Installation and User Manual

Dairy
Smart

Dairy Smart

Climate Controllers

Ag/MIS/UmGb-2834-01/22 Rev 1.0

P/N: 116387

Munters

Dairy Smart

Installation and User Manual

Revision: N.1.0 of 01.2022
Product Software: 1.03

This manual for use and maintenance is an integral part of the apparatus together with the attached technical documentation.

Munters reserves the right to effect modifications to the apparatus in accordance with technical and legal developments.

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1 Introduction

1.1 Disclaimer

Munters reserves the right to make alterations to specifications, quantities, dimensions etc. for production or other reasons, subsequent to publication. The information contained herein has been prepared by qualified experts within Munters. While we believe the information is accurate and complete, we make no warranty or representation for any particular purposes. The information is offered in good faith and with the understanding that any use of the units or accessories in breach of the directions and warnings in this document is at the sole discretion and risk of the user.

1.2 Introduction

Congratulations on your excellent choice of purchasing a Dairy Smart Manual!

In order to realize the full benefit from this product it is important that it is installed, commissioned and operated correctly. Before installation or using the controller, this manual should be studied carefully. It is also recommended that it is kept safely for future reference. The manual is intended as a reference for installation, commissioning and day-to-day operation of the Munters Controllers.

1.3 Notes

Date of release: July 2010

Munters cannot guarantee to inform users about the changes or to distribute new manuals to them.

2 Safety aspects

2.1 Grounding

- Always connect temperature and sensor shields to earth ground. Avoid mixing high voltage wiring with sensor and low voltage wiring.
- Keep the controller as far as possible from heavy contactor boxes and other sources of electrical interference.
- Do not connect communication wire shields, which go from one house to another at both ends. Connect them at one end only. Connection at both ends can cause ground loop currents to flow, which reduce reliability.
- The COM connection for communications is not the shield wire. The COM, RX and TX wires must connect to each other at all controllers.

2.2 Filtering

If this installation includes a power inverter to drive variable speed fans, install an EMI filter in front of the inverter, according to the specifications provided by the inverter manufacturer. Refer to the inverter documentation.

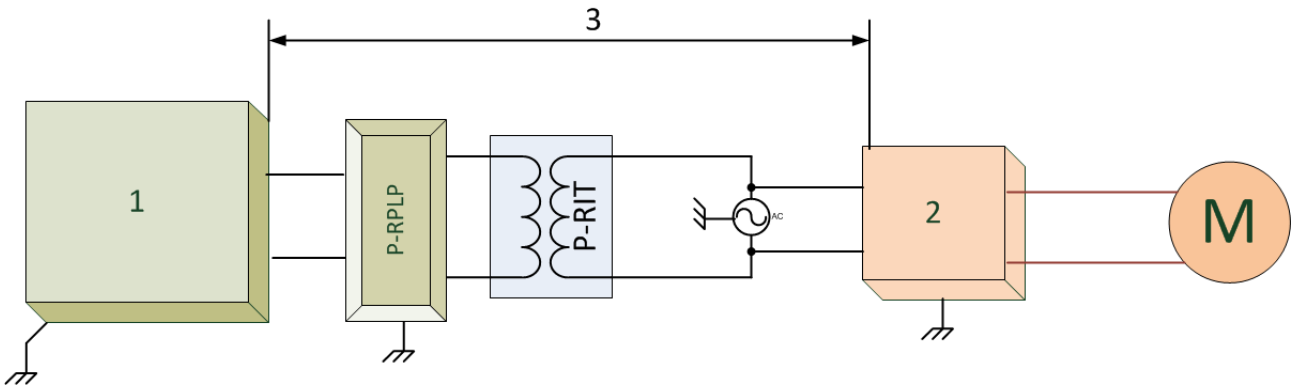
2.3 Checking the battery level

Check the battery once a year. The output must be 2.7 volts (minimum). Authorized personnel only must replace the battery if the output is below the minimum required level or every five years.

2.4 Frequency inverters

Frequency inverters can cause severe electrical and electromagnetic interference. Therefore, when employing a frequency inverter, it is critical that you carefully follow the manufacturer's installation instructions. In particular verify:

- that the cable shielding between the inverter and any motor meets industry standards
- proper grounding of the inverter's chassis and motor power cable
- proper grounding of low voltage cable shield wire
- that the controller and inverter cables are kept in separate conduits or wire bundles



2. Inverter
3. Place the controller at least five meters from the inverter

3 Introduction to the Dairy Smart

Munters' Dairy Smart Controller provides a comprehensive solution for dairy farmers seeking a low cost solution without sacrificing quality. Smart gives you control over the temperature and humidity in buildings using intelligent, user-friendly climate control software.

The primary function of Dairy Smart is to control the curtains; the secondary function is to control fansand foggers. To this end, the switches come pre-programmed to open or close curtains, or to turn thefans and foggers on or off. Curtains are all independent.

- Features
- Theory of Operation
- User Interface
- Menu Structure
- Hot Keys
- General Features
- Dairy Smart Front Panel

3.1 Features

- Controller operates curtains and fans.
- Multiple curtain modes available.
- Prioritized control of curtain via temperature, time, and weather.
- All curtains open and close independently.
- Supports up to two temperature sensors.
- Analog inputs:
  - Temperature
  - Humidity
  - Wind Direction (optional)
- Digital inputs:
  - Wind speed (optional)
  - Presence of rain (optional)

3.2 Theory of Operation

When setting up the Dairy Smart controller, the user configures the following:

- Barn Layout
- Curtain Control

NOTE The following sections provide is general information. Detailed instructions are provided in the manual.

3.2.1 BARN LAYOUT

Barns layout refers to the curtain placement in the barn.

- **Top – Bottom Curtains**: In this setup, the barn has up to two sets of curtains, each set having a top and bottom curtain. Any time conditions are such that curtains must open, the top curtain opens first. The bottom curtain opens only after the top curtain is in position. See Figure 1.

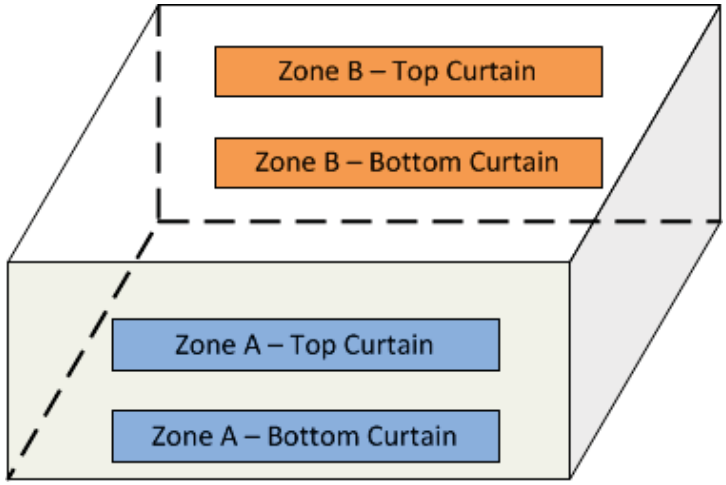


Figure 1: Dairy Barn having Top and Bottom Curtains

- **Independent curtains**: In this setup, the barn has four curtains, one for each zone. Curtainsare independent; all four curtains open independently. See Figure 2.

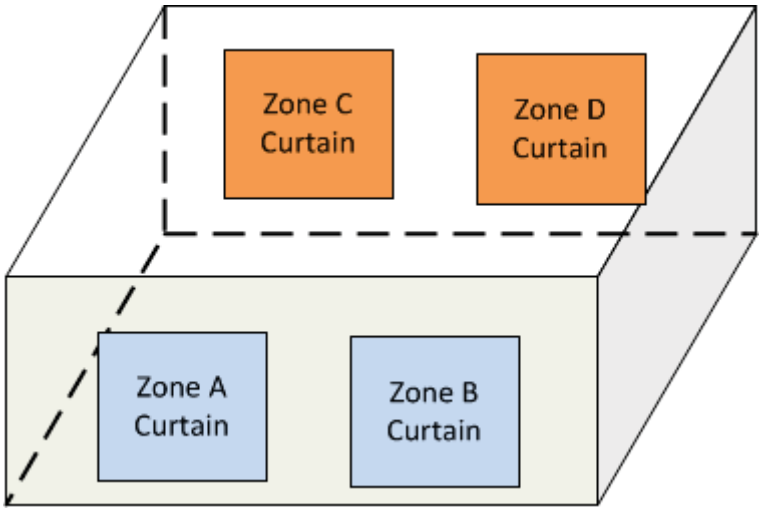


Figure 2: Dairy Barn having Four Independent Curtains

In addition there is a generic setup. This setup enables control of two independent curtains,fans, foggers, and alarm backup systems.

NOTE All layouts support alarm messages. An alarm relay enables connecting the controller toexternal devices such as emergency light and siren, backup devices, and so on.

When you select the barn layout, Dairy Smart automatically defines which relay control which operation. Two relays are required for each curtain, one to open and one to close.

Type	Barn Layout	Relay 1 / 2	Relay 3 / 4	Relay 5 / 6	Relay 7 / 8
A	Top and BottomCurtains	Top Curtain Zone A	Bottom Curtain Zone A	Top Curtain Zone B	Bottom Curtain Zone B
B	Four Curtains	Zone A Curtain	Zone B Curtain	Zone C Curtain	Zone D Curtain
C	Generic	Curtain A	Curtain B	Fan 1 and 2	Fogger / Alarm

3.2.2 CURTAIN CONTROL

The following factors control opening and closing of zone curtains.

- **Temperature**: Curtains open and close according to the current temperature along with the unit's temperature settings and definitions.
    - When the current temperature differs from the target temperature by a certain amount (Temperature Difference Above/Below), curtains open or close in steps.
    - When the current temperature differs from the target temperature by larger amounts Open/Close Set Point), curtains open and close in a single step.

NOTE By default, Dairy Smart maps the curtains to a single sensor. If you install two sensors, you need to assign a sensor to each curtain. Refer to Configuring the Curtains (page 16) for details

- **Time**: Curtains open and close according to a schedule defined by the user. Curtains open toa location specified by the user.
- **Wind direction and speed**: Curtains open and close depending on the wind direction and speed, as measured by sensors and according to user-defined parameters.
- **Wind direction and rain**: Curtains open and close depending on the wind direction and rain, as measured by sensors and according to user-defined parameters.

NOTE Dairy SMART factors in the wind direction when a wind direction sensor has been installed. If there is no sensor, the curtains open and close independently of this factor. However, speed and rain only operate if these sensors have been installed (refer to Figure 9, page 24) and enabled (refer to Configuring Digital Input Sensors, page 15).

- Control priority:
    - The temperature factor is independent. Whenever temperatures reach the levelrequiring curtain opening, the curtains open (regardless of the other factors).
    - Each of the three remaining factors overrides the previous factor. For example, if according to the wind direction curtains need to open, they do so, even if the time schedule does not require open curtains.

3.3 User Interface

- **LED indicator:** ON/OFF state of each LED indicates whether the relay is operating or idle.
- **Prog key:** Navigate to the parameters in main menus and edit parameters (press once toenter edit mode, press again to exit edit mode).
- **Down / Up arrow keys:** Increase/decrease parameter values, navigate Hot Keys (see **Hot Keys** section) and menus.

- **Select key**:
  - Navigates in and out of main screen and menus (press once to enter main menus,press again to exit).
  - Erase changes made to parameters. If you change a parameter incorrectly, click **Select** and the parameter reverts to the previous definition.

Summary: To get to Menu items:

1. Press **Select**.
2. Press **Up/Down** to reach the required menu.
3. Press **Prog** to enter the menu.
4. Press **Up/Down** to reach the menu item.
5. Press **Prog** to edit the item.
6. Edit as required.
7. Press **Prog**.
8. Press **Select**.

For example, to go to Curtain A configuration, from the main screen, press the following keys:

Select > System >Curtain A., until the required parameter appears.

NOTE After changing any parameter, you must go to the main screen to save the change.

3.4 Menu Structure

Table 1: Menu Structure

Temperature	Settings	Alarms	Test	Calibration	System
Target Temp	Curtain A settings	High temperature differential	Temperature sensor 1 - 2	Temperature sensor 1 - 2	Curtain A temperature sensor
	Curtain B settings	Low temperature differential	Wind direction	Wind speed / pulse	Curtain B temperature sensor
	Curtain C settings *(Type B only)*	Delay (seconds)	Humidity sensor *(Type Conly)*	Humidity sensor *(TypeC only)*	Curtain C temperature sensor *(Type B only)*
	Curtain D settings *(Type B only)*		Relays 1 - 8	Wind direction	Curtain D temperature sensor *(Type B only)*
	Fans settings *(Type Conly)*		Digital inputs1 - 2	Curtain 1 - 4 opening / closing times	Temperature Sensor2 Connect
	Fogger settings *(Type Conly)*		Software version		Temperature sensor2

Temperature	Settings	Alarms	Test	Calibration	System
			Hardware version		Wind direction potentiometer
			LCD version		Humidity connect *(Type C only)*
			Communication version		Rain digital input
			System reset		Wind speed digital input
					Weather Delay
					Measurement unit
					Calibration steps
					Current time
					Unit number
					Baud rate

3.5 Hot Keys

The **Dairy Smart** can display key data on the screen (no need to enter the menus). To access thisdata, on the Main screen, press the ▼▲ keys.

Data displayed:

- Current temperature, target temperature, and time
- Individual temperature sensors readings
- Current humidity (only when using Type C)
- Current curtain A & B position
- Current curtain C & D position (only when in Type B mode)

NOTE This information depends on the barn layout type. Type A displays the "Top" and "Bot" (bottom) position of the two curtain zones. Type B displays the actual position of each curtain.Type C displays the two actual position values of Curtains A and B.

- Wind direction and speed
- Fogging cycle state

NOTE If the relevant devices are not installed, wind direction and speed, and rain state appear withN/A appearing next to them.

3.6 General Features

- If a screen other than the main screen is displayed for five consecutive minutes, the system returns to the main screen display automatically (in menus only, not including Hot Keys).

NOTE Allowing the screen to return to the main screen by waiting in this manner erases any changes made to the parameters that have not been saved.

- When a value is being modified with the arrow keys (either ▲ or ▼), the changes occur at arate of 2 changes per second. After holding down an arrow key for 3 seconds, the changesoccur at a rate of 10 changes per second.
- If the system displays one of the Hot Keys and no alarms arise, the screen is refreshed every second. If the system displays a Hot Key screen and alarms arise, both the Hot Key screen and the alarm are displayed alternately every three seconds. If more than one alarm is activated, the Hot Key screen displays the different alarms alternately.

3.7 Dairy Smart Front Panel

Figure 3: Dairy Smart Front Panel

Figure 3 illustrates the relay toggle switches. Set each relay to:

- **On**: Curtain is always open
- **Off**: Curtain is always closed
- **Auto**: The relay operates according to its set parameters.

CAUTION *Refer to Locking the Curtains page 22 before setting the toggle switches!*

Table 1: Type A Mode Switches

Switch 1: Top A Open	Switch 5: Top B Open
Switch 2: Top A Close	Switch 6: Top B Open
Switch 3: Bottom A Open	Switch 7: Bottom B Open
Switch 4: Bottom A Open	Switch 8: Bottom B Open

Table 2: Type B Mode Switches

Switch 1: A Open	Switch 5: C Open
Switch 2: A Close	Switch 6: C Close
Switch 3: B Open	Switch 7: D Open
Switch 4: B Close	Switch 8: D Close

Table 3: Type C Mode Switches

Switch 1: A Open	Switch 5: Fan 1
Switch 2: A Close	Switch 6: Fan 2
Switch 3: B Open	Switch 7: Fogger
Switch 4: B Close	Switch 8: Alarm

4 Using the Dairy Smart

The following sections detail:

- Setting the Barn Layout
- Initial Setup
- Sensor Installation
- Testing Sensors and Relays
- Cooling

Controllers set to Type C mode have the following two additional sections:

- Setting the Fans
- Setting the Fogger

4.1 Setting the Barn Layout

You select the barn layout type during a cold start. Perform a Cold Start after software version replacement, reinstallation, or when instructed by a Munters technician.

NOTE To display the current layout mode, go to Test > Sft Ver.

To perform a Cold Start:

1. Apply power and press these keys simultaneously:

▼	▲	<SELECT>

Select Ctrl Type appears (the current mode appears as well).

2. Press Prog.
3. Scroll to the required mode:

- **Type A**: Top and bottom curtains
- **Type B**: Four independent curtains
- **Type C**: Generic

CAUTION *CAUTION Barn Layout defines the relay functions. It is critical to choose the proper type. Refer to Barn Layout, page 7 for details.*

4. Press **Prog**. 5. Press **Select**.

The controller loads the selected type with the default values.

After performing a Cold Start, manually calibrate the curtains. Refer to Manual Calibration, page 21.

4.2 Initial Setup

The following sections detail the initial steps to be taken after installing a unit.

- Setting the Basic Parameters
- Configuring the Alarm Parameters

4.2.1 SETTING THE BASIC PARAMETERS

Basic parameters are those parameters used to run the software and communications programs.

To set the basic parameters:

1. On the main menu, press **Select**.
2. Scroll to *System* and press **Prog**.
3. Scroll down and set the following parameters. Press **Prog** to enter and exit each parameter.
    - **Measuring Unit:** Select *Metric* or *Non Metric*. This parameter defines both the wind speed unit (kilometers/hour or miles/hour) and the temperature unit (Centigrade or Fahrenheit). Default: Non-metric
    - **Time:** Set the current time.
    - **Unit No:** Leave this parameter at the default setting..
    - **Baud Rate**: Choose the required value (default: 9600). This parameter is a measure of data transmission speed between the controller and computer.

NOTE The faster the speed, the higher chance of errors in data transmission.

4.2.2 CONFIGURING THE ALARM PARAMETERS

The Alarm menu enables setting the alarm parameters.

To set the alarm parameters:

1. In the main menu, go to Alarms.
2. Press Prog.
3. Set the following:
    - **Hi T. (Diff):** The differential above the target temperature at which an alarm is sent.
    - **Lo T. (Diff):** The differential below the target temperature at which an alarm is sent.
    - **Delay (sec):** The number of seconds before the alarm is activated.

Table 5 lists the alarm messages. View the alarms on the main screen. The main screen displays thealarms and the main screen alternately. **Dairy Smart** navigates between the alarms automatically.

Figure 4: Alarm Example

Table 4:Alarm Messages

Alarm Display	Explanation	Possible Alarm Reason
T1 SNS Opened\Shorted	Error in temperature sensor 1	Temperature sensor number 1 is either out of order, disconnected or shorted
T2 SNS Opened\Shorted	Error in temperature sensor 2	Temperature sensor number 2 is either out of order, disconnected or shorted
Wind Dir Sens Fail	Error with the wind direction sensor	The wind direction sensor has been disconnected or has been stuck for over twohours

Alarm Display	Explanation	Possible Alarm Reason
HUM SNS ERR	Error in humidity sensor	Humidity sensor is either out of order or disconnected
High Temperature	High temperature	The average temperature in the building is higher than the temperature set as the alarm's temperature difference.
Low Temperature	Low temperature	The average temperature in the building is lower than the temperature set as the alarm's temperature difference.
Sensor X HighTemp	High temperature in sensor X	The temperature around sensor X is higher thanthe difference set for in the alarm settings.
Sensor X LowTemp	Low temperature in sensor X	The temperature around sensor X is lower thanthe difference set for in the alarm settings.

- Reset the alarm relay by pressing **Select**. The alarm messages continue to be displayeduntil the problem is resolved.

4.3 Sensor Installation

The following sections detail how to install the sensor devices.

- Configuring Temperature Sensors
- Configuring Digital Input Sensors
- Configuring the Humidity Sensor

4.3.1 CONFIGURING TEMPERATURE SENSORS

This section details how to configure temperature sensors.

➲ **Install up to two RTS devices as shown in Figure 9, page 27.**

1. If you have two sensors:
   a. Press **Select** and go to *System > Temp Sens 2*.
   b. Press **Prog** and select *Connect*.
   c. Press **Prog**.
2. Press **Select** and go to *Temperature > Temp*.
3. Set the Target Temperature.
4. Go to *System > Curtain A* and press **Prog**.
5. Define which temperature sensor is connected to Curtain A (sensor 1, 2, or average;default: 1).
6. Press **Prog**.
7. Repeat steps 5 – 7 for each curtain.
8. Press **Prog**.
9. If required, go to *Calibration > T1.*
10. Change the temperature output value. The system remembers the difference between the system's calculation and the changed calibration value.

CAUTION Munters temperature sensors come pre-configured. Calibrate a sensor only if there isa difference between the temperature displayed and the actual temperature.

11. Repeat the calibration for other temperature sensor.

*NOTE If an error occurs with a temperature sensor, the information regarding the specific sensor canbe deleted from the **Calibration** menu. This is done by pressing <**PROG**> when an invalid sensor's field appears.*

4.3.2 CONFIGURING DIGITAL INPUT SENSORS

This section details how to configure digital inputs.

- Configuring a Wind Direction Sensor
- Configuring a Rain Detector or Wind Speed Sensor

NOTE Each digital input is optional and independently installed. Only perform the steps required foryour particular installation.

➲ **Connect the digital input device(s) as shown in Figure 9, page 27.**

4.3.2.1 Configuring a Wind Direction Sensor

1. Go to System > W. Dir and press **Prog**.
2. Select Pot and press **Prog**.
3. Press **Select**.
4. Go to Calibrate and press **Prog**.
5. Scroll to Wind Dir and press **Prog**.
6. Enter the direction (in degrees) of the current wind.
7. Press **Prog**.

4.3.2.2 Configuring a Rain Detector or Wind Speed Sensor

1. To enable a rain detector, go to System > Rain and press **Prog**.
2. Select Dig-In 1 and press **Prog**.
3. To enable a wind speed sensor, scroll to W. Speed and press **Prog**.
4. Select Dig-In 2 and press **Prog**.
5. Press **Select**.

4.3.3 CONFIGURING THE HUMIDITY SENSOR

➲ **Connect the humidity sensor as shown in Figure 9, page 27.**

1. Go to System > Humidity connect and press **Prog**.
2. Select Connect.
3. Press **Prog** and then **Select**.
4. Scroll to Calibration and press **Prog**.
5. Scroll to Humidity sensor and press **Prog**.
6. Enter the current humidity.
7. Press **Prog**.

4.4 Testing Sensors and Relays

This menu is used to test the sensors and the relays. In addition, it displays both the software, controller mode, and the communication versions.

CAUTION *Entering the Test screen pauses any control currently active. Functions restart whenyou exit the screen.*

Pressing **Prog** when any of the relay items (FAN1, FAN2 or Cooling) is shown causes the controller to pause. Pressing **Select** once again makes the controller resume operation.

1. Go to Test.
2. Choose the required test:
    - **T1**: Tests temperature sensor number 1
    - **T2**: Tests of temperature sensor number 2
    - **Wind direction**: Displays the wind direction
    - **Humidity**: Tests humidity sensor and displays the A/D number (*Type C mode only*)
    - **Relay #**: Tests relays 1 – 8 whether they are on or off
    - **Digital Input-1/2**: Tests the digital input pulses
    - **Sft Ver**: Check the software version and display the barn type mode.
    - **Hardware Ver**: Check the hardware version
    - **Comm Ver**: Check the communication version
    - **Sys Reset**: System reset (For technician's use only!)

4.5 Cooling

The following section describes how to define the Dairy Smart's cooling functions. Defining the cooler functions depends on the mode type.

- All modes support curtain control.
- Type C mode supports two additional types of cooling.

The following sections detail how to configure the cooling methods.

- Configuring the Curtains
- Calibrating the Curtains
- Locking the Curtains

4.5.1 CONFIGURING THE CURTAINS

The following section details how to configure the curtains.

NOTE After configuration, calibrate the curtains. Refer to Calibrating the Curtains, page 21 for details.

NOTE Units having two temperature sensors: Map the curtains to the sensors (refer to Configuring Temperature Sensors, page 17) (optional).

1. Press **Select**.
2. Scroll to *Target Temp* and press **Prog**.
3. Set the target temperature to the required temperature and press **Prog**.
4. Scroll to *Settings* and press **Prog**.
5. Scroll to *Curtain A* and press **Prog**.

6. Set the following parameters:
    - **Diff Close Full**: Below this differential the curtain closes to the minimum in one step.
    - **Diff Open Full**: Above this differential the curtain opens to the maximum in one step.
    - **Diff Close Step**: Between the target temperature and this differential, the curtainremains in place. Below this differential, the curtain closes in steps.
    - **Diff Open Step**: Between the target temperature and this differential, the curtainremains in place. Above this differential, the curtain opens in steps.

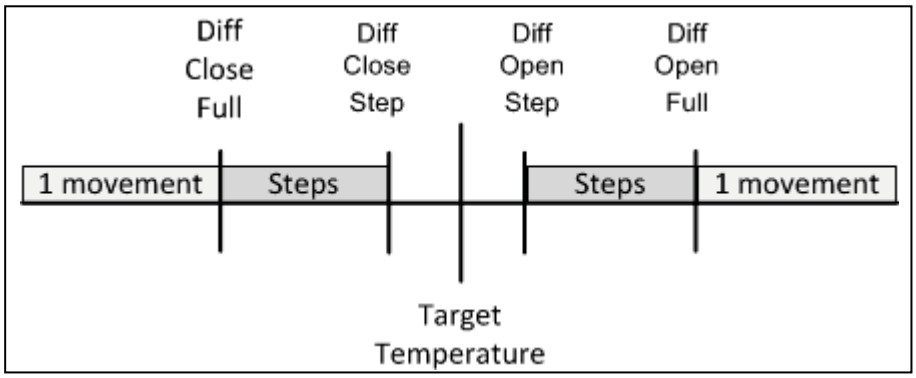


Figure 5: Curtain Opening and Closing Ranges

NOTE 1) If the temperature begins to rise while the curtain is closing (in steps), the curtain remains in place until the temperature reaches the Diff Open Step. Only then does the curtain begin to open. The inverse (temperature begins to drop while the curtain is opening (in steps) is also true.

NOTE 2) If the temperature changes significantly while the curtain is moving to its minimum/maximum position in one step, the curtain first closes/opens and only then moves tothe new position.

- **Time From/Time To/Position**: Between the *Time From* and *Time To* parameters, the curtain opens to the *Position* parameter.
- **Wind Dir From**: The angle **from** which wind direction affects curtain.
- **Wind Dir To**: The angle **until** which wind direction affects curtain. Example: if the:
    - Wind Dir From is 20
    - Wind Dir To is 270

Dairy Smart ignores any wind coming in between 271° to 19°.

NOTE Make sure that your wind direction sensor is calibrated. Refer to Configuring a Wind Direction Sensor, page 15.

- **Wind Speed**: Wind speed at which the curtains close.
- **Stage Delay**: To prevent unnecessary curtain movement, you can delay the curtain opening or closing. Enter the time in seconds.
- **Step Size**: Set increment in percentage between each level.
- **Minimum Position**: Sets minimum curtain position.
- **Wind Enable**: Enables closing the curtain to the minimum position when the windspeed reaches the defined level.
- **Rain Enable**: Enables closing the curtain to the minimum position when rain isdetected.

NOTE Wind Enable and Rain Enable require a wind speed detector and rain detector, respectively.

7. Press **Select**.
8. Scroll to Curtain B and press **Prog**.

9. Repeat steps 6 – 8.
10. Press **Select**.

NOTE In Barn Type B, repeat steps 9 - 10 for Curtains C and D.

4.5.2 CALIBRATING THE CURTAINS

Curtain calibration means entering the amount of time required for the curtains to open or close completely. With this information, Dairy Smart can correctly place the curtain to user-defined positions. Since calibration is required to position the curtains, curtain opening and closing time must be calibrated before the curtains can operate.

During the calibration process, curtains are inoperative. Calibration can be:

- Manual (after a Cold Start)
- Automatic (during specific weather conditions or after a power loss).

4.5.2.1 Manual Calibration

After a Cold Start, the user must calibrate the controller. Until you calibrate the controller, the mainscreen displays **Cal Req!**.

NOTE The curtains' opening and closing times should be included in the product's' specifications.

To manually calibrate the Dairy Smart:

1. Press **Select**.
2. Scroll to *Calibration* and press **Prog**.
3. Scroll to each curtain calibration parameter and press **Prog**.
4. Enter the times.
5. Press **Prog**.
6. Press **Select**.

4.5.2.2 Automatic Calibration

Automatic calibration occurs:

- After a power loss. After power is restored, Dairy Smart waits for 20 seconds to determine the weather conditions. If there is rain or if the wind is above the user defined level, the curtains close completely. If these conditions are not met, the curtains open completely.
- During specific severe weather conditions:
  - Wind direction is within the levels set by the *Settings> Curtain > Wind Dir From* and
  - *Wind Dir To* parameters.
  - Wind speed is above the level set by the *Settings> Curtain >* Speed parameter.
  - Rain is detected.

If all of these conditions are present, Dairy Smart closes the curtains completely until suchtime as the conditions are not met.

While calibration is taking place, the main screen displays **Calib . . .**

When automatic calibration is enabled, the calibration process takes place according to the curtains' current position.

- If the curtains are open more than halfway: the curtains close (0%), open (100%), and then return to their pre-calibrated position.

- If the curtains are open less than halfway: the curtains open (100%), close (0%), and thenreturn to their pre-calibrated position.

To enable automatic calibration:

1. Go to System > Cal Steps.
2. Press **Prog**.
3. Set the number of calibration steps (99 disables automatic calibration).
4. Press **Prog**.

4.5.3 LOCKING THE CURTAINS

Munters recommends that the toggle switches be set to Auto, thereby enabling the relays to operate automatically. If needed, the user can place the toggle switches to *On* or *Off*, to keep the curtains set in one position (opened or closed, respectively).

Each curtain is controlled by two relays, one to open the curtain and one to close it. If the user placestwo toggle switches of a particular relay in the same position (both on or both off), the relay sends contradictory messages to the curtain. To prevent this from happening, Dairy Smart includes dip switches which override the toggle switches. When these switches are set to off (bottom position), theDairy Smart ignores any contradictory toggle placement.

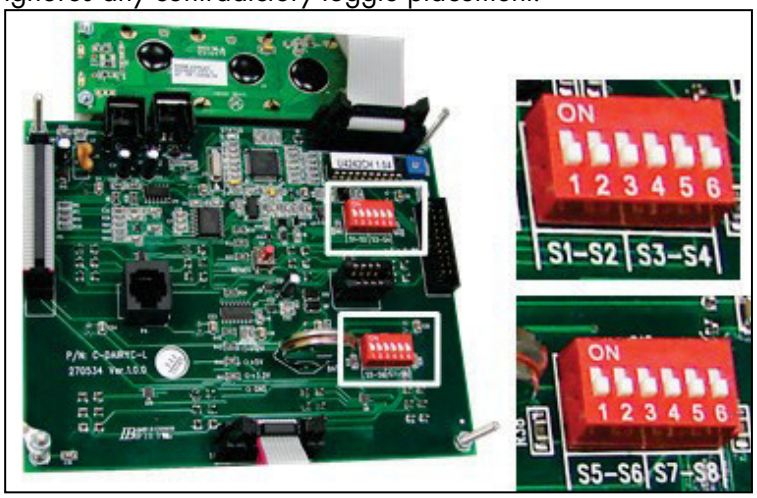


Figure 6: DIP Switch Default Position, Relay Override

To set the DIP Switches:

1. Open the Dairy Switch unit.
2. Each set of relays is controlled by three dip switches. Push all three to the ON position. Figure 6 shows the relay override cancelled for relays 5/6 and 7/8.

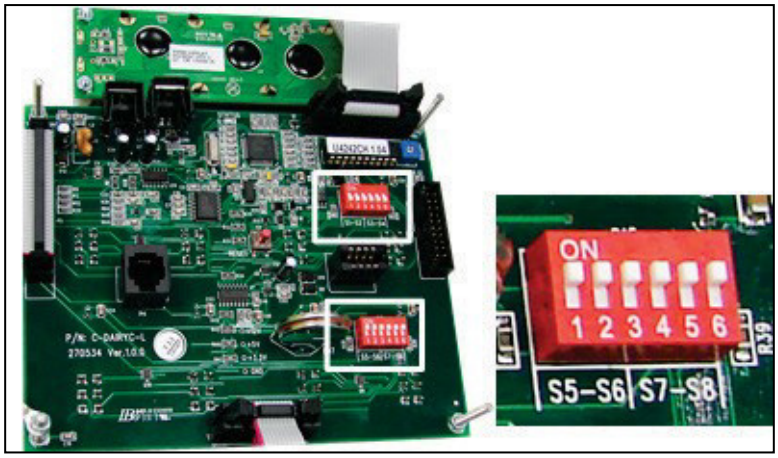


Figure 7: Relays 5/6 and 7/8 Override Cancelled

NOTE When using Type A or B mode, Munters recommends leaving the dip switches in their default position. Users have Dairy Smart Controllers set to Type C mode can turn off the override asshown in Figure 6, but should leave S1 – S4 switches in their default position.

4.6 Setting the Fans

The following section is relevant for Type C mode only. Fans operate only when temperature conditions are met.

1. Press **Select**.
2. Scroll to Settings and press **Prog**.
3. Scroll to Fans and press **Prog**.
4. Set the following parameters:
    - Fan 1 Diff On: The temperature differential above target temperature to turn on Fan
    - Fan 1 Diff Off: The temperature differential above target temperature to turn off Fan
    - Fan 2 Diff on: The temperature differential above target temperature to turn on Fan
    - Fan 2 Diff Off temperature differential above target temperature to turn off Fan
5. After setting each parameter, press **Prog**.
6. Press **Select**.

4.7 Setting the Fogger

The following section is relevant for Type C mode only. Foggers operate only when both temperatureand humidity conditions are met.

1. Press **Select**.
2. Scroll to Settings and press **Prog**.
3. Scroll to Fogging and press **Prog**.
4. Scroll to Fogging and press **Prog**.
5. Set the following parameters:
    - Temp Diff On: The differential above target temperature the cooling system is on.
    - Temp Diff Off: The differential above target temperature the cooling system is off.
    - Fogging to Hum: The limit of relative humidity above which the cooling system does not operate.

NOTE Users wanting to disable the humidity sensor: Go to System > Humidity Connect and select ***No****. Dairy Smart will disregard the sensor input.*

    - Fogging On: The number of seconds to turn on the fogger.
    - Fogging Off: The number of seconds to turn off the fogger.
6. Press **Prog**.
7. Press **Select**.

5 Installation

The following sections details the installation and wiring procedures.

CAUTION *If any problem arises with the hardware, do not open the box. Contact an authorized electrician.*

- Mains Voltage Connections
- Dairy Smart Wiring
- Communication Wiring

5.1 Mains Voltage Connections

Connect the input power of the controller to one or more circuit breakers in the electrical enclose (fuse box).

- **Single wire supply**: Recommended for applications in which the controller's outputs are connected to low power contactors (for example those shown in Figure 16). In this case one18 AWG cable should be used for Phase and Neutral.
- **Multi wire supply**: Recommended for high power applications in which the outputs supply upto 5 Amp each. In this case a separate 18 AWG wires should be connected from each circuit breaker in the electrical enclose (fuse box) to each output and to the variable speed fan. All the wires (from the separate circuit breakers) are from the same single phase.

WARNING! *Multi wire supply! Up to nine independent mains input may be present in the DairySmart Controller. Put all appropriate circuit breakers in the OFF position before servicing.*

5.2 Dairy Smart Wiring

The following drawings detail the Dairy Smart wiring.

WARNING! *Before wiring the unit, disconnect the power!*

- Figure 8: Board Layout
- Figure 9: Wiring Diagram of Low Voltage Section
- Figure 10: Wiring Diagram of Main Voltage Section and Protection (Type A / Type B Mode)
- Figure 11: Wiring Diagram of Main Voltage Section and Protection (Type C)
- Figure 12: Wiring Diagram of Main Voltage Section having Protection and Isolation
- Figure 13: Dairy Smart Communication RS-232 Wiring Diagram
- Figure 14: Dairy Smart Communication RS-485 Wiring Diagram

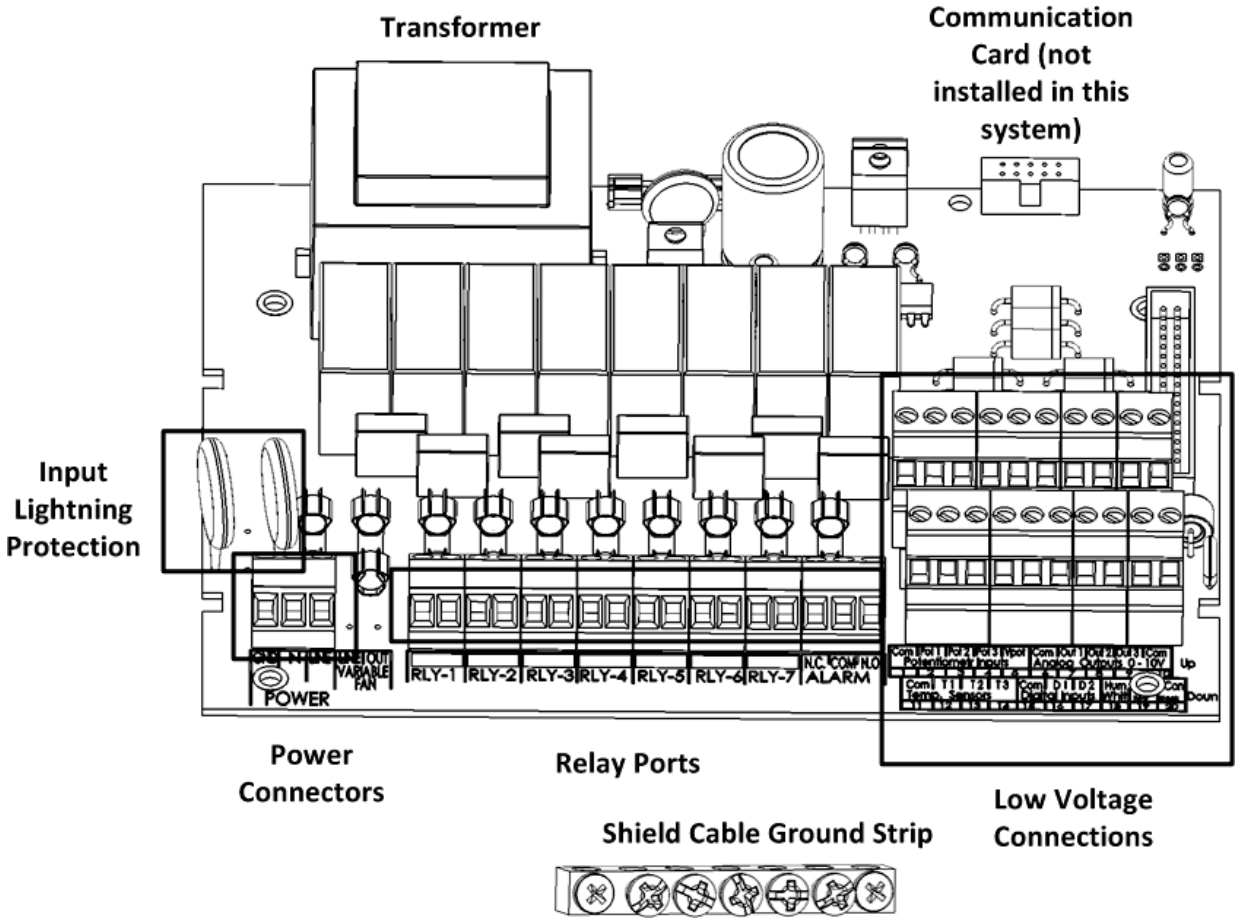


Figure 8: Board Layout

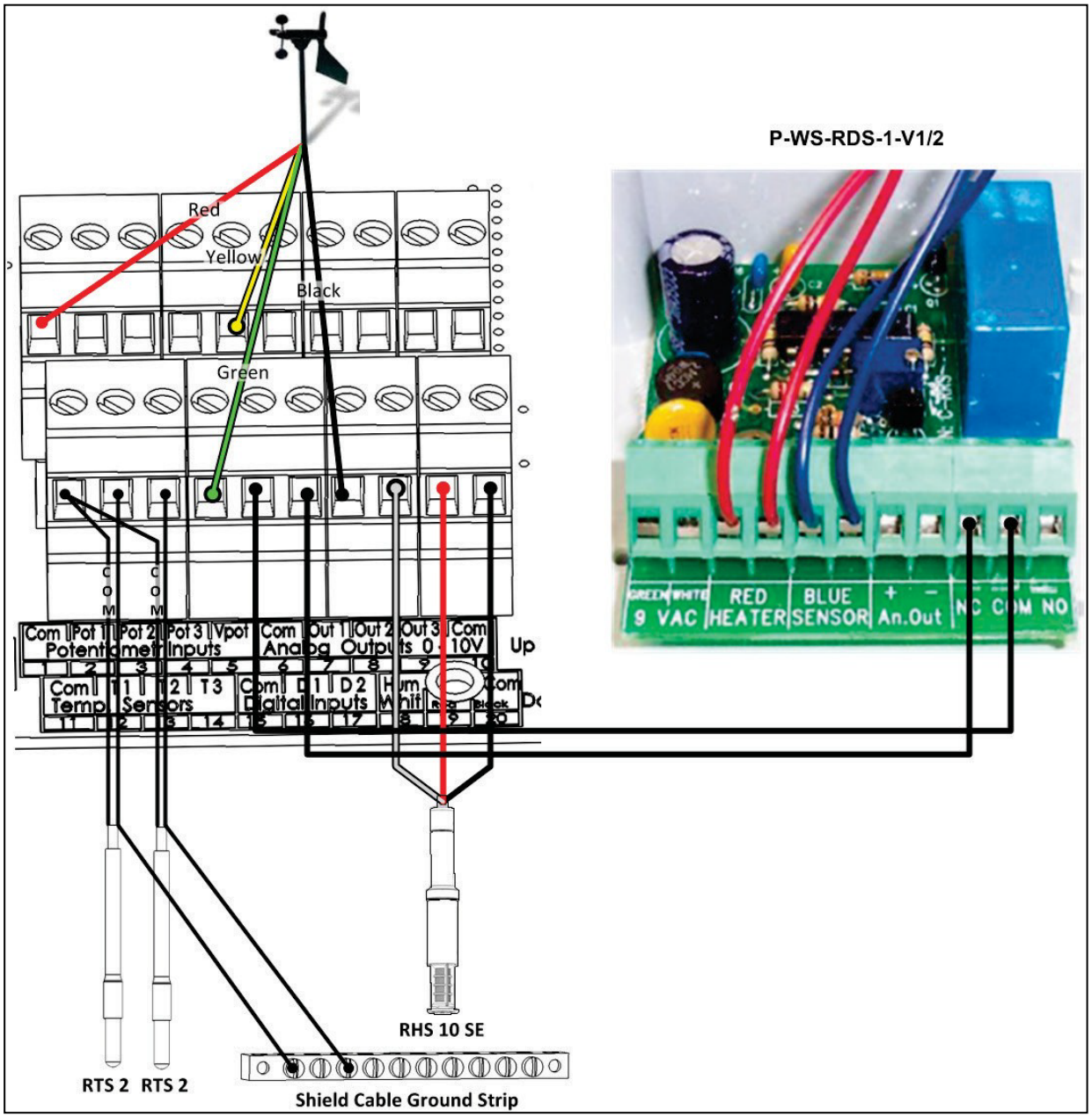


Figure 9: Wiring Diagram of Low Voltage Section

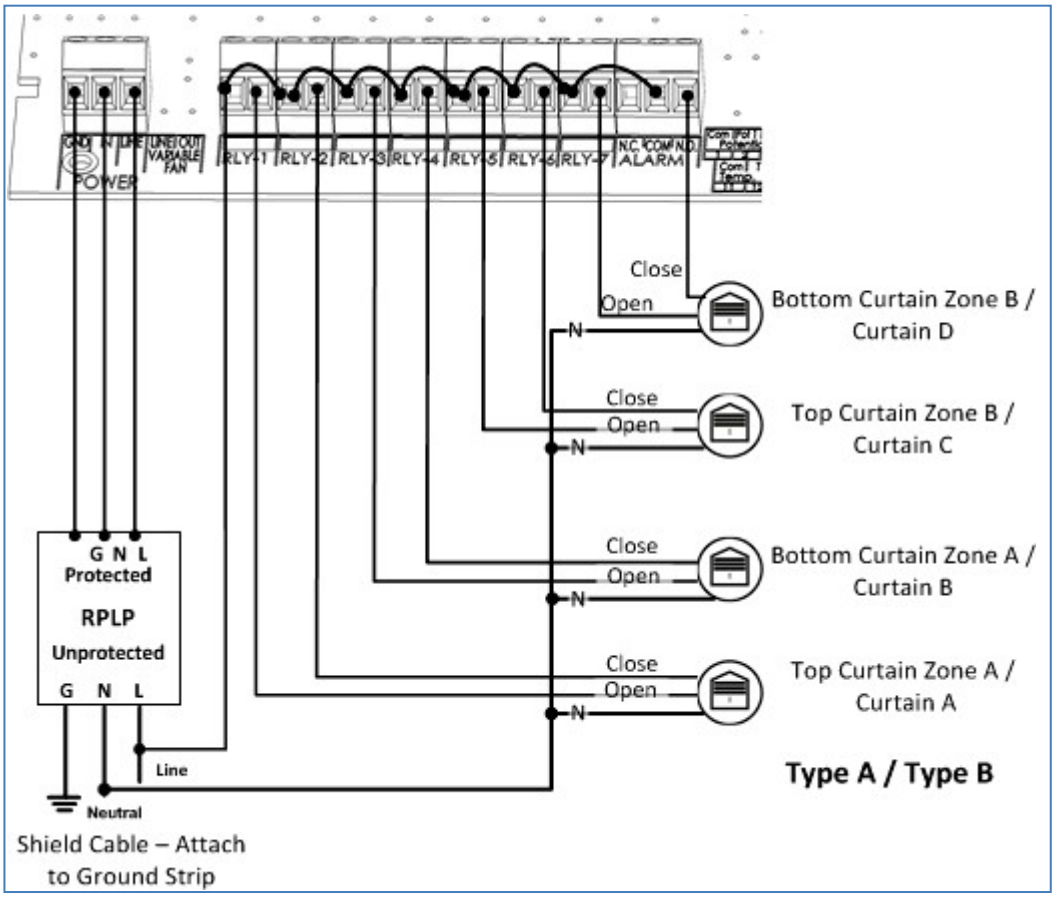


Figure 10: Wiring Diagram of Main Voltage Section and Protection (Type A / Type B Mode)

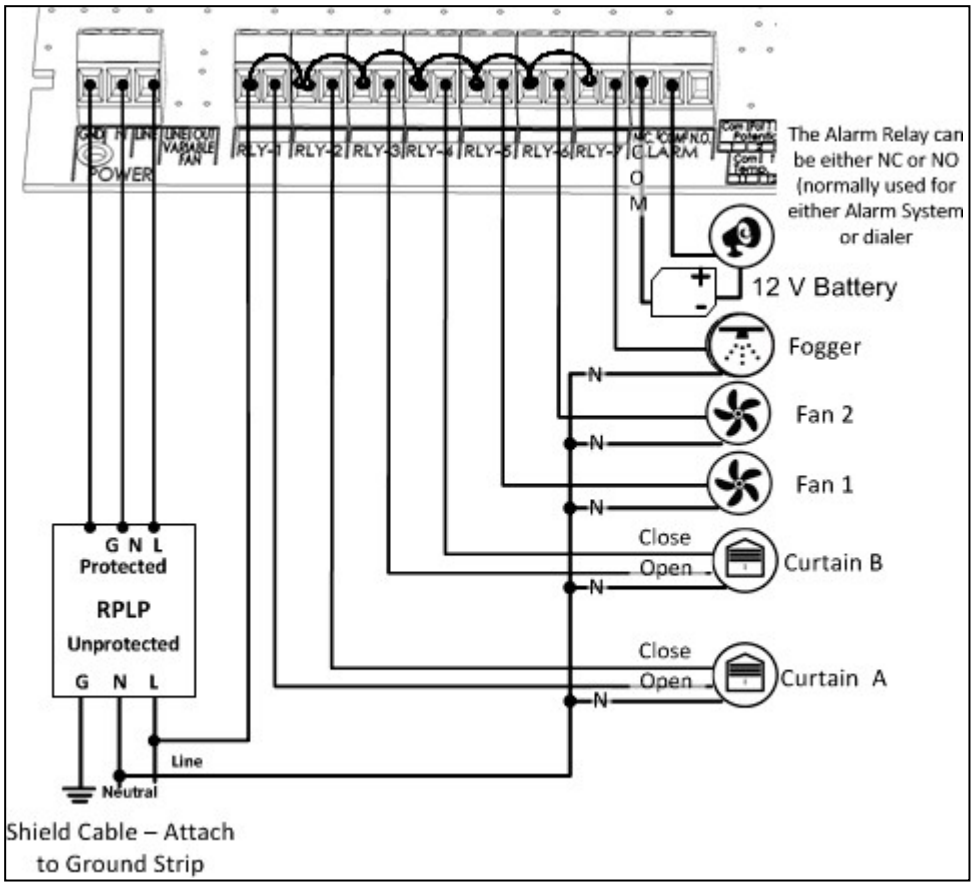


Figure 11: Wiring Diagram of Main Voltage Section and Protection (Type C)

- **RPLP**: Protects the controllers from electrical surges.

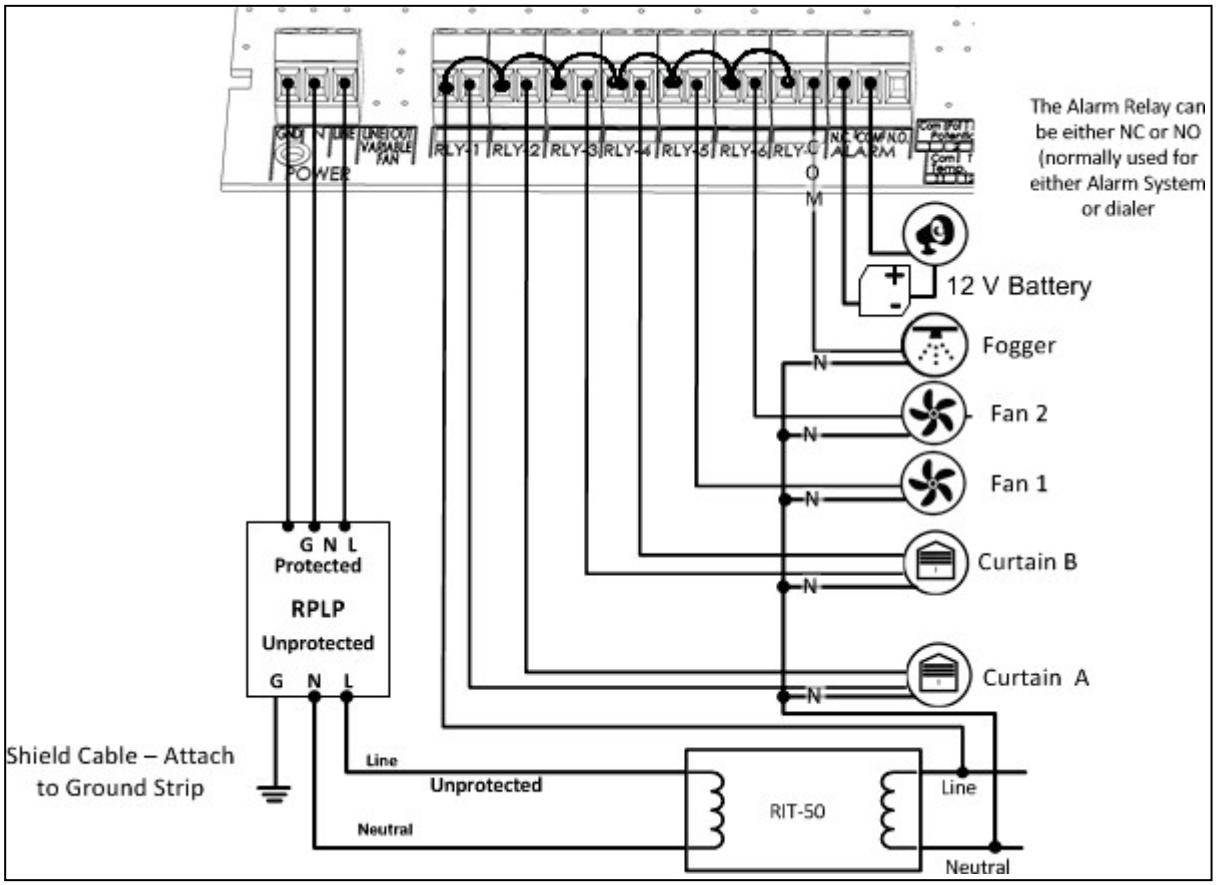


Figure 12: Wiring Diagram of Main Voltage Section having Protection and Isolation

All the remaining wiring to the main voltage section remains as illustrated in **Figure 13** and **Figure 14**.

- **RIT-50**: Separates the electrical source from the controllers, maintaining the voltage at astable level
- **RPLP**: Protects the controllers from electrical surges

5.3 Communication Wiring

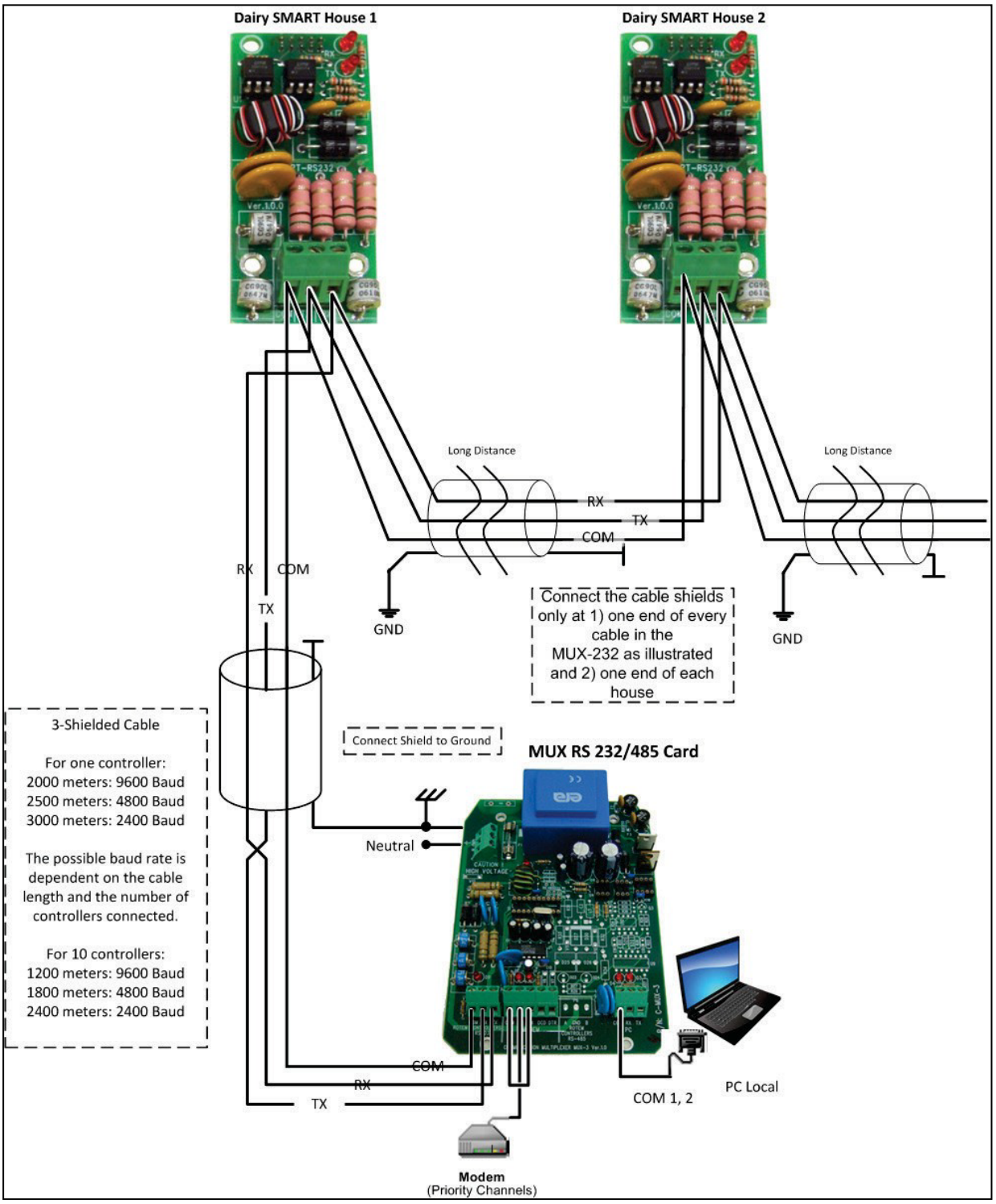


Figure 13: Dairy Smart Communication RS-232 Wiring Diagram

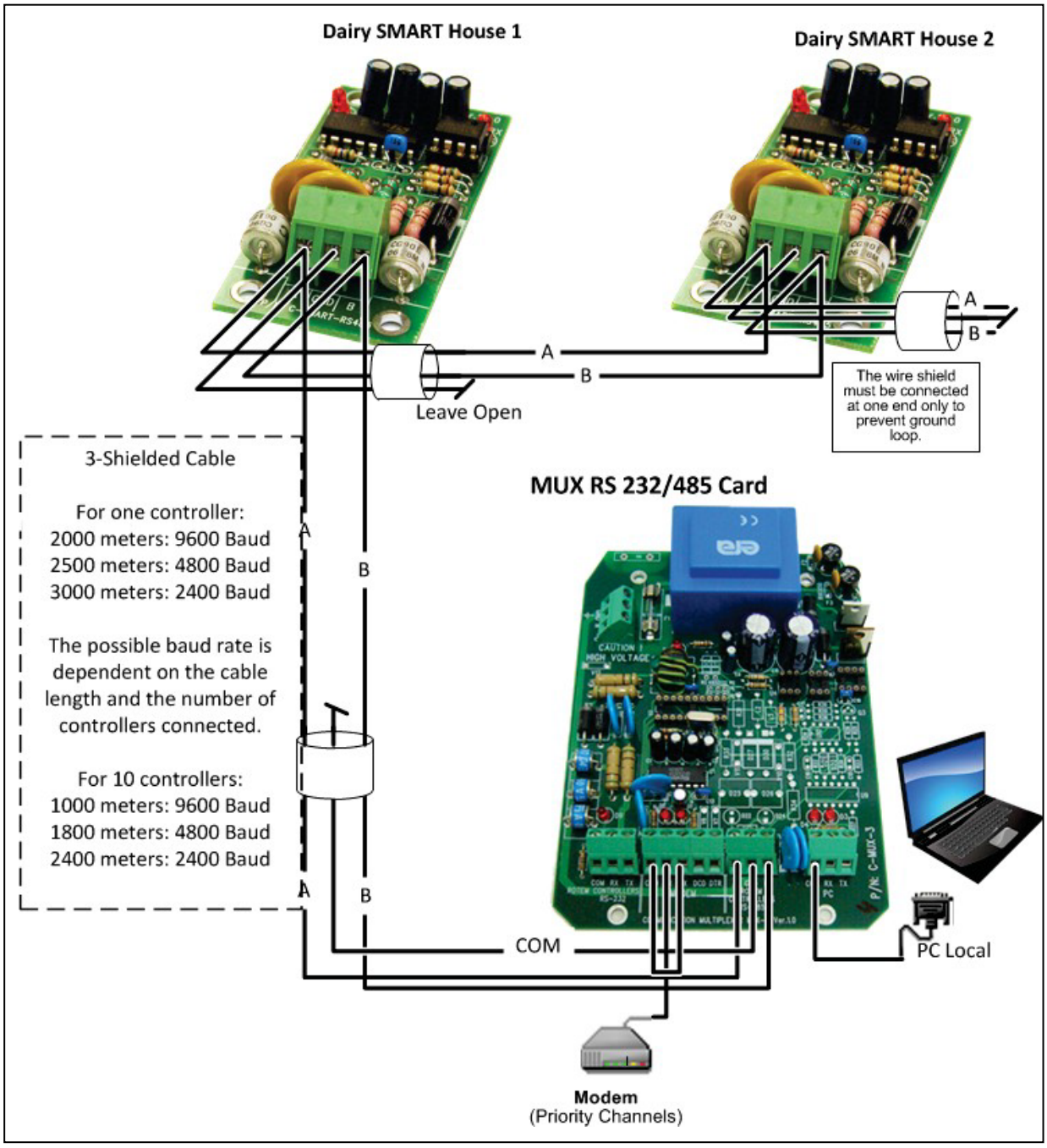


Figure 14: Dairy Smart Communication RS-485 Wiring Diagram

6 Electrical Grounding for Controllers

Electrical equipment can be destroyed or slowly damaged by voltage spikes, lightning hits, etc. Proper electrical grounding in combination with the Smart-C internal protections is essential to protect the system, reduce the risk of damage and prolong its lifetime. Correct selection and installation of equipment will protect your system and reduce the risk of human injury.

Proper grounding provides an easy path for electrical current to return to its source. A grounding system should tie all non-current carrying conductors to earth ground (0 volts). The grounding system should present a minimum resistance to current flow. Make sure all items used are in proper condition; for example, a corroded wire clamp attaching a ground wire to a ground rod might add 100 ohms or more resistance to a system. Less than 5 ohm will be considered a good ground.

6.1 Ground Rods

Ground rods are used to efficiently connect the system to earth where current may be dissipated in thesoil.

- **Material**: Ground rods should be copper clad or galvanized steel.
- **Diameter**: Minimum 5/8", preferably 3/4". Generally the larger the rod diameter, the lower its resistance to current flow.
- **Length**: Minimum 2.5 meters (8 feet), preferably 3-meter (10-foot). A longer ground rod will reach a soil with higher moisture content. Moist soil carries current much better than drier soil.
- **Single grounding**: It is important that there is only one grounding location where a rod orseries of rods are connected to each other using a ground wire.
- Independent ground rods will increase the risk of current, from a lightning strike for example, being dissipated through one rod and reentering the system through an adjacent rod.
- **Location**: Close to the main circuit breaker panel and in moist soil. For example in an areathat is usually wet from a drip or a low spot where water drains. Make sure the area is well protected from damage by lawnmowers, tractors, etc.
- **Rod installation**: Drive the rod into the earth until about 10 cm (4 inches) is left above grade.If it is impossible to drive the rod to the proper depth, it is acceptable to lay the rod horizontally, 80 cm (2.5 feet) below grade.
- In case the rod is exposed to damage, for example by lawnmowers or tractors, it can be installed in a hole, about 20 cm (8 inches) deep so that the rod is about 10 cm under gradeand 10 cm above hole level.

NOTE The National Electric Code (NEC) mandates two ground rods unless you can show less than10 ohms resistance with one rod.

6.2 Ground Wire

The ground wire is a large copper wire that connects the main circuit breaker panel to the ground rod.

- **Material**: Ground rods should be copper clad or galvanized steel.
    - Diameter: Typically, 16 mm (6-gauge) copper wire is sufficient. If the wire run is greater than 20 feet, 20 mm (4-gauge) wire should be used.

- Length: Minimum 2.5 meters (8 feet), preferably 3-meter (10-foot). A longer ground rod will reach a soil with higher moisture content. Moist soil carries current much better than drier soil.

The ground wire should be protected from damage by lawnmowers, tractors, etc. It should be buried minimum 15 cm (6 inches) underground for protection and enter the house as soon as possible. It is important that the wire not be cut; it should remain continuous.

6.3 Ground Clamps

Ground wires should not be merely wrapped around a ground rod. Ground clamps are used to attacha ground wire to a ground rod. The most common clamp is an acorn clamp. Make sure the ground clamps you select are rated for outdoor use. Do not use pipe clamps rated for inside water lines or hose clamps to attach the ground wire.

Figure 15: Ground Connection

6.4 What Should Be Grounded?

Any equipment that is or could become energized, even accidentally, should be grounded. Current from lightning strikes objects in a random fashion. Accounts of lightning strikes reveal scenarios most of us could not predict.

Electric circuits should be wired with a 3-wire conductor consisting of hot, neutral and grounding wires. The grounding wire should be attached cleanly and securely to devices or systems to be grounded. The other end of the grounding wire should be attached to the ground bus on the main panel.

7 Technical Specifications

Input Power Voltage	• One Phase 220 VAC • 0.1 Amp, 50-60Hz
Relay Loads	4/8 x 5.0 Amps, 250 Volts
Analog Inputs	• 2 temperature inputs • 1 humidity input • 1 potentiometer for wind direction 12 VDC for humidity • 0.1 A
Digital Inputs	5 mA @ 5 volts, dry contact 2 inputs (wind speed, rain)
Operating Temperature Range	0° to +50° C (32° to 125° F)
Enclosure:	Water and Dust Tight
Fuses	• Main fuse: 0.100 Amps, 250 Volts • Relay Fuse: 5 A

8 Troubleshooting

Display	Problem	Possible Cause	Possible Solution
Error	Error message on the main screen (instead of Temp indication); the system doesnot read any temperature sensor	Temperature sensor not connected	Connect sensor properly
		Temperature sensor's terminals or wires not connected, or not properlyconnected.	Connect terminals and wires properly. Unbolt thescrew, make sure the plate is upwards
		Wrong terminals connected	Connect appropriateterminals
		Flat cable not properly connected	Connect flat cableproperly
Sensor Fail	Faulty sensor	Sensor not connected	Connect sensor properly
		Sensor's terminals are notconnected, or not properlyconnected	Connect terminals and wires properly. Unbolt thescrew, make sure the plate is upwards
		Wrong terminals connected	Connect appropriateterminals
		Flat cable not properly connected	Connect flat cableproperly
TX and RX LEDs constantly turned ON or OFF	No communication to theunit	Wiring problem	Check the wiringconnections
TX and RX LEDs blinking	No communication to theunit	No unit number is allocated	Allocate unit number
		Unit number is not unique on the network	Make sure the unitnumber is unique
		PC and controller do notuse the same baud rate	Verify PC and controlleruse the same baud rate
		Baud rate too high (relative to cable length)	If all parameters are valid, reduce baud rate

Display	Problem	Possible Cause	Possible Solution
	Output relay not working	Settings are not correct	Refer to the Test sectionin order to check settingsmanually. If the settings are valid, it is a hardwareproblem
		Faulty card, fuse, connections or external device	Replace faulty part
No display	Unit does not operate	No input voltage	Contact authorizedelectrician
		Main fuse burned	Check the main fuse (F9& F6)
		Faulty flat cable	Replace the flat cable
-	Unclear display or no display	Contrast is not set properly	Set contrast (R2) properly
-	No LCD display and LED is blinking	LCD or CPU problem	Replace LCD or CPU card
Alarm or N/A	Sensor fail	Sensor disconnected or not properly connected	Connect sensor properly

CAUTION *In case of hardware problems, do not open the box. Contact an authorized electrician.*

9 Appendix: Features Parameters

The following tables summarize the features parameters.

- Temperature Menu Parameter: Range: 30.0° to 75.0° F. Default: 35° F

Table 5: Curtain Parameters Summary

Parameter Name	Default Value	Increment Value	Min Value	Max Value
Diff Close Full	-20.0	0.1	-50.0	0.0
Diff Open Full	20.0	0.1	0.0	50.0
Diff Close Step	See Table 7			
Diff Open Step				
Time From	00:00	1	00:00	23:59
Time To	00:00	1	00:00	23:59
Position (%)	0	1	0	100
Wind Dir. From	0	1	0	359
Wind Dir. To	0	1	0	359
Wind Speed kmph/mph	20	1	0	50
Stage Delay (seconds)	300	1	10	999
Step size (%)	10	1	1	100
Minimum Position (%)	0	1	1	100

Table 6:Curtain Diff Step Parameters

Parameter Name	Default Value	Increment Value	Min Value	Max Value
Diff Close Step Curtain A	-2.0	0.1	0.0	-50.0
Diff Open Step Curtain A	5.0	0.1	0.0	50.0
Diff Close Step Curtain B	-3.0	0.1	0.0	-50.0
Diff Open Step Curtain B	8.0	0.1	0.0	50.0
Diff Close Step Curtain C	-4.0	0.1	0.0	-50.0
Diff Open Step Curtain C	10.0	0.1	0.0	50.0
Diff Close Step Curtain D	-6.0	0.1	0.0	-50.0
Diff Open Step Curtain D	12.0	0.1	0.0	50.0

Table 7: Fan Parameters Summary

Parameter Name	Default Value	Increment Value	Min Value	Max Value
Fan 1 Difference On	+35° F	0.1	-30° F	+40° F
Fan 1 Difference Off	+31° F	0.1	-30° F	+40° F
Fan 2 Difference On	+40° F	0.1	-30° F	+40° F
Fan 2 Difference Off	+36° F	0.1	-30° F	+40° F

Table 8: Fogging Parameters Summary

Parameter Name	Default Value	Increment Value	Min Value	Max Value
Temp Diff On	35.0° F	0.1	0° F	+60° F
Temp Diff Off	31.0° F	0.1	0° F	+60° F
Fogging to Hum (%)	85	1	0	100
Fogging On (sec)	60	1	0	999
Fogging Off (sec)	60	1	0	999

Table 9: Alarm Parameter Summary

Parameter Name	Default Value	Increment Value	Min Value	Max Value
Hi T. (Diff):	99.0º	± 0.1	1.8 º	178.2º
Lo T. (Diff):	-99.0º	± 0.1	-178.2 º	-1.8º
Delay (sec):	60	± 1	10	999

Table 10: Calibration Parameter Summary

Parameter Name	Default Value	Increment Value	Min Value	Max Value
Thermometer 1/3	0º	± 0.1	-9.0º	+9.0º
Humidity (%)	0	1	-25	25
Wind Direction	200	1	0	359
Curtain Open/Close (seconds)	255	1	0	999

Table 11: System Menu Summary

Parameter Name	Default Value	Increment Value	Possible Value
Curtain Thermometer 1-4	Temp-1	N/A	Temp-1, Temp-2, Average
NOTE Temp Sense 2 must set to Connect for Curtain Thermometer parameters to appear. TheBarn Layout defines the number of these parameters			
Temp Sense 2	None	N/A	None, Connect
Wind Direction	None	N/A	None, Pot
Humidity	None	N/A	None, Connect
Rain Digital Input	None	N/A	None, Dig-1
Wind Speed Digital Input	None	N/A	None, Dig-2
Weather Delay	120	1	0 - 999
Measurement Unit	Non-metric	N/A	Non-metric, Metric
Calibration Steps	99	1	5 to 98 (99 disables this function)
Time	No default	1 minute	00:00 – 23:59
Unit Number	0	1	1 - 255
Baud Rate	9600	N/A	2400, 4800, 9600, 19200

10 Warranty

Warranty and technical assistance

Munters products are designed and built to provide reliable and satisfactory performance but cannot be guaranteed free of faults; although they are reliable products they can develop unforeseeable defects and the user must take this into account and arrange adequate emergency or alarm systems if failure to operate could cause damage to the articles for which the Munters plant was required: if this is not done, the user is fully responsible for the damage which they could suffer.

Munters extends this limited warranty to the first purchaser and guarantees its products to be free from defects originating in manufacture or materials for one year from the date of delivery, provided that suitable transport, storage, installation and maintenance terms are complied with. The warranty does not apply if the products have been repaired without express authorisation from Munters, or repaired in such a way that, in Munters' judgement, their performance and reliability have been impaired, or incorrectly installed, or subjected to improper use. The user accepts total responsibility for incorrect use of the products.

The warranty on products from outside suppliers fitted to Dairy Smart, (for example cables, weights, etc.) is limited to the conditions stated by the supplier: all claims must be made in writing within eight days of the discovery of the defect and within 12 months of the delivery of the defective product. Munters has thirty days from the date of receipt in which to take action, and has the right to examine the product at the customer's premises or at its own plant (carriage cost to be borne by the customer).

Munters at its sole discretion has the option of replacing or repairing, free of charge, products which it considers defective, and will arrange for their despatch back to the customer carriage paid. In the case of faulty parts of small commercial value which are widely available (such as bolts, etc.) for urgent despatch, where the cost of carriage would exceed the value of the parts, Munters may authorise the customer exclusively to purchase the replacement parts locally; Munters will reimburse the value of the product at its cost price.

Munters will not be liable for costs incurred in demounting the defective part, or the time required to travel to site and the associated travel costs. No agent, employee or dealer is authorised to give any further guarantees or to accept any other liability on Munters' behalf in connection with other Munters products, except in writing with the signature of one of the Company's Managers.

WARNING: *In the interests of improving the quality of its products and services, Munters reserves the right at any time and without prior notice to alter the specifications in this manual.*

The liability of the manufacturer Munters ceases in the event of:

- dismantling the safety devices;
- use of unauthorised materials;
- inadequate maintenance;
- use of non-original spare parts and accessories.

Barring specific contractual terms, the following are directly at the user's expense:

- preparing installation sites;
- providing an electricity supply (including the protective equipotential bonding (PE) conductor, in accordance with CEI EN 60204-1, paragraph 8.2), for correctly connecting the equipment to the mains electricity supply;
- providing ancillary services appropriate to the requirements of the plant on the basis of the information supplied with regard to installation;
- tools and consumables required for fitting and installation;
- lubricants necessary for commissioning and maintenance.

It is mandatory to purchase and use only original spare parts or those recommended by the manufacturer.

Dismantling and assembly must be performed by qualified technicians and according to the manufacturer's instructions.

The use of non-original spare parts or incorrect assembly exonerates the manufacturer from all liability.

Requests for technical assistance and spare parts can be made directly to the nearest Munters office.

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