NuDAM®

NuDAM-6000 ***User's Guide***



Recycled Paper

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

© Copyright 1999~2001 ADLINK Technology Inc.

All Rights Reserved.

Manual Rev. 3.00: March 16, 2001

The information in this document is subject to change without prior notice in order to improve reliability, design and function and does not represent a commitment on the part of the manufacturer.

In no event will the manufacturer be liable for direct, indirect, special, incidental, or consequential damages arising out of the use or inability to use the product or documentation, even if advised of the possibility of such damages.

This document contains proprietary information protected by copyright. All rights are reserved. No part of this manual may be reproduced by any mechanical, electronic, or other means in any form without prior written permission of the manufacturer.

Trademarks

Nudam is registered trademarks of ADLINK Technology Inc.,

Other product names mentioned herein are used for identification purposes only and may be trademarks and/or registered trademarks of their respective companies.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Table of Contents

INTRODUCTION **.....11**

1.1 WHAT IS NUDAM ?.....11
1.2 OUTSTANDING FEATURES OF NUDAM.....12
1.3 NUDAM-6000 SERIES PRODUCTS OVERVIEW.....13
1.4 EIA RS-485 STANDARD.....14
1.5 RS-485 ON NUDAM.....14
1.6 NUDAM RS-485 NETWORK CONFIGURATIONS.....15
1.7 CONSTRUCTING A NUDAM NETWORK.....18
1.8 TERMINATION BUS.....18
1.9. SHIELDING.....19

COMMUNICATION MODULE **.....20**

2.1 OVERVIEW OF NUDAM-6520.....20
2.1.1 Features of NuDAM-6520.....20
2.1.2 Specifications of NuDAM-6520.....21
2.1.3 A Look at NuDAM-6520 & Pin Assignment.....22
2.1.4 Pin Definition of NuDAM-6520.....23
2.1.5 NuDAM-6520 Functional Block Diagram.....25
2.1.6 Setup.....26
2.1.7 Installation.....27
2.1.8 Programming.....27
2.2 OVERVIEW OF NUDAM-6510.....28
2.2.1 Features of NuDAM-6510.....28
2.2.2 Specifications of NuDAM-6510.....28
2.2.3 A Look at NuDAM-6510 & Pin Assignment.....30
2.2.4 Pin Definition of NuDAM-6510.....31
2.2.5 NuDAM-6510 Functional Block Diagram.....31
2.2.6 Setup.....32
2.2.7 Installation.....33
2.2.8 Programming.....34
2.3 OVERVIEW OF NUDAM-6530.....35
2.3.1 Features of NuDAM-6530.....35
2.3.2 Specifications of NuDAM-6530.....36
2.3.3 A Look at NuDAM-6530 & Pin Assignment.....37
2.3.4 Pin Definition of NuDAM-6530.....38
2.3.5 NuDAM-6530 Functional Block Diagram.....38

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.3.6 Setup *40*
2.3.7 Installation *41*
2.3.8 Programming *43*
2.4 OVERVIEW OF NUDAM-6531 44
2.4.1 Features of NuDAM-6531 ..... *44*
2.4.2 Specifications of NuDAM-6531 ..... *45*
2.4.3 A Look at NuDAM-6531 & Pin Assignment *46*
2.4.4 Pin Definition of NuDAM-6531 ..... *47*
2.4.5 NuDAM-6531 Functional Block Diagram *48*
2.4.6 Initialation & Installation *49*
2.4.7 Install a New NuDAM-6531 to a Existing Network *51*

ANALOG INPUT MODULES **53**

3.1 OVERVIEW OF NUDAM-6013 53
3.1.1 Features of NuDAM-6013 ..... *53*
3.1.2 Specifications of NuDAM-6013 ..... *53*
3.1.3 A Look at NuDAM-6013 & Pin Assignment *55*
3.1.4 Pin Definition of NuDAM-6013 ..... *56*
3.1.5 NuDAM-6013 Functional Block Diagram *56*
3.2 OVERVIEW OF NUDAM-6017 57
3.2.1 Features of NuDAM-6017 ..... *57*
3.2.2 Specifications of NuDAM-6017 ..... *57*
3.2.3 A Look at NuDAM-6017 & Pin Assignment *59*
3.2.4 Pin Definition of NuDAM-6017 ..... *60*
3.2.5 NuDAM6017 Functional Block Diagram *60*
3.3 OVERVIEW OF NUDAM-6018 61
3.3.1 Features of NuDAM-6018 ..... *61*
3.3.2 Specifications of NuDAM-6018 ..... *61*
3.3.3 A Look at NuDAM-6018 & Pin Assignment *63*
3.3.4 Pin Definition of NuDAM-6018 ..... *64*
3.3.5 NuDAM-6018 Functional Block Diagram *64*

ANALOG OUTPUT MODULES **65**

4.1 OVERVIEW OF NUDAM-6021 65
4.1.1 Features of NuDAM-6021 ..... *65*
4.1.2 Specifications of NuDAM-6021 ..... *66*
4.1.3 A Look at NuDAM-6021 & Pin Assignment *67*
4.1.4 Pin Definition of NuDAM-6021 ..... *68*
4.1.5 NuDAM-6021 Functional Block Diagram *68*
4.2 OVERVIEW OF NUDAM-6024 69

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

4.2.1 Features of NuDAM-6024 ..... *69*
4.2.2 Specifications of NuDAM-6024 ..... *69*
4.2.3 A Look at NuDAM-6024 & Pin Assignment *71*
4.2.4 Pin Definitions of NuDAM-6024 ..... *72*
4.2.5 NuDAM-6024 Functional Block Diagram *73*

DIGITAL I/O MODULES **74**

ABOUT THE NUDAM DIO MODULES 74
5.1 OVERVIEW OF NUDAM-6050 75
5.1.1 Features of NuDAM-6050 ..... *75*
5.1.2 Specifications of NuDAM-6050 ..... *75*
5.1.3 A Look at NuDAM-6050 & Pin Assignment *77*
5.1.4 Pin Definitions of NuDAM-6050 ..... *78*
5.1.5 NuDAM-6050 Functional Block Diagram *79*
5.2 OVERVIEW OF NUDAM-6052 80
5.2.1 Features of NuDAM-6052 ..... *80*
5.2.2 Specifications of NuDAM-6052 ..... *80*
5.2.3 A Look at NuDAM-6052 & Pin Assignment *81*
5.2.4 Pin Definitions of NuDAM-6052 ..... *82*
5.2.5 NuDAM-6052 Functional Block Diagram *83*
5.3 OVERVIEW OF NUDAM-6053 84
5.3.1 Features of NuDAM-6053 ..... *84*
5.3.2 Specifications of NuDAM-6053 ..... *84*
5.3.3 A Look at NuDAM-6053 & Pin Assignment *85*
5.3.4 Pin Definitions of NuDAM-6053 ..... *86*
5.3.5 NuDAM-6053 Functional Block Diagram *87*
5.4 OVERVIEW OF NUDAM-6054 88
5.4.1 Features of NuDAM-6054 ..... *88*
5.4.2 Specifications of NuDAM-6054 ..... *88*
5.4.3 A Look at NuDAM-6054 & Pin Assignment *90*
5.4.4 Pin Definitions of NuDAM-6054 ..... *91*
5.4.5 NuDAM-6054 Functional Block Diagram *92*
5.5 OVERVIEW OF NUDAM-6056 93
5.5.1 Features of NuDAM-6056 ..... *93*
5.5.2 Specifications of NuDAM-6056 ..... *93*
5.5.3 A Look at NuDAM-6056 & Pin Assignment *95*
5.5.4 Pin Definitions of NuDAM-6056 ..... *96*
5.5.5 NuDAM-6056 Functional Block Diagram *97*
5.6 OVERVIEW OF NUDAM-6058 98
5.6.1 Features of NuDAM-6058 ..... *98*

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.6.2 Specifications of NuDAM-6058 ..... *99*
5.6.3 A Look at NuDAM-6058 & Pin Assignment *100*
5.6.4 Pin Definitions of NuDAM-6058 ..... *101*
5.6.5 NuDAM-6058 Functional Block Diagram *102*
5.7 OVERVIEW OF NUDAM-6060 103
5.7.1 Features of NuDAM-6060 ..... *103*
5.7.2 Specifications of NuDAM-6060 ..... *103*
5.7.3 A Look at NuDAM-6060 & Pin Assignment *105*
5.7.4 Pin Definitions of NuDAM-6060 ..... *106*
5.7.5 NuDAM-6060 Functional Block Diagram *107*
5.8 OVERVIEW OF NUDAM-6063 108
5.8.1 Features of NuDAM-6063 ..... *108*
5.8.2 Specifications of NuDAM-6063 ..... *108*
5.8.3 A Look at NuDAM-6063 & Pin Assignment *110*
5.8.4 Pin Definitions of NuDAM-6063 ..... *111*
5.8.5 NuDAM-6063 Functional Block Diagram *112*
5.9 OVERVIEW OF NUDAM-6067 113
5.9.1 Features of NuDAM-6067 ..... *113*
5.9.2 Specifications of NuDAM-6067 ..... *113*
5.9.3 A Look at NuDAM-6067 & Pin Assignment *115*
5.9.4 Pin Definitions of NuDAM-6067 ..... *116*
5.9.5 NuDAM-6067 Functional Block Diagram *117*
5.10 OVERVIEW OF NUDAM-6080 118
5.10.1 Features of NuDAM-6080 ..... *119*
5.10.2 Specifications of NuDAM-6080 ..... *119*
5. 10. 3 A Look at NuDAM-6080 & Pin Assignment *121*
5.10.4 Pin Definitions of NuDAM-6080 ..... *122*
5.10.5 NuDAM-6080 Functional Block Diagram *123*

COMMAND SET **124**

6.1 COMMAND AND RESPONSE 124
6.1.1 Introduction *124*
6.1.2 Format of NuDAM Commands *125*
6.1.3 Response of NuDAM Commands *127*
6.2 SUMMARY OF COMMAND SET 128
6.2.1 Set Configuration *133*
6.2.2 Read Configuration *143*
6.2.3 Read Module Name *146*
6.2.4 Read Firmware Version *147*

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.2.5 Reset Status *148*
6.2.6 Soft Reset *149*
6.3.1 Read Analog Data *150*
6.3.2 Offset Calibration to each Channel *151*
6.3.3 Span Calibration to each Channel *152*
6.3.4 Read Analog Data From Channel N *153*
6.3.5 Read All Analog Data Channel *154*
6.3.6 Enable/Disable channels for Multiplexing *155*
6.3.7 Read Channel Status *156*
6.3.8 Read CJC Status *157*
6.3.9 Enable/Disable CJC *158*
6.3.10 Read enable/disable CJC Status *159*
6.3.11 CJC Offset Calibration *160*
6.3.12 Span Calibration *161*
6.3.13 Offset Calibration *162*
6.4.1 Synchronized Sampling *163*
6.4.2 Read Synchronized Data *164*
6.4.3 Digital Input *165*
6.4.4 Analog Data Output *166*
6.4.5 4mA Offset Calibration *168*
6.4.6 20mA Calibration *169*
6.4.7 Trim Calibration *170*
6.4.8 Last Value Readback *171*
6.4.9 Current Readback *172*
6.4.10 Save Power On Analog Output Value *173*
6.5.1 Synchronized Sampling *174*
6.5.2 Read Synchronized Data *175*
6.5.3 Digital Output *178*
6.5.4 Digital Input *182*
6.5.5 Programmable I/O Mode Setting *185*
6.6.1 Set RTS Status *187*
6.6.2 Read RTS Status *188*
6.6.3 Read CTS Status *189*
6.6.4 Set Device ID *190*
6.6.5 Read Device ID *191*
6.6.6 Set Delimiter *192*
6.6.7 Read Delimiter *193*
6.6.8 Data Pass *194*
6.6.9 Open/Close Data Gate *195*
6.7.1 Set Input Mode *196*

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.2 Read Input Mode *197*
6.7.3 Read Counter/Frequency Value in HEX Format *198*
6.7.4 Read Counter/Frequency Value in DEC Format *199*
6.7.5 Set Gate Mode *200*
6.7.6 Read Gate Mode *201*
6.7.7 Set Maximum Counter Value *202*
6.7.8 Read Maximum Counter Value *203*
6.7.9 Set Initial Count Value *204*
6.7.10 Read Initial Count Value *205*
6.7.11 Start/Stop Counter *206*
6.7.12 Read Start/Stop Counter Status *207*
6.7.13 Clear Counter *208*
6.7.14 Read then Clear Overflow Flag *209*
6.7.15 Enable/Disable Digital Filter *210*
6.7.16 Read Filter Status *211*
6.7.17 Set Minimum Input Signal Width at High Level *212*
6.7.18 Read Minimum Input Signal Width at High Level *213*
6.7.19 Set Minimum Input Signal Width at Low Level *214*
6.7.20 Read Minimum Input Signal Width at Low Level *215*
6.7.21 Set TTL Input High Trigger Level *216*
6.7.22 Read TTL Input High Trigger Level *217*
6.7.23 Set TTL Input Low Trigger Level *218*
6.7.24 Read TTL Input Low Trigger Level *219*
6.7.25 Enable Alarm *220*
6.7.26 Disable Alarm *221*
6.7.27 Set Alarm Limit Value of Counter 0 ..... *222*
6.7.28 Set Alarm Limit Value of Counter 1 ..... *223*
6.7.29 Read Alarm Limit Value of Counter 0 ..... *224*
6.7.30 Read Alarm Limit Value of Counter 1 ..... *225*
6.7.31 Set Digital Output Values *226*
6.7.32 Read Digital Output and Alarm Status *227*
6.8.1 Read Command Leading Code Setting *229*
6.8.2 Change Command Leading Code Setting *230*
6.8.3 Set Host Watchdog Timer & Safety Value *232*
6.8.4 Read Host Watchdog Timer & Safety Value *236*
6.8.5 Change Polarity *240*
6.8.6 Read Polarity *241*
6.8.7 Host is OK *242*

INITIALIZATION & INSTALLATION 243

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

7.1 SOFTWARE INSTALLATION....243
7.2 INITIALIZING A BRAND-NEW MODULE....243
Objective of Initializing a Brand-New NuDAM....243
Default State....244
Initialization Equipments....244
Initialization Procedure....245
Initialization Wiring....245
7.3 INSTALL A NEW NUDAM TO A EXISTING NETWORK....245
Equipments for Install a New Module....245
Installing Procedures....245
7.4 APPLICATION WIRING FOR NUDAM....246
7.4.1 Differential Voltage Input....246
7.4.2 Single Ended Voltage Input....247
7.4.3 Current Measurement....247
7.4.4 Differential Current Outpu....247
7.4.5 RTD Input....248
7.4.6 Differential Voltage Output....249
7.4.7 Digital Input onnect with TTL Signal....249
7.4.8 Digital Input Connect with Switch or Push Button....249
7.4.9 Digital Output Connect with Power Loading....250
7.4.10 Isolated Differential Input....250
7.4.11 Isolated Single Ended Input....250
7.4.12 Wet Contact Input....251
7.4.13 Contact Closure Input....251
7.4.14 Isolated Differential Input with External 24V power....251
7.4.15 Isolated Common Ground Output....252
7.4.16Thermocouple Input Measurement....252
7.4.17 Form C Relay Output....252
7.4.18 Form A Relay Output....253
7.4.19 Discrete Input: Contact Mode....253
7.4.20 Discrete Input: Transistor Mode....253

ANALOG MODULES DATA FORMAT....254

UNIT CONVERSION....254
8.1 Engineering Units....254
8.2 Percent of FSR (Full Scale Range)....258
8.3 Hexadecimal or Two's Complement Hexadecimal....261
8.4 Ohm....263

CALIBRATION....264

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

9.1 HOW TO CALIBRATE THE ANALOG INPUT MODULES ?.....264
Calibration Procedure for ND-6017.....*264*
Calibration Procedure for ND-6013 Firmware Rev A3.05.....*265*
Calibration Procedure for ND-6013 Firmware Rev C4.60.....*266*
Calibration Procedure for ND-6018 Firmware Rev B1.10.....*266*
Calibration Procedure for ND-6018 Firmware Rev E1.00.....*266*
CJC Calibration Procedure.....*267*
Analog Input Module's Calibration Voltages.....*268*
9.2 HOW TO CALIBRATE THE ANALOG OUTPUT MODULES ?.....270

APPENDIX.....272

APPLICATION NOTE.....272
SOFTWARE UTILITY.....274
1.Software Installation.....*274*
2.How to Execute the NuDAM Administration.....*274*
3.NuDAM Administration Function Overview.....*274*
3.1 Change RS-232 Communication Port Setting......*275*
3.2 Search all exist Nudam modules.....*276*
3.3 Using Operations.....*277*
3.4 Save and Print Nudam modules' information.....*281*
3.5 Version Information.....*282*

PRODUCT WARRANTY/SERVICE.....283

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Table of Figure

Figure 1-1 Simple Topology.....15
Figure 1-2 Branch Topology.....16
Figure 1-3 Free Topology.....17
Figure 1-4 Terminator Connection.....18
Figure 2-1 NuDAM-6520 profile.....22
Figure 2-2 Connection Between Host and NuDAM-6520.....24
Figure 2-3 RS-422 Application Wiring.....24
Figure 2-4 RS-485 Application Wiring.....25
Figure 2-6 NuDAM-6510 profile.....30
Figure 2-7 Block Diagram of NuDAM-6510.....31
Figure 2-8 NuDAM-6530 profile.....37
Figure 2-9 Block Diagram of NuDAM-6530.....38
Figure 2-10 NuDAM-6531 profile.....46
Figure 2-11 Block Diagram of NuDAM-6531.....48
Figure 3-1 NuDAM-6013 profile.....55
Figure 3-2 Block Diagram of NuDAM-6013.....56
Figure 3-3 NuDAM-6017 profile.....59
Figure 3-4 Block Diagram of NuDAM-6017.....60
Figure 3-5 NuDAM-6018 profile.....63
Figure 3-6 Block Diagram of NuDAM-6018.....64
Figure 4-1 NuDAM-6021 profile.....67
Figure 4-2 Block Diagram of NuDAM-6021.....68
Figure 4-3 NuDAM-6024 profile.....71
Figure 4-4 Block Diagram of NuDAM-6024.....73
Figure 5-1 NuDAM-6050 profile.....77
Figure 5-2 Block Diagram of NuDAM-6050.....79
Figure 5-3 NuDAM-6052 profile.....81
Figure 5-4 Block Diagram of NuDAM-6052.....83
Figure 5-5 NuDAM-6053 profile.....85
Figure 5-6 Block Diagram of NuDAM-6053.....87
Figure 5-7 NuDAM-6054 profile.....90
Figure 5-8 Block Diagram of NuDAM-6054.....92
Figure 5-9 NuDAM-6056 profile.....95

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Figure 5-10 Block Diagram of NuDAM-6056 97
Figure 5-11 NuDAM-6058 profile 100
Figure 5-12 Block Diagram of NuDAM-6058 102
Figure 5-13 ND-6060 profile 105
Figure 5-14 Block Diagram of NuDAM-6060 107
Figure 5-15 NuDAM-6063 profile 110
Figure 5-16 Block Diagram of NuDAM-6063 112
Figure 5-17 NuDAM-6067 profile 115
Figure 5-18 Block Diagram of NuDAM-6067 117
Figure 5-19 NuDAM-6080 profile 121
Figure 5-20 Block Diagram of NuDAM-6080 123
Figure 6-1 Data Format Setting of ND-601x.....139
Figure 6-2 Data format of ND-602x 140
Figure 6-3 Check sum flag setting of 605x 141
Figure 6-4 Check sum flag setting of 6080 141
Figure 6-5 Response of check sum flag.....145
Figure 7-1 Layout for Initialization the NuDAM module 245
Figure A-1. ND-60xx Default Setting External Connection.....273
Figure A-2 Terminator Connection.....273

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

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.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

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.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

- **Harsh environmental protection**

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**
  - ***ND-6510*** : RS-422/RS-485 Repeater
  - ***ND-6520*** : RS-232 to RS-422/RS-485 Converter
  - ***ND-6530*** : USB to RS-422/RS-485 Converter
  - ***ND-6531*** : Addressable RS-422/RS-485 to RS-232 Converter
- **Analog Input Modules**
  - ***ND-6013*** : 3-channel RTD Input Module
  - ***ND-6017*** : 8-channel Analog Input Module
  - ***ND-6018*** : 8-channel Thermocouple Input Module
- **Analog Output Modules**
  - ***ND-6021*** : Single Channel Analog Output Module
  - ***ND-6024*** : 4-channel Analog Output Module with 7 DI channels
- **Digital I/O Modules**
  - ***ND-6050*** : Module with 7 DI channels and 8 DO channels
  - ***ND-6052*** : 8-channel Isolated Input Module
  - ***ND-6053*** : 16-channel Digital Input Module
  - ***ND-6054*** : 15-channel Isolated Input Module
  - ***ND-6056*** : 15-channel Isolated Output Module
  - ***ND-6058*** : 28-channel Programable Digital I/O Module
  - ***ND-6060*** : 4-channel Relay Output & Isolated Input Module
  - ***ND-6063*** : 8-channel Relay Output Module
  - ***ND-6067*** : 8-channel AC Relay Output Module
  - ***ND-6080*** : 2-channel Counter/Frequency Input Module

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

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.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

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 is used to build the USB signal into RS-485/RS-422/RS-232 signal.

The ND-6531 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.

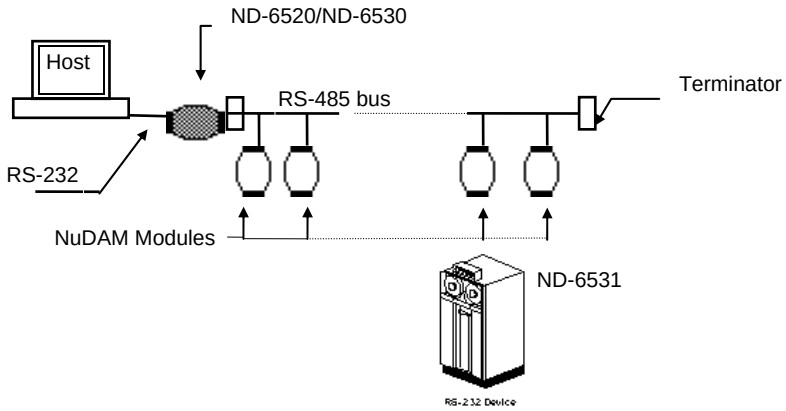


Figure 1-1 Simple Topology

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

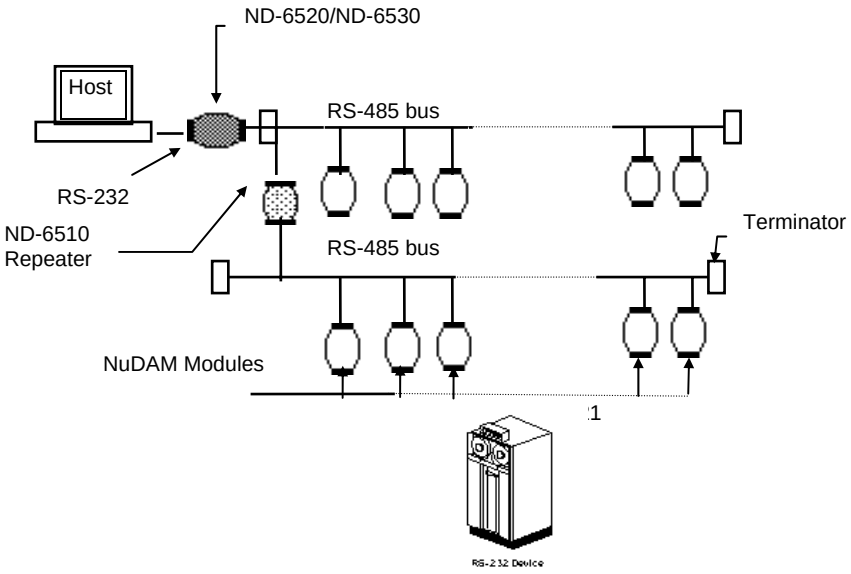


Figure 1-2 Branch Topology

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

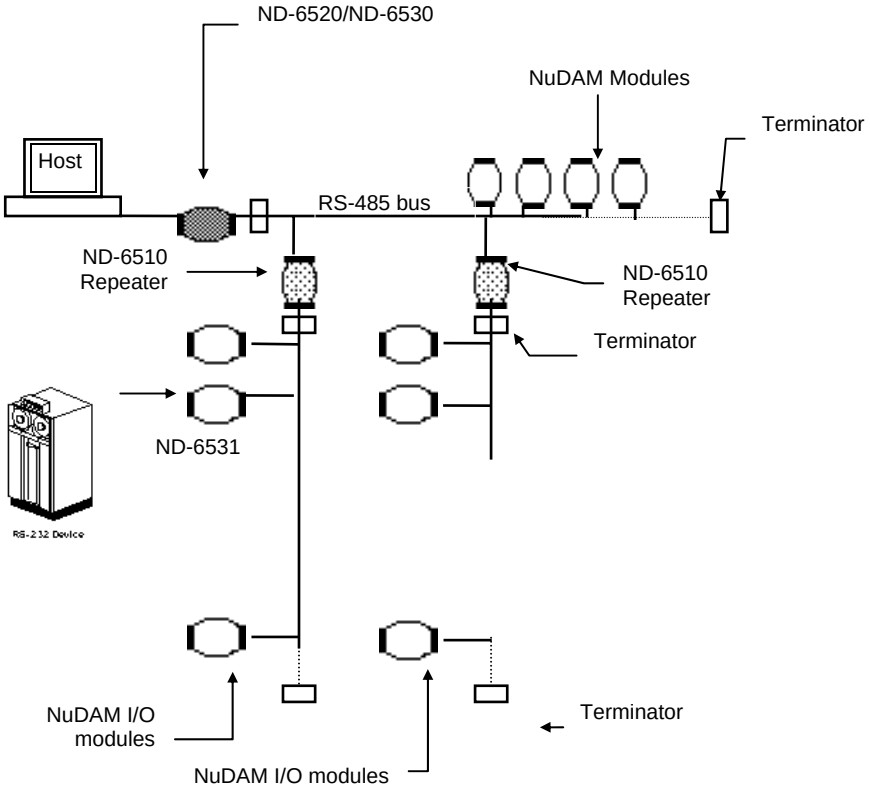


Figure 1-3 Free Topology

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

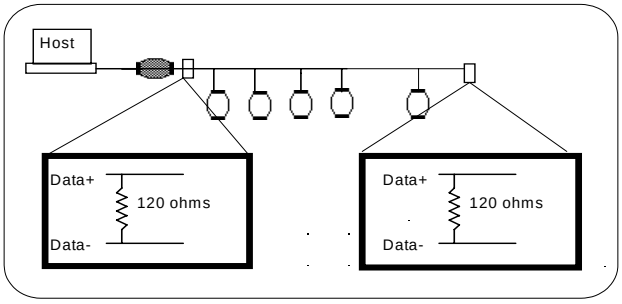
1.7 Constructing a NuDAM Network

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.

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

Figure 1-4 Terminator Connection

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

1.9. Shielding

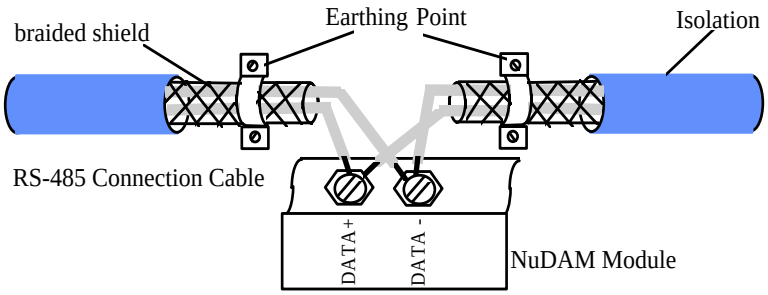
In case of increased interference, a shielded bus cables is recommended to use for wiring between module and modules. In addition, a shielding also should be done for the cable of power supply and for the signal cables.

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.



Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2

Communication Module

2.1 Overview of ND-6520

ND-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.

2.1.1 *Features of ND-6520*

- **RS-422/RS-485 transceiver**
- **Differenial 4-wire full-duplex RS-422**
- **Differenial 2-wire half-duplex RS-485**
- **Easily setup and installation**
- **Auto direction flow control**
- **Maximum 128 modules on a bus without using repeaters**
- **Maximum 256 addressable modules.**
- **High transfer speed**

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

- **High isolation voltage**
- **Lower power consumption**

2.1.2 *Specifications of ND-6520*

- **Input**
  - Interface : standard RS-232 9 pin female D-type connector
  - Speed (bps) : 1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K, 115.2K
  - Data Format * :
    Data bits : 5 bits, 6 bits, 7 bits, or 8 bits
    Stop bits: 1, 2
    Parity type: None, Even, Odd
- **Output**
  - Interface :RS-485, differential, 2 half-duplex wires RS-422, differential, 4 full-duplex wires
  - Speed (bps) : The same with input speed.
  - Max RS-485 network bus distance : 4000 feet. (1200 meter)
- **Isolation**
  - Isolation voltage : 2500 Vrms(between RS-422/RS-485 network and host computer)
- **Bus**
  - Max loading : 128 modules on a RS-485 network
  - Max modules : 256 modules with one ND-6510 repeater
- **Power**
  - Power Supply : +10V to +30V
  - Power Consumption : 0.912 W

Note* : *It supports auto baudrate and parity, data bits adjustment.*

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.1.3 A Look at ND-6520 & Pin Assignment

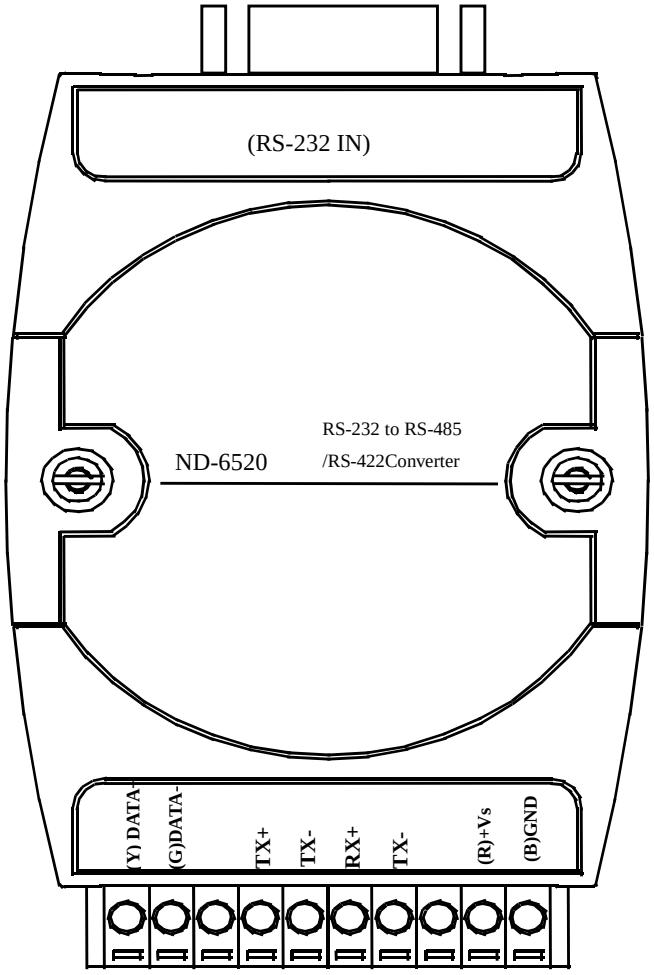


Figure 2-1 ND-6520 profile

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.1.4 Pin Definition of ND-6520

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

D type 9 Pin Connecter Definition of ND-6520

Pin #	Signal Name	Description
2	RXD	RS-232 receiving line
3	TXD	RS-232 transmission line
5	GND	RS-232 Common Ground

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

◆ **Connection Between Host and ND-6520**

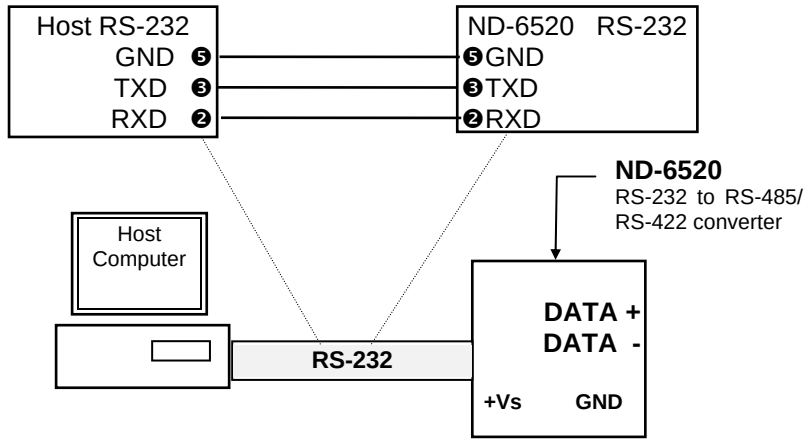


Figure 2-2 Connection Between Host and ND-6520

◆ **RS-422 Application Wiring**

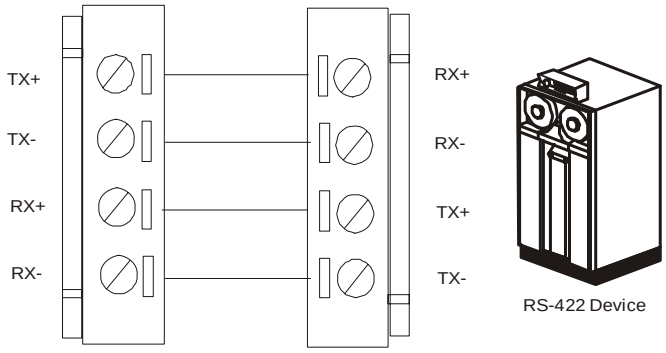


Figure 2-3 RS-422 Application Wiring

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

- **RS-485 Application Wiring**

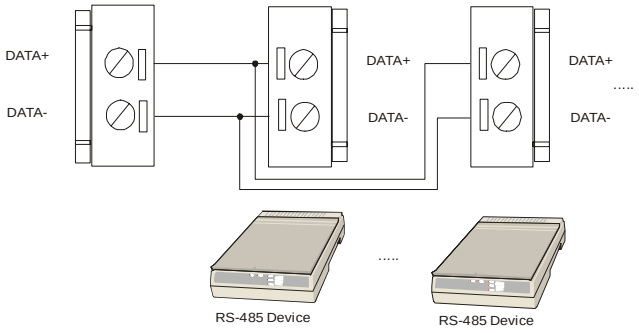


Figure 2-4 RS-485 Application Wiring

2.1.5 ND-6520 Functional Block Diagram

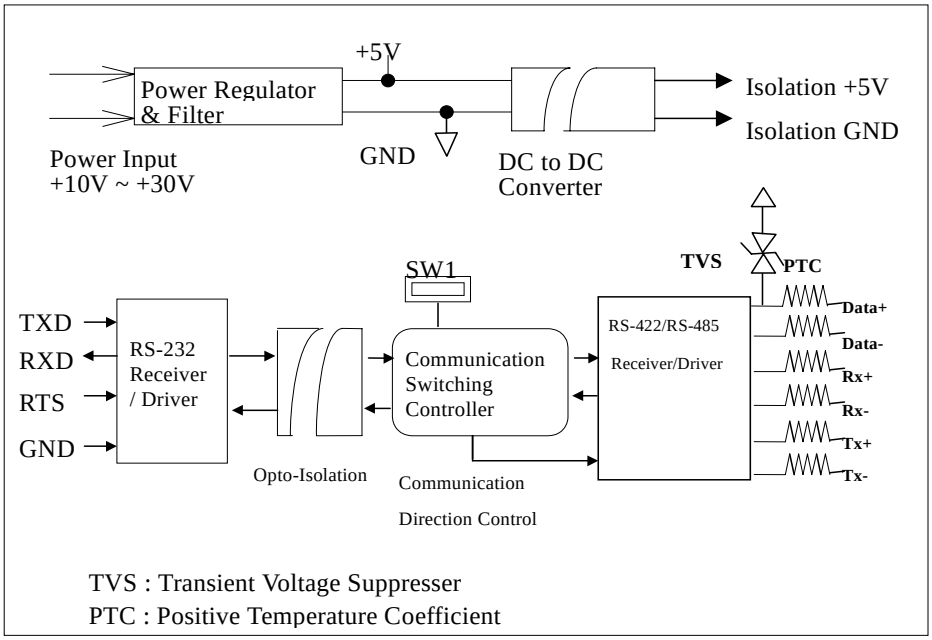


Figure 2-5 Block Diagram of ND-6520

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.1.6 Setup

Objective of Setup

In normal condition, it is not necessary to setup the ND-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 identical otherwise the communication will be not correct.

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

Default Setting

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

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.1.7 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)
Wires (shielded and grounded is recommended)
Installation Procedure
1. Make sure the host computer is power off.
2. Use RS-232 cable to connect ND-6520 with host computer.
3. Wire the power supply to NuDAMs.Note that the power supply should meet the specification.
4. Wire other NuDAMs.

Application Wiring

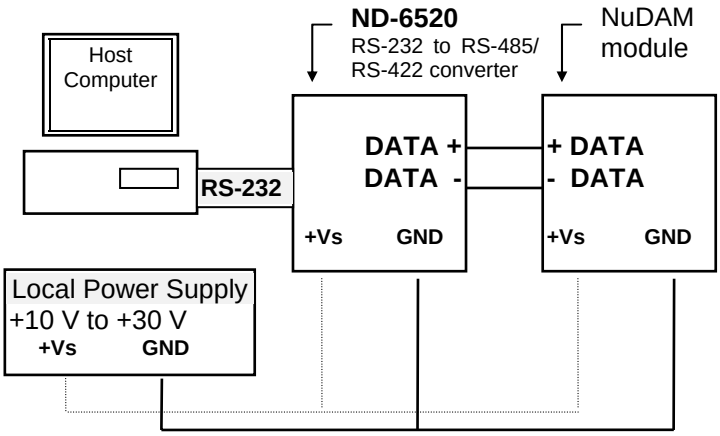


Figure 2-6 Application wiring of NuDAM-6520

2.1.8 Programming

The ND-6520 is a communication module, it is not necessary to do any programming.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.2 Overview of ND-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 exceed 128. In addition, the repeater should also be used when the length of a signal bus is more than 4000 feet.

2.2.1 Features of ND-6510

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

2.2.2 Specifications of ND-6510

◆ **Input / Output**

- ♦ Interface : RS-485, differential, 2 half-duplex wires.
  RS-422, differential, 4 full-duplex wires
- ♦ Speed (bps) : 1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K, 115.2K
- ♦ Data Format* :
  Data bits : 5 bits, 6 bits, 7 bits, or 8 bits
  Stop bits: 1, 2
  Parity type: None, Even, Odd
- ♦ Max RS-485 network bus distance : 4000 feet. (1200 meter)

Note*: *It is auto baudrate and parity, data bits adjust.*

◆ **Bus**

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

- Max Loading : 128 NuDAMs on a bus

- **Power**
  - DC Power Supply : +10V to +30V
  - Power Consumption : 1.104W

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.2.3 A Look at ND-6510 & Pin Assignment

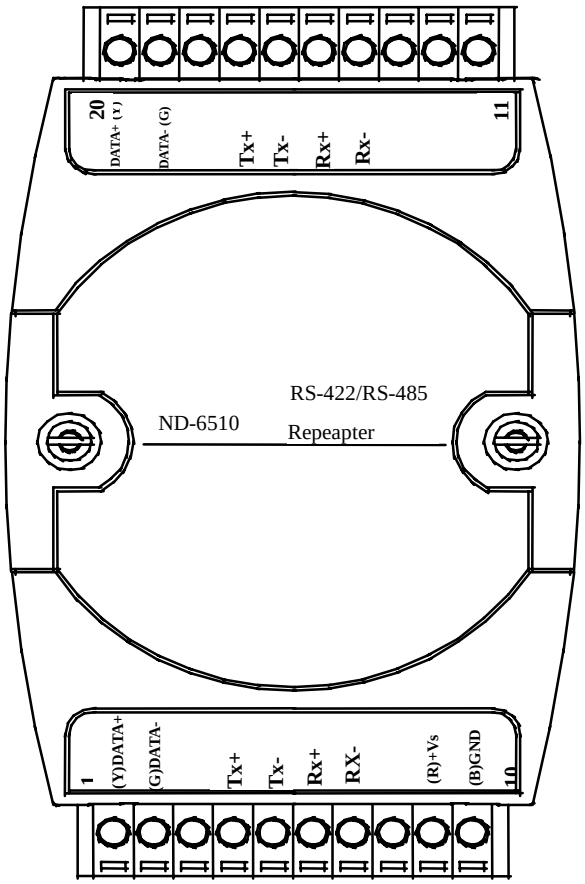


Figure 2-6 ND-6510 profile

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.2.4 Pin Definition of ND-6510

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

Pin #	Signal Name	Description
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

2.2.5 ND-6510 Functional Block Diagram

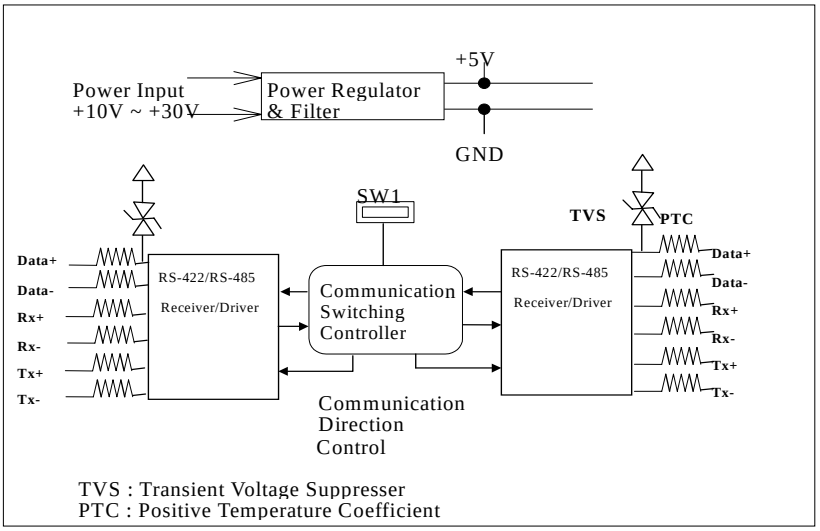


Figure 2-7 Block Diagram of ND-6510

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.2.6 Setup

Objective of Setup

In normal condition, you only need to configure the ND-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, 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 identical 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 valid 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.

Default Setting

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

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.2.7 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 ND-6510. Note that the power supply should meet the specification.
3. Wire other NuDAMs to the extend RS-485 bus

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Application Wiring

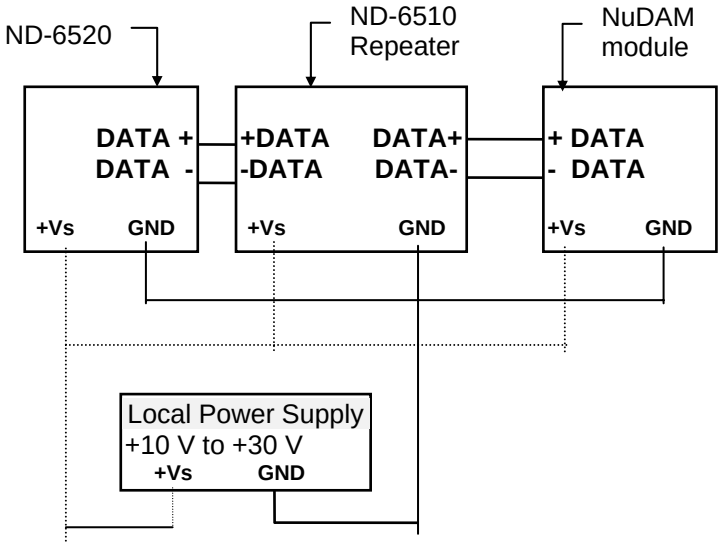


Figure 3-1 ND-6510 wiring.

2.2.8 Programming

The ND-6510 is a communication module, it is not necessary to do any programming

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.3 Overview of ND-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.

2.3.1 Features of ND-6530

- USB Specification 1.1 Compliant
- Plug and Play Installation
- Self power(by USB power)
- RS-232 support RTS, CTS handshake signal
- 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
- 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/XP/Vista/Linux
- Low power consumption
- Easy setup and installation

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.3.2 Specifications of ND-6530

- **USB controller:**
  - USB Spec. 1.1 compliant
- **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, 57600, 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**
- **Storage Temperature Range: -25 to 80 °C**
- **Operating Temperature Range: -10 to 70 °C**
- **Power Requirement: USB bus power**
- **Power Consumption: 0.795W**
- **Case: ABS with captive mounting hardware**
- **CE Class A Conformity**

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.3.3 A Look at NuDAM-6530 & Pin Assignment

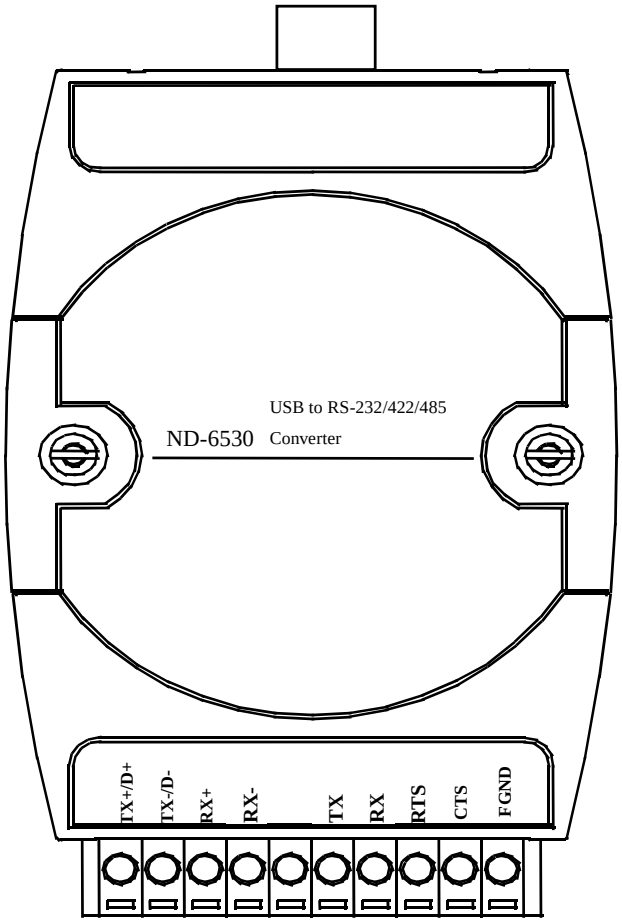


Figure 2-8 ND-6530 profile

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.3.4 Pin Definition of ND-6530

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 Connecter Definition of ND-6530

Pin #	Signal Name	Description
1	+5V	USB +5V bus power
2	Data-	USB data line, negative
3	Data+	USB data line, positive
4	Ground	USB bus power ground

2.3.5 ND-6530 Functional Block Diagram

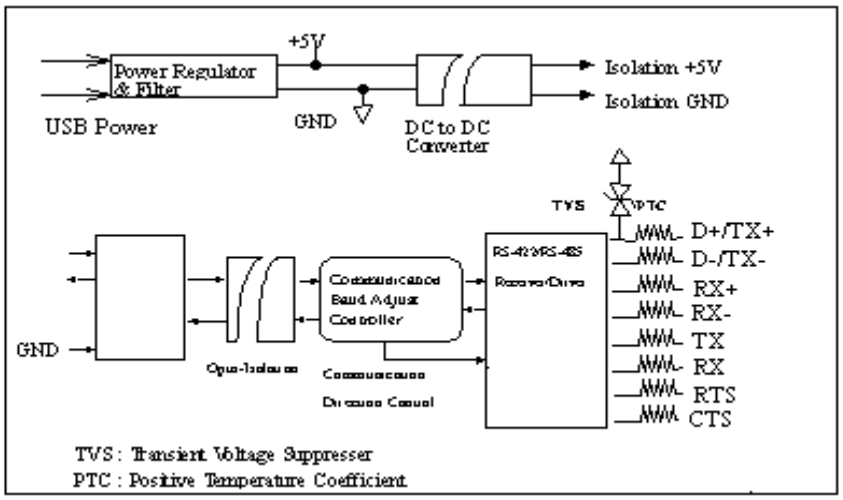
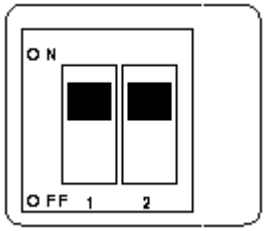


Figure 2-9 Block Diagram of ND-6530

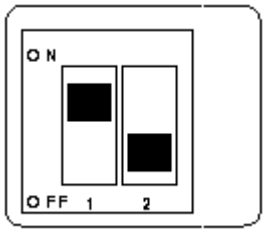
Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

◆ **DIP Switch Setting (Convertion protocol)**

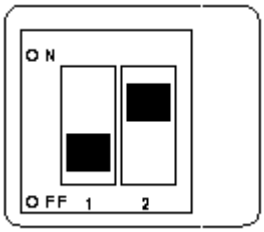
RS-485 Mode(Default)



RS-422 Mode



RS-232 Mode



LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.3.6 Setup

Objective of Setup

In normal condition, it is not necessary to setup the ND-6520. The default configuration of this communication module is in RS-485 mode and support baudrate from 1200 to 115200, with data bit including 5, 6, 7 or 8 bits, and its stop bit support 1, 1.5 or 2 bits, parity types are None, Odd, Even. 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 not necessary 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 protocol types in RS-422, RS-485 or RS-232 interface. The speed and the data format on the whole network must be identical otherwise the communication may be not correct.

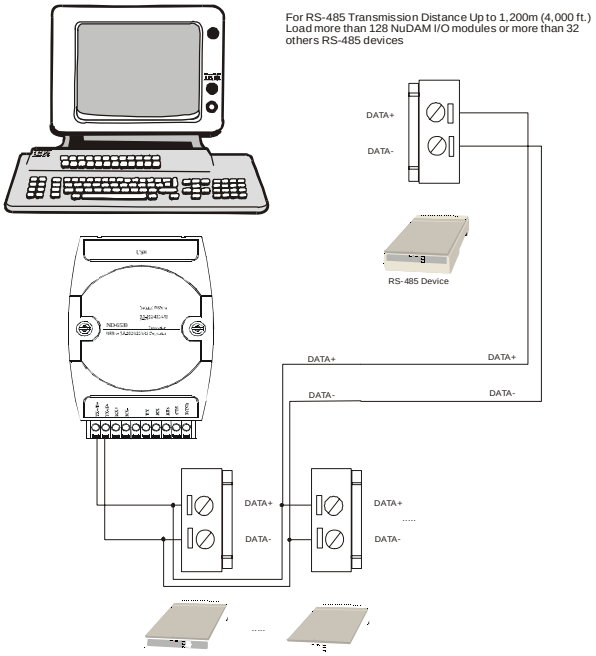
To setup the ND-6530, use the screw driver to adjust the dip switch beside the USB connector to select the protocal type. The new setting is valid even the power is on. The case will not be open.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.3.7 ***Installation***

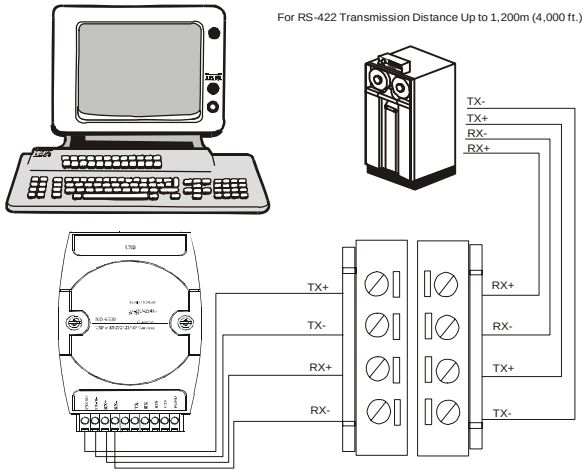
Application Wiring

RS-485

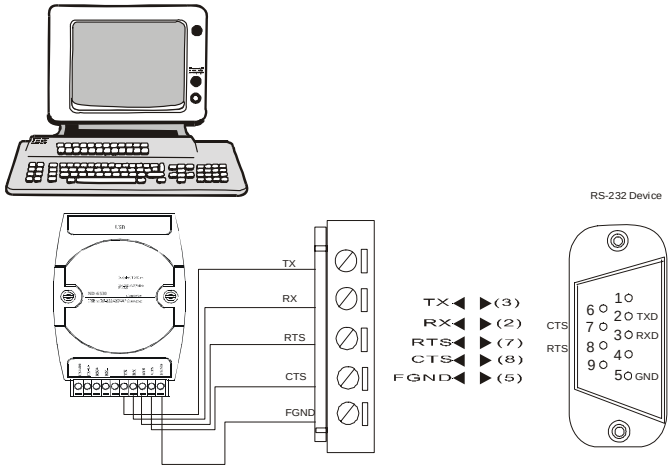


Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

RS-422



RS-232



Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.3.8 Programming

The ND-6530 is a communication module, it is not necessary to do any programming

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.4 Overview of ND-6531

ND-6531 is a 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.

2.4.1 Features of ND-6531

- 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
- Easy setup and installation

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.4.2 Specifications of ND-6531

- **Transmission Speed (bps): 1,200 ~ 115,200 (RS-422/485 and RS-232 can be 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: 1.008W
- **Case: ABS with captive mounting hardware**
- **CE Class A Conformity**

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.4.3 A Look at NuDAM-6531 & Pin Assignment

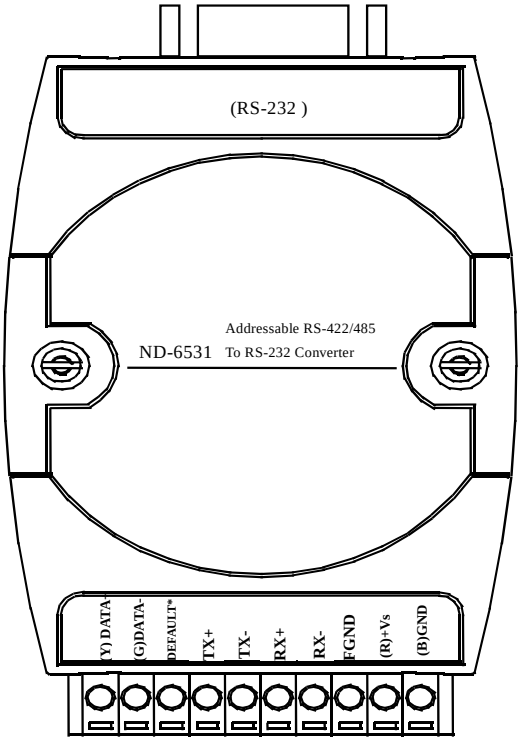


Figure 2-10 NuDAM-6531 profile

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.4.4 Pin Definition of ND-6531

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

D type 9 Pin Connecter Definition of ND-6531

Pin #	Signal Name	Description
2	TXD	RS-232 transmission line
3	RXD	RS-232 receiving line
5	GND	RS-232 Signal Common Ground
7	CTS	RS-232 Clear to Send
8	RTS	RS-232 Ready to Send

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

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

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.4.5 ND-6531 Functional Block Diagram

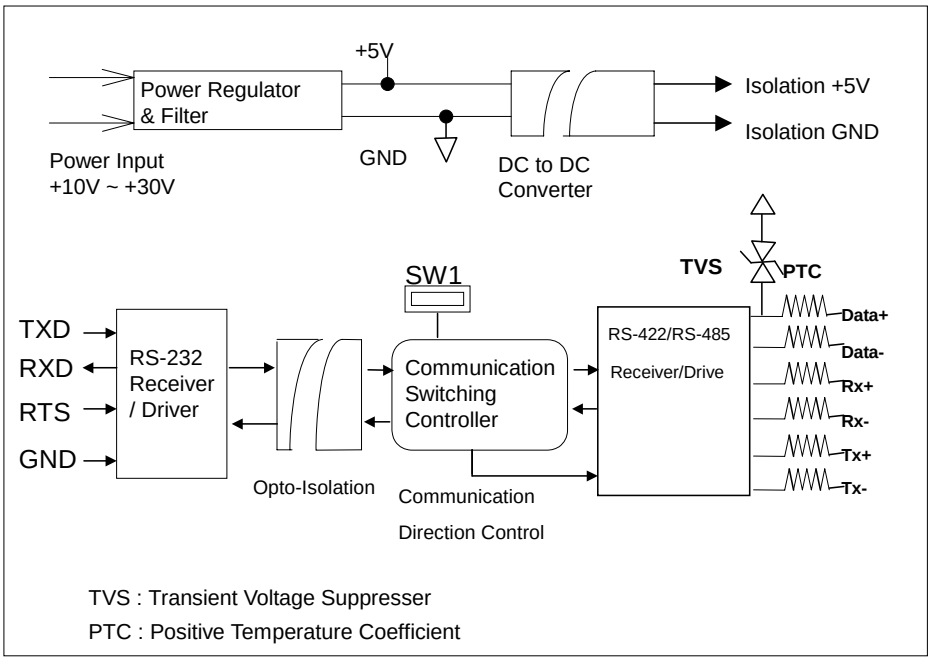


Figure 2-11 Block Diagram of ND-6531

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.4.6 ***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 ND-6531

All NuDAM modules. except ND-6520, ND-6510, and ND-6530, in a RS-485 network must have an *unique* address ID, however, every brand-new ND-6531 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 conflict with other modules if the ID of new module is identical to any of the existing one. The baud rate may also be changed according to user‘s requirement.

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 a 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
- ♦ 8 Data bits,1 Start bit,1 Stop bit and none parity check.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

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

Initialization Equipments

- ♦ Host computer with a RS-232 port.
- ♦ An installed RS-485 module (ND-6520 or ND-6530) with 9600 baud rate.
- ♦ The brand new ND-6531
- ♦ Power supply (+10 to +30 V_{DC}) for NuDAM modules
- ♦ Administration utility software

Note : *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 ND-6520 or ND-6530. Be sure that the baud rate of the ND-6520 or ND-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 2-12 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.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

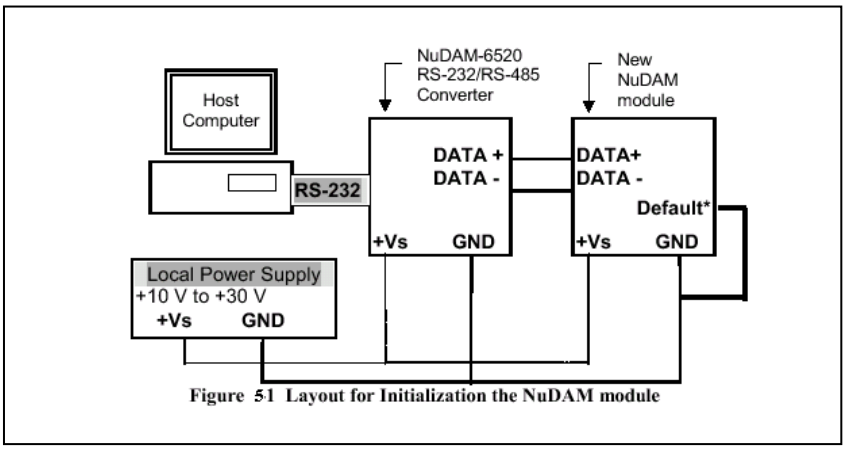


Figure 2-12 Wiring for NuDAM be in default state

2.4.7 Install a New ND-6531 to a Existing Network

Equipments for Install a New Module

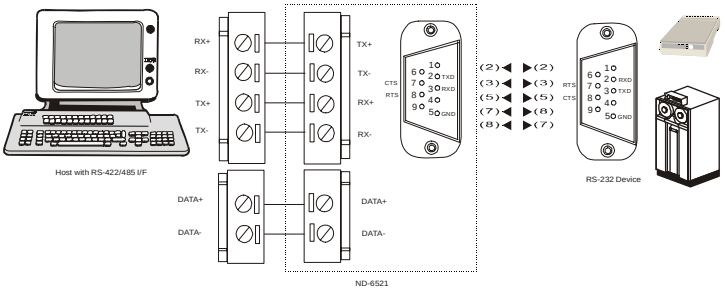
- ♦ A existing NuDAM network
- ♦ New NuDAM modules.
- ♦ Power supply (+10 to +30 V_{DC}).

Installation Procedure

1. Configure the new NuDAM module according to the initialization procedure in section 2.1.6.
2. The baud rate and check-sum status of the new module must be identical with the existing RS-485 network. The address ID must not 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 when 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.
8. Power on the host computer.
9. Power on the NuDAM local power supply.
10. Use the NuDAM administration utility to check entire network.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Application Wiring



Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

3

Analog Input Modules

3.1 Overview of ND-6013

ND-6013 is a RTD input module with 3 input channels. It supports 2, 3 or 4 wires RTD input devices.

3.1.1 Features of ND-6013

- 3 RTD input channels
- 2, 3 or 4 wire RTD input support
- Programmable RTD input range
- Internal watchdog timer for device failure protection
- Easy programming by software
- Easy installation and wiring

3.1.2 Specifications of ND-6013

- **Interface**
  - Interface: RS-485, 2 wires
  - Speed (bps): 1200, 2400, 4800, 9600, 19.2K, 38.4K ,57.6K ,115.2K

- **RTD Input**
  - Input type: Pt or Ni input, 2, 3 or 4 wires
  - Channels Numbers: 3
  - Resolution: 16 bits
  - Sampling Rate:10 sample/sec

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

- Unit Conversion: °C or Ohm
- Temperature Range: Programmable 5 levels, ±100°C, 0~100°C, 0~200°C, 0~600°C, 0~60 Ohms
- Accuracy: ±0.1%

Power

- Power supply: +10V to +30V
- Current consumption: 0.696 W

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

3.1.3 A Look at ND-6013 & Pin Assignment

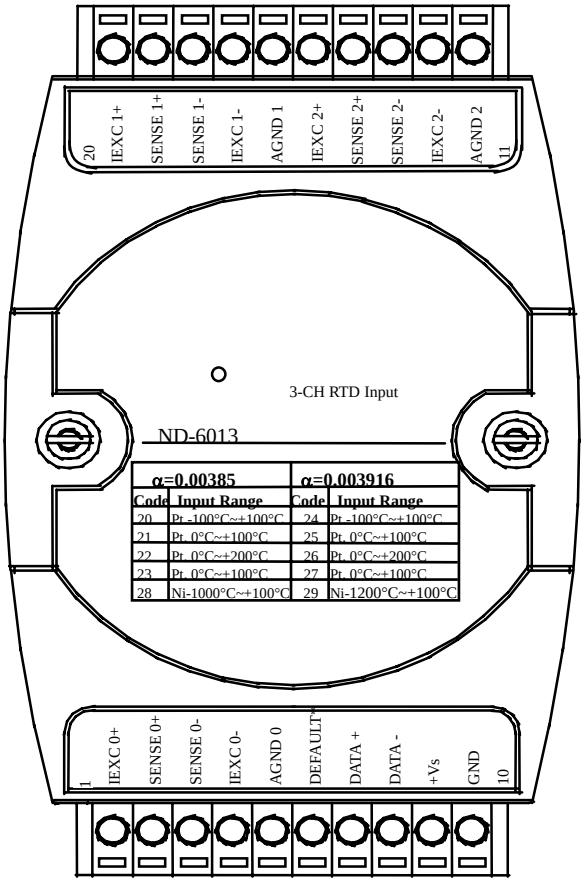


Figure 3-1 ND-6013 profile

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

3.1.4 Pin Definition of ND-6013

Pin #	Signal Name	Description
1	+IEXC0	Current source of CH0
2	+SENSE0	Differential positive input of CH0
3	-SENSE0	Differential negative input of CH0
4	-IEXC0	Current source of CH0
5	AGND0	Analog signal ground of CH0
6	DEFAULT*	Initial state setting
7	(Y) DATA+	RS-485 series signal, positive
8	(G) DATA-	RS-485 series signal, negative
9	(R) +Vs	Power supply, +10V~+30V
10	(B) GND	Ground
11	AGND2	Analog signal ground of CH2
12	-IEXC2	Current source of CH2
13	-SENSE2	Differential negative input of CH2
14	+SENSE2	Differential positive input of CH2
15	+IEXC2	Current source of CH2
16	AGND1	Analog signal ground of CH1
17	-IEXC1	Current source of CH1
18	-SENSE1	Differential negative input of CH1
19	+SENSE1	Differential positive input of CH1
20	+IEXC1	Current source of CH1

3.1.5 ND-6013 Functional Block Diagram

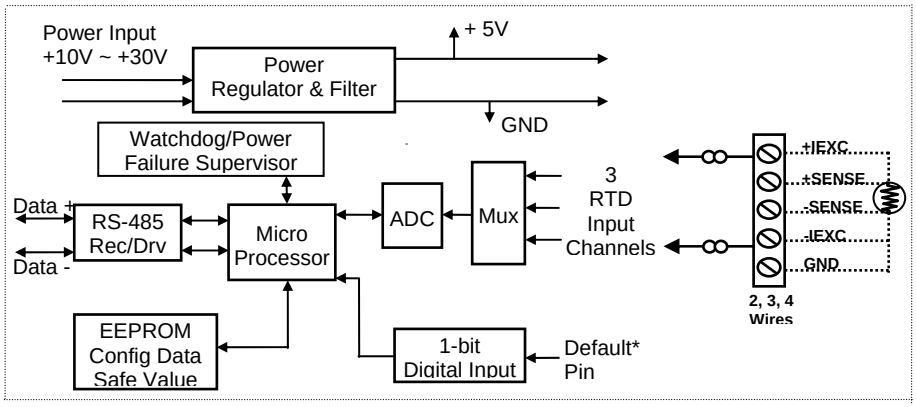


Figure 3-2 Block Diagram of NuDAM-6013

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

3.2 Overview of ND-6017

ND-6017 is an analog input module with 8 input channels. Six of the eight channels are differential type and the other two are single ended type.

3.2.1 Features of ND-6017

- 8 analog input channels
- 6 differential inputs and 2 single ended inputs
- Programmable input voltage range
- Programmable host watchdog timer for host failure protection
- 5000 Vrms isolation voltage
- Internal watchdog timer for device failure protection
- Easy programming by software
- Easy installation and wiring

3.2.2 Specifications of ND-6017

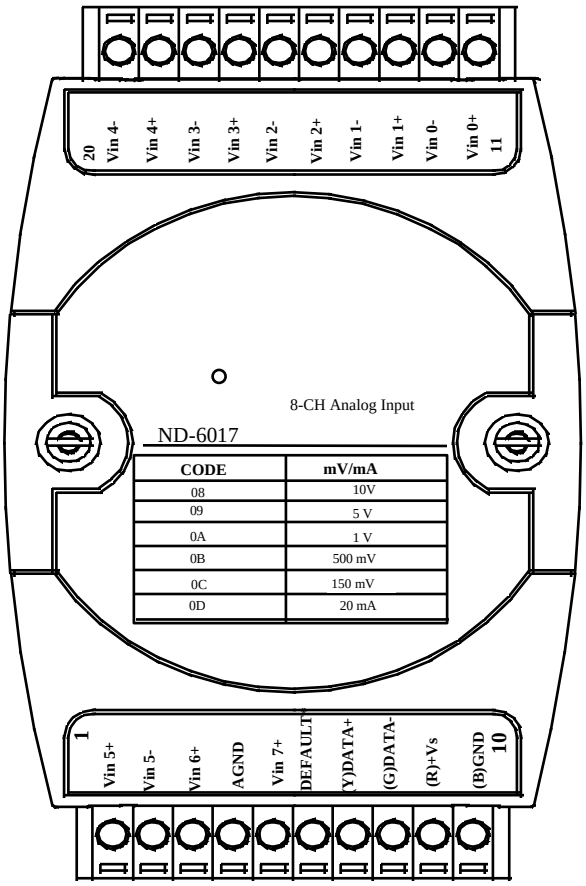
- **Interface**
  - Interface: RS-485, 2 wires
  - Speed (bps): 1200, 2400, 4800, 9600, 19.2K, 38.4K , 57.6K, 115.2K
- **Analog Input ***
  - Input type: Differential input
  - Channels Numbers: 8
  - Resolution: 16 bits
  - Sampling Rate:10 sample/sec
  - Unit Conversion: mV, V, or mA
  - Voltage Range: Programmable 5 levels , ±10V, ±5V, ±1V, ±500mV, ±150mV
  - Current Measurement: 0~20mA (with external 125Ω resistor)
  - Accuracy: ±0.1%
- **Power**
  - Power supply: +10V to +30V
  - Current consumption: 1.2 W

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Note *: *The maximum input voltage shall not exceed to ±30V with reference to AGND. Otherwise, they may cause an unrecoverable damage to the hardware component.*

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

3.2.3 A Look at ND-6017 & Pin Assignment



CODE	mV/mA
08	10V
09	5 V
0A	1 V
0B	500 mV
0C	150 mV
0D	20 mA

Figure 3-3 ND-6017 profile

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

3.2.4 Pin Definition of ND-6017

Pin #	Signal Name	Description
1	Vin5+	Differential positive input channel 5
2	Vin5-	Differential negative input channel 5
3	Vin6+	Single-ended voltage input channel 6
4	AGND	Analog signal ground of CH6 & 7
5	Vin7+	Single-ended voltage input channel 7
6	DEFAULT*	Initial state setting
7	(Y) DATA+	RS-485 series signal, positive
8	(G) DATA-	RS-485 series signal, negative
9	(R) +Vs	Power supply, +10V~+30V
10	(B) GND	Ground
11	Vin0+	Differential positive input channel 0
12	Vin0-	Differential negative input channel 0
13	Vin1+	Differential positive input channel 1
14	Vin1-	Differential negative input channel 1
15	Vin2+	Differential positive input channel 2
16	Vin2-	Differential negative input channel 2
17	Vin3+	Differential positive input channel 3
18	Vin3-	Differential negative input channel 3
19	Vin4+	Differential positive input channel 4
20	Vin4-	Differential negative input channel 4

3.2.5 ND-6017 Functional Block Diagram

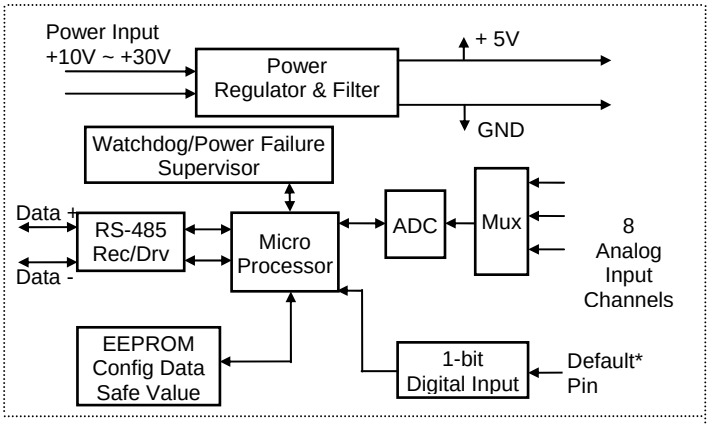


Figure 3-4 Block Diagram of ND-6017

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

3.3 Overview of ND-6018

ND-6018 is a thermocouple input module with 8 input channels. Six of the eight channels are differential type and the other two are single ended type.

3.3.1 Features of ND-6018

- 8 analog input channels
- 6 differential inputs and 2 single ended inputs
- Programmable input voltage range
- Programmable host watchdog timer for host failure protection
- On board CJC for temperature measurement
- 2500 Vrms isolation voltage
- Internal watchdog timer for device failure protection
- Easy programming by software
- Easy installation and wiring
- Wiring open detection

3.3.2 Specifications of ND-6018

- **Interface**
  - Interface: RS-485, 2 wires
  - Speed (bps): 1200, 2400, 4800, 9600, 19.2K, 38.4K , 57.6K, 115.2K
- **Analog Input ***
  - Input type: Differential input
  - Channels Numbers: 8
  - Resolution: 16 bits
  - Sampling Rate:3 sample/sec
  - Unit Conversion: Thermocouple, mV, V or mA
  - Thermocouple Type: J, K, T, E, R, S, B, N, C
  - J: 0°C~760°C K: 0°C~1370°C
  - T: -100°C~400°C E: 0°C~1000°C
  - R: 500°C~1750°C S: 500°C~1750°C
  - B: 500°C~1800°C N: -270°C~1300°C
  - C: 0°C~2320°C
  - Voltage Range: Programmable 6 levels ±2.5V, ±1V, ±500mV, ±100mV, ±50mV, ±15mV
  - Current Measurement: 0~20mA (with external 125Ω resistor)
- **Power**

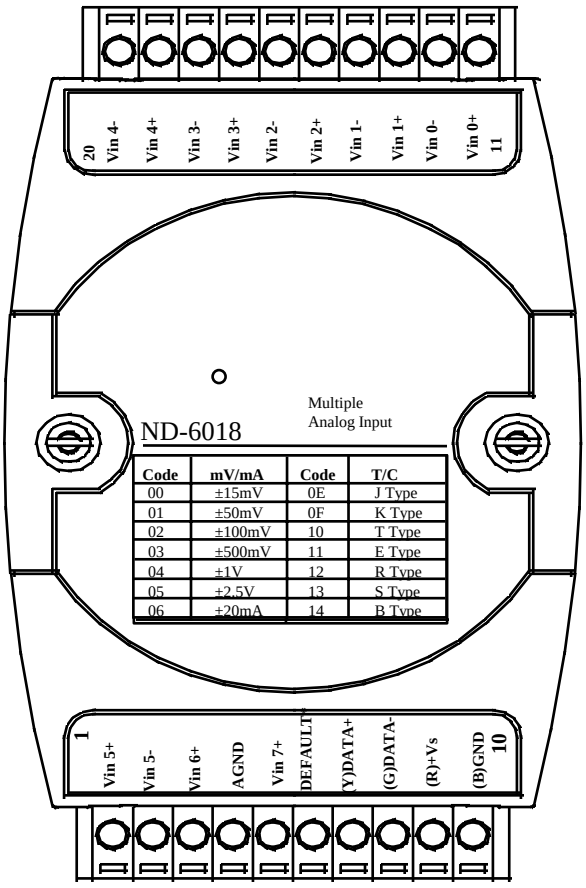
LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

- Power supply: +10V to +30V
- Current consumption: 0.96 W

Note *: **The maximum input voltage shall not exceed to ±30V with reference to AGND otherwise, they may cause an unrecoverable damage to the hardware component**.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

3.3.3 ***A Look at ND-6018 & Pin Assignment***



Code	mV/mA	Code	T/C
00	±15mV	0E	J Type
01	±50mV	0F	K Type
02	±100mV	10	T Type
03	±500mV	11	E Type
04	±1V	12	R Type
05	±2.5V	13	S Type
06	±20mA	14	B Type

Figure 3-5 ND-6018 profile

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

3.3.4 Pin Definition of ND-6018

Pin #	Signal Name	Description
1	Vin5+	Differential positive input channel 5
2	Vin5-	Differential negative input channel 5
3	Vin6+	Single-ended voltage input channel 6
4	AGND	Analog signal ground of CH6 & 7
5	Vin7+	Single-ended voltage input channel 7
6	DEFAULT*	Initial state setting
7	(Y) DATA+	RS-485 series signal, positive
8	(G) DATA-	RS-485 series signal, negative
9	(R) +Vs	Power supply, +10V~+30V
10	(B) GND	Ground
11	Vin0+	Differential positive input channel 0
12	Vin0-	Differential negative input channel 0
13	Vin1+	Differential positive input channel 1
14	Vin1-	Differential negative input channel 1
15	Vin2+	Differential positive input channel 2
16	Vin2-	Differential negative input channel 2
17	Vin3+	Differential positive input channel 3
18	Vin3-	Differential negative input channel 3
19	Vin4+	Differential positive input channel 4
20	Vin4-	Differential negative input channel 4

3.3.5 ND-6018 Functional Block Diagram

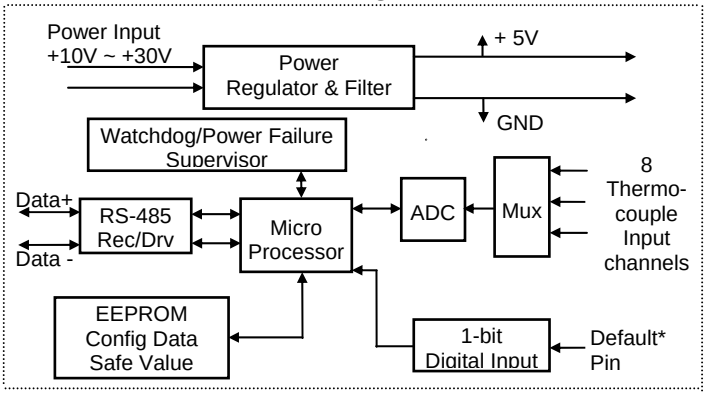


Figure 3-6 Block Diagram of ND-6018

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

4

Analog Output Modules

4.1 Overview of ND-6021

ND-6021 is an analog signal output module. It receives the digital command from host computer through RS-485 network. The format of the digital value can be engineering units, hexdecimal format or percentage of full-scale range(FSR). A microprocessor is used to convert the digital command to digital value to send to DAC. The DAC converts the digital value into analog form. The analog output can be either voltage or current output.

The ND-6021 is designed for safety. It provides many safety functions such as isolation, watchdog, and power on safe value. The opto-isolators provide 5000Vrms isolation voltage to isolate the digital section and the remote controlled analog equipments. The damage of power surges is avoided.

Another safety fucntion is the watchdog. Whenever the host is loss contact with the remoted NuDAM module, or the micro-processor is down, the module will reset itself and send the safety value to the analog output therefore the industry safety is guarantee. The safety value / power-up value can be set by configuration software.

The analog output can be readback through the module‘s ADC. which can monitor the ’real‘ output of the device. The host can check the digital command and the real output to avoid short circuits. The slew rate of the output signal is also controllable by software.

4.1.1 Features of ND-6021

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

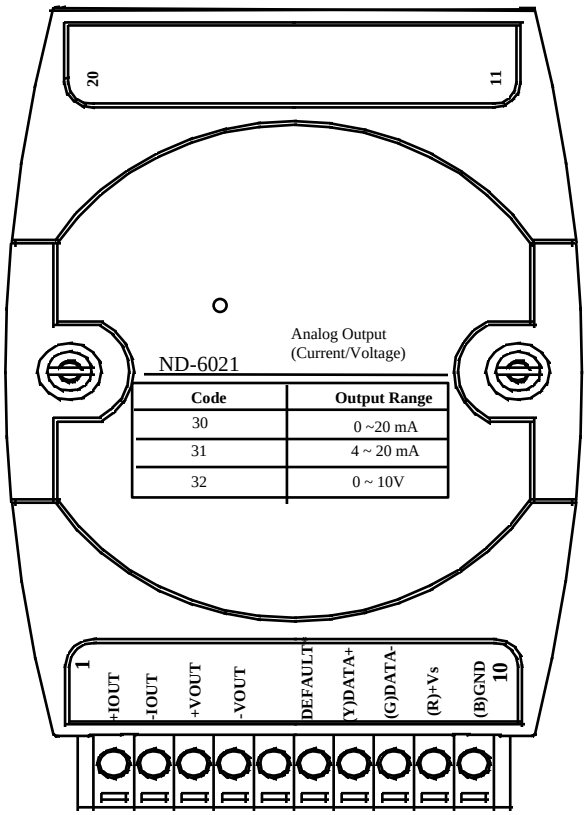
- One uni-polar analog output channel
- Two sets of differential current and voltage output terminals
- Versatile digital signal format
- Programmable host watchdog timer for host failure protection
- Internal watchdog timer for device failure protection
- Easy programming by software
- Easy installation and wiring

4.1.2 Specifications of ND-6021

- **Interface**
  - Interface : RS-485, 2 wires
  - Speed (bps) : 1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K, 115.2K
- **Analog Output**
  - Singal Output type: Differential type
  - Resolution: 12 bits
  - Accuracy: ±0.1% of FSR for current output
  - Accuracy: ±0.2% of FSR for voltage output
  - Unit Convertion: V or mA
  - Voltage output range: 0 to 10 V (uni-polar)
  - Current output range: 0 to 20 mA, 4 to 20 mA
  - Maximum Sampling Rate: 100 samples /sec
  - Slew rate of Voltage output: 0.0625 to 64 V/sec
  - Slew reate of Current output: 0.125 to 128 mA/sec
  - Internal Current Load Resistor: 500Ω (%1)
- **Isolation**
  - Isolation voltage: 5000 Vrms
- **Watchdog Function**
  - Module internal watchdog timer : 150 ms
  - Power failure threshold : 4.65 V
  - Host programmable watchdog : 100 ms ~ 25.500 sec
- **Power**
  - Power supply : +10V to +30V
  - Power consumption : 1.32W

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

4.1.3 A Look at ND-6021 & Pin Assignment



Code	Output Range
30	0 ~20 mA
31	4 ~ 20 mA
32	0 ~ 10V

Figure 4-1 ND-6021 profile

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

4.1.4 Pin Definition of ND-6021

Pin #	Signal Name	Description
1	+IOUT	Positive Current Output Terminal
2	-IOUT	Negative Current OutputTerminal
3	+VOUT	Positive Voltage Output Terminal
4	-VOUT	Negative Voltage Output Terminal
6	Default*	Initial state setting
7	(Y) DATA+	RS-485 series signal, positive
8	(G) DATA-	RS-485 series signal, negative
9	(R) +Vs	Power supply, +10V~+30V
10	(B) GND	Ground

4.1.5 ND-6021 Functional Block Diagram

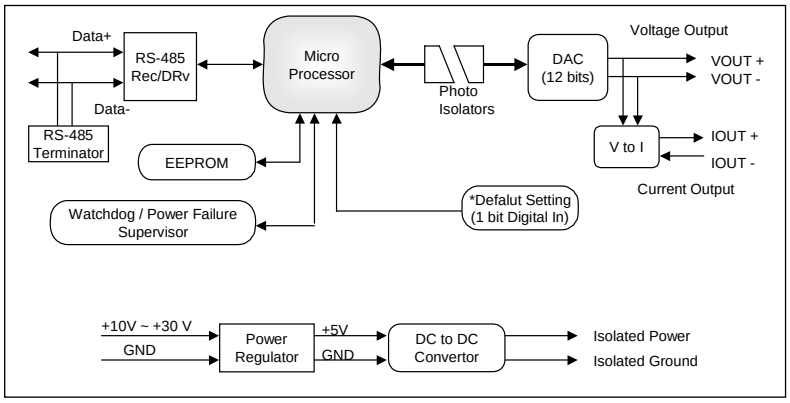


Figure 4-2 Block Diagram of ND-6021

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

4.2 Overview of ND-6024

ND-6024 is a 4 channel bipolar analog signal output module. It receives the digital command from host computer through RS-485 network. A microprocessor is used to convert the digital command to digital value to send to DAC. The DAC converts the digital value into analog form.

The ND-6024 is designed for safety. It provides many safety functions such as isolation, watchdog, and power on safe value. The opto-isolators provide 5000Vrms isolation voltage to isolate the digital section and the remote controlled analog equipments. The damage of power surges is avoided.

Another safety fucntion is the watchdog. Whenever the host is loss contact with the remoted NuDAM module, or the micro-processor is down, the module will reset itself and send the safety value to the analog output therefore the industry safety is guarantee. The safety value/power-up value can be set by configuration software.

4.2.1 Features of ND-6024

- 4 channel bipolar analog output
- Programmable host watchdog timer for host failure protection
- Internal watchdog timer for device failure protection
- Easy programming by software
- Easy installation and wiring

4.2.2 Specifications of ND-6024

- **Interface**
  - Interface : RS-485, 2 wires
  - Speed (bps) : 1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K, 115.2K
- **Analog Output**
  - Channel number : 4
  - Singal Output type: Differential output

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

- **Voltage Output:** ±10V
  - Resolution: 12 bits resolution
  - Accuracy: +/-0.02% of FSR(max.)
- **Digital Input**
  - Channel numbers : 7
  - Switching Level :TTL
- **Isolation**
  - Isolation voltage: 5000 Vrms
- **Power**
  - Power supply : +10V to +30V
  - Power consumption : 1.848W

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

4.2.3 A Look at ND-6024 & Pin Assignment

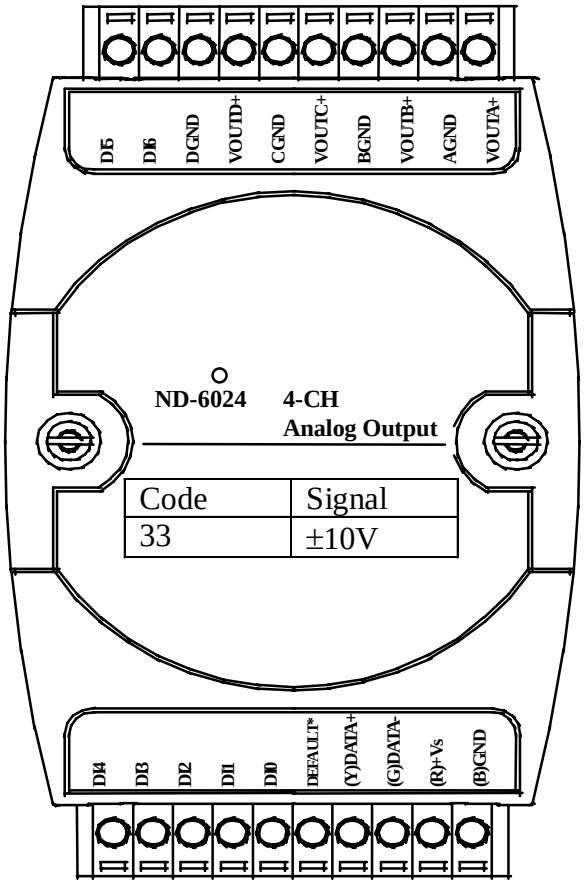


Figure 4-3 ND-6024 profile

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

4.2.4 Pin Definitions of ND-6024

Pin #	Signal	Description
1	DI4	Digital input channel 4
2	DI3	Digital input channel 3
3	DI2	Digital input channel 2
4	DI1	Digital input channel 1
5	DI0	Digital input channel 0
6	Default*	Initial state setting
7	(Y) DATA+	RS-485 series signal, positive
8	(G) DATA-	RS-485 series signal, negative
9	(R) +Vs	Power supply, +10V~+30V
10	(B) GND	Ground
11	VOUTA+	Positive Voltage Output A Terminal
12	AGND	Negative Voltage Output A Terminal
13	VOUTB+	Positive Voltage Output B Terminal
14	BGND	Negative Voltage Output B Terminal
15	VOUTC+	Positive Voltage Output C Terminal
16	CGND	Negative Voltage Output C Terminal
17	VOUTD+	Positive Voltage Output D Terminal
18	DGND	Negative Voltage Output D Terminal
19	DI6	Digital input channel 6
20	DI5	Digital input channel 5

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

4.2.5 ND-6024 Functional Block Diagram

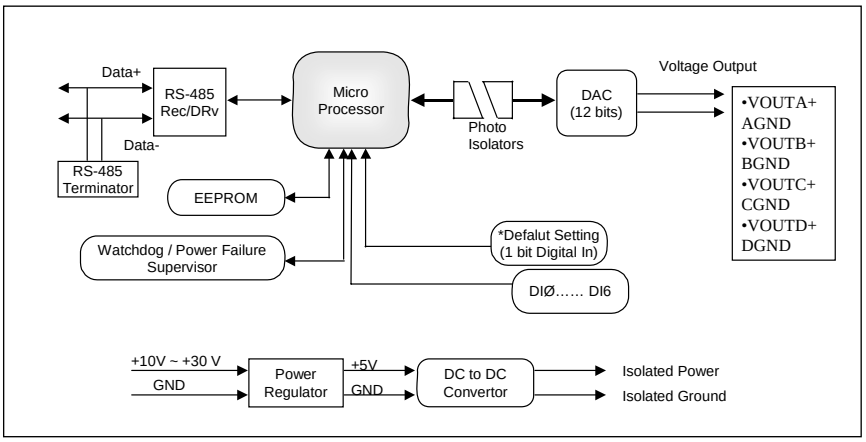


Figure 4-4 Block Diagram of ND-6024

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5

Digital I/O Modules

About the NuDAM DIO Modules

The NuDAM provides a series of digital input or output (DIO) modules to sense the digital signal or to control the remote devices.

The specified features of each module are shown here.

- ***ND-6050*** : Digital I/O module
- ***ND-6052*** : Isolated digital input module
- ***ND-6053*** : 16-channel digital input module
- ***ND-6054*** : 15-channel isolated digital input module
- ***ND-6056*** : 15-channel isolated digital output module
- ***ND-6058*** : 28 programmable digital I/O module
- ***ND-6060*** : relay output and isolated digital input module
- ***ND-6063*** : 8-channel relay output module
- ***ND-6067*** : 8-channel AC relay output module

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.1 Overview of ND-6050

ND-6050 is a digital input and output module. The digital input channels can monitor active TTL signals, and sense passive switch on/off signal because of the internal pull high resistors. The convenient open collector output channels can sink up to 50 mA current. Combining with the relay devices, it is possible to control the high power devices by programming output channel of the ND-6050.

5.1.1 Features of ND-6050

- 7 channels digital input
- 8 channels open collector digital output
- Programmable host watchdog timer for host failure protection
- Internal watchdog timer for device failure protection
- Easy programming by software
- Easy installation and wiring

5.1.2 Specifications of ND-6050

- **Interface**
  - Interface : RS-485, 2 wires
  - Speed (bps) : 1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K, 115.2K
- **Digital Input**
  - Channel numbers : 7
  - Switching Level :TTL
  - Pull up resister : 10KΩ
  - Maximum current : 0.5mA

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

- **Digital Output**
  - Channel number : 8
  - Output characteristic : open collector transistor
  - Maximum current sink : 50mA
  - Max. power dissipation : 300mW
- **Watchdog Function**
  - Module internal watchdog timer: 150 ms
  - Power failure threshold : 4.65 V
  - Safety value : 8 output channels
  - Host programmable watchdog :
  - 100 ms ~ 25.500 sec
- **Power**
  - Power supply : +10V to +30V
  - Current consumption : 0.336W

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.1.3 A Look at ND-6050 & Pin Assignment

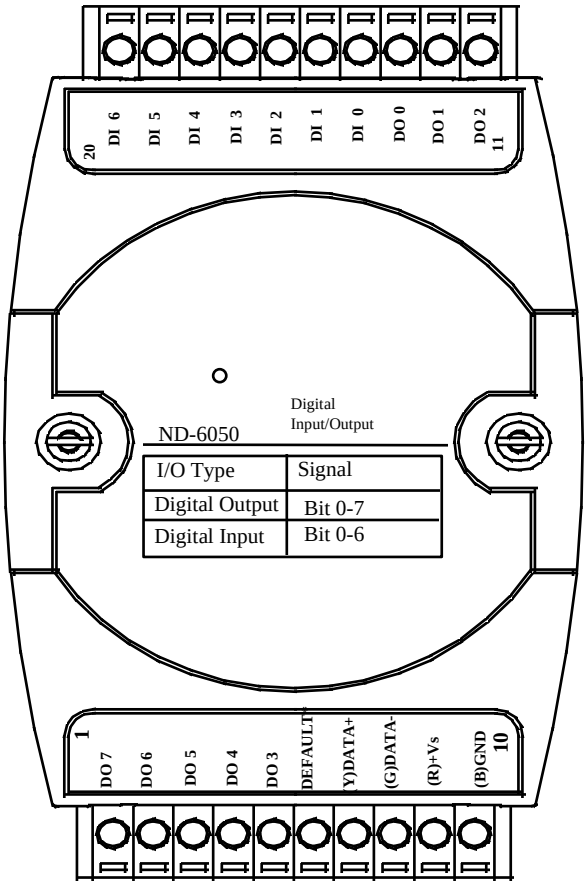


Figure 5-1 ND-6050 profile

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.1.4 Pin Definitions of ND-6050

Pin #	Signal Name	Description
1	DO 7	Digital output channel 7
2	DO 6	Digital output channel 6
3	DO 5	Digital output channel 5
4	DO 4	Digital output channel 4
5	DO 3	Digital output channel 3
6	Default*	Initial state setting
7	(Y) DATA+	RS-485 series signal, positive
8	(G) DATA-	RS-485 series signal, negative
9	(R) +Vs	Power supply, +10V~+30V
10	(B) GND	Ground
11	DO 2	Digital output channel 2
12	DO 1	Digital output channel 1
13	DO 0	Digital output channel 0
14	DI 0	Digital input channel 0
15	DI 1	Digital input channel 1
16	DI 2	Digital input channel 2
17	DI 3	Digital input channel 3
18	DI 4	Digital input channel 4
19	DI 5	Digital input channel 5
20	DI 6	Digital input channel 6

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.1.5 ND-6050 Functional Block Diagram

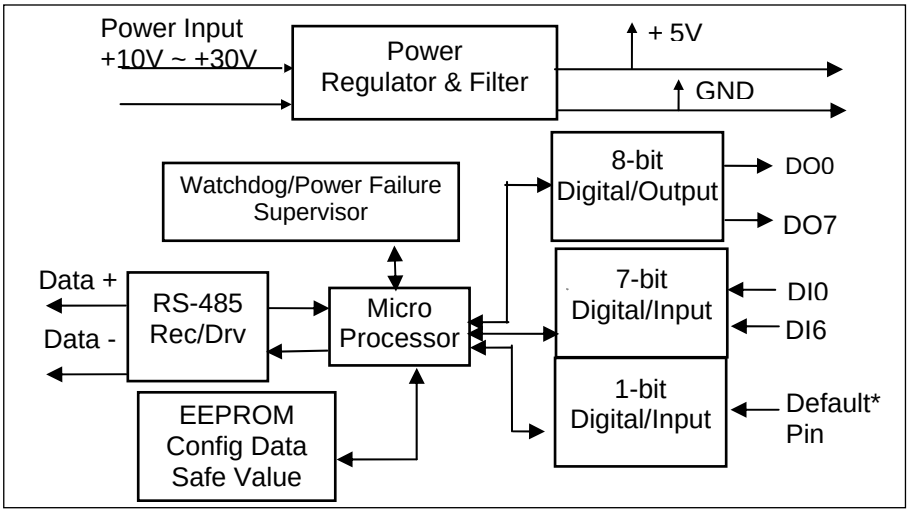


Figure 5-2 Block Diagram of ND-6050

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.2 Overview of ND-6052

ND-6052 provides 8 isolated digital input channels. Six of the input channels are differential type and two of them are single-ended with common ground. The isolation voltage is up to 5000 Vrms. It is suitable to use ND-6052 in industrial environment with high voltage electric shock.

5.2.1 Features of ND-6052

- 8 bits isolated input
- 5000 Vrms isolation voltage
- Programmable host watchdog timer for host failure protection
- Internal watchdog timer for device failure protection
- Easy programming by software
- Easy installation and wiring

5.2.2 Specifications of ND-6052

- **Interface**
  - Interface : RS-485, 2 wires
  - Speed (bps) : 1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K, 115.2K
- **Input**
  - Channel number : 6 differential channels, 2 single ended
  - Logical level 0 : +1V Max.
  - Logical level 1: +3.5V ~ +24V
- **Watchdog Function**
  - Module internal watchdog timer : 150ms
  - Power failure threshold : 4.65 V
  - Safe value : 8 output channels
  - Host programmable watchdog :100 ms ~ 25.5 sec
- **Power**
  - Power supply : +10V to +30V
  - Current consumption : 0.264 W

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.2.3 A Look at ND-6052 & Pin Assignment

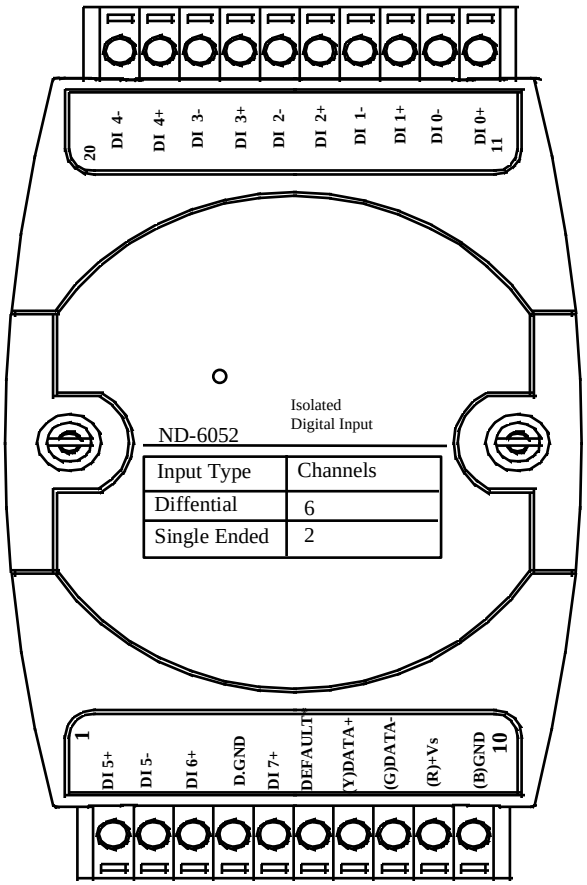


Figure 5-3 ND-6052 profile

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.2.4 Pin Definitions of ND-6052

Pin #	Signal Name	Description
1	DI5+	Digital Input Channel 5+
2	DI5 -	Digital Input Channel 5 -
3	DI6+	Digital Input Channel 6+
4	D.GND	Digital Input Ground
5	DI7+	Digital Input Channel 7+
6	Default*	Initial state setting
7	(Y) DATA+	RS-485 series signal, positive
8	(G) DATA-	RS-485 series signal, negative
9	(R) +VS	Power supply, +10V~+30V
10	(B) GND	Ground
11	DI0+	Digital Input Channel 0+
12	DI0 -	Digital Input Channel 0 -
13	DI1+	Digital Input Channel 1+
14	DI1 -	Digital Input Channel 1 -
15	DI2+	Digital Input Channel 2+
16	DI2 -	Digital Input Channel 2 -
17	DI3+	Digital Input Channel 3+
18	DI3 -	Digital Input Channel 3 -
19	DI4+	Digital Input Channel 4+
20	DI4 -	Digital Input Channel 4 -

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.2.5 ND-6052 Functional Block Diagram

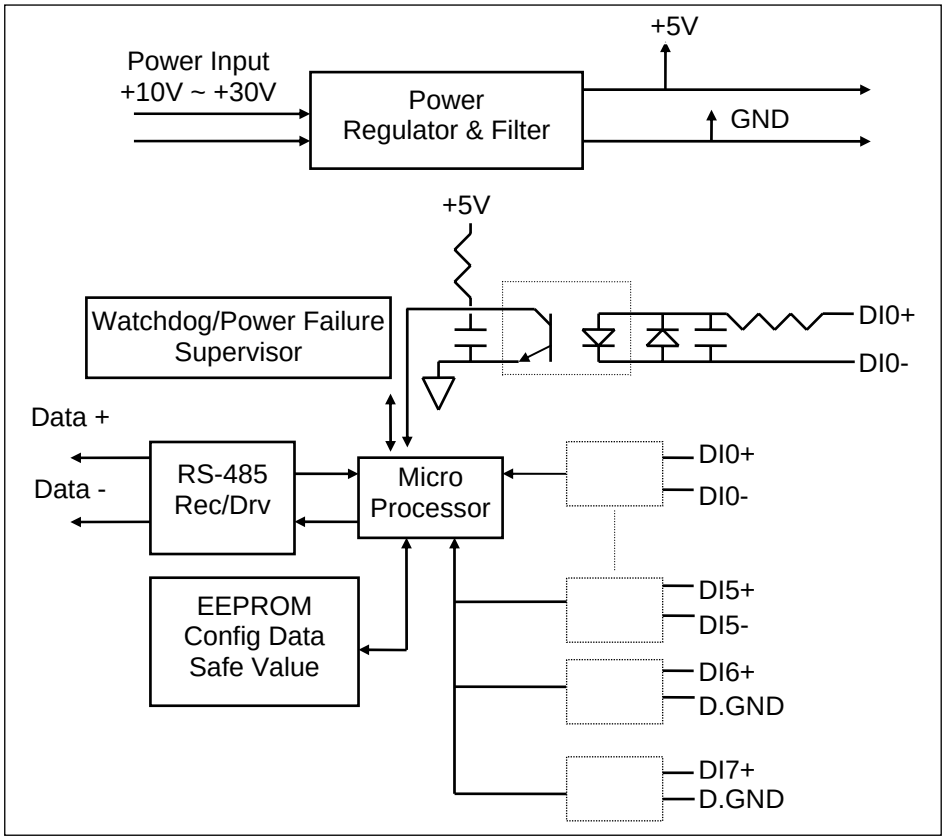


Figure 5-4 Block Diagram of ND-6052

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.3 Overview of ND-6053

ND-6053 provides 16 digital input channels for dry contact or wet contact signals. The effective distance from DI to contact point is up to 500 meter for dry contact input.

5.3.1 Features of ND-6053

- 16 bits digital input
- Programmable host watchdog timer for host failure protection
- Internal watchdog timer for device failure protection
- Easy programming by software
- Easy installation and wiring

5.3.2 Specifications of ND-6053

- **Interface**
  - Interface : RS-485, 2 wires
  - Speed (bps) : 1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K, 115.2K
- **Input**
  - Channel numbers : 16
  - Dry Contact:
  - Logical level 0 : close to GND
  - Logical level 1 : open
  - Wet Contact :
  - Switching Level :TTL
  - Maximum current sink : 50mA
- **Watchdog Function**
  - Module internal watchdog timer : 150ms
  - Power failure threshold : 4.65 V
  - Host programmable watchdog : 100 ms ~ 25.5 sec
- **Power**
  - Power supply : +10V to +30V
  - Current consumption : 0.408 W

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.3.3 A Look at ND-6053 & Pin Assignment

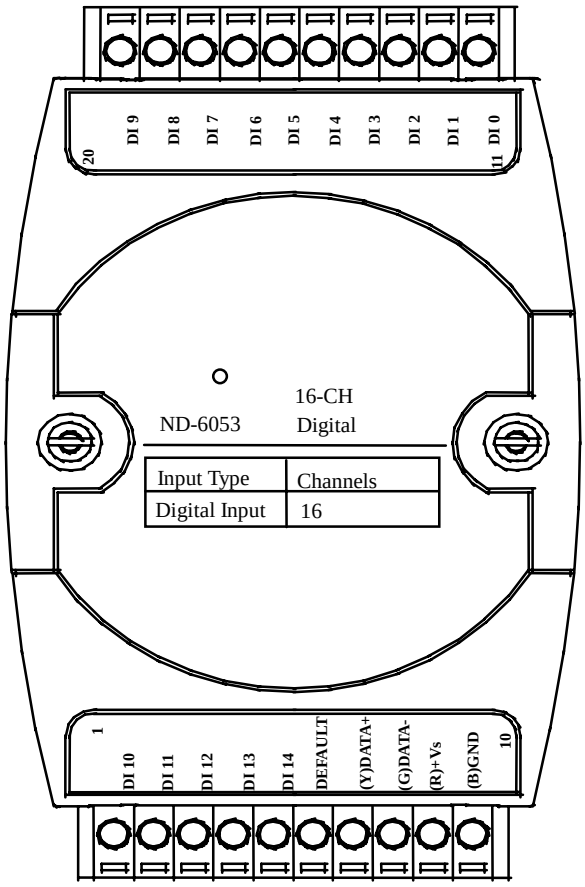


Figure 5-5 ND-6053 profile

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.3.4 Pin Definitions of ND-6053

Pin #	Signal Name	Description
1	DI10	Digital Input Channel 10
2	DI11	Digital Input Channel 11
3	DI12	Digital Input Channel 12
4	DI13	Digital Input Channel 13
5	DI14	Digital Input Channel 14
6	Default*/DI15	Initial state setting/ Digital Input Channel 15
7	(Y) DATA+	RS-485 series signal, positive
8	(G) DATA-	RS-485 series signal, negative
9	(R) +VS	Power supply, +10V~+30V
10	(B) GND	Ground
11	DI0	Digital Input Channel 0
12	DI1	Digital Input Channel 1
13	DI2	Digital Input Channel 2
14	DI3	Digital Input Channel 3
15	DI4	Digital Input Channel 4
16	DI5	Digital Input Channel 5
17	DI6	Digital Input Channel 6
18	DI7	Digital Input Channel 7
19	DI8	Digital Input Channel 8
20	DI9	Digital Input Channel 9

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.3.5 ND-6053 Functional Block Diagram

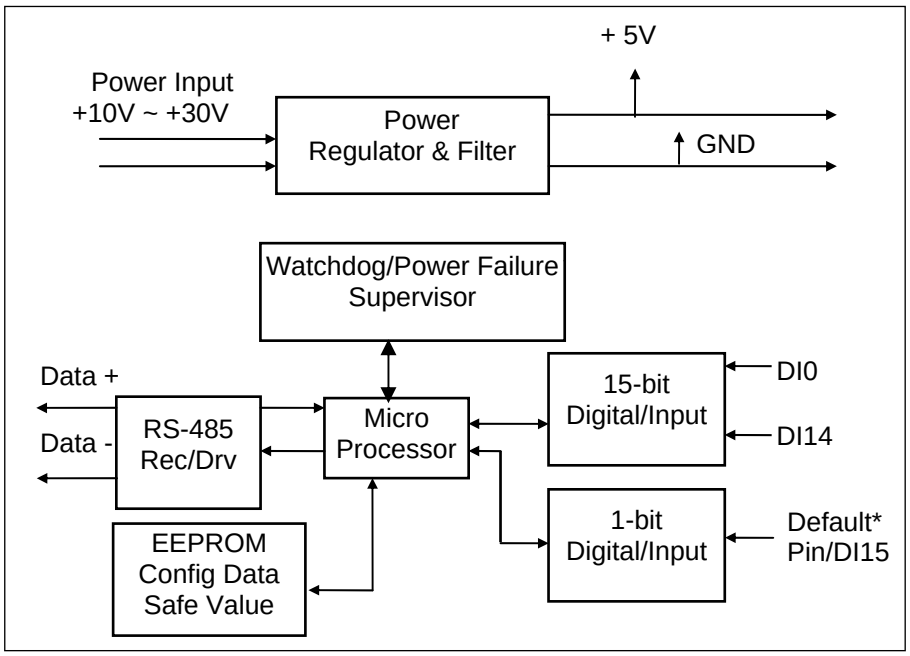


Figure 5-6 Block Diagram of ND-6053

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.4 Overview of ND-6054

ND-6054 provides 15 isolated digital input channels. All of the input channels are common power type and one of them is using the same pin with default (use jumper to choose). The isolation voltage is up to 5000 Vrms. It is suitable to use ND-6054 in industrial environment with high voltage electric shock.

5.4.1 Features of ND-6054

- 15 channels digital inputs with isolation protection and common power
- 5000 Vrms isolation voltage
- Programmable host watchdog timer for host failure protection
- Internal watchdog timer for device failure protection
- Easy programming by software
- Easy installation and wiring

5.4.2 Specifications of ND-6054

- **Interface**
  - Interface : RS-485, 2 wires
  - Speed (bps) : 1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K, 115.2K
- **Input**
  - Channel numbers : 15 isolation common power input channels (the fifteenth channel is the same with default pin, but can use jumper to choose)
  - Logical level 0 : +1V Max.
  - Logical level 1: +3.5V ~ +24V
  - Effective distance: 500 meter
  - Common external voltage: 24V
- **Watchdog Function**

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

- Module internal watchdog timer : 150msec
- Power failure threshold : 4.65 V
- Host programmable watchdog :100 ms ~ 25.5 sec

- **Power**
  - Power supply : +10V to +30V
  - Power consumption : 0.216 W

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.4.3 A Look at ND-6054 & Pin Assignment

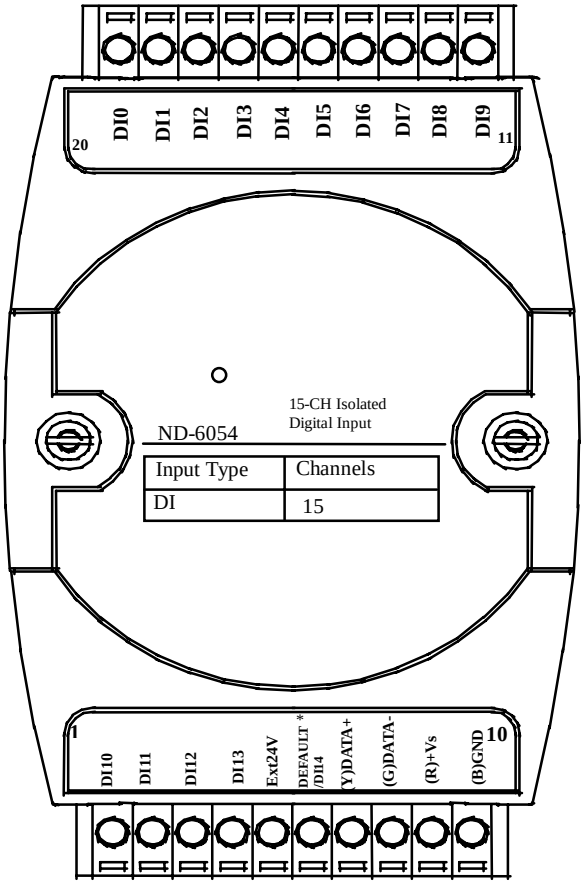


Figure 5-7 ND-6054 profile

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.4.4 Pin Definitions of ND-6054

Pin #	**Signal Name**	**Description**
1	DI10	Digital input channel 10
2	DI11	Digital input channel 11
3	DI12	Digital input channel 12
4	DI13	Digital input channel 13
5	Ext24V	External common +24V
6	Default*/DI14	Initial state setting or digital input channel 14
7	(Y) DATA+	RS-485 series signal, positive
8	(G) DATA-	RS-485 series signal, negative
9	(R) +VS	Power supply, +10V~+30V
10	(B) GND	Ground
11	DI9	Digital input channel 9
12	DI8	Digital input channel 8
13	DI7	Digital input channel 7
14	DI6	Digital input channel 6
15	DI5	Digital input channel 5
16	DI4	Digital input channel 4
17	DI3	Digital input channel 3
18	DI2	Digital input channel 2
19	DI1	Digital input channel 1
20	DI0	Digital input channel 0

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.4.5 ND-6054 Functional Block Diagram

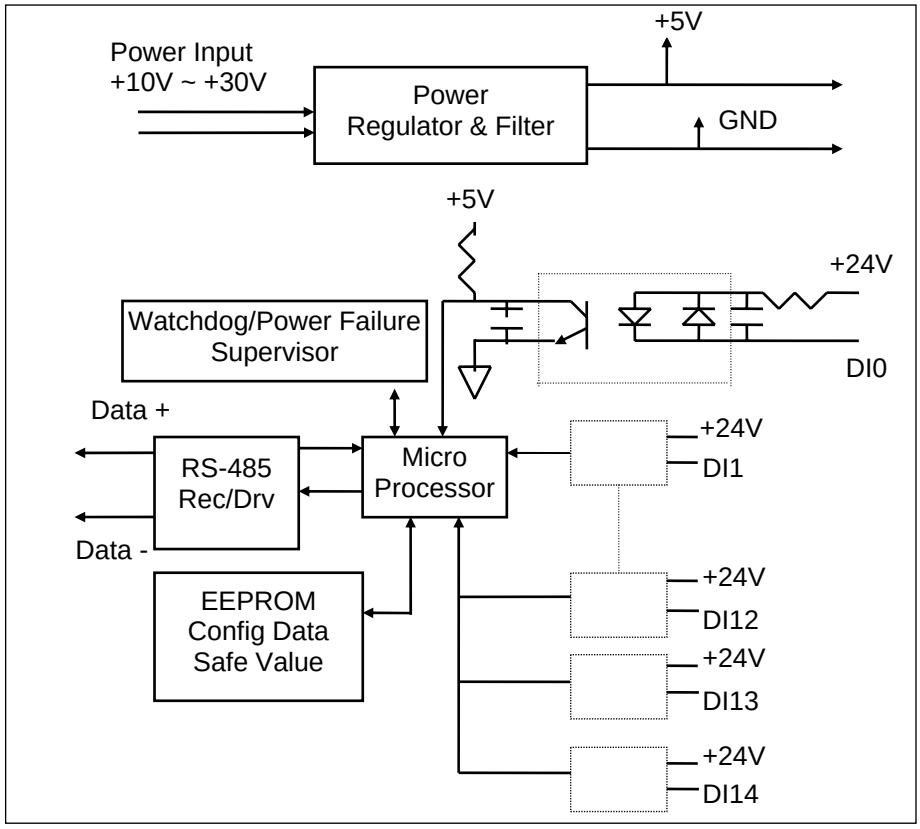


Figure 5-8 Block Diagram of ND-6054

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.5 Overview of NuDAM-6056

What is NuDAM-6056 ?

NuDAM-6056 provides 15 isolated digital output channels. All of the output channels are common ground type and one of them is use the same pin with default (use jumper to choose). The isolation voltage is up to 5000 Vrms. It is suitable to use NuDAM-6056 in industrial environment with high voltage electric shock.

5.5.1 Features of NuDAM-6056

- 15 bits digital open collector output with isolation protection and common ground
- 5000 Vrms isolation voltage
- Programmable host watchdog timer for host failure protection
- Internal watchdog timer for device failure protection
- Easy programming by software
- Easy installation and wiring

5.5.2 Specifications of NuDAM-6056

- **Interface**
  - Interface : RS-485, 2 wires
  - Speed (bps) : 1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K, 115.2K (115.2K is only for firmware reversion above A4.00)
- **Digital Output**
  - Channel numbers : 15 isolation common ground output channels(the fifteenth channel is the same with default pin,but could use jumper to choose).
  - Output characteristic:open collector transistor
  - Maximum current sink:50mA(300mA for Hardware Reversion.A2)
  - Max.power dissiation:200mW(3W for Hardware Reversion.A2)
  - Isolation Voltage:5000Vrms
- **Watchdog Function**

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

- Module internal watchdog timer : 150msec
- Power failure threshold : 4.65 V
- Safe value : 15 output channels
- Host programmable watchdog :100 ms ~ 25.5 sec

- **Power**
  - Power supply : +10V to +30V
  - Current consumption :1.32W

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.5.3 A Look at NuDAM-6056 & Pin Assignment

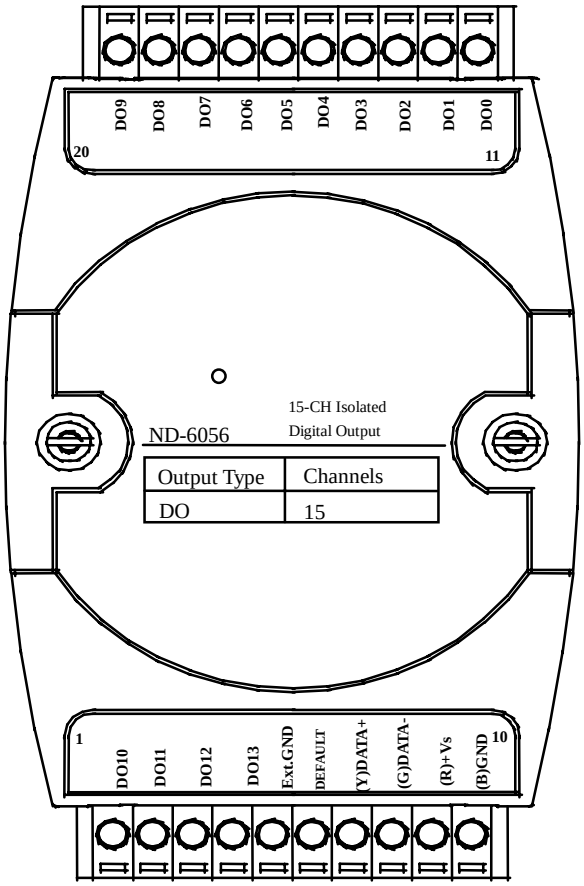


Figure 5-9 NuDAM-6056 profile

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.5.4 Pin Definitions of NuDAM-6056

Pin #	Signal Name	Description
1	DO10	Digital output channel 10
2	DO11	Digital output channel 11
3	DO12	Digital output channel 12
4	DO13	Digital output channel 13
5	ExtGND	External Ground
6	Default*/DO14	Initial state setting or Digital output channel 14
7	(Y) DATA+	RS-485 series signal, positive
8	(G) DATA-	RS-485 series signal, negative
9	(R) +VS	Power supply, +10V~+30V
10	(B) GND	Ground
11	DO0	Digital output channel 0
12	DO1	Digital output channel 1
13	DO2	Digital output channel 2
14	DO3	Digital output channel 3
15	DO4	Digital output channel 4
16	DO5	Digital output channel 5
17	DO6	Digital output channel 6
18	DO7	Digital output channel 7
19	DO8	Digital output channel 8
20	DO9	Digital output channel 9

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.5.5 NuDAM-6056 Functional Block Diagram

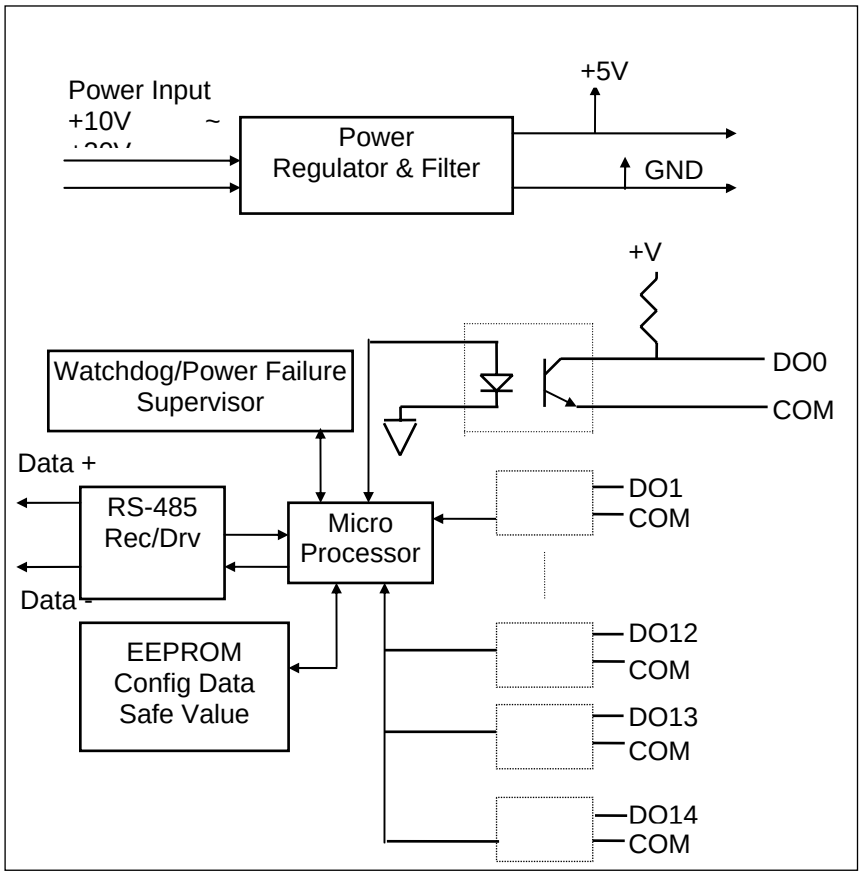


Figure 5-10 Block Diagram of NuDAM-6056

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.6 Overview of NuDAM-6058

What is NuDAM-6058 ?

NuDAM-6058 provides 28 digital I/O channels. It emulates industry standard mode zero configuration of 8255 programmable peripheral interface (PPI) chip. The PPI offers 3 ports A, B and C, the C port can also be subdivided into 2 nibble-wide (4-bit) port – C upper and C lower. A 50 pin SCSI connector equipped with ND-6058 which is corresponding to PPI chip with 24 DIO points.

5.6.1 Features of NuDAM-6058

- Industry standard 8255 programmable peripheral interface mode 0 emulation
- 24 Programmable I/O channels
- 4 dedicated input channels
- Completely TTL compatible I/O lines
- Status read-back capability
- Direct bit set/reset capability
- Buffered circuits for higher driving capability
- Direct interface with OPTO-22 compatible I/O module
- Programmable host watchdog timer for host failure protection
- Internal watchdog timer for device failure protection
- On board resetable fuse to protect power supply form external devices
- Easy programming by software
- Easy installation and wiring

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.6.2 Specifications of NuDAM-6058

- **Interface**
  - Interface : RS-485, 2 wires
  - Speed (bps) : 1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K, 115.2K (115.2K is only for firmware reversion above A4.00)
- **Programmable Digital Input/Output**
  - Channel numbers : 24
  - Input Signal:
  - Logical level 0: 0.8 V_{max}
  - Logical level 1: 2.0 $V_{min.}$
  - Output Signal:
  - Logical level 0: 0.5 $V_{max.}$
  - Logical level 1: 2.4 $V_{min.}$
- **Watchdog Function**
  - Module internal watchdog timer : 150msec
  - Power failure threshold : 4.65 V
  - Safe value : 15 output channels
  - Host programmable watchdog :100 ms ~ 25.5 sec
- **Dedicated Digital Input**
  - Channel numbers : 4
  - Input Signal:
  - Logical level 0: -0.5~0 V
  - Logical level 1: 3 V ~ 5.25 V
- **Connector**
  - 10-pin skew terminal block
  - 50-pin SCSI II connector
- **Power**
  - Power supply : +10V to +30V
  - Current consumption: 1.488 W

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.6.3 A Look at NuDAM-6058 & Pin Assignment

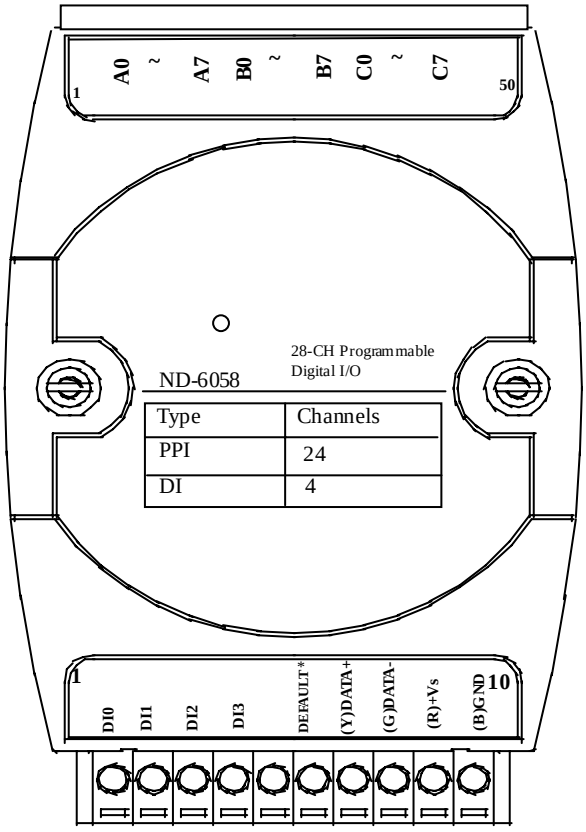
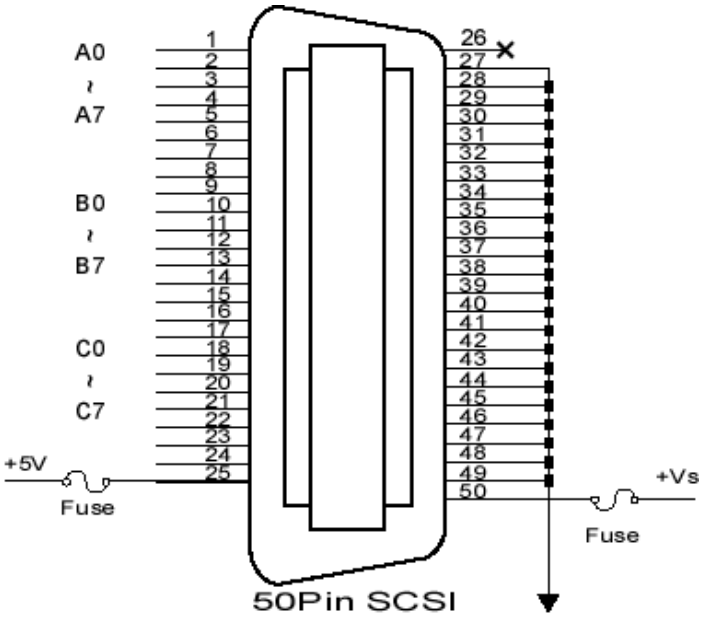


Figure 5-11 NuDAM-6058 profile

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.6.4 Pin Definitions of NuDAM-6058

Pin #	Signal Name	Description
1	DI0	Digital input channel 0
2	DI1	Digital input channel 1
3	DI2	Digital input channel 2
4	DI3	Digital input channel 3
5		
6	Default*	Initial state setting
7	(Y) DATA+	RS-485 series signal, positive
8	(G) DATA-	RS-485 series signal, negative
9	(R) +VS	Power supply, +10V~+30V
10	(B) GND	Ground



Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.6.5 NuDAM-6058 Functional Block Diagram

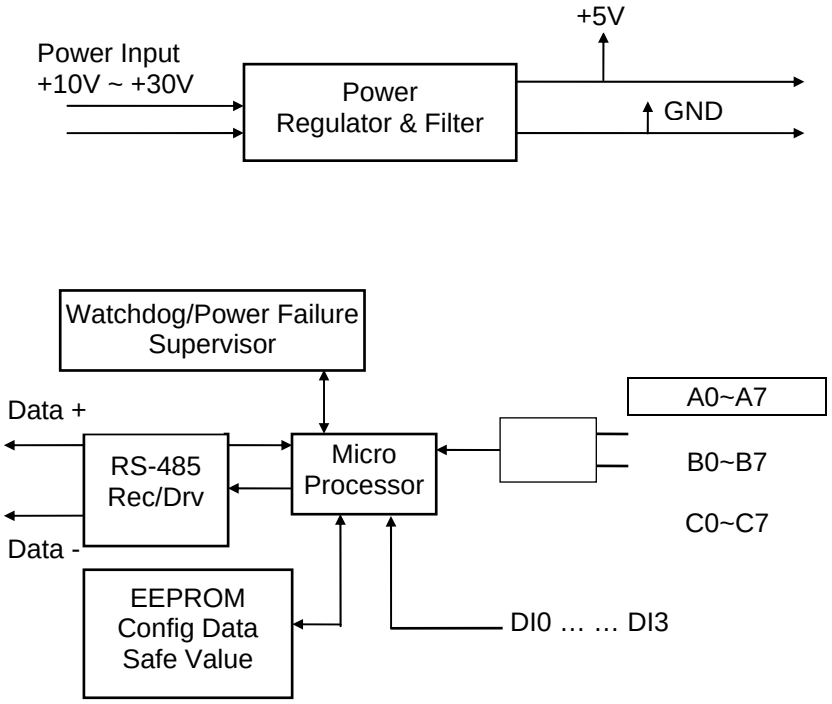


Figure 5-12 Block Diagram of NuDAM-6058

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.7 Overview of NuDAM-6060

NuDAM-6060 provides four relay output channels, two are form A and two are form C. It can control high power devices without external circuits. The isolation guarantees the industrial safety.

5.7.1 Features of NuDAM-6060

- 4 channels relay output
- 4 channels isolated digital input
- Programmable host watchdog timer for host failure protection
- Internal watchdog timer for device failure protection
- Easy programming by software
- Easy installation and wiring

5.7.2 Specifications of NuDAM-6060

- **Interface**
  - Interface : RS-485, 2 wires
  - Speed (bps) : 1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K, 115.2K (115.2K only for firmware reversion above A4.00)
- **Input**
  - Channel numbers : 4
  - Common External Voltage : +24 V
- **Output**
  - Channel numbers : 4 relay output
  - Output type : 2 form C channels, 2 form A channels
  - Contact rating : 0.5A / AC 125V,1A / DC 30V
  - Relay ON/OFF time interval :Max. 3 ms
  - Breakdown voltage : 750 V_{rms}(between open contact),1000 V_{rms}(between contact and coil)
  - Expected life : 10^5 times(0.5A/AC125V resistive load at 20 cpm) or 10^8 times(no load at 180 cpm)
  - Insulation resistance :Min. 1000 MΩ
- **Watchdog Function**

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

- Module internal watchdog timer : 150ms
- Power failure threshold : 4.65 V
- Safety value : 4 output channels
- Host programmable watchdog : 100 ms ~ 25.5 sec

◆ **Power**

- Power supply : +10V to +30V
- Current consumption : 0.84 W

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.7.3 A Look at NuDAM-6060 & Pin Assignment

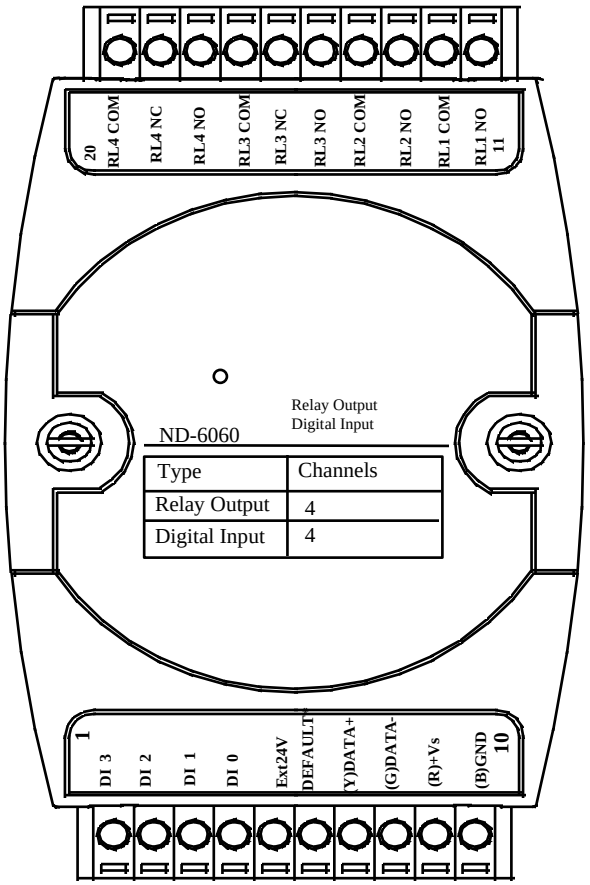


Figure 5-13 ND-6060 profile

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.7.4 Pin Definitions of NuDAM-6060

Pin #	Signal Name	Description
1	DI3	Digital Input Channel 3
2	DI2	Digital Input Channel 2
3	DI1	Digital Input Channel 1
4	DI0	Digital Input Channel 0
5	Ext24	External Common +24V
6	Default*	Initial state setting
7	(Y) DATA+	RS-485 series signal, positive
8	(G) DATA-	RS-485 series signal, negative
9	(R) +VS	Power supply, +10V~+30V
10	(B) GND	Ground
11	RL1 NO	Relay 1, normal open
12	RL1 COM	Relay 1, common ground
13	RL2 NO	Relay 2, normal open
14	RL2 COM	Relay 2, common ground
15	RL3 NO	Relay 3, normal open
16	RL3 NC	Relay 3, normal close
17	RL3 COM	Relay 3, common ground
18	RL4 NO	Relay 4, normal open
19	RL4 NC	Relay 4, normal close
20	RL4 COM	Relay 4, common ground

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.7.5 NuDAM-6060 Functional Block Diagram

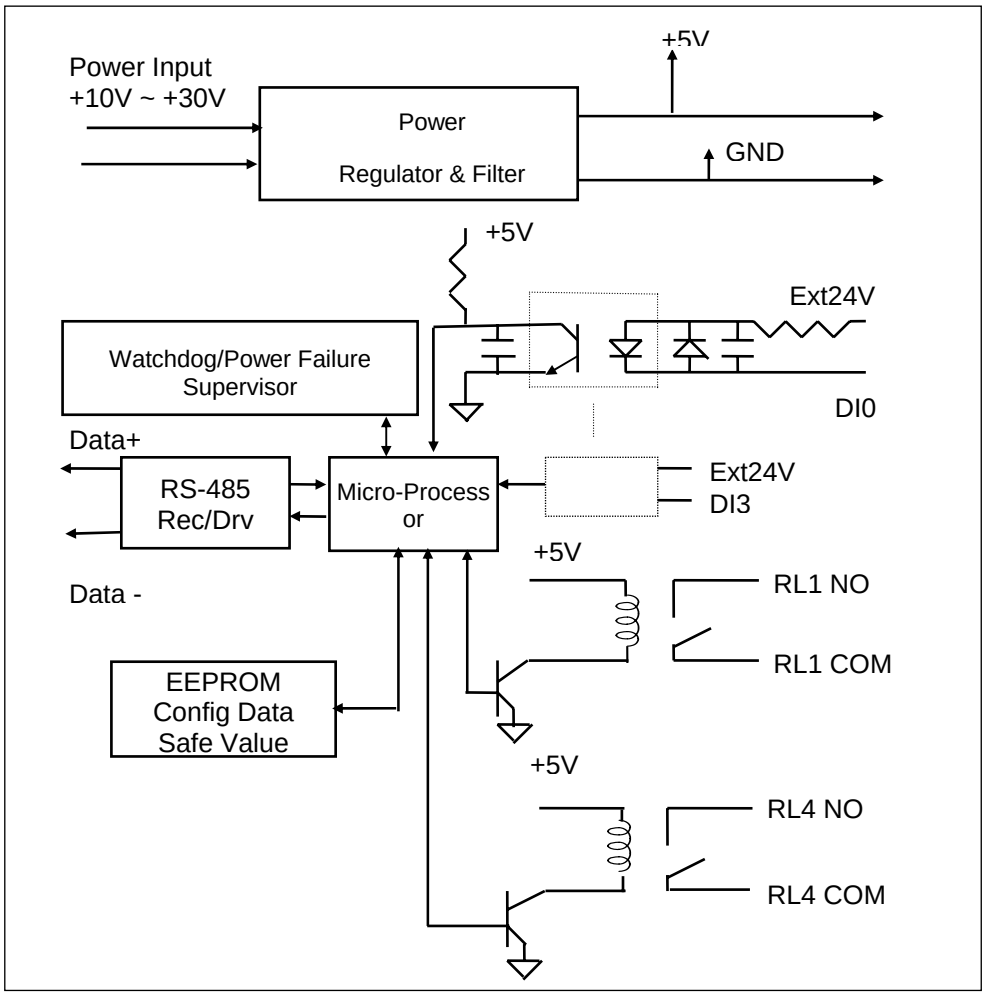


Figure 5-14 Block Diagram of NuDAM-6060

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.8 Overview of NuDAM-6063

NuDAM-6063 provides eight form A relay output channels. It can control high power devices without external circuits.

5.8.1 Features of NuDAM-6063

- 8 channel relay output
- Programmable host watchdog timer for host failure protection
- Internal watchdog timer for device failure protection
- Easy programming by software
- Easy installation and wiring

5.8.2 Specifications of NuDAM-6063

- **Interface**
  - Interface : RS-485, 2 wires
  - Speed (bps) : 1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K, 115.2K (115.2K is only for firmware reversion above A4.00)
- **Digital Output**
  - Channel numbers : 8
  - Output Type : 8 form A channels
  - Contact rating : 0.5A / AC 125V
    1A / DC 30V
  - Relay ON/OFF time interval : Max. 3ms
  - Breakdown voltage : 750 V_{rms}(between open contact),1000 V_{rms}(between contact and coil)
  - Expected life : 10^5 times(0.5A/AC125V resistive load at 20 cpm) or 10^8 times(no load at 180 cpm)
- **Insulation Resistance: Min. 1000 MΩ**
- **Watchdog Function**
  - Module internal watchdog timer : 150ms
  - Power failure threshold : 4.65 V
  - Safety value : 8 output channels
  - Host programmable watchdog : 100 ms ~ 25.5 sec

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

- **Power**
  - Power supply : +10V to +30V
  - Current consumption : 1.2 W

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.8.3 A Look at NuDAM-6063 & Pin Assignment

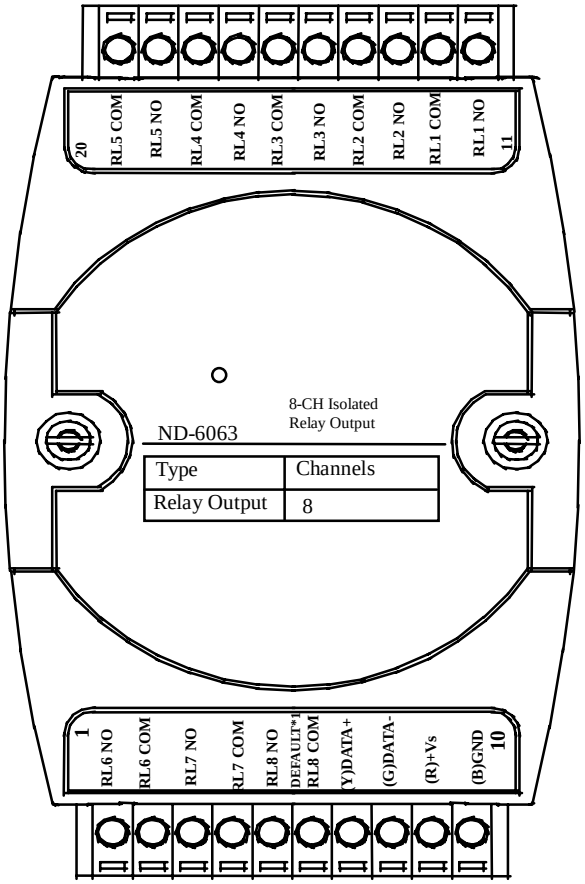


Figure 5-15 NuDAM-6063 profile

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.8.4 Pin Definitions of NuDAM-6063

Pin #	Signal Name	Description
1	RL6 NO	Relay 6, normal open
2	RL6 COM	Relay 6, common ground
3	RL7 NO	Relay 7, normal open
4	RL7 COM	Relay 7, common ground
5	RL8 NO	Relay 8, normal open
6	Default*/ RL8 NO	Initial state setting Relay 8, normal open
7	(Y) DATA+	RS-485 series signal, positive
8	(G) DATA-	RS-485 series signal, negative
9	(R) +VS	Power supply, +10V~+30V
10	(B) GND	Ground
11	RL1 NO	Relay 1, normal open
12	RL1 COM	Relay 1, common ground
13	RL2 NO	Relay 2, normal open
14	RL2 COM	Relay 2, common ground
15	RL3 NO	Relay 3, normal open
16	RL3 COM	Relay 3, common ground
17	RL4 NO	Relay 4, normal open
18	RL4 COM	Relay 4, common ground
19	RL5 NO	Relay 5, normal open
20	RL5 COM	Relay 5, common ground

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.8.5 NuDAM-6063 Functional Block Diagram

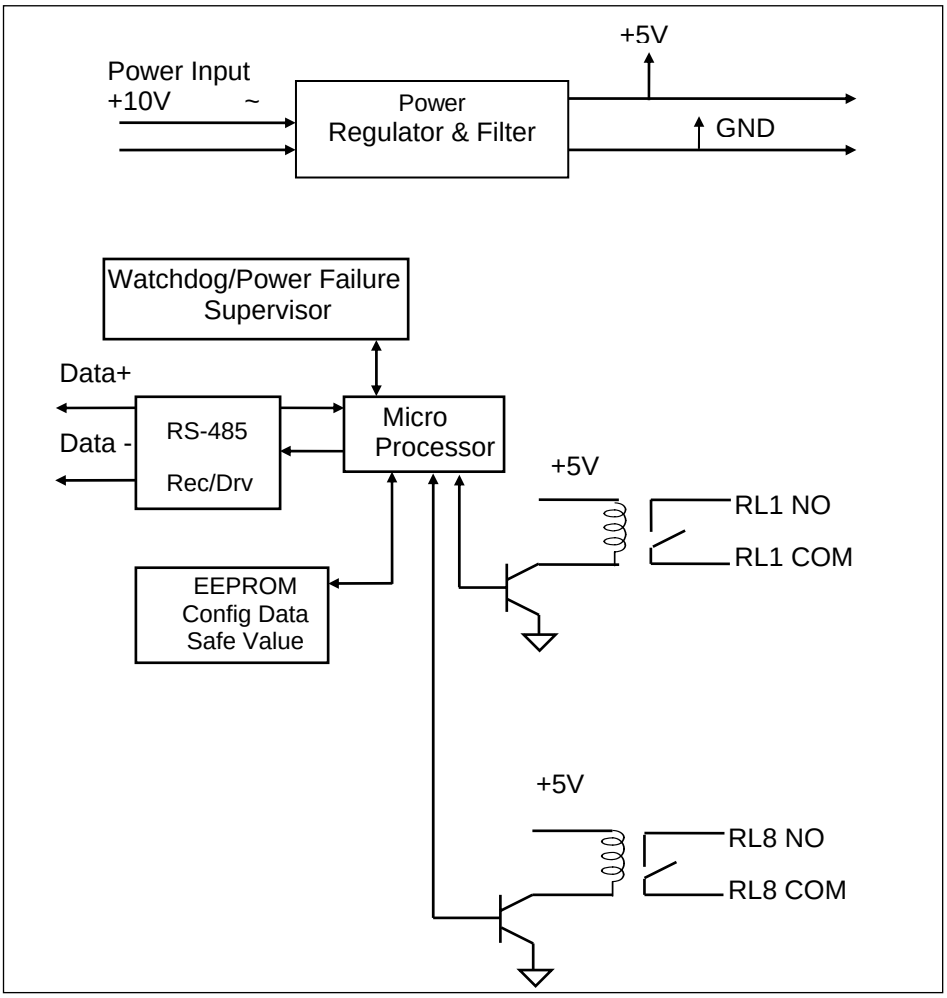


Figure 5-16 Block Diagram of NuDAM-6063

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.9 Overview of NuDAM-6067

NuDAM-6067 provides eight AC relay output channels. It can control high power devices without external circuits.

5.9.1 Features of NuDAM-6067

- 8 channel AC relay output
- Programmable host watchdog timer for host failure protection
- Internal watchdog timer for device failure protection
- Easy programming by software
- Easy installation and wiring

5.9.2 Specifications of NuDAM-6067

- **Interface**
  - Interface : RS-485, 2 wires
  - Speed (bps) : 1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K, 115.2K (115.2K is only for firmware reversion above A4.00)
- **Digital Output**
  - Channel numbers : 8
  - Output Type : 8 form A channels
  - Contact rating : 3A/AC 250V,3A/DC 30V
  - Relay ON/OFF time interval : Approx. 6ms / 3ms
  - Breakdown voltage : 1000 V_{rms}(between open contact),2000 V_{rms}(between contact and coil)
  - Expected life : 10^5 times(3A/AC 250V resistive load at 20 cpm) or 2×10^7 times(no load at 20 cpm)
- **Insulation Resistance: 1000 MΩ minimum (at 500VDC)**
- **Watchdog Function**
  - Module internal watchdog timer : 150ms
  - Power failure threshold : 4.65 V
  - Safety value : 8 output channels
  - Host programmable watchdog : 100 ms ~ 25.5 sec

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

- **Power**
  - Power supply : +10V to +30V
  - Current consumption : 1.2 W

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.9.3 A Look at NuDAM-6067 & Pin Assignment

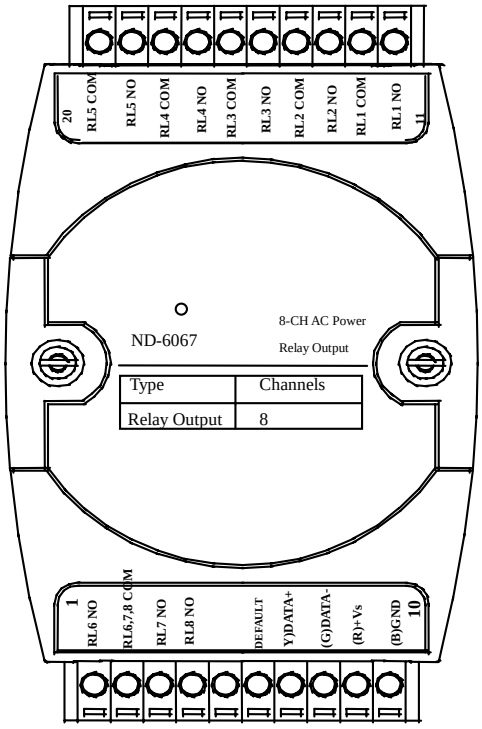


Figure 5-17 NuDAM-6067 profile

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.9.4 Pin Definitions of NuDAM-6067

Pin #	Signal Name	Description
1	RL6 NO	Relay 6, normal open
2	RL6、7、8COM	Relay 6、7 and relay 8 common
3	RL7 NO	Relay 7, normal open
4	RL8 NO	Relay 8, normal open
5	NC	No connection
6	Default*	Initial state setting
7	(Y) DATA+	RS-485 series signal, positive
8	(G) DATA-	RS-485 series signal, negative
9	(R) +VS	Power supply, +10V~+30V
10	(B) GND	Ground
11	RL1 NO	Relay 1, normal open
12	RL1 COM	Relay 1, common ground
13	RL2 NO	Relay 2, normal open
14	RL2 COM	Relay 2, common ground
15	RL3 NO	Relay 3, normal open
16	RL3 COM	Relay 3, common ground
17	RL4 NO	Relay 4, normal open
18	RL4 COM	Relay 4, common ground
19	RL5 NO	Relay 5, normal open
20	RL5 COM	Relay 5, common ground

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.9.5 NuDAM-6067 Functional Block Diagram

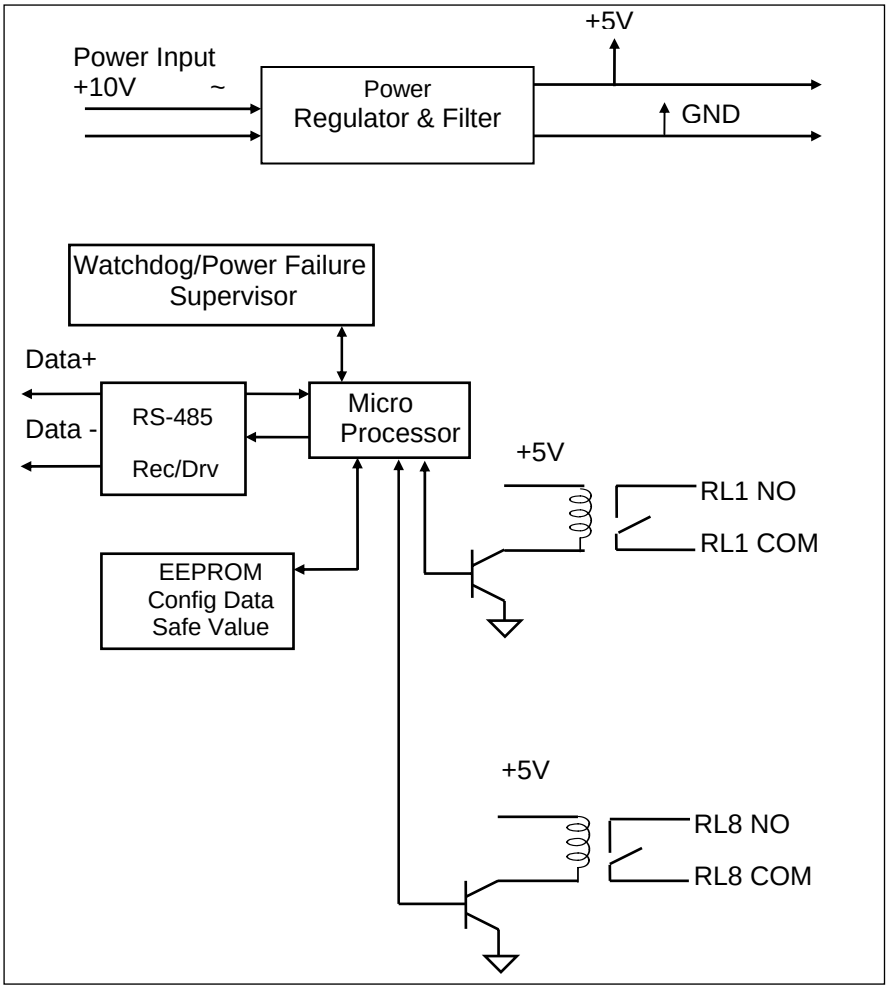


Figure 5-18 Block Diagram of NuDAM-6067

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.10 Overview of NuDAM-6080

ND-6080 is a counter / frequency input module. It has two 32-bit counter input channels with built in programmable timer for frequency measurement and supports both photo isolated and non-isolated input mode. The maximum counting value is 4,294,967,295 for counter input channel and the frequency-input range is from 1 Hz to 20 kHz. A programmable digital filter can be enabled for both high and low level minimum signal width to reduce noise spike. Besides, the programmable threshold for non-isolated input can further reject noise on the input signal level.

The module provides the counter comparator or the alarm function. The alarm limit of two counters can be set independently by programming. The alarm status can be sent to digital output channels if this function is ON. The supervisor of a factory can 'see' or 'hear' the alarm if the digital output channel control a real alarm device. The two digital output channel can be set for general purpose used if the alarm is disable. For example, connecting relay devices to DO channels, the NuDAM-6080 can be used to control the high power devices.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.10.1 Features of NuDAM-6080

- Two 32 bit counter / frequency input channel
- Two digital output channels of open collector type
- 5000 Vrms isolation voltage for isolated input mode
- External gate control for counter input
- Alarm function with alarm output
- Programmable digital filter for noise rejection
- Programmable threshold setting of trigger level for non-isolated input mode
- Programmable host watchdog timer for host failure protection
- Internal watchdog timer for device failure protection
- Easy programming by software
- Easy installation and wiring

5.10.2 Specifications of NuDAM-6080

- **Interface**
  - Interface : RS-485, 2 wires
  - Speed (bps) : 1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K, 115.2K
- **Counter Input**
  - Two independent 32 bit counters
  - Input frequency: 20 kHz max.
  - Input mode: Isolated or non-isolated
  - Isolated input level:
    Logic level 0: +1V max.
    Logic level 1: +3.5V to +30V
  - Isolation voltage: 5000 Vrms
  - Non-isolated input level (programmable threshold):
    Logic level 0: 0 to +5V (default = 0.8V)
    Logic level 1: 0 to +5V (default = 2.4V)
  - Input pulse width > 5 μsec.
  - Programmable digital noise filter:

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

4 μsec. to 1.02 msec.

- Alarm comparator on each counter

- **Frequency measurement Input**
  - Range: 1 Hz to 20 kHz
  - Programmable built in gate time: 0.1/1.0 sec.
- **Digital Output**
  - Channels: Two open collector to 30V, 30 mA max. load
- **Watchdog Function**
  - Module internal watchdog timer : 150 ms
  - Power failure threshold : 4.65 V
  - Safety value : 2 digital output channels
  - Host programmable watchdog: 100 ms ~ 25.500 sec.
- **Power**
  - Power supply : +10V to +30V
  - Power consumption: 2.0W

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.10.3 A Look at NuDAM-6080 & Pin Assignment

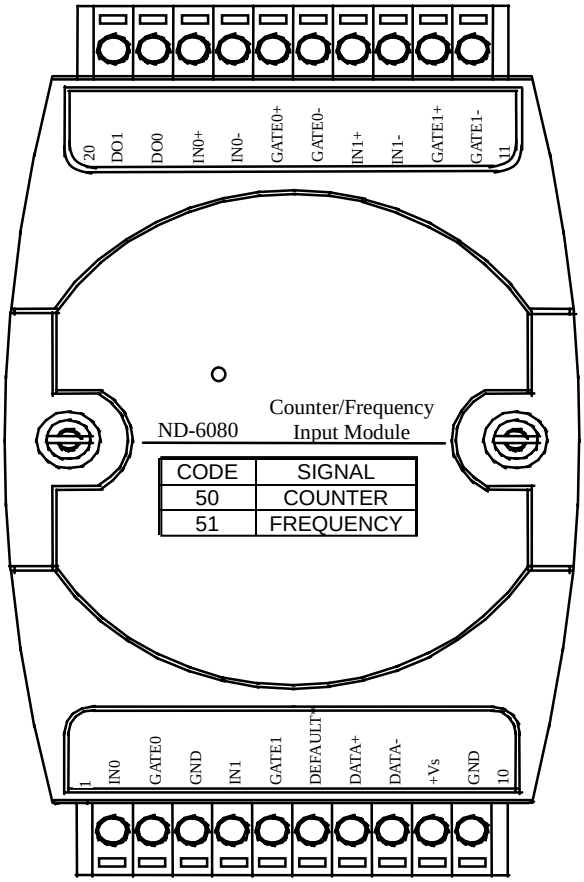


Figure 5-19 NuDAM-6080 profile

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.10.4 Pin Definitions of NuDAM-6080

Pin #	Signal Name	Description
1	IN0	Non-isolated input of counter 0
2	GATE0	External gate control of counter 0
3	GND	Ground for non-isolated input
4	IN1	Non-isolated input of counter 1
5	GATE1	External gate control of counter 1
6	DEFAULT*	Initial state setting
7	(Y) DATA+	RS-485 series signal, positive
8	(G) DATA-	RS-485 series signal, negative
9	(R) +Vs	Power supply, +10V~+30V
10	(B) GND	Ground
11	GATE1-	Differential negative external gate control of counter 1
12	GATE1+	Differential positive external gate control of counter 1
13	IN1-	Differential negative input of counter 1
14	IN1+	Differential positive input of counter 1
15	GATE0-	Differential negative external gate control of counter 0
16	GATE0+	Differential positive external gate control of counter 0
17	IN0-	Differential negative input of counter 0
18	IN0+	Differential positive input of counter 0
19	DO0	Digital output of channel 0 or counter 0 alarm output
20	DO1	Digital output of channel 1 or counter 1 alarm output

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.10.5 NuDAM-6080 Functional Block Diagram

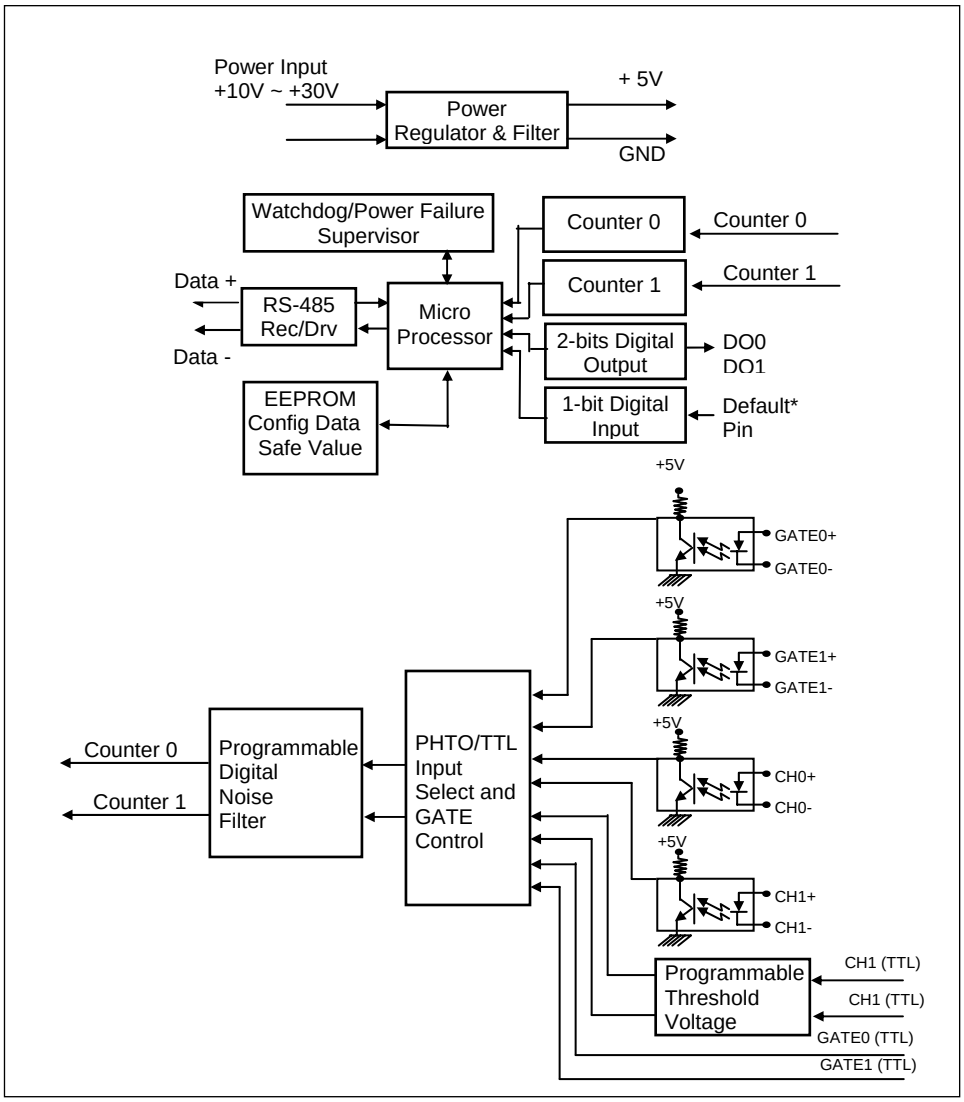


Figure 5-20 Block Diagram of NuDAM-6080

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6

Command Set

6.1 Command and Response

6.1.1 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.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

(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

6.1.2 Format of NuDAM Commands

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

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

How to calculate checksum value ?

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

Example 1: checksum is **disable**

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

$: LeadingCode
01 : Address
2 : Command (Read Configuration)
<CR> : Carriage return 0x0D

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Example 2: checksum is **enable**

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

$	: LeadingCode
01	: Address
2	: Command (Read Configuration)
B7	: Checksum value
<CR>	: Carriage return 0x0D

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

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

'!' = 0x21 '0' = 0x30 '1' = 0x31 '4' = 0x34
'6' = 0x36

AC = **(** 0x21 + 0x30 + 0x31 + 0x34 + 0x30 + 0x30 + 0x36 + 0x30 + 0x30 **) MOD 0x100**

Note: *1.There is no spacing between characters.*
2. At end of command need a <CR> carriage return 0x0D.
3. Checksum is optional parameter.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.1.3 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 is not exist.

2. Syntax error.

3. Communication error

4. Some special commands does not have response.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.2 Summary of Command Set

There are three categories of NuDAM commands. One is the general commands, including set configuration command, read configuration, reset, read module's name or firmware version, etc. Every NuDAM can response to the general commands.

The second category is the functional commands, which depends on functions of each module, not every module can execute all functions.

The third category is the special commands, including functions about the programmable watchdog timer, safe values, and the programmable leading code.

Command Set of Digital I/O Modules			
Command	**Syntax**	**Module**	**Section**
General Commands			
Set Configuration	%(OldAddr)(NewAddr)(TypeCode)(BaudRate)(CheckSumFlag)	601x,602x, 605x,606x 6080,6531	6.2.1
Read Configuration	$(Addr)2	601x,602x, 605x,606x 6080,6531	6.2.2
Read Module Name	$(Addr)M	601x,602x, 605x,606x 6080,6531	6.2.3
Read Firmware Version	$(Addr)F	601x,602x, 605x,606x 6080,6531	6.2.4
Reset Status	$(Addr)5	601x,602x, 605x,606x 6080,6531	6.2.5
Soft Reset	$(Addr)RS	601x,602x, 605x,606x 6080,6531	6.2.6
Analog I/O Modules Functional Commands			
Read Analog Data Channel 0	#(Addr)	6013	6.3.1
Offset Calibration to each Channel	#(Addr)1(Channel No)	6013(11)	6.3.2
Span Calibration to ach Channel	$(Addr)0(Channel No)		6.3.3
Read Analog Data From Channel N	#(Addr)(ChannelNo)	6013,6017, 6018	6.3.4
Read All Analog Data Channel	$(Addr)A	6013,6017, 6018	6.3.5

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Enable/Disable Channel for Multiplexing	$(Addr)5(ChannelVal)	6013,6017, 6018	6.3.6
Read Channel Status	$(Addr)6	6013,6017, 6018	6.3.7
Read CJC Status	$(Addr)3	6018	6.3.8
Enable/Disable CJC	$(Addr)C(Status)	6018(12)	6.3.9
Read Enable/Disable CJC Status	$(Addr)D	6018(12)	6.3.10
CJC Offset Calibration	$(Addr)9(Counts)	6018	6.3.11
Span Calibration	$(Addr)0	6013,6017, 6018	6.3.12
Offset Calibration	$(Addr)1	6013,6017, 6018	6.3.13
Synchronized Sampling	#**	6024	6.4.1
Read Synchronized Data	$(Addr)9		6.4.2
Digital Input	$(Addr)8		6.4.3
Analog Data Out	#(Addr)(OutData)	6021	6.4.4
	#(Addr)(Port)(OutData)	6024	
4 mA Offset Calibration	$(Addr)0	6021(10)	6.4.5
20 mA Offset Calibration	$(Addr)1		6.4.6
Trim Calibration	$(Addr)3(Counts)	6021,6024	6.4.7
Save Power On Analog Value	$(Addr)4	6021,6024	6.4.10
Last Value Readback	$(Addr)6	6021	6.4.8
	$(Addr)6(Port)	6024	
Current Readback	$(Addr)8	6021	6.4.9
Digital I/O Modules Functional Commands			
Synchronized Sampling	#**	6050, 6052, 6053, 6054, 6058, 6060	6.5.1
Read Synchronized Data	$(Addr)4	6050, 6052, 6053, 6054, 6058, 6060	6.5.2
Digital Output	#(Addr)(ChannelNo)(OutData)	6050, 6060, 6063	6.5.3
	#(Addr)(Port)(Odata)	6056, 6058	
	#(Addr)(Port)(ChannelNo)(BitData)		
	#(Addr)T(OdataA)(OdataB)(OdataC)	6058	
Digital Input	$(Addr)6	605x,606x	6.5.4
Set Programmable I/O Mode	$(Addr)S(IOSts)	6058	6.5.5
Communication Module Functional Commands			
Set RTS Status	$(Addr)0(RTS Status)	6531	6.6.1

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Read RTS Status	$(Addr)3	6531	6.6.2
Read CTS Status	$(Addr)1	6531	6.6.3
Set Device ID	$(Addr)6(Device ID)	6531	6.6.4
Read Device ID	$(Addr)7	6531	6.6.5
Set Delimiter	$(Addr)C(Delimiter)	6531	6.6.6
Read Delimiter	$(Addr)D	6531	6.6.7
Data Pass	(Delimiter)(Addr)(Data)	6531	6.6.8
Open/Close Data Gate	&(Addr)8(Data Gate Mode)	6531	6.6.9
Counter/Frequency Input Module Functional Commands			
Set Input Signal Mode	$(Addr)B(InType)	6080	6.7.1
Read Input Signal Mode	$(Addr)B	6080	6.7.2
Read Counter/Frequency Value in Hexadecimal	#(Addr)(CounterNo)	6080	6.7.3
Read Counter/Frequency Value in Decimal	#(Addr)(CounterNo)D	6080	6.7.4
Set Gate Mode	$(Addr)A(Gmode)	6080	6.7.5
Read Gate Mode	$(Addr)A	6080	6.7.6
Set Maximum Counter Value	$(Addr)3(CounterNo)(MaxData)	6080	6.7.7
Read Maximum Counter Value	$(Addr)3(CounetrNo)	6080	6.7.8
Set Initial Count Value	@(Addr)P(CounterNo)(IniData)	6080	6.7.9
Read Initial Count Value	@(Addr)G(CounetrNo)	6080	6.7.10
Start/Stop Counter	$(Addr)5(CounterNo)(SStatus)	6080	6.7.11
Read Counter Start/Stop Status	$(Addr)5(CounterNo)	6080	6.7.12
Clear Counter	$(Addr)6(CounterNo)	6080	6.7.13
Read then Clear the Overflow Flag	$(Addr)7(CounterNo)	6080	6.7.14
Enable/Disable Digital Filter	$(Addr)4(FStatus)	6080	6.7.15
Read Filter Status	$(Addr)4	6080	6.7.16
Set Minimum Input Signal Width at High Level	$(Addr)0H(MinFData)	6080	6.7.17
Read Minimum Input Signal Width at High Level	$(Addr)0H	6080	6.7.18
Set Minimum Input Signal Width at Low Level	$(Addr)0L(MinFData)	6080	6.7.19
Read Minimum Input Signal Width at Low Level	$(Addr)0L	6080	6.7.20
Set TTL Input High Trigger Level	$(Addr)1H(ThData)	6080	6.7.21
Read TTL Input High Trigger Level	$(Addr)1H	6080	6.7.22
Set TTL Input Low Trigger Level	$(Addr)1L(ThData)	6080	6.7.23

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Read TTL Input Low Trigger Level	$(Addr)1L	6080	6.7.24
Enable Alarm	@(Addr)EA(CounterNo)	6080	6.7.25
Disable Alarm	@(Addr)DA(CounterNo)	6080	6.7.26
Set Alarm Limit Value of Counter 0	@(Addr)PA(ArmData)	6080	6.7.27
Set Alarm Limit Value of Counter 1	@(Addr)SA(ArmData)	6080	6.7.28
Read Alarm Limit Value of Counter 0	@(Addr)RP	6080	6.7.29
Read Alarm Limit Value of Counter 1	@(Addr)RA	6080	6.7.30
Set Digital Output Values	@(Addr)DO(DoData)	6080	6.7.31
Read Digital Output and Alarm Status	@(Addr)DI	6080	6.7.32
Special Commands			
Read Command Leading Code Setting	~(Addr)0	601x,602x, 605x,606x, 6080,6531	6.8.1
Change Command Leading Code Setting	~(Addr)10(C1)(C2)(C3) (C4)(C5)(C6)	601x,602x, 605x,606x, 6080,6531	6.8.2
Set Host Watchdog / Safety Value	~(Addr)2(Flag)(TimeOut) (SafeValue)	6021,605x, 606x,6531	6.8.3
	~(Addr)2(Flag)(TimeOut) (SafeA)(SafeB)(SafeC) (SafeD)	6024	
Read Host WatchDog / Safe Value	~(Addr)3	602x,605x, 606x6080, 6531	6.8.4
Change Polarity	~(Addr)CP(Status)	605X,606X	6.8.5
Read Polarity	~(Addr)CR	605X,606X	6.8.6
Host is OK	~**	601x,602x, 605x,606x 6080,6531	6.8.7

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Note : ***"601x" means forND-6013, ND-6017 and ND-6018. "602x" means for ND-6021 and ND-6024. "605x" means forND-6050, ND-6052, ND-6053, ND-6054, ND-6056, and ND-6058. "606x" means for ND-6063 and ND-6067.***

Note(10) : ***This function only support on F/W version above A4.30.***

Note(11) : ***These two functions only support between F/W versionA3.05 to A4.52.***

Note(12) : ***These two functions support on F/W version above B1.31of ND-6018 and F/W version above C4.60 of ND-6013.***

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.2.1 Set Configuration (601x,602x,605x,606x, 6080.6531)

@Description

Configure the basic setting of NuDAM, including the address ID, input range, baud rate, and data format. The new configuration will be available after executing the command.

@Syntax

%(OldAddr)(NewAddr)(InputRange/OutputRange/TypeCode)(BaudRate)(DataFormat/CheckSumFlag/DataFlag)<CR>

%	Command leading code. (1-character)	
(OldAddr)	NuDAM module 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)	
(InputRange)	Define analog input range, refers to Table 6-1 for details. (2-character)	601x
(OutputRange)	Define analog output range, refers to Table 6-2 for details. (2-character)	602x
(TypeCode)	Type Code is fixed *40H* for Digital I/O modules. (2-character)	605x,606x, 6531
	Type Code represents the input mode. (2-character) 50: counter input mode 51: frequency input mode	6080
(BaudRate)	Define communication baud rate, refers to Table 6-3 for details. (2-character)	
(DataFormat)	Define checksum, integration time and output data format, refers to Figure 6-1 for details. (2-character)	601x
	Define checksum, integration time and output data format, refers to Figure 6-2 for details. (2-character)	602x
(CheckSumFlag)	Define check-sum status, refer to Figure 6-3 for details. (2-character)	605x
	Define check-sum status, refer to Figure 6-4 for details. (2-character)	6080
(DataFlag)	Define check-sum status, refer to Table 6-4 for details. (4-character, WXYZ) WX is for module system setting. YZ is for RS-232 configuration.	6531

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

@Response

!(Addr)<CR>

or

?(Addr)<CR>

(Addr)	Address ID.
!	Command is valid.
?	Command is invalid, parameter values are invalid, or change the setting without grounding the DEFAULT* pin.

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

@Example 1 <ND-601x>

User command:	%0130050600<CR>
Response:	!30<CR>

Item	Meaning	Description
%	(Leading Code)	Command leading code.
01	(OldAddr)	Original address ID is 01(Hex).
30	(NewAddr)	New address ID is 30(Hex).
05	(InputRange)	Analog input range is ±2.5V
06	(BaudRate)	Baud rate is 9600.
00	(DataFormat)	00 means data format is engineering units, checksum is disable and integration time is 50 ms (60Hz).
<CR>	Carriage return	0x0D.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Code (Hex)	Input Range	Modules
00	±15 mV	6018
01	±50 mV	6018
02	±100 mV	6018
03	±500 mV	6018
04	±1 V	6018
05	±2.5 V	6018
06	±20 mA (Required 125Ω current conversion resistor.)	6018
08	±10 V	6017
09	±5 V	6017
0A	±1 V	6017
0B	±500 mV	6017
0C	±150 mV	6017
0D	±20 mA (Required 125Ω current conversion resistor.)	6017
0E	Type J Thermocouple 0° to 760°C	6018
0F	Type K Thermocouple 0° to 1370°C	6018
10	Type T Thermocouple -100° to 400°C	6018
11	Type E Thermocouple 0° to 1000°C	6018
12	Type R Thermocouple 500° to 1750°C	6018
13	Type S Thermocouple 500° to 1750°C	6018
14	Type B Thermocouple 500° to 1800°C	6018
15	Type N Thermocouple -270° to 1300°C	6018
16	Type C Thermocouple 0° to 2320°C	6018
20	Pt-100, -100°C to +100°C, α=0.00385	6013
21	Pt-100, 0°C to +100°C, α=0.00385	6013
22	Pt-100, 0°C to +200°C, α=0.00385	6013
23	Pt-100, 0°C to +600°C, α=0.00385	6013
24	Pt-100, -100°C to +100°C, α=0.003916	6013
25	Pt-100, 0°C to +100°C, α=0.003916	6013
26	Pt-100, 0°C to +200°C, α=0.003916	6013
27	Pt-100, 0°C to +600°C, α=0.003916	6013
28	Ni-100, 0°C to +100°C	6013
29	Ni-120, 0°C to +100°C	6013
2A	0~60 Ohms	6013

Table 6-1 AD Input Range Setting

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

@Example 2 <ND-602x>

User command:	%0118310610<CR>
Response:	!18<CR>

Item	Meaning	Description
%	(Leading Code)	Command leading code.
01	(OldAddr)	Original address ID is 01(Hex).
18	(NewAddr)	New address ID is 18(Hex).
31	(OutputRange)	Analog output range is 4 to 20 mA
06	(BaudRate)	Baud rate is 9600.
10	(DataFormat)	10 means a slew rate is 1.000 mA/sec and checksum is disable.
<CR>	Carriage return	0x0D.

Code (Hex)	Signal Range of Output Range	Modules
30	0 to 20 mA	6021
31	4 to 20 mA	6021
32	0 to 10 V	6021
33	-10 to 10 V	6024

Table 6-2 Analog Output Range Setting

@Example 3 <ND-605x>

User command:	%0130400600<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 (Hex).
40	(TypeCode)	Digital I/O module.
06	(BaudRate)	Baud rate is 9600.
00	(CheckSumFlag)	00 means checksum is disable.
<CR>	Carriage return	0x0D.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

@Example 4 <ND-6531>

User ommand:	%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 (Hex).
40	(TypeCode)	6531 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 6-3. Baud rate setting code

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

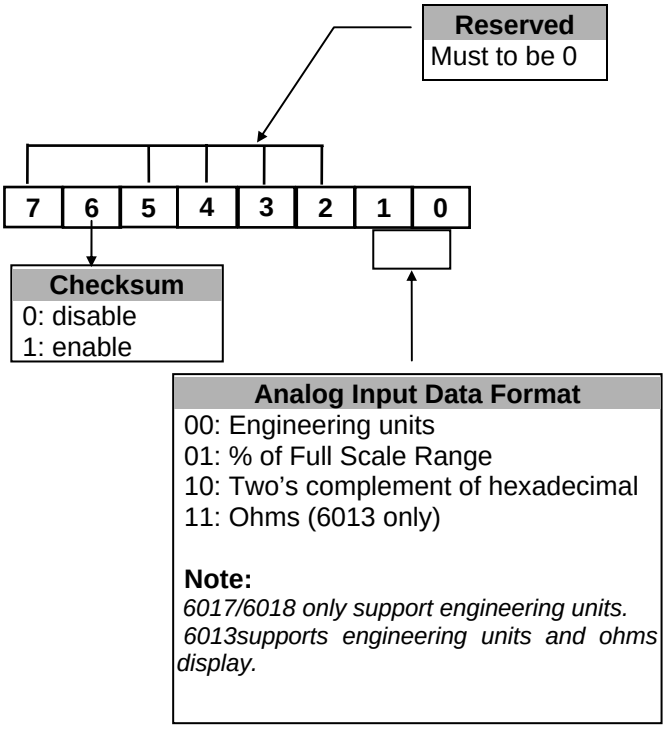


Figure 6-1 Data Format Setting of ND-601x

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

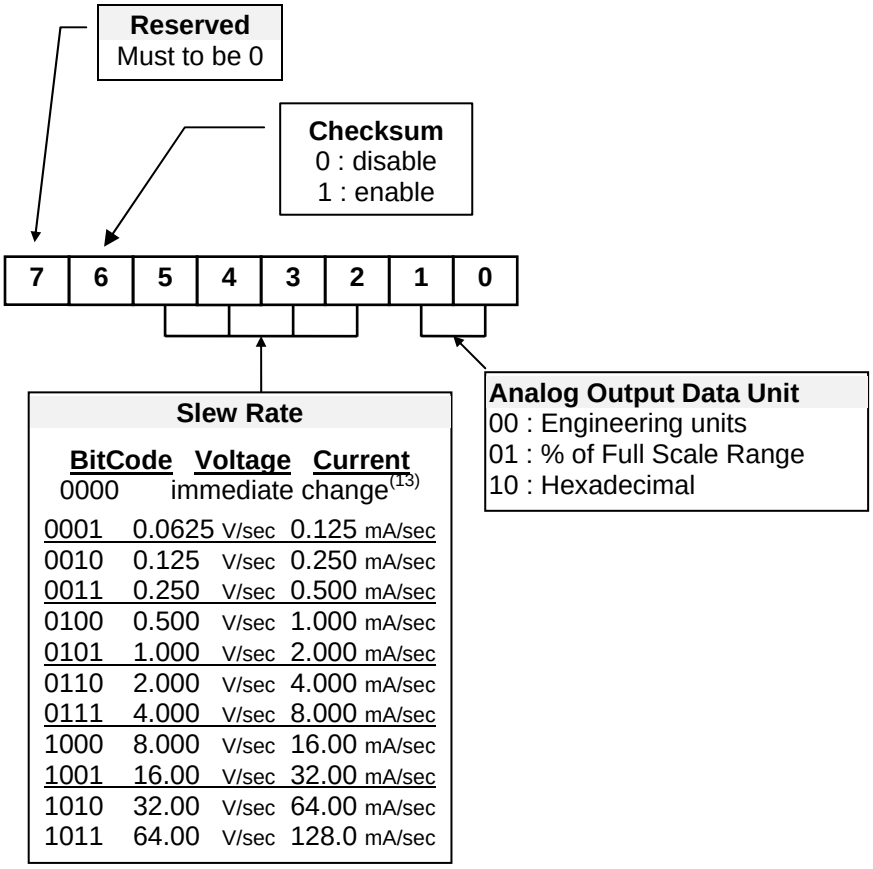


Figure 6-2 Data format of ND-602x

Note(13) : 6024 only supports immediate change and engineering units.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

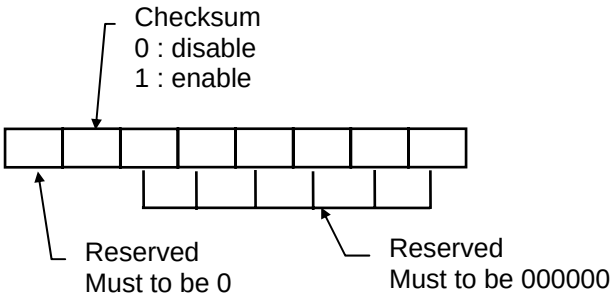


Figure 6-3 Check sum flag setting of 605x

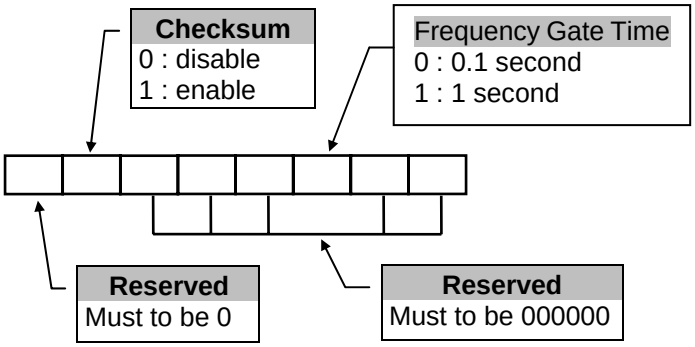


Figure 6-4 Check sum flag setting of 6080

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

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	**0**	**Don't care, set to 0**
X. bit 3	**0**	
X. bit 2	**0**	
X. bit 1	**0**	
X. bit 0	**0**	**Don't append <CR> in output string**
	1	**Append <CR> in output string(*Default Setting)**
Y. bit 3	**0**	**Don't care, set to 0**
Y. bit 2	**0**	
Y. bit 1	**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**

Table 6-4. Data Flag code of 6531

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.2.2 ***Read Configuration*** (601x,602x,605x,606x, 6080.6531)

@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)(InputRange/OutputRange/TypeCode)(BaudRate)(DataFormat/CheckSumFalg/DataFlag)<CR>

or

?(Addr)<CR>

!	Command is invalid.	
?	Command is invalid.	
(Addr)	Address ID.	
(InputRange)	Current setting of analog voltage input, refers to Table 6-1 for details.	601x
(OutputRange)	Current setting of analog voltage output, refers to Table 6-2 for details.	602x
(TypeCode)	It always be 40 (Hex) for digital I/O modules.	605x, 606x, 6531
	Type Code represents the input mode. **(2-character)** 50: counter input mode 51: frequency input mode	6080
(BaudRate)	Define communication baud rate, refers to Table 6-3 for details. **(2-character)**	
(DataFormat)	Current settings of checksum, integration time and output data format, refers to Figure 6-1 for details.	601x
	Current settings of checksum, integration time and output data format, refers to Figure 6-2 for details.	602x
(CheckSumFlag)	Current setting of check-sum flag, refer to Figure 6-5 for details. **(2-character)**	605x
	Current setting of check-sum flag, refer to Figure 6-4 for details. **(2-character)**	6080

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

(DataFlag)	Current setting of module setting and RS-232 configuration refer to Table 6-4 for details. **(4-character, WXYZ)**	6531

@Example 1 <ND-601x>

User command:	$302<CR>
Response:	!30050600<CR>

!	Command is valid.
30	Address ID.
05	Analog input range is ±2.5 V.
06	Baud rate is 9600 bps.
00	checksum is disable.

@Example 2 <ND-602x>

User command:	$182<CR>
Response:	!18320610<CR>

!	Command is valid.
18	Address ID.
32	Analog output range is 0 to 10V
06	Baud rate is 9600 bps.
10	The output data is in engineering units, slew rate is 1mA/sec, checksum is disable.

@Example 3 <ND-605x>

User command:	$302<CR>
Response:	!30400600<CR>

!	Command is valid.
30	Address ID.
40	Digital I/O module.
06	Baud rate is 9600 bps.
00	checksum is disable.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

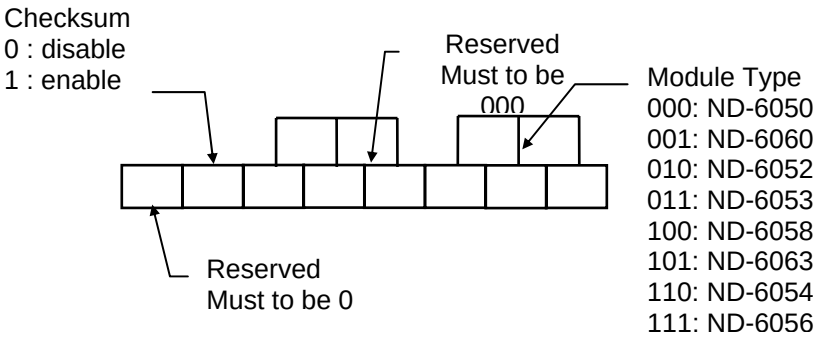


Figure 6-5 Response of check sum flag

@Example 4 <ND-6080>

User command:	$302<CR>
Response:	!30500600<CR>

!	Command is valid.
30	Address ID.
50	Counter Input Mode.
06	Baud rate is 9600 bps.
00	checksum is disable, frequency gate is 0.1 second.

@Example 5 <ND-6531>

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

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.2.3 Read Module Name

(601x,602x,605x,606x,6080,6531)

@Description

Read NuDAM 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:	!306050<CR>

!	Command is valid
30	Address.
6050	ND-6050 (Digital I/O module).

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.2.4 Read Firmware Version (601x,602x,605x,606x,6080,6531)

@Description

Read firmware version of NuDAM at specified address.

@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:	$18F<CR>
Response:	!18A2.30<CR>

!	Command is valid.
18	Address ID is 18 (Hex).
A2.30	Firmware Version

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.2.5 Reset Status

(601x,602x,605x,606x,6080,6531)

@Description

Read the reset status of module at specified address to check whether if 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:	$185<CR>
Response:	!180<CR>

Status is 0 means this digital I/O module has not been reset, since the last reset status command was issued.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.2.6 Soft Reset

(601x,602x,605x,606x,6080,6531)

@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>

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.3.1 Read Analog Data

@Description

Read the analog input value from an analog input module at specified address in a NuDAM network. While for ND-6013, it returns the channel 0 analog data.

@Syntax

#(Addr)<CR>

#	Command leading code
(Addr)	Address ID

@Response

>(InputData)<CR>

>	Delimiter character
(InputData)	The input data represents the analog signal. The unit of the digits depends on the data format used. There are four types of data format. The format is set by the set configuration command. Delimiter character

@Example

User command:	#06<CR>
Response:	>+1.6888<CR>

Read the analog input module data at address 06 (Hex). The analog input module response data is +1.6888 units. The unit depends on the data format.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.3.2 Offset Calibration to each Channel (6013[14])

@Description

To correct the offset errors of AD converter by using the offset calibration.

@Syntax

$(Addr)1(Channel No)<CR>

$	Command leading code
(Addr)	Address ID
1	Offset calibration.
(Channel No)	Channel for calibration.(1 character)0~2

@Response

!(Addr)<CR>

or

?(Addr)<CR>

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

@Example

User command:	$0612<CR>
Response:	!06<CR>

To perform the offset calibration for analog input module ND-6013 channel 2 at specified address 06 (Hex).

Note: *To perform the calibration, a proper input signal should be connected to the analog input module. Different input range have different input voltage, detail refer chapter 9 "**Calibration**" .*

Note[14] **:** *For 6013 F/W version A3.05~A4.60*

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.3.3 Span Calibration to each Channel (6013(14))

@Description

To correct the gain errors of AD converter by using the span calibration.

@Syntax

$(Addr)0(Channel No)<CR>

$	Command leading code (1 character)
(Addr)	Address ID (2 character)
0	Span calibration (1 character)
(Channel No)	Channel for Calibration (1 character) 0~2

@Response

!(Addr)<CR>

or

?(Addr)<CR>

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

@Example

User command:	$0601<CR>
Response:	!06<CR>

To perform the span calibration for analog input module ND-6013 channel 1, address ID is 06H.

Note: *To perform the calibration, a proper input signal should be connected to the analog input module. Different input range have different input voltage, detail refer chapter 9 "**Calibration**" .*

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.3.4 Read Analog Data From Channel N (6013, 6017, 6018)

@Description

Read the analog input value of a specified AD channel from an analog input module at specified address in a NuDAM network.

@Syntax

#(Addr)(ChannelNo)<CR>

#	Command leading code. (1-character)
(Addr)	Address ID. (2-character)
(ChannelNo)	Channel number, range (0 - 7). (1-character) Range (0-2). For ND-6013

@Response

>(InputData)<CR>

>	Delimiter character
(InputData)	Input value from a specified channel number, the data format is a + or - sign with five decimal digits and a fixed decimal point.

@Example

User command:	#061<CR>
Response:	>+1.6888<CR>

Read the analog input channel 1 of AD module at address 06 (Hexadecimal) in the network. The analog input data is +1.6888 Volts (Data format is engineering unit)

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.3.5 Read All Analog Data Channel (6013, 6017, 6018)

@Description

Read all the enable analog input channel value of a specified from an analog input module at specified address in a NuDAM network.

@Syntax

#(Addr)A<CR>

#	Command leading code. (1-character)
(Addr)	Address ID. (2-character)
A	All the enable channel

@Response

>(InputData)(InputData)(InputData)<CR>

>	Delimiter character
(InputData)	Input value from a specified channel number, the data format is a + or - sign with five decimal digits and a fixed decimal point.

@Example

User command:	#06A<CR>
Response:	>+100.88+020.66+006.79<CR>

Read the analog input of AD module at address 06 (Hexadecimal) in the network. The analog input data are +100.88 °C for channel 0, +020.66 °C for channel 1 and +006.79°C for channel 3. (Data format is engineering unit).

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.3.6 Enable/Disable channels for Multiplexing (6013, 6017, 6018)

@Description

Enable/Disable multiplexing simultaneously for individual channel.

@Syntax

$(Addr)5(ChannelVal)<CR>

$	Command leading code. (1-character)
(Addr)	Address ID (2-character)
5	Enable/Disable channel. (1-character)
(ChannelVal)	bit 3~0 of 1st character: control channel 7 - 4. bit 3~0 of 2nd character: control channel 3 - 0. bit value 0: Disable channel bit value 1: Enable channel (2-character)

@Response

!(Addr)<CR>

or

?(Addr)<CR>

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

@Example

User command:	$06548<CR>
Response:	!06<CR>

$	Command leading code.
06	Address ID.
5	Disable/Enable channel.
48	Channel Value is 0x48. '48' is 01001000 that means enable channel 3 and channel 6, the other channels are all disable.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.3.7 Read Channel Status (6013, 6017, 6018)

@Description

Read the enable/disable status the channels of ND-6013, ND-6017 or 6018.

@Syntax

$(Addr)6<CR>

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

@Response

!(Addr)(ChannelVal)<CR>

or

?(Addr)<CR>

!	Command is invalid.
?	Command is invalid.
(Addr)	Address ID.
(ChannelVal)	bit 3~0 of 1st character: controlt channel 7 - 4. bit 3~0 of 2nd character: control channel 3 - 0. bit value 0: Disable channel bit value 1: Enable channel **(2-character)**

@Example

User command:	$066<CR>
Response:	!0648<CR>

4 is equals binary 0100 that means enable channel 6 and disable channel 7, 5, 4.
8 is equals binary 1000 that means enable channel 3 and disable channel 2, 1, 0.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.3.8 Read CJC Status (6018)

@Description

Read the CJC (Cold Junction Compensation) sensors data.

@Syntax

$(Addr)3<CR>

$	Command leading code.
(Addr)	Address ID
3	Read CJC status.

@Response

>(Data)<CR>

or

?(Addr)<CR>

>	Command is invalid.
(Data)	CJC sensor's data. Data format is engineering units. (an + or - sign with five decimal digits and a decimal fixed point. The resolution is 0.1°C
?	Command is invalid.
(Addr)	Address ID.

@Example

User command:	$063<CR>
Response:	>+0037.9<CR>

This command is to read analog input module CJC status at address 06H, return data is 37.9°C.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.3.9 Enable/Disable CJC (6018)

@Description

To disable/enable CJC of ND-6011/D and ND-6018

@Syntax

$(Addr)C(Status)<CR>

$	Command leading code (1 character)
(Addr)	Address ID (2 character)
C	Disable/enable CJC command (1 character)
(Status)	0: Disable 1: Enable

@Response

!(Addr)<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr))	Address ID (2 character)

@Example

User command:	$02C1<CR>
Response:	!02<CR>

To enable CJC and module's address is 02H.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.3.10 Read enable/disable CJC Status (6018)

@Description

To read CJC disable/enable status of ND-6018

@Syntax

$(Addr)D<CR>

$	Command leading code (1 character)
(Addr)	Address ID (2 character)
D	Read CJC disable/enable staus command (1 character)

@Response

!(Addr)(Status)<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Status)	0: Disable 1: Enable

@Example

User command:	$02D<CR>
Response:	!021<CR>

To read CJC disable/enable status, and module's address is 02H., the CJC is enable.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.3.11 CJC Offset Calibration (6018)

@Description

To correct the CJC offset errors use CJC (Cold Junction Compensation) offset calibration.

@Syntax

$(Addr)9(Counts)<CR>

$	Command leading code
(Addr)	Address ID
9	CJC offset calibration.
(Counts)	It is a 4-characters (Hexadecimal) with a sign + or -, range is 0000 to FFFF, each count equals approximately 0.0153°C. Example: +0042 = 4x16 + 2 = 66 66 * 0.0153°C = 1.009°C

@Response

!(Addr)<CR>

or

?(Addr)<CR>

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

@Example

User command:	$089+0042<CR>
Response:	!08<CR>

CJC offset calibration at address 08H. The calibrated offset temperature is +0042(Hex) = 66, 66 x 0.0153°C = 1.009°C

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.3.12 Span Calibration (6013, 6017, 6018)

@Description

To correct the gain errors of AD converter by using the span calibration.

@Syntax

$(Addr)0<CR>

$	Command leading code (1 character)
(Addr)	Address ID (2 character)
0	Span calibration (1 character)

@Response

!(Addr)<CR>

or

?(Addr)<CR>

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

@Example

User command:	$060<CR>
Response:	!06<CR>

To perform the span calibration for analog input module, address ID is 06H.

Note: To perform the calibration, a proper input signal should be connected to the analog input module. Different input range have different input voltage, detail refer chapter 5 "**Calibration**".

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.3.13 Offset Calibration (6013, 6017, 6018)

@Description

To correct the offset errors of AD converter by using the offset calibration.

@Syntax

$(Addr)1<CR>

$	Command leading code
(Addr)	Address ID
1	Offset calibration.

@Response

!(Addr)<CR>

or

?(Addr)<CR>

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

@Example

User command:	$061<CR>
Response:	!06<CR>

To perform the offset calibration for analog input module at specified address 06 (Hex).

Note: To perform the calibration, a proper input signal should be connected to the analog input module. Different input range have different input voltage, detail refer chapter 5 “**Calibration**” .

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.4.1 Synchronized Sampling

@Description

Synchronized all modules to sample input values and stored the values in the module's register at the same time and use "Read Synchronized Data" command to read the data and process it one by one.

For analog output module, this command is only available to modules involving the digital input function, such as NuDAM-6024.

@Syntax

#**<CR>

#	Command leading code.
**	Synchronized sampling command

@Response

Note : Synchronized sampling command **has NO response**.

@Example

User command: #**<CR>

Synchronized sampling command **has no response**.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.4.2 Read Synchronized Data

@Description

After a synchronized sampling command **#**** was issued, you can read the input value that was stored in the addressed module's register and use same method to process other module's data one by one.

@Syntax

$(Addr)9<CR>

$	Command leading code.
(Addr)	Address ID.
9	Read synchronized data.

@Response

!(Status)(DataIn)<CR>

or

?(Addr)<CR>

>	Command is valid.
?	Command is invalid.
(Status)	0 : Data has been sent at least once before. 1 : Data has been sent for the first time since a synchronized sampling command was issued.(1-character)
(DataIn)	Value of digital input channel. (2-character).

@Examples

User command:	$309<CR>
Response:	>17F<CR>

>	Command is valid.
1	Data has not been sent before.
7F	7F(01111111) means digital input channel 0,1,2,3,4,5,6 are HIGH.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.4.3 Digital Input

@Description

Read the digital input channel value.

@Syntax

$(Addr)8<CR>

$	Command leading code.
(Addr)	Address ID
8	Digital data input command.

@Response

!(DataIn)0000<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(DataIn)	Value of digital input. (2-character)

@Example

User command:	$308<CR>
Response:	!320000<CR>

!	Command is valid.
32	32 (00110010) means digital output channel 1, 4, 5 are ON, channel 0, 2, 3, 6 are OFF.
0000	No used

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.4.4 Analog Data Output (602x)

@Description

Send a value to analog output module at specified address. The data format of the value can be engineering unit, percent, or hexdecimal value, which is set by configuration setting command.
(ND-6024 only supports engineering format.)

@Syntax

#(Addr)(OutData)<CR> (6021 Only)

#(Addr)(Port)(OutData)<CR> (6024 Only)

#	Command leading code. (1-character)
(Addr)	Address ID. (2-character)
(Port)	A, B, C or D
(OutData)	Value of the analog output signal,. The unit of the value can be engineering units, % of FSR, or hexadecimal value. Refers to chapter 4 for details of the data format.

@Response

<CR>
or
?(Addr)<CR>

>	Command is valid.
?	Command is invalid or no synchronized sampling command was issued.
(Addr)	Address ID.

@Examples

User command:	#0616.000<CR>
Response:	><CR>

The command sets the analog output to be 16 mA at address 06H, if the data format is configured as engineering units and 0~20mA output range.

User command:	#08+020.00<CR>
Response:	><CR>

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

The command sets the analog output to be 4 mA at address 08H, if the data format is configured as % of FSR and 0~20mA output range.

4mA = 20mA x 20.00%

User command:	#097FF<CR>
Response:	><CR>

The command sets the analog output to be 5 V at address 09H, if the data format is configured as hexdecimal format and output range of 0~10V.

5 V = 7FF / FFF x 10V

User command:	#08A-05.000<CR>
Response:	><CR>

The command sets the analog output port A to be –5 V at address 08H.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

(6021)

6.4.5 4mA Offset Calibration

@Description

Stores the current output value as 4 mA reference at the specified analog output module.(only 6021)

@Syntax

$(Addr)0<CR>

$	Command leading code
(Addr)	Address ID
0	Command Code

@Response

!(Addr)<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid or no synchronized sampling command was issued.
(Addr)	Address ID.

@Example

User command:	$060<CR>
Response:	!06<CR>

To perform the 4 mA calibartion for analog output module at address 06H.

Note : Analog output module should be trimmed to the correct value by “Trim Calibration” command before to execute “4 mA Calibration”. Refers to Chapter 5 “Analog Output Calibration” for details.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.4.6 20mA Calibration

@Description

Stores the current output value as 20 mA reference at the specified analog output module. (only 6021)

@Syntax

$(Addr)1<CR>

$	Command leading code (1 character)
(Addr)	Address ID (2 characters)
1	Function Code, 20 mA calibration (1 character)

@Response

!(Addr)<CR>

or

?(Addr)<CR>

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

@Example

User command:	$061<CR>
Response:	!06<CR>

To perform the 20 mA calibration for analog input module at address ID 06H.

Note : *Analog output module should be trimmed to the correct value by "Trim Calibration" command before to execute "20 mA Calibration". Refers to Chapter 9 "Analog Output Calibration" for details .*

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.4.7 Trim Calibration

@Description

Trims the specified analog output module a specified number of units up or down.

@Syntax

$(Addr)3(Counts)<CR>

$	Command leading code
(Addr)	Address ID
3	Function Code
(Counts)	Number of counts to increase or decrease the output current. Range 00 - 5F : 0 to +95 counts (increase) Range A1 - FF : -95 to -1 counts (decrease) 1 count equals approximately 4.88μA or 2.44mV (4.88mV for ND-6024)

@Response

!(Addr)<CR>

or

?(Addr)<CR>

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

@Example

User command:	$06314<CR>
Response:	!06<CR>

Increase analog output value about 97.6μA (14H * 4.88μA = 97.6μA) at address 06H.

Note : *Analog output module trim calibration should have a corrent calibration wiring. Refers to Chapter 9 "Analog Output Calibration" for details.*

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.4.8 Last Value Readback

@Description

Return the latest analog output value which is set by “Analog Data Out” command. If the analog output module never execute the “Analog Data Out” command then it return the start-up output value. (only 6021)

@Syntax

$(Addr)6<CR> (only 6021)

$(Addr)6(Port)<CR> (6024 Only)

$	Command leading code. (1-character)
(Addr)	Address ID. (2-character)
6	Function code of last value readback. (1-character)
(Port)	Port A, B, C or D.

@Response

!(Addr)(Data)<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr)	Address ID.
(Data)	The current analog output value, the data format depends on module configuration.

@Example

User command:	$086<CR>
Response:	!0802.000<CR>

This analog output module return the latest output value is 2.000 mA at address 08H, if data format is engineering units and the signal range is 0~20mA.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.4.9 Current Readback

@Description

Read the estimated current output value at the specified analog output module.

@Syntax

$(Addr)8<CR>

$	Command leading code. (1-character)
(Addr)	Address ID. (2-character)
6	Function code of last value readback. (1-character)

@Response

!(Addr)(Data)<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr)	Address ID.
(Data)	The current analog output value, the data format depends on module configuration.

@Example

User command:	$088<CR>
Response:	!0802.000<CR>

This analog output module return the latest output value is 2.000 mA at address 08H, if data format is engineering units and the signal range is 0~20mA.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.4.10 Save Power On Analog Output Value (602x)

@Description

Save the current output value to the non-volatile register for NuDAM analog output module. The power on value be put on the output channel when system power ON.

@Syntax

$(Addr)4<CR>

$	Command leading code. (1-character)
(Addr)	Address ID. (2-character)
4	Function code of saving power on analog value. (1-character)

@Response

!(Addr)<CR>

or

?(Addr)<CR>

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

@Example

User command:	$064<CR>
Response:	!06<CR>

Save the current analog output value as the default value when the analog output module start-up.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.5.1 Synchronized Sampling

(6050, 6052, 6053, 6054,6058, 6060)

@Description

Synchronized all modules to sample input values and stored the values in the module's register at the same time and use "Read Synchronized Data" command to read the data and process it one by one.

For digital I/O module, this command is only available to modules involving the digital input function, such as NuDAM-6050, NuDAM-6052, NuDAM-6053, NuDAM-6054, NuDAM-6058 and NuDAM-6060.

@Syntax

#**<CR>

#	Command leading code.
**	Synchronized sampling command

@Response

Note : *Synchronized sampling command **has NO response**.*

@Example

User command: #**<CR>

Synchronized sampling command **has no response**.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.5.2 Read Synchronized Data (6050, 6052, 6053, 6054,6058, 6060)

@Description

After a synchronized sampling command **#**** was issued, you can read the input value that was stored in the addressed module's register and use same method to process other module's data one by one.

@Syntax

$(Addr)4<CR>

$	Command leading code.
(Addr)	Address ID.
4	Read synchronized data.

@Response

ND-6050 module response :

!(Status)(DataOut)(DataIn)00<CR>

ND-6052 module response :

!(Status)(DataIn)0000<CR>

ND-6053 module response :

!(Status)(DataInH)(DataInL)00<CR>

ND-6054 module response :

!(Status)(DataInH)(DataInL)00<CR>

ND-6058 module response :

!(Status)(IOFlag)(DIn)(DataInA)(DataInB)(DataInC)<CR>

ND-6060 module response :

!(Status)(DataOut)(DataIn)00<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

(Status)	0 : Data has been sent at least once before. 1 : Data has been sent for the first time since asynchronized sampling command was issued.(1-character)
(IOFlag)	Status of programmable I/O 0x00: A(O/P) B(O/P) CH(O/P) CL(O/P) 0x01: A(O/P) B(O/P) CH(O/P) CL(I/P) 0x02: A(O/P) B(O/P) CH(I/P) CL(O/P) 0x03: A(O/P) B(O/P) CH(I/P) CL(I/P) 0x04: A(O/P) B(I/P) CH(O/P) CL(O/P) 0x05: A(O/P) B(I/P) CH(O/P) CL(I/P) 0x06: A(O/P) B(I/P) CH(I/P) CL(O/P) 0x07: A(O/P) B(I/P) CH(I/P) CL(I/P) 0x08: A(I/P) B(O/P) CH(O/P) CL(O/P) 0x09: A(I/P) B(O/P) CH(O/P) CL(I/P) 0x0A: A(I/P) B(O/P) CH(I/P) CL(O/P) 0x0B: A(I/P) B(O/P) CH(I/P) CL(I/P) 0x0C: A(I/P) B(I/P) CH(O/P) CL(O/P) 0x0D: A(I/P) B(I/P) CH(O/P) CL(I/P) 0x0E: A(I/P) B(I/P) CH(I/P) CL(O/P) 0x0F: A(I/P) B(I/P) CH(I/P) CL(I/P) *I/P input mode, O/P output mode.
(DataOut)	Value of digital output channel. **(2-character)**
(DataIn)	Value of digital input channel. **(2-character)**
(DIn)	Value of dedicated digital input channel 3-0 for ND-6058. The first character is 0 **(2-character)**
(DataInH)	Value of digital input channel 15-8 **(2-character)**
(DataInL)	Value of digital input channel 7-0 **(2-character)**
(DataInA)	Value of port A channel 7-0 **(2-character)**
(DataInB)	Value of port B channel 7-0 **(2-character)**
(DataInC)	Value of port C channel 7-0 **(2-character)**

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

@Examples <ND-6050>

User command:	$304<CR>
Response:	!1065200<CR>

!	Command is valid.
1	Data has not been sent before.
06	06 (00000110) means digital output channel 1,2 are ON, channel 0,3,4,5,6,7 are OFF.
52	52(01010010) means digital input channel 1,4, 6 are HIGH, channel 0,2,3,5,7 are LOW..

@Examples <ND-6058>

User command:	$304<CR>
Response:	!10C0F010203<CR>

!	Command is valid.
1	Data has not been sent before.
0C	Port A and B are input mode, high and low half byte of port C are output mode.
0F	Channel 0,1,2,3 of digital input is HIGH.
01	01 (00000001) means port A digital input channel 0 is HIGH, others are LOW.
02	02 (00000010) means port B digital input channel 1 is HIGH, others are LOW.
03	03 (00000011) mean port C digital output channel 0,1 are ON, others are OFF.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.5.3 Digital Output

(6050,6056,6058, 6060,6063,6067)

@Description

Set digital output channel value at specified address. This command is only available to modules involving the digital output function.

@Syntax

#(Addr)(ChannelNo)(OutData)<CR>

#(Addr)T(OutDataH)(OutDataL)<CR> (6056 only)

#(Addr)T(OutDataA)(OutDataB)(OutDataC)<CR> (6058 only)

#(Addr)(Port)(OutData1)<CR> (6056, 6058 only)

#	Command leading code. **(1-character)**
(Addr)	Address ID (2-character)
T	Set value to all channels
(ChannelNo)	00 : Set value to all channels 1X : Set value to single channel First character is 1, Second character is channel number. **(2-character)**
(OutData)	Set value to all channels : Each bit is mapping to each channel number Set value to single channel : First character is 0, second character is set to value 0 or 1. **(2-character)**
(OutDataH)	Each bit is mapping to each channel number from 14 to 8. (2-character)
(OutDataL)	Each bit is mapping to each channel number from 7 to 0. (2-character)
(OutDataA)	Output data for port A. Each bit is mapping to each channel number from 7 to 0. (2-character)
(OutDataB)	Output data for port B. Each bit is mapping to each channel number from 7 to 0. (2-character)
(OutDataC)	Output data for port C. Each bit is mapping to each channel number from 7 to 0. (2-character)
(Port)	Set value to indivisual port **0H:** for 6056 channel 14 to 8 **0L:** for 6056 channel 7 to 0 **0A:** for 6058 port A **0B:** for 6058 port B **0C:** for 6058 port C (2-character)

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

(OutData1)	Each bit is mapping to each channel number (2-character)

* if the port of ND-6058 is in input mode, output data to this port will be ignore

@Response

<CR>
or
?(Addr)<CR>

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

@Example 1 <ND-6063>

User command:	#300003<CR>
Response:	><CR>

30	Address ID
00	Set output to all channels
03	03 (00000011), Channel 0 and 1 are set ON other channels are set to OFF

@Example 2 <ND-6063>

User command:	#2F1201<CR>
Response:	><CR>

2F	Address ID
12	**1** : Set output to single channel **2** : Output single channel is channel 2
01	Set single channel to ON

@Example 3 <ND-6056>

User command:	#30T0303<CR>
Response:	><CR>

30	Address ID
T	Set output to all port
0303	0303 (0000001100000011), Channel 0, 1, 8 and 9 are set ON other channels are set to OFF

@Example 4 <ND-6058>

User command:	#2FT010203<CR>
Response:	><CR>

2F	Address ID
T	Set output to all port
01	Set channel 0 of port A ON

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

02	Set channel 1 of port B ON
03	Set channel 0 and 1 of port C ON

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

@Example 5 < ND-6056>

User command:	#300H03<CR>
Response:	<CR>

30	Address ID
0H	Set output to high byte
03	03 (00000011), Channel 8 and 9 are set ON other channels are set to OFF

@Example 6 < ND-6056, ND-6058>

User command:	#2F0A10<CR>
Response:	<CR>

2F	Address ID
0A	Set output to port A
10	Set channel 4 of port A ON

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.5.4 Digital Input

(6050,6052, 6053,6054, 6058,6060)

@Description

Read the digital input channel value and readback the digital output channel value.

@Syntax

$(Addr)6<CR>

$	Command leading code.
(Addr)	Address ID
6	Digital data input command.

@Response

ND-6050 module response :

!(DataOut)(DataIn)00<CR>

ND-6052 module response :

!(DataIn)0000<CR>

ND-6053 module response :

!(DataInH)(DataInL)00<CR>

ND-6054 module response :

!(DataInH)(DataInL)00<CR>

ND-6056 module response :

!(DataOutH)(DataOutL)00<CR>

ND-6058 module response :

!(IoFlag)(DataIn)(DataA)(DataB)(DataC)<CR>

ND-6060 module response :

!(DataOut)(DataIn)00<CR>

ND-6063 module response :

!(DataOutH)0000<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(DataOut)	Value of digital output channel. **(2-character)**
(DataIn)	Value of digital input. **(2-character)**
(DataInH)	Value of digital input channel 15-8. (2-character)
(DataInL)	Value of digital input channel 7-0.**(2-character)**
(DataOutH)	Value of digital output channel 15-8. (2-character)
(DataOutL)	Value of digital output channel 7-0.**(2-character)**
(DataA)	Value of digital channel 7-0.**(2-character)**
(DataB)	Value of digital channel 7-0.**(2-character)**
(DataB)	Value of digital channel 7-0.**(2-character)**

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

(IOFlag)	Status of programmable I/O 0x00: A(O/P) B(O/P) CH(O/P) CL(O/P) 0x01: A(O/P) B(O/P) CH(O/P) CL(I/P) 0x02: A(O/P) B(O/P) CH(I/P) CL(O/P) 0x03: A(O/P) B(O/P) CH(I/P) CL(I/P) 0x04: A(O/P) B(I/P) CH(O/P) CL(O/P) 0x05: A(O/P) B(I/P) CH(O/P) CL(I/P) 0x06: A(O/P) B(I/P) CH(I/P) CL(O/P) 0x07: A(O/P) B(I/P) CH(I/P) CL(I/P) 0x08: A(I/P) B(O/P) CH(O/P) CL(O/P) 0x09: A(I/P) B(O/P) CH(O/P) CL(I/P) 0x0A: A(I/P) B(O/P) CH(I/P) CL(O/P) 0x0B: A(I/P) B(O/P) CH(I/P) CL(I/P) 0x0C: A(I/P) B(I/P) CH(O/P) CL(O/P) 0x0D: A(I/P) B(I/P) CH(O/P) CL(I/P) 0x0E: A(I/P) B(I/P) CH(I/P) CL(O/P) 0x0F: A(I/P) B(I/P) CH(I/P) CL(I/P) *I/P input mode, O/P output mode.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

@Example <ND-6050>

User command:	$306<CR>
Response:	!321100<CR>

!	Command is valid.
32	32 (00110010) means digital output channel 1, 4, 5 are ON, channel 0, 2, 3, 6, 7 are OFF.
11	11 (00000011) means digital input channel 0, 1 are HIGH and channel 2, 3, 4, 5, 6, 7 are LOW.
00	No used

@Example <ND-6058>

User command:	$304<CR>
Response:	!0C0F010203<CR>

!	Command is valid.
0C	Port A and B are input mode, high and low half byte of port C are output mode.
0F	Channel 0,1,2,3 of digital input is HIGH.
01	01 (00000001) means port A digital input channel 0 is HIGH, others are LOW.
02	02 (00000010) means port B digital input channel 1 is HIGH, others are LOW.
03	03 (00000011) mean port C digital output channel 0,1 are ON, others are OFF.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.5.5 Programmable I/O Mode Setting

@Description

Set the programmable input or output mode for ND-6058.

@Syntax

$(Addr)S(IOFlag)<CR> (6058 only)

$	Command leading code.
(Addr)	Address ID
S	Set programmable I/O mode
(IOFlag)	Status of programmable I/O 0x00: A(O/P) B(O/P) CH(O/P) CL(O/P) 0x01: A(O/P) B(O/P) CH(O/P) CL(I/P) 0x02: A(O/P) B(O/P) CH(I/P) CL(O/P) 0x03: A(O/P) B(O/P) CH(I/P) CL(I/P) 0x04: A(O/P) B(I/P) CH(O/P) CL(O/P) 0x05: A(O/P) B(I/P) CH(O/P) CL(I/P) 0x06: A(O/P) B(I/P) CH(I/P) CL(O/P) 0x07: A(O/P) B(I/P) CH(I/P) CL(I/P) 0x08: A(I/P) B(O/P) CH(O/P) CL(O/P) 0x09: A(I/P) B(O/P) CH(O/P) CL(I/P) 0x0A: A(I/P) B(O/P) CH(I/P) CL(O/P) 0x0B: A(I/P) B(O/P) CH(I/P) CL(I/P) 0x0C: A(I/P) B(I/P) CH(O/P) CL(O/P) 0x0D: A(I/P) B(I/P) CH(O/P) CL(I/P) 0x0E: A(I/P) B(I/P) CH(I/P) CL(O/P) 0x0F: A(I/P) B(I/P) CH(I/P) CL(I/P) *I/P input mode, O/P output mode.

@Response

!(Addr)<CR>

or

?(Addr)<CR>

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

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

@Example

User command:	$060C<CR>
Response:	!06<CR>

!	Command is valid.
0C	Port A and B are input mode, high and low half byte of port C are output mode.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.6.1 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

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.6.2 Read RTS Status

(6531)

@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>

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.6.3 Read CTS Status

(6531)

@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>

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.6.4 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”

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.6.5 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”

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.6.6 Set Delimiter

(6531)

@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

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.6.7 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

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.6.8 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)

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.6.9 Open/Close Data Gate

(6531)

@Description

Set the ND-6531 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-6531 can be used as the ND-6520 for transparent data converter.**

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.1 Set Input Mode

@Description

Set the input signal mode of counter/frequency to either TTL or photo isolated mode.

@Syntax

$(Addr)B(InType)<CR>

$	Command leading code.
(Addr)	Address ID
B	Set input mode Command
(InType)	0: TTL input 1: photo isolated input

@Response

!(Addr)<CR>
or
?(Addr)<CR>

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

@Example

User command:	$30B0<CR>
Response:	!30<CR>

Item	Meaning	Description
$	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
B		Set Input mode.
0	(InType)	TTL input.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.2 Read Input Mode

@Description

Read the input signal mode of counter/frequency module.

@Syntax

$(Addr)B<CR>

$	Command leading code.
(Addr)	Address ID
B	Read input mode Command

@Response

!(Addr)(InType)<CR>
or
?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr)	Address ID.
(InType)	0: TTL input mode. 1: Photo isolated input mode.

@Example

User command:	$30B<CR>
Response:	!301<CR>

!	Command is valid.
30	Address
1	Photo isolated input.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.3 Read Counter/Frequency Value in HEX Format (6080)

@Description

Read the Counter/Frequency module of counter 0 or 1 and return the acquired data in hexadecimal format.

@Syntax

#(Addr)(CounterNo)<CR>

#	Command leading code. **(1-character)**
(Addr)	Address ID **(2-character)**
(CounterNo)	0: Counter 0. 1: Counter 1. **(1-character)**

@Response

>Data<CR>
or
?(Addr)<CR>

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

@Example

User command:	#300<CR>
Response:	>0000FFFF<CR>

30	Address ID
0	Read counter 0 value
0000FFFF	Return value 0x0000FFFF = 65,535

User command:	#2F1<CR>
Response:	>00001234<CR>

2F	Address ID
1	Read Counter 1 Value
00001234	Return value 0x00001234 = 4,660

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.4 Read Counter/Frequency Value in DEC Format (6080)

@Description

Read the Counter/Frequency module of counter 0 or 1 and return the acquired data in decimal format.

@Syntax

#(Addr)(CounterNo)D<CR>

#	Command leading code. **(1-character)**
(Addr)	Address ID **(2-character)**
(CounterNo)	0: Counter 0. 1: Counter 1. **(1-character)**
D	Decimal command code.

@Response

>Data<CR>
or
?(Addr)<CR>

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

@Example

User command:	#300<CR>
Response:	>0000065535<CR>

30	Address ID
0	Read counter 0 value
0000065535	Return value 65535

User command:	#2F1<CR>
Response:	>0000001234<CR>

2F	Address ID
1	Read Counter 1 Value
0000001234	Return value 1234

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.5 Set Gate Mode

@Description

Set the counter input module's gate control to either high, low or disable.

@Syntax

$(Addr)A(Gmode)<CR>

$	Command leading code.
(Addr)	Address ID **(2-character)**
A	Gate command code
(Gmode)	0: the gate is low 1: the gate is high 2: the gate is disable

@Response

!(Addr)<CR>
or
?(Addr)<CR>

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

@Example

User command: $30A0<CR>
Response: !30<CR>

Item	Meaning	Description
$	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
A		Set gate mode.
0	(Gmode)	The gate is low.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.6 Read Gate Mode

@Description

Read the counter input module's gate status.

@Syntax

$(Addr)A<CR>

$	Command leading code.
(Addr)	Address ID **(2-character)**
A	Gate command code

@Response

!(Addr)(Gmode)<CR>
or
?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr)	Address ID.
(Gmode)	0: the gate is low 1: the gate is high 2: the gate is disable

@Example

User command:	$30A<CR>
Response:	!301<CR>

Item	Meaning	Description
$	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
A		Set gate mode.

!	Command is valid.
30	Address of counter/frequency module.
1	The gate is high.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.7 Set Maximum Counter Value

@Description

Set the maximum counter value of counter 0 or counter 1.

@Syntax

$(Addr)3(CounterNo)(MaxData)<CR>

$	Command leading code.
(Addr)	Address ID (2-character)
3	Maximum counter value command.
(CounterNo)	0: counter 0 1: counter 1
(MaxData)	The maximum counter value which consists of 8 hexadecimal digits. When counting value exceeds the maximum counter value, an overflow flag status will set.

@Response

!(Addr)<CR>

or

?(Addr)<CR>

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

@Example

User command:	$303000010000<CR>
Response:	!30<CR>

Item	Meaning	Description
$	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
3		Set maximum counter value.
0	(CounterNo)	Counter 0.
00010000	(MaxData)	65536(0x00010000)

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.8 Read Maximum Counter Value

@Description

Read the maximum counter value of counter 0 or counter 1.

@Syntax

$(Addr)3(CounterNo)<CR>

$	Command leading code.
(Addr)	Address ID (2-character)
3	Maximum counter value command code
(CounterNo)	0: counter 0 1: counter 1

@Response

!(Addr)(MaxData)<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr)	Address ID.
(MaxData)	The maximum counter value which consists of 8 hexadecimal digits.

@Example

User command:	$3031<CR>
Response:	!3000001234<CR>

Item	Meaning	Description
$	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
3		Read maximum counter value.
1	(CounterNo)	Counter 1.

!	Command is valid.
30	Address of counter/frequency module.
00001234	4660(0x00001234).

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.9 Set Initial Count Value

@Description

Set the initial count value of counter 0 or counter 1.

@Syntax

$(Addr)P(CounterNo)(IniData)<CR>

$	Command leading code.
(Addr)	Address ID (2-character)
P	Set initial count value command code.
(CounterNo)	0: counter 0 1: counter 1
(IniData)	The initial count value which consists of 8 hexadecimal digits.

@Response

!(Addr)<CR>

or

?(Addr)<CR>

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

@Example

User command: $30P000000100<CR>
Response: !30<CR>

Item	Meaning	Description
$	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
P		Set initial count value.
0	(CounterNo)	Counter 0.
00000100	(IniData)	256(0x00000100)

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.10 Read Initial Count Value

@Description

Read the initial count value of counter 0 or counter 1.

@Syntax

$(Addr)G(CounterNo)<CR>

$	Command leading code.
(Addr)	Address ID (2-character)
G	Read initial counter value command code
(CounterNo)	0: counter 0 1: counter 1

@Response

!(Addr)(IniData)<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr)	Address ID.
(IniData)	The initial count value which consists of 8 hexadecimal digits.

@Example

User command:	$30G1<CR>
Response:	!30000000FF<CR>

Item	Meaning	Description
$	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
G		Read initial count value.
1	(CounterNo)	Counter 1.

!	Command is valid.
30	Address of counter/frequency module.
000000FF	255(0x000000FF).

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.11 Start/Stop Counter

@Description

Start or stop counting of counter 0 or counter 1.

@Syntax

$(Addr)5(CounterNo)(SStatus)<CR>

$	Command leading code.
(Addr)	Address ID (2-character)
5	Start/stop counter command code.
(CounterNo)	0: counter 0 1: counter 1
(SStatus)	0: stop counting 1: start counting

@Response

!(Addr)<CR>

or

?(Addr)<CR>

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

@Example

User command: $30501<CR>
Response: !30<CR>

Item	Meaning	Description
$	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
5		Start/stop counting command.
0	(CounterNo)	Counter 0.
1	(SStatus)	Start counting.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.12 Read Start/Stop Counter Status

@Description

Read the status of counter 0 or counter 1 for its active or inactive condition.

@Syntax

$(Addr)5(CounterNo)<CR>

$	Command leading code.
(Addr)	Address ID (2-character)
5	Start/stop counter command code.
(CounterNo)	0: counter 0 1: counter 1

@Response

!(Addr)(SStatus)<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr)	Address ID.
(Sstatus)	0: stop counting 1: start counting

@Example

User command:	$3050<CR>
Response:	!301<CR>

!	Command is valid.
30	Address of counter/frequency module.
1	Counter 0 is counting.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.13 Clear Counter

@Description

Clear the value of counter 0 or counter 1.

@Syntax

$(Addr)6(CounterNo)<CR>

$	Command leading code.
(Addr)	Address ID (2-character)
6	Clear counter command code.
(CounterNo)	0: counter 0 1: counter 1

@Response

!(Addr)<CR>
or
?(Addr)<CR>

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

@Example

User command:	$3060<CR>
Response:	!30<CR>

Item	Meaning	Description
$	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
6		Clear counter command code.
0	(CounterNo)	Counter 0.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.14 Read then Clear Overflow Flag

@Description

Read the status of the overflow flag of counter 0 or counter 1, and then clear the flag afterward.

@Syntax

$(Addr)7(CounterNo)<CR>

$	Command leading code.
(Addr)	Address ID (2-character)
7	Read then clear overflow command code.
(CounterNo)	0: counter 0 1: counter 1

@Response

!(Addr)(OFlag)<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr)	Address ID.
(OFlag)	0: the overflow flag has not been set 1: the counting value has exceeded the maximum count, the overflow flag has been set.

*** After executing the command, the overflow flag will clear to zero if it has been set.**

@Example

User command:	$3070<CR>
Response:	!301<CR>

Item	Meaning	Description
$	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
7		Read counter overflow command code.
0	(CounterNo)	Counter 0.

!	Command is valid.
30	Address of counter/frequency module.
1	Counter 0 is overflowed.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.15 Enable/Disable Digital Filter

(6080)

@Description

Enable or disable the digital filter function.

@Syntax

$(Addr)4(FStatus)<CR>

$	Command leading code.
(Addr)	Address ID (2-character)
4	Enable/Disable filter command code.
(FStatus)	0: disable filter 1: enable filter

@Response

!(Addr)<CR>
or
?(Addr)<CR>

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

@Example

User command:	$3040<CR>
Response:	!30<CR>

Item	Meaning	Description
$	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
4		Enable/Disable filter command.
0	(FStatus)	Disable filter.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.16 Read Filter Status

@Description

Read the digital filter enable/disable status.

@Syntax

$(Addr)4<CR>

$	Command leading code.
(Addr)	Address ID (2-character)
4	Enable/Disable filter command code.

@Response

!(Addr)(FStatus)<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr)	Address ID.
(FStatus)	0: disable filter 1: enable filter

@Example

User command:	$304<CR>
Response:	!301<CR>

Item	Meaning	Description
$	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
4		Enable/Disable filter command.

!	Command is valid.
30	Address of counter/frequency module.
1	Digital filter is enable.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.17 Set Minimum Input Signal Width at High Level

(6080)

@Description

Set the minimum input signal width at high level, for signal level high less then this value will be filtered out as noise.

@Syntax

$(Addr)0H(MinFData)<CR>

$	Command leading code.
(Addr)	Address ID (2-character)
0H	Set minimum input signal width at high level command code.
(MinFData)	The minimum width data at high level. The unit is μs and its resolution is 1 μs. This value range from 4 μs to 1020 μs, which is a 4-digit integer. (4-character)

@Response

!(Addr)<CR>

or

?(Addr)<CR>

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

@Example

User command: $300H0100<CR>
Response: !30<CR>

Item	Meaning	Description
$	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
0H		Set minimum input signal width.
0100	(MinFData)	100 μs

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.18 Read Minimum Input Signal Width at High Level (6080)

@Description

Read the minimum input signal width at high level.

@Syntax

$(Addr)0H<CR>

$	Command leading code.
(Addr)	Address ID (2-character)
0H	Set minimum input signal width at high level command code.

@Response

!(Addr)(MinFData)<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr)	Address ID.
(MinFData)	The minimum width data at high level. The unit is μs and its resolution is 1 μs. This value range from 4 μs to 1020 μs, which is a 4-digit integer.

@Example

User command:	$300H<CR>
Response:	!300100<CR>

Item	Meaning	Description
$	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
0H		Set minimum input signal width.

!	Command is valid.
30	Address of counter/frequency module.
0100	Digital filter value of minimum signal width at high level is 100 μs.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.19 Set Minimum Input Signal Width at Low Level (6080)

@Description

Set the minimum input signal width at low level, for signal level low less then this value will be filtered out as noise.

@Syntax

$(Addr)0L(MinFData)<CR>

$	Command leading code.
(Addr)	Address ID (2-character)
0L	Set minimum input signal width at low level command code.
(MinFData)	The minimum width data at low level. The unit is μs and its resolution is 1 μs. This value range from 4 μs to 1020 μs, which is a 4-digit integer. (4-character)

@Response

!(Addr)<CR>

or

?(Addr)<CR>

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

@Example

User command: $300L0010<CR>
Response: !30<CR>

Item	Meaning	Description
$	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
0L		Set minimum input signal width.
0010	(MinFData)	10 μs

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.20 Read Minimum Input Signal Width at Low Level (6080)

@Description

Read the minimum input signal width at low level.

@Syntax

$(Addr)0L<CR>

$	Command leading code.
(Addr)	Address ID (2-character)
0L	Set minimum input signal width at low level command code.

@Response

!(Addr)(MinFData)<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr)	Address ID.
(MinFData)	The minimum width data at low level. The unit is μs and its resolution is 1 μs. This value range from 4 μs to 1020 μs, which is a 4-digit integer.

@Example

User command:	$300L<CR>
Response:	!300010<CR>

Item	Meaning	Description
$	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
0L		Set minimum input signal width.

!	Command is valid.
30	Address of counter/frequency module.
0010	Digital filter value of minimum signal width at low level is 10 μs.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.21 Set TTL Input High Trigger Level (6080)

@Description

Set the TTL input high trigger level, for voltage level higher than this value is recognized as logic high.

@Syntax

$(Addr)1H(ThData)<CR>

$	Command leading code.
(Addr)	Address ID (2-character)
1H	TTL input high trigger level command code.
(ThData)	The high trigger level for TTL input. The unit is 0.1 V and its resolution is 0.1 V too. This value range from 0.1 to 5V, which is a 2-digit integer.

@Response

!(Addr)<CR>

or

?(Addr)<CR>

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

@Example

User command: $301H30<CR>
Response: !30<CR>

Item	Meaning	Description
$	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
1H		Set TTL input high trigger level.
30	(ThData)	3 V

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.22 Read TTL Input High Trigger Level (6080)

@Description

Read the TTL input high trigger level.

@Syntax

$(Addr)1H<CR>

$	Command leading code.
(Addr)	Address ID (2-character)
1H	TTL input high trigger level command code.

@Response

!(Addr)(ThData)<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr)	Address ID.
(ThData)	The high trigger level for TTL input. The unit is 0.1 V and its resolution is 0.1 V too. This value range from 0.1 to 5V, which is a 2-digit integer.

@Example

User command:	$301H<CR>
Response:	!3024<CR>

Item	Meaning	Description
$	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
1H		Read TTL input high trigger level.

!	Command is valid.
30	Address of counter/frequency module.
24	The high trigger level is 2.4 V.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.23 Set TTL Input Low Trigger Level (6080)

@Description

Set the TTL input low trigger level, for voltage level lower than this value is recognized as logic low.

@Syntax

$(Addr)1L(ThData)<CR>

$	Command leading code.
(Addr)	Address ID (2-character)
1L	TTL input low trigger level command code.
(ThData)	The low trigger level for TTL input. The unit is 0.1 V and its resolution is 0.1 V too. This value range from 0.1 to 5V, which is a 2-digit integer.

@Response

!(Addr)<CR>

or

?(Addr)<CR>

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

@Example

User command: $301L10<CR>
Response: !30<CR>

Item	Meaning	Description
$	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
1L		Set TTL input low trigger level.
10	(ThData)	1 V

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.24 Read TTL Input Low Trigger Level (6080)

@Description

Read the TTL input low trigger level.

@Syntax

$(Addr)1L<CR>

$	Command leading code.
(Addr)	Address ID (2-character)
1L	TTL input low trigger level command code.

@Response

!(Addr)(ThData)<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr)	Address ID.
(ThData)	The high trigger level for TTL input. The unit is 0.1 V and its resolution is 0.1 V too. This value range from 0.1 to 5V, which is a 2-digit integer.

@Example

User command:	$301L<CR>
Response:	!3008<CR>

Item	Meaning	Description
$	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
1L		Read TTL input low trigger level.

!	Command is valid.
30	Address of counter/frequency module.
08	The low trigger level is 0.8 V.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.25 Enable Alarm (6080)

@Description

Enables alarm function of counter 0 or counter 1. The digital output will assert if the counter value reaches the alarm limit while the alarm is enable.

@Syntax

@(Addr)EA(CounterNo)<CR>

@	Command leading code.
(Addr)	Address ID (2-character)
EA	Enable alarm command code.
(CounterNo)	0: counter 0 1: counter 1

@Response

!(Addr)<CR>

or

?(Addr)<CR>

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

@Example

User command: @30EA0<CR>
Response: !30<CR>

Item	Meaning	Description
@	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
EA		Enable alarm command code.
0	(CounterNo)	Counter 0.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.26 Disable Alarm

@Description

Disables alarm function of counter 0 or counter 1.

@Syntax

@(Addr)DA(CounterNo)<CR>

@	Command leading code.
(Addr)	Address ID (2-character)
DA	Enable alarm command code.
(CounterNo)	0: counter 0 1: counter 1

@Response

!(Addr)<CR>

or

?(Addr)<CR>

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

@Example

User command:	@30DA0<CR>
Response:	!30<CR>

Item	Meaning	Description
@	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
DA		Disable alarm command code.
0	(CounterNo)	Counter 0.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.27 Set Alarm Limit Value of Counter 0 (6080)

@Description

Set the alarm limit value of counter 0.

@Syntax

@(Addr)PA(ArmData)<CR>

@	Command leading code.
(Addr)	Address ID (2-character)
PA	Set alarm limit value command code.
(ArmData)	The alarm limit value which consists of 8 hexadecimal digits.

@Response

!(Addr)<CR>

or

?(Addr)<CR>

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

@Example

User command: @30PA00020000<CR>
Response: !30<CR>

Item	Meaning	Description
@	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
PA		Set alarm limit value of counter 0.
00020000	(ArmData)	131072(0x00020000)

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.28 Set Alarm Limit Value of Counter 1 (6080)

@Description

Set the alarm limit value of counter 1.

@Syntax

@(Addr)SA(ArmData)<CR>

@	Command leading code.
(Addr)	Address ID (2-character)
SA	Set alarm limit value command code.
(ArmData)	The alarm limit value which consists of 8 hexadecimal digits.

@Response

!(Addr)<CR>

or

?(Addr)<CR>

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

@Example

User command:	@30SA0002FFFF<CR>
Response:	!30<CR>

Item	Meaning	Description
@	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
SA		Set alarm limit value of counter 1.
0002FFFF	(ArmData)	196607(0x0002FFFF)

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.29 Read Alarm Limit Value of Counter 0 (6080)

@Description

Read the alarm limit value of counter 0.

@Syntax

@(Addr)RP<CR>

@	Command leading code.
(Addr)	Address ID (2-character)
RP	Read alarm limit value command code

@Response

!(Addr)(ArmData)<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr)	Address ID.
(ArmData)	The alarm limit value which consists of 8 hexadecimal digits.

@Example

User command:	@30RP<CR>
Response:	!300000FFFF<CR>

Item	Meaning	Description
@	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
RP		Read alarm limit value of counter 0.

!	Command is valid.
30	Address of counter/frequency module.
0000FFFF	65535(0x0000FFFF).

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.30 Read Alarm Limit Value of Counter 1 (6080)

@Description

Read the alarm limit value of counter 1.

@Syntax

@(Addr)RA<CR>

@	Command leading code.
(Addr)	Address ID (2-character)
RA	Read alarm limit value command code

@Response

!(Addr)(ArmData)<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr)	Address ID.
(ArmData)	The alarm limit value which consists of 8 hexadecimal digits.

@Example

User command:	@30RA<CR>
Response:	!300001FFFF<CR>

Item	Meaning	Description
@	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
RA		Read alarm limit value of counter 0.

!	Command is valid.
30	Address of counter/frequency module.
0001FFFF	131071(0x0001FFFF).

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.31 Set Digital Output Values (6080)

@Description

Set the value (ON or OFF) of the 2 channel digital outputs.

@Syntax

@(Addr)DO(DoData)<CR>

@	Command leading code.
(Addr)	Address ID
DO	Set digital data output command code.
(DoData)	00: DO0 is OFF, DO1 is OFF 01: DO0 is ON, DO1 is OFF 02: DO0 is OFF, DO1 is ON 03: DO0 is ON, DO1 is ON

@Response

!(Addr)<CR>

or

?(Addr)<CR>

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

@Example

User command: @30DO01<CR>
Response: !30<CR>

Item	Meaning	Description
@	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
DO		Set digital data output.
01	(D0Data)	DO0 is ON, DO1 is OFF

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.7.32 Read Digital Output and Alarm Status (6080)

@Description

Read the current digital output channel values and the status of alarm function.

@Syntax

@(Addr)DI<CR>

@	Command leading code.
(Addr)	Address ID
DI	Read digital data output and alarm status command code.

@Response

!(Addr)(AStatus)(DoData)00<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr)	Address ID.
(AStatus)	0: counter 0 alarm is disabled, counter 1 alarm is disabled. 1: counter 0 alarm is enabled, counter 1 alarm is disabled. 2: counter 0 alarm is disabled, counter 1 alarm is enabled. 3: counter 0 alarm is enabled, counter 1 alarm is enabled.
(DoData)	00: DO0 is OFF, DO1 is OFF 01: DO0 is ON, DO1 is OFF 02: DO0 is OFF, DO1 is ON 03: DO0 is ON, DO1 is ON

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

@Example

User command:	@30DI<CR>
Response:	!3030200<CR>

Item	Meaning	Description
@	(Leading Code)	Command leading code.
30	(Addr)	Address ID is 30H.
DI		Set digital data output.

!	Command is valid.
30	Address of counter/frequency module.
3	Counter 0 alarm is enabled, counter 1 alarm is enabled.
02	DO0 is OFF, DO1 is ON.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.8.1 Read Command Leading Code Setting (601x,602x,605x, 606x,6080,6531)

@Description

Read command leading code setting and host watchdog 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)

@Example

User command:	~060<CR>
Response:	!0600$#%@~*<CR>

Command leading code setting is $#%@~* for module address ID is 06, current status is factory default setting.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.8.2 Change Command Leading Code Setting (601x,602x,605x, 606x,6080,6531)

@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.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

@Examples

User command:	~060<CR>
Response:	!0600**$**#%@~*<CR>
User command:	~0610**A**#%@~*<CR>
Response:	!06<CR>
User command:	**A**06F
Response:	!06A1.8<CR>

Read leading code setting is $#%@~* for module address 06 and change leading code **$** to **A**, then use A06F to read firmware version of module on address 06.

***** WARNING *****

- We do not recommend users to change the default setting of leading code, because it will make you confuse .....
- The leading code change only use the command conflicts other devices on the network.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.8.3 Set Host Watchdog Timer & Safety Value (602x,605x,606x, 6080,6531)

@Description

Set host watchdog timer, module will change to safety state when host is failure. Define the output value in this command.

@Syntax

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

~(Addr)2(Flag)(TimeOut)(SafeA)(SafeB)(SafeC)(SafeD) (6024 only)

~(Addr)2(Flag)(TimeOut)(SafeH)(SafeL)<CR> (6056 only)

~(Addr)2(Flag)(TimeOut)(Safe1)(Safe2)(Safe3)<CR> (6058only)

~(Addr)2(Flag)(TimeOut)00<CR> (6531 only)

~	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. (2~3-character)
(SafeA) (SafeB) (SafeC) (SafeD)	Safety value of analog output for port A, B, C and D when host is failure. (3-character) 800: analog output is –10 V 000: analog output is 0 V FFF: analog output is 10 V
(SafeH) (SafeL)	Safety value of digital output channels, when host is failure. (2-character)
(Safe1) (Safe2) (Safe3)	Safety value of analog output for port A, B, Cwhen host is failure. (2-character)

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

@Response

!(Addr)<CR>
or
?(Addr)<CR>

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

@Example 1 <ND-6080>

User command:	~0621121C<CR>
Response:	!06<CR>

06	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 (Firmware Version 2.x)
1C	1C (00011100) Digital output channel DO3, DO4 and DO5 are high, the others are low.

@Example 2 <ND-6021>

User command:	~0621123F0<CR>
Response:	!06<CR>

06	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
3F0	0x3F0 is hexadecimal Analog output value is 4.923 mA for 0-20mA Analog output value is 4.923 mA for 4-20mA Analog output value is 2.462 V for 0-10 V

Analog output safety value are as following :
For type is 0 ~20 mA or 4~20 mA (Output Range is 0x30, 0x31)
value = (0x3F0 / 0xFFF) * 20 mA = 4.923 mA

For type is 0 ~10V (Output Range is 0x32)
value = (0x3F0 / 0xFFF) * 10 V = 2.462 V

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

@Example 2 <ND-6024>

User command:	~062112800800800800<CR>
Response:	!06<CR>

06	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
800	0x800 is hexadecimal Analog output value is **0V** for port A
800	Analog output value is **0V** for port B
800	Analog output value is **0V** for port C
800	Analog output value is **0V** for port D

@Example 3 <ND-6050>

User command:	~0621121C<CR>
Response:	!06<CR>

06	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
1C	1C (00011100) Digital output channel DO2, DO3 and DO4 are high, the others are low.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

@Example 4 <ND-6056>

User command:	~0621121C1C<CR>
Response:	!06<CR>

06	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
1C1C	1C1C (0001110000011100) Digital output channel DO2, DO3, DO4, DO10, DO11, DO12 are high, the others are low.

@Example 5 <ND-6058>

User command:	~0621121C1C1C<CR>
Response:	!06<CR>

06	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
1C1C1C	1C (00011100) port A, B and C channel 2, 3 and 4 are high, the other are low.

@Example 6 <ND-6531>

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	

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.8.4 Read Host Watchdog Timer & Safety Value (602x,605x,606x, 6080,6531)

@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)(SafeValue)<CR>

!(Addr)(Flag)(TimeOut)(SafeA)(SafeB)(SafeC)(SafeD)<CR>(6024 only)

!(Addr)(Flag)(TimeOut)(SafeH)(SafeL)<CR> (6056 only)

!(Addr)(Flag)(TimeOut)(Safe1)(Safe2)(Safe3)<CR> (6058 only)

!(Addr)(Flag)(TimeOut)00<CR> (6531 only)

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) 01 = 1 * 100 = 100 ms FF = 255 * 100 = 25.5 sec
(SafeValue)	8 channels safety state digital output value when host is failure. (2~3-character)
(SafeA) (SafeB) (SafeC)	Safety value of analog output for port A, B, C and D when host is failure. (3-character)
(SafeH) (SafeL)	Safety value of digital output channels, when host is failure. (2-character)
(Safe1) (Safe2) (Safe3)	Safety value of analog output for port A, B, Cwhen host is failure. (2-character)

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

@Example 1 <ND-6080>

User command:	~063<CR>
Response:	!061121C<CR>

06	Address ID
1	Host watchdog timer is enable.
12	Timeout value. 0x12 = 18 18 * 100 = 1800 ms
1C	1C (00011100) Digital output channel DO3, DO4 and DO5 are high, the others are low.

Between 0 ms and 1800 ms time period, if host does not send (Host is OK) then digital output will change to safety state 1C (00011100) means digital output DO3 , DO4 and DO5 is high, others are low.

@Example 2 <ND-6021>

User command:	~063<CR>
Response:	!061123F0<CR>

06	Address ID
1	Host watchdog timer is enable.
12	Timeout value. 0x12 = 18 18 * 100 = 1800 ms
3F0	0x3F0 is hexadecimal Analog output value is **4.923 mA** for 0-20mA Analog output value is **4.923 mA** for 4-20mA Analog output value is **2.462 V** for 0-10 V

@Example 3 <ND-6024>

User command:	~063<CR>
Response:	!06112800800800800<CR>

06	Address ID
1	Host watchdog timer is enable.
12	Timeout value. 0x12 = 18 18 * 100 = 1800 ms
800	0x800 is hexadecimal Analog output value is **0V** for port A
800	Analog output value is **0V** for port B
800	Analog output value is **0V** for port C
800	Analog output value is **0V** for port D

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

@Example 4 <ND-6050>

User command:	~0621121C<CR>
Response:	!06<CR>

06	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
1C	1C (00011100) Digital output channel DO2, DO3 and DO4 are high, the others are low.

@Example 5 <ND-6056>

User command:	~0621121C1C<CR>
Response:	!06<CR>

06	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
1C1C	1C1C (0001110000011100) Digital output channel DO2, DO3, DO4, DO10, DO11, DO12 are high, the others are low.

@Example 6 <ND-6058>

User command:	~0621121C1C1C<CR>
Response:	!06<CR>

06	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
1C1C1C	1C (00011100) port A, B and C channel 2, 3 and 4 are high, the other are low.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

@Example 7 <ND-6531>

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	

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.8.5 Change Polarity

@Description

To change the polarity state of digital inputs and outputs of the module.

@Syntax

~(Addr)CP(State)<CR>

~	Command leading code (1 character)
(Addr)	Address ID (2 characters)
CP	Change Polarity (2 characters)
(State)	Polarity state of digital inputs and outputs (2characters) 00 : Do not change polarity 01 : Change the polarity of digital inputs 02 : Change the polarity of digital outputs 03 : Change the polarity both the digital inputs and outputs

@Response

!(Addr)<CR>

or

?(Addr)<CR>

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

@Example

User command:	~06CP01<CR>
Response:	!06<CR>

To change the polarity of digital inputs of the DI/O module which ID is 06H.

Note : *For this command ,you could define the logic level which you want, For example, if the input connect to high level signal ,and you want to read back the input as a "0",then you could change the polarity to fit your requirement .*

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.8.6 Read Polarity

(605x,606x)

@Description

To read the polarity state of digital inputs and outputs of the module.

@Syntax

~(Addr)CR<CR>

~	Command leading code (1 character)
(Addr)	Address ID (2 character)
CR	Read Polarity (2 character)

@Response

!(Addr)(State)<CR>

or

?(Addr)<CR>

!	Command is valid.
?	Command is invalid.
(Addr)	Address ID.
(State)	Polarity state of digital inputs and outputs 00 : Polarity were not changed 01 : Change the polarity of digital inputs 02 : Change the polarity of digital outputs 03 : Change the polarity both the digital inputs and outputs

@Example

User command:	~03CR<CR>
Response:	!0602<CR>

Read the polarity of the DI/O module which ID is 03H.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.8.7 Host is OK (602x,605x,606x, 6080,6531)

@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.

Timeout value and safety state output value is defined in 3.14. "Set Host Watchdog Timer & Safety Value".

@Syntax

~**<CR>

~	Command leading code.
**	Host is OK.

@Response

Note : *Host is OK command **has NO response.***

@Example

User command: ~**<CR>

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

7

Initialization & Installation

7.1 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.

7.2 Initializing a Brand-New Module

Objective of Initializing a Brand-New NuDAM

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

- Address ID is 01.
- Baud rate is 9600 bps
- Check-sum disable
- Host Watchdog timer is disable

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Therefore, to configure the brand-new NuDAM before using is necessary to avoid conflicting address. The baud rate may also be changed according to user's requirements.
The initialization procedures of a brand-new NuDAM are shown in the following sections. The procedures are applicable for initializing NuDAM-6013, NuDAM-6017, NuDAM-6018 NuDAM-6021, NuDAM-6024, NuDAM-6050, NuDAM-6052 NuDAM-6053, NuDAM-6054, NuDAM-6056, NuDAM-6060 NuDAM-6063, NuDAM-6067, NuDAM-6080, and NuDAM-6531.

Default State

The NuDAM modules must be set at *Default State* when you want to change the default settings, including the ID address, baud rate, check-sum status etc. All NuDAM modules have an special pin labeled as **DEFAULT***. The module will be in *Default State* if the **Default*[1]** pin is shorted to ground and then power on module again. Under Default state, the default configuration is set as following:

- **Address ID is 00.**
- **Baud rate is 9600 bps.**
- **Check-sum disable.**
- **Watchdog timer is disable.**

Therefore, the configuration of the host and the module can be easily set identically and initializing 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) with 9600 baud rate.
- The brand new NuDAM module
- Power supply (+10 V_{DC} to +30 V_{DC}) for NuDAM modules
- Administration utility software

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

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Initialization Procedure

1. Power off the host computer and the installed NuDAM-6520. Be sure of the baud rate of the NuDAM-6520 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 7-1 for detailed wiring.
3. Power on the host computer.
4. Power on the power supply for NuDAM modules.
5. Use the NuDAM Administration utility to configure the address ID, Baud rate and check-sum status of the module.

Initialization Wiring

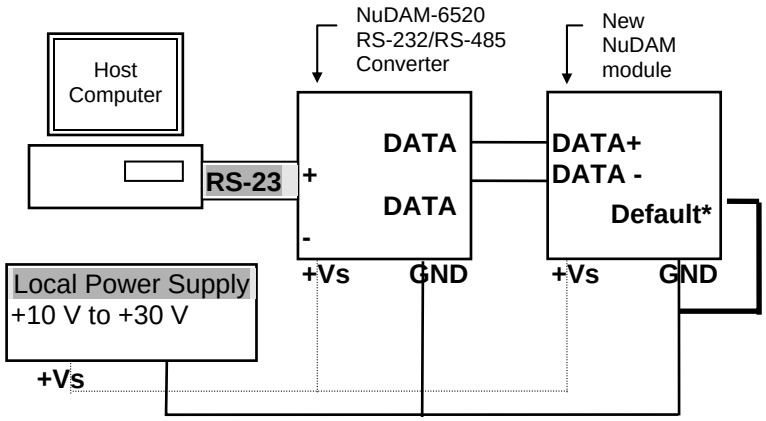


Figure 7-1 Layout for Initialization the NuDAM module

7.3 Install a New NuDAM to a Existing Network

Equipments for Install a New Module

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

Installing Procedures

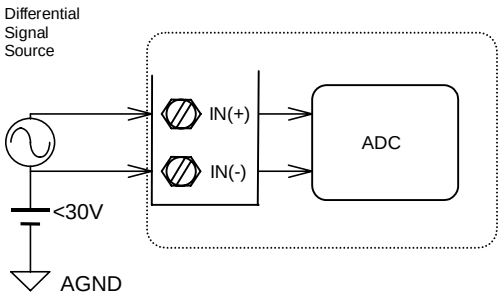
LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

1. Configure the brand-new NuDAM module according to the initialization procedures in section 7.2.
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 7.4 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.

7.4 Application Wiring for NuDAM

7.4.1 Differential Voltage Input

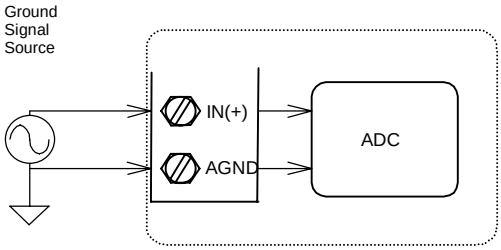
<ND-6017,ND-6018>



LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

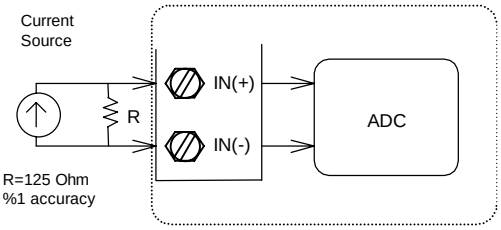
7.4.2 Single Ended Voltage Input

<ND-6017,ND-6018>



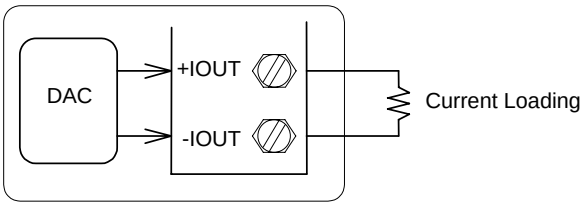
7.4.3 Current Measurement

<ND-6017,ND-6018>



7.4.4 Differential Current Outpu

<ND-6021>

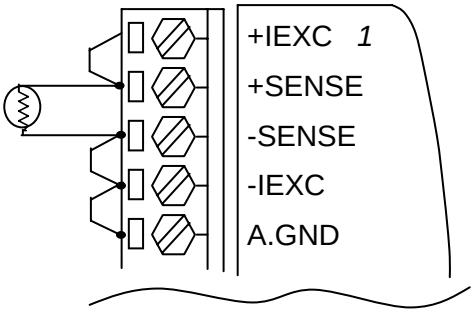


Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

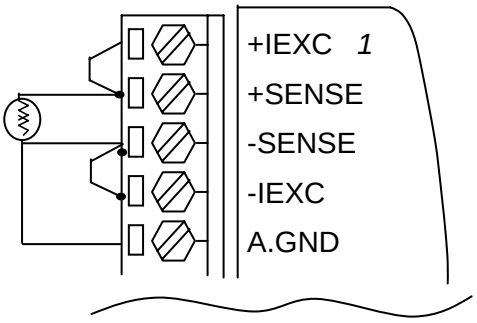
7.4.5 RTD Input

<ND-6013>

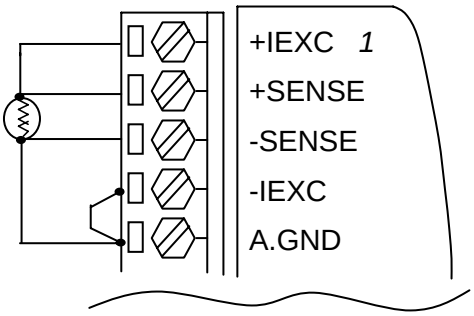
2 Wire RTD



3 Wire RTD



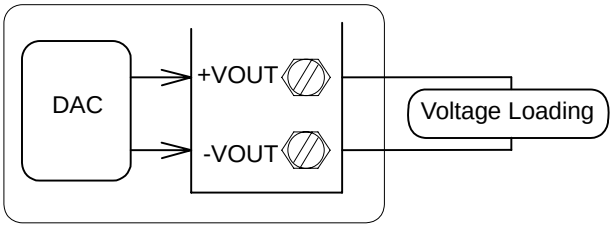
4 Wire RTD



LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

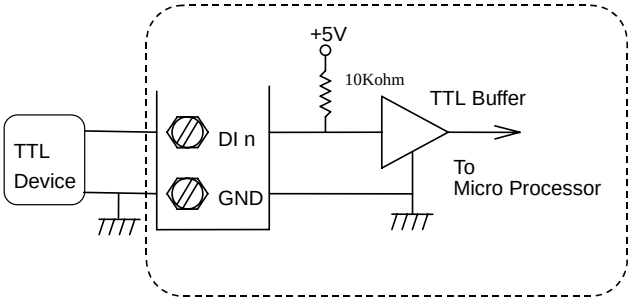
7.4.6 Differential Voltage Output

<ND-6021,ND-6024>



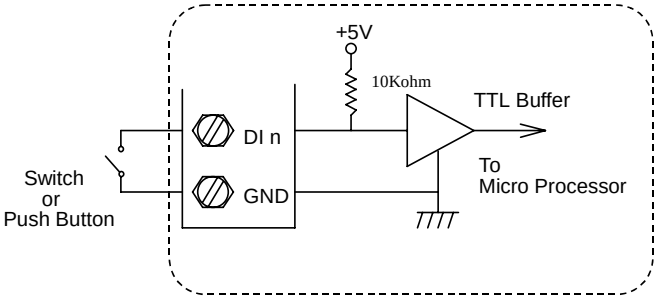
7.4.7 Digital Input onnect with TTL Signal

<ND-6024,ND-6050,ND-6058,ND-6080>



7.4.8 Digital Input Connect with Switch or Push Button

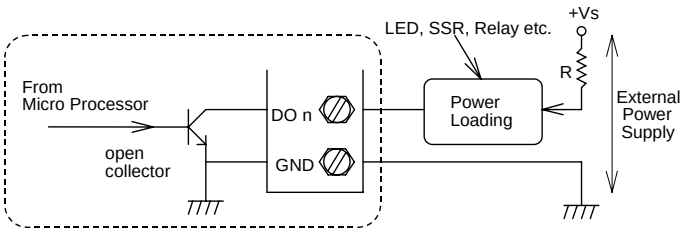
<ND-6050,ND-6058>



Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

7.4.9 Digital Output Connect with Power Loading

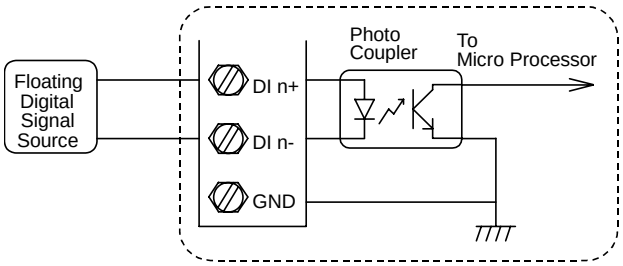
<ND-6050,ND-6080>



R : current limit resistor

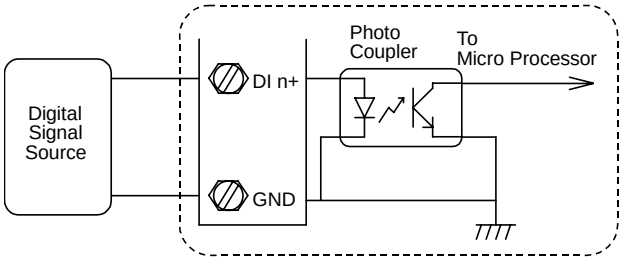
7.4.10 Isolated Differential Input

<ND-6052>



7.4.11 Isolated Single Ended Input

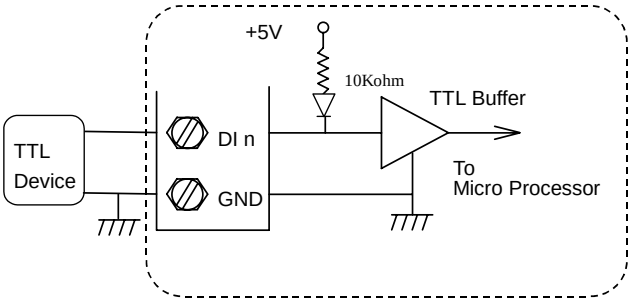
<ND-6052,ND-6080>



Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

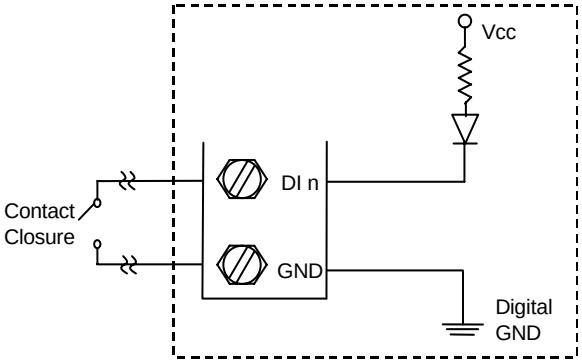
7.4.12 Wet Contact Input

<ND-6053>



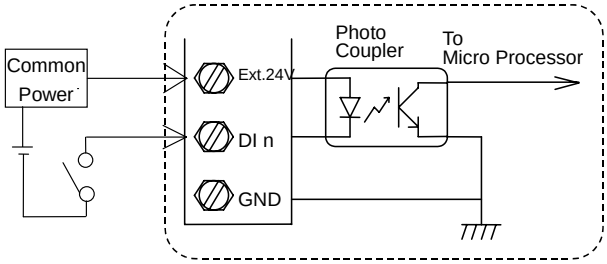
7.4.13 Contact Closure Input

<ND-6053>



7.4.14 Isolated Differential Input with External 24V power

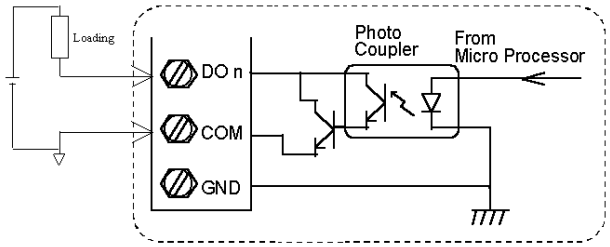
<ND-6054>



LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

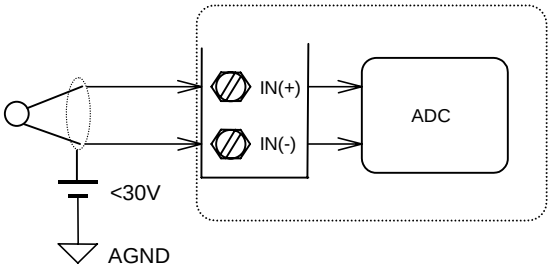
7.4.15 Isolated Common Ground Output

<ND-6056>



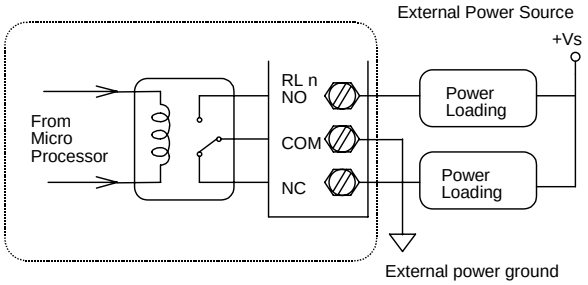
7.4.16Thermocouple Input Measurement

<ND-6018>



7.4.17 Form C Relay Output

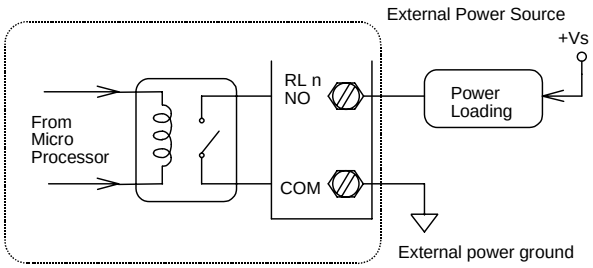
<ND-6060>



Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

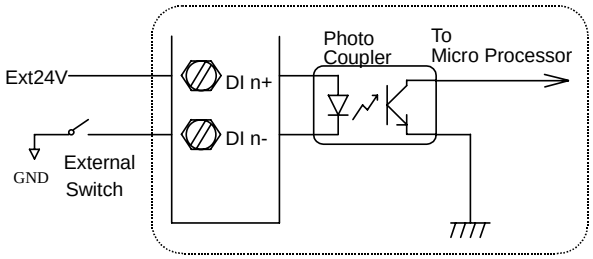
7.4.18 Form A Relay Output

<ND-6060,ND-6063,ND-6067>



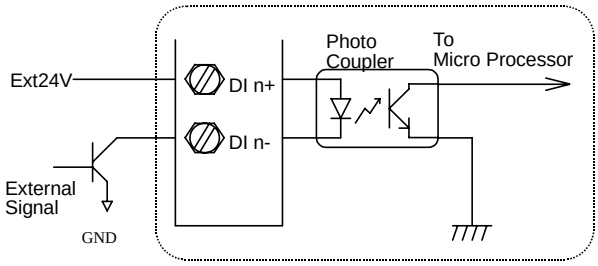
7.4.19 Discrete Input: Contact Mode

<ND-6060>



7.4.20 Discrete Input: Transistor Mode

<ND-6060>



Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

8

Analog modules Data Format

Unit Conversion

The data value in the command of the analog module is corresponding to the amplitude of the physical analog signal. The user should understand the data format to represent a analog signal by an ASCII string.The physical meaning of a data depends on both the unit conversion and the value. The unit conversion of the digits value can be configured by the setting configuration command. Three types of unit conversion are used in analog modules.

1. Engineering units.
2. Percent of FSR (Full Scale Range).
3. Hexadecimal or Two's Complement Hexadecimal.
4. Ohm(For ND-6013)

8.1 Engineering Units

- Set bit 1 and bit 0 of data format variable to "00" means the data is represented in engineering units
- This data format including three components
    1. sign (+ or -,if range is bipolar.)
    2. digits
    3. decimal point

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

- Data is composited with a sign (+ or -) followed with 5-digits and a decimal point.
- It does not exceed 7-characters

The different analog input/output ranges have different resolutions. Refer to Table 8-1 ,Table 8-2 Table 8-3 and Table 8-4 for details.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Code	Input Range	Data Format	+Full Scale	Zero	- Full Scale	Displayed Resolution
00	±15mV	Eng. Units	+15.000	±00.000	-15.000	1μV
01	±50mV	Eng. Units	+50.000	±00.000	-50.000	1μV
02	±100mV	Eng. Units	+100.00	±000.00	-100.00	10μV
03	±500mV	Eng. Units	+500.00	±000.00	-500.00	10μV
04	±1V	Eng. Units	+1.0000	±0.0000	-1.0000	100.00μV
05	±2.5V	Eng. Units	+2.5000	±0.0000	-2.5000	100.00μV
06	±20mA	Eng. Units	+20.000	±00.000	-20.000	1μA
07	Reserved					
08	±10V	Eng. Units	+10.000	±00.000	-10.000	1mV
09	±5V	Eng. Units	+5.0000	±0.0000	-5.0000	100.00μV
0A	±1V	Eng. Units	+1.0000	±0.0000	-1.0000	100.00μV
0B	±500mV	Eng. Units	+500.00	±000.00	-500.00	10μV
0C	±150mV	Eng. Units	+150.00	±000.00	-150.00	10μV
0D	±20mA	Eng. Units	+20.000	±00.000	-20.000	1μA

Table 8-1 Analog Input Range and resolution<ND-6017,ND-6018>

Code	Input Range	Data Format	+Full Scale	Zero	- Full Scale	Disp. Reso.
20	Pt-100, -100°C to +100°C, α=0.00385	Eng. Units	+100.00	±000.00	-100.00	0.01°C
21	Pt-100, 0°C to +100°C, α=0.00385	Eng. Units	+100.00	+000.00	+000.00	0.01°C
22	Pt-100, 0°C to +200°C, α=0.00385	Eng. Units	+200.00	+000.00	+000.00	0.01°C
23	Pt-100, 0°C to +600°C, α=0.00385	Eng. Units	+600.00	+000.00	+000.00	0.01°C
24	Pt-100, -100°C to +100°C, α=0.003916	Eng. Units	+100.00	±000.00	-100.00	0.01°C
25	Pt-100, 0°C to +100°C, α=0.003916	Eng. Units	+100.00	+000.00	+000.00	0.01°C
26	Pt-100, 0°C to +200°C, α=0.003916	Eng. Units	+200.00	+000.00	+000.00	0.01°C
27	Pt-100, 0°C to +600°C, α=0.003916	Eng. Units	+600.00	+000.00	+000.00	0.01°C
28	Ni-100, 0°C to +100°C	Eng. Units	+100.00	+000.00	+000.00	0.01°C
29	Ni-120, 0°C to +100°C	Eng. Units	+100.00	+000.00	+000.00	0.01°C
2A	0 Ohm to 60Ohm	Ohms	+60.00	+000.00	+000.00	0.01°C

Table 8-2 RTD Type ,Temperature Range and resolution<ND-6013>

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Code	Input Range Thermocouple	Data Format	Maximum	Minimum	Displayed Resolution
0E	J (0°C to 760°C)	Eng. Units	+760.00	+000.00	0.01°C
0F	K (0°C to 1000°C)	Eng. Units	+1000.0	+0000.0	0.1°C
10	T (-100°Cto400°C)	Eng. Units	+400.00	-100.00	0.01°C
11	E (0°C to 1000°C)	Eng. Units	+1000.0	+0000.0	0.1°C
12	R (500°C to 1750°C)	Eng. Units	+1750.0	+0500.0	0.1°C
13	S (500°C to 1750°C)	Eng. Units	+1750.0	+0500.0	0.1°C
14	B (500°C to 1800°C)	Eng. Units	+1800.0	+0500.0	0.1°C
15	N (-270°C to 1300°C)	Eng. Units	+1300.0	-0270.0	0.1°C
16	C (0°C to 2320°C)	Eng. Units	+2320.0	+0000.0	0.1°C

Table 8-3 Thermocouple Type ,Temperature Range and resolution <ND-6018>

Code	Output Range	Data Format	Maximum Value	Minimum Value	Output Resolution
30	0 to 20 mA	Eng. Units	20.000	00.000	4.88μA
31	4 to 20 mA	Eng. Units	20.000	04.000	4.88μA
32	0 to 10 V	Eng. Units	10.000	00.000	2.442 mV

Table 8-4 Analog Output Range and resolution<ND-6021,ND-6024>

- **Example 1:**
  - Input Range is ±5 V
  - Input is -1.37 Volts

  engineering units: **-1.3700<CR>**

- **Example 2:**
  - Input Range is ±10 V
  - Input is +3.653 Volts

  engineering units: **+03.653<CR>**

- **Example 3:**
  - Input Range is Type K thermocouple (range 0°C to 1000°C)
  - Input is 406.5°C

  engineering units: **+0406.5<CR>**

- **Example 4:**

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

- Input Range is Type T thermocouple (range -100°C to 400°C)
- Input is -50.5°C

engineering units: **-050.50<CR>**

- **Example 5:**
  - Output range is 0 to 20 mA
  - Output value is +5.678 mA

The data value should be : **05.678<CR>**

- **Example 6:**
  - Output range is 0 to 10 V
  - Output value is +2.345 V

The data value should be : **02.345<CR>**

8.2 Percent of FSR (Full Scale Range)

- Data format bit 1 and 0 set to 01 is percent of FSR
- This data format including three components
  1. sign (+ or -)
  2. digits
  3. decimal point
- Data is sign (+ or -) followed with 5-digits and a decimal point
- It does not exceed 7-characters. Data string of analog output modules is fixed length of 6 characters. The value is composed of five decimal digits with a decimal fixed point.
- Analog input modules maximum resolution is 0.01%, and the decimal point is fixed.Analog output modules maximum resolution is 0.2%.
- Data is the ratio of input signal to the value of full scale range

The different analog input/output ranges have different resolutions. Refer to Table 8-5 ,Table 8-6 and Table 8-7 for details.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Code	Input Range	Data Format	+Full Scale	Zero	- Full Scale	Displayed Resolution
00	±15mV	% of FSR	+100.00	±000.00	-100.00	0.01%
01	±50mV	% of FSR	+100.00	±000.00	-100.00	0.01%
02	±100mV	% of FSR	+100.00	±000.00	-100.00	0.01%
03	±500mV	% of FSR	+100.00	±000.00	-100.00	0.01%
04	±1V	% of FSR	+100.00	±000.00	-100.00	0.01%
05	±2.5V	% of FSR	+100.00	±000.00	-100.00	0.01%
06	±20mA	% of FSR	+100.00	±000.00	-100.00	0.01%
07	Reserved					
08	±10V	% of FSR	+100.00	±000.00	-100.00	0.01%
09	±5V	% of FSR	+100.00	±000.00	-100.00	0.01%
0A	±1V	% of FSR	+100.00	±000.00	-100.00	0.01%
0B	±500mV	% of FSR	+100.00	±000.00	-100.00	0.01%
0C	±150mV	% of FSR	+100.00	±000.00	-100.00	0.01%
0D	±20mA	% of FSR	+100.00	±000.00	-100.00	0.01%

Table 8-5 Analog Input Range and resolution<ND-6017,ND-6018>

Code	Input Range Thermocouple	Data Format	Maximum	Minimum	Displayed Resolution
0E	J (0°C to 760°C)	% of FSR	+100.00	+000.00	0.01%
0F	K (0°C to 1000°C)	% of FSR	+100.00	+000.00	0.01%
10	T (-100°Cto400°C)	% of FSR	+100.00	-025.00	0.01%
11	E (0°C to 1000°C)	% of FSR	+100.00	+000.00	0.01%
12	R (500°C to 1750°C)	% of FSR	+100.00	+028.57	0.01%
13	S (500°C to 1750°C)	% of FSR	+100.00	+028.57	0.01%
14	B (500°C to 1800°C)	% of FSR	+100.00	+027.27	0.01%
15	N (-270°C to 1300°C)	% of FSR	+100.00	-020.76	0.01%
16	C (0°C to 2320°C)	% of FSR	+100.00	+000.00	0.01%

Table 8-6 Thermocouple Type ,Temperature Range and resolution <ND-6018>

Code	Output Range	Data Format	Maximum Value	Minimum Value	Output Resolution
30	0 to 20 mA	% of FSR	100.00	000.00	4.88μA
31	4 to 20 mA	% of FSR	100.00	000.00	4.88μA
32	0 to 10 V	% of FSR	100.00	000.00	2.442 mV

Table 8-7 Analog Output Range and resolution<ND-6021,ND-6024>

- **Example 1:**
  - Input Range is ±5 V
  - Input is +1 Volts

  % of FSR: **+020.00<CR>**
  (+(20/100) x 5 V) = +1 V

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

- **Example 2:**
  - Input Range is ±10 V
  - Input is +4 Volts

  % of FSR: **+040.00<CR>**
  (+(40/100) x 10 V) = +4 V

- **Example 3:**
  - Input Range is Type K thermocouple (range 0°C to 1000°C)
  - Input is 406.5°C

  % of FSR: **+040.65<CR>**
  (+(40.65/100) x 1000°C) = 406.5°C

- **Example 4:**
  - Output range is 0 to 20 mA
  - Output current is 10 mA

  The data value should be : **050.00<CR>**
  10 mA / 20 mA = 50.00 %

- **Example 5 :**
  - Output range is 4 to 20 mA
  - Output current is 10 mA

  The data value should be : **037.50<CR>**
  (10 mA - 4 mA) / (20 mA - 4mA) = 37.50 %

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

8.3 Hexadecimal or Two's Complement Hexadecimal

Hexdecimal Format

Hexdecimal Format is for ND-602x modules.The data is in hexdecimal format as the bit 1 and 0 are set as '10'. The data string length is ***3*** characters. It is equivilant to 12 binary bits. Because the output of ND-6021 is unipolar, the maximum value of the digits is FFF(H) and the minimum value of the digits is 000(H).

As the output range is set to 0~20mA, the value 'FFF(H)' represents 20mA and '000(H)' represents 0mA. Similarily, as the output range is set to 4~20mA, the value 'FFF(H)' represents 20mA and '000(H)' represents 4mA.

The different analog output ranges have different resolutions. Refer to Table 8-8 for details.

Code	Output Range	Data Format	Maximum Value	Minimum Value	Output Resolution
30	0 to 20 mA	Hexdecimal	FFF	000	4.88μA
31	4 to 20 mA	Hexdecimal	FFF	000	4.88μA
32	0 to 10 V	Hexdecimal	FFF	000	2.442 mV

Table 8-8 Analog Output Range and resolution<ND-6021,ND-6024>

◆ **Example 1 :**

- If the output range is set as 0 to 20 mA
- The desired analog output current is 10 mA

Hexdecimal Format: **7FF<CR>**

Two's Complement Hexadecimal

Two's Complement Hexadecimal is for ND-601x modules.

- Data format bit 1 and 0 set to 10 is 2's complement
- Data is 4-character(16 binary bits) hexadecimal string
- Positive full scale is 7FFF (+32767)
- Negative full scale is 8000 (-32768)
-

The different analog input ranges have different resolutions. Refer to Table 8-9 and Table 8-10 for details.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Code	Input Range	Data Format	+Full Scale	Zero	- Full Scale	Displayed Resolution
00	±15mV	2's Comp.	7FFF	0000	8000	1 LSB
01	±50mV	2's Comp.	7FFF	0000	8000	1 LSB
02	±100mV	2's Comp.	7FFF	0000	8000	1 LSB
03	±500mV	2's Comp.	7FFF	0000	8000	1 LSB
04	±1V	2's Comp.	7FFF	0000	8000	1 LSB
05	±2.5V	2's Comp.	7FFF	0000	8000	1 LSB
06	±20mA	2's Comp.	7FFF	0000	8000	1 LSB
07	Reserved					
08	±10V	2's Comp.	7FFF	0000	8000	1 LSB
09	±5V	2's Comp.	7FFF	0000	8000	1 LSB
0A	±1V	2's Comp.	7FFF	0000	8000	1 LSB
0B	±500mV	2's Comp.	7FFF	0000	8000	1 LSB
0C	±150mV	2's Comp.	7FFF	0000	8000	1 LSB
0D	±20mA	2's Comp.	7FFF	0000	8000	1 LSB

Table 8-9 Analog Input Range and resolution<ND-6017,ND-6018>

Code	Input Range Thermocouple	Data Format	Maximum	Minimum	Displayed Resolution
0E	J (0°C to 760°C)	2's Comp.	7FFF	0000	1 LSB
0F	K (0°C to 1000°C)	2's Comp.	7FFF	0000	1 LSB
10	T (-100°Cto400°C)	2's Comp.	7FFF	E000	1 LSB
11	E (0°C to 1000°C)	2's Comp.	7FFF	0000	1 LSB
12	R (500°C to 1750°C)	2's Comp.	7FFF	2492	1 LSB
13	S (500°C to 1750°C)	2's Comp.	7FFF	2492	1 LSB
14	B (500°C to 1800°C)	2's Comp.	7FFF	238E	1 LSB
15	N (-270°C to 1300°C)	2's Comp.	7FFF	E56B	1 LSB
16	C (0°C to 2320°C)	2's Comp.	7FFF	0000	1 LSB

Table 8-10 Thermocouple Type ,Temperature Range and resolution <ND-6018>

- **Example 2:**
  - Input Range is ±5 V
  - Input is +1 Volts

  Two's complement hexadecimal: **1999<CR>**
  ((1/5) x 32768) = 6553.6 = 1999H

- **Example 3:**
  - Input Range is ±5 V
  - Input is -2 Volts

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Two's complement hexadecimal: **CD27<CR>**
((-2/5) x 32768) = -13107.2 = CD27H

- **Example 4:**
  - Input Range is ±10 V
  - Input is +4 Volts

  Two's complement hexadecimal: **3333<CR>**
  ((4/10) x 32768) = 13107.2 = 3333H

- **Example 5:**
  - Input Range is Type K thermocouple (range 0°C to 1000°C)
  - Input is 406.5°C

  Two's complement hexadecimal: **3408<CR>**
  ((406.5/1000) x 32768) = 13320.2 = 3408H

8.4 Ohm

- Data format bit 1 and 0 set to 11 is ohm presentation.
- This data format including three components.
  1. sign (+)
  2. digits
  3. decimal point
- Data is sign (+) followed with 5-digits and a decimal point
- It does not exceed 7-characters
- Maximum resolution is 0.01ohm, the decimal point is fixed

- **Example 1:**
  - Input Range is Pt-100, -100°C to +100°C, α=0.00385
  - Input is 120.23 ohm

  ohm: **+120.23<CR>**

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

9

Calibration

9.1 How to Calibrate the Analog Input Modules ?

What do you need to do calibration ?

1. One 5 1/2 digit multimeter.
2. A voltage calibrator or very stable and noise free DC voltage generator.
3. A precision resistance decade box or discrete resistors.
4. NuDAM Administration Utility.

Calibration Procedure for ND-6017

1. Select the correct input range, different input range have different apply calibration voltage.
2. Apply the correct **offset voltage** to the analog input module, detail voltage value, see table 9-2.
3. Send "**Offset Calibration $(Addr)1**" to analog input module five times.
4. Apply the correct **span voltage** to the analog input module, detail voltage value, see table 9-2.
5. Send "**Span Calibration $(Addr)0**" to analog input module five times.
6. Repeat procedure 2 to procedure 5 two times.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

1. Select the correct input range, different input range have different apply calibration resistance.
2. Apply the correct **offset resistance** to the analog input module ND-6013 channel 0, detail resistance value, see table 9-3.
3. Send "**Offset Calibration $(Addr)10**" to analog input module ND-6013 channel 0 .
4. Apply the correct **span resistance** to the analog input module ND-6013 channel 0, detail resistance value, see table 9-3.
5. Send "**Span Calibration $(Addr)00**" to analog input module ND-6013 channel 0 .
6. Apply the correct **offset resistance** to the analog input module ND-6013 channel 1, detail resistance value, see table 9-3.
7. Send "**Offset Calibration $(Addr)11**" to analog input module ND-6013 channel 1.
8. Apply the correct **span resistance** to the analog input module ND-6013 channel 1, detail resistance value, see table 9-3.
9. Send "**Span Calibration $(Addr)01**" to analog input module ND-6013 channel 1.
10. Apply the correct **offset resistance** to the analog input module ND-6013 channel 2, detail resistance value, see table 9-3.
11. Send "**Offset Calibration $(Addr)12**" to analog input module ND-6013 channel 2.
12. Apply the correct **span resistance** to the analog input module ND-6013 channel 2, detail resistance value, see table 9-3.
13. Send "**Span Calibration $(Addr)02**" to analog input module ND-6013 channel 2 five times.
14. Repeat procedure 2 to procedure 13 two times.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Calibration Procedure for ND-6013 Firmware Rev C4.60

1. Only open channel one and disable the other two channels.
2. Disable open detect function.
3. Select the correct input range, different input range have different apply calibration resistances.
4. Apply the correct **offset resistance** to **channel 0**, detail resistance value, see table 9-3.
5. Send "**Offset Calibration $(Addr)1**" to analog input module five times.
6. Apply the correct **span resistance** to **channel 0**, detail resistance value, see table 9-3.
7. Send "**Span Calibration $(Addr)0**" to analog input module five times.

Repeat procedure 3 to procedure 7 two times.

Calibration Procedure for ND-6018 Firmware Rev B1.10

1. Disable all the channel and open detect function.
2. Select the correct input range, different input range have different apply calibration voltage.
3. Apply the correct **offset voltage** to **channel 0**, detail voltage value, see table 9-1.
4. Send "**Offset Calibration $(Addr)1**" to analog input module five times.
5. Apply the correct **span voltage** to **channel 0**, detail voltage value, see table 9-1.
6. Send "**Span Calibration $(Addr)0**" to analog input module five times.

Repeat procedure 3 to procedure 6 two times.

Calibration Procedure for ND-6018 Firmware Rev E1.00

Power off the module.

1. Connect the default pin to GND.(Because the calibration procedures must be run under default mode).
2. Power on the module and use utility searching the module.
3. There must a "*" before the address ID.
4. Disable open detect function by sending command "**$00O0".**
5. Only enable Ch0.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6. Select the correct input range. Different input range has to apply different calibration voltage.
7. Apply the correct **offset voltage** to **channel 0**, detail voltage value, see table 9-1.
8. Send "**Offset Calibration $(Addr)1**" to analog input module five times.(Actually, the address now is "00", so the command is "$001").
9. Apply the correct **span voltage** to **channel 0**, detail voltage value, see table 9-1.
10. Send "**Span Calibration $(Addr)0**" to analog input module five times. (Actually, the address now is "00", so the command is "$001").
    The apply source must be a precision source. The error range in ±50uV is best.

CJC Calibration Procedure

1. Power off the module.
2. Connect the default pin to GND.(Because the calibration procedures must be run under default mode).
3. Power on the module and find the module.
4. Ensure that the NuDAM units has been powered up for at least 30 minutes and is located away from sources of heat, in still air at constant temperature.
5. Place a calibrated temperature meter, with a resolution of 0.1°C, in close proximity to the CJC sensor of the NuDAM module.
6. Send command "**Read CJC Status $(Addr)3**" to read temperature of CJC, then compare the temperature returned from the CJC sensor with the calibrated temperature. (Actually, the address now is "00", so the command is "$003").
7. If the difference is less than ±0.1°C, the CJC offset is correctly calibrated, if it is greater or less, proceed to step 8.
8. Send "**CJC Offset Calibration $(Addr)9(+0000)"** to set initial CJC offset value to zero.
9. Repeat step 6, then proceed to step 10.
10. Send "**CJC Offset Calibration $(Addr)9(Counts)**" to correct the CJC offset error.(counts is a 4-characters with a sign + or -,range is 0000 to FFFF, each count equals

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

approximately 0.0153 °C). (*For more detail, please refer the CJC Offset Calibration Command*).

11. Repeat procedure 7 to procedure 10 if the CJC value still does not conform to the ambient temperature.

Analog Input Module's Calibration Voltages

Code	Input Range	Offset Calibration voltage	Span Calibration Voltage
00	±15 mV	0 mV	+15 mV
01	±50 mV	0 mV	+50 mV
02	±100 mV	0 mV	+100 mV
03	±500 mV	0 mV	+500 mV
04	±1 V	0 V	+1 V
05	±2.5 V	0 V	+2.5 V
06	±20 mA	0 mA	+20 mA
0E	**J** (0°C to 760°C)	0 mV	+50 mV
0F	**K** (0°C to 1000°C)	0 mV	+55 mV
10	**T** (-100°C to 400°C)	0 mV	+30 mV
11	**E** (0°C to 1000°C)	0 mV	+78 mV
12	**R** (500°C to 1750°C)	0 mV	+25 mV
13	**S** (500°C to 1750°C)	0 mV	+19.5 mV
14	**B** (500°C to 1800°C)	0 mV	+15 mV
15	**N** (-270°C to 1300°C)	0 mV	+55 mV
16	**C** (0°C to 2320°C)	0 mV	+39 mV

Table 9-1: ND-6018 Calibration voltages

Code	Input Range	Offset Calibration voltage	Span Calibration Voltage
08	±10 V	0 mV	+10 V
09	±5 V	0 mV	+5 V
0A	±1 V	0 mV	+1 V
0B	±500 mV	0 mV	+500 mV
0C	±150 mV	0 mV	+150 mV
0D	±20 mA	0 mA	+20 mA

Table 9-2: ND-6012/D/ND-6017 Calibration voltages

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Code	Input Range	Span Calibration Resistance	Offset Calibration Resistance
20	Pt-100, -100°C to +100°C, α=.00385	200Ω	50Ω
21	Pt-100, 0°C to +100°C, α=.00385	200Ω	50Ω
22	Pt-100, 0°C to +200°C, α=.00385	200Ω	50Ω
23	Pt-100, 0°C to +600°C, α=.00385	350Ω	50Ω
24	Pt-100, -100°C to +100°C, α=.003916	200Ω	50Ω
25	Pt-100, 0°C to +100°C, α=.003916	200Ω	50Ω
26	Pt-100, 0°C to +200°C, α=.003916	200Ω	50Ω
27	Pt-100, 0°C to +600°C, α=.003916	350Ω	50Ω
28	Ni-100, 0°C to +100°C	200Ω	50Ω
29	Ni-120, 0°C to +100°C	350Ω	50Ω
2A	0 Ohm to 60Ohm	60Ω	0Ω

Table 9-3: ND-6013 Calibration Resistance

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

9.2 How to Calibrate the Analog Output Modules ?

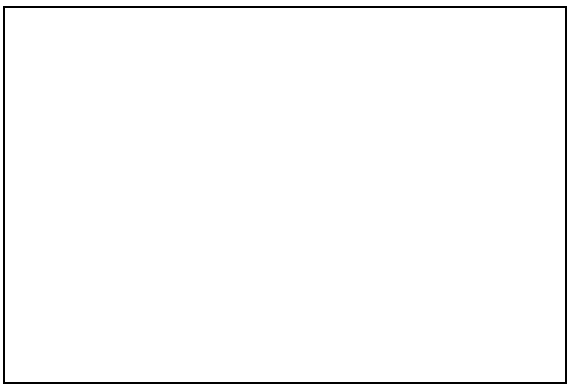
What do you need to do calibration ?

1. One 5 1/2 digit multimeter.
2. A resistor 250 Ω (Accurary is 0.01 %).
3. NuDAM Aministration Utility.

Calibration Procedure

1. Select output range to 0 ~20 mA or 4~20 mA.
2. Put the resistor 250 Ω to the NuDAM-6021 (+ IOUT (Pin.1) and -IOUT (Pin.2)).
3. Put 5 1/2 digit multimeter to measure + IOUT (Pin.1) and -IOUT (Pin.2) .
4. Send the "**Analog Data Output** #(Addr)(OutData**)**" command with output value is **4 mA**. For example if the address is 0x03 then the command is **#0304.000.**
5. Use "**Trim calibration** $(Addr)3(Counts)" command to adjust until the output value to **1 V (4 mA)**.
6. Send "**4mA Calibration** $(Addr)0" command to the analog output module to complete the 4 mA calibration.
7. Send the "**Analog Data Output** #(Addr)(OutData**)**" command with output value is **20 mA**. For example if the address is 0x03 then the command is **#0320.000**
8. Use "**Trim calibration** $(Addr)3(Counts)" command to adjust until the output value to **5 V (20 mA)**.
9. Send "**20mA Calibration** $(Addr)1" command to the analog output module to complete the 20 mA calibration.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000



Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Appendix

Application Note

1. **When setting the baud rate and checksum, please connect the external Default pin to the negative pin of the DC power supply (i.e. GND). Please refer to the circuit path connection in Figure A-1. After setting the device, turn off the power supply and remove the connection between Default and GND. It is now ready for use.**
2. **NEVER connect or disconnect the Default pin signal while the unit is powered .**
3. **While powered up, please be careful when adding or removing pin connectors.**
4. **Keep the module seated away from large power source, strong magnets, etc.**
5. **Use a stable DC source. Avoid using large power source with heavy loads (as motor). If using batteries, please check to ensure for sufficient capacity. Don't mix VS+ and GND signals! Use a 10-30V DC source.**
6. **All NuDAM transmission lines must be shielded twisted pairs (W22-26).**
7. **To prevent signal reflection, add a 120 Ohm resister to the last module (see Figure A-2).**
8. **When using the ND-6531, by all means, must connect the module's FGND to the chassis' Shield GND.**
9. **If using the ND-6018 Temperature Measurement unit, please be sure not to place it in**

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

environments where the temperature changes drastically. It can affect accuracy.

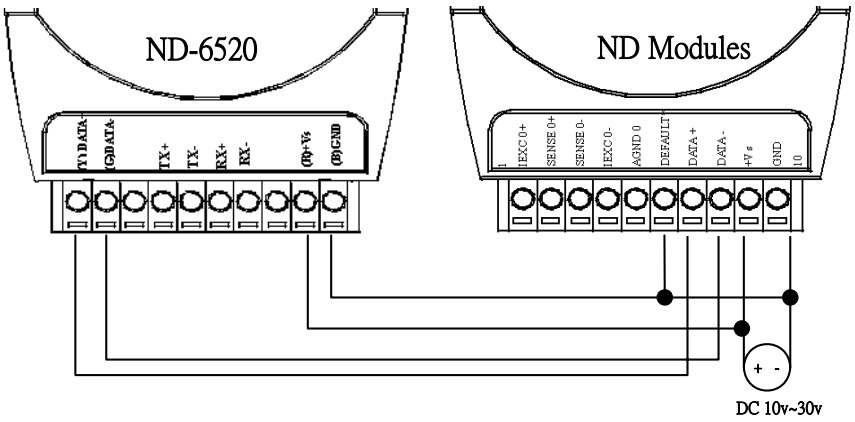


Figure A-1. ND-60xx Default Setting External Connection

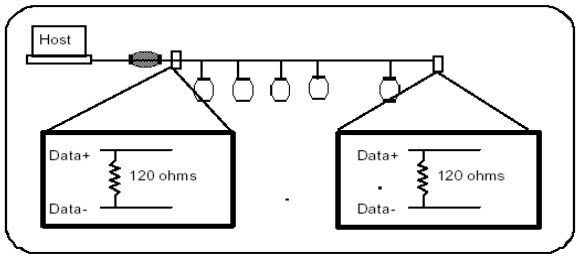


Figure A-2 Terminator Connection

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

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.

2.How to Execute the NuDAM Administration

What environment you needed ?

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

Execute the NuDAM Administration Utility

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

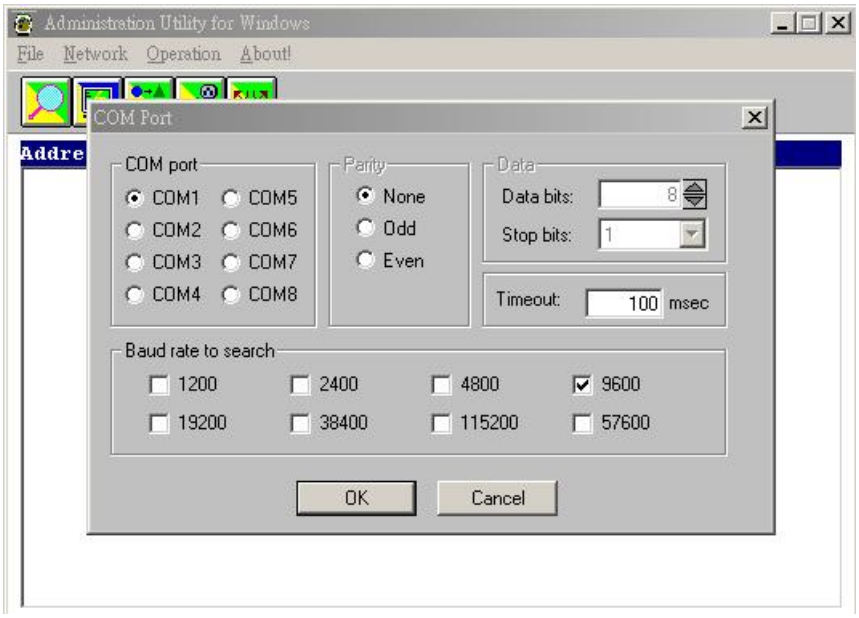
3.NuDAM Administration Function Overview

Default RS-232 Communication Port Setting.

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

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

3.1 Change RS-232 Communication Port Setting.

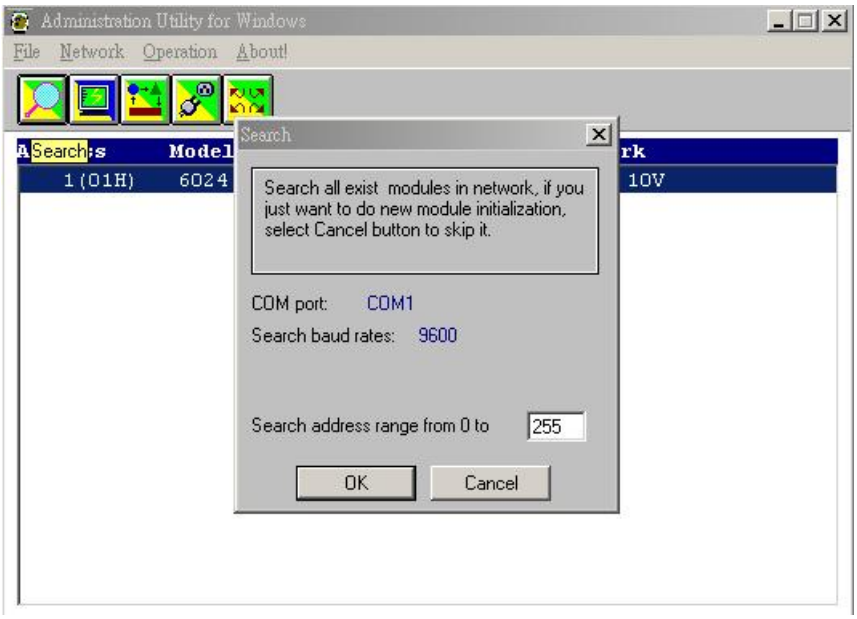


Choose “Network-ComPort” to change setting.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

3.2 Search all exist Nudam modules

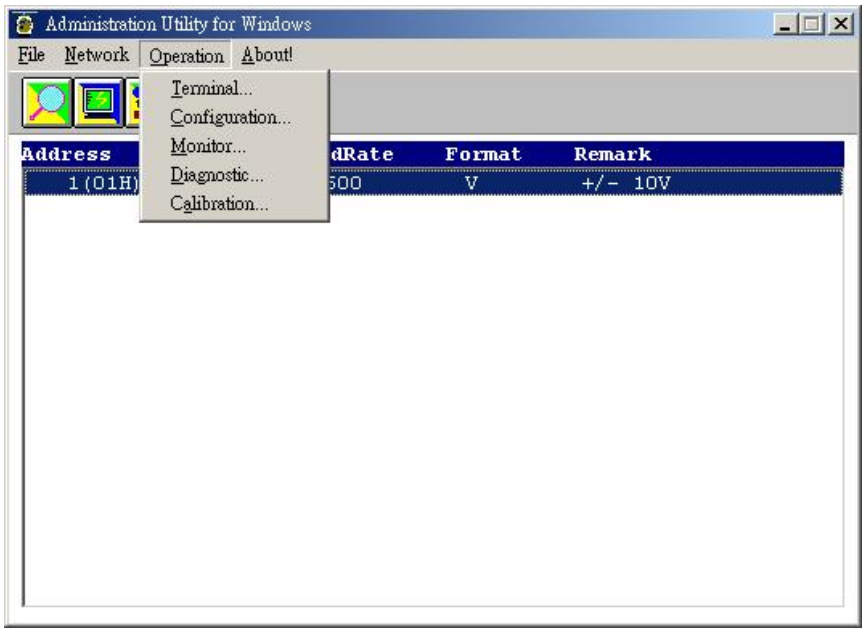
Choose “Network-Search” to search all exist Nudam modules in the current RS-485 network.



Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

3.3 Using Operations

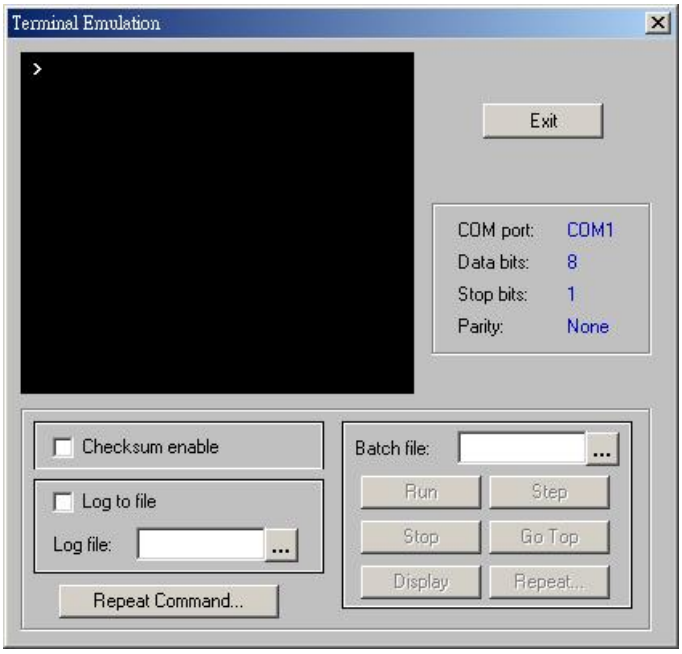
Operation-Terminal :	Terminal Emulation, user can input command and get response message.
Operation-Configuration :	Select one exist NuDAM module and select Configuration to do this module‘s common and private setting .
Operation-Monitor:	Monitor all the module’s function on the network.
Operation-Diagnostic: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



Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Term ICON for Operation-Terminal

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

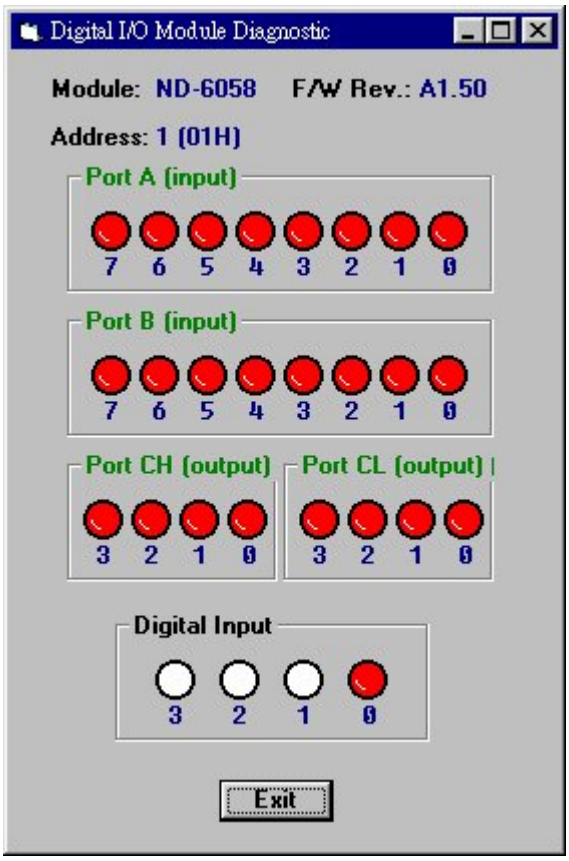


Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

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

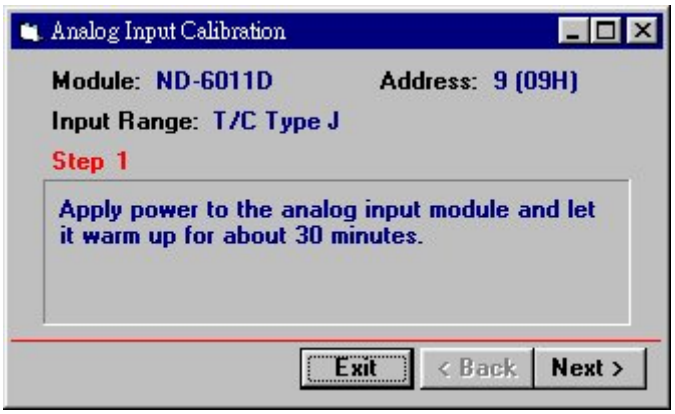
This dialog is different by different-fuction modules.

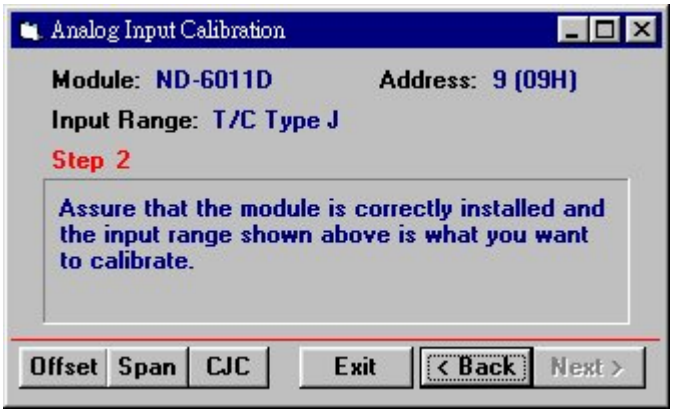


Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Cal ICON for Operation-Calibration

This dialog is different by different-fuction modules.

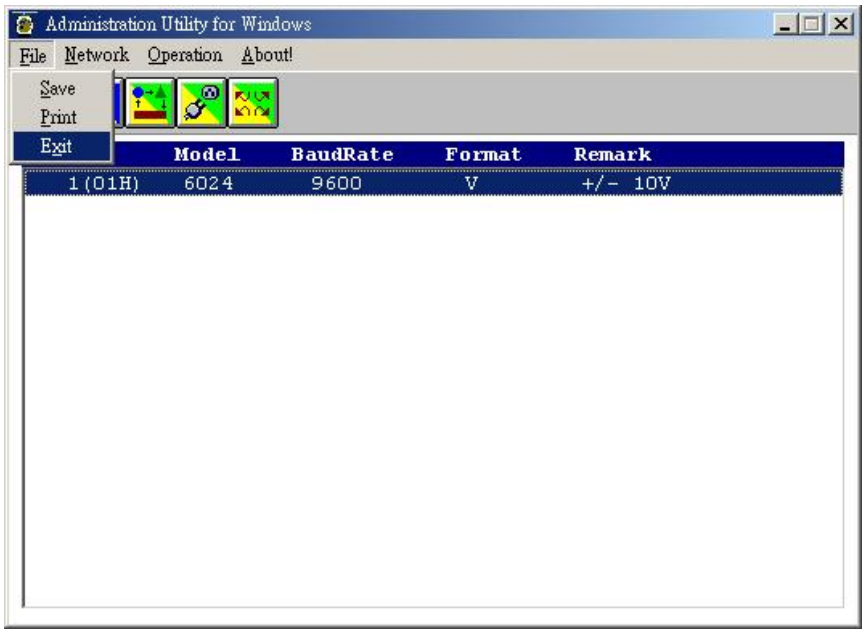




Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

3.4 Save and Print Nudam modules' information

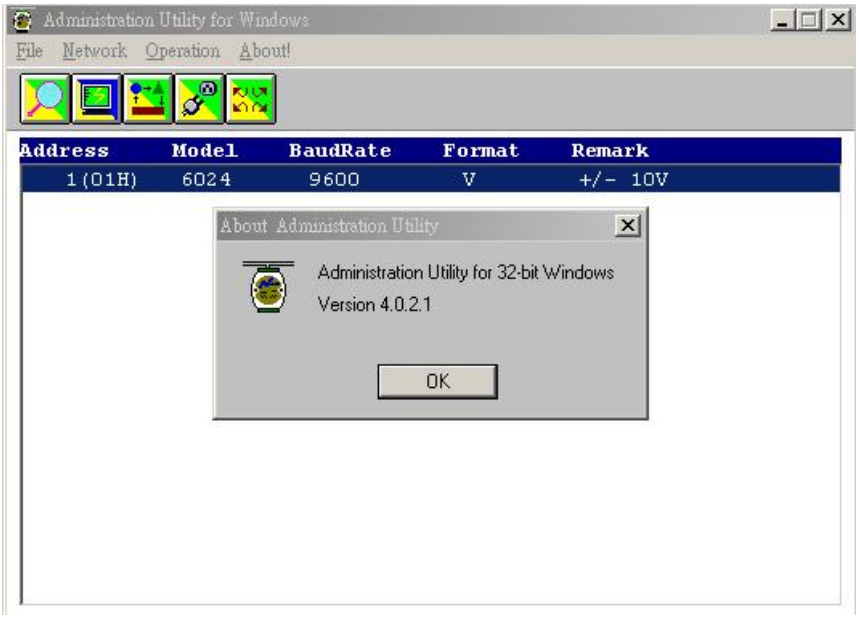
File-Save : Save all exist NuDAM modules information as display as in the listbox in the current RS-485 network.
File-Print : Print the NuDAM module information in the listbox.
File-Exit : Quit the NuDAM Administration Utility.



LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

3.5 Version Information

Help-About Version information



Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Product Warranty/Service

Seller warrants that equipment furnished will be free form defects in material and workmanship for a period of one year from the confirmed date of purchase of the original buyer and that upon written notice of any such defect, Seller will, at its option, repair or replace the defective item under the terms of this warranty, subject to the provisions and specific exclusions listed herein.

This warranty shall not apply to equipment that has been previously repaired or altered outside our plant in any way as to, in the judgment of the manufacturer, affect its reliability. Nor will it apply if the equipment has been used in a manner exceeding its specifications or if the serial number has been removed.

Seller does not assume any liability for consequential damages as a result from our products uses, and in any event our liability shall not exceed the original selling price of the equipment.

The equipment warranty shall constitute the sole and exclusive remedy of any Buyer of Seller equipment and the sole and exclusive liability of the Seller, its successors or assigns, in connection with equipment purchased and in lieu of all other warranties expressed implied or statutory, including, but not limited to, any implied warranty of merchant ability or fitness and all other obligations or liabilities of seller, its successors or assigns.

The equipment must be returned postage-prepaid. Package it securely and insure it. You will be charged for parts and labor if you lack proof of date of purchase, or if the warranty period is expired.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000