 [0]


GPIO Data Out
--------------
GPIO #2 [0]
GPIO #3 [0]
GPIO #4 [0]
GPIO #5 [0]
GPIO #6 [0]
GPIO #7 [0]
GPIO #8 [0]
GPIO #9 [0]
GPIO #10 [0]
```

15. Firmware Update

These commands set up the unit for performing an update of the server firmware.

15.1   SET LOAd XModem

Initiate firmware update via the serial console using the XModem protocol. The server will reset after the firmware update is completed.

```
SET LOAd XModem
```

16. Power Management

16.1 SET NW WLIF

Sets the radio network interface enable.

```
SET NW WLIF [UP | DOWN]
```

UP puts the radio state in a normal operating mode. DOWN disables the radio so it produces no RF output and does not receive any data.

Note: This function is volatile, and the radio is enabled if the module is reset.

16.2 SET POWER LEVEL

Sets the server power profile.

```
SET POWER LEVEL nn
```

nn = 0 for High power and 1 for Low power.
In High power mode, the radio runs in maximum performance mode.
In Low power mode, the radio runs in power save mode.

The SHow POWER command will display the currently configured power level.

17. Other Commands

17.1 SET DEFAULT

Set parameters to factory defaults

17.2 EXIT

This command exits the current configuration console session.

```
EXIT
```

17.3 SH FATal

Shows fatal error log (if there's any)

sample output:
```
Local> SH FAT

No saved errors
```

17.4 CL FATal

Clears the fatal error log

17.5 SH FREE

Shows the amount of heap and configuration memory available

sample output:
```
Local> SH FREE

2 bytes of heap available
Index 2, 6320 bytes
6320 bytes configuration memory available
```

17.6 HElp <command>

This is for getting help on the console commands. You can just type help, or type help and then a command to display instructions on specific commands.

Sample output:
```
Local> HE

EXIT/^D                 Exit program
HElp                    Information on available commands
INitialize              Reset unit
CLear/PUrge/DELete      Remove configuration item
SAVE                    Save configuration to NV memory
SET/DEFine/CHange       Modify unit parameters
SHow                    Display unit parameters
ZEro                    Zero statistical counts

Type 'HElp <cmd>' for more information
```

17.7 INIT

This command instructs the server to do a soft reset when the next exit command is executed.

```
INIT
```

17.8 SET PAssword

Sets the server access (read) password

```
SET PAssword <password>
      (default = "ACCESS")
```

17.9 SAVE

This command saves the current configuration to non-volatile memory. Without this command, the configuration is not saved unless an "EXIT" command is performed.

```
SAVE
```

17.10 SH TEst

Sends configuration data in ASCII to the serial port

```
SH TEst
```

Appendix C
SX-582 Antenna Information

Antenna Specifications

Recommended antennas are from SANSEI ELECTRIC CO.,LTD.

Please refer to the SANSEI ELECTRIC website @ http://www.sansei-e.co.jp/indexe.html for more detailed information for the Antenna, Part No. TD17027A2S0.

Table 23 SX-582 Antenna Electrical Specifications

Parameter	Value
Antenna Type	Omni Directional
Frequency Range	2400 to 2500MHz
	5150 to 5825MHz
Impedance	50 Ohms
Gain (peak)	1.5dBi(2.4GHz)
	2.1dBi(5.825GHz)
VSWR	<2.0
Standard Connector	RPSMA

Appendix D
Firmware Update Procedures

Occasionally it may be necessary to update the SX-582 to take advantage of new features or to fix specific problems. The simplest way to perform this update is with the internal web page of SX-582. This is the web configuration interface embedded to the firmware of SX-582. You can open the web page using a common web browser.

To update the firmware using the internal web page:

1. Download the appropriate firmware update file from *the Support* section of the Silex website (www.silexamerica.com) into a directory on your computer.

2. Access the internal Web page of SX-582. To access the internal Web page, open your Web browser and enter the IP address of SX-582 into the address bar and press Enter key. (* The Web page can also be accessed using the "SX-Finder" utility (SX-582 module discovery utility). Start the SX-Finder utility and select SX-582 that you wish to update the firmware with and click **Configure** button. The internal Web page will be displayed.)

3. In the Web page, click **Firmware Update** on the left menu. In the **Firmware Update** page, click **Browse** to specify the firmware update file that you have downloaded into your computer.

4. Check the correct file name is displayed in **New firmware** field and click **Update**.

You can also use the trivial file transfer protocol (tftp) to update the Serial Device Server firmware:

1. Download the appropriate firmware update file from the *Support* Section of the Silex website (www.silexamerica.com) into a directory on your computer.

2. If you are using Windows 2000, XP, or Vista, 7 enter the following command from the command line of your operating system. (If you use tftp in Windows, you will need to install the software separately on which you can execute the TFTP commands.)

> tftp -i *ipaddress* put *filename*

where *ipaddress* is the IP address of the Serial Device Server and *filename* is the file name (and path, if necessary). For example, to download the file tathsti130.bin from the updates directory on your computer into a Serial Device Server with an IP address of 192.168.5.70, you would enter the command:

> tftp -i 192.168.5.70 put /updates/tathsti130.bin

If you are using a different operating system, please refer to the documentation of that operating system for information on how to use the tftp command.

Appendix E
GNU/Linux Open Source and Programming

The software embedded in this SX-582 module includes the Linux operating system. Linux and certain other software programs used in the SX-582 are licensed under GNU GPL compatible Free Software Licenses. In compliance with these licenses, you can obtain the relevant source code at no charge by contacting Silex at support@silexamerica.com.

For assistance in programming the SX-582, you can purchase consulting time from Silex on a fixed price or hourly rate. To get details on this consulting, please contact Silex sales at 801-748-1199, or E-mail: sales@silexamerica.com

Appendix F
Silex Contact Information

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