Maker Module –

Bottom Freezer Refrigerator

Interface Definition

# Interface Modes:

The interface between the green bean and the refrigerator can take place while the refrigerator is in either a Consumer or a Native Mode. These modes are defined as follows:

**Consumer Mode**: Allows programmers to access appliance high-level algorithms available to the consumer such as activating or deactivating a particular operating mode (Turbo Cool etc.). In C**onsumer Mode** a user connected with the green bean can interact with the appliance as a remote user but can not change the low level functions that govern how the cycle runs.

**Native Mode**: When a programmer uses the green bean to connect to the appliance in N**ative Mode**: the API facilitates low-level, direct control of motors, fans, actuators, heaters, and other controlled devices.  High-level algorithms, such as a maintaining cabinet temperature are not operational.  Native mode allows programmers to utilize the loads to create algorithms not currently supported by the control.

# ⚠WARNING:

To prevent a risk of personal injury or property damage use this device and the API to modify the functionality of your GE Appliance only as directed in the Guide to Safe and Reliable Operation. While a refrigerator operates in Consumer Mode, the control software applies algorithms that help protect consumers from a risk of personal injury or property damage. However, in Native Mode, these algorithms are not active. Therefore you must follow all guidelines for Safe/Reliable Operation detailed below to prevent a risk of personal injury or property damage that can arise during Native Mode Operation.

## Guidelines for Safe/Reliable Native Mode Operation

1. Heater Operation (defrost, hot water…):
   1. The user should not activate the defrost heater(s) and the compressor concurrently as this may exceed rated current.
   2. The user should not activate the defrost heater(s) and the hot water heater concurrently as this may exceed rated current.
   3. The hot water heater should never be on without water in the water tank, as this will damage the heater.
2. Use extreme caution when operating the hot water dispensing feature. The water coming from the hot water dispenser can be very hot. Water temperatures above 125°F (52°C) can cause severe burns or death from scalding. Children, the disabled, and the elderly are at highest risk of being scalded. Always allow water to cool to drinkable temperature and test the temperature of the water before drinking.
3. To avoid excessive component temperatures always run the condenser fan when the compressor is running.
4. Minimize risk for water leaks:
   1. Do not dispense water or ice without an appropriate containers in place
   2. Icemaker fills should be limited in order to prevent leakage/flooding.
   3. Freezing temperatures in the Fresh Food (FF) compartment can lead to water filter or water valve damage that can result in leaking water.
   4. Changes that affect defrost functionality can lead to freezing of the evaporator drain. Freezing of the drain tube can lead to water leaking out of the front of the refrigerator during a defrost cycle.
   5. Warm temperatures in the icebox or in the freezer can lead to melting of ice or melting of the evaporator ice that can lead to water leaking out of the front of the refrigerator.
5. No ice dispense should be performed with doors open.
6. Whenever the water dispense or icemaker fill function is required you must turn on the isolation valve as well as the appropriate dispense valve (water or icemaker).
7. Dispenser solenoids are not designed to operate continuously. The solenoids should not be activated longer than 10 minutes.
8. Leaving interior cabinet lights on indefinitely will affect temperature control performance and may result in discoloration of plastic liners. Limit continuous on time to 10 minutes.
9. To prevent spoilage of food GE recommends setting the Freezer (FZ) and FF temperatures to 0/37 Degrees F respectively.
10. Mode Refresh – The Native Mode must be refreshed with a new Native Mode Command (0xC0) at least one time every 30 minutes (15 minute periodic rate is recommended).
11. Do not send any commands that are not documented. Improper use of reserved or future commands may affect the performance and continued reliability of the unit.
12. Relay operation – Excessive relay cycling can shorten the life of the relays.
13. Dampers within the system could become stuck if left in one position for an extended period of time. It’s recommended that they be cycled at least 1 time every hour during operation.

# Objective:

Documentation is intended to serve as basic instructions for a user interfacing to a Bottom Freezer Refrigerator with the green bean adapter. The primary focus will be the refrigeration main board although as time allows other boards in the system may also be covered. The maker module documentation related to the interfacing to a specific appliance should focus on the following areas:

1. Interaction Guidelines – guidelines for using the green bean module with the Appliances including:
   1. Consumer Mode Interactions – details how to use the product with the currently supported modes to add functionality.
   2. Native Mode Interactions – Details how to use the Native mode to design custom algorithms to add additional functionality to the unit.
2. Command Set – A detailed list of the commands that can be used to interface to the appliance in Consumer and Native modes.

# Interaction Guidelines:

Interaction between an external application and the Refrigerator via communication will take place in either a Consumer or Native Mode. The mode choice depends upon the degree of control required. If a user want to extend the existing user interface to more easily control and monitor the behaviors of the appliance that already exist, then Consumer Mode interaction is sufficient. However, if different control algorithms are desired, then the Native Mode of the control can be used.

## Consumer Mode Interaction:

In the Consumer Mode it is possible to monitor status and control settings that are normally adjusted via the UI boards on the unit. An application could be written that either simplifies the user interface or extends the basic functionality of a unit using existing adjustments.

One specific example might be on a unit that does not support the Turbo Cool feature. The Turbo Cool feature is normally designed to have a unit compensate for the presence of a warm food load so that the unit cools that food load quickly and returns to normal operation. The feature is a timed condition where the FF set point is lowered for a time (8 hours) to compensate for loading the unit after it has been loaded from a shopping trip.

To accommodate that behavior the application would:

1. When the mode is activated the application will
   1. Query the current FZ and FF set points. So they can be restored.
      1. Use Query ERD command (0xF0) for Set Point Temperature ERD (0x1005)
   2. Initiate a countdown timer for a given interval (say 8 hours)
2. Modify the FF Set point – to promote more rapid cooling of the warm load that was added.
   1. Use Write ERD command (0xF1) to modify “Set Point Temperature” ERD (0x1005) for the FF set point and maintain the set point in the FZ.
3. While the countdown timer is running the application:
   1. Could display the count as well as the temperatures within the unit.
      1. Query temperature using the Query ERD command (0xF0) on the “Displayed Temperature” ERD (0x1004)
   2. Monitor for any other set point changes on the unit and terminate the mode if additional changes are observed – mode is overridden at the appliance.
      1. Query the current FZ and FF set points using Query ERD command (0xF0) for Set Point Temperature ERD (0x1005)
4. After the timer has expired the application should restore the FZ and FF set points to their original values and end the special mode.
   1. Use Write ERD command (0xF1) for the “Set Point Temperature” ERD (0x1005) to restore the original FZ and FF set points.

The benefit or remaining in consumer mode is that the control is always monitoring the performance and reliable operation of the appliance while still giving the technical user a chance to customize the User Experience as well as create new functionality from existing modes.

## Native Mode Interaction:

In Native Mode the user/programmer can take a more active role in the control of the unit. However, the reliability and the performance is the responsibility of the programmer and their algorithms. The user is capable of individually controlling loads but as a result of this control they are responsible for following the **Guidelines for Safe/Reliable Native Mode Operation.**

One example using Native mode is to notify/alert the user when a Fresh Food (FF) or Freezer (FZ) temperature is outside of an acceptable range. Consumer mode ERDs can be used to determine when an alert condition should be active. Once an alert condition is known, the application can communicate it to a smart phone or other device for consumer consumption, but in addition the application could periodically force the appliance into a Native Mode and use the FZ cabinet lights to indicate an alarm status (Freezer lights are visible externally when the freezer door is closed).

Pseudo code Implementation:

1. On the application – have user setup alarm set points. Example:
   1. FF maintain temperatures between 32 and 46 Degrees F
   2. FZ maintain temperature lower than +9 Degrees F
2. Assume application maintains several countdown timers with a resolution of seconds. Each second if the countdown timers are non-zero decrement the count. Counters needed include:
   1. Sample\_Cabinet\_Temperature\_Seconds\_Counter (reset to 300 seconds - 5 minutes)
   2. Display\_Alarm\_Interval\_Seconds\_Counter (reset to 3300 seconds - 55 minutes)
   3. Alarm\_Duration\_Seconds\_Counter (reset to 300 seconds - 5 minutes)
   4. Alarm\_Light\_Toggle\_Seconds\_Counter (reset to 2 seconds)
3. Initialize counters and state variables:
   1. Sample\_Cabinet\_Temperature\_Seconds\_Counter - start this at time 0 – to trigger immediate sampling
   2. Display\_Alarm\_Interval\_Seconds\_Counter start this at 0 to trigger immediately if out of range.
   3. Clear FZ\_Light\_State - first act will be to turn on.
   4. Clear Alarm\_Indication\_Active
   5. Clear request\_alarm
4. Begin Execution loop here
   1. If the Sample Cabinet Temperature Counter is 0
      1. Reset the Sample\_Cabinet\_Temperature\_Seconds\_Counter (300)
      2. Sample cabinet temperature – Alerts can be done in one of 2 different ways.
         1. Either poll the temperature directly to apply limits of your choosing
            1. Use ERD to query the cabinet for the Displayed temperatures.

ERD Query (0xF0) for ERD # 0x1004

* + - * 1. If either of the temperatures is outside the limit Then set request\_alarm variable
        2. Else – clear the request \_alarm variable
      1. Or poll the “Temperature Alert” ERD
         1. ERD Query (0xF0) for ERD # 0x1003

(Temperature alert that will tell you if the FF temperature is above 50 or the FZ temperature is above 20.

Set/Clear request\_alarm variable based on return values

* 1. If request\_alarm variable is set
     1. If Display\_Alarm\_Interval\_Seconds\_Counter is 0 (~ 1 hour timer)
        1. If the Alarm\_Indication\_Active is not yet set
           1. Enter Native Mode by issuing “Enter Native Mode” 0xC0
           2. Set FZ\_Light\_State (On/Off – 1/0)
           3. Send “Light Control Command” to the Door board selecting the FZ lights and the state to be On. Data

[0] = 1

[1] = FZ\_Light\_State = 1

* + - * 1. Set Alarm\_Indication\_Active
        2. Set the Alarm\_Light\_Toggle\_Seconds\_Counter to 2
        3. Set Alarm\_Duration\_Seconds\_Counter to 300
      1. Else (Alarm\_Indication\_Active is already 1)
         1. If the Alarm\_Duration\_Seconds\_Counter is 0

Alarm\_Indication\_Active = 0

Reset Display\_Alarm\_Interval\_Seconds\_Counter 3300

Reset FZ\_Light\_State

Exit Native Mode (this will reset the unit)

Exit Native Mode – by sending command (0xC1) – unit will reset

* + - * 1. Else if the Alarm\_Light\_Toggle\_Seconds\_Counter is 0

Set the Alarm\_Light\_Toggle\_Seconds\_Counter to 2

Toggle FZ\_Light\_State (On/Off – 1/0)

Send “Light Control Command” to the Door board selecting the FZ lights and the state. Data

[0] = 1

[1] = FZ\_Light\_State

* 1. Else (requested alarm state = = 0)
     1. If we were indicating an alarm (meaning Alarm\_Indication\_Active = 1)
        1. Exit Native mode – by sending command (0xC1) – unit will reset.
     2. Reset counters/state variables.
        1. Clear Alarm\_Indication\_Active
        2. Clear Display\_Alarm\_Interval\_Seconds\_Counter
        3. Alarm\_Indication\_Active = 0
        4. Clear Display\_Alarm\_Interval\_Seconds\_Counter

# Command Set:

Each command will be listed in general terms. . For each command it is important that the user understand the destination address, the command itself (whether it is single or multi-byte), and the additional data that is sent with the command.

Destination Addresses when dealing with for the Bottom Freezer Refrigerator are as follows:

* Main Board – 0x00 -- referencing software version 2.27
* Door Board – referencing software version 25.47
* Deli Pan board – reference software version 65.04
* ACM – display board - reference software version 60.32
* LCD/com Board – reference software version 0.7

When a command is transmitted it is sent with a source address. Source address may not matter and will only be discussed if the command logic takes the source address into account - “Data” area of the command below will generally be talking about what is added after the basic command.

The command set is as follows:

1. Read Software Version – can be directed to any of the board addresses noted above.
   1. Purpose: Query response to the control to determine current version of the application software.
   2. Command: 0x01
   3. Data sent with command (beyond source address and command): NA
   4. Minimum Response: Current Software major and minor versions. The software version is maintained as AA.BB.CC.DD where each AA-DD are just ## values appears within the range of 00 – 99. The data within the response is represented as a binary/hex value e.g. 99 = 0x63. Note depending upon which board is queried for the version command more data may be returned. Example - -when querying the main board additional data is returned including:
      1. Single byte Unit personality
      2. Software Type (Dual Evaporator or Single Evaporator)
      3. 4 – bytes Main Board DDR Major and minor version
      4. Single byte Hardware version
      5. 2 – byte Hardware board version
      6. 3 byte grid format version
   5. Example Query
      1. [Source address, 0x01]
   6. Example Response: for version 04.02.03.99 …–
      1. [0x00, 0x01, 0x01,0x02,0x03,0x63] where:
         1. 0x00 = Source address of control
         2. 0x01 = command (version response – distinguished from query using total length of packet)
         3. 0x04 = Version AA = 04
         4. 0x02 = Version BB = 02
         5. 0x03 = Version CC = 03
         6. 0x63 = Version DD = 99
2. Get LED Brightness –
   1. Purpose: Query of the current settings (parametric settings in EEPROM) for the brightness settings for the cabinet lighting.
   2. Command:0x04
   3. Data sent with command (beyond source address and command): NA
   4. Response: includes status information for the FX, Recess and FF lighting. The basic format is as follows:[X] – X = data offset
      1. [0] = FF Current Brightness (1 - 100)
      2. [1] = FZ Current Brightness (1 - 100)
      3. [2] = Recess Lights Current Brightness (1 - 100)
      4. [3] = Min FF\_FZ\_Duty\_Cycle\_Percentage (1 - 100)
      5. [4] = FF\_FZ\_Duty\_Cycle\_%\_DSM\_LOW\_MED (1 - 100)
      6. [5] = FF\_FZ\_Duty\_Cycle\_%\_DSM\_HIGH (1 - 100)
      7. [6] = FF\_FZ\_Duty\_Cycle\_%\_DSM\_CRIT (1 - 100)
      8. [7] = FF\_FZ\_Ramp\_Up\_Time (Sec X 10)
      9. [8] = FF\_FZ\_Ramp\_Down\_Time (Sec X 10)
      10. [9] = Min Recess\_Duty\_Cycle\_Percentage (1 - 100)
      11. [10] = Recess\_Duty\_Cycle\_%\_DSM\_LOW\_MED (1 - 100)
      12. [11] = Recess\_Duty\_Cycle\_%\_DSM\_HIGH (1 - 100)
      13. [12] = Recess\_Duty\_Cycle\_%\_DSM\_CRIT (1 - 100)
   5. Example Command:
      1. [Source address, 0x04]
3. Set Current LED Brightness
   1. Purpose: Command used to set the brightness of the cabin lights. Result will be stored as the target going forward.
   2. Command: 0x05
   3. Data sent with command (beyond source address and command): 3 bytes to set the command from 0 – 100 % for the FZ, FF, and Recess lights respectively.
   4. Response: NA
   5. Example Command: Setting the values to 25%, 50%, and 100% respectively.
      1. [Source address, 0x05, 0x19, 0x32, 0x64 ]
4. Set Door Alarm Status
   1. Purpose: Used as a remote means to set the door alarm status to on or off.
   2. Command: 0x06
   3. Data sent with command (beyond source address and command): single byte to control the door alarm status (0x41 = ON, 0x51 = OFF)
   4. Response: NA
   5. Example Command: Turn the Door Alarm ON
      1. [Source address, 0x06, 0x41]
5. Get Dispense Flow Meter Feedback
   1. Purpose: Read activity related to flow meter.
   2. Command: 0x13
   3. Data sent with command (beyond source address and command): NA
   4. Response: 3 bytes indicating whether flow meter was active during last dispense(1 byte 0 or 1) and the current pulse count (2 bytes)
   5. Example Command:
      1. [Source address, 0x13]
   6. Example Response: Flow meter active – count = 1000
      1. [0x00, 0x13, 0x01,0x03, 0xE8]
6. Get Icemaker Status
   1. Purpose: Read status information related to the icemaker
   2. Command: 0x21
   3. Data sent with command (beyond source address and command): NA
   4. Response: 12 bytes covering status of the current ice making cycle. Including:
      1. 32-bit value for icemaker timer
      2. 32-bit value for harvest count
      3. Single status byte – (0,1,2,3 - normal run, thermistor fault, general fault , factory diagnostics)
      4. Icemaker operational level – status byte indicating state 0-12 corresponding to the icemaker state machine. Where:
         1. 0 = Setup for Freeze
         2. 1 = Freeze
         3. 2 = Setup For Harvest
         4. 3 = Harvest
         5. 4 = Setup for Harvest Fix
         6. 5 = Harvest Fix
         7. 6 = Water Fill
         8. 7 = First Fill
         9. 8 = Second Fill
         10. 9 = Third Fill
         11. 10 = Ice Making Paused
         12. 11 = Return from Pause
         13. 12 = Fill Paused State
      5. 16-bit – harvest time remaining.
7. Request Thermistor Data
   1. Purpose: Command to query the filtered and instantaneous temperature reading as well as the most recent ADC value.
   2. Command: 0x22
   3. Data sent with command (beyond source address and command): Modifier related to which thermistor value is being requested where:
      1. 0x00 -> FF1
      2. 0x01 -> FF2
      3. 0x02 -> FFEvap
      4. 0x03 -> FZ
      5. 0x04 -> FZ Evap
      6. 0x05 -> Amb Temp
      7. 0x06 -> Amb Humidity
      8. 0x07 -> Deli Pan
      9. 0x08 -> IceMaker Mold Body
      10. 0x09 -> Conv Drawer
      11. 0x0A -> Reserve 0
      12. 0x0B -> Brownout
      13. 0x0C -> Relay Drive Voltage
      14. 0x0D -> Reserve 1
      15. 0x0E -> High Current
      16. 0x0F -> Low Current
   4. Response: 3 16-bit values related to the Filtered and instantaneous temperature readings in Degrees F x100 as well as the most recent ADC reading.
   5. Example Command: Asking for data related to the Fresh Food 1 thermistor
      1. [Source address, 0x22, 0x00]
   6. Example Response: Reading returns 37.25 Degrees (average) 37.00 last, and 512.
      1. [0x00, 0x22, 0x0E, 0x8D, 0x0E, 0x74, 0x02,0x00]
8. Get Door Board State
   1. Purpose: Query directed to the door board (address 0x03) to determine the current state of various loads controlled by the door board.
   2. Command: 0x23
   3. Data sent with command (beyond source address and command): NA
   4. Response: contains 10 bytes related to the current door board status. Where
      1. [0] = Bit encoded value containing the status On/Off status of various inputs
         1. Bit 0 = Ice Maker Arm Position Sensor (1 = Full)
         2. Bit 1 = Icemaker Rake Position Sensor (1 = Home)
         3. Bit 2 = Dispenser Cup Switch (1 = Pressed)
         4. Bit 3 = Hot Water Cup Switch (1 = Pressed)
         5. Bit 4 = Hot Water Level Switch Input (1 = Full)
         6. Bit 5 = Over Current Detected Input 1
         7. Bit 6 = Over Current Detected Input 2
         8. Bit 7 = Unused
      2. [1] = Bit encoded status on indicated On/Off state of loads:
         1. Bit 0 = Auger Motor Direction
         2. Bit 1 = Auger Motor Run
         3. Bit 2 = Hot Water Valve
         4. Bit 3 = Ice Maker Mold Heater
         5. Bit 4 = Ice Maker Water Valve
         6. Bit 5 = Ice Maker Rake Motor
         7. Bit 6 = Dispenser Water Valve
         8. Bit 7 = Hot Water Heater
      3. [2] - Fill Tube Heater Duty Cycle %
      4. [3] - Recess Heater Duty Cycle %
      5. [4] - Vertical Mullion Heater Duty Cycle %
      6. [5] - Duct Door Status (1 = Open, 0 = Closed)
      7. [6] - Hot Water LED Duty Cycle %
      8. [7] - Door Board Heater Duty Cycle %
      9. [8] - Ice Box Gasket Heater Duty Cycle %
      10. [9] - Relay watchdog current state
9. Read Door State
   1. Purpose: Query sent to the main board that is asking for the current door states.
   2. Command: 0x23
   3. Data sent with command (beyond source address and command): NA
   4. Response: Contains 3 bit encoded bytes indicating the open/closed (1/0) state of various doors in the system as follows:
      1. [0] = Door State
         1. Bit 0 = FF Door State
         2. Bit 1 = FZ Door State
         3. Bit 2 = Unused
         4. Bit 3 = FZ Bottom Door State
         5. Bit 4 = FF Left Door State
         6. Bit 5 = FF Right Door State
         7. Bit 6 - 7 = Unused
      2. [1] = DC Switch State
         1. Bit 0 = Ice Maker 2 Arm Position Sensor (1 = Full)
         2. Bit 1 = Icemaker2 Rake Position Sensor (1 = Home)
         3. Bit 2 = Over Current Status (1 = Over Current Tripped)
         4. Bit 3 = Damper Fault State (1 = Damper in Fault State, For Kodiak Only)
         5. Bit 4- 7 = Unused
      3. [2] = AC Input State
         1. Bit 0 = FZ Top Door State/IM Input/Internal Water Cup Switch
         2. Bit 1 = FZ Bottom Door State
         3. Bit 2 = FF Left Door State
         4. Bit 3 = FF Right Door State
         5. Bit 4 - 7 = Unused
10. Read Door Opening Count
    1. Purpose: Read counter related to # of times and duration that FF and FZ door has been opened.
    2. Command: 0x24
    3. Data sent with command (beyond source address and command): NA
    4. Response: Contains 4 - 16-bit counters related to the FZ Top, FZ bottom, FF left and FF Right door openings. Also 2 4 byte counters indicating the number of cumulative seconds the FZ and FF door has been opened respectively.
    5. Example Command:
       1. [Source address, 0x24]
    6. Example Response: Assume the Upper and left doors are where open each 1000 times and the cumulative time is equivalent to 10,000 and 20,000 seconds each (FZ and FF respectively.
       1. [0x00, 0x24, 0x03, 0xE8,0x00, 0x00, 0x03, 0xE8, 0x00, 0x00, 0x00,0x00,0x27,0x10, 0x00,0x00, 0x4E, 0x20]
11. Request Sealed System (compressor) run times
    1. Purpose: Request run time status related to the most recent compressor run cycle.
    2. Command: 0x25
    3. Data sent with command (beyond source address and command): NA
    4. Response: Contains 16-bit second resolution counters that relate to the amount of time the individual entity has been running. One of these counters should always be incrementing. A Counter is reset on change to the state associated with that counter... e.g. the off counter should be reset when the compressor goes from a run condition to off. In addition the current valve position and valve step is communicated. The details on the counters are as follows:
       1. [0-1] = SS Off Time (MSB First)
       2. [2-3] = SS On Time Valve A (MSB First)
       3. [4-5] = MSB of SS On Time Valve B (MSB First)
       4. [6-7] = MSB of SS On Time Valve C (MSB First)
       5. [8] = SS valve position
       6. [9] = Valve Step Location
12. Read Cabinet Temperature Control Status
    1. Purpose: Reads the control temperature information for each of the cabinets. The control temperature is the target thermistor value for each of the cabinets.
    2. Command: 0x27
    3. Data sent with command (beyond source address and command): Single byte indicating whether the request is for the Fresh Food (FF - 0) or Freezer (FZ -1) compartments.
    4. Response: Information related to the compartment control parameters. As follows:
       1. [0] = Request Modifier (0 = FF, 1 = FZ)
       2. [1-2] = FF or FZ Set Point °F\*100 - adjusted for offset and shift… (MSB First)
       3. [3] = FF or FZ Set Point from the lookup table °F
       4. [4-5] = FF or FZ Offset °F\*100 (MSB First)
       5. [6-7] = FF or FZ Shift °F\*100 (MSB First)
       6. [8-9] = FF or FZ Low Hysteresis °F\*100 (MSB First)
       7. [10-11] = FF or FZ High Hysteresis °F\*100 (MSB First)
       8. [12-13] = FF or FZ Extra High Hysteresis °F\*100 (MSB First)
       9. [14] = FF or FZ Min Set point Degrees F
       10. [15] = FF or FZ Max Set point Degrees F
       11. [16-17] = FF or FZ Long Term Ave (used in Shift Calc) DegFX100 (MSB First)
       12. [18] = FF or FZ Display Filter weight
       13. [19] = FF Pull Down Offset (FF ONLY)
    5. Example Command: Asking for FF status.
       1. [Source address, 0x27, 0x00]
13. Get Defrost Timer Information
    1. Purpose: Read status and configuration information related to the defrost and fan operation.
    2. Command: 0x29
    3. Data sent with command (beyond source address and command): NA
    4. Response: 15 bytes indicating both the current defrost timer counts as well configuration information for the refrigerator fans, platform, and EEPROM options. Details as follows:
       1. [0-3] 32 Bit defrost Timer (MSB First)
       2. [4-5] = Grid Mod Word (MSB First)
       3. [6-7] = SS Selection Word (MSB First)
       4. [8] = Fan Configuration (1/0 = RPM Enabled/Disabled)
          1. -Bit 0 - Evap,
          2. -Bit 1 = Cond
          3. -Bit 3 = FF
          4. -Bit 4 – Ice Cabinet
          5. -Bit 5 = Meat Pan
          6. -Bit 6 = Convertible Drawer
       5. [9] = Fan Configuration (0 = 2 pulses/rev, 1=4 pulses/rev)
          1. -Bit 0 - Evaporator
          2. -Bit 1 = Cond
          3. -Bit 3 = FF
          4. -Bit 4 – Ice Cabinet
          5. -Bit 5 = Meat Pan
          6. -Bit 6 = Convertible Drawer
       6. [10] = Configuration Bit Field
          1. - Bits 7 - 4 = 4 Bits for Platform Type
             1. (0 = SEVS, 1 = DESS, 2 = DEVS, 3 = SESS, 4 = BF\_DE\_VS, 5 = BF\_DE\_SS, 15 = Top Freezer Control)
          2. - Bit 1 = Variable Speed Flag (1 = VS, 0 = SS)
          3. - Bit 0 = Dual Evaporator Flag (0 = Single Evap, 1 = Dual Evap)
       7. [11-12] = Ice and Water Configuration Word (MSB First)
       8. [13-14] = Unit Configuration Word (MSB First)
14. Request Fan Status
    1. Purpose: Command to request information related to a specific fan within the unit.
    2. Command: 0x30
    3. Data sent with command (beyond source address and command): Single byte specifying which fan status information is directed toward (0-5 = Evaporator, Condenser, Fresh Food, Ice Cabinet, Meat Pan, and Convertible Drawer fans respectively.
    4. Response: Status information related to the requested fan as follows:
       1. [0] = Fan (0-5 above)
       2. [1] = Fan State (1/0 On/Off
       3. [2-3] = MSB,LSB of the Fan Measured RPM
       4. [4-5] = MSB,LSB of the Fan PWM output
       5. [6] = Fan Feedback Enabled. 1 = Enabled, 0 = Disabled
       6. [7.8] = MSB,LSB Fan MAX PWM Counts
       7. [9] = Current % Duty Cycle
15. Request General Control Status
    1. Purpose: Query control state information related to cabinet control.
    2. Command: 0x31
    3. Data sent with command (beyond source address and command): NA
    4. Response: Overall summary of the Cooling and Defrost control state machines. Detail on data returned as follows:
       1. [0] – Sealed System State (0-10) 🡪 indicating status of cooling control
       2. [1] – Bit encoded timer status.
          1. Bit 0 = SS state On/Off
          2. Bit 1 – FZ Door state (1/0 – Open/Closed)
          3. Bit 2 – FF door state
          4. Bit3,4 – FZ, FF door count incremented
          5. Bit5,6 – FZ, FF door debounce complete.
          6. Bit 7 – unused
       3. [2] – Compressor relay state (1/0 Closed/Open
       4. [3] – System Mode
          1. Bit 0 = FZ Defrost
          2. Bit 1 = Pre-chill
          3. Bit 2 = Dwell
          4. Bit 3 = Turbo Cool Mode
          5. Bit 4 = Quick Ice
          6. Bit 5 = Turbo Freeze
          7. Bit 6 = Freshness Filter Expired
          8. Bit 7 = Water Filter expired.
       5. [4] = Grid Block number
       6. [5] = Defrost Cycle state - relates to Dual evaporator systems and defrost of FF evaporator (normal FF Run, cycle Defrost active, cycle defrost disabled)
       7. [6] – Ice Rate input (1/0 – Active/Inactive)
       8. [7] = FZ Defrost State
       9. [8] = FZ Defrost Heater State
       10. [9] = System Operating Mode (0 = Normal/Consumer, 1 = Native/Showroom, 2 = Native/Factory)
       11. [10] - Area (From Grid)
       12. [11] = Miscellaneous Status
           1. Bit 7 -> Abnormal FZ Defrost Status Bit
           2. Bit 6 -> Abnormal FF Defrost Status Bit
           3. Bit 5->N/A
           4. Bit 4 -> PBF DD Mullion Heater Status Bit
           5. Bit 3 -2 -> N/A
           6. Bit 1 -> PBF DC Mullion Heater Status
           7. Bit 0 -> PBF AC Mullion Heater Status
       13. [12] = Ice Harvest Count
       14. [13] = Sabbath Mode Active
       15. [14] = DSM Level
       16. [15] = DSM Override (0 = No Override, 1 = Partial Override, 2 = Full Override)
       17. [16] = Module Status Flags
16. Request Dispenser Counts
    1. Purpose: Command to query the current value of the dispenser counters.
    2. Command: 0x32
    3. Data sent with command (beyond source address and command): NA
    4. Response: 6 – 16-bit counters are returned related to the number of activations for Water, Cubed, Crushed, Hot Water, Door Ice Maker Harvest, and main board icemaker harvest counts respectively.
17. Get Relay, Fan, and Damper Status
    1. Purpose: Status request related to relay positions, fan speeds, and damper position.
    2. Command: 0x33
    3. Data sent with command (beyond source address and command): NA
    4. Response: 12 bytes containing status information of various loads. Detail as follows:
       1. [0] =Bit encoded Relay Status (1/0 – Closed/Open)
          1. - Bit 7 - IceMaker2 Rake
          2. - Bit 6 - IceMaker2 Water Valve
          3. - Bit 5 - IceMaker2 Heater
          4. - Bit 4 - Ice Duct Heater
          5. - Bit 3 - Ice Port Heater
          6. - Bit 2 - Isolation Valve
          7. - Bit 1 - Deli Pan Heater
          8. - Bit 0 - FF Defrost Heater
       2. [1] = Bit encoded Relay Status
          1. - Bit 7 -5 Unused
          2. - Bit 4 - DD Mullion Heater
          3. - Bit 3 - IMX Power Relay
          4. - Bit 2 - Reserve Relay 1
          5. - Bit 1 - Comp Relay
          6. - Bit 0 - FZ Defrost Heater
       3. [2] = FZ Evaporator Fan Speed (RPM)
       4. [3] = Cond Fan Speed (RPM)
       5. [4] = FF Fan Speed (RPM)
       6. [5] = Ice Cabinet Fan Speed (RPM)
       7. [6] = Deli Pan Fan Speed (RPM)
       8. [7] = Convertible Drawer Fan Speed (RPM)
       9. [8] = Comp Speed (counts)
       10. [9] = Damper States
           1. -Bit 0 - FF Damper (Open = 1, Closed = 0)
           2. -Bit 1 - FP Chill Damper (Open = 1, Closed = 0)
           3. -Bit 2 - FP Thaw Damper (Open = 1, Closed = 0)
       11. [10] = Valve Position (0 = A, 1=B, 2 =C, 3=D)
       12. [11] = Grid Block Number
18. Get Thermistor Summary Data – Sent to the Door Board
    1. Purpose: Designed to query the average readings of various analog sensors (normally thermistors)
    2. Command: 0x34
    3. Data sent with command (beyond source address and command): NA
    4. Response: 5 – 16-bit temperatures all in Degrees F x 100. Temperatures relate to the following sensors: Icemaker Mold, Icemaker cabinet, hot water 1, hot water 2, and spare respectively.
19. Get Thermistor Summary Data 1 – Sent to Main Board
    1. Purpose: 1 of several commands designed to query the average readings of various analog sensors (normally thermistors)
    2. Command: 0x34
    3. Data sent with command (beyond source address and command): NA
    4. Response: 6 – 16-bit temperatures all in Degrees F x 100. Temperatures relate to the following sensors: FF Average, FF1 Average, FF2 Average, FF Evaporator, FZ Average and FZ Evaporator respectively.
20. Get Thermistor Summary Data 2 – Sent to Main Board
    1. Purpose: 1 of several commands designed to query the average readings of various analog sensors (normally thermistors)
    2. Command: 0x35
    3. Data sent with command (beyond source address and command): NA
    4. Response: 11 – 16-bit values related to sensor readings. Temperatures in Degrees F x 100. Sensors as follows:
       1. Ambient Temperature
       2. Ambient humidity (0-100%)
       3. Deli Pan temperature
       4. IM Mold Body Temperature
       5. Convertible Drawer Temperature
       6. Reserved
       7. Voltage Monitor (Volts x100)
       8. Relay Drive Voltage (Volts x 100)
       9. Reserved
       10. ADC of current monitor Coarse
       11. ADC of current monitor Fine
21. Get Door Board Info
    1. Purpose: Query status of door board sensors and loads.
    2. Command: 0x36
    3. Data sent with command (beyond source address and command): NA
    4. Response: Various data related to the sensors and loads monitored/controlled by the door board. Specific data as follows:
       1. [0-1] = Ice Maker Mold Thermistor (DegFX100)
       2. [2-3] = Ice Cab Thermistor (DegFX100)
       3. [4-5] = Hot Water Thermistor 1(DegFX100)
       4. [6-7] = Hot Water Thermistor 2 (DegFX100)
       5. [8] = DC Switch State
          1. Bit 0 = Ice Maker Arm Position Sensor (1 = Full)
          2. Bit 1 = Icemaker Rake Position Sensor (1 = Home)
          3. Bit 2 = Dispenser Cup Switch (1 = Pressed)
          4. Bit 3 = Hot Water Cup Switch (1 = Pressed)
          5. Bit 4 = Hot Water Level Switch Input (1 = Full)
          6. Bit 5 = Over Current Detected Input 1
          7. Bit 6 = Over Current Detected Input 2
          8. Bit 7 = Unused
       6. [9] = Relay Status
          1. Bit 0 = Auger Motor Direction
          2. Bit 1 = Auger Motor Run
          3. Bit 2 = Hot Water Valve
          4. Bit 3 = Ice Maker Mold Heater
          5. Bit 4 = Ice Maker Water Valve
          6. Bit 5 = Ice Maker Rake Motor
          7. Bit 6 = Dispenser Water Valve
          8. Bit 7 = Hot Water Heater
       7. [10] - Duct Door Status (1 = Open, 0 = Closed)
       8. [11] – Icemaker State Selection
       9. [12] – Icemaker Operational State
       10. [13] - Relay watchdog current state
22. Get Turbo Mode Status
    1. Purpose: Command to query the state for of some special user selectable modes.
    2. Command: 0x55
    3. Data sent with command (beyond source address and command): NA
    4. Response: Single byte response that is encoded to show the active state of some special modes. Bits encoded as follows:
       1. Bit 0 -> 1 = Turbo Cool Active
       2. Bit 1 -> 1 = Turbo Freeze Active
       3. Bit 2 -> 1 = Quick Ice Active
       4. Bit 3 -> 1 = Odor Remover
23. Move Valve command
    1. Purpose: Test command to move the valve position that applies only during Native Modes for dual evaporator systems.
    2. Command: 0x59
    3. Data sent with command (beyond source address and command): Single byte indicating desired valve position. Valid positions are A-D, and Home (0, 1, 2, 3, 9) that correspond to FF only (A), FZ only (B), FF+FZ (C), All closed (D), and Home position respectively. Not all positions will apply on all models.
    4. Response: NA
24. Get Ice Cabinet Status
    1. Purpose: Query the Status information related to the ice cabinet.
    2. Command: 0x5E
    3. Data sent with command (beyond source address and command):NA
    4. Response: Data related to the operation of the main board controlled icemaker. 22 bytes total as follows:
       1. [0] = Fan Speed - 0 = Off, 1 = Low, 2 = Med, 3 = High, 8 = Max
       2. [1] = Heater Status
          1. Bit 2 = Fresh Food Duct Heater (1 = ON) (IID Models Only)
          2. Bit 1 = Air Duct Heater Status (1 = On)
          3. Bit 0 = Fill Tube Heater (1 = On)
       3. [2] = Ice In Door Control State - where
          1. 0 = Disabled
          2. 1 = Startup
          3. 2 = Ice Formation Select
          4. 3 = Ice Formation Fallback,
          5. 4 = Ice Formation Thermistor
          6. 5 = Ice Maintenance Selection,
          7. 6 = Ice Maintenance Fallback
          8. 7 = Ice Maintenance Thermistor,
          9. 8 = Ice Hardening
       4. [3-4] = MSB, LSB FF Door Decrement Counter for Ice Hardening.
       5. [5-6] = Ice Box (IB) Fan New Average [MSB, LSB] in %DC \* 100
       6. [7-8] = Ice Box Fan Average [MSB, LSB] in %DC \* 100
       7. [9-10] = IB Run Target Actual [MSB, LSB] in %DC \* 100
       8. [11-12] = IB Run Time Percentage [MSB, LSB] in %DC \* 100
       9. [13-14] = IB Adjusted Set point (DegFX100)
       10. [15-16] = IB Shift (DegFX100)
       11. [17-18] = Long Term Average (DegFX100)
       12. [19] = AFZ (Freezer Cooling Rate)
       13. [20] = AIB (Ice Box Cooling Rate)
       14. [21] = Gamma
25. Get Diagnostic/F-Code Version Information
    1. Purpose: Query the version that specifies the diagnostics code format.
    2. Command: 0x60
    3. Data sent with command (beyond source address and command): NA
    4. Response: Data related to the diagnostics information available as follows:
       1. [0] - Data Format Version Major (1 byte)
       2. [1] - Data Format Version Minor (1 byte)
       3. [2] - Size of Per Cycle Buffer
       4. [3] - Number of Per Cycle Storage Buffers
       5. [4] - Number of F-Code Storage Buffers
26. Get Diagnostic/F-Code Data
    1. Purpose: Query information related to a specifically stored F-Code location.
    2. Command: 0x61
    3. Data sent with command (beyond source address and command): Index of F-Code requested. Value is 0 – Number of F-Code Storage buffers.
    4. Response: Data related to the diagnostics information available as follows:
       1. [0] - Request Modifier
       2. [1 - 2] = F-Code Number
       3. [3-4] = Days since F Code Set
       4. [5] - Number of Occurrences of this F-Code
       5. [6] = Engineering Data (Return 0x00 For now) [4] - Number of F-Code Storage Buffers
27. Get cycle Data #1
    1. Purpose: Read back of most recent stored “cycle information”
    2. Command: 0x62
    3. Data sent with command (beyond source address and command): Index of the cycle information interested in. Value is from 0 – “Number of Per Cycle Storage Buffers”.
    4. Response:
       1. [0] – index requested.
       2. [1] - FF User set point at start of cycle (Degrees F)
       3. [2] - FZ User set point at start of cycle (Degrees F)
       4. [3] - FF Max Temp during this cycle (Degrees F)
       5. [4] - FF Min Temp during this cycle (Degrees F)
       6. [5] - FZ Max Temp during this cycle (Degrees F)
       7. [6] - FZ Min Temp during this cycle (Degrees F)
       8. [7] - FF Evaporator Max Temp during this cycle (Degrees F)
       9. [8] - FF Evaporator Min Temp during this cycle (Degrees F)
       10. [9] - FZ Evaporator Max Temp during this cycle (Degrees F)
       11. [10] - FZ Evaporator Min Temp during this cycle (Degrees F)
       12. [11-12] - 3Way Valve Time in Position A This Cycle (Seconds)
       13. [13-14] - 3Way Valve Time in Position B This Cycle (Seconds)
       14. [15-16] - 3Way Valve Time in Position C This Cycle (Seconds)
       15. [17-18] -Sealed System off Time this cycle (Seconds)
       16. [19] - Ambient Temperature at Start of Cycle (Degrees F)
       17. [20] - Ambient Humidity at Start of Cycle (Degrees F)
       18. [21] - Number of F Codes that occurred during this cycle
28. Get cycle Data #2
    1. Purpose: Read back of most recent stored “cycle information” (2nd half of data)
    2. Command: 0x63
    3. Data sent with command (beyond source address and command): Index of the cycle information interested in. Value is from 0 – “Number of Per Cycle Storage Buffers”.
    4. Response:
       1. [0] - Request Modifier/index
       2. [1] - Number of Icemaker Fills this cycle
       3. Upper Nibble is the FZ Icemaker Cycles (Mainboard),
       4. Low Nibble is the FF Icemaker Fills (Door Board)) Multi-Fills do not count
       5. [2] - Engineering Data (Return 0x00)
       6. [3] - Number of Hot Water Heating Operations During this cycle
       7. [4] – Miscellaneous Flags
       8. Bit 7 - FF User Set point Changed this cycle
       9. Bit 6 - FZ User Set point Changed this cycle
       10. Bit 5 - FF Heated Defrost Occurred during this cycle
       11. Bit 4 - FZ Heated Defrost Occurred during this cycle
       12. Bit 3 - DSM Critical Signal Received
       13. Bit 2 - DSM High Signal Received
       14. Bit 1 - DSM Medium Signal Received
       15. Bit 0 - DSM Low Signal Received
       16. [5] - Time Stamp in Hours when Record Was Started
       17. [6-7] - Time Stamp in Days when Record Was Started
       18. [8-9] - FF Door Open Time during this cycle
       19. [10-11] - FZ Door Open Time during this cycle
29. Get F-Code History
    1. Purpose: Request a list of all of the most recent F Codes that have taken place. Note the list will only list the most recent 10 F-Codes…
    2. Command: 0x64
    3. Data sent with command (beyond source address and command): Index number – not currently used.
    4. Response:
       1. [0] - Request Modifier/Index
       2. [1 - 2] = F code Number 0
       3. [3 - 4] = F code Number 1
       4. [5 - 6] = F code Number 2
       5. [7 - 8] = F code Number 3
       6. [9 - 10] = F code Number 4
       7. [11 - 12] = F code Number 5
       8. [13 - 14] = F code Number 6
       9. [15 - 16] = F code Number 7
       10. [17 - 18] = F code Number 8
       11. [19 - 20] = F code Number 9
30. Clear F-Codes
    1. Purpose: Clear all active F-Codes.
    2. Command: 0x67
    3. Data sent with command (beyond source address and command): NA
    4. Response: NA
31. Set Turbo Cool State
    1. Purpose: Activate or deactivate the Turbo Cool state.
    2. Command: 0x69
    3. Data sent with command (beyond source address and command): Single byte indicating the desired Turbo Cool status – 1/0 – Activate/Deactivate.
    4. Response: NA
32. Set Turbo Freeze State
    1. Purpose: Activate or deactivate the Turbo Freeze state.
    2. Command: 0x6A
    3. Data sent with command (beyond source address and command): Single byte indicating the desired Turbo Freeze status – 1/0 – Activate/Deactivate.
    4. Response: NA
33. Set Deli Pan Mode
    1. Purpose: Activate or deactivate a Deli pan mode. Mode 0 is deactivated. Modes 1-6 are control modes targeted to different foods (model dependent)
    2. Command: 0x6B
    3. Data sent with command (beyond source address and command): Single byte indicating the desired mode. 0 – 6. (0 = idle, others relate to specialized control)
    4. Response: NA
34. Get Deli Pan Settings
    1. Purpose: Read control settings related to the specific deli pan mode selected.
    2. Command: 0x6C
    3. Data sent with command (beyond source address and command): NA
    4. Response: Status data associated with the Deli Pan
       1. [0] = Mode Selected (0 = off, 1= Mode 1, …)
       2. [1-2] = Mode Set point (Degrees F X 100) (MSB First)
       3. [3-4] = Mode Adjusted Set point (MSB First)
       4. [5-6] = Mode Offset (DegFX100) (MSB First)
       5. [7-8] = Mode Low Grid Line (Degrees F X 100) (MSB First)
       6. [9-10] = Mode High Grid Line(Degrees F X 100) (MSB First)
       7. [11-12] = Mode Timeout (Half Hours) (MSB First)
       8. [13-14] = Time Remaining (Half Hours)(MSB First)
       9. [15] = Current RBG Red % DC
       10. [16] = Current RBG Green % DC
       11. [17] = Current RBG Blue % DC
       12. [18-19] = Deli pan Shift (DegFx100)
       13. [20-21] = Deli Pan Long Term Average (Degrees F X 100)
35. Set Temperature Units
    1. Purpose: Sets Degrees F or Degrees C for the UI of the unit
    2. Command: 0x6E
    3. Data sent with command (beyond source address and command): 1 Byte treated as a Boolean to indicate Degrees C or Degrees F when set to 1/0 respectively.
    4. Response: NA
36. Request Dispense
    1. Purpose: Command that normally is generated from the dispenser board. To trigger the dispense action of water, cubed, or crushed ice. To maintain dispense activity command must be repeated every ½ second. Execution may also be dependent upon door status as well as cub switch position.
    2. Command: 0x70
    3. Data sent with command (beyond source address and command): Modifier indicating the type of dispense requested as follows:
       1. [0] = Dispense Type
          1. Bit 0 = Water
          2. Bit 1 = Cubed
          3. Bit 2 = Crushed
          4. Bit 3 = Hot Water
          5. Bit 4 = Cup Switch Required
          6. Bit 5 = Dispense Button Required
          7. Bit 6 = AutoFill Required
          8. Bit 7 = Hot Water Cup Switch Required
       2. [1-2] = Amount Requested (MSB First)
       3. [3] = Single Serve
          1. Bit 0 = Enable
    4. Response: NA
37. Configure Dispense Command
    1. Purpose: Command that is used to allow the main board to setup conditions to enable a dispense action (hardware dependent). Required for units with isolation water valves etc. where multiple boards are involved in dispenser load control. For the configuration to be maintained the message must be sent periodically (faster than every 3 minutes)
    2. Command: 0x71
    3. Data sent with command (beyond source address and command): 2 bytes clarifying the request as follows:
       * 1. Request Modifier 1
            1. 0= Water
            2. 1 = Cubed
            3. 2 = Crushed
            4. 3 = Hot Water
            5. 4 = Ice Maker Water
            6. 5 = Single Serve
         2. Request Modifier 2
            1. 0 = Stop
            2. 1 = Start
            3. 2 = Continue
    4. Response: NA
38. Set Compressor State
    1. Purpose: Command sent during a Native Mode only in order to control the status of the compressor. Interpretation of the command depends upon hardware configuration (single speed or variable speed compressor).
    2. Command: 0x74
    3. Data sent with command (beyond source address and command): 1 Byte indicating the state requested as follows:
       1. Single Speed compressor
          1. 0x51 = On
          2. 0x41 = Off
       2. Variable speed:
          1. 0x09 = Comp & Cond fan High Speed
          2. 0x00 = Off
          3. 0x01 = Low
          4. 0x02 = Med
          5. 0x03 = High
    4. Response: NA
39. Ice Maker Enable
    1. Purpose: Command sent to enable/disable the operation of the icemaker if it is controlled by the main board (hardware dependent).
    2. Command: 0x79
    3. Data sent with command (beyond source address and command): 1 Byte indicating the state to pause or Run the icemaker (0/1 respectively).
    4. Response: NA
40. Request Ice Maker Enable Status
    1. Purpose: Command to query the status of the icemaker (response is hardware dependent)
    2. Command: 0x7A
    3. Data sent with command (beyond source address and command): NA
    4. Response: Single byte indicating the icemaker presence. Bit encoded as follows:
       1. [0] = Ice Maker Enabled Bits
          1. Bit 0 -> Ice Maker Top Enabled (FF icemaker in a bottom freezer)
          2. Bit 1 -> Ice Maker Bottom Enabled (FZ icemaker in a bottom freezer)
41. Query Ice Maker Presence
    1. Purpose: Command to query whether or not unit is configured to operate with an icemaker controlled by the main or door board. (response is hardware dependent)
    2. Command: 0x7B
    3. Data sent with command (beyond source address and command): NA
    4. Response: Single byte indicating the icemaker status. Bit encoded as follows:
       1. [0] = Ice Maker Enabled Bits
          1. Bit 0 -> Ice Maker Top Enabled (FF icemaker in a bottom freezer)
          2. Bit 1 -> Ice Maker Bottom Enabled (FZ icemaker in a bottom freezer)
42. Feature Pan Command
    1. Purpose: Command to control the operation of the feature pan. (hardware dependent)
    2. Command: 0x7C
    3. Data sent with command (beyond source address and command): Bytes clarifying the command as follows:
       1. [0] = Mode
          1. 0 = Express Chill
          2. 1 = Express Thaw
          3. 2 = Select Temp
       2. [1] = Mode Selection
          1. 0 = No Mode Active
          2. 1 = Mode/Zone 1
          3. 2 = Mode/Zone 2
          4. 3 = Mode/Zone 3
          5. 4 = Mode/Zone 4
    4. Response: NA
43. Control Quick Ice Command
    1. Purpose: Used to activate or clear the quick ice. Normally received from the UI if this is sent directly to the main board. Command to set active state of the odor filter.
    2. Command: 0x80
    3. Data sent with command (beyond source address and command): Single byte indicated to enter/exit Quick Ice mode (1/0).
    4. Response: NA
44. Odor Filter Command
    1. Purpose: Command to set active state of the odor filter.
    2. Command: 0x85
    3. Data sent with command (beyond source address and command): 1 Byte activating or deactivating. (1/0)
    4. Response: NA
45. Reset Door Count
    1. Purpose: Command sent to reset the Door counters maintained for the unit.
    2. Command: 0x87
    3. Data sent with command (beyond source address and command): NA
    4. Response: NA
46. Reset Dispense Counters
    1. Purpose: Command sent to reset the Dispense maintained for the unit.
    2. Command: 0x8C
    3. Data sent with command (beyond source address and command): NA
    4. Response: NA
47. Get Cabinet Temperatures
    1. Purpose: Command sent to request the cabinet temperatures in the unit.
    2. Command: 0x8E
    3. Data sent with command (beyond source address and command): NA
    4. Response: Average temperatures in Degrees F x100 as follows:
       1. [0-1] = MSB, LSB of FF Ave Temp
       2. [2-3] = MSB, LSB of FZ Temp
       3. [4-5] = MSB, LSB of Deli Pan Temp
48. Get Filter Times
    1. Purpose: Command sent to request the filter times for the unit. Meaning of individual times returned varies according to installed hardware.
    2. Command: 0x8F
    3. Data sent with command (beyond source address and command): NA
    4. Response: Timer values as follows:
       1. [0-1] = MSB, LSB of Water Filter Calendar Timer (Each Count is 30 minutes)
       2. [2] = Water Filter Calendar % Used
       3. [3-4] = Water Filter Time Remaining (Hours)
       4. [5-8] = Water Usage Timer (MSB First). (in 0Z x 100)
       5. [9] = Water Filter Usage Time % Used
       6. [10-13] = Water Filter OZ Remaining (OZ)
       7. [14 - 15] = MSB, LSB of Odor Filter Calendar Timer
       8. [16] = Odor Filter %Used
       9. [17-18] = Odor Filter Time Remaining (Hours)
49. Reset Water/Freshness Filter
    1. Purpose: Command sent to request a reset of the water or odor filter. The timers associated with the given filter are reset.
    2. Command: 0x90
    3. Data sent with command (beyond source address and command): 1 Byte where 0 = water filter and 1 is the Odor filter.
    4. Response: NA
50. Request Valve Open Times
    1. Purpose: Command sent to request the total valve open counters
    2. Command: 0x91
    3. Data sent with command (beyond source address and command): 1 Byte where 0 = request for the total time for the valves and 1 is the # of times since the counter was last cleared.
    4. Response:
       1. Values retuned if the modifier was 0:
          1. [0] = Request Modifier
          2. [1-4] = Total Cold Water Valve Open Time seconds (MSB First)
          3. [5-8] = Total Hot Water Valve Open Time seconds (MSB First)
          4. [9-12] = Total Mainboard IM Valve Open Time seconds (MSB First)
          5. [13-16] = Total Door Board IM Valve Open Time seconds (MSB First)
       2. Values returned if the modifier was 1
          1. [0] = Request Modifier
          2. [1-4] = Cold Water Valve Open Time seconds Since Cleared(MSB First)
          3. [5-8] = Hot Water Valve Open Time seconds Since Cleared(MSB First)
          4. [9-12] = Mainboard IM Valve Open Time seconds Since Cleared (MSB First)
          5. [13-16] = Door Board IM Valve Open Time seconds Since Cleared(MSB First)
          6. [17-18] = Water Filter Calendar Timer (In 30 minute increments) (MSB First)
          7. [19-20] = Odor Filter Calendar Timer (In 30 minute increments) (MSB First)
51. Request Reset Count and Operation Time
    1. Purpose: Query the reset counter and the operational time counter for the unit.
    2. Command: 0x93
    3. Data sent with command (beyond source address and command): NA
    4. Response: Counters returned as follows:
       1. [0-1] = MSB, LSB Reset Counter
       2. [2-3] = MSB, LSB Days in the Field
       3. [4] = Hours In the Field
       4. [5] = Minutes In the Field
       5. [6] = Seconds In the Field
52. Read ACM Input Status
    1. Purpose: Query the status of inputs of the ACM board. This board is present on the LCD display models and is accessed at address 0x02 (same as dispenser board).
    2. Command: 0x95
    3. Data sent with command (beyond source address and command): NA
    4. Response: Counters returned as follows:
       1. [0] = Water Switch (1 if pressed, 0 otherwise)
       2. [1] = Crushed Switch
       3. [2] = Cubed Switch
       4. [3] = Cup Switch
       5. [4] = Hot Water Cup Switch
53. Adjust Humidity Set Point
    1. Purpose: Sent to activate or deactivate the humidity control feature.
    2. Command: 0xA3
    3. Data sent with command (beyond source address and command): 1 Byte treated as a Boolean to set the humidity control On or Off.
    4. Response: NA
54. Request Temperature Set Points
    1. Purpose: Query the current set points for the FZ and FF cabinets.
    2. Command: 0xA4
    3. Data sent with command (beyond source address and command): NA
    4. Response: Set points returned as follows:
       1. [0] = FF Set point (in Degrees F)
       2. [1] = FZ Set point (in Degrees F)
       3. [2] = FF Indexed Set point (1-9 or 100 for off) (applies to controls with 1 – 9 temperature adjustment)
       4. [3] = FZ Indexed Set point (1-9 or 100 for off) (applies to controls with 1 – 9 temperature adjustment)
55. Adjust Temperature Set Points
    1. Purpose: Set the control temperatures for the FF and FZ cabinets.
    2. Command: 0xA5
    3. Data sent with command (beyond source address and command): Set point data as well as a modifier that states which set point method is in use. Method should match the control in use.
       1. [0] = FF Temp (in degrees F or indexed)
       2. [1] = FZ Temp (in degrees F or indexed)
       3. [2] = Actual = 0/Indexed =1
       4. [3] = Convertible Drawer Optional byte Must be included when Humidity is required
    4. Response: NA
56. Check EEPROM CRC values
    1. Purpose: Command to query the validity of the data in each of the EEPROM pages that is protected by a CRC.
    2. Command: 0xA6
    3. Data sent with command (beyond source address and command): NA
    4. Response: Status bits that correspond to the CRC checks for each of the pages.
       1. [0] = Pass/Fail Status -> 0 = Pass, Non Zero = Fail
       2. [1 - 4] = CRC Bits
       3. [5-6] Mainboard DDF Version Number (in XX YY format - XX - Major, YY is Minor)
       4. [7-8] EEPROM DDF Version Number (in XX YY format - XX - Major, YY is Minor)
       5. [9-10] = Parametric Data version Critical # (in XX YY format - XX - Major, YY is Minor)
       6. [11-12] =Parametric Data version Non Critical# (in XX YY format - XX - Major, YY is Minor)
       7. [13-14] Parametric Table Image Version Number (in XX YY format - XX - Major, YY is Minor)
       8. [15-16] Parametric Table CRC (MSB First)
       9. [17-18] Parametric Table Program Version Number (in XX YY format - XX - Major, YY is Minor)
57. Inhibit Periodic Messages
    1. Purpose: Written to a control board to stop periodic updates of status for a period of 10 minutes. Normally used only to reduce bus traffic for higher priority communications.
    2. Command: 0xAB
    3. Data sent with command (beyond source address and command): NA
    4. Response: NA
58. Interactive Diagnostic Test Command
    1. Purpose: Command sent to initiate, continue or stop a specific user interactive diagnostic test. Some tests are actually settings. These tests are generally run at the unit form the LCD user interface and therefore may not all be populated for a given unit. An individual test can run for up to 5 minutes without interruption. If it is intended to run the test longer that a keep alive signal (test 0 ) must be sent at a rate faster than the timeout.
    2. Command: 0xB1
    3. Data sent with command (beyond source address and command): Data related to the test number.
       1. Data format as follows:
          1. [0] = MSB of Test Number
          2. [1] = LSB of Test Number
          3. [2] = Status
             1. 0 = Stop
             2. 1 = Start
             3. 2 = Continue
       2. Where Test number is an enumerated value:
          1. 0 = Test support query or keep alive
          2. 1-6 = Reserved
          3. 7 = Go to Degrees C
          4. 8 = Go to Degrees F
          5. 9 = Energy saver on
          6. 10 = Energy saver off
          7. 11-13 = reserved (model specific usage
          8. 14 = Force FF/FZ defrost
          9. 15 = Exit Defrost
          10. 16 = Door board communications test
          11. 17 = Dispenser board communications test
          12. 18 = Deli board communications test
          13. 19 = Internal Temp board communications test
          14. 20 = Zigbee module communications test
          15. 21 = AutoFill Version Query
          16. 22 = Main Board Version Query
          17. 23 = FF1 thermistor test
          18. 24 = FF2 thermistor test
          19. 25 = Evaporator Thermistor Test
    4. Response: NA
59. Request Door Board Diagnostic Information
    1. Purpose: Issued to the Door board address at 0x03 to query diagnostic and current status information.
    2. Command: 0xB4
    3. Data sent with command (beyond source address and command): NA
    4. Response: Diagnostic Status information returned from the door board as follows:
       1. [0-1] = Ice Maker Mold Thermistor Instant(DegFX100)
       2. [2-3] = Ice Cab Thermistor Instant(DegFX100)
       3. [4-5] = Hot Water Thermistor 1 Instant(DegFX100)
       4. [6-7] = Hot Water Thermistor 2 Instant(DegFX100)
       5. [8] = DC Switch State
          1. Bit 0 = Ice Maker Arm Position Sensor (1 = Full)
          2. Bit 1 = Icemaker Rake Position Sensor (1 = Home)
          3. Bit 2 = Dispenser Cup Switch (1 = Pressed)
          4. Bit 3 = Hot Water Cup Switch (1 = Pressed)
          5. Bit 4 = Hot Water Level Switch Input (1 = Full)
          6. Bit 5 = Over Current Detected Input 1
          7. Bit 6 = Over Current Detected Input 2
          8. Bit 7 = Unused
       6. [9] = Relay Status
          1. Bit 0 = Auger Motor Direction
          2. Bit 1 = Auger Motor Run
          3. Bit 2 = Hot Water Valve
          4. Bit 3 = Ice Maker Mold Heater
          5. Bit 4 = Ice Maker Water Valve
          6. Bit 5 = Ice Maker Rake Motor
          7. Bit 6 = Dispenser Water Valve
          8. Bit 7 = Hot Water Heater
       7. [10] - Duct Door Status (1 = Open, 0 = Closed)
       8. [11] – Ice Maker State Selection
       9. [12] - Icemaker Operational State
       10. [13-14] Flow meter Count
       11. [15] How Water Level Switch 2 ,not available, make it 0 for now
       12. [16] Read DB Fill Tube Heater PWM
       13. [17] Read DB Recess Heater PWM
       14. [18] Read Vertical Mullion PWM
       15. [19]Read Hot Water LED PWM
       16. [20]Read DB Heater PWM
       17. [21]Read Ice Gasket Heater PWM
60. Control Sabbath Mode
    1. Purpose: Activate or deactivate the refrigeration Sabbath mode.
    2. Command: 0xBF
    3. Data sent with command (beyond source address and command): 1 Byte treated as a Boolean 1/0 – On/Off for Sabbath mode.
    4. Response: NA
61. Enter Native/Factory Mode
    1. Purpose: Command to Enter Native Mode. On entry all active loads are turned off, FF Damper is closed (if present), and the valve is set to the FF and FZ position.
    2. Command: 0xC0
    3. Data sent with command (beyond source address and command): NA
    4. Response: NA
62. Exit Native Mode
    1. Purpose: Exit Native/Factory or Native/showroom mode (board will reset).
    2. Command: 0xC1
    3. Data sent with command (beyond source address and command): NA
    4. Response: NA
63. Enter Native/Showroom Mode
    1. Purpose: Start special mode where no loads will operate but otherwise the unit will demonstrate features. Normally used on sales floor only.
    2. Command: 0xC2
    3. Data sent with command (beyond source address and command): NA
    4. Response: NA
64. Native Mode Fan Control
    1. Purpose: Control operation of a system fan during the Native/Factory mode operation. User can turn a fan off or on in the system at a designated speed.
    2. Command: 0xC3
    3. Data sent with command (beyond source address and command): Modifiers related to the fan being controlled and the desired speed.
       1. [0] – Fan selected:
          1. 0 = Evaporator Fan
          2. 1 = Cond
          3. 2 = FF
          4. 3 = Ice Cab
          5. 4 = Meat Pan
          6. 5 = Convertible Drawer
       2. [1] = State of fan requested/Duty Cycle (dependent on [2].
          1. If [2] is not 0 then:
             1. 0x00 = Off
             2. 0x01 = Low
             3. 0x02 = Med
             4. 0x03 = Hi
             5. 0x04 = Super High
          2. Else [2] == 0 then this value is the duty cycle in percent.
       3. [2] = 0 = consider fan state to be a duty cycle, else the fan state is coded in a speed request.
    4. Response: NA
65. Main Board Relay Control
    1. Purpose: While in Native Mode this command is used to control the operation of the relays on the main board.
    2. Command: 0xC4
    3. Data sent with command (beyond source address and command): 2 bytes used to select which load and the status of the load (on/OFF):
       1. [0] = Load:
          1. 0 = FF Defrost Heater
          2. 1 = Deli Pan Heater
          3. 2 = Isolation Valve
          4. 3 = Ice Port Heater
          5. 4 = Ice Duct Liner Heater / Internal Dispense Test Switch
          6. 5 = IceMaker2 Heater
          7. 6 = IceMaker2 Water Valve
          8. 7 = Icemaker 2 Rake Motor
          9. 8 = FZ Defrost
          10. 9 = Compressor
          11. 10 = Reserved 1 (Relay 10)
          12. 11 = Reserved 2 (Relay 11)
          13. 12 = DD Mullion Heater / FZ Fill Tube Heater
          14. 13 = Horizontal Mullion Heater
       2. [1] – State: 1/0 = On/Off
    4. Response: NA
66. Door Board Relay Control
    1. Purpose: While in Native Mode this command is sent to the door board address (0x03). The command is used to control the operation of the relays on the door board.
    2. Command: 0xC4
    3. Data sent with command (beyond source address and command): 2 bytes used to select which load and the status of the load (on/OFF):
       1. [0] = Load:
          1. 0 = Auger Motor Direction
          2. 1 = Auger Motor Run
          3. 2 = Hot Water Valve
          4. 3 = Ice Maker Mold Heater
          5. 4 = Ice Maker Water Valve
          6. 5 = Ice Maker Rake Motor
          7. 6 = Dispenser Water Valve
          8. 7 = Hot Water Heater (caution about water…FIXME)
       2. [1] – State ; 1/0 = On/Off
    4. Response: NA
67. Door Board Duct Door Control
    1. Purpose: Command sent to the Door Board (address 0x03) in Native/Factory Mode to control the state of the duct door.
    2. Command: 0xC5
    3. Data sent with command (beyond source address and command): 1 Byte to request to Open/Close door (1/0 respectively).
    4. Response: NA
68. Main Board Damper Control
    1. Purpose: Command sent to the main board (address 0x00) in Native/Factory Mode to control the state of the damper specified.
    2. Command: 0xC5
    3. Data sent with command (beyond source address and command): 2 bytes to specify the damper and the position.
       1. [0] = Damper
          1. 0 = FF Damper
          2. 1 = Deli Pan Damper
       2. [1] = Position (Open/Closed - 1/0 respectively)
    4. Response: NA
69. Door Board Control Devices
    1. Purpose: Command sent to the door board address (0x03) that is used to control the status of various loads. Note that it is not required that the board is in Native/ Factory mode for this command to be acted upon but the main board may also be sending this command as part of its normal algorithm. Likewise the command must be sent periodically in order for the state to be maintained. If the door board does not receive the command within an 8 minute interval the loads will revert to the default states (heaters off and Icemaker state according to user inputs)
    2. Command: 0xC6
    3. Data sent with command (beyond source address and command): Modifiers for load controls as follows:
       1. [0] = Fill Tube Heater %Duty Cycle (DC)
       2. [1] = Recess Heater %DC
       3. [2] = Vert Mullion Heater %DC
       4. [3] = Max FZ Light %DC
       5. [4] = Hot Water LED %DC
       6. [5] = Door Board Heater %DC
       7. [6] = Ice Box Gasket Heater %DC
       8. [7] = Icemaker Grid Disable/Enable
    4. Response: NA
70. Request Door Duty Cycles
    1. Purpose: Command sent to the main board address that is used to query the duty cycles currently being set to the door board by the main board algorithms.
    2. Command: 0xC6
    3. Data sent with command (beyond source address and command): NA
    4. Response: Control Status sent by the main board:
       1. [0] = Fill Tube Heater %Duty Cycle (DC)
       2. [1] = Recess Heater %DC
       3. [2] = Vertical Mullion Heater %DC
       4. [3] = FZ Light %DC
       5. [4] = Hot Water LED %DC
       6. [5] = Door Board Heater %DC
       7. [6] = Ice Box Gasket Heater %DC
71. Control Main Board DC Heaters
    1. Purpose: Command sent only during Native Mode that is used to test the DC heaters driven by the main board.
    2. Command: 0xC7
    3. Data sent with command (beyond source address and command): 2 bytes for selecting the heater and the commanded duty cycle (0-100%).
       1. [0] – Heater
          1. 0 = vertical mullion.
          2. 1 – Heater 1.
          3. 2 = alternate main board heater.
       2. [1] = Duty cycle 0 – 100 %
    4. Response: Control Status sent by the main board: NA
72. FCT\_DAMPER\_COMMAND
    1. Purpose: Applicable only in the factory test mode – this command is used to control the state of the damper.
    2. Command: 0xCC
    3. Data sent with command (beyond source address and command): 2 bytes to specify the damper selected (hardware dependent) as well as the mode to drive the damper.
       1. [0] – damper selected (0-3 potentially hardware dependent)
       2. [1] – Drive mode for the damper
          1. 0 = Forward
          2. 1 = Reverse
          3. 2 = Brake
          4. 3 = Idle
    4. Response: NA
73. FCT Valve Pin Control Command
    1. Purpose: Applicable only in the factory test mode – this command is used to control the state of individual 5 pins involved in the valve interface.
    2. Command: 0xCD
    3. Data sent with command (beyond source address and command): 1 bytes to specify position way to drive the valve control pins
       1. [0] – first 6 bits are used to output to the valve control pins.
    4. Response: NA
74. Door Board DC Load Control Command
    1. Purpose: Applicable only in the Native Mode – this command is sent to the Door board (address 0x03) and is used to control the state of some DC loads that are controlled via PWM.
    2. Command: 0xCE
    3. Data sent with command (beyond source address and command): 2 bytes to specify the load to control and the Duty cycle.
       1. [0] – Load to control
          1. 0 = Fill Tube Heater %DC
          2. 1 = Recess Heater %DC
          3. 2 = Vertical Mullion Heater %DC
          4. 3 = Max FZ Light %DC
          5. 4 = Hot Water LED %DC
          6. 5 = Door Board Heater %DC
          7. 6 = Ice Box Gasket Heater %DC
          8. 7 = FZ Light PWM Control
       2. [1] – Duty Cycle 0 – 100 %
    4. Response: NA
75. Light Control Command
    1. Purpose: Command to control the state of lights within the cabinet. This command is sent to the Door board for the FZ lights.
    2. Command: 0xD1
    3. Data sent with command (beyond source address and command): 2 bytes to specifying which light to control and the state.
       1. [0] – Light to control where:
          1. 0 = FF Lights
          2. 1 = FZ lights
          3. 2 = Deli Pan Lights
          4. 3 = Recess Lights
       2. [1] = Requested state On/Off (1/0)
    4. Response: NA
76. Deli Pan Light Color
    1. Purpose: Command sent to the deli pan board during Native Mode that is used to control the color of the LED indicators
    2. Command: 0xD2
    3. Data sent with command (beyond source address and command): 4 bytes dictating the color to be displayed as follows:
       1. [0] – Red percentage 0 -100%
       2. [1] – Green percentage 0 -100%
       3. [2] – Blue percentage 0 -100%
       4. [3] – White percentage 0 -100%
    4. Response: NA
77. Query Door Alarm State
    1. Purpose: Command sent to the Dispenser Board (address 0x02) to get status of door alarms.
    2. Command: 0xD3
    3. Data sent with command (beyond source address and command): NA
    4. Response: Single byte response as follows where
       1. 0 - Disabled
       2. 1 - Enabled, Inactive (i.e.: Door Closed but feature enabled)
       3. 2 - Enabled, Counting (i.e.: Door Open but alarm not going off yet)
       4. 3 - Enabled, Sounding (i.e.: Alarm is going off)
78. ERD Query
    1. Purpose: Query for Entity Reference Designator (ERD) Data. This command is similar to a read. Requestor can ask for the data associated with 1 or more ERDs.
    2. Command: 0xF0
    3. Data sent with command (beyond source address and command): data that clarifies which ERDs are being queried.
       1. N - 1 byte representing the number of ERDs being requested
       2. N - 16- bit in big endian format that define the ERDs being requested.
    4. Response: The ERDs that were requested are returned assuming they fit in a transmittable data packet. The return format after the command and how many ERDs is noted is an array of ERDs and their associated data.
    5. Example Command: Example is a request for the Model number ERD.
       1. [0x80, 0x F0,0x01 0x00,0x01
    6. Example Response: Example is a request for the Model number ERD. The format of the response is the number of ERDs included in the response followed by the array of ERD data. Each ERD entry includes the 16- bit ERD number (in this example 0x0001), followed by a byte indicating the size of the ERD data (32 bytes in this example), followed by the data (not shown).
       1. [0x80, 0xF0, 0x01, 0x00, 0x01, 0x20,…]
79. ERD Write
    1. Purpose: Writing values to designated ERDs
    2. Command: 0xF1
    3. Data sent with command (beyond source address and command): N # of ERDs and N ERD structures (ERD #, size and data…). Everything in big endian
       1. N = 1 byte - # of ERDs that are being written
       2. N – ERD structures…
          1. 16- bit related to the ERD to write
          2. Y - 8-bit – size of ERD to write
          3. Y – bytes Data to be written
    4. Response: Return value includes a count of ERDs written and the list of ERDs that were written.
       1. N = 8- bit that represents the count
       2. N – 16-bit ERD #s that confirm the ERD was written.
80. ERD Subscribe
    1. Purpose: Gives ability for an entity to be alerted to the status of certain ERD’s either periodically or when the value changes.
    2. Command: 0xF2
    3. Data sent with command (beyond source address and command): The data included is the number of ERDs that are being subscribed to and a structure related to the subscription for each of those ERDs.
       1. N = # of ERDs that are being subscribed to.
       2. N- Structures related to the subscription including:
          1. 16- bit ERD #
          2. Byte – subscription time or 0 for alert on change. Note only alert on change is currently supported.
    4. Response: A count of the number of ERD’s that were subscribed to. Single byte
81. Request current Subscription List
    1. Purpose: Query to ask what the current subscription list is for a given device. List may be broken up into multiple messages if the list cannot fit within the context of 1 message.
    2. Command: 0xF3
    3. Data sent with command (beyond source address and command): NA
    4. Response: Similar to feedback on the write. Return value includes a count of and a list of how many ERDs are on subscription list.
       1. N = 8- bit qty that represents the count
       2. N – 16-bit ERD #s that confirm the ERD was written.
82. ERD Unsubscribe
    1. Purpose: Remove 1 or more ERDs from the subscription list.
    2. Command: 0xF4
    3. Data sent with command (beyond source address and command): Number of ERDs and their identifiers that are to be removed from the subscription list.
       1. N = Number of ERDs to remove
       2. N- 16-bit ERD identifiers.
    4. Response: Simple acknowledgment that reflects the command only.
83. Subscribed ERD Update Notification
    1. Purpose: Virtually identical to the ERD Write command (0xF1), except the response is a simple confirmation packet. This is published by a node when subscribed ERDs have changed or the subscription periodic has expired.
    2. Command: 0xF5
    3. Data sent with command (beyond source address and command): see 0xF1 description
    4. Response: Packet level acknowledgement.
    5. Data sent with command (beyond source address and command): 1 Byte treated as a Boolean to indicate Degrees C or Degrees F when set to 1/0 respectively.
    6. Response: NA
84. Controls Reset
    1. Purpose: Resets whatever control you send the command to.
    2. Command: 0xF9
    3. Data sent with command (beyond source address and command): NA
    4. Response: NA
85. Force Pre-chill
    1. Purpose: Forces unit to perform the pre-chill phase of defrost for the FF only or both the FF and FZ.
    2. Command: 0xFA
    3. Data sent with command (beyond source address and command): 1 Byte that clarifies the request to be FF and FZ or the FF only:
       1. 0 – FF and FZ pre-chill
       2. 1 – FF only pre-chill
    4. Response: NA
86. Force Defrost
    1. Purpose: Forces unit to run a or exit a Defrost cycle
    2. Command: 0xFB
    3. Data sent with command (beyond source address and command): 1 Byte modifier to the indicate type of defrost.
       1. 0 – FF and FZ defrost
       2. 1 – FF only defrost
       3. 2 - exit defrost
    4. Response: NA
87. Force 100% Run
    1. Purpose: Force unit to exit defrost and start a 100% cooling cycle at the highest compressor and condenser fan speed regardless of temperature. This condition will persist for 1 hour or until the control resets.
    2. Command: 0xFC
    3. Data sent with command (beyond source address and command): NA
    4. Response: NA
88. Defrost Disable
    1. Purpose: Disable defrost until unit is reset.
    2. Command: 0xFD
    3. Data sent with command (beyond source address and command): NA
    4. Response: NA

A second aspect of the command set described above is the individual Entity Reference Designators (ERDs) that are supported within a given control. Each of these ERDs may maintain the ability to be read, written, or subscribed to so an external application can be alerted if the data value changes. See:

* Read = ERD Query 0xF0
* Write = ERD Write 0xF1
* Subscribe = ERD Subscribe 0xF2

Each ERD is characterized by its ERD ID, the length of data associated with the ERD, and an attribute that declares whether the ERD is Read Only. Within the appliance control, ERDs can be useful to control or monitor behaviors of the appliance in the consumer mode.

The following ERDs are supported on the refrigeration main board control:

1. ERD Name: Model Number – (same information 0xDD, 0x03, 0x03)
   1. Designator: 0x0001
   2. Data Size: 0x20
      1. Text characters….
   3. Read Only: True
2. ERD Name: Unit Serial Number (same information as 0xDD, 0x03, 0x04)
   1. Designator: 0x0002
   2. Data Size: 0x20
      1. Text characters
   3. Read Only: True
3. ERD Name: Filter Alert (deprecated 2013)
   1. Designator: 0x1000
   2. Data Size: 1 – Bit encoded - Change/OK = 1/0 as follows:
      1. Bit 0 = Water Filter
      2. Bit 1 = Odor Filter
   3. Read Only: True
4. ERD Name: Filter Expiration Status (deprecated 2013)
   1. Designator: 0x1001
   2. Data Size: 14 As follows:
      1. (MSB) Water Filter Calendar Timer (Each Count is 30 minutes)
      2. (LSB) Water Filter Calendar Timer (Each Count is 30 minutes)
      3. Water Filter Calendar % used
      4. Water Filter Time Remaining (Hours)
      5. Water Filter Time Remaining (Hours)
      6. (MSB) Water Usage Timer. (in OZ x 100)
      7. Water Usage Timer. (in OZ x 100)
      8. Water Usage Timer. (in OZ x 100)
      9. (LSB) Water Usage Timer. (in OZ x 100)
      10. Water Filter Usage Time % Used
      11. Water Filter OZ Remaining (OZ)
      12. Water Filter OZ Remaining (OZ)
      13. Water Filter OZ Remaining (OZ)
      14. Water Filter OZ Remaining (OZ)
   3. Read Only: True
5. ERD Name: Command Features (Sabbath Mode Status) (deprecated 2013)
   1. Designator: 0x1002
   2. Data Size: 1 – 1 =
      1. Bit 0 – Sabbath Mode Active/Inactive (1/0)
   3. Read Only: True
6. ERD Name: Temperature Alert
   1. Designator: 0x1003
   2. Data Size: 1
      1. Bit 0 – FF Above 50 Deg F (1/0)
      2. Bit 1 – FZ Above 20 Deg F (1/0)
   3. Read Only: True
7. ERD Name: Displayed Temperature
   1. Designator: 0x1004
   2. Data Size: 2
      1. [0] = FF Temperature (signed char)
      2. [1] = FZ Temperature (signed char)
   3. Read Only: True
8. ERD Name: Set Point Temperature
   1. Designator: 0x1005
   2. Data Size: 2
      1. [0] = FF User Set point
      2. [1] = FZ User Set point
   3. Read Only: False
9. ERD Name: Door Alarm Alert (deprecated 2013)
   1. Designator: 0x1006
   2. Data Size: 1
      1. Bit 0 = FF Door
      2. Bit 1 = FZ Door
   3. Read Only: True
10. ERD Name: Icemaker Bucket Status (deprecated 2013)
    1. Designator: 0x1007
    2. Data Size: 1
       1. Bit 0 = FF IM (present/absent – 1/0)
       2. Bit 1 = FZ IM (present/absent – 1/0)
       3. Bit 2 = FF Bucket (Full/Not Full – 1/0)
       4. Bit 3 = FZ Bucket (Full/Not Full – 1/0)
    3. Read Only: True
11. ERD Name: Odor Filter Expiration (deprecated 2013)
    1. Designator: 0x1008
    2. Data Size: 5
       1. [0] = (MSB) Odor Filter Calendar Timer
       2. [1] = (LSB) Odor Filter Calendar Timer
       3. [2] = Odor Filter % Used
       4. [3] = Odor Filter Time Remaining (Hours)
       5. [4] = Odor Filter Time Remaining (Hours)
    3. Read Only: True