HBX Control Systems Inc.
4516 – 112th AVE SE
Calgary, AB T2C 2K2

Submittal: SNO-1000/SNO-0100

Project:[ ]

HBX Controls Inc. Specification

Part 1: SNO-1000/SNO-0100 Product

1. The Hydronic Snow Melt Control must be a full microprocessor control with at least a 16-bit, 20MHz integrated microprocessor chip.

2. The Control must be capable of utilizing an on-board real-time clock (Month, Day, Year and 24 hour clock) with a Lithium-Ion battery for back up during power outages.

3. A 7-day event history must be stored in EEPROM for viewing and troubleshooting.

4. The Control must be capable of the following Input / Output Functions

a. 3 (2-wire) optically isolated input demand signals from a 20-240VAC source
   i. Idle Demand
   ii. Force Melt Demand
   iii. Zone 2 Demand

b. 5 (2-wire) Thermistor Inputs e.g.
   i. Boiler Temperature
   ii. System Temperature
   iii. Outside Temperature
   iv. Return Temperature
   v. Zone 2 Temperature

c. 2 (2-wire) Programmable Relays for applications such as:
   i. 2 independent heat (boiler) stages
   ii. 2 optional valve controls

d. 1 Optical Snow/Ice detector with integrated slab temperature sensor (thermistor)

e. 1 DIP switch selectable 0-10VDC or 4-20mA modulating output signal

f. 4 Dry contact relays, rated at least 10 A or greater, capable of running boilers

e. The SNO-1000 & SNO-0100 must each have 1 (3-wire) power source rated for 120 VAC ±10% and at least 30 amps. * Each terminal to be labeled L, N & Grnd (Line, Neutral & Ground)

f. 3 (3-wire) 120 VAC outputs rated at least 10 amps each capable of running auxiliary pumps or fans. * Each terminal to be labeled L, N & Grnd (Line, Neutral & Ground)

5. The Control must use built in Arc-Suppression on all PMI (Pulse Modulated Injection) Output Control Relays.

6. The Control must be capable of using PMI (Pulse Modulated Injection) on at least 1 (2-wire) output relay and 1 (3-wire) output relay to modulate either a pump or valve for mixed injection.

7. The Control must have the ability to program and control for Warm Weather Shut Down and Cold Weather Shut Down.

8. The Control must be capable of automatically calculating and resetting the boiler target & system temperature based on delta T (slab protection).

9. The Control must be modular in design. Capable of staging up to 10 on/off boiler stages or 5 modulating boilers (or a combination of on/off and modulating boilers) using optional Expansion Modules and one single microprocessor managing the control logic for potential future upgrades. The Control programming must allow for:

a. Multi-stage boilers can be selected for Hi/Lo or Lo/Lo stage configurations.
b. A fixed first or fixed last option must exist within the control menu.
c. Optional boiler rotation must be available to rotate boilers automatically every 48 hours of actual running time.
d. The Control must directly interface, without any cross wiring, with expansion modules that provide:
   i. extra dry contacts (EXP-0100)
   ii. extra powered contacts (EXP-0300)
   iii. modulating output capability (MOD-0100)

10. The Control must use a 128 x 64 pixel full graphic display. The display must be capable of showing the following information in one single screen:

a. Snow Melt Demand
b. Idle Mode
c. Forced Melt Demand

d. Set Point Zone
e. WWSD (Warm Weather Shut Down) and CWSD (Cold Weather Shut Down)
f. Boiler Temperature (Actual vs. Target)
g. System Temperature (Actual vs. Target)
h. Outdoor Temperature
i. Room Temp (or Set Point Temp)
j. Time, Month, Day and Year

11. In a separate single screen, the Control must be capable of showing Idle status, Slab temperature, Zone 2 temperature.

12. A screen must be available to display and read each of the accumulated run times for each boiler (stage).

13. In addition to the 5 standard Thermistor/sensor inputs, 1 more Thermistor reading for slab temperature (integrated into the SNO-0110 optical sensor) must be available for viewing in the standard Control screen.

14. In the event of Thermistor sensor problems the main display will indicate an "open" or "short" condition in plain text.

15. The Control must be capable of retrieving from its memory both the minimum and maximum temperature extremes that each of the 6 Thermistors have been subjected to. The month, day, year and actual time of the recorded temperature must be displayed to assist in system diagnoses and troubleshooting.

16. A Test function must be present to test and cycle each relay independently for troubleshooting and commissioning purposes. Each relay must be able to stay on for at least 30 seconds.

17. The Control must have remote snow/ice Optical sensing capabilities as well as Slab sensing.

18. The Control must be capable for permanent demand settings:

a. Snow Zone Heat
b. Zone Heat

19. The Control must be capable of snowmelt settings:

a. Idle Temp
b. Melt Temp
c. Melt Time

20. The Control must be programmable for Instant Intensity and Constant Intensity snow options.

21. The Controls must allow for Viscosity Compensation adjusting for slower flow rates and decreased heat capacity.

22. The Control programming options must allow for Snow Zone Priority:

a. No Priority
b. Snow Priority
c. Zone Priority

23. The Control must have a lock-out feature to avoid unauthorized tampering with the programming menu.

24. For staging Modulating boilers, the control programming should allow for 3 selectable modulating processes:

a. Series
b. Parallel
c. Progressive

25. The Control programming must have allow for adjusting and setting the Boiler Delta T and System Delta T, as well as the slab Idle and Melt temperatures.

26. The Control must have a standard RS232 communications port for optional remote communication

27. The Control must be capable of interfacing with optional Communications software and capable of at least the following functions:

a. Real-Time Data Logging
b. System Status viewing
c. Control Reconfiguration
d. Alarm function

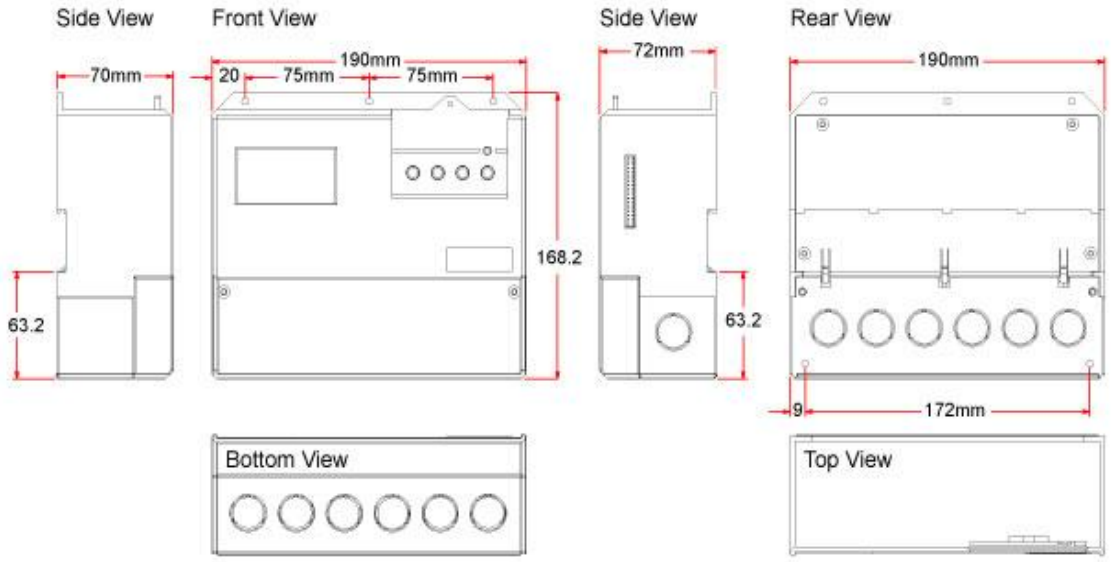
28. The Control must be ETL approved.

Part 2: Acceptable Products

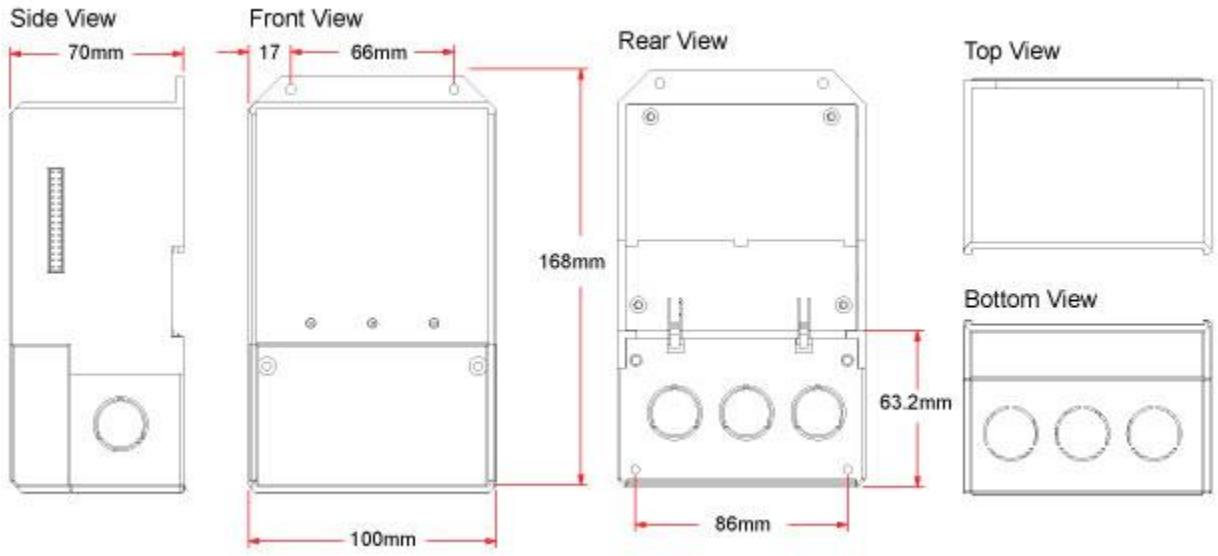
1. HBX SNO-1000/SNO-0100 Control

Part 3: Physical Dimensions

SNO-1000:



SNO-0100:



Comfort Control Innovation

Part 4: Technical Data, Main Parts & Labels

Inputs / Outputs:

SNO-1000:

3 x Thermistor Input (10K Ohm)
3 x Miscellaneous Optically Isolated Powered (Relay) Inputs (20-240 VAC)
2 x Relay Dry Contact (120VAC, 10A) Outputs
3 x Pump Output Relays (120 VAC, 10 A)
1 x RJ-11 (RS-232 Communication)

SNO-0100:

2 x Thermistor Input (10K Ohm)
2 x Relay Dry Contact (240VAC, 10A) Outputs
1 x Optical Snow & Ice Detector / Slab sensor Input

Power Supply:

SNO-1000:

120 VAC, ± 10%, 60Hz

SNO-0100:

120 VAC, ± 10%, 60Hz

Real Time Clock Battery:

Lithium-Ion

Microprocessor:

16Bit, 20MHz

Languages:

English

Graphic Display:

128 x 64 pixels (2.17” x 1.10” (55mm x 28mm) viewable area)

Weight:

SNO-1000:

2.10 lb (0.95 kg)

SNO-0100:

0.90 lb (0.41 kg)

Dimensions:

SNO-1000:

7.48" x 6.69" x 2.76" (190mm x 170mm x 70mm)

SNO-0100:

3.94" x 6.61" x 2.76" (100mm x 168mm x 70mm)

ETL Listings:

Meets CSA C22.2 No. 24
Meets UL Standard 873
ETL Control No. 3068143

Storage:

50°F to 104°F (10ºC to 40ºC)

Supplied Parts:

SNO-1000:

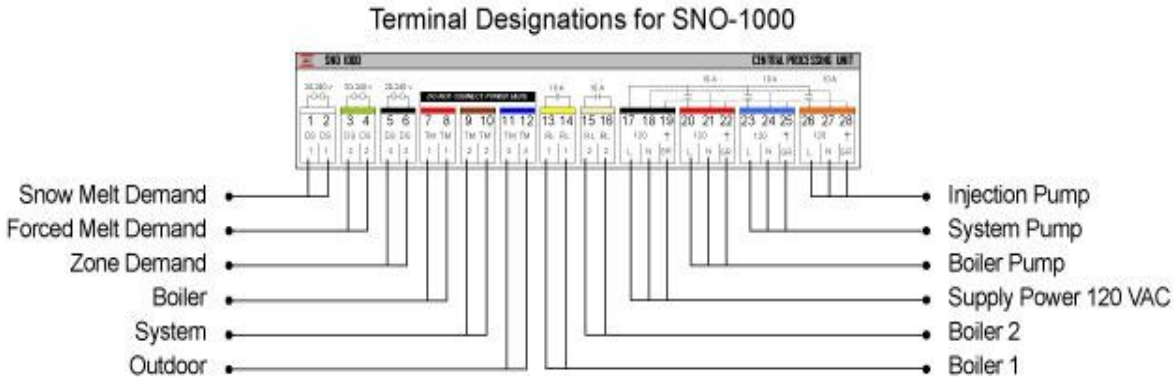
3 x HBX 029-0022 – 10K Ohm Thermistor, 12" lead wire
1 x HBX OUT-0100 – 10K Ohm Outdoor Sensor

SNO-0100:

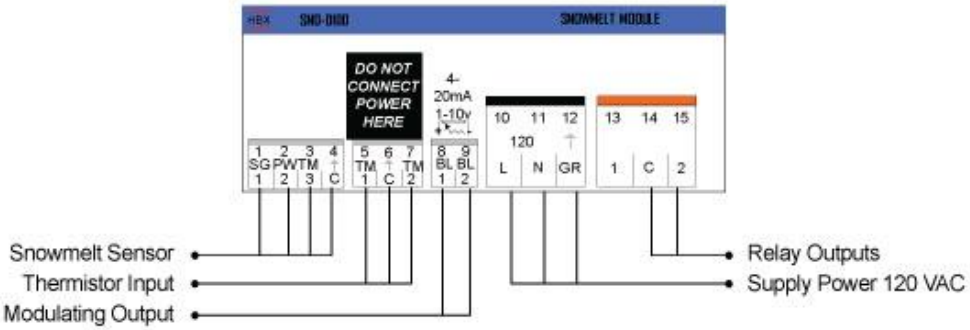
1 x 32 Pin Connector 033-0037
1 x HBX 029-0032 – 10K Ohm Thermistor, 11' lead wire

Pin Out / Terminal Block Labels:

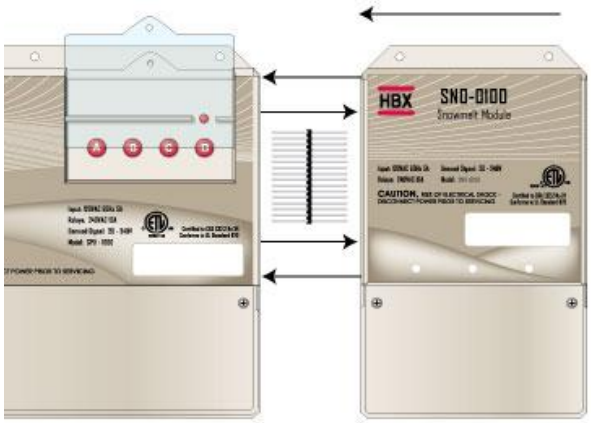
SNO-1000:



SNO-0100:



Part 5: Connecting the SNO-0100 Module:



Comfort Control Innovation

HBX Control Systems Inc.
4516 – 112th AVE SE
Calgary, AB T2C 2K2

Part 6: HBX Sensor Temperature Conversion / Resistance Table

Celsius	Fahrenheit	Ohms	Celsius	Fahrenheit	Ohms	Celsius	Fahrenheit	Ohms
-30	-22	177,000	15	59	15,714	60	140	2,488
-29	-20.2	166,342	16	60.8	15,000	61	141.8	2,400
-28	-18.4	156,404	17	62.6	14,323	62	143.6	2,315
-27	-16.6	147,134	18	64.4	13,681	63	145.4	2,235
-26	-14.8	138,482	19	66.2	13,071	64	147.2	2,157
-25	-13	130,402	20	68	12,493	65	149	2,083
-24	-11.2	122,807	21	69.8	11,942	66	150.8	2,011
-23	-9.4	115,710	22	71.6	11,418	67	152.6	1,943
-22	-7.6	109,075	23	73.4	10,921	68	154.4	1,876
-21	-5.8	102,868	24	75.2	10,449	69	156.2	1,813
-20	-4	97,060	**25**	**77**	**10,000**	70	158	1,752
-19	-2.2	91,588	26	78.8	9,571	71	159.8	1,693
-18	-0.4	86,463	27	80.6	9,164	72	161.6	1,637
-17	1.4	81,662	28	82.4	8,776	73	163.4	1,582
-16	3.2	77,162	29	84.2	8,407	74	165.2	1,530
-15	5	72,940	30	86	8,056	75	167	1,480
-14	6.8	68,957	31	87.8	7,720	76	168.8	1,431
-13	8.6	65,219	32	89.6	7,401	77	170.6	1,385
-12	10.4	61,711	33	91.4	7,096	78	172.4	1,340
-11	12.2	58,415	34	93.2	6,806	79	174.2	1,297
-10	14	55,319	35	95	6,530	80	176	1,255
-9	15.8	52,392	36	96.8	6,266	81	177.8	1,215
-8	17.6	49,640	37	98.6	6,014	82	179.6	1,177
-7	19.4	47,052	38	100.4	5,774	83	181.4	1,140
-6	21.2	44,617	39	102.2	5,546	84	183.2	1,104
-5	23	42,324	40	104	5,327	85	185	1,070
-4	24.8	40,153	41	105.8	5,117	86	186.8	1,037
-3	26.6	38,109	42	107.6	4,918	87	188.6	1,005
-2	28.4	36,182	43	109.4	4,727	88	190.4	974
-1	30.2	34,367	44	111.2	4,544	89	192.2	944
0	32	32,654	45	113	4,370	90	194	915
1	33.8	31,030	46	114.8	4,203	91	195.8	889
2	35.6	29,498	47	116.6	4,042	92	197.6	861
3	37.4	28,052	48	118.4	3,889	93	199.4	836
4	39.2	26,686	49	120.2	3,743	94	201.2	811
5	41	25,396	50	122	3,603	95	203	787
6	42.8	24,171	51	123.8	3,469	96	204.8	764
7	44.6	23,013	52	125.6	3,340	97	206.6	742
8	46.4	21,913	53	127.4	3,217	98	208.4	721
9	48.2	20,883	54	129.2	3,099	99	210.2	700
10	50	19,903	55	131	2,986	100	212	680
11	51.8	18,972	56	132.8	2,787	101	213.8	661
12	53.6	18,090	57	134.6	2,774	102	215.6	643
13	55.4	17,255	58	136.4	2,675	103	217.4	626
14	57.2	16,464	59	138.2	2,579	104	219.2	609