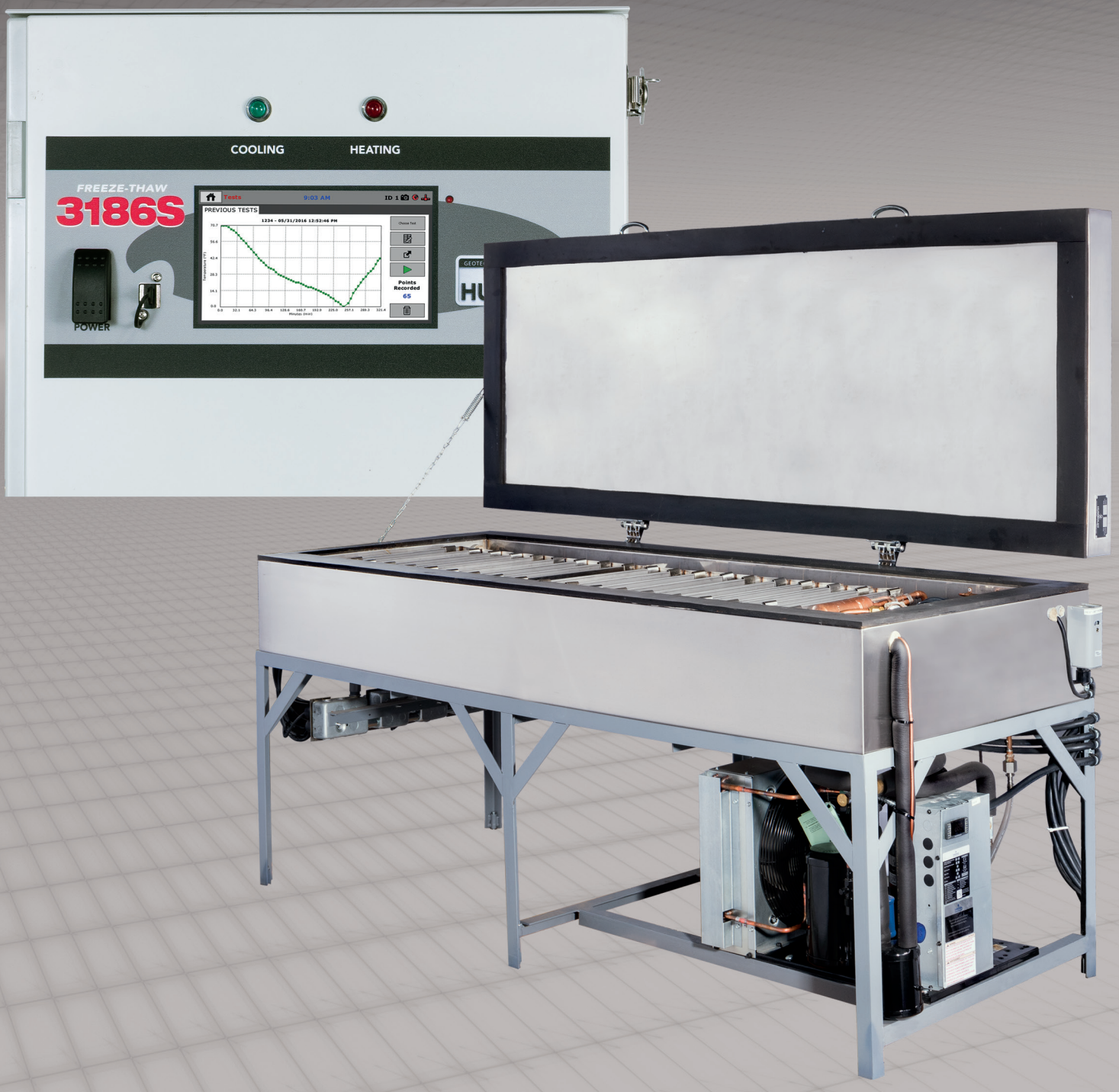
FREEZE-THAW CABINET



ELITE SERIES

Freeze-Thaw

Humboldt's Elite Series, Freeze-Thaw Cabinet is used to measure the resistance of concrete to deterioration caused by repeated cycles of freezing and thawing. The HC-3186S.4F Freeze-Thaw is designed to test up to eighteen 3" x 4" x 16" (76 x 102 x 406cm) concrete specimens simultaneously, with one being a control. Key features of the Freeze-Thaw include:

- Fully automatic operation frees operator to perform other lab duties.
- Allows users to establish field control using correlations between concrete strength and durability
- Permits the evaluation of variables in concrete properties and conditioning.
- Useful in the evaluation of the durability of aggregates, as well as the properties of admixtures.

Humboldt's touch-screen controller provides you with full, graphical monitoring of all testing functions in a stand-alone application. Now you can have full, finger-tip control and monitoring of all testing functions with Humboldt's touch-screen controller, found on our Freeze-Thaw Cabinet. The seven-inch, waterproof screen provides at-a-glance monitoring of testing functions, in a real-time graphical display, without the use of a computer.

HC-3186S.4F

ASTM C666, procedure A; AASHTO T161

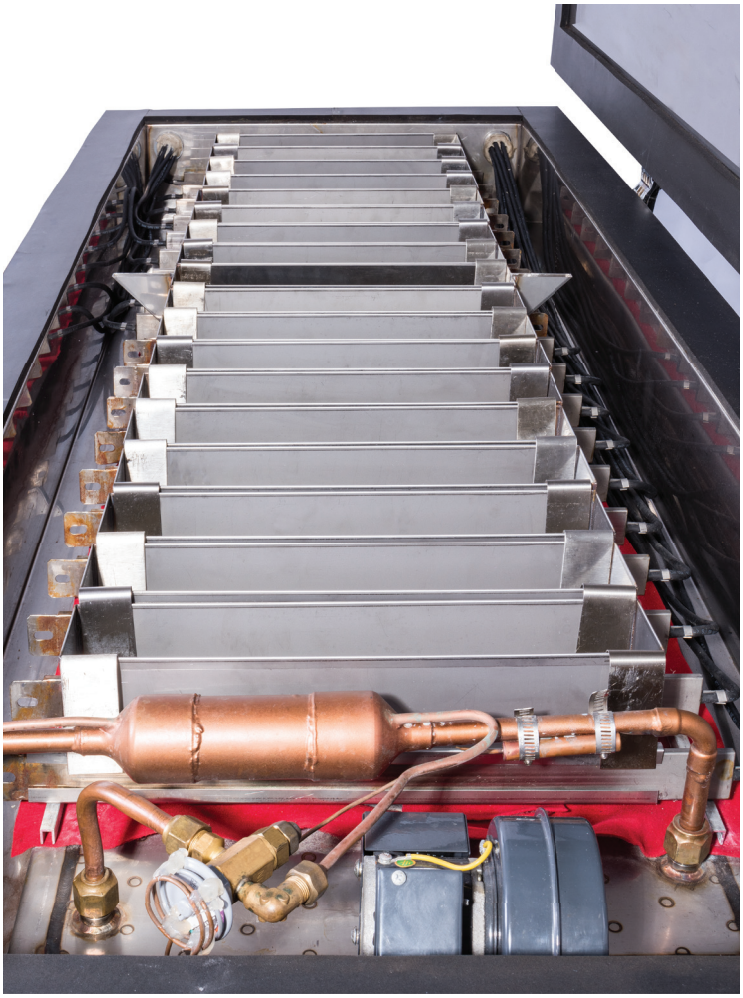
HC-3186S FREEZE-THAW

The HC-3186S Freeze-Thaw provides the following capabilities:

- User-created test control is possible, for changing freeze time, minimum temperature, maximum temperature and the number of cycles desired.
- Real-time, on-screen control and monitoring with graphing, allowing different data views to be chosen.
- Test data can be reviewed after a test is completed, which includes tabulation and graph views.
- Touch-screen interface for easy navigation.
- Test data can be via the front USB port and a flash drive. Reports can be generated by using Humboldt's HM-Data Download software and the exported data.

It is possible to have up to eight freeze-thaw cycles within a 24-hour period, however, the exact number of cycles is dependent upon the time required for the temperature at the center of the control prism to fall from 40 to 0°F (4.4 to -17.8°C) and then back to 40°F (4.4°C). The temperature at the center of the control specimen is controlled with the use of a 0.75HP (0.6KW) refrigeration unit and electric resistance heaters with fully automatic controls.

Current temperature of the control specimen can be checked by a glance at the large, 7" color display on the controller. It is also possible to track the temperatures of freeze-thaw cycles in real-time with a glance at the display. For corrosion resistance and long service life, the HC-3186S Freeze-Thaw features a stainless steel, 84"L x 32"W x 35.75"H (213 x 81 x 91cm) cabinet construction with 3" (76mm) insulation on all sides. The internal test compartment measures 74" x 26" x 6" (188 x 66 x 15cm). A 30-amp circuit is required for operation.



Controller Specifications

Display	7" (178mm) VGA (480 x 800) Resistive-touch screen
Real-time test data	Graphic and tabulation
Processor	Dual 32-bit ARM
RAM	64MB
Memory, non-volatile	4GB
Data acquisition	1 Channel
Logging speed	1 reading every 5 minutes
Multi-test storage	1000
Points per test	3000
USB port	used to export data via thumb drive
Ethernet connection	for network connectivity
Firmware Update	Ethernet or flash drive

Specifications

Condensor Operating Temperature Range	-30°F to 45°F (-34°C to 7°C) evap (R-404A) Designed for up to 110°F (43°C) ambient
Data channels	1
Data storage	1000 tests and up to 3000 readings per test
Cabinet Dims	84"L x 32"W x 35.75"H (213 x 81 x 91cm)
Controller Dims	22.25"H x 16.25 "W x 6"D (56 x 41 x 15cm)
Voltage	208/230V 50/60Hz Single Phase - 30amps
Net weight	1200 lbs (544kg)

Freeze-Thaw Cabinet Includes:

(17) H-3185TA Stainless Steel Sample Trays, 3" x 4" x 16.375" (76 x 102 x 406mm)

(1) H-3185TSA Stainless Steel Sample Tray with spout, 3" x 4" x 16.375" (76 x

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Testing Equipment For Construction Materials

HUMBOLDT

product manual 07.24

HC-3186S

Freeze-Thaw Cabinet

Testing Equipment For Construction Materials

HUMBOLDT

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Introduction

Humboldt's Elite Series, Freeze-Thaw Cabinet is used to measure the resistance of concrete to deterioration caused by repeated cycles of freezing and thawing. The HC-3186S.4F Freeze-Thaw is designed to test up to eighteen 3" x 4" x 16" (76 x 102 x 406cm) concrete specimens simultaneously, with one being a control. Key features of the Freeze-Thaw include:

- Fully automatic operation frees operator to perform other lab duties.
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- Real-time, on-screen control and monitoring with graphing, allowing different data views to be chosen.
- Test data can be reviewed after a test is completed, which includes tabulation and graph views.
- Touch-screen interface for easy navigation.
- Complete report generation from with the Humboldt NEXT software. Test data can also be exported to computers via a network or thumb drive.
- Remote control and monitoring via network and internet.

It is possible to have up to eight freeze-thaw cycles within a 24-hour period, however, the exact number of cycles is dependent upon the time required for the temperature at the center of the control prism to fall from 40 to 0°F (4.4 to -17.8°C) and then back to 40°F (4.4°C). The temperature at the center of the control specimen is controlled with the use of a 0.75HP (0.6KW) refrigeration unit and electric resistance heaters with fully automatic controls.

Current temperature of the control specimen can be checked by a glance at the large, 7" color display on the controller. It is also possible to track the temperatures of freeze-thaw cycles in real-time with a glance at the display. These graphs and tabular data can be used to produce

reports of tests within the Humboldt NEXT software or downloaded to other computers or software for reports.

For corrosion resistance and long service life, the HC-3186S Freeze-Thaw features a stainless steel, 84"L x 32"W x 35.75"H (213 x 81 x 91cm) cabinet construction with 3" (76mm) insulation on all sides. The internal test compartment measures 74" x 26" x 6" (188 x 66 x 15cm). A 30-amp circuit is required for operation

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(1) H-3185TSA Stainless Steel Sample Tray with spout, 3" x 4" x 16.375" (76 x 102 x 406mm)

Hardware Setup

1) Mount the controller box securely on a wall nearest to the Freeze/ Thaw cabinet, but away from water or extreme moisture.

2) Plug in all electrical devices on the cabinet such as heaters, cooling system compressor, fan, and mechanical thermostat to the socket at the bottom of the controller box. All electrical connections have twist to lock plugs that easily attach to the controller box. The heaters consist of 3 banks with 3 identical plugs, but the sockets and cables are marked. Be sure each heater cable is plugged into the proper socket.

3) Be sure the power switch is turn off (down) before applying power.

4) The system is shipped without a plug on the inlet power cable so the user can attach a plug to match their socket or the system can be hard wired into a breaker box or junction box. Power requirements are: 220VAC, 50 or 60Hz, single phase, 30 amps.

5) When all cables are connected, turn on the power switch. You will hear a series of relay clicks from the cooling system which is normal. Wait about a minute after power up before starting a test.

6) Figure 3 shows the home screen that appears on the LCD display when the unit is first turned on.

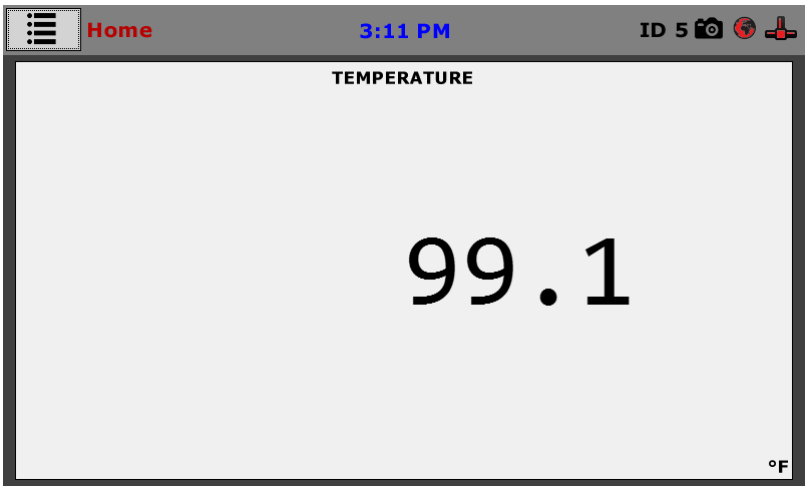

Figure 3

Settings

1) Press the Menu button on the default home screen > System Setting.

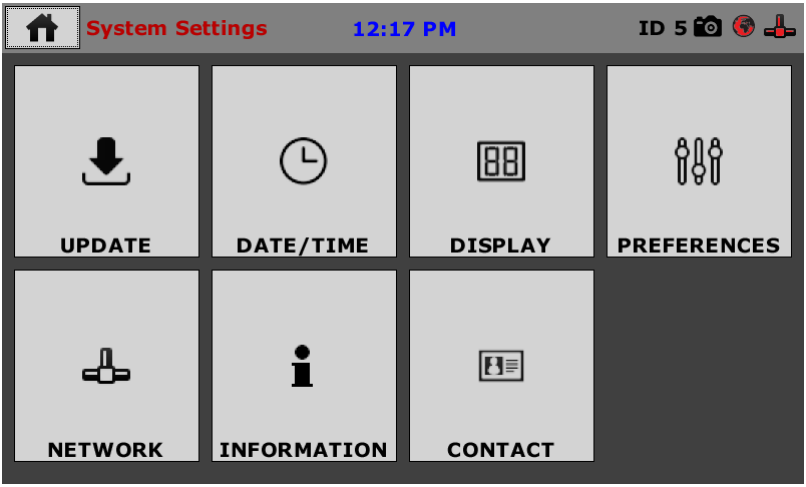

Figure 4

A. Date/time

2) On the System Settings screen, press Date/Time.

3) The Time and Date Settings Screen will appear, as seen in Figure 5.

4) An alternate method is to simply touch the clock, which is located on the top middle of the screen at all times, and it will open the Date/Time Screen.

5) Set the date and time using the keypad that appears by touching the yellow text box for month, day, year, hours, minutes, or seconds (Figure x).

6) The date format can be changed using the drop down menu under “Date Format.”

7) The clock style shown on the top of the screen may be altered by checking or un-checking the boxes for “24 Hour Clock” or “Show Seconds”

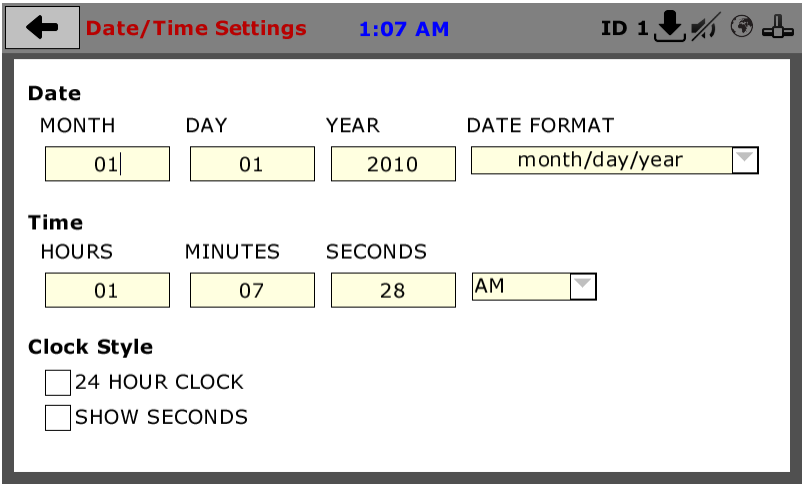

Figure 5

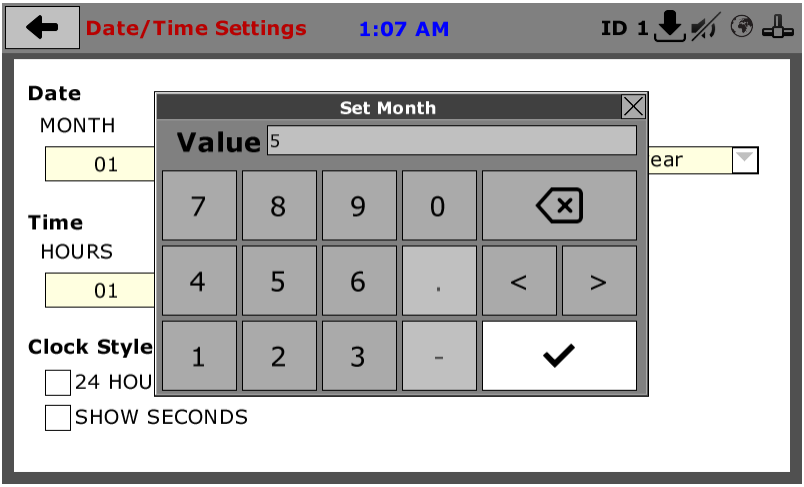

Figure 6

B. Display

1) On the System Settings screen, press Display

2) The Display Settings Screen will appear, as seen in Figure 7. Here, the brightness may be adjusted to a desired level by using the slider on the brightness scale and move it to side of “less” or “more.”

3) To change the time before the screen auto dims, tap the yellow text box under “DIM DISPLAY” (seen in Figure 7), a keypad will appear, and the desired number of minutes can be entered.

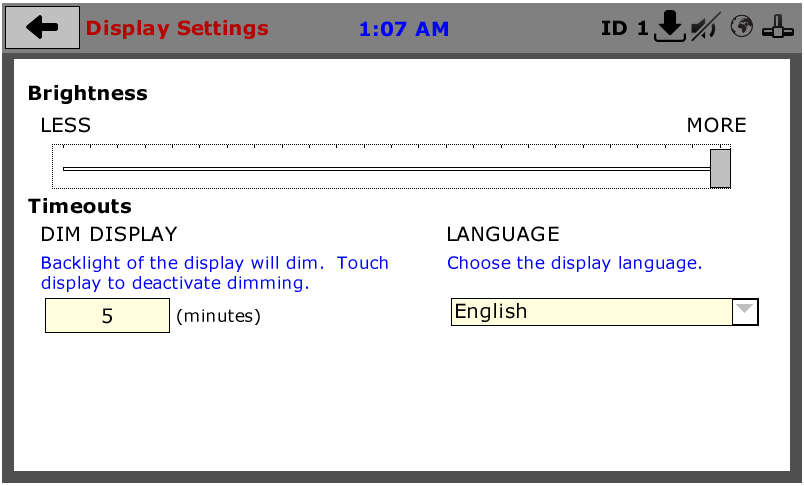

Figure 7

C. Preferences

1) On the System Settings screen, press Preferences. There are 4 options tabs that are used to select user preferences:

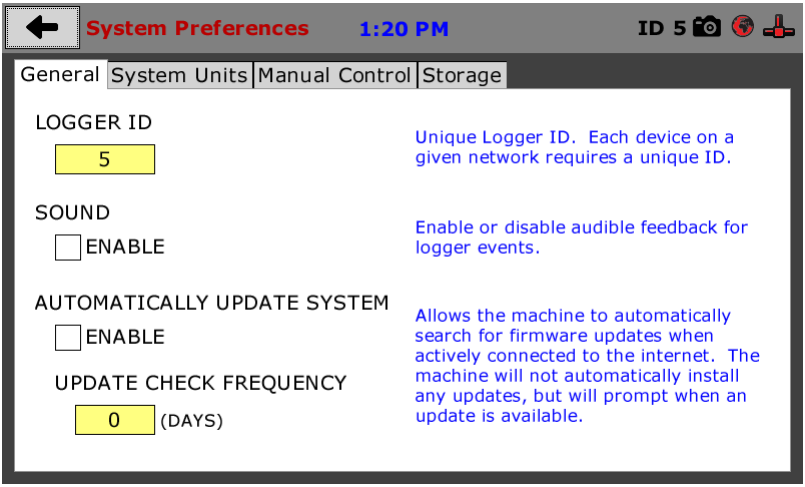

Figure 8

On the main screen you can select the Logger ID number that is used to identify the specific HM-1385 on the network. You can also enable or disable sound and how and when to check for firmware updates. Note: you cannot access the Preferences screen while a test is in progress.

2) On the Preferences screen, press the System Units tab to set the temperature units to Celsius or Fahrenheit.

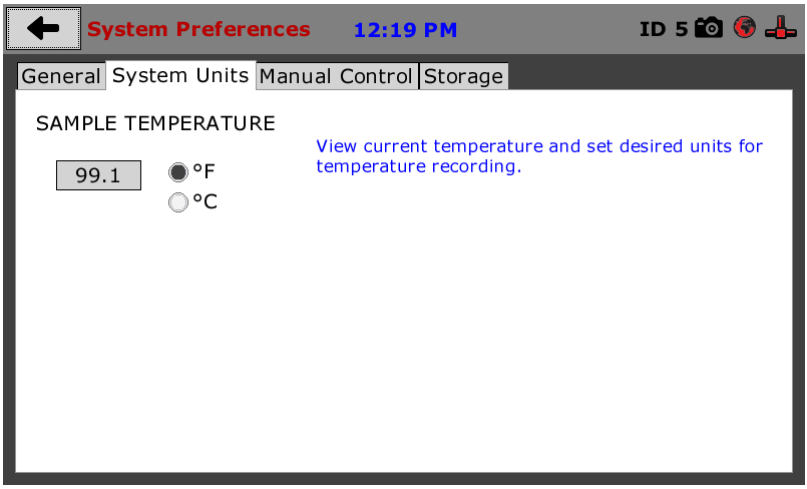

Figure 9

3) On the Preferences screen, press the Manual Control tab to turn on/off the heaters and/or cooling.

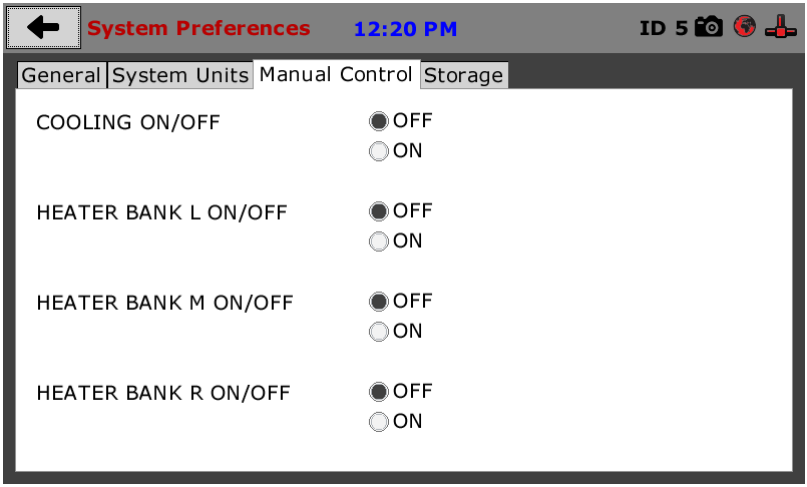

Figure 10

4) On the Preferences screen, press the Storage tab to set limits on how many tests to store and recover deleted tests.

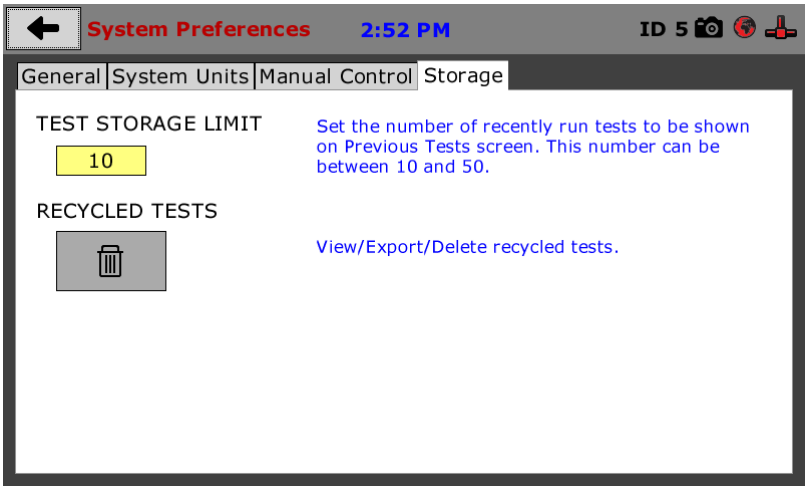

Figure 11

D. Network

5) On the System Settings screen, press Network.

6) The Network Settings screen is shown in Figure 12 below. The Cabinet has a webpage where you can run tests and download data. When using a static IP, type in the IP address shown into a web browser on your PC to access the Cabinet. Note not all network functionality may be available at time of product release. Check for updates frequently.

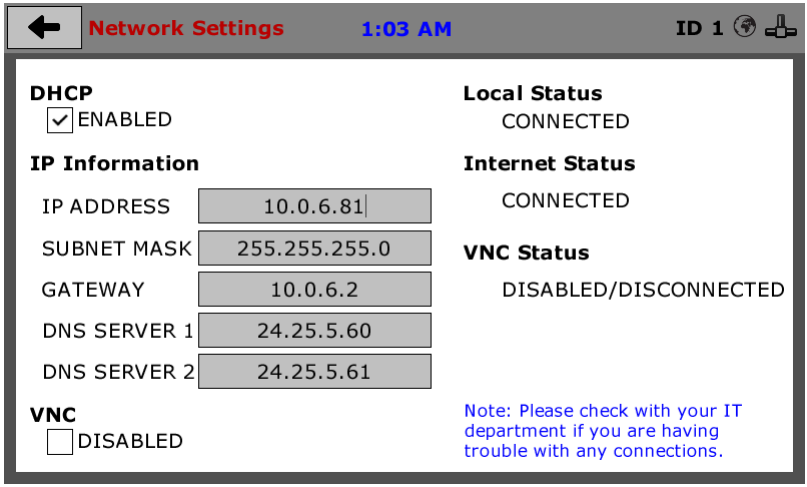

Figure 12

7) By default DHCP is enabled. This will automatically assign all IP Information for the cabinet.

8) To disable DHCP, simply uncheck the box. Once DHCP is disabled, the screen will look like Figure 13.

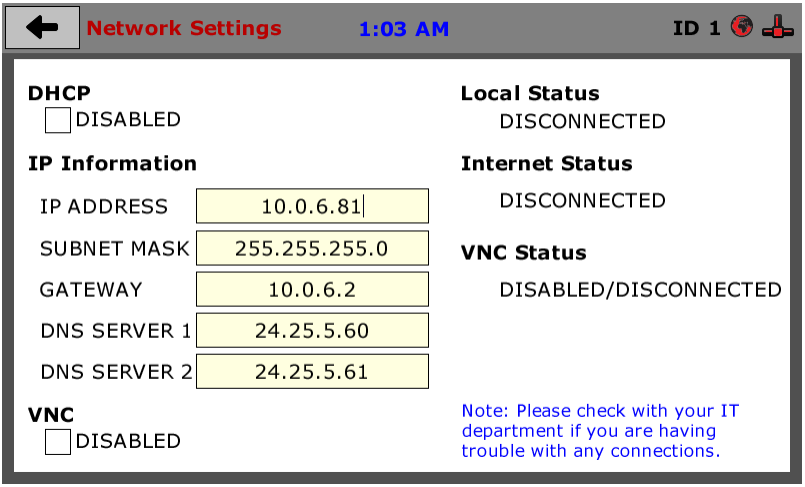

Figure 13

9) All IP Information is now free to be changed for purposes such as static IP.

Note: Disabling DHCP and failing to correctly setup the IP Information will prevent the cabinet from successfully accessing the internet and checking for updates.

Operation

A. Running a test

1) Press the Menu button on the default home screen: New Test.

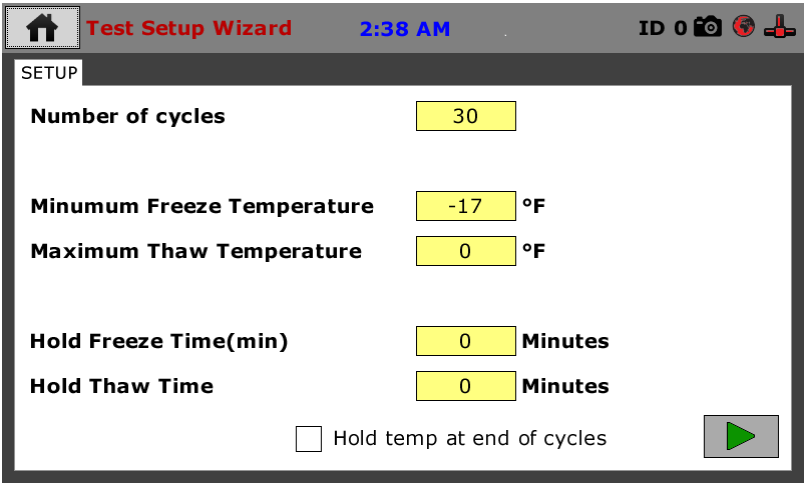

Figure 14

2) On this screen you can set (press the yellow area) the number of freeze / thaw cycles you wish to perform, as well as the min and max temperatures and hold times if desired.

3) After the number of cycles are reached, if the “Hold temp at end of cycles” box is checked, the system will keep the cabinet at the thaw temperature until the Stop test button is pressed.

4) Press the button to give the test a unique name. Once you hit the return button, testing starts immediately.

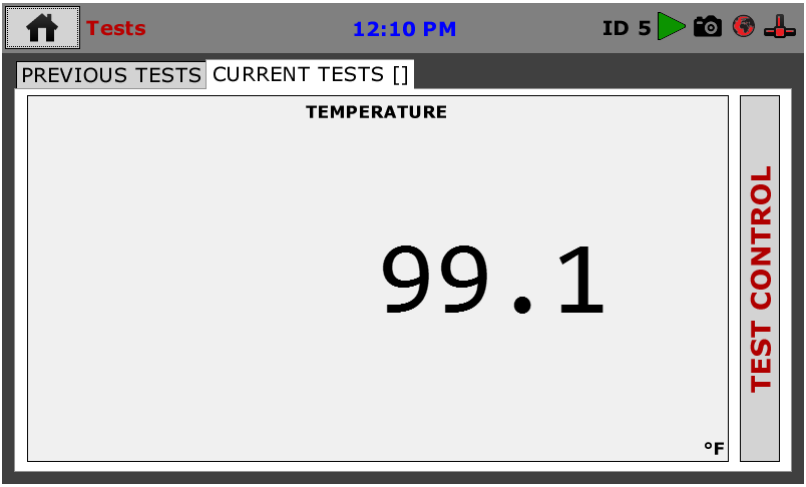

Figure 15

5) Pressing the TEST CONTROL bar will open a window as shown in Figure 16. Note this window is only available when a test is running.

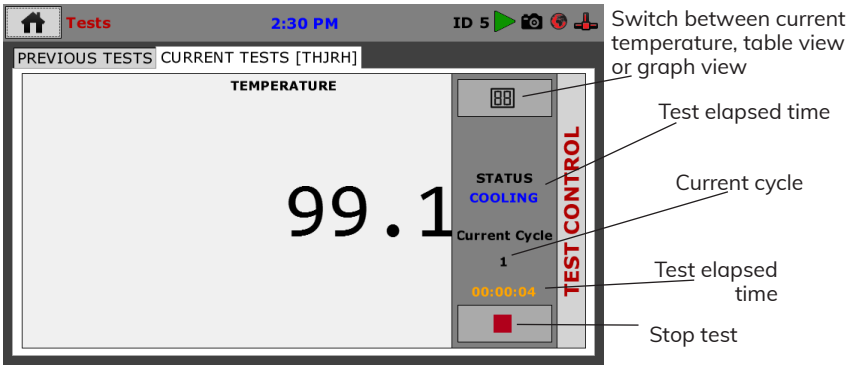

Figure 16

6) Pressing the PREVIOUS TESTS tab will open a window to view previous tests

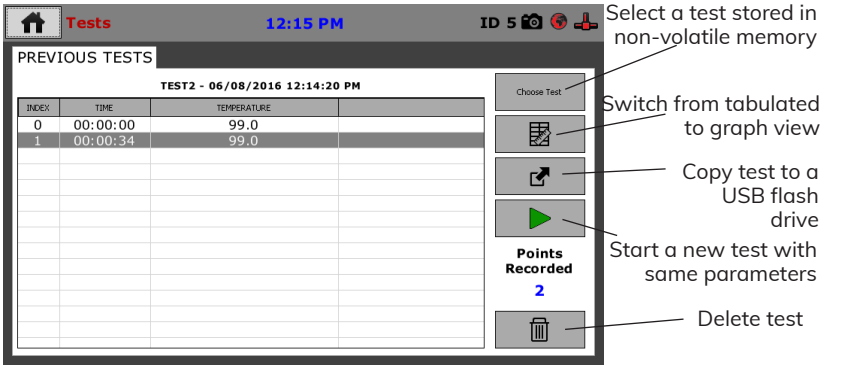

Figure 17

7) Pressing the Choose Test button will open a window to choose the test stored in non-volatile memory.

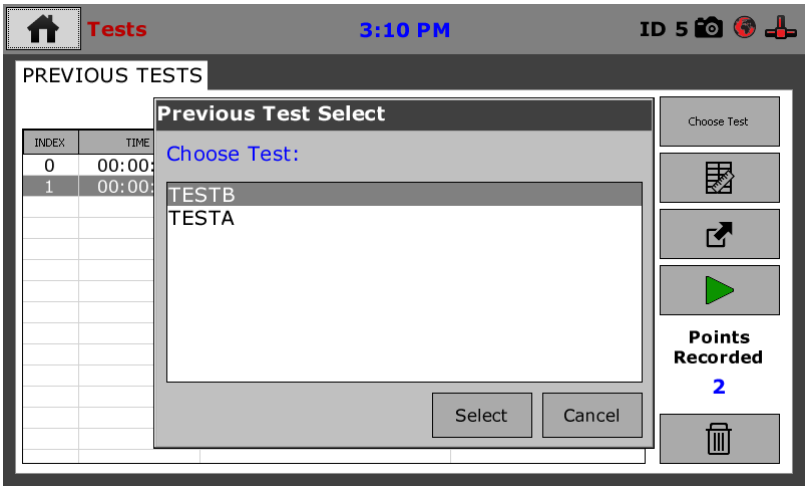

Figure 18

8) After testing is complete, the Current Test tab will disappear and the test will be moved into the Previous Test tab.

Added Features

1) To Take a Screen Shot of results or anything on the screen, hold the menu icon on the top left corner and drag it to the top-middle of the screen—illustrated in Figure 22 below. NOTE: The screen shot is always saved to USB so there must be a USB drive in the port.

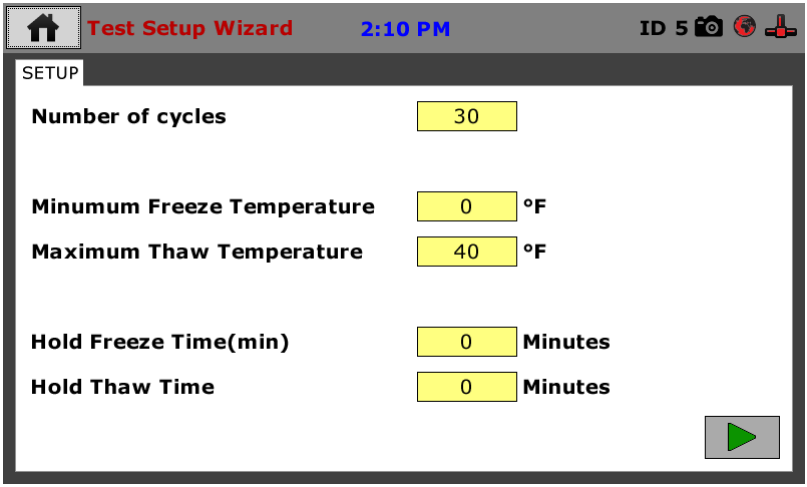

Figure 19

2) When the screenshot is being taken, there will be a camera icon in the top right corner, as seen in figure 19 above.

3) To view the tests on the computer:

a. Go to www.humboldtmfg.com

b. Click “Support”

c. Click "Software"

d. Click on the "Data Download Software" tab

e. The screen illustrated in Figure 20 below will appear.

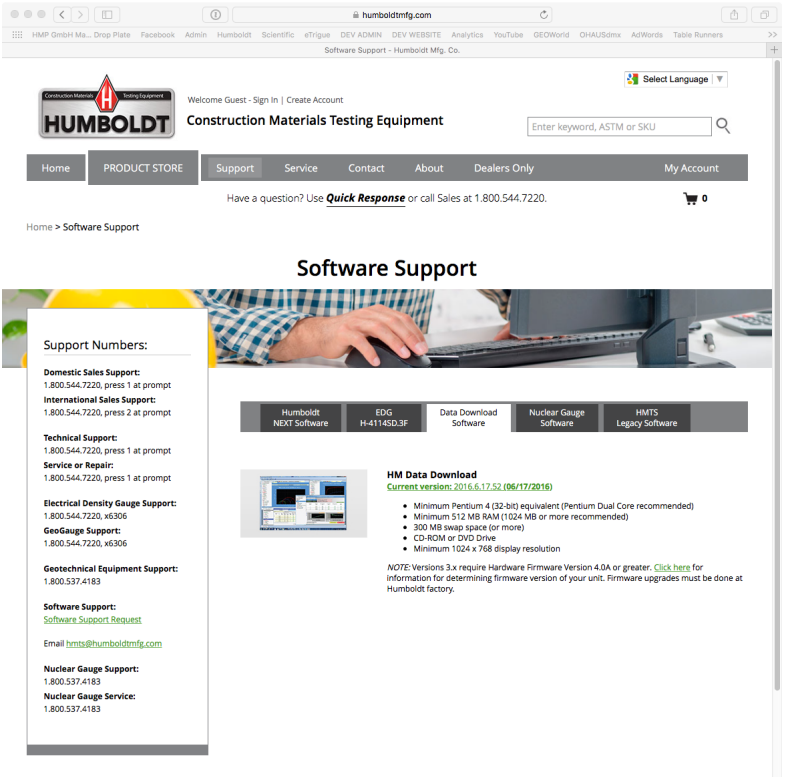

Figure 20

f. Click the Current version link and the software will download.

g. This software will retrieve the file from USB and view recorded data on the computer.

Appendix

Figures 25 and 26 illustrate the Network Settings screen when DHCP is enabled and then disabled respectively. When DHCP is disabled, IP Information can be changed. This is required if you wish to use the unit on a static IP network.

Note: Also notice the two icons in the top right corner of the screen. The furthest right icon indicates the status of a local network, and the globe shaped icon represents the status of internet connection. In figure 25 the icons are transparent indicating the machine is connected to a local network that does have internet access. Figure 26 shows the icons red, indicating no local network or internet connection.

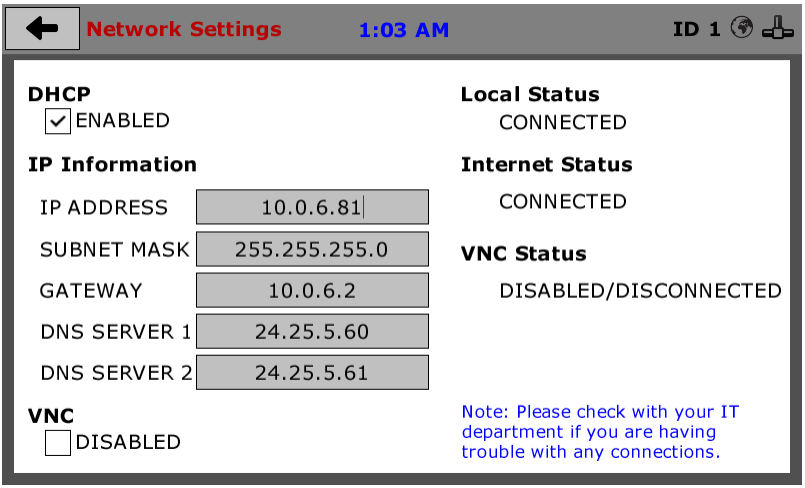

Figure 21

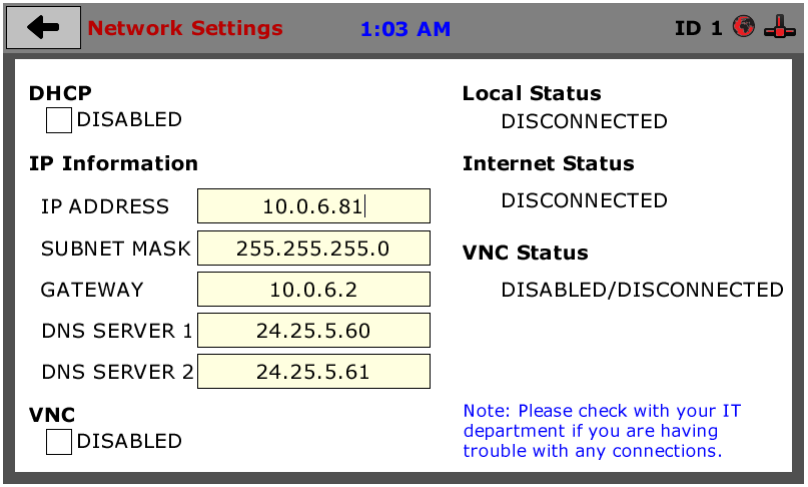

Figure 22

Figure 27 shows the Contact information screen. This screen can be found from the home Screen by pressing the top left button to drop down the menu, accessing the Setup menu and choosing contact. This screen provides the information for contacting Humboldt should any problems arise. In the event of emailing Humboldt directly, screen-shots would be extremely helpful to solving the problem quickly.

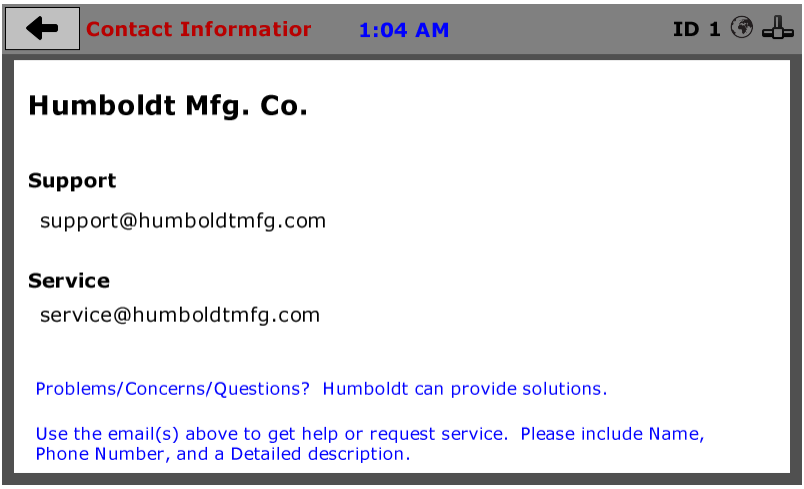

Figure 23

In Figure 28 above, illustrates the screen that will appear upon boot up if clock settings were lost. The appropriate date and time settings will need to be reset.

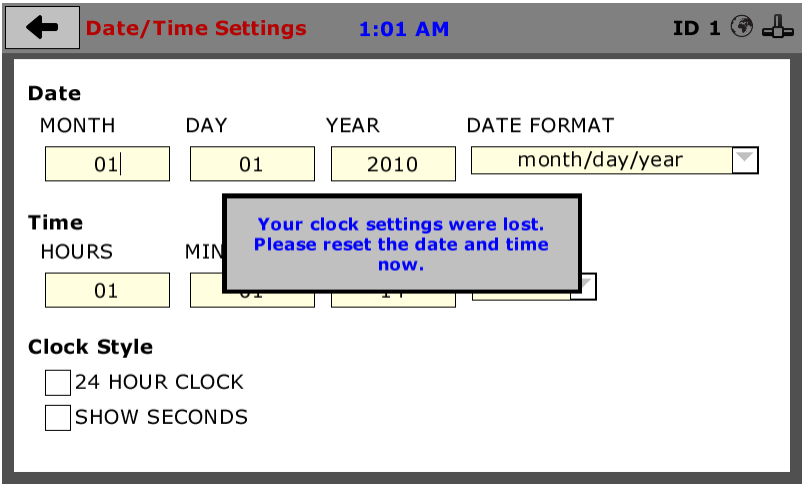

Figure 24

Warning

Heater strips can reach a high temperature that can cause burns to exposed skin; do not touch while machine is testing. Ensure control panel is closed while power is connected to avoid electrical shock.

Warranty

Humboldt Mfg. Co. warrants its products to be free from defects in material or workmanship. The exclusive remedy for this warranty is Humboldt Mfg. Co., factory replacement of any part or parts of such product, for the warranty of this product please refer to Humboldt Mfg. Co. catalog on Terms and Conditions of Sale. The purchaser is responsible for the transportation charges. Humboldt Mfg. Co. shall not be responsible under this warranty if the goods have been improperly maintained, installed, operated or the goods have been altered or modified so as to adversely affect the operation, use performance or durability or so as to change their intended use. The Humboldt Mfg. Co. liability under the warranty contained in this clause is limited to the repair or replacement of defective goods and making good, defective workmanship.

Humboldt Mfg. Co.
875 Tollgate Road
Elgin, Illinois 60123 U.S.A.

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Fax: 1.708.456.0137
Email: hmc@humboldtmfg.com

Testing Equipment for Construction Materials

HUMBOLDT

www.humboldtmfg.com

The MSDS format adheres to the standards and regulatory requirements of the United States and may not meet regulatory requirements in other countries.

"SUVA" 404A
6002FR Revised 29-AUG-2001

CHEMICAL PRODUCT/COMPANY IDENTIFICATION

Material Identification

"SUVA" is a registered trademark of DuPont.

Corporate MSDS Number : DU005612

Tradenames and Synonyms

HP62
404A

Company Identification

MANUFACTURER/DISTRIBUTOR
DuPont Fluoroproducts
1007 Market Street
Wilmington, DE 19898

PHONE NUMBERS
Product Information : 1-800-441-7515 (outside the U.S. 302-774-1000)
Transport Emergency : CHEMTREC 1-800-424-9300(outside U.S. 703-527-3887)
Medical Emergency : 1-800-441-3637 (outside the U.S. 302-774-1000)

COMPOSITION/INFORMATION ON INGREDIENTS

Components

Material	CAS Number	%
PENTAFLUOROETHANE (HFC-125)	354-33-6	44
ETHANE, 1,1,1-TRIFLUORO- (HFC-143a)	420-46-2	52
	811-97-2	
ETHANE, 1,1,1,2-TETRAFLUORO- (HFC-134a)		4

HAZARDS IDENTIFICATION

Potential Health Effects

Inhalation of high concentrations of vapor is harmful and may cause heart irregularities, unconsciousness, or death. Intentional misuse or deliberate inhalation may cause death without warning. Vapor reduces oxygen available for breathing and is heavier than air. Liquid contact can cause frostbite.

(HAZARDS IDENTIFICATION - Continued)

HUMAN HEALTH EFFECTS:

Overexposure to the vapors by inhalation may include temporary nervous system depression with anesthetic effects such as dizziness, headache, confusion, incoordination, and loss of consciousness. Higher exposures to the vapors may cause temporary alteration of the heart's electrical activity with irregular pulse, palpitations, or inadequate circulation; or fatality from gross overexposure. Contact with the liquid may cause frostbite.

Individuals with preexisting diseases of the central nervous or cardiovascular system may have increased susceptibility to the toxicity of increased exposures.

Carcinogenicity Information

None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, OSHA or ACGIH as a carcinogen.

FIRST AID MEASURES

First Aid

INHALATION

If inhaled, immediately remove to fresh air. Keep person calm. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

SKIN CONTACT

Flush area with lukewarm water. Do not use hot water. If frostbite has occurred, call a physician.

EYE CONTACT

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

INGESTION

Not a probable route. However, in case of accidental ingestion, call a physician.

Notes to Physicians

THIS MATERIAL MAY MAKE THE HEART MORE SUSCEPTIBLE TO ARRHYTHMIAS. Catecholamines such as adrenaline, and other compounds having similar effects, should be reserved for emergencies and then used only with special caution.

FIRE FIGHTING MEASURES

Flammable Properties

Flash Point : No flash point

Flammable Limits in Air, % by Volume:
LEL : None per ASTM E681
UEL : None per ASTM E681
Autoignition: Not determined

Fire and Explosion Hazards:

Cylinders may rupture under fire conditions. Decomposition may occur.

Contact of welding or soldering torch flame with high concentrations of refrigerant can result in visible changes in the size and color of torch flames. This flame effect will only occur in concentrations of product well above the recommended exposure limit, therefore stop all work and ventilate to disperse refrigerant vapors from the work area before using any open flames.

R-404A is not flammable in air at temperatures up to 100 deg C (212 deg F) at atmospheric pressure. However, mixtures of R-404A with high concentrations of air at elevated pressure and/or temperature can become combustible in the presence of an ignition source. R-404A can also become combustible in an oxygen enriched environment (oxygen concentrations greater than that in air). Whether a mixture containing R-404A and air, or R-404A in an oxygen enriched atmosphere becomes combustible depends on the inter-relationship of 1) the temperature 2) the pressure, and 3) the proportion of oxygen in the mixture. In general, R-404A should not be allowed to exist with air above atmospheric pressure or at high temperatures; or in an oxygen enriched environment. For example: R-404A should NOT be mixed with air under pressure for leak testing or other purposes.

Experimental data have also been reported which indicate combustibility of HFC-134a, a component in this blend, in the presence of chlorine.

Extinguishing Media

As appropriate for combustibles in area.

Fire Fighting Instructions

Cool cylinder with water spray or fog. Self-contained breathing apparatus (SCBA) is required if cylinders rupture and contents are released under fire conditions. Water runoff should be contained and neutralized prior to release.

ACCIDENTAL RELEASE MEASURES

Safeguards (Personnel)

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

Accidental Release Measures

Ventilate area using forced ventilation, especially in low or enclosed places where heavy vapors might collect. Remove open flames. Use self-contained breathing apparatus (SCBA) for large spills or releases.

HANDLING AND STORAGE

Handling (Personnel)

Avoid breathing vapor. Avoid liquid contact with eyes and skin. Use with sufficient ventilation to keep employee exposure below recommended limits. Contact with chlorine or other strong oxidizing agents should also be avoided. See Fire and Explosion Data section.

Storage

Clean, dry area. Do not heat above 52 deg C (125 deg F).

EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls

Avoid breathing vapors. Avoid contact with skin or eyes. Use with sufficient ventilation to keep employee exposure below the recommended exposure limit. Local exhaust should be used if large amounts are released. Mechanical ventilation should be used in low or enclosed places.

Refrigerant concentration monitors may be necessary to determine vapor concentrations in work areas prior to use of torches or other open flames, or if employees are entering enclosed areas.

Personal Protective Equipment

Impervious gloves should be used to avoid prolonged or repeated exposure. Chemical splash goggles should be available for use as needed to prevent eye contact. Under normal manufacturing conditions, no respiratory protection is required when using this product. Self-contained breathing apparatus (SCBA) is required if a large release occurs.

(EXPOSURE CONTROLS/PERSONAL PROTECTION - Continued)

Exposure Guidelines

Applicable Exposure Limits

PENTAFLUOROETHANE (HFC-125)

PEL	(OSHA)	: None Established
TLV	(ACGIH)	: None Established
AEL *	(DuPont)	: 1000 ppm, 8 & 12 Hr. TWA
WEEL	(AIHA)	: 1000 ppm, 4900 mg/m3, 8 Hr. TWA

ETHANE, 1,1,1-TRIFLUORO- (HFC-143a)

PEL	(OSHA)	: None Established
TLV	(ACGIH)	: None Established
AEL *	(DuPont)	: 1000 ppm, 8 & 12 Hr. TWA
WEEL	(AIHA)	: 1000 ppm, 8 Hr. TWA

ETHANE, 1,1,1,2-TETRAFLUORO- (HFC-134a)

PEL	(OSHA)	: None Established
TLV	(ACGIH)	: None Established
AEL *	(DuPont)	: 1000 ppm, 8 & 12 Hr. TWA
WEEL	(AIHA)	: 1000 ppm, 8 Hr. TWA

* AEL is DuPont’s Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits which are lower than the AEL are in effect, such limits shall take precedence.

PHYSICAL AND CHEMICAL PROPERTIES

Physical Data

Boiling Point	: -46.7 C (-52.1 F) Average
Vapor Pressure	: 182.1 psia at 25 deg C (77 deg F)
% Volatiles	: 100 WT%
Evaporation Rate	: (CL4 = 1) Greater than 1
Solubility in Water	: Not determined
Odor	: Slight ethereal
Form	: Liquefied gas
Color	: Clear, colorless
Specific Gravity	: 1.05 @ 25C (77F)

STABILITY AND REACTIVITY

Chemical Stability

Material is stable. However, avoid open flames and high temperatures.

Incompatibility with Other Materials

Incompatible with active metals, alkali or alkaline earth metals--powdered Al, Zn, Be, etc.

(STABILITY AND REACTIVITY - Continued)

Decomposition

Decomposition products are hazardous. This material can be decomposed by high temperatures (open flames, glowing metal surfaces, etc.) forming hydrofluoric acid and possibly carbonyl fluoride.

These materials are toxic and irritating. Contact should be avoided.

Polymerization

Polymerization will not occur.

TOXICOLOGICAL INFORMATION

Animal Data

The blend is untested.

HFC-125

Inhalation 4 hour ALC: > 709,000 ppm in rats

Single, high inhalation exposures caused lethargy, decreased activity, labored breathing and weight loss. Weak cardiac sensitization effect, a potentially fatal disturbance of heart rhythm caused by a heightened sensitivity to the action of epinephrine. Lowest-Observed-Adverse-Effect-Level for cardiac sensitization: 100,000 ppm.
Repeated exposure caused: No significant toxicological effects. No-Observed-Adverse-Effect-Level(NOAEL): 50,000 ppm

No animal data are available to define carcinogenic, developmental or reproductive hazards. In animal testing this material has not caused developmental toxicity. HFC-125 does not produce genetic damage in bacterial or mammalian cell cultures or when tested in animals (not tested for heritable genetic damage).

HFC-134a

Inhalation 4-hour LC50: 567,000 ppm in rats

Single exposure caused: Cardiac sensitization, a potentially fatal disturbance of heart rhythm associated with a heightened sensitivity to the action of epinephrine. Lowest-Observed-Adverse-Effect-Level for cardiac sensitization: 75,000 ppm. Single exposure caused: Lethargy. Narcosis. Increased respiratory rates. These effects were temporary. Single exposure to near lethal doses caused: Pulmonary edema. Repeated exposure caused: Increased adrenals, liver, spleen weight. Decreased uterine, prostate

(TOXICOLOGICAL INFORMATION - Continued)

weight. Repeated dosing of higher concentrations caused: the following temporary effects - Tremors. Incoordination.

CARCINOGENIC, DEVELOPMENTAL, REPRODUCTIVE,MUTAGENIC EFFECTS:

In a two-year inhalation study, HFC-134a, at a concentration of 50,000 ppm, produced an increase in late-occurring benign testicular tumors, testicular hyperplasia and testicular weight. The no-effect-level for this study was 10,000 ppm. Animal data show slight fetotoxicity but only at exposure levels producing other toxic effects in the adult animal. Reproductive data on male mice show: No change in reproductive performance. Tests have shown that this material does not cause genetic damage in bacterial or mammalian cell cultures, or in animals. In animal testing, this material has not caused permanent genetic damage in reproductive cells of mammals (has not produced heritable genetic damage).

HFC-143a

Inhalation 4-hour LC50: >540,000 ppm in rats

Single exposures by inhalation to 500,000 ppm caused anesthesia but no mortality at 540,000 ppm. Cardiac sensitization occurred in dogs at 300,000 ppm following an intravenous challenge with epinephrine. Two, 4-week inhalation have been conducted. In the first study, pathological changes in the testes were observed at all exposure concentrations; no effects were observed in females. The testicular effect was considered related to the method used to expose the rats to HFC-143a. In the second study using the same exposure concentrations, no effects were noted in males at any concentration. Data from a 90-day study revealed no effects in male or female rats at exposures up to 40,000 ppm. Long-term exposure caused significantly decreased body weights in male rats fed 300 mg/kg for 52 weeks, but there was no effect on mortality. Tests in rats demonstrated no carcinogenic activity when administered orally 300 mg/kg/day for 52 weeks and observed for an additional 73 weeks. Tests in bacterial cell cultures demonstrated mutagenic activity, but the compound did not induce transformation of mammalian cells in culture or in the whole animal. Tests in animals demonstrate no developmental toxicity.

ECOLOGICAL INFORMATION

Ecotoxicological Information

Aquatic Toxicity

HFC 143a
96-hour LC50, Rainbow trout: >40 mg/L

HFC-134a
48-hour EC50, Daphnia magna: 980 mg/L
96-hour LC50, Rainbow trout: 450 mg/L

DISPOSAL CONSIDERATIONS

Waste Disposal

Comply with Federal, State, and local regulations. Reclaim by distillation or remove to a permitted waste disposal facility.

TRANSPORTATION INFORMATION

Shipping Information

DOT/IMO/IATA
Proper Shipping Name : Refrigerant Gas R-404A
Hazard Class : 2.2
UN No. : 3337
Label(s) : Nonflammable Gas

Shipping Containers

Tank Cars.

Cylinders
Ton Tanks

REGULATORY INFORMATION

U.S. Federal Regulations

TSCA Inventory Status : Reported/Included.

TITLE III HAZARD CLASSIFICATIONS SECTIONS 311, 312

Acute : No
Chronic : No
Fire : No
Reactivity : No
Pressure : Yes

(REGULATORY INFORMATION - Continued)

LISTS:

SARA Extremely Hazardous Substance	-No
CERCLA Hazardous Material	-No
SARA Toxic Chemicals	-No

OTHER INFORMATION

NFPA, NPCA-HMIS

NPCA-HMIS Rating

Health	: 1
Flammability	: 0
Reactivity	: 1

Personal Protection rating to be supplied by user depending on use conditions.

The data in this Material Safety Data Sheet relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process.

Responsibility for MSDS	: MSDS Coordinator
>	: DuPont Fluoroproducts
Address	: Wilmington, DE 19898
Telephone	: (800) 441-7515

# Indicates updated section.

This information is based upon technical information believed to be reliable. It is subject to revision as additional knowledge and experience is gained.

End of MSDS