Guide to Operations

Ultra-Low Temperature Freezers

Premium Range

MANUAL No. M1288-0053
Revision L
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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.

Copyright Notice

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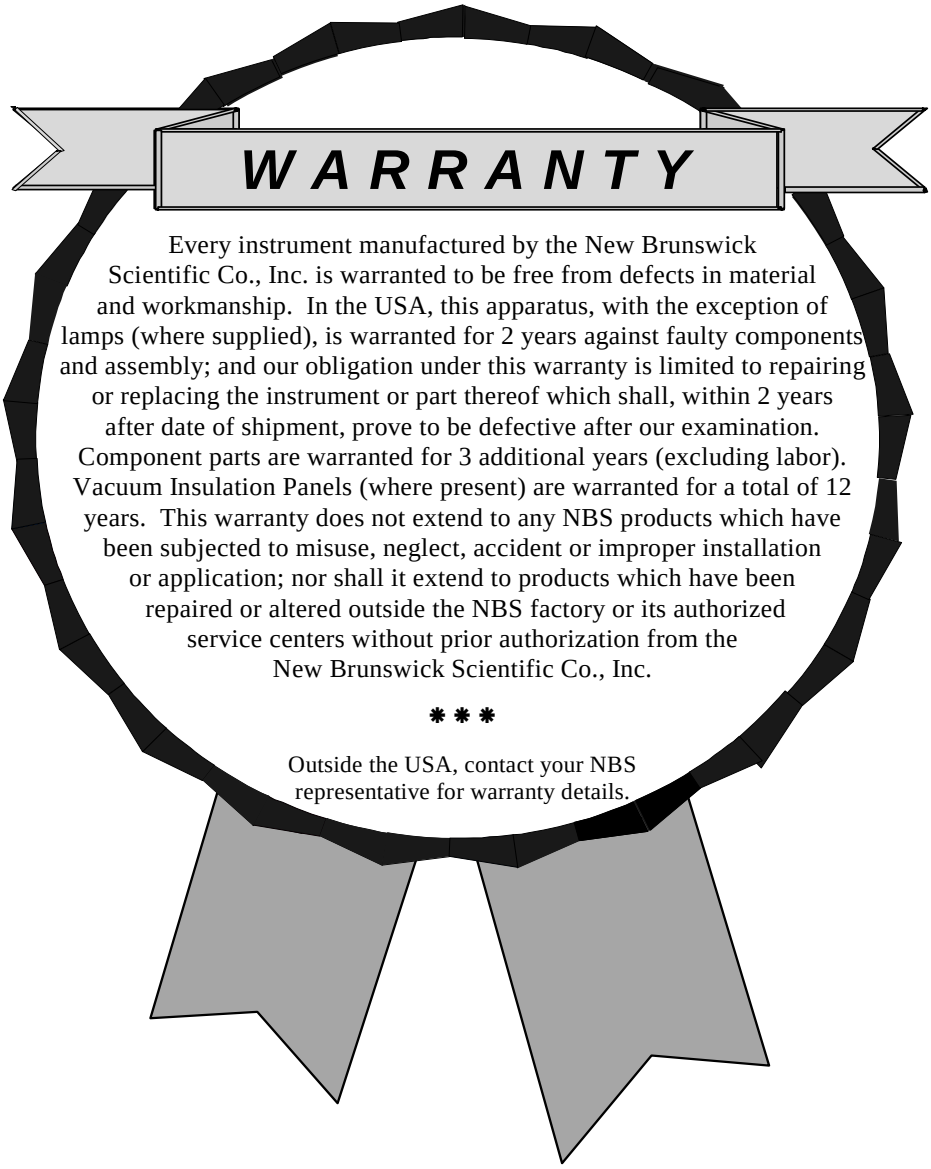
Disclaimer Notice

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.**
	**This particular *Warning* message, whether found in the manual or on the unit, means HOT SURFACE–and therefore represents a potential danger to touch.**
 ***CRUSH WARNING!***	***Crush Warning* messages alert you to specific procedures or practices <u>regarding heavy objects</u> which, if not followed correctly, could result in serious personal injury .**


WARRANTY
Every instrument manufactured by the 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 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.

NEW BRUNSWICK SCIENTIFIC CO., INC.

CERTIFICATE OF CONFORMITY

This is to confirm that the following NBS Low & Ultra Low Temperature Freezers:

Innova U101
Innova U535
Innova U725
Innova C585
Innova C760
Premium U410
Premium U570
Premium C340
Premium C660

conform to the following European Directives:

Electromagnetic Compatibility (EMC) 89/336/EEC & Amendment 92/31/EEC
Test Standard BS EN 55014-1 : 1997
Test Standard BS EN 55014-2 : 1997
Test Standard BS EN 61000-3-2 : 1995
Test Standard BS EN 61000-3-3 : 1995

Low Voltage Directive (LVD) 73/23/EEC
Test Standard EN 61010-1 : 1993 Amendment A2 : 1995
Test Standard ISO 5149 : 1993 (E)

Conducted/Radiated Emissions FCC Part 15 Class B

Approved by _____ on this 21st day of August, 2007
D J Minister, Executive Designer

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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's Guide, 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 compromises the integrity of the freezer.

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

2 INTRODUCTION/OVERVIEW

This manual provides the user with the necessary information for installation and operation of the Ultra-Low Temperature Freezer Premium Range. It also provides some preliminary user maintenance information.

2.1 Description of Equipment

The New Brunswick Scientific range of Premium freezers is designed to provide precise, ultra-low temperature environments for scientific and medical use.

There are two types of Premium freezer: Upright (*see Figure 1 below*) and Chest (*see Figure 2 below*). This manual covers all versions of the Premium freezer models:

Upright Freezer Model	***Capacity***
U410	14.5 cubic feet (410 liters)
U570	20.0 cubic feet (570 liters)
Chest Freezer Model	***Capacity***
C340	12.0 cubic feet (340 liters)
C660	23.3 cubic feet (660 liters)

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

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

A membrane keypad and digital temperature readout are provided on a small control panel. On the upright models, this is located on the door. On the chest models, it is located on a console at the right-hand side of the equipment. *(See Figures 1 & 2)*

Controls for setting the freezer temperature and alarm warning setpoints are enabled by an electronic lock. A unique code, which is selected by the user through the membrane keypad, sets this lock. The code can be changed at any time, provided the current setting of the lock is known. **On delivery, the lock code is "0000" (unlocked).**

Indicator lamps on the control panel provide warnings of power loss, system failure, exceeding Hi/Low temperature setpoints, low battery voltage and filter blockage. There is also an LED to indicate when the freezer is under remote control via the RS-485 optional computer interface.

Figure 1 shows a typical upright freezer and Figure 2 (*following*) shows a typical chest freezer.

Figure 1: Upright Premium Freezer—Side & Front Views

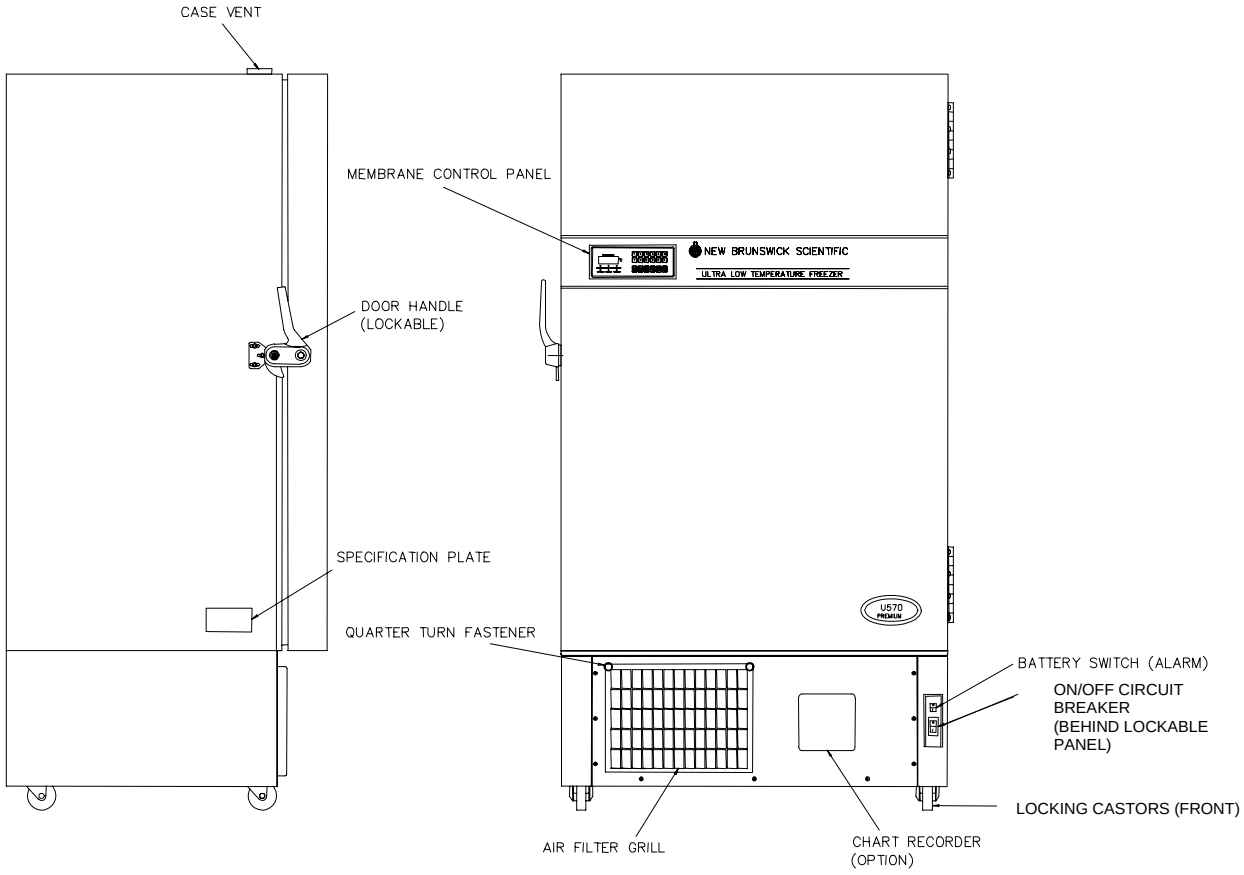
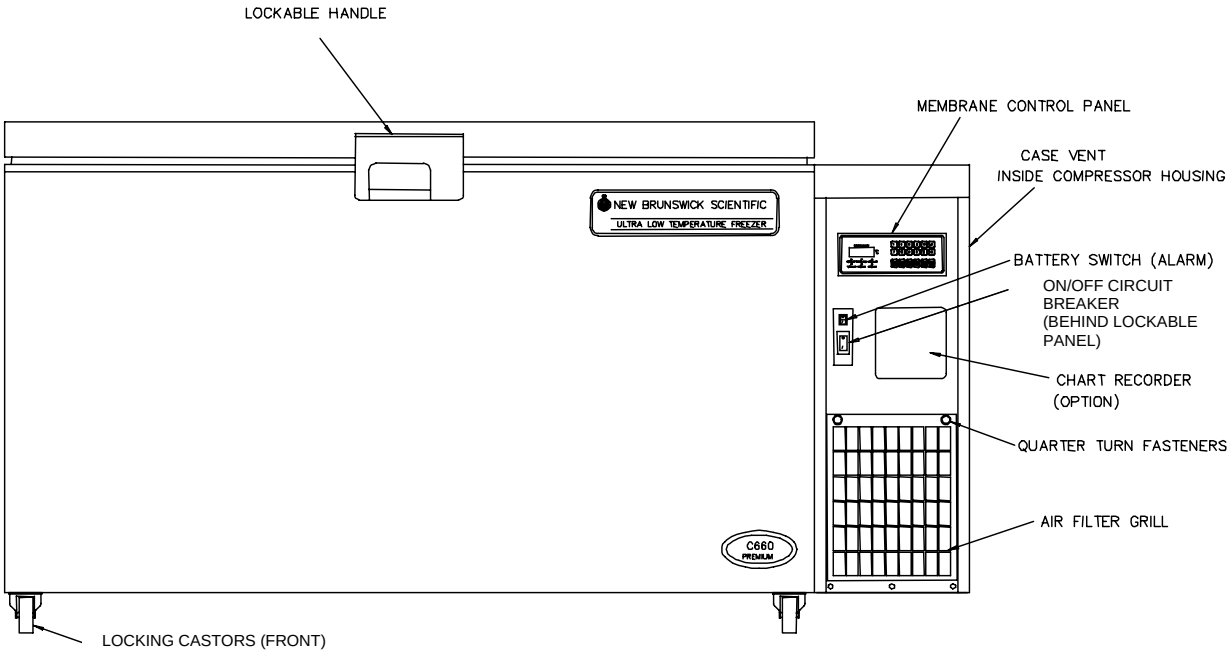


Figure 2: Chest Premium Freezer—Front View



2.1.1 Freezer Handles

Freezers are supplied with lockable handles.

The C340 and C660 are fitted with quarter turn key locks.

The U410 and U570 upright freezer handles are fitted with barrel locks (push to lock, turn key to unlock). The barrel lock may be removed from the upright freezer handle if the lock facility is not required:

1. Remove the two retaining screws at the rear of the handle.
2. Remove the lock barrel and packing plate.
3. Fit the plastic blanking plug supplied.
4. Refit the packing plate using the existing screws.

NOTE:

It is important that the handle lock packing plate be fitted at all times.

NOTE:

For UPRIGHT freezers: DO NOT SLAM THE DOOR WITH THE HANDLE IN THE CLOSED POSITION.

...continued...

The door handle has a cam action to pull the door closed and a reverse can action to break the seal so the door can be opened. When closing the outer door, 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 will open. Always ensure the handle is properly engaged.

3 INSTALLATION

CRUSH WARNING!

DO NOT attempt to lift any freezer by hand. Preferred lifting for loading and unloading is by hydraulic tail lift.

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 Physical Location

All freezers are mounted on castors for ease of movement. Upright and chest freezers have locking front castors to stop the freezer from rolling once it is in position. 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 grill and free air exit from the back; provide a clearance of at least 6 inches (150 mm) on all sides. The grill is located on the front of both chest and upright models (*see Figures 1 & 2*).

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.

WARNING!

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 electrical requirements.

Model U410 and U570 upright freezers are fitted with four adjustable shelves. These can be positioned in ½-inch (12.7 mm) steps anywhere throughout the freezer. To remove the shelf, gently squeeze the shelf clip to release it from the side of the freezer, then reposition it as required.

3.2 Getting Started

3.2.1 Plug In

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 freezer's voltage rating does not match your electrical supply, or if the plug on the power cord does not fit the outlet, *do not plug the freezer in*. 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 receptacle. Check the voltage rating plate on the side of the freezer, to confirm that the freezer is compatible with your laboratory power supply.

3.2.2 Turn On

The **ON**/**OFF** circuit breaker is located (a) within the lockable panel at the bottom right-hand corner of the upright freezer, or (b) to the left of the control panel on the chest models. The lockable 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** circuit breaker to the **I** (ON) position. The temperature 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.

3.2.3 Alarm Activation

The equipment is delivered with the battery deactivated. The Power Fail alarm is activated by the battery rocker switch within the lockable panel. On upright models, the panel is located at the bottom right-hand corner *(see Figure 1)*. On chest models, the panel is located on front right of the unit, near the display *(see Figure 2)*. The switch is labelled **I** (ON) and **O** (OFF).

To activate the alarm, put the battery switch in the **I** position.

After activating the alarm, test its operation by pressing the **ALARM TEST/MUTE** key on the display. The audible alarm should sound. The **ALARM TEST/MUTE** key also tests the LED lamps, which all light up together.

NOTE:

When the equipment is first switched on, it will take approximately six hours to reach a temperature of -86°C. The alarm will sound every 30 minutes until the temperature setpoint is reached. Use the ALARM TEST/MUTE key to mute the alarm during this initial pull-down period.

If the freezer is turned off during the initial pull-down period, the alarm will activate 30 minutes after you switch it back on again.

The factory-set temperature is –80º C.

3.2.4 Remote Alarm

The freezer is also fitted with a remote alarm socket. *(See Section 4.4 for details.)* This can be tested by turning off (**O**) the **ON/OFF** switch. This tests the **POWER FAIL** (*see Section 4.1*) and **ALARM** output at the same time. The battery must be switched on to test the **POWER FAIL**. The remote alarm facility provides voltage-free contacts rated at 1 amp, 24 volts maximum.

3.2.5 Vacuum Effect

NOTE:

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

After closing the door or lid of the freezer, following access to the contents, a vacuum may be created. 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 vent tube. Do not try to force the door or lid. During the release of the vacuum, a slight hissing may be heard.

4 OPERATING CONTROLS & DISPLAYS

4.1 Operating Controls

Switch the freezer on using the **ON**/**OFF** circuit breaker at the front of the equipment. On upright models, this is located behind the locked panel, low on the right-hand side. On chest models, it is located behind the locked panel on the right-hand side, adjacent to the control panel. (*See Figures 1 & 2*)

Operating controls are located on a membrane panel mounted in the door of the upright models U410 and U570. The same panel is located on the right-hand side of all chest freezers.

Every NBS freezer is equipped with the unique S.M.A.R.T. Plus™ diagnostic software, to help identify, by means of an error code, the cause of a fault or setpoint variance.

The available functions, identified by Item numbers called out in Figure 3, are described in the sections below.

4.1.1 Temperature ºC Display

Item	*Name*	*Function*
1	**TEMPERATURE °C**	The digital display normally shows the current internal temperature of the freezer. Temperature is displayed in 1°C increments.

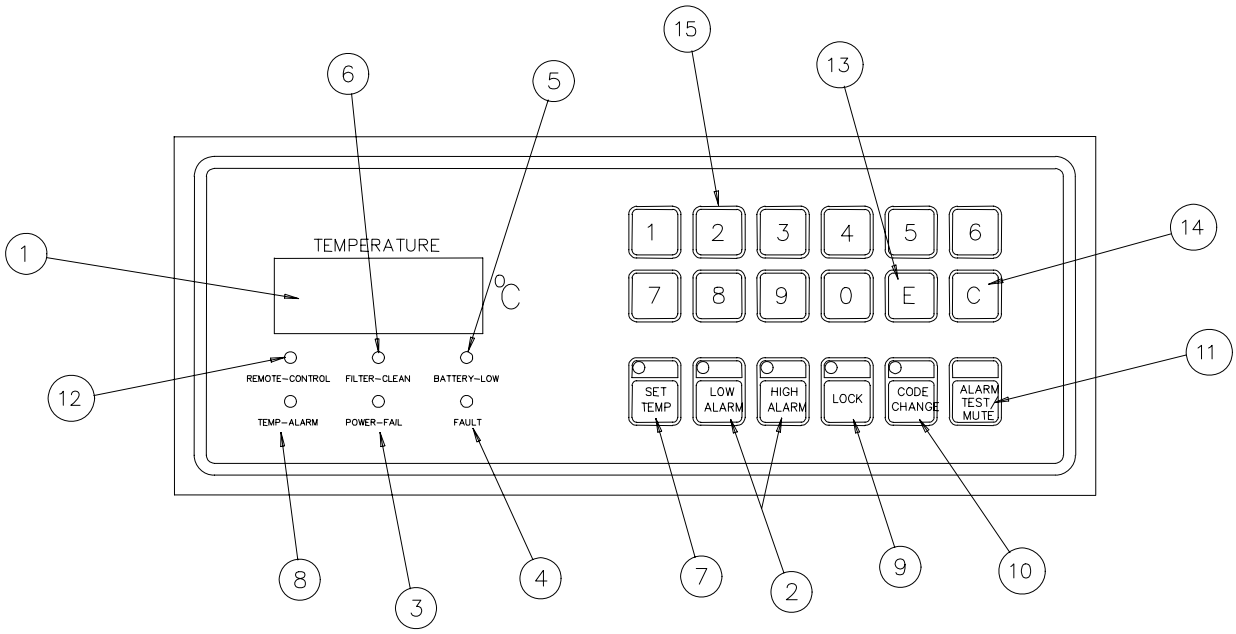
4.1.2 High Alarm/Low Alarm Lights

Item	*Name*	*Function*
2	**[HIGH/LOW] TEMP-ALARM**	Illuminates if the freezer's internal temperature is above/below the user-selected alarm setpoints. Illuminates as soon as the setpoint is passed. The audible alarm, however, does not sound until the freezer temperature has been beyond alarm setpoint for 30 minutes. After the temperature returns to the normal range, the **TEMP-ALARM** switches off & the audible warning stops.

NOTE:

The audible alarm can be turned off by pressing the ALARM TEST/MUTE KEY. If, after 30 minutes, the temperature has not returned to normal range, the audible warning will sound again. This pattern will continue to repeat until the temperature returns to normal.

Figure 3: Membrane Keypad



4.1.3 Temp-Alarm Light

Item	*Name*	*Function*
8	**TEMP-ALARM**	Should a power failure cause the temperature to surpass the alarm setpoint, the **TEMP-ALARM** illuminates. (The audible alarm will already be sounding due to the power failure). The **TEMP-ALARM** will stay on after the temperature returns to normal range, to indicate that a power failure has occurred. Temperature-sensitive samples stored in the freezer should be checked for deterioration. Cancel the **TEMP-ALARM** by pressing the **ALARM TEST/MUTE KEY**.

4.1.4 Power-Fail Light

Item	*Name*	*Function*
3	**POWER-FAIL**	Illuminates if the power supply fails, flashing at approximately 10-second intervals, accompanied by an audible alarm. When power is restored, the indicator goes off and the audible alarm stops. (The battery must be switched on and charged for this indicator to operate.)

4.1.5 Fault Light

Item	*Name*	*Function*
4	**FAULT**	Illuminates if there is a system failure within the freezer. Interfacing with the S.M.A.R.T. Plus™ diagnostics via the control panel, the fault can be determined (*see Section 6.1*). System failure is accompanied by an audible alarm. Correction of the fault extinguishes the light and audible alarm.

4.1.6 Battery-Low Light

Item	*Name*	*Function*
5	**BATTERY-LOW**	*With power ON:* illuminates if battery voltage is below 6 volts; starts flashing when voltage drops to 5 volts. *With power OFF:* should battery voltage drop below 5.5 volts, this fault indicator will stop functioning.

4.1.7 Filter-Clean Light

Item	*Name*	*Function*
6	**FILTER-CLEAN**	Illuminates, accompanied by an audible alarm, to indicate a potentially blocked or dirty filter. Filter is located on the front at the bottom of all freezers. Remove by turning the two thumbscrews on the filter holder ¼ turn. Clean filter by washing in mildly soapy water, then air dry. If filter warning light does not go out after replacing the cleaned filter, contact your local New Brunswick Scientific service representative.

4.1.8 Remote Control Light

Item	*Name*	*Function*
12	**REMOTE CONTROL**	Indicates when freezer is operating under remote computer control via the optional RS-485 interface port.

4.1.9 Set Temp Key

Operation in normal mode with **LOCK** lamp off.

Item	*Name*	*Function*
7	**SET TEMP**	Displays current temperature setting. Used to change temperature settings.

4.1.10 High Alarm/Low Alarm Keys

Operation in normal mode with **LOCK** lamp off.

Item	*Name*	*Function*
2	**HIGH-ALARM**	Displays current high alarm temperature setting.
2	**LOW ALARM**	Displays current low alarm temperature setting.

4.1.11 Lock Key

Normal mode is with **LOCK** lamp off.

Item	*Name*	*Function*
9	**LOCK**	Locks and unlocks the control panel for programming sequence.

4.1.12 Code Change Key

Operation in normal mode with **LOCK** lamp off.

Item	*Name*	*Function*
10	**CODE CHANGE**	Used to change freezer lock codes. Inactive in normal mode.

4.1.13 Alarm Test/Mute Key

Operation in normal mode with **LOCK** lamp off.

Item	*Name*	*Function*
11	**ALARM TEST/MUTE**	Sounds the audible alarm. If the audible alarm is on due to a fault condition, press this key to silence the alarm. The lamp LED lights can also be tested by pressing this key. The lights should all illuminate and the display should read "8888".

4.1.14 "E" Key

Operation in normal mode with **LOCK** lamp off.

Item	*Name*	*Function*
13	**E**	Used to enter data when programming.

4.1.15 "C" Key

Operation in normal mode with **LOCK** lamp off.

Item	*Name*	*Function*
14	**C**	Used to cancel data when programming.

4.1.16 Numerical Keys

Operation in normal mode with **LOCK** lamp off.

Item	*Name*	*Function*
15	**NUMERICAL KEYS (1-0)**	Used to input data when programming.

4.2 Programming the Freezer

Set the freezer to any temperature within the optimal range from -50°C to -86°C.

4.2.1 Setting Operating Temperature

To set the operating temperature for the freezer:

1. Press the **LOCK** key. The **LOCK** lamp will go on, indicating the system is unlocked and parameters can be changed.
2. Press the **SET TEMP** key; its indicator will flash and the display will indicate 0.
3. Using the numerical keys, enter a new temperature. The temperature selected will appear in the **TEMPERATURE** display.
4. If you make any input errors, use the **C** key to clear the display.
5. When the correct temperature is displayed, press the **E** key to enter the data. The **SET TEMP** lamp will go off.

NOTE:

All temperature setpoints are automatically negative °C.

4.2.2 Setting High/Low Alarm Setpoints

After you have set the operating temperature, and while the **LOCK** is still unlocked, select the **high setpoint** beyond which the temperature should not rise:

1. Press the **HIGH ALARM** key; its indicator will flash and the display will indicate 0.
2. Using the numerical keys, enter a new alarm setpoint temperature. The selected temperature will appear in the **TEMPERATURE** display.
3. If you make any input errors, use the **C** key to clear the display, then enter the correct value.
4. When the correct temperature is displayed, press the **E** (Enter) key to enter the data. The **HIGH ALARM** indicator will turn off.

Now select the **low setpoint** below which the temperature should not drop:

5. Press the **LOW ALARM** key; its indicator will flash and the display will indicate 0.
6. Using the numerical keys, enter a new alarm setpoint temperature. The selected temperature will appear in the **TEMPERATURE** display.
7. If you make any input errors, use the **C** key to clear the display, then enter the correct value.
8. When the correct temperature is displayed, press the **E** (Enter) key to enter the data. The **LOW ALARM** indicator will turn off.
9. With the operating temperature and high & low alarm temperatures set, press the **LOCK** key again. The **LOCK** lamp will go out and the freezer will return to normal mode.

When you press the **LOCK** key, if its light flashes, a lock code (*see Section 4.2.4 below*) has been entered. This is a security code, which means that the temperature settings cannot be changed if you do not know the lock code.

4.2.3 Checking Temperature Settings

To find out what operating temperature has been set for the freezer, press the **SET TEMP** key and read the display.

To find out what alarm setpoint has been set, press the **HIGH ALARM** key or the **LOW ALARM** key and read the display.

If you press the **SET TEMP**, **HIGH ALARM** or **LOW ALARM** key while the **LOCK** key lamp is flashing, the display will read ---- , which indicates that the freezer is locked.

4.2.4 Changing Lock Codes

CAUTION!

If you enter a lock code when there is none, or if you replace an existing lock code with a new one, be sure to take careful note of the new code before you enter it.

If the code is forgotten, you will need to call Customer Service to regain access to the programming mode of the freezer.

The freezer is delivered unlocked. To change the code, the freezer must be unlocked. If a lock code has already been set (indicated by the **LOCK** lamp flashing when the **LOCK** key is pressed), that same code must be entered to unlock the freezer. When the freezer is unlocked, the **LOCK** lamp is on (not flashing).

Once the freezer is unlocked, follow these steps to set a new lock code:

1. Press the **CODE CHANGE** key. The lamp will flash and the display will go blank.
2. Using the numerical keys, enter the new four-digit number. Check it on the display.
3. Press the **C** key to cancel the entry if the display shows it to be incorrect, then enter the correct number.

4. When the number is correct, record the new number somewhere secure (where it will not be lost but where it will not be accessible to anyone unauthorized), then press the **E** (Enter) key. The **CODE CHANGE** indicator will turn off.
5. Press the **LOCK** key; its indicator will turn off.

The freezer now has a new lock code. If at any time you wish to change this code, as indicated above, you will have to enter this code to unlock the system before you can enter a new code.

Setting the lock code to 0000 disables the lock completely. With the 0000 code, you would need only press the **LOCK** key to reprogram the freezer.

4.3 Battery Backup Switch

This is a rocker switch labeled **I/O** behind the locked front panel. In the **O** position, the battery is disconnected. This position should only be used while in transit, in storage, or to change the battery.

At all other times the switch should be kept in the **I** position for the battery to be charged, and for the alarm function to be available in the event of power failure. **(Failure to set the switch may result in impaired battery life, and the alarm will not trigger if the power fails.)**

With the battery switch on, during a power failure, the internal freezer temperature will be displayed at ten-second intervals, and the audio alarm will also sound. The audible alarm may be muted by pressing the **ALARM TEST/MUTE** key on the control panel, but will sound again after 30 minutes if the fault has not been corrected. Pressing the same button again will mute the alarm for an additional 30 minutes; the pattern will continue to repeat until the initial problem is corrected.

4.4 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. This plug can be connected either to a central monitoring system or to a remote alarm via an auto-dialer. The configuration of the socket is shown in Figures 4 & 5, as viewed from the rear of the freezer socket.

Within the freezer, the socket is connected to voltage-free contacts rated at 24 volts, 1 amp. In normal operation, with the power on, pin 1 is connected to pin 2 (N/C), and in the alarm condition, with power off, pin 1 is connected to pin 3.

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

Figure 4: Remote Alarm Socket —Chest Freezer

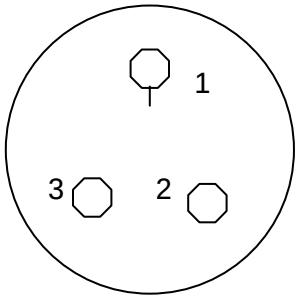
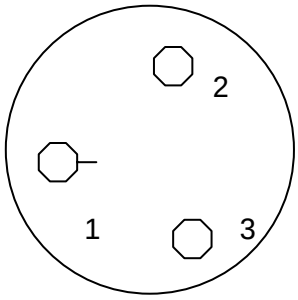


Figure 5: Remote Alarm Socket—Upright Freezer



4.5 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.

CRUSH WARNING!
These freezers are very heavy. DO NOT attempt to lift any freezer by hand. Always have a trained operator use mechanical lifting equipment.

4.6 General Operating Procedures

> ***WARNING!***
> **Be sure to wear protective gloves at all times when handling glassware and/or ultra-low temperature items.**

4.6.1 After a Power Failure

Should the power supply be interrupted for any reason, the **POWER-FAIL** indicator lamp (Item ③ in Figure 3) will illuminate. In addition, the audible alarm will sound and the display will flash at approximately 10-second intervals.

When power is restored, both alarm and light will automatically be cancelled.

If power has been interrupted for only a short time, the internal temperature of the freezer will not have risen above the temperature setpoint (the user-set alarm threshhold), so normal operation will be resumed immediately.

If, however, the interruption was long enough for the internal temperature to rise above the temperature setpoint, the **TEMP-ALARM** indicator will illuminate. If the internal temperature does not fall below the temperature setpoint within 30 minutes after power was restored, the audible alarm will sound again. The **TEMP-ALARM** indicator will remain illuminated until the operator resets it by pressing the **ALARM TEST/MUTE** key.

4.6.2 Interior Warming

If the lid or door is left open long enough for the internal temperature to rise above the temperature setpoint, the same effects will be observed as described in Section 4.6.1 above regarding power failure.

To minimize the risk of this happening, the lid or door should not be opened more frequently than is absolutely necessary, and then only for the shortest possible time.

The upright freezers are fitted with internal doors which latch shut, minimizing temperature rise when the outer door is opened.

Chest freezers are fitted with inner insulating lids to ensure efficient running of the freezer. These should remain fitted at all times when the freezer is running.

4.6.3 Start-Up

To start the freezer, connect the power cord and switch on the main circuit breaker. Set the battery switch (*see Figures 1 & 2*) to **I** (ON). After approximately one minute, the compressors will start to cool the freezer.

5 MAINTENANCE

> ⚠ ***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.**

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. **<u>Do not</u> use abrasive cleaners or solvents.**

5.1.2 Panels & Shelves

The interior panels and shelves are made of stainless steel. They may be cleaned and sterilized.

5.1.3 Air Intake Grill & Filter

The air intake grill must be cleaned regularly to keep it free from dust and debris. Under normal conditions, clean the grill once every three months. If the area around the freezer is very dusty or dirty, however, clean the grill more often. Brush the grill with a soft brush and, if a vacuum cleaner is available, vacuum the dust from the grill.

> ⚠ ***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. Remove the filter from behind the grill by turning the thumbscrews ¼ turn and opening grill downward. The filter should be washed in warm, soapy water and left to air dry before replacing.**

5.1.4 Vent Tube

NOTE:

There is an electrically-heated 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 vent tube. If the vent tube is allowed to become blocked, a vacuum will be created when the 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 seal, which can take up to two hours due to the high quality of the seals.

Check monthly that the vent tube is clear of ice. If necessary, remove ice by breaking it off with a gloved hand.

The vent tube is located (a) on the top of upright models and (b) in the compressor housing of chest models.

5.1.5 Door/Lid Seal

Be sure to treat the door seal on the upright freezer and the lid seal on the chest freezer with great care. Avoid damaging this seal 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 the surface against which it seals 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. De-activate the alarm by switching the battery (alarm) switch (located behind the lockable panel on the front of the freezer) to **O**.
2. Unplug the freezer from the electrical supply.
3. Leave the door or lid open.

4. Allow the accumulated ice to melt.

CAUTION!
<u>Do not</u> attempt to chip or scrape the ice with a sharp instrument. Allow the ice to melt naturally.

5. Mop up the resulting water
6. Dry and decontaminate the interior of the freezer.
7. When defrosting is complete, reconnect the freezer to the electrical supply.
8. Turn the main power switch on (**I**) and re-activate the battery (alarm) switch.

5.3 Electrical Components

5.3.1 Lamps

Regularly check the indicator lamps by pressing the **ALARM TEST**/**MUTE** key. All of the indicator lamps should illuminate, and the display should read **8888**.

5.3.2 Alarms

Regularly check the alarm by pressing the **ALARM TEST**/**MUTE** key. The **TEMP** indicator should illuminate and the audible alarm should sound.

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

5.3.3 Battery Replacement

The YUASA–NP6V 2.8Ah battery is mounted on the electrical panel. This is located (a) behind the right-hand 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 part number. The battery must be fitted so the terminals correspond to the polarity labels on the electrical panel.

To replace the battery, first switch off the power switch and disconnect the power supply. Remove the side cover and the battery clamp securing the battery to the electrical panel. Disconnect the battery terminals.

Be certain, when reconnecting the battery, to respect the correct polarity (red is + positive and black is – negative).

5.3.4 Fuses

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

Main Power Supply Plug (UK only)	13A Bussmann 1 x ¼"
†Control Panel	FS1 - 800mA 20x5mm Quick Acting (F) 250V Ceramic FS2 - 1A 20x5mm Anti-Surge (T) 250V Ceramic
†PCB A1201	FS1 - 2A 20x5mm Quick Acting (F) 250V

† These fuses must be replaced by an NBS-approved service engineer.

6 TROUBLESHOOTING

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

6.1 Error Codes

Your electronically-controlled NBS freezer incorporates the unique Systems Monitoring And Reporting Technology (S.M.A.R.T. Plus™) self-diagnostic software to diagnose faults in its electronic systems, its probes and/or its refrigeration system.

This table interprets error codes that may appear in the control panel display:

Error Code	*Possible Solution/Explanation*
E-01	PT100 Probe 1 failure. Probe, located inside freezer, indicates cabinet temperature. Call NBS Service department.
E-02	Probe 2 failure. Monitors cascade condenser. Call NBS Service department.
E-03	Probe 3 failure. Monitors air-cooled condenser. Call NBS Service department.
E-04	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. Cool the room. *If alarm continues,* (3) Fan may have failed. Call NBS Service department.

6.2 Other Symptoms

Symptom	*Possible Solution/Explanation*
Door won't open	(1) Check to see if handle is locked; unlock with key. (2) Check to see that air vent is clear of ice. *If door still won't open,* (3) Call NBS Service department.
FILTER-CLEAN light on	(1) Clean the filter according to the instructions in Section 5.1.3. *If the light remains on,* (2) Call your NBS service department.

7 ACCESSORIES & SPARE PARTS

7.1 Accessories

A number of accessories are available for the New Brunswick Scientific range of ultra-low temperature freezers. Contact your local NBS representative or distributor for details.

7.1.1 CO_2 & LN_2 Back-Up Systems

These systems are available to temporarily protect the contents of the freezer against the consequences of freezer or power failure. In an emergency, the system can be attached to the freezer to inject either carbon dioxide or liquid nitrogen from a storage bottle. Carbon dioxide back-up systems will maintain temperatures between -40°C and -70°C (subject to environmental conditions) for a period of up to 48 hours, during which time the freezer can be repaired. Liquid nitrogen back-up systems will maintain the freezer temperature at -86°C.

CO_2 and LN_2 back up systems can be retrofitted by the user. Contact your local NBS distributor for options available. Instructions are included in the kit.

7.1.2 Racking Systems

A very comprehensive set of aluminum racks is available. These are designed to accommodate various sizes of boxes neatly, while giving maximum packing density in the freezer. Custom-made racking is also available upon request.

7.1.3 Chart Recorder

A 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 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 RTMS Software/RS-485 Computer Interface

This allows up to 30 individual freezers to be remotely temperature-controlled and monitored. The computer interface comes complete with datalogging and control software.

7.2 Spare Parts

NOTE:

Only NBS-approved engineers may service these Ultra-Low Temperature Freezers.

Description	*Part No.*	*Freezer Model(s)*
Battery 6V, 2.8 Ah	K0480-0170	All
Fuse 1A ceramic, pack of 5	K0380-0565	All
Fuse 800mA, pack of 5	K0380-0560	All
Fuse 2A T 250v (Control PCB), pack of 5	P0625-1240	All
Fuse 1x1/4" 13A (UK only), 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 Only, Chest Lid Handle	P0625-0110	Chest models
Power Switch Plate Lock	K0160-0082	All
Power Switch Locking Plate Assembly	P0625-0170	All
Power Cord, 230V 50 Hz UK	P0625-0357	All
Power Cord, 230V 50 Hz, European Schuko	P0625-0356	All
Power Cord, 115V 60 Hz	P0625-0354	All
Power Cord, 208/220V 60 Hz	P0625-0358	All
Lock & Key Chest Handle	K0220-0425	Chest models
Chest Handle Replacement Kit	K0160-0135	Chest models
Black Plastic Molded Handle Replacement Kit	K0220-0431	Upright models
Black Plastic Molded Handle (handle only)	K0220-0432	Upright models
Door Latch Assembly (replacement)	K0160-0067	Upright models
Air Filter, Uprights (replacement)	K0200-0511	Upright models
Air Filter, Chest (replacement)	K0200-0516	Chest models

...continued...

Description	*Part No.*	*Freezer Model(s)*
Air Filter Grill, Upright	K0200-0510	Upright models
Air Filter Grill, Chest	K0200-0515	Chest models
Inner Lid, C340	K0280-1041	C340
Inner Lid, C660	K0280-1043	C660
Inner Shelf, U410 with Mounting Clips x 4	K0280-1031	U410
Inner Shelf, U570 with Mounting Clips x 4	K0280-1030	U570
Shelf Clips, stainless steel, pack of 4	K0280-0550	Upright models
Inner Door Assembly, U410	K0280-1051	U410
Inner Door Assembly, U570	K0280-1000	U570
Inner Door Latch Spring Clip, pack of 5	K0260-0720	Upright models
Hole Plug, Upright Door Handle, 28.5mm, pack of 2	P0625-0150	Upright models
Hole Plug, Upright Door Handle Lock, 19mm, pack of 2	P0625-0151	Upright models
Alarm Connector Plug	K0380-0451	All
White Plastic Bung, CO_2/LN_2 Ports, pack of 2	P0625-0140	All
Swivel Castor	K0160-0730	All
Locking Swivel Castor	P0625-0160	All

For additional information on spare parts, please call your local NBS equipment supplier.

8 SPECIFICATIONS

8.1 Upright Freezers

Model No.		***U410***	***U570***
Part No.		U9260-0000, -0002, -0001	U9270-0000, -0002, -0001
Internal Dimensions: **Height x Width x Depth**		1265 x 550 x 575 mm 49.8 x 21.6 x 22.6 inches	1265 x 765 x 575 mm 49.8 x 30.1 x 22.6 inches
External Dimensions: **Height x Width x Depth**		1915 x 800 x 852 mm 75.3 x 31.5 x 33.5 inches	1925 x 1025 x 852 mm 75.8 x 40.3 x 33.5 inches
Capacity		410 Liters 14.5 cubic feet	570 Liters 20.0 cubic feet
Net Weight		235 Kg 518 lb	265 Kg 584 lb
Lock		Supplied as standard	
No. Compartments		5	5
Interior		Stainless steel grade 304L	
Alarms		Hi/Low temperature, power fail, battery low, filter clean, fault	
Insulation Material		Urethane Foam	
Refrigerants		High Stage Refrigerant: R404A / Low Stage Refrigerant: R508B	
Remote alarm port		Standard	Standard
RS-485 interface		Optional	Optional
***Power Consumption:**			
• **115V electrical supply**		540 Watts	590 Watts
• **220V electrical supply**		540 Watts	590 Watts
• **240V electrical supply**		525 Watts	565 Watts
Power Source		100-120V 60Hz single phase	100-120V 60Hz single phase
		208-230V 60Hz single phase	208-230V 60Hz single phase
		220-240V 50Hz single phase	220-240V 50Hz single phase
Current Rating	**USA**	115V 16.5 amps	115V 16.5 amps
	USA	220V 8 amps	220V 9 amps
	EU	230V 5 amps	230V 6 amps
Performance		-50°C to -86°C at +32°C maximum ambient operating temperature	
Operating Environment		All freezers are designed for: • Indoor use • Altitude up to 2000m • Ambient temperature range 5°C to 32°C • Maximum relative humidity 80% for temperatures up to 32°C • Power supply voltage fluctuations not to exceed ± 10% of the nominal voltage • Installation category II • Pollution degree 2	

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

8.2 Chest Freezers

Model No.		***C340***	***C660***
Part No.		U9230-0000, -0001	U9250-0002, -0001
Internal Dimensions: **Height x Width x Depth**		760 x 760 x 590 mm 30 x 30 x 23.2 inches	760 x 1470 x 590 mm 30 x 57.8 x 23.2 inches
External Dimensions: **Height x Width x Depth**		1075 x 1340 x 840 mm 42.3 x 52.7 x 33 inches	1075 x 2050 x 840 mm 42.3 x 80.7 x 33 inches
Capacity		340 Liters 12.0 cubic feet.	660 Liters 23.3 cubic feet
Net Weight		205 Kg 441 lb	280 Kg 617 lb
Lock		**Supplied as standard**	
No. Compartments		N/A	N/A
Interior		Stainless steel grade 304L	
Alarms		Hi/Low temperature, power fail, battery low, filter clean, fault	
Insulation Material		Urethane Foam	
Refrigerants		High Stage Refrigerant: R404A / Low Stage Refrigerant: R508B	
Remote alarm port		Standard	Standard
RS-485 interface		Optional	Optional
***Power Consumption:**			
• **115V electrical supply**		430 Watts	N/A
• **220V electrical supply**		N/A	625 Watts
• **240V electrical supply**		420 Watts	595 Watts
Power Source		100-120V 60Hz single phase	N/A
		N/A	208-230V 60Hz single phase
		220-240V 50Hz single phase	220-240V 50Hz single phase
Current Rating	**USA**	115V 16.5 amps	N/A
	USA	N/A	220V 8amps
	EU	230V 4.5 amps	230V 6 amps
Performance		-50°C to -86°C at +32°C maximum ambient operating temperature	
Operating Environment		All freezers are designed for: • Indoor use • Altitude up to 2000m • Temperature range 5°C to 32°C • Maximum relative humidity 80% for temperatures up to 32°C • Power supply voltage fluctuations not to exceed ± 10% of the nominal voltage • Installation category II • Pollution degree 2	

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

9 DRAWINGS

9.1 Circuit Diagram/Wiring Schematic

Figure 6: Circuit Diagram/Schematic for 115V/220V 60Hz Models

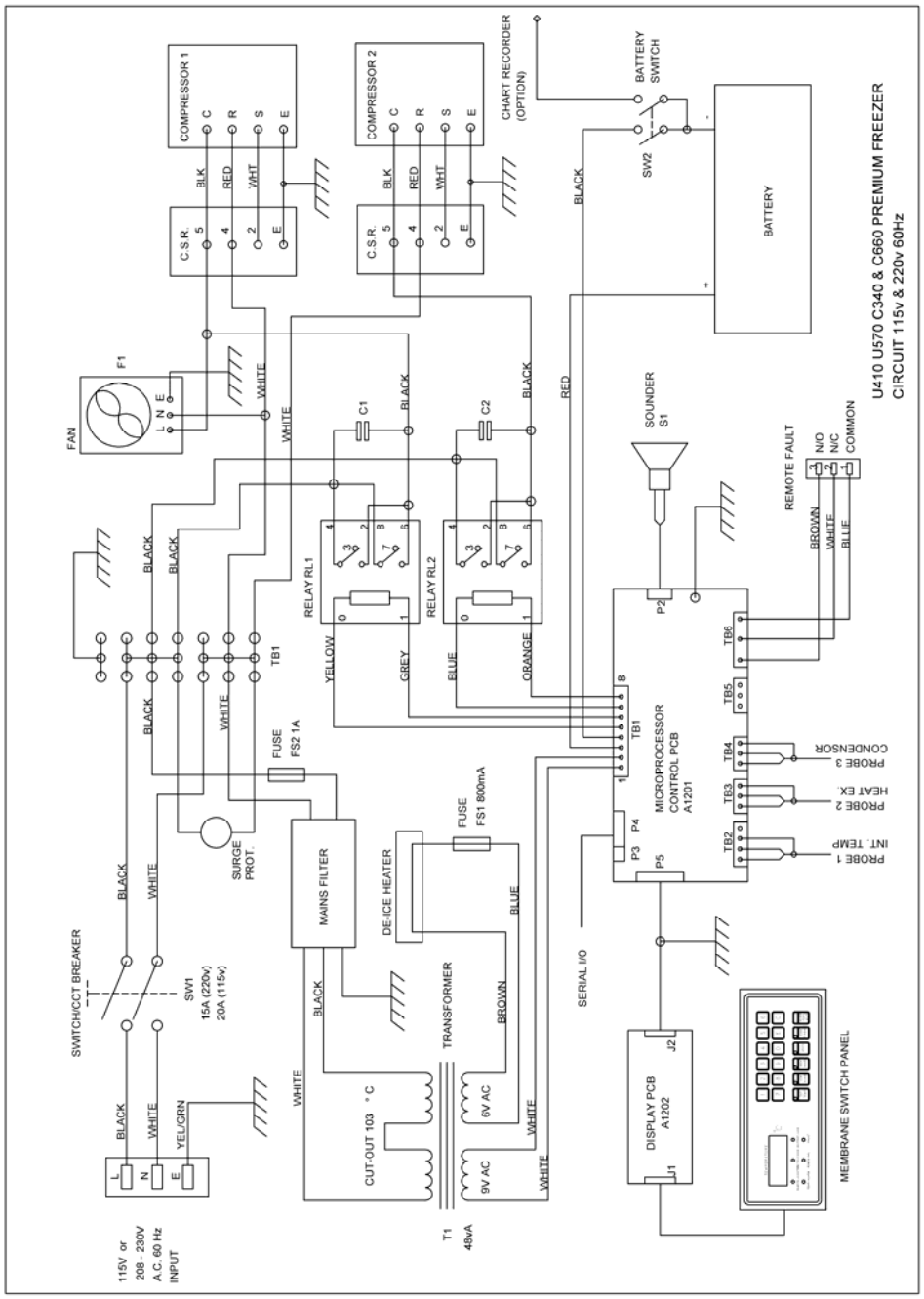
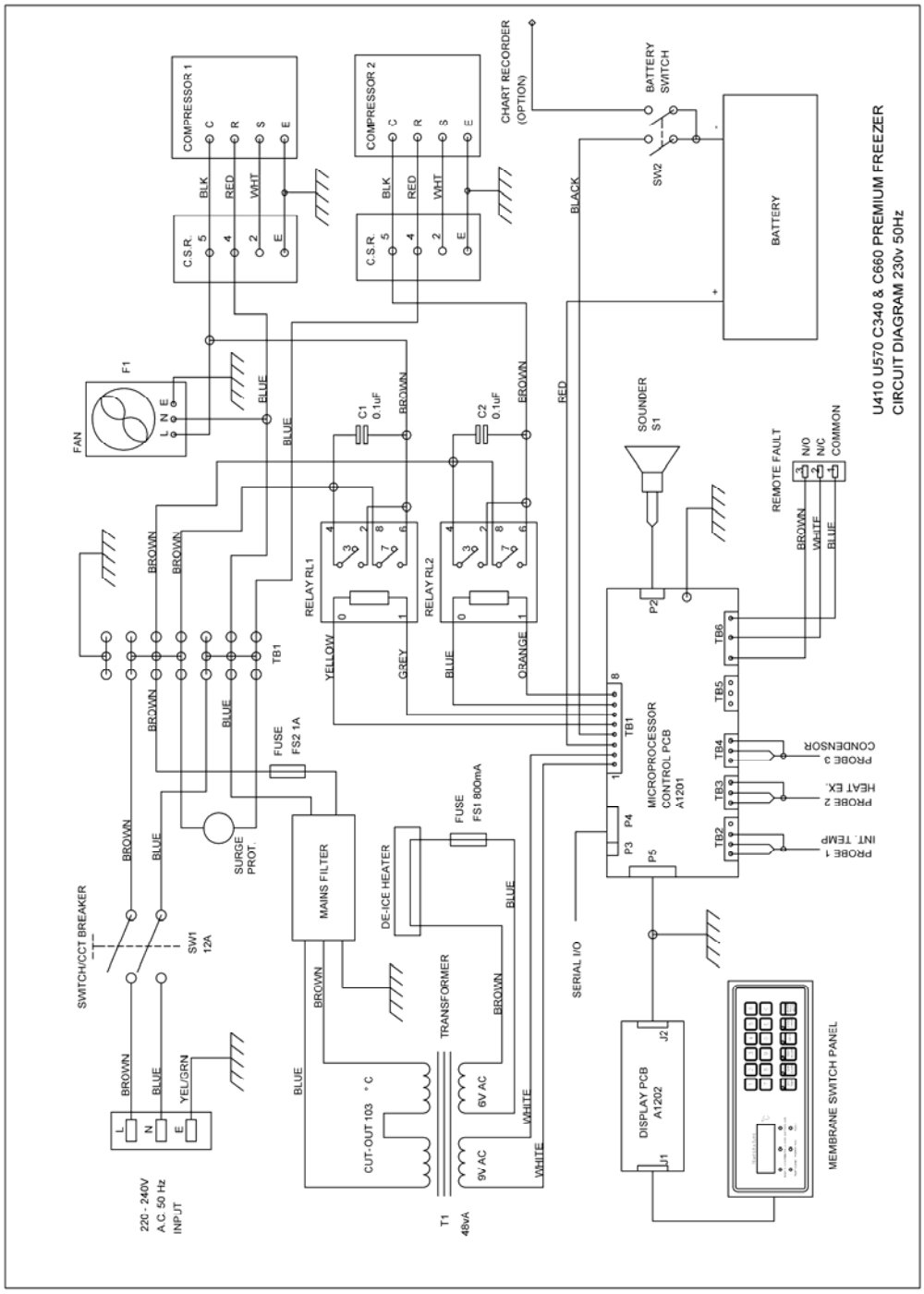


Figure 7: Circuit Diagram/Schematic for 230V, 50Hz Models



9.2 Index of Drawings

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