



Rainwise CC-3000 & CC-3000R

User's Guide

Rev 0
May 15, 2011



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Introduction

The CC-3000 is a data logger and computer interface for Rainwise MK-III weather stations. There are several variants of the CC-3000, make sure you know which one you have and follow its specific instructions. In most instances the CC-3000 will be used with a third party software programs. In these instances, you will need to use this guide to install and connect the CC-3000 to you computer. You will need the software instructions for operational instructions.

Minimum System Requirements

The CC-3000 will communicate with any host system that supports the FTDI USB serial bridge. Using a virtual com port (VCP) driver the CC-3000 will appear as a serial communications port on the host system. The VCP drivers were written and supplied by FTDI.

VCP Specifications

Port:	USB 2.0 Full Speed
Interface IC:	FT232R
Baud rate:	115200 bps
Parity:	None
Data bits:	8
Stop bits:	1
Handshaking:	None

The CC-3000R is equipped with both RS-232 and RS-485 serial ports. This version is used when only a serial interface is available or when used with custom firmware (software in the C-3000R). Only one port may be used at a time.

RS-232 Specifications

Baud rate:	115200 bps
Parity:	None
Data bits:	8
Stop bits:	1
Handshaking:	None (DTR & DSR available but not used)

RS-485/422 Specifications

Baud rate:	115200 bps
Parity:	None
Data bits:	8
Stop bits:	1
Interface mode:	2-wire half duplex

Software Requirements

The CC-3000 is supported by several third party software packages. Please refer to www.rainwise.com for a list of available software.

The CC-3000 can also be used with any generic terminal emulator software such as HyperTerminal. Refer to the protocol section of this manual for details.

Hardware Specifications

The CC-3000 is available in several variants.

Part numbering system:

CC-3000_ _ - _ _ _
| |
| |
| 41 = 418 MHz
| 42 = 433 MHz
| _ _ = 2.4 GHz (LR compatible)
|
R = Serial (RS-232,RS485)
_ = USB 2.0

Common Specifications

- Power Requirements: 9 VDC to 12VDC at 130mA
- Temperature: 0°C to 60°C
 - Backup Batteries: 4 x 1.2V AA NiMh (only)
 - Backup run-time: Nominal 24 hours (battery dependent)
 - Charge time: Nominal 48 hours (battery dependent)

Inside Temperature:

- Range: -40° to °60C
- Accuracy: +/- 0.5 °C

Memory:

- Type: Flash
- Capacity: 2 MB, 49,834 data records (nominal)
- Retention: > 20 years
- Write cycles: 10 Million chip erase cycles

USB Specifications

- Interface IC: FTDI—FT232RL
- Compatibility: USB 2.0 Full Speed.
- Connector: Type B

Serial Specifications

RS-232

- Port: DB-9 female (DCE Device)
- Max Speed: 115,200 bps

RS-485/422

- Mode: 2-wire half duplex
- Connector: 3-position screw terminal, (A,B and signal ground)
- Max Speed: 115,200 bps
- Termination: 120 ohms (internal jumper enable)

2.4 GHz Specifications

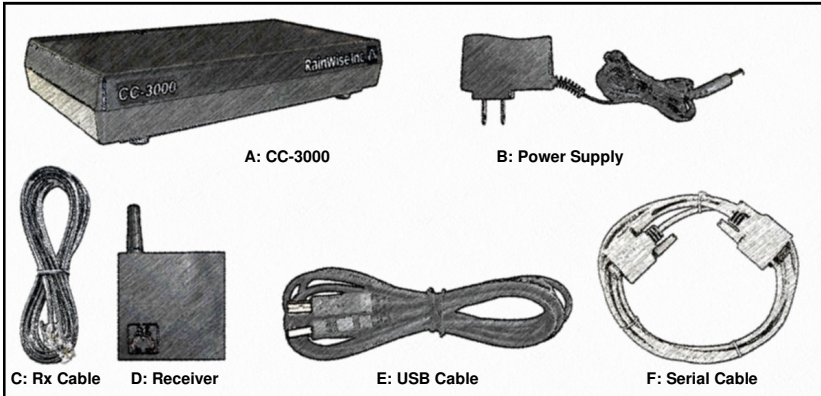
- Frequency: Spread spectrum 2.4 GHz (does not transmit)
- Sensitivity: -92 dBm
- Antenna: Internal

418/433 MHz Specifications

- Frequency: 418 or 433 Mhz OOK keying
- Sensitivity: -100 dBm
- Antenna: External. Plug-in receiver.

Getting Started

Each CC-3000 is supplied with a 9 or 12 VDC DC power supply and communication cable. This will either be a USB cable or a serial RS-232 cable depending on the model.



Hardware Components

- A: CC-3000
- B: Power Supply
- C: Rx Cable—418/433MHz Models only.
- D: Receiver—418/433MHz Models only.
- E: USB Cable—USB Models only.
- F: Serial Cable—RS-232/485 Models only.

* Rainwise CD-ROM not shown.

Installing USB Drivers (USB Models only)

The USB version of the CC-3000 requires a virtual comport driver. Drivers are provided on the CD-ROM supplied with the CC-3000. There are two methods for installing the drivers, Automatic or Manual.

Automatic Driver Install

1. Insert the Rainwise CD-ROM.
2. A startup program should appear within a few seconds. Click on “Install USB Driver”. A command prompt window will appear while the driver is being installed. The Window close when complete.
3. Connect the USB cable to the CC-3000. Windows will report that it has found a new device. If the driver was successfully installed, Windows will report that it is ready for use.

Manual Driver Install

When the USB cable is connected to the computer (Windows PCs) it will request a driver. Browse to the appropriate sub folder in the **Drivers** folder on the CD-ROM. The Drivers folder has the following structure:

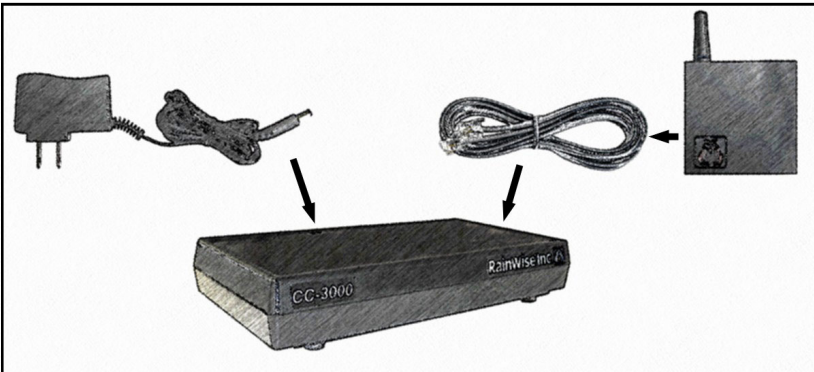
Drivers

- _ Windows
- _ Mac OSX
- _ Linux

Note: There maybe newer drivers available online at www.rainwise.com

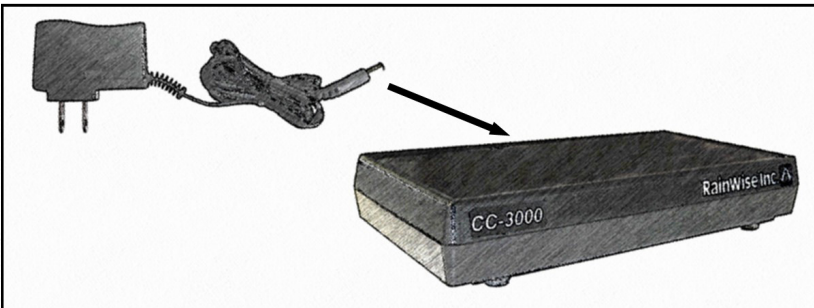
Connecting 418/433 MHz Models

418 and 433 MHz models have external receivers. Connect the components as shown below. Ensure that power is applied only after all the receiver connections have been made. The power jack is located on the back of the CC-3000 and the receiver jack is on the side. *Do not apply power to the radio receiver, only apply power to the CC-3000.*



Connecting LR Models

The CC-3000 for LR (long range) weather stations has an internal radio receiver. These units only require power.



Connecting USB (USB Models Only)

Make sure that the USB driver is correctly installed before connecting the USB cable to the computer. The USB port is located on the back of the CC-3000. The USB driver will assign a communications port to the device. Note that the port number will change if you plug the USB cable into a different port. On Windows based computers use the **Device Manager** to determine which port has been assigned to the CC-3000. It will be listed under **Ports (Com & LPT)**.

Drivers are supplied on the Rainwise CD-ROM included with your CC-3000 or from www.rainwise.com.

Connecting RS-232 (RS-232/485 Models Only)

A single DB-9 Female connector is located on the back of the CC-3000. The CC-3000 is configured as a DCE device. DTR and DSR are connected but not used by most firmware builds. The RS-232 cable supplied with the CC-3000 is a straight through cable and is designed to connect to a DTE device such as a computer. The RS-232 port can not be used simultaneously with the RS-485 port.

Connecting RS-485/422 (RS-232/485 Models Only)

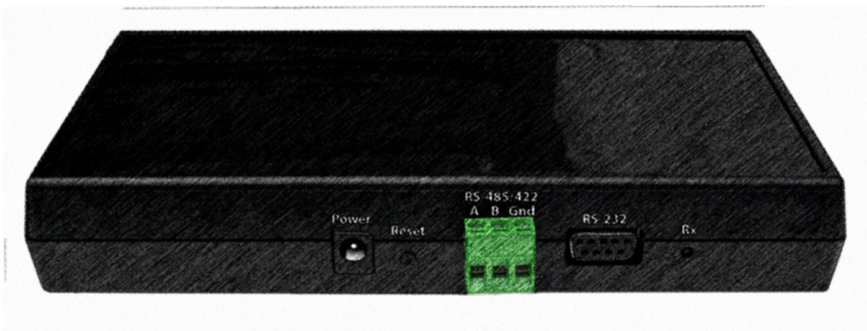
The CC-3000R is supplied with a half duplex RS-485/422 serial port. The default firmware build only supports RS-422. Custom firmware builds are addressable and support integration into RS-485 networks. Contact Rainwise for further information.

Wiring connections are made using the 3 pin screw terminal on the back of the CC-3000R. Cable is not supplied with the unit. The RS-485/422 lines are terminated with a 120 ohm resistor. This can be disabled by moving the termination jumper inside the unit to the OFF position. This requires removing the top of the case. To do this, remove the 4 screws on the bottom side of the unit.

RS-485/422 Terminals

A : Positive RS-485
B : Negative RS-485
Gnd: Signal Ground

RS-485 is rated to 4,000 feet (1,200 m) at 90 kbs. It operates by default at 115.2 kbps which reduces the theoretical range slightly. The RS-485 port on the CC-3000 is surge protected but is not isolated.



Verifying Communication with the Weather Station

A red LED is located on the back of the CC-3000. This LED will flash when the interface is receiving data from a weather station. It will blink every two seconds. As 418/433 MHz systems only broadcast every thirty seconds, the LED will provide one long blink upon reception of the data packet. It will then continue to blink every two seconds for the next 28 seconds.

On power up, the LED will blink once even if no weather station is present. This indicates that the interface has booted up.

Using the CC-3000 with Third Party Software

The CC-3000 is supported by several third party software applications. Please refer to the desired software's instruction manual for further details.

Station Coding

MKIII-LR weather stations can be coded to prevent interference from another MK-III weather station that is located in radio range. A dipswitch in the sensor assembly selects a station number from 0 to 3. The default is 0. Should it be necessary to change the code, follow the sensor assembly instructions to set a different station number. The CC-3000 can then be configured with the "STATION" command. Refer to the instruction set for details. The default setting for the CC-3000 is also zero so this setting is not normally required.

The LED will not flash if the station code and station number do not match.

Indoor temperature

The CC-3000 includes a built in temperature sensor. The sensor is mounted internally. Do not place the CC-3000 near any heat sources such as computer towers or routers. These devices will cause inaccurate temperature readings. The sensor may take several hours to stabilize. **Allow the unit to run powered for 3 to 4 hours before adjusting the temperature offset.**

Reset Button

The reset on the back of the CC-3000 will force a soft reset. This will cause the device to reboot but will not reset the system clock. A soft reboot can also be initiated by issuing the “REBOOT” command. Refer to the instruction set for details.

Backup Batteries

The CC-3000 must use 4 AA NiMH batteries for backup in the event of AC power loss. These **batteries are optional**. Stored data will not be lost if the batteries are not used. With batteries installed the CC-3000 will continue to function normally with no AC power. The run time will depend on the charge state, capacity and age of the batteries. If batteries are not installed the CC-3000 will not lose any stored data but it will lose its clock setting and will not record any new data while not powered. The clock will reset to the factory default on power up.

The CC-3000 will automatically detect when to charge the batteries and will keep them fully charged. The CC-3000 charger is a slow charger and will take up to 48 hours to recharge a completely depleted battery.

The battery voltage and charger status are available using the command protocol but not all 3rd party software programs support this functionality.

It is recommended that the NiMH batteries are replaced every year for optimum performance.

- USE RECHARGEABLE NiMH BATTERIES ONLY!-

Software/Firmware Updates

The software or firmware in the CC-3000 can be updated or changed using either the USB or RS-232 connection depending on the model. Updates can not be performed using the RS-485 port. Updates will be posted on the Rainwise website. Versions will vary depending on model. Make sure you read the update instructions carefully to be sure you are installing the correct software. As with all updates there are risks associated with changing the flash memory. Updates are loaded using a Windows based program called IAPflash. This program is supplied with the “.enc” file along with instructions. Windows is required to perform updates. No other operating systems are currently supported.

Commands Set:

Commands must be terminated with a <CR> character. Responses begin and end with a <CR><LF>.

If the command syntax or parameters are incorrect the device will respond with **ERROR**. If the command is accepted the device will respond with **OK**. Commands may not be chained together. Commands are not case sensitive.

Echo: ECHO

Description: When set to **ON** (default), the device will echo all characters that are received. **OFF** disables echo.

Values: ON, OFF

Syntax: ECHO=ON, ECHO=OFF

Sample Response:

OK

Get Column Headers: HEADER

Description: Returns a series of comma delimited text descriptions. These descriptions are used to identify the type and order of the returned data in both **NOW** and **DOWNLOAD** commands.

Values: None

Syntax: HEADER

Sample Response:

HDR,"TIMESTAMP","TEMP OUT","HUMIDITY","PRESSURE","WIND DIRECTION","WIND SPEED","WIND GUST","RAIN","STATION BATTERY","BATTERY BACKUP","TEMP IN",!E264

Key:

HDR : Identifier, HDR= Header, MSG= Message,
REC= Data Record,

MAX= Maximums and MIN= Minimums.

TIMESTAMP : Current logger time and date or timestamp of a record.

TEMP OUT : Current outside temperature

HUMIDITY : Current outside humidity

WIND DIRECTION : Current wind direction or interval average direction.

WIND SPEED : Current wind speed or interval average.
 WIND GUST : Wind speed gust for the logging interval.
 PRESSURE : Barometric pressure.
 TEMP IN : Current inside temperature
 RAIN : Current daily rainfall total.
 !XXXX : CRC-16 Checksum. *See Calculating the Checksum.*

NOTE: The parameter count may increase in future models.

Get Current Data: NOW

Description: Returns the current values in a comma-delimited format. The order of the data values corresponds to the output of the HEADER command. **NO DATA** is returned if the unit has not received a transmission from the weather station.

Values: None
Syntax: NOW

Sample Response:

2011/01/16 12:45:47, 22.1, 80,29.30,270, 2.0, 9.0, 0.00, 7.35, 2.46, 49.2,!6ACA

Auto Output: AUTO

Description: Automatically outputs current data every second. This is equivalent to issuing the NOW command every second. This mode will exit on reception of any character. If no data is received from the weather station the units will not output.

Values: None
Syntax: AUTO

Sample Response:

OK

Measurement Units: UNITS

Description: Returns the current measurement units if no parameter is supplied. Units are set by supplying the desired units value.

Values: ENGLISH, METRIC

Syntax (Read): UNITS=?

Syntax (Write): UNITS=ENGLISH or UNITS=METRIC

Sample Read Response:

ENGLISH

Sample Write Response:

OK

Logging Interval: LOGINT

Description: Returns the current logging interval no parameter is supplied. The interval is set by supplying the desired logging rate in minutes. Zero prevents logging. 60 is the maximum value.

Values: 0 - 60

Syntax (Read): LOGINT=?

Syntax (Write): LOGINT=[minutes]

Sample Read Response:

5

Sample Write Response:

OK

Memory Management: MEM

Description: When set with "?", the device returns the number of bytes of memory used, the number of records saved and the percentage of memory used. CLEAR erases all logged data. The OK is delayed approximately 4 seconds while the memory is being cleared.

Values: ?, CLEAR

Syntax : MEM=?

Sample "?" Response:

19656 bytes, 468 records, 2%

Sample Write Response:

OK

Memory Download: DOWNLOAD

Description: Returns all of the saved data records, one record per line. The first line of the output is the header. The header is used to identify the various data fields in the data that follows. The last line of the output is an 'OK' which indicates that the data output is complete. Daily minimums and maximums are output at the end of each day. Refer to the MAX and MIN for format details. Issuing DOWNLOAD without a parameter will cause the CC-3000 to download all records. By specifying a number, the CC-3000 will download the specified number of records. These will be the last saved records. For example passing a "5" will request the last 5 records in memory. It should be noted, the CC-3000 will record even while outputting. This means that should a logging interval occur during the download this record will also be output. The output stops on the last available record.

Values: None, number of records

Syntax : DOWNLOAD
or
DOWNLOAD=X

Sample Response:

```
HDR,"TIMESTAMP","TEMP OUT","HUMIDITY","PRESSURE","WIND
DIRECTION","WIND SPEED","WIND GUST","RAIN","STATION BAT-
TERY","BATTERY BACKUP","TEMP IN",!E264
MSG,"2011/01/16","12:52",CLEAR ON COMMAND,!33FE
REC,"2011/01/16","12:53," 21.2, 81,29.30,287, 8.4, 13.0, 0.00, 7.32,
2.46, 49.3,!F8AE
MSG,"2011/01/16","12:56",REBOOT,!EB05
REC,"2011/01/16","12:57," 20.8, 84,29.30,329, 6.7, 11.0, 0.00, 7.35,
2.38, 49.1,!CF0F
OK
```

Maximums: MAX

Description: Returns the maximum values for each parameter. The time and value for each parameter are output in comma separated format. The maximum values can be reset by passing the RESET parameter.

Values: ?, RESET

Syntax (Read): MAX=?

Syntax (Write): MAX=RESET

Output parameter order:

Outside temperature, humidity, pressure, wind direction, wind speed, rainfall (daily total), station voltage, inside temperature. If any optional sensors have been enabled they will also be displayed.

Sample Read Response (hh:mm value, hh:mm value):

MAX,13:59 24.3,05:07 98,14:07 29.33,05:07 292,05:07 4.0,05:26
0.00,05:07 7.65,07:10 95.4,!AC30

Sample Write Response:

OK

Minimums: MIN

Description: Returns the minimum values for each parameter. The time and value for each parameter are output in comma separated format. The minimum values can be reset by passing the RESET parameter. If any optional sensors have been enabled they will also be displayed.

Values: ?, RESET

Syntax (Read): MIN=?

Syntax (Write): MIN=RESET

Output parameters order:

Outside temperature, humidity, pressure, wind direction, wind speed, rainfall (ignore), station voltage, inside temperature.

Sample Read Response (hh:mm value, hh:mm value):

MIN,05:48 20.5,14:02 70,06:14 29.28,05:08 0,05:07 4.0,05:26
0.00,13:12 7.23,05:20 84.9,!8E11

Sample Write Response:

OK

Real-Time-Clock: TIME

Description: If issued without a parameter the device will return the current date and time. The clock is set by passing the desired data and time as a parameter

Values: YYYY/MM/DD HH:mm:ss

Syntax(Read) : TIME=?

Syntax(Write) : TIME=YYYY/MM/DD hh:mm:ss

Sample Read Response:

2010/08/24 14:36:55

Sample Write Response:

TIME=2010/10/04 09:23:30

Daylight Saving: DST

Description: If issued without a parameter, the device will return the dates and times when the clock will change due to daylight saving. The number of minutes that the clock will change are also reported. The schedule can be set by adding the three parameters, forward date and time, back date and time and number of minutes to change (120 max). Daylight saving can be disabled by setting the daylight-saving to zero.

Values: ?, MM/DD HH:mm, MM/DD HH:mm, mm

Syntax(Read) : DST=?

Syntax(Write) : DST=MM/DD hh:mm,MM/DD hh:mm,mm
DST=0 (*disable daylight saving*)

Sample Read Response:

03/14 02:00,11/7 02:00,60

disabled response:

00/00 00:00,00/00 00:00,00

Sample Write Response:

OK

Barometer Offset: BARO

Description: The barometer can be adjusted to compensate for altitude. To set the barometric pressure offset, issue this command with a current known pressure. The offset will be calculated and saved. To clear the offset set the pressure to zero. The pressure value must be in inches of mercury when English units are in use and in millibars when using metric.

Values: [English inches] XX.XX or [Metric millibars] XXXX.X

Syntax

(English): BARO=29.98

Syntax

(Metric): BARO=1005.4

Syntax

(To Clear): BARO=0

Sample Write Response:

OK

Sample Response:

OK

Rainfall: RAIN

Description: The CC-3000 maintains a rainfall counter that is only reset by a reboot or by issuing the reset command. The counter counts in 0.01” increments and rolls over at 65536 counts. Issuing the rainfall reset command will clear all rainfall counters including the current daily rainfall.

Values: RESET

Syntax (Read): RAIN=?

Syntax (Write): RAIN=RESET

Sample Read Response:

267

Sample Write Response:

OK

Battery Charger: CHARGER

Description: Indicates the charger status and battery voltage of the backup batteries in the CC-3000. TIME indicates how many minutes the batteries have been on charge.

Syntax (Read): CHARGER

Sample Responses:

NO BATTERIES

or

CHARGER=ON, BATTERIES= 4.56V, TIME= 120

Station Number: STATION

Description: The MK-III weather station can be configured with a station number 0-3. This prevents interference between units. The CC3000 station number must match the weather station

Values: 0 - 3

Syntax (Read): STATION=?

Syntax (Write): STATION=[number]

Sample Read Response:

2

Sample Write Response:

OK

Software Reboot: REBOOT

Description: Forces a soft reboot of the interface. On boot up the version information is output.

Values: None

Syntax: REBOOT

Sample Response:

Rainwise CC-3000 Version: 1.0 Build 002 Jan 16 2011
Flash ID 202015
Initializing memory...OK.

Version Information: VERSION

Description: Returns firmware version information.

Values: None

Syntax: VERSION

Sample Response:

Rainwise CC-3000 Version: 1.0 Build 002 Jan 16 2011

Solar Radiation: SOLAR

Description: Enables or disables solar radiation for MK-III weather stations equipped with a solar radiation sensor. This affects the header, output strings, minimums and maximums. Solar radiation is reported in Watts per meter squared. Use the HEADER command to determine the parameters position in the data string for the NOW, DOWNLOAD, MIN and MAX commands.

Values: ?,ENABLE, DISABLE

Syntax (Read): SOLAR=?

Syntax (Write): SOLAR=ENABLE *or* SOLAR= DISABLE

Sample Read Response:

ENABLED

Sample Write Response:

OK

UV Index: UV

Description: Enables or disables UV index for MK-III weather stations equipped with a UV index sensor. This affects the header, output strings, minimums and maximums. UV index is reported as an index value from 0 to 20. Use the HEADER command to determine the parameters position in the data string for the NOW, DOWNLOAD, MIN and MAX commands.

Values: ?,ENABLE, DISABLE

Syntax (Read): UV=?

Syntax (Write): UV=ENABLE *or* UV= DISABLE

Sample Read Response:

ENABLED

Sample Write Response:

OK

Additional Temperatures: T1 or T2

Description: Enables or disables additional temperatures for MK-III weather stations equipped auxiliary temperature sensors. This affects the header, output strings, minimums and maximums. Use the HEADER command to determine the parameters position in the data string for the NOW, DOWNLOAD, MIN and MAX commands.

Values: ?,ENABLE, DISABLE

Syntax (Read): T1=? or T2=?

Syntax (Write): T1=ENABLE or T1= DISABLE
or
T2=ENABLE or T2= DISABLE

Sample Read Response:

ENABLED

Sample Write Response:

OK

Calculating the Checksum:

The CC-3000 uses a 16 CRC checksum. The CRC uses the same polynomial as the one used in Xmodem transfers (XMODEM-CRC).

The Polynomial is as follows:

$$x^{16} + x^{12} + x^5 + 1$$

The CRC is calculation starts at the first ASCII character of the response. Leading carriage return line feeds are not included. All characters are included in the calculation up until but not including the exclamation character. The checksum is represented as a hexadecimal number.

The following C example code can be used to calculate the checksum:

```

/* Global Variables */
unsigned short int acc;

/* *****
/* Initialize Accumulator
/* *****/
void
crc16Init(void)
{
    acc= 0;
}

/* *****
/* Add byte
/* *****/
void
crc16Add( unsigned short int _data )
{
    unsigned char n;

    for (n=8; n ;n--)
    {
        if ((acc & 0x8000)>0)
        {
            acc<<= 1;
            _data<<= 1;
            if ((_data & 256)!=0)
                acc++;
            acc^= 0x1021;
        }
        else
        {
            acc<<= 1;
            _data<<= 1;
            if ((_data & 256)!=0)
                acc++;
        }
    }
}

/* *****
/* Return CRC accumulator
/* *****/
unsigned short int crc16Acc(void)
{
    unsigned short int tmp= acc, retval;

    crc16Add(0);
    crc16Add(0);    // add two zeros to get a valid crc
    retval= acc;
    acc= tmp;       //restore acc

    return retval;
}

```

Support

Before you contact support...

Before you contact Rainwise support, please review our frequently asked questions for this product.

Contact Support

If your support inquiry is not resolved by consulting either our documentation or our downloads, you may wish to contact Rainwise Support at (207)-288-5169 or (800)-762-5723.

Warranty

Rainwise, Inc. warrants this CC-3000 against defects in materials and workmanship for a period of two years from the date of purchase, and agrees to repair or replace any defective product without charge.

This warranty does not cover damage resulting from accident, misuse or abuse, lack of reasonable care, the fixing of any attachment not provided with the product or damage due to a lightning strike. Rainwise will not reimburse for take down or reinstallation charges. Rainwise will not pay for any warranty service performed by a non-authorized repair service and will not reimburse the consumer for damage resulting from warranty service performed by a non-authorized repair service. No responsibility is assumed for any special, incidental or consequential damages. No other warranty, written or oral is authorized by Rainwise, Inc. This warranty gives you specific legal rights, and you may also have other rights which may vary from state to state. Some states do not allow the exclusion, incidental or consequential damages, so the above exclusions and limitations may not apply to you.



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