

Messenger System

Overview

for
Remote Site/Equipment Alarm Monitoring
And
Pulse Counting/Meter Reading Functions

www.nhds.co.uk



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1 Introduction

New Hampshire Digital Services (NHDS) specialise in supplying monitoring products and systems to industry.

The Messenger system comprises of a range of products each with specific functionality to accommodate various applications as briefly detailed below.

Messenger M62 monitors output contacts for status change reporting such events in real time. It is also equipped with pulse counting inputs. Meters and other equipment that generate electrical pulse outputs can be monitored and current readings downloaded to a host terminal at a pre-configured interval or in real time.

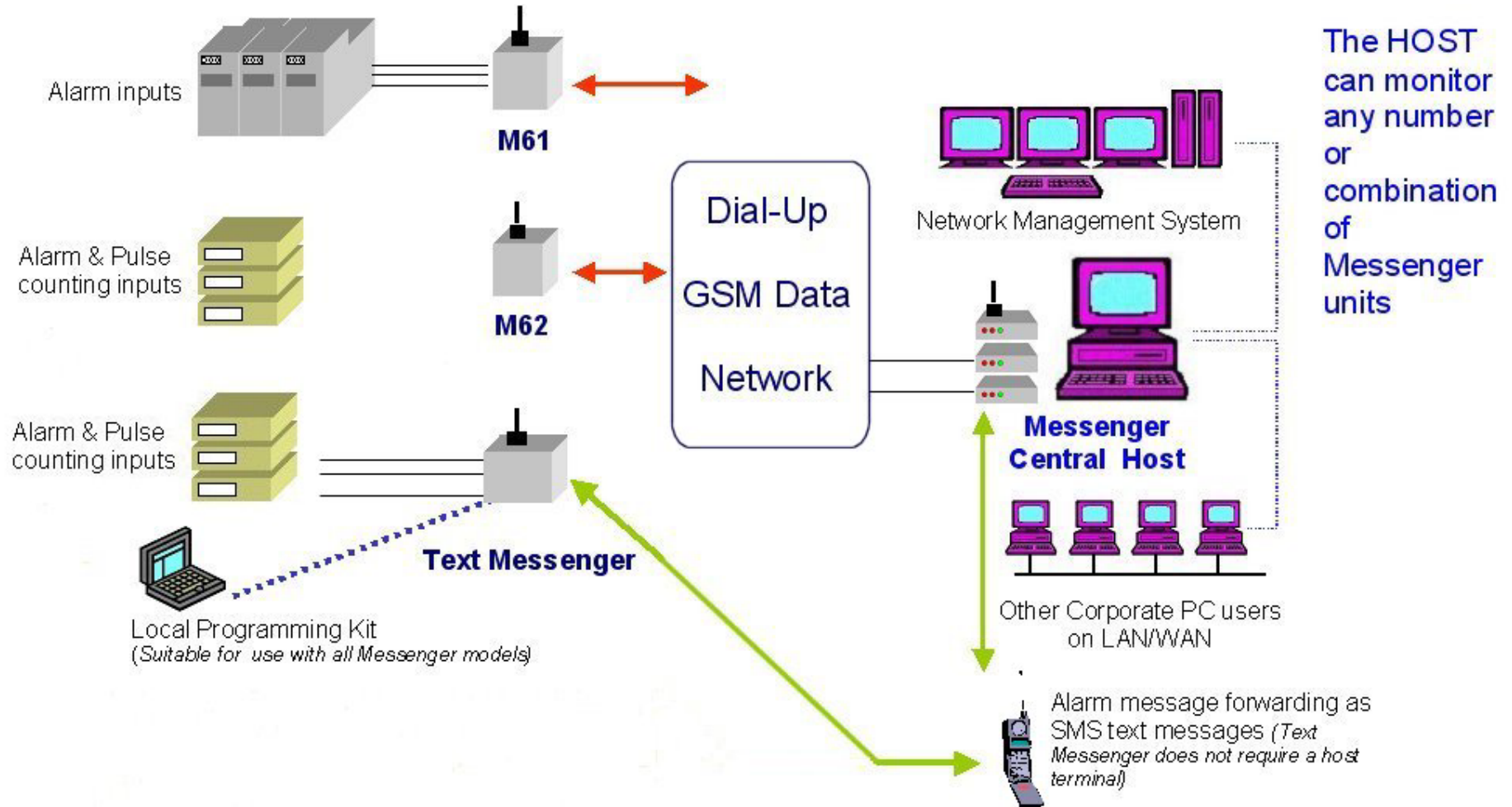
Messenger M61 monitors output contacts for status change. These changes are reported as alarms in real time. This unit requires no external power source and has an operating life of 10 years

Text Messenger has the same functionality as the M62 but reports event alarms and meter/pulse counting readings directly to a mobile phone(s) as SMS text messages.

This document outlines all products and the central host application used to collect and display Messenger units site information and associated data.



2 System Schematic

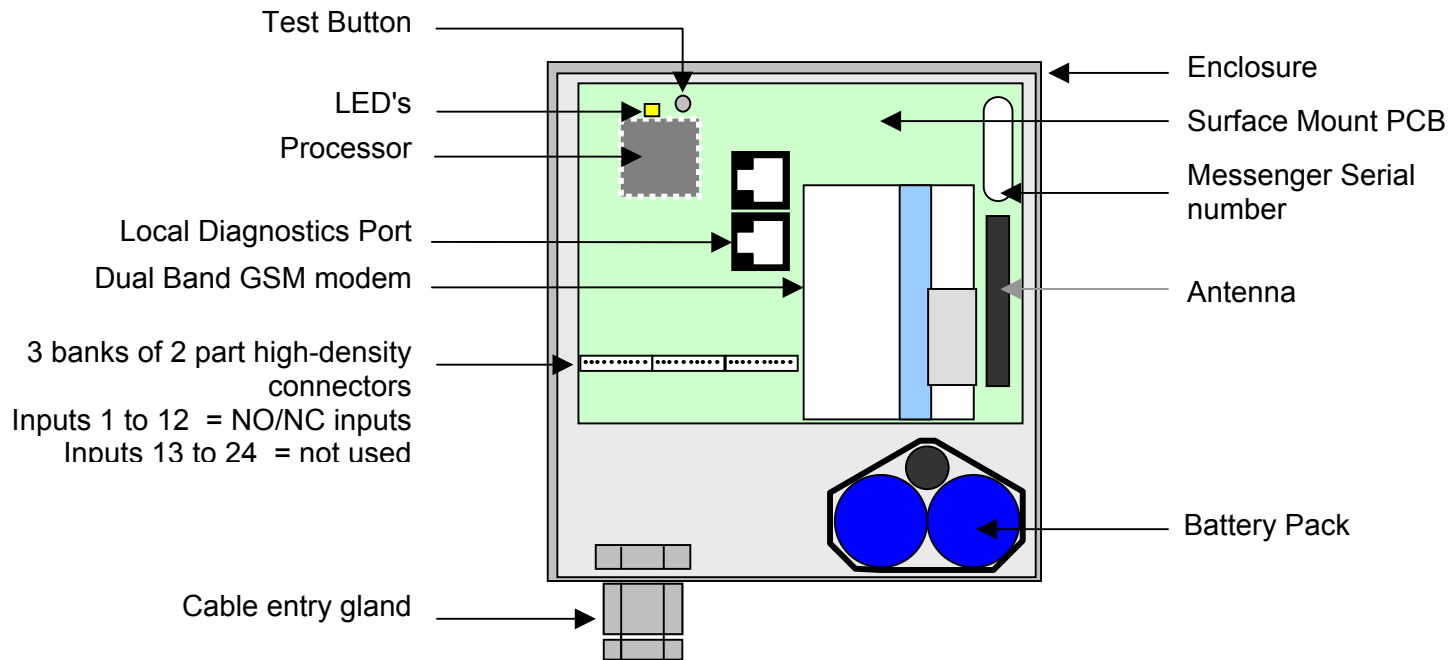




3 M61



M61 Internals



Pole mounted M61



4 M61 & Text Messenger Features

Power Supply

DOES NOT REQUIRE ANY EXTERNAL POWER SUPPLY

3.6v, 36Ah Lithium battery with lead acid component. The battery has a 10-year life and has been tested to make more than 3,000 calls.

Modem

Type: WMOI3 dual band 900/1800Mhz GSM (Optional Tri Band 900/1900Mhz GSM). The modem requires a data enabled SIM card to enable connection to the GSM network. The SIM card can be replaced if necessary to accommodate networks with greater coverage.

The M61 Messenger unit make outgoing calls only, to preserve battery life.

Local Diagnostics Port

Used for configuration to program input settings and host number, although this is usually done prior to delivery. The diagnostics port is also used for fault finding.

Processor

Single low power PIC processor design. The current drain from the processor during standby mode is as little as 10 micro Amps. The PIC's real time clock is synchronised with the host during each contact. Events are stored in separate non-volatile memory.

Digital Inputs

Inputs 1 to 12:

Digital status bits. Changes in status are date and time stamped and reported to the host in real time. The host can display the inputs as normally open or normally closed. Inputs can be displayed as alarms, status only or disabled by the host.

Inputs 13 to 24:

These are available for future expansion at the request of customers.

Enclosure and Glanding

The enclosure provides protection to IP67 and is fitted with a Goretex™ gland to prevent moisture build up (unavoidably caused by atmospheric changes). Alternative enclosures can be supplied as requested.

Test Button

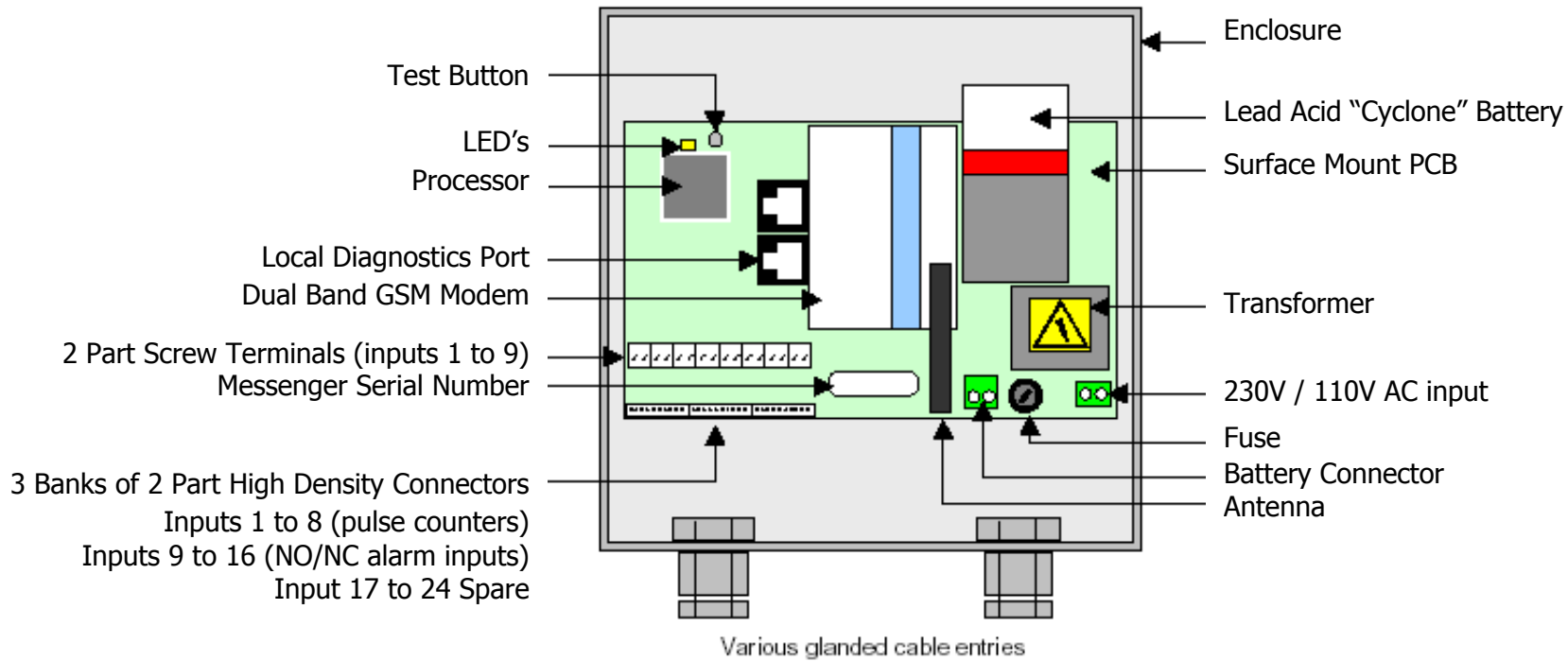
Forces the unit to call the host. Not usually used except during on-site commissioning.

LED

Reports TX/RX retry status of modem



5 M62 & Text Messenger Schematic



M62 Internals



M62 mounted in a meter cabinet



6 M62 & Text Messenger Features

Power Supply

Requires an AC mains supply. Standard 230V / 110V transformer (other voltage options available on request). The unit is fitted with a replaceable 3A fast blow fuse and the transformer is potted.

Battery

12V Hawker Cyclone rechargeable lead acid. Provides power to the modem and processor during periods without AC mains power.

Modem

Type Wavecom WMOi3 dual band 900/1800 or optional 900/1900 GSM. The modem requires a valid SIM card in order to connect to the GSM network. The SIM card is removable. Connection to the network is via the "Data" service.

The M62 makes outgoing calls and also receives incoming calls from the host.

Local Diagnostics

Used during faultfinding. Can also be used for local programming and configuration of input settings, although the M62 meter can be programmed remotely over air.

Processor

Single low power PIC processor design. The current drain from the processor during standby is as low as 10 micro amps. The PIC's real time clock is synchronised with the host PC clock during each contact. Counters and events are recorded in separate non-volatile memory.

Pulse Counting inputs

Inputs 1 to 8:

16 bit counters. Suitable for use with volt free, dry contact inputs. Space saving high-density connectors. Alternatively screw terminals can be supplied.

Inputs can be disabled for monitoring by the host.

Digital inputs

Inputs 9 – 16:

Digital status bits. Changes in status are time and date stamped and then called into the host. The host can display the inputs as Normally Open or Normally Closed.

Inputs can be disabled from monitoring.

Spare Inputs

Inputs 17 to 24:

For future use when requested by customers.

Test Button

Forces the unit to make a call to the host. Not usually used except during fault diagnosis and configuration.

LED

Reports TX/RX/Retry status of modem.



7 Messenger Operation

Digital Inputs

The Messenger units can be connected to any equipment with volt-free auxiliary contacts, such as circuit breakers, relays, fault indicators, door alarms etc. When an input changes state, the date and time and the type of change (open to closed or closed to open) is logged and stored in a local non-volatile memory. At the same time an "alarm call" to the Messenger host terminal is initiated. While the Messenger unit is calling the host any further changes to the status on any of the inputs are logged in the same way and reported to the host during communication.

During each contact with the host the current status of the inputs is reported, date/time stamped and the site information screen updated with any changes.

All alarm events will be saved to a database on the Host PC hard drive and can be viewed and sorted by the host operator.

Pulse Counter Inputs – M62 & Text Messenger only

Pulses of 100 ms or greater can be detected by the above units to perform metering or counting functions. Each of the 8 pulse counting inputs has a 16-bit (65,536) counter associated with it. Each pulse on the input increments the counter by a value of 1, scaling factors can be set up by the host where large counts are appropriate (i.e. 1000 pulses scaled by 100 shows a value of 10). These counter values are again stored in a non-volatile memory.

During each communication between the Messenger host and associated remote units the counter values are downloaded. In addition the host operator can make a call at any time and download the values in real time.

Counter values are saved to the host PC hard drive and can be reported in a number of different standard reports using the host terminal report generator. The data can also be exported for use with existing software such as Microsoft Excel.

Two way calling

The unit can be configured to make routine calls to the host terminal, download logs and check health status. The host operator can also make a call to any Messenger M62 site on demand. The M61 Messenger can be configured to make routine outgoing calls to the host, but calls from the host to the unit cannot be made in order to preserve the life of the lithium cell.



7 Messenger Operation Cont.

Test/Health check Calls

During normal operation all Messenger units will make a routine test call to the host on a weekly (or other user programmable interval) basis. During this contact with the Host a variety of information is passed in both directions, including:

- Digital input status
- The current value of all input counters
- Communication statistics (successful calls, failed calls)
- Date / time at the PC
- Next routine call date / time
- Host telephone numbers for next call

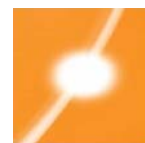
AC Failure - M62 &Text Messenger only

The 230V/110V AC mains supply to these units is monitored. Loss and restoration to the supply is date and time stamped and called into the host terminal as an alarm. During AC mains failure conditions the units will continue to monitor and report any input alarms.

During short periods without AC mains power (approx 48 hours) the battery will keep the unit operational. As battery power gets low a warning alarm will be sent, before an auto shut down sequence is initiated to prevent any damage to the unit.

Cold Start

When the units are first connected the battery will be fully discharged. The charging circuit will therefore commence battery charge. The processor recognises that the time and date will be incorrect and initiates a call to the host number stored in the non-volatile memory. During this information exchange, as with all calls, the date and time is synchronised with the host and a "cold start" event is logged in the database.



8 Host Terminal – Introduction

Software

The Messenger Host Terminal is a bespoke application designed and developed by NHDS. Running in a Windows environment it provides a user-friendly front end to all the central operation and maintenance activities required by the Messenger system. The software is based on an open platform with a number of pre installation, configurable options available to cater for a wide audience. Whilst a number of these features are hidden, as in most cases they will not all be appropriate, they can be added as future requirements dictate.

Hardware

The application runs on a standard Pentium grade PC platform. The only additional hardware required will be the communication ports for systems with multiple Host modems.

Modems

Up to 16 modems can be connected to a single Host terminal. This means that for the very largest of systems, 16 simultaneous calls can be handled. Modems can either be PSTN (landline network) modems or GSM (mobile network) modems.

Any Number of Sites

There is no limit to the number of Messenger units that can be monitored from a single host. In practical terms however we would advise that with a modem limit of 16, if more than approximately 3000 units are to be connected, a sub system prior to a central system should be considered.

Easy to Install & Maintain

Installation is via a single CD. The comprehensive and easy to follow user manual has a section on configuring the Host Application and modem set ups etc. Maintenance is also made easy with features like "System Alarm" and "Archive" functions.

Scalability

The Host terminal can be increased in size as units are added. NHDS have considerable experience of integrating with existing management systems. This has been accomplished both from the outset and as system structures have grown. (See later section for interfacing).

Flexibility

The Host terminal application supports all types of Messenger models manufactured by NHDS. This caters for all types of metering and monitoring functions within a customer's organisation regardless of geographical, power supply or communication restriction.



9 Host Terminal – M62 Site Information Display

The screenshot shows the UC2 View software interface with several sections and annotations:

- Information:** Messenger Serial No: 62000001, Group: Text Messenger, Site Name: Text Messenger Demonstration Unit, Site Location, Equipment Type: Cooling Plant1, Site Contact, Host Location, Equipment Supplier.
- Meter Readings/Counters:** Meter 1: 88375, Meter 2: 219461, Meter 3: 11, Meter 4: 2, Meter 5: 33, Meter 6: 0. Includes buttons for "Reset Meter/Counter(s)" and "Reset Latched Inputs".
- General Status:** Total Calls Initiated by Host: N/A, Total Calls Initiated by Messenger: N/A, Number of Successful Calls: N/A. Battery Status OK, AC Supply OK.
- Communications Status:** Communications OK, Settings Up to Date: No, Last Contact: 17:15:21 on Mon, 09 Feb 2004, Next Contact: 01:08:20 on Mon, 16 Feb 2004, First Contact: 17:14:54 on Mon, 09 Feb 2004. Includes a "Reset" button.
- Inputs Status:** Input 1 OK, Input 2 OK, Input 3 OK, Input 4 Fail, Input 5 OK, Input 6 OK, Input Not Enabled, Input Not Enabled. Includes a "Reset Latched Inputs" button.
- Miscellaneous Notes:** A text area for user notes.
- Buttons:** Close, Call, Edit Information, Edit Profile, Edit Notes, View Logs, and a checkbox for "Park Mode (Disable Reporting and Logging of Faults)".

Annotations with arrows point to the following areas:

- Site Location Details:** Points to the Information section.
- Counter Input Readings:** Points to the Meter Readings/Counters section.
- Communication routines and status:** Points to the Communications Status section.
- Digital Input Status:** Points to the Inputs Status section.
- View date/time stamped event history:** Points to the View Logs button.
- Force a Polling Call to the unit button:** Points to the Call button.
- Power Supply Status:** Points to the Battery Status and AC Supply OK indicators.
- Communication Details:** Points to the General Status section.
- User Notes:** Points to the Miscellaneous Notes section.



Change Unit Settings

10 Host Terminal – Messenger Profile

Each Messenger unit’s operational settings are stored in a “Profile” both in the unit and at the Host. It is a simple task to edit settings individually and globally from the central Host.

Edit Profile - General Settings

Primary Telephone Number to Report Faults To: +447739597052
 Secondary Telephone Number to Report Faults To: +447739597052
 Status Text to Define Late/Out of Contact Units: No Contact
 Status Text to Define Disabled Units: Disabled

Edit Profile - Meters/Counters

Enable	Name	Check for Faults	Fault Period
<input checked="" type="checkbox"/>	Ram Counter	<input type="checkbox"/>	30
<input checked="" type="checkbox"/>	Hour Meter	<input type="checkbox"/>	30
<input checked="" type="checkbox"/>	Water Meter	<input type="checkbox"/>	30
<input type="checkbox"/>	Cheese Sandwich	<input type="checkbox"/>	30
<input type="checkbox"/>	50p Slot counter	<input type="checkbox"/>	30
<input type="checkbox"/>	£1.00 slot counter	<input type="checkbox"/>	30
<input type="checkbox"/>	Meter 7	<input type="checkbox"/>	30
<input type="checkbox"/>	Meter 8	<input type="checkbox"/>	30

Edit Profile - Contact Input Settings

Select Events To Be Forwarded

Contact Input Alarm Events				Contact Input Reset Events				Miscellaneous Events			
Event Type	1	2	3	Event Type	1	2	3	Event Type	1	2	3
Input 1 Alarm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Input 1 Reset	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Test Call	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Input 2 Alarm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Input 2 Reset	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cold Start	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Input 3 Alarm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Input 3 Reset	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Buffer Overrun	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Input 4 Alarm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Input 4 Reset	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Late	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Input 5 Alarm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Input 5 Reset	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Mains Fail	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Input 6 Alarm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Input 6 Reset	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Mains Restored	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Input 7 Alarm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Input 7 Reset	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Batt. Fail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Input 8 Alarm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Input 8 Reset	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Batt. Restored	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Edit Profile - SMS Forwarding

Enable SMS Message Sending/Forwarding for Received Alarms:

Enable	Phone Number	Description
<input checked="" type="checkbox"/>	1234 56789	Standby Engineer
<input checked="" type="checkbox"/>	8990 888777	Security
<input type="checkbox"/>		

NOTE: Events will only be forwarded to phone numbers if selected on this page AND, in the case of contact inputs, enabled for monitoring in the Contact Input Settings page in the profile



11 Host terminal – Alarm Monitoring Features

Icon key

Messenger Host Terminal

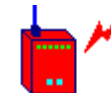
File Database Configuration Logging/Reports Help

View Units As Icons View All Units In List

Nom de Site	Equipment Type	Group	Status	Date of Alarm
Abandonit	F61-Saurpiytut	Messengers	AC Supply Failure, Fuite Comp	09/03/04 16:54:47
Dorma Foods	Alpha Compactor	Systematic Messenger Units	No Contact	26/01/04 15:36:46
Text Messenger Demc	Cooling Plant1	Text Messenger	No Contact	09/02/04 17:16:00
M61 Demonstration U	Turbine 3	M61 Messenger Units		
M61 Demonstration U	Turbine 4	M61 Messenger Units	Disabled	
Prima Fruits	Beta Compactor	Systematic Messenger Units	No Contact	26/01/04 15:37:19



RED ICON WITH BACKGROUND: This indicates a new alarm that has not been acknowledged. An alarm is acknowledged by double clicking on the alarm to view the details.



RED ICON: This indicates a Messenger in an alarm condition that has been acknowledged (viewed).

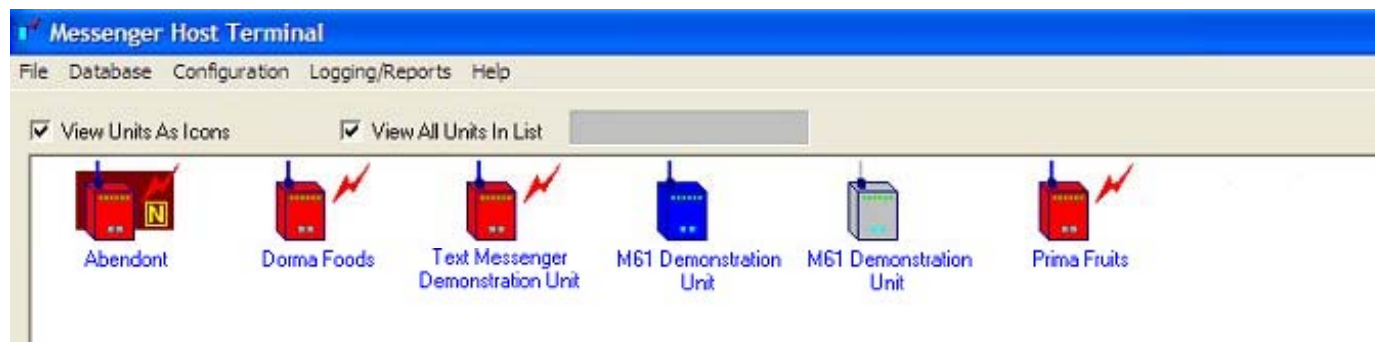


BLUE ICON: This indicates a Messenger with no alarm conditions (i.e. healthy).



GREY ICON: This indicates a Messenger that has been disabled and is therefore no longer displaying alarm conditions. (i.e. Out of Service).

Messenger units can be displayed in a **list** or as **icons**



GREEN ICON : This indicates a MESSENGER that has been powered for the first time. This usually denotes a newly commissioned Messenger.



12 Host Terminal – Event History Information

One click views date/time stamped event history for one or all sites, the reported timescale can be selected by “Range of dates to List”

Event Logs

Range of Dates to List

Start Date: 01 Dec 2003 End Date: 10 Mar 2004

Days Months Days Months

Today

Events to Display

Contact Inputs/Meters/Mains Test/Late/Battery

Units to Display

All Units Selected Units Select

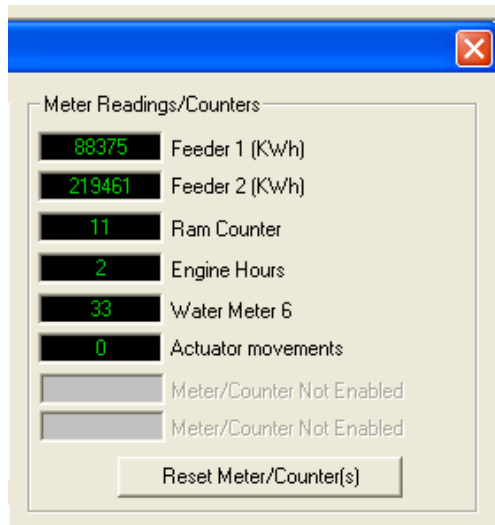
Show Latest Logs First

Date of Event	Equipment Type	Event	Location de Site
04/12/03 17:25:23	Prima Compactor	Host Initiated Call	Evesham
04/12/03 17:25:22	Prima Compactor	Ram Stroke Counter at 17206	Evesham
04/12/03 16:50:43	Prima Compactor	Stop Circuit Normal	Evesham
04/12/03 16:50:43	Prima Compactor	Stop Circuit Active	Evesham
04/12/03 12:57:43	Prima Compactor	Compactor Pre-Full	Evesham
04/12/03 12:57:26	Prima Compactor	Host Initiated Call	Evesham
04/12/03 12:57:25	Prima Compactor	Ram Stroke Counter at 17111	Evesham
04/12/03 12:54:36	Prima Compactor	Compactor Full	Evesham
04/12/03 12:52:03	Prima Compactor	Host Initiated Call	Evesham
04/12/03 12:52:01	Prima Compactor	Ram Stroke Counter at 17105	Evesham
04/12/03 09:24:32	Prima Compactor	Host Initiated Call	Evesham
04/12/03 09:24:30	Prima Compactor	Ram Stroke Counter at 17065	Evesham
04/12/03 07:53:35	Prima Compactor	Auto Mode Active	Evesham
04/12/03 07:53:11	Prima Compactor	Auto Mode Off	Evesham



13 Host Terminal – Meter Reading/Pulse counting Features

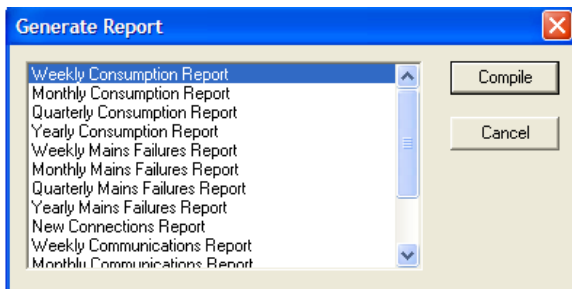
Current Counter Value Display



The site information screen displays information on the most recently updated pulse counter or meter reading value of the 8 counter inputs.

When a Messenger is installed in a new site or moved to a new location, if required, the operator can reset these values to Zero. The previous values can remain stored within the Host Terminal database for historical reporting purposes.

Inputs that are not connected can be disabled or removed as shown.



User Reports

The Host offers the functionality to generate reports on counter operations using a variety of pre installed report templates. For convenience and interoperability the reports can be viewed using 3rd party software such as Microsoft Excel or other existing management systems. From this the data can be displayed in a number of different ways, for example graphically.



14 Host Terminal – Meter Reading/Pulse counting Features Cont.

Automatic report Generation

Automatic reports can be generated by the system, these can be produced at pre-defined intervals. They can be written to disk (network drive if required) in CSV format for viewing via 3rd party software. The reports can also be generated and automatically forwarded to any number of e-mail addresses.



14 Host Terminal – Input Naming and Configuration

Edit Profile

General Settings | Meters/Counters | Contact Input Settings | SMS Forwarding

	Enable	Input is N/C	Enable Flutter Detection	Input Latched	Input Is Status Only	Status Text for Input OK	Status Text for Input Fail
Input 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Compactor OK	Compactor Full
Input 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Compactor OK	Compactor Pre-Full
Input 3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Oil Level OK	Oil Level Low
Input 4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Overload Normal	Overload Tripped
Input 5	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Stop Circuit Normal	Stop Circuit Active
Input 6	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Auto Mode Off	Auto Mode Active
Input 7	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	PIR 1 OK	PIR 1 Activated
Input 8	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	PIR 1 OK	PIR 1 Activated

Input Naming

Alarm and pulse counting inputs can be enabled/disabled and given configurable text names to help with identification.

Other Configuration options: -

- Normally open or Closed
- Flutter detection
- Latched or un latched
- Status only (alarmed state is displayed as a blue button and no visible or audible warning given)

Scaling factors can be set for the pulse counting inputs i.e. divide by X or multiply by X. The telephone number(s) for the Messenger host to report to are also set up here, along with mobile phone numbers to forward alarms as SMS text messages. Inputs to be forwarded are selectable and all configurations can be unit specific or global.



15 Host Terminal – Other Main Features

Creating New Sites

Adding a new Messenger to the Host System is a very easy procedure with no special training required.

During commissioning of the Host a "Default Profile" is created. This includes operational settings such as primary and secondary Host terminals, which inputs are enabled, frequency of routine health check/test calls etc.

To add a new unit simply click the following menu options *Database > Edit Records > Add New Record*. Enter the serial Number and that's it.

Backup

The Messenger system uses very few database files. These are stored in the user configurable directories and therefore can be readily backed up.

Archive

For larger Messenger systems the size of the event history can become cumbersome. The system allows archiving of data via a single screen, which allows users to specify what events should be archived and where files should be stored.

Data Export

Event, counting and unit location data can be exported in CSV format.

System Status

A single screen displays the key performance indicators for the system including modem and port status, database file size and licence information.

Interfacing with other systems

There are four standard options available

- Serial RS232 ASCII
- CSV event file, updated as events are received
- DNP3 protocol, level 1 slave
- OPC

One of NHDS's primary skills in providing host terminal packages is our extensive experience in communication protocols. NHDS have over 20 years experience in interfacing with equipment using an ever increasing variety of protocols, from simple ASCII serial interfaces, through to full SCADA protocols, such as DNP3.0 or IEC807 and including specific protocols from a variety of industries such as security, road transport, telecommunications, mobile data, etc.