



Messenger W

User Manual

9M02-7000-A001-EN



CONNECT. CONTROL. PROTECT.

Revision History

VERSION	DATE	NOTES
		Initial Release
1.1.0	07/2018	
A	11/2020	Document rebranded and contact information updated

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Contents

1	Description	5
1.1	Capabilities	5
1.2	Monitoring	5
1.3	Host Server Communications	5
1.3.1	Event Codes	6
1.3.2	Store and Forward Data Queue	6
1.4	Specifications	6
2	Installation and Setup	7
2.1	Installation Steps	7
2.2	Unpacking the Equipment	7
2.3	Mounting the Equipment	7
2.3.1	EEC Thermoplastic Enclosure	8
2.4	Mounting the Antenna	8
3	LED States	9
4	Channels	11
4.1	Defined Channels	11
4.2	Channel Data	12
5	SMS Text Commands	14
5.1	Command Syntax	14
6	Diagrams	16
7	Technical Support	18



Introduction

This User Manual describes installation and setup of the Messenger W product.

The Messenger W is a complete monitoring, alarm notification and telemetry platform. It supports monitoring of data values from onboard physical IO.

Features

The hardware feature set of this platform includes the following:

- Battery-backed on power fail
- Power fail detection
- Three Digital Inputs (user configurable to accept a voltage or ground input)
- One Digital Output (transistor closures to ground)
- One Analog Input (10-bit, user configurable for V or mA input)
- 3G or LTE cellular modem and antenna



1 Description

1.1 Capabilities

The Messenger W is a highly configurable platform for remote monitoring and control applications. Some of the capabilities are listed below.

- Local computations from monitored conditions
- Time stamping of monitored data and events
- Battery-backed historical data/event buffers
- Automatic monitoring of max/min for analog values
- Event and data logging
- Telemetry of monitored conditions to host server-based applications via cellular
- Over-The-Air (OTA) programming and diagnostics
- SMS messages sent on monitored conditions
- Parameter setting via SMS messages
- Rate of change alarm/flow totalization on physical analog input channel
- Pulse counter on all physical digital input channels
- High/low warning/alarm on all analog channels
- Daily count and duration alarm on all physical digital input channels

1.2 Monitoring

All monitored values can be transmitted via cellular to a host server of the customer's choosing. Monitored values are transmitted based on time or notification events. Notification events are based on rules set by the user and each event can generate an immediate report. Telemetry includes cellular data connectivity to host server or SMS messaging direct to user.

Monitored data values are mapped to fixed channels in the Messenger W. A channel defines a set of attributes for the monitored data for doing calculations, alarm detection, data formatting and reporting.

For example, the physical analog input is fixed to channel 62. For channel 62, the user can set high/low limits to generate notifications to a host server or directly to the user via SMS.

A description of all the predefined channel numbers can be found in the [Defined Channels](#) section.

1.3 Host Server Communications

The Messenger W utilizes a proprietary protocol to send notifications and to receive OTA commands from a host server. Each notification sent typically consists of location, date/time, an event code and associated data. An event code provides a unique identifier to indicate the reason that the notification is being sent – for example, normal scheduled update or an alarm detection event. A description of the protocol, format of messages and definition of event codes is available on request (document number "M09-PRTCLxxx").



Some of the conditions on which notifications can be sent to the host server are listed below:

- Any monitored value exceeding a predefined or user-defined limit
- A digital input changing state (on/off)
- A digital output changing state
- An analog input transitioning into a warning or alarm region
- A scheduled update
- System faults
- SMS text commands from a user or host server
- Power on or reset

1.3.1 Event Codes

Every message sent by the Messenger W to a host-based server application is triggered by an event. The event generates a message and the message contains an Event Code. The Event Code uniquely identifies to the server the reason the message is being sent. Some of the messages generated contain data; others serve simply as notification that a particular event has occurred.

1.3.2 Store and Forward Data Queue

There are several scenarios where a message may not be deliverable – network down, host server down and poor connectivity, to name a few. In the event that a message cannot be delivered, it is stored in memory and is continually re-sent until it is properly acknowledged. This store and forward memory is non-volatile and remains intact during power off.


1.4 Specifications

Power Input:	8-32 VDC 50 mA @ 24 VDC Reverse polarity protection Overvoltage protection Externally fused
Digital Outputs:	Transistor switch to ground (current sink) 2 A @ 24 VDC Current limited Overvoltage protection
Digital Inputs:	Two modes of operation (user selectable): voltage input or ground input Current limited Overvoltage protection
Analog Input:	10-bit ADC Accuracy: +/- 2% FS Input ranges (user selectable): 0-1 V, 0-5 V, 0-10 V, 0-20 mA



2 Installation and Setup

This section provides information on installing the Messenger W and confirming its initial operation.

	WARNING
	IT IS RECOMMENDED THAT YOU READ THIS ENTIRE SECTION BEFORE STARTING THE INSTALLATION.

2.1 Installation Steps

Installation consists of the following steps:

1. Unpack the Equipment.
2. Mount the Equipment.

The Messenger W should be mounted in a vertical position to try and minimize the chance of water entering through the antenna connection. The antenna wire should have a service loop just below the antenna connector.

3. Connect Main Power.
4. Connect Field Signals (digital, analog, Modbus) to the appropriate wire. Wiring information can be found in [Figure 2](#) and [Figure 3](#) in the [Diagrams](#) section.


2.2 Unpacking the Equipment

The Messenger W is shipped with the following:

- The Messenger W electronics in a Deutsch thermoplastic enclosure or a board-only product
- A Cellular antenna (magnetic mount or bulkhead)
- User Manual
- Optionally, a cable harness

2.3 Mounting the Equipment

The Messenger W is available in an automotive grade weather resistant enclosure; the dimensions of the enclosure are shown in [Figure 1](#).

	CAUTION
	MOUNT THE MESSENGER W VERTICALLY AND PROVIDE A SERVICE LOOP FOR THE ANTENNA CABLE TO PREVENT WATER INTRUSION.



2.3.1 EEC Thermoplastic Enclosure

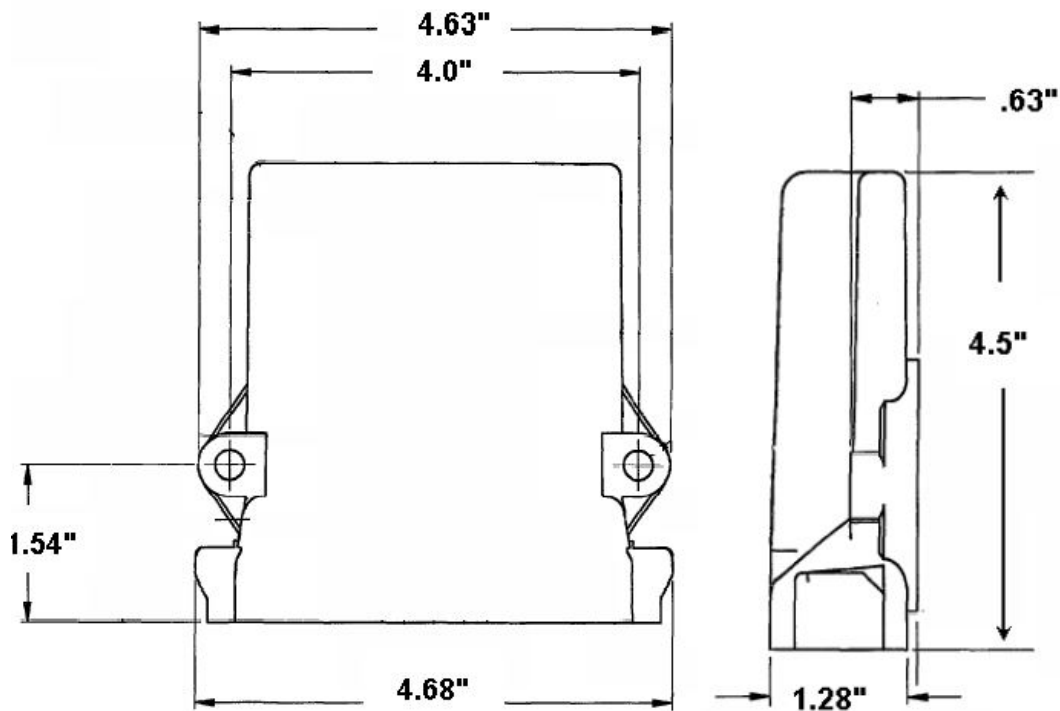


Figure 1: Deutsch EEC Thermoplastic Enclosure Dimensions

2.4 Mounting the Antenna

The antenna shipped with the Messenger W is a cellular hockey puck style. The antenna can be ordered with a magnetic or a screw mount base.

In general, the antenna should be mounted with an unobstructed view of the sky. If the antenna is mounted outside and may be subject to lightning, a surge arrestor can be inserted between the antenna and the Messenger W. If the antenna is mounted inside, it should be located near a window.



CAUTION

SERVICE LOOPS SHOULD BE PROVIDED FOR THE ANTENNA CABLING, NEAR THE ANTENNA CONNECTION, TO MINIMIZE WATER INGRESS THROUGH THE CONNECTION.



3 LED States

There are eight LEDs used to indicate various system conditions. The locations of these LEDs can be seen in [Figure 2](#) in the [Diagrams](#) section. Specific information is conveyed to the user via LED blink patterns. On power-up, an LED test is performed by blinking all LEDs every second for 3 seconds. Following the LED test, the LEDs blink based on the following conditions.

LED 1 (GRN) – System

State	Rate	Definition
Blink	1 blink every 5 seconds	Sleep Mode
Blink	1 blink every second	CPU Run – Normal
Blink	5 blinks every second	Boot Loader Mode (all other LEDs off)
On or Off	Solid	System Failure

LED 2 (RED) – Cell Registration

State	Rate	Definition
Blink	Rapid blink, then off	OK – Rx/Tx Activity with CELL Modem
Blink	1 blink every second	Not Registered Check APN Verify valid cellular account
Off	Solid	OK – Registered

LED 3 (RED) – Cell Status

State	Rate	Definition
Blink	10 blinks every second	No SIM card or communications failure with modem
On	Solid	Not Ready/Fault
Blink	1 blink every second	Error
Off	Solid	OK

LED 4 (RED) – CAN

State	Rate	Definition
On	Solid	Fault, no engine bus activity detected
Blink	2 blinks every second	OBD traffic detected, but no response to data queries
Blink	1 blink every second	Engine bus not selected, check DIP Switch 2
Off	Solid	No Faults, engine bus activity detected



LED 5 (RED) – GPS

State	Rate	Definition
Blink	1 blink every second	No Fix
Off	Solid	Fix

LED 6 (RED) – Modbus

State	Rate	Definition
Blink	Rapid (burst)	OK – Rx/Tx Activity on Port 2 or 3
On	Solid	Fault (comm. timeout error)
Off	Solid	OK – No Faults

LED 7 (RED) – USR1

State	Rate	Definition
Blink	1 blink every second	Lithium Coin Cell battery is low or RTC has stopped
On	Solid	If DIN1, DIN2, DIN3 or DIN4 are configured as pulse counter inputs, this LED will light when any input is activated; off when all inputs are idle
Off	Solid	No Faults

LED 8 (RED) – CELL Signal Strength

Rate	Definition
OFF	Not registered or not detectable
1 blink, 1.2 sec pause	signal strength <6, weak
2 blinks, 1.2 sec pause	signal strength <=12
3 blinks, 1.2 sec pause	signal strength <=18
4 blinks, 1.2 sec pause	signal strength <=24
5 blinks, 1.2 sec pause	signal strength >24, strong



4 Channels

The Messenger W maps all monitored conditions into channels. Each channel has data storage and configuration parameters. Data storage holds current value, max/min values, and other run time data values.

Every channel in the Messenger W is referenced by a fixed channel number; for example, the analog input channel is always channel 62. There is a set of predefined channels (numbers 1-300) and a set of Modbus channels (numbers 301-380). The Modbus channels are user configurable for reading/writing digital or analog values from a Modbus RTU slave device.

4.1 Defined Channels

The following channels are predefined in the Messenger W. The wiring for some of these channels can be found in [Figure 2](#) and [Figure 3](#) in the [Diagrams](#) section.

Table 4.1: Predefined Channels

Channel Number	Channel Name	Type	Description
Start Digital Channels (data values are '0' or '1')			
1	Cell	Digital (System)	Status of cellular modem operation 1 = fault 0 = normal
2	Comm	Digital (System)	Status of any serial port used for communications with external device (MODBUS Master, Slave, or proprietary) 1 = fault 0 = normal
4	User DIN1 (used for power fail detection)	Digital	If SWX4-1 closed: 0 = input open 1 = input voltage < 1 VDC If SWX4-1 open: 1 = input open 0 = input voltage > 3 VDC
21	User DIN2	Digital	If SWX4-2 closed: 0 = input open 1 = input voltage < 1 VDC If SWX4-2 open: 1 = input open 0 = input voltage > 3 VDC



Channel Number	Channel Name	Type	Description
5	User DIN3	Digital	If SWX4-3 closed: 0 = input open 1 = input voltage < 1 VDC If SWX4-3 open: 1 = input open 0 = input voltage > 3 VDC
6	User DIN4	Digital	If SWX4-4 closed: 0 = input open 1 = input voltage < 1 VDC If SWX4-4 open: 1 = input open 0 = input voltage > 3 VDC
30	User DOUT1	Digital	State of digital output 1 0 = not energized 1 = energized

Start Analog Channels (data values are floating point, precision is user configurable)

62	User Analog	Analog	Onboard analog input, 10-bit ADC can be configured for 0-1 VDC, 0-5 VDC, 0-10 VDC, or 0-20 mA
154	Daily Flow Volume	Derived	Accumulated flow volume for the day (flow rate from ADC input)
155	Running Flow Volume	Derived	Accumulated flow volume since last volume reset (flow rate from ADC input)

4.2 Channel Data

All values read from physical IO or from a Modbus slave device are continually updated and tested as defined by the configuration parameters. For each channel, based on its type (analog or digital), there is a basic set of data collected. For purposes of discussion, the term “not normal” is used to indicate an analog value that has violated a limit threshold or a digital value that does not match its configured ‘normal’ state.

Basic Data Set –

For the analog channel:

- Current value
- Max/min values (daily and trip)



For the digital channels:

- Current value
- Previous value
- Count of transitions to not normal (counts)
- Accumulated time in not normal state (duration)

There are a few channels that can be configured for special functions. All the physical digital input channels can accept pulse inputs (e.g., from a flow meter) and the physical analog input can be used to totalize volume when the input is flow rate. These channels have an extended data set.

Extended Data Set –

For the analog channel:

- Daily total volume (available on separate channel, 154)
- Continuous running total volume (available on separate channel, 155)

For the digital channels:

- Flow rate
- Daily total volume
- Continuous running total volume

The Messenger W also maintains a set of daily data.

The daily data set is a separate set of current and max/min values that span the 24 hour period from midnight to midnight, UTC time. At midnight, an end of day report is generated from this data.

Because Modbus channel data is polled, Modbus digital channels do not maintain count or duration values.



5 SMS Text Commands

The Messenger W can receive and execute SMS commands to perform several functions. The SMS command set includes the following:

- ACTION – on-demand action request

5.1 Command Syntax

The commands can be upper case, lower case or a combination, as illustrated here:

- **<ACTION(x)>** - request to execute action identified by action number
x = action number, as defined below

Action Commands

Action Number	Action Description	Response
1	Generate on-demand standard report to host server	ack + report
2	Return status to sender	status
3	Force cell modem reset	ack
4	Clear all stored data records	ack
5	Return Cell config to sender	cell config
6	Force digital output 1 on	ack
7	Force digital output 1 off	ack
8	Generate on-demand end of day report to host server	ack + report
10	Return a subset of channel data values to sender	data values
13	Clear oldest data record	ack
26	Force exit of mini-ping mode	ack
28	Zero all non-volatile counter data	ack
30	Return SIM card info	SIM info
32	Clear ADC channel daily flow totals	ack
33	Clear ADC channel running flow totals	ack



Action Responses:

ack text:

v: r: c

status text:

VID(v)-CELL(i s)-REG(r g)-RSSI(#)-GPS(p)-JBUS(j m n)-DATAQ(d e f)-OUTP(a b)-SWX(x)-MSGS(f c)-
VER(v#.#.# date prot modem jbus)

VID: v = vehicle ID

CELL: i = init state
s = current state

REG: r = tower registration
g = data registration

RSSI: # = signal strength

GPS: p = 1 for fix, 0 for no fix

JBUS: j = J1939, J1708, OBD2
m
n

DATAQ: d = count in queue
e = deleted from queue
f = failed

OUTP: A
B

SWX

MSGS: f = failed
c = count

VER: prot = protocol (Antx, Rastrac, other)
modem = type of modem
jbus = type of bus

SIM info text:

VID(v)-MSISDN(s)-ICCID(g)-IMSI(u)-IMEI(p)

data text:

VID v-Running: s-52 RPM: r-x Hours: h- CoolTemp: x-Battery -OilPress -Odometer o

generator control text:



6 Diagrams

These figures provide some additional details concerning the wiring and LED locations in the Messenger W.

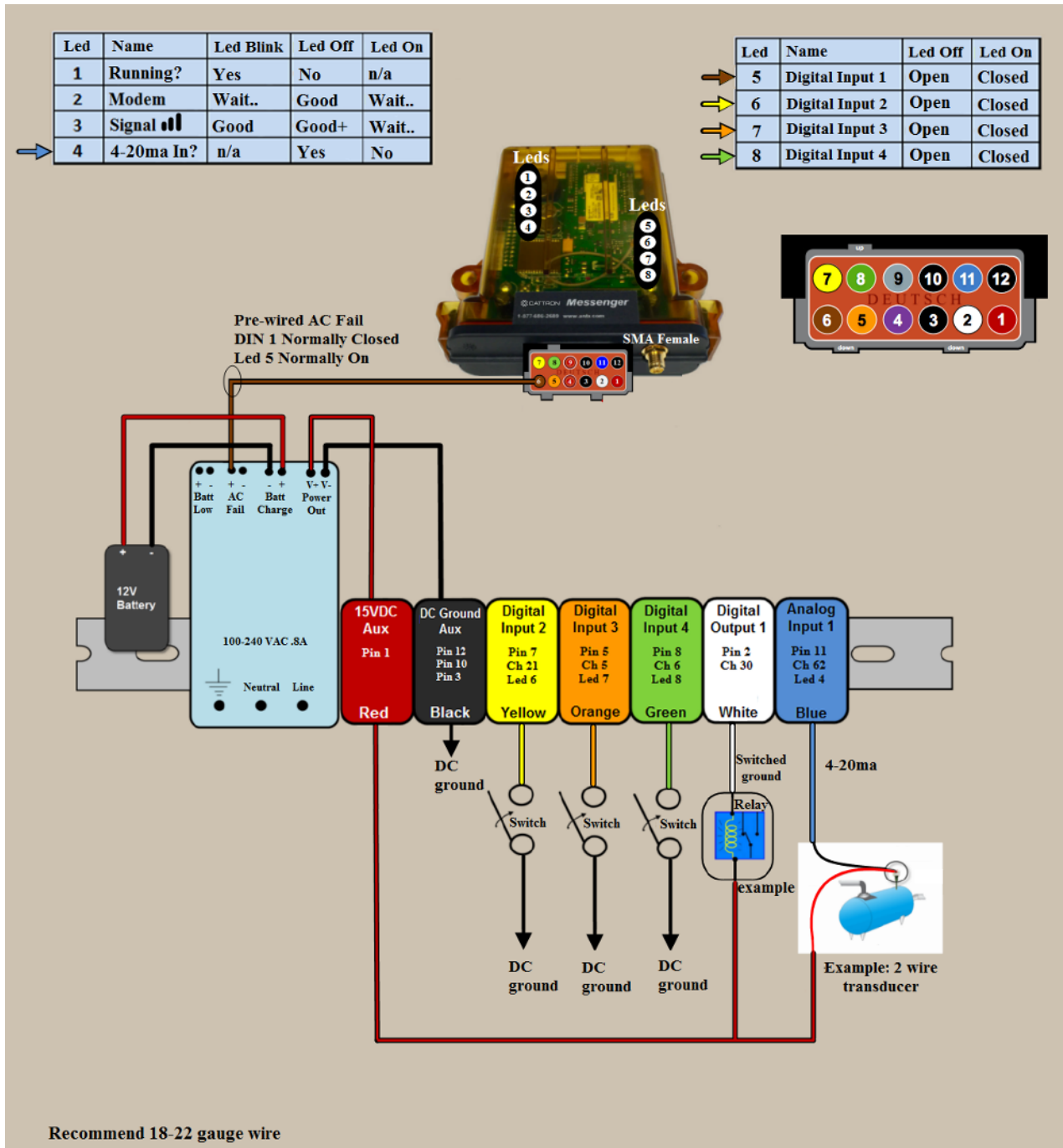


Figure 2: LED Locations and Wiring Information



Water Messenger Wiring

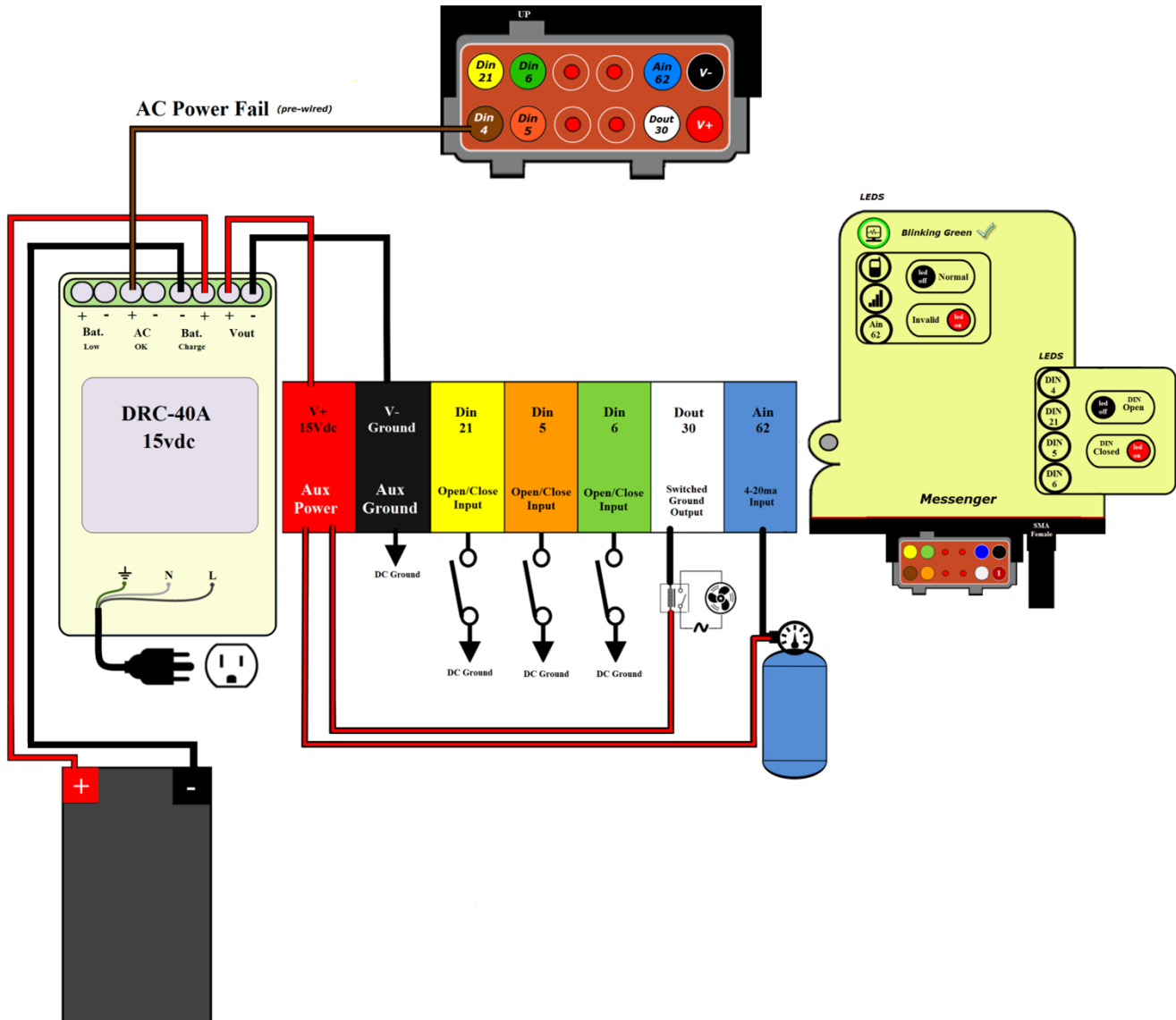


Figure 3: Messenger W Wiring Details



7 Technical Support

For remote and communication control systems support, parts and repair, or technical support, visit us online at: www.cattron.com/contact.



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