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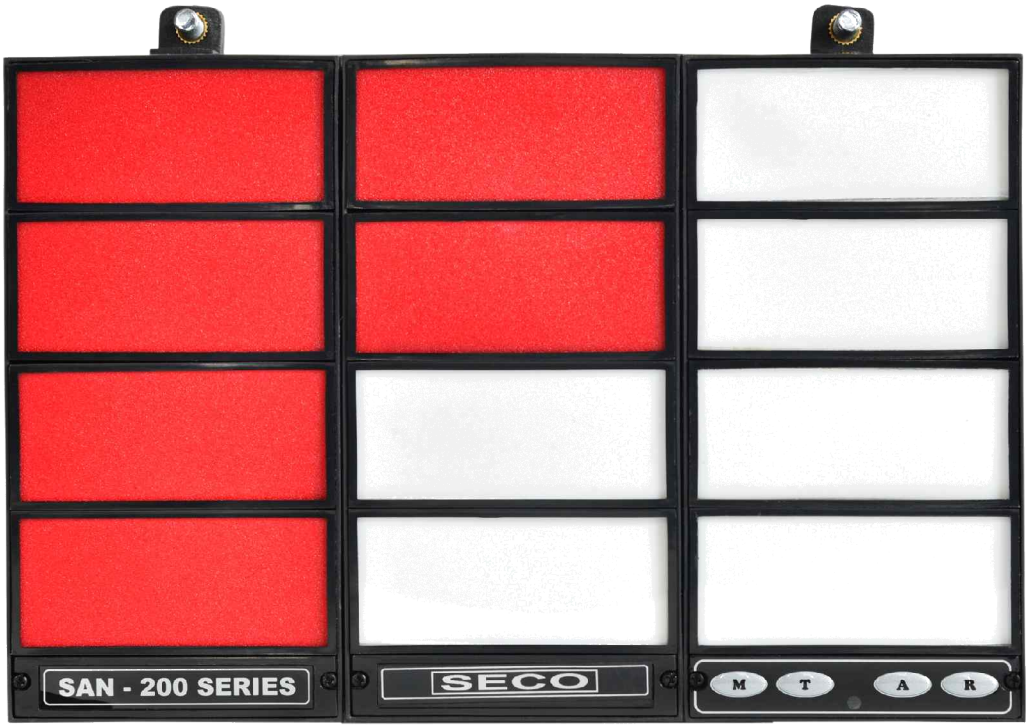
SECO



ANNUNCIATOR MODBUS PROTOCOL MAPPING PROCEDURE

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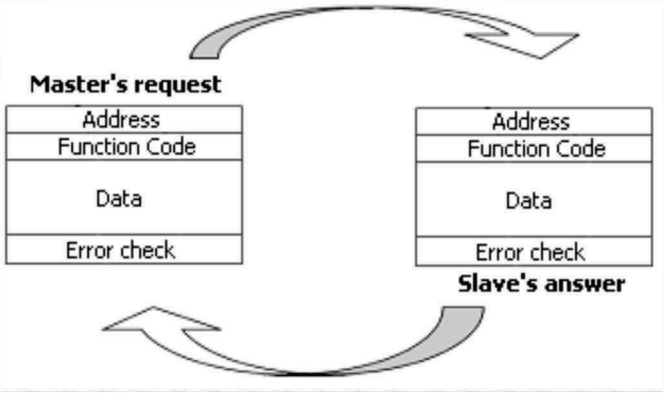
Tx / Rx – RS485 COMMUNICATION TERMINALS
DEVICE ID – XX (UNIT DEVICE ID)

DB-9 FEMALE CONNECTOR FOR ADDRESS CONFIGURATION

The Modbus protocol is based on a Master-Slave model, where only one device, the Master can start a transmission known as queries. Slaves answer to the Master request by performing action that is demanded and wait for a new order. The role of master and slaves are fixed.

Message exchanging:



On the request telegram, the function code informs the addressed slave device about the action that must be performed. The data bytes contain the detailed information required for the function execution. For example, register address that must be accessed and the quantity of bytes that must be returned. At the end of the telegram, a cyclic redundancy guarantees the quality of the data transmission.

The answer telegram carries the result of the search or action performed by the slave. The telegram header is as same as the request telegram, carrying the address of the slave and the function code requested. If the slave encounters any problems when performing the action required, special answers for many types of errors will be sent.

Transmission modes:

The Modbus standard allows two different transmission modes: ASCII (American Code for Information Interchange) and RTU (Remote Terminal Unit). The alarm Annunciator's family just works with the RTU mode. All detailed information about the protocol contained in this document refers to this mode.

RTU Mode- Telegram format:

START	ADDRESS	FUNCTION	DATA	CRC	STOP
Silence 3.5 chars	← 8 bits →	← 8 bits →	← N x 8 bits →	← 16 bits →	Silence 3.5 chars

Address (ID): The Modbus protocol allows slaves with address between 1 and 247. The address "0" is reserved and used by the master for broadcast telegrams, messages sent to the network carrying actions that must be performed by all connected devices.

Function Code (FC): The identification of the function must be performed by the slave after a master request. There are different types of functions. For example, to write and read values or send commands.

Data: This field is size variable and is determined by the selected function code. It can contain parameters for a certain function on master request or the data gathered in the slave as the result of a master request.

Cyclic Redundancy Check (CRC): The CRC field checks the telegram's bit sequence in order to guarantee its consistency. This value is a 16-bit long data calculated by the telegram sender and checked by the receiver, who will reject the received data if the CRC calculated doesn't match the expected value.

Modbus Function Codes:

The data acquisition and command assignments on Annunciators are performed by the following function codes:

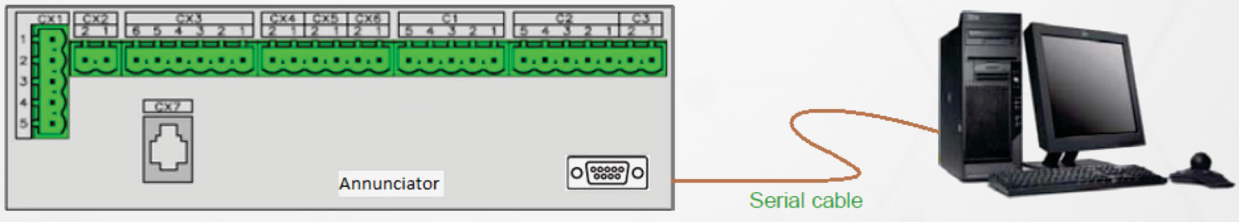
- **Code 04 (04h) - Read Input Registers** – for physical inputs reading and for registered events reading
- **Code 06 (06h) - Write Single Register** – for logical alarms writing and remote commands assignment

Prerequisites of Modbus Communication:

The assembling of Annunciator's network is simple but demands some attention on the following aspects:

- The use of twisted pair shielded cables, 24 AWG on the entire RS-485 bus is recommended.
- One of the shield's extreme must be connected to ground.
- Maximum of 32 devices on a RS-485 network is recommended.
- If the Modbus Master (for example: computer) has a RS-232 interface, a RS-232/RS-485 converter must be used.
- The maximum cable length for the RS-485 network is 1000 meters.
- A parallel 130Ω termination resistor must be connected in the beginning of RS-485 bus (i.e. in the converter) and on the end of the line.

Device Addressing Procedure:

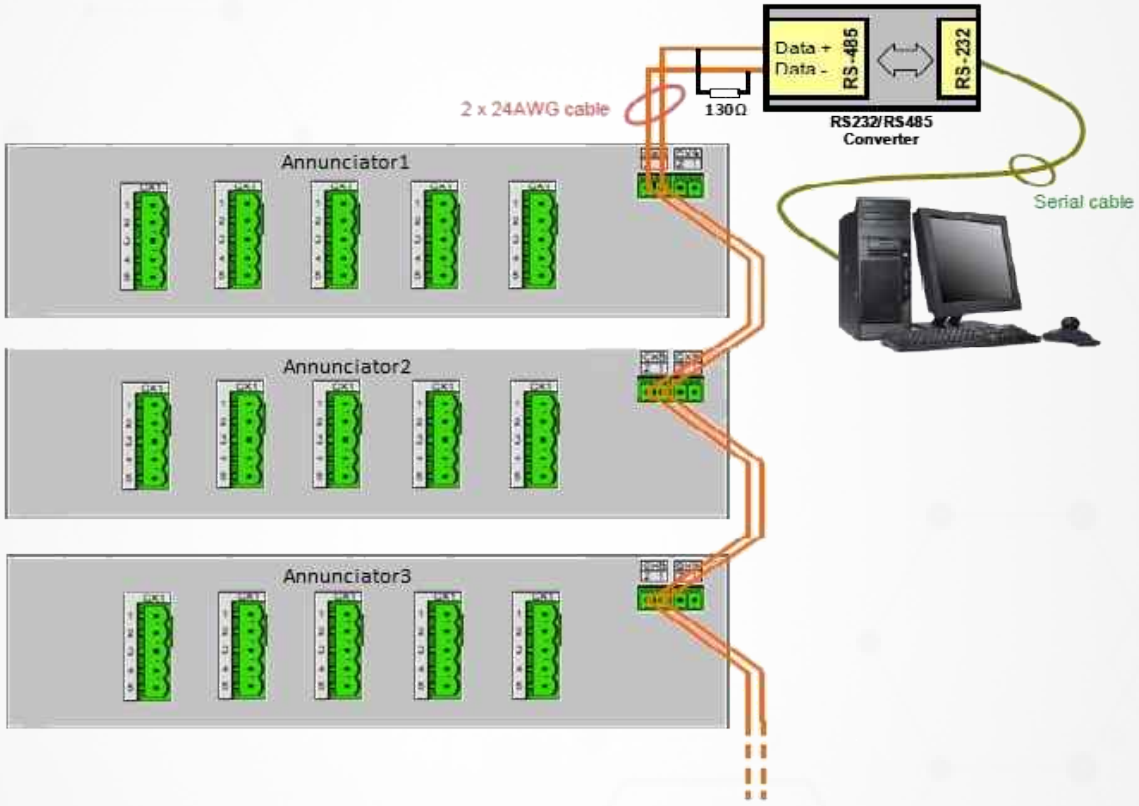


- Each Annunciator device is connected through serial port without the converter and address is fused to each device with the following format using standard RS232 protocol.
- Data format is "**$ ADD A**".

  Where **$** : 1 byte character indicating start of frame.

  ADD: address to be fused.

  A: End of the Data: 232 protocol standard followed is Baud Rate: 9600, Stop bit: 1, Parity bit: None & com port selection.



Connection of Modbus Master (PC) and various Annunciators:

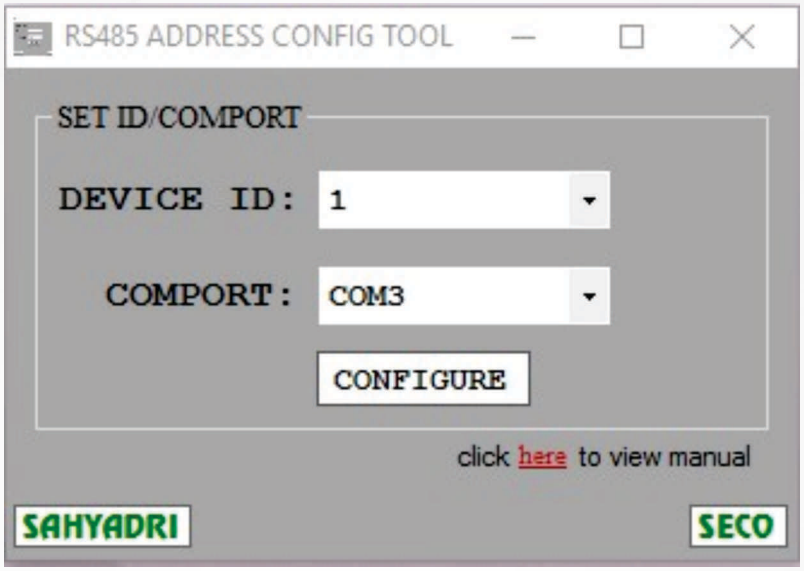
- The above fig gives a clear picture of how modbus communication is established over RS232.
- Once the devices are addressed, it can be connected as shown above. With modbus protocol, communication is established. The protocol followed is discussed below.

MODBUS SLAVE CONFIGURATION

The Modbus parameterization on Annunciator is performed through the software Annunciator Monitoring Tool. This operation requires the connection of the computer where the software is running with the annunciator through the CS-02 cable. The following procedures must be followed:

1 – Modbus address

Run RS485 ADDRESS CONFIG TOOL exe and a dialog appear as shown below.



To configure the Annunciator, connect

the valid comport/serial port cable to the unit (db-9 connector at rear side of the unit).

Select the device id from DEVICE ID combo box & you will find id between 1 to 247 respectively.

Remember that the address “0” (zero) is reserved and cannot be used for this purpose.

Select valid comport & press configure to fuse the address to the unit connected in the network.

Note: Before configuration, the following steps have to be taken in unit.

1. Keep unit in test condition (Press “Test” or “T” push button) and make sure that the unit is in test condition (all windows are flashing along with relay/alarm).
2. Make sure that the selected comport is free or not used by some other applications.
3. If 'yes', then close the specified application which is using the comport and make sure the status of comport once.
4. Then click CONFIGURE. Once the unit is configured properly, then the unit becomes restart/normal.
5. If not, check whether the cable is properly connected with unit, and also checks whether the selected comport is valid or not.
6. If everything is technically verified as per above steps, but still not configured, then contact manufacturer.

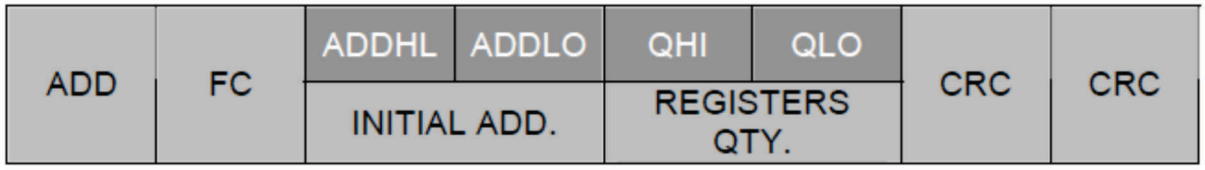
The Protocol Structure:

PHYSICAL INPUTS READING: The physical inputs are the field's signal value and represent the real state of the alarm point. Each bit is an image of one Annunciator's alarm point. If the bit has the value “0” (zero) the alarm is not present (off state), while the value “1” (one) represents that the alarm is present (on state).

For input state reading without time stamp information, the Modbus master must request data through **Function Code 04 (04h) – Read Input Register**.

Request format:

The master's request must have the following syntax:



Where:

ADD – Device's Modbus address

FC – Function Code 04h – Read Input Register

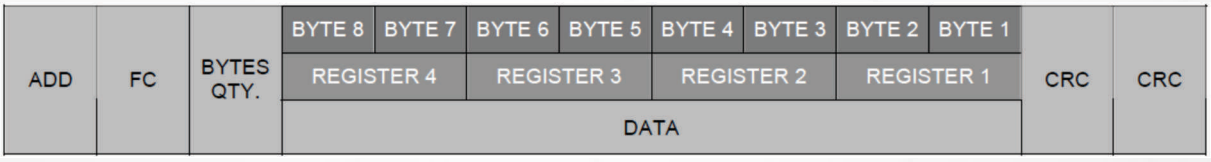
INITIAL ADD. – Initial register address (2 Bytes).

REGISTERS QTY. – Quantity of registers (16-bits) requested (always 0004h in this case).

CRC – Frame sequence check (CRC16)

Answer format:

The right answer from Annunciator must be:



Where:

ADD – Device's Modbus address

FC – Function Code 04h – Read Input Register

BYTES QTY. – Quantity of transmitted bytes (always 08h for this function, representing four 16-bits registers)

Mapping Registers:

Function Code (04): Read Input Registers

- **30001 - Data for Test Condition**

Window Status For Test Condition:

- **0X0001 – Test/Accept**
- **0X0000 – Fault** ➢ **30002, 30003……300nn (nn-represents number of windows) for window status.**

30002 – Data for 1st Window

30003 – Data for 2nd Window

30004 – Data for 3rd Window

30005 – Data for 4th Window and so on...

Window Status:

- **0X0001 – Fault**
- **0X0002 – Accept/Ack**
- **0X0000 – Reset**

Function Code (06): Write Single Register

- **40001 for Mute, Test, Accept, Reset**

DATA – State of the alarm points, arranged as follows:
- BYTE 1 = Register 1 least significant byte (LSB)
- BYTE 2 = Register 1 most significant byte (MSB)
- BYTE 3 = Register 2 least significant byte (LSB)
- BYTE 4 = Register 2 most significant byte (MSB)
- BYTE 5 = Register 3 least significant byte (LSB)
- BYTE 6 = Register 3 most significant byte (MSB)
- BYTE 7 = Register 4 least significant byte (LSB)
- BYTE 8 = Register 4 most significant byte (MSB)

CRC – Frame sequence check (CRC16)

KEYPAD REMOTE COMMANDS:

The buttons on Annunciator's front – **MUTE, TEST, ACCEPT**, and **RESET** - can also be controlled through Modbus protocol. These commands are sent through the Function Code 06(06h) – Write Single register, in the same way done with the logical alarms described on the previous session.

Command Format

The writing syntax must have the following format:

ADD	FC	ADDHL	ADDLO	BYTE2	BYTE1	CRC	CRC
		REGISTER ADD.		REGISTERS QTY.			

Where:

ADD – Device's Modbus address

FC – Function Code 06h – Write single register

REGISTER ADD. – It will be 00h usually.

REGISTERS – Register data will be as follows:

- 0x0001 for **Mute** button

- 0x0002 for **Test** button

- 0x0003 for **Accept** button

- 0x0004 for **Reset** button

CRC – Frame sequence check (CRC16)

Answer format

The answer from the Annunciator must be identical to the request telegram sent by the master.