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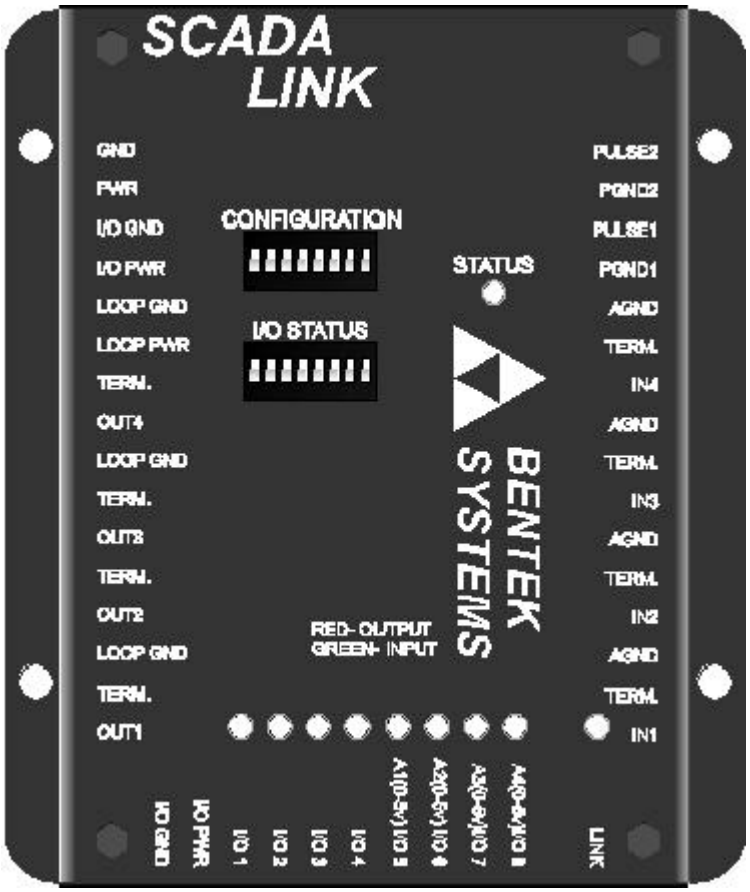

SCADA*Link* IOEXP442

I/O Expansion Module for 900 -MB

USER MANUAL

Issue V1.1 for SCADAL*ink* IOEXP442

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1 I/O EXPANSION MODULE FEATURES

1.1 I/O SUMMARY

The IOEXP442 is an Expansion Module that easily connects to an existing SCADALink 900-MB or MB-RTU to give it enhanced I/O capability. These units are not standalone and require a 900-MB or MB-RTU to operate properly. **Note: Since the MB-RTU is a simply a 900-MB without the radio, any references in this manual to the 900-MB shall be applicable to the MB-RTU as well.**

1.1.1 DEDICATED ANALOG INPUTS (IN1 – IN4):

- 4 analog current input channels (0-20 mA/4-20 mA) with 12 bit resolution.
- 0 to 5 volts may be measured on same channels by simple wiring change.

1.1.2 DEDICATED ANALOG OUTPUTS (OUT1 - OUT4)

- Each channel can be configured as a 0-20 mA or as a 4-20 mA current output with 12 bit resolution using Switch 7 Config 1 on the attached SCADALink 900MB radio modem.
- Each channel can also be configured as a 0-5V or 1-5V output by configuring the same DIP switch and wiring the inputs slightly different to recognize a voltage instead of a current input.

1.1.3 MULTIPLEXED DIGITAL I/O (I/O1 - I/O4)

- Each pair of adjacent channels can be configured as 2 digital inputs or as 2 open collector digital outputs using the I/O STATUS DIP switch.

1.1.4 MULTIPLEXED DIGITAL & ANALOG I/O (A1(0-5V)I/O1 – A4(0-5V)I/O4):

- Each pair of adjacent channels can be configured as 2 digital inputs or as 2 open collector digital outputs using the I/O STATUS DIP switch.
- Each pair of adjacent channels can also be configured as 2 analog inputs (8 bits). Both voltage and current signals can be connected: voltage source is directly connected while current source is connected in parallel to a 250 Ohm external terminating resistor.

1.1.5 DEDICATED PULSE INPUTS (PULSE1 – PULSE2)

- high speed pulse input channels able to accept pulse frequencies up to 25khz.

Note: No calibration is required for any of the above I/O.

1.2 MODES OF OPERATION

To understand how the I/O Expansion Module operates, it is necessary to understand how the SCADAL*ink* 900-MB operates. This manual uses terms defined in the SCADAL*ink* 900-MB User manual and readers unfamiliar with these terms should consult the 900-MB User manual.

The I/O Expansion Module can operate in both of the SCADAL*ink* 900-MB's two modes of operation: **Modbus RTU Mode** and **End to End Telemetry Mode.** These modes are selected by configuring the 900-MB's CONFIG 4 DIP switch.

1.2.1 MODBUS RTU SLAVE MODE

In this mode, the 900-MB/Expansion Module pair can be polled by a Modbus master via Modbus RTU protocol. The Modbus address of the pair is configured on the 900-MB's CONFIG 4 DIP switch. All relevant information including I/O, status and serial ports from both the 900-MB and the I/O Expansion Module are accessible to the master. The Modbus address mapping is given in Table 8.

1.2.2 END TO END TELEMETRY MODE

In End to End Mode, inputs on one side of the radio link become outputs on the other side. An End to End configured system acts like a virtual cable. The tables below show the allowable I/O mapping when two I/O Expansion Modules are configured in End to End mode. Table entries on the left-hand column map to the corresponding table entries on the right hand column.

TABLE 1: END TO END MODE IOEXP442 TO IOEXP442

IOEXP442 Module 1		IOEXP442 Module 2
IN1 – IN4	→	OUT1-OUT4
OUT1 – OUT4	←	IN1 – IN4
I/O1 – I/O4	⇄	I/O1 – I/O4
A1(0-5V)I/O1 – A4(0-5V)I/O4	⇄	A1(0-5V)I/O1 – A4(0-5V)I/O4

For both I/O1 – I/O4 and A1(0-5V)I/O1 – A1(0-5)I/O4, channel pairs configured as digital inputs on one side must correspond to the same channel pairs configured as digital outputs on the other side.
Note that only digital values can be transmitted across on A1(0-5V)I/O 1 to A4(0-5V)I/O4 in End to End Mode; 8 bit analog values cannot.

In End to End Mode, the serial ports can still be used for serial data transmission however, there are 2 things the user must be aware of if End to End I/O Telemetry and serial data transmission are used simultaneously:

1. End to End I/O mode reduces serial data throughput by up to half.

2. Modbus protocol cannot be used.

Refer to the 900-MB User manual for a detailed description of End to End Telemetry Mode configuration and operation.

2 OPERATION

2.1 INITIAL SETUP

Like the 900-MB, the I/O Expansion Module can be completely configured using the switches on the front of the unit…no user programming is required**. Note that new switch settings are only recorded when power is reset.** The diagram below shows the switch configuration.

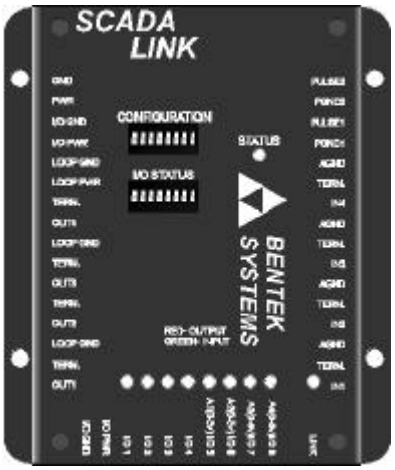


Figure 1: Front Cover Layout

2.1.1 CONFIGURATION (SW1)

TABLE 2: CONFIGURATION DIP SWITCH

DIP SWITCH POSITION	FUNCTION	OFF	ON
1 (far left)	NOT USED - normally OFF		
2	NOT USED - normally OFF		
3	NOT USED - normally OFF		
4	NOT USED - normally OFF		
5	Current test mode	OFF	ON
6	NOT USED - normally OFF		
7	NOT USED - normally OFF		
8 (far right)	NOT USED - normally OFF		

2.1.2 I/O STATUS (SW2)

TABLE 3: I/O STATUS DIP SWITCH

DIP SWITCH POSITION	FUNCTION	OFF	ON
1 (far left)	I/O 1, I/O 2 MODE	INPUT	OUTPUT
2	I/O 3, I/O 4 MODE	INPUT	OUTPUT
3	I/O 5, I/O 6 MODE	INPUT	OUTPUT
4	I/O 7, I/O 8 MODE	INPUT	OUTPUT
5	I/O LED MODE	ENABLED	DISABLED
6	NOT USED - normally OFF		
7	NOT USED - normally OFF		
8 (far right)	NOT USED - normally OFF		

2.2 I/O TERMINAL BLOCKS

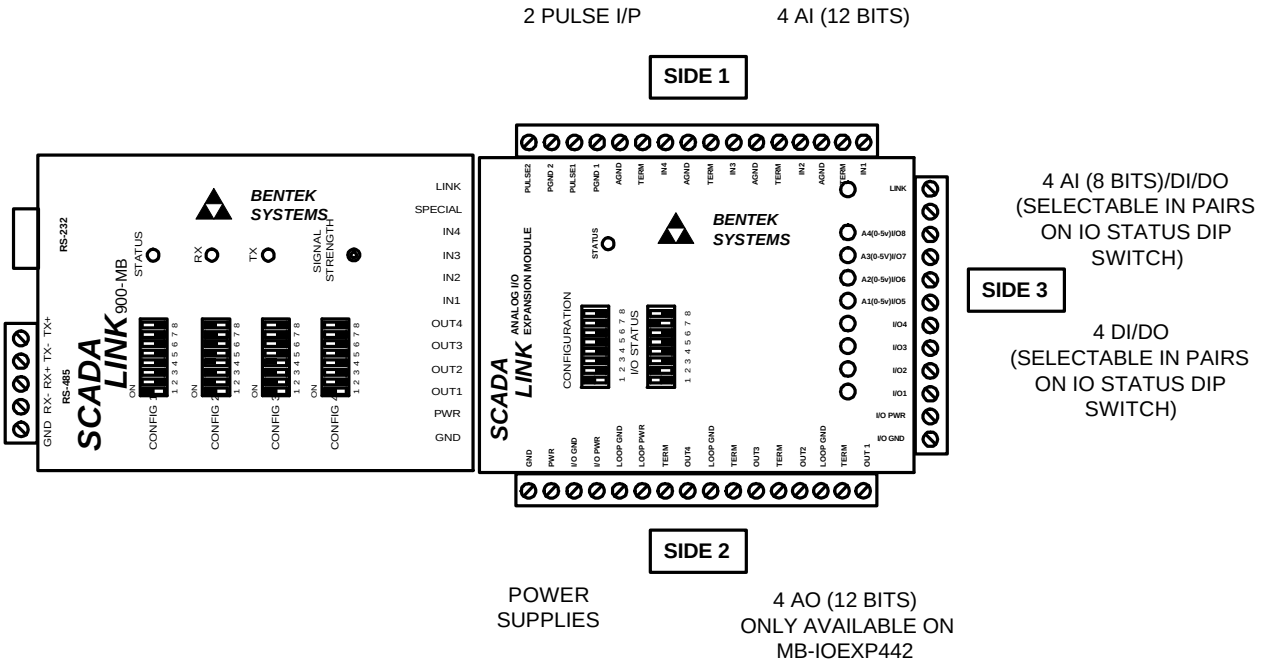


Figure 1: I/O Terminal Block Sides

TABLE 4: SIDE 1 I/O TERMINAL BLOCKS

DESIGNATION	PARAMETERS	TERMINAL #
IN1	0-5 VDC or 0-20mA/4-20mA	1
TERM	0-20mA/4-20mA (must be connected to IN1)	2
AGND	+/- 4.6 VDC max. from I/O GND	3
IN2	0-5 VDC or 0-20mA/4-20mA	4
TERM	0-20mA/4-20mA (must be connected to IN2)	5
AGND	+/- 4.6 VDC max. from I/O GND	6
IN3	0-5 VDC or 0-20mA/4-20mA	7
TERM	0-20mA/4-20mA (must be connected to IN3)	8
AGND	+/- 4.6 VDC max. from I/O GND	9
IN4	0-5 VDC or 0-20mA/4-20mA	10
TERM	0-20mA/4-20mA (must be connected to IN4)	11
AGND	+/- 4.6 VDC max. from I/O GND	12
PGND1	Pseudo Differential GND for PULSE1	14
PULSE1	40mV – 30V Input Pulse Counter (MAX 25KHz)	13
PGND2	Pseudo Differential GND for PULSE2	16
PULSE2	40mV – 30V Input Pulse Counter (MAX 25KHz)	15

TABLE 5: SIDE 2 I/O TERMINAL BLOCK

DESIGNATION	PARAMETERS	TERMINAL #
GND	Ground for 900-MB or previous module	1
PWR	Power for 900-MB or previous module (10.5-30VDC)	2
I/O GND	Ground for I/0 Expansion Module (internally connected to LOOP GND)	3
I/O PWR	Power for I/O Expansion Module (10.5-30VDC)	4
LOOP GND	Ground for current loop (internally connected to I/O GND)	5
LOOP PWR	Power for 4-20mA Current Loop (10.5-30VDC)	6
TERM	For 0-5V (must be connected to OUT4)	7
OUT4	0-5 VDC or 0-20mA/4-20mA	8
LOOP GND	Current loop Ground	9
TERM	For 0-5V (must be connected to OUT3)	10
OUT3	0-5 VDC or 0-20mA/4-20mA	11
TERM	For 0-5V (must be connected to OUT2)	12
OUT2	0-5 VDC or 0-20mA/4-20mA	13
LOOP GND	Current loop Ground	14
TERM	For 0-5V (must be connected to OUT1)	15
OUT1	0-5 VDC or 0-20mA/4-20mA	16

TABLE 6: SIDE 3 I/O TERMINAL BLOCK

DESIGNATION	PARAMETERS	TERMINAL #
I/O GND	Ground for I/O Expansion Module	1
I/O PWR	Power for I/O Expansion Module (10.5-30VDC)	2
I/O 1	Digital Input or Output	3
I/O 2	Digital Input or Output	4
I/O 3	Digital Input or Output	5
I/O 4	Digital Input or Output	6
I/O 5	Digital Input or Output or Analog Input 0..5V/4-20mA (8 bit resolution)	7
I/O 6	Digital Input or Output or Analog Input 0..5V/4-20mA (8 bit resolution)	8
I/O 7	Digital Input or Output or Analog Input 0..5V/4-20mA (8 bit resolution)	9
I/O 8	Digital Input or Output or Analog Input 0..5V/4-20mA (8 bit resolution)	10
Reserved		11
LINK	Open collector to GND (Fail-Safe Output)	12

2.2.1 POWER SUPPLY TERMINALS

There are 4 separate sets of power supply inputs (2 of these are the same but found in 2 different locations). They are described below:

PWR provides power to the 900-MB connected to the I/O Expansion Module.

PWR voltage can be monitored by a Modbus master (see Table 8 for Modbus addresses). The following formula is used to calculate the PWR voltage from this read digital value:

PWR Voltage = 30 * MODBUS Address 40046 / 32767

For higher accuracy, use Modbus register 40048 (each step in 0.1V) and the following equation:

PWR Voltage Level = MODBUS Address 40048

Note: The 900-MB power supply PWR can be completely isolated from I/O PWR or LOOP PWR.

I/O PWR provides power to the pulse counters and the digital I/O on the I/O Expansion Module.

For new installations, all required power can be provided to the I/O Expansion Module by connecting to SIDE 2 (where PWR, I/O PWR and LOOP PWR can all be found together in one group). There is also another set of I/O PWR terminals occurring on SIDE 3. It is electrically the same as the SIDE 2 I/O PWR but exists to make SIDE 3 compatible to the 900-MB I/O connector. This allows connectors from legacy 900-MB systems to connect directly to an added I/O Expansion Module without any need for rewiring.

I/O PWR voltage can be monitored by a master (see Table 8 for Modbus addresses). The following formula is used to calculate the power from this read digital value:

I/O PWR Voltage = 30 * MODBUS Address 40056 / 32767

LOOP PWR provides power to the dedicated analog inputs and outputs.

Note: LOOP GND and I/O GND must not differ by more than 4.6V for proper operation.

If the 0-20 mA/4-20 mA section is unused, LOOP GND and LOOP PWR do not need to be connected.

LOOP PWR voltage can be monitored by a Modbus master (see Table 8 for Modbus addresses). The following formula is used to calculate the power from this read digital value:

LOOP PWR Voltage = 30 * MODBUS Address 40055 / 32767

2.2.2 POWER SUPPLY WIRING EXAMPLES

The number of power supplies used depends on whether the I/O Expansion Module is used in a new or a legacy system.

Typically, in a new design one properly sized power supply can supply power to all the power supply input terminals found on SIDE 2.

In a legacy system, however, the existing 900-MB connector can plug right into the SIDE 3 terminal strip of the I/O Expansion Module. This is because all 3 power circuits (PWR, LOOP PWR and I/O PWR) have the same voltage range. The existing power supply subsequently provides power to I/O PWR in the expanded system. If the original power supply had adequate power, the designer can use the extra capacity to power the PWR and LOOP PWR circuit. However, many legacy systems have power supplies that only possess enough capacity for the 900-MB. In this case, the designer then needs to supply one new power supply for PWR and LOOP PWR. Power specifications are given in Table 9 .

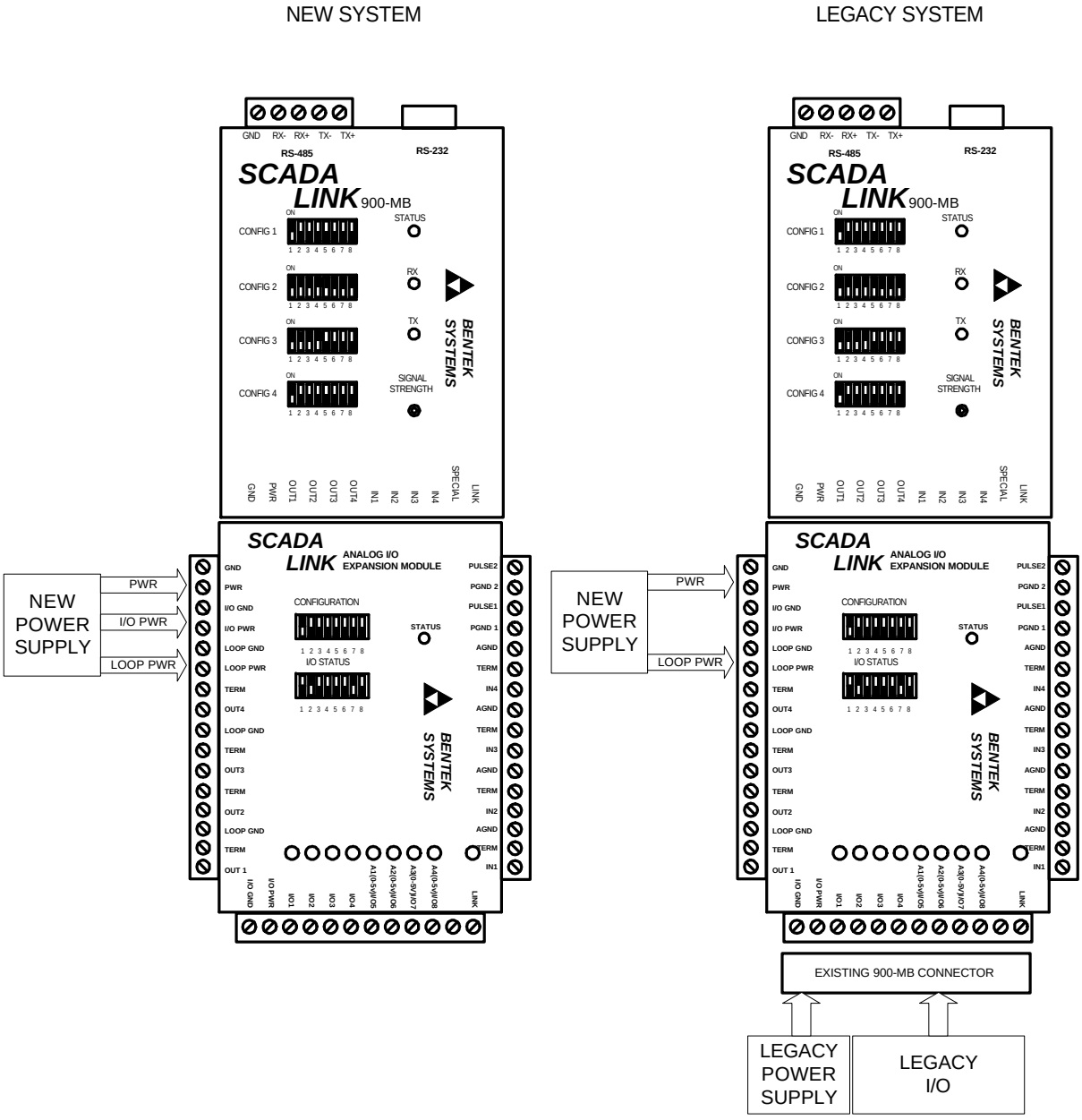


Figure 3: Power Supply Wiring: New vs. Legacy System

2.2.3 DEDICATED ANALOG INPUTS

There are 4 dedicated analog input channels named IN1 - IN4. Each of these channels provides 12 bits resolution and can operate in two modes: current or voltage.

2.2.3.1 Current Mode

To measure current using one of the dedicated analog inputs IN1 – IN4, connect the signal terminal (+) of the current transmitter to one of the channel inputs then jumper that channel input to its adjacent TERM terminal where an internal 250-ohm terminating resistor connects to AGND.

2.2.3.1.1 Two wire loop-powered transmitter:

1. Connect the (-) terminal of the loop power supply to AGND and LOOP GND
2. Connect the (+) terminal of the loop power supply to the (-) terminal of the loop transmitter.
3. Connect the (+) terminal of the loop transmitter to INx.

2.2.3.1.2 Four wire self-powered transmitter:

1. The self-powered transmitter has it's own power supply, connect this supply to LOOP GND and LOOP PWR respectively
2. Connect the (-) of the transmitter to AGND and the (+) of the transmitter back to the input Inx.

Note: AGND is the "Analog Ground" and must be within 4.6 Volts of the Power Supply grounds (GND).

2.2.3.2 Voltage Mode

1. Voltage source must not exceed 5V DC
2. Connect the signal directly to the channel input. The adjacent terminator (TERM) is not used.

2.2.3.3 Input Register Scaling

The 12 bit IN1 to IN4 input values are read from MODBUS locations 30001 to 30004 while the 8 bit A1(0-5V)IN1 to A4(0-5V)IN4 input values are read from MODBUS locations 30005 to 30008 (See Table 8).

2.2.3.3.1 Current Measurement

Use the following equations to generate a current value in physical units of milliAmperes:

0 – 20 mA Input current mA = 20 * MODBUS Value / 32767
4 – 20 mA Input current mA = (20 * (MODBUS Value – 6553) / 32767) + 4

2.2.3.3.2 Voltage Measurement

Use this equation to generate a voltage value in physical units of Volts:

Voltage = 5 * MODBUS Value / 32767

The figure below show a 2-wire loop-powered, a 4-wire self-powered and a voltage transmitter connection to IN1, IN2 and IN4 respectively of the I/O Expansion Module.

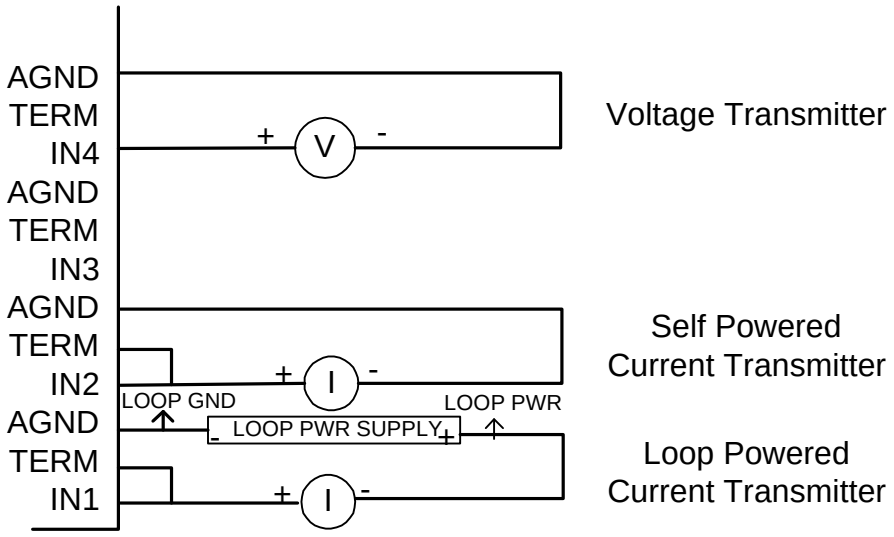


Figure 4: Analog Input Wiring

2.2.4 DEDICATED ANALOG OUTPUTS

There are four dedicated analog output channels named OUT1 - OUT4. Each channel provides 12 bit resolution and can operate in 2 modes: current or voltage.

2.2.4.1 Current Output

1. Set Switch 7 Config 1 on the attached SCADALink 900MB radio modem for the output channel to source either 0-20 mA or 4-20mA.
2. Connect OUTx to one terminal of the current load and connect the return lead to the LOOP GND terminal adjacent to OUTx.

2.2.4.2 Voltage Output

1. Set Switch 7 Config 1 on the attached SCADALink 900MB radio modem (up:4-20, down:0-20) to configure the channel for 0-20 mA.

2. Connect OUTx to (+) terminal of the voltage load and connect the return lead to the AGND terminal adjacent to OUTx.

The minimum and maximum impedance for loads connected to the current loop outputs is based on the LOOP Power Supply of 10.5 to 30 volts. The maximum Loop Resistance is calculated with the following formula.

Maximum Loop Resistance = (Loop Voltage – 3V) * 50 ohm

Figure 5 below shows typical current and voltage output connections. Note that TERM is jumpered to OUTx when a voltage output is desired.

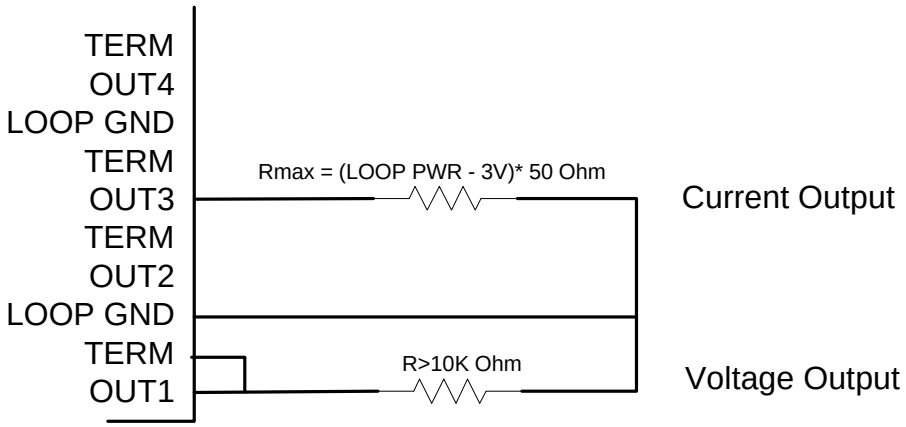


Figure 5: Analog Output Wiring

2.2.5 MUTIPLEXED DIGITAL INPUTS AND OUTPUTS

There are 4 multiplexed digital I/O channels named I/O1 – I/O4. Each channel can be configured for 1 of 2 modes: digital input or digital output.

2.2.5.1 Digital Input

1. Set the appropriate I/O STATUS DIP switch channel pair as digital inputs.
2. Connect the digital input **(Note: voltage greater than 2.5V will be considered ON and the corresponding I/O LED will be lit green).**

2.2.5.2 Digital Output

1. Set the appropriate I/O STATUS DIP switch channel pair as digital outputs.
2. Connect the digital output **(Note: Digital outputs are open-collector type, which pull to ground when active. This is the same configuration as presently used on the 900-MB radio. When configured as an output and the output is active, the corresponding light will be red**).

All input and output devices should be referenced to the I/O power and ground connection on the same connector.

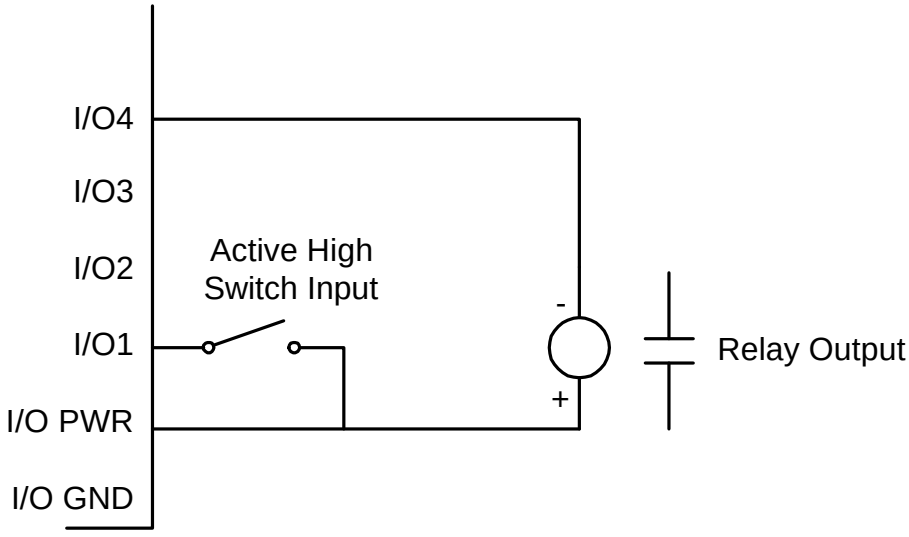


Figure 6: Digital Input/Output Wiring

An external pull-up resistor of 10K ohms can be used if active low is used (input active when pulled to ground). Typically, OPTO22 (or equivalent) DC output modules require this wiring configuration. **Note: do not use external Pullup resistors when the I/O point is configured as an output.**

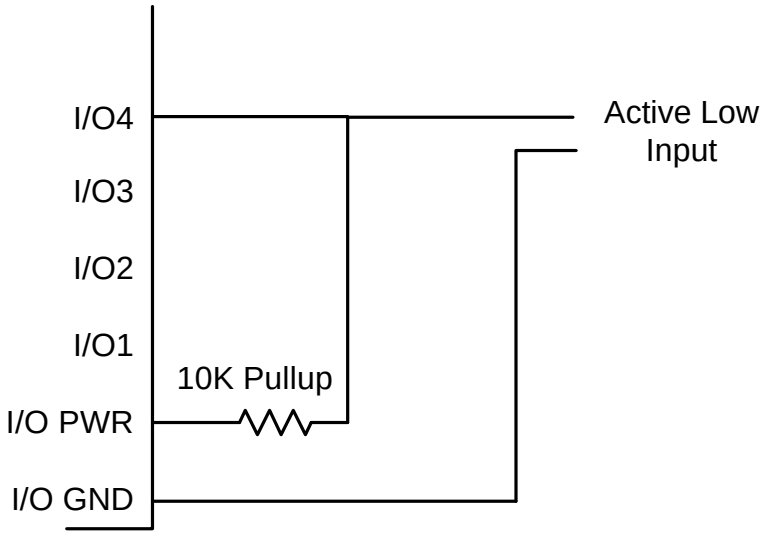


Figure 7: Digital Input Wiring (Active Low Input)

2.2.5.3 Input Register Scaling

Digital inputs or outputs can be read or written to at Modbus address locations 00001-00004 (Outputs) and 10001-10004 respectively (See Table 8).

2.2.6 MULTIPLEXED ANALOG INPUTS, DIGITAL INPUTS AND DIGITAL OUTPUTS

There are 4 multiplexed mixed analog and digital I/O channels named A1(0-5V)I/O1 – A4(0-5V)I/O4. Each channel can operate in 3 modes: analog input, digital input or digital output. The digital inputs and outputs operate exactly the same way that I/O1 – I/O4 does so will not be described here.

2.2.6.1 Analog Voltage Input

Connect the (+) terminal of the voltage source to Ax(0-5V)I/Ox and the (-) terminal to I/O GND.

2.2.6.2 Analog Current Input

To measure current using one of the multiplexed inputs A1(0-5V)I/O1 – A4(0-5V)I/O4, the appropriate I/O STATUS DIP switch channel pair must first be set as an input. **Note: these inputs can only yield 8 bit resolution.**

2.2.6.2.1 Two wire loop-powered transmitter

1. Connect the (-) terminal of the loop power supply to I/O GND
2. Connect the (+) terminal of the loop power supply to the (-) terminal of the loop transmitter.
3. Connect the (+) terminal of the loop transmitter to Ax(0-5V)I/Ox
4. Connect a 250 Ohm resistor between Ax(0-5V)I/Ox and I/O GND

2.2.6.2.2 Four wire self-powered transmitter

1. Connect the loop power supply (-) terminal to (I/O GND or LOOP GND) and the loop power supply (+) terminal to I/O PWR
2. Connect the (-) of the loop transmitter to I/O GND or LOOP GND and the (+) of the transmitter back to the input Ax(0-5V)I/Ox
3. Connect a 250 Ohm resistor between Ax(0-5V)I/Ox and I/O GND

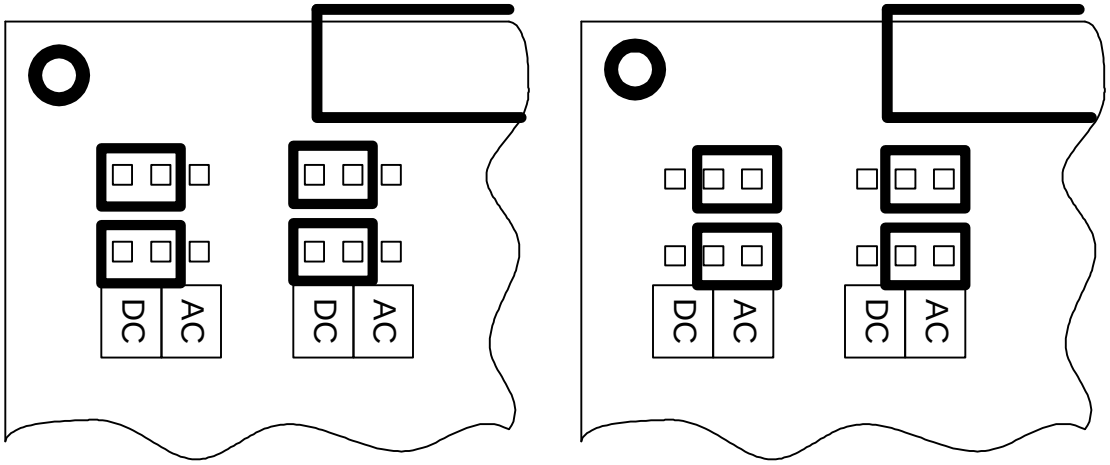
2.2.6.3 Input Registry Scaling

The 8 bit A1(0-5V)IN1 to A4(0-5V)IN4 input values are read from MODBUS locations 30005 to 30008 (See Table 8).

2.2.7 PULSE INPUTS

There are two high speed pulse counter input channels. These inputs will accept either a 5V LOGIC DC input or 40mV AC input. The frequency counter is updated each second and the input frequency can range from 0 Hz to 25 kHz. The reported value is in Hertz and each pulse counter is 32 bits wide with a corresponding 16-bit frequency word (See Table 8).

The pair of jumpers on the bottom board of the assembly are used to configure the pulse counter input as either AC or DC. Factory Default is DC Input Configuration.



DC Input Configuration
Supplied as default.

AC Input Configuration

In DC Input Configuration, the connector pins PGND1 and PGND2 are the same ground as I/O Ground. In AC Input Configuration, the measured signal must be within 5 volts of I/O Ground in order for the internal comparators to function.

The pulse counters operate from the I/O power supply terminals. If the power supplies are separated, it is possible to continue to operate the pulse counters while letting the 900-MB and the current loops power fail. The pulse counter values are saved during power failure.

2.2.8 LINK OUTPUT

The IOEXP442's LINK Output is used to indicate the status of the radio link. It is a direct wire to the 900-MB LINK Output. Refer to the 900-MB User manual for operation and connection details.

2.2.9 LED INDICATORS

STATUS LED indicates the I/O Expansion Module has commenced operation and that the internal electronics are operating.

LINK LED indicates a good radio link. This LED is synchronized with the LINK output found on SIDE 3 and operates as described in the SCADALink 900-MB User manual.

I/O LED's indicate status of digital inputs or outputs on the I/O, A(0-5V)I/O channels.

TABLE 7: I/O LED DESCRIPTION

LED Color	Description
Green	Channel is configured as an input and the input is > 2.5 VDC
Red	Channel is configured as an output AND an output is active

2.2.10 MODBUS ADDRESSING

TABLE 8: MODBUS ADDRESSING

	0	10,000	30,000	40,000
1	I/O1 (DOUT1)	I/O1 (DIN1)	IN1	OUT1
2	I/O2 (DOUT2)	I/O2 (DIN2)	IN2	OUT2
3	I/O3 (DOUT3)	I/O3 (DIN3)	IN3	OUT3
4	I/O4 (DOUT4)	I/O4 (DIN4)	IN4	OUT4
5	A1(0-5V)I/O1 (DOUT5)	A1(0-5V)I/O1 (DIN5)	A1(0-5V)I/O1 (AIN1)	
6	A1(0-5V)I/O1 (DOUT6)	A2(0-5V)I/O2 (DIN6)	A2(0-5V)I/O2 (AIN2)	
7	A1(0-5V)I/O1 (DOUT7)	A3(0-5V)I/O3 (DIN7)	A3(0-5V)I/O3 (AIN3)	
8	A1(0-5V)I/O1 (DOUT8)	A4(0-5V)I/O4 (DIN8)	A4(0-5V)I/O4 (AIN4)	
9				WATCHWRITE
10				
11				
12				
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17				
18				
19				
20				
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29				
30				
31				
32				
33				
34				
35				
36				
37				
38				SERIAL NUMBER L
39				SERIAL NUMBER H

40				GROUP
41				ID1
42				ID2
43				CONFIG12
44				CONFIG34
45				RSSI - 16 BIT
46				PWR – 16 BIT
47				RSSI- dBm
48				PWR in 0.1 V STEPS
49				WATCHREAD
50				PACKED DIN 1-16
51				IN1
52				IN2
53				IN3
54				IN4
55				LOOP PWR
56				I/O PWR
57				
58				
59				FREQ F1
60				FREQ F2
61				
62				
63				COUNTER1 – L
64				COUNTER1 – H
65				COUNTER2 – L
66				COUNTER2 – H
67				
68				
69				
70				

Notes: L = Least significant word (lower 16 bits)
H = Most significant word (upper 16 bits)

3 SPECIFICATIONS

TABLE 9: POWER SUPPLY SPECIFICATIONS (@ TEMPERATURE = –30 TO +70 C)

DESIGNATION	MAX	TYP	MIN	UNITS
PWR (RADIO) VOLTAGE	30	-	10.5	VDC
PWR (RADIO) CURRENT(Peak) NOTE 2	600	-	-	mA
PWR (RADIO) CURRENT (Average)[2]	350	290	200	mA
I/O PWR VOLTAGE	30	-	10.5	VDC
I/O PWR CURRENT	80	-	20	mA
LOOP PWR VOLTAGE	30	-	10.5	VDC
LOOP PWR CURRENT (IOEXP442)	100	-	20	mA
POWER UP-DELAY	.5	-	-	SEC

NOTE 1 *- ALL SUPPLYS HAVE REVERSE PROTECTION, PTC FUSE PROTECTION, AND 30V TRANSIENT SUPRESSORS ON THE SUPPLYS. THE LOOP SUPPLY AND THE I/O SUPPLY ARE OPTICALLY ISOLATED FROM THE RADIO SUPPLY.*
NOTE 2 *- I/O MODULE PLUGGED INTO 900-MB.*

TABLE 10: I/O SPECIFICATIONS FOR DIGITAL I/O SIDE 3 TERMINAL BLOCK (@ TEMPERATURE = –30 TO +70 C)

DESIGNATION	MAX	TYP	MIN	UNITS
OUTPUT SINK CURRENT NOTE 3	.5	-	-	AMP
OUTPUT TOTAL SINK CURRENT NOTE4	-	1	-	AMP
DRAIN-SOURCE VOLTAGE	60	-	-	VDC
DIG INPUT TURN ON VOLTAGE	-	2.5	-	VDC
MAX INPUT VOLTAGE	60	-	-	VDC
ANALOG INPUT RESOLUTION	-	8	-	BITS
ANALOG REPEATIBILITY	-	+/-2	-	%
ANALOG RANGE	5	-	0	VDC
INPUT RESISTANCE TO GND	-	100	-	K ohms

NOTE 3 *- SINGLE CHANNEL ON, ALL OUTPUTS HAVE TRANSIENT PROTECTION AND WILL SURVIVE RESISTIVE SHORTS TO DC SUPPLIES LESS THAN 30V.*
NOTE 4 *– DERATES TO .59 AMP AT 70C*

TABLE 11:CURRENT/VOLTAGE OUTPUT SPECIFICATIONS (@ TEMPERATURE = –30 TO +70 C)

DESIGNATION	MAX	TYP	MIN	UNITS
RESOLUTION	-	12	-	BITS
SPAN ADJUSTMENT RANGE	-	2.5	-	% FULL SCALE
4 MA ZERO ADJUST RANGE	-	5	-	% 4 mA
TEMPERATURE DRIFT	-	.5	-	% FULL SCALE
LINEARITY	-	.05	-	% FULL SCALE
5V OUTPUT LOAD RESISTOR NOTE 5	-	252	-	OHMS .1% 25PPM

NOTE 5 *- LOAD RESISTOR MUST BE JUMPERED TO THE CURRENT OUTPUT, OUTPUT CONFIGURED TO 0-20MA TO GET VOLTAGE (0-5V) OUT.*

TABLE 12: CURRENT/VOLTAGE INPUT SPECIFICATIONS (@ TEMPERATURE = –30 TO +70 C)

DESIGNATION	MAX	TYP	MIN	UNITS
RESOLUTION	-	12	-	BITS
ACCURACY	-	.25	.5	% FULL SCALE
5VDC INPUT RESISTANCE TO GND	-	31.5	-	K ohms
ANALOG GND	4.6	0	4.6	VDC FROM I/O GND
ANALOG GND CURRENT	200	-	-	mA
INPUT VOLTAGE	30	-	-	VDC

NOTE 6 *- TO GET CURRENT INPUT YOU MUST CONNECT THE (Ax I IN) PIN TO THE TERM PIN.*

TABLE 13: PULSE INPUT SPECIFICATIONS (@ TEMPERATURE = –30 TO +70 C)

DESIGNATION	MAX	TYP	MIN	UNITS
FREQ	25	-	-	kHz
BACKUP INTERVAL	-	1	-	TIMES/SEC
DC VOLTAGE NOTE 7	30	5	3	VDC
AC VOLTAGE MAX NOTE 7	30	-	-	V PEAK TO PEAK
AC VOLTAGE MIN	-	-	40	mV
FREQ INTERVAL	-	1	-	SEC

NOTE 7 *- TO CHANGE FROM AC PULSE COUNTING TO DC PULSE COUNTING, THE JUMPERS INSIDE THE UNIT MUST BE MOVED.*

ALL Specifications subject to change without notice.

4 Ordering Information

IOEXP442	4 Dedicated AI (12 bits) 4 Dedicated AO (12 bits) 2 Dedicated Pulse Inputs 4 Multiplexed DI/DO (Adjacent pairs configured for DI or DO via DIP switches) 4 Multiplexed AI (8 bits)/DI/DO (Adjacent pairs configured for AI, DI or DO via DIP switches)