A2L Refrigerant Supplemental Guide

CONTENTS

GENERAL

This technical manual contains basic installation information, controls scheme, and wiring for the Dissipation System on 39L/M Air Handlers with Direct Expansion Coil Sections containing A2L refrigerant.

For more detailed instruction on installation, operation, and service, refer to the Service and Installation Manual.

SAFETY CONSIDERATIONS

The 39L/M air-handling equipment is designed to provide safe and reliable service when installed and operated within design specifications. Improper installation, adjustment, alteration, service maintenance, or use can cause explosion, fire, electrical shock, or other conditions which may cause personal injury or property damage. Use good judgment and follow safe practices as outlined below. Consult a qualified installer, service agency, or your distributor or branch for information or assistance. The qualified installer or agency must use factory-authorized kits, accessories and replacement parts when modifying this product. Refer to individual instructions packaged with the kits or accessories when installing.

39 Series air handler units are partial evaporator units, complying with partial unit requirements of UL/CSA standards, and must only be connected to other units that have been confirmed as complying to corresponding partial unit requirements of UL 60335-2-40/CSA C22.2 No. 60335-2-40 (Refrigerant Safety Group A1 or A2L) or UL 1995/CSA C22.2 No 236 (Refrigerant Safety Group A1 only).

Recognize safety information. This is the safety-alert symbol ⚠. When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury. Understand the signal words DANGER, WARNING, and CAUTION. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which will result in severe personal injury or death. WARNING signifies hazards which could result in personal injury or death. CAUTION is used to identify unsafe practices which may result in minor personal injury or product and property damage. NOTE is used to highlight suggestions which will result in enhanced installation, reliability, or operation.

⚠ WARNING

UNIT OPERATION AND SAFETY HAZARD

Failure to follow this warning could cause personal injury, death and/or equipment damage.

R-454B is an A2L refrigerant. All service equipment or components must be A2L refrigerant rated. Do not use non-A2L rated equipment or components on R-454B refrigerant equipment.

⚠ AVERTISSMENT

RISQUE DE FONCTIONNEMENT ET DE SÉCURITÉ DE L'APPAREIL

Le non-respect de cet avertissement peut entraîner des blessures corporelles, la mort et/ou des dommages matériels.

Le R-454B est un réfrigérant A2L. Tous les équipements ou composants d'entretien doivent être homologués A2L. N'utilisez pas d'équipements ou de composants non homologués A2L sur un équipement fonctionnant au R-454B.

⚠ WARNING

RISK OF FIRE — FLAMMABLE REFRIGERANT

Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.

Do not pierce or burn.

Be aware that refrigerants may not contain an odor.

⚠ AVERTISSMENT

RISQUE D'INCENDIE — RÉFRIGÉRANT INFLAMMABLE

N'utilisez aucun moyen pour accélérer le dégivrage ou pour nettoyer autre que ceux recommandés par le fabricant.

Ne pas percer ni brûler.

Sachez que les réfrigérants peuvent être inodores.

A2L REFRIGERANT INFORMATION

This equipment may contain R-454B or R-32, mildly flammable refrigerants classified as A2L. Know the refrigerant type used with this unit and ensure all instructions are read prior to storing, installing, or servicing this equipment. For units containing R-410A or R-22, information and instructions regarding A2L refrigerants within this document may be disregarded.

Detection of Flammable Refrigerants

Never use potential sources of ignition for the search or detection of refrigerant leaks. This is universal for both A2L and non-A2L refrigerants. A halide torch or other detectors using open flames shall not be used, under any circumstance.

The following leak detection methods are deemed acceptable for all refrigerant systems.

Electronic leak detectors may be used to detect refrigerant leaks, but in the case of flammable refrigerants the sensitivity may not be adequate or require recalibration. Detection equipment shall be calibrated in a refrigerant-free area. Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25% max.) is confirmed. Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipework. Examples of leak detection fluids:

- Bubble method.
- Fluorescent method agents.

⚠ CAUTION

If a leak is suspected, all naked flames shall be removed/extinguished.

⚠ PRUDENCE

Si une fuite est suspectée, toutes les flammes nues doivent être retirées/éteintes.

If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system away from the leak and leak repair. Removal of refrigerant will follow the steps outlined in below sections.

⚠ CAUTION

Do not use torch to remove any component that contains a refrigerant or oil charge. Ensure the refrigerant or oil charge is fully evacuated or isolated from any hot work.

⚠ PRUDENCE

N'utilisez pas de chalumeau pour retirer un composant contenant une charge de réfrigérant ou d'huile. Assurez-vous que la charge de réfrigérant ou d'huile est entièrement évacuée ou isolée de tout travail à chaud.

Ignition Source Mitigation

No person carrying out work on an appliance containing A2L refrigerants which involves exposing any pipe work shall use any sources of ignition in such a way that can lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, must be kept sufficiently far away from the site of work. This includes, but is not limited to, installation, repair, removal, and disposal of equipment.

Work shall be performed under a controlled procedure to minimize the risk of flammable gas or vapors being present while work is performed.

Minimum Conditioned Space Area

The space area served by ducted equipment with A2L refrigerant is restricted by building code. This is based on the refrigerant volume that is potentially releasable to the conditioned space through the duct system.

Determine the conditioned space area by calculating the floor area (room length x room width) of all spaces served by a common duct system and adding them all together to get the total conditioned space area. Compare the calculated total conditioned space area to the minimum conditioned space area (TA_{min}) calculated using equations 1 and 2 from UL 60335-2-40, 3rd Edition Annex GG. The total system operating charge is not identified in just the Air Handler unit and must be determined once the full system is assembled to include the Air Handler Unit (AHU) coil, interconnecting piping and condensing unit. When multiple circuits are utilized, the “worst-case” circuit is to be used.

CALCULATING THE MINIMUM CONDITIONED SPACE AREA

The maximum refrigerant charge based on the room area for the total conditioned space shall be in accordance with the following:

Equation 1: $m_{max} = SF \times LFL \times H \times TA$

or

The required minimum total conditioned room area TA_{min} of installed appliance with refrigerant charge m_c (kg) shall be in accordance with the following:

Equation 2: $TA_{min} = m_c / (SF \times LFL \times H)$

where:

- SF = Safety Factor of 0.25
- m_{max} = Allowable maximum refrigerant charge in the system (kg)
- m_c = Refrigerant charge in the appliance (kg)
- TA_{min} = required minimum area of the total conditioned space (square meters [m^2])
- H = Height of the room (2.2m)
- TA = Area of the total conditioned space (m^2)
- LFL = Lower Flammable Limit (kg/m^3)

NOTE: If TA is smaller than TA_{min}, additional ventilation is required.

Reference Table 1 for example TA_{min} at various charge increments. The minimum conditioned space height is based on 2.2 meters.

The charge must include the AHU coil, interconnecting piping and the condensing unit. For this example, the TA_{min} is calculated using (6 x Charge [kg]) or (29.35 x Charge [lb]).

Table 1 — TA_{min} at Various Charge Increments

CHARGE		TA_{min}	
lb	kg	Square Feet (ft^2)	Square Meters (m^2)
5	2.27	147	13.61
15	6.80	440	40.82
25	11.34	734	68.04
35	15.88	1027	95.25
45	20.41	1321	122.47
55	24.95	1614	149.69
65	29.48	1908	176.90
75	34.02	2201	204.12
85	38.56	2495	231.33
95	43.09	2788	258.55
105	47.67	3082	286.02
115	52.13	3375	312.80
125	56.70	3669	340.20
135	61.25	3962	367.51
145	65.77	4256	394.59
155	70.31	4549	421.88
160	72.57	4696	435.45
170	77.11	4990	462.66

Duct System and Ventilation

Equipment with A2L refrigerant should be utilized with an air distribution system with a fully ducted supply and return. If an open (plenum) return is required, refer to local or national building code for requirements for using open plenum return duct systems with equipment with A2L refrigerant.

⚠ CAUTION

Do not install ignition sources in the duct distribution system.

⚠ PRUDENCE

N'installez pas de sources d'inflammation dans le système de conduit de distribution.

Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. Adequate ventilation shall be maintained while work is carried out. The ventilation should safely dissipate any released refrigerant and, preferably, expel it to the external atmosphere. Should an auxiliary ventilation system be present, check that it is operating correctly and no outlets are obstructed.

INSTALLATION

The following checks shall be made to installations using A2L refrigerants:

1. The actual charge is in accordance with the room size within which the refrigerant containing parts are installed.
2. Supplementary ventilation machinery and outlets are operating adequately and are not obstructed.
3. For appliances utilizing indirect refrigeration, the secondary circuit shall be checked for the presence of refrigerant.
4. Warning markings on the equipment is visible and legible, with those that are not being either replaced or corrected.
5. Refrigerant piping or components are installed in a position where they are unlikely to be exposed to any substance which may corrode them, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against said corrosion.
6. Validate that the A2L leak dissipation function is operational by using the test function on the A2L dissipation board.

Refrigerant Piping

For units that utilize R-454B or R-32, installation of pipe-work must be kept to a minimum, and the pipe-work shall be protected from physical damage. The following must be adhered to:

1. Connecting joints shall only be made in easily accessible locations for service purposes.
2. There shall be no bends in pipe-work lines with a centerline bend radius less than 2.5 times the external diameter.
3. Be protected from potential damage during normal operation, service or maintenance.

Servicing

Prior to, and during the work being performed on an appliance containing A2L refrigerants, the area must be checked with an appropriate refrigerant detector to ensure that the person or persons performing work are aware of a potentially toxic or flammable atmosphere. The area must also be surveyed to ensure there are no flammable hazards or ignition risks. “No Smoking” signs shall be displayed.

Should any hot work need to be performed on the refrigerant system, or associated parts, appropriate fire extinguishing equipment shall be available nearby. Have a dry powder or CO_2 fire extinguisher adjacent to the charging area.

All maintenance staff and others working in the local area shall also be instructed on the nature of work being carried out. Work in confined spaces shall be avoided wherever possible.

Evacuation, Removal, and Repair

When breaking into the refrigerant circuit to make repairs – or for any other purpose – conventional procedures shall be used. However, for flammable refrigerants it is important that best practice be followed, since flammability is a consideration.

The following procedure shall be adhered to:

1. Safely remove refrigerant following local and national regulations.
2. Evacuate.
3. Purge the circuit with inert gas (optional for A2L refrigerants).
4. Evacuate (optional for A2L refrigerants).
5. Continuously flush or purge with inert gas when using flame to open circuit.
6. Open the circuit.

For appliances containing flammable refrigerants, purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum. This process may need to be repeated several times until the system is free from refrigerant. When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place.

The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labeled for that refrigerant. Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible cooled before recovery occurs.

The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of the flammable refrigerant. If in doubt, the manufacturer should be consulted. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect coupling and in good condition.

The recovered refrigerant shall be processed according to local legislation in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units, and especially not in cylinders.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The compressor body shall not be heated by an open flame or other ignition sources to accelerate this process. When oil is drained from a system, it shall be carried out safely.

At no point during this process should the outlet for the vacuum pump be close to any potential ignition sources, and ventilation shall be available.

Charging

In addition to conventional charging procedures, the following requirements shall be followed.

1. Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
2. Cylinders shall be kept in an appropriate position according to the instructions.
3. Ensure that the refrigerating system is grounded prior to charging the system with refrigerant.
4. Label the system when charging is complete (if not already).
5. Extreme care shall be taken not to overfill the refrigerating system.
6. Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

DECOMMISSIONING

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail. It is a recommended good practice to recover all refrigerant safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant. It is essential that electrical power is available before the task is commenced.

1. Become familiar with the equipment and its operation.
2. Isolate the system electrically.
3. Before attempting the procedure, ensure that:
   a. Mechanical handling equipment is available, if required for handling refrigerant cylinders.
   b. All personal protective equipment is available and being used correctly.
   c. The recovery process is supervised at all times by a competent person.
   d. Recovery equipment and cylinders conform to the appropriate standards.
4. Pump down refrigerant system, if possible.
5. If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
6. Make sure that the cylinder is situated on the scales before recovery takes place.
7. Start the recovery machine and operate in accordance with instructions.
8. Do not overfill cylinders (no more than 80% of volume liquid charge).
9. Do not exceed the maximum working pressure of the cylinder, even temporarily.
10. When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from the site promptly and all isolation valves on the equipment are closed off.
11. Recovered refrigerant shall not be charged into another refrigerating system unless it has been cleaned and checked.
12. Equipment shall be labeled that it has been decommissioned and emptied of refrigerant. The label shall be dated and signed. For appliances containing flammable refrigerants, ensure that there are labels on the equipment stating the equipment contains flammable refrigerant.

LEAK DETECTION AND DISSIPATION

Overview

For 39L/M units using R-454B and R-32 refrigerants, a factory-installed refrigerant leak dissipation system will be required as a safety protocol in case of refrigerant leakage. The dissipation system features A2L refrigerant leak detection sensors and a dissipation control board.

The A2L refrigerant detection sensor communicates via a wiring harness to the dissipation board. Dissipation mode initiates when the refrigerant sensor detects a refrigerant concentration above 20% of the Lower Flammable Limit (LFL). When this occurs the board:

1. Sends a signal to the fan controller to activate the fan to the minimum dissipation airflow, (this minimum value will be 20% of the nominal operating condition).
2. Sends a signal to the customer's building management system (BMS). The customer will have to program the signal on their BMS to shut down the compressor, electric heat, gas heat and open zoning dampers.

Once the sensor detects that the gas concentration has dropped below 20% LFL, the dissipation board will initiate a 5-minute delay to remain in dissipation mode. After 5 minutes the board will send a signal to the fan and BMS to return to its normal operation.

The dissipation board also includes a feature to allow smoke detector overrides during dissipation mode. In the case that refrigerant leaks within the unit and dissipation mode is activated, the smoke detector would be able to override the board's function if a fire or emergency were to occur and return the unit to normal operation.

IMPORTANT: For units containing A2L refrigerant R-454B or R-32, external power and ground must be ALWAYS given to the dissipation board. Failure to provide proper power and grounding can lead to false dissipation events.

Dissipation System Components

The part numbers for refrigerant sensor and dissipation boards are detailed in Table 2.

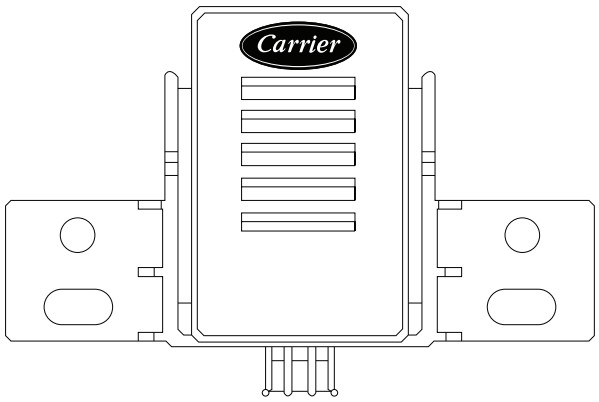
Table 2 — Refrigerant Leak Dissipation System Parts

DESCRIPTION	PART NUMBER
R-454B Leak Sensor	HH96ZX005
R-32 Leak Sensor	39MA51000097
A2L Dissipation Board (Single Sensor)	HK50ZA004
A2L Dissipation Board (Two Sensor)	HK50ZA007

See Fig. 1 for the A2L Refrigerant leak sensor details. If the refrigerant sensors are ever to be replaced, ensure replacement parts are specified by the manufacturer.

Orientation and location of the refrigerant sensors is critical to their functionality. Sensors are factory installed in the correct upright orientation and location, no alterations are to be made to this positioning. See Fig. 2 for refrigerant sensor locations on a 39M single coil unit, and Fig. 3 for refrigerant sensor locations on a 39M dual coil unit. Fig. 4 shows sensor locations for a single coil 39L unit, and Fig. 5 shows sensor locations for a 39L staggered coil.

R-32 Sensor



R-454B Sensor

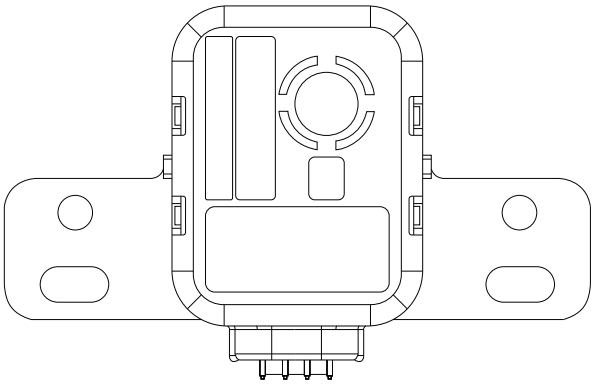


Fig. 1 — Refrigerant Leak Sensor for R-32 and R-454B Refrigerants

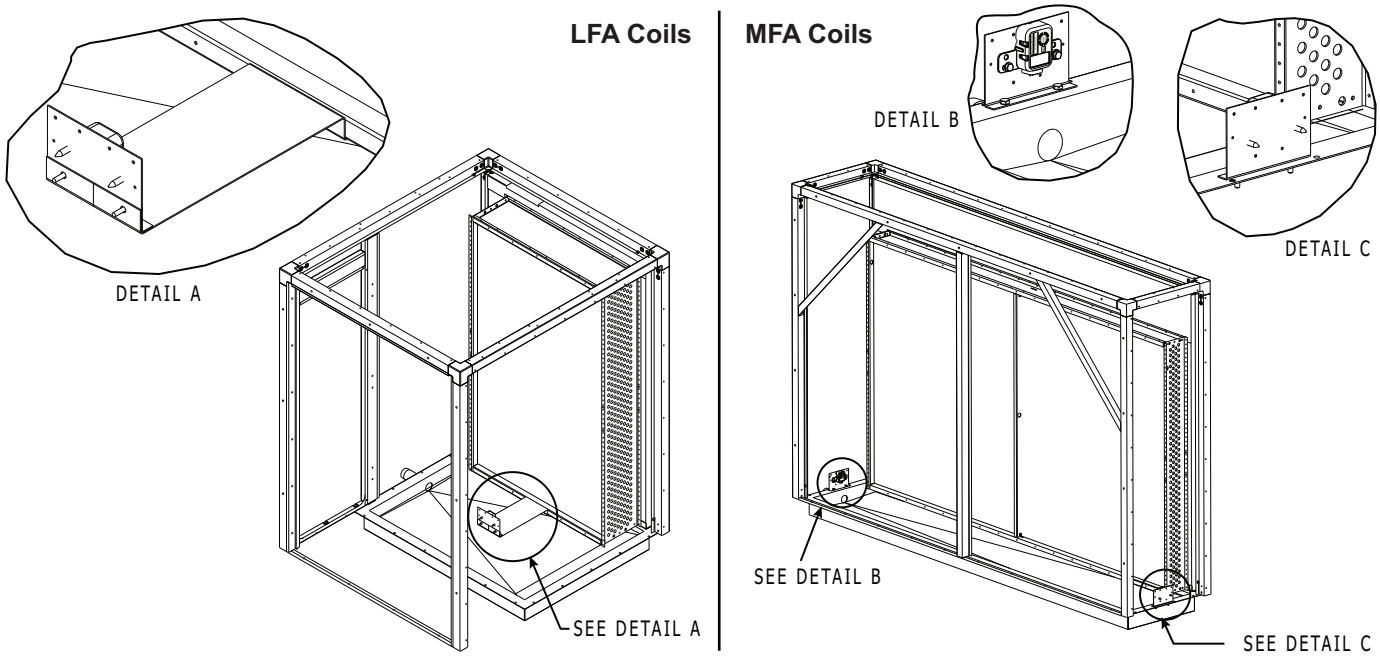


Fig. 2 — Sensor Locations for 39M Units with Single Coil, Placement for LFA Coils (left) and Placement for MFA Coils (right)

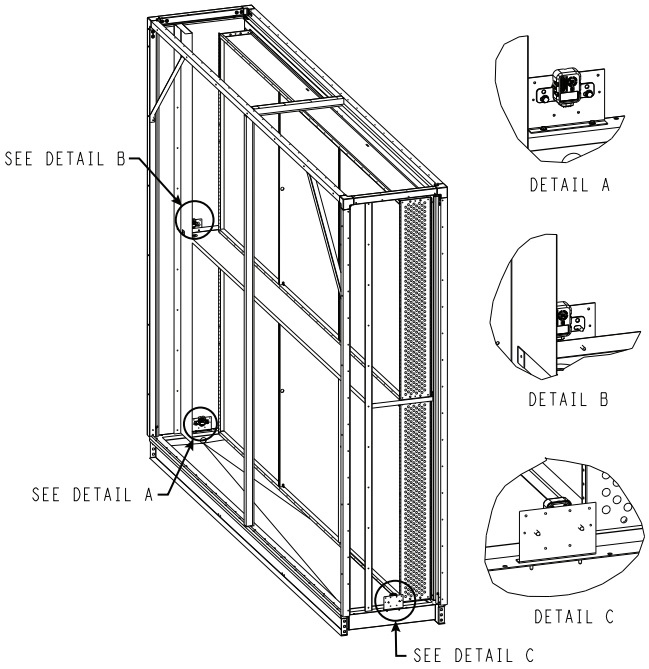


Fig. 3 — Sensor Locations for 39M Units with Dual Coils

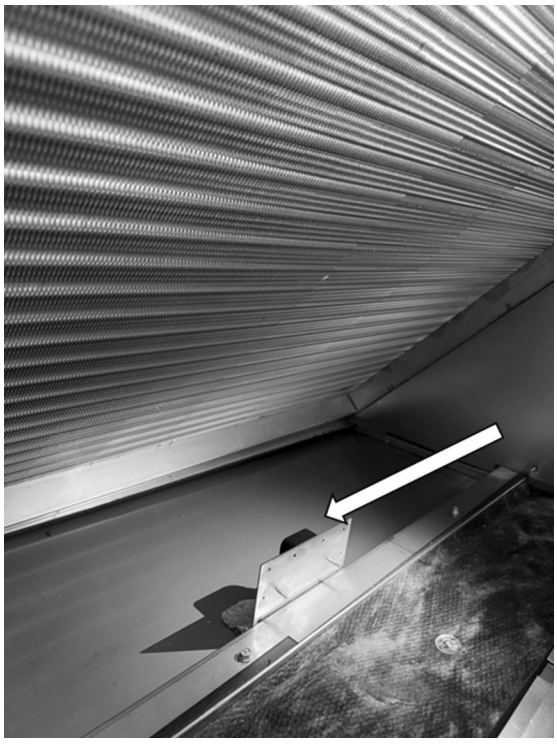


Fig. 4 — Sensor Locations for 39L Units with Single Coil

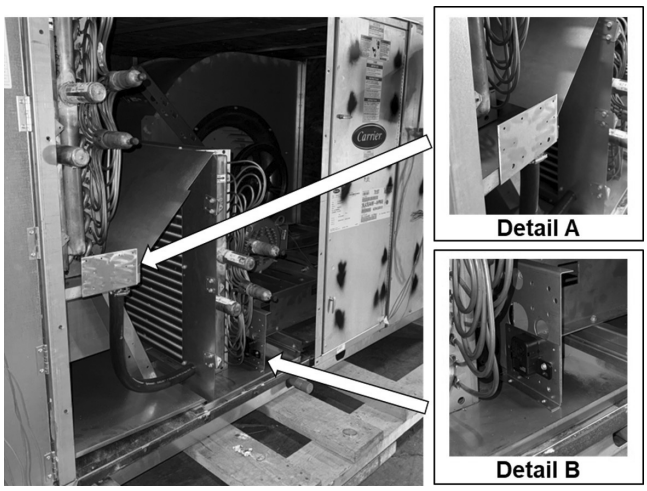


Fig. 5 — Sensor Locations for 39L Units with Staggered Coils

Figure 6 shows the A2L dissipation board layout. A test button is included on the A2L dissipation board. After pressing the test button for approximately 1-4 seconds, the system will enter A2L Leak Dissipation Mode for 60 seconds. The status bar will indicate dissipation mode is enabled by flashing one time. Consult Table 3 for more test button functionality.

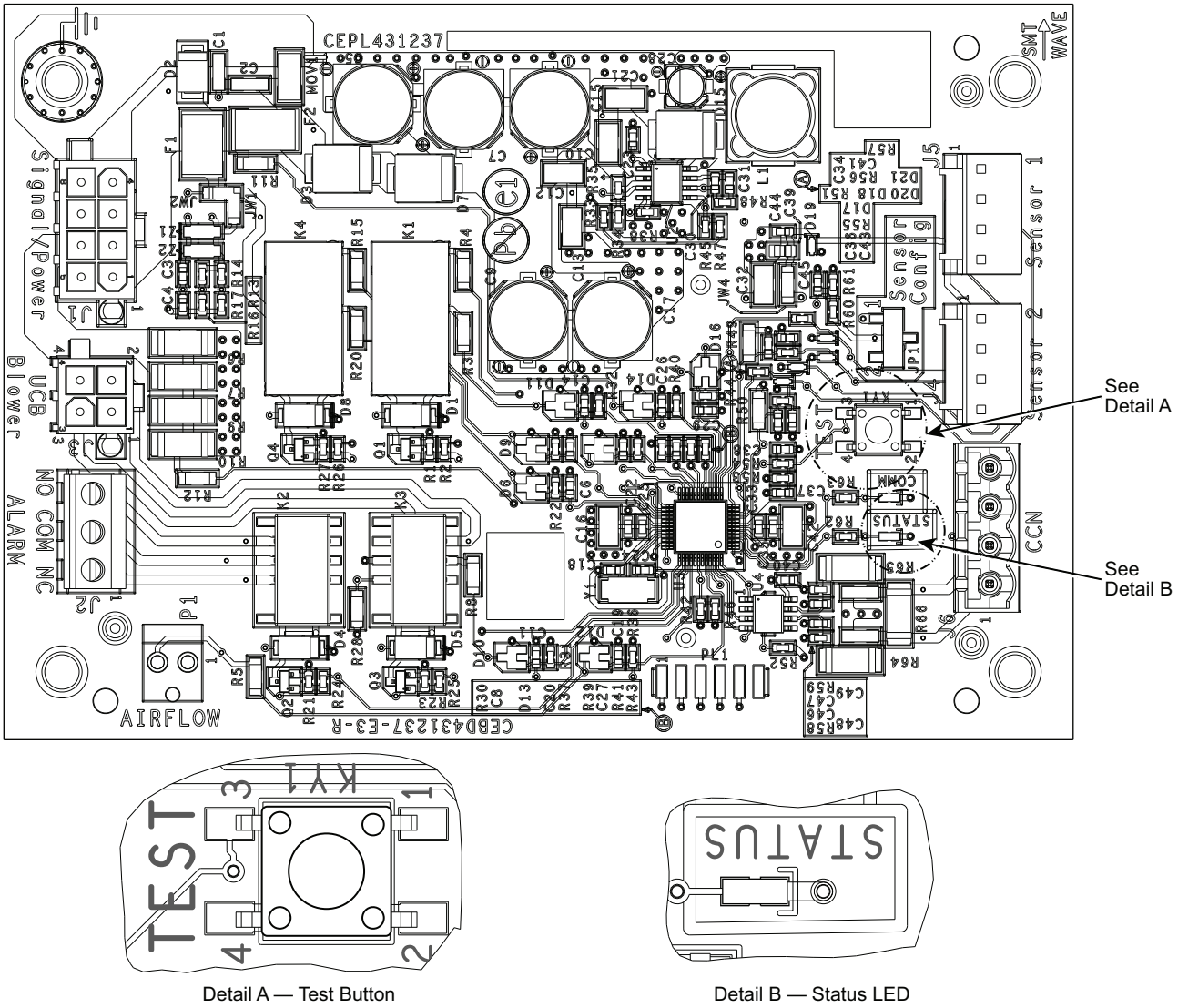


Fig. 6 — Dissipation Board Layout

Table 3 — Dissipation Board Test Button Functionality

TEST BUTTON HOLD TIME (sec)	FUNCTION	STATUS BAR
1-4	Activates Dissipation Mode	Flash 1 time
5-29	Display flash code history	Will display previous flash code
30+	Flash Code 6	Flash 6 times
3 Rapid Presses	Clear flash code history	Status bar will return to steady

The dissipation boards status bar can be used to troubleshoot the dissipation system. Reference Table 4 for status bar codes and the corresponding error mode. A status code label is located on every unit containing R-32 and R-454B. This label is located on the A2L control box enclosure and reiterates the information in Table 4.

Table 4 — Dissipation Board Status LED Error Codes

STATUS LED	ERROR MODE
ON	Normal Operation
OFF	Hardware Failure
1 Flash	Sensor 1 Refrigerant Leak
2 Flash	Sensor 1 Open
3 Flash	5 Minute Mitigation Off Delay
4 Flash	Blower Output Not Operating
5 Flash	Sensor 1 Fault
6 Flash	Test Button Stuck
7 Flash	K1 or K4 Relay Wiring Inverted
8 Flash	K1 or K4 Relay Wiring Shorted
9 Flash	Sensor 2 Refrigerant Leak
10 Flash	Sensor 2 Open
11 Flash	Sensor 2 Fault
12 Flash	Incorrect Temp Sensor
13 Flash	Fire or Smoke Override

FAN CONTROLLER PROGRAMMING

ZA ECM Fans

For applications where A2L refrigerant, R-454B and R-32 is being used, additional fan programming is required. This additional programming sets the fan speed during dissipation mode to be 20% of the nominal fan speed.

The dissipation mode parameters are preprogrammed onto the Ziehl-Abegg (ZA) fans in the factory. Do not override this programming as it could interfere with dissipation mode functionality and cause safety risk in case of refrigerant leaks. For replacement fans, please reference the below instructions for adding the dissipation mode programming. The programming procedures are different for ZA Modbus fans and ZA BACnet fans.

ZA MODBUS

For ZA Modbus Fans follow these programming instructions using the ZA software program **ZAset**:

1. Select **New server**.
2. Select **Add new client** (see Fig. 7).

Fig. 7 — ZA — Add New Client

3. Set the **Start Address** to the fan number you are addressing. This can be found on the fan number label on the inside of the fan power box.
4. Set **Count** to the number of fans in the assembly.
5. Select **Easy Modbus** (see Fig. 8).

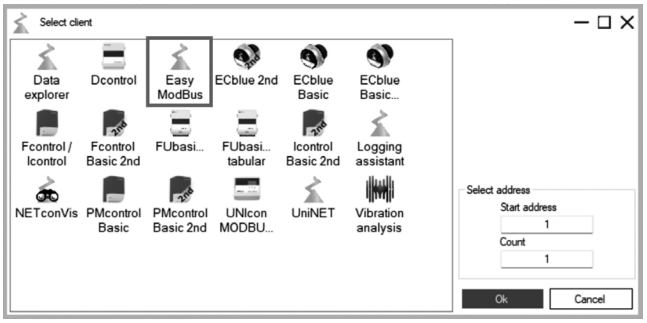


Fig. 8 — ZA — Easy Modbus Selection

6. The **Easy Modbus** window will appear (see Fig. 9). From this window, you can set parameters for Modbus and 0-10V controls.

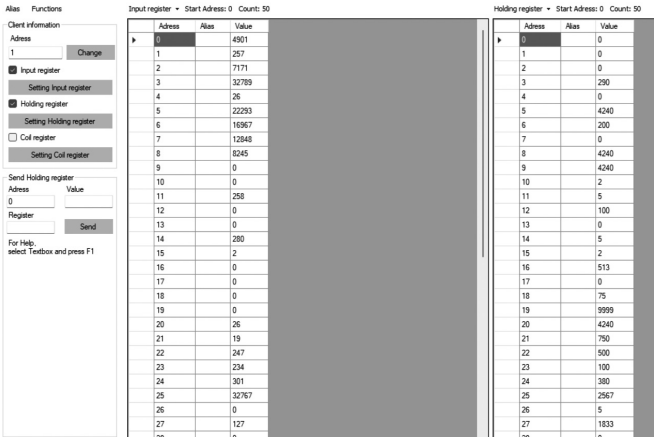


Fig. 9 — ZA — Easy Modbus Window

7. The **Send Holding Register** section:
   a. Set the **Address** to **0** as this tells the software to broadcast the values sent to all fans. (User may also set the **Address** to **1** if addressing a singular fan in the array). See Fig. 10.

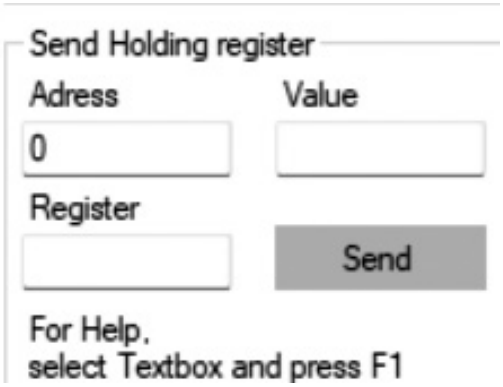


Fig. 10 — ZA — Send Holding Register — Setting Address

   b. To set the fan speed for A2L, identify the dissipation rpm in Table 5 based on the fan part number. This rpm will be 20% of the fans normal operating speed.

Table 5 — ZA Fan Dissipation RPM

FAN MANUFACTURER	FAN PART NUMBER	MAX SPEED (rpm)	DISSIPATION (rpm)
ZA	LA26ZZ015	3,550	710
	LA26ZZ016	3,380	676
	LA26ZZ017	3,000	600
	LA26ZZ018	4,240	848
	LA26ZZ019	3,000	600
	LA26ZZ020	2,770	554
	LA26ZZ021	2,900	580
	LA26ZZ022	2,700	540
	LA26ZZ023	3,200	640
	LA26ZZ024	3,550	710
	LA26ZZ025	2,300	460
	LA26ZZ026	2,630	526
	LA26ZZ027	2,160	432
	LA26ZZ028	1,800	360

   c. Once dissipation rpm is identified, in the same section, for **Value** input the dissipation rpm (e.g., 20% RPM), and for **Register** input **6**. Press the **Send** button. This will set the dissipation modes override rpm. See Fig. 11.

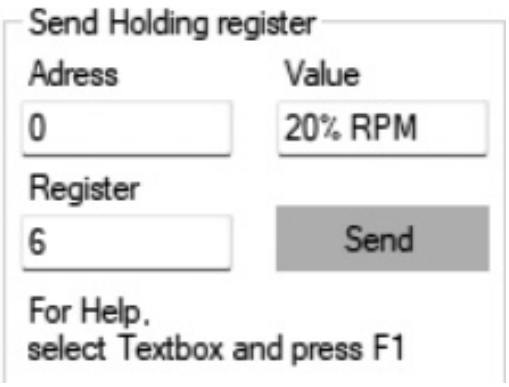


Fig. 11 — ZA — Send Holding Register — Input 20% rpm and Register

   d. The D1 input needs to be inverted due to the dissipation board function. In **Value** input **2**, and for **Register** input **10**. Press the **Send** button. See Fig. 12.

Fig. 12 — ZA — Send Holding Register — Inverting D1 Input

   e. In **Register**, input **4.** The value needs to be set based on the communication type used. For Modbus control, in **Value** input **0**. For 0-10V control, in **Value** input **1**. Press the **Send** button. See Fig. 13.

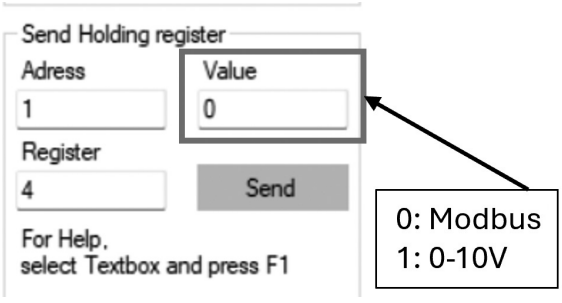


Fig. 13 — ZA — Send Holding Register — Set Holding Register, Register 4

f. The last step is to setup the D1 function to initiate the preset rpm. In **Value** input **5**, and for **Register** input **14**. Press the **Send** button. See Fig. 14.

Fig. 14 — ZA — Send Holding Register — Programming Full RPM

ZA BACNET

For ZA BACnet fans the BACnet registers are limited and do not contain the parameters necessary to program the A2L settings. There are alternative tool options available that can be used for this process, (1) **AM-STICK** Bluetooth module or (2) **AM-MODBUS** module. See Table 6 for the correct fan module accessory part number.

Table 6 — ZA Fan Module Accessories

No.	PART NAME	PART NUMBER
1	AM-STICK-WB	349081
2	AM-MODBUS	349045

To install either of these devices the BACnet module will need to be removed. Once the module is removed you can move forward with installing either module.

To program with the AM-MODBUS module, first install the device in the same location as the now removed BACnet module. Then follow the programming instructions previously given for ZA Modbus fans (see "ZA Modbus" on page 8).

To program the ZA motor using the AM-STICK Bluetooth Module, follow these instructions below:

1. Install the Bluetooth Module to the fan and locate the fan label that shows the serial number of the motor (e.g.,: 31957842/001).
2. Using the ***ZAset*** application select **New Server**.
3. Select **Connect server** (see Fig. 15).

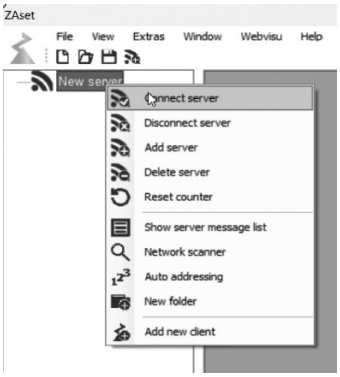


Fig. 15 — ZA — Connect Server

4. The **Select Interface** window will open and your Bluetooth device should appear in the window. Select the Bluetooth device (see Fig. 16).
5. The **Select Interface** window will prompt you to input the serial number (S/N) and PIN for the ZA motor. Locate the S/N (e.g., 31957842/001) and input it in the field provided. The default pin is "9999" (See Fig. 16).

Fig. 16 — ZA — Select Interface Window

6. Press **OK** once all details are added.
7. Right-click on the server again and select **Add new client** (see Fig. 17).

Fig. 17 — ZA — Add New Client Window

8. The ***Select client*** window will open, select **ECblue 2nd** and press **OK**.
9. The ***ECblue 2nd*** window will open, go to ***IO Setup → Digital input D1 → D1 function*** and select **Set internal 2** (see Fig. 18).

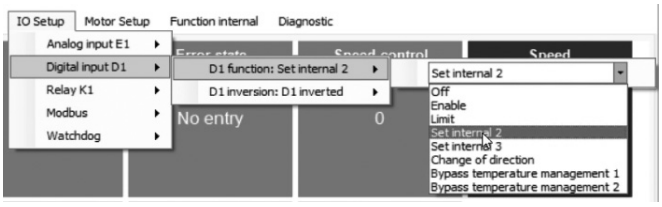


Fig. 18 — ZA — IO Setup ECblue 2nd Window — Set internal 2

10. In the same window, go to ***IO Setup → Digital input D1 → D1 inversion*** and select **D1 inverted** (see Fig. 19).

Fig. 19 — ZA — IO Setup ECblue 2nd Window — D1 Inversion

11. The last step is in the **Settings** tab of the ***ECblue 2nd*** window, go to ***Set internal 2 [1/min]***. Input the dissipation (rpm) fan speed corresponding to the ZA fan part number in Table 5 (see Fig. 20).

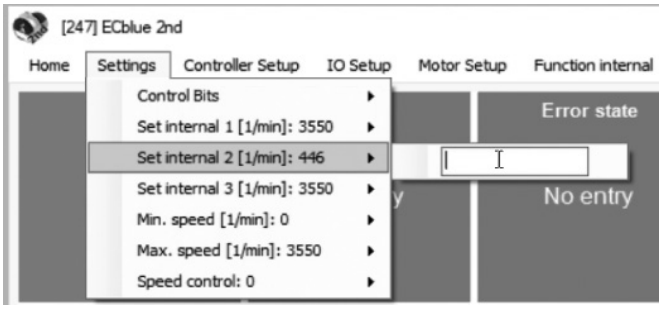


Fig. 20 — ZA — Settings ECblue 2nd Window — Set Internal 2 [1/min]

EBM ECM Fans

For applications where A2L refrigerant, R-454B and R-32 is being used, additional fan programming is required. This additional programming sets the fan speed during dissipation mode to be 20% of the nominal fan speed.

The dissipation mode parameters are preprogrammed onto the EBM fans in the factory. Do not override this programming as it could interfere with dissipation mode functionality and cause safety risk in case of refrigerant leaks. For replacement fans, please reference the below instructions for adding the dissipation mode programming.

1. Program Start and Fan Connection
   a. From the "**EC-Control**" Program on the PC Desktop.
   b. The landing page will ask from username and password, fill in these credentials.
   c. To verify the fan is connected properly, go to the file tree on the left side of the window and select the green fan. A black box should appear in the main window. See Fig. 21.
   d. Double click this black box to open the **Device Settings**.
   e. From this window, ensure **Device Type** is selected from the tree. Find the status of the fan, where **Device OK** indicates good communication.

Fig. 21 — EC-Control Fan Connection Verification

2. Parameter Set 1
   a. This parameter set corresponds to **Input Curve 1**.
   b. Set the following parameters to match Fig. 22. **Current Parameter Set** will not be changeable, this is only to indicate what parameter set the fan is currently in.

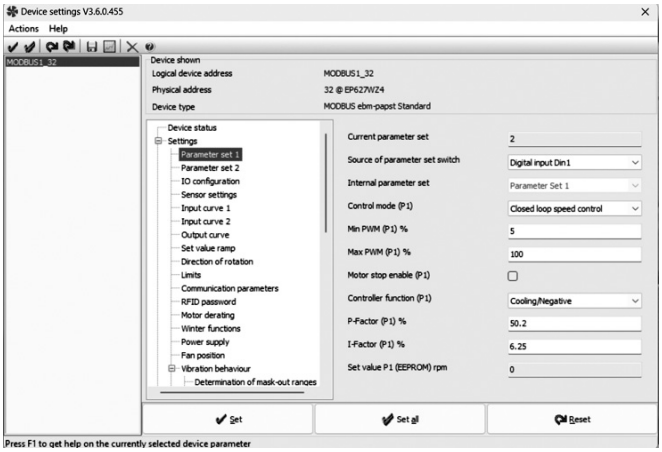


Fig. 22 — EC-Control Parameter Set 1

3. Parameter Set 2
   a. This parameter set corresponds to **Input Curve 2**.
   b. Set the following parameters to match Fig. 23. **Current Parameter Set** will not be changeable, this is only to indicate what parameter set the fan is currently in.

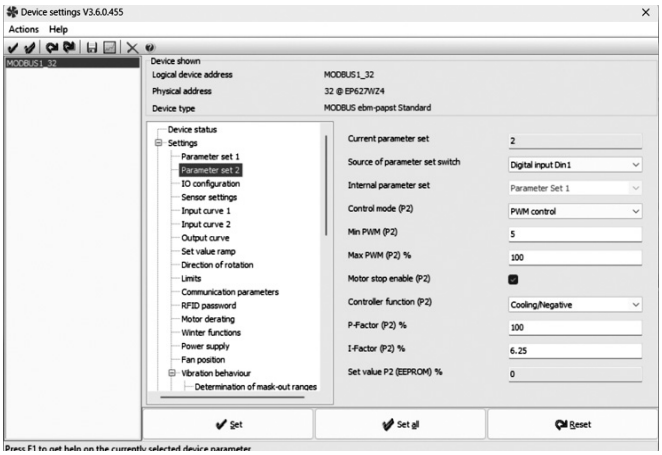


Fig. 23 — EC-Control Parameter Set 2

4. I/O Configuration
   a. In the **Device Settings** window, select ***Settings*** → ***IO Configuration*** from the tree.
   b. Set the following parameters to match Fig. 24.
      NOTE: **Source of Set Value** is dependent on fan control type.
      1) If 0-10V control, select **Analog Input Ain2 0-10V**.
      2) If Modbus/BACnet control, select **RS485/Bus**.
   c. Select **Set All** to save changes.

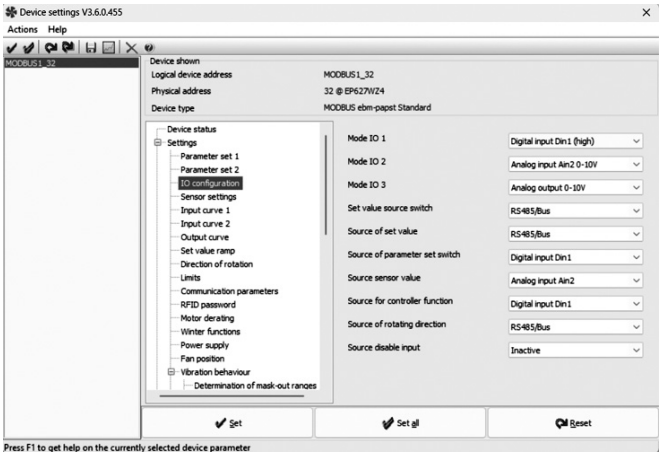


Fig. 24 — EC-Control Setting IO Configuration

5. Input Curve 2
   a. These parameters are for full speed fan operation, where the dissipation board is continuously giving off a 10V signal.
   b. Check that inputs match those of Fig. 25, where:
      1) **Input curve X1 (P2) %** equals 0
      2) **Input curve Y1 (P2) %** equals 0
      3) **Input curve X2 (P2) %** equals 100
      4) **Input curve Y2 (P2) %** equals 100
   c. Select **Set All** to save changes.

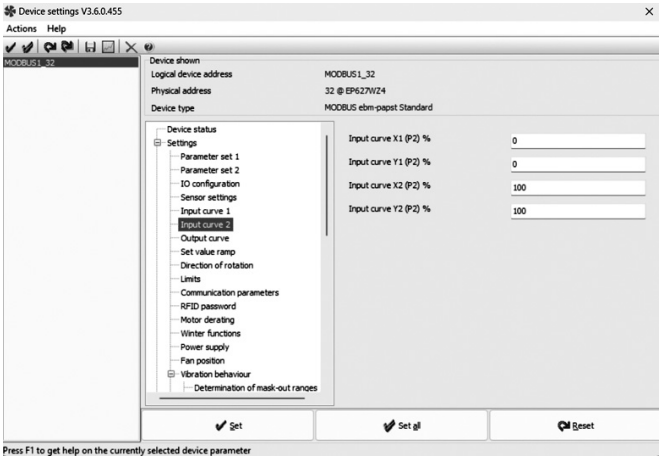


Fig. 25 — EC-Control Setting for Input Curve 2 for Full Speed Fan Operation

6. Input Curve 1
   a. These parameters are for running the fan at 20% speed (see Fig. 26). Once the 10V signal from the dissipation board is lost, the program will switch from **Curve 2** to **Curve 1**.
   b. To set the fan speed for A2L, identify the dissipation rpm in Table 7 based on the fan part number. This rpm will be 20% of the fans normal operating speed.

Table 7 — EBM ECM Fan Dissipation RPM

FAN MANUFACTURER	FAN PART NUMBER	MAX SPEED (rpm)	DISSIPATION (rpm)
EBM	LA26ZZ003	4,000	800
	LA26ZZ004	4,000	800
	LA26ZZ007	3,800	760
	LA26ZZ008	2,800	560
	LA26ZZ009	2,300	460
	LA26ZZ010	2,480	496
	LA26ZZ044	4,000	800
	LA26ZZ045	4,000	800
	LA26ZZ046	3,800	760
	LA26ZZ047	2,800	560
	LA26ZZ048	2,300	460
	LA26ZZ049	2,480	496
	LA26ZZ050	2,810	562
	LA26ZZ051	2,610	522
	LA26ZZ052	2,410	482
	LA26ZZ053	2,372	474

   c. Set the values to reflect those listed below. For the rpm values, input the dissipation rpm.
      NOTE: Ensure the rpm input is the same for both **Input Curve Y1 (P1) rpm** and **Input Curve Y2 (P1) rpm** as this will keep the same rpm regardless of voltage.
      1) **Input Curve X1 (P2) V** equals 0
      2) **Input Curve Y1 (P2) rpm** see Table 7 — EBM ECM Fan Dissipation RPM
      3) **Input Curve X2 (P2) V** equals 10
      4) **Input Curve Y2 (P2) rpm** see Table 7 — EBM ECM Fan Dissipation RPM

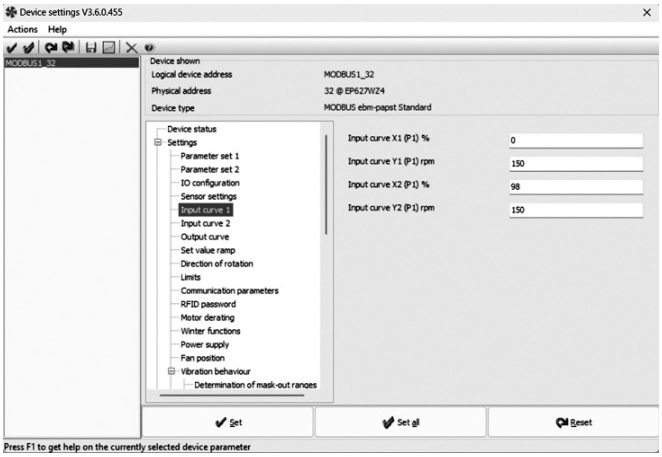


Fig. 26 — EC-Control Setting Input Curve 1 For 20% Speed Operation

7. All additional parameters for A2L programming are now set. Repeat this procedure on all fans that need programming.

VARIABLE FAN DRIVE (VFD)

For units containing A2L refrigerant R-454B or R-32, the VFD has been programmed with a dissipation frequency in case of a refrigerant leak event. When triggered by a refrigerant leak, this programming will override current VFD programming, and instead operate at 15 Hz until the leak has dissipated. After which, normal operation will ensue. Reference Table 8 for details on which programming parameters are altered for units containing A2L refrigerants. These procedures are only applicable to the ABB ACH580 VFD series.

Table 8 — A2L VFD Program Parameters

PARAMETER NUMBER	DESCRIPTION	VALUE
32.05	Supervision 1 function	Default
32.07	Supervision 1 signal	Default
32.10	Supervision 1 high	Default
32.11	Supervision 1 hysteresis	Default
70.02	Override enable	On
70.03	Override activation source	–DI6
70.05	Override direction	Forward
70.06	Override frequency	15 Hz

IMPORTANT: For units containing A2L refrigerant R-454B or R-32, external power and ground must be ALWAYS given to the dissipation board. Failure to provide proper power and grounding can lead to false dissipation events.

IMPORTANT: For units containing A2L refrigerant R-454B or R-32, DO NOT overwrite or remove A2L factory programmed settings. Alteration made to this programming could result in undetected refrigerant leaks.

FACTORY WIRING

A2L Enclosure Wiring

SENSOR

Units will contain 1-3 A2L refrigerant leak sensors per DX coil section. The number of sensors is dependent on type and configuration of the coil. Reference Table 9 for quantity of sensors for 39M units and Table 10 for quantity of sensors for 39L units.

Table 9 — 39M Sensor Quantity per Coil Section

UNIT TYPE	NUMBER OF SENSORS	DX COIL DESCRIPTION	
		SIZE	CONFIGURATION
39M	1	Large Faced Area (LFA)	Single
	2	Medium Faced Area (MFA)	Single
	3	LFA or MFA	Stacked

Table 10 — 39L Sensor Quantity per Coil Section

UNIT TYPE	NUMBER OF SENSORS	DX COIL CONFIGURATION
39L	1	Single
	2	Staggered

The sensor communicates to the dissipation board via wiring harness. The wiring harness will feature a 4-pin female connector on both ends, as shown in Fig. 27.

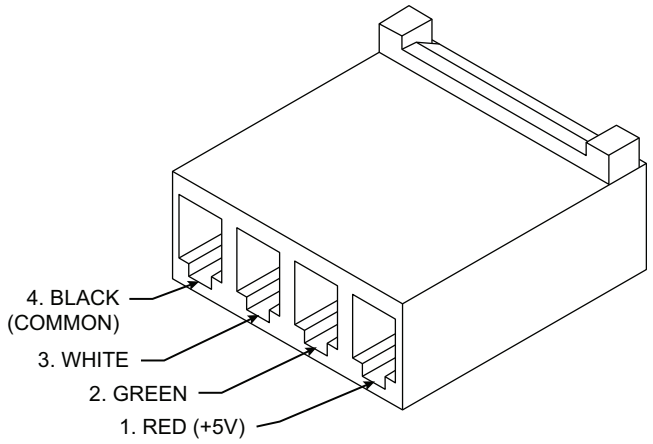


Fig. 27 — 4-Pin A2L Sensor Harness Connector

This harness will be attached to the A2L sensors 4-pin male connection point. These are mating components, so harness connector must be the correct orientation to fully engage with sensor pins.

The dissipation board will include a corresponding 4-pin male connection point, labeled "**Sensor 1**" or "**Sensor 2**", the other end of the A2L sensor harness will plug in here. See Fig. 28 for location of this connection point.

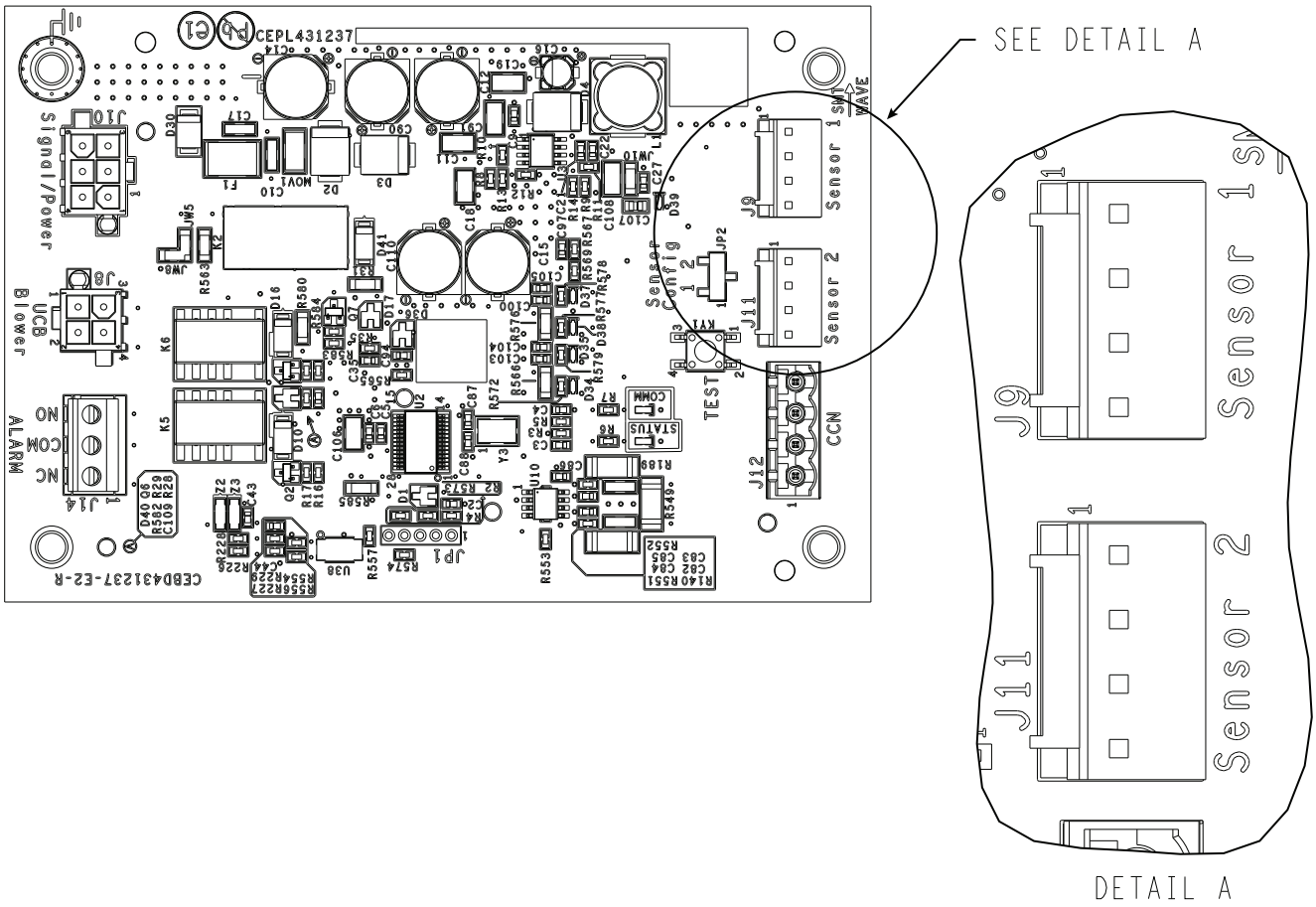


Fig. 28 — Dissipation Board Sensor Plug Locations

COIL-TO-COIL SECTION WIRING

Units may contain a second A2L DX Coil section. If this is the case, the A2L enclosures will be wired together in series. The primary coil section is located closest to the fan section and will feature the fan controller harness. The secondary coil section is furthest away from the fan section.

FIELD WIRING

General

Customers must provide power and ground connections to the A2L dissipation system enclosure. 24 vac is to be provided to terminal block 1, circuit 2. Ground is to be provided to terminal block 1, circuit 4.

IMPORTANT: For units containing A2L refrigerant R-454B or R-32, external power and ground must be ALWAYS given to the dissipation board. Failure to provide proper power and grounding can lead to false dissipation events or inability to detect refrigerant leaks.

For units with two A2L direct expansion coil sections, only provide external power and grounding to the primary coils A2L dissipation system enclosure.

See "Appendix A — A2L Enclosure Wiring Diagrams" on page 17 for various unit configuration wiring diagrams.

Shipping Splits

In the case of shipping splits, the fan controller and coil-to-coil wiring harnesses will be segmented based upon the number of shipping split sections. Customers must connect these harnesses after the unit is fully assembled and ensure all the connectors are attached before powering the dissipation system and/or unit.

Coil-to-coil harnesses are used when the unit contains two direct expansion coil sections. Here, a 6-pin connector, as shown in Fig. 29, is used in the case of shipping splits. These connectors are mating components and must be the correct orientation to fully engage with sensor pins.

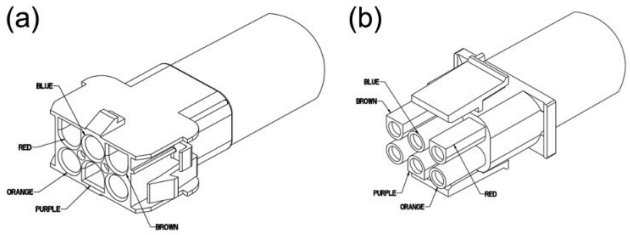


Fig. 29 — 6-Pin Coil-to-Coil Wiring Connection

For all fan controllers, a 4-pin Molex[1] connector harness is to be established. See Fig. 30 for the 4-pin Molex connections.

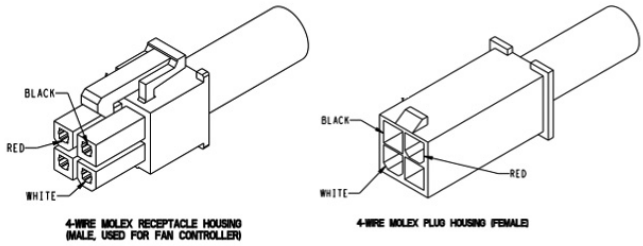


Fig. 30 — 4-Pin Molex Fan Controller Harness Connection

1. Third-party trademarks and logos are the property of their respective owners.

BUILDING MANAGEMENT SYSTEM (BMS)

It is the customer's responsibility to ensure that the fan controller and BMS are correctly connected to Carrier's provided A2L Dissipation System and verify Dissipation Mode operation in compliance with UL60335-2-40. The BMS is responsible for the function of the dampers, electric heat, gas heat, compressor and condenser. Under normal operating conditions the Dissipation Board provides a 24 vac signal to the connected BMS. When the board enters dissipation mode, the 24 vac signal reduces to 0 vac. Customers must use this signal reduction to tell the BMS to open dampers, shut down electric heat, gas heat, compressor and condenser function.

To connect the dissipation system to the customer BMS, use circuit 3 of terminal block 1 located inside the dissipation system enclosure.

If connected, when **Dissipation Mode** is entered, the BMS will be triggered, causing:

- All air distribution zone dampers to open.
- Electric and gas heat to turn off.
- Compressor and condenser to turn off.

SMOKE DETECTOR OVERRIDE

The smoke detector override feature will override the systems **Dissipation Mode** in case of fire, allowing the fans to normally operate. Customers are responsible for setting up the smoke detector override with an external smoke detection system, if desired.

24VAC is to be provided to terminal block 1, circuit 1. If supplying this power, the jumper connection from terminal block 1, circuit 1 to terminal block 2, circuit 2 needs to be removed. The 24VAC signal is reduced to 0VAC when smoke is detected.

FAN CONTROLLER FIELD WIRING

In accordance with UL60335-2-40, any system operating with an A2L class refrigerant must provide a means to dissipate refrigerant in the event of a leak within the evaporator unit.

This section provides guidance to connect a fan controller to the Carrier provided A2L Dissipation System in the field. This guidance is based on the schema for the fan controllers provided by Carrier as part of the air handler. Details may vary for specific situations based on the individual fan controller selected by the customer at their job site. It is the customers' responsibility to ensure that the fan controller is correctly connected to Carrier's provided A2L Dissipation System in compliance with UL60335-2-40.

To connect your fan controller (ECM motor, VFD, starter, or equivalent) to the Carrier provided A2L dissipation system, the connection must be made through the relay mounted within the A2L enclosure. See Table 11 for the list of the relay connections and specifications.

Table 11 — Relay Specifications

RELAY	SPECIFICATION
Series Name	RXG series
Contact Type	2 Form C
[Uc] Control Circuit Voltage	24 vac
Maximum Switching Voltage	250-v
Load Current	5 A
Minimum Switching Capacity	50 mW at 10 mA, 5 vdc
Maximum Switching Capacity	1250 VA AC / 150 W DC
Contact Resistance	100 mOhm
Connections/Terminals	Screw terminals: 1 x 0.34 (1 x 2.5 mm²), AWG 22 – AWG 14 (flexible, with cable end)

During normal operation, the relay is energized by a constant 24 vac signal. In the event of a refrigerant leak, the system enters dissipation mode, which interrupts the 24 vac signal to the relay, thereby de-energizing it. This serves as the trigger for the fan controller to send it into override mode.

In override mode, the fan controller should cycle the fan at a constant speed equal to 20% of rated peak rpm. The fan controller is expected to keep the fan in override mode until the relay is energized once again with the 24 vac signal indicating normal operation has resumed.

The recommended wiring scheme is as follows:

1. Connect the digital input of the fan controller to the COM (common) terminal of the relay
2. Connect the controller's voltage source (typically 24 vdc) to the NO (normally open) terminal of the relay
3. Connect the controller's ground (GND) to the NC (normally closed) terminal of the relay

Under normal operating conditions, the relay coil remains energized, allowing the digital input to receive the controller-supplied voltage through the NO contact. When the system enters dissipation mode, the relay coil is de-energized, switching the digital input to GND through the NC contact. The fan controller should be programmed such that when the digital input detects 0V, it overrides all other functions and drives the fan at 20% of its rated capacity.

APPENDIX A — A2L Enclosure Wiring Diagrams

39L — A2L Fan Controller Wiring Diagrams

TYPE	CONFIGURATION	DIAGRAM	PAGE
Starter	1 Sensor	39MA51053757	18
	2 Sensor	39MA51010038	19
VFD	1 Sensor	39MA51053760	21
	2 Sensor	39MA51010042	22

39L — A2L Fan Sensor Wiring Diagrams

WIRING DIAGERAM	39MA51053761	39MA51010032
PAGE	**33**	**34**
UNIT MODEL	**1 SENSOR**	**2 SENSORS**
LA	Unit Size 03 - Unit Size 21	Unit Size 25
LB	Unit Size 03 - Unit Size 25	—
LC	Unit Size 03 - Unit Size 25	—
LD	Unit Size 03 - Unit Size 21	Unit Size 25
LF	Unit Size 03 - Unit Size 25	—
LG	N/A	
LH	N/A	

39M — A2L Fan Controller Wiring Diagrams

TYPE	CONFIGURATION	DIAGRAM	PAGE
Starter	1 Sensor	39MA51053757	18
	2 Sensors	39MA51010038	19
	3 Sensors	39MA51053758	20
One VFD	1 Sensor	39MA51053760	21
	2 Sensors	39MA51010042	22
	3 Sensors	39MA51010044	23
Two or more VFDs	1 Sensor	39MA51010043	24
	2 Sensors	39MA51030056	25
	3 Sensors	39MA51010045	26
EBM-PAPST	1 Sensor	39MA51010040	27
	2 Sensors	39MA51030055	28
	3 Sensors	39MA51010041	29
Ziehl-Abegg	1 Sensor	39MA51010039	30
	2 Sensors	39MA51030054	31
	3 Sensors	39MA51053759	32

39M — A2L Fan Sensor Wiring Diagrams

WIRING DIAGRAM	39MA51053761	39MA51010032	39MA51010035	
PAGE	**33**	**34**	**35**	
CONFIGURATION	**1 SENSOR**	**2 SENSORS**	**3 SENSORS**	
	MFA/LFA + Non-Stacked coil	**MFA + Non-Stacked coil**	**LFA + Stacked coil**	**MFA/LFA + Stacked coil**
UNIT SIZE	03W	16T	16T	35T
	06W	18T	18T	37T
	07T	22T	22T	42T
	08W	25T	25T	51T
	09T	30T	30T	58T
	10W	40W	40W	61W
	11T	50W	50W	72W
	12W	—	—	85W
	12T	—	—	96W
	14W	—	—	110W
	17W	—	—	—
	21W	—	—	—
	25W	—	—	—
	30W	—	—	—
	36W	—	—	—

39M — A2L Sensor(s) Wiring Diagrams for Units with 2 DX Coils

TYPE	CONFIGURATION	DIAGRAM	PAGE
2 DX Coils	**1 Sensor per Coil**	39MA51010046	36
	2 Sensors per Coil	39MA51030051	37
	3 Sensors per Coil	39MA51050051	38

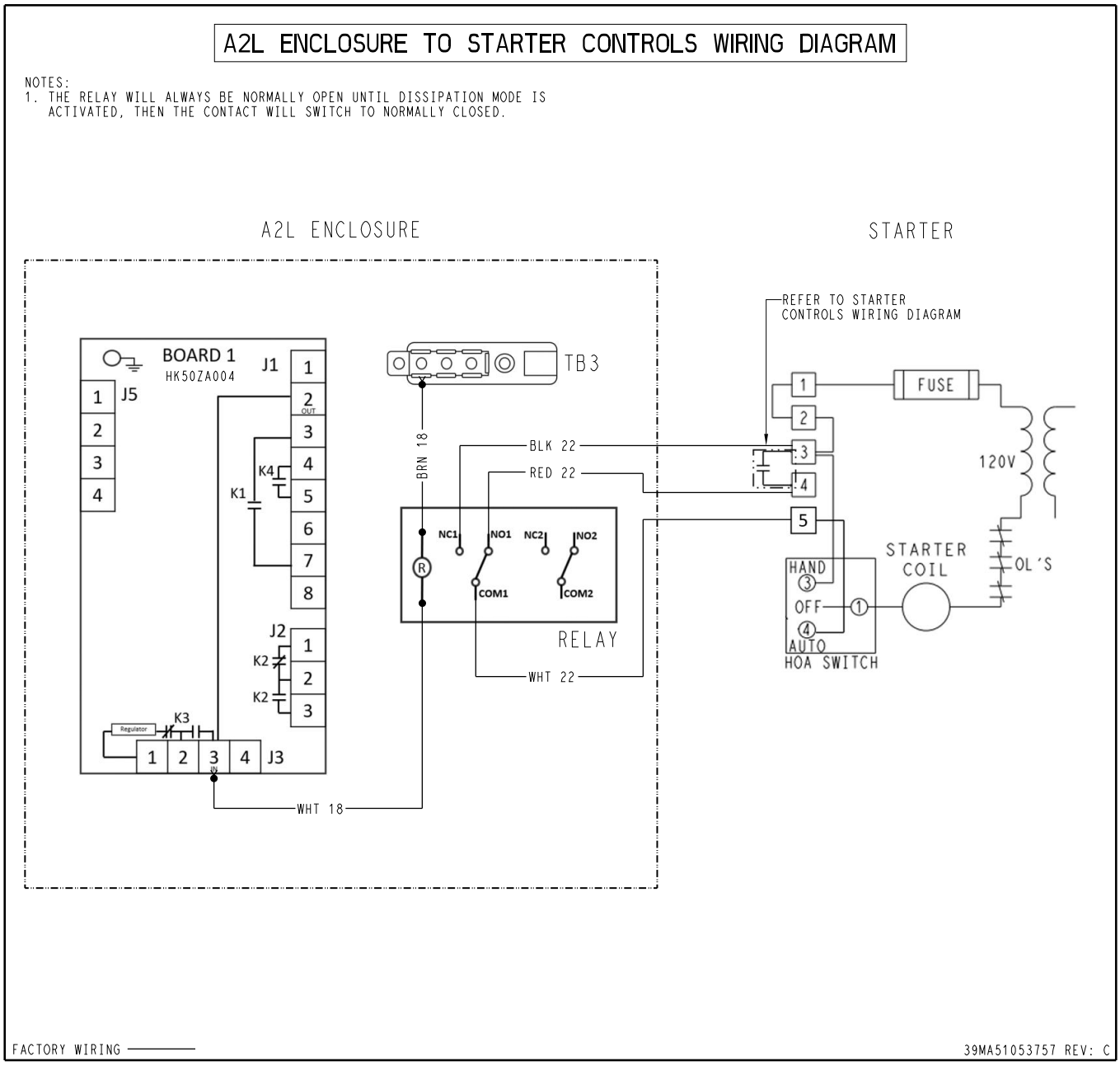


Fig. A — 39L/M — Starter — 1 Sensor

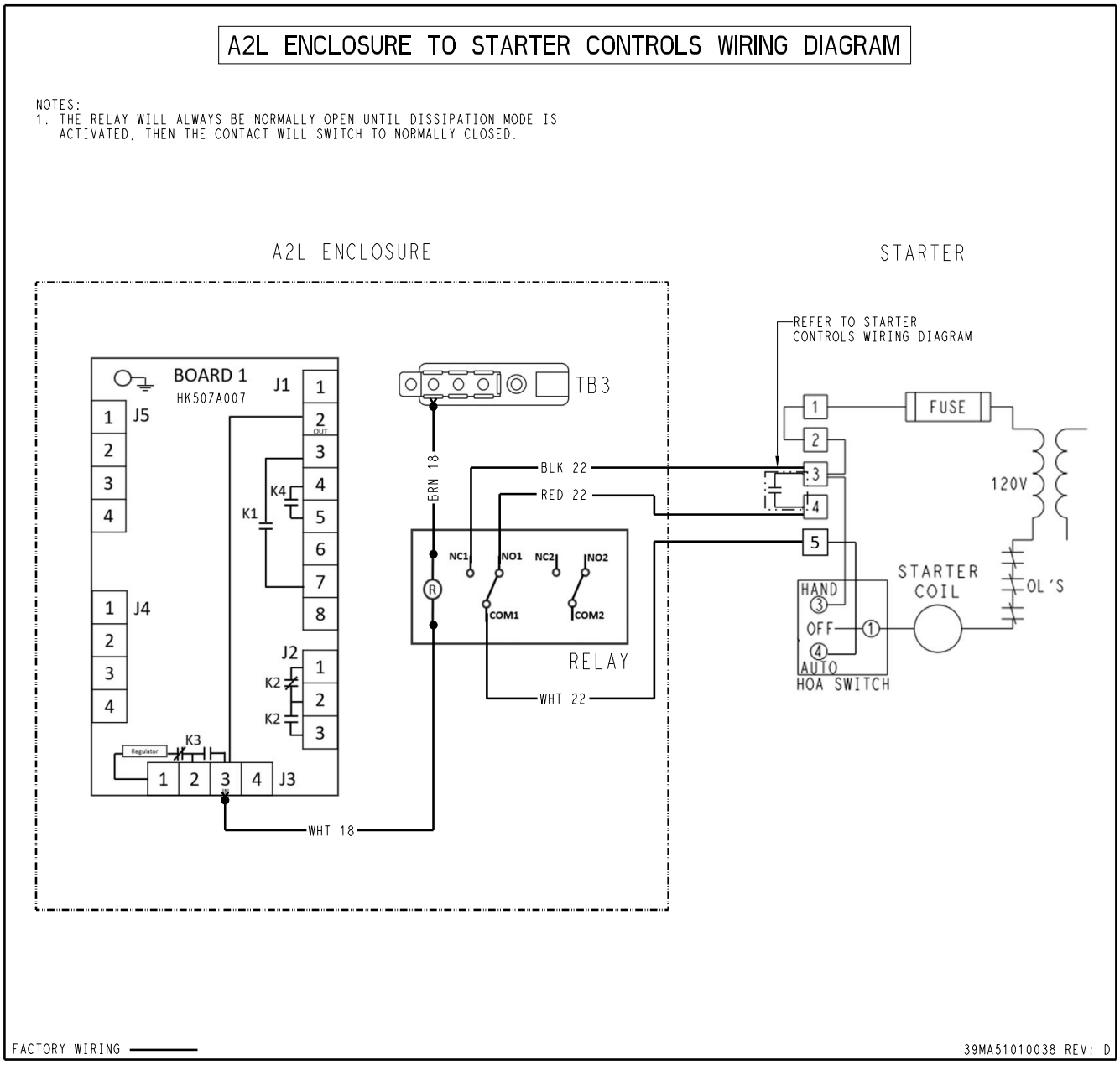


Fig. B — 39L/M — Starter — 2 Sensor

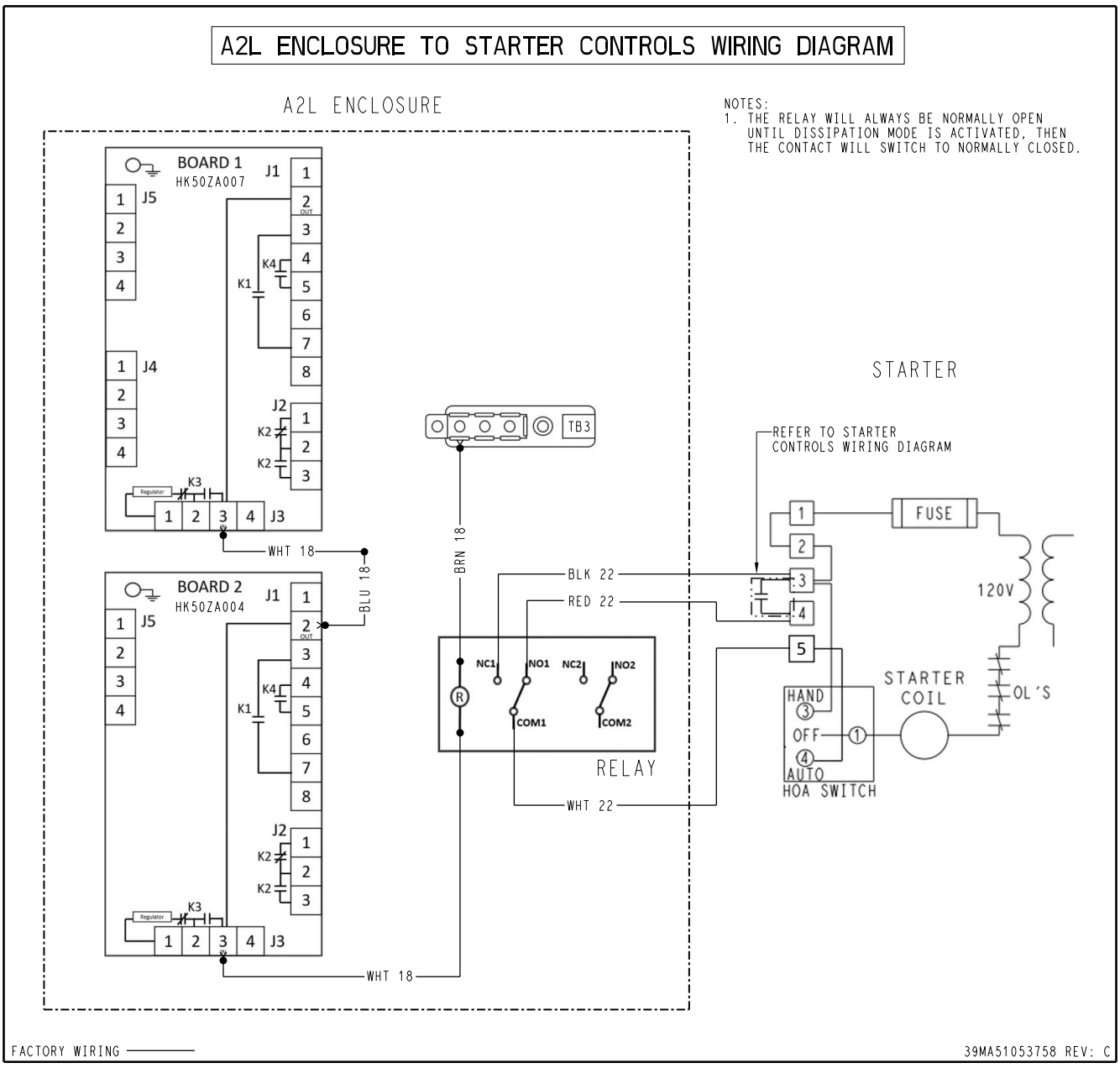


Fig. C — 39M — Starter — 3 Sensor

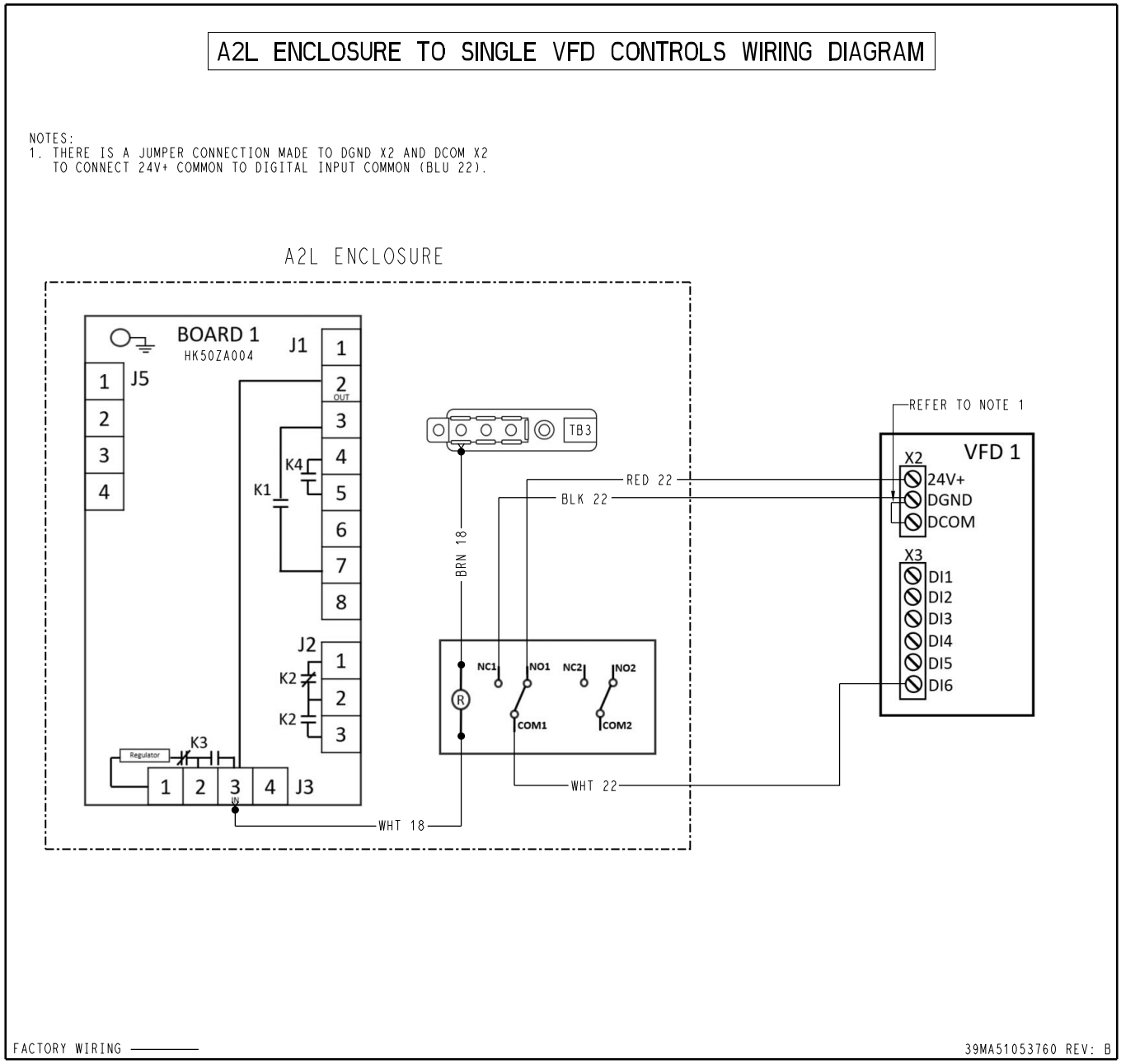


Fig. D — 39L/M — One VFD — 1 Sensor

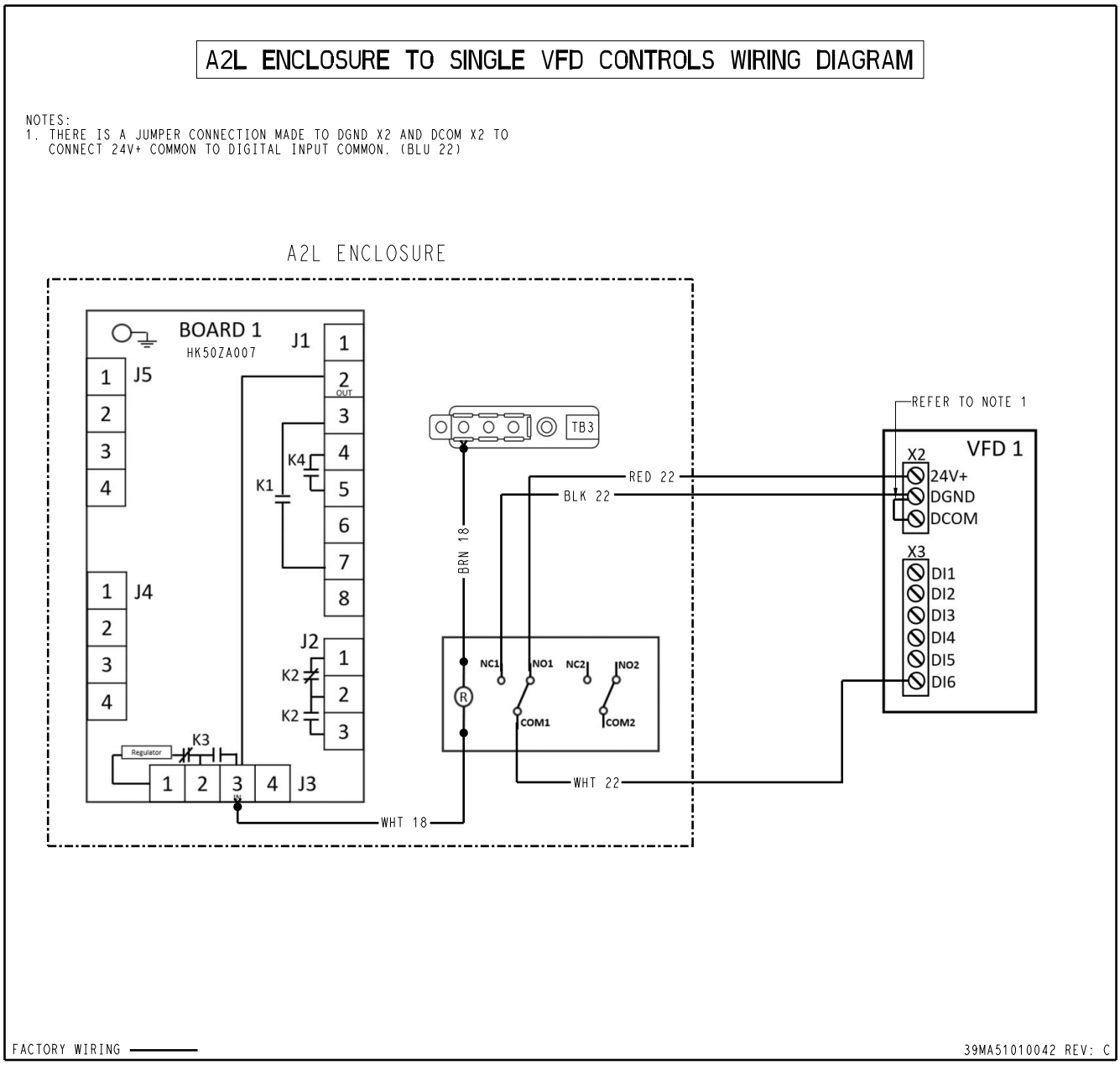


Fig. E — 39L/M — One VFD — 2 Sensors

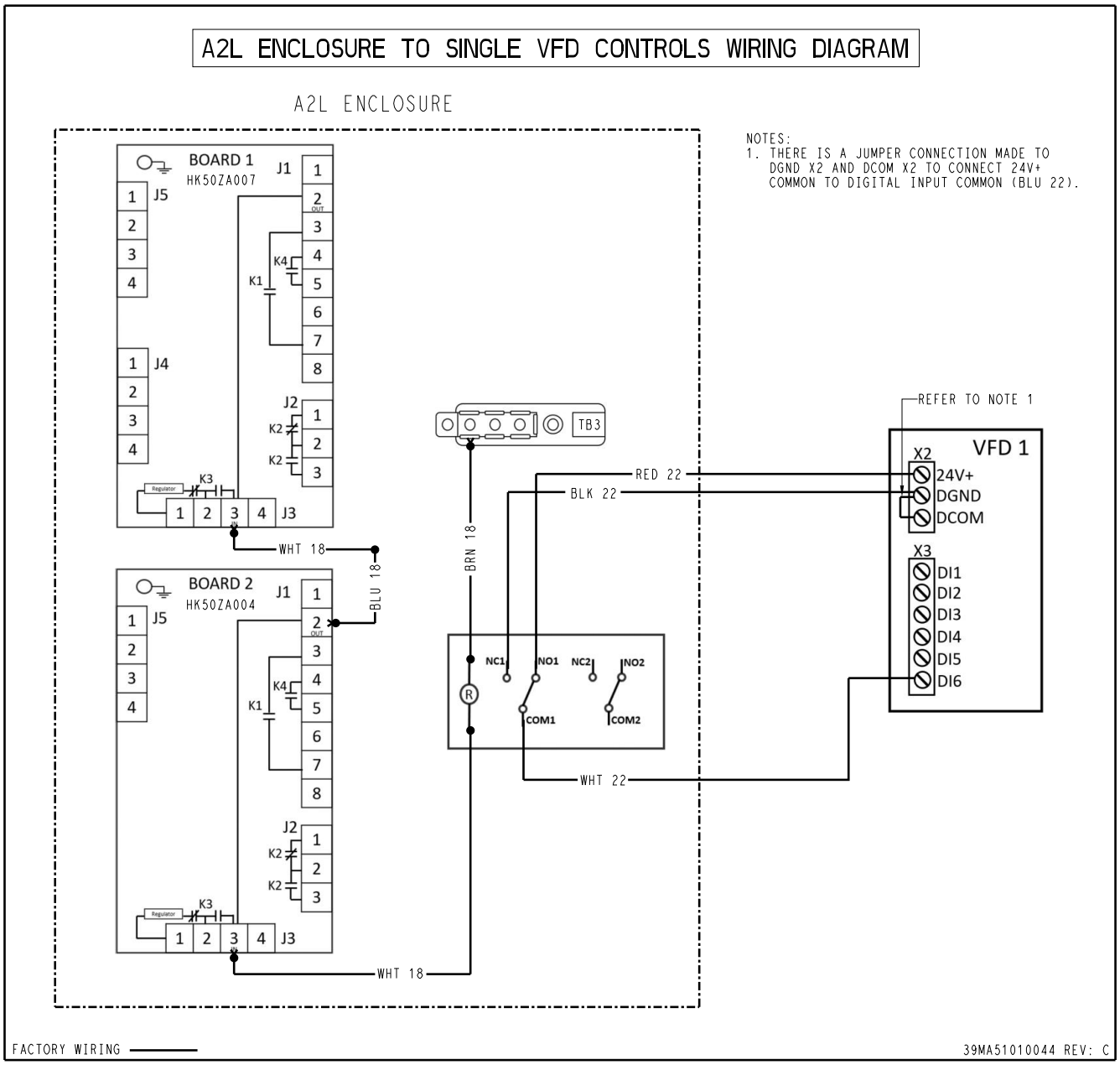


Fig. F — 39M — One VFD — 3 Sensors

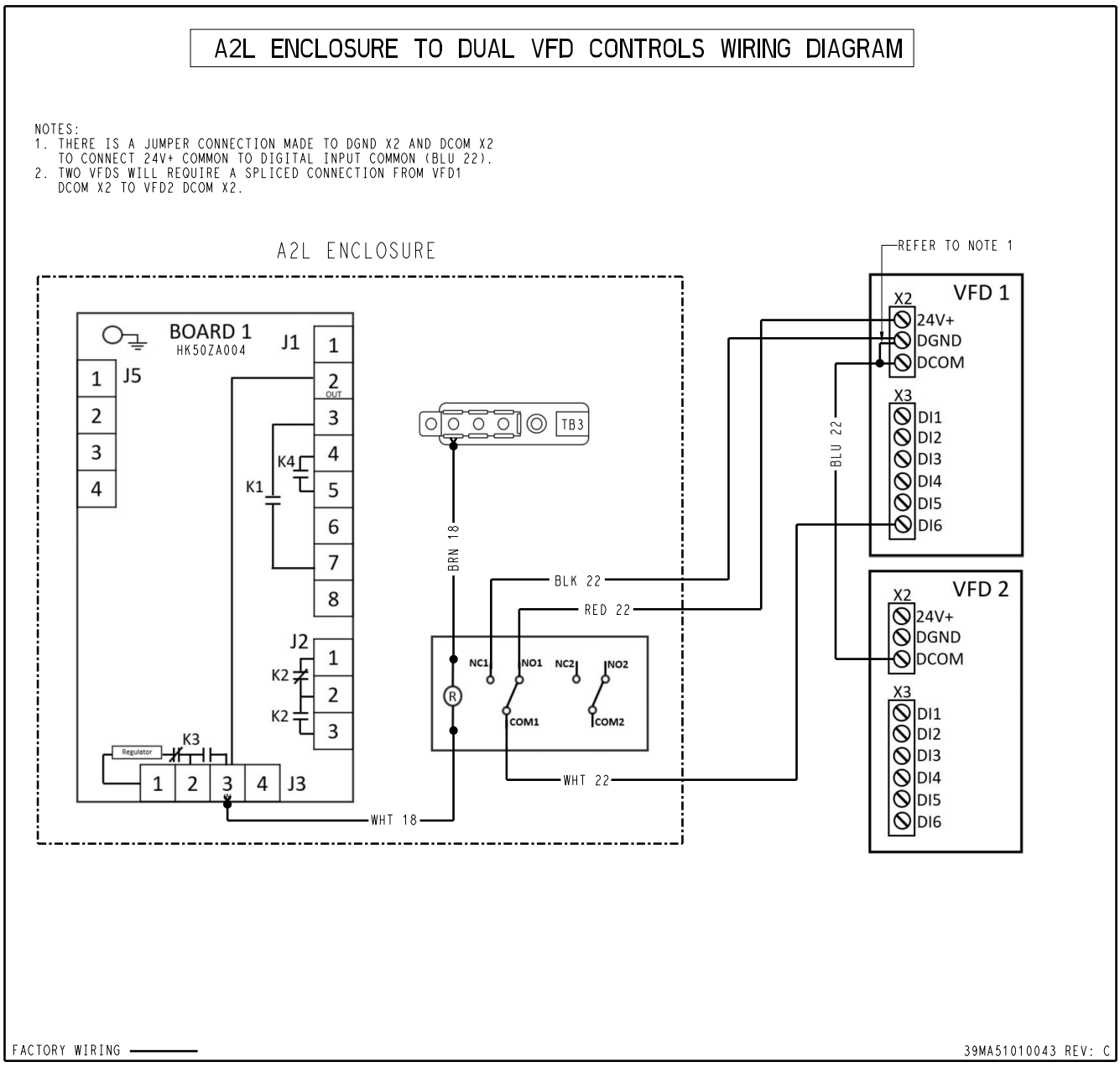


Fig. G — 39M — Two or more VFDs — 1 Sensor

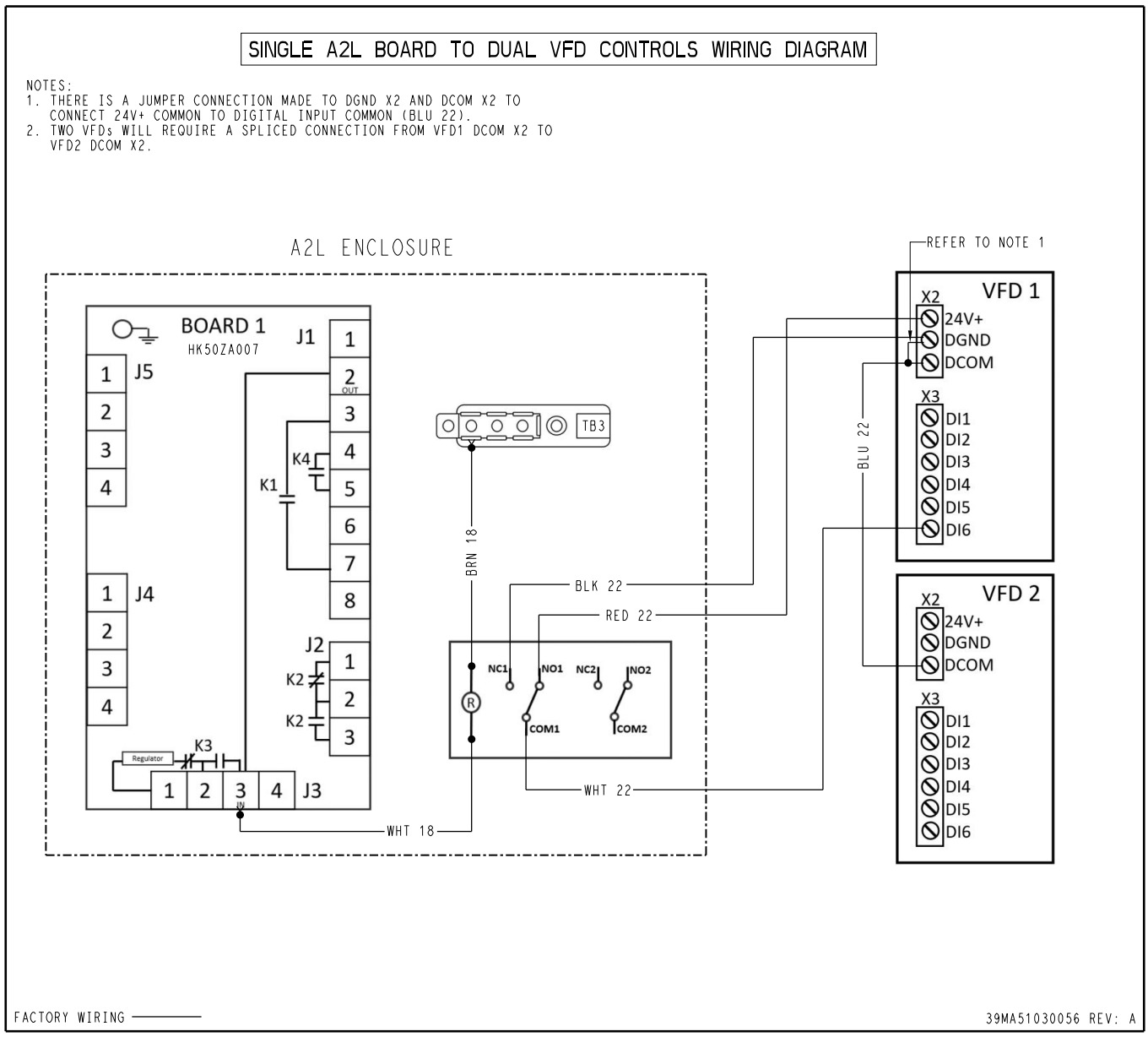


Fig. H — 39M — Two or more VFDs — 2 Sensors

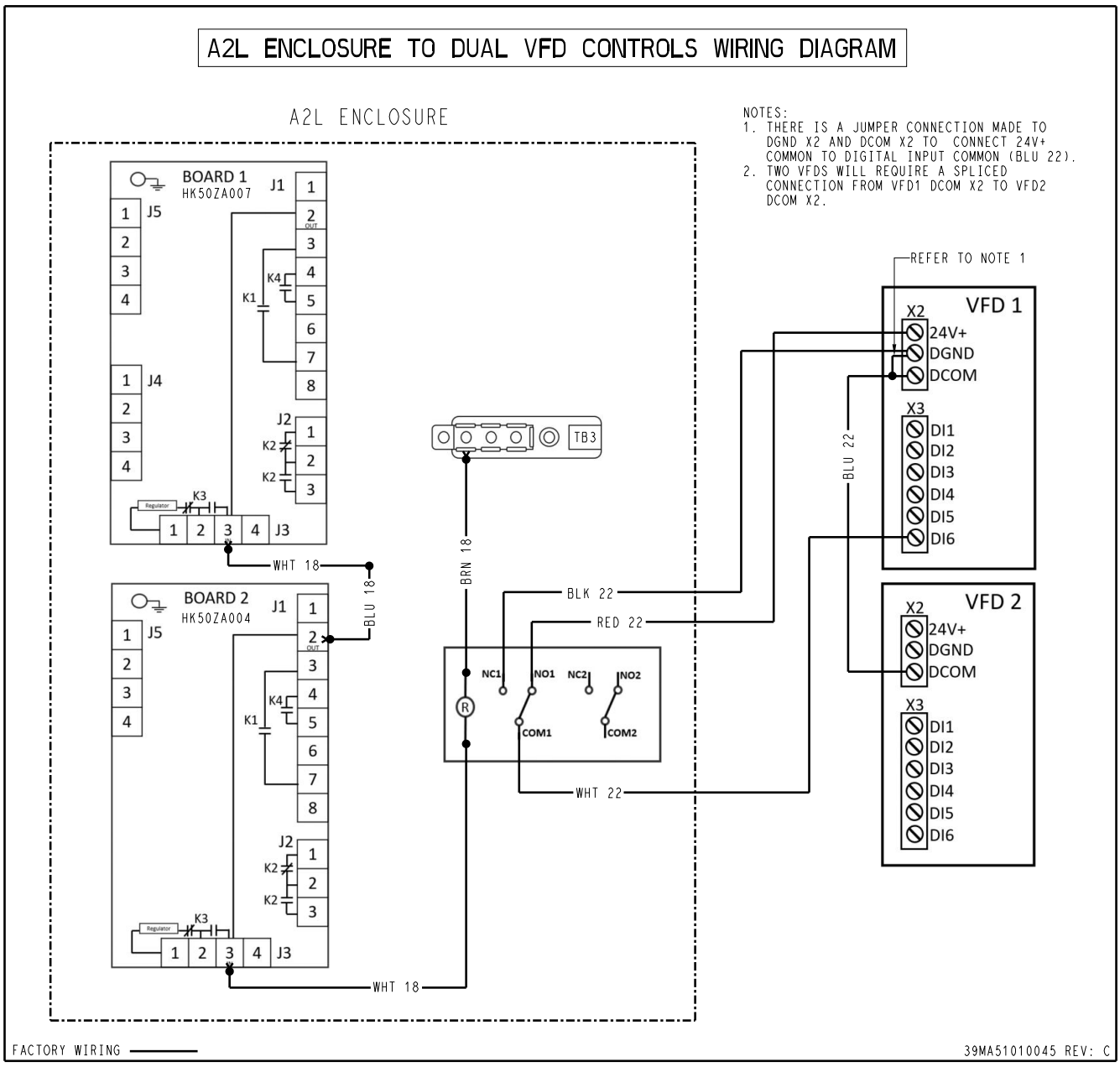


Fig. I — 39M — Two or more VFDs — 3 Sensors

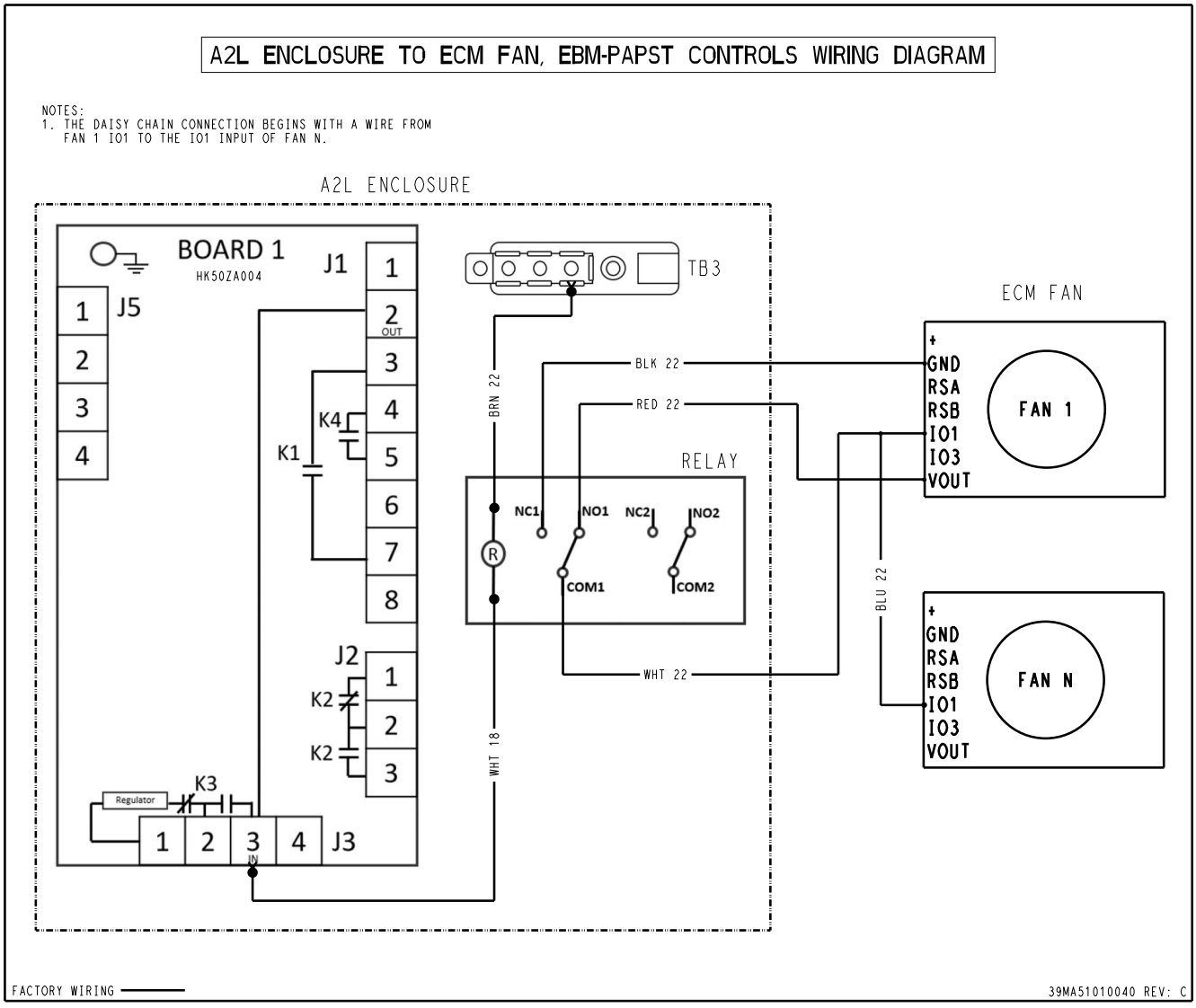


Fig. J — 39M — EBM-PAPST — 1 Sensor

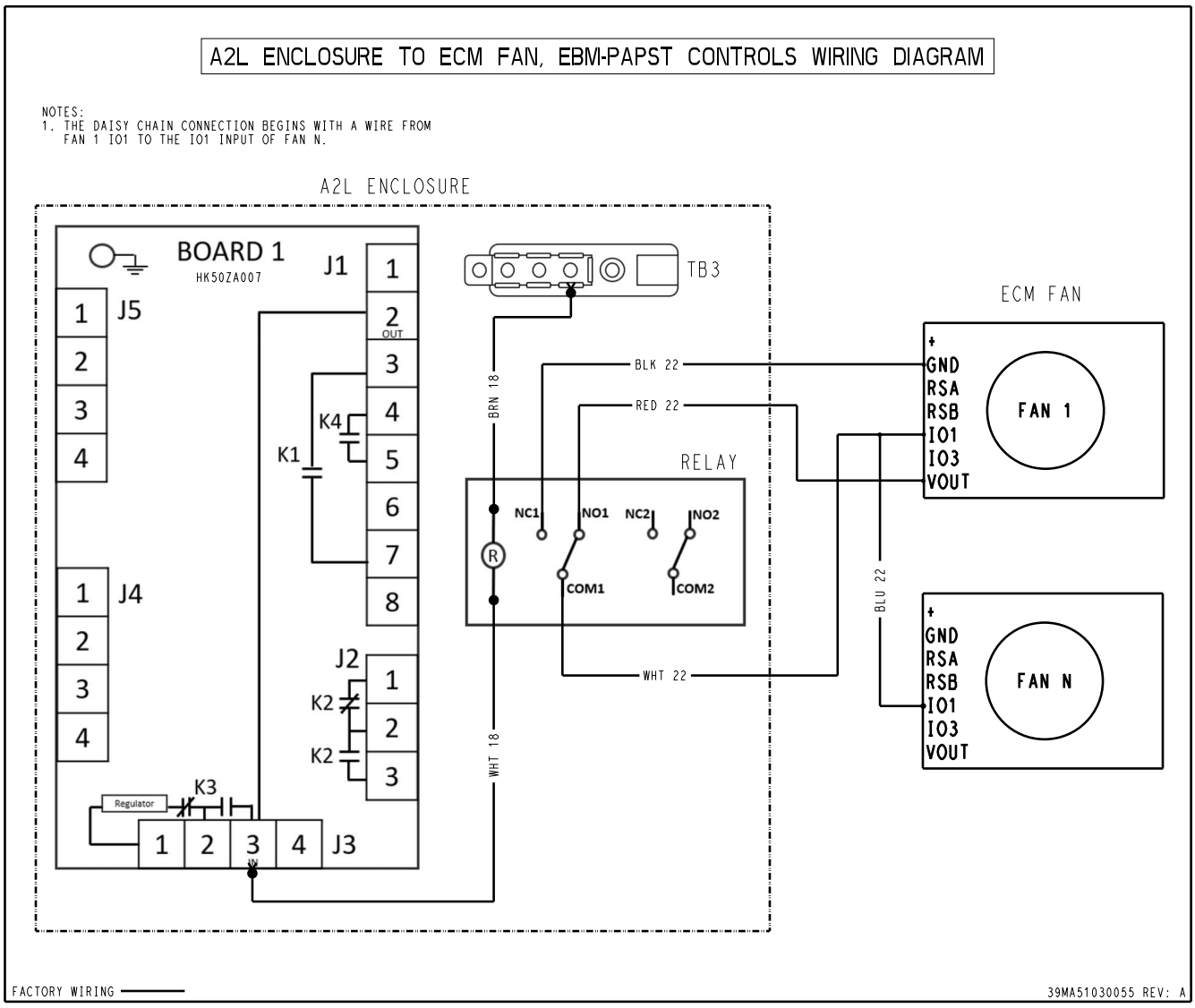


Fig. K — 39M — EBM-PAPST — 2 Sensors

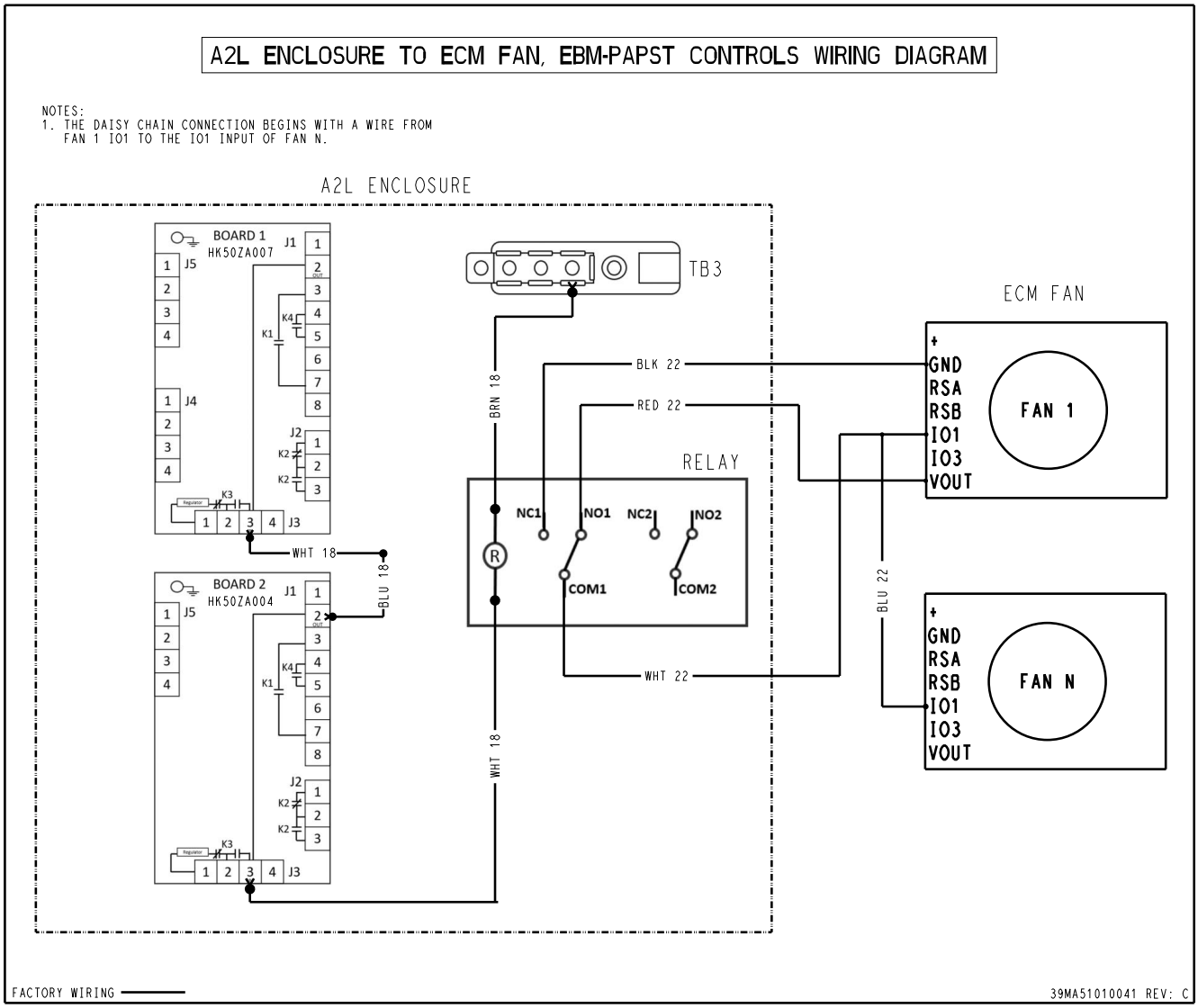


Fig. L — 39M — EBM-PAPST — 3 Sensors

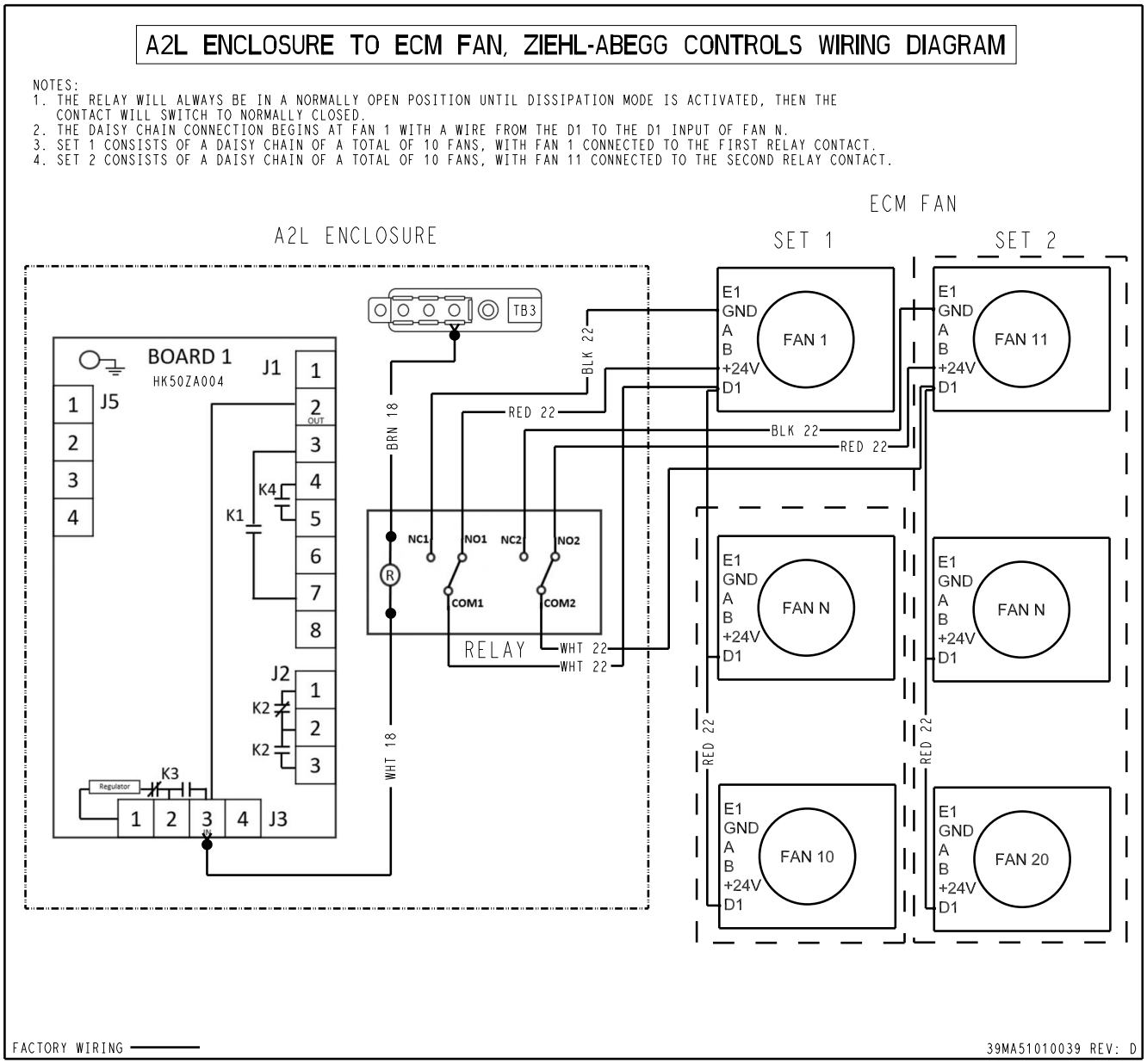


Fig. M — 39M — Ziehl-Abegg — 1 Sensor

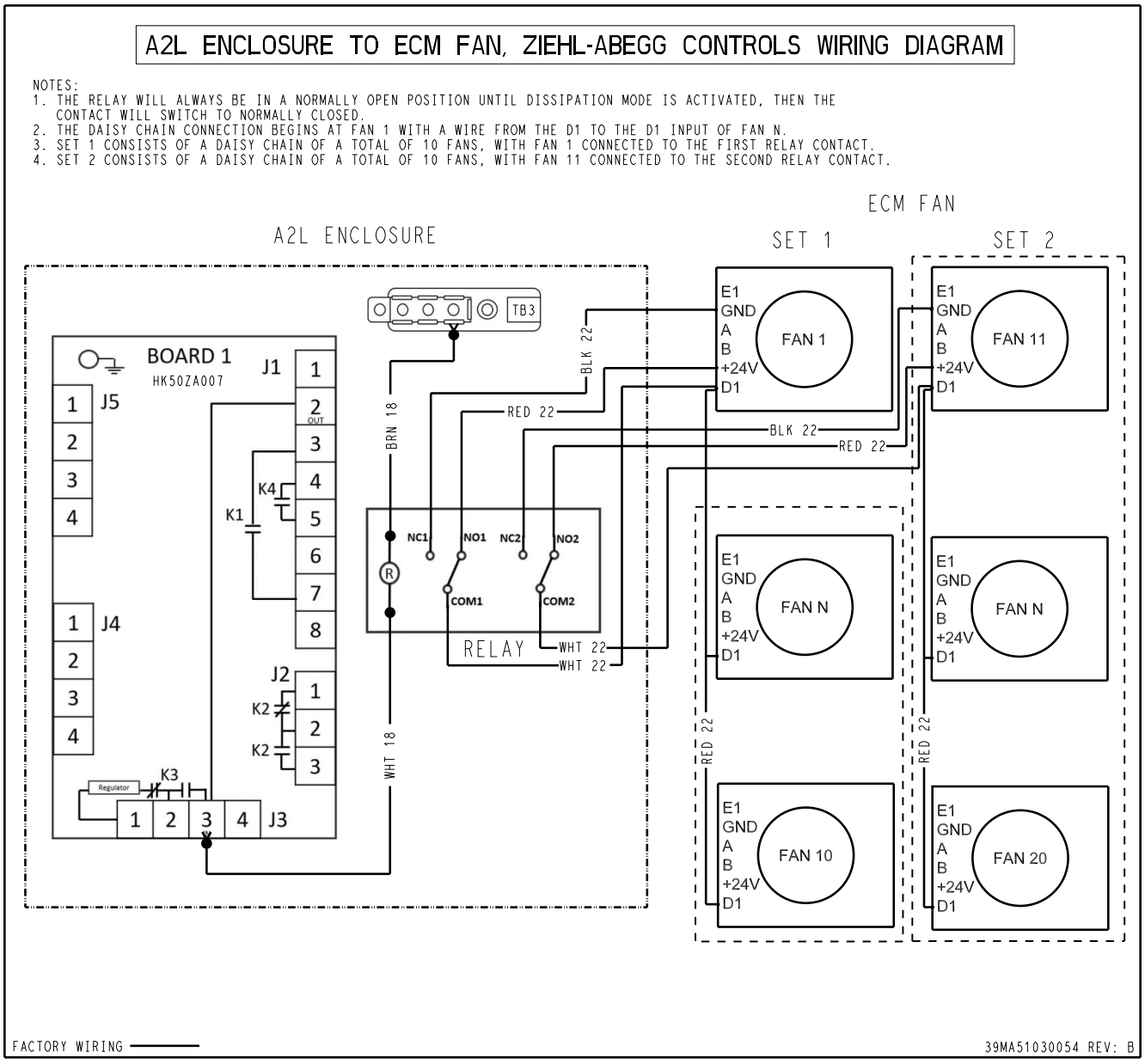


Fig. N — 39M — Ziehl-Abegg — 2 Sensors

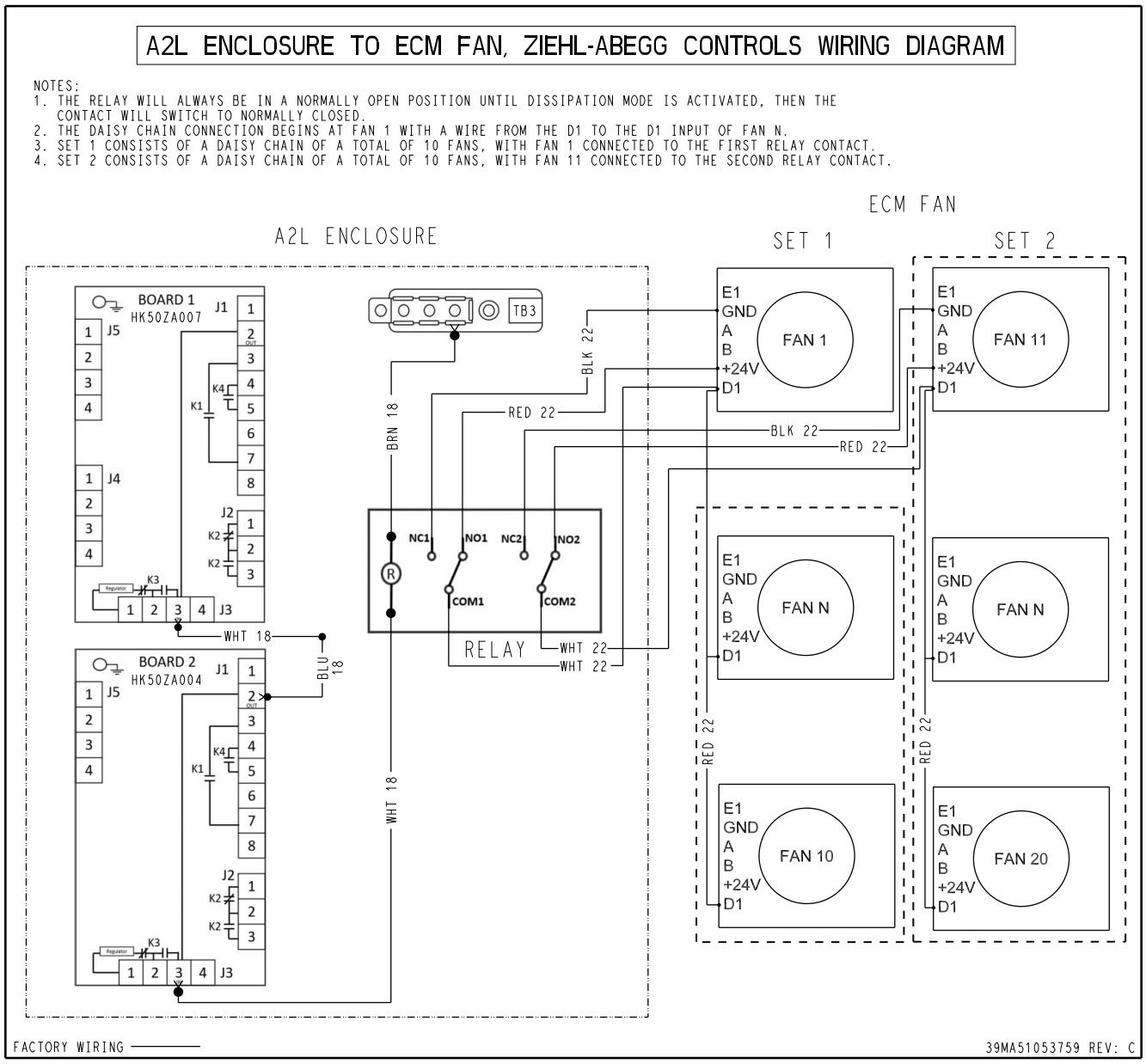


Fig. O — 39M — Ziehl-Abegg — 3 Sensors

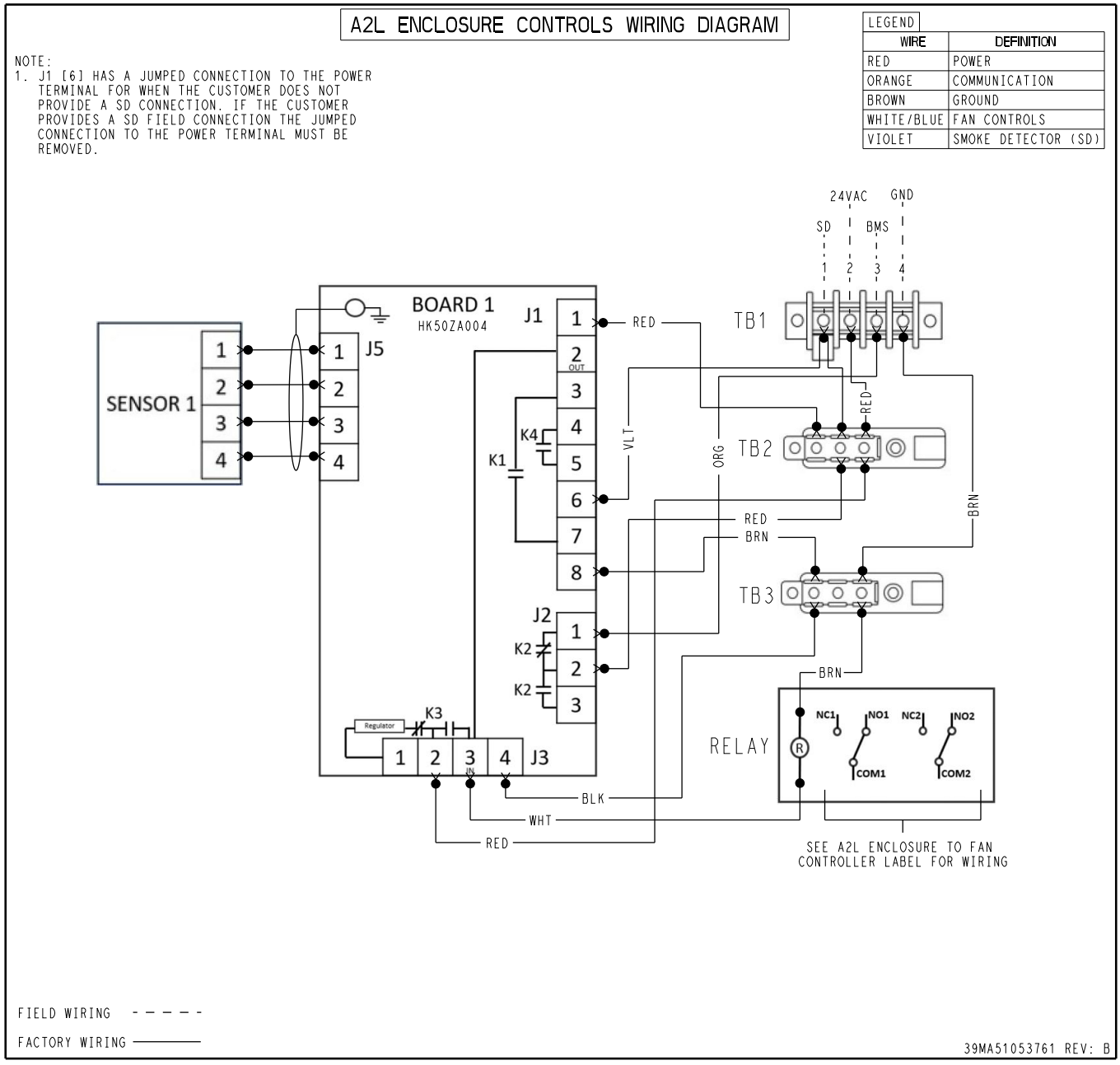


Fig. P — 39L/M — MFA/LFA and Non-Stacked Coil (03W-36W, 07T-12T) — 1 Sensor

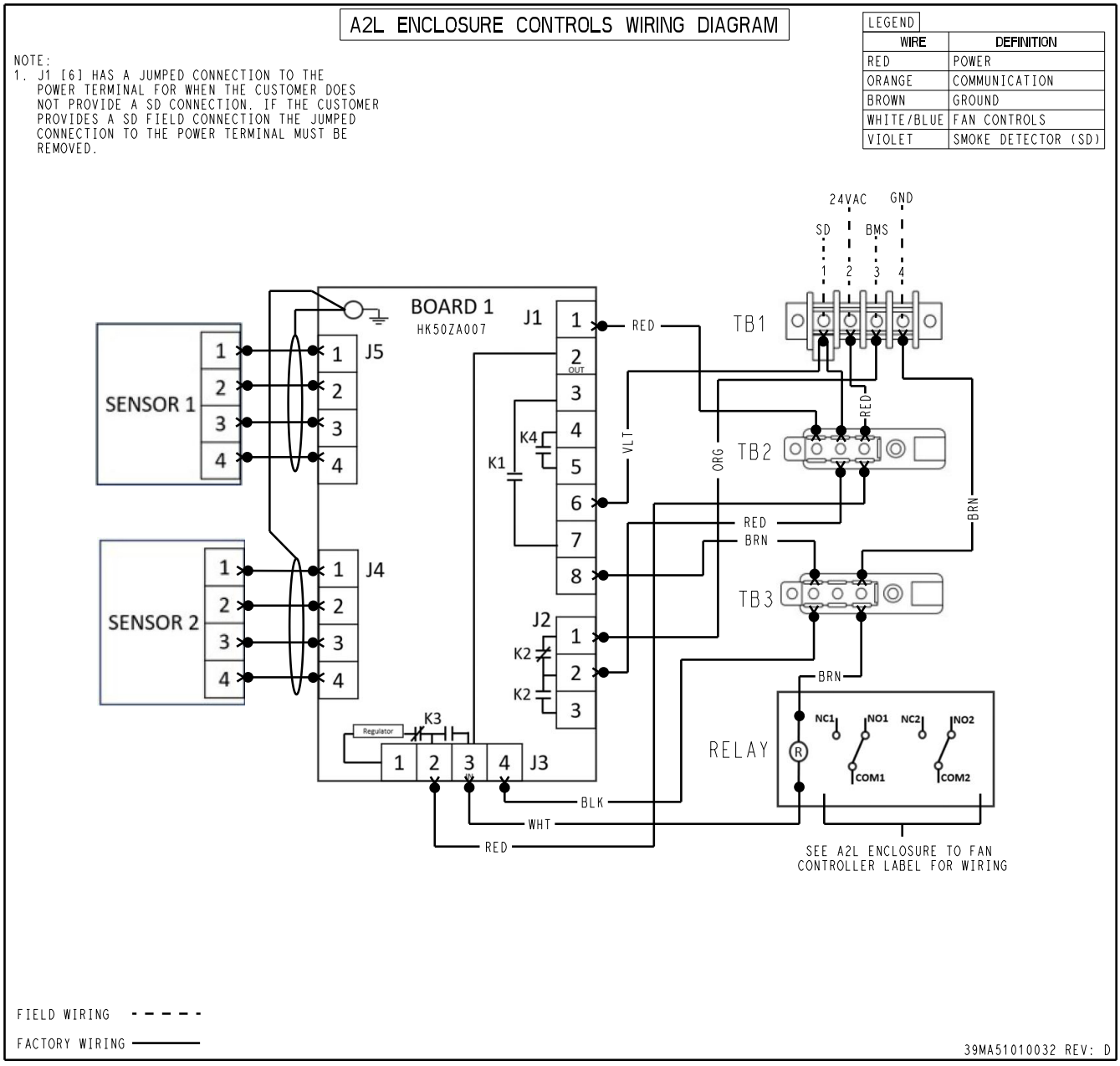


Fig. Q — 39L/M — MFA and Non-Stacked Coil (16T-30T, 30W-40W) — 2 Sensors

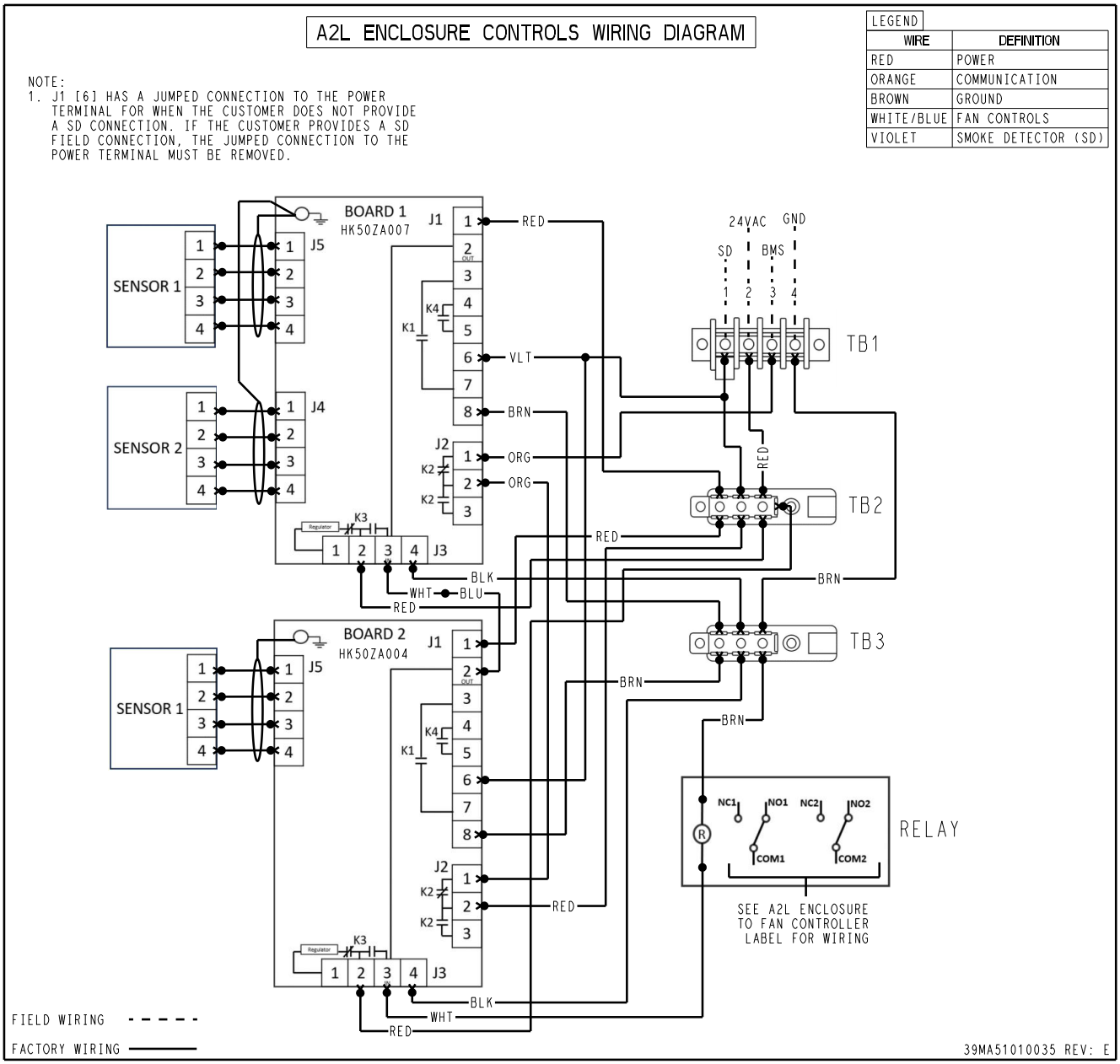


Fig. R — 39M — LFA and Stacked Coil (16T-30T, 30W-40W), MFA/LFA and Stacked Coil (35T-58T, 61W-110W) — 3 Sensors

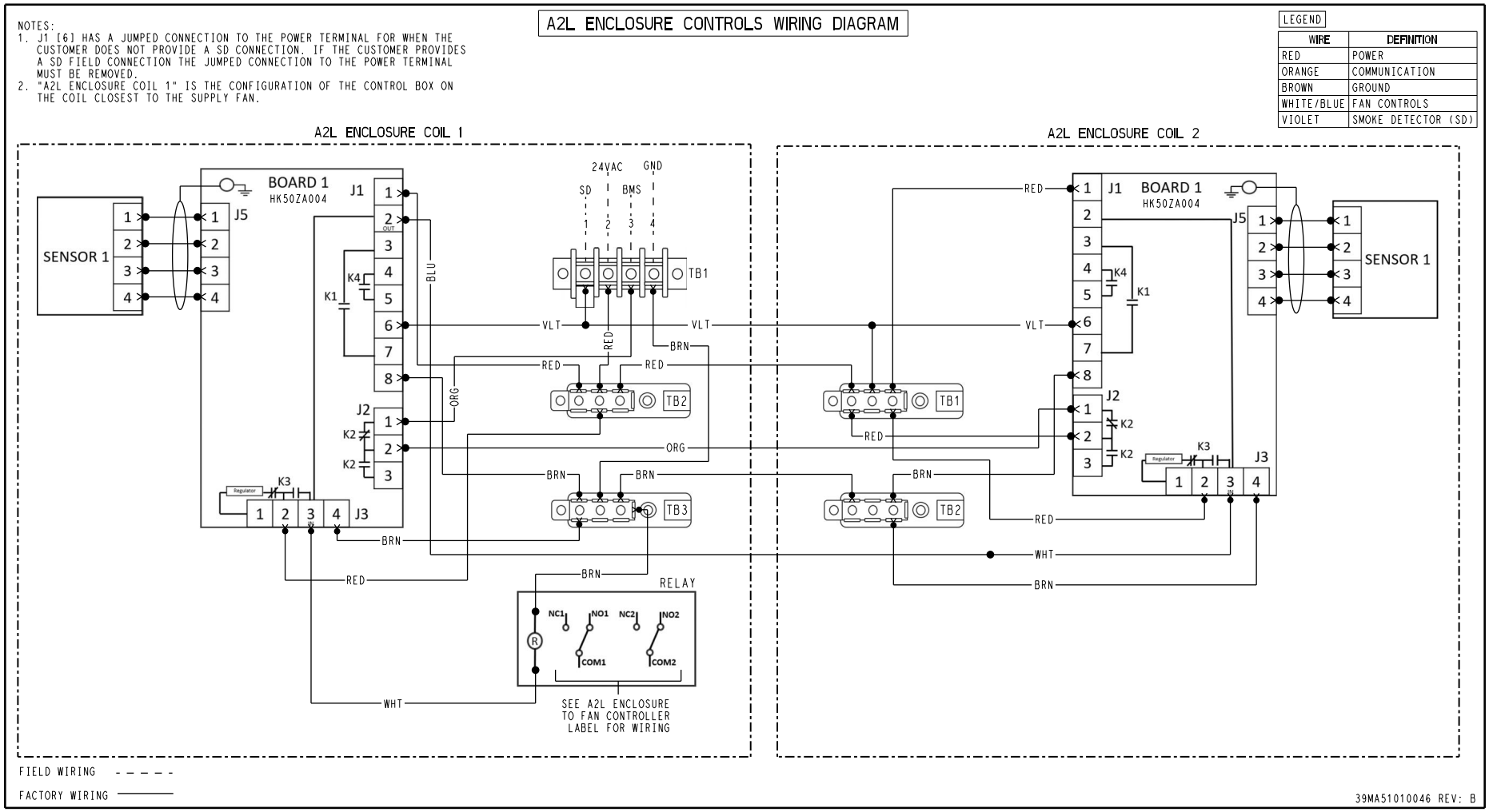


Fig. S — 39M — Units with 2 DX Coils — 1 Sensor per Coil

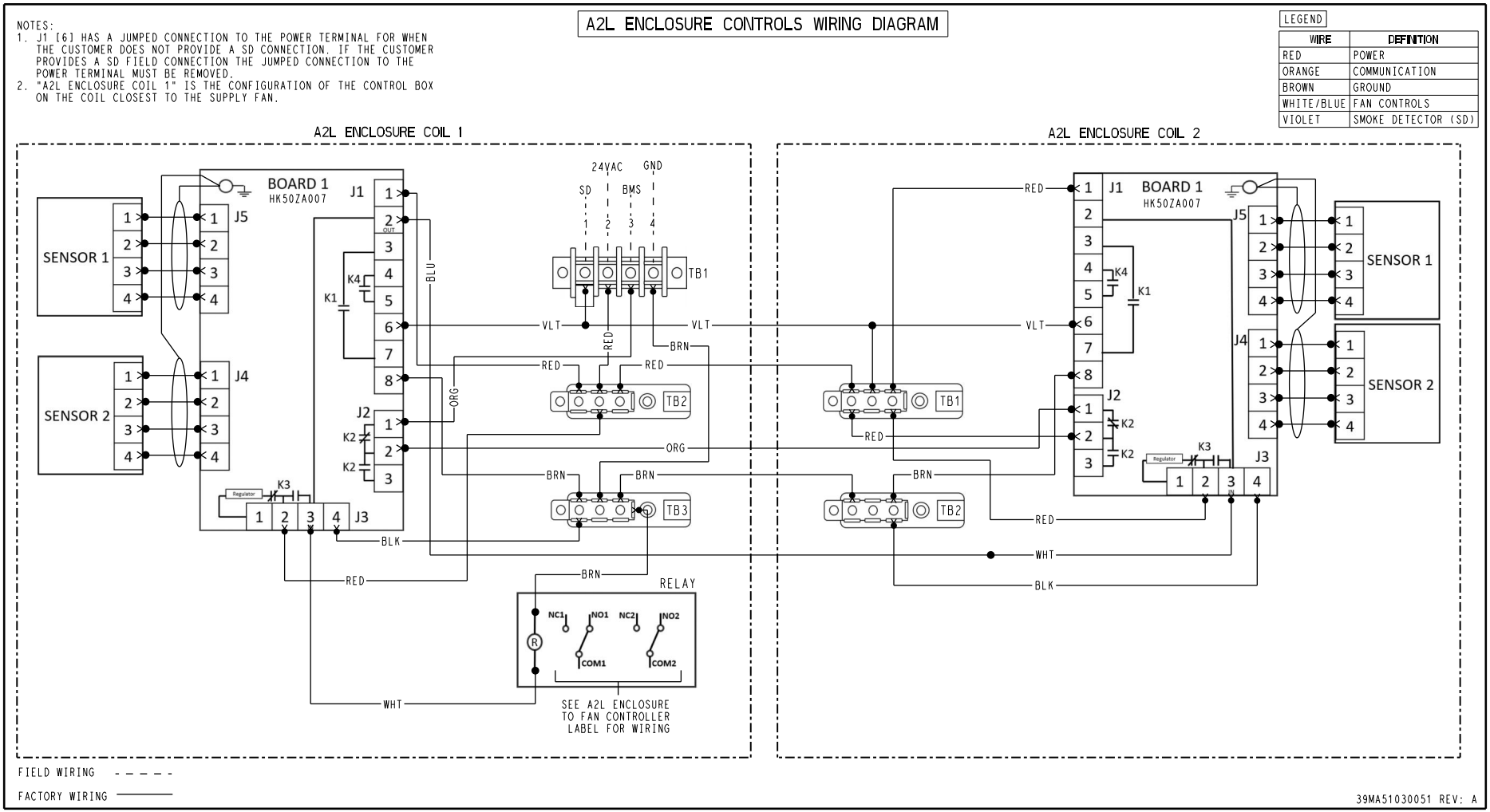


Fig. T — 39M — Units with 2 DX Coils — 2 Sensors per Coil

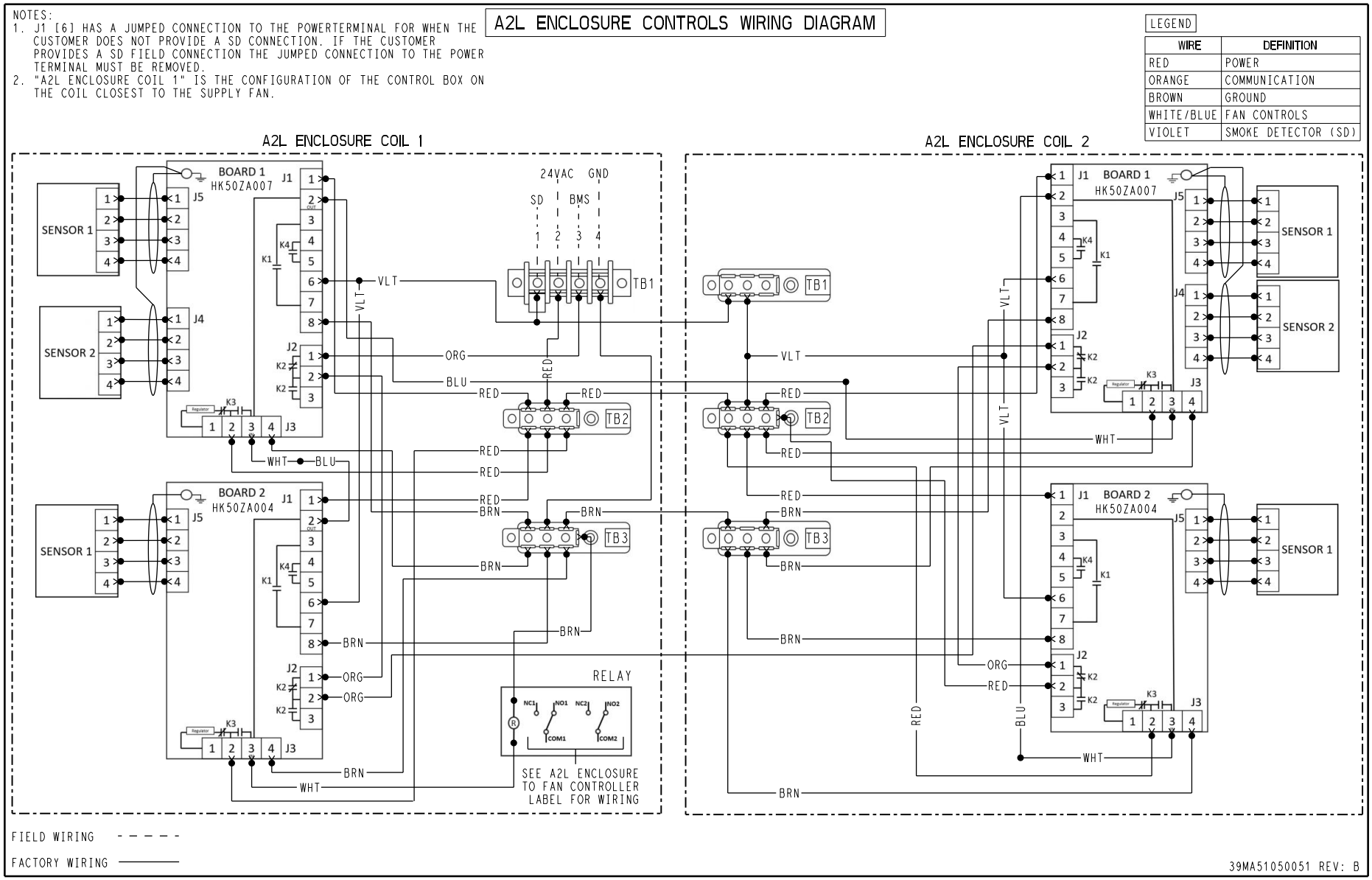


Fig. U — 39M — Units with 2 DX Coils — 3 Sensors per Coil