



**SM300 Series  
RTUs**

*User Reference*

## NBT Telemetry Products

### REVISION RECORD

Revision 1.0	Initial Release
Revision 1.1	7-10-96
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Revision 1.3	2-10-99

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# 1. Overview

The SM300 Series of RTUs are rugged industrial/utility monitoring and control nodes. They are MODBUS compatible and have built in communications for RS232 connection or via 202 Modem (either 2 wire or radio connections).

Built in features include:

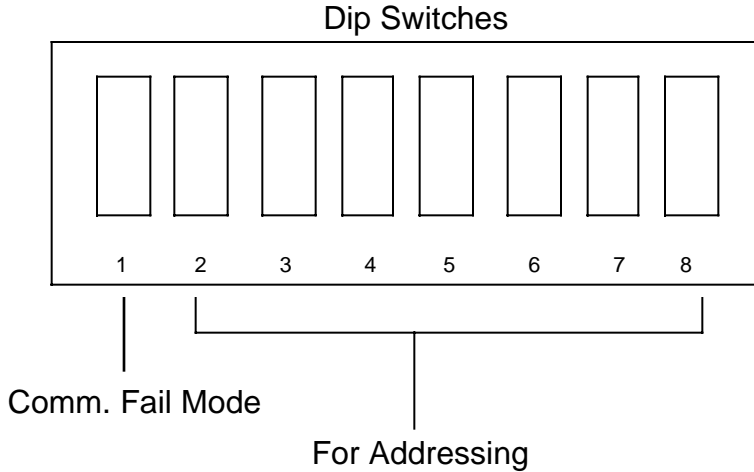
- Selectable output actions based on communications failures.
- Recording of ON/OFF cycles and accumulated ON (RUN) times.
- Recording of Minimum and Maximum readings for analog points.

Variety of point configurations ideal for any well site, tank site or lift station requirements.

## 2. Common Features

### 2.1 RTU Addressing

Addressing is in the range of 1-127. Setup of the site address is accomplished with 7 DIP switches.



( Switches shown are enlarged for ease of viewing)

Addressing Examples: Right most switch UP (#8) = Address 1

Two right most UP (#7 and 8) = Address 3

Addressing range is detailed below:

High                      Low                      (left to right)

2	3	4	5	6	7	8	
64	32	16	8	4	2	1	

(switch number marking)

(weighted values)

**The address is the sum of the weighted values of the switches in the UP position.**

### 2.2 Comm. Fail Setting

There are two modes in dealing with communications failure with the master. If the left most (#1) dip switch is in the up position, the outputs will hold the last values received from the master. If down, then the outputs will reset (to 0) when a communications failure is detected.

The #1 Dip Switch controls the actions of outputs when a communication failure is detected.

- UP-                      Hold last output state
- DOWN-                Fail to the OFF condition.

## **2.3 Communications Options**

There are two communications options available for the SM300 RTU:

- a) RS232
  - for direct connection
  - for External modem connection
  
- b) Internal modem (Bell 202)
  - for HDX 2 wire connection
  - for HDX radio connection (4 wires)

### **2.3.1 RS232 Connection**

For RS232 connection, the modem board is not present and HDR2 and HDR3 have to have jumpers installed to bring the RS232 signals to the external connector.

For RS232 Direct connect, insert the following jumpers:

HDR2 1-2, 9-10

HDR3 1-2, 7-8

For RS232 connection to an external modem (HDX), insert the following jumpers:

HDR2 1-2, 3-4, 7-8, 9-10

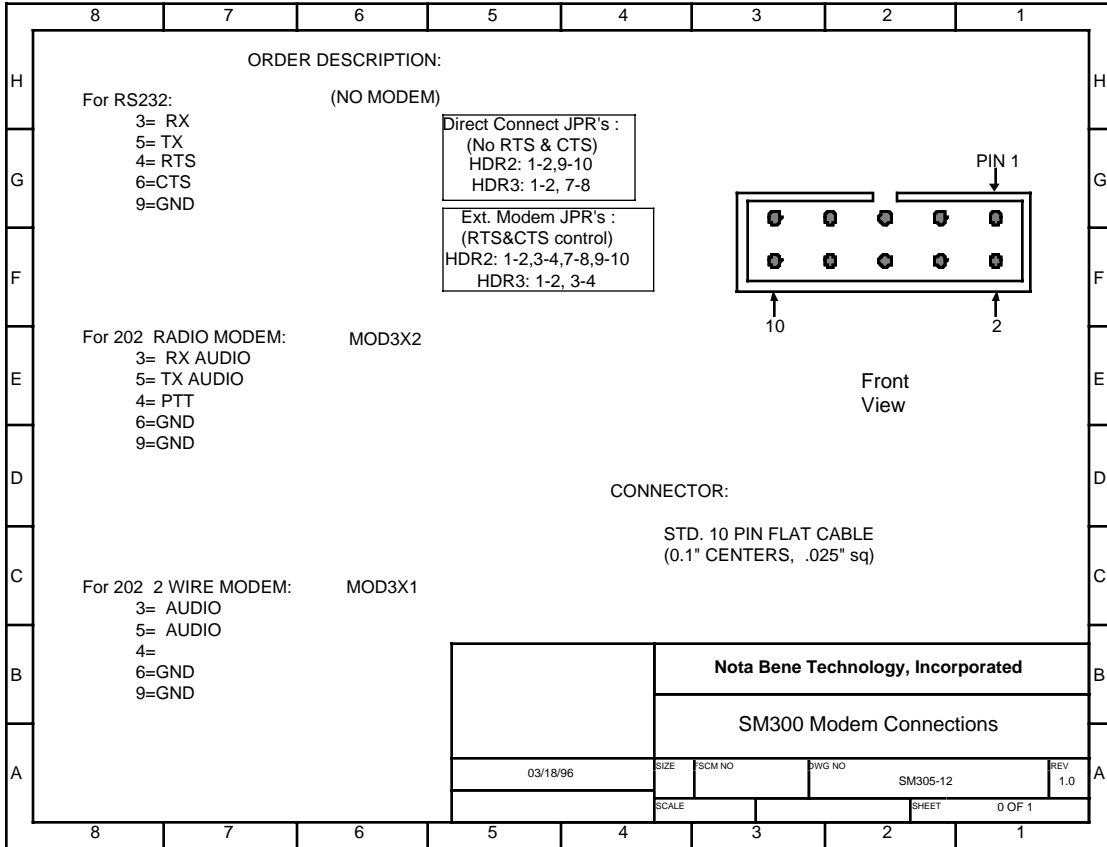
HDR3 1-2, 3-4

### **2.3.2 Baud Rate Setting**

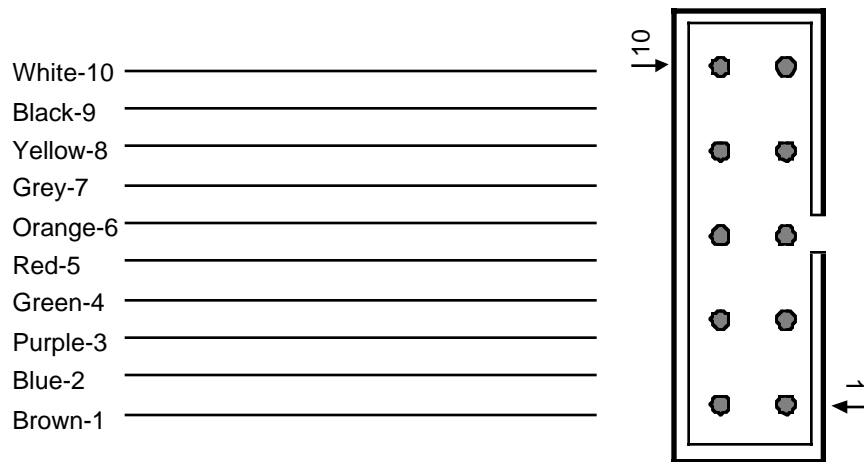
JP1 on the RTU main board sets the baud rate to either 1200 baud or 9600 baud.

(IN= 1200, OUT=9600)

## 2.4 Communications Connections

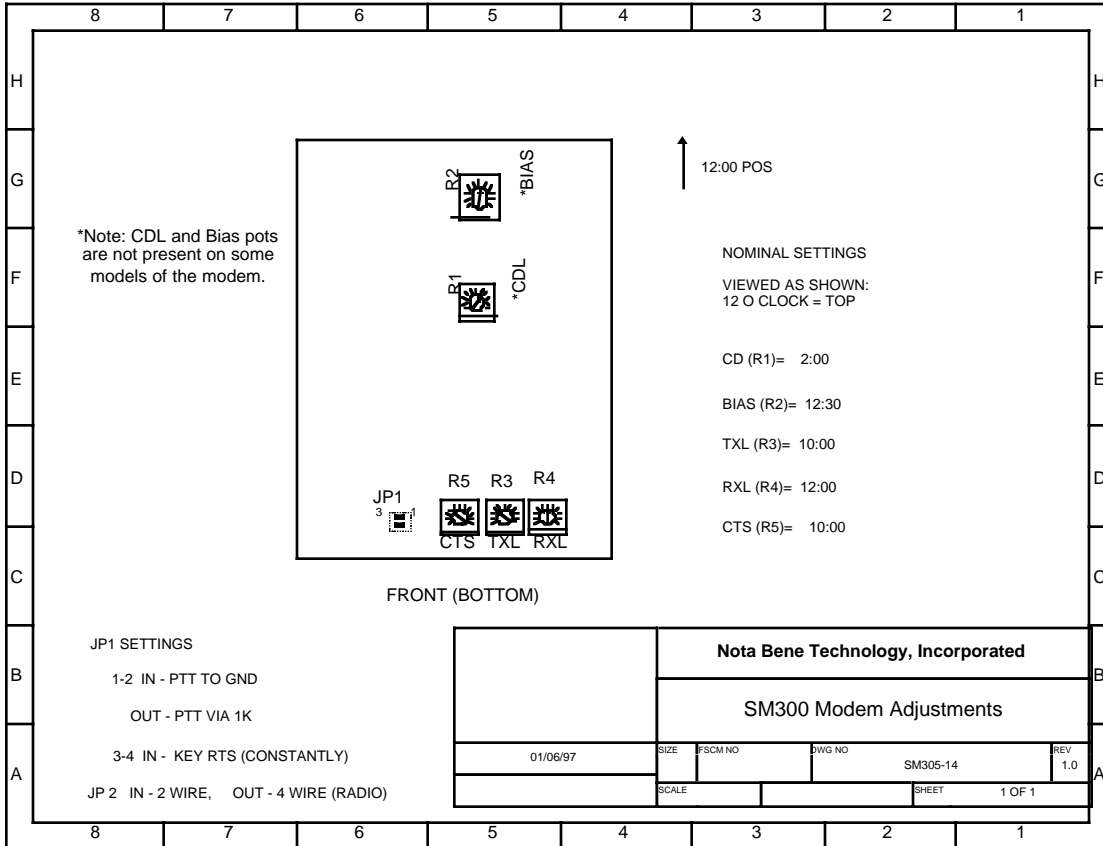


### Colored Wiring Harness for the 10 PIN RS232 Connection





### 2.4.1 Modem Settings

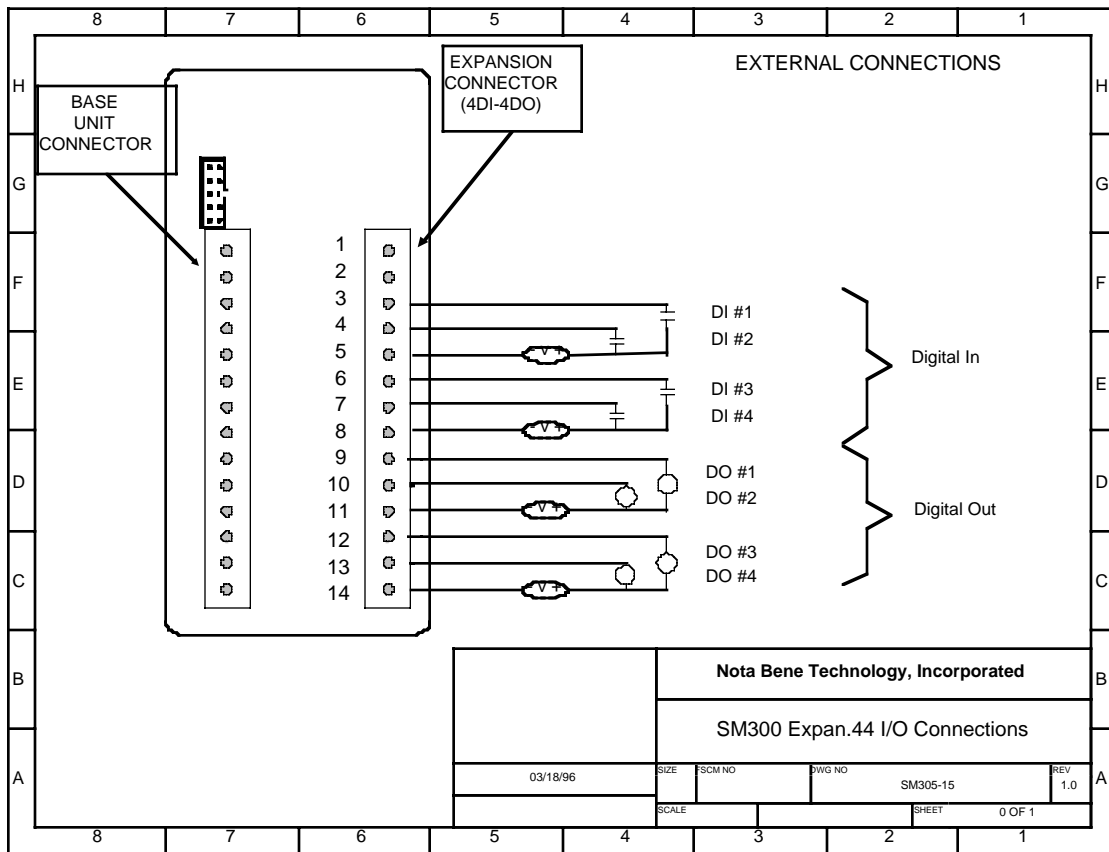


\* NOTE: CDL and BIAS pots are not present on some models of the modem

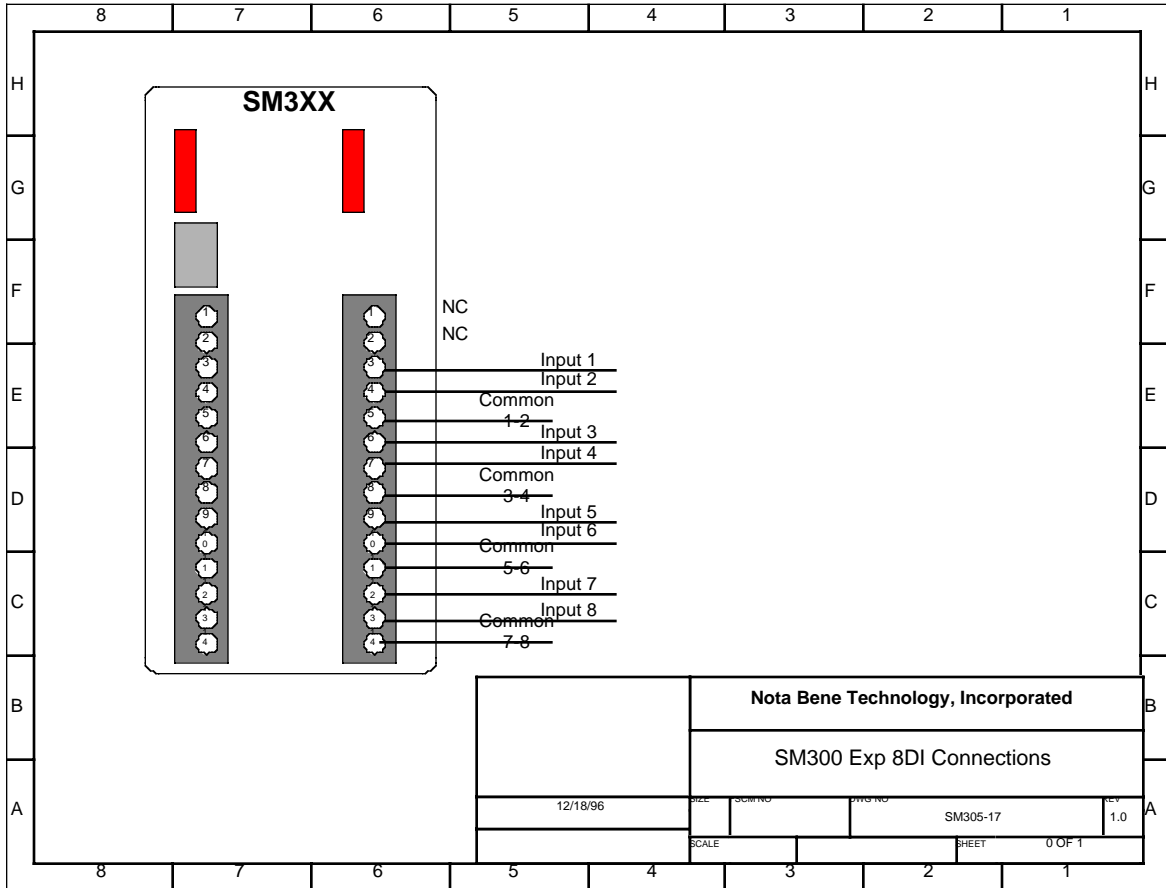
## 2.5 Expansion I/O Cards

The SM3XX RTU's can be equipped with a single I/O expansion card. There are currently two expansion cards available. If an expansion card is included, the case width increases by 1 inch.

### 2.5.1 Expansion 4 DI + 4 DO Connections



### 2.5.2 Expansion 8DI Connections



## 3. SM305

### 3.1 SM305 REGISTERS (TABLE 2), (MODBUS 40001+ N)

Register	Bit Position	Description
0	0	Base Digital Input 0
0	1	Base Digital Input 1
0	2	Base Digital Input 2
0	3	Base Digital Input 3
0	4	Power Fail Indication (Stays set for one read after a power reset)
0	6	Power Fail Indication Manual (Stays set until manually changed after a power reset)
1	0-7	Expansion Card Digital Inputs 0 - 7
2		Analog Input 0 (0-510)
3		Digital Input 0 Cycles
4		Digital Input 1 Cycles
5		Digital Input 2 Cycles
6		Digital Input 3 Cycles
7		Digital Input 0 Runtime (1/10 hours)
8		Digital Input 1 Runtime (1/10 hours)
9		Digital Input 2 Runtime (1/10 hours)
10		Digital Input 3 Runtime (1/10 hours)
11		Analog Input 0 Maximum
12		Analog Input 0 Minimum
13	0	Base Digital Output 0
13	1	Base Digital Output 1
13	2	Base Digital Output 2
13	3	Base Digital Output 3
14	0-3	Expansion Card Digital Outputs 0-3

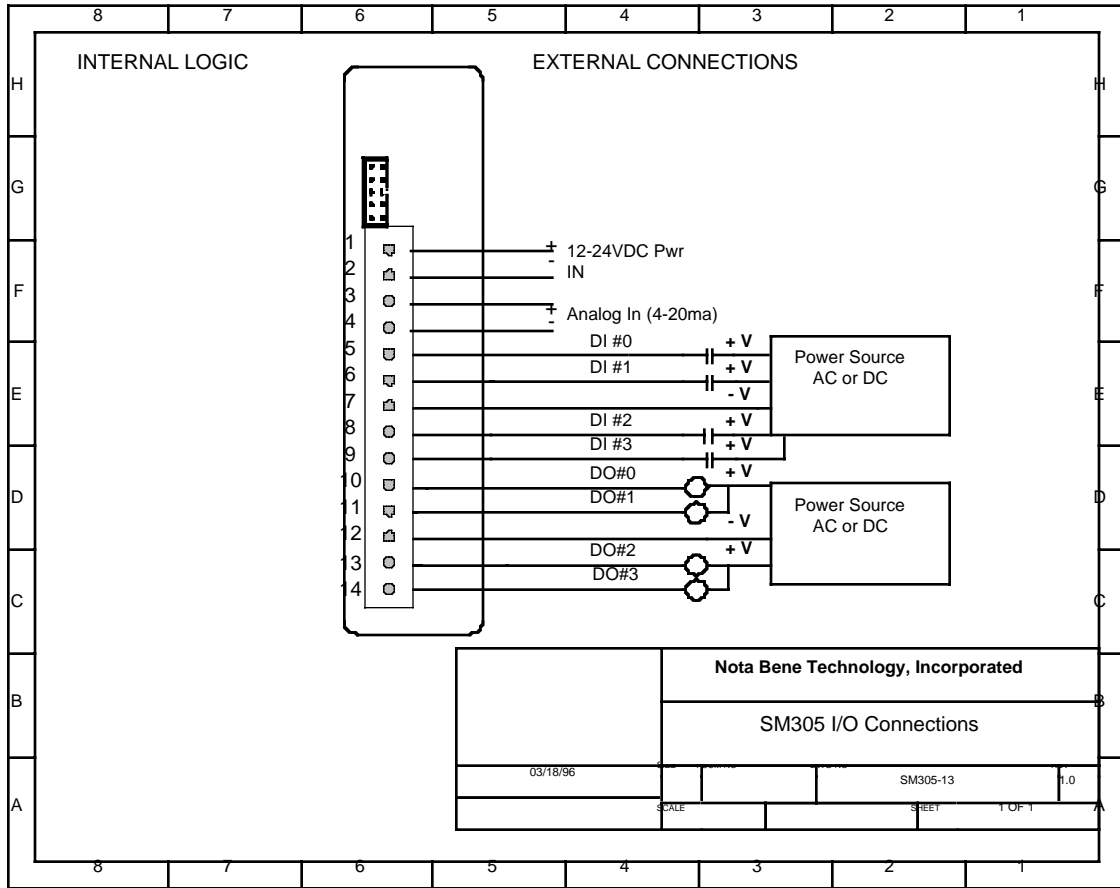
### 3.2 Indicators:

- 1 TX Data
- 2 Digital Input 0
- 3 Digital Input 1
- 4 Digital Input 2
- 5 Digital Input 3
- 6 Run (Flashing)
- 7 Digital Output 0
- 8 Digital Output 1
- 9 Digital Output 2

Note: Flashes station address at power up. Special off-line mode displays 8 MSB (most significant bit) of analog.

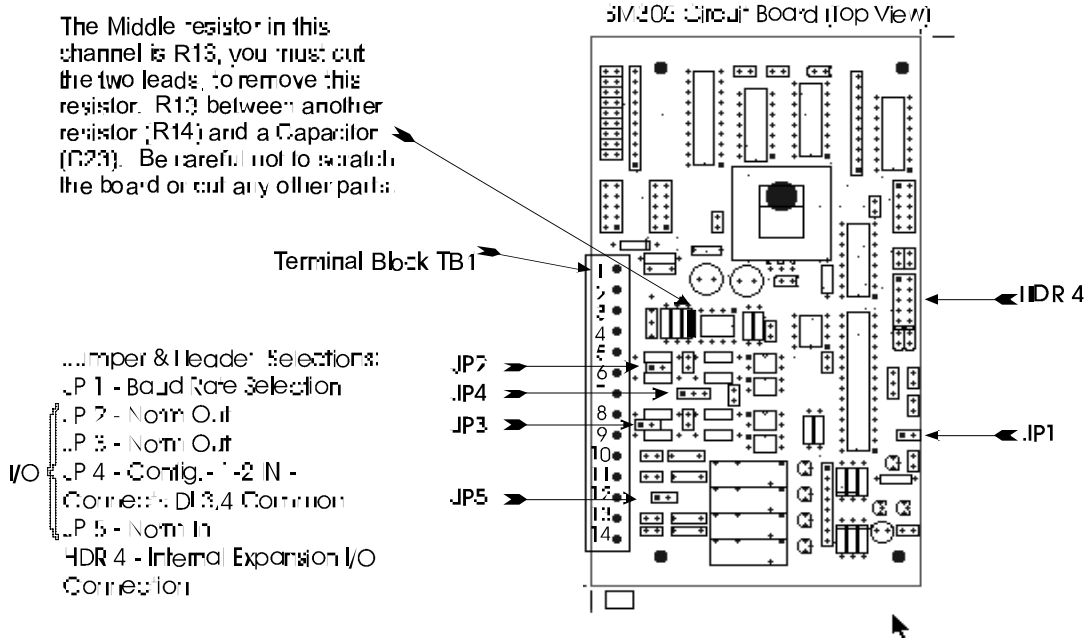
**The SM300 is factory ready to accept any 4-20ma Analog signal, see Chapter 3.4 for Analog signals of 0-5VDC.**

### 3.3 Diagrams



### 3.4 SM305 Board Layout (w/Analog Options)

Below you will find a schematic of the circuit board layout for the SM305 Series it is factory ready to accept an Analog 4-20ma signal. For any **operations where your require 0-5VDC Analog capabilities you must remove one resistor from the circuit board.**



Alternate SM305 I/O Jumper:

- JP2 - Connects DI Common to Power Supply Common
- JP4 - 3,4 Only 3 Inputs, 2RD Input Isolated, Connected on Table - 8 & TB1 - 9
- JP5 - Connects TB1 - 12 to power supply Common
- JP5 -In Connects DO 3&4 Common to TB1 - 12

Analog Calibration Display- After power up, if all dip switches are in the down position then the 8 MSB (most significant bits) of the analog input are shown on the lower 8 LEDs. When finished, restore the switches to their original address positions. Note: the run time will be on steady until the address switches correctly match the previous settings.

## 4. SM315

### 4.1 SM315 REGISTERS (TABLE 2) , (MODBUS 40001+ N)

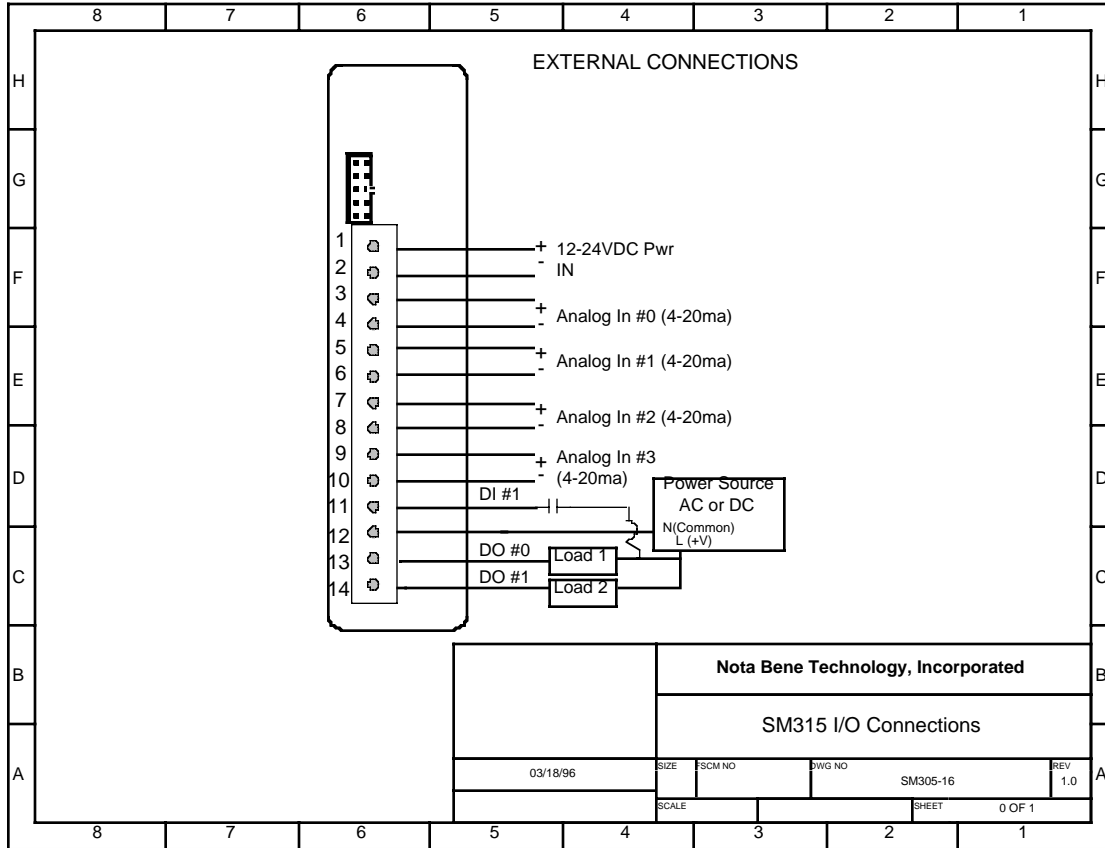
Register	Bit Position	Description
0	0	Base Digital Input 0
0	4	Power Fail Indication (Stays set for one read after a power reset)
0	6	Power Fail Indication Manual (Stays set until manually changed after a power reset)
1	0-7	Expansion Card Digital Inputs 0 - 7
2		Analog Input 0 (0-510)
3		Analog Input 1 (0-510)
4		Analog Input 2 (0-510)
5		Analog Input 3 (0-510)
6		Digital Input 0 Cycles
7		Digital Input 0 Runtime (1/10 hours)
9		Analog Input 0 Maximum
10		Analog Input 0 Minimum
11		Analog Input 1 Maximum
12		Analog Input 1 Minimum
13	0	Base Digital Output 0
13	1	Base Digital Output 1
14	0-3	Expansion Card Digital Outputs 0-3

### 4.2 Indicators:

- 1 TX Data
- 2 Digital Input 0
- 3 NU
- 4 NU
- 5 NU
- 6 Run (Flashing)
- 7 Digital Output 0
- 8 Digital Output 1
- 9 NU

Note: Flashes station address at power up. Special off-line mode displays 8 MSB (most significant bit) of selected analog.

### 4.3 Diagrams



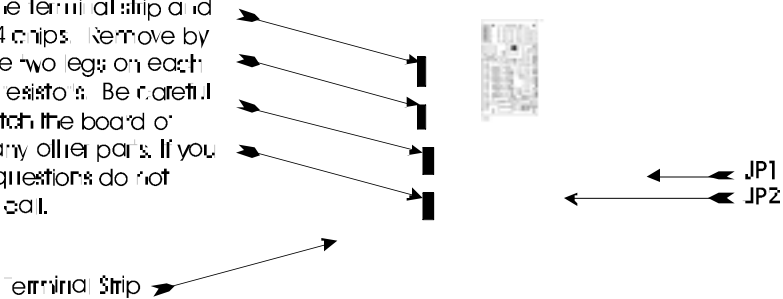


## 4.4 SM315 Board Layout (w/Analog Options)

Below you will find a schematic of the circuit board layout for the SM315 Series. It is factory ready to accept Analog signals that are 4-20ma. For any **operations where you require 0-5VDC Analog capabilities you must remove one resistor from the circuit board per 0-5VDC Analog signal.**

SM315 Circuit Board (Top View)

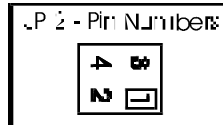
The middle resistor in these 4 channels must be removed to accommodate 0-5VDC Analog signals. These 4 channels are between the terminal strip and the set of 4 chips. Remove by clipping the two legs on each of the four resistors. Be careful not to scratch the board or damage any other parts. If you have any questions do not hesitate to call.



SM315 - JP2 Jumpers used to select Analog input for Calibration Display

### 1-2 3-4 - PINs

IN IN = Display of Analog input #1  
 Out IN = Display of Analog input #2  
 In Out = Display of Analog input #3  
 Out Out = Display of Analog input #4



Analog Calibration Display- After power up, if all dip switches are in the down position then the 8 MSB (most significant bits) of the analog input are shown on the lower 8 LEDs. When finished, restore the switches to their original address positions. Note: the unit will be on steady until the address switches correctly indicate the previous settings.

## 5. SM305 Master RTU

### 5.1 SM305 Master REGISTERS (TABLE 2) , (MODBUS 40001+N)

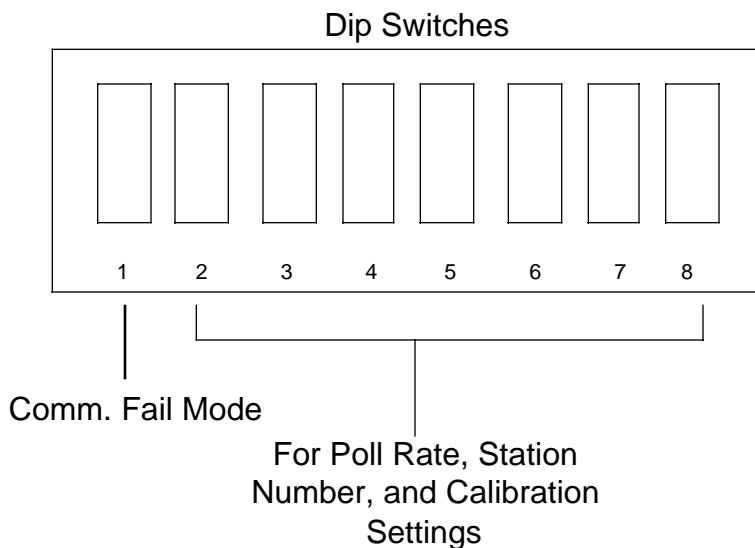
Register	Bit Position	Description
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0	1	Base Digital Input 1
0	2	Base Digital Input 2
0	3	Base Digital Input 3
0	4	Power Fail Indication (Stays set for one read after a power reset)
0	6	Power Fail Indication Manual (Stays set until manually changed after a power reset)
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7		Digital Input 0 Runtime (1/10 hours)
8		Digital Input 1 Runtime (1/10 hours)
9		Digital Input 2 Runtime (1/10 hours)
10		Digital Input 3 Runtime (1/10 hours)
11		Analog Input 0 Maximum
12		Analog Input 0 Minimum
13	0	Base Digital Output 0
13	1	Base Digital Output 1
13	2	Base Digital Output 2
13	3	Base Digital Output 3
14	0-3	Expansion Card Digital Outputs 0-3

### 5.2 Indicators- SM305 Master LED's

LED'S:

- 0- TXDAT (DIRECT)
- 1- DI0
- 2- DI1
- 3- DI2
- 4- DI3
- 5- RUN
- 6- CM1
- 7- CM2
- 8- CM3

### 5.3 Dip Switch Settings



#### 5.3.1 Switch Positions

If the left most (#1) dip switch is in the up position, the 4<sup>th</sup> digital output will close on comm. Fail. In this mode, the 4<sup>th</sup> output (on base connector) is the logical OR of the remote input and comm. fail.

The #1 Dip Switch controls the actions of outputs when a communication failure is detected.

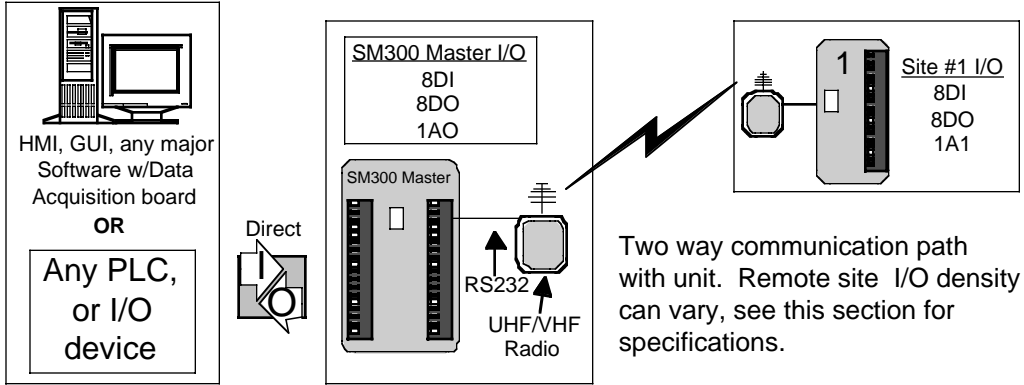
- UP-                    DO#4 outputs fail indicator. (Logical OR of remote input and comm. fail)
- DOWN-                No communication fail

Switch:

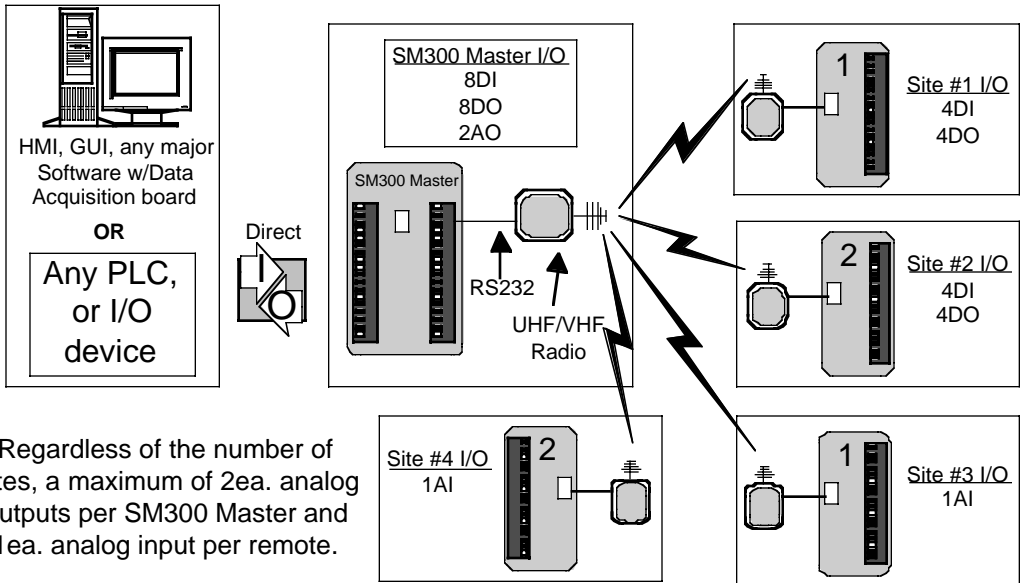
- 2- NOT USED
- 3- POLL RATE      HI BIT    0=CONT, 1=1 MIN (Cont. = 3&4 DWN, 1MIN.=4UP, 3DWN)
- 4- POLL RATE      LO BIT    2=10 MIN, 3=30MIN (10MIN.= 4DWN, 3UP; 30MIN.=3&4UP)
- 5- # STA                (1 RTU = 5&6DWN; 2 RTUs = 5DWN, 6UP)
- 6- # STA                (3 RTUs = 5UP, 6DWN, 4 RTUs = 5&6UP)
- 7- A.CALIB            UP=CALIB DISPLAY (Normally DWN)
- 8- A.CALIB SEL      (AI1 / AI0 )        (DWN= AI0)

## 5.4 Diagrams for Remote I/O Configuration

### 1. Point-to-Point - Single remote configuration



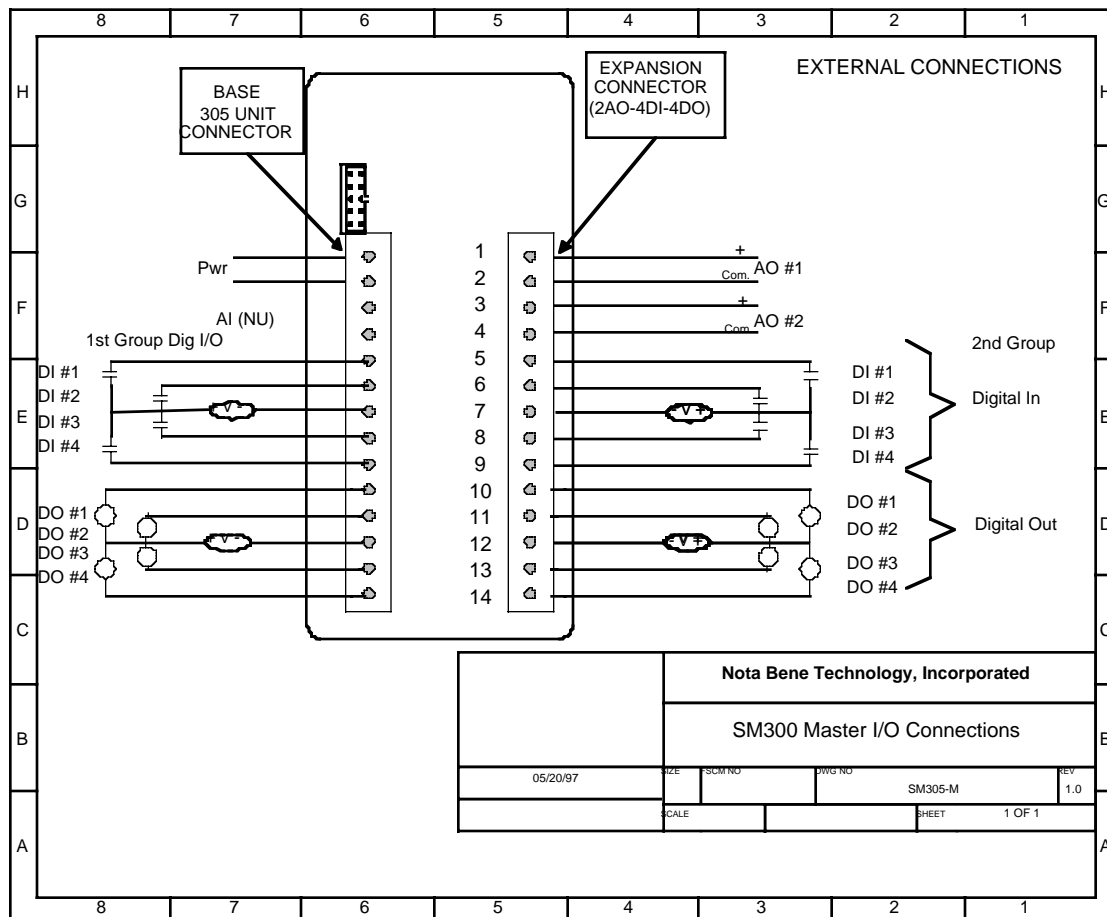
### 2. Point-to-Multipoint - Choose from two, three, or four remotes



## 5.5 Baud Rate Jumper settings

The Master SM300 can either be set to 1200Baud by having JP1 jumper on, (see section 4.4 for JP1 location), or 9600Baud by taking the JP1 jumper off.

### 5.6 Connections



	Digitals - 1 <sup>st</sup> I/O Group	Digitals - 2 <sup>nd</sup> I/O Group	1 <sup>st</sup> Analog Output	2 <sup>nd</sup> Analog Output
1RTU	RTU Base 1	RTU1 Expansion	RTU1	NA
2RTU	RTU Base 1-1st A.O.	RTU2 Base -2nd A.O.	RTU1	RTU2
3RTU	RTU Base 1	RTU2 Base	RTU3	RTU2
4RTU	RTU Base 1	RTU2 Base	RTU3	RTU4