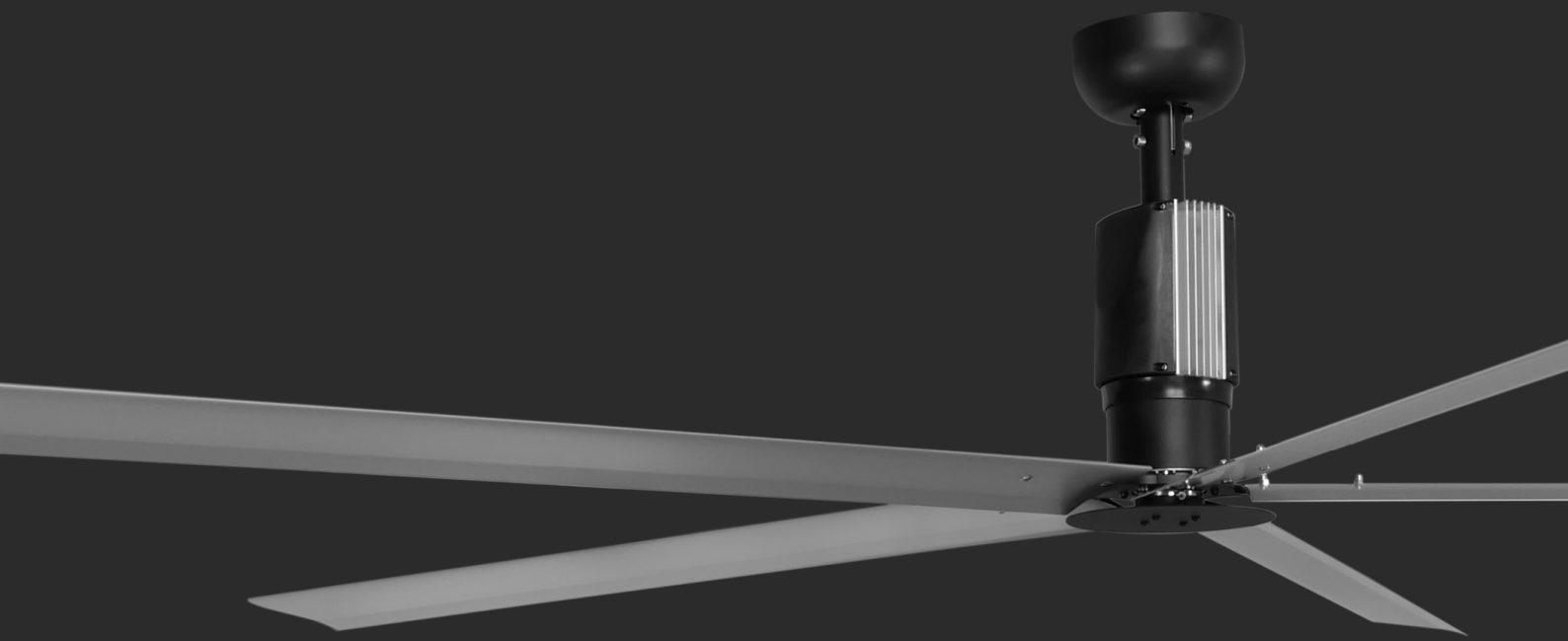


# ADVANCED OPERATIONS

INTEGRATING TO A BUILDING  
MANAGEMENT SYSTEM



**NORDICCO®**

CLEAN • CLIMATE-FRIENDLY • COMFORT

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**IMPORTANT:** CONNECTING TO THE MODBUS TERMINALS REQUIRES ACCESSING THE NORDICCO® SYSTEM DRIVE, WHICH VOIDS THE WARRANTY UNLESS PRIOR WRITTEN APPROVAL HAS BEEN OBTAINED FROM THE MANUFACTURER.



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# GETTING STARTED

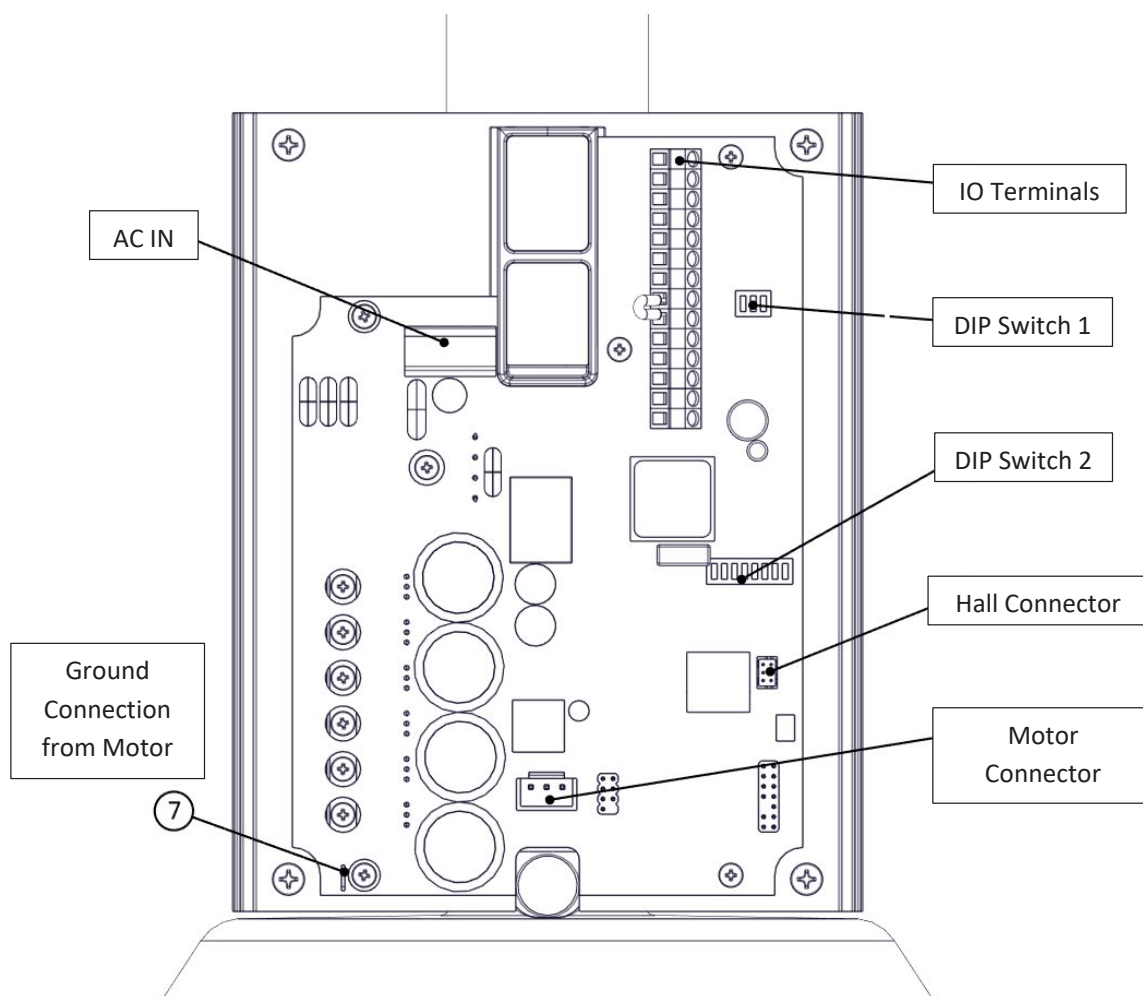
This manual will help show you how to connect NORDICCO® fans and provide a few tips on how to avoid potential issues.

## A COUPLE OF KEY THINGS TO CONSIDER BEFORE YOU START:

- Use only shielded Cat5E or Cat6 cables.
- Maximum 60-meter cable length between fans.
- Maximum total network cable length of 500-meter.
- If you face a noise issue, you can add a 10K resistor from the digital ground (GND terminal) to the chassis. Generally, only 1 connection to the chassis throughout the network is required.
- If fire cable is to be used, then add an extender at the end of the existing fire cable.

# DRIVE BOARD LAYOUT

AC IN	230VAC
Motor Connector	Connection to motor
Hall Connector	From motor
DIP Switch 1	3 position, Modbus term. settings, active low, see table below
DIP Switch 2	8 position, Modbus addr. settings, active low, see table below
IO Terminals	14 position I/O rail, see table below



# DIP SWITCHES

Dip Switch 1	Position 1	120ohm, 1nf termination
	Position 2	680ohm pullup
	Position 3	680ohm pulldown
Dip Switch 2	Position 1	Modbus Address/Unit ID (1-32) = (binary 00..1F)+1 Default: 1 (on)
	Position 2	
	Position 3	
	Position 4	
	Position 5	
	Position 6	0=even parity, 1=no parity (default 1)
	Position 7	1=Use Register 27, 0=19200 baud rate Default: 0 (off)
	Position 8	1 = Modbus Address Selection (Register 29) (DIP Switch 3, Pins 1-5 Not Used) Default: 0 (off)

## DIP-SWITCH (SW) 2 SETTING

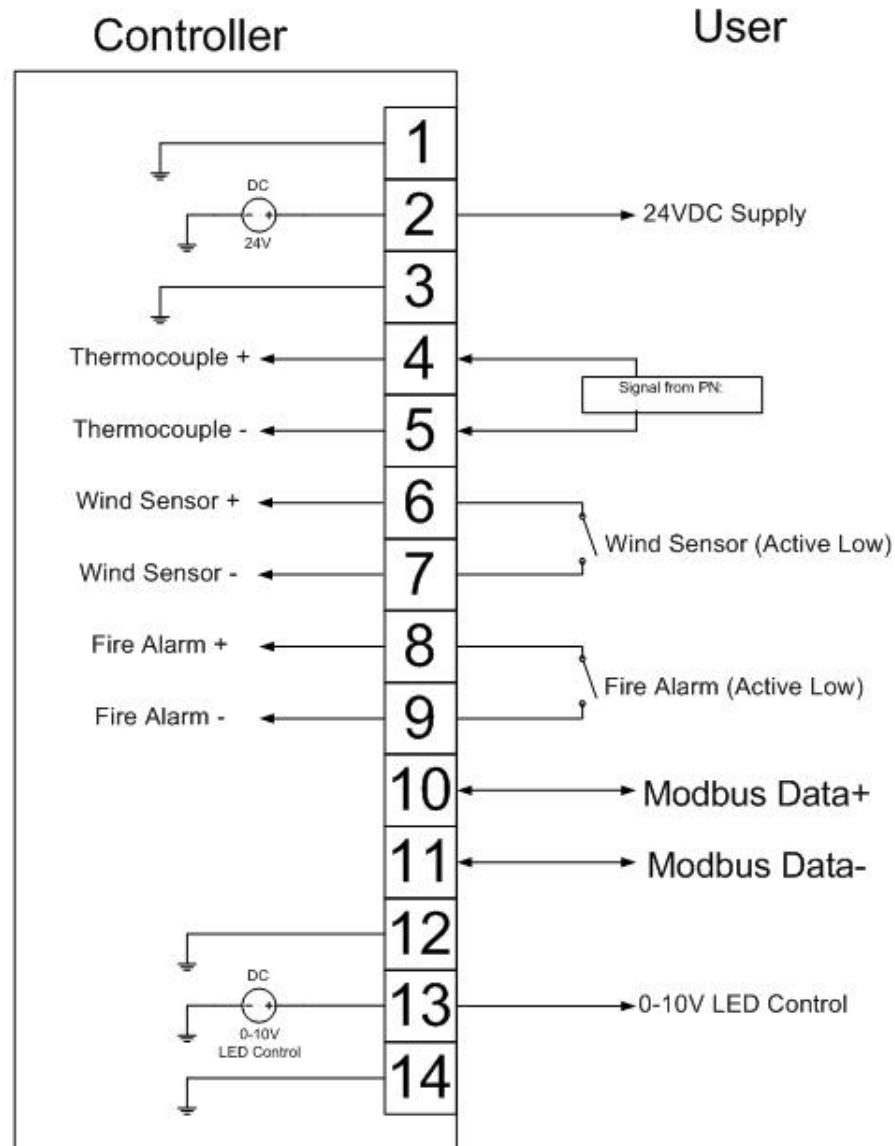
Address	SW2-1	SW2-2	SW2-3	SW2-4	SW2-5	SW2-6*	SW2-7	SW2-8
2	ON	OFF	OFF	OFF	OFF	ON/OFF	OFF	OFF
3	OFF	ON	OFF	OFF	OFF	ON/OFF	OFF	OFF
4	ON	ON	OFF	OFF	OFF	ON/OFF	OFF	OFF
5	OFF	OFF	ON	OFF	OFF	ON/OFF	OFF	OFF
6	ON	OFF	ON	OFF	OFF	ON/OFF	OFF	OFF
7	OFF	ON	ON	OFF	OFF	ON/OFF	OFF	OFF
8	ON	ON	ON	OFF	OFF	ON/OFF	OFF	OFF
9	OFF	OFF	OFF	ON	OFF	ON/OFF	OFF	OFF
10	ON	OFF	OFF	ON	OFF	ON/OFF	OFF	OFF
11	OFF	ON	OFF	ON	OFF	ON/OFF	OFF	OFF
12	ON	ON	OFF	ON	OFF	ON/OFF	OFF	OFF
13	OFF	OFF	ON	ON	OFF	ON/OFF	OFF	OFF
14	ON	OFF	ON	ON	OFF	ON/OFF	OFF	OFF
15	OFF	ON	ON	ON	OFF	ON/OFF	OFF	OFF
16	ON	ON	ON	ON	OFF	ON/OFF	OFF	OFF
17	OFF	OFF	OFF	OFF	ON	ON/OFF	OFF	OFF
18	ON	OFF	OFF	OFF	ON	ON/OFF	OFF	OFF
19	OFF	ON	OFF	OFF	ON	ON/OFF	OFF	OFF
20	ON	ON	OFF	OFF	ON	ON/OFF	OFF	OFF
21	OFF	OFF	ON	OFF	ON	ON/OFF	OFF	OFF
22	ON	OFF	ON	OFF	ON	ON/OFF	OFF	OFF
23	OFF	ON	ON	OFF	ON	ON/OFF	OFF	OFF
24	ON	ON	ON	OFF	ON	ON/OFF	OFF	OFF
25	OFF	OFF	OFF	ON	ON	ON/OFF	OFF	OFF
26	ON	OFF	OFF	ON	ON	ON/OFF	OFF	OFF
27	OFF	ON	OFF	ON	ON	ON/OFF	OFF	OFF
28	ON	ON	OFF	ON	ON	ON/OFF	OFF	OFF
29	OFF	OFF	ON	ON	ON	ON/OFF	OFF	OFF
30	ON	OFF	ON	ON	ON	ON/OFF	OFF	OFF
31	OFF	ON	ON	ON	ON	ON/OFF	OFF	OFF

\* 0=even parity, 1=no parity (default 1)

# IO TERMINALS

Position	Description
1	GND
2	+24V supply
3	GND
4	Thermocouple +
5	Thermocouple -
6	Wind Sensor +
7	Wind Sensor -
8	Fire Alarm +
9	Fire Alarm -
10	Modbus Data +
11	Modbus Data -
12	GND
13	0-10V Analog Signal to LED Driver
14	GND

# IO TERMINAL WIRING DIAGRAM



Standard input R = 10k Ohms pull up



Comm: **SW2: Pin 7**  
**Baud Rate 19200 (OFF)**  
**Use Register 27 (ON)**

**8 Bits**

**SW2 Pin 6**  
**Even Parity: OFF**  
**No Parity: ON**

**SW2 Pins 1-5 Binary Format (Pin 1 = Bit 0)**  
**Address : 1-32**

**MODBUS REGISTER MAP**

	Register	Name	R/W	Retentive	Signed	Format	Range	Default	Description	Detail
Control	1	Run Command	R/W			x	0,1,2		0=Stop=clear Fault(s); 1=Forward; 2=Reverse; 99=Reset	
	2	Speed Reference	R/W			xxx	1...100		Percentage of full speed/torque (Blade Size LookUp Table)	
	3	Operational Status	R			x	0...6		1=Comm CRC errors, 2=Drive Faulted, 3=Motor temp warning, 4=IGBT temp warning, 5=Drive Inhibited (Fire Input), 6=Wind Shut Down active	
	4	Light Control	R/W			xxx	0..100	0	J5 0-10V Output for Optional Light Control (%)	Resets to 0 after power cycle
	5	External Temperature	R			xxxxx	-400..1100		External Temp (°C) (0.1 unit)	Based off an external 10K @ 25C NTC thermistor
Fault	6	Last fault code	R	R		xxx			Integer code representing fault history	At each fault occurrence, values are shifted to next register and the current fault is displayed in Last Fault Code. Values are retained after power cycle.
	7	Second last fault	R	R		xxx			Integer code representing fault history	
	8	Third last fault	R	R		xxx			Integer code representing fault history	
	9	Fourth last fault	R	R		xxx			Integer code representing fault history	
	10	Fifth last fault	R	R		xxx			Integer code representing fault history	
Diagnostics	11	Firmware Version	R	R		xxxxx	1-500			Incremental Version Count
	12	Operating Hours	R	R		xxxxx	0-65535		Operating hours (driving motor)	MAX 65535
	13	Motor RPM	R		S	xxx	-300...300		Motor RPM (0.1 rpm)	
	14	Voltage, DC Bus	R			xxx	0...1000		Bus Voltage (Volts) (1 units)	
	15	Voltage, Output RMS	R			xxx	0...1000		RMS Modulated Output Voltage (Volts) (1 Units)	
	16	Current, Motor RMS	R			xx.x	0...150		RMS Motor current (Amps) (0.1 units)	
	17	Temperature, Motor	R		S	xxx.x	-300...1100		Motor Temp (°C) (0.1 units)	
	18	Temperature, Transistor	R		S	xxx.x	-400...1250		Transistor Temp (°C) (0.1 units)	Transistor to Heatsink
	19	Temperature, Ambient	R		S	xxx.x	-300...1350		MCU Temp (°C) (0.1 units)	
	20	Thermal Speed Derate	R			xxx	0...100		Speed/Torque derate based on overtemp (%)	Thermal regulation (Motor and/or Drive)
	21	Communication Errors	R			xxx	0-65535		Number of errors since last power cycle	0-65535
	22	--spare--	R					0		
	23	-- spare --	R					0		
	24	-- spare --	R					0		
	25	-- spare --	R					0		
Configuration	26	KEEP ALIVE (WatchDog)	R/W	R		xxxxx	0-65535	30	Seconds; 0: Disables	Any message resets; if a Timeout occurs, Fan will stop (if running)
	27	MODBUS Serial Speed	R/W			x	0...9	5	Baud Rate Setting (SW2: Pin 7 ON)	0 1200 bps
										1 2400 bps
										2 4800 bps
										3 9600 bps
										4 19200 bps
										5 38400 bps
										6 57600 bps
										7 115200 bps
	28	Motor Type	R/W				0..2	0	13,70,170	0=13; 1 = 70; 2=170
29	MODBUS Device ID	R/W	R			1-247	2	New Device ID is set after power cycle	SW2 PIN 8 must be set (on) for this to take effect	
30	-- spare --	R/W					0			
Schedule	36	Set/Read Time(Mins,Secs)	R/W	R		xx:xx	0-59:0-59		High byte Mins; Low Byte Seconds	Bits 15-8: Minutes
	37	Set/Read Time( Hrs, DayOfWeek)	R/W	R		xx:xx	0-23:1-7		High byte Hours; Low byte Day of Week	Bits 15-8: Hours; Bits 7-0:DayofWeek (1-7) Mon=1
	38	Set/Read Time(DayofMonth, Mon)	R/W	R		xx:xx	1-31:1-12		High Byte DayofMonth; Low Byte Month	Bits 15-8: DayofMonth; Bits 7-0: Month
	39	Set/Read Year	R/W	R		xxxx	2020-2399		Year	
	40	Schedule Number	R/W	R		x	1-5	1	Schedule Number	Set this for reading/writing values in registers 41-47
	41	Schedule Day	R/W	R		xx	1-127	1	Boolean Value (Bits 6-0)	Day 7-1; Bit0 = Mon (1); Bit1=Tues(2); Bit2=Wed(3),etc
	42	Start Hour:Min	R/W	R		xx:xx	0-23:0-59	0x08:01	High byte Hours; Low byte Minutes	
	43	End Hour:Min	R/W	R		xx:xx	0-23:0-59	0x17:02	High byte Hours; Low byte Minutes	
	44	Direction	R/W	R		x	1,2	1	Forward 1; Reverse 2	
	45	Speed Reference	R/W	R		xx	0-100	0	0-100% Torque	From Blade Size Lookup Table
46	Schedule Active	R/W	R		x	0-1		0: Not Active; 1: Active	Enable/Disable Schedule	
47	Schedule Status	R			x	0-1		0: Not Running; 1: Running	Schedule Running/Not Running	
48	-- spare --	R					0			
49	-- spare --	R					0			

# FAULT CODES

	Code	Fault	Description
Application Faults	0	No Fault	
	1	Modbus Timeout	No activity on Modbus > parameter setting (30sec default)
	2	Impact detection	Unexpected change in speed and/or torque indicates impact
	3	Motor over temperature	Motor Temperature > 110C
	4	Drive over temperature	Transistor > 110C or MCU > 110C
	5	Bus over voltage	13Nm, DC Bus voltage > 385V; 70-170Nm 850V
	6	Bus under voltage	DC Bus voltage < 140V
	7	Phase Over Current	13Nm Phase Current > 6A RMS; 70-170Nm 18A RMS
	8	Microcontroller High Temp	MCU Temperature > 110C
	9	Overspeed Fault	Blade Speed > 300RPM
Critical Hardware Faults	100	Motor thermistor error	Value out of expected range
	101	Heatsink thermistor error	Value out of expected range
	102	Hall error	Value out of expected range
	103	CRC Error	Critical hardware error (not field servicable)
	104	Drive on fire	TBD

Warning Codes	
Code	Description
5	Drive Inhibited (Fire Suppression Input)
1	Communication Frame/CRC errors exceed 50%
2	Drive Faulted
3	90% of Max Drive Temp exceeded, auto reduce speed
4	90% of Max Motor Temp exceeded, auto reduce speed
0	No Warning

#### Fault Action:

- Fan stops
- Fault Code written to Last Fault Code register
- User must write 0 to Command register (1) to clear current fault

#### Warning Action:

- Warnings do not stop drive operation
- Warning Code written to Operational Status register
- If any Fault is active, write 2 to Operational Status register