

Quality is more than a word



ESPEC Benchtop Series Options Manual

BTL, BTX, BTZ, BTU Models

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Disclaimer

ESPEC North America, Inc. assumes no responsibility for accidents or equipment trouble that comes from the failure to observe handling instructions contained in this user manual. Do not perform any operation or handle the chamber in any way that is not described in this manual or that is specifically prohibited.

The contents are subject to change without prior notice.

Read this manual thoroughly and familiarize yourself with all safety precautions before using equipment.

Regulatory Compliance

Products with the CE label comply with the Directives and European Standards applicable at the time of certification. Specific Directives and Standards will be listed on provided Declaration of Conformity when applicable.

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Chapter 1

Safety Precautions

This chapter explains safety precautions that should be observed to operate the equipment safely. Be sure to read carefully and follow instructions so as to prevent harm to yourself, anyone else, specimens, or the equipment.

Damage to any chamber equipment by prohibited substances is not covered by ESPEC warranty

1.1 Safety Symbols and Descriptions


DANGER
DANGER INDICATES IMMEDIATE DANGER OR SERIOUS INJURY AND PRECAUTIONS ARE NECESSARY
CAUTION
CAUTION WARNS AGAINST POTENTIAL HAZARDS OR TO CAUTION AGAINST UNSAFE PRACTICES
WARNING
WARNING IF THE PRECAUTION IS NOT TAKEN, IT MAY CAUSE MINOR OR MODERATE INJURY OR DAMAGE

Note: A note provides information for gaining full performance from the chamber or to prevent damage to equipment.

Procedure: A procedure explains how to operate on a step-by-step basis. Offers supplementary information.

1.2 Substances Not to Be Placed Inside Equipment

1.2.1 Explosive, Inflammable and Combustible Substances

DANGER	
	<p>DO NOT INTRODUCE EXPLOSIVE, COMBUSTIBLE, OR INFLAMMABLE SUBSTANCES INTO THE EQUIPMENT. KEEP SUBSTANCES AWAY FROM THE EQUIPMENT AND IMMEDIATE AREA. WHEN EXPOSED TO EXCESSIVE HEAT SUBSTANCES MAY CAUSE FIRES AND/OR EXPLOSIONS.</p>

EXPLOSIVE SUBSTANCES

- Nitro glycol, nitroglycerine, nitrocellulose and other explosive ester nitrates.
- Trinitro-benzene, trinitrotoluene, picric acid and other explosive nitro compounds
- Peracetic acid, methyl ethyl ketone peroxides, benzoyl peroxide and other organic peroxides.

INFLAMMABLE SUBSTANCES

- Combustible Substances:
 - Metal lithium, metal potassium, metal sodium, yellow phosphor, phosphor sulfide, red phosphor, celluloids, calcium carbonate (also called carbide), calcium phosphate, magnesium powder, aluminum powder, metal powders other than magnesium powder and aluminum powder, hydrosulfite.
- Oxides:
 - Potassium chlorate, sodium chlorate, ammonium chlorate and other chlorates.
 - Potassium perchlorate, sodium perchlorate, ammonium-perchlorate and other perchlorates.
 - Potassium peroxide, sodium peroxide, barium peroxide and other inorganic peroxides.
 - Potassium nitrate, sodium nitrate, ammonium nitrate and other nitrates.
 - Sodium chlorite and other chlorites.
 - Calcium hypochlorite and other hypochlorites.
- Ignitable Substances:
 - Ethyl ether, gasoline, acetaldehyde, propylene oxide, carbon disulfide and other substances with an ignition point of -30°C (-22°F).
 - Normal hexane, ethylene oxide, acetone, benzene, methyl ethyl ketone and other substances with an ignition point above -30°C (-22°F) and below 0°C (32°F).
 - Methanol, ethanol, xylene, pentyl acetate, amylacetate and other substances with an ignition point above 0°C and below 30°C (85°F).
 - Kerosene, light oil, turpentine oil, isopentyl alcohol (also called isoamyl alcohol), acetic acid and other substances with an ignition point above 30°C (85°F) and below 65°C (150°F).

- Combustible Gases
 - Hydrogen, acetylene, ethylene, methane, ethane, propane, butane and other combustible substances that are in a gaseous state at a temperature of 15°C (60°F) and at a pressure of 1 atmosphere.

1.2.2 Corrosive Substances



Humidifying water or specimens which generate substances that corrode stainless steel or silicone rubber can drastically shorten service-life of internal parts, including the refrigerator and packing.

Though apparently harmless at ambient temperature, these substances can readily corrode circuit boards and other parts when the equipment is run at high temperature and high humidity.

Even trace amounts of corrosives in the humidity water supply or released by the test items will become concentrated in the humidifying tray during extended periods of humidity operation. If corrosion is observed in the humidifying tray during extended high humidity testing, it should be drained and refilled daily to flush out the corrosive contaminants. This can be done by opening the wick arm drain valve for a least 30 seconds.

CORROSIVE SUBSTANCES (NOT LIMITED TO)

- Chlorine
- Chlorides
- Acids

1.3 Global Warming Potential of Refrigerants


Refrigeration circuit contains fluorinated greenhouse gases covered by the Kyoto Protocol. See Table for global warming potential of refrigerants used by ESPEC. See chamber serial tag for refrigerant and quantity used in this chamber.

TABLE 1.1. GLOBAL WARMING POTENTIAL OF REFRIGERANTS

Substance	GWP
R-23	12,000
R-134a	1,300
R-404a	3,800
R-508b	12,000

Insulation material is made of foam blown with fluorinated greenhouse gases.

1.4 Other Precautions

DANGER	
	<p>DO NOT USE OR LEAVE EQUIPMENT OUTDOORS. OUTDOOR ENVIRONMENTS ADVERSELY AFFECT PERFORMANCE AND FUNCTIONING. ELECTRICAL PART CONTACT WITH WATER CAN LEAD TO SHORT-CIRCUIT, FIRE, ELECTRICAL SHOCK, AND BREAKDOWN.</p>

Chapter 2

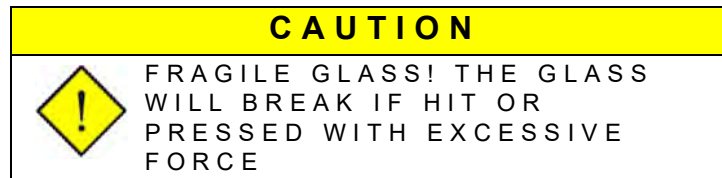
Chamber Cabinet

2.1 Door with Viewing Window

2.1.1 Purpose

The window is used for observing the specimen in the test chamber

2.1.2 Precautions



- The window and chamber light option may affect the temperature transition rate, temperature uniformity, and the lowest attainable temperature.
- During operation at low temperatures at high ambient humidity, condensation or frost may form on the external window surface.
- During operation at high temperature, the exterior window surface may be hot.

2.1.3 Specifications

Temperature Range	Model	Temperature Range
	BTL, BTU	-20 to 180°C
	BTX, BTZ size 1	-70 to 180°C
	BTX, BTZ size 4	-65* to 180°C
Viewing Window	6"W x 5"H heated window for size 1 6"W x 10.6"H heated window for size 4	
Chamber Lamp	2.7W 240DC LED light array ESPEC part 4ACX0002	
Chamber Lamp Switch	Located on the Instrumentation Panel	
LED Life	Change the LED after every 50,000 hours of service whenever the LED becomes too dim or stops working	

*Low temperature limit increased from standard specification

2.1.4 LED Strip Replacement

Procedure:

1. Set main power switch to OFF position
2. Remove screws from top and bottom of viewing window frame
3. Cut cable ties and remove screws from light panel



4. Disconnect power connector and replace LED strip. See replacement parts list for chamber model.



2.2 Ports (BT-CP2, BT-CP4)

2.2.1 Purpose

Allows access through chamber wall for wires/tubes to chamber interior.

2.2.2 Precaution

Powering heat generating items in chamber can lead to thermal run away. Refer to Benchtop User Manual for instructions for interlocking power circuits to chamber “specimen power” contact.

2.2.3 Operation

Ensure that port is sealed around wires/tubes to prevent ambient air infiltration into the chamber. A silicone port plug is provided for this purpose.

2.3 Shelf (BT-SS1,SS4)

2.3.1 Purpose

Allows support/stacking of small test items in chamber

2.3.2 Precaution

Avoid arranging test items such that they interfere with or block chamber airflow

2.3.3 Installation and Operation

Procedure:

1. Insert support clips (4) into wall supports at desired shelf level
2. Place shelf on support clips




Note: Do not exceed rated shelf loading of 15 lbs per shelf or 45 lbs combined total for all shelves.

2.4 Spark Resistant Chamber Interior

This option is used to reduce the potential for generation of sparks in the chamber workspace or plenum area. The use of low watt density heaters reduces the operational temperature of the chamber based on the AIT of the substance being tested.

There is a combination pilot light and reset pushbutton that is used to indicate and reset, respectively, the sheath heater controller in the event of an overheat condition. The controller itself is preset at the factory to match AIT specified at time of order.

PREPARED BY	6/3/10 BTP		SPARK RESISTANT CHAMBER INTERIOR SPECIFICATION	Model	Drawing No.	Spc. No.	ECSP10003	1/1
REVISION	A	2011/06/21 GLM		BT-SR				
	B	07/15/13 TJE		EGN-SR				
	C			EN-SR				
	D			EP-SR				
	E			EW-SR				

1. Model
BT, EGN, EN, EP, EW-SR
2. Product Name
Spark resistant chamber interior.
3. Description/Purpose
Modifications to reduce the potential for generation of sparks in the chamber workspace or plenum area. Change of heater design to prevent auto-ignition of combustible substances.
4. Performance
 - 4.1. Maximum chamber temperature
The substance specified will determine the maximum chamber temperature. See table below.
 - 4.2. Heat up time
The mass and surface temperature limit of the sheath heaters will increase heat up time.
5. Construction
 - 5.1. Circulator Fans
Spark resistant per AMCA Type B.
Aluminum fan blades, with aluminum "rub ring" for motor shaft port.
 - 5.2. Sheath Heaters
Incoloy sheath heater with wiring connection outside of the workspace, in place of nichrome wire.
 - 5.3. Heater Surface Temperature Limit/Control
Heater sheath temperature control and high limit set in accordance with the auto-ignition temperature (AIT) of the combustible substance that will be present in the chamber.
 - 5.3.1. Substance examples
Limit and control set point examples, with associated chamber temperature limit:

Substance	AIT	Limit (=AIT x 80%)	Control (=Limit - 10°C)	Max Chamber Temp
Methane	630°C	504°C	494°C	Std
Hydrogen	520°C	416°C	406°C	Std
Propane	450°C	360°C	350°C	Std
Gasoline	280°C	224°C	214°C	<164°C
Diesel Fuel #2	260°C	208°C	198°C	<148°C
Li-ion batt organic electrolyte	230°C	184°C	174°C	<124°C
Auto Trans Fluid (typical)	195°C	156°C	146°C	<96°C

- 5.4. Light Fixtures
If equipped, light fixtures will be isolated from chamber interior, or have "Div 2" hazardous location rating.

2.5 Chamber Ventilation Blower with Vent Port


This option purges the chamber with ambient air. The blower supplies ambient air into the chamber through a port with “flapper” check valve which closes when the vent blower is off. Exhaust from chamber is via a “star washer” port in the chamber ceiling. Outlet port has external flange for connection of exhaust duct.

A 3-position selector switch is used to choose the mode of ventilation operation:

AUTO: Blower turns on when gas monitor reaches a warning level.

OFF: Blower is off.

ON: Blower runs continuously


PREPARED BY	BTP 5/27/10		CHAMBER VENTILATION BLOWER AND VENT PORT SPECIFICATION	Model	Drawing No.	Spc. No.	ECSP10007	1/1
REVISION	A	11/24/10 RLH		BT-VENT				
	B	2011/11/15 GLM		EGN-VENT				
	C	07/15/13 TJE		EN-VENT				
	D			EP-VENT				
	E			EW-VENT				

1. Model
BT, EGN, EN, EP, EW -VENT
2. Product Name
Chamber ventilation blower with vent port
3. Description/purpose
Ventilation blower purges the chamber with ambient air
4. Construction
The blower supplies ambient air into the chamber through a port with “flapper” check valve which closes when the vent blower is off. Exhaust from chamber is via a “star washer” port in the chamber ceiling. Outlet port has external flange for connection of exhaust duct.
5. Location
The vent blower is mounted inside the water box, if room allows, or on the top or side of the chamber.
6. Performance/Dimensions

Chamber Model	CFM	Outlet Port Flange (in) ¹
BT, EGN, EN, EP	50	4 in
EW	200	6 in

7. Operation
OFF-AUTO-ON selector switch is used to choose the mode of ventilation operation:
OFF: blower off.
AUTO: chamber programmer time signal, or gas monitor warning level (if present).
ON: blower on.
8. Safety Features
Vent blower operation is disabled when the gas monitor reaches alarm level.

2.6 Chamber Door Lock

PREPARED BY	6/3/10 BTP		CHAMBER DOOR LOCK SPECIFICATION	Model	Drawing No.	Spc. No.	ECSP10004	1/2
REVISION	A	11/24/10 RLH		BT				
	B	2011/11/15 GLM		EGN				
	C	07/15/13 TJE		EN				
	D	01/04/23 JAP		EP				
	E			EW				

1. Model

Model	Part Number	Description
BT1	114532	OPTION, DOOR INTERLOCK, BT1
BT4,4200	118962	OPTION, DOOR INTERLOCK, BT4,4200
EGN	EGN-DL	
EN	EN-DL	
EP	EP-DL	
EW	EW-DL	

2. Product Name

Solenoid activated pin door lock

3. Purpose

The lock is used to prevent operator access to the chamber interior during operation.

4. Location

At top of the chamber door

5. Operation

The lock is controlled by the chamber electrical control system. When the chamber is running, the lock will be energized (i.e. door is locked). When the chamber is not running, the lock will not be energized (i.e. door is unlocked).

5.1. Over-ride Key-switch

UNLOCK-AUTO-LOCK key-switch allows over-riding door lock.


UNLOCK: Door is unlocked.

AUTO: Door is locked when chamber is running.

LOCK: Door is locked at all times (unless chamber main power is interrupted, or Emergency Stop (if equipped) is pressed).

Note: This option does not prevent accidental door opening due to sudden pressure release in the chamber. See option "-LAT" for reinforced Latch option.

2.7 Chamber Plug Port Restraint

PREPARED BY	6/4/10 BTP		CHAMBER PORT PLUG RESTRAINT SPECIFICATION	Model	Drawing No.	Spc. No.	ECSP10006	1/2
REVISION	A	11/24/10 RLH		BT				
	B	2011/11/15 GLM		EGN				
	C	07/15/13 TJE		EN				
	D	01/03/24 JAP		EP				
	E			EW				

1. Model

Model	Part Number	Description
BT	119019	OPTION, PLUG RESTRAINT, 2"
	121374	OPTION, PLUG RESTRAINT, 4"
	121375	OPTION, PLUG RESTRAINT, 6"
EGN	EGN-PPR	
EN	EN-PPR	
EP	EP-PPR	
EW	EW-PPR	

2. Product Name

Port Plug Restraint

3. Description

Removable horizontal rod across the outside of the chamber port plug.
This will restrain the plug during a chamber pressure event.

4. Location

The port plug restraint is mounted on the exterior of the chamber, in any location where cable ports are installed.

Chapter 3

Water Circuit

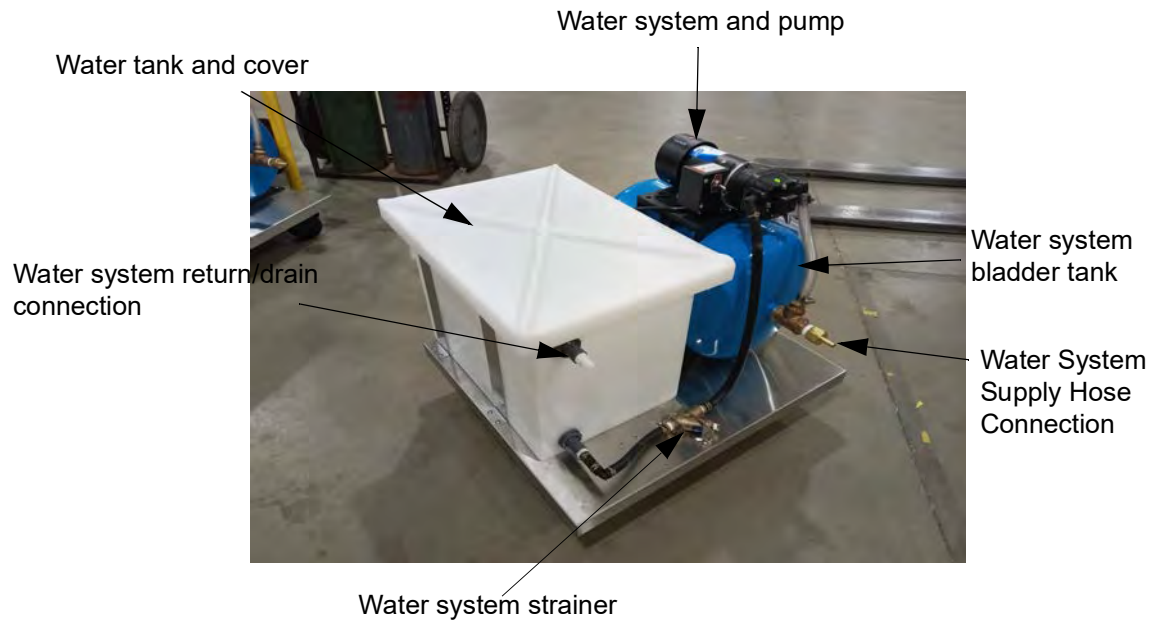
This chapter does not apply to BTZ-4200 model.

3.1 Water Supply Tank (BT-WT2)

3.1.1 Purpose

To supply the chamber humidity system with water from a refillable water tank. The volume of water is about 8 gallons. The water consumption of the chamber will vary with the set point selected, however, one tank of water should last at least 48 hours (for an open loop system). One tank of water for a closed loop water tank system should last at least 7 days.

3.1.2 Names and Functions of Parts



Note: See Jabsco 31801 Series Water Pressure System Manual for component-level spare parts for the water tank system.

3.1.3 Installation



Procedure: Pressurizing the water tank

1. Pressurize tank to 18 psi before starting the pump. Air valve is a standard tire valve, a compressed air hose or hand pump may be used to pressurize. Pressure can be reduced by pressing the center pin in the valve.

Procedure: Installation for closed loop (i.e. recirculating) water tank system

1. Locate the water tank system next to or behind the chamber.
2. Lock water tank base casters to keep water system from moving.
3. Connect the system water supply to the chamber with the 3/8" hose (included with this option). Reference the chamber user's manual for location of water supply connection on the chamber.
4. Locate condensate pump on floor behind chamber. Feed drain line from under chamber into tank on pump.
5. Connect the system return/drain hose between the chamber drain connection and the water tank inlet hole. This is a 3/8" hose connection.
6. Remove the water tank lid and fill with water, replace lid.
7. Connect the water system pump to 115 VAC power (max. amp draw: 3.0A).
8. Connect the condensate pump to 115 VAC power (max. amp draw: 0.5A).

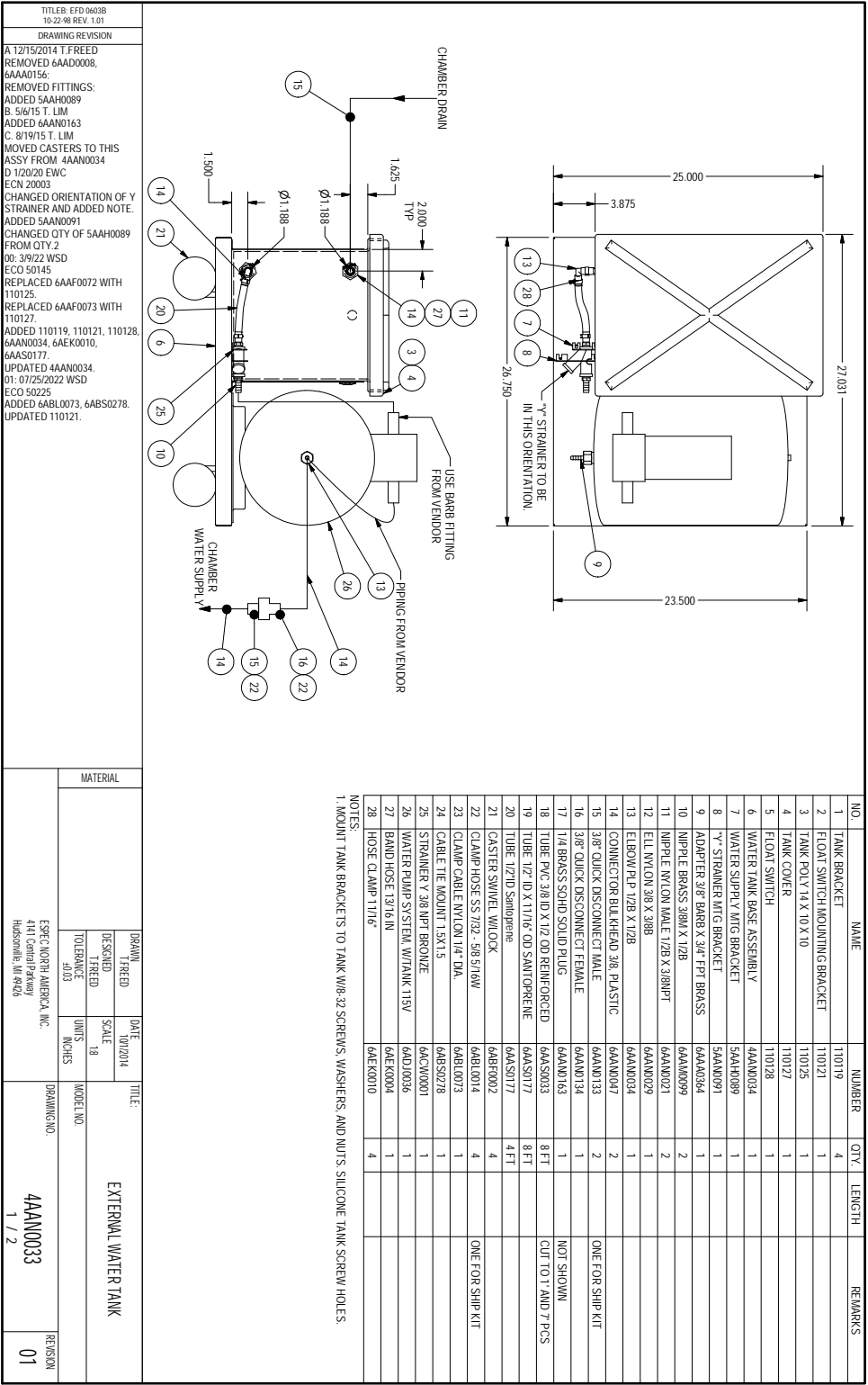
3.1.4 Operation

Procedure: To Fill the Water Tank away from chamber

1. Unplug 115VAC supply power from water pump system and condensate pump.
2. Disconnect water system supply 3/8" hose using quick disconnect installed in hose.
3. If the water tank system is recirculating type, disconnect the water tank return/drain hose from the hose barb mounted near the top of the water tank.
4. Unlock water tank base casters to allow movement of system.
5. Roll the water tank system over to the water filling station. Fill tank and replace lid.
6. Move the water tank system back to chamber.
7. Lock water tank base casters to keep water system from moving.
8. Re-connect the water system supply 3/8" hose using quick disconnect.
9. If tank system is recirculating, re-connect the water tank return/drain hose to the hose barb mounted near the top of the water tank.
10. Plug in water pump and condensate pump supply power cord to 115VAC source.

Note: Be careful not to overfill. Use only 1 to 4 MΩ clean water (unless chamber is equipped with a deionizing cartridge).


3.1.5 External Water Tank



3.2 De-Ionizing Cartridge (BT-DW2)

3.2.1 Purpose

To provide 0.2 to 10Ω water to the humidity circuit from a pressurized source with low mineral and organic content.

CAUTION	
	<p>THE DE-IONIZATION CARTRIDGE LIFE IS GREATLY REDUCED WHEN OPERATED ON LOW PH WATER OR WATER WITH HIGH CARBON DIOXIDE LEVELS, AND TOTAL DISSOLVED SOLIDS. PRE-TREATMENT OF WATER MAY BE REQUIRED TO LENGTHEN CARTRIDGE LIFE.</p>

3.2.2 Installation

Procedure:

1. Mount cartridge assembly at location near chamber and water supply
2. Connect water supply to cartridge inlet
3. Connect cartridge outlet to chamber humidity water inlet port
4. Turn on water supply and check for leaks

3.2.3 Utilities and Operation

Utility	Requirement
Water Temperature	5 to 30°C (41 o 85°F)
Supply Water	Maximum Flow: 10 GPH (20-85 psig)
Connection	3/8" NPT


3.2.4 Maintenance and Troubleshooting

Cartridge Check (every week)

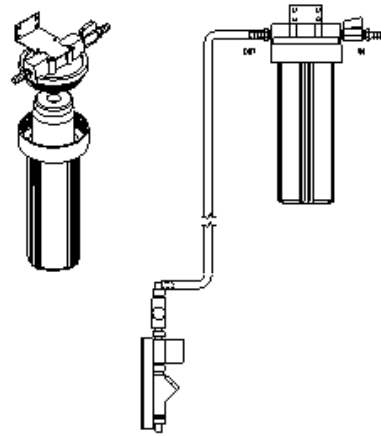
The cartridge will change color from the bottom to the top as the cartridge media is consumed. The time it takes to consume the media will vary with the supply water quality. The cartridge should be checked at least once a week.

Procedure: Changing cartridge (replace cartridge when resins turn amber in color)

1. Contact ESPEC Customer Support for replacement cartridges and reference provided replacement parts list.
2. Close shut off valve at supply to cartridge.
3. Turn cartridge drain valve (8) to drain cartridge
4. Loosen the cartridge holder bottom using filter wrench. Replace cartridge.
5. Tighten the cartridge holder bottom

CAUTION	
	BE SURE THE TUBING HAS THE TUBE CLAMPS RE- INSTALLED

6. Close drain valve (8)
7. Open shut off valve at supply to cartridge and check for leaks.



3.2.5 De-Ionizing (DI) Cartridge Assembly Wall Mount (BT-DW2)

NO.		NAME	NUMBER	QTY	LENGTH	REMARKS
1		WATER TAG	5ABS0002	1		
2		ADAPTER 1/4" TUBE X 1/4" MPT BRASS	6AAA0353	1		
3		ADAPTER 1/4" TUBE X 3/8" MPT BRASS	6AAA0354	1		CONNECT TO CHAMBER
4		VALVE HAND 1/4MPT X 1/4FPT	6AAD0009	2		
5		NIPPLE BRASS 1/4M X 3/8B	6AAM0098	2		
6		NIPPLE BRASS 1/4 X CLO	6AAM0106	1		
7		TEE 1/4 NPT SCH 40 SS304	6AAM0129	1		
8		SCREW WOOD #10 X 2 1/4	6AAP0349	4		
9		SCREW ANCHOR FOR #10 SCREW	6AAP0350	4		
10		TUBE 1/4" OD X .180" ID NYLON	6AAS0176	20 FT		
11		DI CARTRIDGE	6ACW0027	1		

NOTES:

1. USE 5/16" DRILL FOR SCREW ANCHORS.
2. USE TEFLON TAPE ON ALL THREADED JOINTS.
3. CONNECT 3/8" TUBE X 3/8" MPT ADAPTER (6AAA0354) TO CHAMBER WATER SUPPLY INLET.

TITLE: DI CARTRIDGE ASSY WALL MOUNT	
DRAWN B. NUMBER	DATE 1/25/2010
DESIGNED B. NUMBER	SCALE 1:4
TOLERANCE ±.03	UNITS INCHES
MODEL NO.	
DRAWING NO. BT-DW2	
REVISION	

ESPEC NORTH AMERICA, INC.
4141 Central Parkway
Hudsonville, MI 49426

TITLE: EFD 06038
10-22-98 REV. 1.01
DRAWING REVISION

3.3 Controlled Low Humidity (BT-LH)

3.3.1 Purpose

To operate the chamber at low humidity conditions. See specification for actual range.

3.3.2 Installation

Procedure:

1. Mount dry air purge panel at location near chamber and air supply
2. Connect air supply to filter inlet
3. Connect flow meter outlet to chamber dry air inlet port using supplied 1/2" OD tube
4. Turn on air supply and check for leaks
5. Plug dry air module into 115V or 220V outlet

3.3.3 Operation

Manual

Go to the Profile Event setting in the programmer and use dry air purge. The dry air will flow as required for set point condition.

Programmable


Create a step in your program for the low humidity set point and switch on in Profile Event. Run the program as normal and output 1 will trigger INST1-5 on the dry air purge to flow as required for step condition.

3.3.4 Maintenance and Troubleshooting

Checking Dry Air Desiccant (every month)

Set the chamber to low humidity operation. Wait approximately 10 minutes, then check the moisture indicator on the dry air module. The normal color of the indicator is blue when the dry air is flowing. The moisture indicator will be purple (pink) if the desiccant needs to be changed.

3.3.5 Low Humidity Control (BT-LH) Specifications

PREPARED BY	09/27/11 TJE	BENCH TOP SERIES OPTIONAL EQUIPMENT LOW HUMIDITY CONTROL SPECIFICATIONS	Model	Drawing No.	Sp. No.	ECCP11009	1/2
REVISION	A		BT				
	B						
	C						
	D						
	E						
	10/06/11 TJE						
	11/11/11 BAM						
	7/23/12 BAM						
	08/27/15 MAR						
	01/04/24 JAP						

1. Model

Model	Part Number	Description
BT1	N/A	
BTL-4, BTX-4	121498	OPTION, LOW HUMIDITY, BT4
BTU-4, BTZ-4	N/A	
BT4200	N/A	

2. Description

To extend the low humidity operating range of the chamber.

3. Construction

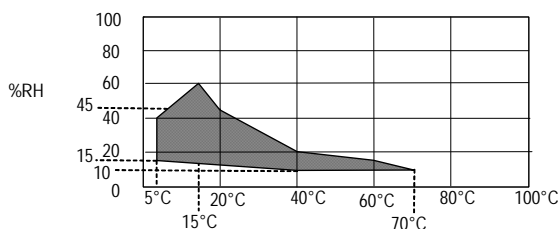
The low humidity control system consists of a wall mount 5cfm dry air purge system and flow meter. A control solenoid is mounted in the chamber to control the amount of dry air supplied to the chamber. The system also includes BT-SH1 solid state humidity sensor.

4. Operation

To enable the low humidity control, the Dry Air / Low Humidity Time signal must be turned on. Also, the dry air purge module must be connected to the chamber with the supplied air line, and the module must be plugged in. The control solenoid then operates by the dehumidification signal from the chamber controller.

5. Performance

5.1. Humidity Range Extension



6. Utilities Required

Compressed Air
Connection
Pressure
Flow Rate
Power

Drain Connection

Clean, dry, oil-free.

¼" NPT.

80-100 psig

8 ft³/min

DAP panel requires its own 120V-1Ø-60Hz VAC power supply.

(Max. amp. draw is 2 A) Standard US 120V plug provided.

(2) – 3/8" hose barb

3.4 Water Leak Detection (BT-WLD)

3.4.1 Purpose

Detects if there is a water leak in the chamber, and shuts off incoming water supply through the use of an isolation safety valve.

3.4.2 Operation

The sensor will detect a small amount (puddle) of water. The chamber will then alarm and turn off the humidity water supply line, and, if water cooled, turn off the supply and return cooling water lines.

Water detection sensor is always active, any time the chamber power is turned on. The chamber does not need to be running in order for the leak detection system to function.

If a water leak is detected, the shut off valve will close which disables all water feed into the chamber. The chamber specimen power terminal will open and the chamber alarm output will close for customer water leak notification. Optionally, an indicator light may be illuminated.

3.5 Water Leak Containment (BT-WLC)

3.5.1 Purpose

Captures water that is leaking from the chamber, and contains it within the pan; so that the testing area is not affected with water or drippage.

3.5.2 Operation

The containment pan is designed to capture water from “low volume” leaks (as well as any condensation drippage) and drain it away from the chamber. Proper connection of drain lines to the drain connection(s) on the pan is required in order for the containment function to work properly.

The containment pan by itself is not intended to capture large flow/volume leaks. A full volume leak from a city water supply or the cooling water system will quickly over fill the pan and its drain line. For large leak protection, see the Water Leak Detection and Isolation option.

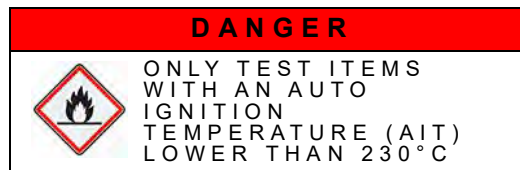
Chapter 4

Electronic Devices - Instrumentation

4.1 Spark Resistant Chamber Interior

This option is used to reduce the potential for generation of sparks in the chamber workspace or plenum area. The use of low watt density heaters reduces the operational temperature of the chamber to a safe temperature.

There is a combination pilot light and reset pushbutton that is used to indicate and reset, respectively, the sheath heater controller in the event of an overheat condition. The controller itself is mounted inside the electrical enclosure and is not operator adjustable.



4.2 Chamber Door Switch

This option inhibits/stops the chamber operation if the door is open. The chamber will not start with the chamber door open.

4.3 Product Overheat Protector with Product Sensor

This option is used for the protection of test product from temperature higher than desired. A set-point selector for the POHP is located on the chamber control panel area. The user must set the appropriate high temperature limit that is necessary for protection of their test product. The POHP will “trip” when the product temperature has risen higher than specified by the set-point selector. When the POHP has tripped, the chamber will shut down and “Overheat Alarm” is indicated on the touchscreen display. To reset the fault, the user must wait for the product temperature to drop below the product overheat protection set-point and then reset the controller by cycling the controller “power” button.

4.4 Emergency Stop Switch (BT-ES1)

4.4.1 Purpose

Use this switch to stop chamber operation during an emergency.

4.4.2 Operation

For normal chamber stops, press the START/STOP key on the F4T Controller.

Procedure:

1. Pressing the Emergency Stop Switch shuts OFF control power to the equipment
2. To resume operation, turn the switch in the direction of the arrows until it unlocks

4.5 Dry Air Purge (BT-DA2)

4.5.1 Purpose

To purge air into the chamber during pull-down to help prevent frost or condensation in the product

4.5.2 Operation

Manual

Go to the Profile Actions setting. Select View/Edit Profile Events and enable Dry Air. The dry air will flow as required for set point condition.

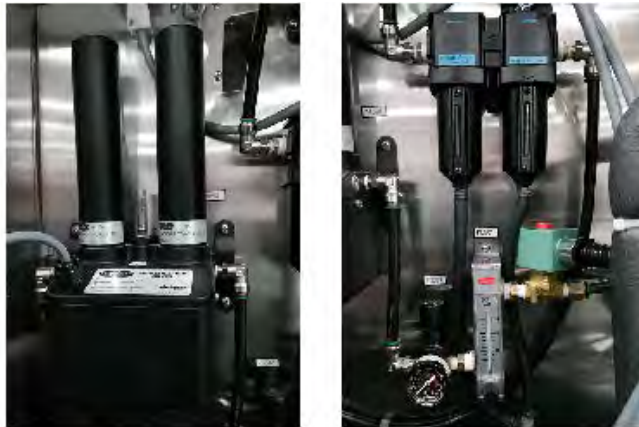
Programmable

Create a step in your program for the low humidity set point and switch on in Profile Event. Run the program as normal and output will trigger on the dry air purge to flow as required for step condition.

4.5.3 System Options

1. Wall mount panel (external system) - Sizes 1,4
 - Twin desiccant regenerative type towers to produce dry air with a filter
 - Adjustable flow meter
 - Moisture indicator. A control solenoid is mounted in the chamber, activated by the controller.
2. Back of chamber (internal system) - See Figure 4.1 Internal System for BTZ-4200
 - Twin desiccant regenerative type towers to produce dry air with a filter
 - Adjustable flow meter
 - Moisture indicator. A control solenoid is mounted in the chamber, activated by the controller.

FIGURE 4.1.INTERNAL SYSTEM FOR BTZ-4200

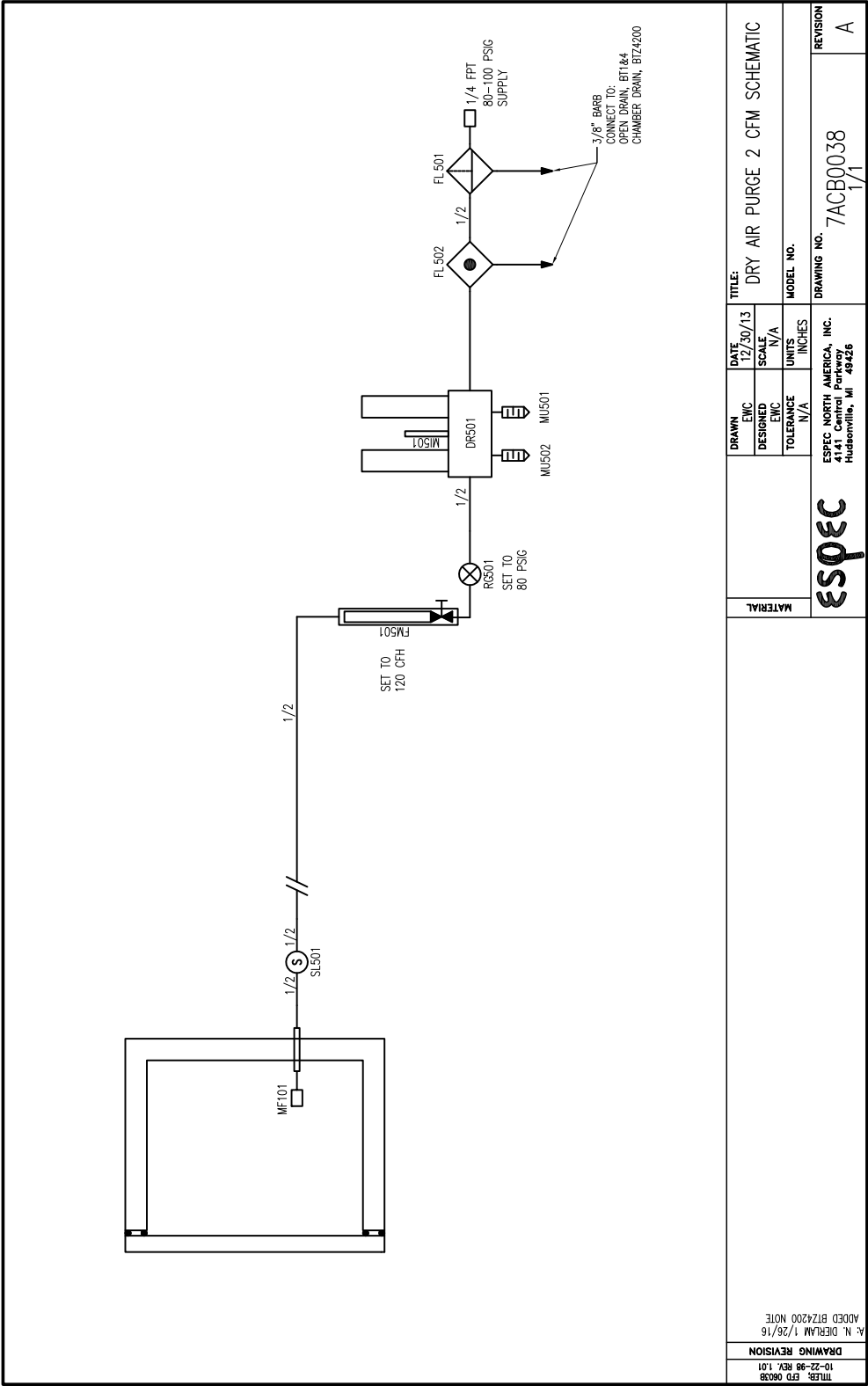


4.5.4 Utilities

Compressed Air	Clean, dry, oil free
Connection	1/4" NPT
Pressure	100-120 psig
Flow Rate	2.8 ft ³ /min.
Power	DAP panel requires a dedicated 120V-1Ø-60Hz VAC power supply (Max. amp draw is 2A) Standard US 120V plug provided*

*All models except BTZ-4200

4.5.5 BT-DA2




4.6 Nitrogen Gas Purge (BT-GN2)

4.6.1 Purpose

To purge nitrogen into the chamber during pull-down to help prevent frost or condensation in the product

4.6.2 Operation

DANGER	
	<p>DO NOT INTRODUCE EXPLOSIVE, COMBUSTIBLE, OR INFLAMMABLE SUBSTANCES INTO THE EQUIPMENT. KEEP SUBSTANCES AWAY FROM THE EQUIPMENT AND IMMEDIATE AREA. WHEN EXPOSED TO EXCESSIVE HEAT SUBSTANCES MAY CAUSE FIRES AND/OR EXPLOSIONS.</p>

Note: There is a flanged exhaust port located on the chamber to vent the GN₂ (nitrogen gas). The connecting exhaust system must be free of obstructions.

Note: The installation of an O₂ sensor in the chamber room is HIGHLY recommended. Venting of the GN₂ should be to the outdoors through a sloped exhaust pipe.

Manual

Go to the Profile Actions setting. Select View/Edit Profile Events and enable GN₂. The GN₂ will flow as required for set point condition.

Programmable

Create a step in your program for the low humidity set point and switch on in Profile Event. Run the program as normal and output will trigger on the GN₂ to flow as required for step condition.

4.6.3 System Features

- Adjustable flow meter
- A control solenoid is mounted in the chamber, activated by the controller
- Door limit switch for operator safety
- Flanged exhaust port

4.6.4 Utilities

Compressed GN ₂	Clean, dry, oil free
Connection	1/4" NPT

Pressure	100-120 psig
Flow Rate	2.0 ft ³ /min.

4.7 Control Temperature Sensor Output (BT-CTS)

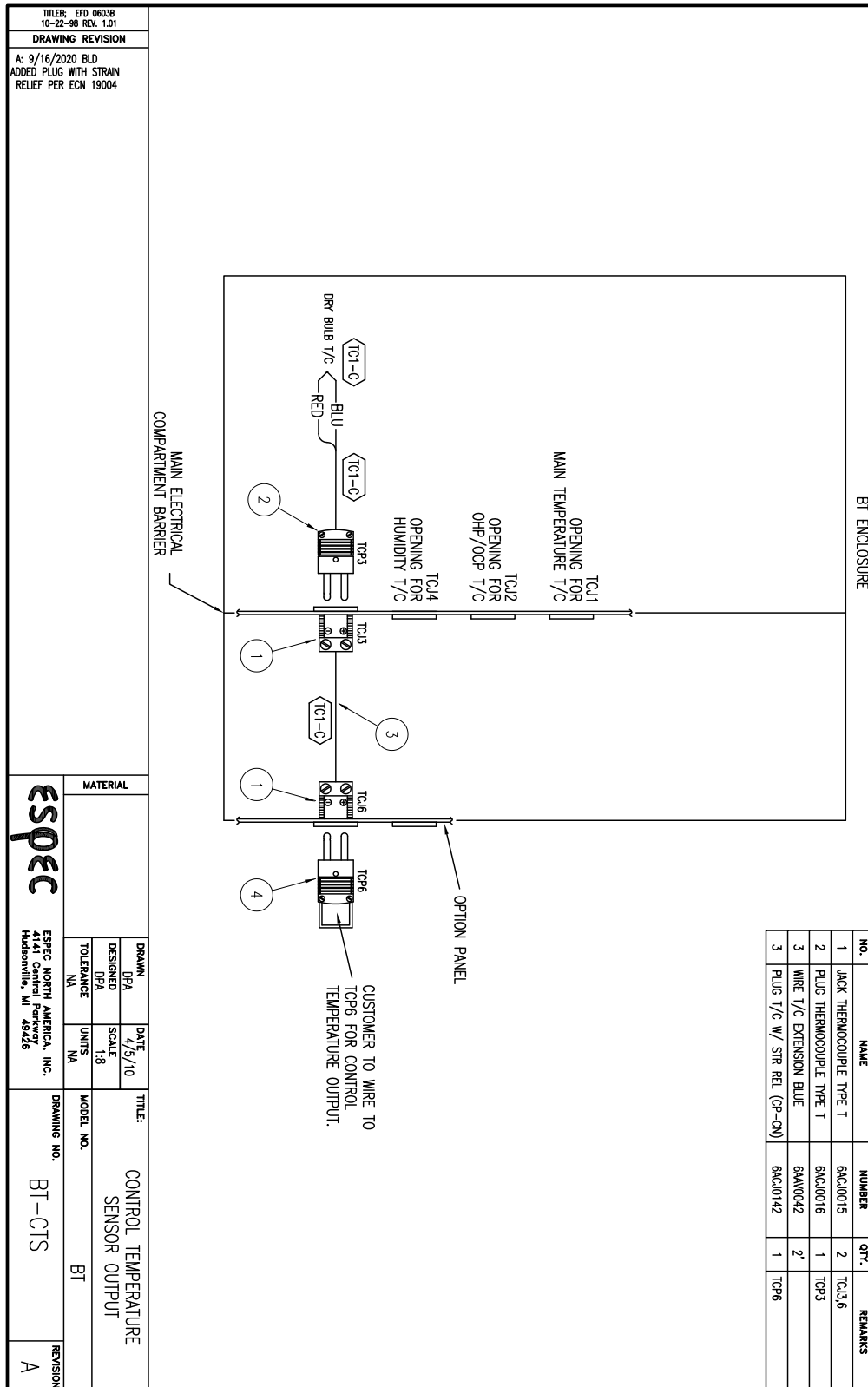
4.7.1 Purpose

To allow remote monitoring of chamber control temperature.

4.7.2 Operation

To monitor the control temperature, the user must connect a “type T” T/C wire to the provided T/C plug and then insert the plug into the T/C jack on the option panel. The user can then connect the other end of the T/C wire to the appropriate monitoring equipment. When external control temperature monitoring is not required, the T/C plug can be disconnected from the jack on the option panel.

4.7.3 BT-CTS



4.8 Solid State Humidity Sensor (BT-SH1)

4.8.1 Purpose

To digitally measure the relative humidity inside the chamber.


4.8.2 Performance Range

10 to 95% RH

4.8.3 Specifications

Operating Temperature at Electronics	-5° to 55°C (23° to 131°F)
Humidity Measuring Range	0 to 100% RH
Operating Temperature at Sensor	-70° to 180°C (-94° to 356°F)
Accuracy (including non-linearity, Hysteresis, and repeatability) Temp Range: -20 to 40°C Temp Range: 40 to 180°C	+/- 2% RH (0 to 90% RH) +/- 3% RH (90 to 100% RH) +/- 2.5%RH (0 to 90% RH) +/- 3.5% RH (90 to 100% RH)
90% Response Time at 20°C	60 seconds with PTFE filter
Sensor Protection	Porous PTFE filter

Note: Electronic solid state humidity sensor replaces the Wet Bulb Thermocouple and Wick Pan Water Level Regulator. The porous PTFE filter on the solid state humidity sensor should be replaced if dirty.

CAUTION	
	<p>WHEN THE FILTER IS REMOVED, THE SENSOR IS EXPOSED AND EXTRA CARE SHOULD BE TAKEN TO ENSURE THAT THE SENSOR IS NOT TOUCHED OR DAMAGED.</p>

Note: Refer to the Solid State Sensor Manual for complete maintenance and calibration procedures.

4.9 Temperature and Humidity Recorders

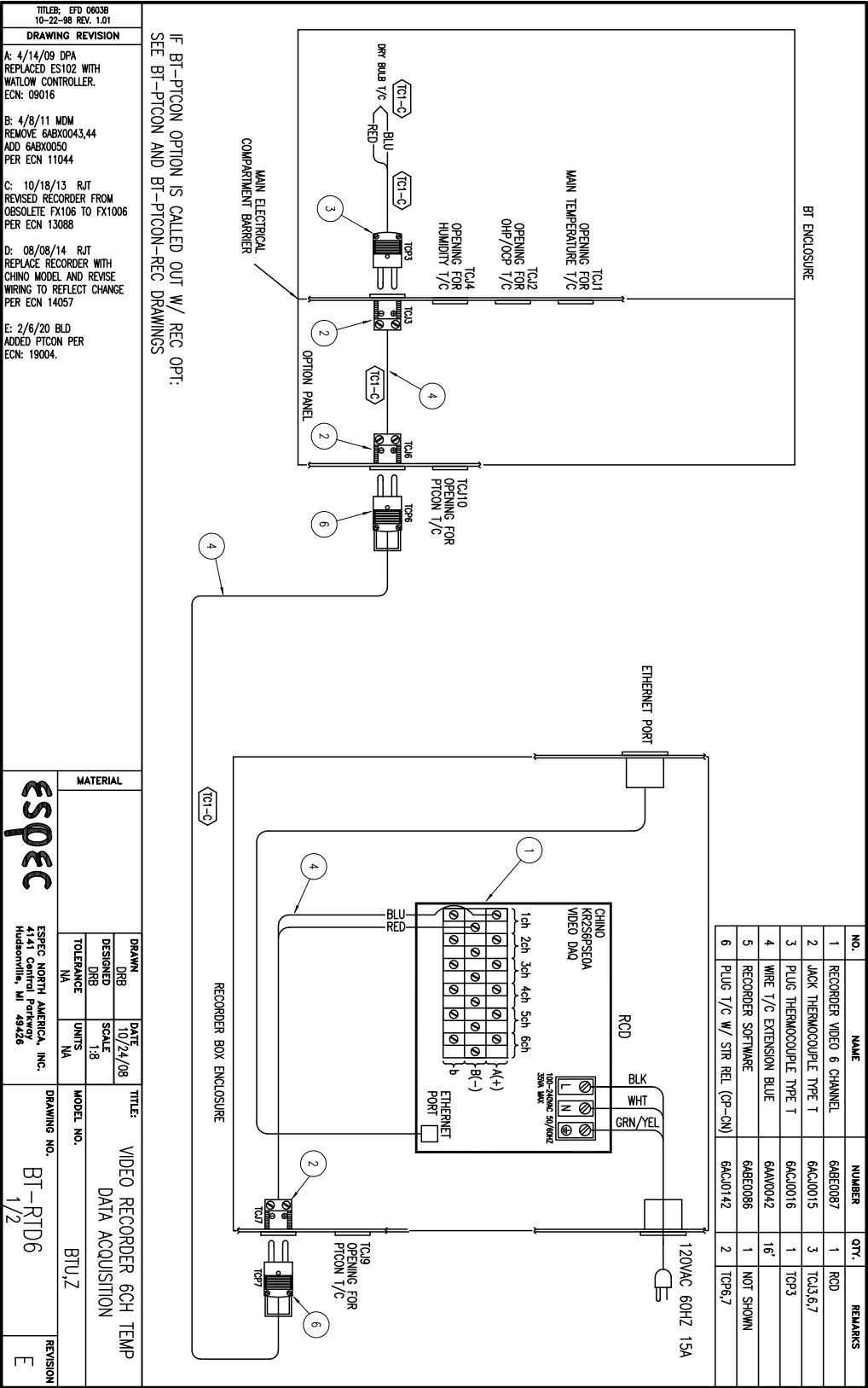
4.9.1 Purpose

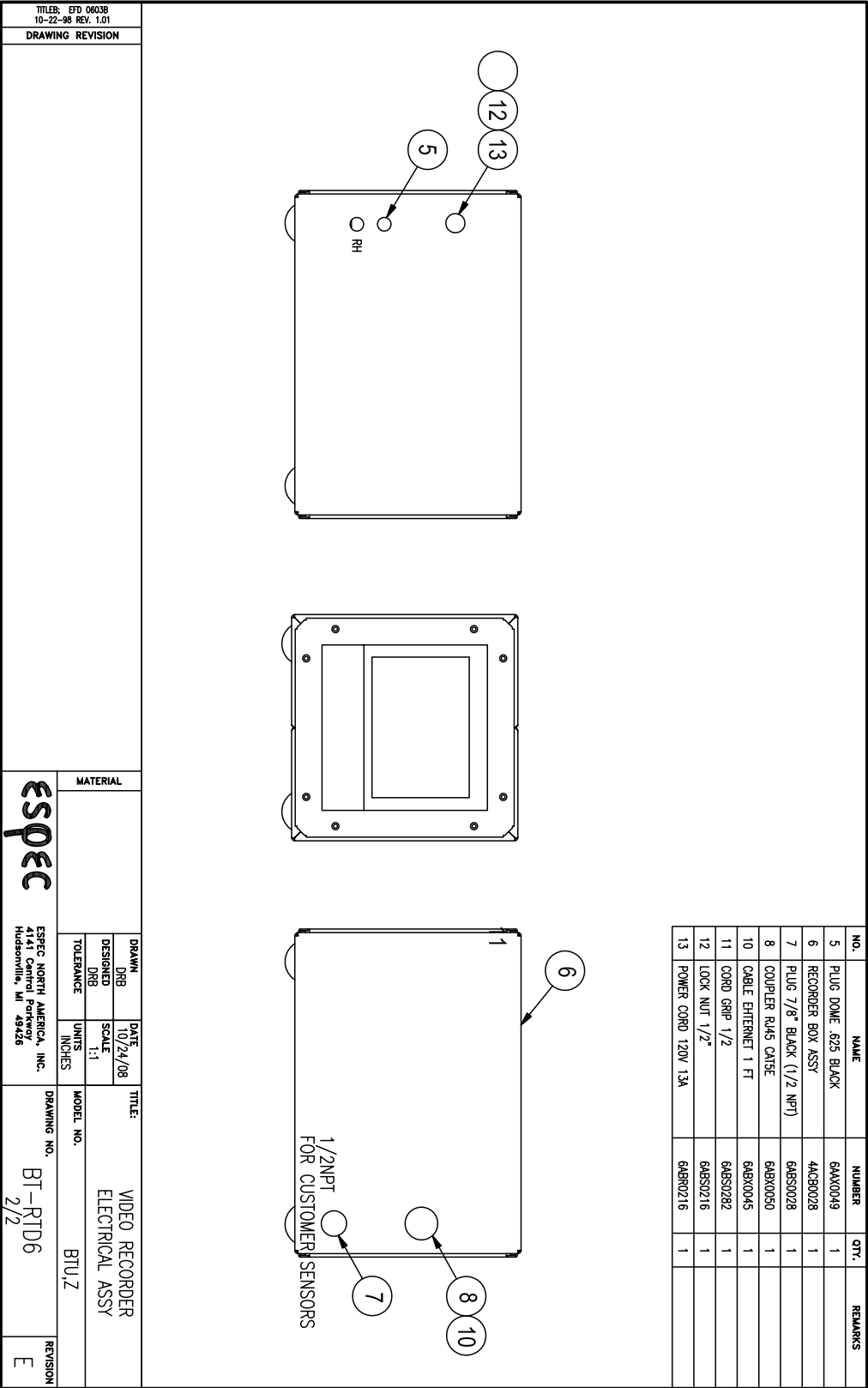
Record temperature and/or humidity operations

4.9.2 Operation

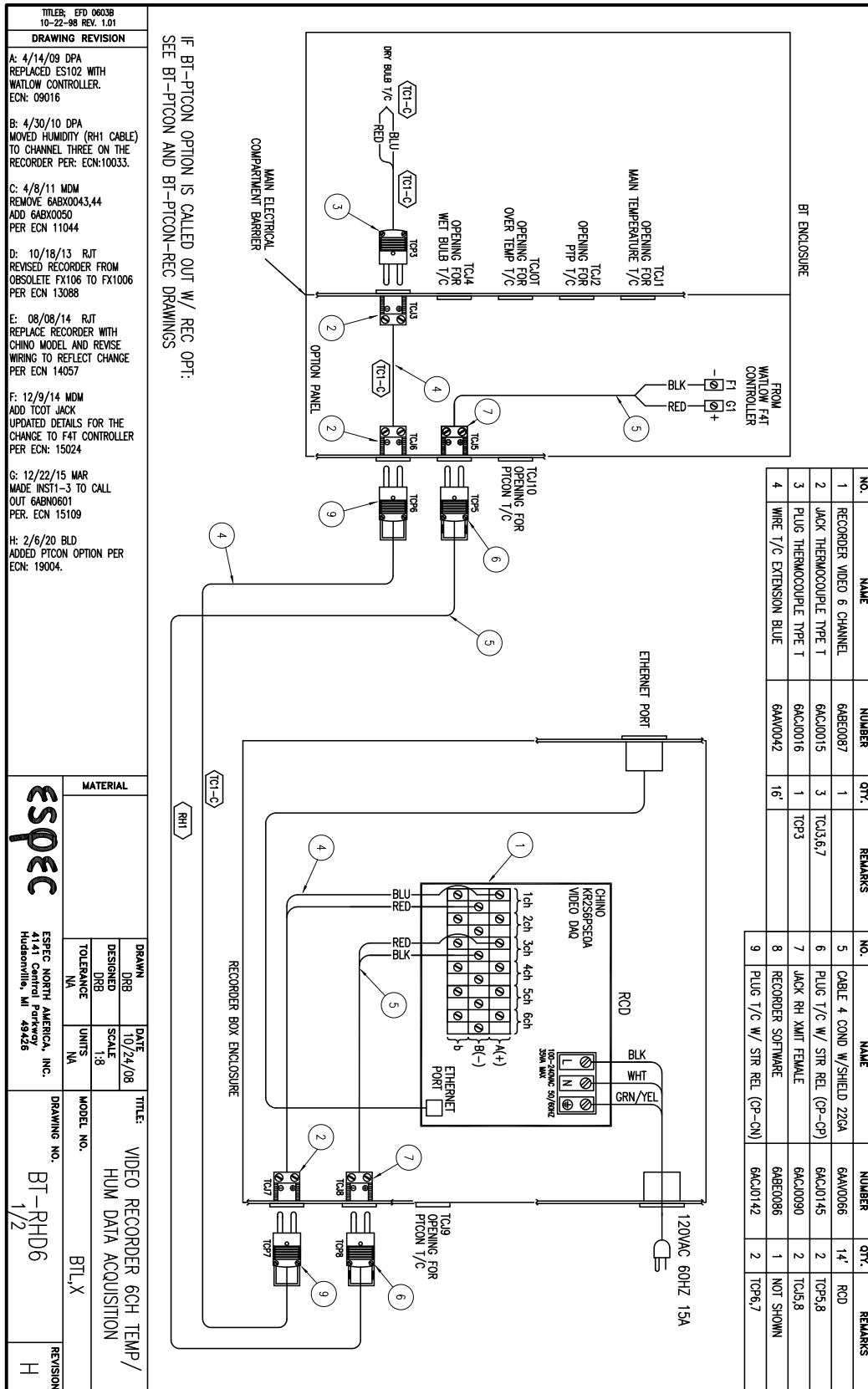
For details on how to operate your recorder, refer to the Recorder Instruction Manual.

4.9.3 BT-RTD6





4.9.4 BT-RHD6



NO.	NAME	NUMBER	QTY.	REMARKS
8	RECORDER BOX ASSY	4ACB0028	1	
9	PLUG 7/8" BLACK (1/2 NPT)	6AB50028	1	
10	COUPLER RJ45 CAT5E	6ABX0050	1	
12	ETHERNET CABLE 1 FT*	6ABX0045	1	
13	CORD GRIP 1/2"	6AB50282	1	
14	LOCK NUT 1/2"	6AB50216	1	
15	POWER CORD 120V 13A	6ABR0216	1	

○ PTC (TCJ9)
○ RH (TCJ8)
○ TEMP (TCJ7)

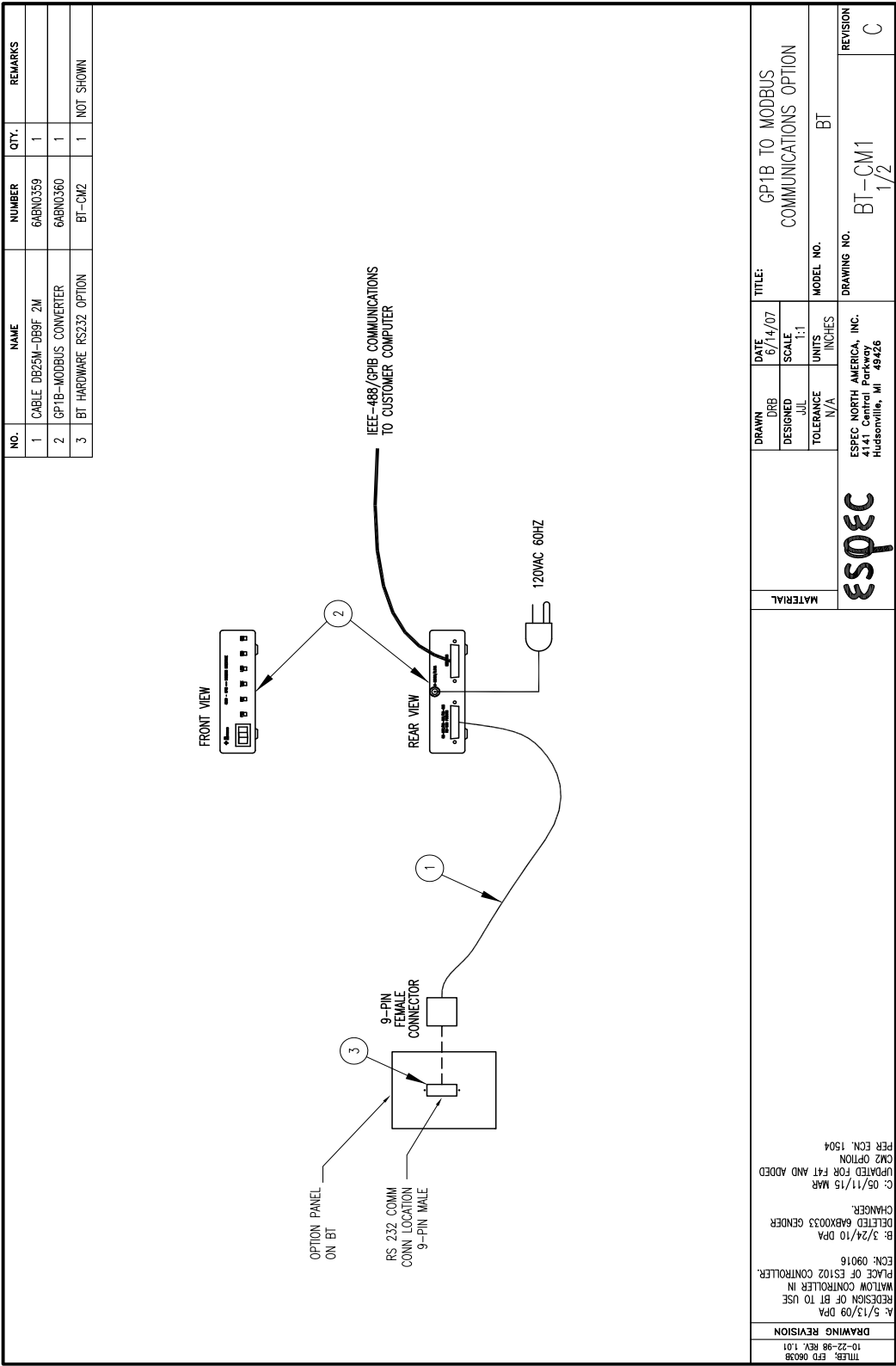
1/2NPT
FOR CUSTOMER SENSORS


DRAWN		DATE		TITLE:	
DRB	10/24/08	SCALE	1:1	VIDEO RECORDER	
DESIGNED	DRB	TOLERANCE	UNITS	MODEL NO.	ELECTRICAL ASSY (HUM)
				BTL,X	

ESPEC NORTH AMERICA, INC.
4141 Central Parkway
Hudsonville, MI 49426

DRAWING NO.	REVISION
BT-RHD6 2/2	H

4.9.5 GPIB to MODBUS Communication (BT-CM1)



TITLE: EFD 0603R 10-22-98 REV. 1.01 DRAWING REVISION			
 ESPEC NORTH AMERICA, INC. 4141 Central Parkway Hudsonville, MI 49426		MATERIAL	
		DRAWN DRB DESIGNED JLL TOLERANCE N/A	DATE 6/14/07 SCALE 1:1 UNITS INCHES
		TITLE: GPIB TO MODBUS COMMUNICATIONS OPTION	
MODEL NO. BT		DRAWING NO. BT-CM1 2/2	
REVISION C			

BT-CM1 validate instructions for ICS Electronics 4899 GPIB/232 converter

- 1) Verify Watlow F4T communication parameters. Baud rate: 9600, Address: 1
- 2) Connect RS-232 cable from ICS 4899 to front of ECT (RS-232 port).
- 3) Connect laptop to GPIB port on ICS 4899.
- 4) Turn on power for ICS 4899.
- 5) Turn on laptop and start windows.
- 6) On laptop, press START -> PROGRAMS -> GPIB SOFTWARE -> ICS ELECTRONICS GPIB -> ICS GPIBKYPD PROGRAM
 - . On GPIB keyboard program, settings should be as below (default):
 - Controller address: 21
 - Device address: 704
 - Comm. Term: CR - not checked, LF - checked
 - Device response: Auto query response - checked,
 - Display byte count - not checked
 - Remote REN: checked
- 7) Type the following commands into the "Device command" box to verify communications. Press "Send" after entering each command.
 - . Command: C 1 (space between C & 1) Response: Send string -> C1
 - . Command: R? 0,1 (space between ? and zero) Response: 5270
[This command reads Watlow model number, Watlow F4T is 5270]
 - . Command: R? 100,1 (space between ? and 1) Response: Current PV (x10)
[This command reads the current temperature from the Watlow F4]

ERROR HANDLING

If you get an error or handshake timeout, you must reset the GPIB controller. To reset the controller, type the following command: *ESR?

After resetting the error, the ICS 4899 should have the following LEDs turned on PWR, RDY, TALK.

4.10 RS-232 Communications (BT-CM2)

4.10.1 Purpose

Provides RS-232 Communications to chamber Temperature/Humidity Controller

4.10.2 Operation

See Watlow F4T User's Guide for Communications protocols and syntax.

4.11 RS-485 Communications (BT-CM4)


4.11.1 Purpose

Provides RS-485 Communications to chamber Temperature/Humidity Controller

4.11.2 Operation

See Watlow F4T User's Guide for Communications protocols and setup.

4.11.3 RS-485 Communication Specifications

PREPARED BY	07/24/07 TJE	BENCHTOP SERIES OPTIONAL EQUIPMENT RS-485 COMMUNICATION SPECIFICATIONS	Model	Drawing No.	Sp. No.	ECCP08002	1/1
REVISION	A	09/02/10 MAR	BT-ALL	BT-CM4			
	B	08/27/15 MAR					
	C	1/18/15 MDM					
	D						
	E						

- Product Name** RS-485 Communication Option
- Model** BT-CM4
- Communication Interface** The RS-485 interface is bi-directional full duplex.
- Baud Rate*** 9600, 19200, or 38400 bps.
- Address *** 1 to 247
- Maximum Transmission Distance** 500M
- Maximum number of Chambers Connectable** 16
- RS-485 Connector**

Pin No.	Signal Name	Signal	Connected
1	Spare	Open	Not Connected
2	Tx/Rx+	Transmission data / Reception data (+)	Connected
3	Tx/Rx -	Transmission data / Reception data (-)	Connected
4	Spare	Open	Not Connected
5	GND/COM	Ground /COM	Connected
6	Spare	Open	Not Connected
7	Spare	Open	Not Connected
8	Spare	Open	Not Connected
9	Spare	Open	Not Connected

*Programmable

4.12 Web Controller Communications (BT-WEB)

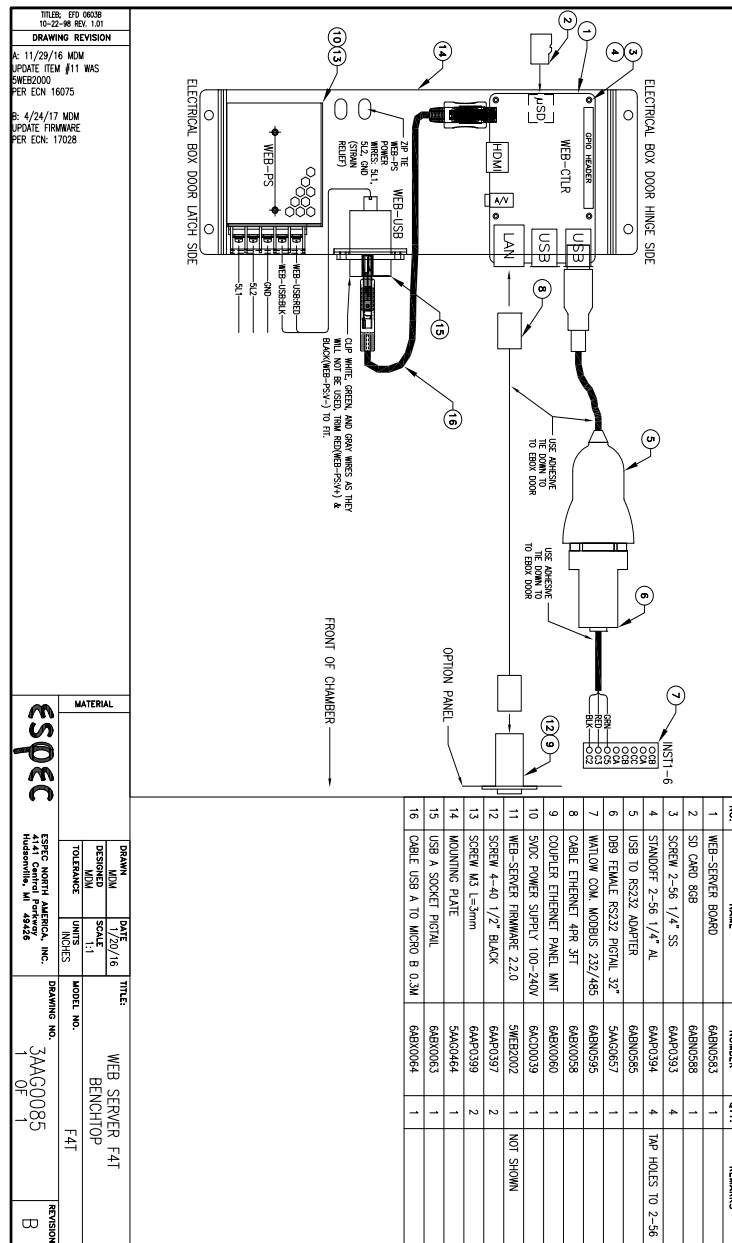
4.12.1 Purpose

Provides a web based user interface to the chamber Temperature and Humidity Controller.


4.12.2 Operation

See Web Controller user manual.

4.12.3 F4T Web Server



4.12.4 Web Controller Specifications

PREPARED BY		MDM 1/22/16	OPTIONAL EQUIPMENT SPECIFICATIONS WEB CONTROLLER	Model	Drawing No.	Spc. No.	ECCP16002	1/1
REVISION	A	MDM 11/29/16		BT-WEB				
	B			EP-WEB				
	C			EGN-WEB				
	D			EWP-WEB				
	E			EN-WEB				

1. **Product Name** Universal Web controller
2. **Model** BT-WEB, EP-WEB, EGN-WEB, EWP-WEB, EWS-WEB, EN-WEB
3. **Purpose** Simple remote operation of P300, SCP-220 or Watlow F4T controller via Ethernet.
4. **Function** View and control via standard web browser
5. **Capabilities**
 - Remote monitoring and control
 - Integrated data collection, download, and samba access.
 - Simple program creation and management
 - Copy programs from computer to chamber and chamber to computer
 - Allows for unlimited program storage capability by storing programs on a network or PC
 - Email alert for chamber alarms
 - Use any standard wireless device (iPhone, iPod touch, etc) for viewing and controlling through web browser
6. **Communication interface** 10/100baseT Ethernet
7. **Location** The network connection is located on the option panel.
8. **Utilities** 5VDC (supplied by the chamber)
9. **Operation** The web controller can be operated through any standard web browser, by navigating to the web controller hostname or IP address. Initial default hostname is "espec_serial#" where _serial#_ is the chamber's serial number.
10. **Maximum data storage** One million records at a user settable logging interval of 10 seconds to 60 minutes.
 - 115 days at 10 second logging intervals (factory default)
 - 347 days at 30 second logging intervals
 - 694 days at 60 second logging intervals
11. **Version updating** The firmware can be easily updated in the future by swapping out the SD card that contains the file system; or by uploading an update file using the "Firmware Update" tool on the setup page.
12. **Access Control** Users must log in to perform any action other than monitoring; the web controller supports the following access types.
 - "Guest": Not logged in may monitor status only.
 - "User": Guest privileges plus start, stop, and constant mode changes.
 - "Technician": User privileges plus editing programs.
 - "Administrator": Access to every function including setup. (default account username: "admin", password: "admin")

Issue Date: 2/11/04
 Rev. Level: 1.02
 ESPEC Form / Document EFD 0504A

Written By: Engineering Manager
 Approved By: Quality Assurance Supervisor
 Page: 1 of 1


4.13 Control Humidity Sensor Output (BT-CHS)

4.13.1 Purpose

To allow remote monitoring of chamber control humidity.

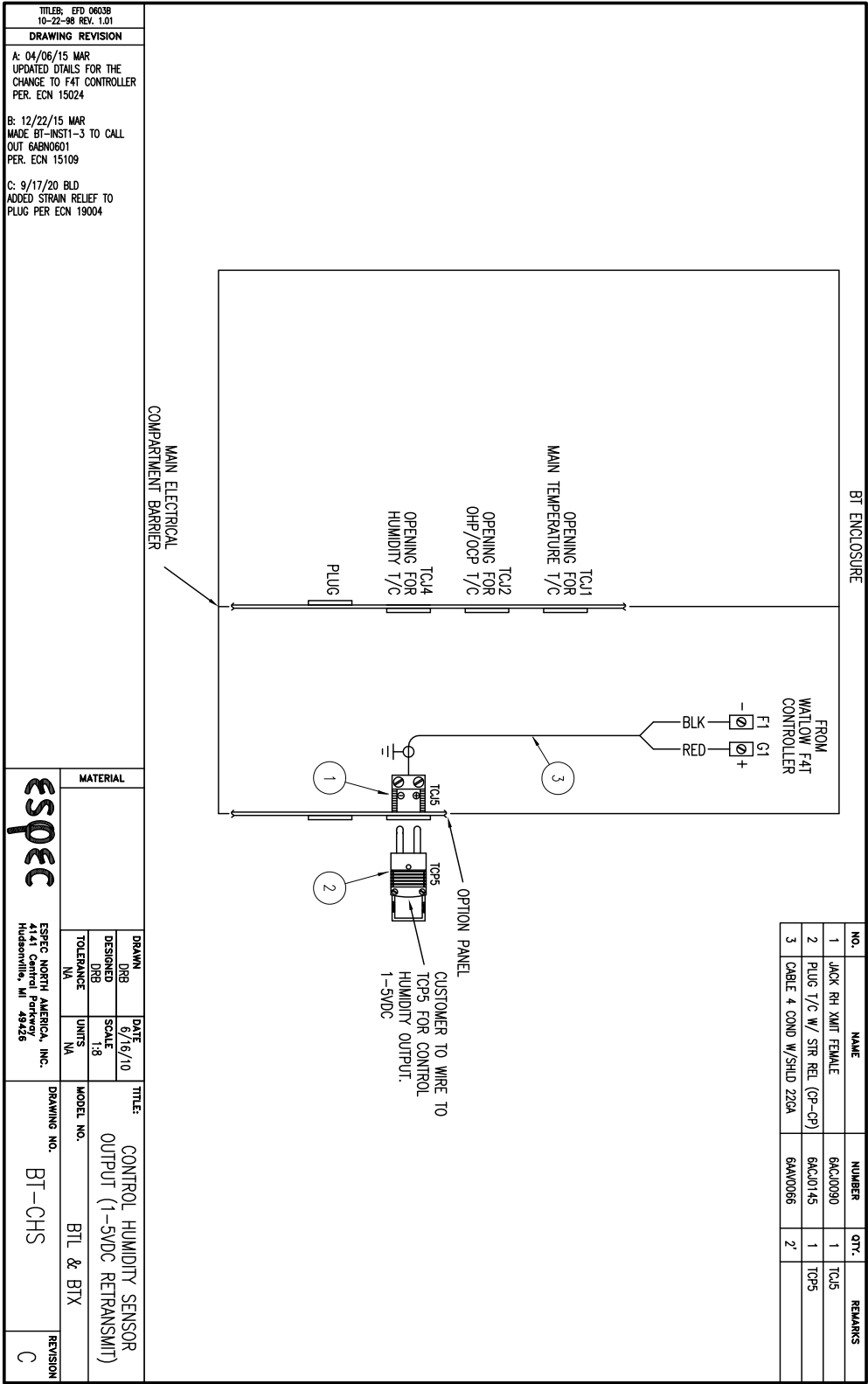
4.13.2 Operation

To monitor the control humidity, the user must connect a shielded 2 wire cable to the humidity plug and then insert the plug into the humidity jack on the option panel. The user can then connect the other end of the cable to the appropriate monitoring equipment. When external control humidity monitoring is not required, the humidity plug can be disconnected from the jack on the option panel.











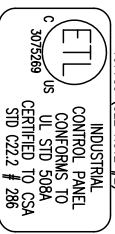

PREPARED BY	06/16/10 DRB	BENCHTOP SERIES OPTIONAL EQUIPMENT CONTROL HUMIDITY SENSOR OUTPUT SPECIFICATIONS	Model	Drawing No.	Sp. No.	ECCP10003	1/1
REVISION	A		BT-L,X	BT-CHS			
	B						
	C						
	D						
	E						

- | | |
|-----------------|---|
| 1. Model | BT-CHS |
| 2. Product Name | Control Humidity Sensor Output Option |
| 3. Purpose | To allow remote monitoring of chamber control humidity. |
| 4. Construction | The Control Humidity Sensor option includes the jacks, plugs and wire required to wire the control humidity 1-5V signal from the F4 to the option panel. |
| 5. Operation | To monitor the control humidity, the user must connect a shielded cable to the provided humidity plug and then insert the plug into the humidity jack on the option panel. The user can then connect the other end of the humidity cable to the appropriate monitoring equipment. When external control humidity monitoring is not required, the humidity plug can be disconnected from the jack on the option panel. |

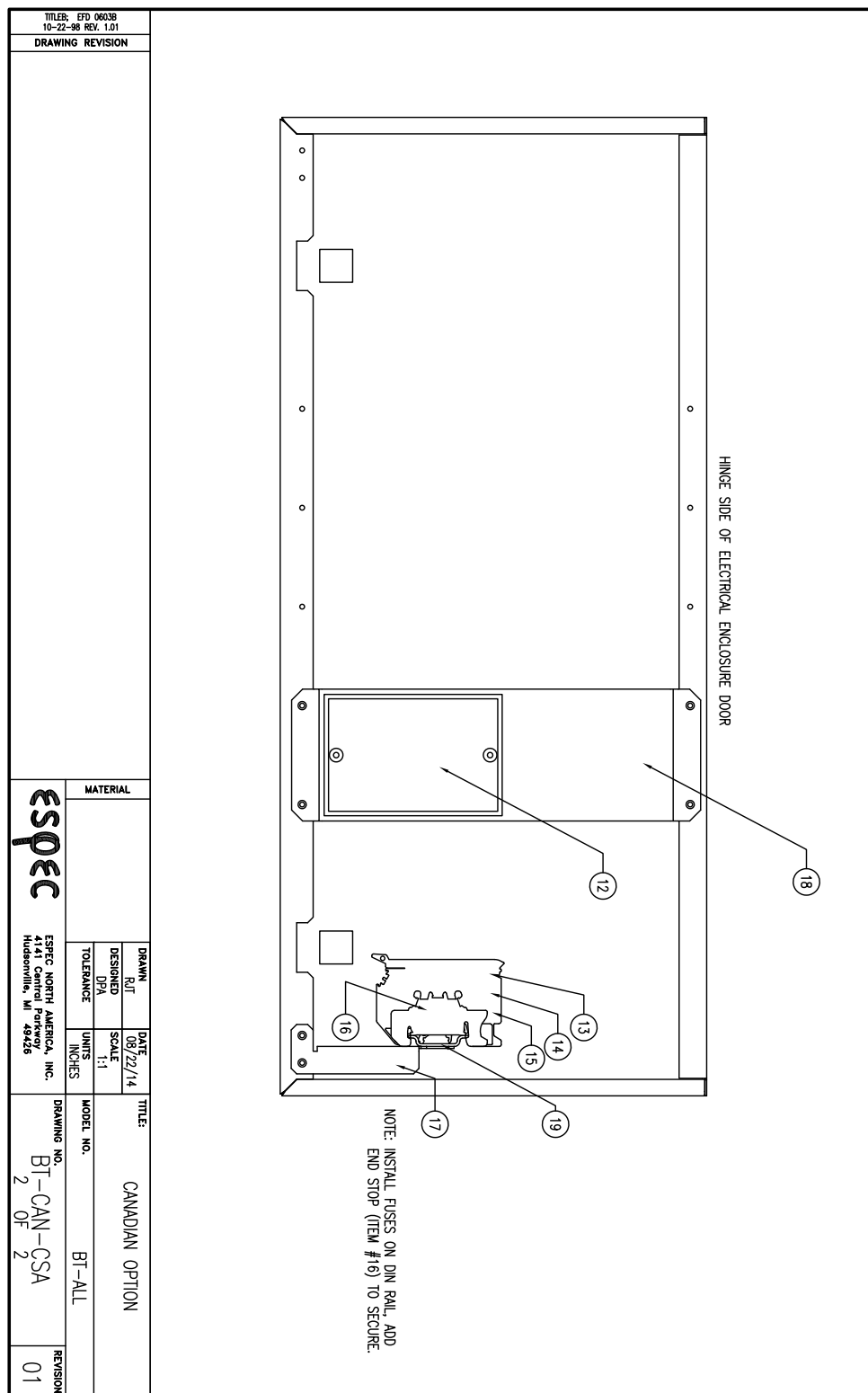
4.13.3 BT-CHS



4.14 Canada CSA Modification (BT-CAN-CSA)

TITLER: ETD 08038 10-22-98 REV. 1.01		DRAWING REVISION																																																																																																															
00: 4/1/22 BLD INITIAL RELEASE PER ECN 50159		01: 10/21/22 KAM PAGE 2 ADDED FOR ELECTRICAL COMPONENT MOUNTING PER ECO 50185																																																																																																															
																																																																																																																	
																																																																																																																	
																																																																																																																	
																																																																																																																	
																																																																																																																	
																																																																																																																	
NOTES: 1. DO NOT USE "WARNING EXPLOSION" TAG (5ABT0025) WHEN THE CHAMBER IS SPARK RESISTANT. USE "SPARK RESISTANT INTERIOR" TAG (5ABT0030) IN ITS PLACE. 2. 107753 IS APPLIED TO ELECTRICAL PANEL. AFTER CHAMBER PASSES CAN/CSA 22.2 #286, OTHER TAGS ARE PLACED ADJACENT TO ENGLISH VERSION TAG WITH SAME MESSAGE.		<table><tr><th>NO.</th><th>NAME</th><th>NUMBER</th><th>QTY.</th><th>REMARKS</th></tr><tr><td>1</td><td>LABEL UL508A & CSA 286-17</td><td>107753</td><td>1</td><td></td></tr><tr><td>2</td><td>CAUTION HOT/COLD (FRENCH)</td><td>5ABT0021</td><td>AR</td><td>(ENGLISH) 5ABT0001</td></tr><tr><td>3</td><td>CAUTION USE SPECIMEN (FRENCH)</td><td>5ABT0022</td><td>AR</td><td>(ENGLISH) 5ABT0002</td></tr><tr><td>4</td><td>WARN ELEC HAZ MULT (FRENCH)</td><td>5ABT0023</td><td>AR</td><td>(ENGLISH) 5ABT0008</td></tr><tr><td>5</td><td>WARN DO NOT ENTER (FRENCH)</td><td>5ABT0024</td><td>AR</td><td>(ENGLISH) 5ABT0005</td></tr><tr><td>6</td><td>WARNING EXPLOSION (FRENCH)</td><td>5ABT0025</td><td>AR</td><td>(ENGLISH) 5ABT0006</td></tr><tr><td>7</td><td>WARN ELEC HAZ DISC (FRENCH)</td><td>5ABT0026</td><td>AR</td><td>(ENGLISH) 5ABT0004</td></tr><tr><td>8</td><td>WARN MECH HAZARD (FRENCH)</td><td>5ABT0027</td><td>AR</td><td>(ENGLISH) 5ABT0007</td></tr><tr><td>9</td><td>WARN EXPLOSION SR (FRENCH)</td><td>5ABT0030</td><td>AR</td><td>(ENGLISH) 5ABT0028</td></tr><tr><td>10</td><td>WARN SLIPPERY FLOOR (FRENCH)</td><td>5ABT0033</td><td>AR</td><td>(ENGLISH) 5ABT0003</td></tr><tr><td>11</td><td>DANGER: DISCON B4 SERVICING</td><td>5ABT0048</td><td>AR</td><td>FRENCH/ENGLISH</td></tr><tr><td>12</td><td>LIMIT CTRL WAITLOW LF 216C</td><td>6ABN0654</td><td>1</td><td>SHOWN ON SHEET 2</td></tr><tr><td>13</td><td>FUSE FAST ACTING 2A 1R 125V</td><td>6AAU0023</td><td>2</td><td>SHOWN ON SHEET 2</td></tr><tr><td>14</td><td>BLOCK FUSE 600V 16A 1P</td><td>10S307</td><td>2</td><td>SHOWN ON SHEET 2</td></tr><tr><td>15</td><td>BLOCK FUSE END SECTION</td><td>10S308</td><td>1</td><td>SHOWN ON SHEET 2</td></tr><tr><td>16</td><td>TERMINAL QTC2.5 END BRACKET</td><td>6ACE0236</td><td>2</td><td>SHOWN ON SHEET 2</td></tr><tr><td>17</td><td>FUSE MOUNTING BRACKET</td><td>113983</td><td>1</td><td>SHOWN ON SHEET 2</td></tr><tr><td>18</td><td>OT BLOCK MOUNTING BRACKET</td><td>113990</td><td>1</td><td>SHOWN ON SHEET 2</td></tr><tr><td>19</td><td>TRACK DIN RAIL 24 LENGTH</td><td>6ABU0031</td><td>2"</td><td>SHOWN ON SHEET 2</td></tr><tr><td>20</td><td>FUSE REPLACEMENT TAG</td><td>5ABT0051</td><td>1</td><td></td></tr><tr><td>21</td><td>FUSE FAST ACTING 2A 1R 125V</td><td>6AAU0023</td><td>1</td><td>ROUTE TO SHIP KIT</td></tr></table>		NO.	NAME	NUMBER	QTY.	REMARKS	1	LABEL UL508A & CSA 286-17	107753	1		2	CAUTION HOT/COLD (FRENCH)	5ABT0021	AR	(ENGLISH) 5ABT0001	3	CAUTION USE SPECIMEN (FRENCH)	5ABT0022	AR	(ENGLISH) 5ABT0002	4	WARN ELEC HAZ MULT (FRENCH)	5ABT0023	AR	(ENGLISH) 5ABT0008	5	WARN DO NOT ENTER (FRENCH)	5ABT0024	AR	(ENGLISH) 5ABT0005	6	WARNING EXPLOSION (FRENCH)	5ABT0025	AR	(ENGLISH) 5ABT0006	7	WARN ELEC HAZ DISC (FRENCH)	5ABT0026	AR	(ENGLISH) 5ABT0004	8	WARN MECH HAZARD (FRENCH)	5ABT0027	AR	(ENGLISH) 5ABT0007	9	WARN EXPLOSION SR (FRENCH)	5ABT0030	AR	(ENGLISH) 5ABT0028	10	WARN SLIPPERY FLOOR (FRENCH)	5ABT0033	AR	(ENGLISH) 5ABT0003	11	DANGER: DISCON B4 SERVICING	5ABT0048	AR	FRENCH/ENGLISH	12	LIMIT CTRL WAITLOW LF 216C	6ABN0654	1	SHOWN ON SHEET 2	13	FUSE FAST ACTING 2A 1R 125V	6AAU0023	2	SHOWN ON SHEET 2	14	BLOCK FUSE 600V 16A 1P	10S307	2	SHOWN ON SHEET 2	15	BLOCK FUSE END SECTION	10S308	1	SHOWN ON SHEET 2	16	TERMINAL QTC2.5 END BRACKET	6ACE0236	2	SHOWN ON SHEET 2	17	FUSE MOUNTING BRACKET	113983	1	SHOWN ON SHEET 2	18	OT BLOCK MOUNTING BRACKET	113990	1	SHOWN ON SHEET 2	19	TRACK DIN RAIL 24 LENGTH	6ABU0031	2"	SHOWN ON SHEET 2	20	FUSE REPLACEMENT TAG	5ABT0051	1		21	FUSE FAST ACTING 2A 1R 125V	6AAU0023	1	ROUTE TO SHIP KIT
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DRAWING NO. BT-CAN-CSA 1 OF 2		REVISION 01	
DATE 08/22/14		TITLE: CANADIAN OPTION	
SCALE 1:1		MODEL NO. BT-ALL	
DESIGNED BY: [blank]		DRAWN BY: [blank]	
TOLERANCE INCHES		MATERIAL	
ESPEC NORTH AMERICA, INC. 4141 Central Parkway Hudsonville, MI 49426		INDUSTRIAL CONTROL PANEL CONFORMS TO UL STD 508A CERTIFIED TO CSA STD C22.2 # 286	



4.15 Product Temperature Control (BT-PTCON)

4.15.1 Purpose

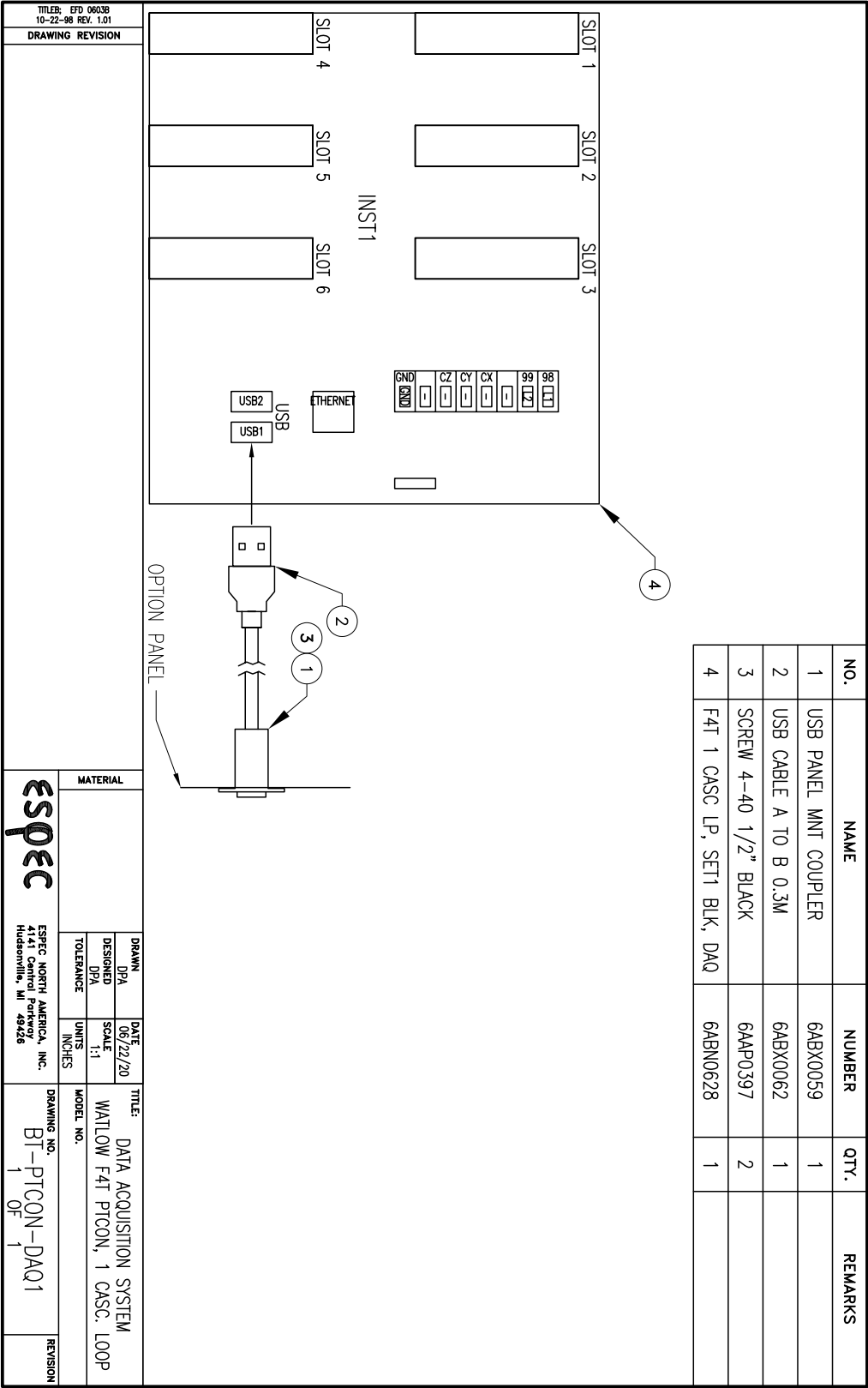
The Product Temperature Control Option adds an additional thermocouple for the product being tested. The thermocouple is wired to the controller for the purpose of product temperature control testing.

4.15.2 Operation

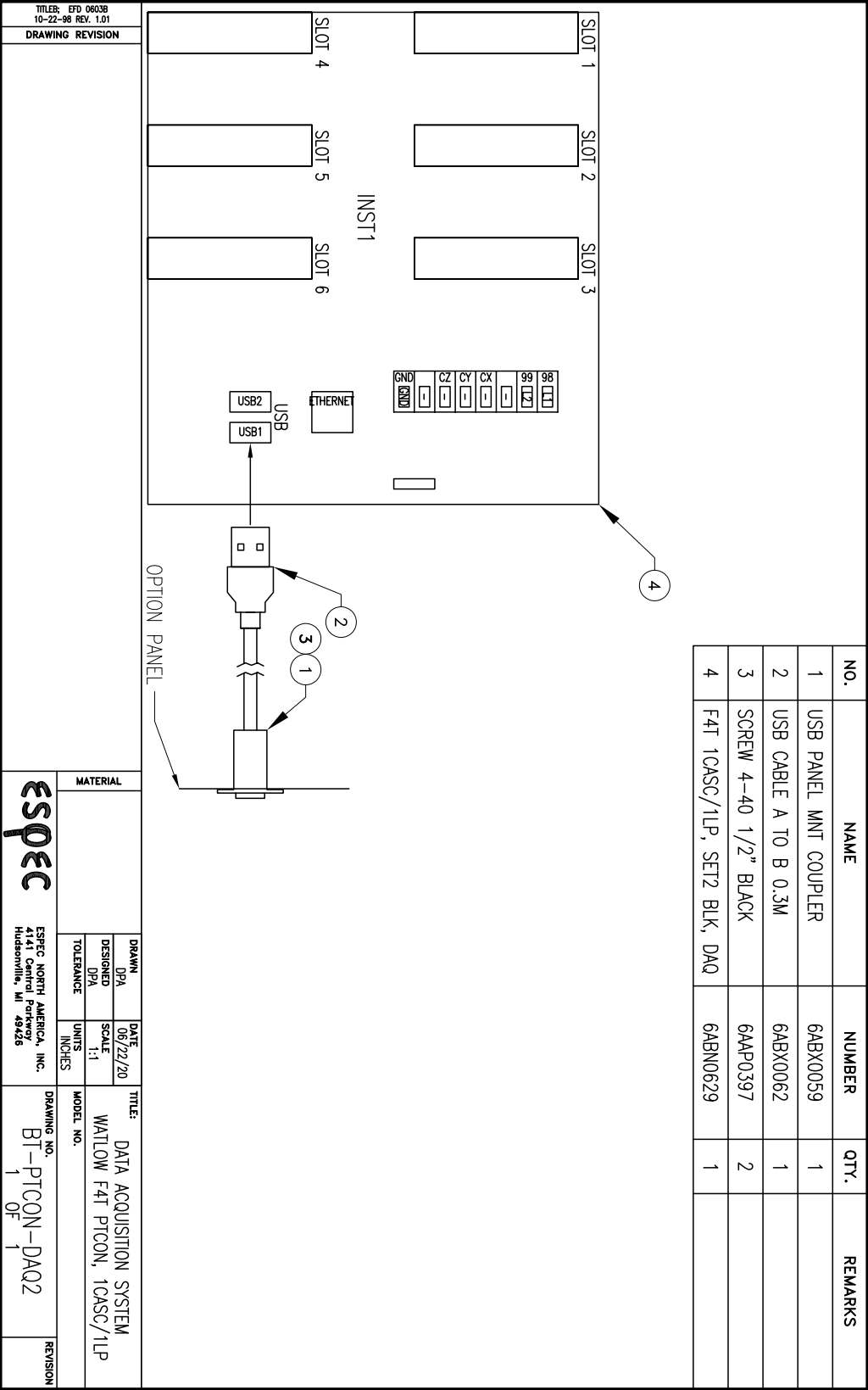
The Product Temperature Control Option includes the T/C jacks, plugs, and wire required to wire the product thermocouple (also included) to the controller. Port is located above option panel, on the side of the chamber. Chamber test area is used to provide a path for the T/C wire to exit the test area and get plugged into the jack located on the top side of the water box.

To enable cascade temperature control, you must select it from the event button at the bottom of the F4T Control.


4.15.3 PTCON-DAQ1



4.15.4 PTCON-DAQ2



4.16 Fire Detection System

PREPARED BY	11/17/10 RLH		FIRE DETECTION SYSTEM SPECIFICATION	Model	Drawing No.	Spc. No.	ECSP10011	1/1
REVISION	A	2011/06/21 GLM		BT-FIREDET				
	B	07/15/13 TJE		EGN-FIREDET				
	C			EN-FIREDET				
	D			EP-FIREDET				
	E			EW-FIREDET				

1. Model
BT, EGN, EN, EP, EW -FIREDET
2. Product Name
Fire detection system
3. Description/Purpose
Detects a fire in the chamber and shuts down the chamber.
4. Construction
 - 4.1. Fire Detector
Fenwall "Detect-a-fire" thermal sensor located in chamber interior in return airstream from workspace
 - 4.2. Alarm Indication
Red alarm light and audible horn (extends approx. 11 in. above top of top of chamber).
Alarm contacts to activate fire suppression (see -FIRESUPP option) and remote signaling.
5. Operation
 - 5.1. Detection
Fire detector activates upon rapid rate of temperature rise, or upon reaching an absolute high limit. Fire detector will automatically reset after fire condition has cleared.
 - 5.2. Alarm
If a fire is detected, a red alarm light and audible alarm is activated; and the chamber operation is shut down.
 - 5.3. Keyswitch
ON: Fire detection active.
OFF: Fire detection off, or if fire detector is activated, terminates the alarm.

Chapter 5

Refrigeration Circuit

5.1 Liquid Nitrogen (LN₂) Boost Cooling (BT-LN)

5.1.1 Purpose

To accelerate the temperature pull-down time

5.1.2 Installation

LN₂ pressurized at approximately 30-35 psig

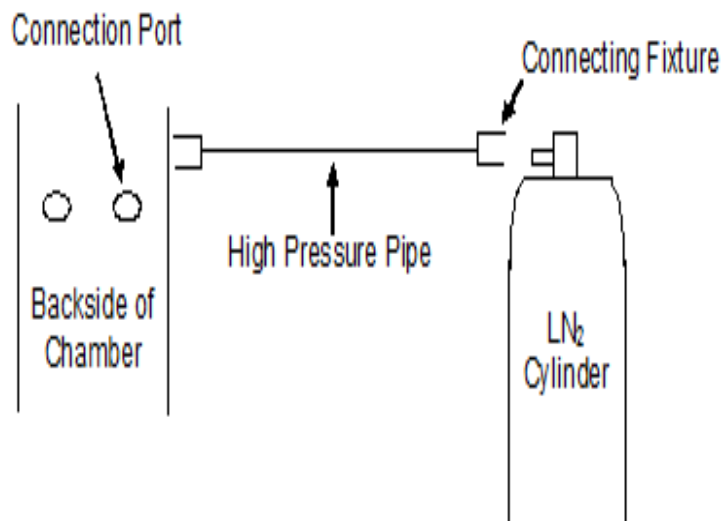
Consumption about 2 lb./min.

Connecting of Cylinder

1. Fit the connecting fixture (1/4" SAE flare) onto the LN₂ cylinder
2. Connect the high pressure pipe (1/4" SAE flare connections). Always insulate the high pressure pipe before using the LN₂ injection system.
3. Open the LN₂ cylinder and check for leaks

Note: Steps should be taken to prevent the cylinder from tipping

The LN₂ cylinder, cylinder connector, and high pressure pipe are to be procured by the customer.



DANGER



THE CHAMBER SHOULD BE IN A PROPERLY VENTILATED AREA OR THE LN₂ EXPANDED GAS SHOULD BE VENTED TO THE OUTDOORS THROUGH A SLOPED EXHAUST PIPE. THE INSTALLATION OF AN O₂ SENSOR IN THE CHAMBER ROOM IS RECOMMENDED.

THE CHAMBER LN₂ SYSTEM PRESSURE RELIEF VALVES ARE NOT INTENDED TO BE THE PRIMARY SAFETY FOR THE LN₂ PIPING SYSTEM. INSTALLATION OF AN LN₂ SAFETY PRESSURE RELIEF VALVE IN THE MAIN SUPPLY LINE BEFORE THE CHAMBER IS REQUIRED.

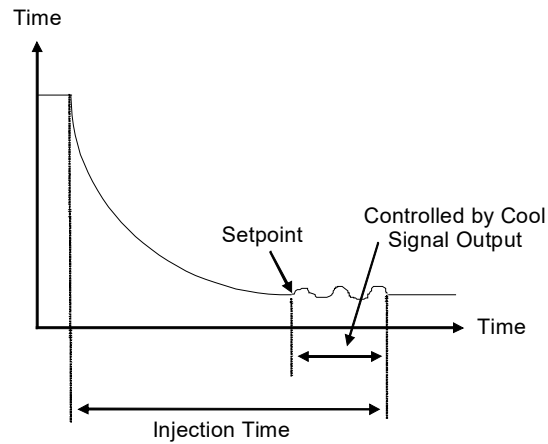
5.1.3 Operation

Manual


Go to the constant mode setting in the programmer and turn on Time Signal No. 2. The LN₂ will stage in as required.

Programmable

Create a discrete step in your program for the LN₂ injection by setting Time Signal No. 2 ON. This step should not exceed 30 minutes. Run the program as normal and the Time Signal will trigger the LN₂ option injection time.



5.2 Liquid Nitrogen Injection Boost Specifications

PREPARED BY	10/04/09 TJE	BENCH TOP SERIES OPTIONAL EQUIPMENT LIQUID NITROGEN INJECTION BOOST SPECIFICATIONS	Model	Drawing No.	Spc. No.	ECCP09014	1/1
REVISION	A		BT				
	B						
	C						
	D						
	E						

1. Model

Model	Part Number	Description
BT1	117532	OPTION, LIQUID NITROGEN BOOST, BT1
BT4	117533	OPTION, LIQUID NITROGEN BOOST, BT4
BT4200	121034	OPTION, LIQUID NITROGEN BOOST, BT4200

2. Description

The liquid nitrogen boost option is used to cool the chamber at a faster (than standard) rate.

3. Construction

The liquid nitrogen boost system consists of two cryogenic solenoid valves and a safety relief valve. The chamber overall height will increase by six inches.

4. Operation

To enable the liquid nitrogen boost control, the LN₂ Time signal must be turned on. Once enabled, the liquid nitrogen boost is turned on after a full cooling demand is present for a period of time. As soon as the cooling demand is less than full, the liquid nitrogen boost is turned off. Additionally, the liquid nitrogen boost is interlocked off when in humidity mode.

5. Safety Devices

The redundant liquid nitrogen solenoid valve is piped in series with the primary liquid nitrogen control solenoid valve. If the primary liquid nitrogen control solenoid valve should ever be "stuck open" when the liquid nitrogen is not supposed to be on, the redundant liquid nitrogen solenoid valve will remain closed thus disabling a constant liquid nitrogen feed. A door limit switch prevents Nitrogen from injecting into the chamber while the chamber door is open.

6. Utilities Required

Liquid Nitrogen
Supply Rate: 2 Lbs/minute.
Supply Pressure: 30-35 PSIG.
Connection: 1/4" flare (male).

ISSUED BY ESPEC NORTH AMERICA, INC.

Issue Date: 2/5/16
Rev. Level: 1.03
ESPEC Form / Document EFD 0504A

Written By: Engineering Manager
Approved By: Quality Assurance Supervisor
Page: 1 of 1

5.3 Fire Suppression System

Reference: See user manual for Firetrace Fire Suppression System and video tutorial online at <https://youtu.be/JrHi4OI5b4Q>



5.3.1 Tamper-Proof Valve Lock

The system has a Tamper-Proof Valve Locking device. The ball valve on top of the ILP, DLP, and IHP valves is NOT supervised. It is critical that this valve have some type of lock to ensure that it is OPEN when the system is armed and CLOSED during routine maintenance procedures. Images to the right show each valve lock the OPEN (Armed) clip, which is GREEN, and the CLOSED (Lockout) clip which is RED.



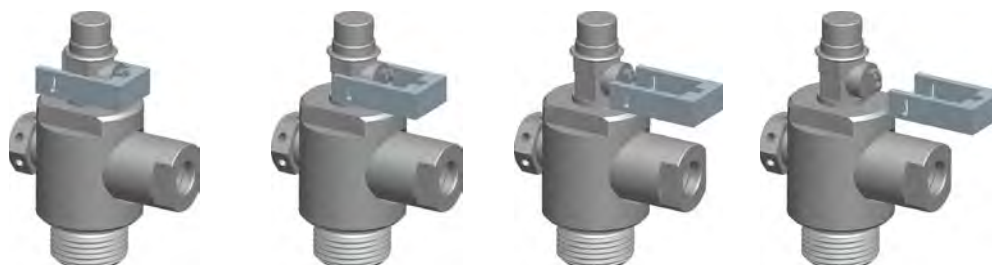
GREEN = OPEN
RED = CLOSED


5.3.2 Valve Shipping Lock-in Clip

The black and red handle (lever) will be removed from the valve during shipment to ensure that the valve is not opened and does not activate the system. See image to the right. The small little set screw on the valve handle is also used to lock in the tamper clip.



FIGURE 5.1. LOCK-IN CLIP EXAMPLE



PREPARED BY		06/01/10 BTP	FIRE SUPPRESSION SYSTEM SPECIFICATION	Model	Drawing No.	Spc. No.	ECSP10012	1/2
REVISION	C	12/19/11 GLM		BT-FIRESUPP				
	D	11/07/12 GLM		EGN-FIRESUPP				
	E	07/15/13 TJE		EN-FIRESUPP				
	F	5/10/23 TJE		EP-FIRESUPP				
	G	3/29/24 RLH		EW-FIRESUPP				

1. Model
2. Product Name
3. Description/Purpose
4. System Application

BT, EGN, EN, EP, EW-FIRESUPP
Fire suppression system.
Injection system to suppress/extinguish fire in chamber.

Suppression Agent	CO ₂	FK-5-1-12	Argon
Fire Class ¹	A, B, C	A, B, C	A,B,C,D
Agent code →	-CO	-FK	-IN
Agent -qty ↓	Applicable Chamber Series↓		
-3	NA	BT ALL EP (2,3) EGN (12, 16)	NA
-4	NA	EP (4) EGN (28,35) EN (42, 60, 112)	NA
-5	BT EP EGN EN(42, 60)		
-17	NA	EW(≤300)	NA
-30	NA	EW(301-500)	NA
-45	NA	EW(501-1000)	NA
-70	NA	EW(1001-1375)	NA
-80	NA	NA	EP EN EGN EW(≤200)

Note: True inert gas (argon) systems are suitable for suppressing metal fires, e.g., lithium. Other multi-atomic "inert" suppressants are not suitable for suppressing metal fires, as the gases can decompose at high temperature. Decomposed CO₂ supplies oxygen (O₂) to the fire, and decomposed N₂ can react to form combustible or polluting compounds.

5. Option Designation

<chamber series> - FIRESUPP - <agent code> - <agent qty>.
Example: EGN-FIRESUPP-FK-3
EGN = Global-N series
FIRESUPP = Fire suppression system
FK = FK-5-1-12 suppression agent
3 = 3 qty agent.

6. System Components

6.1. Cylinder

For suppression agent

¹ A = Ordinary combustible solids (paper, wood, plastic, etc.).
B = Flammable liquids, vapors, and gases.
C = Electrical equipment.
D = Combustible metals.

- 6.2. Release Valve
 - 6.3. Nozzle
 - 6.4. Vent Port
 - 6.5. Manual Pull Alarm Station
 - 6.6. Alarm Horn/Strobe
 - 6.7. Remote Signaling Contact
 - 6.8. Keyswitch
 - 6.9. UPS
 - 7. Operation
 - 7.1. Activation Source
 - 7.1.1. Manual Fire Alarm Pull Station
 - 7.1.2. Fire Detection System
 - 7.1.3. Remote Alarm Contact
 - 7.2. System Action
 - 7.3. Keyswitch Function
 - 8. Required System Maintenance
 - 9. Chamber Modifications (Required)
- Electrically (24 vdc) activated agent relief valve.
- Agent injection nozzle located to flood chamber interior.
- To prevent chamber over-pressurization when agent is released.
- Red fire alarm pull station. Tool reset.
- Red horn/strobe assembly (24 vdc).
- For signaling to room or building alarm system.
- Arms/disarms system.
- Powers system during power failure.
- Fire suppression system is active (powered) whenever chamber main disconnect switch is ON. Chamber E-stop (if equipped) does not deactivate fire suppression system.
- Contact closure from any of the following devices:
- See 6.4 above.
- See separate "-FIREDET" option.
- From room or building fire detection/alarm system.
- Upon activation:
- Release solenoid energized, releasing suppression agent, flooding chamber with suppression agent.
- Chamber operation stopped (equivalent to E-stop)
- Alarm horn/strobe energized.
- Remote signaling contact closes.
- ARM: System armed. Operates upon activation source.
- DISARM (prior to activation): System disarmed, activation sources disabled.
- DISARM (after activation): Silences horn/strobe, opens remote signaling contact.
- By qualified fire protection contractor. System requires refilling after release, and periodic maintenance checks if not released.
- Refilling requires disconnection, refilling, reconnection, and re-arming of agent cylinder / valve assembly by fire protection contractor.
- For proper operation, Fire Suppression Option requires the following options to be included on the chamber:
- "-LAT" Reinforced latch.
- "-PRP" Pressure Relief Port.

