

# dara-4g<sup>2</sup>

## Installation, Operation & Maintenance Manual



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*Precise by Design*

**Data Aire, Inc. reserves the right to make design changes for the purpose of product improvement or to withdraw any design without notice.**

# TABLE OF CONTENTS

1- Overview and Design Features .....	3-6
Overview .....	3
Design Features .....	3
Routine Status Display .....	4
Conditions and Functions Displayed .....	4
Power On/Off Switch .....	4
System Reset Button .....	4
Control Outputs.....	4
Summary Alarm Contacts .....	5
Audible Alarm and Alarm Silence.....	5
Historical Data .....	5
Units Runtimes .....	5
Menus Driven to Program Lead/lag and Rotation Schedule .....	5
Forced Rotation .....	5
Conditions and Functions Displayed .....	4
Alarm Input Signals.....	6
Manual Bypass Switches.....	6
Optional Zone Temperature and Humidity Sensor.....	6
Optional Network communication for monitoring and control .....	6
2 – Program Menus Setting .....	7-9
Buttons functions .....	7
Passwords .....	7
Menu A- On/Off .....	7
Menu C- Clock .....	8
Menu D- Input/output.....	8
Menu E- Historical data .....	8
Menu F- Information .....	8
Menu G- Network configuration .....	8
Menu H- Calibration sensor .....	8
Menu I- Manual Control .....	8
Menu J- Factory settings .....	8
Menu K- Alarms and Limits.....	8
Menu L- Configuration I/O .....	9
3 – Control Logic.....	9-10
Alarm Standby Logic.....	9
Zone Temperature Control.....	10
4 – Wiring Connection .....	11-12
5– Specifications.....	13

# 1. OVERVIEW AND FEATURES

## Overview

dara-4g<sup>2</sup> is a Lead/Lag Rotation and Alarm Auto changeover control panel for up to four HVAC units. The number of HVAC unit to maintain online and to hold offline is programmed on dara-4g<sup>2</sup> menus. Routine lead/lag unit rotation can be set from 4 hours up to 30 days, or no rotation. Force rotation setting allows user to manually advance the rotation schedule to the next desired lead/lag rotation pattern. Each HVAC unit is controlled by a non-power relay contact. Unit status messages are continually scrolled on a front panel 4 rows 22 characters liquid crystal display (LCD). dara-4g<sup>2</sup> has two levels of password to prevent an unauthorized access for service and for programming. dara-4g<sup>2</sup> has a manual diagnostic menu that allows user to test the control inputs and outputs. Four built-in manual override switches allow the user to override the automatic functions in an emergency case or a failure of the dara-4g<sup>2</sup>. An optional zone air temperature and humidity sensor allows dara-4g<sup>2</sup> to monitor the zone air condition and controls standby unit based on a zone air temperature setpoint (Temperature Assist Mode). An optional network communication card allows dara-4g<sup>2</sup> to interface with a BMS via Modbus or BACnet network protocol to monitor and control the system.

## Design Features

- Fuses protected 24 VAC power input
- Built-in liquid crystal display with system status
- Power On/Off slide switch
- Four control relays with 8 amp non-power control contacts
- Audible alarm with selectable sound patterns
- A form C summary alarm contacts for remote alarm status monitoring
- Force rotation menu for rotation pattern selections
- Four alarm inputs dry contacts
- Units manual bypass switches
- Soft buttons for programming
- Menus driven to program
  - o Number of units connected
  - o Number of units on
  - o Lead unit selection
- Optional zone temperature sensor for monitoring and control
- High zone temperature setpoint
- Manual diagnostic test
- Two levels passwords for security
- Date and time display with real time clock
- Rotation schedule display
- Current units status with lead unit indicator
- Historical data for alarm history and units' runtimes
- Silence alarm button to reset alarm units
- Units on fail-safe
- USB port for firmware upgrade
- Optional BACnet MSTP, BACnet IP and Modbus RTU network card for BMS interface

## Routine Status Display

Status messages are continually scrolled on a built-in 4-rows, 22-characters liquid crystal display (LCD). All information is routinely reported on the dara-4g<sup>2</sup> display as follows:

### Routine Status Messages

Message	Meaning of Messages
<b>dara-4g<sup>2</sup></b>	
11:11:11 16:30	Time and date.
System status: on	dara-4g <sup>2</sup> is currently online.
U1 U2 U3 U4	Number of unit connected.
Run Run Off Off	Current running and standby unit status .
■	Black box indicates current leading unit.
Time to next rotation	Time to next rotation schedule.
Days:00 Hrs:23 Min:45	Countdown time clock to the next rotation.
Optional Status Messages	
TEMP: 72.2° F	Display if an optional Zone temperature sensor installed.
R. HUM : 45%	Display if an optional Zone Relative humidity sensor installed.
Alarm Messages	
Unit 1 In Alarm	Unit 1 has alarm
Unit 2 In Alarm	Unit 2 has alarm
U1 U2 U3 U4	Number of unit connected
R+A Run ALM ALM	R+A = Unit has alarm but must stays online because there is no standby unit available.
High Zone Air Temperature	Optional zone temperature is higher than zone temperature setpoint plus deadband.
Standby Units Assists	Standby unit is on by zone temperature setpoint
Override Switch Activated	Manual override switches are on

### Power On/Off Switch

The main power ON/OFF switch for the dara-4g<sup>2</sup> panel is located on circuit board inside the enclosure. The switch controls 24 VAC power input to dara-4g<sup>2</sup> circuit board and controller. After turning the main power ON/OFF switch, press and hold the ESC button on the display for five (5) seconds, to turn on the dara-4g<sup>2</sup> controller.

### System Reset Button

Alarm Silence button will be used to reset dara-4g<sup>2</sup> to its original state after an alarm change-over event. The unit's alarm must be cleared and unit's alarm contact must be open before a reset. Press the Alarm silence button twice when alarm message appears on dara-4g<sup>2</sup> display to reset the dara-4g<sup>2</sup>.

### Control Outputs

There are four 8-Amp @250VAC normally closed contacts on dara-4g<sup>2</sup> to control four HVAC units. These contacts will be wired to each unit for on/off control. dara-4g<sup>2</sup> will open the contacts to put standby units into off mode or close the contacts to activate the units. The fail- safe mode of dara-4g<sup>2</sup> control contacts is normally close; this will keep all units running if dara-4g<sup>2</sup> panel fails.

## Summary Alarm Contacts

dara-4g<sup>2</sup> has a standard form C (N.C and N.O) summary alarm contacts for system monitoring. When an alarm condition is detected, the alarm contacts will change its state until the alarm condition is corrected.

## Audible Alarm and Alarm Silence

The audible alarm will sound when dara-4g<sup>2</sup> detects an alarm condition. The audible alarm sounds can be programmed to short beep, long beep, full on or none using Audio mode on menu K- Alarms and Limits of the dara-4g<sup>2</sup>. Press Silence button once when alarm display on LCD screen to silence and audio alarm.

## Historical Data

dara-4g<sup>2</sup> can record up to 100 alarm events. Alarm history can be viewed in Historical Data menu E and cleared using Reset Alarm Log setting in menu K- Alarm and Limits. To reset alarm log, go to menu K, change the Reset Alarm Log setting from NO to YES, alarm log will clear and setting will reverse to No.

## Units Runtimes

dara-4g<sup>2</sup> records units' runtimes in its historical data memory. Units' runtimes can be viewed in menu E Historical Data. To view runtimes, go to menu E then press down key to go to Runtimes screen. To clear runtimes, use enter and up or down key to change letter "No" next to runtime to "Yes", runtime will reset to zero value.

## Menus Driven to Program Lead/Lag and Rotation Schedule

The following unit Lead/lag and rotation schedule settings are programmed in menu J-Factory settings of the dara-4g<sup>2</sup>. Factory password requires accessing this menu.

### System Settings

- Unit in the Zone (1-4)  
This setting defines the number of units are connected to dara-4g<sup>2</sup> panel to rotation control. It can be set from 1 to 4.
- Number Units On (1-4)  
This setting defines the number of units need to be online at all times.

### Rotation

- Time Rotation : None, 4 hrs, 8 hrs, 12 hrs, 24 hrs, 7 days, 14 days, 30 days
- Current Lead Unit: Unit 1 (Unit 2, Unit 3)  
This indicates the current lead unit, use Force Rotation setting to select a desire lead unit.

## Forced Rotation

When the dara-4g<sup>2</sup> panel is first powered on and finished with its start-up self-tests, it will always begin with the default programmed rotation pattern with unit#1 as the lead unit. To select a different rotation pattern go to menu J-factory Settings then go to Force Rotation and change the setting from No to Yes. Each time the Force Rotation menu setting is changed the leading unit will rotate to the next available unit. dara-4g<sup>2</sup> will begin using the last programmed pattern when panel is reset. Rotation interval timing is restarted fresh each time a new pattern is selected.

All possible rotation patterns are shown in the following chart. Each number refers to the HVAC Unit number:

- 1 = Unit 1
- 2 = Unit 2
- 3 = Unit 3
- 4 = Unit 4

Active online units are indicated with bold number in the chart, and standby unit are indicated with small unit number in the chart. The Off designation means that the HVAC Unit is currently OFF but available in the case of alarm.

Rotation Patterns				
	Pattern 1	Pattern 2	Pattern 3	Pattern 4
<b>2 Units connected</b>				
1 in Off	1 > 2	n/a	n/a	n/a
<b>3 Units connected</b>				
1 in Off	1 > 2 > 3	2 > 3 > 1	3 > 1 > 2	n/a
2 in Off	1 > 2 > 3	2 > 3 > 1	3 > 1 > 2	n/a
<b>4 Units connected</b>				
1 in Off	1 > 2 > 3 > 4	2 > 3 > 4 > 1	3 > 4 > 1 > 2	4 > 1 > 2 > 3
2 in Off	1 > 2 > 3 > 4	2 > 3 > 4 > 1	3 > 4 > 1 > 2	4 > 1 > 2 > 3
3 in Off	1 > 2 > 3 > 4	2 > 3 > 4 > 1	3 > 4 > 1 > 2	4 > 1 > 2 > 3

If Time Rotation in Menu J-Factory Settings is set to “None” then units remain in an unchanging (fixed) lead/lag pattern. The Force Rotation menu can still be used to force the rotation patterns to select the desired fixed pattern. The lead/lag pattern will remain unchanged indefinitely until the pattern is manually advanced.

### Alarm Input Signals

dara-4g<sup>2</sup> panel accepts four alarm inputs dry contacts from the Alarm Relay at each HVAC Unit. These contacts must be dry set of contacts (Non-Power contacts). dara-4g<sup>2</sup> panel will indicate alarm status based on the conditions of these alarm input signals (Open Contact = no alarm; Close Contact = active alarm).

When alarms are detected, dara-4g<sup>2</sup>'s alarm auto-changeover function can systematically bring on-line an equal number of designated standby units to make up for any lost capacity until all standby units are in use. Specific Alarm Standby control logic options are programmed on menu K-Alarm & Limits – Unit Action menu. These options are: Turned Off, Stay On, and Condition. See Alarm Standby Logic section below for detailed logic.

### Manual Bypass Switches

The dara-4g<sup>2</sup> panel is equipped with 4 manual bypass switches to override the dara-4g<sup>2</sup> panel and manually turn on each corresponding HVAC unit. dara-4g<sup>2</sup> monitors the status of the bypass switches, the dara-4g<sup>2</sup> audible alarm will sound if programmed and the LCD will display the message MANUAL OVERRIDE SWITCH ACTIVATED if one of the manual override switches is in the on position. However, this condition does not activate the dara-4g<sup>2</sup> alarm relay and no changes are made to the standard lead/lag rotation and alarm auto changeover sequence.

### Optional Zone Temperature and Humidity Sensor

Optional Zone temperature and humidity sensor can be connected to dara-4g<sup>2</sup> for monitoring and temperature control. Select Temperature Assist if zone temperature control is desired. dara-4g<sup>2</sup> will bring next available standby Unit online when zone temperature rises above Zone High Temperature setpoint plus Temperature deadband.

### **Optional Network Communication card for Monitoring and Control**

dara-4g<sup>2</sup> supports an optional network communication card that allows an interface with a BMS or BAS system for system monitoring and control. dara-4g<sup>2</sup> supports one of the following network protocols: Modbus RTU, Modbus TCP/IP, BACnet MS/TP, BACnet IP, SNMP.

The following points are available:

For monitoring:

- Units' status (on or off)
- Units' alarm (unit in alarm mode)
- Manual override alarm status
- Optional zone temperature reading
- Optional zone humidity reading







For Control:

- Change units status setting
- Zone temp setpoint
- Zone Temp deadband
- Changeover delay
- Changeover schedule



## 2. PROGRAM MENU SETTING

### Button Functions

<p>Alarm</p> 	<p>Allows viewing of active alarms Silences audible alarms Resets active alarms and reset the system</p>
<p>Menu</p> 	<p>Allows entry to Main Menu Go to Password screen</p>
<p>ESC</p> 	<p>Return to previous screen or exit menus Hold 5 seconds to turn system ON or OFF</p>
<p>Up</p> 	<p>Allows scrolling to next screen Advance to next menu Allows values changes (increase)</p>
<p>Down</p> 	<p>Returns to previous screen Advance to next menu Allows value changes (decrease)</p>
<p>Enter</p> 	<p>Allows entry to Menus (enter programming mode) Advances cursor and save settings</p>

### PROGRAMMING

#### Passwords

To enter dara-4g<sup>2</sup> Menu mode a password is required, press Menu button then use Enter and Up/Down button to enter Service password which is default to 0000 (menu A to I) or Factory password which is default to 0002 (menu J to L) then press Enter.

To change passwords, press Menu button to go Security Access screen (Insert Password page) then press Down button to go to change Service password screen or press Down button twice to go to change Factory password page. Use Enter and Up/Down button to enter new password.

•Menus and Settings

MENU	SETTINGS
A - On/Off	Start-Delay : 5s (5s-600s)
	Start-up Mode: Off (On)
C - Clock	Day
	Date
	Hour
D - Input/Output	No programming or settings. Only to view panel inputs and outputs D=digital and B= binary
E - Historical Data	->Scroll Up/Down? Press Enter then use Up/down button to view alarm history and unit runtimes
F - ?Information	Data Aire Inc.
	Model dara-4g2
	Ver : 0.1
	Controller ID: 001
	BIOS 6.09 11/12/12
	Boot: 4:07 12/18/09
G - Network Config	BMS PORT 1
	Protocol: N/A – Modbus RTU, BACnet MSTP and BACnet TCP/IP*
	*Optional network card required.
H - Calibrate Sensor	Zone Temperature (Optional Zone sensor required)
	Input B001
	Offset: 0.00
	Value 72.01 (current value)
	Zone humidity (Optional Zone sensor required)
	Input B002
	Offset: 0.00
	Value: 48.00 (current value)
I - Manual Control	Return to Auto: 10s (10-300s) Time delay to reverse manual mode to auto mode- <b>This is used for relays testing only.</b>
	Unit 1 Auto Off/On (change to Man then toggle off to on or on to off)
	Unit 2 Auto Off/On
	Unit 3 Auto Off/On
	Unit 4 Auto Off /On
	Alarm Auto Off /On
	Manual Override
	Manual DI 1: OFF
	Manual Position: CLOSED
	DI 1 Status: Open (Turn on a manual override switch to test input)
J - Factory Settings	Screen Flip Delay: 2s (2-10s)
	Units in the Zone: 2 (1-4)
	Number Units On: 1 (1-4)
	Temp. Sensor: Not Used (Installed)

	Humidity Sns: Not Used (Installed)
	Change Over Delay: 5s (5-600 seconds)
	Time Rotation: 24 hrs (4 hrs,8 hrs,12 hrs,24 hrs,7 days,14 days,30 days)
	Current lead: Unit1
	Days: 00 Hrs: xx Mins:xx
	Force Rotation: No/Yes
	Temp Units: Fahrenheit
	Zone High Temp: 72 (65-85)
	Deadband: 2 (1-5)
	Temperature Assist: Yes/No
	Min Assist Time: 15M (15-60M)
	Language: English
	Clear User settings and replace them with factory defaults? No
	(Change from No to Yes will put all settings back to default value)
K - Alarms & Limits	Audio Mode: Short beep (Long beep, Full beep, None)
	Unit Action: Condition (Turn off, Stay on) defines change-over logic on alarm condition- See alarm logic for details.
	Reset Alarm Log: No/Yes
	Alarm Screen Contact: No Contact message, Data Proc. Mngr, Custom message, Service Company, Maint. Engineer (select one)
L - Config I/O	Factory used only

### 3. CONTROL LOGIC

On the power up, the dara-4g<sup>2</sup> will go thru a self-test for about 40 seconds then the display will start to show the conditions, and dara-4g<sup>2</sup> starts to cycle on primary unit(s) every 5 seconds. After all the primary units cycle on, the dara-4g<sup>2</sup> starts to monitor primary units' alarm status and changes over to back-up unit after a programmable change-over time delay. The change over time delay can be set from 5 seconds to 600 seconds on menu J- Factory settings. The default setting is 5 seconds. If a rotation time schedule is selected, the lead unit will rotate when rotation time clock elapses. Rotation time clock is restarted fresh each time a new pattern is selected.

#### Alarm Standby Logic

When alarms are detected, dara-4g<sup>2</sup>'s alarm auto-changeover function can systematically bring online an equal number of designated standby units to make up for any lost capacity until all standby units are in use. Specific Standby options are selected on Menu K- Alarms and Limits -Unit Action menu. The options are: Turned Off, Stay On, and Condition.

Turned Off - Always discontinue using and turn off any unit with an alarm. If available, bring 1 standby unit online for each alarmed unit. If an alarm is received from a running unit, and the dara-4g<sup>2</sup> panel will:

1. Turn off the alarmed unit.
2. Not use the alarmed unit again until the dara-4g<sup>2</sup> panel is reset
3. Will, if one is available, bring on the next scheduled standby unit to replace the capacity of the alarmed unit.
4. Will discontinue rotation and will hold the lead/lag pattern fixed until reset.
5. Sound the audible alarm to signal an alarm until silence.
6. Continue to display the unit alarm message on the LCD until reset
7. Hold the dara-4g<sup>2</sup> Alarm Relay energized until alarm is corrected.
8. Will continue to bring on additional standby units if additional alarmed units are detected.

Stay On - Always keep units with alarms online and continue to use them as if the units had no alarms. If available, bring 1 standby unit online for each alarmed unit. If an alarm is received from a running unit then ddara-4g<sup>2</sup> will:

1. Allow the alarmed unit to continue operation as if it had no alarm.
2. Will, if one is available, bring on the next scheduled standby unit to supplement the capacity of the alarmed unit.
3. Will discontinue rotation and will hold the lead/lag pattern fixed until reset.
4. Sound the audible alarm to signal an alarm until silence.
5. Continue to display the unit alarm message on the LCD until reset
6. Hold the dara-4g<sup>2</sup> alarm relay energized until alarm is corrected
7. Will continue to bring on additional standby units if additional alarmed units are detected.

Condition - If standby units are available then discontinue using and turn off any unit with an alarm. Bring 1 standby unit online for each alarmed unit -- OR -- If no standby units are available then keep the alarmed unit online and continue to use it as if it had no alarm. If Condition is selected then dara-4g<sup>2</sup> will:

1. Turn off the alarmed unit.
2. Not use the alarmed unit again until the dara-4g<sup>2</sup> panel is reset.
3. Will bring on the next scheduled standby unit to replace the capacity of the alarmed unit.
4. Will discontinue rotation and will hold the lead/lag pattern fixed until reset.

5. Sound the audible alarm to signal an alarm until silence
6. Continue to display the unit alarm message on the LCD until reset
7. Hold the dara-4g<sup>2</sup> Alarm Relay energized until alarm is corrected.
8. Will continue to bring on additional standby units if additional alarmed units are detected.

If no standby units are available then dara will:

1. Allow the alarmed unit to continue operation as if it had no alarm.
3. Will discontinue rotation and will hold the lead/lag pattern fixed until reset.
4. Sound the audible alarm to signal an alarm until silence.
5. Continue to display the unit alarm message on the LCD until reset
6. Hold the dara-4g<sup>2</sup> alarm relay energized until alarm is corrected.

After the cause of alarms has been investigated and corrected, the dara-4g<sup>2</sup> panel must be reset by pressing the silence button twice when units' alarm message appears on LCD display. When reset, the dara-4g<sup>2</sup> panel will refresh the rotation time clock, and then start routine normal operation.

### **Zone Temperature Assist (Optional)**

Zone temperature assist option requires an optional zone temperature sensor. After installing temperature sensor, advance to menu J- Factory Settings and program Temp. Sensor to "Installed"; and Temperature Assist to "Yes". Use menu H to calibrate sensor if necessary. dara-4g<sup>2</sup> will bring next available standby Unit online when zone temperature rises above Zone High Temperature setpoint plus Temperature deadband. The Zone temperature assist logic is as follow:

1. There is a five-minute delay between stop to start of the same standby unit.
2. When a standby unit is turned on by the zone temperature setpoint, it will stay on for at least 15 minutes even when the zone temperature setpoint is satisfied.

Standby unit "ON" Sequence (Rising Temperature)

- 1st Standby unit ON at Zone Temperature Setpoint + Zone Temperature Deadband
- 2nd Standby unit ON at Zone Temperature Setpoint + (2 x Zone Temperature Deadband)
- 3rd Standby unit ON at Zone Temperature Setpoint + (3 x Zone Temperature Deadband)

Standby unit "OFF" Sequence (Falling Temperature)

- 1st Standby unit OFF at Zone Temperature Setpoint + (2 x Zone Temperature Deadband)
- 2nd Standby unit OFF at Zone Temperature Setpoint + Zone Temperature Deadband
- 3rd Standby unit OFF at Zone Temperature Setpoint

## 4. WIRING CONNECTION

### IMPORTANT NOTE:

- The wiring between dara-4g<sup>2</sup> and units must be at least 18 AWG wires and met the local electrical code.
- The power supply does not come with dara-4g<sup>2</sup> panel. Power supply must be provided by customer. See dara-4g<sup>2</sup> specifications below for power input requirement.

### Wiring Terminal Connections

#### TB1

##### Power

TB1-1	24 VAC Power hot
TB1-2	24 VAC Common
TB1-3	Earth Ground

##### Alarm Signal Relay

TB1-4	Alarm Relay Normally open	(Connect to BAS or monitoring panel)
TB1-5	Alarm Relay Common	(Connect to BAS or monitoring panel)
TB1-6	Alarm Relay Normally closed	(Connect to BAS or monitoring panel)

##### To HVAC Unit 1

TB1-7	Relay Common	(To remote shutdown connection of HVAC unit 1)
TB1-8	Relay Normally Open	(To remote shutdown connection of HVAC unit 1)
TB1-15	Alarm Input	(To HVAC unit alarm relay common)
TB1-16	Alarm Input	(To HVAC unit alarm relay normally open)

##### To HVAC Unit 2

TB1-9	Relay Common	(To remote shutdown connection of HVAC unit 2)
TB1-10	Relay Normally Open	(To remote shutdown connection of HVAC unit 2)
TB1-17	Alarm Input	(To HVAC unit alarm relay common)
TB1-18	Alarm Input	(To HVAC unit alarm relay normally open)

##### To HVAC Unit 3

TB1-11	Relay Common	(To remote shutdown connection of HVAC unit 3)
TB1-12	Relay Normally Open	(To remote shutdown connection of HVAC unit 3)
TB1-19	Alarm Input	(To HVAC unit Alarm relay common)
TB1-20	Alarm Input	(To HVAC unit Alarm relay normally open)

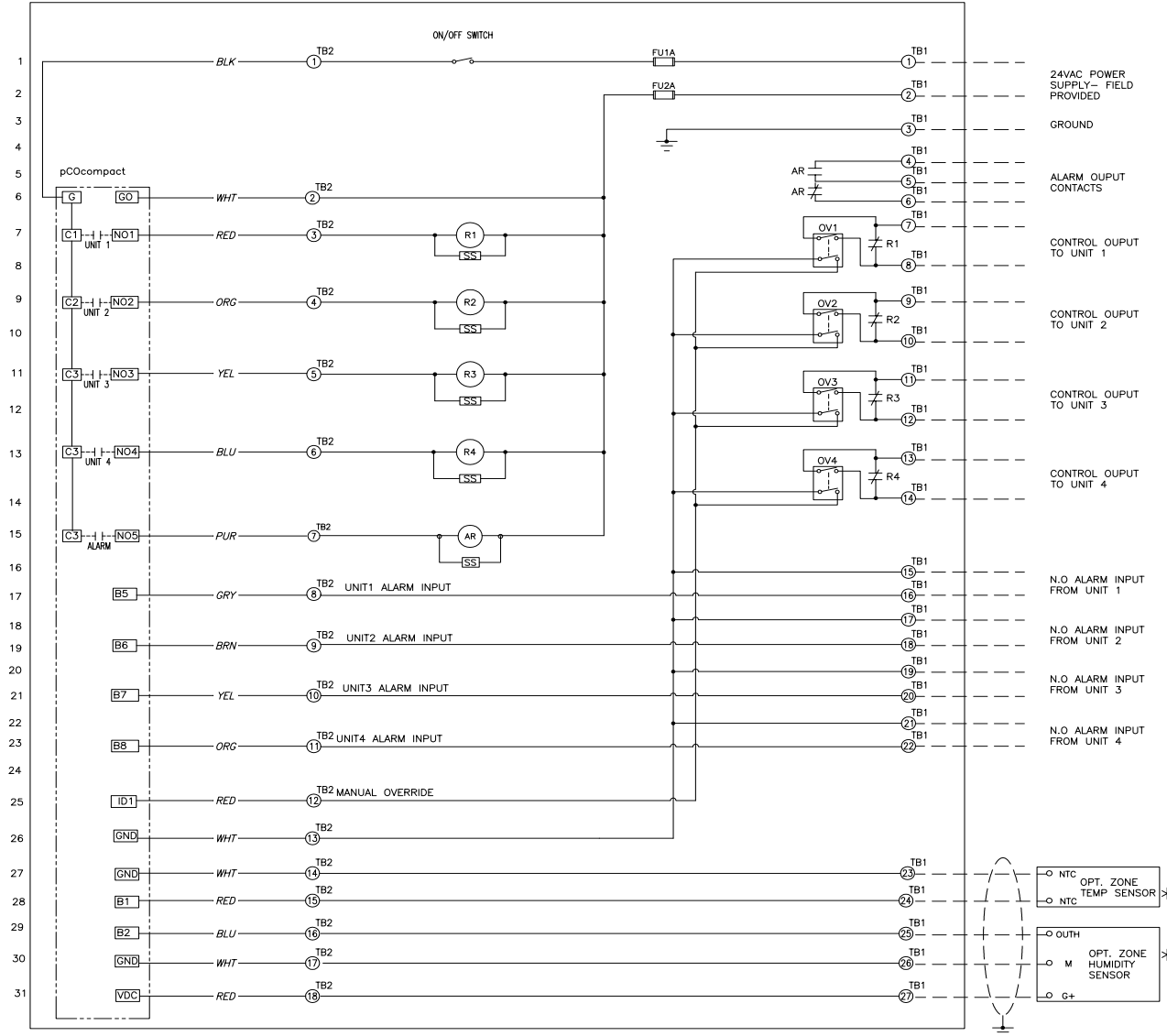
##### To HVAC Unit 4

TB1-13	Relay Common	(To remote shutdown connection of HVAC unit 4)
TB1-14	Relay Normally Open	(To remote shutdown connection of HVAC unit 4)
TB1-21	Alarm Input	(To HVAC unit alarm relay common)
TB1-22	Alarm Input	(To HVAC unit alarm relay normally open)

##### Optional Zone Temperature and humidity sensor

TB1-23	NTC Temperature sensor
TB1-24	NTC Temperature sensor
TB1-25	Humidity sensor signal output (OUTH)
TB1-26	Humidity sensor power GND (M)
TB1-27	Humidity sensor power G+

dara-4g<sup>2</sup> Panel



ONE TITLE  
**dara-4g<sup>2</sup>**  
 WIRING CONNECTIONS  
 TO UNITS IN NETWORK

JOB NO.:	DRAWN BY:
PROJECT NO.:	CHECKED BY:
DATE:	EFFECTIVE DATE:
REVISION:	A

DRAWING NO.  
**dara-4g<sup>2</sup>**

**DATA AIRE INC.**  
 230 WEST BALLEWEE AVENUE  
 ORANGE, CALIFORNIA 92665

**PANEL LEGEND**

- ALARM RELAY
- RELAY
- RELAY OPEN CONTACT
- RELAY OPEN CONTACT
- OVERVOLTAGE PROTECTION
- TERMINAL BLOCK
- TERMINAL BLOCK
- TERMINAL BLOCK
- TERMINAL BLOCK
- FIELD WIRING - MINIMUM 18 AWG WIRE
- OPTIONAL COMPONENTS

## 5. SPECIFICATIONS

Power Input Requirement	24 VAC @ 50/60 Hz, 1A
Remote Alarm Contacts rating	10 Amps maximum @ 24VAC
Power supply Fuse FU1A, FU2A	2 Amps @250 V, 5X20 mm fast-acting miniature fuse
Control Output Contacts rating	8 Amp @ 24 VAC
Alarm Inputs	DI-None Power Contacts
Connections	Miniature screw-type terminals
Wiring	18 AWG
Dimensions (L x W x H) in inches	14" x 9" x 2.5"
Shipping Weight	8 lbs











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