NuDAM®

ND-6520 RS-232 to RS-422/RS-485 Converter

ND-6510 RS-422/RS-485 Repeater

ND-6530 USB to RS-485/RS-422/RS-232 Converter

ND-6521 Addressable RS-422/RS-485 to RS-232 Converter

User's Guide



Recycled Paper

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Manual Rev. 3.00: March 16, 2001

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1

Introduction

1.1 What is NuDAM ?

NuDAM is a series of data acquisition modules. It provides a total solution of the data acquisition network and control system. You can remotely control up to 256 NuDAM modules on RS-485 netowrk. All you need is to use a host computer, like PC (Personal Computer), with one RS-232 serial port for controlling the whole system. The maximum communication distance is 4000 feet from the host computer.

NuDAM is based on the RS-485 multi-drop network system, each module has an unique address ID. Using simple ASCII command & response protocol through standard RS-485 interface can control all the NuDAM modules in the RS-485 network.

The NuDAM modules provide direct linkage to a wide variety of sensors and perform all signal conditioning, scaling, linearization and conversion. The modules can be used to measure temperature, pressure, flow, voltage, current and numerous types of digital signals.

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1.2 Outstanding Features of NuDAM

- **Industry standard networking**

All NuDAM modules use the RS-485 communication protocol for transmitting and receiving at high rates and over long distance.

- **Two-wire and multi-drop communication**

A single twisted pair of wires is used to transmit and receive data between modules. Multi-drop capability makes system configuration more flexible and easy set-up of a network.

- **High transfer speed**

NuDAM modules provide up to 115.2K bps data / command transfer rate. It can promote system bandwidth.

- **Simple command / response protocol**

All communications are performed with printable ASCII characters. This allows the information to be processed with string functions common to the most high-level languages.

- **Industrial design**

The screw terminal plug connectors on every NuDAM module ensures simple installation and easy modification. The compact size allows the modules to be mounted on DIN rail, back-panel wall-mount, etc.

- **Watch-dog supervisory**

NuDAM contains a watch-dog supervisory circuitry that will automatically reset the module when the system fails. In addition, a user-programmable software timer provides a 'safe' output signal in the event of host computer failure.

- **High isolation voltage**

NuDAM provides photo-isolators, which ensure high isolation voltage, between the data acquisition circuits and the communication port. The fatal electric-shock won't go through and damage all the modules on the network.

- **Noise immunity**

The NuDAM provide extra noise immunity capability. An electrode, which is coated inside the ABS case, can reduce electro-magnetic interference (EMI) and noise.

- **Harsh environmental protection**

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A surface coating covers on the PCB and electronic components of the NuDAM. It allows superior resistance to harsh environment such as humidity, salt spry and most harsh chemicals.

1.3 NuDAM-6000 series products overview

The NuDAM-6000 series provides the complete sets of data acquisition modules, including the communication modules, the analog input modules, the analog output modules, and the digital I/O modules.

- **Communication Module**
  - NuDAM-6510 : RS-422/RS-485 Repeater
  - NuDAM-6520 : RS-232 to RS-422/RS-485 Converter
  - NuDAM-6530 : USB to RS-422/RS-485 Converter
  - NuDAM-6521 : Addressable RS-422/RS-485 to RS-232 Converter
- **Analog Input Modules**
  - NuDAM-6011: Multifunction High Gain Analog Input Module(with DI/O)
  - NuDAM-6011D:Multifunction High Gain Analog Input with 5 ½ digit LED Display(with DI/O)
  - NuDAM-6012: Analog Input Module(with DI/O)
  - NuDAM-6012D: Analog Input Module with 5 1/2 digit LED Display(with DI/O)
  - NuDAM-6013: 3-channel RTD Input Module
  - NuDAM-6014D: Analog (Transmitter) Input Module with 5 1/2digit LED Display
  - NuDAM-6017: 8-channel Analog Input Module
  - NuDAM-6018: 8-channel Thermocouple Input Module
- **Analog Output Modules**
  - NuDAM-6021: Single Channel Analog Output Module
  - NuDAM-6024: 4-channel Analog Output Module(with DI)
- **Digital I/O Modules**
  - NuDAM-6050 : Module with 7 DI channels and 8 DO channels
  - NuDAM-6052 : Isolated Digital Input Module
  - NuDAM-6053 : 16-channel digital Input Module
  - NuDAM-6054 : 15-channel digital Input Module
  - NuDAM-6056 : 15-channel digital Output Module
  - NuDAM-6058 : 28-channel programable digital I/O Module
  - NuDAM-6060 : 4-channel Relay Output & Digital Input Module

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- NuDAM-6063 : 8-channel Relay Output Module
- NuDAM-6080 : Counter/Frequency Input Module

1.4 EIA RS-485 Standard

The EIA RS-485 interface is a communication standard developed for multi-dropped systems that can communicate at high rate over long distance. The standard RS-485 can operate at speed up to 10 M bps over cable length up to 4000 feet.

The RS-485 interface can support up to 32 drivers / receivers on the same line. This allows actual networking applications on a parity line system (sometimes called multi-drop).

The RS-485 uses differential transmission on a balance line. Its easy wiring make it popular to use in industrial applications.

1.5 RS-485 on NuDAM

The NuDAM improves the RS-485 capability for minimizing the user's cost. On each NuDAM module, a half-duplex RS-485 transceiver is used to communicate with other modules. A single twisted pair of wires, which provides standard differential transmission, is used to transmit and receive data between modules. The high input impedance of each NuDAM receiver allows up to ***128*** NuDAM modules on the same RS-485 bus without using a signal repeater.

The maximum transfer rate of NuDAM is 115.2Kbps which is lower than the maximum speed of the RS-485 standard. The slew-rate limiter on every RS-485 transceiver of NuDAM is very useful for transmitting error-free data, minimizing EMI, and reducing reflections caused by improperly terminated cables.

The NuDAM on a network may not use the same power supply. Therefore, the voltage difference between ground of the modules may exist.

Excessive output current and power dissipation caused by faults or by bus contention are prevented by the current limiter and the thermal shutdown circuitry inside the NuDAM.

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1.6 NuDAM RS-485 Network Configurations

NuDAM-6000 series is designed under RS-485 multi-drop network architecture. Up to 256 NuDAM modules can be controlled in a multi-drop network. The limit of 256 is due to command code. The network can be connected by simple topology (Figure 1-1) or branch topology (Figure 1-2) or free topology (Figure 1-3).

The ND-6520 and ND-6510 are the two basic communication modules to construct a RS-485 network. The ND-6520 is a RS-232 to RS-485/RS-422 converter. The ND-6520 is used to build a RS-485 port for the host computer by converting standard RS-232 signal into RS-485 signal.

The ND-6510 is the RS-485 signal repeater which is used to extend or to lengthen the network distance. A NuDAM bus can connect up to 256 modules, each segment is up to 128 modules. Whenever the numbers of the modules excess 128, the repeater should be used. In addition, the length of a standard RS-485 bus is up to 4000 feet, the repeater should be used whenever the length of a signal bus is more than 4000 feet.

The ND-6530 is the USB to RS-485/RS-422/RS-232 converter, and it used to build the USB signal into RS-485/RS-422/RS-232 signal.

The ND-6521 is an addressable RS-485/RS-422 to RS-232 converter, it allows the RS-232 devices easily link to Host by the RS-485/422 bus.

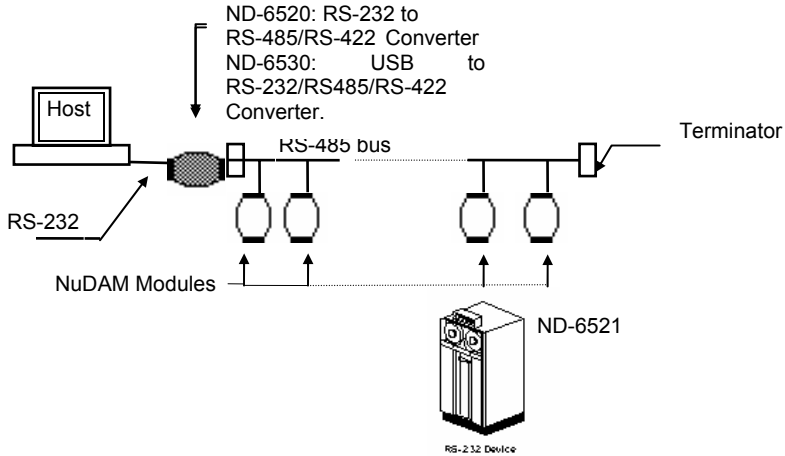


Figure 1-1 Simple Topology

ND-6520: RS-232 to
RS-485/RS-422 Converter
ND-6530: USB to
RS-232/RS485/RS-422
Converter.

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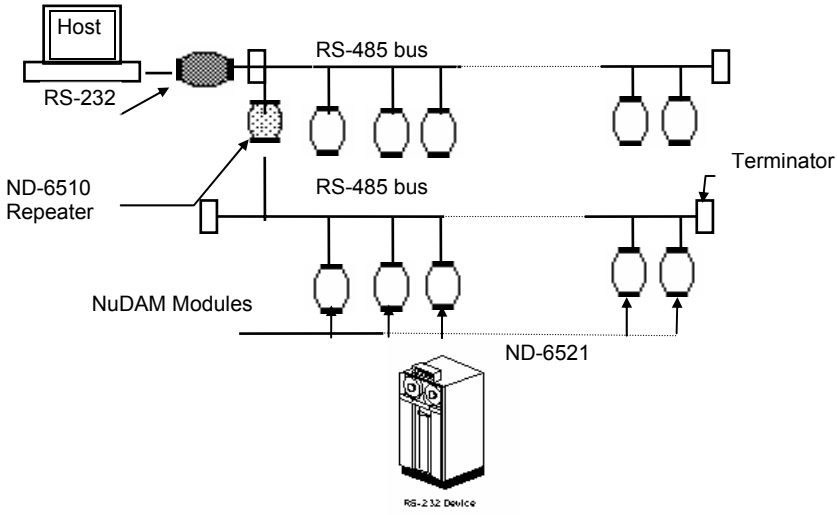


Figure 1-2 Branch Topology

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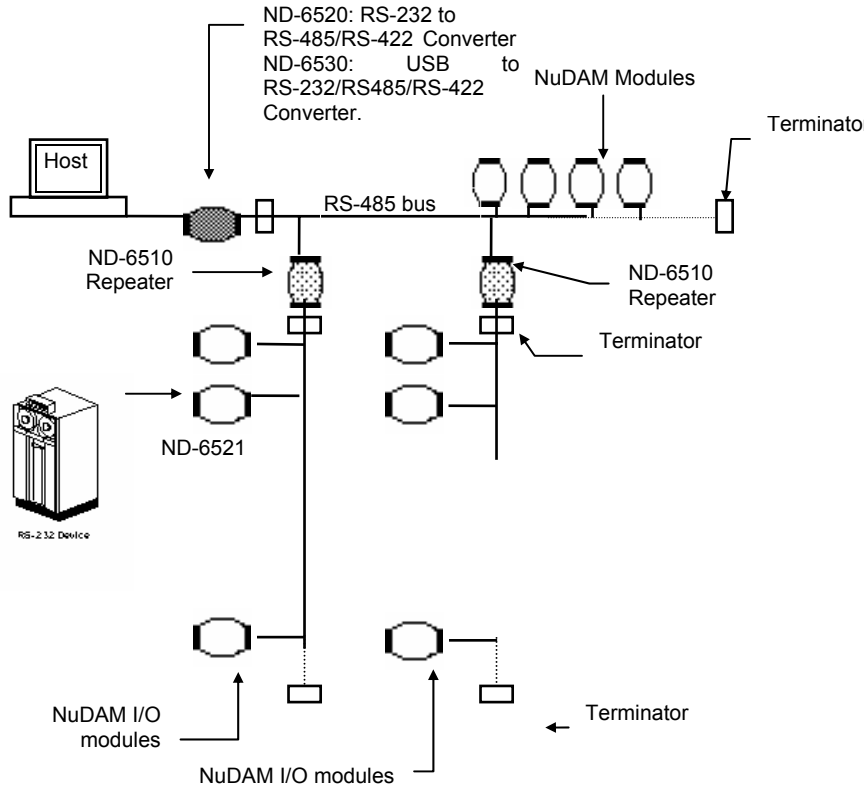


Figure 1-3 Free Topology

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1.7 Constructing a NuDAM Network

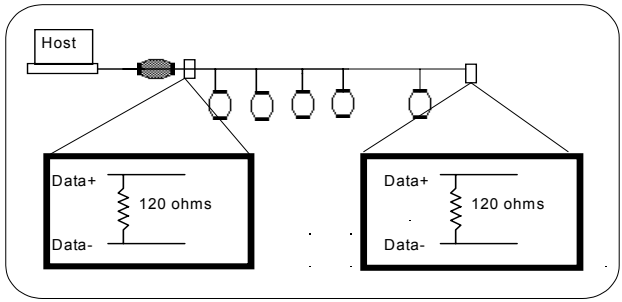
Go through the following steps, the user can construct a NuDAM network easily.

1. Setup a ND-6520 or ND-6530.
2. Connect the host computer with the ND-6520 or ND-6530.
3. Setup one or more ND-6510 if necessary.
4. Connect the ND-6510 to extend to RS-485 bus if necessary.
5. Install the NuDAM utility software or ND-6530 driver from disk.
6. Initialize the brand-new NuDAM modules.
7. Add the new NuDAM modules into RS-485 network.

Refer to chapter 2 and chapter 4 for executing step 1 and 2. Refer to chapter 3 for executing step 3, 4 and for understanding the time to install ND-6510. The knowledge about the software for operating the NuDAM is in chapter 6. For executing the step 6 and step 7, please refer to the install procedures of each module and chapter 6.

1.8 Termination Bus

In order to avoid signal reflections on the bus, each bus segment has to be blanked off at its physical beginning and at its end with the characteristic impedance. An termination resister (Rt) is intalled for this purpose. The Rt value - 120Ω ± 2% is recommended, and the detailed connection of Rt can be referred from the “Terminator Connection” diagram below.



Terminator Connection

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1.9. Shielding

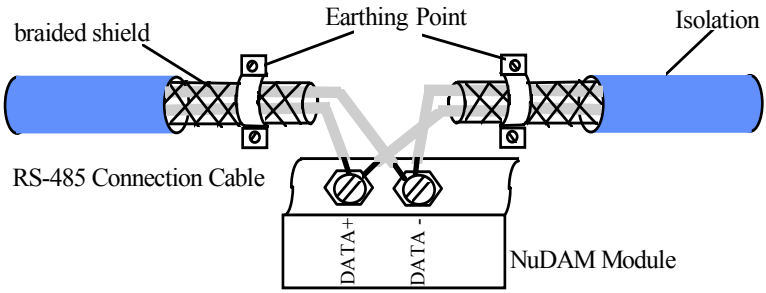
In case of increased interference, a shielded bus cables is recommended to use for wiring between module and modules. In addition, a shielding also should be done for the cable of power supply and for the signal cables.

Some experiences and recommendations are concerning for shield connection.

1. The shield should be connected with protective earthing at each bus connection.

2. The shield should be applied additionally several times along the course of the cable.

3. The Computer should be applied the shield directly to the appliance or to separate shield rails.



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1.10. How to Calculate Checksum Value

Format of NuDAM Commands

(LeadingCode)(Addr)(Command)(Data)**[Checksum]**<CR>

When checksum is enable then [Checksum] is needed, it is 2-character.

[Checksum] = (**(**LeadingCode)+(Addr)+(Command)+(Data)**) MOD 0x100**

Example 1: checksum is **disable**

User Command	:	$012<CR>
Response	:	!01400600

Example 2: checksum is **enable**

User Command	:	$012**B7**<CR>
Response	:	!01400600**AC**

'$' = 0x24 '0' = 0x30 '1' = 0x31 '2' = 0x30

B7 = (0x24 + 0x30 + 0x31 + 0x32 **) MOD 0x100**

'!' = 0x24 '0' = 0x30 '1' = 0x31 '4' = 0x34

'6' = 0x36

AC= (0x24+ 0x30+ 0x31+ 0x34+ 0x30+ 0x30+ 0x36+ 0x30+ 0x30**) MOD 0x100**

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2

NuDAM-6520

2.1. Overview

What is NuDAM-6520 ?

NuDAM-6520 is a RS-232 to RS-422/RS-485 converter, it converts the RS-232 signal to the RS-422/RS-485 signals. The ND-6520 can be considered as an extension RS-422/RS-485 serial port for the host computer. A standard 9-pin D-type connector is used to connect the host computer and the ND-6520. Hence, the ND-6520 can connect with all kinds the PC, IPC or Notebook PC, which install a standard RS-232 interface.

- **Features of NuDAM-6520**
  - RS-422/RS-485 transceiver
  - Differenial 2-wire half-duplex RS-485
  - Easily setup and installation
  - Auto direction flow control
  - Maximum 128 NuDAM on a bus without using repeaters
  - Maximum 256 addressable NuDAM modules
  - High transfer speed
  - High isolation voltage
  - Lower power consumption

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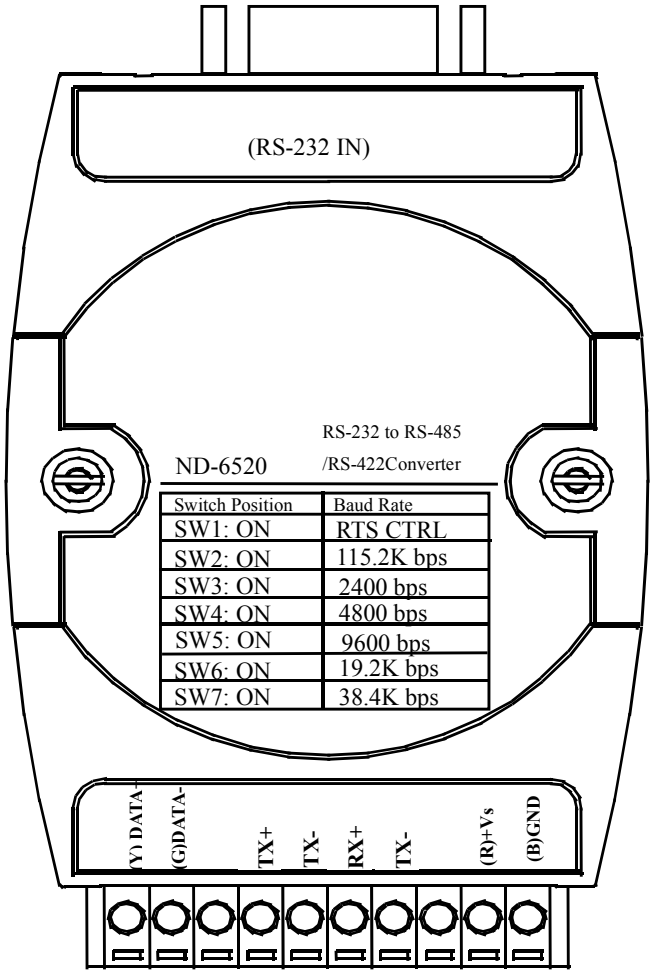
Specifications of NuDAM-6520

- **Input**
  - Interface : standard RS-232 9 pin female D-type connector
  - Speed (bps) : 1200(115.2K[1]), 2400, 4800, 9600, 19.2K, 38.4K, RTS
  - Data Format : 9 bits, 10 bits, 11 bits, or 12 bits
- **Output**
  - Interface :RS-485, differential, 2 half-duplex wires RS-422, differential, 4 full-duplex wires
  - Speed (bps) : 1200(115.2K[1]), 2400, 4800, 9600, 19.2K, 38.4K, RTS
  - Max RS-485 network bus distance : 4000 ft. (1200m)
- **Isolation**
  - Isolation voltage :5000 Vrms(between RS-422/RS-485 network and host computer)
- **Bus**
  - Max loading : 128 NuDAMs on a RS-485 network
  - Max modules : 256 NuDAMs with one ND-6510 repeater
- **Power**
  - Power Supply : +10V to +30V
  - Power Consumption : 0.95 W

Note 1: 115.2K is supported by Firmware version A1.2 or later.

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A Look at NuDAM-6520 & Pin Assignment

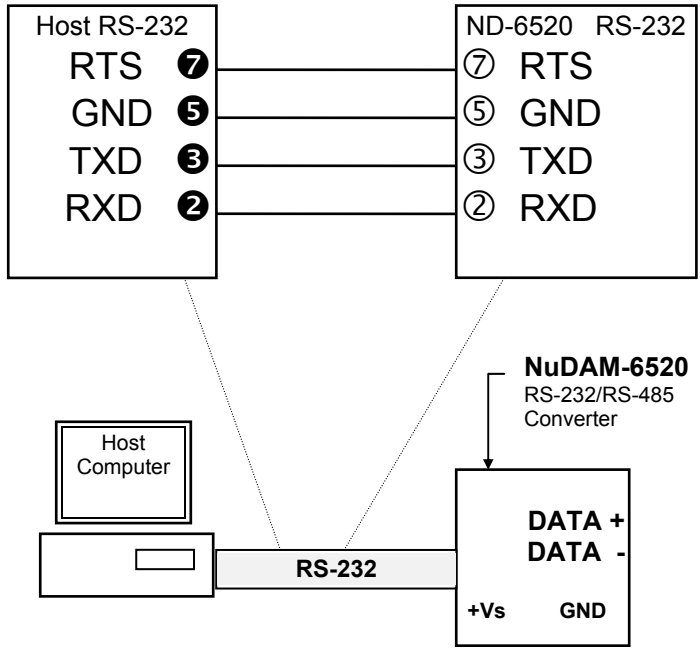


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Pin Definitions

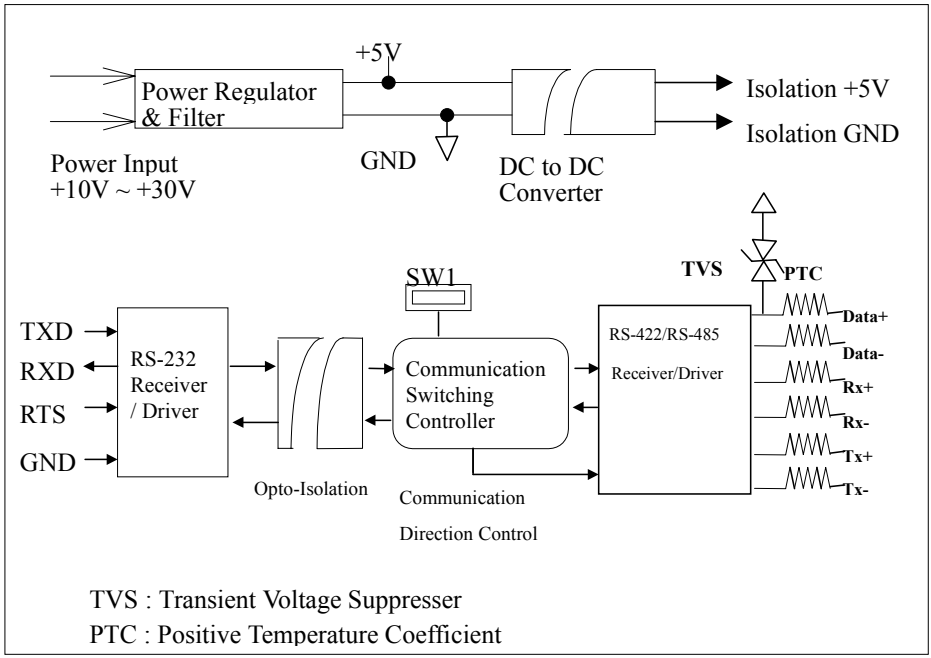
Pin #	Signal Name	Description
1	(Y)DATA+	RS-485 transmission line, positive
2	(G)DATA-	RS-485 transmission line, negative
4	TX+	RS-422 transmission line, positive
5	TX-	RS-422 transmission line, negative
6	RX+	RS-422 receiving line, positive
7	RX-	RS-422 receiving line, negative
9	(R)+VS	NuDAM power supply, +10V~+30V
10	(B)GND	NuDAM ground
--	RS-232 IN	9-pin RS-232 connector

Connection Between Host and ND-6520



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Functional Block Diagram



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2.2 Setup

Objective of Setup

In normal condition, it is not necessary to setup the NuDAM-6520. The default configuration of this communication module is 9600 bps and data format of 8 data bits with 1 start bit, 1 stop bit, and no parity check. Note that the data format is reserved to be compatible with other brand's communication port, it should not be modified if only NuDAM is used in a system. The baud rate can be configured according applications' requirement.

Setup Equipments

Only screw driver is used to open the case. Software, power supply, and wiring are not necessary.

Setup Procedure

Only hardware switch setting can be setup in ND-6520. The user can set the speed of the serial interface (RS-232 and RS-422/RS-485), and the serial data format. The speed and the data format on the whole RS-485 network must be identity otherwise the communication will be not correct.

To setup the ND-6520, use the screw driver to open the case, then change the switch setting. The new setting is available after power on. The case must be put back and locked carefully. Note that do not scratch the surface of the circuit while setting up, otherwise the surface coating or even the circuits will be damaged.

(Note: For Harware Rev.C1 or upper, there is switchless for Baudrate adjust. It is auto baudrate and parity, data bits adjust.)

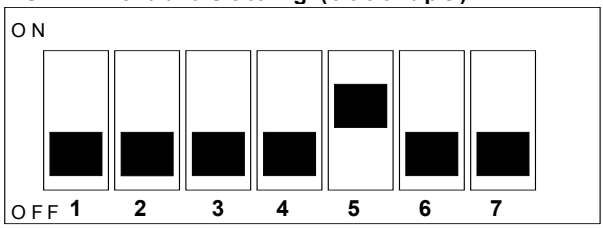
Default Setting

- 9600 baud rate
- 10 bits series data format : one start bit, eight data bits, one stop bit, no parity check

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SW1 Setting

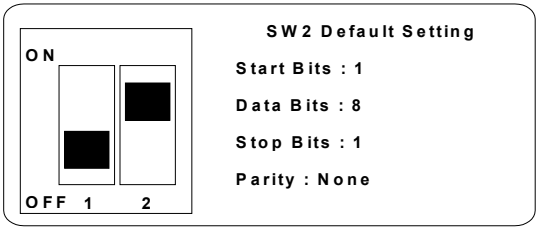
SW1 Default Setting (9600 bps)



1	2	3	4	5	6	7	Baud Rate
ON	OFF	OFF	OFF	OFF	OFF	OFF	RTS Control
OFF	ON	OFF	OFF	OFF	OFF	OFF	1200 or 115.2k[1] bps
OFF	OFF	ON	OFF	OFF	OFF	OFF	2400 bps
OFF	OFF	OFF	ON	OFF	OFF	OFF	4800 bps
OFF	OFF	OFF	OFF	ON	OFF	OFF	9600 bps
OFF	OFF	OFF	OFF	OFF	ON	OFF	19200 bps
OFF	OFF	OFF	OFF	OFF	OFF	ON	38400 bps

Note 1: 115.2kbps is supported by version A1.2 or later.

SW2 Setting



1	2	Start Bit	Data Bits	Stop Bit	Parity	Packet Data Bits
OFF	OFF	1	7	1	0	9
		1	6	1	1	
OFF	ON	1	8	1	0	10
		1	7	1	1	
ON	OFF	1	9	1	0	11
		1	8	1	1	
ON	ON	1	10	1	0	12
		1	9	1	1	

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2.3. Installation

Software Utility
Software is not necessary for this module.
Equipments for Installation
A host computer with RS-232 port
RS-232 cable (DB-9 female)
DC Power supply (+10V~+30V) (NDP-243u is recommended)
Wires (shielded and grounded is recommended)
Installation Procedure
1. Make sure the host computer is power off.
2. Use RS-232 cable to connect NuDAM-6520 with host computer.
3. Wire the power supply to NuDAM. Note that the power supply should meet the specification.
4. Wire other NuDAMs.

Application Wiring

The Figure 2-1 shows the application wiring of NuDAM-6520.

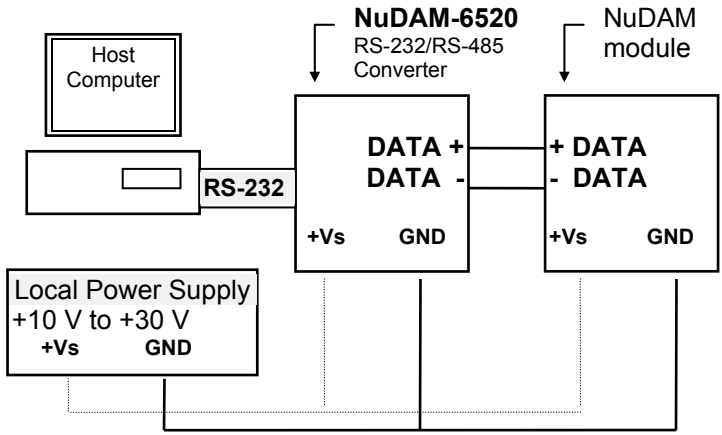


Figure 2-1 Application wiring of NuDAM-6520

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2.4 Programming

The NuDAM-6520 is a communication module, it is not necessary to be programmed

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3

NuDAM-6510

3.1. Overview

What is NuDAM-6510 ?

The ND-6510 is the RS-422/RS-485 signal repeater which is used to extend or to lengthen the network distance. A NuDAM bus can connect up to 128 modules. The repeater should be used when the numbers of the modules excess 128. In addition, the repeater should also be used when the length of a signal bus is more than 4000 feet.

Features of NuDAM-6510

- RS-422/RS-485 signal transceiver & repeater
- Bi-directions signal transmission for both RS-422/RS-485 ports
- Automatic transmission direction control
- Easily setup and installation
- Maximum 128 NuDAM on a bus
- Maximum 256 addressable NuDAM modules
- High transfer speed
- Surge protection
- Lower power consumption

Specifications of NuDAM-6510

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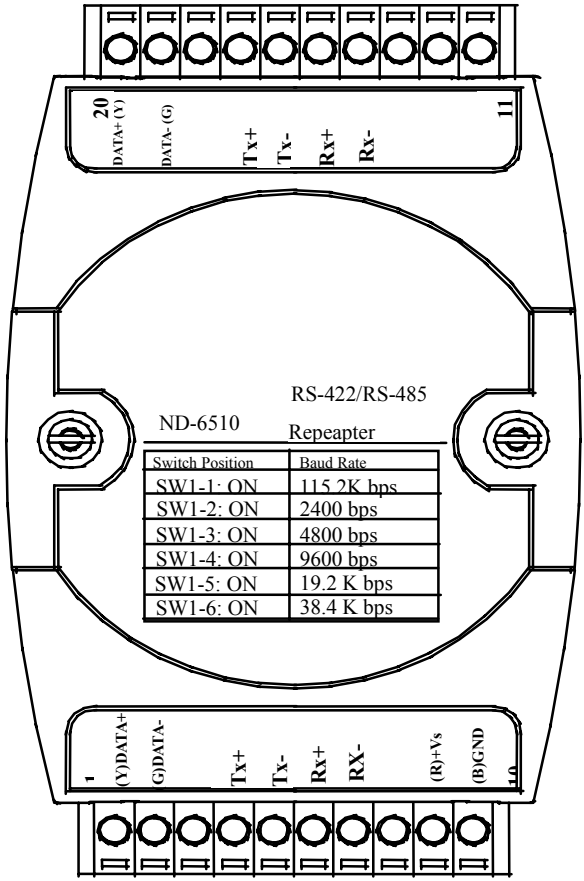
- **Input / Output**
  - Interface : RS-485, differential 2 half-duplex wires RS-422, differential, 4 full-duplex wires
  - Speed (bps) : 1200(115.2K[1)], 2400, 4800, 9600, 19.2K, 38.4K
  - Data Format : 9 bits, 10 bits, 11 bits, or 12 bits
  - Max RS-485 network bus distance : 4000 ft. (1200m)

Note 1: 115.2k is supported by version A1.2 or later.

- **Bus**
  - Max Loading : 128 NuDAMs on a bus
- **Power**
  - DC Power Supply : +10V to +30V
  - Power Consumption : 0.9 W

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A Look at NuDAM-6510 & Pin Assignment

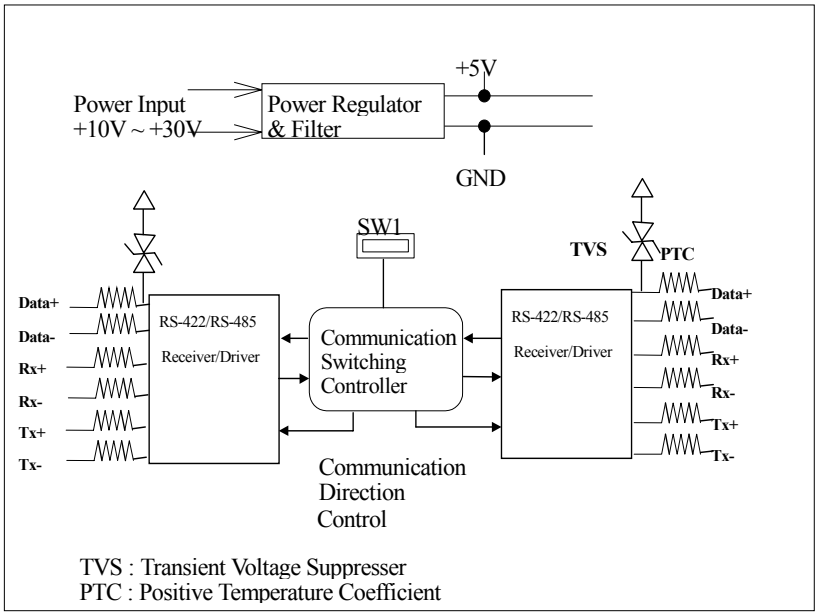


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Pin Definitions

Pin #	Signal Name	Description
1	(Y)DATA+	RS-485 transmission line, positive
2	(G)DATA-	RS-485 transmission line, negative
4	TXIN+	RS-422 transmission input line, positive
5	TXIN-	RS-422 transmission input line, negative
6	RXOUT+	RS-422 receiving output line, positive
7	RXOUT-	RS-422 receiving output line, negative
9	(R)+VS	NuDAM power supply, +10V~+30V
10	(B)GND	NuDAM ground
14	RXIN-	RS-422 receiving input line, negative
15	RXIN+	RS-422 receiving input line, positive
16	TXOUT-	RS-422 transmission output line, negative
17	TXOUT+	RS-422 transmission output line, positive
19	(G)DATA-	RS-485 transmission line, negative
20	(Y)DATA+	RS-485 transmission line, positive

ND-6510 Functional Block Diagram



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3.2. Setup

Objective of Setup

In normal condition, it only needs to setup the NuDAM-6510 when the NuDAM bus with more than 128 modules or the distance exceeds 4000 feet long. The default configuration of this communication module is 9600 bps and data format of 8 data bits with 1 start bit, 1 stop bit, and no parity check. Note that the data format is reserved to be compatible with other brand's communication port, it should not be modified if only NuDAM is used in a system. The baud rate can be configured according user's requirement.

Setup Equipments

Only screw driver is used to open the case. Software, power supply, and wiring are not necessary.

Setup Procedure

Only hardware switch setting can be setup in ND-6510. The user can set the speed and the data format of the RS-422/RS-485 interface. The speed and the data format on the whole network must be identity otherwise the communication may be not correct.

To setup the ND-6510, use the screw driver to open the case, then change the switch setting. The new setting is available after power on. The case must be put back and locked carefully. Note that do not scratch the surface of the circuit while setting up, otherwise the surface coating or even the circuits will be damaged.

(Note: For Harware Rev.C1 or upper, there is switchless for Baudrate adjust. It is auto baudrate and parity, data bits adjust.)

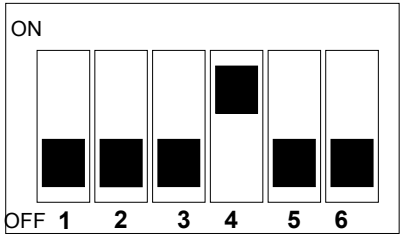
Default Setting

- 9600 Baud rate
- 10 bits serial data format : one start bit, eight data bits, one stop bit, no parity check

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SW1 Setting

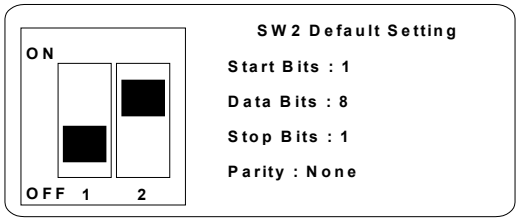
SW1 Default Setting (9600 bps)



1	2	3	4	5	6	Baud Rate
ON	OFF	OFF	OFF	OFF	OFF	1200 or 115.2k[1] bps
OFF	**ON**	OFF	OFF	OFF	OFF	2400 bps
OFF	OFF	**ON**	OFF	OFF	OFF	4800 bps
OFF	OFF	OFF	**ON**	OFF	OFF	9600 bps
OFF	OFF	OFF	OFF	**ON**	OFF	19200 bps
OFF	OFF	OFF	OFF	OFF	**ON**	38400 bps

Note 1: 115.2kbps is supported by version A1.2 or later.

SW2 Setting



1	2	Start Bit	Data Bits	Stop Bit	Parity	Packet Data Bits
OFF	OFF	1	7	1	0	9
		1	6	1	1	
OFF	ON	1	8	1	0	10
		1	7	1	1	
ON	OFF	1	9	1	0	11
		1	8	1	1	
ON	ON	1	10	1	0	12
		1	9	1	1	

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3.3 Installation

Software Utility

Software is not necessary.

Equipments for Installation

A 2-wire RS-485 network or 4-wire RS-422 network.

DC Power supply (+10V~+30V)

Wires

Installation Procedure

1. Make sure the original RS-422/RS-485 network is power off.
2. Wire the power supply to NuDAM-6510. Note that the power supply should meet the specification.
3. Wire other NuDAMs to the extend RS-485 bus.

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Application Wiring

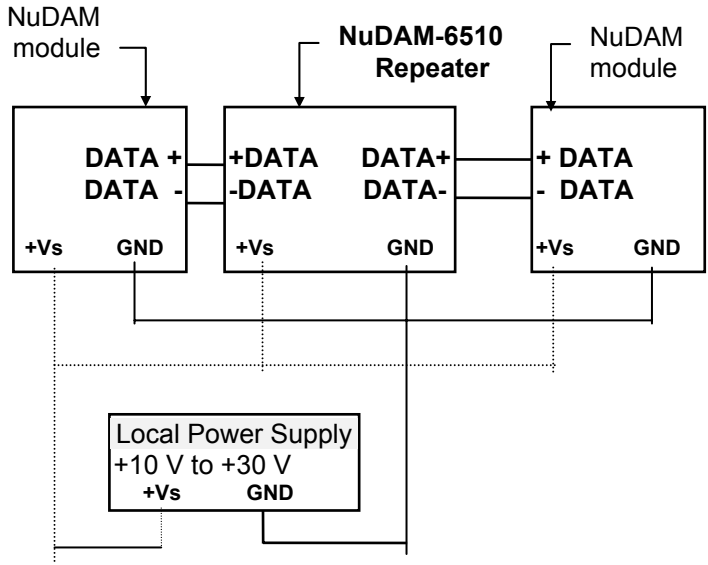


Figure 3-1 NuDAM-6510 wiring.

3.4 Programming

The NuDAM-6510 is a communication module, it is not necessary to be programmed

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4

NuDAM-6530

4.1. Overview

What is NuDAM-6530 ?

Universal Serial Bus (USB) is an open, royalty free, Plug and Play standard for PC peripheral connectivity, supported by leading computer, telecommunications and software company. It behaves in a similar fashion to conventional bus technology (serial, parallel, ISA…), but is a faster, no extra slots or IRQ required manner.

The ND-6530 takes advantages of the USB technology, and for the convenience to the users of numerous PC, IPC, notebooks, laptops and handheld PC, it provides an easy way to link with industry standard buses interface of RS-232/422/485.

Features of NuDAM-6530

- USB Specification 1.1 Compliant
- Plug and Play Installation
- Self power
- RS-232 support RTS CTS handshake signal
- Full-Duplex RS-422 support
- Half-Duplex RS-485 support

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- Up to 128 RS-485 devices on the bus
- Auto direction flow control on RS-485
- High transfer Speed up to 115.2Kbps
- High isolation voltage up to 2500Vrms
- Surge protection on RS-232/422/485 lines
- Driver support for Windows 2000/98
- Low power consumption
- Easily setup and installation

Specifications of NuDAM-6530

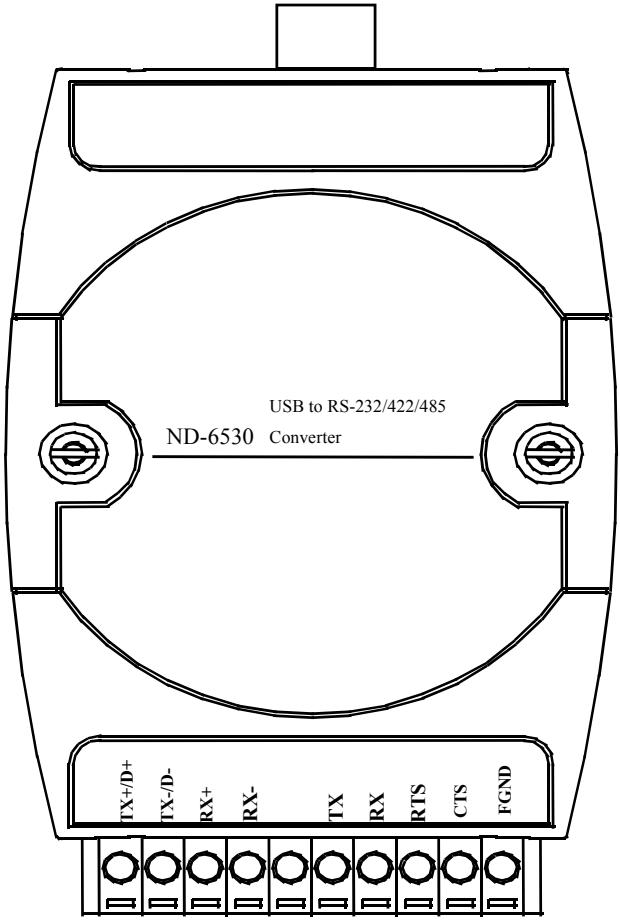
- **USB controller:**
  - USB Spec. 1.1 compliant
- **Transceiver:**
  - RS-232: SP385E
  - RS-422: LT490
  - RS-485: LT1487
- **I/O Interface:**
  - RS-232/422/485 DIP switch selectable
  - RS-232 support RXD, TXD, RTS, CTS, FGND signals
  - RS-422 support TX+, TX-, RX+, RX- 4 wires full-duplex signals
  - RS-485 support DATA+, DATA- signals with auto direction control
  - Selectable transfer speed with 1200, 2400, 4800, 9600, 19200, 38400, 115200 bps
  - 2500Vrms isolation
  - Surge protection on all signal lines
- **Connector:**
  - USB type B
  - 10 pin screw terminal block
- **LED Indicator:**
  - ON: Receiving USB power
  - Flashing: Data transfer
  - OFF: No power applied
- **Cable: Type A to type B**

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- **Storage Temperature Range: -25 to 80 °C**
- **Operating Temperature Range: -10 to 70 °C**
- **Power Requirement: USB bus power**
- **Power Consumption: 0.6W**
- **Case: ABS with captive mounting hardware**
- **CE Class A Conformity**

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A Look at NuDAM-6510 & Pin Assignment

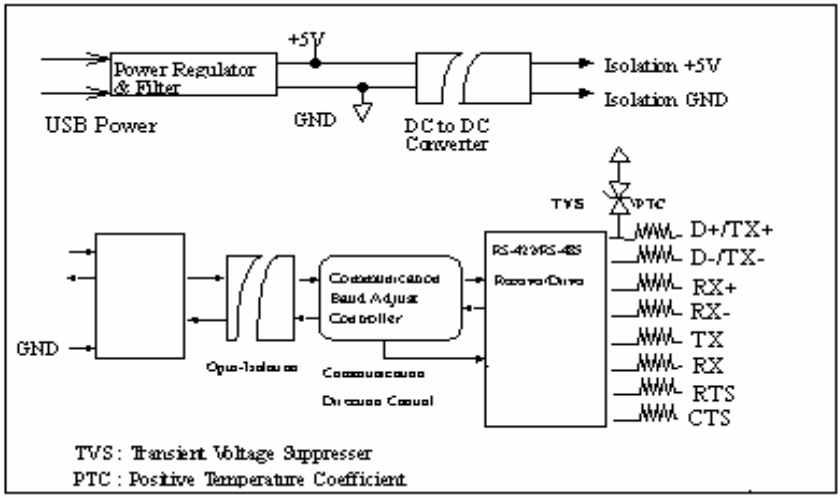


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Pin Definitions

Pin #	Signal Name	Description
1	TX+/D+	RS-422 or RS-485 transmission line, positive
2	TX-/D-	RS-422 or RS-485 transmission line, negative
3	RX+	RS-422 receive line, positive
4	RX-	RS-422 receive line, negative
5	NC	No connection
6	TX	RS-232 transmission line
7	RX	RS-232 receive line
8	RTS	Request to send
9	CTS	Clear to send
10	F.GND	Ground
	USB	Type B connector
1	+5V	USB +5V bus power
2	Data-	USB data line, negative
3	Data+	USB data line, positive
4	Ground	USB bus power ground

ND-6530 Functional Block Diagram



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4.2 Setup

Objective of Setup

In normal condition, it is not necessary to setup the NuDAM-6520. The default configuration of this communication module is in RS-485 mode and support baudrate from 75 to 115200, with data format including 5, 6, 7, 8 or 16 bits, and its stop bit support 1, 1.5 or 2 bits, parity types are None, Odd, Even, Mark and Space. Note that the data format is reserved to be compatible with other brand‘s communication port, it should not be modified if only NuDAM is used in a system. The baud rate is no needed to config.

Setup Equipments

Only screw driver is used on the dip switch beside the USB connector to select the protocal type.

Setup Procedure

Only hardware switch setting can be setup in ND-6530. The user can select the portocal types in RS-422, RS-485 or RS-232 interface. The speed and the data format on the whole network must be identity otherwise the communication may be not correct.

To setup the ND-6530, use the screw driver to adjust the dip switch beside the USB connector to select the protocal type. The new setting is available even power on. The case will not be open.

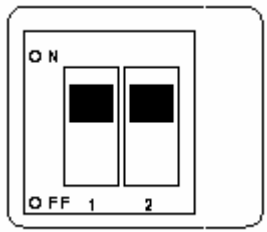
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Default Setting

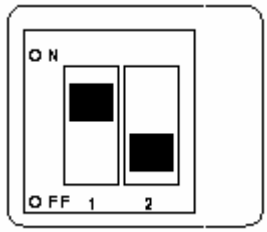
- **RS-485 Interface**

DIP Switch Setting

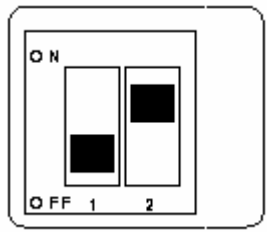
RS-485 (Default)



RS-422



RS-232



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4.3 Installation

Software Utility

ND-6530 Driver.

Equipments for Installation

A computer with USB port

Window 98 or Win2000 operation system

USB host controller installed on the system

USB cable (type A to type B)

◆ **Windows 98 Installation:**

1. Plug the ND-6530 into the computer USB port or a USB hub. The **New Hardware Wizard** appears, click on **Next** to continue.(show as figure)



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2. In the dialog box that comes up, leave the default choice (Search for the best drivers for your device), click on **Next** to continue.



3. In the dialog box that comes up, leave the default choice (**Floppy disk drives**), insert the distribution diskette in the floppy (**A:**) drive, click on **Next** to continue.

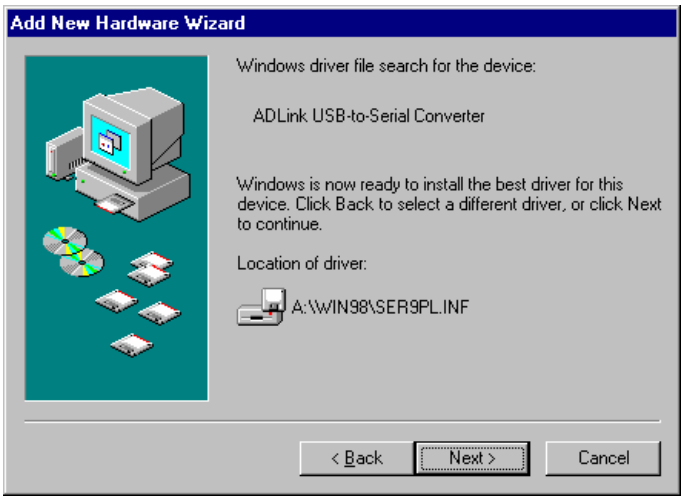


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4. In the dialog box that comes up, click on **Next** to continue. Files are now copied to your hard disk.

5. After the driver files have been copied to the hard disk, a dialog box appears to tell you that the installation has finished. **Click on Finish.**(show as figures)



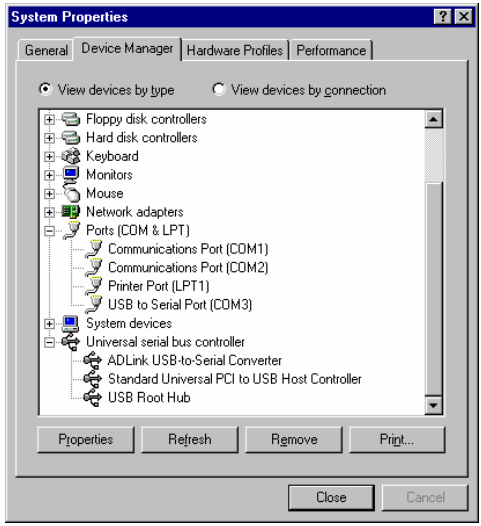


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Installation Complete:

Now you have installed ND-6530 on your system, you can see a new USB serial device in **Control → Device Manager.** The ND-6530 plays a role as standard COM port, you can use any UART serial communication utility (eg. HyperTerminal), or call standard windows API for COM



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◆ Windows 2000 Installation

1. Plug the ND-6530 into the computer USB port or a USB hub

2. Then there will be a dialog box as following



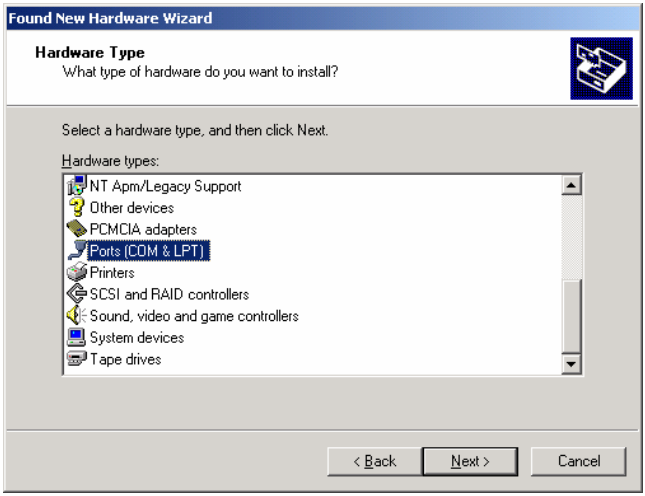
3. Please click the next step, and it will show as



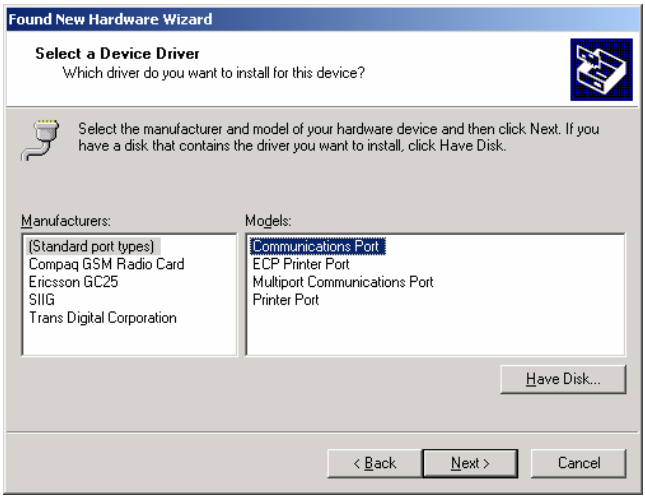
Please select the item “Display a list of the known drivers so that I can choose a specific driver" and click **Next**.

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4. Then it will appear the following dialog box, please choose the item "**Com & LPT"** and click **Next**

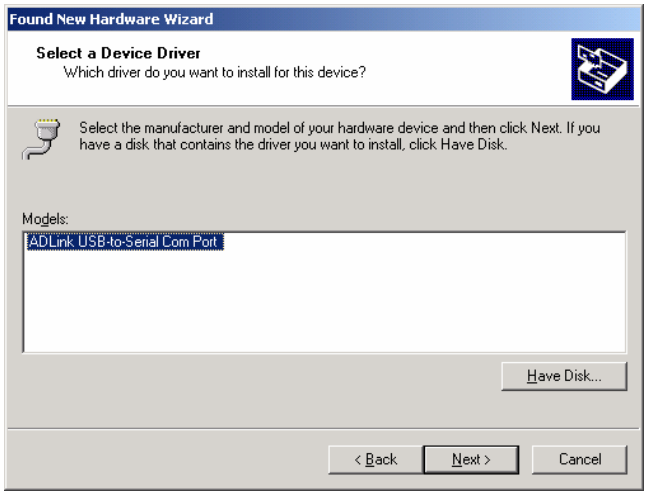


And please choose the device as following

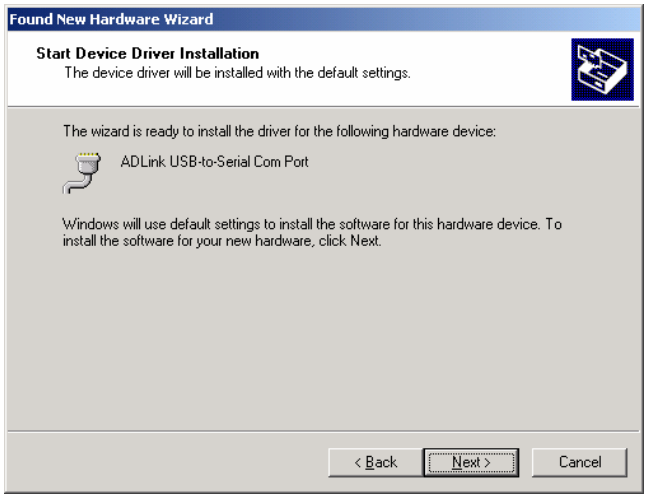


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5. Then you should use the driver to find the following device



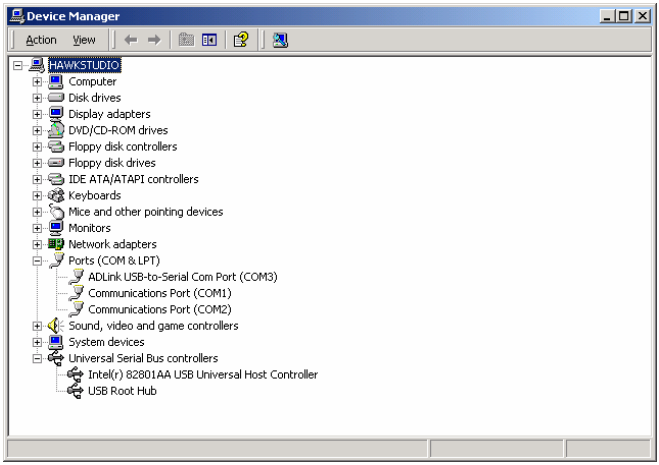
6. After this, you should see the dialog box as



Then you have success to install the ND-6530 on your host

7. To check if the installation is success, please check the device in your device manager, and there should be a device as

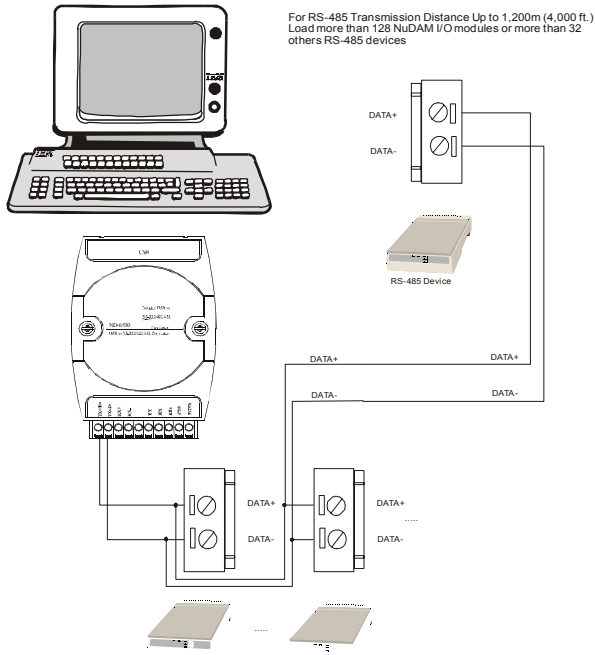
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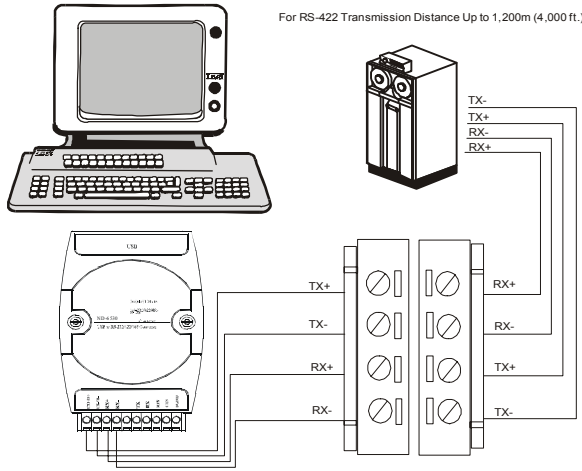
Application Wiring

RS-485

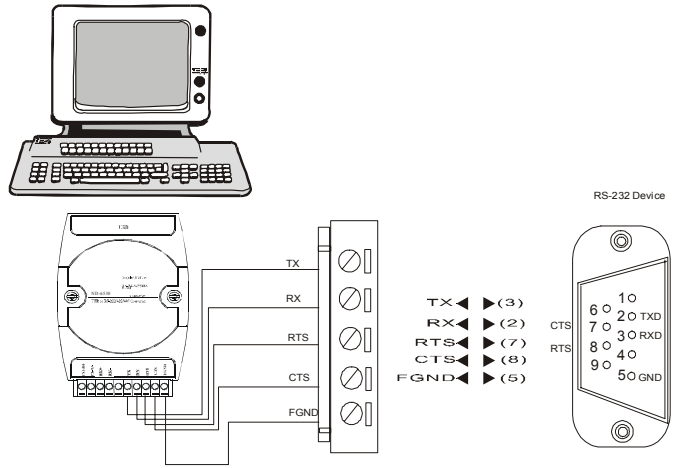


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RS-422



RS-232



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4.4 Programming

The NuDAM-6530 is a communication module, it is not necessary to be programmed

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5

NuDAM-6521

5.1. Overview

What is NuDAM-6521 ?

NuDAM-6521 is an RS-422/485 to RS-232 converter. it converts the RS-422/485 communication signal to the RS-232 signals which makes your RS-232 devices easily link up to RS-422/485 multi-drop network.

Features of NuDAM-6521

- RS-422/RS-485 transceiver
- RS-232 support RTS CTS handshake signal
- RS-232 and RS-422/485 can be different baud rate
- Full-Duplex RS-422 support
- Half-Duplex RS-485 support
- Up to 128 RS-485 devices on the bus
- Auto direction flow control on RS-485
- Addressable and non-addressable mode configurable
- High transfer Speed up to 115.2Kbps
- High isolation voltage up to 2500Vrms
- Surge protection on RS-422/485 lines
- Low power consumption
- Easily setup and installation

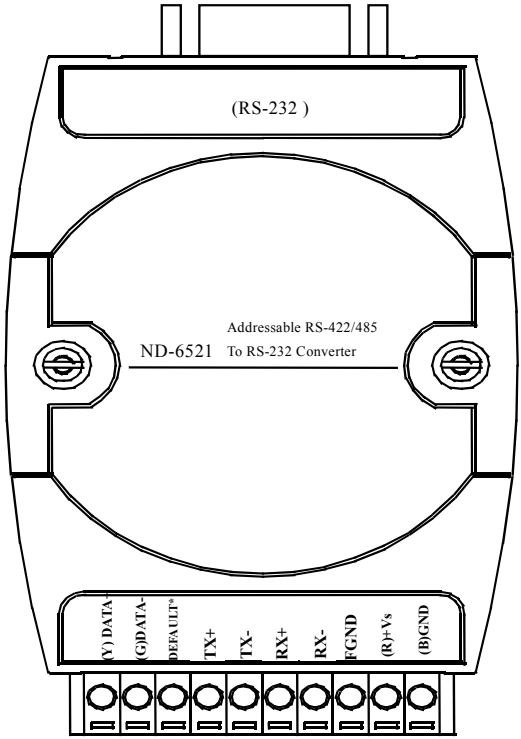
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Specifications of NuDAM-6521

- **Transmission Speed (bps): 1,200 ~ 115,200 (RS-422/485 and RS-232 can set to different baud rate)**
- **Data Format: (RS-232) (RS-422/485 is fixed to 1 stop bit, non-parity, 8 data bits format)**
  - Stop bits: 1, 2
  - Parity type: None, Even, Odd
  - Data bits: 5, 6, 7, 8
- **RS-232:**
  - 9 pin D-sub female connector
  - Support RXD, TXD, RTS, CTS signals
- **RS-422:**
  - Differential 4 full duplex wires
  - Support TX+, TX-, RX+, RX- signals
  - Surge protection on signal pins
- **RS-485:**
  - Differential 2 half duplex wires
  - Support DATA+, DATA- signals
  - Surge protection on signal pins
- **Isolation Voltage: 1000 V_{DC}**
- **Storage Temperature Range: -25 to 80 °C**
- **Operating Temperature Range: -10 to 70 °C**
- **Power Requirement: +10V to +30V_{DC} Unregulated with against power reversal**
  - Power Consumption: 0.75W
- **Case: ABS with captive mounting hardware**
- **CE Class A Conformity**

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A Look at NuDAM-6521 & Pin Assignment



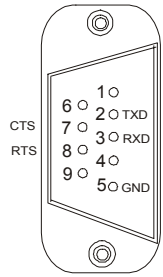
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Pin Definitions

Pin #	Signal Name	Description
1	(Y)DATA+	RS-485 transmission line, positive
2	(G)DATA-	RS-485 transmission line, negative
3	DEFAULT*	Initial state setting
4	TX+	RS-422 transmission line, positive
5	TX-	RS-422 transmission line, negative
6	RX+	RS-422 receiving line, positive
7	RX-	RS-422 receiving line, negative
8	FGND	Field ground
9	(R)+VS	Power supply, +10V~+30V
10	(B)GND	Ground
	RS-232	9-pin RS-232 connector

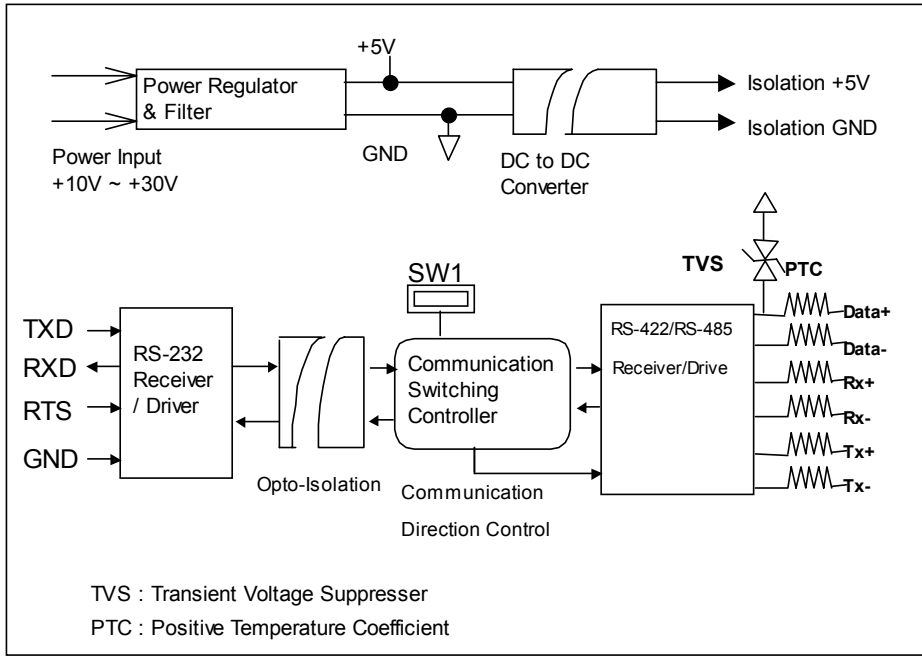
***The module is in DEFAULT mode when DEFAULT* pin connected to GND while applying power on the module.**

***Do not apply any power signal to DEFAULT* pin, just left it open or connected it to GND.**



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Functional Block Diagram



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5.2 Initialation & Installation

Software Installation

1. If you have already installed “NuDAM Administration” then skip other steps.
2. Backup your software diskette
3. Insert “NuDAM Administration” disc into CD-ROM:
4. Change drive to the path of CD-ROM. For example, your drive of CD-ROM is F:, then change the drive to F:
5. Find the setup of NuDAM Administration and run it.
6. Please follow the steps of setup program then you can successful to install the nudism Administration.

Objective of Initializing a Brand-New NuDAM-6521

All NuDAM modules. except NuDAM-6520, 6510, and 6530, in a RS-485 network must have an *unique* address ID, however, every brand-new NuDAM-6521 has a factory default setting as following:

- Address ID is 01.
- Baud rate is 9600 bps
- RS-485 Interface
- Host Watchdog timer is disable

Therefore, to configure the brand-new NuDAM before using is necessary, otherwise the address ID will be conflict with others modules because the ID of new modules are identity . The baud rate may also be changed according to user‘s requirements.

Default State

The NuDAM I/O modules must be set at *Default State* when you want to change the default settings, such as the ID address, baud rate, check-sum status etc. All NuDAM I/O modules have an special pin labeled as **DEFAULT***. The module will be in *Default State* if the **DEFAULT*** pin is shorted to ground when power ON. Under this state, the default configuration is set as following:

- Address ID is 00.
- Baud rate is 9600 bps.
- RS-485 Interface

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Therefore, the communication between host and the module will can be easily set as the same configuration, the initialization of a module will be possible no matter what configuration is set under operating state

Initialization Equipments

- Host computer with an RS-232 port.
- An installed RS-485 module (NuDAM-6520 or 6530) with 9600 baud rate.
- The brand new NuDAM-6521
- Power supply (+10 to +30 V_{DC}) for NuDAM modules
- Administration utility software

Note1: Never Connect the DRFAULT* pin to Vs or power source just left it open or wired to GND.

Initialization Procedure

1. Power off the host computer and the installed NuDAM-6520 or 6530. Be sure of the baud rate of the NuDAM-6520 or 6530 is 9600 bps.
2. Connect a brand new NuDAM module with the RS-485. Set the module in *Default State* by shorting the **DEFAULT*** pin. Refer to Figure 5.1 for detailed wiring.
3. Power on the host computer.
4. Power on the power supply for NuDAM modules.
5. Use the NuDAM Administrating utility to configure the address ID, Baud rate and check-sum status of the module.

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Initialization Wiring

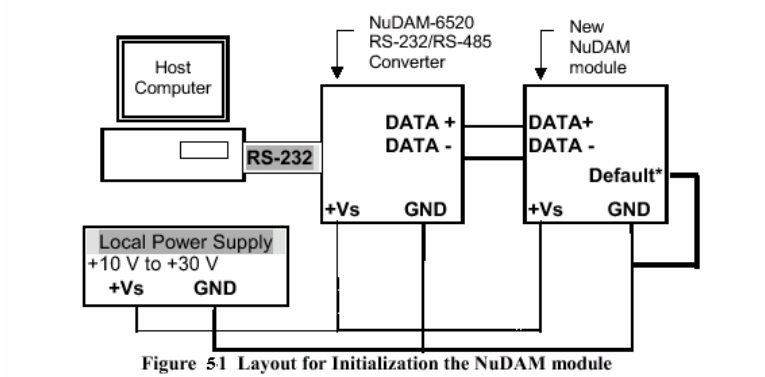


Figure 5-1 Layout for Initialization the NuDAM module

5.3. Install a New NuDAM-6521 to a Existing Network

Equipments for Install a New Module

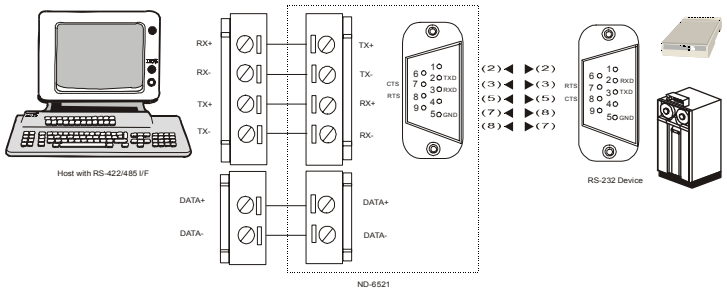
- A existing NuDAM network
- New NuDAM modules.
- Power supply (+10 to +30 V_{DC}).

Installation Procedure

1. Configure the new NuDAM module according to the initialization procedure in section 2.2.
2. The baud rate and check-sum status of the new module must be identity with the existing RS-485 network. The address ID must not be conflict with other NuDAM modules on the network.
3. Power off the NuDAM power supply of the existing RS-485 network.
4. Power off the host computer.
5. Wire the power lines for the new NuDAM with the existing network. Be careful about the signal polarity as wiring.
6. Wire the RS-485 data lines for the new NuDAM with the existing network. Be careful about the signal polarity as wiring.
7. Wire to the input or output devices. Refer to section 2.4 for illustrations.
8. Power on the host computer.
9. Power on the NuDAM local power supply.
10. Use the NuDAM administration utility to check entire network.

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Application Wiring



5.4 Command Set

5.4.1 Command and Response

Introduction

The NuDAM command is composed by numbers of characteristics, including the leading code, address ID, the variables and a carriage return to indicate the end of a command. The host computer can only command only one NuDAM module. The slave device may or may not give response to the command.

Document Conventions

The NuDAM command is composed by numbers of characteristics, including the leading code, address ID, the variables and a carriage return to indicate the end of a command. The host computer can only command only one NuDAM module. The slave device may or may not give response to the command.

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(Leading Code)	Leading Code is the first characteristic of the NuDAM command. All NuDAM commands need a command leading code, such as %,$,#,@,...etc. 1- character
(Addr)	Module's address ID, the value is in the range of 00 - FF (Hexadecimal) if no specified in the following. 2- character
(Command Variable)	Items indicate command codes or value of variables. Variable length
[Data]	Some output command need data. Variable length
[Checksum]	Checksum in brackets indicate optional parameter, only checksum is enable then this field is required. 2- character
< >	Identifies a control code character, such as <CR> for carriage return, its value is 0x0D. **1- character**

Format of NuDAM Commands

(Leading Code)(Addr)(Command)[Data]<CR>

Example:

User Command:	$012<CR>
Response:	!01400600<CR>

$: LeadingCode

01: Address

2: Command (Read Configuration)

<CR>: Carriage return 0x0D

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Response of NuDAM Commands

The response message depends on NuDAM command. The response is also composed with several characteristics, including leading code, variables, and carriage return for ending. There are two kinds of leading code for response message, "!" or ">" means valid command and "?" means invalid. By checking the response message, user can monitor the command is valid or invalid.

Note : Under the following conditions, there will have no response message.
1. The specified address ID does not exist.
2. Syntax error.
3. Communication error.
4. Some special commands do not have response.

5.4.2 Summary of Command Set

Command Set of Digital I/O Modules	
Command	**Syntax**
General Commands	
Set Configuration	**%(OldAddr)(NewAddr)(TypeCode)(BaudRate)(CheckSumFlag)**
Read Configuration	**$(Addr)2**
Read Module Name	**$(Addr)M**
Read Firmware Version	**$(Addr)F**
Soft Reset	**$(Addr)RS**
Reset Status	**$(Addr)5**
Functional Commands	
Set RTS Status	**$(Addr)0(RTS Status)**
Read RTS Status	**$(Addr)3**
Read CTS Status	**$(Addr)1**
Set Device ID	**$(Addr)6(Device ID)**
Read Device ID	**$(Addr)7**
Set Delimiter	**$(Addr)C(Delimiter)**
Read Delimiter	**$(Addr)D**
Data Pass	**(Delimiter)(Addr)(Data)**
Open/Close Data Gate	**&(Addr)8(Data Gate Mode)**
Special Commands	

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Read Command Leading Code Setting	**~(Addr)0**
Change Command Leading Code Setting	**~(Addr)10(C1)(C2)(C3) (C4)(C5)(C6)**
Set Host Watchdog / Safety Value	**~(Addr)2(Flag)(TimeOut) (SafeValue)**
Read Host WatchDog / Safe Value	**~(Addr)3**
Host is OK	**~****

5.4.3 Set Configuration

@Description

Configure the basic setting about address ID, baud rate, and checksum.

@Syntax

%(OldAddr)(NewAddr)(TypeCode)(BaudRate)(DataFlag)<CR>

%		Command leading code. (1-character)
(OldAddr)		Original address ID. The default address ID of a brand new module is 01. The value range of address ID is 00 to FF in hexadecimal. **(2-character)**
(NewAddr)		New address ID, if you don't want to change address ID, let new address ID equals to the old one. **(2-character)**
(TypeCode)		Type Code is fixed *40H*. **(2-character)**
(BaudRate)		Communication baud rate, refer to Table 3-1 for details. The first character is for RS-232, the second character is for RS422/485. **(2-character)**
(DataFlag)		Define check-sum status, refer to Table3-2 for details. **(4-character, WXYZ)** WX is for module system setting. YZ is for RS-232 configuration.
W. bit 3	**0**	Normal addressable mode (*Default Setting)
	1	**Non-addressable mode (ND-6520 mode)**
W. bit 2	**0**	**Disable checksum (*Default Setting)**
	1	**Enable checksum**
W. bit 1	**0**	**RS-422 interface**
	1	**RS-485 interface (*Default Setting)**
W. bit 0		**Don't care, set to 0**
X. bit 3		**Don't care, set to 0**
X. bit 2		**Don't care, set to 0**

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X. bit 1		**Don't care, set to 0**
X. bit 0	**0**	**Don't append <CR> in output string**
	1	**Append <CR> in output string(*Default Setting)**
Y. bit 3		**Don't care, set to 0**
Y. bit 2		**Don't care, set to 0**
Y. bit 1		**Don't care, set to 0**
Y. bit 0	**0**	**Odd parity (*Default Setting)**
	1	**Even parity**
Z. bit 3	**0**	**Non-parity mode (*DefaultSetting)**
	1	**Parity mode**
Z. bit 2	**0**	**One stop bit (*Default Setting)**
	1	**Two stop bit**
Z. bit 1 0	**00**	**5 data bit format**
	01	**6 data bit format**
	10	**7 data bit format**
	11	**8 data bit format**

@Response

!(Addr)<CR>

or

?(Addr)<CR>

(Addr)	Address ID.
!	Command is valid.
?	Command is invalid. Invalid parameter values, When you wanted to change the setting without grounding the DEFAULT* pin.

Note :When you want to change the checksum or baud rate or DataFlag, then the DEFAULT* pin should be grounded at first.

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@Example

User command:	%013040662103<CR>
Response:	!30<CR>

Item	Meaning	Description
%	(Leading Code)	Command leading code.
01	(OldAddr)	Original address ID is 01H.
30	(NewAddr)	New address ID is 30H (Hexadecimal).
40	(TypeCode)	6521 module.
6	(BaudRate for RS-422/485)	Baud rate is 9600 for RS-422/485.
6	(BaudRate for RS-232)	Baud rate is 9600 for RS-232.
2103	(DataFlag)	Addressable mode Checksum is disable RS-485 interface Append <CR> Non-parity 8 data bit
<CR>	Carriage return	0x0D.

Code	Baudrate
3	1200 bps
4	2400 bps
5	4800 bps
6	9600 bps
7	19200 bps
8	38400 bps
9	115200 bps
A	57600 bps

Table 5-1. Baud rate setting code

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5.4.4 Read Configuration

@Description

Read the configuration of module on a specified address ID.

@Syntax

$(Addr)2<CR>

$	Command leading code
(Addr)	Address ID.
2	Command code for reading configuration

@Response

!(Addr)(TypeCode)(BaudRate)(DataFlag)<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr)	Address ID.
(TypeCode)	It always be 40 (Hex)
(BaudRate)	Current setting of communication baud rate of RS-422/485 and RS-232, refer to Table 3-1 for details.
(DataFlag)	Current setting of module setting and RS-232 configuration. Refer 3.3 for details.

@Example

User command:	$302<CR>
Response:	!3040662103<CR>

!	Command is valid.
30	Address ID.
40	Digital I/O module.
66	Baud rate is 9600 for RS-422/485 and RS-232.
2103	Addressable mode Checksum is disable RS-485 interface Append <CR> Non-parity 8 data bit

5.4.5 Read Module Name

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@Description

Read module‘s name.

@Syntax

$(Addr)M<CR>

$	Command leading code.
(Addr)	Address ID
M	Read module name

@Response

!(Addr)(ModuleName) <CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr)	Address ID.
(ModuleName)	NuDAM module‘s name.

@Example

User command:	$30M<CR>
Response:	!306521<CR>

!	Command is valid.
30	Address
6521	ND-6521 (RS-422/485 to RS-232 converter)

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5.4.6 Read Firmware Version

@Description

Read NuDAM module‘s firmware version.

@Syntax

$(Addr)F<CR>

$	Command leading code.
(Addr)	Address ID
F	Read module firmware version.

@Response

!(Addr)(FirmRev) <CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr)	Address ID.
(FirmRev)	NuDAM module‘s firmware version.

@Example

User command:	$30F<CR>
Response:	!30E1.00<CR>

!	Command is valid.
30	Address
E1.00	Firmware Version

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5.4.7 Soft Reset

@Description

Reset the module by software command

@Syntax

$(Addr)RS<CR>

$	Command leading code.
(Addr)	Address ID
RS	Soft Reset Command

@Response

!(Addr)<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr)	Address ID.

@Example

User command:	$30RS<CR>
Response:	!30<CR>

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5.4.8 Reset Status

@Description

Checks the reset status of module at specified address to see whether it has been reset since the last reset status command was issued to the module.

@Syntax

$(Addr)5<CR>

$	Command leading code.
(Addr)	Address ID
5	Reset Status Command

@Response

!(Addr)(Status)<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr)	Address ID.
(Status)	0 : It has not been reset since the last reset status command was issued. 1 : It has been reset since the last reset status command was issued

@Example

User command:	$305<CR>
Response:	!300<CR>

Status is 0 means this module has not been reset since the last reset status command was issued.

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5.4.9 Set RTS Status

@Description

Set the RS-232 RTS signal to specified value.

@Syntax

$(Addr)0(RTS Status)<CR>

$	Command leading code. **(1-character)**
(Addr)	Address ID (2-character)
0	Set RTS Status command
(RTS Status)	0 : Set RTS Status to 0 1: Set RTS Status to 1

@Response

!(Addr)<CR>

or

?(Addr)<CR>

!	Command is valid
?	Command is invalid.
(Addr)	Address ID.

@Example

User command:	$3001<CR>
Response:	!30<CR>

30	Address ID
0	Set RTS Status command
1	Set the RTS signal to 1

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5.4.10 Read RTS Status

@Description

Read the RS-232 RTS status.

@Syntax

$(Addr)3<CR>

$	Command leading code. **(1-character)**
(Addr)	Address ID (2-character)
3	Read RTS status command

@Response

!(Addr)(RTS Status)<CR>

or

?(Addr)<CR>

!	Command is valid
?	Command is invalid.
(Addr)	Address ID.
(RTS Status)	0 : RTS Status is 0 1: RTS Status is 1

@Example

User command:	$303<CR>
Response:	!301<CR>

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5.4.11 Read CTS Status

@Description

Read the RS-232 CTS status.

@Syntax

$(Addr)1<CR>

$	Command leading code. **(1-character)**
(Addr)	Address ID (2-character)
1	Read CTS status command

@Response

!(Addr)(CTS Status)<CR>

or

?(Addr)<CR>

!	Command is valid
?	Command is invalid.
(Addr)	Address ID.
(CTS Status)	0 : CTS Status is 0 1: CTS Status is 1

@Example

User command:	$301<CR>
Response:	!300<CR>

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5.4.12 Set Device ID

@Description

Set the ID of RS-232 network.

@Syntax

$(Addr)6(Device ID)<CR>

$	Command leading code. **(1-character)**
(Addr)	Address ID (2-character)
6	Set Device ID command
Device ID	RS-232 Device ID for up to 24 bytes

@Response

!(Addr)<CR>

or

?(Addr)<CR>

!	Command is valid
?	Command is invalid.
(Addr)	Address ID.

@Example

User command:	$306NuDAM Network 1<CR>
Response:	!30<CR>

30	Address ID
6	Set Device ID command
NuDAM Network 1	Set the ID on address #30 to “NuDAM Network 1”

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5.4.13 Read Device ID

@Description

Read the ID of RS-232 network.

@Syntax

$(Addr)7<CR>

$	Command leading code. **(1-character)**
(Addr)	Address ID (2-character)
7	Read Device ID command

@Response

!(Addr)(Device ID)<CR>

or

?(Addr)<CR>

!	Command is valid
?	Command is invalid.
(Addr)	Address ID.
Device ID	RS-232 Device ID

@Example

User command:	$307<CR>
Response:	!30NuDAM Network 1<CR>

30	Address ID
NuDAM Network 1	The ID on address #30 is “NuDAM Network 1”

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5.4.14 Set Delimiter

@Description

Set the delimiter character for the Data Pass command.

@Syntax

$(Addr)C(Delimiter)<CR>

$	Command leading code. **(1-character)**
(Addr)	Address ID (2-character)
C	Set Delimiter command
Delimiter	8 special character: **: [ ] ^ { } | ~** can be used for delimiter

@Response

!(Addr)<CR>

or

?(Addr)<CR>

!	Command is valid
?	Command is invalid.
(Addr)	Address ID.

@Example

User command:	$30C{<CR>
Response:	!30<CR>

30	Address ID
C	Set Delimiter command
{	Use { as Data Pass delimiter

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5.4.15 Read Delimiter

@Description

Read the delimiter character.

@Syntax

$(Addr)D<CR>

$	Command leading code. **(1-character)**
(Addr)	Address ID (2-character)
D	Read delimiter command

@Response

!(Addr)(Delimiter)<CR>

or

?(Addr)<CR>

!	Command is valid
?	Command is invalid.
(Addr)	Address ID.
Delimiter	Delimiter character

@Example

User command:	$30D<CR>
Response:	!30{<CR>

30	Address ID
{	{ is used as delimiter for Data Pass command

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5.4.16 Data Pass

@Description

Pass the data to RS-232 device.

@Syntax

(Delimiter)(Addr)(Data)<CR>

(Delimiter)	Data pass delimiter character
(Addr)	Address ID (2-character)
Data	Data to the RS-232 device, up to 80 bytes of data can be passed by one command

@Response

No response

@Example

User command:	{30ABCDEFGHIJ<CR>
Response:	

{	Use { as Data Pass delimiter
30	Address ID
ABCDEF	Data pass to RS-232 device (if X.0 = 0, don't append <CR>)
ABCDEF<CR>	Data pass to RS-232 device (if X.0 = 1, append <CR> mode)

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5.4.17 Open/Close Data Gate

@Description

Set the ND-6521 as non-addressable mode or addressable mode.

@Syntax

&(Addr)8(Data Gate Mode)<CR>

&		Command leading code. **(1-character)**
(Addr)		Address ID (2-character)
8		Open/Close Data Gate Command
Data Mode	Gate	10: Open the ND-6521 as non-addressable mode 00: Close the ND-6521 as addressable mode

@Response

!(Addr)<CR>

or

?(Addr)<CR>

@Example

User command:	&30810<CR>
Response:	!30

&	Command leading code
30	Address ID
10	Open data gate

*** Once the gate is open, the ND-6521 can be used as the ND-6520 for transparent data converter.**

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5.4.18 Read Command Leading Code Setting

@Description

Read command leading code setting status.

@Syntax

~(Addr)0<CR>

~	Command leading code.
(Addr)	Address ID
0	Read command leading code setting.

@Response

!(Addr)(Status)(C1)(C2)(C3)(C4)(C5)(C6)<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr)	Address ID
(Status)	(2-character) Bit 0 : Reserved Bit 1 : Power failure or watchdog failure Bit 2 : Host watchdog is enable Bit 3 : Host failure
(C1)	Leading code 1, for read configuration status, firmware version, etc. default is **$.** (1-character)
(C2)	Leading code 2, for read synchronize sampling, digital output ,default is **#. (1-character)**
(C3)	Leading code 3, for change configuration. default is %. (1-character)
(C4)	Leading code 4, for read alarm status, enable alarm, etc. default is **@. (1-character)**
(C5)	Leading code 5, for read command leading code, change command leading code, etc. default is **~. (1-character)**
(C6)	Leading code 6, this leading code is reserved. Default is ***. (1-character)**

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@Example

User command:	~300<CR>
Response:	!3000$#%@~*<CR>

Command leading code setting is $#%@~* for module address ID 30, current status is factory default setting.

5.4.19 Change Command Leading Code Setting

@Description

User can use this command to change command leading code setting as he desired.

@Syntax

~(Addr)10(C1)(C2)(C3)(C4)(C5)(C6)<CR>

~	Command leading code.
(Addr)	Address ID, range (00 - FF).
10	Change command leading code setting.
(C1)	Leading code 1, for read configuration status, firmware version, etc. default is **$. (1-character)**
(C2)	Leading code 2, for read synchronize sampling, digital output ,default is **#. (1-character)**
(C3)	Leading code 3, for change configuration. default is %. (1-character)
(C4)	Leading code 4, for read alarm status, enable alarm, etc. default is **@. (1-character)**
(C5)	Leading code 5, for read command leading code, change leading code, etc. default is **~.** (1-character)
(C6)	Leading code 6, this leading code is reserved. default is ***. (1-character)**

@Response

!(Addr)< CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr)	Address ID.

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@Examples

User command:	~300<CR>
Response:	!3000**$**#%@~*<CR>
User command:	~3010**A**#%@~*<CR>
Response:	!30<CR>
User command:	**A**30F
Response:	!30E1.00<CR>

Read leading code setting is $#%@~* for module address 30 and change leading code **$** to **A**, then use A30F to read firmware version of module on address 30.

*** WARNING ***

We do not recommend users to change the default setting of leading code, because it will make you confuse

The leading code changing only when the command conflicts other devices on the network.

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5.4.20 Set Host Watchdog Timer

@Description

Set host watchdog timer, module will change to safety state when host is failure.

@Syntax

~(Addr)2(Flag)(TimeOut)00<CR>

~	Command leading code.
(Addr)	Address ID, range (00 - FF).
2	Set host watchdog timer and safe state value.
(Flag)	0 : Disable host watchdog timer 1 : Enable host watchdog timer **(1-character)**
(TimeOut)	Host timeout value, between this time period host must send (Host is OK) command to module, otherwise module will change to safety state. Range 01 - FF. **(2-character)** One unit is 100 ms 01 = 1 * 100 = 100 ms FF = 255 * 100 = 25.5 sec
(SafeValue)	8 channels safety value of digital output channels when host is failure. **(2-character)**

@Response

!(Addr)<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr)	Address ID

@Example

User command:	~30211200<CR>
Response:	!30<CR>

30	Address ID
2	Set host watchdog timer and safe state value.
1	Enable host watchdog timer.
12	Timeout value. 0x12 = 18 18 * 100 = 1800 ms
00	

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5.4.21 Read Host Watchdog Timer

@Description

Read host watchdog timer setting and the safety value.

@Syntax

~(Addr)3<CR>

~	Command leading code.
(Addr)	Address ID
3	Read host watchdog setting and module safety state value.

@Response

!(Addr)(Flag)(TimeOut)00<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr)	Address ID, range (00 - FF).
(Flag)	0 : Host watchdog timer is disable 1 : Host watchdog timer is enable**(1-character)**
(TimeOut)	Host timeout value. Range 01 - FF. **(2-character)** One unit is 100 ms 01 = 1 * 100 = 100 ms FF = 255 * 100 = 25.5 sec
00	

@Example

User command:	~303<CR>
Response:	!3011200<CR>

06	Address ID
1	Host watchdog timer is enable.
12	Timeout value. 0x12 = 18 18 * 100 = 1800 ms
00	

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5.4.22 Host is OK

@Description

When host watchdog timer is enable, host computer must send this command to every module before timeout otherwise **"host watchdog timer enable"** module's output value will go to safety state output value.

@Syntax

~**<CR>

~	Command leading code.
**	Host is OK.

@Response

Note : Host is OK command has NO response.

@Example

User command: ~**<CR>

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6

Software Utility

6.1 Software Installation

1. Insert “ADLink All-in-one CD” into your CDROM driver.
2. Move cursor on NuDAM and click.
3. Move cursor on NuDAM 6000 Admin Utility and click.
4. Select the driver you want to install and follow the setup instructions on screen.

6.2 How to Execute the NuDAM Administration

What environment you needed ?

1. At least one RS-232 communication port.
2. Microsoft Windows(version 3.1, 95/98/NT)
3. At least 2MB Hard Drive Space
4. A VGA monitor(optional)
5. Mouse (optional)

Execute the NuDAM Administration Utility

- **Run “NuDAM Administration Utility” Icon.**

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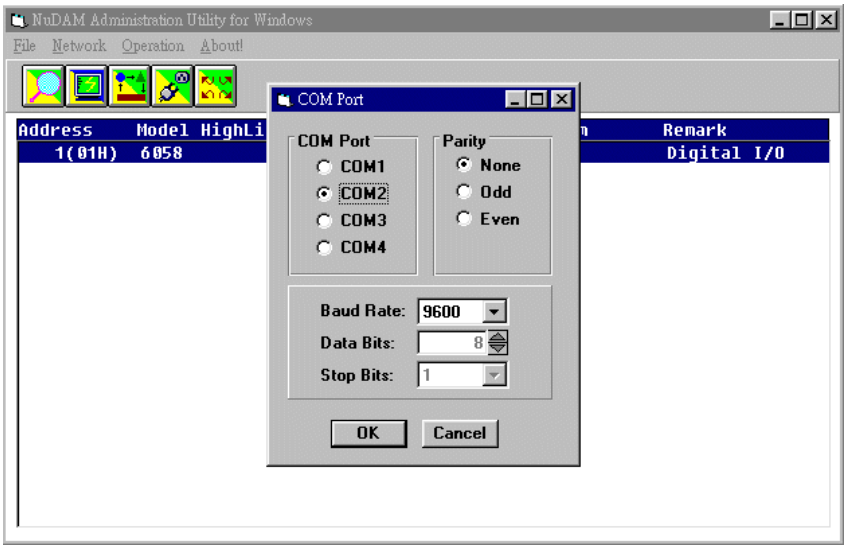
6.3 NuDAM Administration Function Overview

Default RS-232 Communication Port Setting.

- Communication Port : **COM2**
- Baud Rate : **9600**
- Data Bits : **8**
- Stop Bits : **1**
- Parity : **None**

6.3.1 Change RS-232 Communication Port Setting.

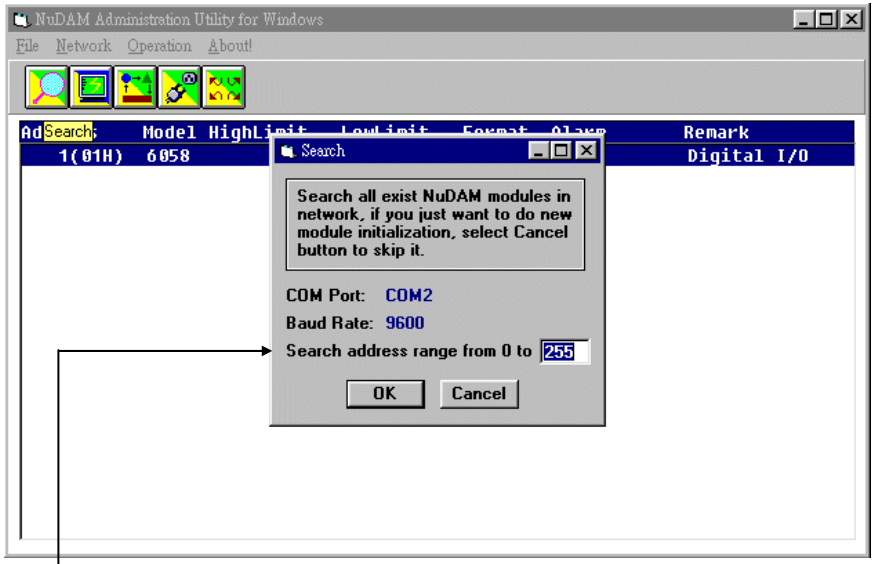
Choose “Network-ComPort” to change setting.



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6.3.2 Search all exist Nudam modules

Choose “Network-Search” to search all exist Nudam modules in the current RS-485 network.

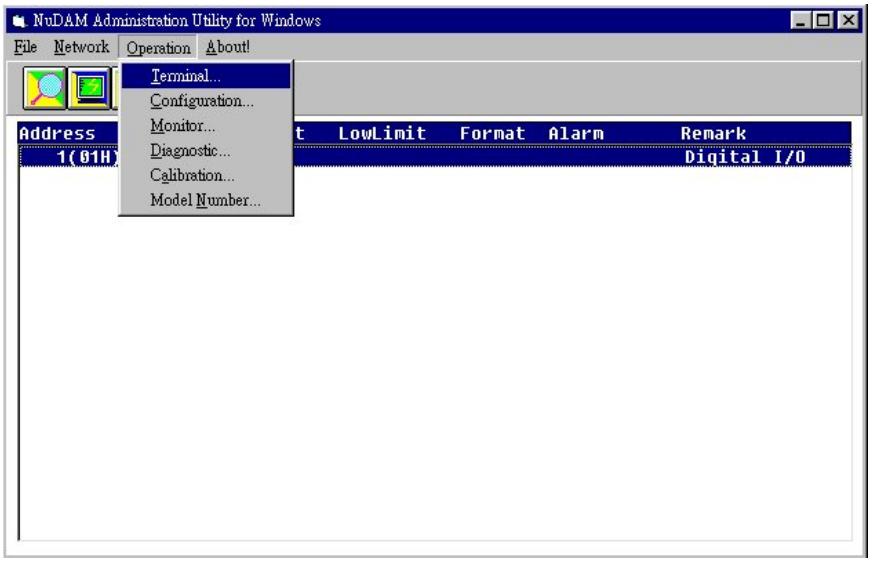


You can change search addresses range from here.

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6.3.3 Using Operations

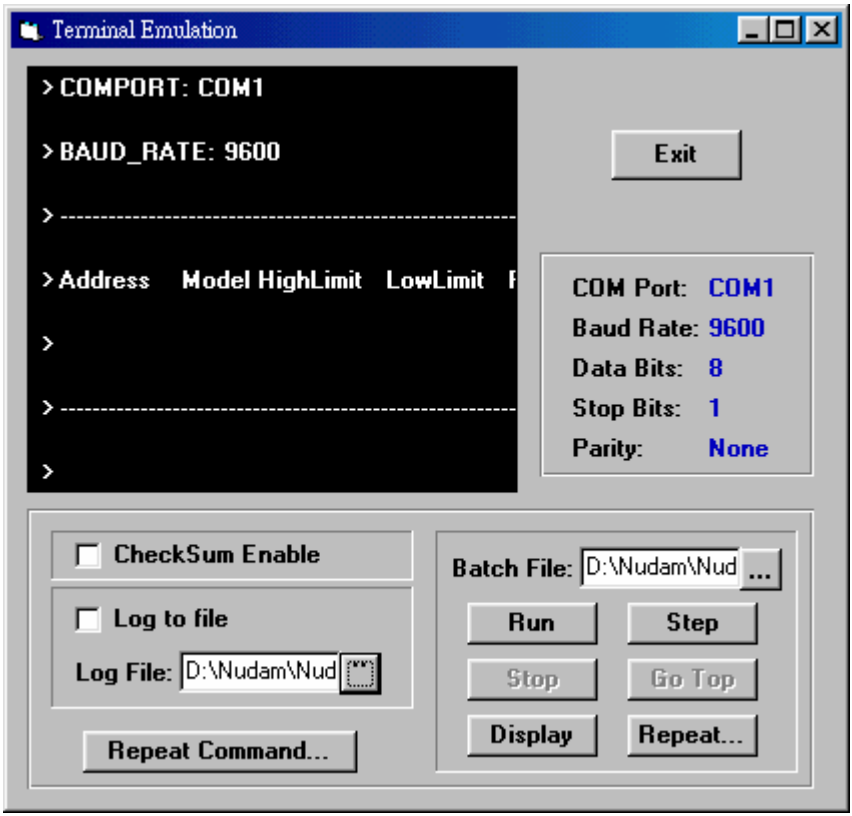
Operation-Terminal :	Terminal Emulation, user can input command and get response message.
Operation-Configuration :	Select one exist NuDAM module and select Configuration to do this module‘s common and private setting .
Operation-Monitor:	Monitor all the module’s function on the network.
Operation-Diagnostic:	Diagnostic module‘s function.
Operation-Calibration:	Some A/D modules need do calibration
Operation-Model Number:	Select Model Number



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Term ICON for Operation-Terminal

You can remote control all moudles by directly using command mode, or testing your modules from this Terminal.

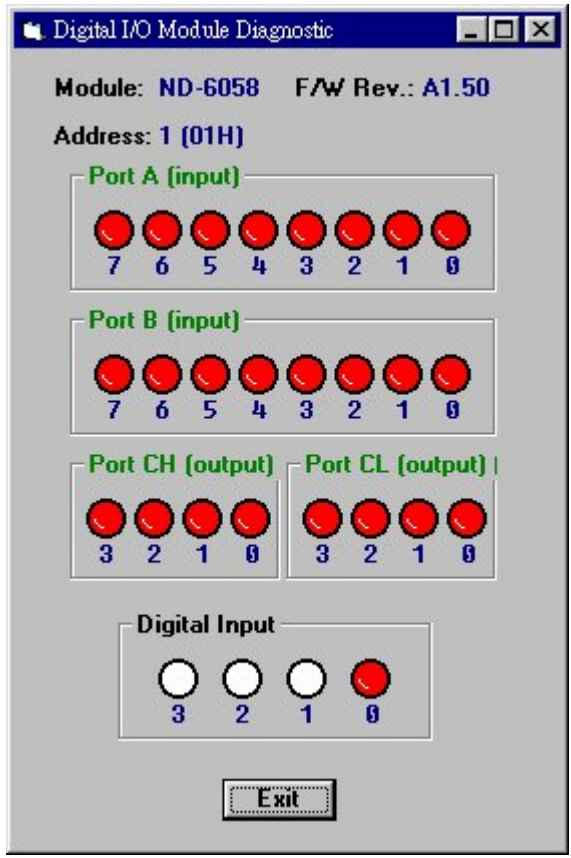


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Operation-Run Batch	:	Run batch command file in BATCH.CMD user can edit this text file.
Operation-Step Batch	:	Run the batch command step by step.
Operation-Display Batch:		Display content of BATCH.CMD
Operation-Repeat	:	Repeat one command n times

Diag ICON for Operation-Diagnostic

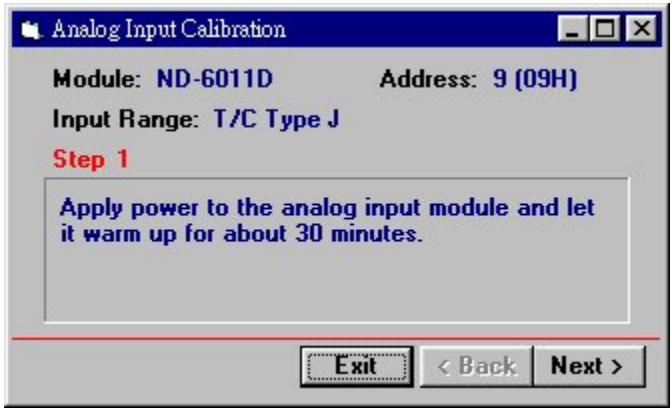
This dialog is different by different-fuction modules.

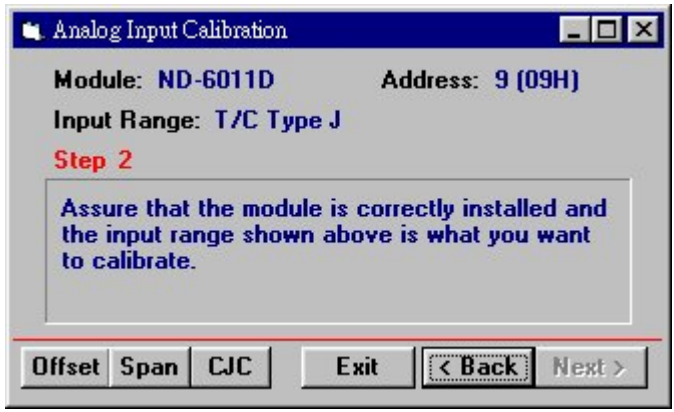


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Cal ICON for Operation-Calibration

This dialog is different by different-fuction modules.

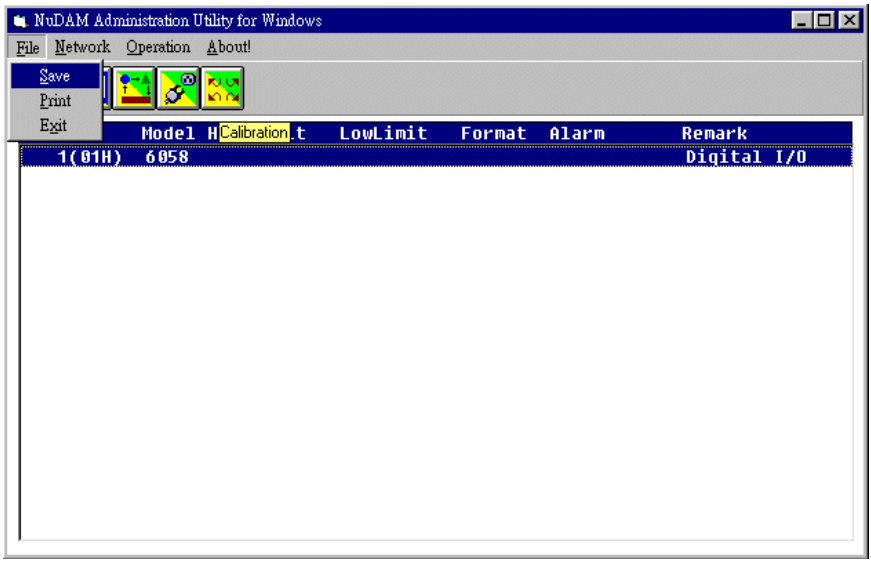




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6.3.4 Save and Print Nudam modules' information

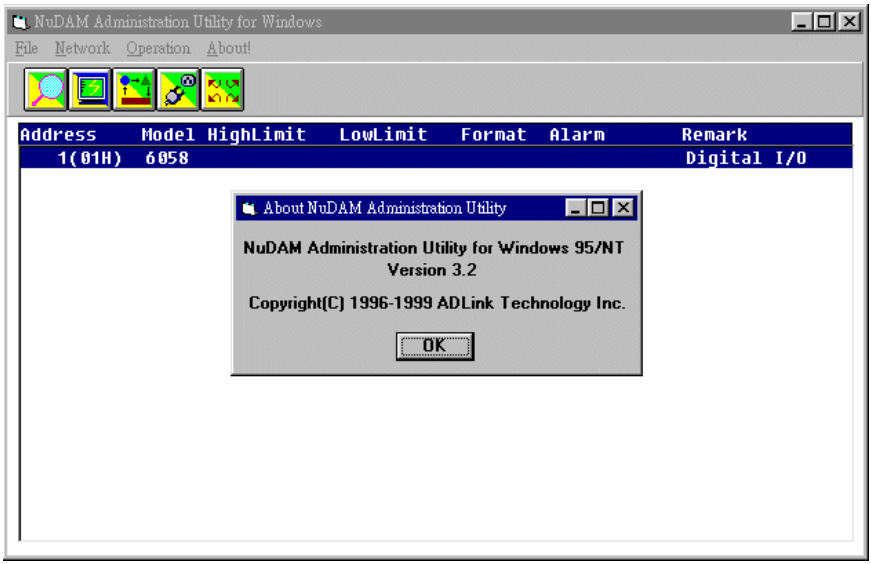
File-Save : Save all exist NuDAM modules information as display as in the listbox in the current RS-485 network.
File-Print : Print the NuDAM module information in the listbox.
File-Exit : Quit the NuDAM Administration Utility.



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6.3.5 Version Information

Help-About Version information



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Troubleshooting and Maintenance

Preventive Maintain

- Periodic check for loose connection

ATTENTION: To avoid electircal shock or unintended operation of the module, remove incoming power before checking connections.

Using the LED Indication

The LED provides status information on Modules operation. The troubleshooting about shows LED indicator. It also shows how to use the LED to detect and correct common operating problems.

LED	What it Means:	What to do:
OFF	Module is not receiving input power by loosing wiring.	Check module wiring, cable connections, and cable connections on terminal block.
ON(RED)	Normal receiving state.	No action required.
Flashing	Normal transmitting state.	No action required.

Other Malfunctions

Problem	What it Means:	What to do:
Do not function	Loose wiring Incorrect DIP switch setting	Check wiring and cable connection Check Baudrate and data packet setting of the DIP switch.

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Warranty Policy

Thank you for choosing ADLINK. To understand your rights and enjoy all the after-sales services we offer, please read the following carefully.

1. Before using ADLINK's products please read the user manual and follow the instructions exactly. When sending in damaged products for repair, please attach an RMA application form which can be downloaded from: http://rma.adlinktech.com/policy/.
2. All ADLINK products come with a limited two-year warranty, one year for products bought in China.
    - The warranty period starts on the day the product is shipped from ADLINK's factory.
    - Peripherals and third-party products not manufactured by ADLINK will be covered by the original manufacturers' warranty.
    - For products containing storage devices (hard drives, flash cards, etc.), please back up your data before sending them for repair. ADLINK is not responsible for any loss of data.
    - Please ensure the use of properly licensed software with our systems. ADLINK does not condone the use of pirated software and will not service systems using such software. ADLINK will not be held legally responsible for products shipped with unlicensed software installed by the user.
    - For general repairs, please do not include peripheral accessories. If peripherals need to be included, be certain to specify which items you sent on the RMA Request & Confirmation Form. ADLINK is not responsible for items not listed on the RMA Request & Confirmation Form.
3. Our repair service is not covered by ADLINK's guarantee in the following situations:
    - Damage caused by not following instructions in the User's Manual.
    - Damage caused by carelessness on the user's part during product transportation.
    - Damage caused by fire, earthquakes, floods, lightening, pollution, other acts of God, and/or incorrect usage of voltage transformers.

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- Damage caused by inappropriate storage environments such as with high temperatures, high humidity, or volatile chemicals.
- Damage caused by leakage of battery fluid during or after change of batteries by customer/user.
- Damage from improper repair by unauthorized ADLINK technicians.
- Products with altered and/or damaged serial numbers are not entitled to our service.
- This warranty is not transferable or extendible.
- Other categories not protected under our warranty.

4. Customers are responsible for all fees necessary to transport damaged products to ADLINK.

For further questions, please e-mail our FAE staff: service@adlinktech.com

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