ABACOM Technologies

# 16IO-SSRT-09HP   RF Wireless I/O Extension Modules

The 16IO-SSRT-09HP spread spectrum transceiver modules provide a wireless extension of an external device's discrete digital output states and/or ON/OFF states. The state of the 16IO-SSRT-09's eight inputs at the *local* end of the link will be replicated at the corresponding outputs of the *remote* 16IO-SSRT-09HP, at distances of up to 40 miles apart!. With bi-directional communications, the converse is also achieved, where the input states of the *remote* 16IO-SSRT-09HP module will be replicated at the corresponding outputs at the *local* 16IO-SSRT-09HP.

The 16IO-SSRT-09HP features a user configurable timeout function. The timeout function monitors the integrity of the RF link and, if for some reason, there is a break in RF communications for longer than the timeout setting, the on-board timeout relay will energize. The timeout relay contacts may be used to trigger an external alarm circuit or perform any other user determined function. The timeout function is particularly useful for "failsafe" applications.

The 16IO-SSRT-09HP outputs at the remote end may be user configured to follow or invert the state of the inputs at the local end.

Features

- **Simplex and Half Duplex Wireless I/O Extension**

- **902-928MHz FM Operation: 1 Watt TX power**

- **Also available in lower power 100mW version**

- **Secure Frequency Hopping Spread Spectrum Architecture**

- **8x Discrete 5V Digital Inputs, active low.**

- **8x Discrete 5V Digital Outputs**

- **8x Open Collector Outputs**

- **Configurable HIGH or LOW Outputs On Power Up**

- **Up to 40 miles open field range (antenna dependant)**

- **Output Status LED's**

- **Communication, Timeout and Power LED's**

- **Integrated Watchdog with three selectable timeouts**

- **Outputs Configurable For TRUE or INVERTED States**

- **Reverse polarity (male) SMA Antenna Connector**

- **Available as Open PCB or Packaged Form Factor**

- **Wide supply range: 7.5V-16Vdc, 560mA nominal**

- **Dimensions: 4.25" x 2.5" x 0.75"**

User I/O Device   User I/O Device
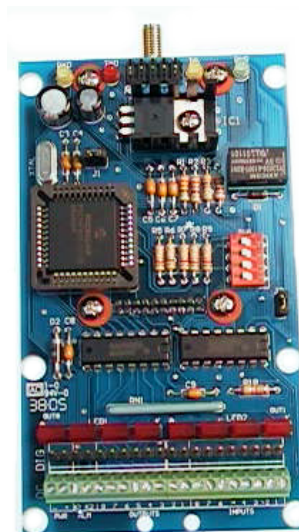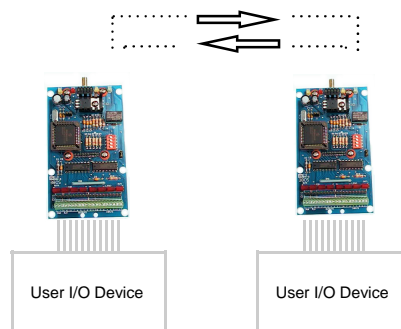
Setup and Configuration

Power supply

The 16IO-SSRT-09HP will operate off an unregulated supply of between 7.5Vdc to 16Vdc. Typical operation would be at 12Vdc which may be a linear power supply such as wall adaptor or battery. Switching power supplies are not recommended for use with the 16IO-SSRT-09HP . The power supply should be capable of providing at least 800mA. If the open collector outputs are to be used , the power supply voltage and current should be determined by the user based on the open collector loads to be driven.

Digital Inputs / Digital Outputs

(Refer to the examples for typical I/O interfacing on page 5)

The digital input lines are 5V CMOS/TTL compatible. The inputs have pull up resistors to +5Vdc. They are normally held HIGH and are active LOW. The 16IO-SSRT-09 inputs will accept voltages of 0V and 5V. Care should be taken not to exceed the input voltage above or below the 0V and 5V limits as this will damage the 16IO-SSRT-09HP.

An input taken LOW by the externally connected device will be replicated as a LOW (0V) on the corresponding digital output at the remote 16IO-SSRT-09HP. For example: A *closed* switch connected across the local 16IO-SSRT-09 input 1 and 0V (GND) will provide a 0V (LOW) output at the remote 16IO-SSRT-09HP digital output 1. An input left open (ie not connected) or applied with +5V will be replicated as a HIGH (+5V) the corresponding digital output at the remote 16IO-SSRT-09HP. **Note:** an input change must be ≥50ms duration for it to be reflected at the corresponding output of the remote 16IO-SSRT-09HP module. For pulsed inputs the maximum input pulse rate is 5Hz.

Setting the appropriate DIP switch position (4) on the *local* 16IO-SSRT-09HP, will set the output states of the *remote* unit to be TRUE or INVERTED. The output configuration DIP switch set to TRUE on the *local* 16IO-SSRT-09HP will cause the outputs at the *remote* 16IO-SSRT to follow the state of the discrete inputs of the *local* 16IO-SSRT-09HP. The output configuration DIP switch (4) set to INVERTED on the *local* 16IO-SSRT-09HP will cause the corresponding outputs at the *remote* 16IO-SSRT-09HP to be inverted, for example: Input 1 taken LOW on the local 16IO-SSRT-09HP will result in output 1 on the remote unit to be HIGH. (See Table 4).

Digital Inputs / Open Collector Outputs

(Refer to the examples for typical I/O interfacing on page 5)

In addition to the eight discrete digital outputs, the 16IO-SSRT-09HP wireless I/O extender modules feature eight open collector outputs. The open collector outputs are able to switch/control loads that demand higher operating voltages and/or currents. The open collector outputs include EMF transient protection diodes for driving inductive loads such as relay coils. The absolute maximum open collector load current is 500mA with only **one** active output conducting. With all open collector outputs conducting the maximum load current should not exceed 100mA per output. Other load current configurations are shown in table 1 below

As with the digital outputs described above, the open collector outputs may be configured to be TRUE or INVERTED.

Number of Outputs Conducting Simultaneously For : Open Collector Channels 1-8	Maximum Load Current @ 100% Duty Cycle	Maximum Load Current @ 50% Duty Cycle
1	450mA	500mA
2	290mA	450mA
3	210mA	350mA
4	175mA	290mA
5	150mA	250mA
6	125mA	210mA
7	110mA	190mA
8	100mA	140mA

Table 1: Maximum Open Collector Output Current

Output State at Power Up

The 16IO-SSRT-09 outputs may be user configured to default to all HIGH or all LOW when power is applied to the module. Power-up output state is configured with DIP switch 1 as indicated in table 2 below. As soon as communication between a pair of 16IO-SSRT-09 modules is established, the outputs will then take on the state of the remote 16IO-SSRT-09's inputs. The output states are indicated by an array of 8 green LED's. An LED ON indicates an output is HIGH and OFF indicates an output is LOW

SW1	Function
OFF	Local outputs LOW (0V) at power up
ON	Local outputs HIGH (5V) at power up

Table 2

Timeout Function

The 16IO-SSRT-09HP transceivers continually monitor the integrity of the RF link.

If for any reason there is a breakdown in the communications between a pair of 16IO-SSRT-09HP's each 16IO-SSRT-09HP will signal the event by activating the green timeout (TO) LED and simultaneously energize the timeout relay. The single pole, normally open relay contacts will close and this may be used for example as a trigger mechanism to some external device such as a telephone autodialer, trigger an alarm system. It may be used as an emergency system shutdown or it may be used to trigger an external device to reset the 16IO-SSRT-09HP through cycling the power supply.

The timeout timing configuration is given in the table 3 below. DIP switches 2 and 3 are used to configure the timeout function and may be set for: disabled, 3 seconds, 10 seconds or 30 seconds. The 16IOSSRT-09HP will accept the timeout setting at power up. Note that changes made to these settings whilst power is applied will only be accepted once the power is cycled.

SW2	SW3	Function
OFF	OFF	30 second timeout
OFF	ON	10 second timeout
ON	OFF	3 second timeout
ON	ON	Timeout disabled

Table 3

Output Invert Function

The state of the eight outputs of the 16IO-SSRT-09HP modules may be configured to be TRUE or INVERTED by setting the DIP switch 4 on the 16IO-SSRT-09HP. When set to TRUE, the eight outputs replicate the state of the eight inputs on the remote unit . When set to INVERT, the eight outputs will be set to output the inverse state of the eight inputs at the remote unit.
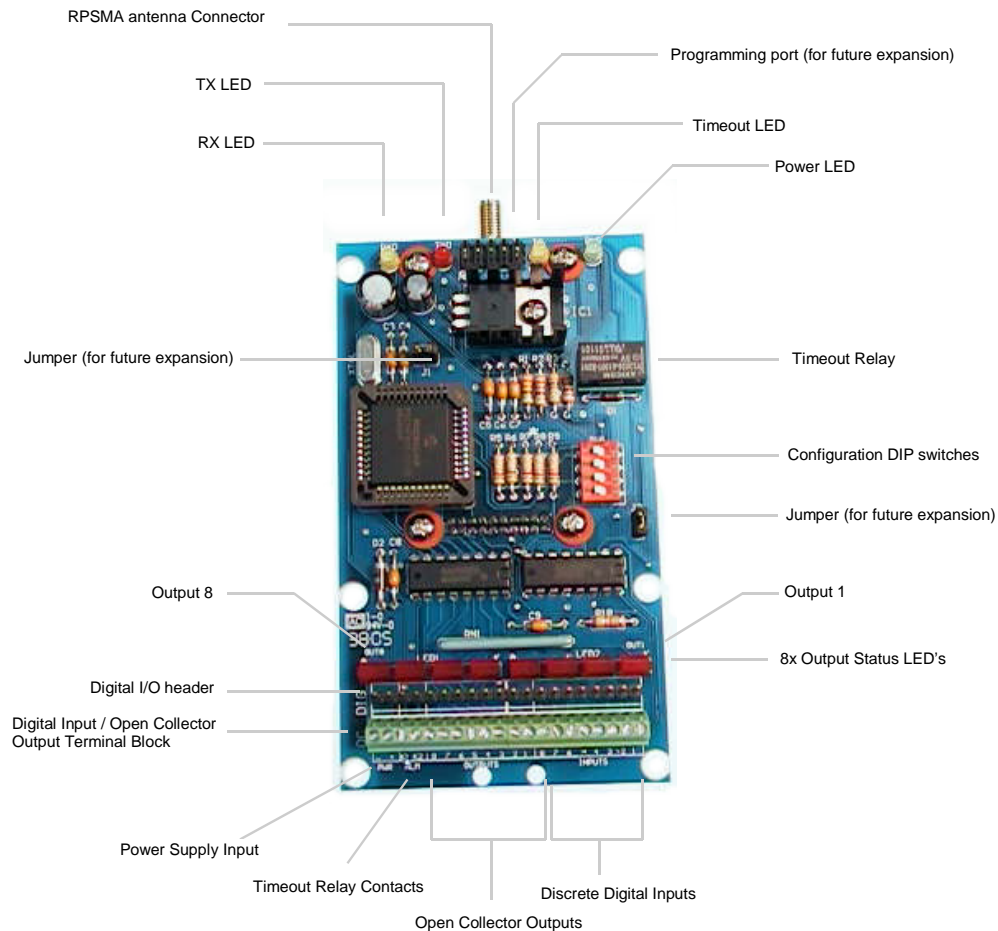
SW4	Output
ON	TRUE
OFF	INVERTED

Table 4

Antenna

The 16IO-SSRT-09 antenna connection is via a reverse polarity (male) SMA connector. This connector accommodates the 1/2-900-SMA articulating dipole antenna for direct connection to the 16IO-SSRT-09. For applications that require an off board antenna, terminated cables of varied lengths are available to connect the antenna to the 16IO-SSRT-09. For extended range requirements, directional gain antenna are available. The antenna should have as much free space around it as possible.

16IO-SSRT-09HP Anatomy

RPSMA antenna Connector

Programming port (for future expansion)

TX LED

Timeout LED

RX LED

Power LED

Jumper (for future expansion)

Timeout Relay

Configuration DIP switches

Jumper (for future expansion)

Output 8

Output 1

8x Output Status LED's

Digital I/O header

Digital Input / Open Collector
Output Terminal Block

Power Supply Input

Timeout Relay Contacts

Discrete Digital Inputs

Open Collector Outputs

Input/Output and Power Supply Connections

The 16IO-SSRT-09HP modules contain two I/O and power supply connection ports: a 20 way screw terminal port and a 20 pin header port.

Considering the two I/O ports labeled OC (screw terminals) and DIG (header):

- the two power supply screw terminals and header pins are linked (common) to each other
- the eight discrete digital input screw terminals and header pins are linked (common) to each other
- the two timeout relay contacts screw terminals and header pins are linked (common) to each other.
- the 8 open collector outputs are available via the 8 screw terminals (OC port) only
- the 8 discrete digital outputs are available via the 8 pins of the DIG header only
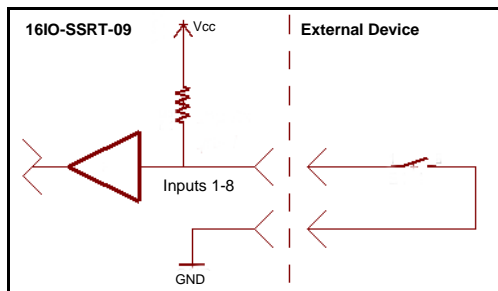
I/O Interfacing Examples
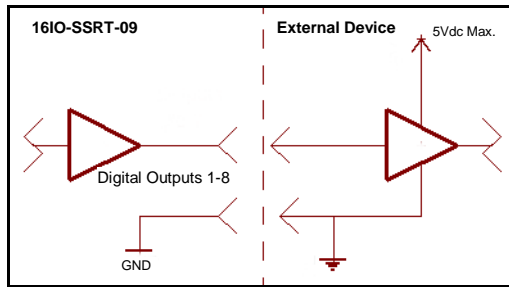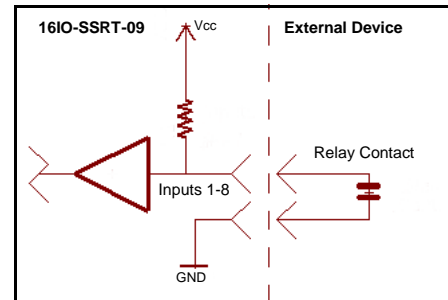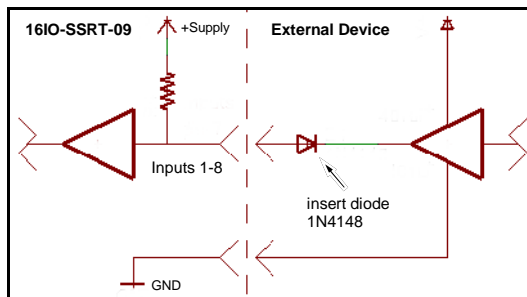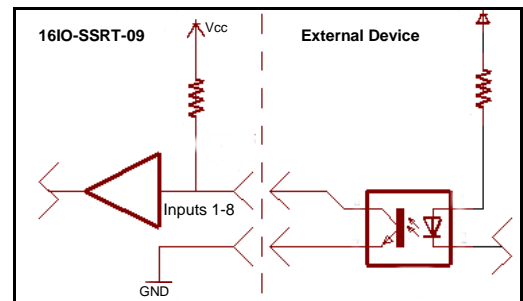

Solid State Output
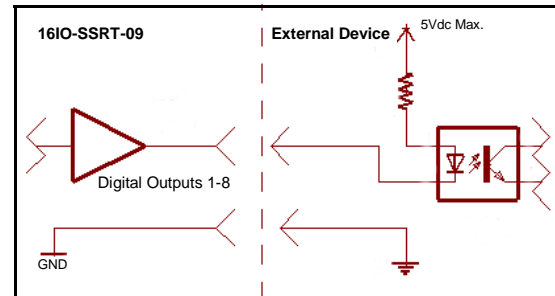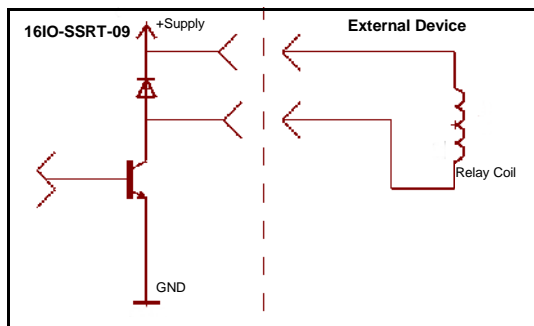

Isolated Solid State Output

Switch Input

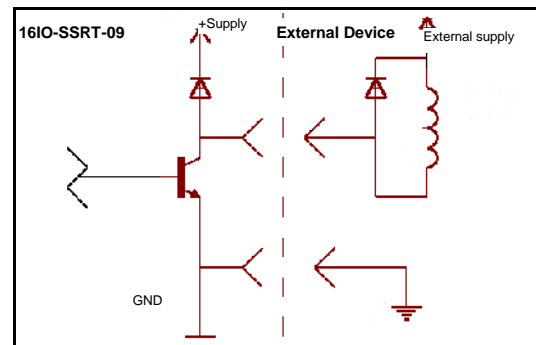**Isolated Mechanical Input**

Solid State Input

Opto Isolator Solid Sate Input

Open Collector Output

Open Collector Output

Output Feedback Confirmation

Looping an active digital output to an unused input at the remote 16IO-SSRT-09HP will provide feedback to the local 16IO-SSRT-09HP and of the I/O extension event. This configuration is useful in some applications and when setting up the RF I/O extension link.

Multiple 16I/O-SSRT-09 Deployment

If more than one pair of 16I/O-SSRT-09HP RF wireless I/O extension modules are deployed, it is important to have each system pair setup to include one master and one slave module. Two master modules or two slave modules will not communicate with each other, only a master and slave will communicate. Each 16I/O-SSRT-09HP module has a label on the printed circuit board identifying it as a "master" or a "slave".

NOTE:
If more than one 16I/O-SSRT-09HP pair are to operate *within radio range* of another pair (or pairs), then each operating pair will require a unique address code to prevent "crosstalk". The address codes are programmed into the 16I/O-SSRT-09HP modules prior to shipping.

Specifications

Parameter		Notes
Operating Frequency	902-928MHz	Direct FM Frequency Hopping Spread Spectrum
RF Output Power	1Watt	
RF Sensitivity	-110dBm	
Range	Indoor: 600-1500ft Outdoor: 15mi. With dipole antenna and over 40mi with high gain antenna	
Supply Voltage	7.5 to 16Vdc unregulated	
Current Consumption	560mA nominal	Excluding Digital and Open Collector Loads
Operating Temperature	0°C to 70°C	Extended Temperature Range Available
Input Connector	Screw Terminal and PinHeader	
Power Supply Input Connector	Screw Terminal and PinHeader	
Timeout Relay Connector	Screw Terminal and PinHeader	
Digital Output Connector	Pin Header	
Open Collector Output Connector	Screw Terminal	
Timeout Relay	SPST, Normally Open	
Timeout Relay Contact Rating	1A, 150Vdc. Max.	
Digital Inputs	Normally Pulled High (5V) Active Low Max. input voltage 5Vdc	
Digital Outputs	0V to 5V CMOS/TTL compatible. Source or sink 25mA	
Input Duration for Valid Remote Output	$\geq$ 50ms	
Pulsed Input Frequency for Valid Remote Output	$\leq$ 5Hz	Duty Cycle between 10% and 90%
Antenna Connector	Reverse Polarity SMA (male)	
Enclosure	Black ABS Plastic (optional)	Part # 16IO-SSRT-HP-**PKG**
Board Dimensions	4.25" x 2.5" x 0.75"	
Weight	(2.7oz) 76g	

16IO-SSRT-09HPM Monitor Receiver (optional add-on module)

This is an optional add-on unit for applications that require remote passive monitoring of the 16IO-SSRT-09HP system. The 16IO-SSRT-090HP**M**, in appearance, is identical to the 16IO-SSRT-09HP modules, but runs different microcontroller firmware. The module functions as a receiver only and is user configured to monitor the status of the system's master unit or the slave unit. In either master or slave monitoring mode, the 16IO-SSRT-09HP**M** will reproduce (as outputs) the state of the inputs of the master or slave transceivers.

Setup and Operation

Setting up the monitor is similar to that of the master and slave, with the following differences:

- Dip Switch 1 sets the 16IO-SSRT-09HP**M** to monitor the master or the slave. In the OFF position, the master is monitored, and in the ON position, the slave is monitored. Changing the state of the this switch should be performed with the power OFF and takes effect when power to the module is applied.
- DIP Switches 2&3 set to OFF sets the timeout function to 30 seconds. Any other positions, disables the timeout function. The timeout is activated if there has been interrupted (zero) communication from the master or slave for a period of 30 seconds.
- Transmitter and all digital inputs are disabled.

DIP SW1	DIP SW2	DIP SW3	DIP SW4	Function
OFF				Monitoring of Master
ON				Monitoring of Slave
	OFF	OFF		Set 30 Sec. Timeout
	Any other combination			Timeout disabled
			OFF	Outputs set to INVERTED
			ON	Outputs set to TRUE

Operation

Once the 16IO-SSRT-09HP master and slave have been set up and their RF link is established, the monitor unit located at some remote point is powered up. With the DIP switch 1 set to OFF will reproduce the state of the master's inputs as outputs, and with the DIP switch 1 set to ON, will reproduce the slave's inputs as outputs.

If DIP switch 1 is set to OFF and there is a break in the communication between the master and the monitor for a period of more than 30 seconds, then the monitor timeout function will go active. When communication is restored, the timeout will reset. The same applies with respect to the monitor and slave when DIP switch 1 is set to ON.

The **RX communication LED** will **flash in a fast sequence** which indicates normal operation. Normal operation means that the monitor is within range of the master and slave's signal and is able to monitor the master and slave reliably and also indicates that the master and slave are communicating with each other.

If the **RX communication LED flashes in a 10 second interval**, this indicates that the monitor is only able to monitor the slave, which means that either the master is out of range of the monitor,or there is a break in the communications between the master and the slave.

If the **RX communication LED flashes in a 1 second interval**, this indicates that the monitor is only able to monitor the master, which means that either the slave is out of range of the monitor, or there is a break in the communications between the master and the slave.

RX LED Flashing Sequence	System Diagnostics
Fast	Normal operation. Master and slave are communicating. Monitor can monitor master and slave
10 Second Interval	Master is out of range or is not communicating with slave. Monitor can only monitor slave.
1 Second Interval	Slave is out of range or is not communicating with master. Monitor can only monitor master.

PCB Dimensions
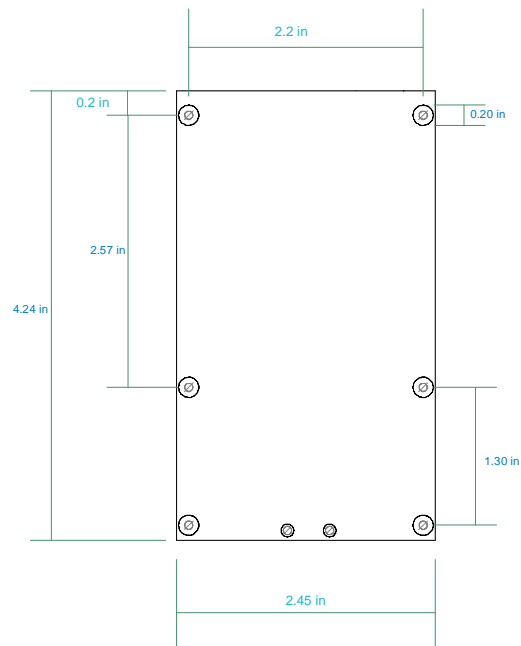
Disclaimer:

Technical specifications are subject to change without notice. Whilst every effort has been made to ensure the accuracy of the information contained in this document, ABACOM Technologies Inc. does not assume responsibility for any errors or omissions that may exist. ABACOM Technologies Inc. does not assume responsibility for any damage caused through use or misuse of their products and the onus lies entirely with the end user in determining the suitability of and use of the product for any particular application. ABACOM Technologies Inc. products are not recommended for applications where human life may be at risk.
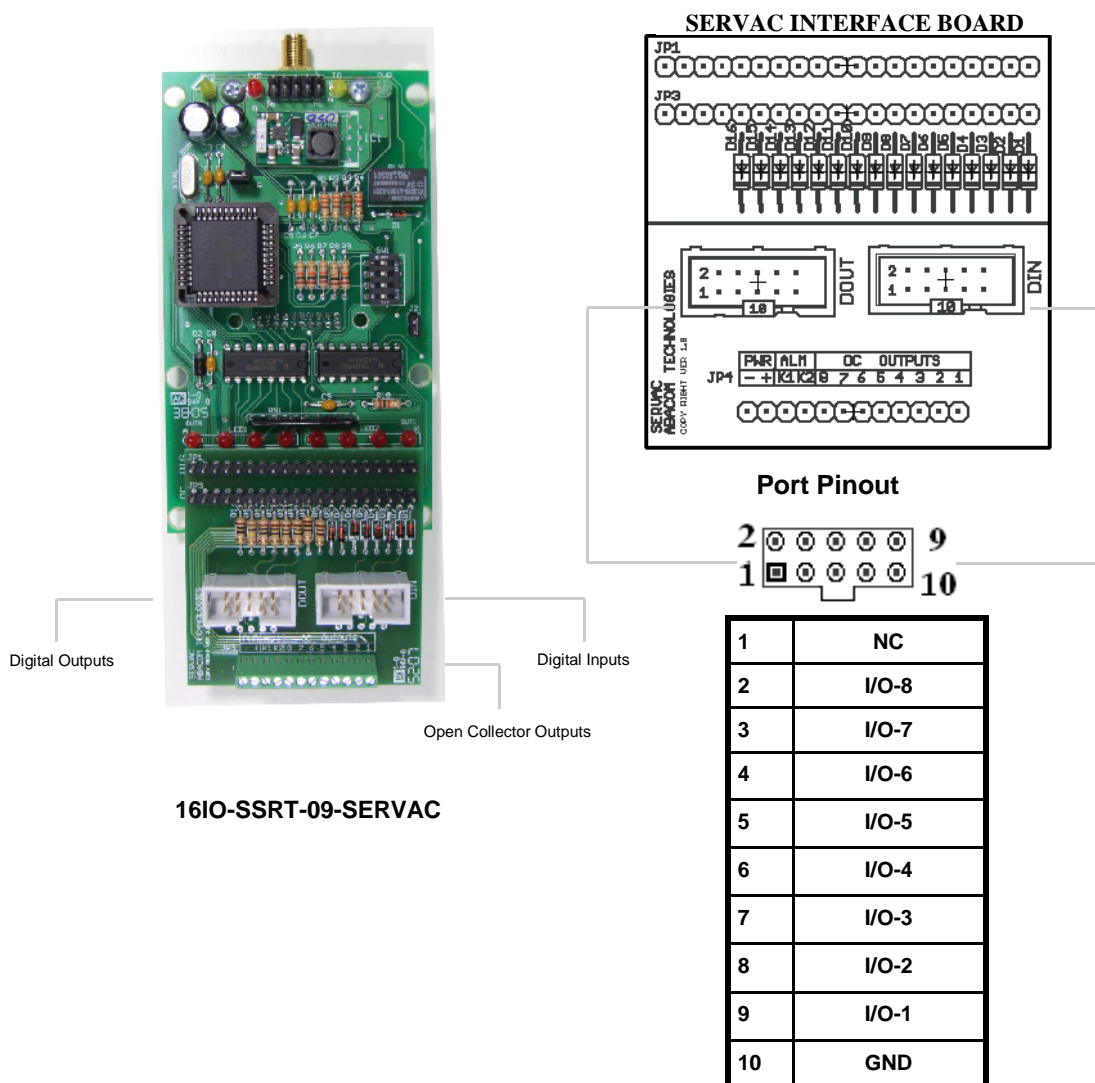
16IO-SSRT-09-SERVAC

16IO-SSRT-09-SERVAC is functionally identical to **16IO-SSRT-09.** The added interface board provides compatibility with 32IOSERVER. This version enable users to monitor and control the input and output ports of the16IO-SSRT-09 over the internet when connected to the 32IO SERVER.

The suffix **SERVAC** indicates that the module is a 32IO **SERV**ER **AC**CESSORY. See 32IO SERVER documentation for complete system details.

The 16IO-SSRT-09-SERVAC provides an RF extension to the 32IO SERVER's input and output ports. Digital inputs of 16IO-SSRT-09 connect to an OUTPUT configured port on the 32 IO SERVER and Digital outputs connect to an INPUT configured port on the 32 IO SERVER.

The following page shows a typical system setup.

SERVAC INTERFACE BOARD

16IO-SSRT-09-SERVAC

Digital Outputs

Digital Inputs

Open Collector Outputs

Port Pinout

1	NC
2	I/O-8
3	I/O-7
4	I/O-6
5	I/O-5
6	I/O-4
7	I/O-3
8	I/O-2
9	I/O-1
10	GND

32IO SERVER Configuration

Example system setup using the 16IO-SSRT-09 transceivers (SERVAC versions) with the 32IO SERVER
This configuration provides a bidirectional wireless link from the user's devices to the 32IO SERVER
and from the 32IO SERVER to the user's devices. With this configuration, a computer connected to the internet
anywhere in the world, is able to control up to 8 user devices and monitor up to 8 user device states over a
wireless link. Two remaining ports on the 32IO SERVER allows for further expansion to control and/or monitor
an additional 16 devices either locally connected or wirelessly connected.
With the ALARM input connected, email notification will be sent if there is an interruption or failure in the
wireless link.

INTERNET

MODEM

ROUTER

32IO SERVER

→ INPUT

→ OUTPUT

ALARM →

16IO-SSRT-09-SERVAC

up to
10 miles apart
(-HP versions)

16IO-SSRT-09-SERVAC

TO
USER'S
I/O
DEVICES