USER'S MANUAL

Maxiflex Single Harwell NIM
M1588
User Manual

SCOPE

This document describes the installation, configuration and use of the Maxiflex M1588 Single Harwell NIM. This version of the manual refers to the NIM based on the M1592 platform with no link settings required for changing between RS232 and RS485. For earlier versions based on the M1585 platform please refer to the Rev 4 manual.

Date	Revision	Comments
20/06/2003	1	Initial Release
11/09/2003	2	Updated to include minor NIM modifications
22/09/2003	3	Data formatting changed
27/02/2004	4	Enable / Disable Queries added to volatile area of DIT
20/04/2006	5	Changes for new serial port pinouts
16/11/2011	6	Double byte command functionality added

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1. Introduction

The Maxiflex M1588 Single Harwell NIM is an Omniflex product designed to communicate with the Canberra-Harwell range of radiological monitoring instruments, namely the AB96, iCAM and G64. NIM or '**N**etwork **I**nterface **M**odule' is a generic term used for a range of Maxiflex products that provide a interfaces to a variety of third party or proprietary devices to facilitate monitoring or control of these instruments from a Maxiflex system, or ultimately from a higher level system such as a SCADA or DCS. The term 'Single' is used to indicate that the NIM has a single serial port to differentiate it from dual serial port versions. The Harwell NIM is not available in a dual serial port version.

The Harwell AB96 monitor is an alpha / beta monitor. The iCAM is a newer Harwell offering which effectively replaces the AB96. The G64 is a gamma monitor. A mixture of these monitor types can be accommodated by the NIM on the same network.

2. Overview of Operation

The Harwell NIM is generally used to interrogate Harwell monitors in the field for status and alarm information and present this data in a set of registers (referred to as the **D**ata **I**nterchange **T**able or DIT), for retrieval by an HMI type system. The HMI will be connected to the Maxiflex system via a CPU network port that could be Modbus serial, Modbus TCP, Conet/c or Conet/e to name a few.

A typical system may consist of one or more Harwell NIMs each connected to one or more monitors. A multi-drop, 2 or 3 wire RS485 network is used to connect the NIM (Host) to the monitors (Slaves). The number of monitors that may be connected to one NIM is limited by the NIM configuration but in practice the limit is more likely to be physical. Assuming that cable meeting RS485 specifications is used a maximum cable run of 1km is permitted.

In order to set up the NIM, a basic knowledge of the Canberra Harwell protocol, specifically the network communication commands is required. Reference should be made to a Canberra Harwell document entitled 'AB96,iCAM,G64 Networking Technical Guide'. The reason that this is necessary is because a number of different commands may be sent to each monitor type. These commands return different information from the monitors. The Harwell NIM therefore provides the flexibility to allow commands (or queries) of the users choice to be set up for each monitor. It is possible to set up one or more queries to any one monitor. A maximum of 64 queries can be configured which effectively determines the monitor limit, notwithstanding the physical limitations.

The number of queries ('n' say) to be used in a system is configurable i.e. if less than the maximum of 64 are needed. The NIM executes the queries sequentially from 1 to n. Reducing the number of configured queries will speed up the 'query cycle', hence it is important to optimise each system. Configured queries may be individually enable or disabled. With this feature a system where monitors are moved from location to location may be setup. Queries may then be location specific and they may be enabled or disabled depending on whether a monitor is connected to a location or not.

In addition to presenting the data returned by the monitors as a result of the queries, the NIM also provides an indication of the current status of each query. This enables the HMI to determine the health of the network or the health of an individual monitor.

Query data, query status and query configuration resides in the DIT. A layout of the DIT with specific information regarding the meaning of each register is detailed in section 5.

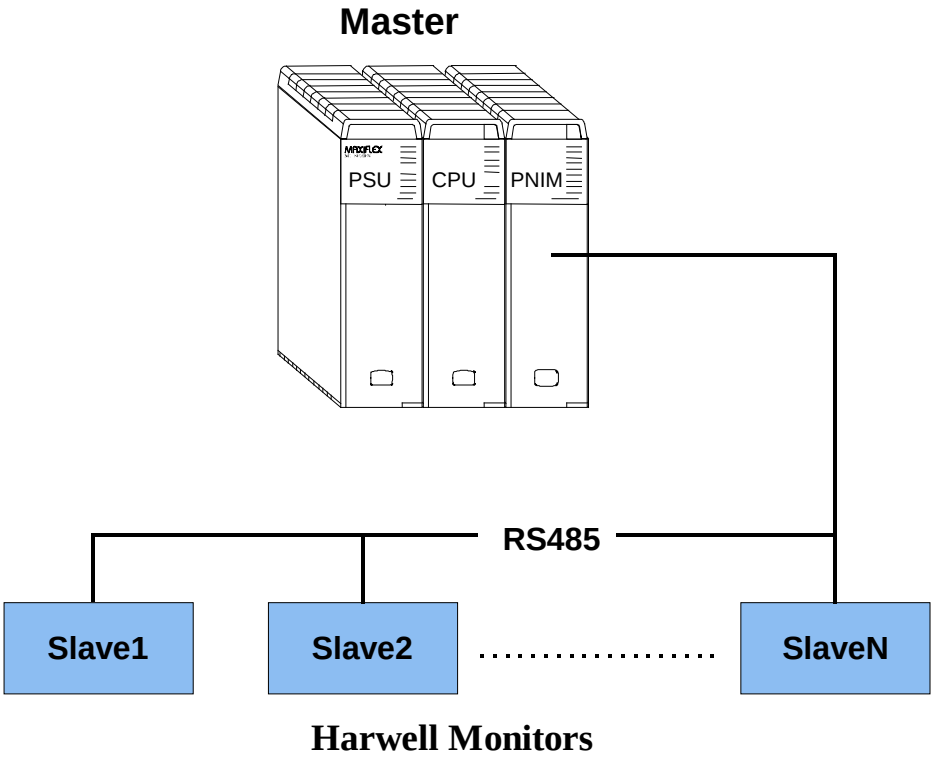
3. System Installation

3.1 Overview

A typical installation will consist of a Maxiflex Master Node that will poll the monitors and present the data in its DIT registers for retrieval by some other system such as a SCADA system.
The Master Node will typically consist of the following Maxiflex Modules:

- Maxiflex I/O Base(s)
- Maxiflex Power Supply
- Maxiflex T2 or P3 CPU with a network port of choice.
- Maxiflex Harwell NIM (1 or more)

The 'Slave Network' connected to each Harwell NIM will consist of 1 or more AB96, iCAM or G64 monitors multi-dropped on a RS485 bus. A single type of monitor or a mixture of monitor types may be connected on the same network to one NIM. Up to fifteen M1588 Harwell Serial NIMs may be fitted to a single Maxiflex rack thereby accommodating up to 15 Harwell networks.



Master Slot Layout:

SLOT NUMBER:	PSU SLOT	CPU SLOT	SLOT 1	..	SLOT 15
FUNCTION:	Maxiflex Power Supply Module	Maxiflex T2 CPU	Maxiflex Harwell NIM	..	Maxiflex Harwell NIM

3.2 Serial Port Connections

The following table illustrates the serial port pin outs.

Pin Number	RS232	RS485
1	nc	Rx+
2	Rx	Rx-
3	Tx	nc
4	nc	Tx+
5	GND	GND
6	nc	+5V
7	RTS	nc
8	CTS	nc
9	nc	Tx-

nc – no connection

Generally the Harwell NIM will be connected to a network of Harwell monitors using 2 or 3 wire RS485. To connect the NIM in two wire RS485 mode, connect pins 1 and 4 together (Data+) and pins 2 and 9 together (Data-).

3.3 Dipswitch Settings

An 8-position dipswitch is situated behind the front door of the NIM. To access the switch, remove the serial cable and open the door (hinges on the right).

For normal operation the Harwell NIM should have all dipswitches set to OFF (to the left). This will be the default setting in which the NIM will be shipped.

It is possible to communicate with the NIM operating as a slave to configure it directly via its serial port (i.e. not via the Maxiflex CPU) using Modbus or Conet/s protocols.

The following table illustrates how to set up each mode of operation:

Communications Protocol	Dipswitch setting
Harwell protocol (Master): All protocol settings are set up in DIT register 3100. See section 5. Address is not applicable.	**Set all DIP switches to OFF**
Modbus Protocol (slave device): Transmission mode: ASCII Baud rate: 9600 Data bits: 7 Parity: None Stop bits: 1 Slave address: see DIP switch	Switches 1-5: Modbus slave ID Switch 6: Reserved Switch 7: OFF Switch 8: ON
Conet/s Protocol: Transmission mode: RTU Baud rate: 19200 Data bits: 8 Parity: None Stop bits: 1 Slave address: see DIP switch	Switches 1-5: Conet/s ID Switch 6: Reserved Switch 7: ON Switch 8: OFF

The following diagram illustrates how the dipswitch would be set up for Modbus operation with a slave ID of 2.

[*White square indicates position of switch lever*]

3.4 Front Panel Diagnostics

A number of LED indicators are provided on the front face of the NIM. The purpose of each of these is described below:

LED Legend	LED Colour	Description
PNIM OK	Green	ON – NIM is healthy OFF or flashing – NIM faulty or no power applied
RUN	Green	ON – user application software is running OFF – no user application software is running Flashing – terminal interaction with NIM
(Port0) Rx	Yellow	ON – data is being received on the serial port OFF – serial port receiver is idle
(Port0) Tx	Red	ON – data is being transmitted on the serial port OFF – serial port transmitter is idle

4. Configuration

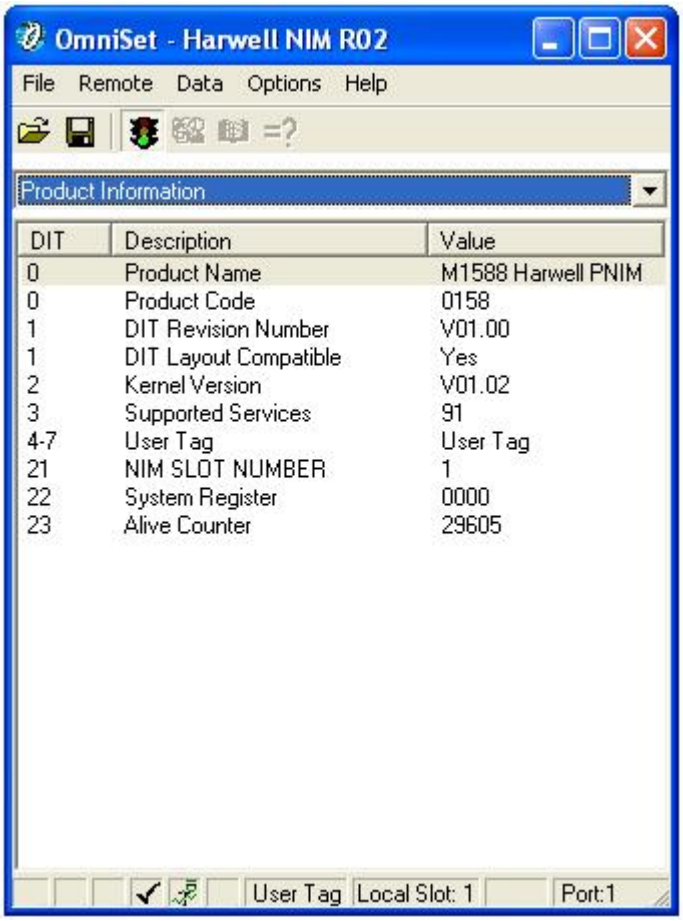
This section describes how to set up and use the Omniflex configuration tools for the purpose of configuring the Harwell NIM. For register specific details refer to section 5.

The NIM may be configured using one of two tools. These are either DITview which is part of the Conet Explorer Suite or Omniset which a free configuration utility. One of these programs must be installed before reading this section. The following text assumes Omniset is being used, however exactly the same procedure applies for DITview.

To configure a NIM, follow this procedure:

STEP1: Connect an Omniflex (M1831A) Programming Cable between your PC com port and the programming port of the Maxiflex T2/P3 CPU.

STEP2: Run Omniset by clicking on Start **à** Programs **à** Omniflex **à** Omniset. Open the Template File for the product by clicking File **à** Open Template... and selecting Maxiflex NIM **à** M1588D Harwell PNIM Template. Once the file is opened the following window will be displayed.



*Note: The template file contains both Static and Dynamic groups. Static groups contain all the configuration data that can be written to or read from the NIM. Dynamic groups contain live data and which is continually updated by the NIM during normal operation. To view the current values in the NIM for a static group, the group must first be read from the NIM. This can be done on an individual group-by-group basis by clicking on the read current group icon on the toolbar, or alternatively all of the groups may be read in one operation by clicking on the read

all groups icon. If changes are made to the data in any static group the group needs to be written to the NIM. This may be done by clicking on the write current group icon.

STEP3: Select the group “Setup Serial Port” and make any changes necessary.

STEP4: Select the group “General Configuration” and change if necessary.

STEP5: Select each query group in turn and make any changes as necessary. The query groups are arranged in blocks of 8 queries each.

STEP6: One all static changes have been made and written successfully to the NIM, return to the “General Configuration” group and change the “Driver Configuration” value to “Re-configure”. Write this to the NIM and then read back the group. Ensure that the “Driver Configuration” parameter has changed to “Configuration Successful”. If not, there may be a problem with the configuration.

STEP7: Once the set up is complete it is a good idea to check that the NIM is correctly configured. To do this, click on the Verify all Static Groups with Target icon. The result of the verification will be displayed at the end of the process. A “Verify failed” message indicates that the configuration in the NIM does not correspond with the configuration in the file. Check that all static groups have been written to the NIM or check the communications link between the PC and the CPU if this occurs.

STEP8: Once the NIM has been successfully set up, enable or disable the queries in the “Enable/Disable Queries” group as necessary.

STEP9: It should now be possible to monitor the status of the queries to ascertain that the NIM is operational.

5. DIT Layout

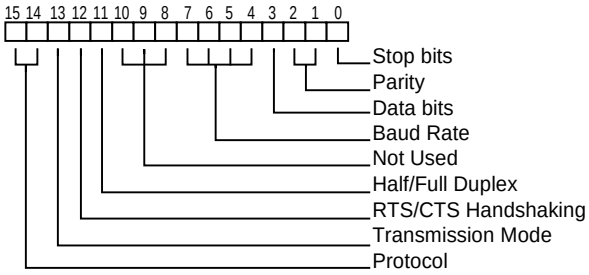
Refer to the following table for details of general NIM registers, configuration registers and query data and status registers.

Note that any registers not specifically listed in the table should be considered to be reserved and no data should be written into these registers.

DIT Number	Description
0 – 2999	**Dynamic DIT Area** This Dynamic DIT area is a bank of volatile registers, suitable for storing run time variables and status indicators. All status and variable data retrieved form the Harwell monitors can be stored in the unused registers in this block.
0 – 23	**System Information** This section contains general functional information about the NIM.
0	**Product Code** Unique Number in BCD format that reflects the type of product as follows: 0158 – M1588 Harwell NIM
1	**DIT Revision Number** Version Number of the DIT Layout supported by the NIM.
2	**Kernel Version Number** Version number of the CPU Kernel. BCD format.
3	**Supported Services Flags** Network related services supported by the Kernel: Bit 0: DIT service Bit 1: Subscription service Bit 2: Queue service Bit 3: Datagram service Bit 4: Routing service Bit 5: Reserved Bit 6: Programming service Bit 7: Reserved Bits 8-15: Reserved Bits set indicate which service is supported.
4-7	**User Tag** User configurable string of DIT registers in ASCII format. The user is able to write up to 8 ASCII characters into these DIT registers to uniquely identify each NIM.
8-21	RESERVED
22	**System Register** Indicates the following conditions current in the NIM: Bit 0: Application program HALTED (0) or RUNNING (1) The Harwell NIM does not contain an application program. For this reason this register will indicate HALTED. Bits 1-15: Reserved
23	**Alive Counter** Free running counter in the NIM. Useful for communications diagnostics. While this register is incrementing, the Operating System is running. If this register is static, the NIM has halted or communications has failed.

DIT Number	Description
100 – 104	**Query Status**
100	**Error Count** This DIT increments for every failed query detected.
101	**Query 1-16 Bit Status Summary** Bit status summary of each query 1-16. A failed query is represented by a 1 and successful query is represented by a 0.
102	**Query 17-32 Bit Status Summary** Bit status summary of each query 17-33. A failed query is represented by a 1 and successful query is represented by a 0.
103	**Query 33-48 Bit Status Summary** Bit status summary of each query 33-48. A failed query is represented by a 1 and successful query is represented by a 0.
104	**Query 49-64 Bit Status Summary** Bit status summary of each query 49-64. A failed query is represented by a 1 and successful query is represented by a 0.
105 – 108	**Query Enable / Disable** These registers allow queries to be enabled or disabled on an individual basis. They are automatically backed up into the non-volatile area of the DIT (3984 – 3987) on change of state. Both sets of registers are automatically synchronised. Changing a bit in one set will change the corresponding bit in the other set. However to enable or disable queries it is preferable to write to this volatile area of the DIT, because the non-volatile area is specified for limited write cycles. Note: When a query is changed from enabled to disabled, the relevant area of the DIT that is designated for this query to store its data, is cleared.
105	**Query 1-16 Enable / Disable** This register allows queries 1 – 16 to be enabled or disabled on an individual basis. Set the relevant bit to 0 to disable a query or to 1 to enable the query.
106	**Query 17-32 Enable / Disable** This register allows queries 17 – 32 to be enabled or disabled on an individual basis. Set the relevant bit to 0 to disable a query or to 1 to enable the query.
107	**Query 33-48 Enable / Disable** This register allows queries 33 – 48 to be enabled or disabled on an individual basis. Set the relevant bit to 0 to disable a query or to 1 to enable the query.
108	**Query 49-64 Enable / Disable** This register allows queries 49 – 64 to be enabled or disabled on an individual basis. Set the relevant bit to 0 to disable a query or to 1 to enable the query.
110 – 173	**Query Status Code area** This block of registers is used to indicate the status of each configured query. One register per query is allocated. A value of 0 indicates a successful, disabled or not configured query and a non-zero value indicates a failed query. Refer to Appendix B for details of these status codes. **Note** that the start DIT address for this block can be changed if required. Refer to register 3976.

DIT Number	Description
200 – 2999	**Dynamic DIT area** This section is available to store the data retrieved from the Harwell Slave Instruments. The user configures each query with a destination DIT address in this area. The data may therefore be located anywhere in this area although it is advisable for efficiency to locate data blocks contiguously.
3000 – 3999	**Configuration DIT Area** This DIT area is maintained in the NIM as non-volatile memory. Data content is retained during power off conditions. Configuration of the NIM serial port and the queries is stored here.
3000 – 3098	**Reserved**
3099 – 3100	**Serial Port Configuration**
3099	**RTS/CTS Timeout** If RTS/CTS handshaking is enabled, then the transmitter will assert RTS when it is ready to transmit. If CTS is asserted before the timeout period in this register, then transmission will commence. If CTS is not asserted, then the transmission will be aborted. Handshaking is enabled in DIT register 3100.

DIT Number	Description
3100	**Serial Port Setup** This register sets up the communications parameters for the serial port on the NIM. The format of this register is as follows:  Stop Bits: 1 = 1 stop bit, 0 = 2 stop bits Parity: 00 = none, 01 = odd, 10 = even Data Bits: 1 = 8 data bits, 0 = 7 data bits Baud: 0000 = 300 baud 0001 = 600 baud 0010 = 1200 baud 0011 = 2400 baud 0100 = 4800 baud 0101 = 9600 baud 0110 = 19200 baud 0111 = 38400 baud DTR/CTS Handshaking: 1 = ON, 0 = OFF Half/Full Duplex 0=half, 1=full Transmission Mode: 1 = ASCII, 0 = RTU(Binary) Protocol: 00 = Conet/s 01 = Modbus 10 = User Protocol **Important Note:** The NIM is shipped with a set of default settings. Only the baud rate should need to be changed to suit the application. However to ensure correct operation verify the following settings: • The Harwell monitors typically operate at 9600 or 19200 baud with 8 data bits, no parity and 1 stop bit. • Set RTS/CTS to off • Set Half/Full duplex to Half. • Set Transmission mode to RTU. • Set Protocol to User.
3101 – 3299	**Reserved**

DIT Number	Description
3300 – 3939	**Query Configuration Area** This area makes provision for 64 queries each with the following format: Note – Each query starts at DIT Register number = 3300 + (n-1)*10, where 'n' is the query number. DIT Offset (from query start) — Description 0 — Instrument Address (4 ASCII bytes) 2 — Command Type 3 — Number of bytes (response size expected) 4 — Destination DIT (where to put response data) 5 — Number of register (number of DITs) 6 — Padding Byte 1 Position 7 — Padding Byte 2 Position 8 — Padding Byte 3 Position 9 — Reserved Refer to Appendix A for further details about setting up queries.
3952 – 3983	**General Configuration DIT Area** This is the area that configures the operation of the NIM.
3952	**Driver Configuration** This DIT allows the user to reconfigure the NIM if any changes are made in the General Configuration Area **OR** in the query configuration area. The re-configuration is invoked by selecting the Re-Configure option (set this register to 255). This action will result in either a Configuration Successful (0) or a Configuration Failed (1) flag being returned.
3956	**Query Response Time (ms)** Milliseconds timeout used to monitor communications from individual Harwell Slave devices on the slave network. If no response to a transmitted query is received within this time, the NIM will move on to the next query. The NIM will indicate a failed (timeout) status for this query depending on the setting for the Maximum Retries – see register 3957.
3957	**Maximum Retries** The NIM uses this number to determine whether to indicate a query failure or not. If the number of consecutive failures of any one query exceeds this parameter, the query will be flagged as failed by setting the relevant bit in the query bit status summary registers. This setting has no effect on the value stored in the query status code register. The latter will always indicate the result of the last query. The maximum retries should be optimised for each system. Setting this parameter too low will result in the unnecessary reporting of failures. Setting it too high on the other hand will delay the time before a genuine failure is reported. Certain monitor types such as the G64 may not always respond to a command if it they are busy doing other processing. Setting the Maximum Retries can therefore cater for this.
3958-3959	**Home Address (4 ASCII Characters)** The 'Home Address' is the address that the NIM assumes. It is the source address for commands and hence the address to which responses are returned. It can hold any address other than one that would conflict with an instrument address.

DIT Number	Description
3972	**Inter-set-delay (x10ms)** Sets the delay between sets of queries i.e. between sending the last query and sending the first query again. This time should be optimised to get reliable communications as fast as possible. Typically a value of around 50ms (5) achieves this.
3973	**Inter-query-delay (x10ms)** Sets the delay between individual queries. This time should be optimised to get reliable communications as fast as possible. Typically a value of around 50ms (5) achieves this.
3974	**Number of Queries** Set this to the number of the last query that is configured. Queries that are disabled or not configured within this block will be ignored but must be included in this count.
3976	**Status Table DIT Location** Points to the starting DIT register where the individual status codes for each query will be stored. By default this is set to DIT 110, but may be changed if required.
3984 – 3987	**Query Enable / Disable** These registers allow queries to be enabled or disabled on an individual basis. They are automatically synchronised to registers 105 – 108 in the volatile area of the DIT. **Important Note:** *These registers reside in the non-volatile area of the NIM. The NIM will therefore be able to resume polling as configured, after a power cycle. However care should be taken to ensure that any application that writes to these particular registers does not do so unnecessarily. This is because these registers can endure a limited number of write cycles. For this reason it is preferable to enable / disable queries using registers 105 to 108.* Note: When a query is changed from enabled to disabled, the relevant area of the DIT that is designated for this query to store its data, is cleared.
3984	**Query 1-16 Enable / Disable** This register allows queries 1 – 16 to be enabled or disabled on an individual basis. Set the relevant bit to 0 to disable a query or to 1 to enable the query.
3985	**Query 17-32 Enable / Disable** This register allows queries 17 – 32 to be enabled or disabled on an individual basis. Set the relevant bit to 0 to disable a query or to 1 to enable the query.
3986	**Query 33-48 Enable / Disable** This register allows queries 33 – 48 to be enabled or disabled on an individual basis. Set the relevant bit to 0 to disable a query or to 1 to enable the query.
3987	**Query 49-64 Enable / Disable** This register allows queries 49 – 64 to be enabled or disabled on an individual basis. Set the relevant bit to 0 to disable a query or to 1 to enable the query.
3988 – 3999	Unused

Appendix A: Query Definition

While reading this section, reference should be made to the Harwell document: 'AB96,iCAM,G64 Networking Technical Guide'.

The format of a query as set up in the NIM is:

<Address><Command><Number of bytes><Address for data><Number of registers><Padding Byte 1 Position><Padding Byte 2 Position><Padding Byte 3 Position><Reserved>

These parameters are explained below:

Address this comprises 4 ASCII characters and is the address of the instrument to which the command is being sent.

Command a single or double byte that is the command to be sent to the instrument. When using single byte commands, the low byte must be used for the command. When using double byte commands, the low byte is the command and the high byte is the parameter.

Number of bytes this is the expected number of bytes in the reply. It includes the first byte of the data set, which is the status byte. This byte will not appear in the query data area. It is important that this parameter is set correctly. If not, the response message will not be correctly decoded by the NIM.

Address for data the starting DIT register address where the returned data is to be stored

Number of registers the number of DIT registers used to store the data (in words). This does not include the status byte, which is the first byte of the data – this is interpreted by the NIM and used in the status reporting mechanism. The number of registers will determine how much data is stored by the NIM. It is possible to ignore some of the response data using this setting.

Padding Byte 1 to 3 Positions

Some of the monitor responses contain floating-point numbers (floats) that occupy 4 bytes of data. These must be aligned to a DIT register boundary in order for them to be interpreted correctly by a top-level system (e.g. SCADA). This can be achieved by 'padding' the received data with a zero at the appropriate position(s) – a byte of value zero will be inserted by the NIM before the specified byte. The necessity for this 'padding' can be easily determined by checking that all floats start at odd byte counts.

Reserved Reserved for future use.

The following table gives an example of a set of queries in the DIT registers. It assumes that there are two instruments configured. This example applies to the AB96 or iCAM instruments. The same principles are applied to all message and instrument types.

Name	Example Value	DIT Address	Comment
Instrument address	'2''3'	3300	Instrument 1 address in ASCII
Second part	'4''5'	3301	Total of 4 bytes
Command	0x0F	3302	Status report
Number of bytes	13	3303	Bytes returned in response to command
Address for data	1200	3304	First location in DIT
Number of registers	6	3305	Number of DIT locations
Padding Byte 1 Position	0	3306	No floats in reply
Padding Byte 2 Position	0	3307	
Padding Byte 3 Position	0	3308	

Name	Example Value	DIT Address	Comment
Reserved	0	3309	
Instrument address	‘2’’3’	3310	Instrument 1 address in ASCII
Second part	‘4’’5’	3311	Total of 4 bytes
Command	0x15	3312	Summary report
Number of bytes	26	3313	Bytes returned in response to command
Address for data	1206	3314	First location in DIT
Number of registers	13	3315	Number of DIT locations
Padding Byte 1 Position	0	3316	First float starts at byte 9 (odd) – no padding required.
Padding Byte 2 Position	0	3317	Floats are in a contiguous block
Padding Byte 3 Position	0	3318	
Reserved	0	3319	
Instrument address	‘1’‘2’	3320	Instrument 2 address in ASCII
Second part	‘3’‘4’	3321	Total of 4 bytes
Command	0x0F	3322	Status report
Number of bytes	13	3323	Bytes returned in response to command
Address for data	1219	3324	First location in DIT
Number of registers	6	3325	Number of DIT locations
Padding Byte 1 Position	0	3326	No floats in reply
Padding Byte 2 Position	0	3327	
Padding Byte 3 Position	0	3328	
Reserved	0	3329	
Instrument address	‘1’‘2’	3330	Instrument 2 address in ASCII
Second part	‘3’‘4’	3331	Total of 4 bytes
Command	0x15	3332	Summary Report
Number of bytes	26	3333	Bytes returned in response to command
Address for data	1225	3334	First location in DIT
Number of registers	13	3335	Number of DIT locations
Padding Byte 1 Position	0	3336	First float starts at byte 9 (odd) – no padding required.
Padding Byte 2 Position	0	3337	Floats are in a contiguous block
Padding Byte 3 Position	0	3338	
Reserved	0	3339	
Instrument address	‘1’‘2’	3340	Instrument 2 address in ASCII
Second part	‘3’‘4’	3341	Total of 4 bytes
Command	0x7008	3342	Alpha Alarm Setpoints
Number of bytes	14	3343	Bytes returned in response to command
Address for data	1238	3344	First location in DIT
Number of registers	7	3345	Number of DIT locations
Padding Byte 1 Position	0	3346	First float starts at byte 1 (odd) – no padding required.
Padding Byte 2 Position	0	3347	Floats are in a contiguous block
Padding Byte 3 Position	0	3348	
Reserved	0	3349	

Notes:

1. It is possible to disable an individual query (and not get a configuration error) by setting the command register to zero. This can be useful for some applications.
2. When a query is changed from enabled to disabled, the relevant area of the DIT that is designated for this query to store its data, is cleared. The number of DIT registers cleared is determined by the 'Number of registers' parameter.
3. If a query is changed (reconfigured), it is best to first disable the current query to clear the data area, then change the query configuration and finally enable the new query.
4. To specify the padding byte positions, look at the response data and determine where padding bytes need to be inserted. Remember that inserting one padding byte will increment all subsequent byte numbers by one. If a second padding byte (or third) needs to be added, the original byte numbers in the response must still be specified. For example if you specified padding bytes at 1, 10 and 17 these bytes will appear in positions 1, 11 and 19 in the stored data in the DIT.

Appendix B: Query Status Codes

The query status code registers indicate the success or failure of each query If the value of a status code register is 0, it could mean that the query is not configured or disabled or that the query is OK. When a query fails, the NIM tries to ascertain the reason for the failure and reports it as per the following table. When a query fails, no data will be stored in the DIT.

Status Code	Meaning
0	Query response OK
1000	No response received within query response time
1001	Failed on message number, instrument has replied to wrong message
1002	Failed on addressing, addresses in reply don't match addresses in request
1003	Wrong number of bytes in reply.
1004	Timeout on RTS-CTS (unlikely to happen).
1005	CRC checksum failure on reply from instrument.
65535	Invalid query configuration