Guide to Operations

Ultra-Low Temperature
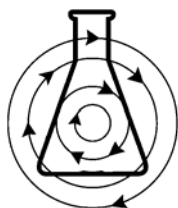**Freezers**
innova® **Range**

(with vacuum insulation panel technology)

MANUAL No. M1288-0070
Revision E
October 29, 2007

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⚠️ *CAUTION!*
**This equipment *must* be operated as described in this manual.
If operational guidelines are not followed, equipment damage and
personal injury *can* occur.**

Please read the entire User's Guide before attempting to use this unit.

HEALTH AND SAFETY AT WORK ACT 1974

(FOR THE UNITED KINGDOM)

New Brunswick Scientific, as manufacturers and suppliers of laboratory equipment, are obliged under the terms of the above Act to provide our users with instructions on the safe installation, operation and maintenance of our equipment.

Our equipment is designed to acceptable standards and does not entail any hazard if used, as advised in the attached instructions.

The following safety precautions should be observed by all personnel using this equipment:

1. Read and understand this manual. If in doubt, contact one of the New Brunswick Scientific Companies listed.

2. Do not remove any covers. There are no operable controls other than those referred to in this manual. There are voltages in excess of 41.5 volts AC behind the covers.

3. Use freezer gloves at all times when loading or unloading the equipment. The temperature of operation is such that direct contact with the cold contents or inside the equipment can burn unprotected skin.

4. Observe good housekeeping practices, at all times keeping the equipment and the adjacent areas clean, dry and uncluttered.

5. Should any malfunctions occur or be suspected, immediately call a qualified service engineer to investigate.

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Disclaimer Notice

New Brunswick Scientific Co., Inc. reserves the right to change
information in this document without notice. Updates to information in
this document reflect our commitment to continuing product
development and improvement.

Manual Conventions

NOTE: **Notes contain essential information that deserves special attention.**

CAUTION!   ***Caution* messages appear before procedures which, if caution is not observed, could result in damage to the equipment.**

WARNING!   ***Warning* messages alert you to specific procedures or practices which, if not followed correctly, could result in serious personal injury.**

Bold   **Text in boldface type emphasizes key words or phrases.**

New Brunswick Scientific

DECLARATION OF CONFORMITY

New Brunswick Scientific, hereby declares that the product(s) listed below conform to the European Union directives and standards identified in this declaration.

Product(s)

Innova U101	Innova U725
Innova U360	Innova C585
Innova U535	Innova C760

EU Directive(s)

CE Marked (93/68/EEC)
Low Voltage (73/23/EEC Amendment 93/68/EEC)
Electromagnetic Compatibility EMC (2004/108/EC)
Conducted/Radiated Emissions (FCC Part 15 Class B)

Standard(s)

Low Voltage EN61010-1 First Edition
EMC EN61326 : 1997 A1, A2

The conformity assessment documents are held at the following facility:

NBS Cryo Research Ltd.
Woodrolfe Road
Tollesbury, Essex
CM9-8SE
United Kingdom

United Kingdom

08/21/07

Executive Design Engineer   Date

WARRANTY

Every instrument manufactured by New Brunswick Scientific Co., Inc. is warranted to be free from defects in material and workmanship. In the USA, this apparatus, with the exception of lamps (where supplied), is warranted for 2 years (including labor) against faulty components and assembly; and our obligation under this warranty is limited to repairing or replacing the instrument or part thereof which shall, within 2 years after date of shipment, prove to be defective after our examination. Component parts are warranted for 3 additional years (excluding labor). Vacuum Insulation Panels (where present) are warranted for a total of 12 years. This warranty does not extend to any NBS products which have been subjected to misuse, neglect, accident or improper installation or application; nor shall it extend to products which have been repaired or altered outside the NBS factory or its authorized service centers without prior authorization from the New Brunswick Scientific Co., Inc.

❋ ❋ ❋

Outside the USA, contact your NBS representative for warranty details.

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1   INSPECTION & UNPACKING OF EQUIPMENT

1.1   Inspection of Boxes/Packaging

After you have received your order from New Brunswick Scientific, inspect the boxes/packaging carefully for any damage that may have occurred during shipping. Report any damage immediately to the carrier and to your local NBS Sales Order Department.

1.2   Packing List Verification

Unpack your order, saving the packing materials for possible future use. Also be sure to save the User Manual, for instruction and reference.

Verify against your NBS packing list that you have received the correct materials, and that nothing is missing.

If any part of your order was damaged in transit, is missing, or fails to operate, please fill out Customer Satisfaction Form 6300 and return it by fax or mail. You can also call the New Brunswick Scientific Service Department or your local NBS representative.

⚠️ *CAUTION!*
Inspect the freezer cabinet panels for punctures or other damage that could compromise the integrity of the freezer.

Any unauthorized punctures or other damage deliberately made to the cabinet walls will invalidate the warranty.

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2 INTRODUCTION/OVERVIEW

This manual provides the user with the necessary information for installation and operation of the Innova® ultra-low temperature freezer line utlizing vacuum insulation panel technology. It also provides some preliminary user maintenance information.

2.1 Description of Equipment

The New Brunswick Scientific Innova range of vacuum insulation panel freezers is designed to provide precise, ultra-low temperature environments for scientific and medical use. They are designed to provide optimal ultra-low temperature sample storage from -50°C to -86°C

⚠ **CAUTION!**
Vacuum insulation panel technology is used in the construction of these freezers. The panels are mounted in the cavity against the steel outer wall of the freezer. Any drilling or puncture of the outer wall could release the vacuum from the panel, possibly impairing freezer performance.

There are two types of Innova freezer: Upright (*see Figure 1*) and Chest models. This manual covers all versions of the Innova freezer models:

Table 1: Innova Freezer Models

Upright Freezer Model	Capacity
U101	Not Yet Available
U360	12.7 cubic feet (360 liters)
U535	Not Yet Available
U725	Not Yet Available
Chest Freezer Model	**Capacity**
C585	Not Yet Available
C760	Not Yet Available

The freezers are manufactured using high quality steel and electronics for long life. The cabinets are insulated with a combination of foamed-in-place polyurethane foam and vacuum insulation panels. This combination ensures the best insulation properties while maintaining an extra large internal capacity for the footprint of the freezer. The Innova freezers have many features designed to provide ease of use and maintenence, security and reliability to your ultra-low temperature storage needs. They are built to stringent regulatory requirements for safety and environmental friendliness and disposability, and they are CE registered.

- A large, ergonomically located, backlit LCD display provides all operational information about the freezer including temperature and setpoint info, on-screen messaging, programmable alarms, data graphing and even help information.

- Upright models utilize gasketed and insulated inner doors to reduce cold air loss and recovery times, reduce internal temperature fluctuations and conserve energy. Chest models utilize insulated covers to reduce internal temperature fluctuations and conserve energy.

- The freezers utilize vacuum insulation panel technology, reducing the cabinet wall thickness while maintaining superb insulation characteristics to provide the largest internal volume per floor space used.

- The freezer's compressor housing is specially designed to reduce running noise levels.

- The freezers are supplied with a heated vacuum release port that not only provides rapid re-opening of the outer door, but also provides a plunger to maintain an open port.

- All interior panels and shelves are made of high grade corrosion-resistant stainless steel, making them durable and easy to keep clean and sterilize.

- The freezers are totally free of CFCs (Chlorofluorocarbons) and HCFCs (Hydrochlorofluorocarbons). They use HFCs (Hydrofluorocarbons) as refrigerants.

- All models are supplied on heavy duty castors for easy installation and relocation (the model U101 has rear rollers and adjustable front legs)

- The freezers are provided with two access ports for the addition of back-up systems or sensors that can provide cooling protection for your samples in the case of a power outage or other system failure.

- The freezers are provided with an external alarm contact that can be used to connect to an external monitoring device or system.

- The freezers can be fitted with an optional 7-day circular chart recorder to provide independent temperature recording.

- All models have lockable handles, with an option for a padlock adaptor, to provide sample security. The microprocessor-controlled system can also be protected from inadvertent programming changes through the use of passwords and user IDs.

Figure 1: Model U360 Upright Freezer—Side & Front Views
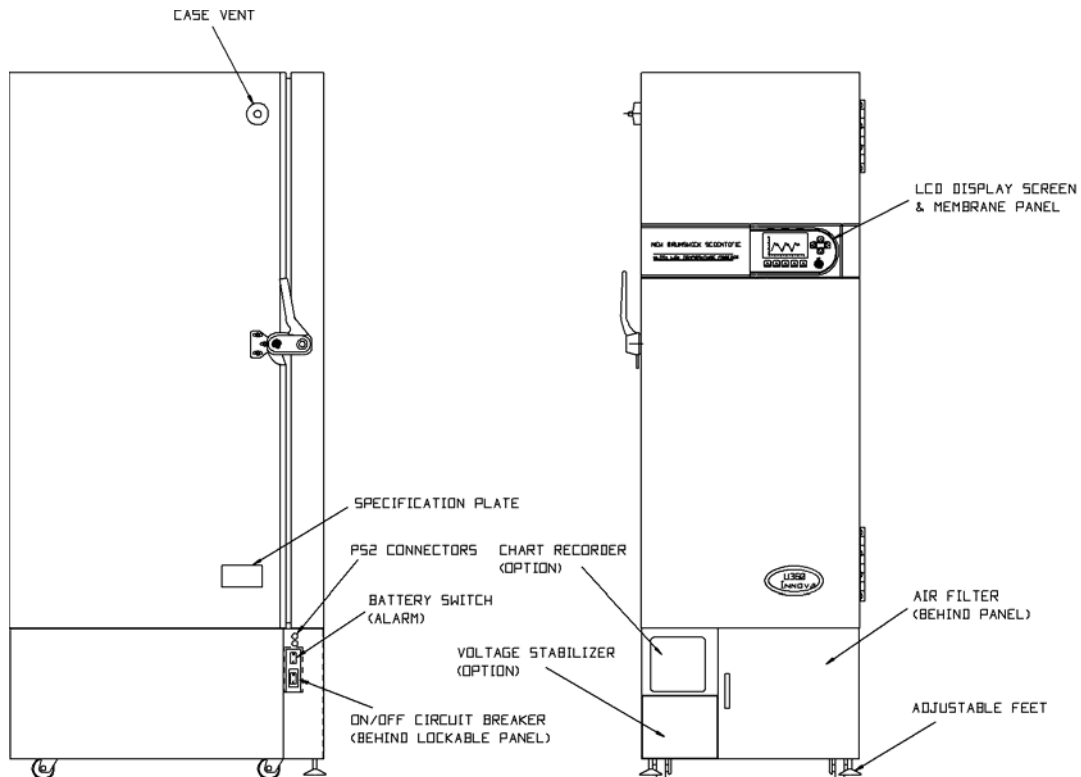
2.1.1   Freezer Handles

The freezers are supplied with lockable handles. The U101, C585 and C760 models are fitted with quarter turn key locks. The U360, U535 and U725 upright freezer handles are fitted with push-barrel locks (push in & turn to lock, turn key to unlock).

An optional padlock adaptor can provide extra security by allowing the addition of a customer-supplied padlock to secure the freezer handle.

✎ NOTE:

NEVER SLAM ANY FREEZER'S DOOR/LID, particularly with the handle in the closed position.   The door handles have a cam action to pull the door/lid closed. When closing the outer door/lid, ensure that the cam is engaged for correct operation. The initial vacuum inside the cabinet may cause the door to appear closed, but when the vacuum releases, the door may open. Always ensure the handle is properly engaged.

2.1.2   Voltage Stabilizer

Certain freezer models have the option of being fitted with an automatic voltage stabilizer. See Section 4.12 for details.

3   INSTALLATION & SETUP

⚡ *WARNING!*
  DO NOT attempt to lift any freezer by hand. Preferred lifting for loading and unloading is by hydraulic lift.

⚠ *CAUTION!*
Maintenance, adjustment and repair work should be carried out only by QUALIFIED, EXPERIENCED personnel who have been AUTHORIZED to undertake such work by New Brunswick Scientific or its authorized agents.

  Failure to use authorized service agents may invalidate the warranty.

3.1   Setup Guide

The following is a quick-start guide to setting up the freezer. More detailed information is presented in subsequent sections to clarify the process.

1. Unpack the freezer and remove it from its packing pallet.
2. Place the freezer in its designated location.
3. Remove the contents from the inside of the freezer.
4. Unwrap and install the shelves (if provided).
5. Install the power cord and lock it in place.
6. Install the keys in the door lock and the power switch cover lock.
7. Plug the unit into the power supply and turn the unit on.
8. Set the time, date and set temperatures (*see Section 4.3.1*).
9. Wait until the unit has reached its setpoint temperature before placing anything inside the freezer.

3.2   Physical Location

All freezers are mounted on castors for ease of movement. Upright freezers have feet that provide both a leveling feature and a locking feature to stop the freezer from rolling once it is in place.

Chest freezers have locking front castors; these do not provide leveling adjustment, so the site chosen for the freezer must have a flat, level floor.

Position the freezer to allow free air entry through the intake grille and free air exit from the back; a clearance of at least 6 inches (150 mm) on all sides is recommended to prevent heat build-up in the compressor housing. The grille is located on the front of both chest and upright models (*see Figure 1*). On upright models, the grille is located behind the lower right front panel of the compressor housing.

For efficient temperature control, the freezer should be placed in a shaded area, away from sources of excessive heat. For maximum cooling capability, the unit should be located in an air-conditioned room.

3.3   Shelf Installation

Chest model C585 and C760 freezers cannot be fitted with shelves. The upright model U101 freezer is factory-fitted with one fixed shelf.

Upright models U360, U535 and U725 have two adjustable shelves. These can be positioned in 12.7 mm steps anywhere throughout the freezer. But to effectively utilize racks within the freezer, be sure to position them so that each shelf is aligned with the bottom of each inner door.

To install the shelves (model U360, U535, & U725 only):

1. To protect yourself, make sure the freezer is turned off and unplugged.
2. Remove the protective plastic coating from the shelf.
3. Position the four shelf clips evenly within the freezer by squeezing the clip, then inserting it into the shelf support within the freezer.
4. Place the shelf in the freezer, making sure all four shelf clips are supporting the weight of the shelf.

To readjust the shelf or shelf clips, gently squeeze the shelf clip to release it from the side of the freezer, then reposition it as needed.

3.4   Connecting to the Power Supply

⚠ **CAUTION!**
BEFORE connecting the freezer to the electrical supply, make sure that the power supply matches the requirements of the equipment. Check the specification plate (located on the side of the freezer) for the freezer's electrical requirements.

3.4.1 Installing the Power Cord

Once you have verified that the power supply matches the electrical requirements of the freezer, connect the unit to the power supply using the power cord provided.

⚠️ *CAUTION!*
If the plug on the power cord does not fit the outlet, or if the freezer's voltage rating does not match your electrical supply, *do not plug the freezer into the power supply*. Contact your laboratory supervisor, safety officer, or qualified service or electrical engineer.

✎ NOTE:
Some freezers are supplied with more than one removable power cord. Utilize the cord that matches your power outlet.

1. Unwrap the power cord(s) provided. If you have more than one, select the correct cord for your facility's power outlet.
2. Install the rectangular end of the cord into the power outlet at the back of the freezer.
3. Fasten the safety clip around the cord by tightening the screw located at the top of the safety clip.
4. Plug the other end of the cord into an appropriately rated power outlet.

3.4.2 Power Switch Operation

The **ON/OFF** circuit breaker power switch is located within the lockable panel (a) at the bottom lefthand corner on models U360, U535 & U725, or (b) at the top righthand side on models U101, C585 & C760. The panel can be removed by turning the key (provided) one quarter turn to the right. The key can be removed to prevent access.

Set the **ON/OFF** power switch to the **I (ON)** position. The display illuminates immediately.

✎ NOTE:
The freezer's compressor will not operate for approximately one minute after connection of the power supply, because there is an automatic delay device in the circuit. Temperature and alarm settings, however, can be adjusted immediately.

3.5   Alarm Activation & Alarm Battery Charging

The equipment is delivered with the audible alarm & alarm battery deactivated. The black battery rocker switch behind the lockable power switch panel activates the alarm system battery. The switch is labelled **I** (**ON**) and **O** (**OFF**).

To activate the audible alarm and to charge the alarm battery, place the battery switch in the **I** (**ON**) position. The alarm system battery will continuously charge when the battery switch is in the **ON** position.

⚠️ *CAUTION!*
Failure to turn on the battery switch may lead to a discharged battery, low battery alarm indication, and/or a disabled alarm system.

The operation of the audible alarm can be verified at any time by pressing and holding the **TEST** button within the **DIAG** menu of the display.   The audible alarm should sound.

✐ NOTE:
When the equipment is first switched on, it will take up to approximately six hours to reach a temperature of -86°C, depending upon the size of the freezer.

3.6   Remote Alarm Socket

The freezer is also fitted with a remote alarm socket *(see Section 4.6 for details)* for connection to an external alarm monitoring system via the provided plug. The remote alarm facility provides voltage-free contacts rated at 1 amp, 24 volts maximum. The socket can be tested by turning off (**O**) the freezer's main power switch or by pressing and holding the **TEST** button within the **DIAG** menu of the display.

✐ NOTE:
In a power failure situation, the alarm socket will operature regardless of the state of the alarm battery or battery switch.

3.7   *Vacuum Effect*

After closing the door or lid of the freezer, following access to the contents, a vacuum may be created by the contraction of the warm air that entered the freezer. Before the door can be opened again, it may be necessary to wait two or three minutes for the vacuum to be released by the vacuum release vent tube. Do not try to force the door or lid.

During the release of the vacuum, a slight hissing may be heard. In order to minimize vacuum formation, the vent contains a heater assembly to prevent ice buildup inside the vent tube and has a spring-loaded plunger to clear ice from the internal opening of the vent.

✎ NOTE:

Be careful not to place a rack directly against the vent, as this will inhibit the vent/plunger's ability to operate correctly (*see Section 5.1.4*).

4   OPERATION

4.1   Operating Features

Operating controls are located on a membrane panel mounted in the door of upright models U360, U535 and U725. The same panel is located on the righthand side of all chest freezers and the small U101 upright model.

Each Innova freezer is equipped with a sophisticated control system and large, backlit LCD display that not only provides an immediate view of all freezer conditions, but also provides access and display of programmable features, on-screen messaging, alarm functions, service information and even help files (*see Figure 2*).

Figure 2: Operating Controls

DIRECTIONAL KEYPAD

MENU SELECTIONS

MENU KEYPAD
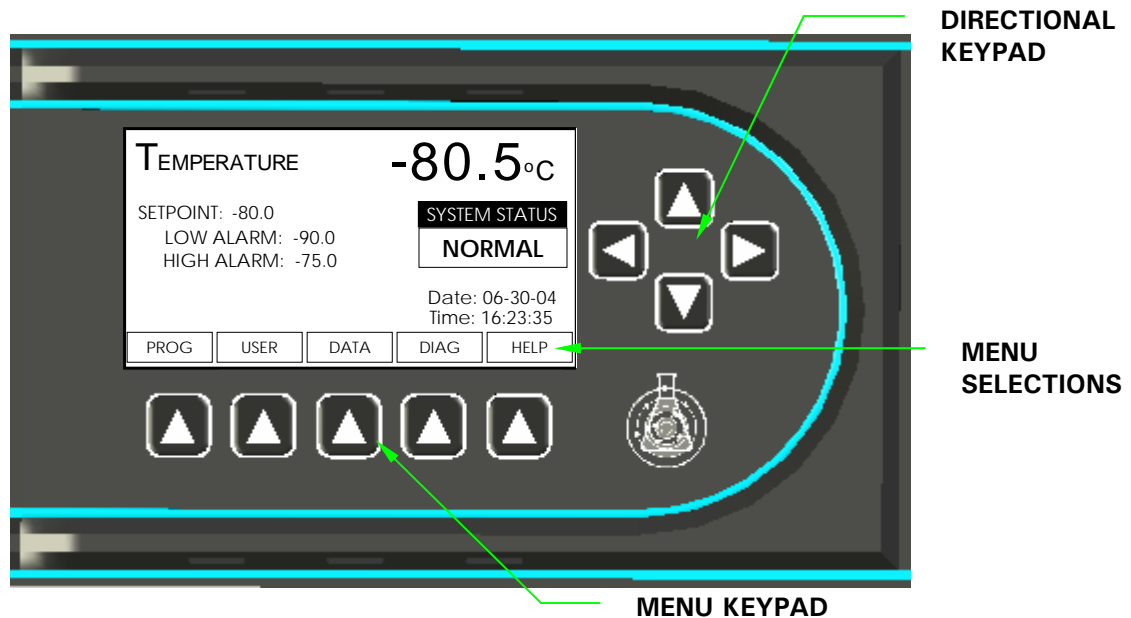
4.2   Operational Controls

All adjustable setpoints and features are controllable through the display touchpad (*see Figure 2*). Four directional keys allow features to be selected or modified while menu keys provide access to specific functions listed at the bottom of the screen. Changes to any menu can be saved by pressing the **SAVE** menu key. The **EXIT** menu key can be pressed to return to the previous menu. If the **EXIT** menu key is pressed prior to pressing the **SAVE** menu key, any changes made within that screen will not be accepted.

4.3   Menu System

The menu system is made up of five main selection catagories, as you can see in Figure 3: **PROG** (programming), **USER** (user-specific information), **DATA** (stored data), **DIAG** (diagnostics) and **HELP**.

Figure 3: Main Screen
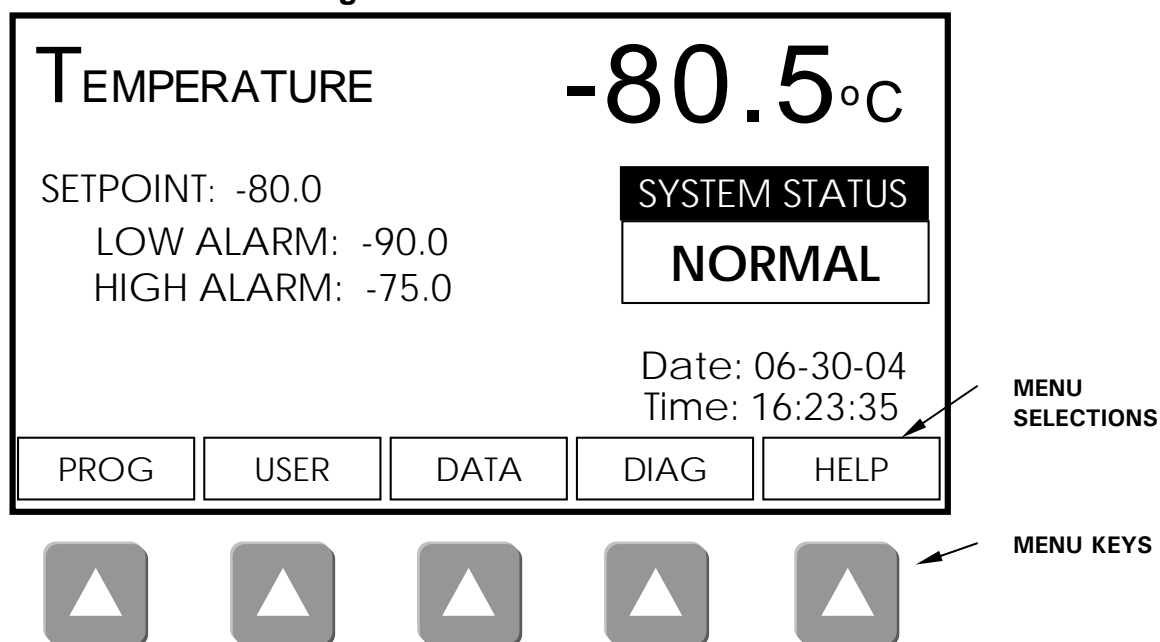
Each menu is accessed by pressing the menu key directly beneath the menu selection label in the display. Table 2 provides a brief description of each category:

Table 2: Main Screen Menu Selections

Menu Selection	Description
PROG	Menu of all setpoint values and access to **ALARMS** and **TIME & DATE** functions.
USER	Menu for entering user security information such as **USER ID** and **PASSWORDS**, and access to **ALARM ACKNOWLEDGEMENT**.
DATA	Menu for access to stored data such as the **ALARM LOG** and temperature graphs.
DIAG	Menu for access to general diagnostic information and to the freezer's engineering mode (**ENG**) .
HELP	Menu for access to general Help files.

4.3.1   Setting Operating Temperature & Alarm Setpoints

The freezer is pre-programmed to an operating setpoint of -80°C. The high and low temperature alarm setpoints are automatically set to five degrees above and below the temperature setpoint whenever you adjust the temperature setpoint. If desired, you can manually adjust higher and lower temperature alarm setpoints; they cannot, however, be set fewer than 5 degrees from the chosen setpoint in either direction. The maximum high and low temperature alarm setpoints are -45°C and -91°C respectively.

1. To adjust the setpoints, press the **PROG** menu key. The display will show the temperature setpoint programming screen:

Figure 4: Setpoint Programming Screen

```
┌─────────────────────────────────────────────┐
│         SETPOINT PROGRAMMING                 │
├─────────────────────────────────────────────┤
│                            ┌──────────────┐  │
│                            │   COLDER     │  │
│                            └──────────────┘  │
│  LOW TEMP ALARM SETPOINT:     -91.0oC        │
│                                              │
│  TEMPERATURE SETPOINT:        -86.0oC        │
│                                              │
│  HIGH TEMP ALARM SETPOINT:    -81.0oC        │
│                            ┌──────────────┐  │
│                            │   WARMER     │  │
│                            └──────────────┘  │
│  ┌────────┐┌────────┐┌────────┐┌──────┐┌─────┐│
│  │ ALARMS ││  TIME  ││  DATE  ││ SAVE ││EXIT ││
│  └────────┘└────────┘└────────┘└──────┘└─────┘│
└─────────────────────────────────────────────┘
```

2. Use the ▲ and ▼ directional keys (*see Figure 2 for reference*) to select the setpoint you wish to adjust.
3. Use the ◄ and ► directional keys to select a value for the setpoint.
4. Press the **SAVE** menu key to store the new settings, or press the **EXIT** menu key to cancel and return to the previous menu <u>without</u> storing the new values.

4.3.2   Checking Temperature Settings

The operating temperature setpoint and high and low temperature alarm setpoints are continuously displayed on the main screen of the display.

4.3.3   Setting Time & Date

The freezer is provided with a microprocessor that measures and displays a 24-hour clock and both US or European style dating. This feature allows for alarms and other critical activities to be time/date-stamped for tracking purposes.

1. To change the Time or Date, from the main menu screen, press the **PROG** menu key.
2. Then press either the **TIME** or **DATE** menu key. The Time/Date editing menu will open.
3. Using the ▲ and ▼ directional keys, select the time or date character positions and modify as desired.
4. Press **SAVE** to save the settings or **EXIT** to return to the previous menu without saving.
5. If you wish to change from U.S. (MM/DD/YY) to European (DD/MM/YY) dating format or vice versa, select the **DATE FORMAT** menu with the ▲ and ▼ directional keys, and modify the format selection using the ◄ and ► directional keys.
6. Press **SAVE** to save your changes.

4.4   Alarm Functions & System Sensors

The freezer is equipped with multiple sensors that monitor and record critical information about the freezer and its environment. Many of these sensors are linked to alarms that can be controlled or modified through the menu system.

The sensors are linked to a sophisticated monitoring system that can identify and advise of multiple alarm conditions, whether they are temperature- or operation-based. The temperature-based alarms warn of any temperature deviations, both inside and outside the freezer cabinet. The operational alarms warn of a malfunction of any of the major components of the system or sensors within the system.

The following is a list of all temperature-based alarms:

- Cabinet temperature high alarm
- Cabinet temperature low alarm
- Ambient temperature high alarm (fixed at 34°C)
- Ambient temperature low alarm (fixed at 10°C)
- Air filter clogged/High condensor temperature alarm
- High cascade condensor temperature alarm

The following is a list of all operational based alarms:

- Door open alarm
- Power failure alarm
- Electrical fault
- Sensor failure
  - Cabinet temperature sensor
  - Ambient temperature sensor
  - Air-Cooled Condensor temperature sensor
  - Cascade Condenser temperature sensor

Each alarm is identified in plain English and displayed on the main screen for the duration of the alarm or fault condition. All alarms, including a time/date stamp of their occurrence, are also stored in the alarm log, found in the **DATA** menu screen.

4.4.1 Modifying Alarm Functions

1. To modify the alarm functions, press the **PROG** menu key, then the **ALARMS** menu key. The alarm programming screen will be displayed:

Figure 5: Alarm Programming Screen

```
┌─────────────────────────────────────────────┐
│            ALARM PROGRAMMING                 │
├─────────────────────────────────────────────┤
│                                              │
│  TEMPERATURE ALARM DELAY:      60 MIN        │
│                                              │
│  DOOR OPEN ALARM DELAY:        1   MIN       │
│                                              │
│  AUDIBLE ALARM MUTE:           30 MIN        │
│                                              │
│  ALARM SOCKET DELAY:           30 MIN        │
│                                              │
│                                              │
│  ┌───────┐┌──────┐┌──────┐┌───────┐┌──────┐ │
│  │ HELP  ││      ││      ││ SAVE  ││ EXIT │ │
│  └───────┘└──────┘└──────┘└───────┘└──────┘ │
└─────────────────────────────────────────────┘
```

2. Using the ▲ and ▼ directional keys, select the alarm function to modify.
3. Use the ◄ and ► directional keys to select among the preset options for each alarm feature. (*Details are provided in Sections 4.4.2 through 4.4.7.*)
4. Press the **SAVE** menu key to save your changes.

4.4.2   Temperature Alarm Delay

When the cabinet temperature is disturbed by opening the door, the temperature fluctuation can inadvertently trigger a high temperature alarm. The **TEMPERATURE ALARM DELAY**, programmable from 5 to 180 minutes, helps prevent false high temperature alarms by delaying the high temperature alarm for a set period of time after the outer door is opened. If the freezer temperature recovers to within the high and low temperature alarm settings during the set delay period, no alarm will be triggered. If the freezer has not recovered within the set delay period, an alarm will be triggered. The subsequent alarm can be muted (*see Section 4.4.6 for details*).

This programmable feature does not affect low temperature alarms, nor will it prevent an alarm in the advent of a temperature fluctuation that is <u>not</u> the result of a door opening (for example, a power failure).

4.4.3   Door Open Alarm Delay

The **DOOR OPEN ALARM DELAY**, programmable from 1 to 10 minutes provides the user with an audible warning that the outer door has not been closed properly, or that the door is being held open for a prolonged period of time. When the outer door is opened, a timer counts down the programmed period of delay, after which the alarm is triggered if the door is still open.

4.4.4   Audible Alarm Mute

The **AUDIBLE ALARM MUTE**, programmable from 5 to 60 minutes, provides the user with a means to delay the audible alarm from re-activating after an audible alarm has been muted.

When an audible alarm is activated, **the alarm can be muted by pressing any directional key when the main screen is displayed**. The audible alarm will then be muted for the programmed delay period before reactivating.

If the alarm condition clears before the delay period is over, the audible alarm will not re-activate and the delay countdown will be cancelled.

4.4.5   Alarm Socket Delay

The **ALARM SOCKET DELAY**, programmable from 5 to 180 minutes, allows you to delay the activation of the alarm monitoring socket during a temperature alarm.

When a temperature alarm is activated, alarm socket activation will be delayed for the programmed period. If the alarm condition is still active after the delay period, the alarm socket will activate (*see Section 4.4.5 for more information*).

In the case of a power failure or any non-temperature-based alarm (e.g., a sensor failure), the alarm socket will activate immediately, and the delay period will be ignored.

4.4.6   Alarm Mute & Acknowledgment

When an alarm occurs, the audible alarm can be muted when the main screen is displayed by pressing any directional key. The alarm log will record the time and date when the alarm was muted, and the alarm will be muted for the selected delay period. The mute function will silence all alarms active at the moment the mute button is pressed.

As an added level of security, alarm acknowledgment can be required. When alarm acknowledgment function is turned on, a **USER ID** will be required to silence the alarm. When an alarm is triggered, any attempt to mute an alarm will cause a **USER ID** selection screen to open. The user will need to enter a **USER ID**, which will automatically be logged in the **ALARM LOG** to identify the person who acknowledged or muted the alarm.

The alarm acknowledgement feature requires at least one **USER ID** to exist in the system. To enter a **USER ID**:

1. Press the **USER** menu key.
2. Use the directional keys to select **USER ID & PASSWORD** from the list and press **SELECT**.
3. To enter a **USER ID**, use the directional arrow keys to select a **USER ID** position on the screen to store the **ID** (any open position can be used), then press **SELECT**.
4. A menu-based alphanumeric selection window will appear. Use the directional arrow keys to select each character and use the **SELECT** key to store each character. Use the ← menu key to delete an entered character or **DELETE** to erase the entire **ID**.
5. When finished, press **SAVE** to store the new **USER ID**, then press **EXIT** to return to the previous screen. *If you press* **EXIT** *before you press* **SAVE**, *your changes will be discarded.*
6. Once entered, the **USER ID** is functional and the **ALARM ACKNOWLEDGMENT** feature is automatically activated.
7. If desired, **ALARM ACKNOWLEDGMENT** can be set to **INACTIVE** in the **USER** menu using the directional keys without deleting any **USER ID**'s.
8. A **USER ID** can be deleted by opening the **USER ID** alphanumeric selection screen and simply pressing the **DELETE** key, then the **SAVE** key.

4.4.7   Setpoint & Security Control

The freezer is delivered with all settings accessible to general users. Changes to the freezer settings can, however, be protected from inadvertent or unauthorized changes. Up to eight user names and passwords can be entered into the system so that only the **specified users with passwords** may make changes to the freezer settings.

1. To activate setpoint and ID security, press the **USER** menu key.
2. Use the directional keys to select **USER ID & PASSWORD** from the list and press **SELECT**.
3. If you wish to enter a **USER ID**, at this point, follow the instructions in Section 4.4.6, Steps 3-5.
4. To require a **PASSWORD** when making any changes to the system settings, scroll the cursor to the password position corresponding to the **USER ID** that requires the password and press **SELECT**.
9. When you press **SELECT**, a menu-based alphanumeric selection window will appear. Use the directional arrow keys to select each character and use the **SELECT** key (*not the* **SAVE** *key*) to store each character. Use the ← menu key to delete an entered character or **DELETE** to erase the entire password. All the characters you choose will appear as ***.
5. When finished, press **SAVE** to store the new **PASSWORD**, then press **EXIT** to return to the previous screen. *If you press* **EXIT** *before you press* **SAVE**, *your changes will be discarded.*
6. Once saved, the password position next to the **USER ID** will be marked as **ACTIVE**. The only way to deactivate a password is to delete it.
7. A **PASSWORD** can be deleted by opening the password alphanumeric selection screen and simply pressing the **DELETE** key, then the **SAVE** key.

If a **USER ID** is entered, **ALARM ACKNOWLEDGEMENT** is automatically activated. If alarm acknowledgment is not required with the use of a password, this feature may be deactivated in the **USER** menu system without affecting password control. Adding or adjusting a **PASSWORD** only will not automatically turn on **ALARM ACKNOWLEDGEMENT**.

Once activated, a single password will lock the entire system and prevent any subsequent changes to system settings, ID's or passwords without the use of a specific password matched to a specific **USER ID**. Each combination of **USER ID** and **PASSWORD** is unique (one **USER ID** cannot use the **PASSWORD** of another **USER ID** to make system changes).

The **USER ID**'s can be viewed at any time. Once a password is set, the **USER SCREEN** is not generally accessible, and can only be accessed by a user who has a valid password. Passwords are never visible to general users. Passwording does not prevent general users from viewing data on the system at any time, including the alarm log.

✎ **NOTE:**

Take care to note your password somewhere. If a password is forgotten, you must contact an NBS customer service representative to recover or delete the forgotten password.

4.5   Audible Alarm Battery Backup

The alarm system is protected by a battery backup system in the case of power and/or system failure. The battery is designed to operate the audible alarm and data recording system for up to 24 hours. When a power failure occurs, with the battery switched on, the power failure audible alarm sounds immediately and the main display shuts off to conserve power.

You can activate the LCD screen by pressing any directional key. When you do, the internal temperature will be displayed on the screen, which will remain on briefly, then shut down again to conserve power. Be sure to take note of the following cautions:

⚠ *CAUTION!*
Frequent operation of the display during a power failure will substantially reduce the life of the alarm battery.

⚠ *CAUTION!*
Opening the freezer door during a power failure will increase the cabinet temperature.

⚠ *CAUTION!*
Failure to turn on the alarm battery switch will disable the audible alarm system and data recording during a power failure.

The alarm battery backup system does <u>not</u> affect the external alarm monitoring socket. The alarm socket is designed to operate regardless of the condition or state of the freezer or alarm battery.

The audible alarm should be checked periodically to verify its function:

1. Press the **DIAG** menu key to enter the diagnostics system.
2. Press and hold the **TEST** menu key for at least 5 seconds.
3. The audible alarm should sound repeatedly.
4. Press the **EXIT** menu key to return to the main screen.

4.6   Alarm Monitoring Socket

The freezers are provided with an alarm monitoring socket at the rear of the freezer and a matching plug for external monitoring purposes. The plug can be connected either to a central monitoring system or to a remote alarm. The configuration of the socket is shown in Figures 6a & 6b.

Within the freezer, the socket is connected to voltage-free contacts rated at 24 volts, 1 amp. In normal operation, pin 1 (*see Figures 6a & 6b*) is connected to pin 2, and in the alarm condition, pin 1 is connected to pin 3.

The alarm socket should be checked periodically to verify its function.

1. Press the **DIAG** menu key to enter the diagnostics system.
2. Press and hold the **TEST** menu key for at least 5 seconds.
3. The alarm socket will switch to its alarm mode.
4. This can be verified by connecting an appropriately rated continuity testing device across the contacts as described in the alarm socket diagrams on the next page.
5. Press the **EXIT** menu key to return the main screen.

⚠ *CAUTION!*
  **Hazardous voltages must not be connected to the remote alarm socket.
  Maximum rating is 24 volts, 1 amp.**

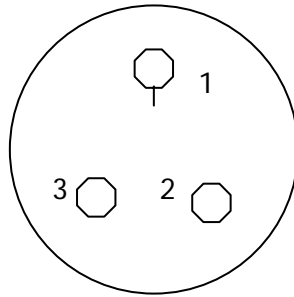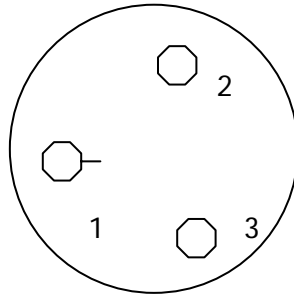**Figure 6a: Remote Alarm Socket—Chest & U101 Upright Freezers**

Figure 6b: Remote Alarm Socket—Upright Freezers (except U101)

4.7   Data Storage and Viewing

The freezer is equipped with multiple sensors that help to maintain its operation and to warn of conditions that can affect performance. Among the sensors are:

- a cabinet temperature probe
- an air-cooled condenser probe
- a cascade condenser probe
- an ambient temperature probe
- a door position sensor

The information from each sensor is recorded by the system processor, and updated to the display screen and memory log. The system stores data from each of the sensors every 60 seconds.

Up to 30 days worth of stored data can be viewed anytime by pressing the **DATA** menu key and selecting one of the **DATA LOG** choices (*see Sections 4.7.1 - 4.7.3 for details)*:

- **ALARM LOG**
- **CABINET & AMBIENT TEMPERATURE GRAPH**
- **1ST STAGE CYCLING & CONDENSER TEMPERATURE GRAPH**
- **2ND STAGE CYCLING & CONDENSER TEMPERATURE GRAPH**

4.7.1   Alarm Log

The alarm log records all alarms activated on the system in sequential order based upon their time/date stamp. The most recent alarm appears at the bottom of the screen (*see Figure 7*). This log also records any alarm mute activity and alarm acknowledgements, including the **USER ID** and time and date of acknowledgment.

Use the ▲ and ▼ directional keys to review any historical log data that is not visible on the screen.

The entire log can be cleared at any time by pressing the **CLEAR** menu button.
To leave this screen, press the **EXIT** menu key.

Figure 7: Alarm Log Screen

| ALARM LOG	
DOOR OPEN ALARM	06/07/04 13:24:21
DOOR OPEN ALARM	07/09/04 08:24:32
HIGH TEMP ALARM	07/10/04 11:24:41
J.FERGUSON	07/10/04 13:32:01
POWER FAIL	08/10/04 13:24:21
MUTED	08/10/04 14:32:01
CLEAR	EXIT

4.7.2   Cabinet & Ambient Temperature Graph

Information about the internal cabinet temperature and ambient room temperature is viewable through the **CABINET & AMBIENT TEMPERATURE GRAPH**. This graph provides a running display of cabinet and ambient temperatures; it also identifies the time and duration of outer door openings (*see Figure 8*).

To allow for more detailed viewing, both the time and temperature scales may be expanded or contracted by pressing the **ZOOM X** button to scale the X or time axis, and the **ZOOM Y** button to scale the Y or temperature axis. The entire temperature log may be deleted by pressing the **DELETE** key.

Historical data may be viewed by pressing the ◄ and ► directional keys. The graph data may also be adjusted up and down on the temperature scale using the ▲ and ▼ directional keys to realign the graph for better viewing.

Figure 8: Chamber & Ambient Temperature Graph Screen
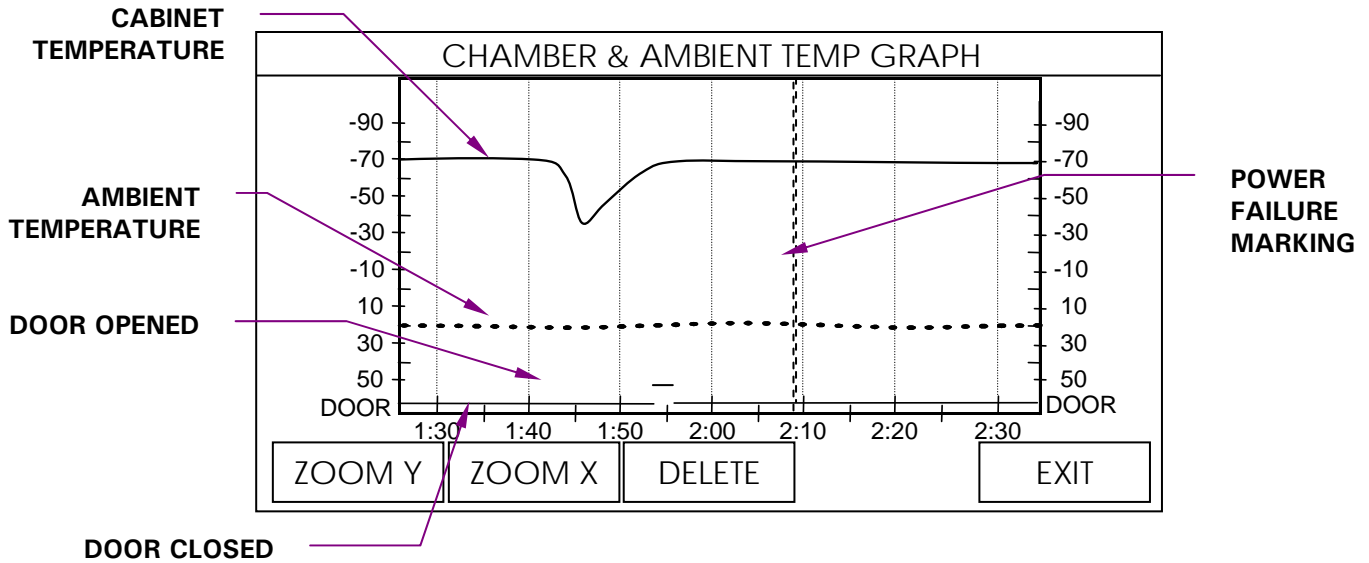
4.7.3   1ˢᵗ & 2ⁿᵈ Stage Cycling & Condenser Temp Graphs

For diagnostic purposes, the system records and displays system temperatures relating to the first and second stage refrigeration system. These graphs provide immediate access to vital information regarding compressor operation and critical refrigeration temperatures. This information is highly useful for evaluating or troubleshooting any performance issues. You can move around in these graphs as in the **CHAMBER & AMBIENT TEMPERATURE GRAPH** above. Each graph also displays the ambient temperature for reference.

Figure 9: 1st Stage Cycling & Condenser Temperature Graph Screen
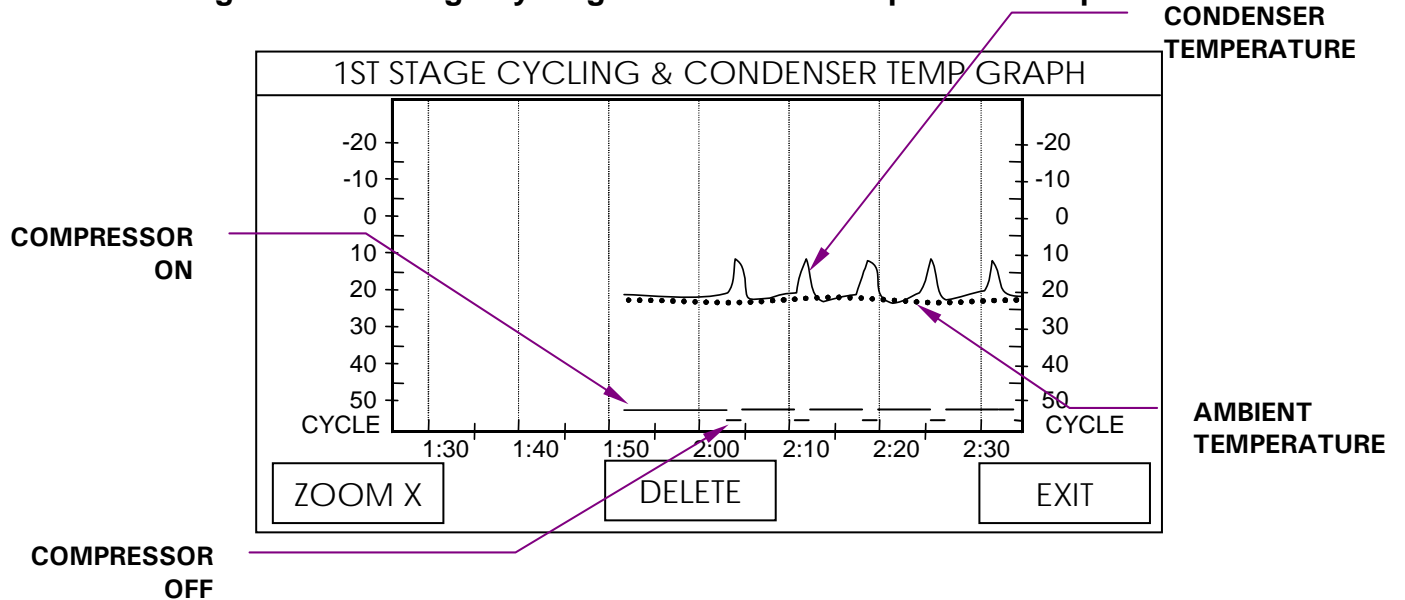
4.8   *Diagnostics*

In order to quickly provide critical information for troubleshooting and monitoring performance issues, the **DIAG** menu button opens the DIAGNOSTIC INFORMATION screen (*see Figure 10*), which provides an immediate overview of all critical parameters and also allows the user to test critical functions.

Figure 10: Diagnostic Information Screen

```
┌─────────────────────────────────────────────────┐
│              DIAGNOSTIC INFO                      │
├─────────────────────────────────────────────────┤
│ CHAMBER TEMP: -86.5        SETPOINT: -86.0        │
│ AMBIENT TEMP: 23.5      ┌──────────────────────┐  │
│ STAGE 1 TEMP: 24.5      │      = 1 HOUR         │  │
│ STAGE 2 TEMP: -42.0     │  CHAMBER TEMP:        │  │
│ ALARM RELAY:    OFF     │  HI -84.5  LO -86.5   │  │
│ DOOR SENSOR:   CLOSED   │  AMBIENT TEMP:        │  │
│ 1ST STAGE COMP:    ON   │  HI 25.5   LO 22.0    │  │
│ 2ND STAGE COMP:   OFF   │  CYCLE ON: 41    MIN  │  │
│                         │  CYCLE OFF:19    MIN  │  │
│                         └──────────────────────┘  │
│ ┌──────┐ ┌───────┐ ┌──────┐ ┌─────────┐ ┌──────┐ │
│ │ ENG  │ │CALC = │ │ TEST │ │ DEFAULT │ │ EXIT │ │
│ └──────┘ └───────┘ └──────┘ └─────────┘ └──────┘ │
└─────────────────────────────────────────────────┘
```

Table 3 describes the function of each menu button in this screen:

Table 3: Diagnostic Information

DIAG Screen Button	Description
ENG	This button is ONLY for use by qualified service personnel. It requires a factory-set password.
CALC =	Pressing this button allows the user to quickly view historical minimum and maximum (HI and LO) temperatures and to view compressor cycle run times over a period of 1, 2, 3 or 6 hours, by sequentially pressing the button.
TEST	Pressing this button allows the user to verify the function of the audible alarm and the alarm socket relay.
DEFAULT	Pressing this button quickly reverts all adjustable setpoints to the factory setpoints. This action does NOT delete USER ID or PASSWORD information, graph data or alarm log data.
EXIT	Pressing this button returns you to the DATA LOG screen.

4.9 PS2 Service Data Ports

The freezer is equipped with 2 PS2 data ports. These ports are provided for service access to the freezers operating system. They provide the ability for service personnel to record information from the system and to upload new revisions to the system's firmware.

4.10 Removal & Reinstallation

Should it be necessary to relocate the freezer at any time, care should be taken when moving it.

DO NOT tilt the freezer, and avoid giving the freezer any bumps or shocks as this can displace the hermetically sealed compressors from their suspension system.

⚡ **WARNING!**

These freezers are very heavy. Do not attempt to lift any freezer by hand. Always ask a trained operator to use mechanical lifting equipment.

Be sure to wear protective gloves at all times when handling ultra-low temperature items.

4.11 General Functional Guidelines

4.11.1 Safety Alarms

In order to avoid accidentally disabling the alarm system, the sytem is designed to prevent the user, under specific conditions related to power cycles and changes in setpoints, from turning the alarm system off. The system will trigger the temperature alarms if the freezer temperature is outside the alarm temperature setpoints when any of the following occurs:

- Initial System Start-up
- Power Failure (then return to operation)
- Temperature Setpoint Change

The alarm can be muted until the freezer returns to within the alarm setpoints.

4.11.2   Power Failure

If power cannot be restored in a timely fashion, the audible alarm and controller/display power can be permanently disabled by opening the lockable power switch cover plate and physically placing the battery alarm switch in its off position. This will also shut down all data recording.

4.11.3   Inner Doors or Lids

The upright freezers are fitted with internal doors which latch shut, minimizing temperature rise when the outer door is opened. Inner door gaskets require the door to be latched at all times when the freezer is running in order to be effective. Failure to latch the inner doors properly will lead to ice buildup between the outer and inner doors, and under the inner door seals. The inner doors can easily be removed and de-iced via their lift-off hinges. Make sure they are thoroughly dry before returning them to service.

Chest freezers are fitted with inner insulating lids to reduce cold air loss when opening the outer lid. These should remain fitted at all times when the freezer is running.

4.12   Voltage Stabilizer

The following freezer models have the option of an internal voltage stabilizer:

- Innova U360, 100-120V, 60 Hz
- Innova U535, 100-120V and 208-220V, 60 Hz
- Innova U725, 208-220V, 60Hz
- Innova C585, 100-120V and 208-220V, 60Hz
- Innova C760, 208-220V, 60Hz

The optional internal voltage stabilizer automatically compensates for variations in the supply voltage (in case of over-voltage, brown-outs, dips, sags and surges). The output of the stabilizer is only adjusted if the power disturbance is sustained for at least two seconds.

4.12.1   Voltage Stabilizer Installation

The voltage stabilizer is supplied as a removable slide-in module. The device can be installed in the freezer at any time:

1. Make certain the freezer is turned off and unplugged before you begin to install the voltage stabilizer.

---

2. Open the small front panel of the freezer (found at the bottom left of the compressor housing on upright models), directly below the chart recorder blanking plate. Remove the upper attachment bolt first, then completely loosen the lower attachment bolt and remove the cover.
3. Remove the plug from the electrical socket at the back of the stabilizer slide.
4. Align the base of the voltage stabilizer module with the guide in the base of the freezer.
5. Slide the stabilizer toward the back of the freezer until it locks into position.
6. Close and secure the stabilizer access panel by tightening the lower attachment screw first, then the upper attachment screw.

4.12.2   Voltage Stabilizer Operation

The voltage stabilizer unit indication is displayed on the lower right front panel of the upright freezers and on the front panel above the air filter on the chest freezers.

When you switch the freezer on, if the input voltage is within the specified range, the green **NORMAL** LED will illuminate. If the voltage stays within the specified range, the green LED will remain illuminated.

Sustained variations in the input power will be automatically compensated for by the stabilizer circuit and indicated by a red LED for **HIGH VOLTAGE** or an amber LED for LOW VOLTAGE.

4.12.3   Voltage Stabilizer Specifications

	115V Unit	208/220V Unit
Current Rating:	20 Amps	15 Amps
Operating Voltage:	115V ±10%	230V ±10%
▪ **Normal Voltage Stabilizer Operating Range (LED Green)**	106-123V ±2.5V	204V-242V ±2.5V
▪ **Low (Boost) Voltage Limit (LED Amber)**	<106V	<204V
▪ **High (Buck) Voltage Limit (LED Red)**	>123V	>242V

5   MAINTENANCE

⚠ *CAUTION!*
**Maintenance, adjustments and repair work should be carried out ONLY
by QUALIFIED, EXPERIENCED personnel who have been AUTHORIZED
by New Brunswick Scientific or its authorized agents to undertake such
work.**

5.1   Cleaning

5.1.1   Painted Surfaces

All exterior paint work and inner doors should be cleaned using a solution of
mild detergent in water. **Never use abrasive cleaners or solvents.**

5.1.2   Panels & Shelves

The interior panels and shelves are made of stainless steel. They may be
cleaned with any non-corrosive cleaner and either chemically or heat sterilized.

5.1.3   Air Intake Grille & Filter

The air intake grille and filter must be cleaned regularly to keep them free from
dust and debris. Under normal conditions, clean the grille and filter once every
three months. If the area around the freezer is very dusty or dirty, however,
clean the grille and filter more often.

⚠ *CAUTION!*
**Serious damage to the freezer may result if the air intake is allowed to
become blocked. Check that there is no obstruction of the airflow to the
freezer.**

The air intake filter must also be cleaned regularly.

To clean the air intake filter and grille:

1. Press in on the black plastic insert on the front, lower right side of the compressor housing to expose the finger loop.
2. Pull the finger loop to open the filter housing panel.
3. Remove the filter grille by turning the grille attachment screw, located at the top of the grille, counter-clockwise.
4. Brush the grille with a soft brush and, if a vacuum cleaner is available, vacuum the dust from the grille.
5. The filter is washable. Wash the filter in warm soapy water and rinse it thoroughly.
6. Allow the filter to dry before reinstalling it on the freezer.
7. Reverse the above steps to reinstall the filter, grille and close the filter housing panel.

5.1.4   Vacuum Release Vent Tube

✎ NOTE:

There is an electrically-powered vacuum release vent tube in the freezer which must not be allowed to become blocked or sealed off.

Over a period of a few weeks, depending on how often the freezer is being used, a small mushroom of ice will form around the end of the vacuum release vent tube. If the tube is allowed to become blocked, a vacuum will be created when the outer door is closed. It will not then be possible to open the door or lift the lid until the vacuum has leaked away through the outer door seal, which can take up to two hours, due to the high quality of the seals.

The vacuum release vent tube is located (a) on the top left-hand side of upright models and (b) on the left-hand side of chest models. If the door or lid cannot be opened, press the manual plunger on the outside of the air vent in order to break the ice formation.

5.1.5   Door/Lid Seal

Be sure to treat the door seal on the upright freezers and the lid seal on the chest freezers with great care. Avoid damaging the seals in any way, as the freezer cannot operate properly with a defective seal.

Once each month, it is advisable to wipe both the seal and its mating surface with a soft dry cloth.

5.1.6   Lubrication

Every 12 months the outer door hinges and the handle mechanism should be *lightly* lubricated using general purpose oil or spray grease.

5.2   Defrosting

After an extended period of operation, defrosting may become necessary:

1. Deactivate the power off audible alarm by switching the alarm battery switch (located behind the lockable panel on the front or side of the freezer) to its off (**O**) position.
2. Turn the freezer power switch off (**O**).
3. Unplug the freezer from the electrical supply.
4. Leave the door or lid open.
5. Allow the accumulated ice to melt.

⚠️ *CAUTION!*
 DO NOT attempt to chip or scrape the ice with a sharp instrument.
 Allow the ice to melt naturally.

---

6. Remove the resulting water
7. Dry and decontaminate the interior of the freezer.
8. When the freezer is clean and dry, reconnect the freezer to the electrical supply.
9. Turn the power switch on (**I**) and reactivate the alarm battery switch.

5.3   Electrical Components

⚠️ *CAUTION!*
 There are no user controls behind any panels. **The removal of any part or panels from the freezer by anyone other than a qualified and authorized Service Engineer may invalidate the warranty.**

5.3.1   Audible Alarm

Regularly check the audible alarm by pressing and holding the **TEST** key in the **DIAGNOSTIC INFORMATION** screen

5.3.2 Battery Replacement

The 6.0v Cyclon battery is mounted within the compressor housing, near the interface board.

This is located (a) behind the lefthand base cover on the upright freezers, or (b) in the compressor housing on the chest freezers.

⚡ *WARNING!*
Use only a replacement battery of the correct type and proper part number. The battery must be fitted so the terminals correspond to the polarity labels on the electrical panel.

To replace the battery:

1. Turn off (**O**) the power switch and disconnect the power supply.
2. Remove the side cover and the screws that secure the battery to the housing panel.
3. Disconnect the battery terminals.
4. Be certain, when connecting the new battery, to respect the correct polarity (red is + positive and black is – negative).
5. Reinstall the battery fixing screws and the side cover.
6. Reconnect the freezer to the power supply and turn the power switch on (**I**).

5.3.3 Fuses

The following are the specifications for the fuses required by the freezers:

Main Power Supply Plug (UK only)	13A Bussmann 1 x ¼"
†Vacuum Vent Heater	FS1 - 800mA 20x5mm Quick Acting (F) 250V Ceramic
†Main Voltage Input	FS2 - 1A 20x5mm Anti-Surge (T) 250V Ceramic
†Voltage Stabilizer Module (option)	FS1* – 1A 20x5mm Quick Acting (F) 250V Ceramic

† These fuses must be replaced by an NBS-approved service engineer.
* This is not the same as the Vacuum Vent Heater fuse; the "FS1" designation for both fuses refers to separate manufacturing drawings

6   TROUBLESHOOTING

If you are experiencing a problem with your freezer, check the following troubleshooting guides before you contact your NBS authorized Service technician.

6.1   Errors, Alarms & Messaging

Your electronically-controlled NBS freezer incorporates a microprocessor-controlled system to troubleshoot, diagnose and report faults and problems in its electronic and refrigeration systems. The system uses plain language where appropriate to describe the problem and suggest corrective actions.

This table interprets error/alarm messages that may appear on the display:

Errors/Alarms/Messages	Possible Solution/Explanation
CHAMBER SENSOR FAILURE CALL FOR SERVICE	PT100 Probe failure. This probe, located inside the freezer cabinet, indicates cabinet temperature. Call NBS Service representative.
CASCADE SENSOR FAILURE CALL FOR SERVICE	This probe monitors the cascade condenser temperature. Call NBS service representative.
CONDENSER SENSOR FAILURE CALL FOR SERVICE	This probe monitors the air-cooled condenser temperature. Call NBS Service representative.
AMBIENT SENSOR FAILURE CALL FOR SERVICE	This probe monitors the ambient air temperature. Call NBS Service representative.
HIGH CONDENSER TEMP CHECK AIR FILTER	Air-cooled condenser temperature too high: (1) Filter may be blocked. Clean filter according to the instructions in Section 5.1.3. (2) Ambient temperature may be too high. Reduce the room temperature. *If alarm continues,* (3) Fan may have failed. Call NBS Service department.
HIGH CONDENSER TEMP CHECK ROOM TEMP	Air-cooled condenser temperature too high: (1) Ambient temperature may be too high. Reduce the room temperature. (2) Freezer airflow may be blocked or heated air from other equipment is being drawn into the freezer's air intake. Remove restrtictions to air flow and make sure no other equipment is forcing hot air into the freezer intake. *If alarm continues,* (3) Fan may have failed. Call NBS Service department.

Errors/Alarms/Messages	Possible Solution/Explanation
EXCESSIVE CONDENSER TEMP THERMAL OVERLOAD FREEZER WILL REMAIN OFF UNTIL SYSTEM COOLS	Freezer will automatically shut down if critical condenser temperature is reached to avoid system damage. Thermal fuse will automatically reset after system cools.
HIGH CASCADE TEMPERATURE	A high cascade condenser temperature may indicate a refrigeration problem. Call NBS Service department if problem persists.
HIGH AMBIENT TEMPERATURE	Room temperature has exceeded 34°C. If room temperature is not reduced, it may affect freezer performance.
LOW AMBIENT TEMPERATURE	Room temperature has dropped below 10°C. If room temperature is not increased, low ambient temperature may affect performance.
DOOR OPEN ALARM DOOR OPEN: X SEC (MIN)	System records & displays time during which outer door is held open.
POWER FAILURE POWER OFF: X SEC (MIN, HRS)	System records & displays accumulated time since a power failure occurred.
ELECTRICAL FAULT CALL FOR SERVICE	General message for electrical faults not including those listed above.
LOW BATTERY ALARM BATTERY CHARGE IS LOW	Message is displayed when the alarm battery charge is low. Chronic low battery charge is indicative of a defective or worn battery.
ALARM MUTED X SEC (MIN)	Whenever an alarm is muted, the alarm delay countdown is displayed to advise when the audible alarm will reactivate.
SYSTEM WILL RE-LOCK AFTER X SEC	Whenever a password is used to unlock the system, the system will automatically relock to prevent further changes after the system returns to the main screen.

6.2 Other Symptoms

Symptom	Possible Solution/Explanation
Door won't open	(1) Check to see if handle is locked; unlock with key. (2) Use manual air vent plunger to break ice (*see Section 5.1.4*). Allow time for vacuum to leak away. *If door still won't open,* (3) Call NBS Service representative.
Two or three Voltage Stabilizer LEDs are on at once.	Voltage Stabilizer may have failed. Call NBS Service representative.
No Voltage Stabilizer LED is on.	Voltage Stabilizer may have failed. Call NBS Service representative.

7   OPTIONS & ACCESSORIES

7.1   Accessories

A number of accessories are available for the New Brunswick Scientific range of ultra-low temperature freezers, some of which are described in the following sections. Contact your local NBS representative or distributor for further information.

7.1.1 CO_2 & LN_2 Back-Up Systems

These independent, battery-operated systems are available to temporarily protect the contents of the freezer against the consequences of freezer or power failure. They are designed to operate on battery power for up to for a period of up to 48 hours. In an emergency, the system will inject either liquid carbon dioxide or liquid nitrogen from a storage bottle or dewar. Carbon dioxide back-up systems will maintain temperatures down to -70°C (subject to environmental conditions). Liquid nitrogen back-up systems will maintain the freezer temperature down to -86°C.

CO_2 and LN_2 back-up systems can be retrofitted by a skilled technician. Instructions are included in the kit. Contact your local NBS distributor for available technical service support.

Description	Part Number
CO_2 Back-up System,120 – 220v, 60Hz	U9043-0002
CO_2 Back-up System, 230v, 50Hz	U9043-0004
LN_2 Back-up System,120 – 220v, 60Hz	U9044-0002
LN_2 Back-up System, 230v, 50hz	U9044-0004

7.1.2   Racking Systems

A comprehensive set of aluminum racks is available. These racks are designed to accommodate various sizes of boxes neatly, while giving maximum packing density in the freezer.

Custom-made racking may also be available upon request.

Upright Freezer Racks: U360

Description	Quantity	Part Number
2" Aluminum Box Rack	1	K0641-3000
3" Aluminum Box Rack	1	K0641-3001
4" Aluminum Box Rack	1	K0641-3002

7.1.3 Chart Recorder

An optional paper chart recorder is available to provide a continuous record of the temperature inside the freezer over a period of seven days. The record is presented on a circular paper chart. The following items are available for all freezer models:

Description	Quantity	Part Number
Chart Recorder Kit	1	K0440-0355
Chart Recorder Paper	100	K0540-0025
Chart Recorder Pens	3	K0660-0051

7.1.4 Ethernet/RS-485 Data & Computer Interface

The freezers can be supplied with an RS485/Ethernet interface as an optional communication package that allows for data acquisition from the freezer's operating system.

8   SPARE PARTS

✎ **NOTE:**

> **Only NBS-appoved engineers may service these Ultra-Low Temperature Freezers. For information on the availability of spare parts, please call your local NBS equipment supplier.**

Description	Part Number	Freezer Model(s)
Battery 6V, 5 Ah	P0625-0970	All
Fuse 1A ceramic (pack of 5)	K0380-0565	All
Fuse 800mA (pack of 5)	K0380-0560	All
Fuse 1x1/4" 13A (pack of 5)	K0380-0570	All (UK only)
Key Only for Power Switch Locking Plate	P0625-0111	All
Key Only for Black Plastic Door Handle	P0625-0640	Upright models
Key & Lock for Black Plastic Door Handle	P0625-0113	Upright models
Key & Lock for Power Switch Plate	K0160-0082	All
Power Switch Locking Plate Assembly, charcoal	P0625-0170	All except U101
Power Switch Locking Plate Assembly, light grey	K0160-0085	U101
Power Cord, 230V 50 Hz UK	P0625-0357	All
Power Cord, 230V 50 Hz, European Schuko	P0625-0356	All
Power Cord, 115V 60 Hz	P0625-0355	U101
Power Cord, 115V 60 Hz	P0625-0354	All except U101
Power Cord, 208/220V 60 Hz	P0625-0353	All
Black Plastic Molded Handle Replacement Kit	K0220-0431	Uprights, except U101
Black Plastic Molded Handle (handle only)	K0220-0432	Uprights, except U101
Door Latch Assembly (replacement)	K0160-0067	Uprights, except U101
Air Filter, U360 (replacement)	P0625-1110	U360
Air Filter Grille, U360	P0625-1100	U360
Inner Shelf, U360 (1 shelf with 4 clips)	P0625-1180	U360
Shelf Clips, stainless steel, Pk of 4	K0280-0550	Upright models
Inner Door Assembly, U360	P0625-1160	U360
Inner Door Latch Pin and Spring Clip	TBA	Upright models
Hole Plug, Upright Door Handle, 28.5mm	P0625-0150	Upright models
Hole Plug, Upright Door Handle Lock, 19mm	P0625-0151	Upright models
Alarm Connector Plug	K0380-0451	All
Black Plastic Bung, CO_2/LN_2 Ports	K0740-0330	All
Adjustable Foot, Uprights	K0160-0995	Upright models
Swivel Castor	K0160-0735	All

9 SPECIFICATIONS

9.1 Upright Freezers

Model No.	U101	U360	U535	U725
Part No.	U9420-000**X***	U9425-000**X***	U9430-000**X***	U9440-000**X***
Internal Dimensions: Height x Width x Depth	N/A	1365 x 440 x 615 mm 53.7 x 17.3 x 24.2 in.	N/A	N/A
External Dimensions: Height x Width x Depth	N/A	1950 x 600 x 867 mm 76.8 x 23.6 x 34.1 in.	N/A	N/A
Capacity	N/A	360 Liters 12.7 cubic feet	N/A	N/A
Net Weight	N/A	230kg 509lbs	N/A	N/A
Door Lock	N/A	Standard	N/A	N/A
No. Compartments	N/A	3	N/A	N/A
Interior	Stainless steel grade 304L			
Alarms	Hi/Low temp., power fail, battery low, filter clean, door open, electrical faults			
Insulation Material	Vacuum insulation panels and urethane foam			
Remote alarm port	N/A	Standard	N/A	N/A
PS2 Ports (2)	N/A	Standard	N/A	N/A
RS-485/Ethernet interface	N/A	Optional	N/A	N/A
‡Power Consumption: (kWatts/24hours)				
• 115V elec. supply	N/A	11.7	N/A	N/A
• 220V elec. supply	N/A	N/A	N/A	N/A
• 230V elec. supply	N/A	11.8	N/A	N/A
Power Source (USA)	100-120V 60Hz single phase		N/A	N/A
Power Source (USA)	N/A	N/A	N/A	
Power Source (EU)	220-240V 50Hz single phase			N/A
Current Rating (USA)^	N/A	16.5	N/A	N/A
Current Rating (USA)^	N/A	N/A	N/A	N/A
Current Rating (EU)^	N/A	6.5	N/A	N/A
Pull Down Time From +25°C to –85°C (freezer empty; 240V, 50Hz electrical supply**)	N/A	~5.7 hours	N/A	N/A
Performance	-50°C to -86°C (± 5ºC) at +32°C maximum ambient operating temperature			
Operational Parameters: *All freezers use components tested to CE & UL specifications:*	• Indoor use • Altitude up to 2000m • Ambient temperature range 5°C to 40°C • Maximum relative humidity 80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C • Power supply voltage fluctuations not to exceed ± 10% of the nominal voltage • Installation category II • Pollution degree 2			

* **X** = 0 for 100-120V, 2 for 208-220V (N/A for U360) or 1 for 220-240V

^ Average current consumption

9.2 Chest Freezers

Model No.	C585	C760
Part No.	U9400-0000, -0002, -0001	U9410-0002, -0001
Type	Chest	Chest
Internal Dimensions: Height x Width x Depth	N/A	N/A
External Dimensions: Height x Width x Depth	N/A	N/A
Capacity	N/A	N/A
Net Weight	N/A	N/A
Lock	N/A	N/A
No. Compartments	N/A	N/A
Interior	N/A	
Alarms	N/A	
Insulation Material	N/A	
Remote alarm port	N/A	N/A
RS-485 interface	N/A	N/A
• 115V electrical supply	N/A	N/A
• 220V electrical supply	N/A	N/A
• 240V electrical supply	N/A	N/A
Power Source (USA)	N/A	N/A
Power Source (USA)	N/A	
Power Source (EU)	N/A	
Current Rating (USA)	N/A	N/A
Current Rating (USA)	N/A	N/A
Current Rating (EU)	N/A	N/A
Pull Down Time From +25°C to –85°C (freezer empty; 240V 50Hz electrical supply*)	N/A	N/A
Operational Parameters All freezers use components tested to CE & UL specifications:	• Indoor use • Altitude up to 2000m • Ambient temperature range 5°C to 40°C • Maximum relative humidity 80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C • Power supply voltage fluctuations not to exceed ± 10% of the nominal voltage • Installation category II • Pollution degree 2	

*120V & 220V: TBA

‡ Freezer set to –80°C, empty, ambient 20-25°C at rated electrical supply

10 DRAWINGS

Figure 11: 115V, 60 Hz Circuit Diagram/Schematic
Models U360, U535, U725, C585 & C760
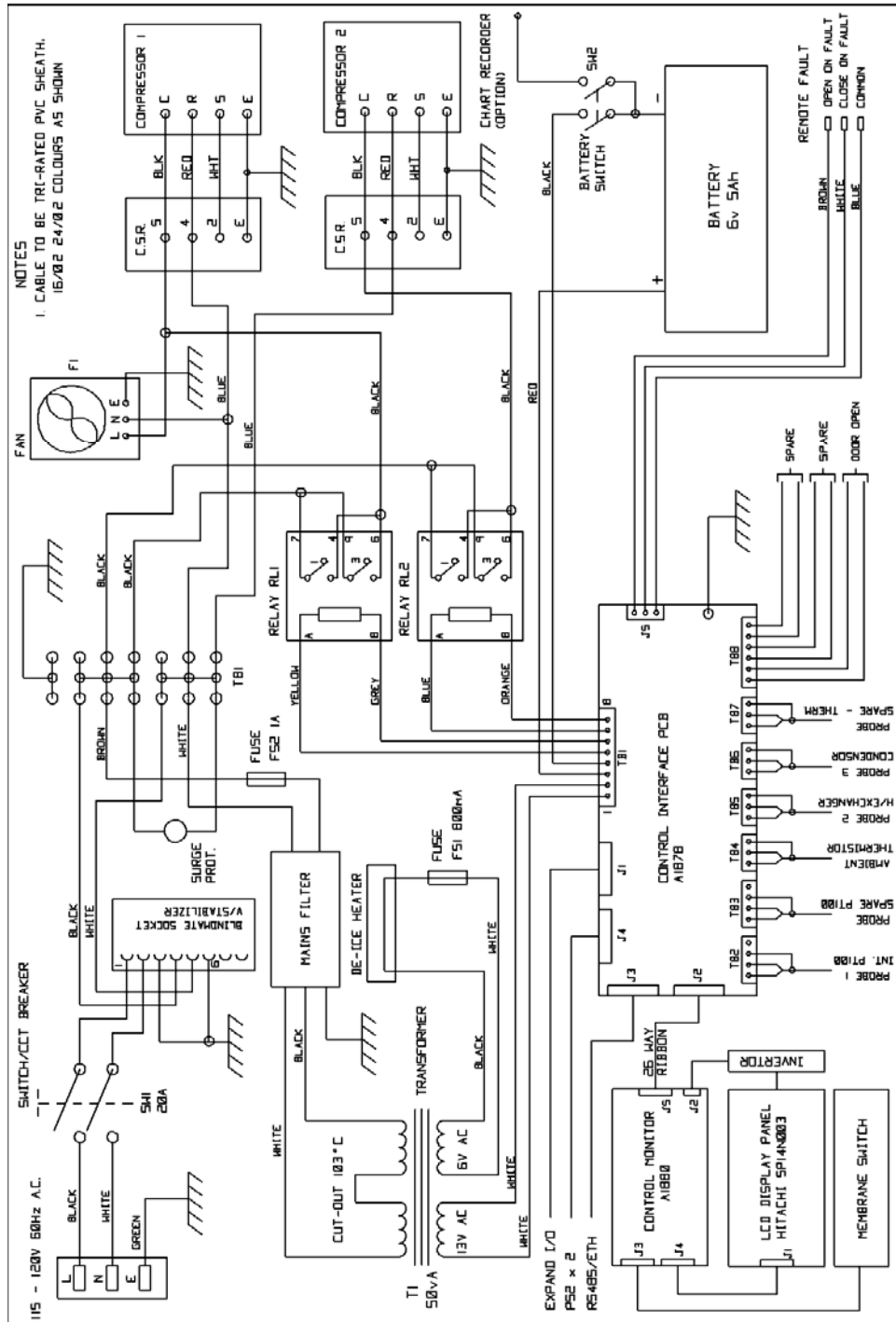
Figure 12: 230V, 50Hz Circuit Diagram/Schematic
Models U360, U535, U725, C585 & C760
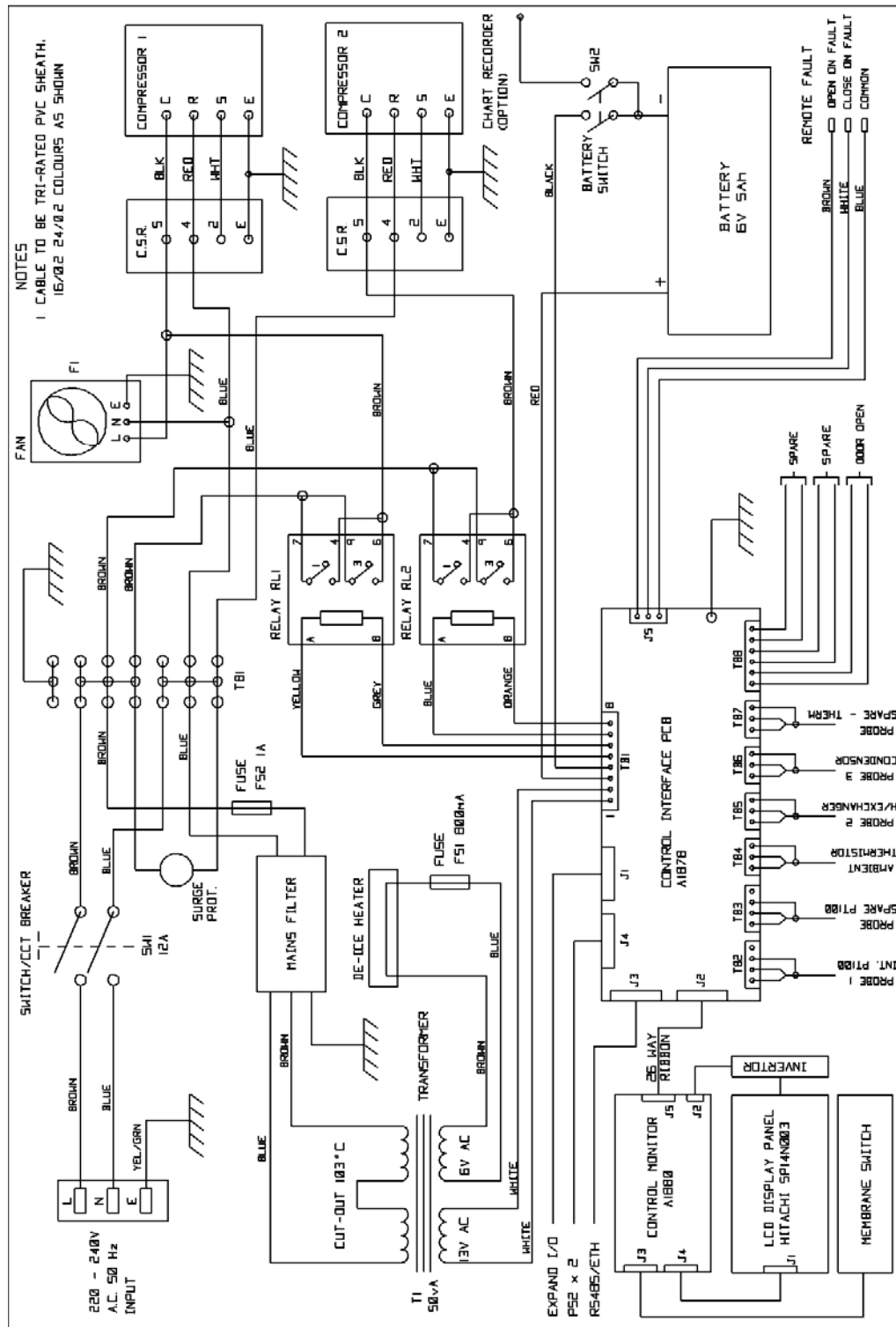
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