TM-260
Slide, Awning, and Motor Controller

Application Document

Feature Summary

The TM-260 has the ability to control up to 6 devices – slide rooms, awnings, or shades – and/or up to 15 DC outputs. In addition, it can provide up to three temperature readings.

Individual outputs may be set to operate thermostatically, based on any RV-C ambient temperature reading.

General Specifications

Input Voltage	8 VDC - 18 VDC
Input Amperage	60 mA @ 12V (idle) 150 mA @ 12V (max draw - outputs on)
Temperature Range	-40 - 185 Deg F (Industrial)
Environmental Limitations	Not sealed for exterior mounting.
Flash Memory (code space)	64K
EEPROM	2K
RAM	256 bytes RAM + 2048 bytes ERAM
External Dimensions	5.55” (L) x 3.79” (W) x 1.25” (H)
Source Address	Dynamic, starting at 191 (0xBF, Mechanical Components)
Default Source Address	Multiple

Product ID

The TM-102 transmit PRODUCT_ID PGN (0xFEEB) data upon request. Details on this PGN are found in the RV-C Protocol Manual. The format of the data appears as:

SILVERLEAF*TM260-v.vv-V0**aaaaaaaa*

Where:

v.vv	product version number
aaaaaaaa	current DIP switch setting, consisting of string of 1s and 0s.

.

Dip Switch	*Function*
1	
2	
3	
4	
5	
6	

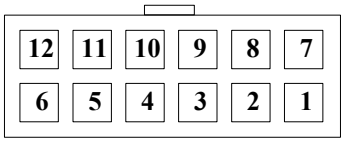
7	
8	

Connectors

Connector Types

All diagrams are “wire-side” view.

Molex 12-Pin
Receptacle - Molex 5557 Series. Part #39-01-2120
Strain Relief - 41995 Series. Part #15-04-0345
Crimp-on Connectors - 5556 Series. Part #39-00-0039



Connector Pinouts

Main Connector *12-pin Molex*

Pin	Designation	Type	Notes
1	GROUND	Ground	
2	Unused		
3	Unused		
4	Unused		
5	RV-C DATA +	CAN	Attach to RV-C Bus
6	RV-C DATA -	CAN	Attach to RV-C Bus
7	POWER	12V Power Input	Attach to constant power source
8	Serial Transmit	RS-232	Do Not Connect (Used for Diagnostic purposes)
9	Serial Receive	RS-232	Do Not Connect (Used for Diagnostic purposes)
10	Serial Ground	RS-232	Do Not Connect (Used for Diagnostic purposes)
11	Unused		
12	Unused		

Temperature (TEMP1, TEMP2, TEMP3) *4-pin Molex*

Pin	Designation	Type	Notes
1	Unused		
2	Unused		
3	GROUND	Ground	Attach to Temp Sensor
4	AMBIENT TEMP	Analog Input	Attach to Temp Sensor

Output (OUT1) *6-pin Molex*

Pin	Device Index	Output Index	Type
1			Ground
2	Device 1 Extend	Output 1	Output – Configurable. See below for capacity constraints.

Pin	Device Index	Output Index	Type
3	Device 1 Retract	Output 2	Output – Configurable. See below for capacity constraints.
4	Device 2 Extend	Output 3	Output – Configurable. See below for capacity constraints.
5	Device 2 Retract	Output 4	Output – Configurable. See below for capacity constraints.
6	Device 1/2 Stop	Output 5	Output - Active Low . Max current 680 mA.

Output (OUT2) *6-pin Molex*

Pin	Device Index	Output Index	Type
1			Ground
2	Device 3 Extend	Output 6	Output – Configurable. See below for capacity constraints.
3	Device 3 Retract	Output 7	Output – Configurable. See below for capacity constraints.
4	Device 4 Extend	Output 8	Output – Configurable. See below for capacity constraints.
5	Device 4 Retract	Output 9	Output – Configurable. See below for capacity constraints.
6	Device 3/4 Stop	Output 10	Output - Active Low . Max current 680 mA.

Output (OUT3) *6-pin Molex*

Pin	Device Index	Output Index	Type
1			Ground
2	Device 5 Extend	Output 11	Output – Configurable. See below for capacity constraints.
3	Device 5 Retract	Output 12	Output – Configurable. See below for capacity constraints.
4	Device 6 Extend	Output 13	Output – Configurable. See below for capacity constraints.
5	Device 6 Retract	Output 14	Output – Configurable. See below for capacity constraints.
6	Device 5/6 Stop	Output 15	Output - Active Low . Max current 680 mA.

Slide Rooms are controlled with Active High signals. Awnings are controlled with Active Low signals. Other outputs are configurable for Active High or Low.

The capacity of the configurable outputs depends on the acceptable voltage drop. When used as an Active High output, the outputs provide voltage directly from the main connector. There is a voltage drop of 1V per 100mA of current drawn. When used as an Active Low, the outputs provide a Ground, and there is a voltage rise of about 0.5V per 100 mA of current sunk (assuming a 12V source. If the source is 5V, the voltage rise is 1.2V per mA.) If the current exceeds 1.5A the output will be damaged.

System Configuration

System configuration is through a series of proprietary PGNs following the general RV-C guidelines.

If a conflict occurs in which a Device and an Output that use the same physical output are

both enabled, the unit will accept the more recent configuration message.

PGNs Supported

Proprietary - Calibrate Ambient Temperature

Name:	PROP_CALIBRATE_AMBIENT_TEMP	
PGN:	0xEF##	
Byte 1:	Operation	Always 0xF9
Byte 2:	Sensor	1- 3
Byte 3,4:	Reference Temperature	Per RV-C

Name:	PROP_CONFIGURE_TEMP_INSTANCES	
PGN:	0xEF##	
Byte 1:	Operation	Always 0xB4
Byte 2:	Temp Sensor 1 Instance	Per RV-C. 0 = Disabled
Byte 3:	Temp Sensor 2 Instance	Per RV-C. 0 = Disabled
Byte 4:	Temp Sensor 3 Instance	Per RV-C. 0 = Disabled

TM260 Device Configuration

Name:	PROP_TM260_DEVICE_CONFIG	
PGN:	0xEF##	
Byte 1:	Operation	Always 0xB6
Byte 2:	Device Index	1 – 6 0 = Send all Reports
Bits 3.1-3.4	Device Type	0 = Disabled 1 = Slide Room 2 = Awning
Bits 3.7-3.8	Reserved	
Byte 4:	Device Instance I	Instance of Type
Bits 5.1-5.2	Safety Interlock – Park Brake	00 = No Interlock 01 = Park Brake must be set to Extend.
Bits 5.3-5.4	Safety Interlock – Engine Run	00 = No Interlock 01 = Engine must be running to operate.
Bits 5.5-5.6	Automatic Retract	00 = No Automatic Retraction 01 = Automatically Retract on Park Brake Release
Bits 5.7-5.8	Reserved	
Byte 6	Extend Time	Maximum Extension Time (seconds) 0 = No Maximum
Byte 7	Retract Time	Maximum Retraction Time (seconds) 0 = No Maximum. Invalid if Auto Retract active.
Byte 8	Reserved	

The unit will respond with the PROP_TM260_DEVICE_STATUS for the indicated device. If the Device Index is 0, no settings will change but the unit will respond with all six device configurations.

TM260 Output Configuration

Name:	PROP_TM260_OUTPUT_CONFIG

PGN:	0xEF##	
Byte 1:	Operation	Always 0xB8
Byte 2:	Device Index	1 – 15 0 = Send all Reports
Bits 3.1-3.4	Device Type	0 = Disabled 1 = DC Load 2 = Thermostatic Output - Heat 3 = Thermostatic Output – Cool
Bits 3.5-3.6	Output Polarity	0 = Active High 1 = Active Low. Ignored for Outputs 5,10,15.
Bits 3.7-3.8	Output Enabled	0 = Disabled 1 = Enabled. This is the equivalent of setting the Operating Mode for thermostatic outputs. Ignored for DC Load outputs.
Byte 4:	Device Instance	Instance of Type
Byte 5:	Target Instance	Ambient Temperature Status monitored.
Byte 6,7,8	Reserved	

The unit will respond with the PROP_TM260_OUTPUT_STATUS for the indicated device. If the Device Index is 0, no settings will change but the unit will respond with all output configurations.

The dead band is hard coded to approx 1 deg F.

PGNs Reported

TM260 Configuration

Name: PROP_TM260_DEVICE_STATUS
PGN: 0xEF##
Byte 1: Operation Always 0xB5
The format is the same as PROP_TM260_DEVICE_CONFIG

Name: PROP_TM260_OUTPUT_STATUS
PGN: 0xEF##
Byte 1: Operation Always 0xB7
The format is the same as PROP_TM260_OUTPUT_CONFIG

Name: PROP_REPORT_TEMP_INSTANCES
PGN: 0xEF##
Byte 1: Operation Always 0xB0

DC Loads

PGNs Supported

DC Load Command

Name:	DC_LOAD_COMMAND	
PGN:	0x1FFBC	
Byte 1:	Instance	per RV-C
Byte 3:	Desired Level	0% = Off, non-zero values are On

PGNs Reported

DC Load Status

Name:	DC_LOAD_STATUS	
PGN:	0x1FFBD	
Byte 1:	Instance	per RV-C
Byte 3:	Operating Status	0% = Off, 100% (0xC4) = On

Ambient Temperature, Thermostat Control

Calibration is provided via the proprietary PGN detailed in the Configuration section above.

Each Thermostatic device must be configured as either a Furnace or an Air Conditioner.

PGNs Supported

Thermostat Command

Name:	THERMOSTAT_COMMAND_1	
PGN:	0x1FEF9	
Byte 1:	Instance	Instance of Output
Bits 2.1-2.4:	Operating Mode	0000b — Off 0001b — Cool 0010b — Heat 0011b — Auto heat/Cool
Byte 4-5:	Heat Set Point	Supported per RV-C.
Byte 6-7:	Cool Set Point	Supported per RV-C.

This PGN is accepted by every Thermostatic Output. Each output can either heat or cool, according to its configuration. The Auto mode is translated into either Cool or Heat, per the configuration.

PGNs Reported

Ambient Temperature Status

Name:	THERMOSTAT_AMBIENT_STATUS	
PGN:	0x1FF9C	
Byte 1:	Instance	See DIP switch table.
Byte 2-3:	Ambient Temperature	Supported per RV-C

This PGN is sent for every temperature sensor with a valid Instance. A thermostatic output that monitors an external temperature sensor will receive, but not transmit, this PGN.

Thermostat Status

Name:	THERMOSTAT_STATUS_1	
PGN:	0x1FFE2	
Byte 1:	Instance	Instance of Output
Bits 2.1-2.4:	Operating Mode	Per RV-C
Byte 4-5:	Heat Set Point	Supported per RV-C.
Byte 6-7:	Cool Set Point	Supported per RV-C.

This PGN is sent for every Thermostatic Output defined in the configuration. Either the Heat or Cool set point is included.

Furnace Status

Name:	FURNACE_STATUS	
PGN:	0x1FFE4	
Byte 1:	Instance	Supported per RV-C *pre v2.03:* Always same as External Temp Sensor.
Byte 4:	Heat Output Level	0 = Off. 200 = On.

This PGN is sent for every Thermostatic Output set to provide heat.

Air Conditioner Status

Name:	AIR_CONDITIONER_STATUS	
PGN:	0x1FFE1	
Byte 1:	Instance	Supported per RV-C *pre v2.03:* Always same as External Temp Sensor.
Byte 6:	Cooling Output Level	0 = Off. 200 = On.

This PGN is sent for every Thermostatic Output set to provide cooling.

Slide Control

PGNs Supported

Slide Command

Name:	SLIDE_COMMAND	
PGN:	0x1FFE7	
Byte 1:	Instance	per RV-C
Byte 3:	Motion	00 = Stop, 01 = Extend, 02 = Retract

The “Extend” and “Retract” commands must be repeated every 100 ms to keep the slide in motion. If a longer gap occurs, the slide shall stop automatically for safety. The “Stop” command does not need to be repeated, but it should certainly be sent to stop the motion.

Chassis Mobility Status

Name:	CHASSIS_MOBILITY_STATUS	
PGN:	0x1FFF4	
Byte 1-2:	Engine RPM	per RV-C. To register as “running”, must be >600.
Bits 3.1-3.2:	Park Brake Status	per RV-C

PGNs Reported

Slide Status

Name:	SLIDE_STATUS	
PGN:	0x1FFE8	
Byte 1:	Instance	per RV-C
Byte 2:	Motion	0 = No motion, 01 = Extending, 02 = Retracting
Bits 4.3.-4.4	Unlock Status	00 = Slide is Ok to Move 01 = Slide is Not Ok to Move

Awning

PGNs Supported

Awning Command

Name:	AWNING_COMMAND	
PGN:	0x1FEF2	
Byte 1:	Instance	per RV-C
Byte 3:	Motion	00 = Stop, 01 = Extend, 02 = Retract
Byte 4:	Move to Position	0 = Fully Retract, 200 = Fully Extend

The “Extend” and “Retract” commands must be repeated every 100 ms to keep the awning in motion. If a longer gap occurs, the awning should stop automatically for safety. The “Stop” command does not need to be repeated, but it should certainly be sent to stop the motion.

The Move to Position ignores the Motion parameter. Intermediate values between 0 and 200 are ignored.

PGNs Reported

Awning Status

Name:	AWNING_STATUS	
PGN:	0x1FEF3	
Byte 1:	Instance	per RV-C
Byte 2:	Motion	0 = No motion, 01 = Extending, 02 = Retracting
Bits 4.3.-4.4	Unlock Status	00 = Awning is Ok to Move 01 = Awning is Not Ok to Move

Diagnostics

The DSA for these DM1 reports is 84 (Slide Room)

Cause	*Lamp*	*SPN*	*MSB*	*ISB*	*LSB*	*FMI*	*Notes*
NVRAM write error	RED	4				12	Exceeded 100,000 write cycles/page – replace CPU

The DSA for these DM1 reports is 88 (Themostat)

Cause	*Lamp*	*SPN*	*MSB*	*ISB*	*LSB*	*FMI*	*Notes*
Temperature range error	RED		1	zone instance	0	0 or 1	Temperature sensor missing or bad

Index

AC Power Sharing 11
Ambient Temperature 8
Connectors 4
Diagnostics 13
Feature Summary 2
General Specifications 2
Maintained States 5
PGN:
- AIR_CONDITIONER_COMMAND 9
- AIR_CONDITIONER_STATUS 10
- HEAT_PUMP_COMMAND 7, 9
- HEAT_PUMP_STATUS 10
- PRODUCT_ID 3
- THERMOSTAT_AMBIENT_STATUS 10
- THERMOSTAT_COMMAND_1 8
- THERMOSTAT_COMMAND_2 8
- THERMOSTAT_SCHEDULE_COMMAND_1 9
- THERMOSTAT_SCHEDULE_STATUS_1 10
- THERMOSTAT_STATUS_1 10
- THERMOSTAT_STATUS_2 10

Product ID 3
Proprietary PGN:
- PROP_CALIBRATE_AMBIENT_TEMP 6
- PROP_DWELL_COMMAND 6, 7, 12
- PROP_DWELL_STATUS 7
- PROP_POWERSHARE_CONFIG_COMMAND 7, 8, 11
- PROP_POWERSHARE_CONFIG_STATUS 8
- PROP_POWERSHARE_PERMISSION 11, 12
- PROP_POWERSHARE_STATUS 12
- PROP_POWERSHARE_ZONE_STATUS 11, 13
- PROP_SETTLING_COMMAND 6, 8
- PROP_SETTLING_STATUS 8

Proprietary PGNs 5
Supported Devices 5
System Clock 8
System Configuration 5
Thermostat Control 8