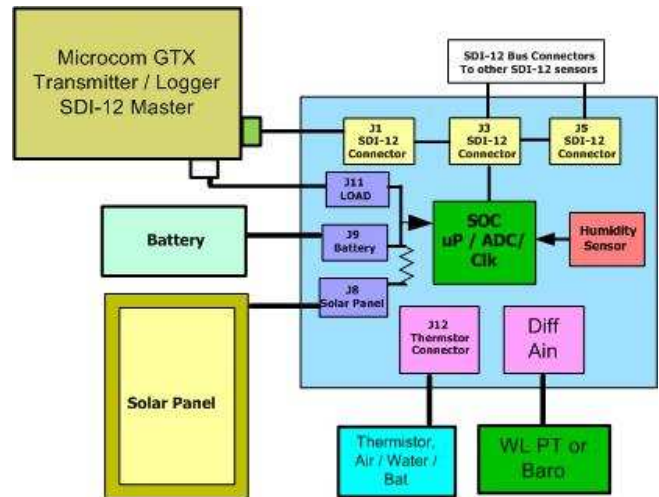




Microcom Design, Inc.

SDI Multi Sensor Module with Charger Enclosure Station Support

P/N 410 MSM-1



Description

The purpose of the SDI Multi Sensor Module with Charger is to provide a low power temperature compensated battery charge controller and a general-purpose interface for analog sensors. Sensor and charge controller data are acquired via the SDI-12 port. The 410 module provides sensor expansion capabilities for the GTX capabilities as well battery charge control.

There are six analog sensors configured. These are:

1. Solar Panel Voltage
2. Battery voltage
3. Battery charge current
4. First user defined single ended analog input or Internal enclosure Relative Humidity
5. Second user defined single ended analog input or external thermistor
6. Third user defined single ended or differential analog input, (Water Level PT or barometer).

The 410 also contains three SDI-12 3-wire (power / ground / data) interface connectors, which allows for three SDI-12 devices to directly connect to the SBCM SDI-12 BUS. All three connections are in parallel. A block diagram of the SBCM is shown above with barometer, thermistor and internal RH in place.

Analog Sensor Inputs

The basic analog measurement is a 12 bit ADC integrated with the Microprocessor. It may be operated in either an absolute value or ratio metric mode. The later is used for resistive type measurements commonly found in temperature measurements or in pressure sensors used for water level or barometer measurements. The measurement process in the SBCM has its own unique scale and offset values. Default is a scale of 1 and offset of zero.

The maximum number of available sensor inputs is eight. Six are configured in the standard configuration. Three are committed to operation of the battery charge controller. One may be used as an analog input. (FS is 2.2 volts). A second is configured as a single ended analog that may be set up to use thermistors for temperature measurements (see US Sensor or YSI). The third may be set up either as a single ended or differential sensor input.

Using US Sensor or YSI thermistor probes accuracy to 0.1 C may be attained for water or air temperatures.

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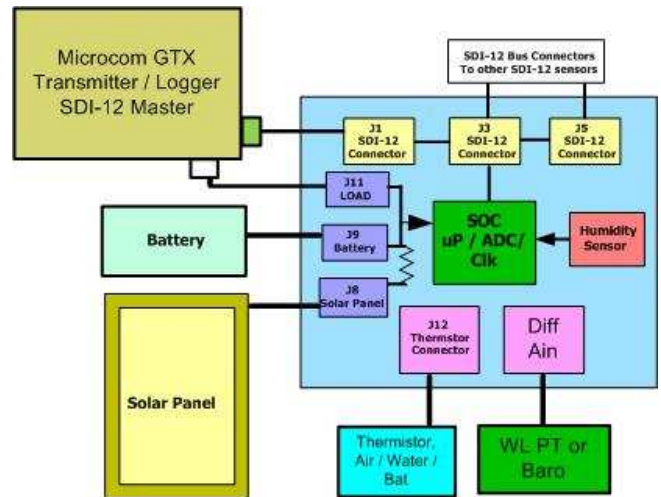
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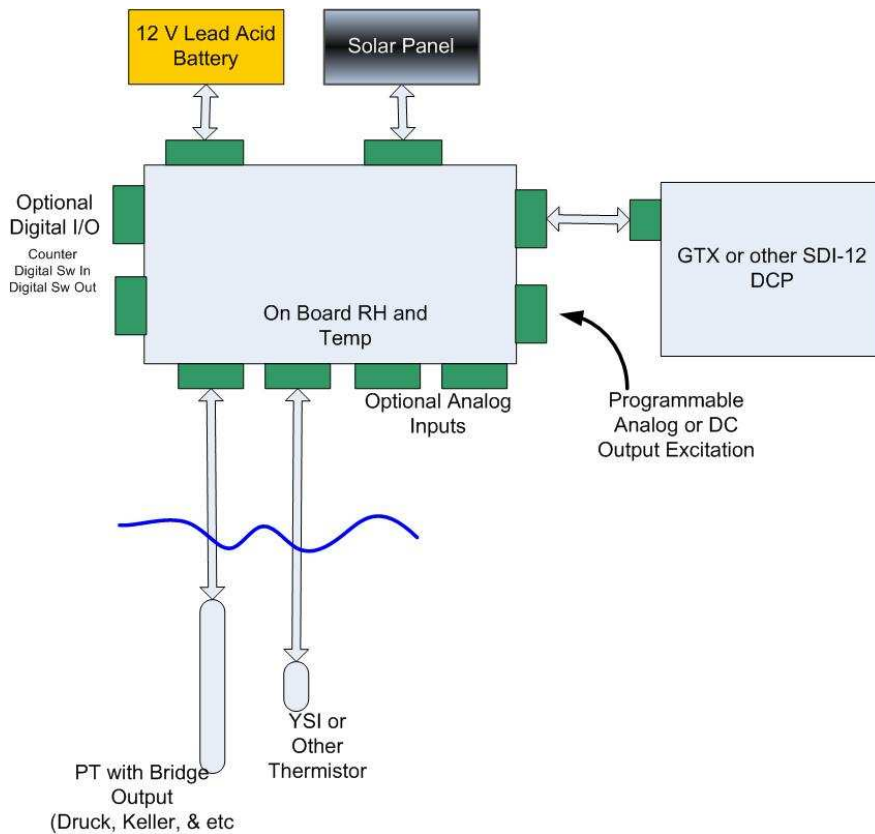
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SBCM Set Up as Battery Charger with Water Level and Temperature Measurements



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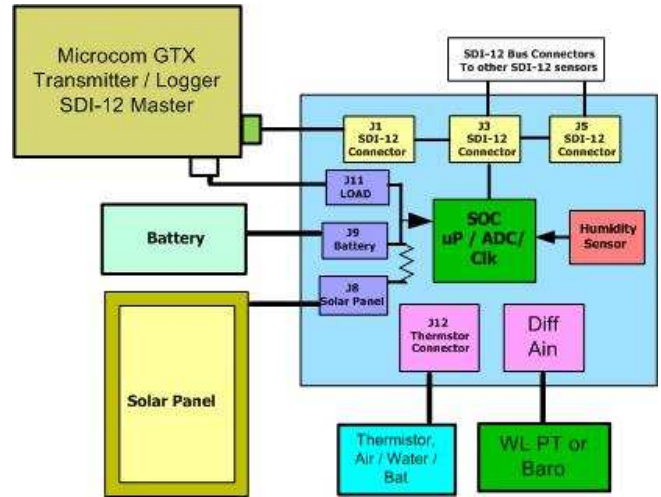
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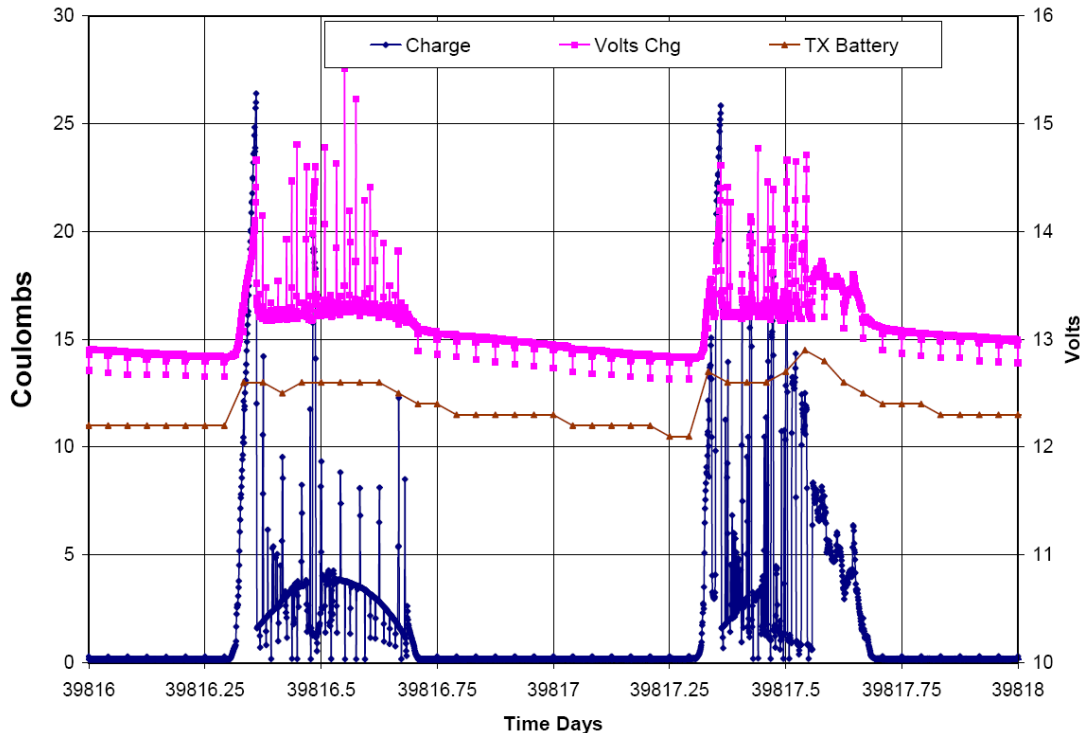
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Battery Charger Operation

The battery charge controller operation permits low power (½ milliwatt) temperature compensated charge control. Charge control can be set up for lead acid or lithium battery chemistry. Four variables are used in the charge control operation; these are solar panel voltage, battery voltage, temperature, and charge current. The solar panel voltage is used so that no charging operation occurs when there is no sun-generated power. Temperature is derived from the internal electronics temperature sensor and is used to determine the battery charge cut off voltage. Battery voltage is measured during charge to indicate the charge level. Charge current is measured so that battery and solar panel operation may be remotely monitored. Charge in Coulombs (a Coulomb is one amp for one second) is integrated using one-second samples. The curves below indicate operation with a 20-watt solar panel and 12 Amp / Hr sealed lead acid battery.



Two Day Operation, 20 watt panel, 12 Amp / Hr battery and Hourly 5 seconds GTX Transmissions

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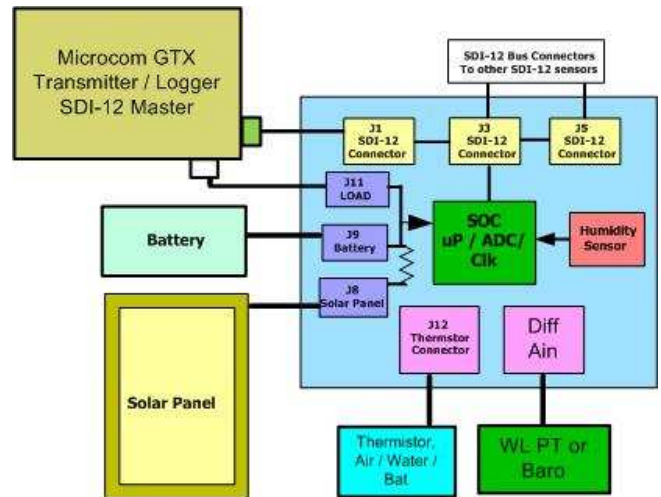
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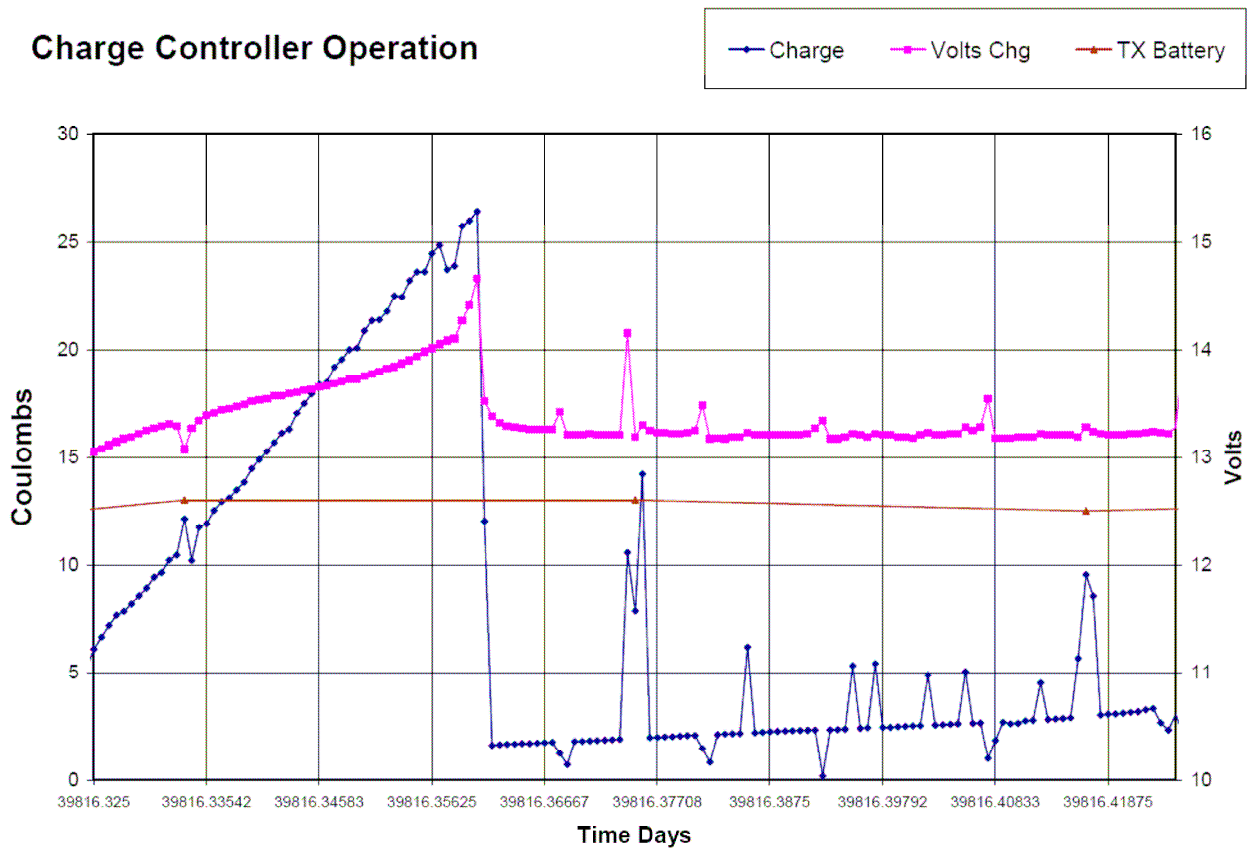
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Charge Controller Operation



Charger Operation for 2.4 Hours

The two curves show operation for 2 days for the top and then the initial 2.4 hours operation is shown in the lower curve. Three variables are displayed. The data labeled charge are the number of Coulombs of charge sampled each second and integrated over a minute. The maximum number of Coulombs for a 20-watt panel during 60 minutes would be about 96. (This is an equivalent to 1.6 amp for 60 seconds). The brown line labeled TX battery is the loaded voltage reported by the GTX. The upper pink line labeled Volts charge is the open circuit battery voltage measured at the end of the minute. The battery condition is easily assessed with the difference in these two measurements of loaded and open circuit battery voltage.

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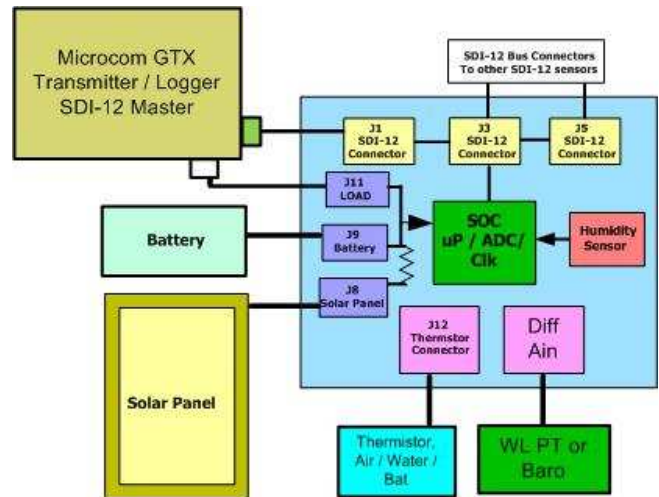
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Observing the two-day record and magnified start up sun up condition and sun down condition plus some cloudy spots can be seen. The start up brought the battery to full charged and this condition was again attained more quickly on the next sun up condition.

These data may be acquired on a compact basis by the GTX and reported as operational sensor data.
Ordering Information:

The model 410 is packaged within the GTX enclosure.

The basic 410 MSM-1 Sensor Interface Controller includes three (two single ended and one differential) user analog inputs and the temperature compensated battery charge controller.

Options:

1. Internal RH sensor (single ended)
2. Water temperature sensor with 100 feet of cable (0.1 C) (single sensor)
3. Air temperature sensors (single ended)
4. Barometer (differential)
5. Water Level PT (differential)

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