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SENSA-LINX

DETECTOR NETWORKING SYSTEM

OPERATIONAL INSTRUCTIONS/USER MANUAL

Prepared by: Smiths Detection Ltd.
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Part No.   20270-1B

Date of Issue: Pre Issue 2 Draft Release Feb2012

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APPROVED BY: ………………………………………………………………..

(Technical Authority)

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SENSA-LINX
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OPERATORS' MANUAL

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FOREWORD

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FCC & IC COMPLIANCE

Radio Regulations

This section is applicable to the 2.4GHz Standard, 2.4GHz International and 900MHz Standard Variants of the Sensor Node only.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not in-stalled and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
— Reorient or relocate the receiving antenna.
— Increase the separation between the equipment and receiver.
— Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
— Consult the dealer or an experienced radio/ TV technician for help.

This Class B digital apparatus complies with Canadian ICES-003. Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

This radio transmitter has been approved to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.
2.4GHz Standard: Panorama PCG2400-TNC.
2.4GHz International: Panorama PCX-W24-TNC.
900MHz Standard: Panorama PCG-TNC-921.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Le présent émetteur radio a été approuvé pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.
2.4GHz Standard: Panorama PCG2400-TNC.
2.4GHz International: Panorama PCX-W24-TNC.
900MHz Standard: Panorama PCG-TNC-921.

To comply with FCC RF exposure compliance requirements, only the supplied accessories (including the pouch) should be used with the equipment and the equipment must not be co-located or operated in conjunction with any other antenna or transmitter.

SAFETY SUMMARY

The following are general safety precautions and instructions that must be understood and applied during phases of operation and maintenance to ensure personal health and safety and the protection of the equipment. Warnings and Cautions are repeated elsewhere in this publication where they are appropriate.

WARNINGS & CAUTIONS

Warnings, Cautions and general safety information notes are strategically placed throughout this manual prior to operating or maintenance procedures, practices or conditions where considered essential for the protection of personnel (WARNING) or equipment (CAUTION). A WARNING or CAUTION will apply each time the related step is repeated. Before any task is started all Warnings and Cautions included in this manual must be reviewed and understood and personnel must be conversant with the safety precautions and any first aid instructions shown:

- On the labeling of the container the equipment is supplied in.
- In local Safety Precautions and Regulations.

The equipment does not present any significant hazard to personal safety during normal operations. However, the Warnings and Cautions and general safety information notes that follow have been identified as potential hazards if the equipment is damaged, mishandled or used incorrectly.

WARNINGS

WARNING – SENSOR NODE RF TRANSMISSIONS

THE SENSOR NODES TRANSMIT IN THREE DIFFERENT FREQUENCIES.

- **RF ENERGY IN THE 902 TO 928 MHZ FREQUENCY RANGE AT POWERS UP TO 0.158 WATTS (22 dBm).**
- **RF ENERGY IN THE 868 MHZ FREQUENCY RANGE AT POWERS UP TO 0.5 WATTS (27 dBm)**
- **RF ENERGY IN THE 2.4GHZ FREQUENCY RANGE AT POWERS UP TO 0.1 WATTS (20 dBm)**

THIS MAY CAUSE ACTIVATION OF RADIO CONTROLLED EQUIPMENT SUCH AS IMPROVISED EXPLOSIVE DEVICES (IED). SENSOR NODES SHOULD NOT BE USED IN CIRCUMSTANCES WHERE RF TRANSMISSIONS COULD CAUSE A HAZARD TO PERSONNEL.

WARNING - DAMAGE TO PERSONAL PROTECTIVE EQUIPMENT

PERSONAL PROTECTIVE EQUIPMENT CAN BE TRAPPED OR PINCHED WHEN OPERATING THE EQUIPMENT. MAKE SURE THAT THE INTEGRITY OF THE NBC SUIT AND GLOVES IS NOT COMPROMISED WHILST OPERATING THE EQUIPMENT.

WARNING – BATTERIES

THE SENSOR NODE CAN USE EITHER LITHIUM IRON DISULFIDE AA BATTERIES OR ALKALINE MANGANESE DIOXIDE AA BATTERIES. THESE BATTERIES ARE A FLAMMABLE, CORROSIVE AND VAPOUR HAZARD. THE LITHIUM IRON DISULFIDE BATTERIES CONTAIN, LITHIUM, IRON DISULFIDE, AND AN ELECTROLYTE. THE LITHIUM REACTS VIGOROUSLY WHEN IMMERSED IN WATER. THE ELECTROLYTE IS FLAMMABLE AND HIGHLY CORROSIVE.

DO NOT IMMERSE BATTERIES IN WATER, DECONTAMINANT SOLUTION OR OTHER LIQUIDS.

DO NOT CRUSH OR BURN BATTERIES.

DO NOT ATTEMPT TO RECHARGE NON-RECHARGEABLE BATTERIES.

DO NOT STORE BATTERIES AT TEMPERATURES ABOVE 70°C (158°F).

IN THE EVENT THAT A BATTERY WITHIN THE SENSOR IS SHORTED OR DAMAGED IT SHOULD BE REMOVED FROM THE UNIT AND DISPOSED OF ACCORDING TO LOCAL PROCEDURES FOR HAZARDOUS WASTE. SUITABLE PROTECTIVE CLOTHING SHOULD BE WORN WHEN HANDLING SUSPECTED BATTERIES. IF THE SKIN OR EYES COME INTO CONTACT WITH THE ELECTROLYTE, WASH THOROUGHLY WITH WATER AND SEEK MEDICAL ATTENTION.

WARNING – DANGEROUS SUBSTANCES - CHEMICAL WARFARE AGENTS

AFTER A LIVE CHEMICAL WARFARE AGENT ATTACK EQUIPMENT MAY BE CONTAMINATED BY HARMFUL SUBSTANCES WHICH COULD CAUSE INJURY TO PERSONNEL. BEFORE ANY MAINTENANCE ACTIVITY IS PERFORMED EQUIPMENT USED IN A LIVE CHEMICAL WARFARE AGENT ATTACK SHOULD BE DECONTAMINATED.

WARNING - RISK OF EXPLOSION

SENSOR NODES MAY PROVIDE AN IGNITION SOURCE IN AN EXPLOSIVE ATMOSPHERE DUE TO RF TRANSMISSIONS. DO NOT USE THE SENSOR NODES IN AN ENVIRONMENT WHERE EXPLOSIVE VAPOURS ARE PRESENT.

WARNING – DANGEROUS SUBSTANCES - SODIUM HYPOCHLORITE

SODIUM HYPOCHLORITE LIQUID AND SOLUTION CAUSE IRRITATION TO THE SKIN AND THE DIGESTIVE SYSTEM IF INGESTED. VAPOUR CAUSES IRRITATION TO THE EYES AND THE RESPIRATORY SYSTEM. PROTECT THE SKIN AND DO NOT SWALLOW SODIUM HYPOCHLORITE LIQUID OR SOLUTION. DO NOT INHALE OR EXPOSE THE EYES TO THE VAPOUR. WEAR FULL PERSONAL PROTECTION EQUIPMENT (PPE) WHEN DECONTAMINATING EQUIPMENT.

DO NOT MIX SODIUM HYPOCHLORITE WITH ANY OTHER SOLUTIONS AS THIS MAY CREATE TOXIC COMPOUNDS AND FUMES.

DISPOSE OF ALL SOLUTIONS, MATERIALS, AND PPE USED AS CONTAMINATED WASTE.

WARNING – ELECTRIC SHOCK

SENSOR NODES CAN BE POWERED BY BATTERIES, AN EXTERNAL DC SUPPLY OR AN EXTERNAL AC POWER SUPPLY. TO PREVENT ELECTRIC SHOCK MAKE SURE THAT THE SENSOR NODE IS SWITCHED OFF AND THE BATTERIES ARE REMOVED OR THE EXTERNAL POWER SUPPLY IS DISCONNECTED PRIOR TO PERFORMANCE OF ANY MAINTENANCE ACTIVITY.

WARNING - TOXIC HAZARD

TOXIC SUBSTANCES MAY BE RELEASED IF THE SENSOR NODE CATCHES FIRE OR IS BURNED AS A MEANS OF DISPOSAL. DO NOT DISPOSE OF IN FIRE.

WARNING - TRIP HAZARD

WHEN THE SENSA-LINX DETECTOR NETWORKING SYSTEM IS IN USE THERE ARE CABLES THAT CAN CAUSE TRIP HAZARDS. ALWAYS ROUTE THE CABLES TO AVOID TRIPPING POSSIBILITIES FOR CROSSING PERSONNEL.

WARNING - BURNS

IF THE OUTER COVER OF A BATTERY INSTALLED IN THE BATTERY CASSETTE IS DAMAGED, A SHORT CIRCUIT CAN OCCUR AND THE BATTERIES MAY OVERHEAT. ALWAYS CHECK THAT THE OUTER COVER OF EACH BATTERY IS UNDAMAGED BEFORE INSTALLING IN THE BATTERY CASSETTE.

WARNING – EFFECTIVE DECONTAMINATION

A SINGLE DECONTAMINATION OF THE LAPTOP PC USING HAND-HOT (100ºF (38ºC)) SOAPY WATER MAY NOT BE SUFFICIENT TO REMOVE ALL HARMFUL CONTAMINATION. DECONTAMINATION SHOULD BE REPEATED UNTIL ALL HARMFUL CONTAMINATION IS REMOVED FROM THE LAPTOP PC. PERSONNEL SHOULD CONTINUE TO USE PERSONAL PROTECTIVE EQUIPMENT UNTIL FULL DECONTAMINATION IS CONFIRMED. IF FULL DECONTAMINATION CANNOT BE CONFIRMED THE LAPTOP PC SHOULD BE DISPOSED OF AS CONTAMINATED EQUIPMENT AND A REPLACEMENT ITEM OBTAINED.

WARNING – UNTRAINED PERSONNEL

THE SENSOR NODE CONTAINS COMPONENTS THAT CAN BE HAZARDOUS TO PERSONNEL. A TRAINED OPERATOR CAN PERFORM ONLY THOSE MAINTENANCE TASKS SHOWN IN THE HANDBOOK AND USERS GUIDE. FOR ALL OTHER REPAIRS THE SENSOR NODE MUST BE RETURNED TO THE MAINTENANCE CONTRACTOR/MANUFACTURER.

WARNING – BATTERY DISPOSAL

BATTERIES CONTAIN HAZARDOUS SUBSTANCES. ALWAYS DISPOSE OF BATTERIES AS HAZARDOUS WASTE IN ACCORDANCE WITH LOCAL RECOMMENDED PROCEDURES.

WARNING – RISK OF ELECTRIC SHOCK

THERE IS A REMOTE POSSIBILITY OF ELECTRIC SHOCK WHEN USING THE POWER SUPPLY UNIT IN WET CONDITIONS. USE ONLY 110 V AC SUPPLY WHEN OPERATING THE POWER SUPPLY UNIT OUTDOORS. BEFORE USE INSPECT THE POWER CABLE AND POWER SUPPLY UNIT TO ENSURE THAT THERE IS NO DAMAGE. DO NOT OPERATE THE POWER SUPPLY UNIT WHEN EITHER THE POWER SUPPLY UNIT OR THE CABLE IS IMMERSED IN WATER.

WARNING – LAPTOP PC BATTERY

THE LAPTOP PC CONTAINS A LITHIUM ION BATTERY PACK WHICH CAN EXPLODE IF NOT PROPERLY REPLACED, USED, HANDLED OR DISPOSED OF CORRECTLY. DISPOSE OF THE BATTERY AS REQUIRED BY LOCAL REGULATIONS. USE ONLY BATTERIES RECOMMENDED BY THE COMPUTER MANUFACTURER.

WARNING – LAPTOP PC HIBERNATION AND LOST COMMUNICATIONS

THE SENSA-LINX SYSTEM COMMUNICATION WITH THE BASE STATION NODE WILL STOP WHEN THE LAPTOP PC RUNNING THE C2 PROGRAM GOES INTO HIBERNATION (SLEEP MODE). WHILE THE LAPTOP PC IS IN HIBERNATION ANY SENSOR NODE ALARMS AND OTHER INFORMATION WILL NOT BE RECEIVED BY THE LAPTOP PC AND SOME DATA MAY BE LOST (NOT RECORDED) EVEN AFTER COMMUNICATION IS RESUMED. TO ENSURE THAT ALL SENSOR NODE ALARMS AND OTHER INFORMATION ARE RECIVED BY THE LAPTOP PC AND THAT ALL DATA IS RECORDED MAKE SURE THE LAPTOP PC IS SET UP SO THAT IT DOES NOT HIBERNATE.

WARNING – HEAVY EQUIPMENT

A FULLY LOADED TRANSIT CASE HAS AN OVERALL WEIGHT OF APPROXIMATELY 21KG. HEAVY ITEMS IF LIFTED INCORRECTLY MAY CAUSE HARM TO THE OPERATORS. OBSERVE MANUAL HANDLING GUIDELINES AND FOLLOW LOADING GUIDELINES INDICATED ON EQUIPMENT. OBTAIN HELP AS REQUIRED WHEN LIFTING OR MOVING HEAVY ITEMS.

WARNING – EXPOSURE TO RADIO FREQUENCY ENERGY.

THIS DEVICE TRANSMITS RADIO FREQUENCY ENERGY. WHEN WORN ON THE BODY, ONLY THE SUPPLIED ACCESSORIES (INCLUDING THE POUCH) MAY BE USED WITH THE EQUIPMENT AND THE EQUIPMENT MUST NOT BE CO-LOCATED WITH OR OPERATED IN CONJUNCTION WITH ANY OTHER ANTENNA OR TRANSMITTER

CAUTIONS

CAUTION – Use of Sensor Nodes in wet weather

The SENSA-LINX Sensor Nodes and Laptop PC contain electronic components which can be damaged by water. In heavy rainfall conditions make sure equipment battery compartments are fully closed against water ingress and the antenna is installed to the Sensor Node.

CAUTION - Radio Modem Frequency Band

The Sensor Nodes use a frequency band that is available for use by other unlicensed RF devices. Such devices may interfere with the operation of the Sensor Nodes or may be interfered with by the Sensor Nodes. The Sensor Nodes incorporate features to minimise such interference but performance may be degraded. Check the location and frequency of other RF devices in the area before operating the Sensor Nodes.

CAUTION – Incorrect Connections

There are two connectors on the Sensor Node. These connectors are keyed to prevent misconnection but damage may occur if an incorrect connection is attempted forcefully. Check that the correct connector is being used before connection. Make connections carefully and do not force connection if resistance is felt.

CAUTION – User Serviceable Components

The Sensor Node contains no user serviceable components. Attempted access by untrained personnel may render the unit unserviceable. Do not attempt to gain access to the interior of the unit.

CAUTION – Incorrect Insertion of Batteries

Batteries inserted into the Sensor Node in the incorrect orientation may cause damage. Always make sure batteries are inserted in the correct orientation.

CAUTION – Corrosion Due To Battery Leakage

Batteries must not be left in the Sensor Node if it will not be used for a period of time in case of leakage, which will cause corrosion. Make sure that the batteries are removed from the Sensor Node prior to any storage period.

CAUTION – Mixing Battery Types

Using both lithium and alkaline battery types within the Battery Cassette may cause damage to the Sensor Node. Do not use both lithium and alkaline battery types at the same time within the Battery Cassette.

CAUTION – Siting of Equipment

The Sensor Node can benefit from 'line-of-sight' for effective communication when near the limits of its transmission range. If the Sensor Node is incorrectly sited, proper communication may not be established with its paired Sensor Node. Ensure the Sensor Node is correctly sited.

CAUTION – Equipment Contamination

Contamination such as dirt and fluids can enter the interior of the Sensor Node through the Battery Cassette compartment. This may cause the Sensor Node to malfunction or cease to operate altogether. Make sure that the Battery Cassette is removed only when required and reinstalled as soon as possible.

CAUTION – Equipment damage

The Sensor Node contains components that may be damaged by water or other liquids. To prevent fluid from entering the equipment make sure the Sensor Node Battery Cassette and Antenna are properly installed prior to cleaning or decontamination.

CAUTION – Sodium hypochlorite

Sodium hypochlorite is a strong oxidiser and could cause damage to the laptop PC if used for decontamination. It is recommended that only hand-hot (38ºC (100ºF)) soapy water is used to decontaminate the laptop PC.

CAUTION – Inaccurate Contamination Spread Prediction

In ATP-45 reports the "height" field will default to zero (this field represents the height above ground level, not altitude, and this cannot be acquired from the GPS). This may give inaccurate results if used to predict the spread of contamination when the sensor is positioned at a significant height above ground level (e.g. on a tall building). If using ATP-45 reports to predict contamination spread; either position sensors at ground level, or set the ATP-45 mode to 'Manual ATP-45' and edit the "height" field to a realistic value.

CAUTION – Battery Power Discharge

Batteries left in the Sensor Node will discharge over a period of time even when the equipment is switched off. The expected battery life may be significantly reduced if a Sensor Node has stored containing batteries. If the Sensor Node will not be used for a period of time, make sure that the batteries are removed prior to any storage period.

CAUTION – Equipment damage.

The Laptop Power Supply is rated to be connected to supplies from 100V to 240V AC at 50 to 60Hz. Connecting to a supply outside of this range may cause damage to the equipment. Do not connect the Laptop Power Supply to an external power source outside the stated range.

CAUTION – Equipment damage.

The AC to DC transformer is rated to be connected to supplies from 100V to 280V AC at 50 to 60Hz. Connecting to a supply outside of this range (e.g. using the Mains travel Adapter) may cause damage to the equipment. Do not connect the AC to DC transformer to an external power source outside the stated range.

CAUTION – Reduced System Performance

Changing the Sensor Node Refresh Period and GPS Refresh Period can adversely affect the performance of the Sensa-LINX system. Setting the refresh rate too high may result in system overload whereas setting the refresh rate too low may result in lost data or non-current data being displayed. Take care if changing the refresh rates from their default settings (40 seconds for fixed nodes and 5 seconds for mobile nodes). Revert to the default settings if issues occur.

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REVISION RECORD

Issue	Incorporated By	Date
Initial Issue	Manufacturer	December 2011

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CHAPTER 1 INTRODUCTION

1.1   SCOPE OF THIS MANUAL

This manual provides set up and operating instructions for the Sensa-LINX Detector Networking System, information on the safe use and care of the equipment, operator maintenance procedures with some basic troubleshooting, and a list of repair parts and consumables.

1.2   SYSTEM OVERVIEW

The Sensa-LINX Detector Networking System is equipment to allow a collection of sensors to be combined into a network, wirelessly connected to a base station to provide centralized control and monitoring of the data.   Each sensor is connected to a Sensor Node (Radio Modem) which communicates with another Sensor Node (Radio Modem) at the Base Station Node connected to the Laptop PC (Base Station).

This system is intended for remote monitoring of an unmanned perimeter of sensors, monitoring a network of worn sensors as personnel move through an area, collation of data from multiple sensors into a single tactical map, and combinations of the above tasks.

The Laptop PC uses data acquired from the network of sensors to produce standard CBRNE report messages.

The Sensor Nodes (Radio Modems) have built-in Global Positioning System (GPS) receivers that obtain position co-ordinates. The GPS receiver is then disabled soon after start up to conserve battery power. The GPS capability is re-enabled when the Sensor Node's (Radio Modem's) accelerometer detects movement.

Due to operating restrictions in different countries, a number of Sensor Node (Radio Modem) variants are offered. These include an International and Standard 2.4GHz variant, an International and Standard 900MHz variant, and an International and Standard 868MHz variant. Each of these has its own characteristics which can be seen in TABLE 2 Radio Modem Variants.

The Sensa-LINX system can currently interface to the Smiths Detection LCD3.3, LCD Nexus and CAM XTR chemical sensors.

Figure 1   Base Station Node and Sensor Node Pelican Cases

1.3   GLOSSARY

Acronym/ Term	Definition
TABLE 1. Abbreviations and Acronyms	
BIT	Built In (Self) Test
BSN	Base Station Node - Sensor Node connected directly to the Controller PC. The 'base' of the radio network from the perception of the host PC.
C2	Command and Control
CWA	Chemical Warfare Agent
COM	Communications Port
COMMS	Communications
COTS	Commercial Off The Shelf (equipment)
Detector	LCD3.3 or LCD Nexus or CAM XTR (AKA Sensor)
GHz	Gigahertz
GPS	Global Positioning System
IBIT	Initiated Built In Test
KHz	Kilohertz
LCD	Lightweight Chemical Detector
LED	Light Emitting Diode
LOS	Line Of Sight
MHz	Megahertz
NEXUS	Portable and highly sensitive and selective CWA and TIC detector
PBIT	Periodic Built In Test
PC	Personal Computer
POST	Power On Self Test
PWM	Pulse Width Modulation
Sensor	LCD3.3 or LCD Nexus or CAM XTR (AKA Detector)
SN	Sensor Node – Sensor Node connected to a detector. Acts as a message relay between the host PC and the detector, so that the two can communicate without being wired to each other.
SPI	Serial Peripheral Interface
TIC	Toxic Industrial Chemical
USB	Universal Serial Bus
Georeferenced	A map that is georeferenced is one whose existence has been defined in physical space.

1.4   EQUIPMENT OVERVIEW

1.4.1   Command & Control (C2) System

1.4.1.1   Laptop PC

The Laptop PC is provided to run the C2 software. Any laptop PC or other PC with the following specification is capable of running the C2 application software and providing the command and control function for the network of sensor nodes.

The Laptop PC runs Windows 7 Ultimate Edition and is pre-loaded with the Sensa-LINX C2 program. If there is a requirement to install the C2 Program onto a PC not supplied as part of the

Sensa-LINX equipment, the program can be loaded from the software support CD provided with the Base Station Kit. Instructions for loading the Sensa-LINX C2 Program are given in Section 4.1 of this manual. The PC onto which the Sensa-LINX C2 Program is to be installed should meet or exceed the specification of the Panasonic Toughbook CF-31 shown below.

Figure 2   Laptop PC

The Laptop PC that can be supplied as part of the Sensa-LINX equipment is the Panasonic Toughbook CF-31 which has the following specification:

- Processor: Intel Core i5-2520M 2.5GHz.
- Memory: 4 GB.
- Display: 1024*768 resolution full colour.
- RS232 port.
- Hard Disk Drive: 320 GB.
- DVD drive.
- Serial port and USB ports.
- A rechargeable battery.
- A power supply unit for connecting to an external AC supply.
- Good resistance to environmental factors including temperature, dust, rain and shock.

1.4.1.2   C2 Application

The Sensa-LINX C2 allows the user to set up and change networks, monitor status of the sensors and sensor nodes including mapping their locations, make changes to sensor and sensor node settings, and save logs of alarms, warnings and other events for later review.

1.4.2   Base Station Node/Sensor Node

1.4.2.1   Base Station Node

The base station node is physically connected to the Laptop PC via a communications cable and forms the controlling point of the network topology.

1.4.2.2   Sensor Node

The role of the sensor node is to provide wireless communications capability for a deployed sensor or act as a mesh repeater on the network. It can connect to the LCD3.3, LCD3.3 in Power & Comms Adaptor (PCA), LCD NEXUS. and the CAM XTR.

The SN communicates with the base station node via a wireless network and as such will need to remain within RF communications range in order to operate correctly. The RF range is dependent on the type, density, RF frequency, and position of RF obstacles between the SN and BSN (see para 1.4.3 for more information on range capabilities).

1.4.2.3   Sensor Nodes (Radio Modems)

The Sensor Nodes are Radio Modems that are rugged, waterproof and tested to military standards (see para 1.8.1 for details).

The Sensor Nodes (Radio Modems) have a number of variants (see para 1.4.3), each approved for use in specific regions of the world. The Sensor Nodes (Radio Modems) have detachable antennas and some variants use different antennas. It is important that they are operated **only** with the antenna provided with them. Using different antennas (including antennas from other variants of Sensor Nodes (Radio Modems)) will affect the radio performance of the unit and may breach local regulations on transmission power.

The BSN and the SN are two different roles played by the same Sensor Node (Radio Modem). When a Sensor Node (Radio Modem) is first powered up it assumes a SN role. If it is connected to the Controller PC it will automatically switch to a BSN role after communicating with the Sensa-LINX C2 software.

Figure 3   Sensor Node (Radio Modem)

1.4.3   Sensor Node (Radio Modem) Variants

TABLE 2. RADIO MODEM VARIANTS							
Variant	Antenna	Approvals	Transmit Power (EIRP dbm)	Freq. Range (MHz)	Theoretical Range (metres) [1]		Mesh Capable
					Indoor /Urban	Outdoor LOS	
2.4GHz International	Panorama PCX-W24-TNC	FCC, IC, CE, C-Tick, Telec	12	2400.0 - 2483.5	50	200	Y
2.4GHz Standard	Panorama PCG2400-TNC	FCC, IC, C-Tick	20	2400.0 - 2483.5	100	500	Y
900MHz Standard	Panorama PCG-TNC-921	FCC, IC	22	902 - 928	100	3000	Y
900MHz International	Panorama PCG-TNC-921	C-Tick	22	916 - 928	100	3000	Y
868MHz Standard	Panorama PCG-TNC-851	CE	27	869.4 - 869.65	200	7000	N
868MHz International	Panorama PCG-TNC-851	CE	5	869.4 - 869.65	100	800	N

[1] These are Rough Order of Magnitude theoretical estimates. Actual ranges achieved will be highly dependant on the location, conditions and the presence of other transmitters in the area and may be considerably lower. "Outdoor LOS" range also assumes Line-Of-Sight between Sensor Nodes.

1.4.3.1   2.4GHz International

The 2.4GHz International variant has relatively low power and thus lower range than the Standard 2.4GHz node. This variant is approved for use in the USA, Canada, some European countries, Australia and Japan. Check the label on the sensor node for approval details and check local regulations before using it in any other locations.

1.4.3.2   2.4GHz Standard

The 2.4GHz standard variant is higher power than the International 2.4GHz variant resulting in increased range but is not available for use in Europe or Japan. This variant is approved for use in the USA, Canada and Australia. Check the label on the sensor node for approval details and check local regulations before using it in any other locations.

1.4.3.3   900MHz Standard

The 900MHz Standard variant has some increased range of the Standard 2.4GHz variant but cannot be used in many countries due to frequency restrictions. This variant is approved for use in the USA and Canada only. Check the label on the sensor node for approval details and check local regulations before using it in any other locations.

1.4.3.4   900MHz International

The 900MHz International variant is a slightly modified version of the Standard 900MHz variant to meet Australian regulations. Power output (and thus range) is the same but it is more restricted in frequency and thus may be more prone to interference. This variant is approved for use in Australia only. Check the label on the sensor node for approval details and check local regulations before using it in any other locations.

1.4.3.5   868MHz Standard

The 868MHz Standard variant is available for use in most of Europe with some restrictions. It has significant increased range potential over the International 2.4GHz but is not suitable for use in North America due to frequency restrictions. Note that the 868 variants cannot "mesh" - i.e. you cannot use sensor nodes as repeaters to increase the range of data transmission. This variant is approved for use in some European countries (but specifically not in Italy and Slovakia). Check the label on the sensor node for approval details and check local regulations before using it in any other locations.

1.4.3.6   868MHz International

The 868MHz International variant is the low power variant of the 868MHz standard. It meets specific Italian and Slovakian restrictions. It has a lower transmit range compared to the standard 868MHz. It may have a slight range advantage over the International 2.4GHz variant but is not suitable for use in North America due to frequency restrictions. This variant is approved for use in some European countries (including Italy and Slovakia). Check the label on the sensor node for approval details and check local regulations before using it in any other locations.

1.5   ANCILLARIES

1.5.1   Packaging

The ancillaries section provides details of the packaging provided with the Sensa LINX system. There are different levels of packaging on offer:

- 4 Node Sensor Node system
- Base Station system
- Individual Sensor Nodes (cardboard box packaging)

1.5.2   Consumables

The only consumable used by the Sensa-LINX system is batteries. For further information on battery types see para 1.7.2.2.

1.5.3   Accessories

There are various Sensa-LINX accessories available which include the following:
- Comms cables (various types)
- Power cables
- Cable adaptors ('Y' piece)
- DC-DC transformer (laptop PC supply e.g. from a vehicle)
- AC-DC transformer
- Mounting brackets (various) – SN to sensor
- Sensor Node Pouch
- LCD3.3 Detector Pouch with Dock
- Shoulder strap
- Mounting strap

1.5.3.1   *Comms Cables*

Figure 4   Detector to SN Comms Cable (20172)

Figure 5   Laptop PC to BSN Comms Cable (20173)

Figure 6   Short Spiral Comms Cable (20175)

Figure 7   Spiral Comms Cable (20234)

1.5.3.2   *Power Cables and Adaptors*

Figure 8   Mains Power Cable (5356-5085)

Figure 9   Mains Travel Adaptor (3370-2506)

1.5.3.3   *Combined Power & Comms Cable*

Figure 10   Power and Comms Cable (20553)

1.5.3.4   *DC-DC Transformer*

Figure 11   DC-DC Transformer(3330-5120)

1.5.3.5   *AC-DC Transformer*

Figure 12   AC-DC Transformer (20734 [Green] or 20734A [Black])

1.5.3.6   Mounting Brackets
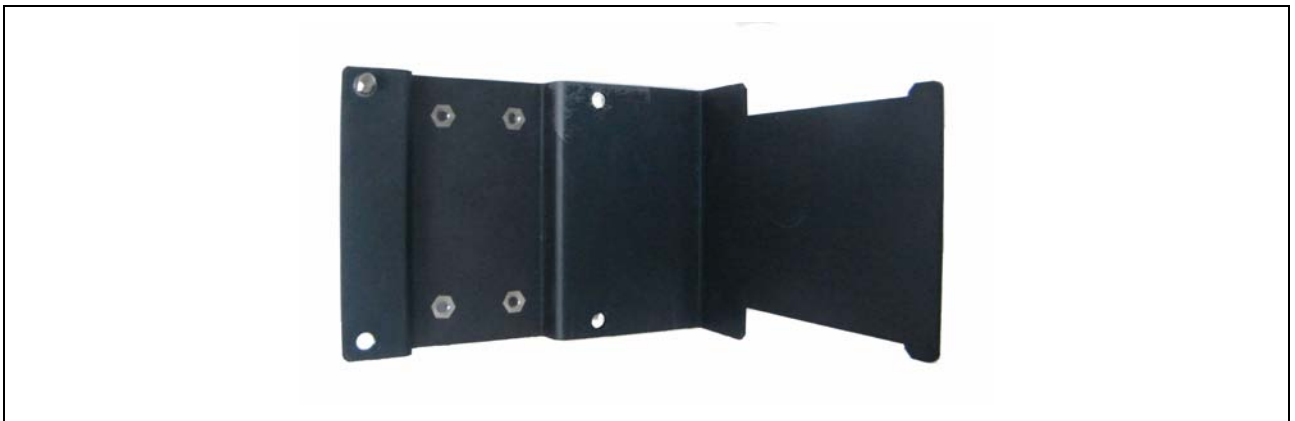
Figure 13   Nexus Mounting Bracket (20466)

Figure 14   PCA Mounting Bracket (20336)

Figure 15   Tripod Mounting Bracket (20330)

Figure 16   Sensor Node PCA Mounting (20339)

1.5.3.7   Sensor Node Pouch

Figure 17   Sensor Node Pouches (20334)

1.5.3.8   LCD3.3 Pouch with Dock

Figure 18   LCD3.3 Pouch (20335) with Dock (20420)

1.5.3.9   Shoulder Strap

Figure 19   Shoulder Strap (5368-9020 [Green] or 19268 [Black])

1.5.3.10   Mounting Strap

Figure 20   Mounting Strap (20735 [Green] or 20735A [Black])

Figure 21   Tripod (6881-0216)

1.6 DOCUMENTATION

The following documentation is provided with the Sensa-LINX system:
- Sensa-LINX Operator's Manual (this document)
- PC Manual
- Sensa-LINX Quick Reference Guide

Sensor documentation is supplied with the sensors.

1.7 POWER OPTIONS

1.7.1 C2 Laptop PC

1.7.1.1 External

The Laptop PC is supplied with its own external power supply with a UK standard plug fitted. The system is also provided with a Mains travel Adapter (see Figure 9) that can be used to adapt the UK plug for use elsewhere in the world.

A DC to DC converter is also available as an option to power the laptop from a vehicle power outlet (see Section 1.5.3.4).

1.7.1.2 Battery

The Laptop PC uses the Panasonic Lithium Ion battery pack, provided with the Laptop PC. Refer to the manufacturer's documentation for more information.

1.7.2 Sensor/Base Station Node

1.7.2.1 External

The Sensor Node/Base Station Node can be powered by an optional AC to DC transformer. This transformer is fitted with a UK standard plug fitted. The system is also provided with a Mains travel Adapter (see 1.5.3.2) that can be used to adapt the UK plug for use elsewhere in the world.

1.7.2.2 Battery

Any kind of COTS AA type batteries can be used to power the SN/BSN, although the design has been specifically centred around the use of Lithium Iron, Alkaline and NiMH cells.

A software algorithm inside the SN/BSN provides the ability to estimate the current battery capacity as a percentage of its maximum. The percentage remaining is communicated to the C2 application as part of the SN/BSN status reporting message. The setting of the battery type is available from the C2 application.

When the battery voltage drops below a threshold the battery LED on the front of the SN/BSN will begin to flash. The threshold level used is dependent on the type of battery used and the temperature measurement made by the SN/BSN.

The batteries are installed into a Battery Cassette prior to insertion into the Radio Modem. The unit uses four AA-size batteries

1.7.2.2.1   Lithium Iron
Lithium batteries are recommended as this battery type gives the best battery life performance, particularly at low temperatures.

1.7.2.2.2   Alkaline
Alkaline batteries can be used as an alternative but give a reduced performance, particularly at low temperatures.

1.7.2.2.3   Nickel Metal Hydride (Rechargeable)
Nickel Metal Hydride rechargeable batteries may also be used.

1.8   OPERATING CHARACTERISTICS

1.8.1   Environmental

The Sensa-LINX equipment is designed to operate within the temperature range shown in TABLE 3 below.

TABLE 3. OPERATING TEMPERATURE RANGES	
Radio Modem	-32 °C (-25.6 °F) to 50 °C (122 °F)
Laptop PC	5 °C (41 °F) to 35 °C (95 °F)

CHAPTER 2 OPERATING INFORMATION

2.1   EQUIPMENTS CONTROLS AND INDICATORS

2.1.1   Laptop PC – Controls and Features

The Laptop PC has the following controls. For further information on the controls and their functions see TABLE 4 below.
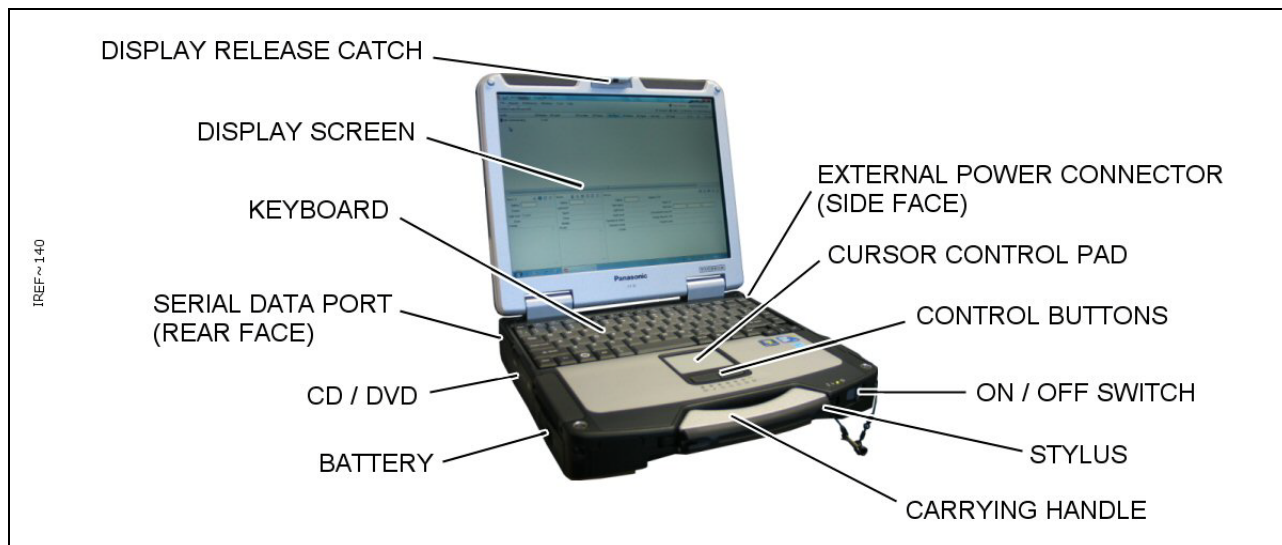
Figure 22   Laptop PC

TABLE 4. LAPTOP PC CONTROLS AND FEATURES	
Feature	Function
Power Connector	Connection of external power supply
Cursor Control Pad	Controls the cursor on the screen display
Control Buttons	Left and right click buttons for cursor
ON / OFF Switch	Switches the Laptop PC ON and OFF
Carrying Handle	Carrying closed laptop PC
Battery Pack Slot	For insertion and removal of internal re-chargeable battery pack
Serial Data Port	Connection of Sensor Node
Keyboard	Standard QWERTY keyboard
Display Screen	LCD display
Display Release Catch	Catch to hold display shut and release when required
Stylus	Screen pointing device for use with 'touch-screen' functionality.

2.1.2 Sensor Node (Radio Modem)

The Sensor Node (Radio Modem) has the following controls. For further information on the controls and their functions see TABLE 5.
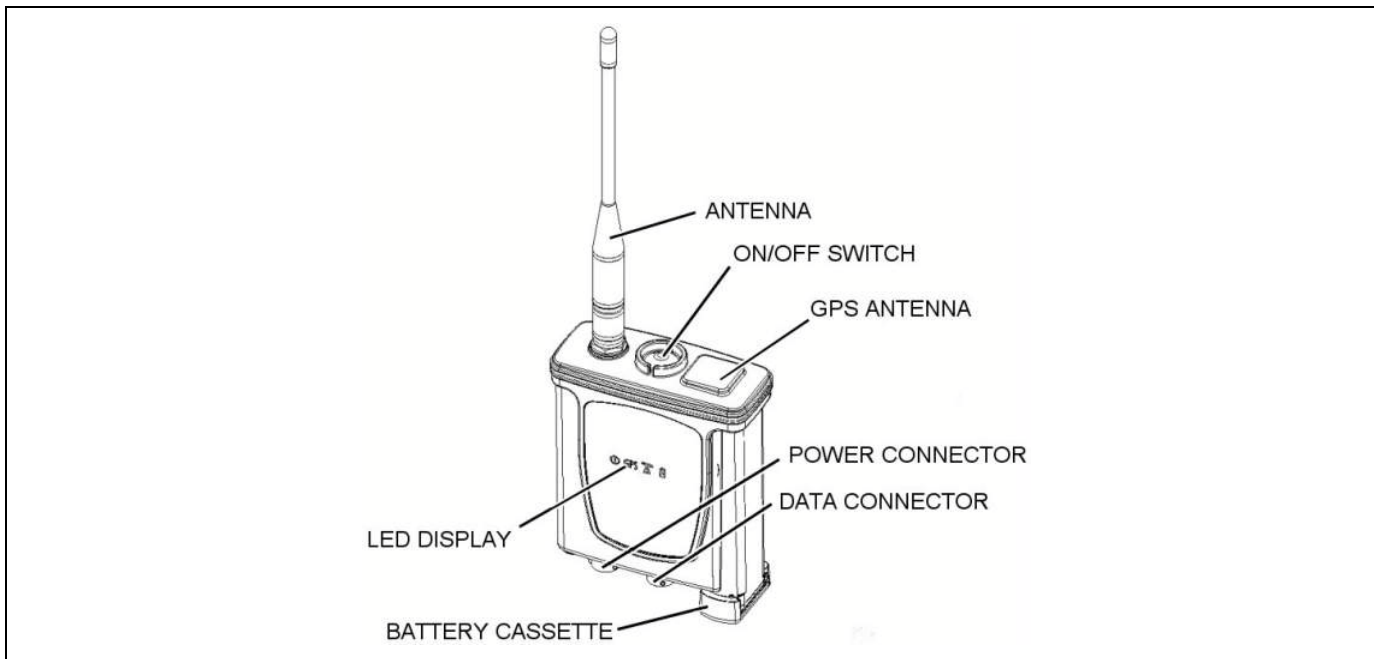
Figure 23   Radio Modem

TABLE 5. CONTROLS AND FUNCTIONS	
Control	Function
Antenna	Provides radio connection between the BSN and the SNs.
ON / OFF Switch	Switches the Sensor Node (Radio Modem) ON and OFF. This is a latching connector requiring press / release operation.
GPS Antenna	Provides positional information to system.
Battery Cassette	Houses the batteries.
Data Connector	Allows connection of the Sensor Node (Radio Modem) to the Controller PC or to a LCD3.3 or LCD Nexus or CAM XTR detector using the supplied cable.
Power Connector	Allows connection of the Sensor Node (Radio Modem) to an external AC power supply using the cable supplied.
LED Display	Provides information to the operator using 4 LED's.

2.1.3 Sensor Node Initial Configuration

The Sensor Node is delivered ready for operation with some settings pre configured. If there is a requirement to change these settings, refer to Appendix A for detailed information on configuring sensor nodes.

2.1.4 Sensor Node (Radio Modem) User Interface

The Sensor Node (Radio Modem) display consists of four LED's, three green and one amber. For information on the indications and their meanings see TABLE 6.

TABLE 6. LED FUNCTIONS	
ⓞ GPS 📡 🔋 Illuminated icons as viewed on front of Radio Modem	
Icon and LED	**Function**
ⓞ Green LED - Power	On - External power. Pulse - Battery Power. Off – Radio Modem switched off or no power
GPS Green LED – GPS, BIT Indicator	Off – GPS 'Powered Off'. GPS in power save mode. Single Blink –GPS powered on; currently seeking 'Fix'. Double Blink – GPS powered on; has 2D 'Fix' i.e. latitude and longitude but not altitude. Triple Blink – GPS powered on; has 3D 'Fix' i.e. latitude, longitude and altitude. Continuous Rapid Blink – GPS BIT errors detected
📡 Green LED - Radio Link Indicator	Short Triple Pulse - Strong radio link achieved and Sensor Node is transmitting. Long Triple Pulse - Strong radio link achieved but Sensor Node is not transmitting. Short Double Pulse - Good radio link achieved and Sensor Node is transmitting. Long Double Pulse - Good radio link achieved but Sensor Node is not transmitting. Short Single Pulse - Poor radio link has been achieved and Sensor Node is transmitting. Long Single Pulse - Poor radio link has been achieved but Sensor Node is not transmitting. Off - Radio link has not been achieved
🔋 Amber LED - Battery Low	Pulse - Low battery power. Off - Good battery power or external power.
All indicators for POST BIT and Initiated BIT Tests only. (Periodic BIT will not blink the LED's as this will interfere with normal operating mode).	On application of power, the power, radio, and battery lights come on as a test. Then the power light goes off and the radio and battery lights remain on while the unit is booting. On – In the event POST or Initiated BIT test detects a catastrophic failure – all indicators remain illuminated if possible.

When pulsing, all LED's on the Sensor Node pulse together. The brightness of the Sensor Node LEDs is 'persistent' so that, when switched on, the brightness is the same as the last time the Sensor Node was used. If the brightness setting of the Sensor Node LEDs does not match the brightness setting of the detector display a warning will be shown in the C2 application on the PC at the Base Station Node indicating that the settings are different. This warning is recorded in the Warnings Log. The Sensor Node LED brightness setting can be changed only via the controls in the C2 application on the Base Station Node PC. The brightness cannot be adjusted on the Sensor

Node itself. The brightness of the detector display can be adjusted using the controls in the C2 application also or can be adjusted at the detector using the detector controls. For further information refer to the detector Operators' Manual.

2.2 'PULL THE DOT' FASTENERS

Some of the equipment pouches use 'Pull-The-Dot' fasteners. These press studs are manufactured in such a way that they press together and come apart in only one particular direction making them suitable for resisting significant forces when fastened so that they will not come apart, even under stressed loading, unless correctly unfastened.

With reference to Figure 24, observe the fastener for the dot marked on the cap. To open the fastener pull up and back in the opposite direction to the dot. To close the fastener push down and forward in the direction of the dot.

Figure 24   Pull-The-Dot Fastening

2.3   SENSA-LINX NETWORK SET UP & OPERATION

The Sensa-LINX network set up and operation sequence should be followed in order as shown below:

1. Unpack and check the Sensa-LINX Detector Networking System equipment. See section 2.3.1 below for further information.

2. Set up the Base Station Node. See section 2.3.2

3. Set up the Sensor Node(s). (Activities to set up multiple Sensor Nodes can be performed in parallel). See section 2.3.3.

4. Confirm Sensa-LINX Network Operation and begin monitoring activities.

2.3.1   Unpacking and Initial Checks

Prior to setting up the Sensa-LINX Network all Transit Cases and boxes should be opened at a single location and checked to confirm all equipment is present and operates correctly. If any equipment is missing, unserviceable or does not operate correctly obtain a replacement item.

2.3.1.1   *Laptop PC*

1   Unpack the Laptop PC.

WARNING –LAPTOP PC BATTERY

THE LAPTOP PC CONTAINS A LITHIUM ION BATTERY PACK WHICH CAN EXPLODE IF NOT PROPERLY REPLACED, USED, HANDLED OR DISPOSED OF CORRECTLY. DISPOSE OF THE BATTERY AS REQUIRED OF BY LOCAL REGULATIONS. USE ONLY BATTERIES RECOMMENDED BY THE COMPUTER MANUFACTURER.

2   If not already in place insert the Laptop PC battery.

WARNING - TRIP HAZARD

SENSA-LINX EQUIPMENT CABLES CAN BE TRIP HAZARDS. ALWAYS ROUTE THE CABLES TO AVOID TRIPPING POSSIBILITIES FOR PERSONNEL.

CAUTION – Equipment damage.

The Laptop Power Supply is rated to be connected to supplies from 100V to 240V AC at 50 to 60Hz. Connecting to a supply outside of this range may cause damage to the equipment. Do not connect the Laptop Power Supply to an external power source outside the stated range.

3   Connect the Laptop PC power supply if external power is available (refer to Panasonic Toughbook manual for connection details).

4   Turn on the Laptop PC by sliding the switch in the bottom right hand corner until the LEDs light up and login. Refer to local procedures for the username and password. Note: when first delivered, the C2 laptop computer will start up and operate without asking for a username or password, however for additional security user accounts with passwords can be set up. For more information, refer to para 3.1.

5   Double click the icon on the desktop and startup the C2 program. Confirm that the program starts. Close the program. If the system is not to be setup immediately logoff from the machine and turn off the Laptop PC (if the system is to be set-up immediately the Laptop PC may be left on and logged in).

2.3.1.2   *Sensor Nodes*

During this set up/test procedure the Sensor Node will need to be powered in a location where a good GPS reception can be made i.e. outside of any buildings or vehicles if good GPS data is required. The Sensor Node should always have batteries installed even when connected to an external power supply to negate problems in the event of power supply interruption. It is not necessary to connect the Sensor Node to an external power supply but doing so will conserve battery power. Unpack and set up the number of Sensor Nodes of the required type in turn as shown in the procedure below. Return any packaging materials to the Transit Case for re-use.

When setting up 2.4GHz or 900MHz network, a sensor node can act as a network relay for one or more detector sensor nodes. A network relay can be used if the detector sensor node(s) is not in "line-of-sight" or has RF obstruction to Base Station node. Network relay is created by positioning the sensor node between the detector sensor node and Base Station node such that messages to the detector sensor node are relayed through the sensor node.

WARNING - RISK OF EXPLOSION

SENSOR NODES MAY PROVIDE AN IGNITION SOURCE IN AN EXPLOSIVE ATMOSPHERE DUE TO RF TRANSMISSIONS. DO NOT USE THE SENSOR NODES IN AN ENVIRONMENT WHERE EXPLOSIVE VAPOURS ARE PRESENT.

1   Remove a Sensor Node from the Transit Case.

CAUTION – Equipment damage.

The Sensor Node contains components that may be damaged by water or other liquids. To prevent fluid from entering the equipment make sure the Sensor Node Battery Cassette and Antenna are properly installed prior to cleaning or decontamination.

2   Remove an antenna from the Transit Case and attach it to the Sensor Node. To attach the antenna to the sensor node, align the antenna with the antenna port on top of the Sensor Node, push the antenna onto the connector and screw into place. Make sure the antenna is securely attached but hand tight only.

WARNING - BURNS

IF THE OUTER COVER OF A BATTERY INSTALLED IN THE BATTERY CASSETTE IS DAMAGED, A SHORT CIRCUIT CAN OCCUR AND THE BATTERIES MAY OVERHEAT. ALWAYS CHECK THE OUTER COVER OF EACH BATTERY IS UNDAMAGED BEFORE INSTALLING IN THE BATTERY CASSETTE.

CAUTION – Incorrect Insertion of Batteries

Batteries inserted into the Sensor Node in the incorrect orientation may cause damage. Always make sure batteries are inserted in the correct orientation.

CAUTION – Mixing Battery Types

Using both lithium and alkaline battery types within the Battery Cassette may cause damage to the Sensor Node. Do not use both lithium and alkaline battery types at the same time within the Battery Cassette.

3   Obtain batteries (refer to Section 1.7.2.2 for information on suitable battery types). Remove a Battery Cassette from the Transit Case and install batteries into the Battery Cassette and insert the Battery Cassette into the Sensor Node.

WARNING - TRIP HAZARD

SENSA-LINX EQUIPMENT CABLES CAN BE TRIP HAZARDS. ALWAYS ROUTE THE CABLES TO AVOID TRIPPING POSSIBILITIES FOR PERSONNEL.

CAUTION – Incorrect Connections

There are two connectors on the Sensor node. These connectors are keyed to prevent misconnection but damage may occur if an incorrect connection is attempted forcefully. Check that the correct connector is being used before connection. Make connections carefully and do not force connection if resistance is felt.

4   If required obtain the Power Supply Unit (PSU) and connecting cables from the Transit Case. Connect the power supply to a mains output socket and then connect either of the circular connectors on the power supply cable to the connector marked "1" on the Sensor Node.

CAUTION – Siting of Equipment.

The Sensor Node benefits from 'line-of-sight' for effective communication. If the Sensor Node is incorrectly sited, proper communication may not be established with its paired Sensor Node. Ensure the Sensor Node is correctly sited.

5   In an outside location (i.e. outside of any buildings or vehicles so that a good GPS reception can be made) power up the Sensor Node – press and release the power switch on the Sensor Node and wait for the Sensor Node to power up. The LEDs on the Sensor Node will now light up to indicate status. For further information on LEDs refer to Section 2.1.4.

6   If the correct sequence is not completed successfully obtain a replacement Sensor Node.

7   Following confirmation of correct operation of the equipment, turn off the Sensor Node by pressing and releasing the power switch. Check all the LEDs go off.

2.3.2   Base Station Node Set Up

The Base Station is the point from which the Sensa-LINX Detector Networking System can be centrally monitored and controlled. Use the following information as a guide to setting up a Base Station Node for the Sensa-LINX Detector Networking System.

1   At the Base Station Node location the following equipment is required as a minimum:

- The Laptop PC (with battery fitted)
- One Sensor Node (with antenna and batteries fitted)
- One Communications cable (Sensor Node to Laptop PC)

2   At the Base Station Node location the following equipment is optional:

- The Laptop PC power supply (if external power is available).
- One Sensor Node pouch (for securing the Sensor Node into position and weather protection)
- External power supply for Sensor Node (if external power is available).

WARNING - TRIP HAZARD

SENSA-LINX EQUIPMENT CABLES CAN BE TRIP HAZARDS. ALWAYS ROUTE THE CABLES TO AVOID TRIPPING POSSIBILITIES FOR PERSONNEL.

3   Position the Laptop PC in the chosen location taking into account factors such as terrain, local structures and weather conditions. For further information on positioning factors refer to para 3.2

4   If external power is available connect the Laptop PC power supply. Refer to the Panasonic Toughbook manual for connection details if required.

WARNING – SENSOR NODE RF TRANSMISSIONS

THE SENSOR NODES TRANSMIT IN THREE DIFFERENT FREQUENCIES.

- **RF ENERGY IN THE 902 TO 928 MHZ FREQUENCY RANGE AT POWERS UP TO 0.158 WATTS (22 dBm).**
- **RF ENERGY IN THE 868 MHZ FREQUENCY RANGE AT POWERS UP TO 0.5 WATTS (27DBM)**
- **RF ENERGY IN THE 2.4GHZ FREQUENCY RANGE AT POWERS UP TO 0.1 WATTS (20DBM)**

THIS MAY CAUSE ACTIVATION OF RADIO CONTROLLED EQUIPMENT SUCH AS IMPROVISED EXPLOSIVE DEVICES (IED). SENSOR NODES SHOULD NOT BE USED WHERE RF TRANSMISSIONS COULD CAUSE A HAZARD TO PERSONNEL.

WARNING - RISK OF EXPLOSION

SENSOR NODES MAY PROVIDE AN IGNITION SOURCE IN AN EXPLOSIVE ATMOSPHERE DUE TO RF TRANSMISSIONS. DO NOT USE THE SENSOR NODES IN AN ENVIRONMENT WHERE EXPLOSIVE VAPOURS ARE PRESENT.

CAUTION – SITING OF EQUIPMENT.

The Sensor Node benefits from 'line-of-sight' for effective communication. If the Sensor Node is incorrectly sited, proper communication may not be established with its paired Sensor Node. Ensure the Sensor Node is correctly sited.

5   Position the Base Station Sensor Node in the chosen location. Make sure that the Sensor Node is positioned as high as practical (at least 1.5 meters above ground level to achieve maximum range). If necessary put the Sensor Node into a pouch and use this to secure the Sensor Node into place.

6   If required, connect a mains power supply connector 1 on the Sensor Node using the supplied power cable. See Figure 25.
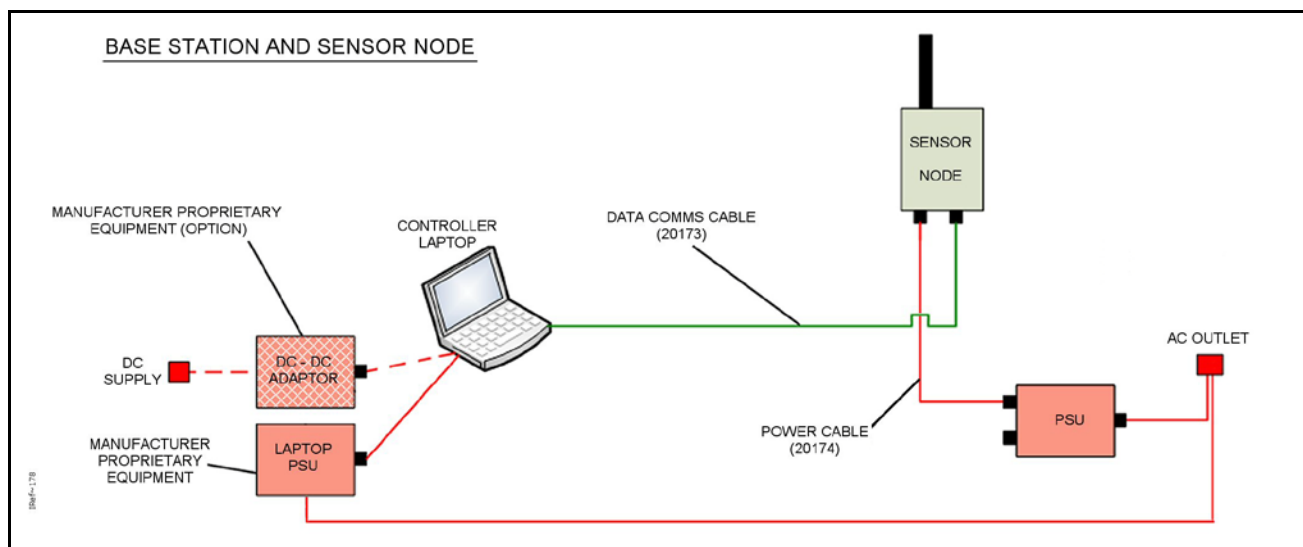
Figure 25   Interconnection Diagram for Base Station Node using Battery Power

WARNING - TRIP HAZARD

WHEN THE SENSA-LINX DETECTOR NETWORKING SYSTEM IS IN USE THERE ARE CABLES THAT CAN CAUSE TRIP HAZARDS. ALWAYS ROUTE THE CABLES TO AVOID TRIPPING POSSIBILITIES FOR CROSSING PERSONNEL.

7   Using the Communications cable provided with the Base Sensor Node kit or provided as an optional additional accessory, connect the RS232 port on the Laptop PC to connector 3 on the Sensor Node. See Figure 25.

8   Turn on the Sensor Node by pressing and releasing the power switch on the Sensor Node. The LEDs on the Sensor Node will now light up to indicate status. For further information on LEDs refer to Section 2.1.4. If the correct sequence is not completed successfully obtain a replacement Sensor Node.

9   Turn on the Laptop PC and login. Refer to local procedures for the username and password Note: when first delivered, the C2 laptop computer will start up and operate without asking for a username or password, however for additional security user accounts with passwords can be set up. For more information, refer to para 3.1. If required check that the internal clock of the Laptop PC is set to the 'local' time. Double click the icon on the desktop and start the C2 program.

Note: The first time the application is run the operator is presented with a blank network configuration document. The operator must then manually add sensor nodes to reflect the current network configuration. This configuration will be saved to disk and in future sessions, the last open configuration will be automatically loaded. In addition, the operator always has the choice to start from scratch with a blank configuration using 'File -> New' or to load some other previously saved network configuration document using 'File -> Open'. Once opened, configuration can be used unmodified or changed if required. The C2 must be in the disconnected state in order to load either a new or an existing network document. Press the Connect button at the top of the main window (Figure 26). A dialog will appear presenting a list

of known serial ports on the Controller PC. COM 1 is typically the comm port that will be used though it will depend on the specific set up. For detailed information on setting up the Base Station Sensor Node see para 2.3.1.2. The Base Station Sensor Node radio modem may be operationally disconnected from the network by pressing the Disconnect button that replaces the Connect button.
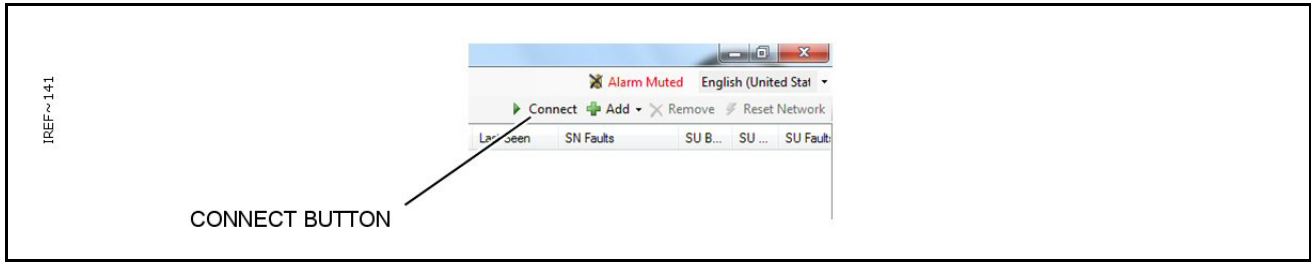
Figure 26   Connect Button – C2 Program Main Window

10 Confirm that the Laptop PC is now communicating with the Sensor Node by checking in the bottom left hand of the C2 program that the status of the Base Station is now 'Connected' as shown in Figure 27.
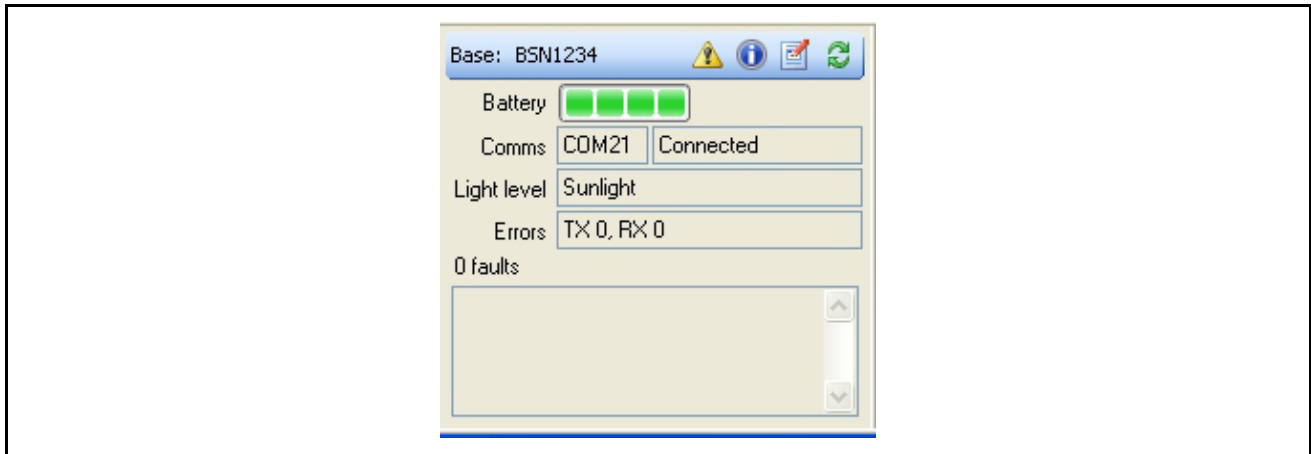
Figure 27   Base Station Sensor Node Detail Panel

11 Obtain from the storage cases the required quantity of Sensor Nodes and make a note of the serial number of each Sensor Node. These serial numbers are marked on the identification label of the Sensor Node.

12 In the C2 Program on the Laptop PC, use the 'Add' function and choose between adding a single sensor node and adding multiple sensor nodes to the network. Enter the serial numbers of all the Sensor Nodes that will be used at each Detector Sensor Node. The sequence in which these numbers are added is not important but it is essential to ensure that each Sensor Node is added to the program and appears on the screen before the Sensor Nodes are taken away to the Detector Sensor Node locations. For further information on adding Sensor Nodes to the network see para 3.4.3.3.

13 The Base Station Sensor Node is now setup and ready for operation. When Sensor Nodes are set up commence operation of the Sensa-LINX Network.

14 Although the network is now ready for use, it is useful to take advantage of one or both of the map panels as these can provide a good deal of information at a glance. Open a map panel if it isn't already and press the 'Open map file' button on the toolbar (see Figure 28).

IREF~142

MAP TOOLBAR

OPEN MAP FILE BUTTON
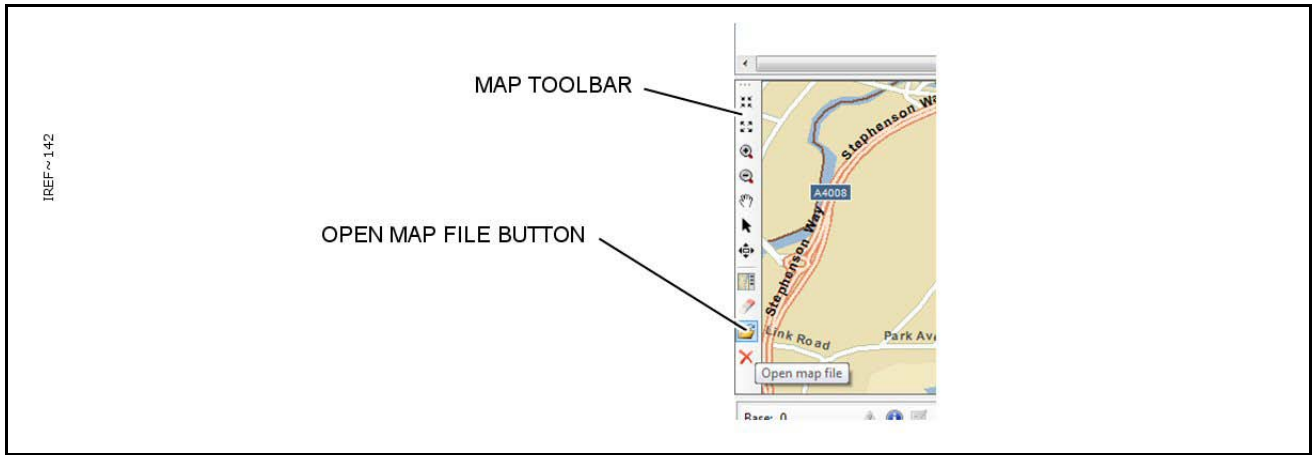
Open map file

Figure 28   'Open Map File' Button

15   Choose between opening a map file and opening an image file (see Figure 29). For further information on maps see para 3.4.1.5.

IREF~143

Select Map

○ Load a map file
○ Load an image file

File Name:
C:\Program Files\Smiths Detection\LINX\StreetMap   ...

OK   Cancel
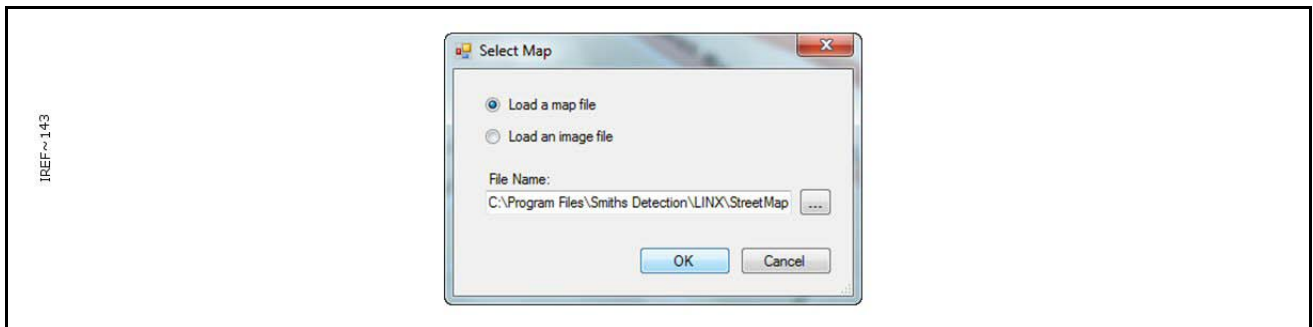
Figure 29   Map / Image file dialog

2.3.3 Sensor Node Set Up

A Sensor Node is the point at which a detector is to be setup as a node on the Sensa-LINX Detector Networking System. Use the following information as a guide to setting up a Sensor Node for the Sensa-LINX Detector Networking System. Equipment for this location is provided as part of the Detector Sensor Node Kit. The detector Sensor Node set up varies slightly depending on which detector is being used and if an external power source is to be used. There is, however, no significant difference to the set up whether the sensor node is to be secured in a fixed location, secured to a vehicle or worn as personal equipment. Refer to Figure 30 and Figure 31 below for further cable and connector information.

1   At the Sensor Node the following equipment is required as a minimum:

- One LCD3.3, with Adaptor Pouch or PCA as required, or LCD Nexus detector or CAM XTR. Detectors must have Sieve Pack(s) installed and batteries fitted.
- One Sensor Node with antenna and batteries fitted.
- One Data (Comms) cable (Detector to Sensor Node).

2   At the Sensor Node the following equipment is optional:

- Sensor Node and Detector Power Supply Unit and cables (if external power is available)
- One Sensor Node Pouch (for securing the Sensor Node in position and weather protection).
- One Detector Node Pouch (for securing the Detector in position and weather protection).
- Mounting brackets and accessories to mount the Sensor Node to the relevant sensor

WARNING – EXPOSURE TO RADIO FREQUENCY ENERGY.

THIS DEVICE TRANSMITS RADIO FREQUENCY ENERGY. WHEN WORN ON THE BODY, ONLY THE SUPPLIED ACCESSORIES (INCLUDING THE POUCH) MAY BE USED WITH THE EQUIPMENT AND THE EQUIPMENT MUST NOT BE CO-LOCATED WITH OR OPERATED IN CONJUNCTION WITH ANY OTHER ANTENNA OR TRANSMITTER

3   Determine where the Sensor Node is to be located taking into account factors such as terrain, local structures and weather conditions and proximity to other Sensor Nodes. For further information on positioning factors refer to para 3.3. If required put the Sensor Node into a pouch and use this to secure the Sensor Node into place. If the Sensor Node is to be used in a mobile situation (i.e. worn or carried by the operator) make sure only the correct accessories are used and no other radio equipment is present.

WARNING - TRIP HAZARD

WHEN THE SENSA-LINX DETECTOR NETWORKING SYSTEM IS IN USE THERE ARE CABLES THAT CAN CAUSE TRIP HAZARDS. ALWAYS ROUTE THE CABLES TO AVOID TRIPPING POSSIBILITIES FOR CROSSING PERSONNEL.

CAUTION – Incorrect Connections

There are two connectors on the Sensor node. These connectors are keyed to prevent misconnection but damage may occur if an incorrect connection is attempted forcefully. Check that the correct connector is being used before connection. Make connections carefully and do not force connection if resistance is felt.

4   Place the LCD3.3 into the LCD 3.3 Pouch with Dock, or PCA (operator option).

5   Position the detector (LCD3.3 NEXUS or CAM XTR) at the chosen location or use as a personal detector and set it up for operation (refer to the appropriate section of the detector Operators' Manual for further information).

CAUTION – Siting of Equipment.

The Sensor Node can benefit from 'line-of-sight' for effective communication when near the limits of its transmission range. If the Sensor Node is incorrectly sited, proper communication may not be established with its paired Sensor Node. Ensure the Sensor Node is correctly sited.

6   Determine an appropriate location for the Sensor Node and secure in position making sure it is at least 1.5 metres above ground level. For further information on siting Sensor Nodes refer to para 3.3.

CAUTION – Use of Sensor Nodes in wet weather.

The Sensa-LINX Sensor Nodes and Laptop PC contain electronic components which can be damaged by water. In heavy rainfall conditions make sure equipment battery compartments are fully closed against water ingress and the antenna is installed to the Sensor Node.

7   Using the appropriate Data (Comms) cable provided with the Detector Sensor Node Kit, connect the connector on the LCD3.3 Pouch with Dock, PCA or NEXUS detector or CAM XTR to Connector 3 on the Sensor Node. Refer to Figure 30.
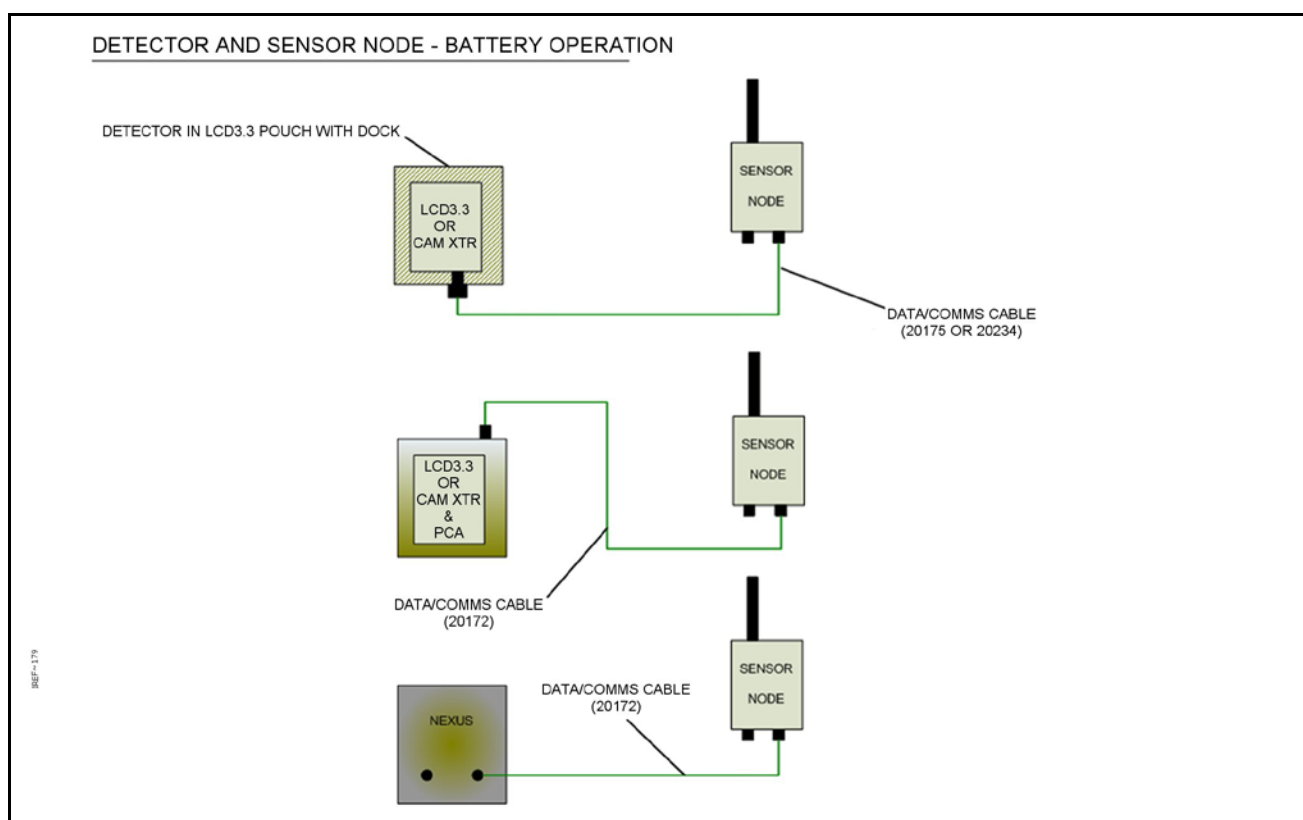
Figure 30   Interconnection Diagram for the Sensor Node using Battery Power

8   If an external power supply is available and is to be used, use the PSU or DC to DC Adaptor (see Figure 11) and relevant cable to connect an external supply to Connector 1 on the bottom of the Sensor Node. Refer to Figure 31.

9   Start the detector. For further information refer to the manufacturer's handbook.
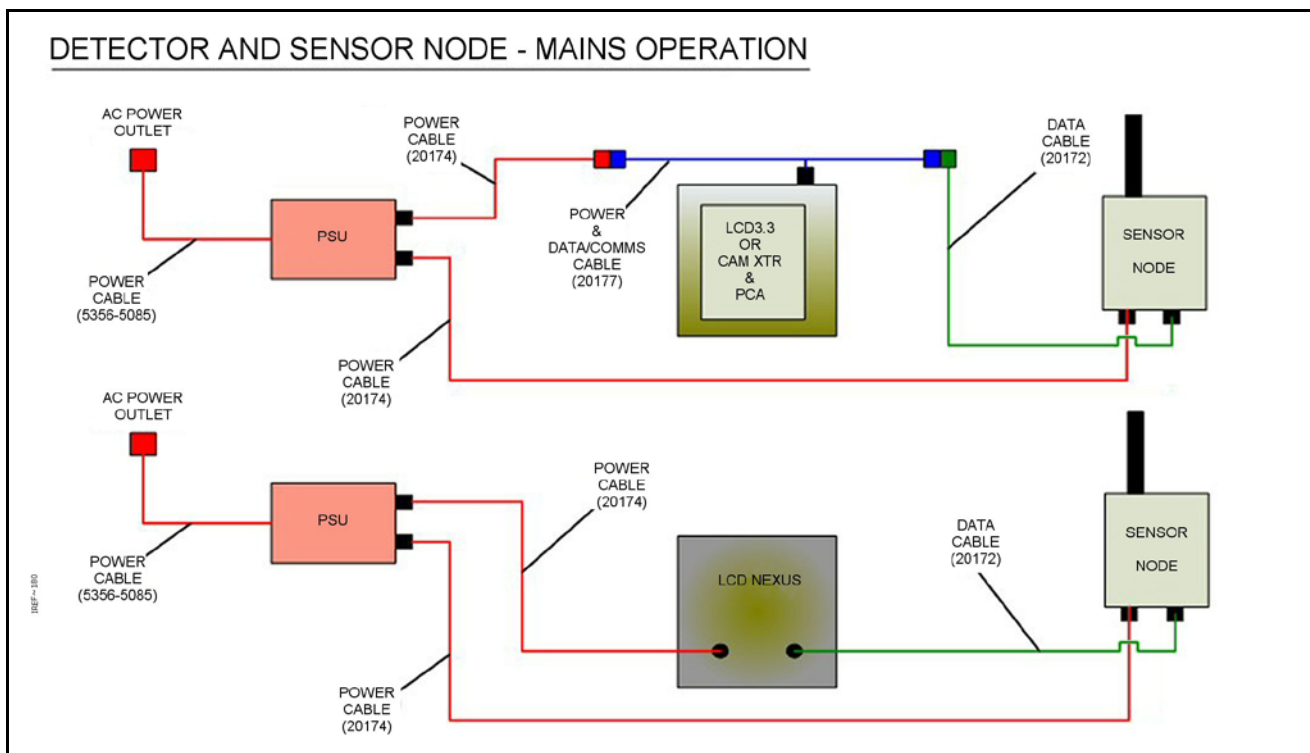
Figure 31   Interconnection Diagram for the Sensor Node using Mains Power

WARNING - RISK OF EXPLOSION

SENSOR NODES MAY PROVIDE AN IGNITION SOURCE IN AN EXPLOSIVE ATMOSPHERE DUE TO RF TRANSMISSIONS. DO NOT USE THE SENSOR NODES IN AN ENVIRONMENT WHERE EXPLOSIVE VAPOURS ARE PRESENT.

CAUTION - Radio Modem Frequency Band

The Sensor Nodes use a frequency band that is available for use by other unlicensed RF devices. Such devices may interfere with the operation of the Sensor nodes or may be interfered with by the Sensor Nodes. The Sensor Node incorporates features to minimise such interference but performance may be degraded. Check the location and frequency of other RF devices in the area before operating the Sensor Nodes.

9.1.   Turn on the Sensor Node by pressing and releasing the power switch on the Sensor Node. The LEDs on the Sensor Node will now light up to indicate status. For further information on LEDs refer to Section 2.1.4. If the correct sequence is not completed successfully obtain a replacement Sensor Node.

9.2.   The green Radio LED will initially be off (indicating no signals being received from the Laptop PC location. Wait for at least 1 minute before moving the Sensor Node - the Sensor Node may take up to this time to acquire communications with the Base Station Sensor Node. The LED will start to pulse when a signal is being received: a single pulse for a poor signal, a double pulse for a good signal and a triple pulse for a strong signal. To improve the signal, if required, move the Sensor Node to either

9.2.1.   a higher location.
9.2.2.   a clearer line of sight.
9.2.3.   a shorter range to the Base Station location.

10 When the Sensor Node has acquired radio communications, confirm at the Detector that it is communicating with the Sensor Node (a "U" icon will appear on the display of the Detector, it may take a few moments for this to appear).

11 Repeat set up activity for each required Sensor Node. At this stage the Sensor Node is setup.

12 Once all Sensor Nodes are setup and indicating radio signal connection, return to the Base Station Node and check the status of the C2 program. Confirm that each Sensor Node appears on the screen with an active status.

13 The network is now ready for use. Once connected, changes can be made to Base Station Node, Sensor Node, and Sensor settings using the various Detail panels as described in Section 3.4.6.

2.4   ALARMS
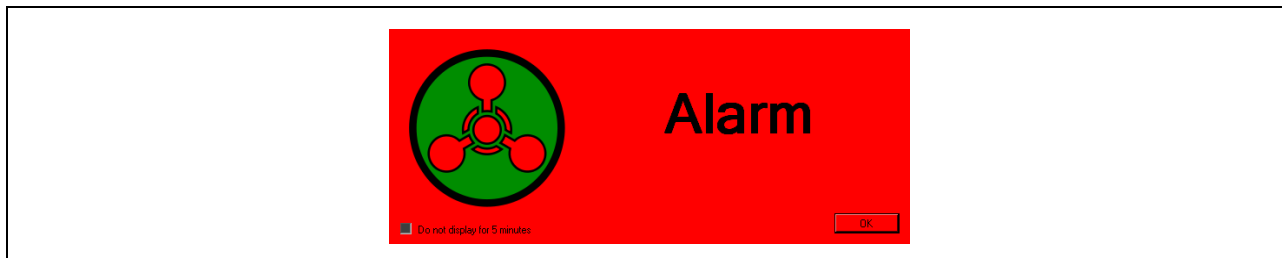
Figure 32   Alarm Pop-up Window

The Sensa-LINX C2 program can be configured so that when a 'new' alarm is received by the Laptop PC the alarm pop-up window will be shown (Figure 32) and this must be acknowledged using the 'OK' button before proceeding. Once this dialog has been acknowledged the alarm will continue to sound but can be stopped with the 'Silence Local Alarm' button in the Alarms log window. The alarm will sound again at the next detection event. The alarms log window, see para 3.4.7, will be activated automatically when a new alarm is received and the new alarm will be highlighted. Depending on the selected system preferences the Alarm Log Window may open automatically or may open minimised and indicated by a flashing button on the toolbar. If ATP-45 generation mode is set to manual then the 'ATP-45' button is enabled in the Alarms window which allows the ATP-45 form to be launched against the selected alert; in automatic generation mode the ATP-45 report will be generated at this point. For further information on ATP45 reports see para 3.4.2.1.

In the event of an alarm, audible alarms may be sounded at both the Controller PC and the sensor, and the C2 program offers the opportunity to silence both. **CAUTION** is advised before silencing the sensor alarm because if it has been enabled it is likely that personnel in the vicinity of the sensor wish to exercise control over the audible alarm.

Summary of the actions possible when an alarm is received:

- Click OK on the Alarm pop-up window. This clears the visual alarm.

- Click 'Silence Local Alarm' in the Alarms window. This silences the alarm sound produced by the Laptop PC.

- Click 'Silence Sensor Alarms' in the Alarms window or on the Sensor Panel in the main window. This silences the alarm on the selected sensor(s).

- An operator near the alarming sensor node can also silence the alarm by pressing any button on the keypad. This does not silence the local alarm on the Controller PC.

For further information about alarms see para 3.4.7.

2.5   LOSS OF COMMUNICATIONS.

WARNING - LOST COMMUNICATIONS

DETECTION DATA CANNOT BE TRANSMITTED IF COMMUNICATION BETWEEN THE SENSOR NODE AND THE BASE STATION IS INTERRUPTED OR LOST. PROTECTION FOR PERSONNEL MAY BE REDUCED IF ALARMS/ALERTS ARE NOT IMMEDIATELY DISPLAYED AT THE BASE STATION AND SOME INFORMATION THAT IS STORED WAITING FOR COMMUNICATION TO RESUME MAY BE OVERWRITTEN. MAKE SURE THAT COMMUNICATION BETWEEN THE SENSOR NODE AND THE BASE STATION IS MAINTAINED AS MUCH AS POSSIBLE AND ANY LOST COMMUNICATION IS INVESTIGATED AND REPAIRED AS QUICKLY AS POSSIBLE.

If communication between a Sensor Node and the Base Station is lost or interrupted Alarm/Alert messages sent by the Sensor Node will not immediately be displayed by the C2 application.

In the event of lost or interrupted communications some detection information will be stored in the buffer memory of the Sensor Node awaiting restoration of communication. Operators should be aware that, depending on the type and amount of detection information being gathered, the information record may not be complete as some information may be overwritten.

When communication is restored the messages will be sent to the Base Station and will be displayed by the C2 application as historical alarms accompanied by an indicator showing the original time of the alarm/alert occurrence. It is expected that communications will be restored within a reasonable timeframe however if communications are not restored, data will discarded after 90 hours from the time of storage.

2.6   SAVING NETWORK SETTINGS

The current network configuration can be saved at any time using either File>Save or File>Save As.

2.7   SHUT DOWN

2.7.1   C2 Shut Down

To exit the C2 application, choose File -> Exit or click the X in the top right corner of the main window. The current configuration will be automatically saved to disk for use in the next session.

It is not necessary to disconnect from the network before exiting the C2 application but it does not hurt to do so.

2.7.2   Equipment Shut Down

The Sensor Node (Radio Modem) is shut down by pressing and releasing the power switch on the top of the unit.

When shutting down the Laptop PC, follow the procedure described for program shutdown above, then shut down the laptop PC using the normal PC Start -> Shutdown method. For further information refer to the manufacturer's handbook.

For information on shutting down a detector refer to the manufacturer's handbook.

2.8 PUTTING SENSA-LINX EQUIPMENT INTO STORAGE

CAUTION – Corrosion due to Battery Leakage

Batteries must not be left in the Sensor Node if it will not be used for a period of time in case of leakage, which will cause corrosion. Make sure that the batteries are removed from the Sensor Node prior to any storage period.

CAUTION – Battery Power Discharge

Batteries left in the Sensor Node will discharge over a period of time even when the equipment is switched off. The expected battery life may be significantly reduced if a Sensor Node has stored containing batteries. If the Sensor Node will not be used for a period of time, make sure that the batteries are removed prior to any storage period.

Remove all batteries when placing Sensa-LINX equipment into storage.

The Sensa-LINX equipment should be stored in a dry environment within the temperature range also shown in TABLE 7 below.

TABLE 7. STORAGE TEMPERATURE RANGES	
Radio Modem	-39 °C (-38.2 °F) to 70 °C (158 °F)
Laptop PC	-20 °C (-4 °F) to 60 °C (140 °F)

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CHAPTER 3 TECHNICAL DESCRIPTION

3.1 USER ACCOUNTS ON THE C2 LAPTOP OR OTHER COMPUTERS

For delivery, the C2 laptop computer is configured to start-up without asking for a username or password. The system can be used in this configuration, however for additional security user accounts with passwords can be added. For more information, please refer to the help files that are installed on the computer (Go to the "Start Menu", Select "Help and Support", search for "account" and select "Create a user account", see below).
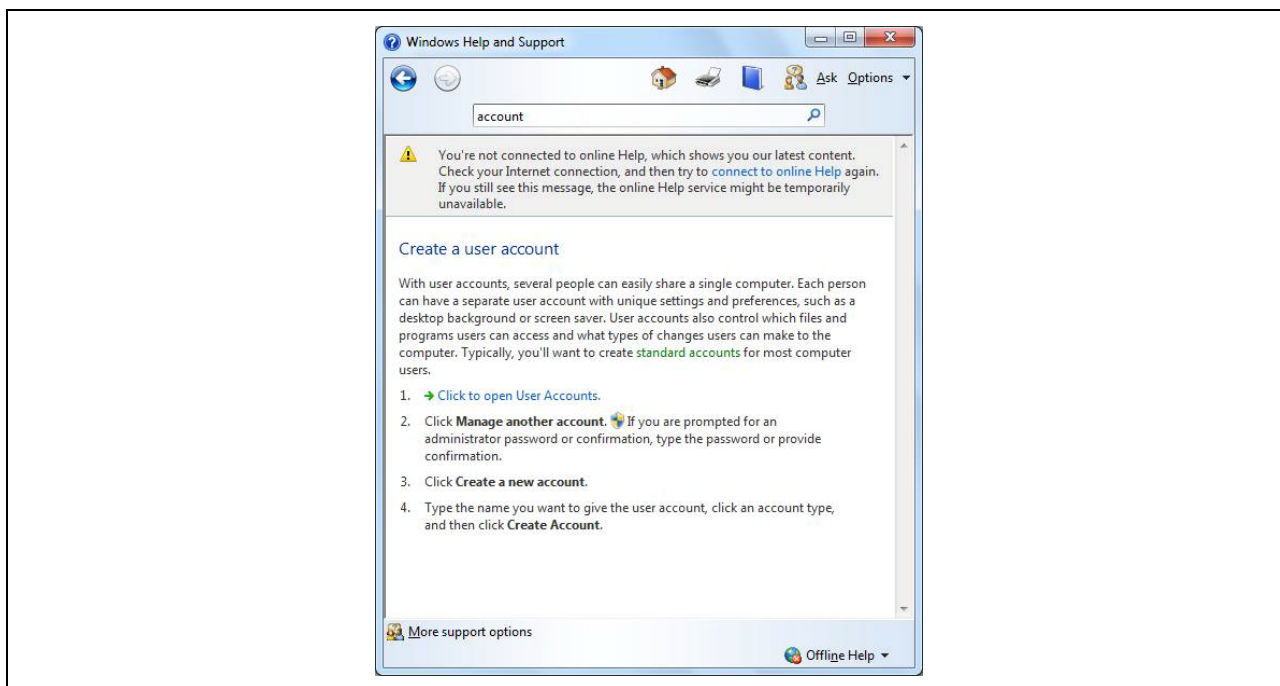
Figure 33   Windows 'Help and Support'

If you do create new accounts (or install the C2 application on a different computer) ensure that it is set never to "hibernate" as the system will lose communication with the Sensa-LINX network when the computer hibernates (On Windows 7, go to "Control Panel / Power Options / Edit Plan Settings" and set "Put the computer to sleep" to "Never" in all circumstances, see below).
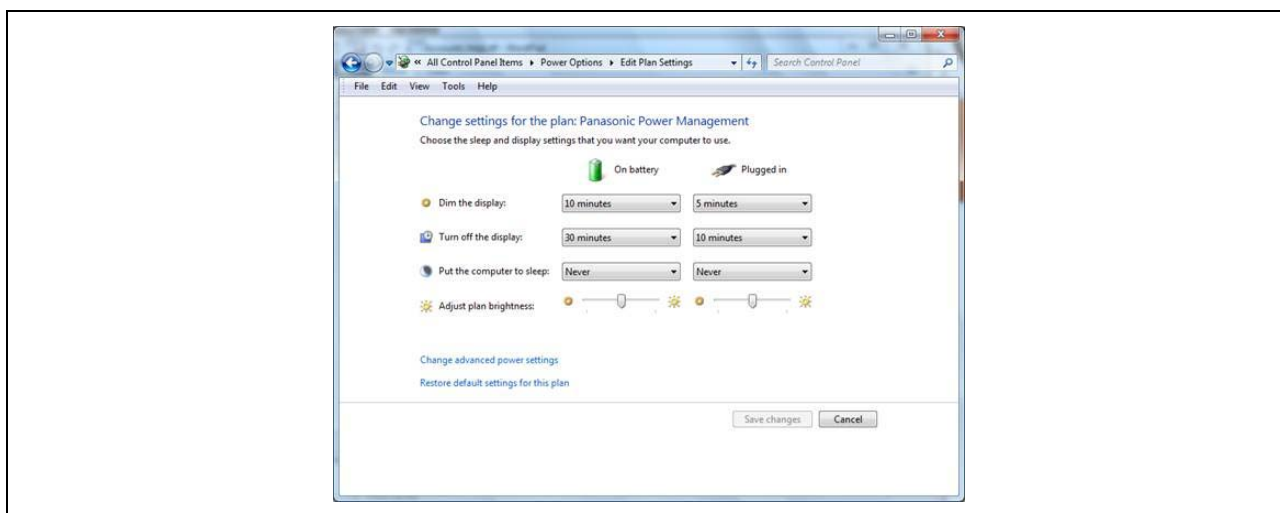
Figure 34   Power Management Pop-up Window

3.2   POSITIONING FACTORS FOR THE BASE STATION NODE

The following factors should be taken into consideration when positioning the Base Station Node:

- Where possible avoid positioning the Sensor Node near metal structures and objects.
- Sensor nodes must be positioned with the antenna pointing straight up (i.e. do not lie the sensor node down on top of another object).
- The Base Station Node must be positioned so that:

  1. For a network using 868MHz hardware every Sensor Node will be within the range limitations of the Base Sensor Node. For more information on range capabilities see TABLE 2 Radio Modem Variants

  2. For a network using 900MHz or 2.4GHz hardware at least one Sensor Node will be within the range limitations of the Base Sensor Node and any other Sensor Node is within the range limitations of another Sensor Node (this type of sensor node can "repeat" signals to the basestation node). For more information on range capabilities see TABLE 2 Radio Modem Variants

- The Laptop PC should be protected from direct exposure to precipitation as the Laptop PC is splash proof but not fully weatherproof.
- If external power is to be used the Laptop PC must be positioned within range of an AC power outlet.
- The Base Station Sensor Node must be positioned within the cable length of the Laptop PC so that it can be connected to the Laptop PC.
- The Base Station Sensor Node must be positioned at least 1.5 meters above ground level for best range coverage. The higher the Sensor Node can be located, the better the network performance will be.
- When GPS data is required the Base Station Sensor Node must be oriented with a clear view of the sky so that a GPS signal can be located.
- If external power is to be used for the Base Station Sensor Node then the Sensor Node must be positioned within the cable range of an AC power outlet.

3.3   POSITIONING FACTORS FOR THE SENSOR NODE

The following factors should be taken into consideration when positioning the Sensor Node:

- Sensor nodes must be positioned with the antenna pointing straight up (i.e. do not lie the sensor node down on top of another object).
- For sensor nodes that are mobile (e.g. being worn by an operator) or when first positioning a fixed sensor node, set the node to be "Mobile" (see Section 3.4.6.1.6). This will increase the data rate from the sensor node so that its position and communications status is regularly updated.
- Once a good position is located, if the sensor node is in a fixed position (i.e. not expected to move) then it should be set using the C2 to be "Fixed" (see Section 3.4.6.1.6). This will reduce the data update rate from that sensor, leaving more capacity for more sensors (although alarm signals are always sent as high priority messages, regardless of this setting) and will also warn the operator if the sensor node's GPS position changes.
- The detector should be positioned as required to detect hazardous vapors (refer to appropriate part of detector manual for further information)

- The Sensor Node must be positioned so that:

  1. For a network using 868MHz hardware every Sensor Node will be within the range limitations of the Base Sensor Node. For more information on range capabilities see TABLE 2

Radio Modem Variants

2. For a network using 900MHz or 2.4GHz hardware at least one Sensor Node will be within the range limitations of the Base Sensor Node and any other Sensor Node is within the range limitations of another Sensor Node (this type of sensor node can "repeat" signals to the basestation node). For more information on range capabilities see TABLE 2 Radio Modem Variants.

- The Detector Sensor Node must be positioned within the cable range of the detector.
- When GPS data is required the Detector Sensor Node must be positioned with a clear view of the sky so that a GPS signal can be located.
- The Detector Sensor Node, when in a fixed location, must be positioned at least 1.5 meters above ground level to prevent signal interference. If the Sensor Node is to be mobile i.e. worn by personnel the equipment should be positioned as high as practically possible.
- Where possible avoid positioning the Sensor Node near metal structures and objects e.g. fences, shipping containers etc.
- If external power is to be used the Sensor Node must be positioned within the cable range of the AC power outlet.

3.4 DETAILED C2 DESCRIPTION

Following is a comprehensive description of each element of the Sensa-LINX C2 Application.

3.4.1 GUI Layout

The C2 program is based around a main window, and from this a number of other windows are accessible. Below is an overview of the main window.
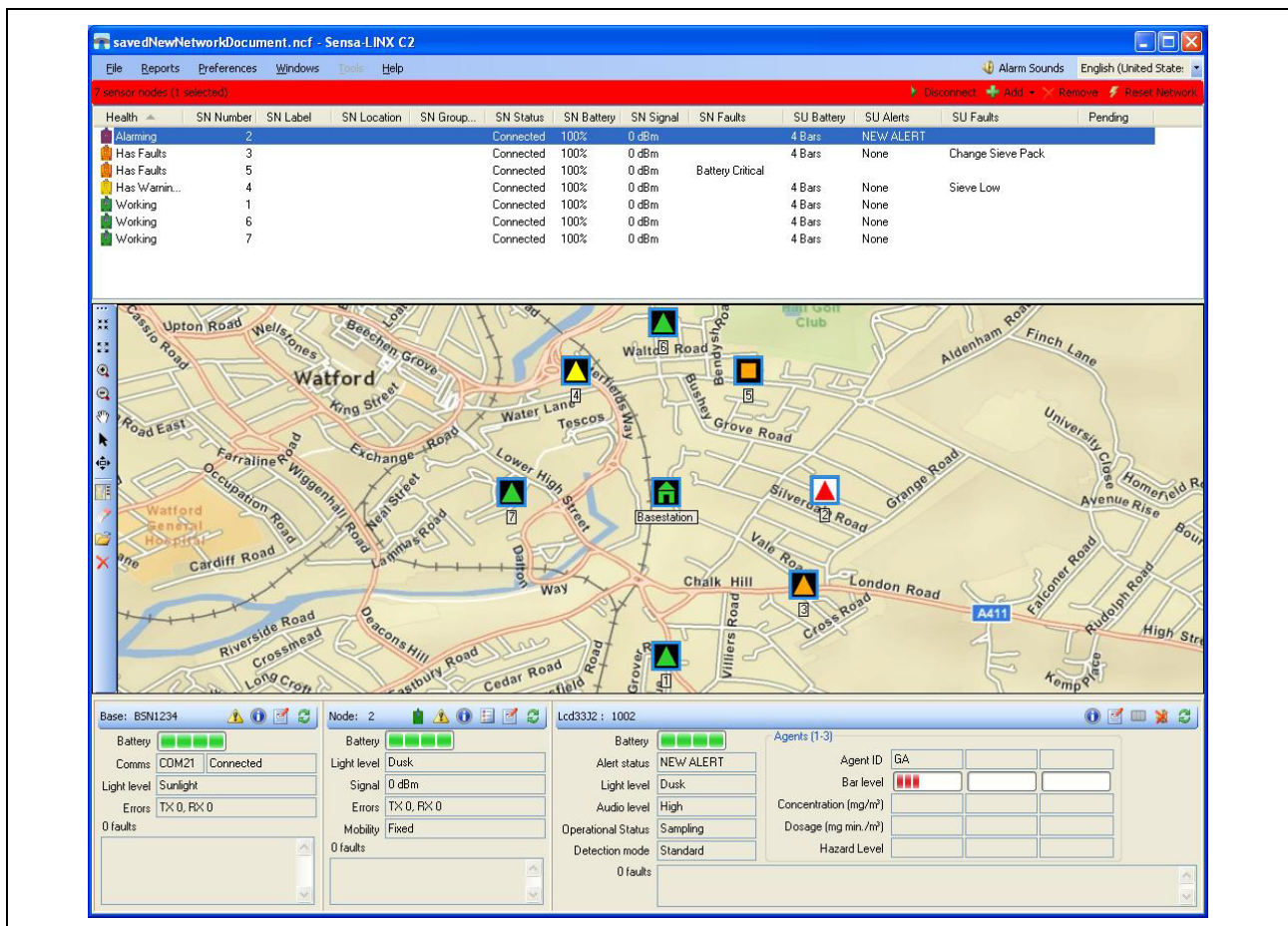
Figure 35   Sensa-LINX C2 Main Window

3.4.1.1   Title bar

The title bar displays the name of the current network configuration document as well as the application name and the standard Windows minimize, maximize, and close buttons.

3.4.1.2   Menu bar

The menu bar houses a number of menus for managing and configuring the C2 and the network. In addition, it allows the operator to mute local alarms and choose which language is used for the C2 display. For further information on the available menus and their functions see para 3.4.2.

3.4.1.3   Status bar

The status bar is home to four buttons for managing the state of the network: Connect/Disconnect, Add, Remove, and Reset Network. Additionally, it provides at-a-glance health of the network by changing to the color of the least healthy node in the network. The health colors are:

TABLE 8. HEALTH COLORS	
Color	**Meaning**
Green	Communicating and no faults or alarms reported
Grey	Not Communicating
Yellow	Communicating but has some faults (e.g. battery low) which do not prevent operation
Orange	Communicating, but has more serious faults (e.g. sieve expired, not connected to sensor) which may prevent the sensor or sensor node from functioning correctly or at all
Red	Agent Alarm

3.4.1.4   Sensor Node List

The sensor node list displays information about each of the sensor nodes in the network. Each line shows an icon and indicates the status of both the sensor node and any attached sensors along with the health of the connection to the Base Station Node and a number of other system metrics.

3.4.1.5   Map Panels

The map panels, of which there are two, allow the operator to load either a georeferenced map or an image, such as a building schematic, and to display the BSN and SNs in the network at their relevant locations.

- For map files, valid formats include ESRI maps (.mxd) and GeoTiffs (.tiff).

- For image files, valid formats include .bmp, .jpeg, .png, .gif and .tiff. Note: If a GeoTiff is opened with the 'Load an image file' radio button enabled then it will be treated like an image and not like a map which means nodes will not be able to be automatically placed on it.

3.4.1.6   *Detail Panels*

The detail panels display in depth information about the BSN as well as the selected SN(s) and sensor(s). The panels also allow the operator to change settings, initiate Built-In-Tests, and perform other component specific operations.

3.4.2   Menus

See TABLE 9 below for information on the available menus and their functions.

<table>
<tr><td colspan="3">TABLE 9.   C2 PROGRAM MENUS</td></tr>
<tr><td>Level 1 Menu Item</td><td>Level 2 Menu Item</td><td>Description</td></tr>
<tr><td rowspan="6">File</td><td>New*</td><td>Creates a new (blank) Network Configuration Document. Requests confirmation of the action from the user if the current NCD has unsaved changes.</td></tr>
<tr><td>Open*</td><td>Loads an existing Network Configuration Document. Opens an OS-provided File Open dialog to enable the user to choose the NCD. Requests confirmation of the action from the user if the current NCD has unsaved changes.</td></tr>
<tr><td>Save</td><td>Saves the current Network Configuration Document.</td></tr>
<tr><td>Save As</td><td>Saves the current Network Configuration Document to a user-specified filename. Opens an OS-provided File save dialog to enable the user to choose the name for the NCD.</td></tr>
<tr><td>Undo all changes</td><td>Reverts the current Network Configuration Document to its last saved state. This feature is not available if the network is in online mode or the configuration has not been saved.</td></tr>
<tr><td>Exit</td><td>Closes the application. Requests confirmation of exit from the user if the application is operating in online mode.</td></tr>
<tr><td rowspan="3">Reports</td><td>ATP-45 Report</td><td>Opens the ATP-45 Report generation dialog. See Section 3.4.2.1 for details.</td></tr>
<tr><td>Manual ATP-45</td><td>Sets the ATP-45 report generation mode to manual. The operator will have to manually generate a report when an alarm occurs. See Section 3.4.2.1 for details.</td></tr>
<tr><td>Automatic ATP-45</td><td>Sets the ATP-45 report generation mode to automatic. A report will automatically be generated and saved to disk when an alarm occurs.</td></tr>
<tr><td rowspan="3">Preferences</td><td>Folder Options</td><td>Opens the Folder Options dialog. See Section 3.4.2.2 for details.</td></tr>
<tr><td>System Preferences</td><td>Opens the System Preferences dialog. See Section 3.4.2.3 for details.</td></tr>
<tr><td>Map Label Choices</td><td>The next four entries in the Preferences allow the operator to choose what is used as the base station node and sensor node labels on the map panels. The choices are:

• Label map nodes with no labels – Don't show a label.

• Label map nodes with SN label – Use the sensor node's label as its label on the map.

• Label map nodes with SN Serial Number – Use the sensor node's serial number as its label on the map.

• Label map nodes with SN Group Location</td></tr>
</table>

TABLE 9. C2 PROGRAM MENUS		
	Map Group Coloring Choices	Map group colouring choices The next three entries in the Preferences menu allow the operator to choose how the sensor nodes on the map are highlighted in terms of group locations. • Highlight no groups – Don't do any group specific highlighting • Highlight all groups – Highlight each group of nodes in a different colour. • Highlight the selected group – Highlight only those nodes in the same group as the node currently selected.
Windows	**Alarms**	Displays the Alarms window
	Warnings	Displays the Warnings window
	Events	Displays the Events window
	Show Details Panels	Toggle item. Enables or disables display of the BSN, SN and sensor details panes
	Show Map 1	Toggle item. Enables or disables display of the first map window
	Show Map 2	Toggle item. Enables or disables display of the second map window
Tools	**Sensa-LINX NCT**	If the NCT is installed then the Tools menu will be enabled and contain an item that will launch the NCT from the C2.
Help	**Operators Manual**	Displays the C2 application operators manual in another window (using Adobe Reader or an equivalent package if installed). The Operators Manual will be in the currently selected language
	Map Icons Legend	Displays the Map Icons Legend window. See Section 3.4.2.4 for details.
	About	Displays application version information in an about box

* Denotes menu options only available when the C2 is in Offline mode

3.4.2.1 *ATP-45 Report Dialog*

ATP 45 reports may be automatically generated against any alarm event detected (from the alarms window); however it is also possible to manually generate an ATP-45 report, which launches the ATP-45 window with no default fields apart from the date and time. This window is opened from the Reports menu item on the main window toolbar.

CAUTION – inaccurate contamination spread prediction

In ATP-45 reports the "height" field will default to zero (this field represents the height above ground level, not altitude, and this cannot be acquired from the GPS). This may give inaccurate results if used to predict the spread of contamination when the sensor is positioned at a significant height above ground level (e.g. on a tall building). If using ATP-45 reports to predict contamination spread; either position sensors at ground level, or set the ATP-45 mode to 'Manual ATP-45' and edit the "height" field to a realistic value.

The fields 'Time & Date', Position (Lat/Long), Sensor Height (above ground level) are mandatory (although the default sensor height of zero is an acceptable value). One of 'Agent Name', 'Agent Type' or 'Agent ID' is also mandatory. All other fields are optional. If a mandatory field is not filled when the user presses 'OK', a pop up window will remind the operator to enter required data.

ATP-45 reporting has two configurable modes – 'Manual ATP-45' mode and 'Automatic ATP-45' mode, selectable via the Reports menu and saved as preference for each user. In 'Automatic Mode' an ATP-45 report is generated for each 'new' alarm event (i.e. when a sensor transitions between not alarming and alarming) but not for new information about the same alarm. In 'Manual Mode' a single Alarm record must be highlighted to access the ATP-45 menu, the ATP-45 reports are generated by the operator from a button on the Alarms window (see 3.4.7); no attempt is made to ensure that an ATP-45 report is filed.

The Date & Time of Chemical Detection, Latitude and Longitude and most Chemical Agent Detail fields are automatically filled in but can be manually filled or changed by the Operator.

If a known agent is detected, then the 'Agent Name' field will be populated; otherwise the 'Agent Type' field will be populated.

Figure 36   ATP-45 Report Dialog

TABLE 10. ATP-45 REPORT DIALOG FIELDS	
Field Name	**Contents**
Date & Time of Chemical Detection	Date/Time in UTC
Position of Chemical Detection	Latitude, longitude, and height of the sensor at time of detection
Chemical Agent Details	Agent name - Name of the chemical agent detected
	Agent type - Type of chemical agent detected
	Agent ID - ID of the chemical agent detected
	Type of persistency. Valid values are: Non-Persistent Persistent Thickened Unknown
	Level of chemical contamination - Concentration by volume of the detected substance.
	Level of chemical dose. Dosage information for the detected substance.
	Agent note - Operator defined note

3.4.2.2 *Folder Options*
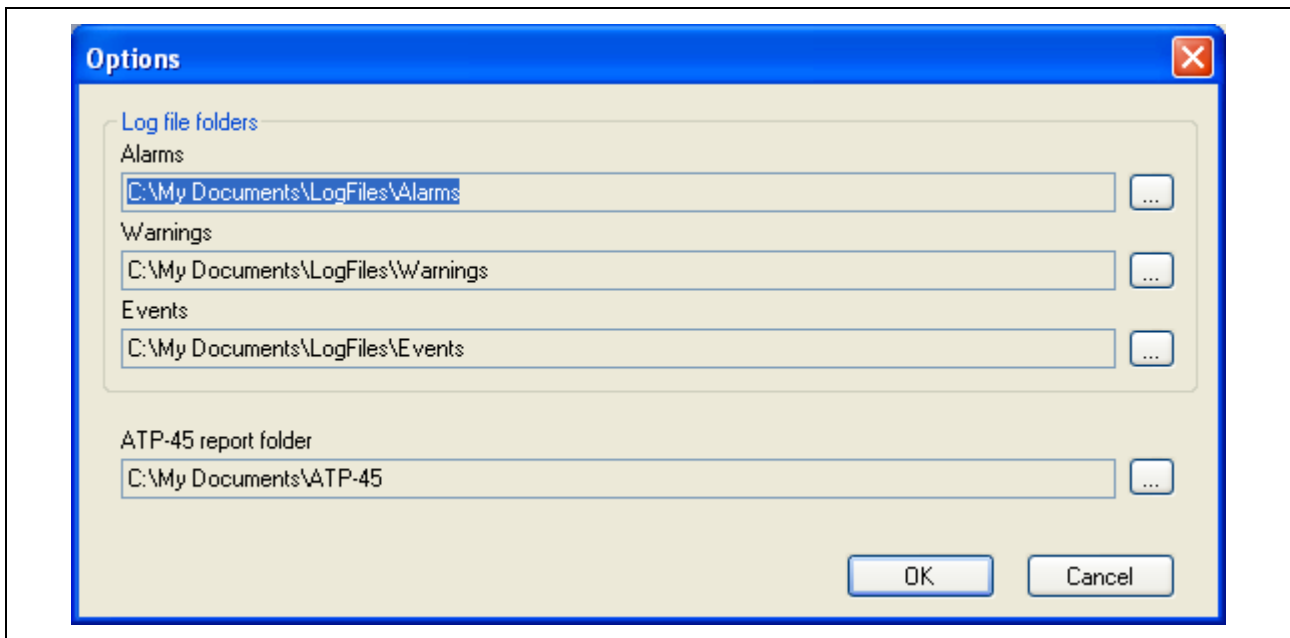
Figure 37   Folder Options Dialog

| TABLE 11. FOLDER OPTIONS DIALOG FIELDS ||
Field Name	Contents
Alarms	Location to which the alarms log files will be written
Warnings	Location to which the warnings log files will be written
Events	Location to which the events log files will be written
ATP-45 report folder	Location to which the ATP-45 reports will be written

Storage locations for log files may be changed by the user. Clicking on the ellipsis button opens a new dialog that allows the user to browse for the preferred storage location. Clicking the OK button in each case will change and then save the preferred storage location

Note: In Windows 7 the default path will display as:

C:\Users\<user name\Documents\...

when you actually go to navigate to this directory the Documents folder is called 'My Documents' so the actual path is:

C:\Users\<user name\My Documents\...

3.4.2.3   *System Preferences*

CAUTION – Reduced System Performance

Changing the Sensor Node Refresh Period and GPS Refresh Period can adversely affect the performance of the Sensa-LINX system. Setting the refresh rate too high may result in system overload whereas setting the refresh rate too low may result in lost data or non-current data being displayed. Take care if changing the refresh rates from their default settings (40 seconds for fixed nodes and 5 seconds for mobile nodes). Revert to the default settings if issues occur.
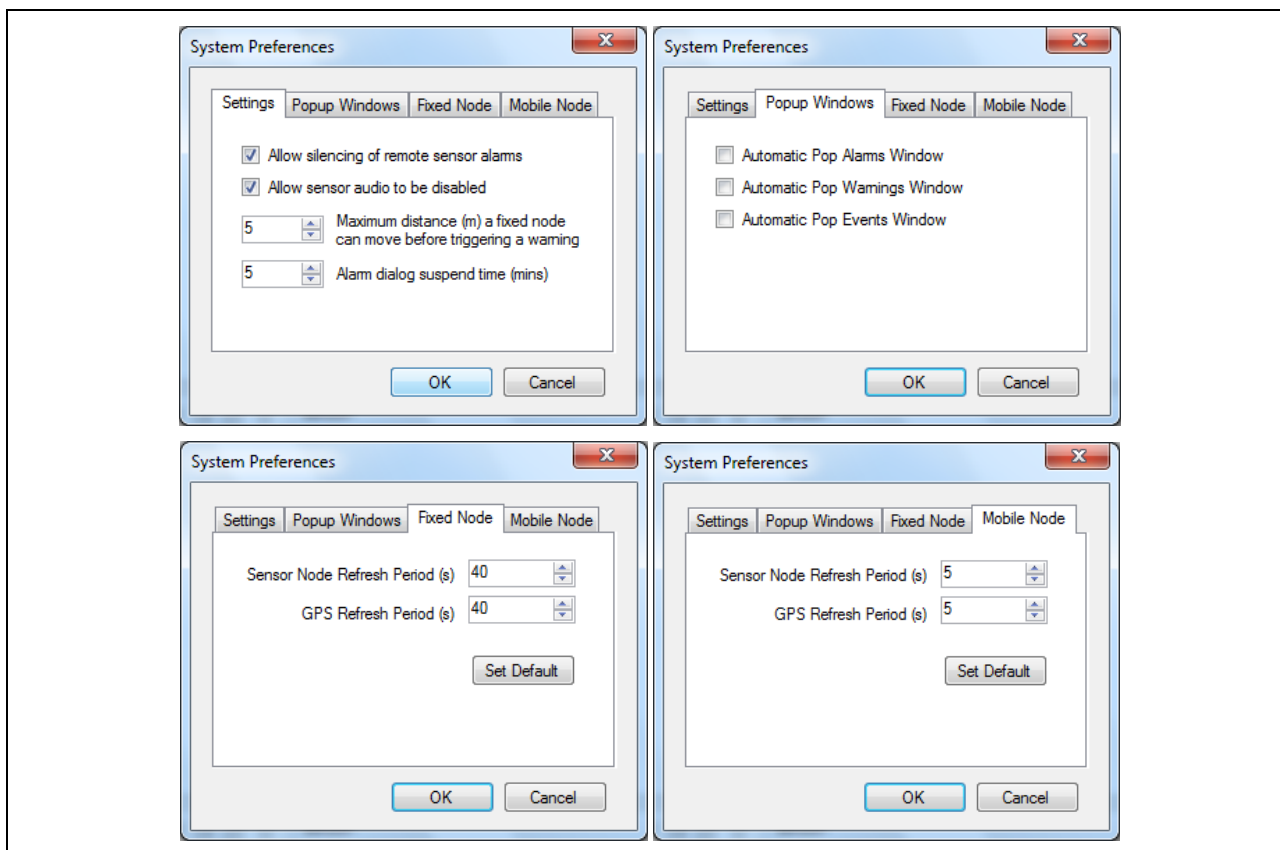
Figure 38   System Preferences Dialog

TABLE 12. SYSTEM PREFERENCES DIALOG FIELDS	
Field Name	**Contents**
Allow silencing of remote alarms	Controls whether the operator is able to silence alarms on the sensor themselves from the C2.
Allow sensor audio to be disabled	Controls whether the operator is able to silence alarms on the Laptop PC through the C2.
Maximum distance (m) a fixed node can move before triggering a warning	Movement of a sensor node with mobility set as 'Fixed' triggers a warning in the system. This option allows the operator to set the distance that the node must move before the warning is generated. This is useful in situations where some GPS drift may occur.
Alarm dialog suspend time (mins)	The amount of time that an Alarm event window will be suspended when the "Do not display for x minutes" is selected by the operator (see Section 2.4).
Automatic Popup Alarms Window	When selected, new alarms (or changes in alarm status) will cause the alarms log window to open

	automatically in front of the main window (but behind any alarm indication).
Automatic Popup Warnings Window	When selected, new warnings (or changes in warning status) will cause the warnings log window to open automatically in front of the main window.
Automatic Popup Events Window	When selected, new events will cause the events window to open automatically in front of the main window.
Fixed Node: Sensor Node Refresh Period	The rate at which routine data will be reported from the sensor node to the basestation for a node marked as "Fixed" (see Section 3.4.6.1.6). Note: alarm messages are always sent immediately, regardless of this setting.
Fixed Node: GPS Refresh Period	The rate at which GPS data will be reported from the sensor node to the basestation for a node marked as "Fixed" (see Section 3.4.6.1.6).
Mobile Node: Sensor Node Refresh Period	The rate at which routine data will be reported from the sensor node to the basestation for a node marked as "Mobile" (see Section 3.4.6.1.6). Note: alarm messages are always sent immediately, regardless of this setting.
Mobile Node: GPS Refresh Period	The rate at which GPS data will be reported from the sensor node to the basestation for a node marked as "Mobile" (see Section 3.4.6.1.6).

3.4.2.4   Map Icons Legend Window
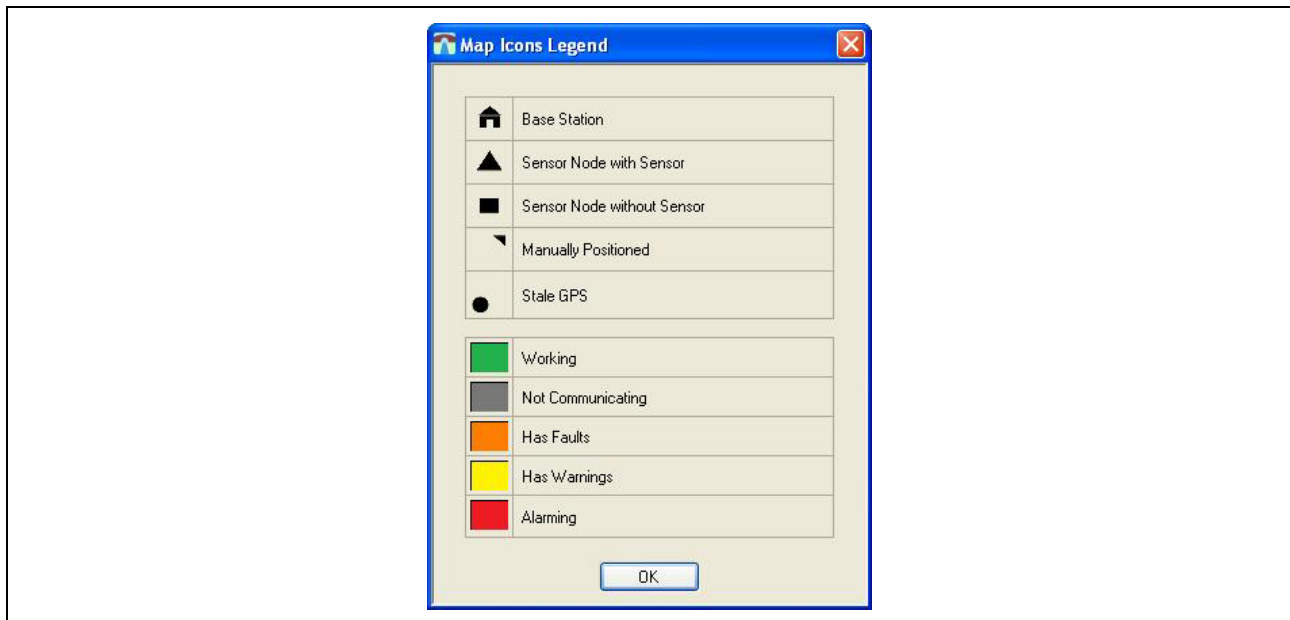
Figure 39   Map Icons Legend Window

3.4.2.5   Alarm Sounds / Alarm Muted button

Allows the operator to prevent the audible alarm on the PC from sounding when an alarm is raised.

3.4.2.6   Language selection menu

Allows the operator to change the language in which the application is displayed at run-time.

3.4.3   Status bar

In addition to the information described below. The status bar indicates the health status of the least healthy node in the network by changing to one of the five health colors. (for further information on Health Colours see TABLE 8)

3.4.3.1   Sensor node counts

The left portion of the status bar displays a count of how many sensor nodes are in the network and how many are currently selected in the C2.

3.4.3.2   Connect/Disconnect button

Used to toggle between Offline and Online modes. When toggling to Online mode, a Connect dialog is displayed which lets the operator select which COM port the C2 should use to connect to the base station node. The Panasonic Toughbook CF31 that is supplied when requested has only one COM port.
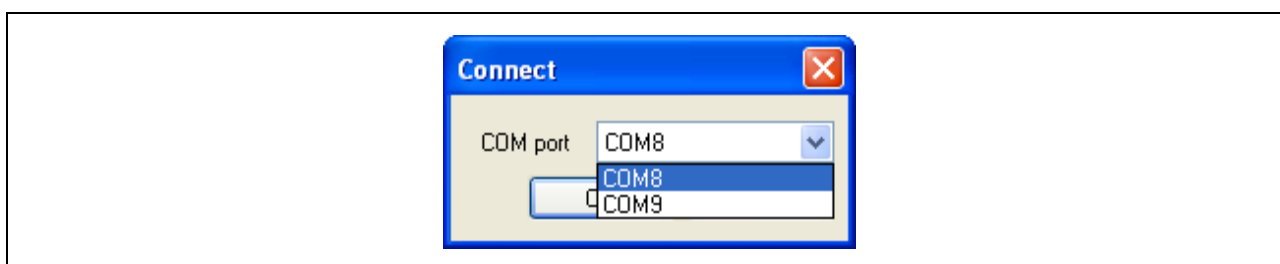
| Figure 40 | Connect Dialog |

3.4.3.2.1   Connectivity Modes

The C2 is always considered to be in one of two modes: Offline or Online. It is in Offline mode any time it is not trying to connect or currently connected to a Base Station Node.   The significance of these modes is that various fields throughout the application will either display current information or last known information depending on the mode.

The mode of the C2 can be determined by looking at the Connect/Disconnect button in the status bar. In Offline mode the button will say 'Connect' and in Online mode the button will say 'Disconnect'.

3.4.3.3   Add button

The Add button drops down a menu with two choices: Add single sensor node and Add multiple sensor nodes

3.4.3.3.1   Add Single Sensor Node Dialog
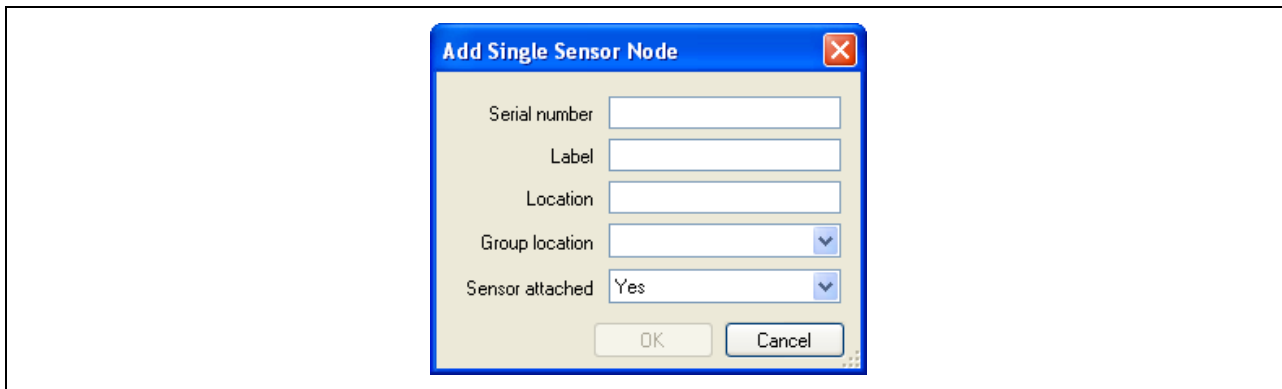
Figure 41   Add Single Sensor Node Dialog

Field Name	Contents
TABLE 13. ADD SINGLE SENSOR NODE DIALOG FIELDS	
Serial Number	Sensor Node Serial Number (as shown on SN Label)
Label	Operator defined label
Location	Operator defined location
Group location	Operator defined group location
Sensor Attached	Whether or not this sensor node has an attached sensor (a Sensor Node without an attached detector may be used to repeat a radio signal from more distant /less accessible Sensor Nodes)

3.4.3.3.2   Add Multiple Sensor Nodes Dialog
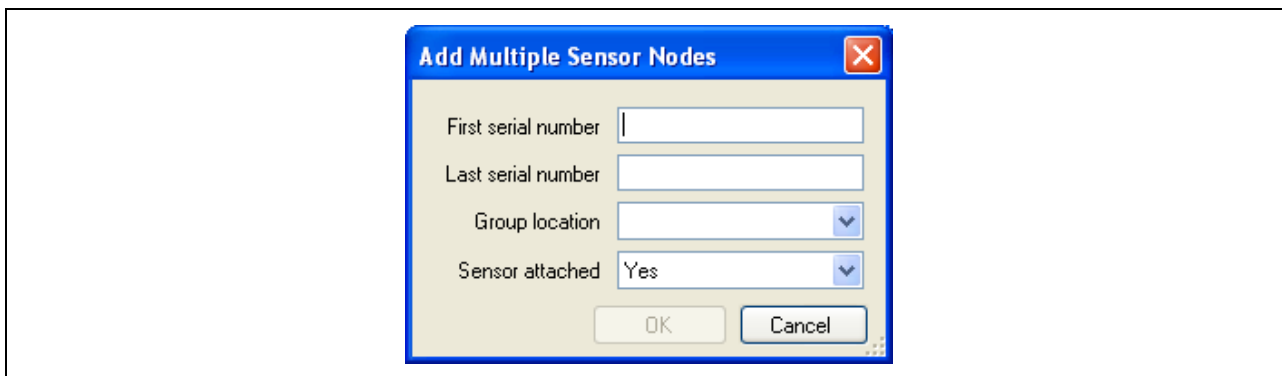
Figure 42   Add multiple Sensor Nodes Dialog

This dialog allows the operator to add multiple sensor nodes at the same time as long as they have consecutive serial numbers.

Field Name	Contents
TABLE 14. ADD MULTIPLE SENSOR NODES DIALOG FIELDS	
First serial number	Serial number of the first sensor node in the group to be added
Last serial number	Serial number of the last sensor node in the group to be added
Group location	Operator defined group location
Sensor Attached	Whether or not these sensor nodes have attached sensors (Sensor Nodes without an attached detector may be used to repeat a radio signal from more distant /less accessible Sensor Nodes)

TIP: The serial number of a Sensor Node can be acquired by connecting to the base station node and waiting for warnings to come in indicating that unknown sensor nodes are attempting to join the network. The serial numbers of these sensor nodes will be presented in the warning and can then be entered in to either of the Add Sensor dialogs. This method works equally well for single (para 3.4.3.3.1) or multiple (para 3.4.3.3.2) sensor nodes to be added to a network.

- For single sensor node addition, the sensor node serial number and the attached sensor fields are required, and the other fields are provided so the operator can add useful information for interpretation in the main window and the alarms, warnings, and events windows.

- The attached sensor field is used by the C2 to determine whether the sensor node should have a sensor attached. This is used by the C2 to prevent false 'missing sensor node' warnings when a sensor node is being used simply as a network relay.

- For multiple sensor node addition, the first and last serial numbers in a sequential list of serial numbers can be entered and the sensor attached state must be set. In addition it is possible for the operator to define a common Group Location for the new sensor nodes. Note: The Label, Location, Group location fields are provided as a means for the operator to identify and categorize the sensor nodes in the network in a way that makes sense for their particular application.

3.4.3.4   Remove

The 'Remove' button removes the selected sensor nodes from the network after operator confirmation. To remove one or more sensor nodes from an existing network, select the node(s) in either a map panel or in the sensor node list and press the Remove button at the top of the main window and confirm when requested. The C2 will no longer communicate with the removed sensor nodes unless they are added back to the network.

3.4.3.5   Reset Network

Performs an automatic disconnect and reconnect of the network.

The operator does not normally need to use the Reset button but it is available if the network fails to respond.

3.4.4   Sensor Node List

Health ▲	SN Number	SN Label	SN Location	SN Group...	SN Status	SN Battery	SN Signal	SN Faults	SU Battery	SU Alerts	SU Faults	Pending
Alarming	2				Connected	100%	0 dBm		4 Bars	NEW ALERT		
Has Faults	3				Connected	100%	0 dBm		4 Bars	None	Change Sieve Pack	
Has Faults	5				Connected	100%	0 dBm	Battery Critical				
Has Warnin...	4				Connected	100%	0 dBm		4 Bars	None	Sieve Low	
Working	1				Connected	100%	0 dBm		4 Bars	None		
Working	6				Connected	100%	0 dBm		4 Bars	None		
Working	7				Connected	100%	0 dBm		4 Bars	None		

Figure 43   Sensor Node List

The sensor node list displays information about each of the sensor nodes in the network. Each line shows a colored icon indicating the health of the connection and/or sensor node, along with a number of status items for both the sensor node and the attached sensor.

Note: Fault/Warning/Alarm coloring is maintained even when a device stops communicating and thus an icon referring to a Sensor Node with a fault will NOT turn grey if communication stops.

The list can be sorted by any of these status items by clicking on the corresponding column title. In addition, the columns can be resized and reordered. If the columns do not all fit on the screen then a horizontal scroll bar will appear at the bottom of the sensor node list.

If there are more Sensor Nodes than can be displayed in the list at once then a vertical scroll bar will appear.

Selecting Sensor Nodes in the C2 is mentioned for a variety of operations and can be achieved in a number of ways. Single Sensor Nodes can be selected by either clicking on their entry in the Sensor Node list or clicking on their icons in the map area of a map panel.

Multiple Sensor Nodes can be selected by holding CTRL and clicking on the desired Sensor Node's entries in the Sensor Node list or on their icons in the map area of a map panel. It is also possible to select multiple Sensor Nodes at once by holding SHIFT, clicking on an entry in the Sensor Node list and then clicking on another entry farther down the list. Both the clicked on Sensor Nodes and all the ones in between will be selected.

Column Name	Contents
TABLE 15. STATUS ITEMS	
Health	A health status for the sensor node/sensor pair. The health status indicator includes a coloured icon that gives a visual indication to the health of the item(s).
SN Number	Serial number
SN Label*	Operator defined label
SN Location*	Operator defined location
SN Group Location*	Operator defined group location
SN Status	Comms status
SN Battery	Charge percentage of the SN battery
SN Signal	Signal strength
SN Faults	Fault indication for the SN
SU Battery	Battery bars indication for the attached sensor
SU Alerts	Alert status for the attached sensor
SU Faults	List of faults on the attached sensor
Pending	List of pending changes for the sensor node and its attached sensor unit.

Denotes fields that can be defined when the sensor node is added to the network document as mentioned above and also through the sensor node detail panel as described below

3.4.5   Maps
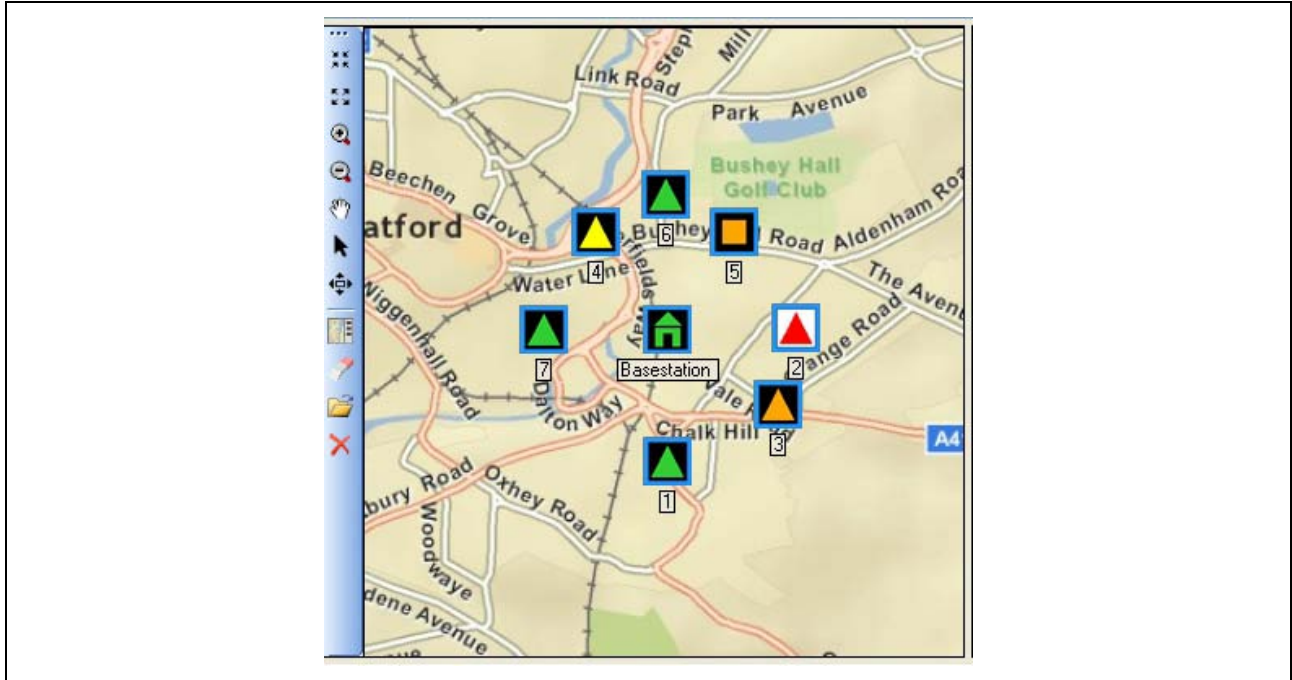
Figure 44   Map Panel

The map panel allows the operator to load either a georeferenced map or an image, such as a building schematic. It is then possible to display the sensor nodes in the network at their relevant locations.

If a map file was loaded, a decision is required as to whether the Sensor Node locations should be positioned automatically using GPS data or if they should be positioned manually. Manual positioning will override the GPS data in the C2 program and may affect things like the data shown in the alarms window and data in the ATP-45 reports.

Nothing further is required for automatically positioned Sensor Nodes. They will be sited at the proper location on the map as soon as the C2 receives their position.

For manually placed nodes on both a map and an image, open the icon panel and drag the nodes from there onto the map/image.

On a map, it is possible to toggle between the two positioning modes for a sensor node by right-clicking on the sensor-node on the map and toggling the value in the resulting context menu. The positioning mode may also be changed using the BSN settings dialog. See Section 3.4.6.1.2.

The map panel is composed of a toolbar, a map area, and an icon panel that can be optionally shown or hidden. The toolbar contains the following buttons:

TABLE 16. MAP TOOLBAR ITEMS	
Tool Name	**Action**
Zoom In	Zooms in on the displayed map/image by a fixed amount
Zoom Out	Zooms out on the displayed map/image by a fixed amount
Zoom in and center	Places the cursor in Zoom In mode and will zoom in and center on the clicked position of the map/image
Zoom out and center	Places the cursor in Zoom Out mode and will zoom out and center on the clicked position of the map/image
Pan	Places the cursor in pane mode which allows the operator to pan the map/image by clicking and dragging on the map area
Deselect map tools	Returns to the arrow cursor
Set Automatic/Manual extent mode	Toggles the extent mode of the map control. In automatic extent the bounds of the map changes as needed to ensure that the BSN and all of the SNs on the map/image are visible at all times. Manual extent mode leaves it to the operator to choose the map/image bounds.
Show/Hide Icon Panel	Toggles the icon panel
Remove all sensors	Removes all nodes from the map/image and places them back in the icon panel. Note: In Online mode, any nodes in automatic placement mode will return to the map/image on their next GPS position update.
Open map file	Launches the Select Map dialog from which a map or image file can be loaded into the map area.
Close map control	Hides the map panel. To show the panel again, use the Windows menu.

The map area displays the open map/image along with the BSN and SNs. It also facilitates operator interaction with the BSN and SNs in the form of tooltips and the ability to reposition the BSN and SNs by clicking and dragging them to new location.

TIP: In addition to the zoom tools mentioned above, it is also possible to zoom in and out using the scroll wheel on the mouse and to zoom in by holding CTRL, right-clicking and dragging on the map/image. This will define the map's bounding box when you let up on the mouse button.

The icon panel contains the BSN and SNs when not displayed on the map. This is most often used in conjunction with an image and it is where the operator acquires the BSN and SNs to be placed in the map area.

The icons used for the BSN and SNs convey information about their state such as their type, health, and positioning mode. The map legend accessible through the 'Help -> Map Icons Legend' gives a more detailed overview of the icons. In addition, the tooltip for each icon displays more detailed BSN and SN information such as serial number, position, positioning mode, etc. Finally, right clicking on the BSN or a SN brings up a context menu which allows you to toggle its positioning mode.

3.4.6   Detail Panels

The Detail Panels are three separate panels; the Base Station Panel (Section 3.4.6.1) the Sensor Node Panel (Section 3.4.6.1.3) and the Sensor Panel (Section 3.4.6.2).

3.4.6.1   Base Station Panel

Shows details on the status of the BSN. The BSN serial number is displayed in the title bar of the panel and the rest of the details are displayed below.
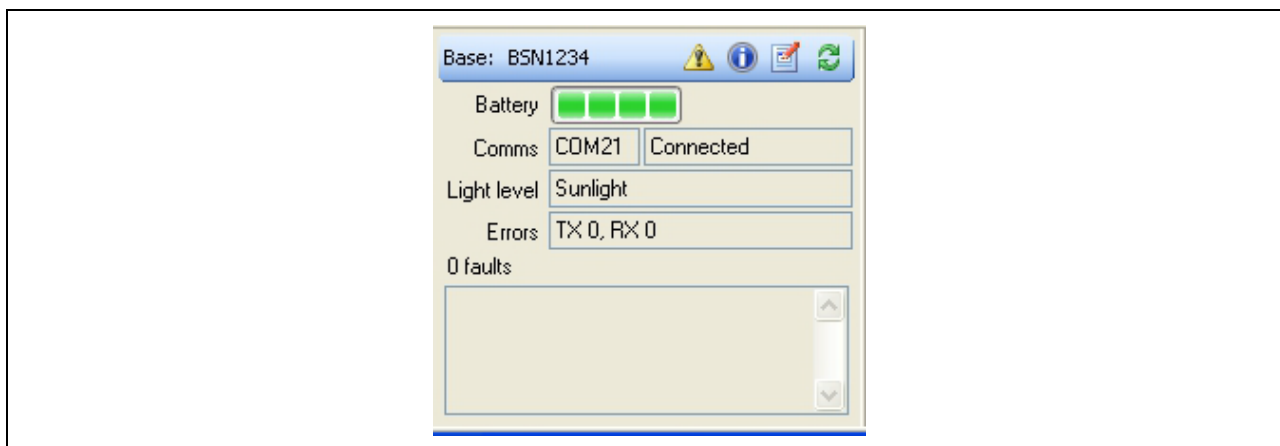

Figure 45   Base Station Panel

TABLE 17. BASE STATION PANEL FIELDS	
Field Name	**Contents**
Battery indicator	Shows the charge level of the battery
Comms	Shows the name of the COM port on the C2 PC which is used to connect to the BSN.
Light level	The configured light level of the LEDs on the BSN.
Errors	The total number of transmit and receive errors reported by the BSN.
Faults	This field shows a list of current faults reported by the BSN.

In addition to displaying detailed information, the Base Station panel contains a toolbar.

| TABLE 18. BASE STATION PANEL TOOLBAR ITEMS	
Field Name (from left to right)	**Contents**
Identifier	The identifier will show "Base:" followed by the serial number of the BSN. In Offline mode, '0' will be displayed.
BIT (Button)	Invokes a Built-In Test on the BSN. This function is not available in offline mode.
Info (Button)	Opens the Base Station Information window (see section 3.4.6.1.1)
Settings (Button)	Opens the **Base Station Settings** dialog (see section 3.4.6.1.2**)** where the frequency and light level settings of the BSN can be set. In Offline mode, this button is greyed out.
Refresh (Button)	Forces the C2 application to request status and settings information from the base station node. The application will request confirmation from the user before proceeding with the action. In Offline mode, this button is greyed out.

3.4.6.1.1 Base Station Information Window
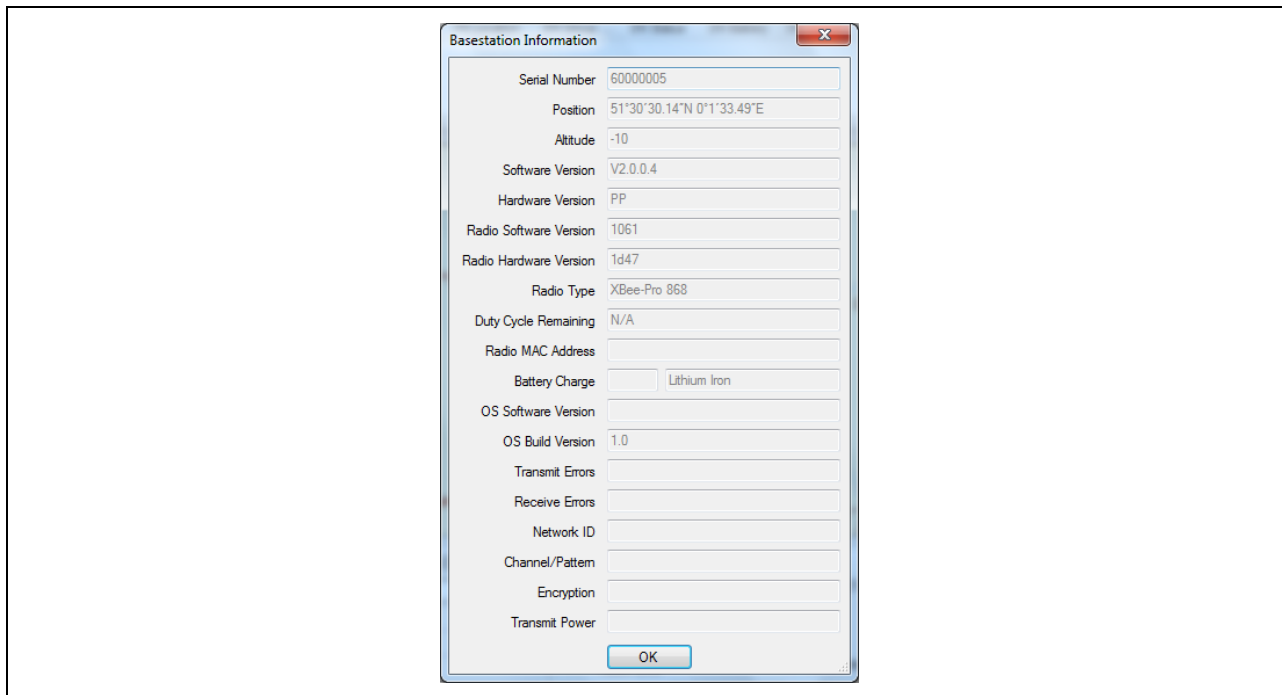
Figure 46   Base Station Information Window

| TABLE 19. BASE STATION INFORMATION WINDOW FIELDS	
Field Name	**Contents**
Sensor node number	The serial number of the BSN
Position	Either the GPS or manual position of the BSN depending on its positioning mode in DMS format. **Note**: Field is greyed out when data is stale. "(M)" is appended when BSN is in manual positioning mode.
Altitude	Height above mean sea level in meters of the BSN. **Note**: Field is greyed out when data is stale.
Software Version	The version of the Smiths application software operating on the BSN
Hardware Version	The hardware version of the BSN
Radio Software Version	The software version of the Digi software operating on the radio module within the sensor node
Radio Hardware Version	The hardware version of the Digi radio module within the sensor node
Radio Type	The type of the Digi radio module within the sensor node
Radio MAC Address	The MAC address of the Digi radio module within the sensor node
Battery Charge	Charge level for the BSN battery and the battery type
Duty Cycle Remaining	Only shown for 868MHz radio modules: the percentage of the permitted radio duty cycle that is remaining for use.
OS Software Version	The version of the Operating System running on the single board computer within the BSN
OS Build Version	Build Information of the Operating System running on the single board computer with the BSN
Transmit Errors	The number of transmission errors reported by the BSN
Receive Errors	The number of receive errors reported by the BSN
Network ID	The Digi Network ID (reported in hexadecimal)
Channel/Pattern	The radio channel or hopping pattern being used (where applicable)
Encryption	The encryption settings of the sensor node – can report AES128, FIPS, AES128 & FIPS or none.
Transmit Power	The transmission power setting of the Digi radio module – reported in both dBm and in milliwatts

3.4.6.1.2   Base Station Settings Dialog
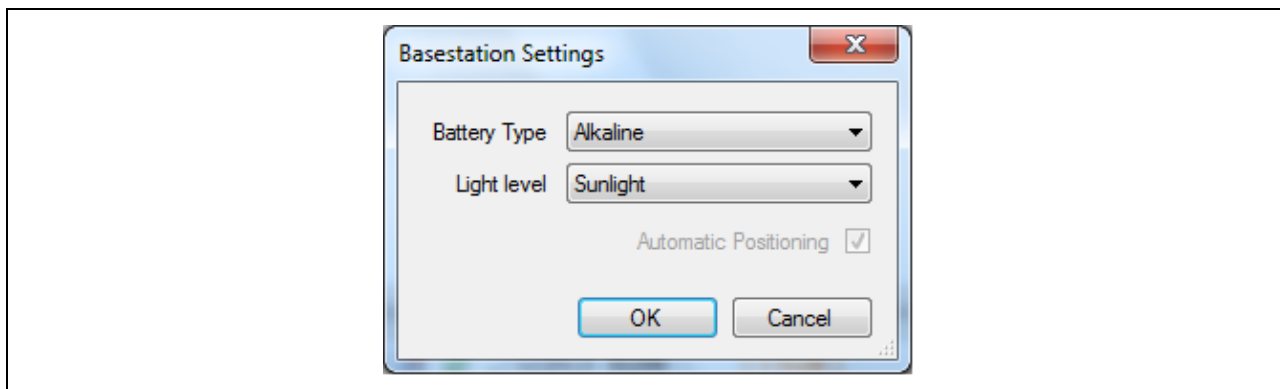
Figure 47   Base Station Settings Dialog

TABLE 20. BASE STATION SETTINGS DIALOG FIELDS

Field Name	Contents
Battery Type	Type of battery in the BSN.
Light level	Brightness of the BSN display.
Automatic Positioning	If BSN is set to manual positioning mode, allows changing to automatic positioning mode. See section 3.4.5 for setting positioning mode on maps.

Sensor Node Panel
Displays detailed information about the selected sensor node(s). If more than one sensor node (SN) is selected then each field will either display the common value or 'Various' otherwise.
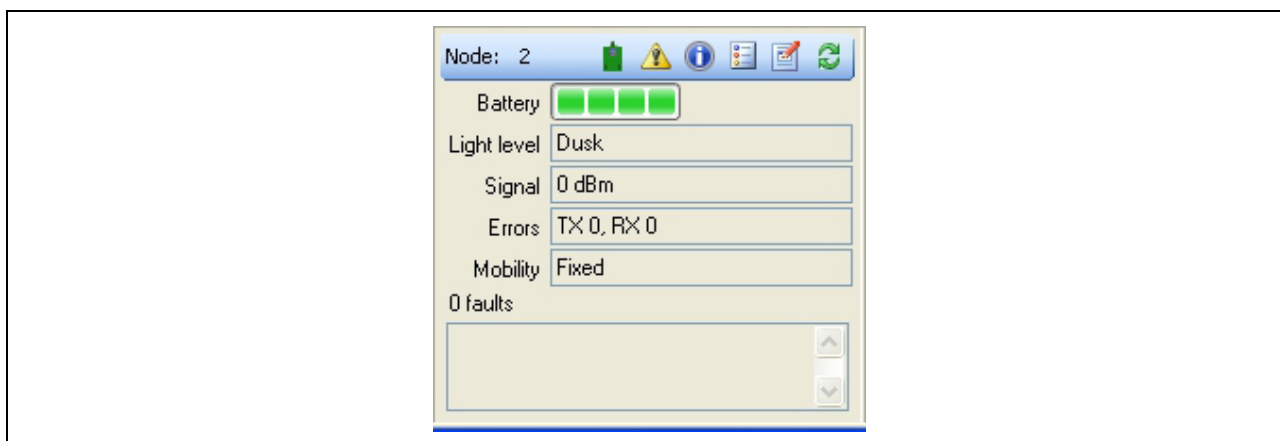
Figure 48   Sensor Node Panel

TABLE 21. SENSOR NODE PANEL FIELDS

Field Name	Contents
Battery indicator	Shows the charge level of the battery/batteries. If the sensor node is using an AC Mains power supply the battery 'bars' will be replaced with a solid green rectangle overlaid with a gold-coloured 'lightning' symbol.
Light level	The configured light level of the LEDs on the SN(s).
Signal	The received signal strength in dBm as reported by the SN(s)
Errors	The total number of transmit (TX) and receive (RX) errors reported by the SN(s).
Mobility	Whether the SN(s) is/are expected to move (Mobile) or not (Fixed).

In addition to displaying information, the sensor node panel contains a toolbar.

| TABLE 22. SENSOR NODE PANEL TOOLBAR ITEMS	
Field Name (from left to right)	**Contents**
Identifier	The identifier will show "Node:" followed by the serial number of the SN. If multiple SNs are selected then it will display 'Various'
Attached Sensor	Allows the operator to set whether the SN should have an attached sensor.
BIT (Button)	Invokes a Built-In Test on the SN. This button is only enabled when a single SN is selected.
Info (Button)	Opens the Sensor Node Information Window (see Section 3.4.6.1.3)
Tags (Button)	Opens the **Sensor Node Tags** dialog (see Section 3.4.6.1.4) where Label, Location and Group Location of the SN can be set if a single SN is selected. Otherwise it opens the Multiple Sensor Node Tags Dialog where only the Group Location can be set.
Settings (Button)	If a single SN is selected it opens the **Sensor Node Remote Settings** dialog (see Section 3.4.6.1.6) where the light level, mobility, and battery type of the SN can be set. Otherwise it opens the Multiple Sensor Node Remote Settings (see Section 3.4.6.1.6) where the same settings can be set but the serial number is not displayed. In Offline mode, this button is greyed out.
Refresh (Button)	Forces the C2 application to request status and settings information from the SN. The application will request confirmation from the user before proceeding with the action.

3.4.6.1.3   Sensor Node Information Window
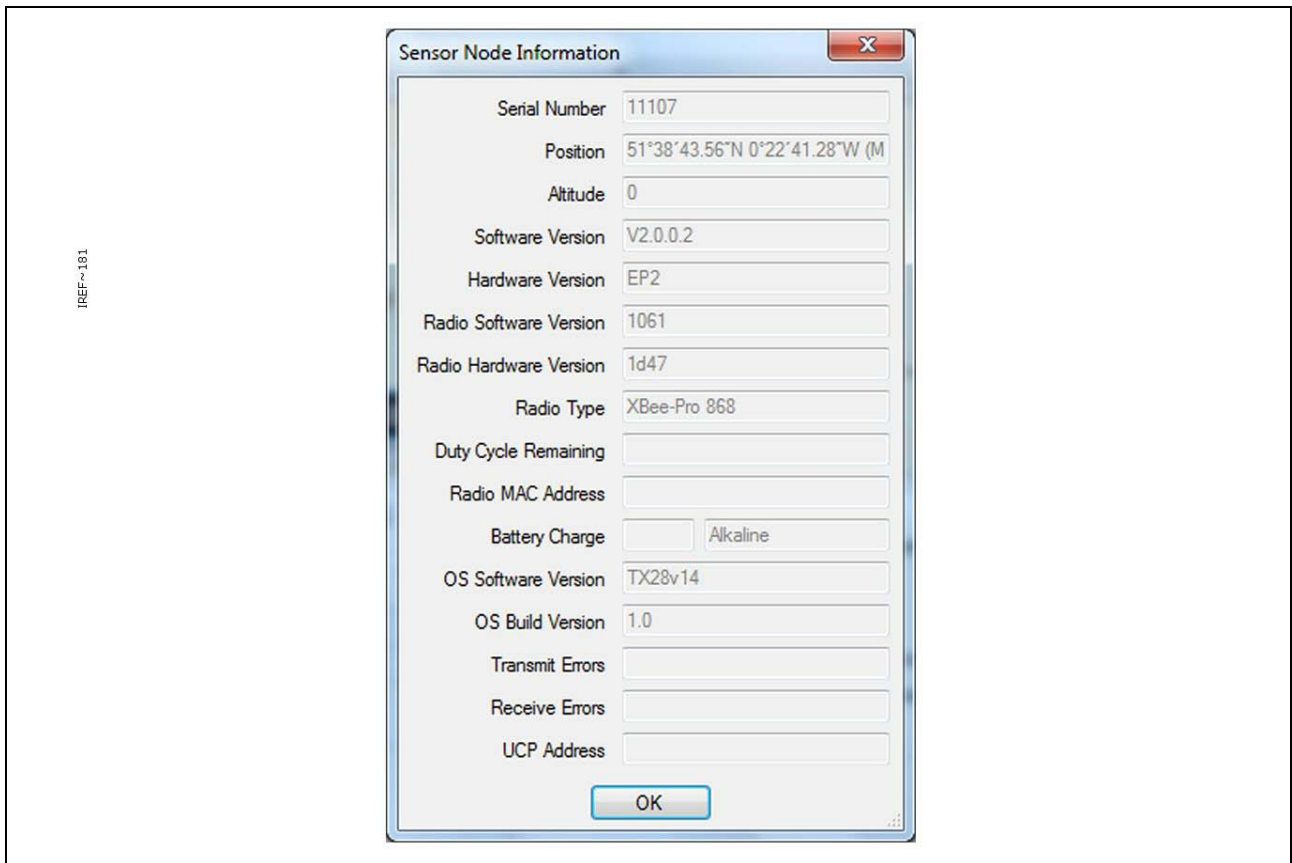
Figure 49   Sensor Node Information Window

TABLE 23. SENSOR NODE INFORMATION WINDOW FIELDS	
Field Name	**Contents**
Sensor node number	The serial number of the SN
Position	Either the GPS or manual position of the SN depending on its positioning mode in DMS format. **Note**: Field is greyed out when data is stale. "(M)" is appended when SN is in manual positioning mode.
Altitude	Height above mean sea level in meters. **Note**: Field is greyed out when data is stale.
Software Version	The version of the Smiths application software operating on the SN
Hardware Version	The hardware version of the SN
Radio Software Version	The software version of the Digi software operating on the radio module within the sensor node
Radio Hardware Version	The hardware version of the Digi radio module within the sensor node
Radio Type	The type of the Digi radio module within the sensor node
Duty Cycle Remaining	Only shown for 868MHz radio modules: the percentage of the permitted radio duty cycle that is remaining for use.
Radio MAC Address	The MAC address of the Digi radio module within the sensor node
Battery Charge	Charge level for the SN battery and the battery type. If the sensor node is using an AC Mains power supply the percentage charge field will show 'EXT'
OS Software Version	The version of the OS running on the single board computer within the BSN
OS Build Version	Build Information of the OS running on the single board computer with the SN
Transmit Errors	The number of transmission errors reported by the SN
Receive Errors	The number of receive errors reported by the SN
UCP Address	Internal network number assigned to the SN.

3.4.6.1.4   Sensor Node Tags Dialog
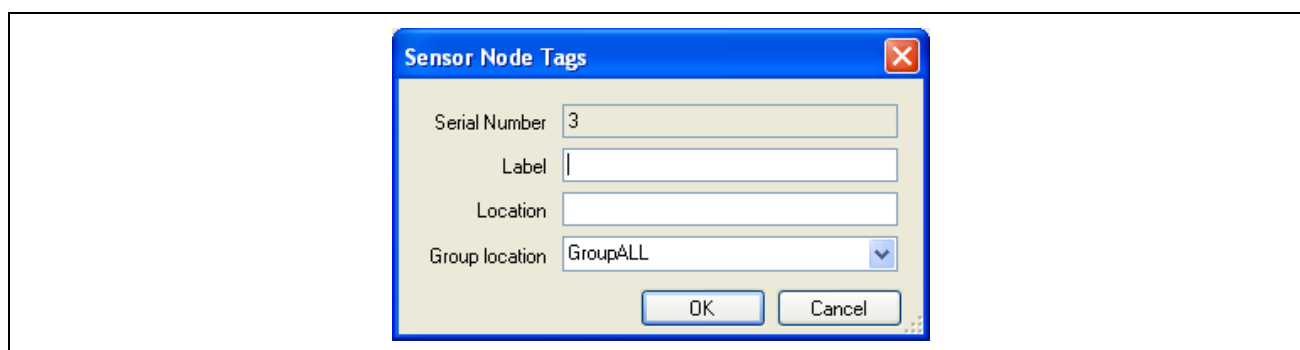
Figure 50   Sensor Node Tags Dialog

TABLE 24. SENSOR NODE TAGS DIALOG FIELDS	
Field Name	**Contents**
Serial Number	Sensor Node Serial Number
Label	Operator defined label
Location	Operator defined location
Group location	Operator defined group location

3.4.6.1.5   Multiple Sensor Node Tags Dialog
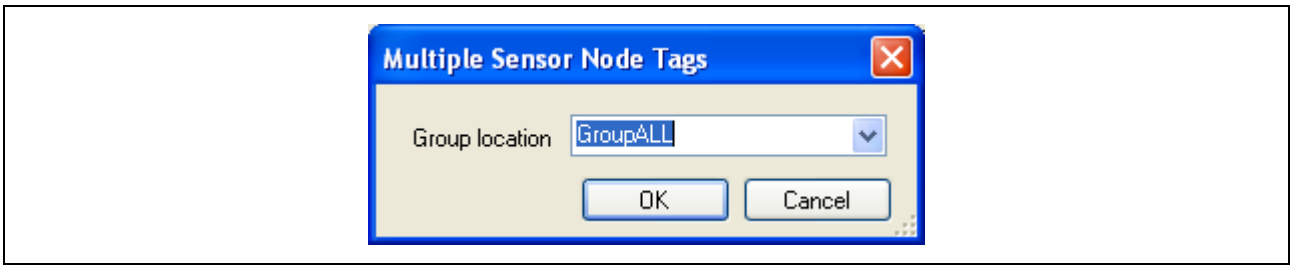
Figure 51   Multiple Sensor Node Tags Dialog

TABLE 25. MULTIPLE SENSOR NODE TAGS DIALOG FIELDS	
Field Name	**Contents**
Group location	Operator defined group location

3.4.6.1.6   Sensor Node Settings Dialog / Multiple Sensor Node Remote Settings Dialog
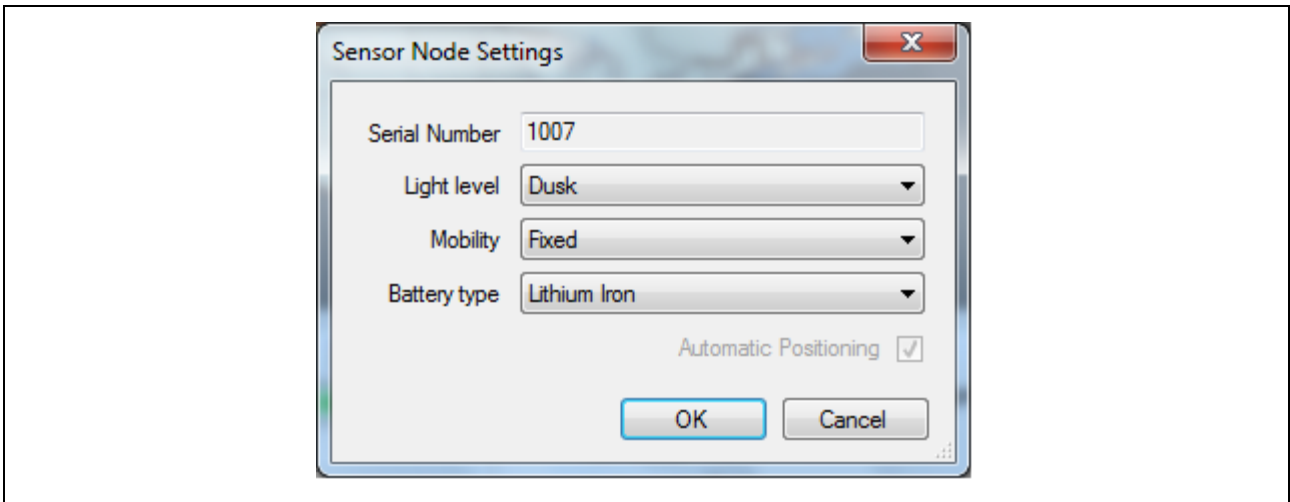

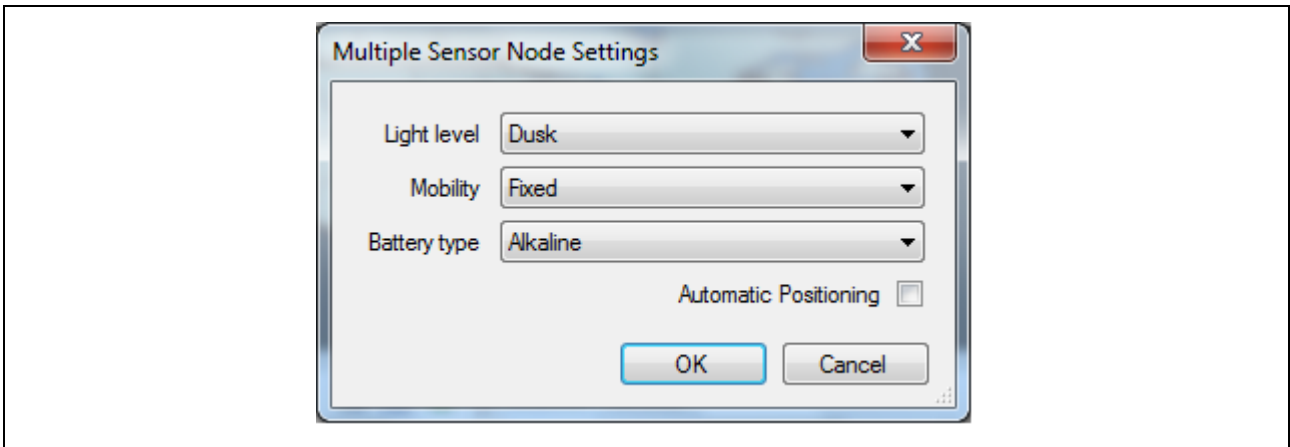Figure 52   Sensor Node Settings Dialog

Figure 53   Multiple Sensor Node Settings Dialog

TABLE 26. SENSOR NODE REMOTE SETTINGS DIALOG FIELDS	
Field Name	**Contents**
Light level	Set the brightness of the LEDs on the SN(s).
Mobility	Set whether the SN(s) is/are expected to move (Mobile) or not (Fixed).
Battery Type	Set the type of battery in the SN(s). This setting is used by the SN to determine when a battery low warning should be issued.
Automatic Positioning	If SN is set to manual positioning mode, allows changing to automatic positioning mode. See section 3.4.5 for setting positioning mode on maps.

Sensor node settings may be changed individually or as a group. For individual changes select only that sensor node and press the Settings button in Sensor Node panel.

To change the settings of multiple sensor nodes, select all of the relevant sensor nodes in a map panel or in the sensor node list and press the same Settings button as used for single sensor node changes.

3.4.6.2   *Sensor Panel*

Displays detailed information about the attached sensors of the selected sensor node(s). If there is more than one attached sensor then each field will display the common value or 'Various' otherwise. The title bar displays the sensor serial number or 'Various' if there are multiple selected sensors.
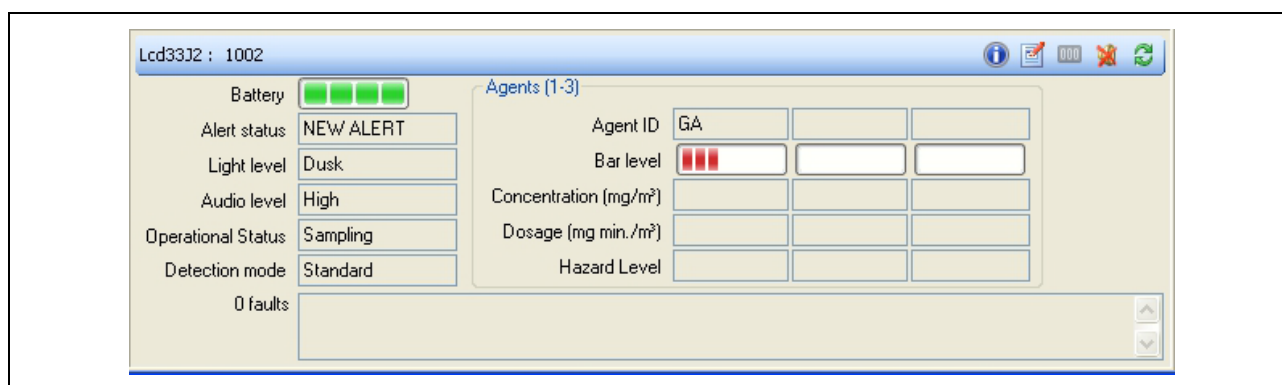

Figure 54   Sensor Panel

TABLE 27. SENSOR PANEL FIELDS	
Field Name	**Contents**
Battery indicator	Shows the charge level of the battery/batteries. If the sensor is using an AC Mains power supply the battery 'bars' will be replaced with a solid green rectangle overlaid with a gold-coloured 'lightning' symbol.
Alert status	Alert status – Indicates the alarm status of the sensor. Possible values are: - NEW Alert - Acknowledged - None
Light level	The configured light level of the LED's on the sensor.
Audio level	Displays the current audio setting of the sensor. Possible Values are: - High - Medium - Low - Off* *This will only be displayed if the System Preferences "Allow sensor audio to be disabled" option is enabled or the audio level of the selected sensor(s) is already off
Operational Status	Displays the current operation status of the sensor(s). Possible values vary according to sensor type but typically include:

		• Sampling
		• Wait
		• Major Fault
Detection mode	Displays the current detection mode of the sensor. Values vary according to the sensor type	
Agents	If only one sensor is selected, displays information about up to three detected agents, otherwise, these fields are blank.	
	Agent ID – Type of toxic chemical substance detected by the sensor using an internationally recognized code	
	Bar Level – Measure of the degree of danger posed by the detected substance. Higher bar levels imply a higher degree of danger. Bar levels are related to the current level of concentration of the detected substance.	
	Concentration – Concentration of the agent measure in mg/m^3	
	Dosage – The measure of accumulated quantity detected since power on of the sensor. **Note:** Dosage information is not supported by all sensor types.	
	Hazard Level – Measure of the danger posed by the accumulated dosage of the agent. **Note:** Hazard level information is not supported by all sensor types.	
Faults	This field shows a list of current faults reported by the BSN.	

In addition to displaying information, the sensor panel contains a toolbar.

| TABLE 28. SENSOR PANEL TOOLBAR ITEMS	
Field Name (from left to right)	**Contents**
Identifier	The identifier will show sensor type (i.e. "LCD3.3" or "Nexus") followed by the serial number of the sensor. If multiple sensors are selected then it will display 'Various'
Info (Button)	Launches the Sensor Information Window. See Section 3.4.6.2.1 for details.
Settings (Button)	It opens the Sensor Settings dialog (see section 3.4.6.2.2) where detection mode, audio level, backlight and keyguard can be set. In Offline mode, this button is greyed out.
Reset Dosage Counters (Button)	Resets the accumulated dosage information on sensors that support this. Caution: refer to the manual for the sensor before using this control. In Offline mode, no serial number will be displayed.
Silence Alarm (Button)	Silence the sensor(s) audible alarm. In Offline mode this function is not available.
Refresh (Button)	Forces the C2 application to request status and settings information from the sensor. The application will request confirmation from the user before proceeding with the action.

3.4.6.2.1   Sensor Information Window
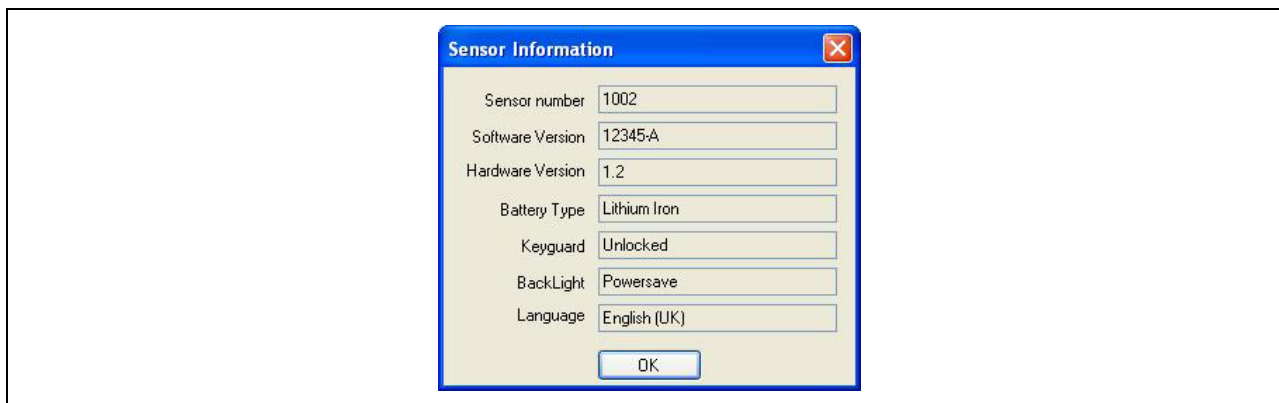
Figure 55   Sensor Information Window

TABLE 29. SENSOR INFORMATION WINDOW FIELDS

Field Name	Contents
Serial number	The serial number of the sensor. This field is omitted when multiple Sensor Nodes are selected.
Software Version	The version of the Smiths application software operating on the sensor(s)
Hardware Version	The hardware version of the sensor(s)
Battery Type	Type of battery / batteries in the sensor(s)
Keyguard	State of the key guard on the sensor(s). Can be locked or unlocked.
BackLight	Mode of the backlight on the sensor(s). Can be continuous or powersave mode.
Language	Language setting for information displayed on the sensor. **Note:** Not all sensor types display this information.

3.4.6.2.2   Sensor Settings Dialog

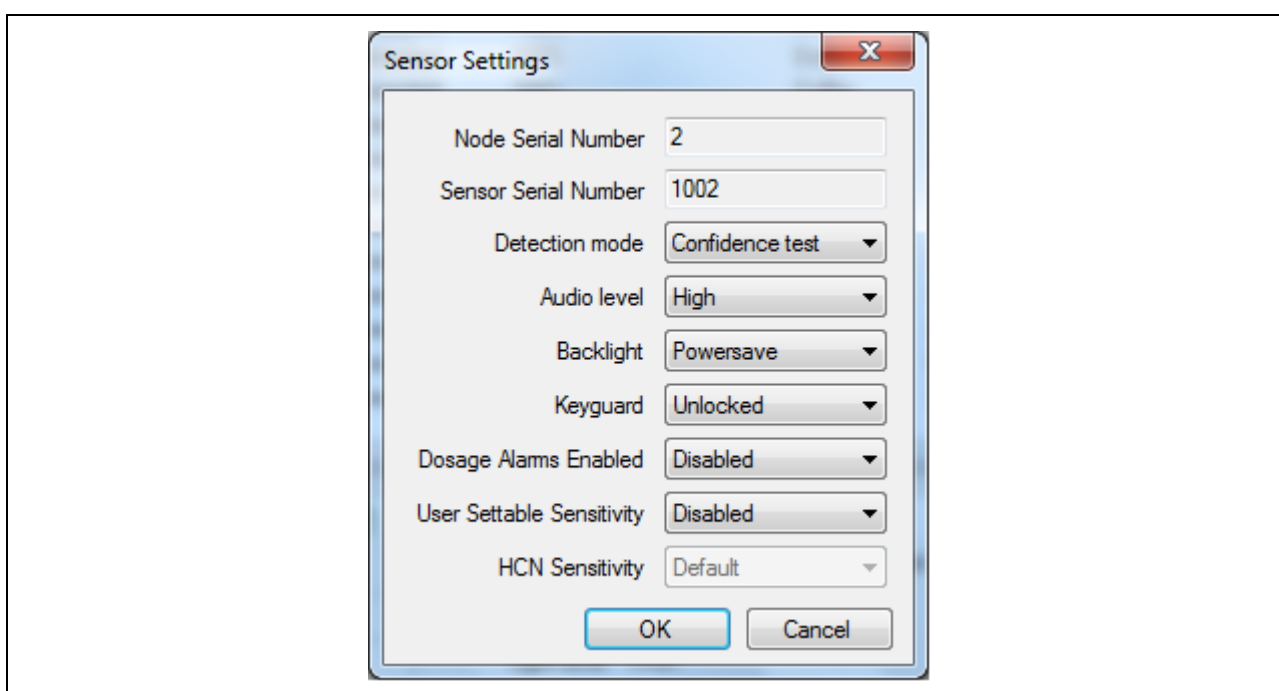If a single sensor is selected then the dialog looks like:

Figure 56   Sensor Settings

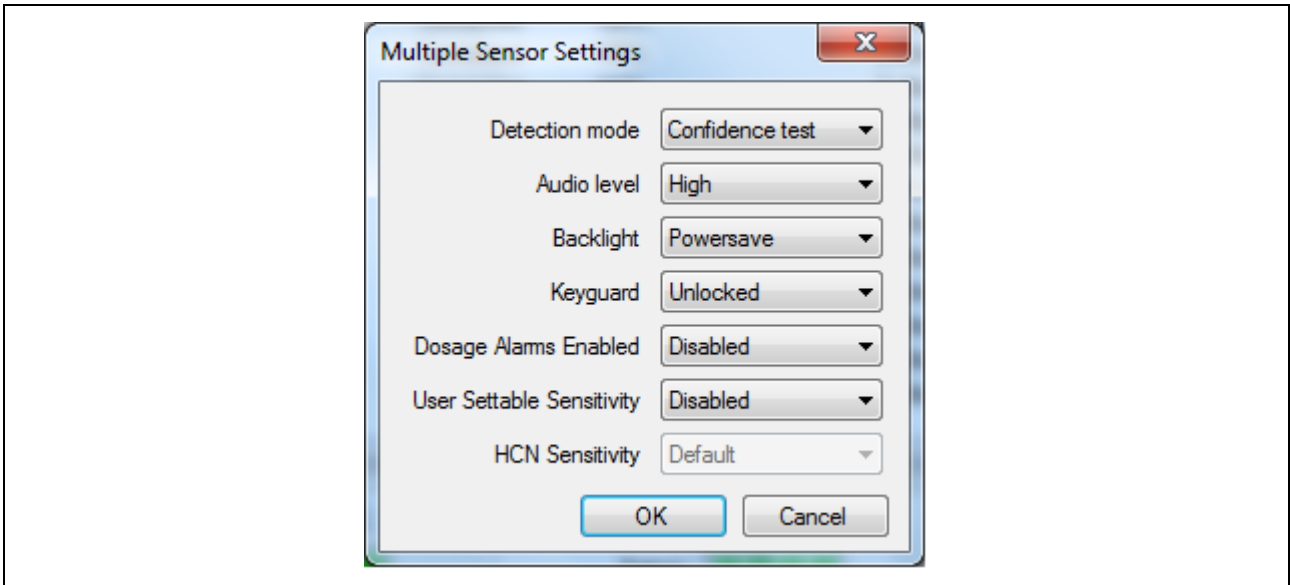If multiple sensors are selected then the dialog looks like:

Figure 57   Sensor Settings (Multiple Sensors)

TABLE 30. SENSOR SETTINGS DIALOG FIELDS

Field Name	Contents
Node serial number*	The serial number of the sensor node this sensor is attached to
Sensor number*	Sensor serial number
Detection mode	Detection mode
Audio level	The audio level of the sensor alarms
Backlight	Backlight mode.
Keyguard	State of the keyguard.
Dosage Alarms Enabled	Set to whether dosage alarms are enabled or disabled. **Note:** Dosage information is not supported by all sensor types. Dosage alarm must be enabled on sensor to use this setting.
User Settable Sensitivity	State of sensitivity
HCN Sensitivity	Set the HCN sensitivity. This field is accessible when User Settable Sensitivity field is set to 'Enabled'

* Denotes fields only shown in the dialog when a single sensor is selected.
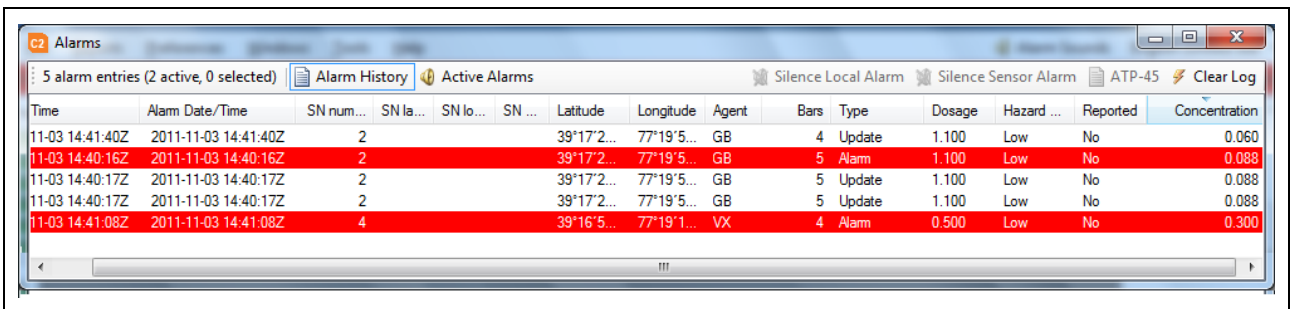
3.4.7   Alarms Log window

Figure 58   Alarms Window – Alarms History

The Alarms Log window displays details of alarms that have occurred on sensors attached to the network.

By default, when a new alarm is received by the C2, the alarms log window is opened automatically and the new alarm is highlighted. **Note:** This window behaviour can be modified from the System Preferences window. See Section 3.4.2.3 for further details.
The Alarms Log window can also be launched manually from the Windows menu.

The Alarms Log window is composed of a status bar and a detailed listing of alarm events.
The list can be switched between two distinct modes
- Alarm History mode where a list of all alarm events that have occurred since the C2 was started are displayed
- Active Alarms mode where a list of current (active) alarms is presented
Switching between the two modes is achieved by pressing the appropriate button on the status bar of the Alarms Log window.

The status bar displays summary information about the alarms list, buttons to change the mode of display, and further buttons to perform specific alarm-related functions.

The summary information comprises counts of alarm events, the currently active alarms and selected alarms.
In addition to the mode selecting buttons, the status bar contains four buttons:

- Silence Local Alarm – Silences the audible alarm on the computer running the C2

- Silence Sensor Alarm – Silences the audible alarm on the sensor itself

- ATP-45 – Opens the Generate ATP-45 Report dialog

- Clear Log – Clears the list of displayed alarms and begins a new Alarms log file on disk.

The detailed alarms list is comprised of columns of information that can be reordered, resized and used to sort the list of alarms. These columns include:

TABLE 31. ALARM LOG WINDOW COLUMNS	
Column Name	**Contents**
Date/Time	The date and time at which the alarm was received by the C2
Alarm Date/Time	The date and time at which the alarm was generated
SN Number	Serial number of the SN attached to an alarming detector
SN label	Operator defined label
SN Location	Operator defined location
SN Group Location	Operator defined group location
Latitude	The Latitude of the detector at the time the alarm occurred
Longitude	The Longitude of the detector at the time the alarm occurred
Agent	Agent that triggered the alarm
Bars	Measure of the degree of danger posed by the detected substance. Higher bar levels imply a higher degree of danger. Bar levels are related the current level of concentration of the detected substance.
Concentration	Concentration of the detected agent
Dosage	The measure of accumulated quantity detected since power on of the sensor. **Note:** Dosage information is not supported by all sensor types.
Hazard Level	Measure of the danger posed by the accumulated dosage of the agent. **Note:** Hazard level information is not supported by all sensor types.
Reported	Indicates whether an ATP-45 report has been generated for this alarm entry
Type	Indicates whether an entry in the alarms log is a new alarm, update to an existing alarm, or the clearance of a previous alarm condition Alarm events that occur prior to the Sensor Node joining the network, or while communications were not possible between the Sensor Node and the C2, are marked with '(H)' to denote a historical alarm.

When a new alarm is above threshold (typically 3 bars) or has dosage information is received, the alarm is listed in 'Alarms History' tab and in 'Active Alarms' tab. If the new alarm is below threshold or has no dosage information, the alarm is only listed under 'Alarms History' tab. If an existing alarm increases or decreases in reading whilst staying in alarm, (say 3 bars up to 4 bars) then a new line is generated in the 'Alarms History' tab but the new line is not highlighted and the existing entry in 'Active Alarms' tab is updated. If a different sensor reports an alarm, then a new line is added to 'Alarms History' tab and 'Active Alarms' tab and the line is highlighted. This 'highlighting' will be different from selection so it will be possible to select one of the highlighted alerts and to make an ATP-45 report based on its data. These alarm events are automatically saved to log files on disk with a unique filename in all of the supported languages, but a restart of the program creates a new log file.
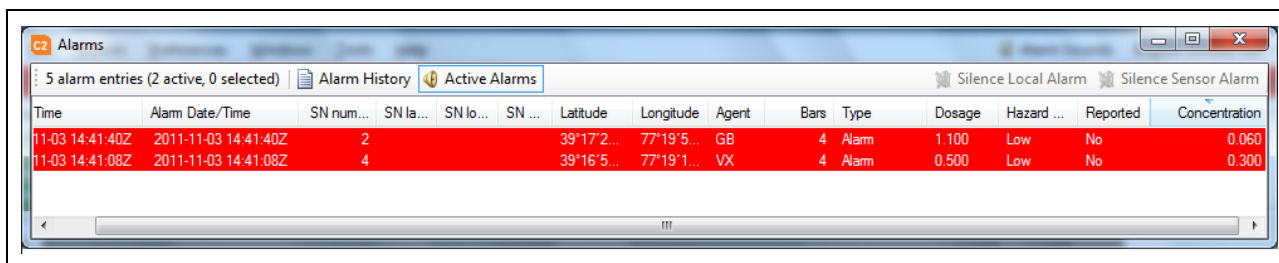

Figure 59   Alarms Window – Active Alarms

When multiple lines are selected, it will not be possible to perform ATP-45 reporting as each event must be reported separately but the 'Silence Sensor Alarm' option will still be enabled so that multiple alarms can be silenced in one operation; this brings up the 'Silence Multiple Alarms' dialog.

If a detection condition drops below the alarm threshold and has no dosage information then the Sensor Unit audible alarms will stop (the Controller PC alarm will continue to sound until the 'Silence Local Alarm' menu option in the Alarms window is pressed) the alarm event is removed from the 'Active Alarms' tab and the active alarm count on the status bar is reduced. It will still be possible to generate an ATP-45 report from the line in question. If the window has been sorted according to a different criteria from the default (decreasing timestamp) then if an alarm is raised no attempt will be made to change this. This may result in an alarm being highlighted but invisible to the operator, but the window will still be brought to the front.

Refer to sensor Operators Manual for further information on sensor set up and alarm generation.

3.4.8   Warnings window
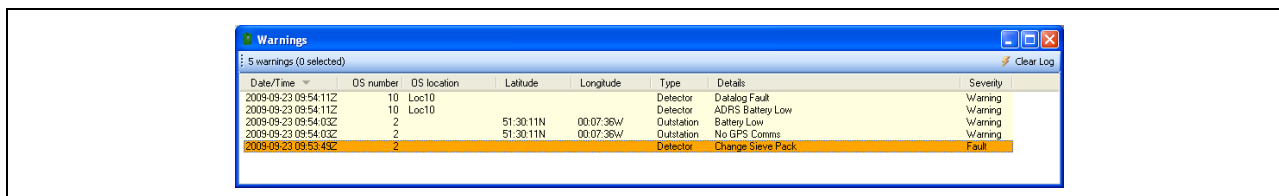
Figure 60   Warnings Window

Displays detailed information about warnings generated by the base station node, the sensor nodes, or the C2 itself. The Warnings window is composed of a status bar and a detailed warnings list.

The status bar displays the total number of warnings in the list and how many are currently selected. In addition it contains a Clear Log button that clears the warnings list in the C2 and starts a new Warnings log file on disk.

The detailed warnings list is comprised of columns of information that can be reordered, resized and used to sort the list of alarms. These columns include:

Column Name	Contents
Date/Time	Date/time the warning was generated. May be blank if no data has been generated.
SN Number	Serial number of the BSN or SN that generated the warning if this warning came from the BSN or a SN May be blank if no data has been generated.
SN Location	Operator defined location of the sensor node associated with the warning (if any) May be blank if no data has been generated.
SN Group Location	Operator defined group location of the sensor node associated with the warning (if any) May be blank if no data has been generated.
Latitude	Latitude of the BSN or SN associated with the warning (if any)
Longitude	Longitude of the SN attached to an alarming detector. May be blank if no data has been generated.
Type	The source of warning. Can be Network, Base Station, Sensor Node or Sensor.
Details	The text of the warning
Severity	The severity of the warning.

TABLE 32. WARNING WINDOW COLUMNS
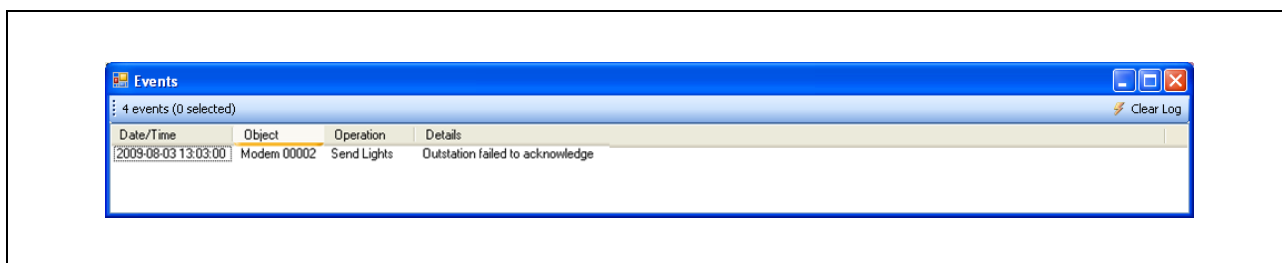
3.4.9 Events window

Figure 61   Events Window

Displays detailed information about events generated by the network and software diagnostic information. This includes failing to receive acknowledgement messages in a timely fashion, loss of communications and internal timeouts. These events are intended as a diagnostic aid for engineers so the contents will only be logged in English.

The Events window is composed of a status bar and a detailed events list.

The status bar displays the total number of events in the list and how many are currently selected. In addition, the status bar contains a Clear Log button that clears the events list and starts a new Events log file on disk.

The detailed events list is comprised of columns of information that can be reordered, resized and used to sort the list of alarms. These columns include:

Column Name	Contents
Date/Time	Date and time the event was generated
Object	These columns display technical information related to the particular event that occurred.
Operation	
Details	

TABLE 33. EVENT WINDOW COLUMNS

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CHAPTER 4 INSTALLATION INFORMATION

4.1   SENSA-LINX SOFTWARE INSTALL AND UNINSTALL

4.2   SENSA-LINX C2 AND NCT INSTALLATION

The Sensa-LINX C2 (Command and Control) and NCT (Network Configuration Tool) applications are installed to the Controller PC. The following information is provided if it is necessary to install these applications to a laptop PC or a workstation that does not already have them installed.

Requirements:

- Operating System: Microsoft Windows XP (32-bit editions) with Service Pack 3 or later, Microsoft Windows Vista (32-bit editions) with Service Pack 2 or later, or Microsoft Windows 7 (32 or 64-bit editions) with Service Pack 1 or later

- Microsoft .NET Framework 3.5 with Service Pack 1 or later

- ArcGIS Engine Runtime 10.0 with Service Pack and Internet Tiled Maps Patch

- *To use some NCT functions you will require Windows Mobile Media Center (on Windows Vista or Windows 7) or Microsoft ActiveSync (on Windows XP) – see section APPENDIX A for details*

NOTE – Administrative privileges are required for installation

The install CD will contain:

- Operating Instructions for Panasonic Toughbook CF-31 ruggedized laptop

- ESRI ArcGIS Engine Runtime 10.0 Installer

- ESRI ArcGIS Engine Runtime SP2 Installer

- ESRI ArcGIS Engine Runtime SP2 Internet Tiled Maps Patch

- Sensa-LINX Installer (includes the C2 and NCT applications)

- Freescale Manufacturing Tool – Used by the NCT to update the sensor node firmware

- Adobe Reader – This is provided as a convenience to the user as an electronic copy of the operator's manual will be provided in PDF format.

The install order of the software should be:

- .NET Framework 3.5 with Service Pack 1 (obtainable from Microsoft – this may already be installed on your computer)

- ESRI ArcGIS Engine Runtime
      (located at *CDDrive:*\ESRI\EngineRT\setup.exe)

- ESRI ArcGIS Engine Runtime SP2
      (located at *CDDrive:*\ESRI\ArcGISEngine10sp2.msp)

- ESRI ArcGIS Engine Runtime SP2 Internet Tiled Maps Patch
      (located at *CDDrive:*\ESRI\Gis10sp2-E-ITL-Patch.msp)

- Sensa-LINX C2 and NCT applications
      (located at *CDDrive:*\Sensa-LINX Version *n.n.nnnn* Installer.exe)

- Optionally, Adobe Reader
      (located at *CDDrive:*\AdobeReader\AdbeRdr1010_en_US.exe)

NOTE – INSTALLING ArcGIS

The ArcGIS products must be installed AFTER the .NET framework components. If not, or they will NOT install correctly. If they are installed first, they must be completely removed and reinstalled after the .NET framework has been installed.

The ArcGIS components must be installed BEFORE the Sensa-LINX C2 application – otherwise the C2 application will not work correctly - it must be completely removed and reinstalled after the ArcGIS components have been installed

Use the following instructions to install the Sensa-LINX C2 program.

1   Insert the Sensa-LINX Software CD into the CD/DVD drive

2   If the CD does not auto-run, run Windows Explorer and navigate to the CD/DVD drive.

3   Double click the Sensa-LINX executable file (Sensa-LINX Version *n.n.n.nnnn* Installer.exe) in the list of files on the CD. The Sensa-LINX installer should launch.

4   Select a language for the installer, and click the OK button. Note: The language chosen here will determine the initial language used by the C2. This can be changed at run-time.

5   When the Welcome screen is shown, click 'Next' to continue.

6   Read and accept the License Agreement then click 'Next' to continue. The license agreement must be accepted before installation can proceed.

7   On the Choose Components screen, select the 'Command and Control Application' check box to install C2. Additionally, you may choose to install the Sensa-LINX NCT at this time as well by selecting 'Node Configuration Tool' check box.   This application is used to perform some configuration functions on the network nodes. (Additional information on the NCT can be found in Appendix A.). The 'Operator's Manual' checkbox is automatically selected and an electronic copy of the operator's manual is installed when checkbox for C2 or NCT component is selected.   Click 'Next' to continue.

8   On the Choose Install Location screen, you may accept the default install location or click Browse to choose a different location.   Click 'Next' to continue.

9   On the Choose Start Menu Folder screen, again you may accept the default location or choose a new location. In addition, you may choose not to have any shortcuts installed on your system by checking the "Do not create shortcuts" checkbox on the lower left. Click Install to continue. Note: If you choose not to create shortcuts there will not be any shortcuts automatically created on your Desktop, in your Start Menu, or on your Quick Launch bar.

Once installation is complete, click Finish to complete the installation. If you chose to have shortcuts created, you should now see one on your Desktop for Sensa-LINX C2 (and for the NCT if you chose to install it).

NOTE – QUICK LAUNCH TOOLBAR ON WINDOWS 7

Note: On Windows 7, the quick launch tool bar is not visible by default. If you wish to use it, perform the following steps to make it visible.

1   Right-click on the task bar and choose 'Toolbars -> New toolbar…'

2   Navigate to or use the folder field to enter the path :

C:\Users\<user name>\AppData\Roaming\Microsoft\Internet Explorer\Quick Launch

3   There will now be a Quick Launch menu on your taskbar

If you do not wish to use the quick launch toolbar, you may wish to pin the Sensa-LINX applications to the taskbar (consult your Windows documentation on how to achieve this)

4.3   UNINSTALLING SENSA-LINX C2 AND NCT

In case it becomes necessary to remove the C2 application and/or NCT application from the computer in the future, the installation process includes an 'Uninstall' component available from

either the Start Menu, the Add/Remove programs application in the Control Panel, or in the installation directory itself. Note: Admin privileges are required for this action.

1   Run the uninstaller from one of the three places mentioned above.

2   When the Welcome screen is shown, click 'Next' to continue.

3   On the Choose Components screen, choose which components of the Sensa-LINX you would like to uninstall. To uninstall everything, select all checkboxes. Click 'Next' to continue.

4   The next screen will display where the application(s) is being uninstalled from. Click 'Uninstall' to continue uninstall process.

5   On the final screen, click Finish to complete the uninstall process. The components you chose should now be completely removed from your system.

4.4   MAP INSTALLATION

Additional maps are available for North America (20877-1) and Europe (20876-1) that allow the Sensa-LINX C2 to display map information throughout these regions when internet access is not available.

These maps are installed by inserting the appropriate product DVD, double-clicking on the installer program on the DVD and following the on-screen instructions.

The installation order of the maps and the C2 application is not important.

4.5   UNINSTALLING MAPS

In case it becomes necessary to remove the European and/or North American maps from the computer in the future, the installation process for each map includes an 'Uninstall' component available from either the Start Menu, the Add/Remove programs application in the Control Panel, or in the installation directory itself. Note: Admin privileges are required for this action.

1   Run the uninstaller from one of the three places mentioned above.

2   When the Welcome screen is shown, click 'Uninstall' to continue.

3   On the final screen, click Finish to complete the uninstall process. The map you chose should now be completely removed from your system.

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CHAPTER 5 MAINTENANCE INFORMATION AND INSTRUCTIONS

5.1 GENERAL

WARNING – UNAUTHORISED OPERATION AND MAINTENANCE

THE SENSOR NODE CONTAINS COMPONENTS THAT CAN BE HAZARDOUS. OPERATION AND MAINTENANCE ACTIVITIES ON THE SYSTEM AND EQUIPMENT MUST ONLY BE PERFORMED BY APPROPRIATELY TRAINED PERSONNEL.

WARNING – ELECTRIC SHOCK

THE SENSOR NODE CAN BE POWERED BY BATTERIES OR AN EXTERNAL POWER SUPPLY. TO PREVENT ELECTRIC SHOCK MAKE SURE THAT THE SENSOR NODE IS SWITCHED OFF AND THE BATTERIES ARE REMOVED OR THE EXTERNAL POWER SUPPLY IS DISCONNECTED PRIOR TO PERFORMANCE OF ANY MAINTENANCE ACTIVITY.

WARNING – DANGEROUS SUBSTANCES - CHEMICAL WARFARE AGENTS

AFTER A LIVE CHEMICAL WARFARE AGENT ATTACK THE SENSOR NODE THAT HAS BEEN CO-LOCATED WITH A DETECTOR MAY BE CONTAMINATED BY HARMFUL SUBSTANCES WHICH COULD CAUSE INJURY TO PERSONNEL. BEFORE ANY MAINTENANCE ACTIVITY IS PERFORMED EQUIPMENT USED IN A LIVE CHEMICAL WARFARE AGENT ATTACK SHOULD BE DECONTAMINATED.

CAUTION – User Serviceable Components

The Sensor Node contains no user serviceable components. Interference by untrained personnel may render the unit unserviceable. Do not attempt to gain access to the interior of the unit.

If the Laptop PC or Sensor Nodes fail to startup when switched on make sure that serviceable batteries are correctly installed.

5.2 PREVENTIVE MAINTENANCE

TABLE 34 shows the preventive maintenance tasks that are applicable to the C2 SOFTWARE APPLICATION and the scheduled interval at which those tasks should be performed.

TABLE 34. PREVENTIVE MAINTENANCE TASKS AND SCHEDULED INTERVAL.	
Preventive Maintenance Task	Scheduled Interval
Pre use checks	At equipment start up

5.2.1 General Cleaning

This cleaning procedure is applicable for equipment that has become dirty in use. If the equipment is contaminated with CWAs or TICs, the decontamination procedure in paragraph 5.3.1 must be followed.

5.2.1.1 Laptop PC

Refer to the Laptop PC's User's manual for cleaning instructions.

5.2.1.2 Sensor Nodes and Cables

CAUTION – Equipment damage.

The Sensor Node contains components that will be damaged by water or other liquids. To prevent fluid from entering the equipment switch off the Sensor Node and make sure the Battery Cassette and Antenna are properly installed prior to cleaning or decontamination.

4   Make sure a Battery Cassette, Antenna, and Connector Caps are fitted to each Sensor Node.

5   Remove any traces of oil, grease etc using a water-soluble de-greaser.

6   Wash the equipment using hand-hot soapy water, using a small stiff brush, and make sure all traces of de-greaser (if applied) are removed. Sensor Node immersion is not recommended.

7   Rinse with clean cold water.

8   Dry with a lint-free cloth and leave to stand in a warm (approx 20ºC) ventilated environment to allow any water residue to evaporate.

5.2.1.3 Pouches

Inspect the pouches. If the pouches are heavily soiled with oils, greases etc dispose of them and replace with new. Pouches can be laundered if facilities are available. If no laundry is available, follow the procedure below.

1   Remove any traces of oil, grease etc using a water-soluble de-greaser. If removal is unsuccessful, dispose of the item(s) and replace with new.

2   Immerse the equipment in hand-hot soapy water, and use a small stiff brush for cleaning, and make sure all traces of de-greaser (if applied) are removed.

3   Rinse and immerse in clean cold water and agitate to remove traces of detergent. Repeat if necessary.

4   Dry excess water with a lint-free cloth and leave to stand in a warm ventilated environment to allow water residue to evaporate.

5.3 CORRECTIVE MAINTENANCE

WARNING – UNTRAINED PERSONNEL

THE SENSOR NODE CONTAINS COMPONENTS THAT CAN BE HAZARDOUS TO UNTRAINED PERSONNEL. A TRAINED OPERATOR CAN PERFORM ONLY THOSE MAINTENANCE TASKS SHOWN IN THE HANDBOOK AND USERS GUIDE. FOR ALL OTHER REPAIRS THE RADIO MODEM MUST BE RETURNED TO THE MAINTENANCE CONTRACTOR/MANUFACTURER.

CAUTION – User Serviceable Components

The Sensor Node contains no user serviceable components. Interference by untrained personnel may render the unit unserviceable. Do not attempt to gain access to the interior of the unit.

TABLE 35 shows the corrective maintenance tasks that are applicable to the Sensa-LINX system and the maintenance level at which those tasks should be performed.

TABLE 35. CORRECTIVE MAINTENANCE TASKS AND MAINTENANCE LEVELS.			
Maintenance Task	Organizational (Operator)	Maintenance Contractor	Smiths Detection
Decontamination of Sensa-LINX system	●	-	-
Replace Radio Modem Batteries and or Battery Cassette	●	-	-
Replace Radio Modem Antenna	●	-	-
Replace Inoperative Sensa-LINX Equipment	●		
All other maintenance tasks	-	-	●

5.3.1   Equipment Decontamination

WARNING – DANGEROUS SUBSTANCES - SODIUM HYPOCHLORITE

SODIUM HYPOCHLORITE LIQUID AND SOLUTION CAUSE IRRITATION TO THE SKIN AND THE DIGESTIVE SYSTEM IF INGESTED. VAPOUR CAUSES IRRITATION TO THE EYES AND THE RESPIRATORY SYSTEM. PROTECT THE SKIN AND DO NOT SWALLOW SODIUM HYPOCHLORITE LIQUID OR SOLUTION. DO NOT INHALE OR EXPOSE THE EYES TO THE VAPOUR. WEAR FULL PERSONAL PROTECTION EQUIPMENT (PPE) WHEN DECONTAMINATING EQUIPMENT.

DO NOT MIX SODIUM HYPOCHLORITE WITH ANY OTHER SOLUTIONS AS THIS MAY CREATE TOXIC COMPOUNDS AND FUMES.

DISPOSE OF ALL SOLUTIONS, MATERIALS, AND PPE USED AS CONTAMINATED WASTE.

CAUTION - Equipment damage

Sodium Hypochlorite liquid and solution are corrosive and will damage Sensor Node components if soaked for extended periods. Wash Sodium Hypochlorite off the equipment after the recommended soaking period.

CAUTION – Equipment damage.

The Sensor Node contains components that will be damaged by water or other liquids. To prevent fluid from entering the equipment switch off the Sensor Node and make sure the Battery Cassette, Antenna, and Connector Caps are properly installed prior to cleaning or decontamination.

Do not remove PPE until the equipment is proven to be decontaminated. Decontaminate the Sensor Node in accordance with the recommended procedures as follows:

5.3.1.1 Sensor Node and Cables

1   Put on Personal Protective Equipment.

2   Make sure a Battery Cassette and Antenna are fitted to the Sensor Node.

3   Make sure dust caps are installed to all cable connectors

4   Use a blotting cloth to remove any liquid contamination from the equipment.

5   Wash equipment with hand-hot soapy water at 100ºF (38ºC). Do no immerse the Sensor Node.

6   Rinse with clean water.

7   Apply a solution of sodium hypochlorite to a concentration of between 10% and 12% available chlorine using a small, stiff bristled brush or similar as required and soak for a minimum of 15 minutes and maximum of 30 minutes.

8   Rinse with clean water and dry using lint-free cloth.

9   Allow the equipment to dry for a further 40 minutes minimum in a well ventilated environment. Dry in a fume hood or an appropriate open-air site.

10   Perform post decontamination checks. See paragraph 5.3.2.

5.3.1.2 Laptop PC

WARNING – EFFECTIVE DECONTAMINATION

A SINGLE DECONTAMINATION OF THE LAPTOP PC USING HAND-HOT (100ºF (38ºC)) SOAPY WATER MAY NOT BE SUFFICIENT TO REMOVE ALL HARMFUL CONTAMINATION. DECONTAMINATION SHOULD BE REPEATED UNTIL ALL HARMFUL CONTAMINATION IS REMOVED FROM THE LAPTOP PC. PERSONNEL SHOULD CONTINUE TO USE PERSONAL PROTECTIVE EQUIPMENT UNTIL FULL DECONTAMINATION IS CONFIRMED. IF FULL DECONTAMINATION CANNOT BE CONFIRMED THE LAPTOP PC SHOULD BE DISPOSED OF AS CONTAMINATED EQUIPMENT AND A REPLACEMENT ITEM OBTAINED.

CAUTION – Sodium hypochlorite

Sodium hypochlorite is a strong oxidiser and could cause damage to the laptop PC. It is recommended that only hand-hot (100ºF (38ºC)) soapy water is used to decontaminate the laptop PC.

1   Make sure all Laptop PC drives and covers are closed.

2   Use a blotting cloth to remove any liquid contamination from the equipment.

3   Wash with hand-hot (100ºF (38ºC)) soapy water. Do not immerse the laptop PC.

4   Rinse with clean water and dry using lint-free cloth.

5   Allow the equipment to dry for a further 40 minutes minimum in a well ventilated environment. Dry in a fume hood or an appropriate open-air site.

6   Perform post decontamination checks. See paragraph 5.3.2.

5.3.1.3 *Pouches*

1 Use a blotting cloth to remove any liquid contamination from the equipment.

2 Wash the pouch in hand-hot (100ºF (38ºC)) soapy water. Pouches can be fully submerged.

3 Rinse with clean water. Pouches can be fully submerged.

4 Apply a solution of sodium hypochlorite to a concentration of between 10% and 12% available chlorine with a small, stiff bristled brush or similar as required and submerge and soak in the solution for a minimum of 15 minutes and maximum of 30 minutes.

5 Rinse with clean water and dry using lint-free cloth.

6 Allow the pouch to dry for a further 40 minutes minimum in a well ventilated environment. Dry in a fume hood or an appropriate open-air site.

7 Perform post decontamination checks. See paragraph 5.3.2.

5.3.2 Post Decontamination Checks

After the decontamination procedure has been completed, check the equipment using an appropriate CWA Detector in survey role, e.g. CAM. If CWA vapor is detected, allow further time in a ventilated environment, e.g. 24 hours. If contamination is persistent, put the equipment back through the decontamination procedure.

If required record the performance of the decontamination exercise.

Re-assemble the equipment and carry out a Functional Test to confirm that the equipment is ready for normal operation.

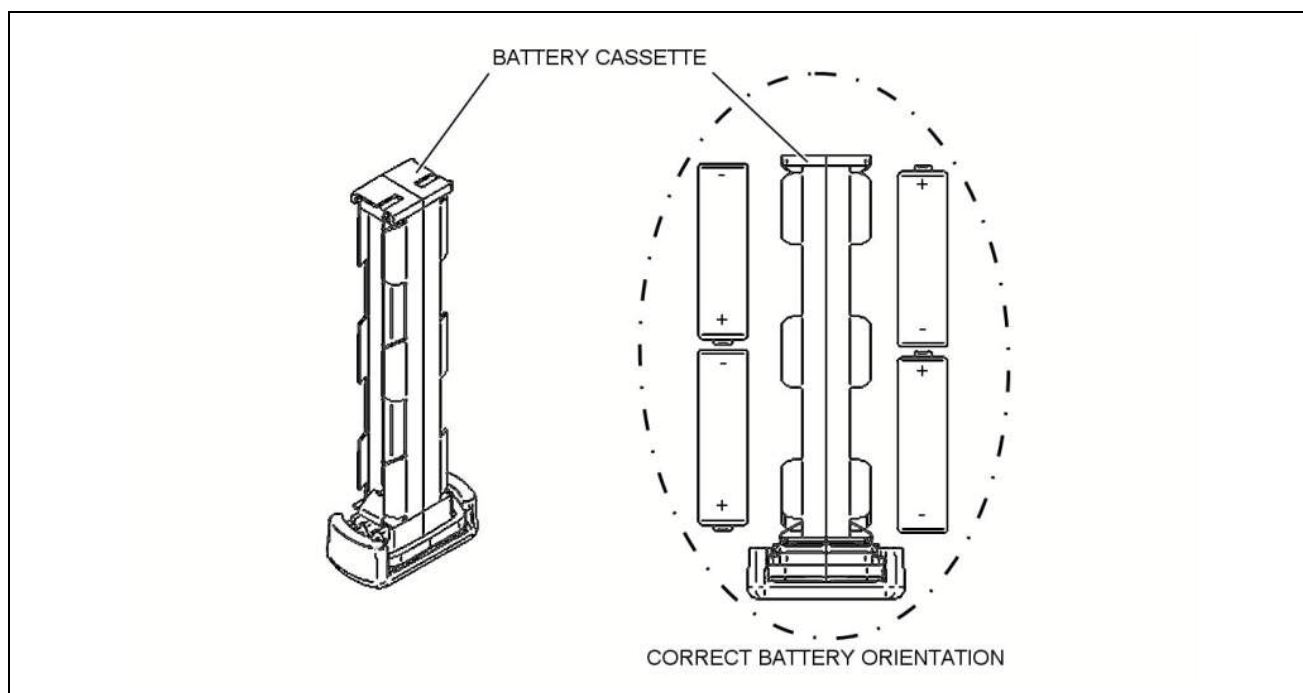
5.3.3 Replace Sensor Node Batteries or Battery Cassette

Figure 62   Sensor Node Batteries or Battery Cassette Replacement

1 If the Sensor Node is operating, shut down by pressing the button on the top of the Sensor node. Wait for 3 seconds so that the Sensor Node can shut down correctly.

2 Open the Battery Cassette Locking Cover.

3   Fully withdraw the Battery Cassette from the Sensor Node.

WARNING –BATTERIES

THE SENSOR NODE CAN USE EITHER LITHIUM IRON DISULFIDE AA NON RECHARGEABLE BATTERIES OR ALKALINE MANGANESE DIOXIDE AA NON RECHARGEABLE BATTERIES. THESE BATTERIES ARE A FLAMMABLE, CORROSIVE AND VAPOUR HAZARD. THE LITHIUM IRON DISULFIDE BATTERIES CONTAIN LITHIUM AND AN ELECTROLYTE. THE LITHIUM REACTS VIGOROUSLY WHEN IMMERSED IN WATER. THE ELECTROLYTE IS FLAMMABLE AND HIGHLY CORROSIVE:

DO NOT IMMERSE BATTERIES IN WATER, DECONTAMINANT SOLUTION OR OTHER LIQUIDS.

DO NOT CRUSH OR BURN BATTERIES.

DO NOT ATTEMPT TO RECHARGE BATTERIES.

DO NOT STORE BATTERIES AT TEMPERATURES ABOVE 158°F (70°C).

IN THE EVENT THAT A BATTERY WITHIN THE RADIO MODEM IS SHORTED OR STARTS TO HEAT UP, IT SHOULD BE REMOVED FROM THE UNIT AND TAKEN TO THE OUTDOORS OR TO A WELL VENTILATED AREA TO COOL DOWN. ONCE THE TEMPERATURE HAS DROPPED THE BATTERY CAN BE DISPOSED OF ACCORDING TO LOCAL PROCEDURES FOR HAZARDOUS WASTE. SUITABLE PROTECTIVE CLOTHING SHOULD BE WORN WHEN HANDLING SUSPECT BATTERIES. IF THE SKIN OR EYES COME INTO CONTACT WITH THE ELECTROLYTE, WASH THOROUGHLY WITH WATER AND SEEK MEDICAL ATTENTION.

WARNING – BATTERY DISPOSAL

BATTERIES CONTAIN HAZARDOUS SUBSTANCES. ALWAYS DISPOSE OF BATTERIES AS HAZARDOUS WASTE IN ACCORDANCE WITH THE LOCAL RECOMMENDED PROCEDURES.

WARNING - BURNS

IF THE OUTER COVER OF A BATTERY INSTALLED IN THE BATTERY CASSETTE IS DAMAGED, A SHORT CIRCUIT CAN OCCUR AND THE BATTERIES MAY OVERHEAT. ALWAYS CHECK THE OUTER COVER OF EACH BATTERY IS UNDAMAGED BEFORE INSTALLING IN THE BATTERY CASSETTE.

4   Remove the four batteries from the Battery Cassette and discard in accordance with local regulations.

CAUTION – Mixing Battery Types.

Mixing lithium and alkaline battery types within the Battery Cassette may cause damage to the sensor node. Do not mix lithium and alkaline battery types within the Battery Cassette.

CAUTION – Equipment damage.

Batteries inserted into the Sensor Node in the incorrect orientation may cause damage. Always make sure the batteries are inserted in the correct orientation.

CAUTION – Mixing Batteries of different ages

Mixing exhausted and fresh within the Battery Cassette may cause damage to the Sensor Node. Do not mix batteries of different ages within the Battery Cassette.

CAUTION – Equipment Contamination

Contamination can enter the interior of the Sensor Node through the battery cassette compartment. This may cause the Sensor Node to malfunction or cease to operate altogether. Make sure that the battery cassette is removed only when required.

5   Inspect the Battery Cassette for damage or degradation. If there is significant damage or degradation discard the Battery Cassette and obtain a replacement.

6   Install four fresh batteries into the Battery Cassette in the correct orientation as marked on the cassette.

7   Insert the loaded Battery Cassette fully into the battery compartment and close the Battery Cassette Locking Cover.

5.3.4   Replace Sensor Node Antenna

Figure 63   Radio Modem Antenna Replacement

1   If the Sensor Node is operating shut down by pressing the on-off button.

2   Remove and discard the Antenna.

3   Install the replacement Antenna making sure that it is the correct one for the Sensor Node.

5.3.5   Replace Inoperative Sensa-LINX Equipment

In the event of any item of Sensa-LINX equipment malfunctions, or ceases to operate altogether, obtain a replacement item. For information on spares see section 6.1. Dispose of equipment in accordance with approved procedures. If equipment is contaminated with harmful substances make sure that items are disposed of carefully and in accordance with approved procedures for disposal of hazardous waste.

5.4 FAULT ANALYSIS

This section is divided into two parts – equipment faults not indicated by the system, and faults that are indicated to the user, either by LED status at the Sensor Node or on the user interface at the Controller.

5.4.1 Fault Diagnosis

This section covers equipment faults that do not produce any fault indications.

TABLE 36. BASE STATION AND SENSOR NODE RADIO MODEM FAULTS		
Fault	Cause/Effect	Corrective Action
After button press, power LED is not illuminated	Radio Modem is inoperable.	Check the other LEDs: If none are illuminated it is likely that the batteries are fully discharged. Re-press Radio Modem switch, change batteries and re-try, or connect the Power Supply Unit and switch it on. If there is still no power LED but there are other LEDs illuminated, check Controller display: if the BSN or SN icon is shown and there are no faults, the LED has failed. To rectify, replace the Radio Modem and return for repair.
GPS LED is not illuminated	The Position function of Radio Modem is inoperable	Note: It can take up to 10 minutes for the GPS to achieve a lock (particularly if the unit has been off for a long period of time or has been moved a large distance since it last achieved a GPS lock). Also note that a GPS lock will not generally be achieved inside buildings or in heavily built up areas. Check the Radio Modem is switched on – look for green Power LED or check the C2 display for the BSN or SN. Move the Radio Modem clear of overhead obstructions to get a better view of the sky.
Battery Low LED does not illuminate before batteries fail.	The Battery Low function has failed or the LED has failed.	Check external power is not connected. Replace the Radio Modem and return for repair.
Radio Modem is working as indicated by Power, GPS and/or Radio Link LEDs but is not recognized by the sensor.	Data reporting is not possible.	Check the sensor is set up to communicate with the sensor node. Check the connections. Replace cable. Replace sensor and return for repair.

TABLE 36. BASE STATION AND SENSOR NODE RADIO MODEM FAULTS		
Fault	Cause/Effect	Corrective Action
Radio Link LED is not illuminated.	A radio link has not been achieved.	Note: It can take up to 1 minute to achieve a radio link. Allow sufficient time for this to occur. Check the Radio Modem is switched on by checking the power LED on the modem or by checking the C2 display. Check the antenna is installed correctly. Make sure there is a line of sight to the receiving modem(s) and the range is less than values listed in section 1.4.3 for the radio variant. Verify Network ID is set the same on all Sensor Nodes. Verify Channel/Pattern is set the same on all Sensor Nodes. Verify encryption enable/disable is set the same for all Sensor Nodes. Note: Encryption keys must be the same on all Sensor Nodes for communications to be established when encryption is enabled. If still no LED, replace Radio Modem and return for repair.

TABLE 37. LAPTOP PC FAULTS		
Fault	Cause/Effect	Corrective Action
BSN is not recognized by the Laptop PC.	Sensa-LINX C2 communications are inoperable.	Check BSN is switched on and working correctly. Check cable connections. Check Comms settings in the Sensa-LINX C2. Close Node Configuration Tool application if open. Replace BSN and re-try. If communications are achieved, return defective Radio Modem for repair. If still no communication, replace Laptop PC and return for repair.
SNs are not recognized by the Laptop PC	The BSN Modem is inoperable.	Check the BSN is switched on. Check cable connections.
Not all SNs are recognized by the Laptop PC	There are faults at the SN – refer to SN faults above.	

TABLE 37. LAPTOP PC FAULTS		
Fault	Cause/Effect	Corrective Action
Does not power up when switched on with external power.	Does not power up when switched on with external power.	Replace Laptop PC and return for repair.
Does not power up when switched on with battery power.	Does not power up when switched on with battery power.	Connect to external power. If still inoperable, replace Laptop PC and return for repair. If operable with external power the battery needs charging. Run with external power until battery is charged. If battery charging has been attempted but still unable to power up from the battery, replace the battery and dispose of the old one in accordance with local regulations. Note: Lithium Ion.
Battery life is very short	Laptop PC must be run from external power.	Connect to external power. Replace internal re-chargeable battery pack and charge up.

TABLE 38. GENERAL FAULTS		
Fault	Cause/Effect	Corrective Action
Equipment Damage	Visible damage to equipment	Repair damaged items by replacement. See corrective maintenance TABLE 35 for the list of replaceable items. If damage is not repairable obtain replacement equipment. Return faulty items for repair.
Map license requires repair	Map is not displayed	The license for the Sensa-LINX C2's mapping capabilities is automatically activated and deactivated when the C2 is installed and uninstalled. During the activation process, your computer's hardware profile is used in order to bind the license to your machine. If, after license activation, the hardware profile of your machine changes significantly, it is possible that the binding may break resulting in the mapping capabilities of the C2 to stop working. If this happens, simply generate a new binding by running RepairASR.exe located in the 'ESRI License Activation' directory under the Sensa-LINX C2 installation directory. If this does not resolve the issue, contact customer services listed in Foreword section of this document.

5.4.2   Fault Messages

This section covers faults that produce indication, by LED status at the Sensor Node or on the user interface at the Controller.

Message	Cause/Effect	Corrective Action
TABLE 39. BASE STATION FAULT MESSAGES		
No GPS Comms	The BSN cannot communicate with the internal GPS receiver. Position cannot be determined.	Cycle the BSN Power. If unsuccessful, replace the BSN and return for repair.
No GPS reception	The BSN cannot determine position.	Note: It can take up to 10 minutes for the GPS to achieve a lock (particularly if the unit has been off for a long period of time or has been moved a large distance since it last achieved a GPS lock). Also note that a GPS lock will not generally be achieved inside buildings or in heavily built up areas. Move the BSN clear of overhead obstructions to get a better view of the sky. If unsuccessful, replace the BSN and return for repair.
Battery Critical	Battery life is very low.	Replace the batteries in the BSN.
Duty Cycle Alert	The 868 variant of sensor node is reaching its upper duty cycle limit and will soon cease communicating.	Reduce the data rate of the network: Set as many sensor nodes as possible to be "Fixed" (see Section 3.4.6.1.6). Reduce the number of sensor nodes on the network.
Supply voltage out of spec	The BSN cannot operate from the supply provided.	Correct the supply, whether external or due to incorrect batteries fitted, or batteries fitted incorrectly.
BIT fail	The BSN Built In Self Test has failed and it cannot detect faults.	Replace the BSN and return for repair.
Synth lock fail	The BSN transmitter has failed. The unit cannot communicate with SNs.	Replace the BSN and return for repair.

TABLE 40. SENSOR NODE FAULT MESSAGES		
Message	Cause/Effect	Corrective Action
No GPS Comms	The SN cannot communicate with internal GPS receiver. Position cannot be determined.	Cycle SN Power. If unsuccessful, replace Base Station Radio Modem and return for repair.
No GPS reception	The SN cannot determine position.	Move the SN clear of overhead obstructions to get a better view of the sky.
Battery Critical	Battery life is very low.	Replace the batteries in the SN.
Supply voltage out of spec	The SN cannot operate from the supply provided.	Correct the supply, whether external or due to incorrect batteries used, or batteries fitted incorrectly.
BIT fail	The SN Built In Self Test has failed and it cannot detect faults.	Replace the SN and return for repair.
Duty Cycle Alert	The 868 variant of sensor node is reaching its upper duty cycle limit and will soon cease communicating.	Reduce the data rate from this sensor node by setting it to be "Fixed" (see Section 3.4.6.1.6).
No Sensor Comms	SN has lost communication with the associated sensor.	Request that the sensor status and the SN connections are checked, and relevant corrective action is carried out.
Sensor protocol mismatch	The Sensor Comms protocol is set to GPS not ADRS. The SN cannot communicate with the sensor.	Request that the Detector Unit Comms is set to ADRS. Refer to sensor Operators Manual for further information on sensor set up and configuration.

CHAPTER 6 SPARES INFORMATION

6.1 GENERAL

This section details the recommended spare parts, consumables and optional ancillaries for the Sensa-LINX System.

	TABLE 41. SPARE PARTS		
	Item	Part Number	NATO Stock Number (NSN)
1	SYSTEM MANUAL	20270	7610-99-250-2360
2	AC ADAPTOR, PANASONIC CF31	3370-2530	6130-99-373-6412
3	LAPTOP, C2	20765	7010-99-815-0238
4	QUICK REFERENCE GUIDE	20449	7610-99-591-4923
5	LCD3.3 DOCK ASSY.	20420	5340-99-448-0573
6	SOFTWARE CD, SENSA-LINX	20451	7030-99-471-5953
7	SENSOR NODE ASSY, 2.4GHz INT, GREEN	20399	6665-99-375-0324
8	SENSOR NODE ASSY, 2.4GHz STD, GREEN	20399A	6665-99-601-9543
9	SENSOR NODE ASSY, 900MHz INT, GREEN	20399B	6665-99-306-4353
10	SENSOR NODE ASSY, 900MHz STD, GREEN	20399C	6665-99-814-5887
11	SENSOR NODE ASSY, 868MHz INT, GREEN	20399D	6665-99-695-3724
12	SENSOR NODE ASSY, 868MHz STD, GREEN	20399E	6665-99-355-4823
13	SENSOR NODE ASSY, 2.4GHz INT, BLACK	20399F	6665-99-321-2716
14	SENSOR NODE ASSY, 2.4GHz STD, BLACK	20399G	6665-99-169-4811
15	SENSOR NODE ASSY, 900MHz INT, BLACK	20399H	6665-99-928-8068
16	SENSOR NODE ASSY, 900MHz STD, BLACK	20399J	6665-99-979-2786
17	SENSOR NODE ASSY, 868MHz INT, BLACK	20399K	6665-99-737-5529
18	SENSOR NODE ASSY, 868MHz STD, BLACK	20399L	6665-99-297-8655
19	SENSOR NODE TRANSIT CASE	20403	8145-99-562-8505
20	BASE STATION TRANSIT CASE	20404	8145-99-915-8467

TABLE 41. SPARE PARTS			
	Item	Part Number	NATO Stock Number (NSN)
21	ANTENNA, 868MHZ	20900	5985-99-254-7939
22	ANTENNA, 2.4GHZ STANDARD	20903	5985-99-690-7821
23	ANTENNA, 900MHZ	20901	5985-99-239-4949
24	ANTENNA, 2.4GHZ INTERNATIONAL	20902	5985-99-290-6918
25	SENSOR NODE POUCH, GREEN	20334	8465-99-726-6283
26	SENSOR NODE POUCH, BLACK	20334A	8465-99-494-2118
27	MOUNTING STRAP, GREEN	20735	5340-99-856-4468
28	MOUNTING STRAP, BLACK	20735A	5340-99-442-7408
29	BATTERY CASSETTE ASSEMBLY, GREEN	20014	6160-99-993-1165
30	BATTERY CASSETTE ASSEMBLY, BLACK	20014A	6160-99-877-4879
31	COMMS CABLE - SN TO NEXUS OR PCA (3m)	20172	5995-99-880-0447
32	SCREW DRIVER 6.5mm X 30mm PARALLEL	5749-0612	5120-99-587-3876
33	EUROPEAN MAP FILES DVD	20876	7030-99-925-1099
34	NORTH AMERICA MAP FILES DVD	20877	7030-99-407-2501
35	COMMS CABLE - SN TO LAPTOP (3m)	20173	5995-99-995-0754
36	COMMS CABLE - SN TO NEXUS OR PCA (3m)	20172	5995-99-880-0447
37	DETECTOR POUCH, LCD3.3 (GREEN)	20335	8465-99-340-3087
38	DETECTOR POUCH, LCD3.3 (BLACK)	20335A	8465-99-173-1167
39	COMMS CABLE - SN to LCD3.3 (SHORT)	20175	5995-99-152-2369
40	COMMS CABLE - SN to LCD3.3 (SPIRAL)	20234	5995-99-152-2370
41	MAINS POWER ADAPTOR (GREEN)	20734	6130-99-464-9563
42	MAINS POWER ADAPTOR (BLACK)	20734A	6130-99-961-5920
43	POWER CABLE, UK	5356-5085	6150-99-213-7559
44	POWER CABLE, TRANSFORMER TO SN / NEXUS (3m)	20174	6150-99-979-2782
45	POWER & COMMS CABLE, PCA & SN	20553	5995-99-958-6054

TABLE 41. SPARE PARTS			
Item		Part Number	NATO Stock Number (NSN)
46	PCA MOUNTING (GREEN)	20336	5340-99-248-5225
47	PCA MOUNTING (BLACK)	20336A	5340-99-853-3885
48	PCA (PIK) MOUNTING PLATE	20339	5340-99-856-4469
49	TRIPOD MOUNTING BRACKET	20330	5340-99-837-1194
50	TRIPOD	6881-0215	
51	SENSOR NODE - NEXUS (PIK) MOUNTING	20466	5340-99-814-5871
52	12-32VDC LAPTOP ADAPTOR	3330-5100	5895-01-577-7515
53	MAINS TRAVEL ADAPTOR	3370-2506	5935-99-155-5802
54	SHOULDER STRAP (GREEN)	5368-9020	8465-99-458-9745
55	SHOULDER STRAP (BLACK)	19268	8465-99-667-6259
56	USB CABLE ASSEMBLY	20966	5995-99-297-8667

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APPENDIX A

Node Configuration Tool User Instructions

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APPENDIX A - TABLE OF CONTENTS

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NETWORK CONFIGURATION TOOL (NCT)
USER INSTRUCTIONS

1   INTRODUCTION

The Node Configuration Tool (NCT) is a Windows Graphical User Interface (GUI) application that allows an operator to view and configure various Sensor Node parameters and to update the Sensor Node software. The NCT software runs on a Windows PC (XP, Vista, 7) and can communicate with a sensor node using a RS-232 serial interface (or USB for software loading). Since the NCT uses a single wired interface, it can only communicate with one sensor node at a time. On Laptop PCs delivered as Sensa-LINX equipment the NCT Application is pre-installed. If there is a requirement to re-install the application or to install the application onto another PC refer to section 9.

2   APPLICATION OVERVIEW

The NCT supports the following capabilities:

- To display and change current sensor node settings. The sensor nodes come with a standard configuration that allows the Sensor Nodes to operate in a normal manner. However some settings can be changed to alter or improve performance in certain circumstances. See Section 4.1 for details on how to do this.

- To update the Sensor Node Operating System (OS). This will only be required if a system software update has been received from Smiths Detection with a new version of the OS included and should only be performed in these circumstances. See Section 4 for details on how to do this.

- To update the Sensor Node Application. This will only be required if a system software update has been received from Smiths Detection and should only be performed in these circumstances.

- To copy the Sensor Node log files to a local PC directory. This will only be required if Smiths Detection request the log files for analysis and should only be performed in these circumstances. See Section 7 for details on how to do this.

Section 8 provides a detailed reference to each of the NCT features.

Section 9 provides instructions on how to install the NCT on a new computer (note that the NCT is pre-installed on any computer delivered as part of a Sensa-LINX system).

3   HARDWARE CONFIGURATION

Figure 1 shows the hardware setup used to configure a sensor node using the NCT. It consists of a PC connected to a sensor node via a wired serial cable. The NCT does not support configuring sensor nodes via a wireless interface.

Figure 1   Hardware Configuration

When using the NCT to read and write sensor node parameters (see Section 4) then the standard RS232 cable can be used to connect the C2 laptop to the Sensor Node (in the same way as normally connected when using the Sensor Node as a basestation).

However, if using the NCT to update the Sensor Node OS, application software or to read Sensor Node log files, then both an RS232 and a USB port need to be connected to the Sensor Node. This requires the special cable RS232/USB that is provided with a C2 computer.

4   SENSOR NODE SETTINGS

Caution: Sensor Node Settings.
Changing these settings on a Sensor Node can adversely affect its performance. Read this section carefully before changing the settings and only make a change if you are confident that you understand the implications. Refer to Smiths Detection for assistance if in doubt.

This section describes the steps required to change the configuration settings in the sensor node. These steps assume that the NCT software is already installed on the computer.

<u>**Note:**</u>
When you are finished making any/all configuration changes to a sensor node, you MUST cycle power on the sensor node before using it in a network configuration.

4.1   DISPLAYING THE CURRENT SENSOR NODE SETTINGS

To connect to a Sensor Node and show the current settings:

1   Attach the serial cable to the computer's serial port (use the standard RS232 cable that is used to connect a Sensor Node as a basestation).

2   Start the NCT application.

3   Click the 'Connect' button and select the desired COM port (the first time the NCT runs this will default to COM1, it will only need to be changed if you are using a different port).

4   Attach the sensor node end of the serial cable to the sensor node.

5   Turn on the sensor node power.

6   Wait for the NCT to establish a link with the sensor node.

7   When a link is made the NCT will automatically get and display the sensor nodes current settings. The Network Type of the attached sensor node will be automatically added to the new settings column. See Figure 2.
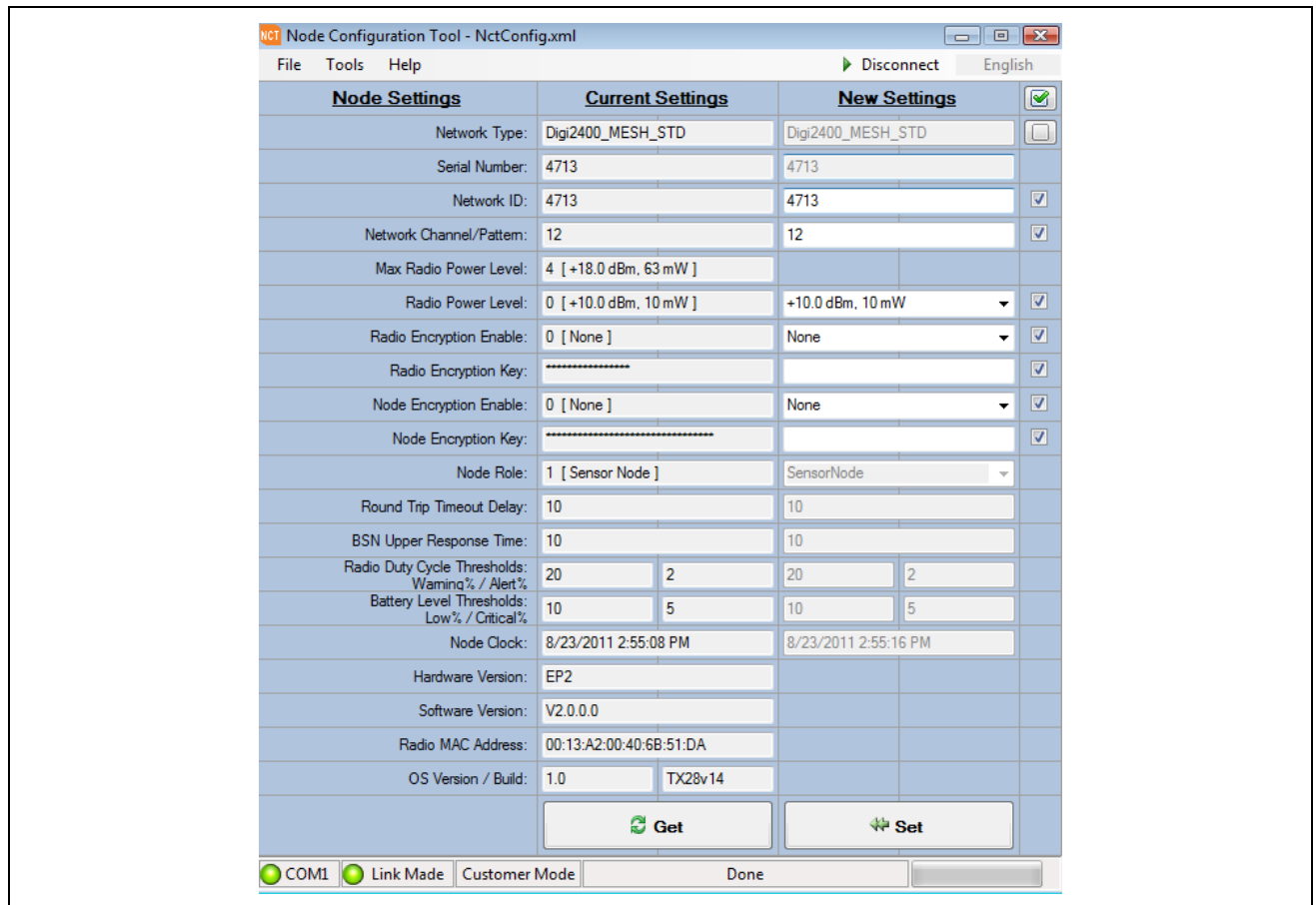
Figure 2   NCT Main Screen Showing the current Sensor Node settings

4.2   CHANGE SENSOR NODE SETTINGS USING THE NCT

To change the settings on a Sensor Node:

1   Change the values in the "New Settings" column that you wish to alter and tick the check box next to each setting that you wish to change.

2   Verify that the new settings are set to the desired values and that the check box next to each setting you want to change is checked.

3   Click the 'Set' button. When the set operation is complete, the NCT will automatically get and display the sensor nodes current settings.

4   Verify that the desired changes now appear in the current settings column.

5   Power down the sensor node and remove it from the serial cable.

6   Steps 3–9 can be repeated with additional sensor nodes.

4.3 **SENSOR NODE SETTINGS**

This section describes the sensor node settings that can be read and (in some circumstances) altered by the user.

The NCT provides the following capabilities to read or write sensor node settings:

Sensor Node Setting	Capability
Network Type	Read
Serial Number	Read
Network ID	Read/Write
Network Channel	Read/Write
Max Radio Power Level	Read
Radio Power Level	Read/Write
Radio Encryption Enable	Read/Write
Radio Encryption Key	Write
Node Encryption Enable	Read/Write
Node Encryption Key	Write
Node Role	Read
Round Trip Timeout Delay	Read
BSN-IN Upper Response Time	Read
Radio Duty Cycle Thresholds	Read
Battery Level Thresholds	Read
Sensor Node Clock	Read
Hardware Version	Read
Software Version	Read
Radio MAC Address	Read
OS Version & Build	Read
Update Sensor Node OS	Write
Update Sensor Node Application	Write
Copy Sensor Node Log Files	Read

The following sections provide information on the Sensor Node Settings in detail.

4.3.1 **NETWORK TYPE**

Used to determine the network type of the sensor node. This setting indicates the type of radio that is installed in the sensor node. This value is determined by the type of radio that is installed in the sensor node and can not be changed using factory, developer, or customer access mode.

Note: The network type is a read-only setting and can not be changed.

Value	Network Type
1	Digi 868MHz Point-To-Multipoint (PTMP)
2	Digi 900MHz Mesh Network
3	Digi 900MHz Mesh Network
4	Digi 2.4GHz Mesh Network
5	Digi 2.4GHz Mesh Network (reduced TX power option)

4.3.2 **NETWORK ID**

Used to configure the sensor node to a specific network ID. All sensor nodes that are required to communicate on a network MUST have the same Network ID. The network ID allows 1 or more co-located networks to operate without being logically joined (i.e. a broadcast on one will not propagate to the other, and in a meshing environment the networks with different network ID will not mesh together.

Note: The network ID is a read-write setting.

Type of Network	Min Value	Max Value
Digi 868MHz PTMP Network	0	32767
Digi 900MHz Mesh Network (All variants)	0	32767
Digi 2.4GHz Mesh Network (All variants)	0	65535

4.3.3   NETWORK CHANNEL PATTERN

Used to configure the sensor node to a specific RF Channel. All sensor nodes that are required to communicate on a network must have the same network channel/pattern.

Note: The network channel/pattern is a read-write setting.

Type of Network	Min Value	Max Value
Digi 868MHz PTMP Network	Not Supported	
Digi 900MHz Mesh Network (standard variant)	0	7
Digi 900MHz Mesh Network (international variant)	0	3
Digi 2.4GHz Mesh Network (All variants)	12	23

4.3.4   RADIO POWER LEVEL

Used to get/set the transmit power level that the radio module is set to. The values displayed in the Radio Power Level drop-down control are determined by the selected setting in the Max Radio Power Level drop-down control.

Note: The radio power level is a read-write setting.

Network Type	Value	Allowed Power Settings
Digi868_PTMP	0	0.0 dBm, 1 mW
	1	+13.7 dBm, 23 mW
	2	+20.0 dBm, 100 mW
	3	+22.0 dBm, 158 mW
	4	+25.0 dBm, 316 mW
Digi900_MESH	0	+17.0 dBm, 50 mW
Digi900_MESH_RCO	0	+17.0 dBm, 50 mW
Digi2400_MESH	0	+10.0 dBm, 10 mw
	1	+12.0 dBm, 16 mW
	2	+14.0 dBm, 25 mW
	3	+16.0 dBm, 40 mW
	4	+18.0 dBm, 63 mW
Digi2400_MESH_RTO	4	+10.0 dBm, 10 mW

Caution: When adjusting the Radio Power Level, care must be taken to not set a level that would breach the local licensing rules for the geographical area where the node will be used.

4.3.5   RADIO ENCRYPTION ENABLE

Used to enable or disable radio encryption in the sensor node.

Note: The radio encryption enable is a read-write setting.

4.3.6   RADIO ENCRYPTION KEY

Used to set the radio encryption key of the sensor node. The user can either enter a Hex encryption key or generate one automatically using the Tools→Generate Radio Key menu item. When this

menu item is selected, an AES-128 key is automatically pasted into the Radio Encryption Key control in the New Settings column.

The radio encryption key is a write-only settings; therefore, '********' is displayed in the current settings column.

Caution: The radio encryption key is a write-only setting. Each sensor node in a network must have the same encryption key to be able to communicate with each other. Since the encryption key can not be read back, it is highly recommended that the key be recorded. The key could be saved in a configuration file so that it can be used to configure other sensor nodes that are added to the same network at a later time. Refer to 8.1.2.1 for information on opening and saving configuration files.

4.3.7   NODE ENCRYPTION ENABLE

Used to enable or disable the node encryption in the sensor node.

Note: The node encryption enable is a read-write setting.

4.3.8   NODE ENCRYPTION KEY

Used to set the node encryption key of the sensor node. The user can either enter a Hex encryption key or generate one automatically using the Tools→Generate Node Key menu item. When this menu item is selected, the 16-byte FIPS key is automatically pasted into the Node Encryption Key control in the New Settings column.

The node encryption key is a write-only settings; therefore, '****************' is displayed in the current settings column.

Caution: The node encryption key is a write-only setting. Each sensor node in a network must have the same encryption key to be able to communicate with each other. Since the encryption key can not be read back, it is highly recommended that the key be recorded. The key could be saved in a configuration file so that it can be used to configure other sensor nodes that are added to the same network at a later time. Refer to 8.1.2.1 for information on opening and saving configuration files.

4.3.9   HARDWARE VERSION

Used to get the hardware version of the sensor node.

Note: The software version is a read-only setting and can not be changed.

4.3.10   SOFTWARE VERSION

Used to get the software version of the sensor node.

Note: The software version is a read-only setting and can not be changed.

4.3.11   RADIO MAC ADDRESS

Used to get the MAC address of the sensor node radio.

Note: The Radio MAC Address is a read-only setting and can not be changed.

4.3.12   OS VERSION & BUILD

Used to get the OS version & build information of the sensor node.

Note: The OS version & build is a read-only setting and can not be changed.

5   UPDATING SENSOR NODE OPERATING SYSTEM

Caution: Sensor Node Operating System Settings.

Changing the Operating System or Software on a Sensor Node can adversely affect its performance and may render it inoperable if not performed correctly. Only update the Sensor Node with software provided by Smiths Detection. Only update those Sensor Nodes for which the software is intended. Read this section carefully before changing the software and only make a change if you are confident that you understand the procedure. Refer to Smiths Detection for assistance if in doubt.

This section describes the steps required to update the Windows CE Operating System on the sensor node.

5.1   UPDATE PROCEDURE

This section describes the steps required to update the Windows CE operating system in the sensor node.

5.1.1   OS FILE DIRECTORY

The updated OS file will be delivered on computer media and will have a name that indicates the current version number similar to NK_SN_EP2_V1.20_Tx28.nb0. This file must be copied from the computer media into the directory shown below and renamed to NK.nb0.

"C:\Program Files\Smiths Detection\Sensa-LINX\Sensa-LINX NCT\mfgtools\Profiles\TX28 WinCE Update\OS Firmware\files\"

Notes:
1. **The above folder name assumes that the NCT was installed in the default location of C:\Program Files\Smiths Detection\Sensa-LINX\Sensa-LINX NCT**
2. **Administrator privileges are required to copy a file into the folder. If you are logged in as a user, you will see the dialog shown in Figure 3 and will be required to enter in the Administrator password to copy the file into this directory.**
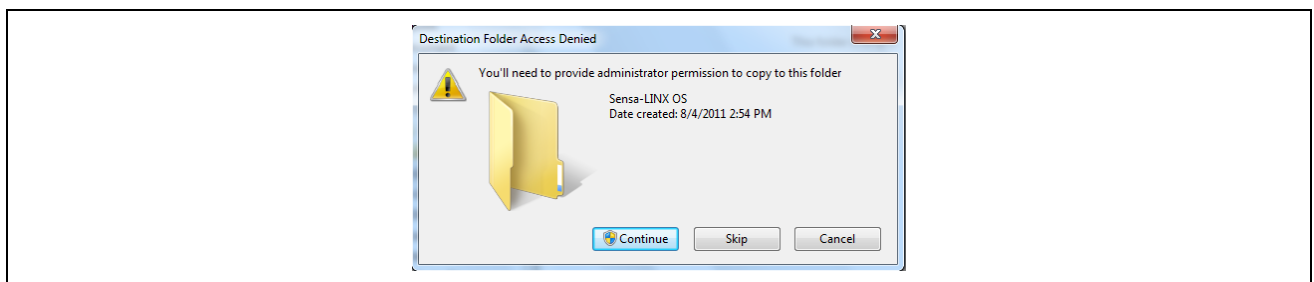
Figure 3   Destination Folder Access Denied Dialog

5.1.2   SENSOR NODE OS UPDATE STEPS

1   Attach the Comms cable to the PC serial port and to the sensor node.

2   Start the NCT application, click the 'Connect' button, and select the COM1 port.

3   Turn 'ON' the sensor node power.

4   Wait for the NCT to establish a link with the sensor node. When a link is made the NCT will automatically get and display the sensor nodes current settings. The sensor node Network Type will be added to the new settings column.

5   Make note of the OS version and build numbers that are displayed in the current settings column.

6   In the Tools menu, select the "Update Sensor Node Operating System…" menu item. When the Reprogram Warning seen in Figure 4 appears, select 'Yes' to continue or 'No' to quit.
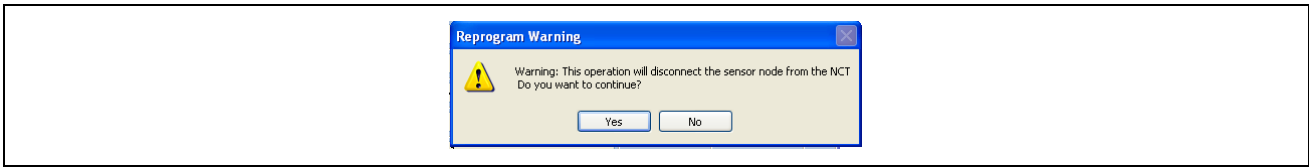
Figure 4   Reprogram Warning Dialog

7   When the Starting Update of Sensor Node OS dialog shown in Figure 5 appears, follow the steps outlined in the dialog.
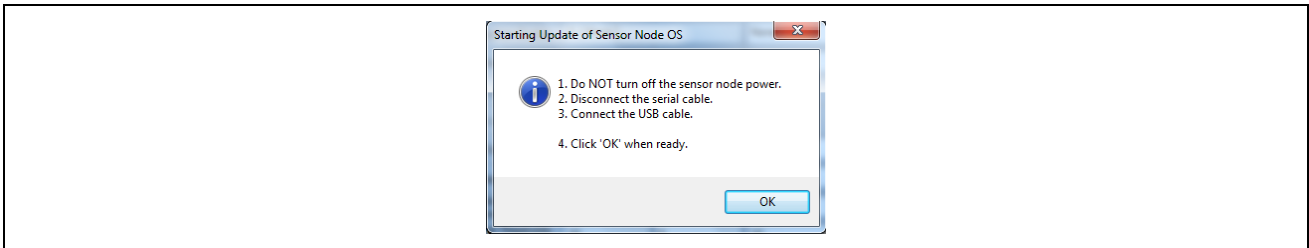
Figure 5   Starting OS Update Dialog

8   If the reprogramming software is not found then the dialog shown in Figure 6 will allow you to browse to the MfgTool.exe file.
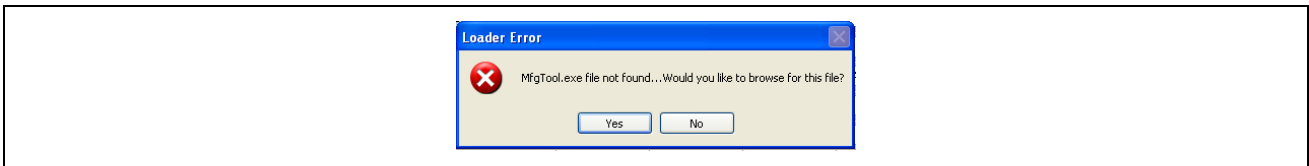

Figure 6   Loader Error Dialog

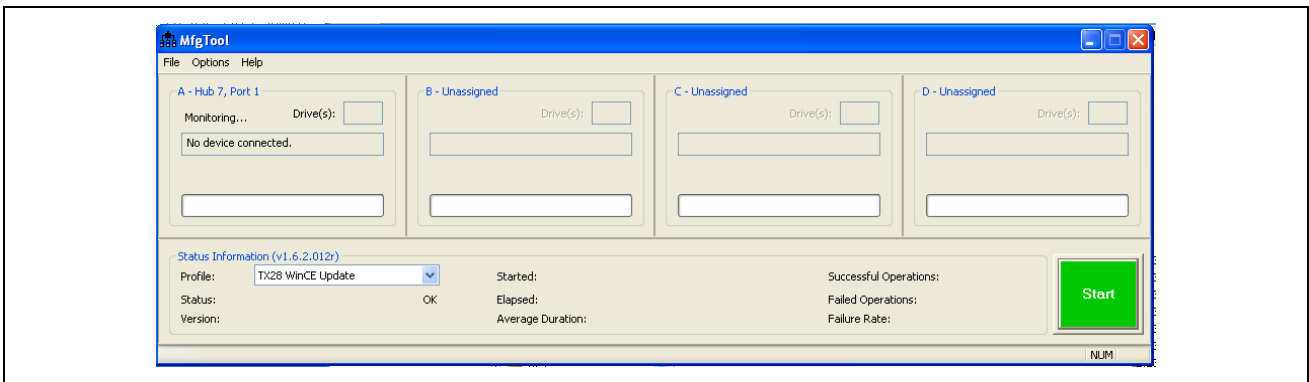9   If the loading of the Manufacturing Tool is successful, the dialog shown in Figure 7 is displayed.

Figure 7   MfgTool Main Screen

10   If the MfgTool has not been previously configured then execute the steps listed in paragraph 9.4 "Configuring the Manufacturing Tool" before continuing to the next step.

11   In the left hand pane A, verify that the Monitoring… text control displays "No device connected" and the Profile drop-down list control is set to "TX28 WinCE Update".

12   Plug the sensor node USB connector into the PC.

13   If the sensor node is detected the Monitoring… text control should display "HID-compliant device" as shown in Figure 8.
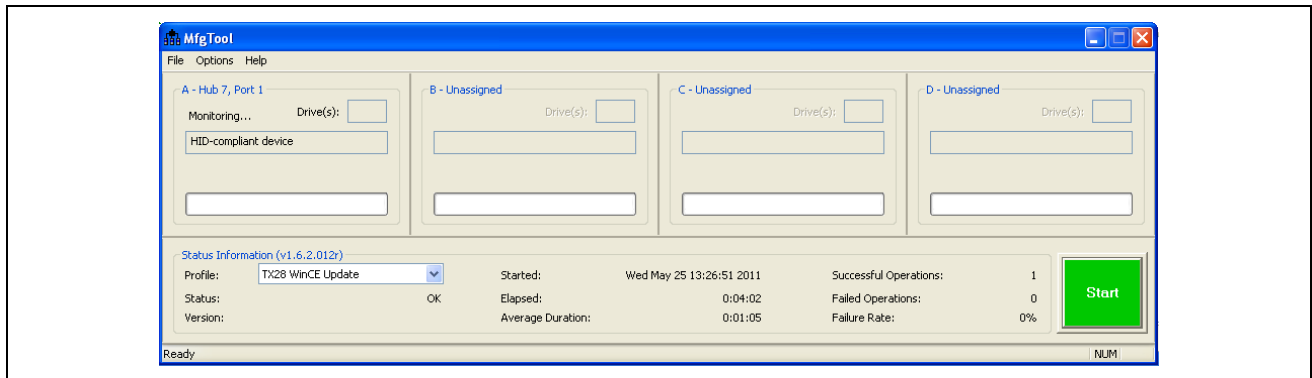
Figure 8   MfgTool Connected

14   Click on the green Start button. The sensor node software should start loading as seen by the progress bars in Figure 9.

Caution:

Turning OFF the sensor node power during this operation could result in a corrupted OS and the sensor node will have to be returned to the factory for repair.
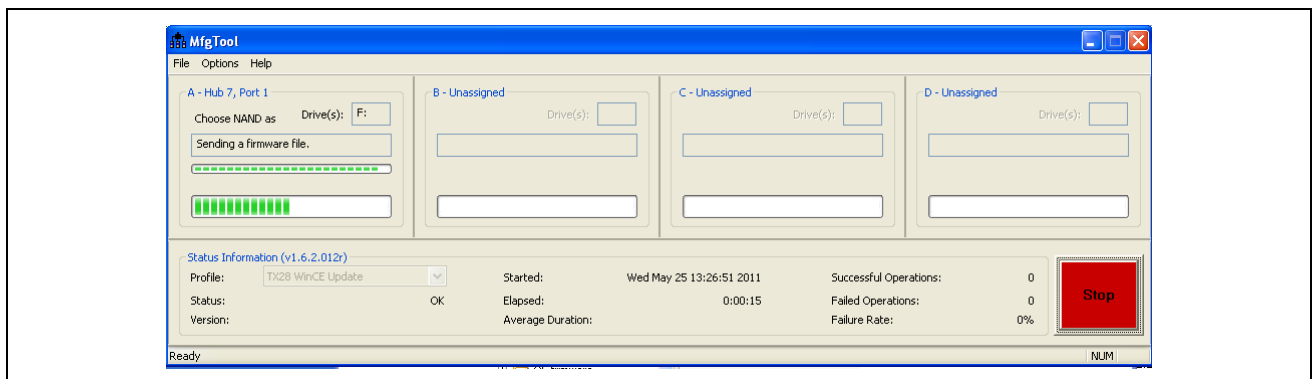
Figure 9   MfgTool Busy

15   When the software update is complete the MfgTool Monitoring… text control should display "FSL UUC USB Device" and the Successful Operations counter should have incremented.

16   Click the Stop button to halt 'MfgTool'.

17   Disconnect the USB connector from the PC.

18   Turn 'OFF' the sensor node power.

19   Wait a few seconds and turn 'ON' the sensor node power.

20   When the NCT links with the sensor node and loads the current settings, verify that the Software Version has changed from what was noted in step 6.

21   Turn 'OFF' the sensor node power and disconnect it from the serial cable.

6 UPDATING SENSOR NODE APPLICATION

This section describes the steps required to update the sensor node Application file.

6.1 EQUIPMENT NEEDED

This section identifies the equipment needed to update the sensor node application file using the NCT.

Part No.	Description
	Toughbook laptop CF-31
20172	USB cable: Sensor Node to C2 laptop
2456502	Node configuration Tool Software
	Sensor Node Application File

6.2 REQUIRED SOFTWARE TOOLS

To run the "Update Sensor Node Application" tool, certain tools must be installed prior to running the NCT. The following table lists the required tool for each Windows operating system.

Operating System	Tool
Windows XP	ActiveSync
Windows Vista	Windows Mobile Media Center
Windows 7	Windows Mobile Media Center

Note: Installation instructions can be found for the above tools in Section 9.1 and Section 9.2.

6.3 UPDATE PROCEDURE

This section describes the steps required to update the sensor node application file.

6.3.1 APPLICATION FILE DIRECTORY

The updated sensor node application file will be delivered on computer media and will have a name that indicates the current version number similar to *SN_BSN_EP2_v1.37_Tx28.exe*. This file should be copied from the computer media into a folder on the C:\ drive where it can be accessed by all users having either Administrator or User accounts.

Example Folder: "C:\Sensor Node Applications\"

6.3.2 SENSOR NODE APPLICATION UPDATE STEPS

1 Start the NCT application and select the COM1 port. Note that a COM port connection is not really required to update the sensor node application.

2 In the Tools menu, select the "*Update Sensor Node Application…*" menu item. The *Update Sensor Node Application* dialog should appear as seen in Figure 10.
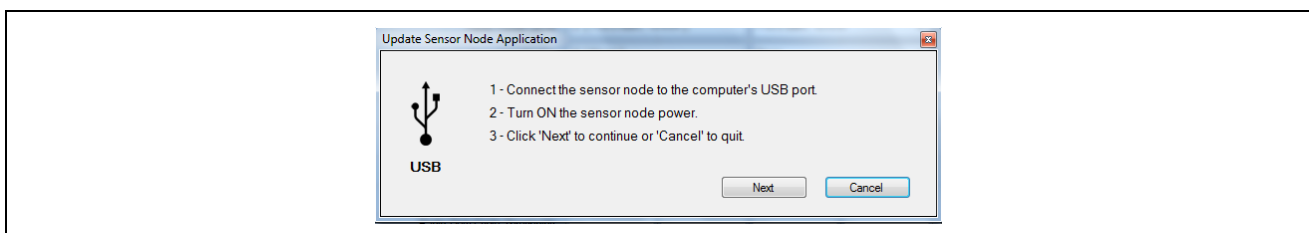
Figure 10   Update Sensor Node Application Dialog

3   Connect the sensor node USB cable to the PC USB port and to the sensor node.

4   Turn ON the sensor node power.

5   Click the 'Next' button to continue. Note that the user can click the 'Cancel' button at any time quit the update of the sensor node application.

6   If a Windows Mobile screen appears, select the "Connect without setting up the device" option and then minimize the window.

7   Follow the instructions on the dialog and click the next button to continue

8   The dialog seen in Figure 11will be displayed while the NCT is attempting to connect to the sensor node via the USB port.
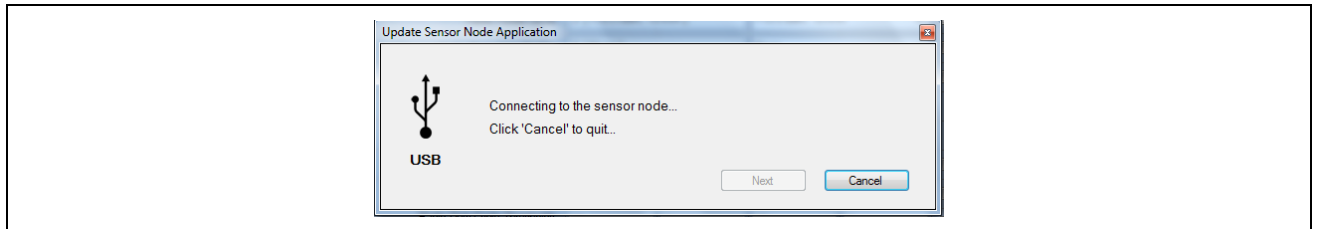
Figure 11   Connecting to the sensor node dialog

9   When the NCT has connected to the sensor node, the dialog seen in Figure 12 will be displayed. Click the Next button to select the sensor node application file to load.
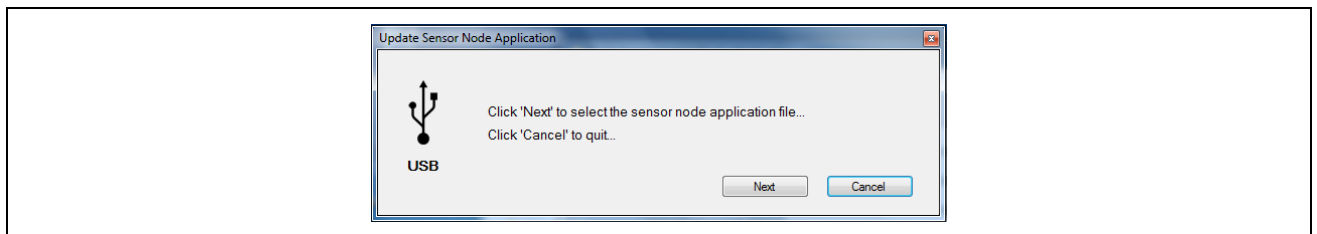
Figure 12   Select sensor node application file dialog

10   If the NCT is unable to connect to the sensor node for any reason, the dialog seen in Figure 13will be seen. At this point you can click the Retry button to try again waiting at least 15 seconds between each retry.
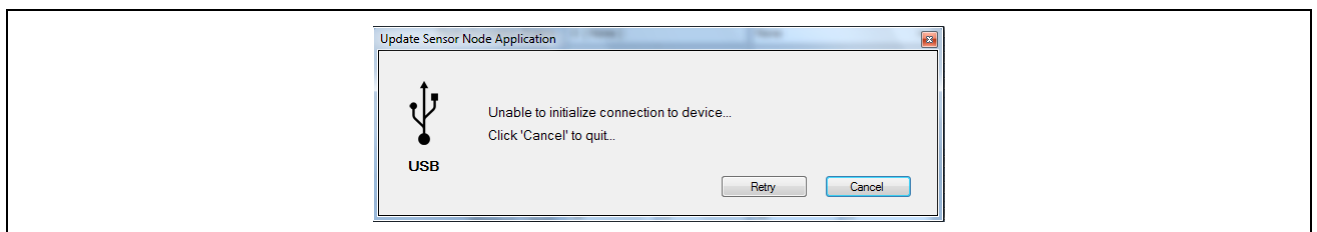
Figure 13   Unable To Initialize Connection Dialog

11   The Select Sensor Node Application File dialog is displayed as seen in Figure 14. If the folder containing the Sensor Node Application file is not shown in the dialog then select the folder where the file was copied as described in paragraph 6.3.1.
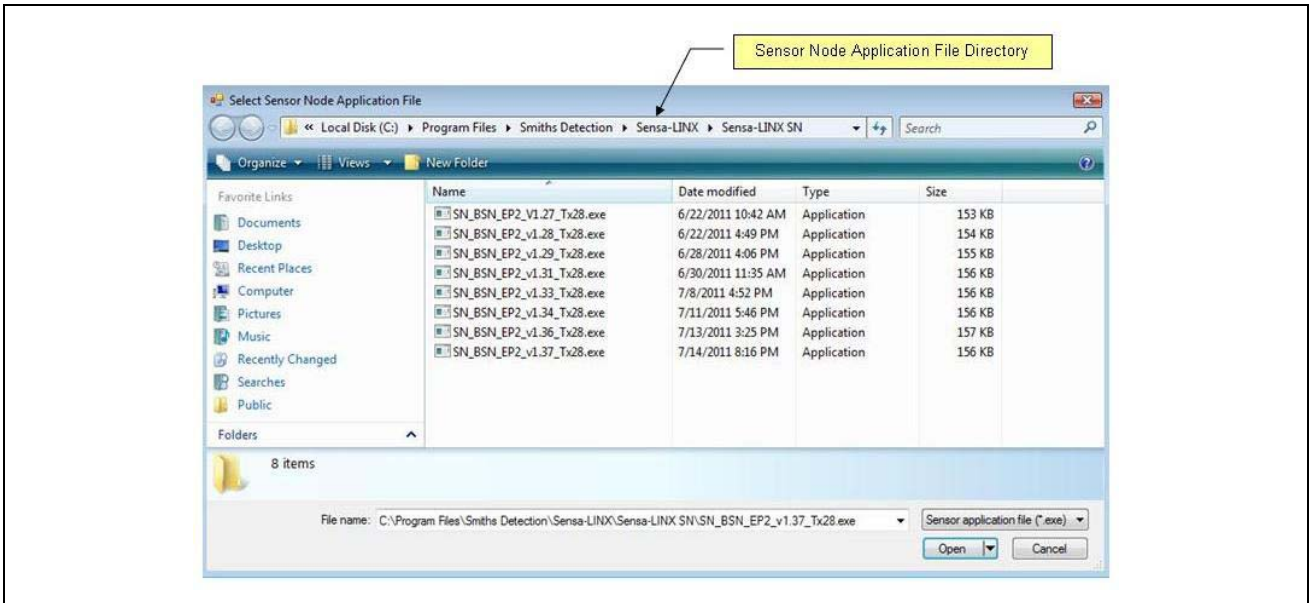
Figure 14   Select Sensor Node Application File Dialog

12   In the dialog shown in Figure 14, select the sensor node application file that was copied from the CD in paragraph 6.3.1 and click the Open button. The Start Update dialog seen in Figure 15 will appear. Click the Next button to start the update.
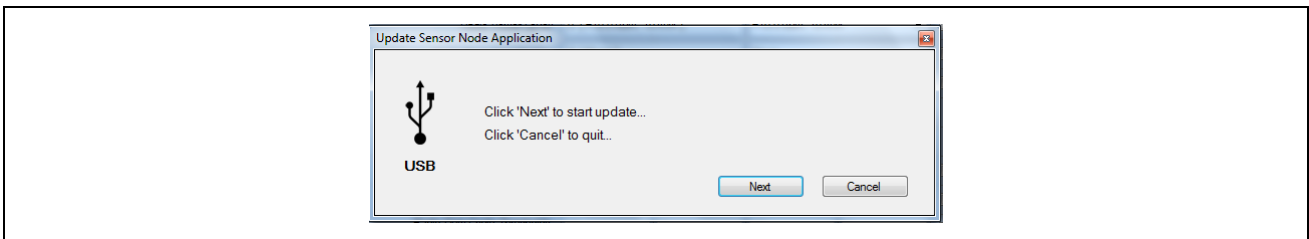
Figure 15   Start Update Dialog

13   If the update completed successfully the dialog seen in Figure 16 will be shown. If the update failed then the dialog seen in Figure 17 will appear indicating that the update failed.
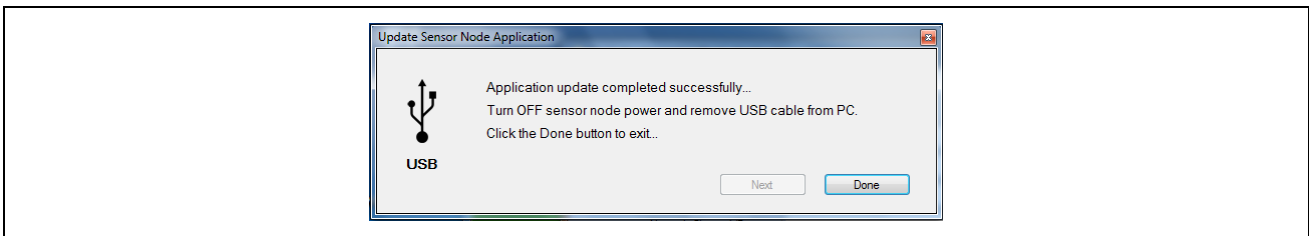
Figure 16   Application Completed Successfully Dialog
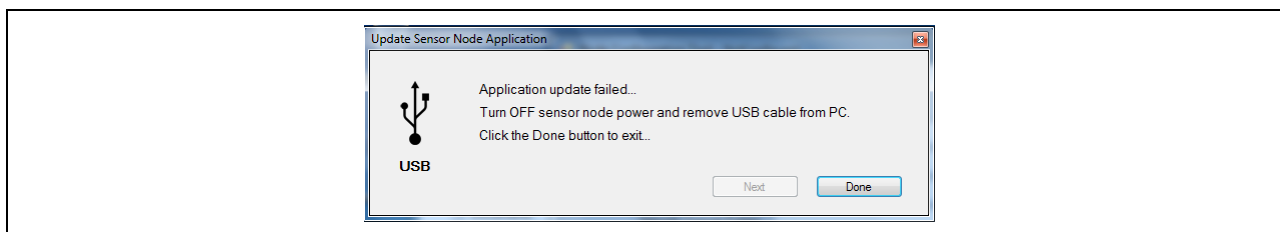
Figure 17   Application Update Failed Dialog

14   Click the Done button to exit the update mode.

15   Turn OFF the sensor node power and remove the USB cable from the PC.

16   Close the NCT application.

7   COPY SENSOR NODE LOG FILES

7.1   *REQUIRED SOFTWARE TOOLS*

To run the "Update Sensor Node Application" tool, certain tools must be installed prior to running the NCT. The following table lists the required tool for each Windows operating system.

Operating System	Tool
Windows XP	ActiveSync
Windows Vista	Windows Mobile Media Center
Windows 7	Windows Mobile Media Center

Note: Installation instructions can be found for the above tools in Section 9.1 and Section 9.2.

7.2   *STEPS TO COPY LOG FILES*

The NCT provides a tool to allow the user to copy the log & xml files from the sensor node to a local PC directory.

1   If the NCT application is not running then start it up and select the COM1 port. Note that a COM port connection is not required to copy the sensor node log files.

2   Select the Tools->Copy Sensor Node Log Files… menu item which should display the Sensor Logs Form shown in Figure 18.
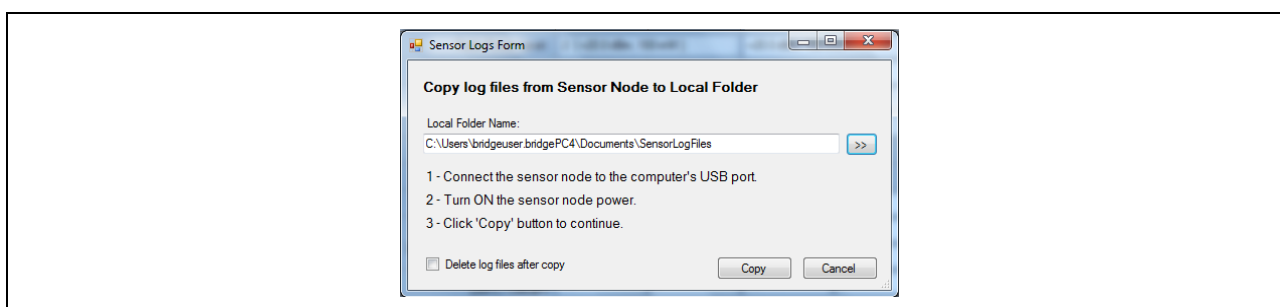
Figure 18   Copy Sensor Logs Dialog

3   Connect the sensor node to the PC USB port and turn ON the sensor node power.

4   If the Local Folder Name text box does not contain a folder name you can either type one in or use the Browse button to create a new folder or select an existing folder.

5   Check the 'Delete log files after copy' if you want to delete the log files on the sensor node after they are copied.

6   Click the 'Copy' button to continue.

7   If a connection is made to the sensor node USB port, the dialog seen in Figure 19 is shown.

8   When the copy is complete the dialog seen in Figure 20 is shown.

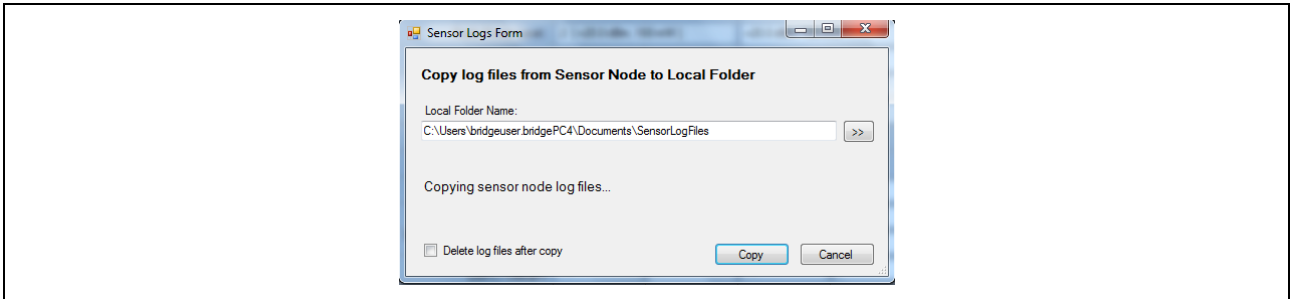9   Turn OFF the sensor node power, remove the USB cable from the PC, and click on the 'Done' button to exit.
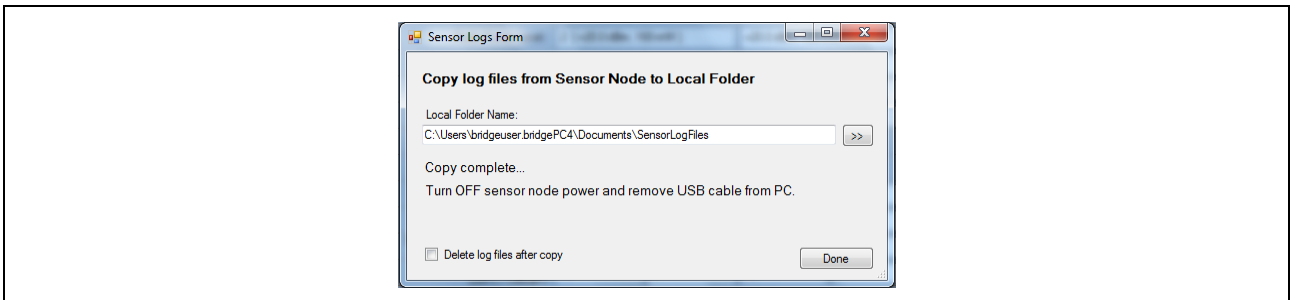
Figure 19   Copying Sensor Node Log Files Dialog

Figure 20   Copy Complete dialog

8 NCT GRAPHICAL USER INTERFACE

This section describes the features of the NCT in detail.

8.1 MAIN SCREEN

The Main Screen of the Node Configuration Tool (NCT) is shown in Factory Mode and in Customer Mode in Figure 21. The Main Screen consists of a Title Bar, Menu Bar, Configuration Tool, and a Status Bar.

Factory Mode   Customer Mode
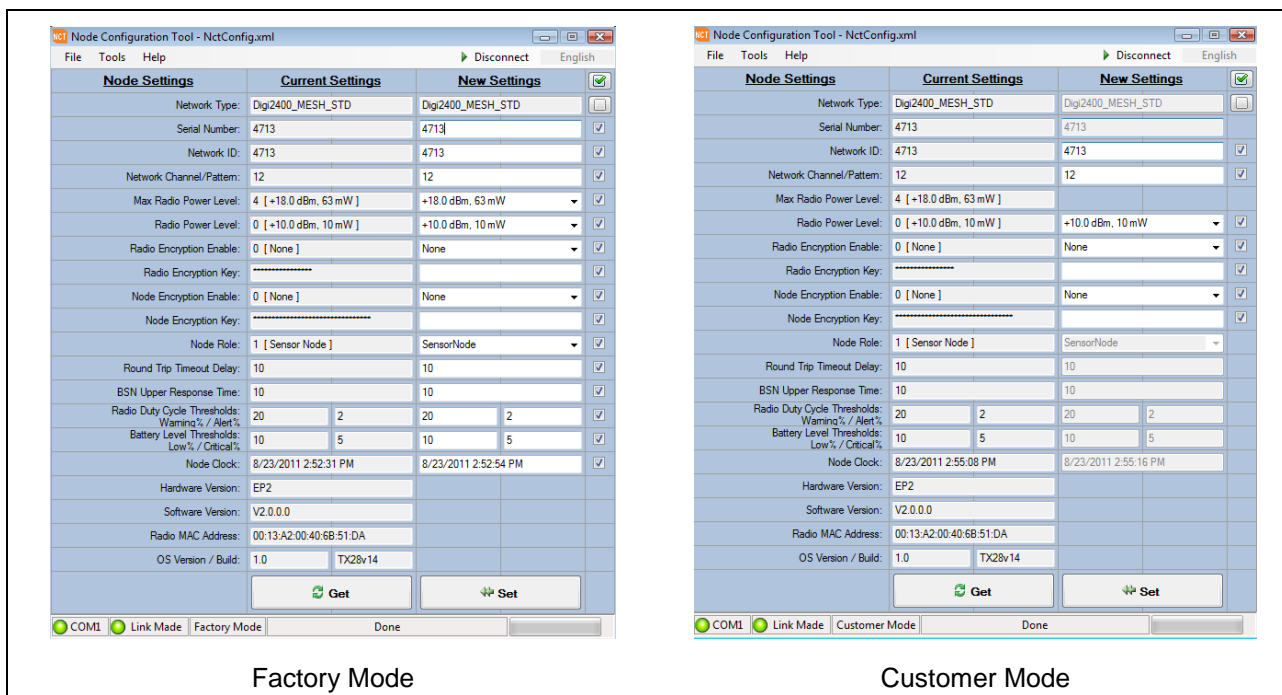
Figure 21   NCT Main Screen

8.1.1 TITLE BAR

The Title Bar is located at the top of the Main Screen and contains the application name (Node Configuration Tool) and the name of the configuration file that is currently loaded (NctConfig.xml in the sample screen shot).

8.1.2 MENU BAR

The Menu Bar is located directly beneath the Title Bar and give access to the File, Tools, and Help menus.

8.1.2.1 FILE MENU

The File Menu shown in Figure 22, provides a menu to open and save NCT configuration files. The various items shown in the File menu are given in TABLE 1 below.
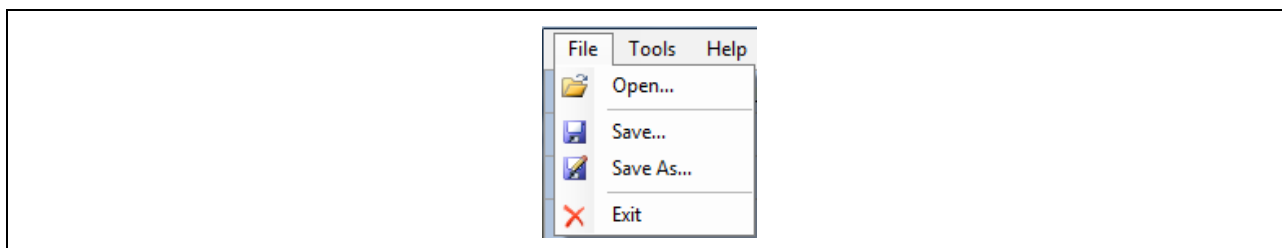
Figure 22   File Menu

TABLE 1. FILE MENU ITEMS	
Open	The 'Open' menu item is used to load a previously saved NCT configuration file. The settings information contained in the configuration file are loaded into New Settings column.
Save	The 'Save' menu item is used to save a NCT configuration file. A configuration file can be used to save information that may be written to several sensor nodes that will be part of a network. The data contained in the New Settings column is written to the filename selected by the user.
Save As	The 'Save As' menu item is used to save NCT configuration settings to a different file name. The file name of the saved configuration file is then displayed in the main form title bar.
Exit	The 'Exit' menu item is used to close the NCT application.

8.1.2.2 TOOLS MENU

The 'Tools' menu, shown in Figure 23, provides a menu of various tools that are provided by the application. The various items shown in the Tools menu are given in TABLE 2 below.
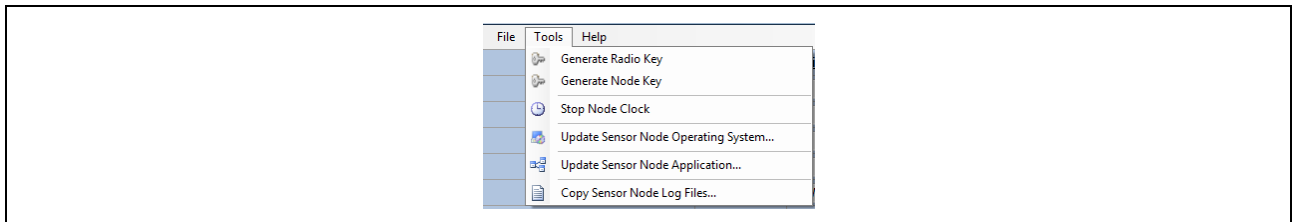
Figure 23　　Tools Menu

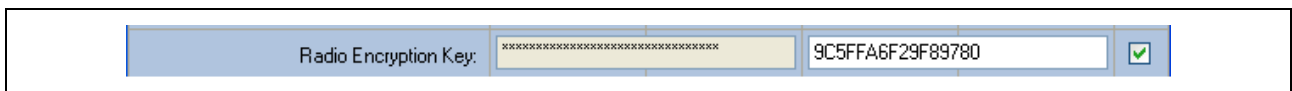| TABLE 2. TOOLS MENU ITEMS	
Generate Radio Key	This menu item is used to automatically generate an AES-128 encryption key and insert the value into the Radio Encryption Key field in the New Settings column as seen in Figure 24.
Generate Node Key	This menu item is used to automatically generate a FIPS encryption key and insert the value into the Node Encryption Key field in the New Settings column.
Stop Node Clock	This menu item is used to start/stop the date-time updates in the Node Clock field in the New Settings column.
Update Sensor Node Operating System	This menu item is used to launch a manufacturing tool that allows you to update the sensor node Windows CE Operating System software. Refer to section 5 for details on how to update the sensor node operating system.
Update Sensor Node Application	This menu item is used to launch a GUI tool that allows you to update the sensor node application software.
Copy Sensor Node Log Files	This menu item is used to launch a GUI tool that allows you to copy the sensor node log files to a local directory on the PC. Refer to section 7 for details on how to copy the sensor node log files.

Figure 24　　Radio Key

8.1.2.3 HELP MENU

The 'Help' menu shown in Figure 25provides an About menu item to view information about the NCT application. See TABLE 3 below.
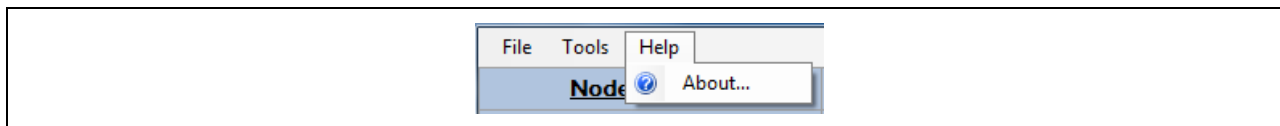

Figure 25	Help Menu

TABLE 3. TOOLS MENU ITEMS	
About	The 'About' menu item is used to display information about the NCT application. The About dialog is shown in Figure 26.

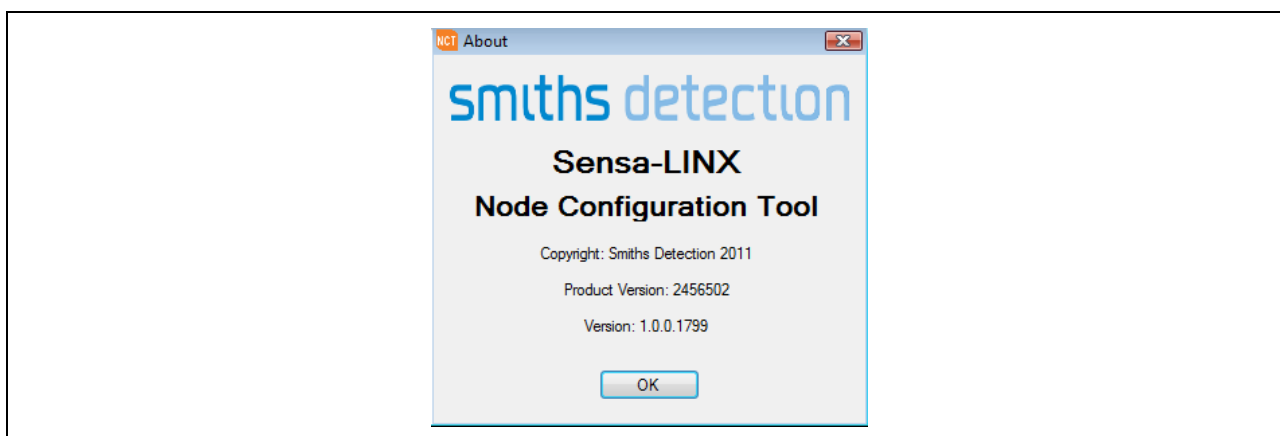| Figure 26	About Dialog

8.1.3 CONFIGURATION TOOL

The Configuration Tool area is below the menu bar and is used to get the current settings from the sensor node and set new settings into the sensor node. The main components of the tool are explained in TABLE 4 below.

TABLE 4. CONFIGURATION TOOL COMPONENTS	
Current Settings Column	The "Current Settings" column lists the decimal and string values of the settings that are currently set in the connected sensor node. These settings are automatically updated when a link is made to a sensor node. These settings can be refreshed by clicking on the 'Get' button.
New Settings Column	The "New Settings" column allows the user to enter the new settings data that will be sent to the attached sensor node. These settings are sent to the sensor node using the 'Set' button.
New Settings Check Boxes	The "New Settings Check Boxes" are to the right of the new settings column. These check boxes allow the user to select which settings to update. The state of the check boxes is saved to the configuration file so that they will be restored when the configuration opened.
Check All Button	This button has a checked check box icon and is used to check all of the New Settings Check Boxes.
Uncheck All Button	This button has an unchecked check box icon and is used to uncheck all of the New Settings Check Boxes.
Get Button	This button is used to refresh the current settings from the connected

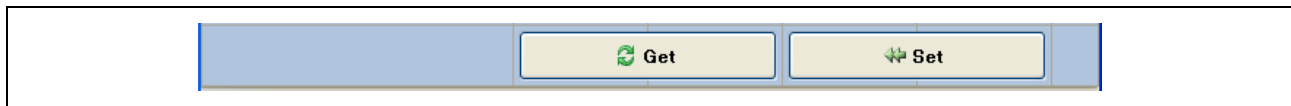|	
	sensor node. See Figure 27.
Set Button	This button is used to send the new settings to the connected sensor node. See Figure 27.

Figure 27   Get and Set Buttons

8.1.4   STATUS BAR

The Status Bar is located at the bottom of the main screen and contains a number of indicators to display the status of various parts of the Sensa-LINX System. The displays and indications are explained in TABLE 5 below*.*

TABLE 5. STATUS BAR DISPLAYS AND INDICATIONS	
COM Port Status Indicator	This status area displays a green LED image plus the name of the COM port that is currently open. The LED is OFF when there is no COM port connection and ON when a connection is made.
Link Status Indicator	This indicator displays a green LED image plus text that indicates the current link status between the NCT and the Sensor Node. If a link has not been established, the LED will be in the OFF and the text displayed is "Link Down". If a link has been established the LED will be ON and the text displayed is "Link Made".
Access Mode Indicator	This indicator displays text that indicates the access mode that the application was installed with. There are three possible access modes: Factory, Developer, and Customer.
Program Status Indicator	This indicator displays the current NCT program status.
Get/Set Progress Bar	This indicator displays the progress of the Get and Set operations.

9   INSTALLATION OF NCT

The NCT is pre-installed on any Command and Control (C2) computer delivered as part of a Sensa-Linx system. If it is required to install the NCT on any other computer, follow the procedure described below.

9.1   SETUP OF ACTIVE SYNC ON WINDOWS XP

To run the *"Update Sensor Node Application"* and "*Copy Sensor Node Log Files*" tools on the NCT, ActiveSync must be installed on Windows XP computers.

9.1.1   ACTIVESYNC INSTALLATION FOR WINDOWS XP

The following instructions are for the installation and setup of ActiveSync on a Windows XP computer.

1   Connect the XP computer to the Internet and download ActiveSync 4.5 or greater from a Microsoft web page.

2   Run the setup program and accept the default settings.

3   If the setup is successful, connect a sensor node to the computers USB port and turn on the sensor node power.

4   Open up the "*MyComputer*" windows application. A Mobile Device icon should appear after about 30 seconds under the *Other* label.

5   If the icon appears, the installation is complete and the NCT is ready to use. See section 9.3 for instructions on installing the NCT software.

9.2   SETUP OF MOBILE MEDIA CENTER ON VISTA AND W7

To run the *"Update Sensor Node Application"* and "*Copy Sensor Node Log Files*" tools on the NCT, Windows Mobile Media Center must be installed on Windows Vista and Windows 7 computers.

9.2.1   WINDOWS MOBILE MEDIA CENTER INSTALLATION FOR WINDOWS VISTA AND WINDOWS 7

The following are the installation and setup instructions of Windows Mobile Media Center (WMMC) on a Windows Vista or Windows 7 computer.

1   Connect the computer to the Internet.

2   Connect a sensor node to the computers USB port and turn on the sensor node power.

3   If WMMC is not installed, Windows will automatically install it for you via the Internet connection.

4   If the installation completes successfully, open up the "*Computer*" windows application. A Windows CE icon should appear after about 30 seconds under the *Portable Devices* label.

5   If the Windows CE icon appears, the installation is complete and the NCT is ready to use. See section 9.3 for instructions on installing the NCT software.

9.3   NCT SOFTWARE INSTALLATION

The NCT software and the Manufacturing tools required to update the sensor node OS are installed as part of the Sensa-LINX Installer. Refer to "Uninstalling Sensa-LINX C2 and NCT" section in the main document for uninstalling NCT software.

Notes:
- **Before installing the NCT software, make sure that that you have performed the steps in sections 9.1 or 9.2 for the operating system on the computer where NCT will be installed.**

- **Administrator privileges are required to install the NCT software. If you are logged in as a user you will be required to enter in the Administrator password to run the installer.**

To install the NCT software perform the following steps:

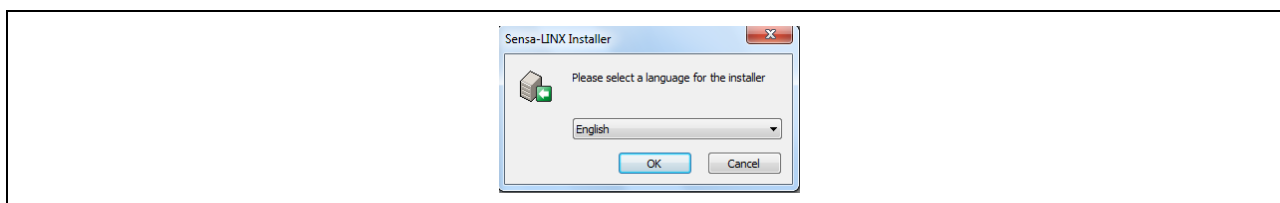1   Run the Sensa-LINX setup program, select a language for the installer, and click the Next button.

Figure 28   Installer language select dialog

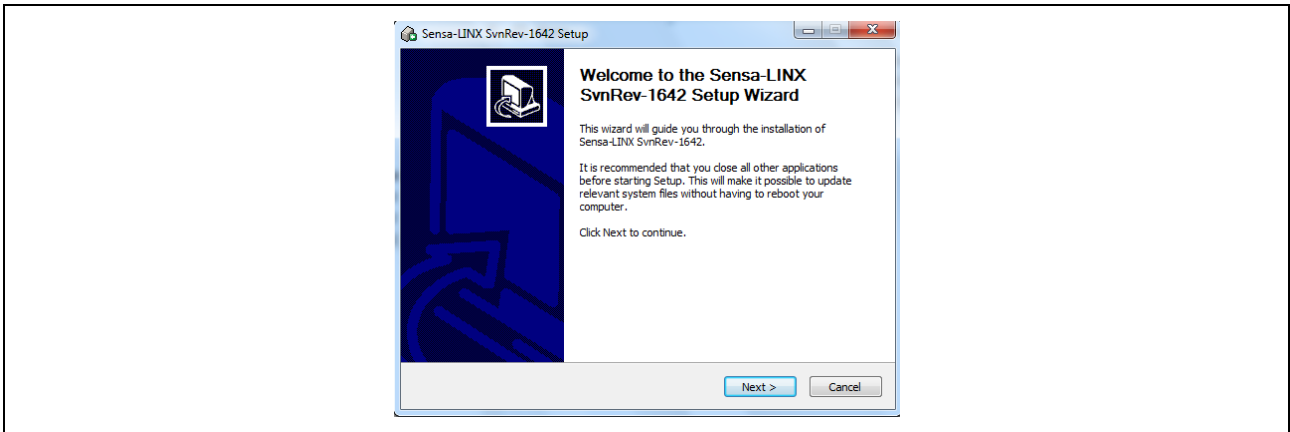2   When the Welcome screen is shown, click on Next to continue.

Figure 29   Installer welcome dialog

3   Read the license agreement. If you do not agree with all of the terms then click the Cancel button.   If you agree with the terms then check the "I accept the terms of the License Agreement" check box. Click on the Next button to continue the installation.
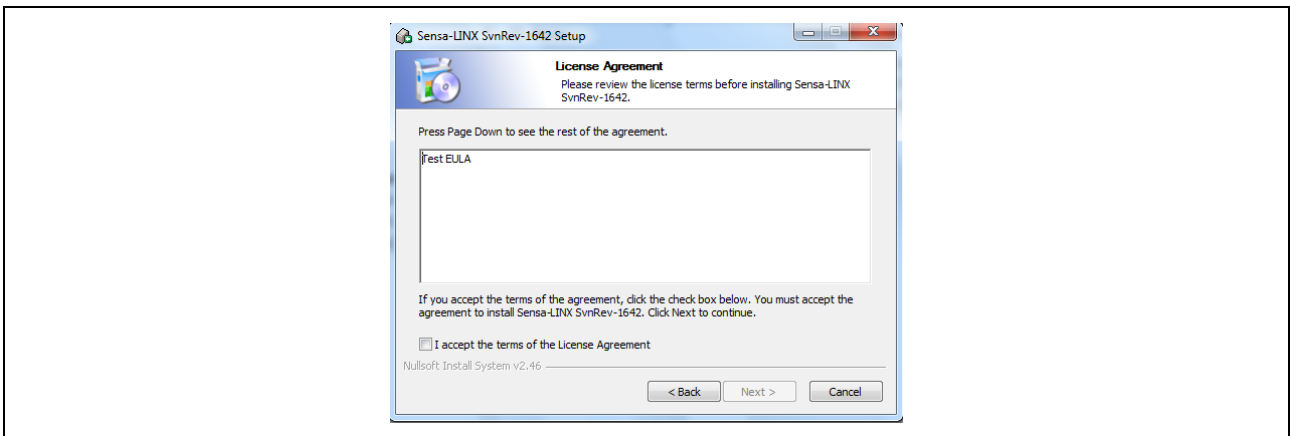

Figure 30   Installer license agreement dialog

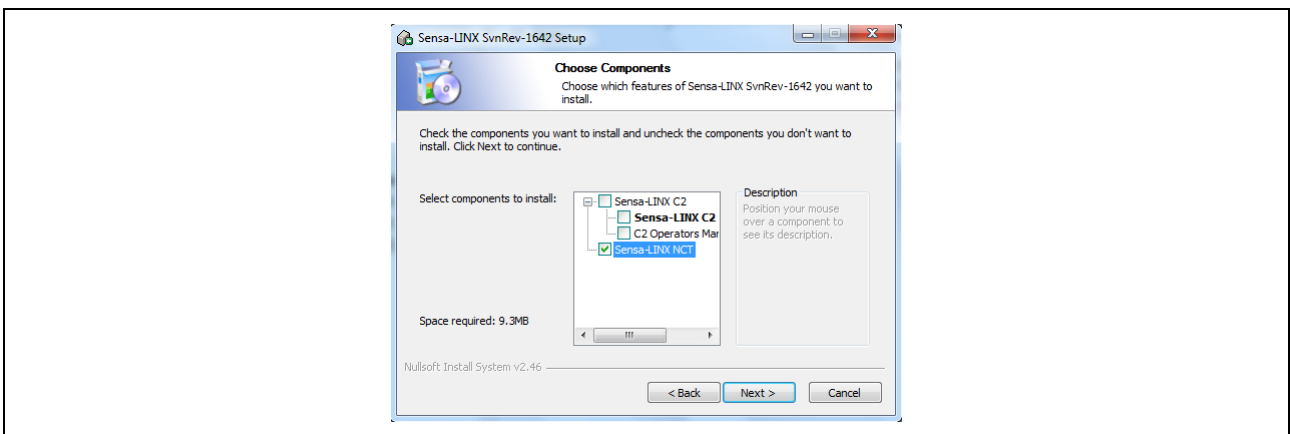4   On the choose components screen, check the Sensa-LINX NCT check box and click the Next button.

Figure 31   Installer choose components dialog

5   On the Choose Install Location screen, either accept the default folder or Browse to your preferred folder. Click the Next button to continue.
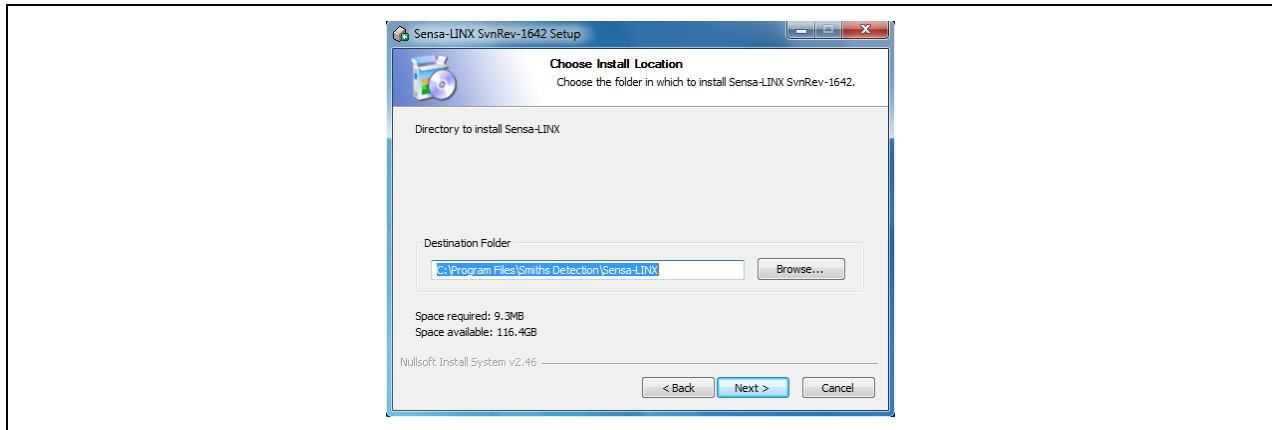

Figure 32   Installer choose install location dialog

6   On the Choose Start Menu Folder screen, either accept the default or select a new start menu folder. Click the Install button to continue.
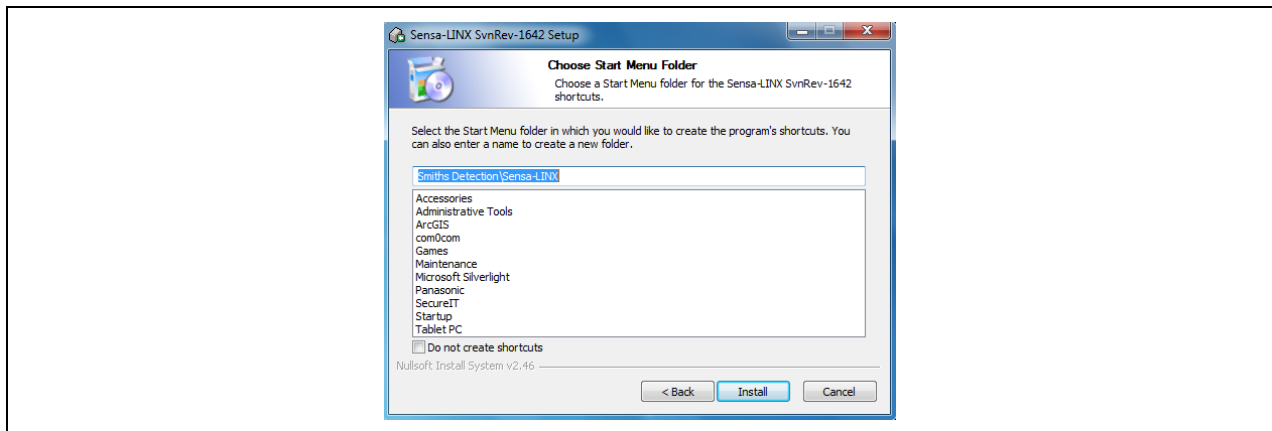

Figure 33   Installer start menu folder dialog

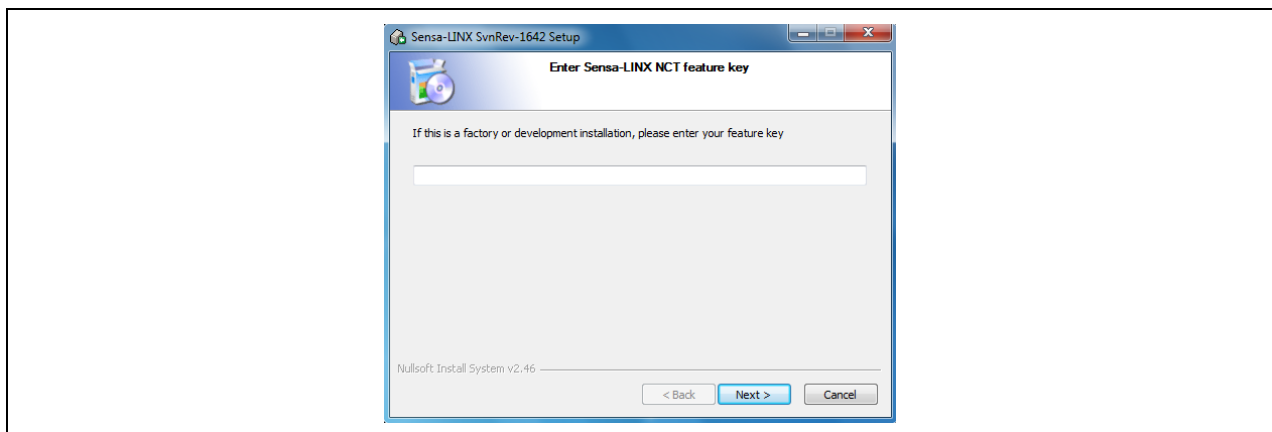7   On the feature key this field should be left blank. Click the Next button to continue.

Figure 34   Installer key option dialog

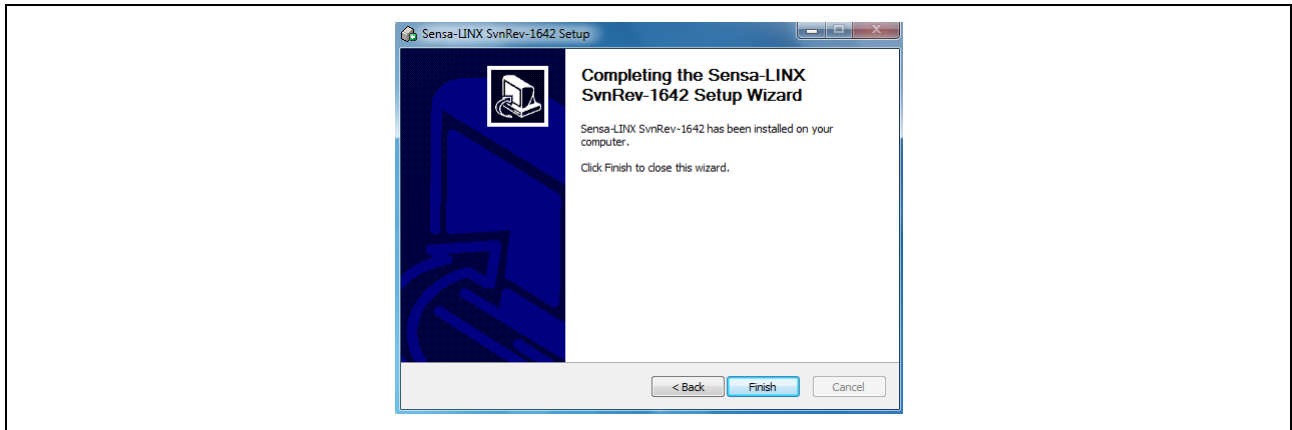8   Click the Finish button to exit the installer

Figure 35   Installer setup complete dialog

9.4   *CONFIGURING THE MANUFACTURING TOOL*

This section describes the steps needed to configure the Manufacturing Tool. This configuration has to be completed each time it is installed on a computer. However this configuration is only required if you are going to use the NCT to load a new OS, load new software or download data log files. If you are only going to use the tool to configure sensor node parameters then the remaining steps can be omitted.

1   From the main screen of the MfgTool, select the Options→Configuration menu item. The dialog shown in Figure 36 will be displayed
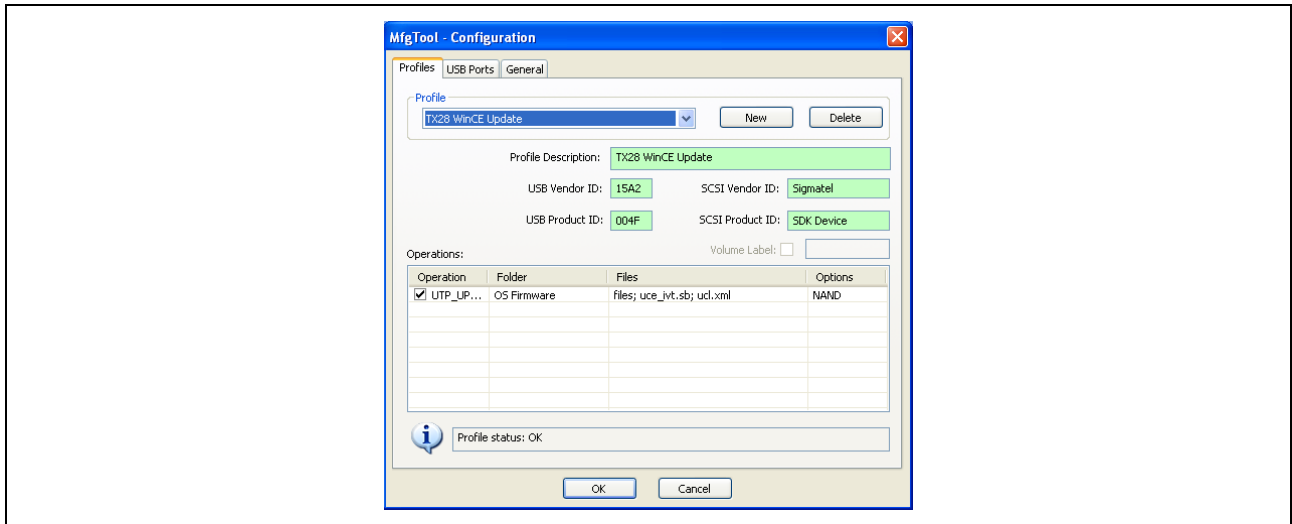

Figure 36   MfgTool Configuration Dialog

2   Select the 'USB Ports' tab and select a Hub and Port to use as shown in Figure 37. Refer to paragraph 9.4.1 for detailed instructions on how to set up the USB ports.
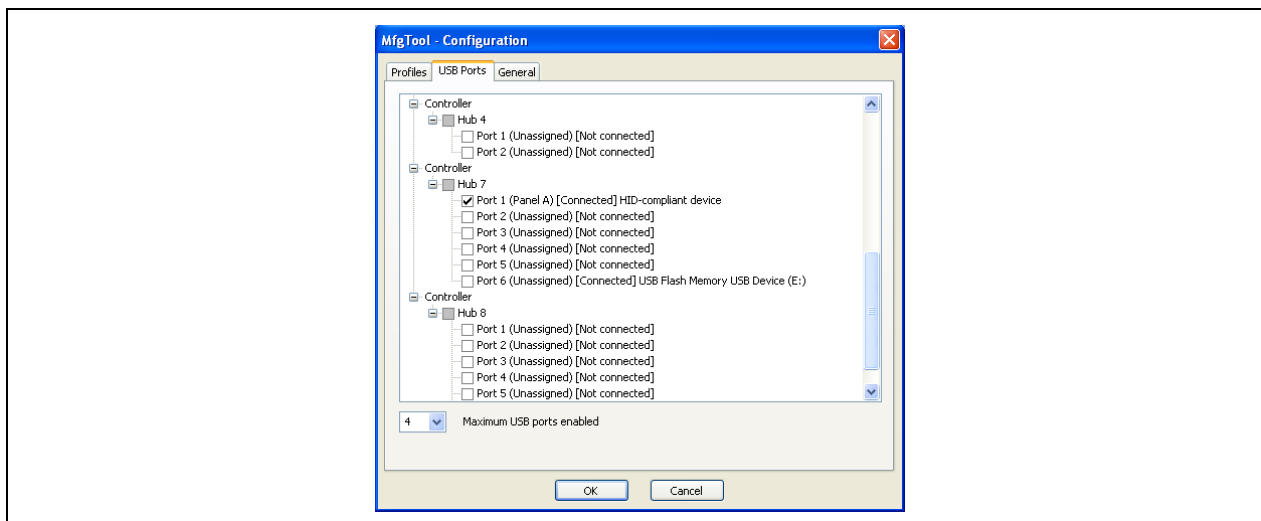
Figure 37   MfgTool USB Ports Dialog

3   Select a Port number as shown in Figure 37.

4   Click on the OK button and return to the Reprogramming Procedure.

9.4.1   **USB PORTS TAB**

Within the USB Ports tab, a visual representation of all the USB ports on the system is displayed. When any USB device is attached to the computer, the device description will appear next to the port node, and it will indicate *Connected*.

Up to sixteen (16) physical ports can be assigned for use during the manufacturing process. Use the Maximum USB Ports control in the lower left portion of the window to define the maximum number of USB ports to be used.

While selecting ports, after the maximum defined ports are selected, the rest of the checkboxes will gray out indicating that no more ports are available. The Panels are assigned in alphabetical order. Given that all Panels are unassigned, the first USB port checked will be assigned to Panel A, the second port checked will be assigned to Panel B, etc. If some Panels are already assigned, the next checked port will be assigned to the first available Panel alphabetically.
Select the physical ports that are to be used during the manufacturing process. When a port is selected, the name of the associated (assigned) Panel will appear next to the port node. The operation panels (A, B, C, and D) in the main application window correspond to the four physically assigned ports shown in Figure 37.

Do not add or remove USB hubs from the system once the Operations Panels are assigned to USB ports.

It is recommended that the user label each of the physical hub ports with the corresponding Panel letter to facilitate the cycling of devices though the process.

The Start button in the main application window will not be enabled unless at least one USB port is assigned to a panel.

Note: For more detailed information on setting up the USB ports, refer to the Freescale Manufacturing Tool User Manual that is installed as part of the NCT installation.

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