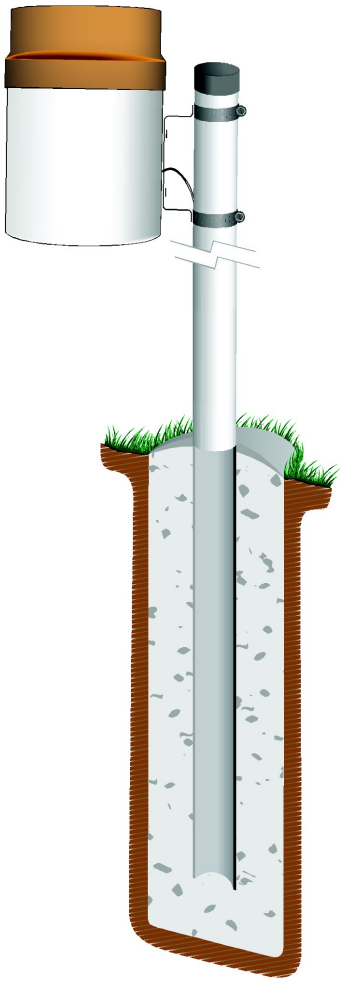
PRODUCT MANUAL

Sensor

TE525 Series

Tipping Bucket Rain Gage



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RELIABLE MONITORING SINCE 1974

Campbell SCIENTIFIC®

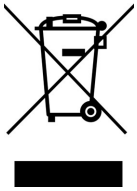
Please read first

About this manual

Please note that this manual was produced by Campbell Scientific Inc. primarily for the North American market. Some spellings, weights and measures may reflect this. In addition, while most of the information in the manual is correct for all countries, certain information is specific to the North American market and so may not be applicable to European users. Differences include the U.S. standard external power supply details where some information (for example the AC transformer input voltage) will not be applicable for British/European use. Please note, however, *that when a power supply adapter is ordered from Campbell Scientific it will be suitable for use in your country*.

Reference to some radio transmitters, digital cell phones and aerials (antennas) may also not be applicable according to your locality. Some brackets, shields and enclosure options, including wiring, are not sold as standard items in the European market; in some cases alternatives are offered.

Recycling information for countries subject to WEEE regulations 2012/19/EU



At the end of this product's life it should not be put in commercial or domestic refuse but sent for recycling. Any batteries contained within the product or used during the products life should be removed from the product and also be sent to an appropriate recycling facility, per The Waste Electrical and Electronic Equipment (WEEE) Regulations 2012/19/EU. Campbell Scientific can advise on the recycling of the equipment and in some cases arrange collection and the correct disposal of it, although charges may apply for some items or territories. For further support, please contact Campbell Scientific, or your local agent.

Table of contents

1. Introduction

The TE525-series tipping bucket rain gages are adaptations of the standard National Weather Service tipping bucket rain gages. They funnel rain into a mechanism that tips when filled to the calibrated level. The TE525 and TE525WS measure in 0.01-inch increments and the TE525MM measures in 0.1-mm increments. The TE525WS conforms to the National Weather Service recommendation for an 8-inch funnel orifice. The TE525 and TE525MM have an orifice diameter of 6 inch and 24.5 cm, respectively.

> NOTE:
> This manual provides information only for CRBasic data loggers. For retired Edlog data logger support, see an older manual at www.campbellsci.com/old-manuals.

2. Precautions

- READ AND UNDERSTAND the Safety section at the back of this manual.
- TE525-series tipping bucket rain gages are precision instruments that must be handled with care.
- Sensor is factory-calibrated and should not require field calibration. Refer to for field calibration check and factory calibration.
- During field installation, ensure that you have removed the small rubber band that secures the tipping mechanism during shipping.
- Debris filters, funnel, and bucket reservoirs should be kept clean.
- Santoprene® rubber, which composes the black outer jacket of the TE525 cable, will support combustion in air. It is used because of its resistance to temperature extremes, moisture, and UV degradation. It is rated as slow burning when tested according to U.L. 94 H.B. and passes FMVSS302. However, local fire codes may preclude its use inside buildings.

3. Initial inspection

- Upon receipt, inspect the packaging and contents for damage. File damage claims with the shipping company.
- The model number and cable length are printed on a label at the connection end of the cable. Check this information against the shipping documents to ensure the correct product and cable length are received.

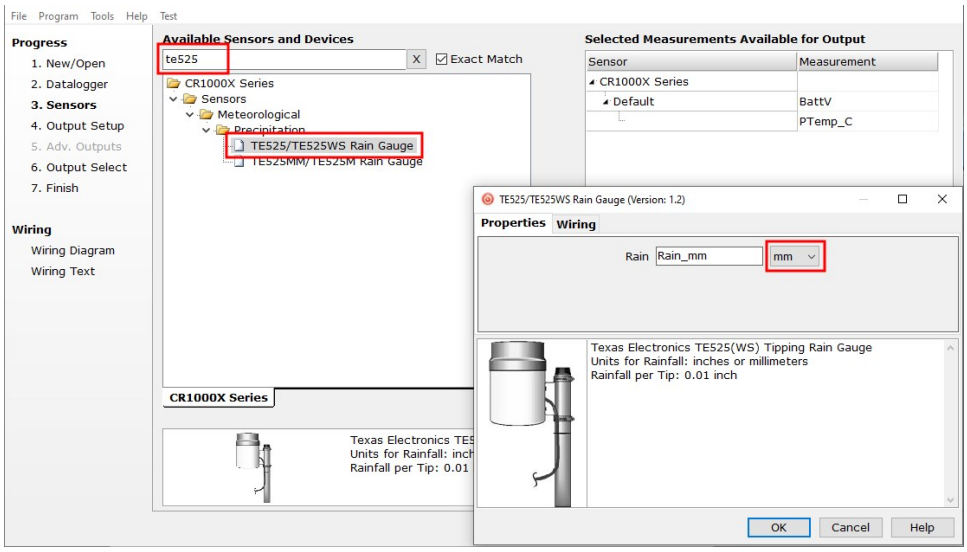
4. QuickStart

A video that describes data logger programming using ***Short Cut*** is available at: www.campbellsci.com/videos/cr1000x-data logger-getting-started-program-part-3. ***Short Cut*** is an easy way to program your data logger to measure the sensor and assign data logger wiring terminals. ***Short Cut*** is available as a download on www.campbellsci.com. It is included in installations of ***LoggerNet***, ***RTDAQ***, and ***PC400***.

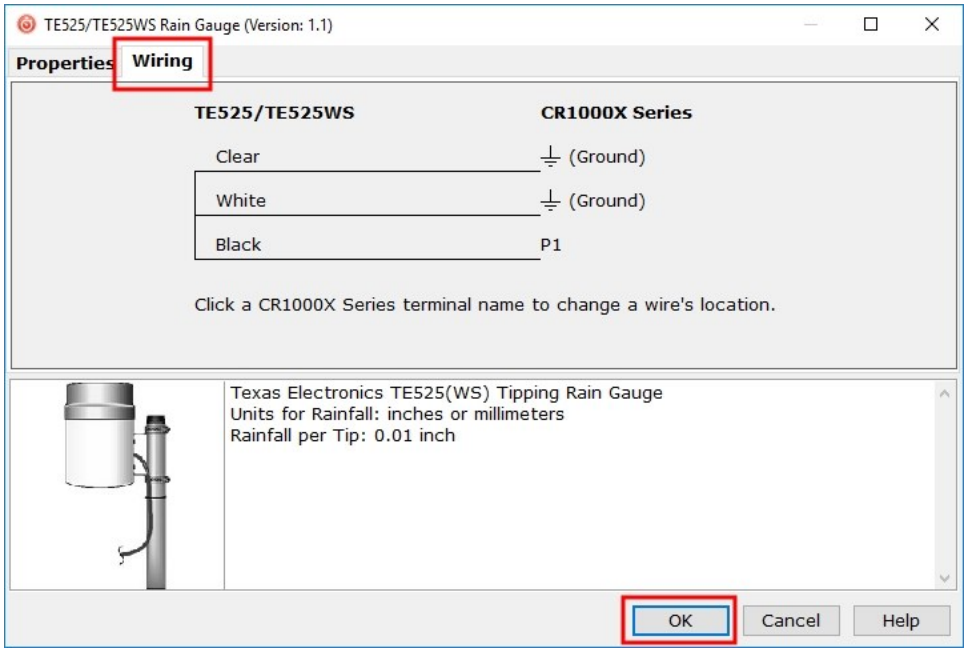
The following procedure also describes programming with ***Short Cut***.

1. Open ***Short Cut*** and click **Create New Program**.
2. Double-click the data logger model.

3. In the **Available Sensors and Devices** box, type TE525 or locate the sensor in the **Sensors** > **Meteorological** > **Precipitation** folder. Double click **TE525/TE525WS Rain Gauge** or **TE525MM/TE525M Rain Gauge**, depending on which model you have. Data defaults to millimeters. This can be changed by clicking the **mm** box and selecting **inch**.

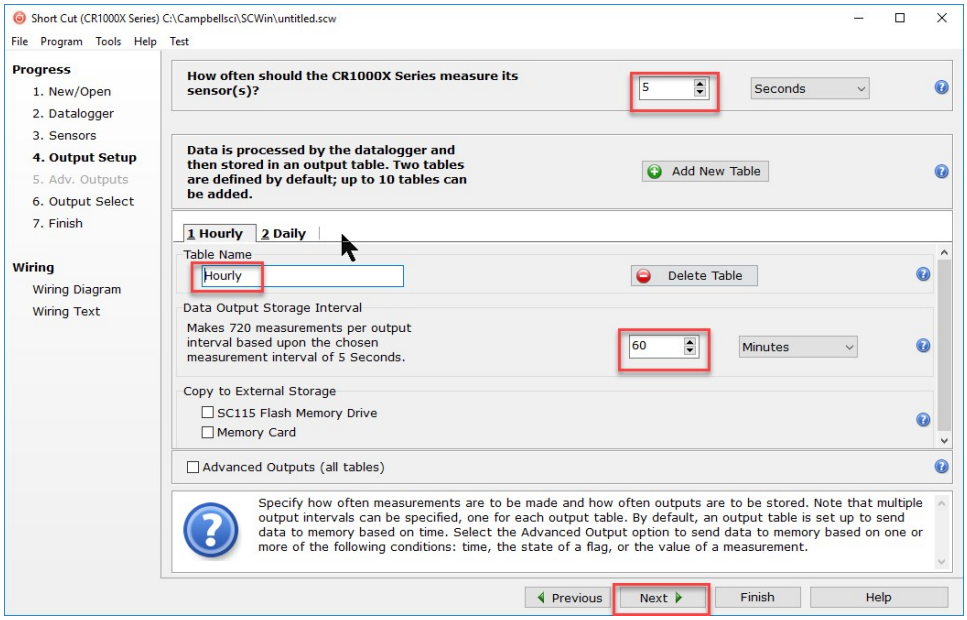


4. Click the **Wiring** tab to see how the sensor is to be wired to the data logger. Click **OK** after wiring the sensor.

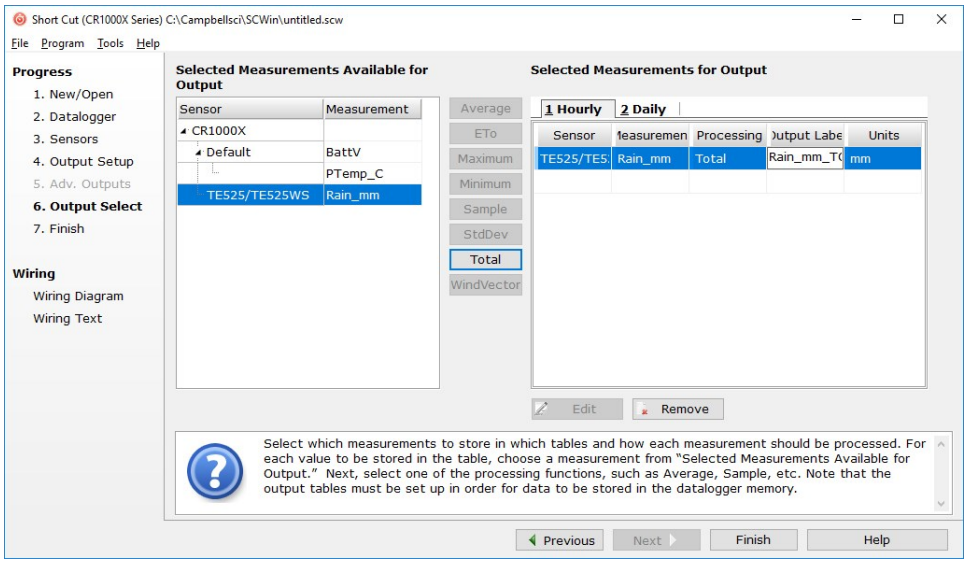


5. Repeat step three for other sensors being measured.

6. In **Output Setup**, enter the scan rate, **Data Output Storage Intervals**, and meaningful table names.



7. Select the measurement and its associated output options.



8. Click **Finish** and save the program. Send the program to the data logger if the data logger is connected to the computer.
9. If the sensor is connected to the data logger, check the output of the sensor in the data display in ***LoggerNet***, ***RTDAQ***, or ***PC400*** to make sure it is making reasonable measurements.

5. Overview

TE525-series tipping bucket rain gages funnel precipitation into a bucket mechanism that tips when filled to a calibrated level. A magnet attached to the tipping mechanism actuates a switch as the bucket tips. The momentary switch closure is counted by the pulse-counting circuitry of Campbell Scientific data loggers.

The TE525-series tipping bucket rain gages are manufactured by Texas Electronics and cabled by Campbell Scientific.

Features:

- High precision
- Compatible with all Campbell Scientific data loggers
- TE525WS conforms to the National Weather Service recommendation for an 8-inch funnel orifice.
- TE525WS is directly compatible with the CS705 Snowfall Adapter, allowing it to measure the water content of snow.

5.1 Wind screen

Campbell Scientific offers the 260-953 Wind Screen to help minimize the effect of wind on rain measurements. This wind screen consists of 32 freely hanging leaves that swing as wind moves past them. Refer to the 260-953 manual for siting information and the installation procedure.

5.2 Snowfall adapter

Campbell Scientific CS705 Snowfall Conversion Adapter uses antifreeze to melt snow, allowing the TE525WS to measure the water content of snow. The CS705 cannot be used with either the TE525 or TE525MM. However, both the TE525 and TE525MM can be converted to a TE525WS by returning them to Campbell Scientific (see Assistance page at the back of this document). Refer to the CS705 manual for siting information and the installation procedure.

6. Specifications

Sensor type:	Tipping bucket/potted magnetic momentary-contact reed switch
Operating temperature range:	0 to 50 °C
Storage temperature range:	–40 to 70 °C
Switch ratings:	30 VDC at 2 A 115 VAC at 1 A
Closure time:	135 ms
Bounce settling time:	0.75 ms
Resolution:	1 tip
Accuracy:	1.0% up to 2 in/hour (50 mm/hr)
Materials	
Bucket:	White powder-coated spun aluminum
Funnel collector:	Gold anodized spun aluminum
Screen:	Gold anodized spun aluminum
Locking snap ring:	Stainless steel
Tipping mechanism:	UV protected black ABS plastic with hardened stainless steel jewel bearings and pivot
Cable:	2-conductor shielded cable (length must be specified for all –L options at time of order)
Cable weight:	0.1 kg (0.2 lb) per 10 ft
Mounting:	Gold anodized aluminum side bracket with adjustable pipe clamps for pole or mast mounting

Table 6-1: Specification comparisons			
	TE525	TE525WS	TE525MM
Volume per tip[1]	4.73 ml (0.16 fl. oz)	8.24 ml (0.28 fl. oz)	4.73 ml (0.16 fl. oz)
Rainfall per tip	0.01 in (0.254 mm)	0.01 in (0.254 mm)	0.1 mm (0.004 in)
Funnel collector diameter[2]	15.4 cm (6.060 in)	20.3 cm (8 in)	24.5 cm (9.7 in)
Height	24.1 cm (9.5 in)	26.7 cm (10.5 in)	29.2 cm (11.5 in)
Tipping bucket weight	0.9 kg (2 lb)	1 kg (2.2 lb)	1.1 kg (2.4 lb)

[1]The volume of water required to cause a tip in the TE525 and the TE525MM is the same. The difference in calibration is strictly due to funnel size.

[2]If the CS705 Snowfall Adapter or other eight-inch funnel is installed on these gages, refer to Table 7-2 (p. 9) for the multiplier. See Changing funnels with a different size (p. 16) before replacing funnels on any TE525 tipping bucket rain gage with a different size funnel.

7. Installation

If you are programming your data logger with ***Short Cut***, skip Wiring (p. 8) and Data logger programming (p. 8). ***Short Cut*** does this work for you. See QuickStart (p. 2) for a ***Short Cut*** tutorial.

This section includes the following information:

7.1 Wiring

The following table shows the connections to Campbell Scientific data loggers.

Table 7-1: Wire color, wire function, data logger connection		
Wire color	Wire function	Data logger connection
Black	Rain signal	P or U[1] (pulse terminal)
White	Rain signal reference	⏚ (analog ground)
Clear	Shield	⏚ (analog ground)
[1]U terminals are automatically configured by the measurement instruction.		

Campbell Scientific installs a 100 Ω resistor, connected in series, at the switch to prevent arcing by limiting current (Figure 7-1 [p. 8]).

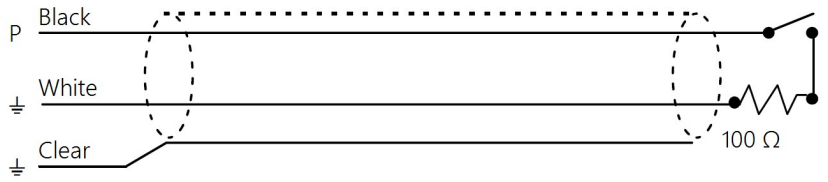


Figure 7-1. TE525-series rain gage schematic

7.2 Data logger programming

Short Cut is the best source for up-to-date programming code for Campbell Scientific data loggers. If your data acquisition requirements are simple, you can probably create and maintain a data logger program exclusively with ***Short Cut***. If your data acquisition needs are more complex, the files that ***Short Cut*** creates are a great source for programming code to start a new program or add to an existing custom program.

> NOTE:
> ***Short Cut*** cannot edit programs after they are imported and edited in ***CRBasic Editor***.

A ***Short Cut*** tutorial is available in QuickStart (p. 2). If you wish to import ***Short Cut*** code into ***CRBasic Editor*** to create or add to a customized program, follow the procedure in Importing Short Cut code into CRBasic Editor (p. 14). This section provides programming basics for CRBasic data loggers. A complete program example can be found in Example program (p. 15).

Campbell Scientific data loggers measure TE525 rain gages by counting switch closures and converting the total to rainfall. The `PulseCount()` CRBasic instruction employs dedicated

pulse count accumulators, which continuously monitor the input signal, even when the data logger is between program scans. To create a pulse, an internal 100 kΩ pull-up resistor pulls the pulse input to 5 VDC when the switch is open, and a switch closure to ground pulls the input to 0 VDC.

```
PulseCount(Dest,Reps,PChan,PConfig,POption,Mult,Offset)
```

- Choose Switch Closure for the **PConfig** parameter. For the CR6 and CR1000X, choose Switch Closure with pull up.
- The **Multiplier** parameter determines the units in which rainfall is reported (Table 7-2 [p. 9]).

Table 7-2: Multipliers for rain measurement

Rain gage	Inches	Millimeters
TE525	0.01	0.254
TE525WS	0.01	0.254
TE525MM	0.00394	0.1
TE525 or TE525MM w/8 in funnel	0.0057	0.1459

7.3 Siting and mounting

Mount the rain gage in a relatively level spot representative of the surrounding area. Ensure that the lip of the funnel is horizontal, at least 30 cm above the ground, and higher than the average snow depth.

Place the rain gage away from objects that obstruct the wind. The distance should be two to four times the height of the obstruction.

The TE525 includes hose clamps to mount the gage to a 1-inch to 2-inch IPS vertical pole. For additional stability and better leveling capabilities, the CM270 leveling base can be used instead (Figure 7-2 [p. 10]). This leveling base is included with the CM705 Snowfall Adapter, but can be purchased separately. The CM270 is compatible with a pole with an outer diameter of 2 inches or less. For more information, see CM270 Installation Guide at https://s.campbellsci.com/documents/us/technical-papers/cm270.pdf.

Figure 7-2. CM270 Rain Gage Mount attaches to the base of a TE525-series rain gage to give added stability

Both the hose clamps and the CM270 leveling base can mount to the CM300 series mounting poles. The models are stainless steel 1.5 IPS vertical poles of different lengths (Table 7-3 [p. 10]).

Table 7-3: CM300-series pole lengths

Model	Pole length
CM300	58 cm (23 in)
CM305	119 cm (47 in)
CM310	142 cm (56 in)

The pole or pipe can be attached to a concrete foundation using J-bolts or self supporting legs (Figure 7-3 [p. 11]) or placed directly into a concrete foundation (Figure 7-4 [p. 11]). A concrete pad is recommended, but it should not be installed over a large paved or concrete surface.

Figure 7-3. Mounting pole base options

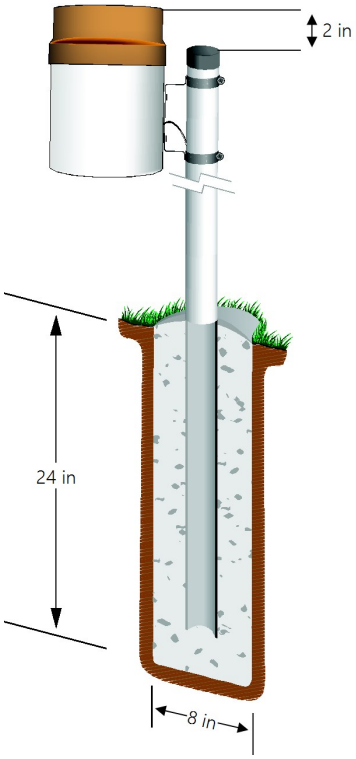


Figure 7-4. TE525 Tipping Bucket Rain Gage

Mount the gage with its lip at least 5 cm (2 in) above the post or pole (Figure 7-4 [p. 11]). The mounting pole must be vertical. Use a torpedo level to get the pole as vertical as possible.

The rain gage has a bubble level to ensure it is level. To access the bubble level, loosen the thumbscrews holding the funnel on the bucket and then take the funnel off the top of the bucket. The bubble level is inside the bucket toward the bottom. Center the bubble level while mounting the bucket to the pole.

While the funnel is off the bucket, remove the small rubber band securing the tipping bucket, which protects it during shipping. Seat the funnel back on to the rain gage, and push the funnel all the way down until it is fully seated on the main body. Hand tighten the thumb screws (if present) to secure the funnel to the body.

> NOTE:
> Press either end of the bucket down against its stop to make sure the bucket is NOT hung up in the center beforehand tightening the thumb screws.

8. Troubleshooting and maintenance

> NOTE:
> All factory repairs and recalibrations require a returned material authorization (RMA) and completion of the "Declaration of Hazardous Material and Decontamination" form. Refer to the Assistance page at the back of this manual for more information.

If not getting any precipitation data, check the following:

1. Check that the sensor is wired to the pulse terminal specified by the `PulseCount()` instruction.
2. Verify that the **`Configuration Code`** (switch closure) and **`Multiplier`** parameters for the `PulseCount()` instruction are correct.
3. Disconnect the sensor from the data logger and use an ohmmeter to do a continuity check of the switch. The resistance measured at the terminal block on the inside of the bucket between the black and white wires should vary from infinite (switch open) when the bucket is tipped, to less than an ohm (switch closed) when the bucket is balanced.

Maintenance:

The funnel and bucket mechanism must be kept clean. Routinely check for and remove debris such as leaves, dust, or insects.

9. Calibration

A field calibration check is advised every 12 months.

Field calibration check:

1. Secure a can or bottle that will hold at least 16 oz of water.
2. Punch a very small hole in the bottom of the can or bottle. If it takes less than 45 minutes for 16 oz of water to run out, the hole in the can is too large.
3. Place the can in the top funnel of the rain gage and pour 16 fluid ounces of water into the can. (A 16 oz soft drink bottle filled to within 2.5 inches of the top may be used for a rough field calibration. An exact volume will allow for a more precise calibration.)
4. The following number of tips should occur:

TE525, TE525MM	100 ± 3
TE525WS	57 ± 2

5. Adjusting screws are located on the bottom adjacent to the large center drain hole. Adjust both screws the same number of turns. Rotation clockwise increases the number of tips per 16 oz. of water; counter clockwise rotation decreases the number of tips per 16 oz. of water. One half turn of both screws causes a 2% to 3% change.
6. Check and re-level the rain gage.

Factory calibration:

If factory calibration is required, contact Campbell Scientific to obtain an RMA (see Assistance at back of manual).

Appendix A. Importing *Short Cut* code into *CRBasic Editor*

Short Cut creates a .DEF file that contains wiring information and a program file that can be imported into ***CRBasic Editor***. By default, these files reside in the C:\campbellsci\SCWin folder.

Import ***Short Cut*** program file and wiring information into ***CRBasic Editor***:

1. Create the ***Short Cut*** program, then save it. Click the **Advanced** tab then the **CRBasic Editor** button. Your program file will open in CRBasic with a generic name. Provide a meaningful name and save the CRBasic program. This program can now be edited for additional refinement.

   > **NOTE:**
   > Once the file is edited with ***CRBasic Editor***, ***Short Cut*** can no longer be used to edit the program.

2. To add the ***Short Cut*** wiring information into the new CRBasic program, open the .DEF file located in the C:\campbellsci\SCWin folder. Copy the wiring information found at the beginning of the .DEF file.
3. Go into the CRBasic program and paste the wiring information at the beginning of the program.
4. In the CRBasic program, highlight the wiring information, right-click, and select **Comment Block**. This adds an apostrophe (') to the beginning of each of the highlighted lines, which instructs the data logger compiler to ignore those lines when compiling. The **Comment Block** feature is demonstrated at about 5:10 in the CRBasic | Features video.

Appendix B. Example program

CRBasic Example 1: CR1000X program measuring the TE525 or TE525WS using a pulse terminal

```
'Program records precipitation from one TE525 or TE525WS Rain Gage once a
'second and stores the total every 60 minutes

'Wiring Diagram
'==============
'TE525 or TE525WS

' Wire
' Color      Function          CR1000X
' -----      --------          -------
' Black      Pulse Output      P1
' White      Ground            ⏚
' Clear      Shield            ⏚

'Declare the variables and units for the rain measurement
Public Rain_mm
Units Rain_mm=mm

DataTable(Rain,True,-1)
  DataInterval(0,60,Min,0)
  Totalize(1,Rain_mm,FP2,0)
EndTable

BeginProg
  Scan(1,Sec,1,0)
    PulseCount(Rain_mm,1,P1,1,0,0.254,0)
    'For TE525MM Rain Gage, use multiplier of 0.1 in PulseCount instruction
    'Call Data Table
    CallTable(Rain)
  NextScan
EndProg
```

Appendix C. Changing funnels with a different size

The TE525 and TE525MM rain gages use the same tipping mechanism that is calibrated to tip with the same amount of water. Changing their funnel does not necessitate changing the tipping mechanism, but it does require changing the multiplier in the data logger program to match the funnel size. See Table 7-2 (p. 9) for the correct multiplier.

The TE525WS rain gage uses a different tipping mechanism that is calibrated differently than the TE525 or TE525MM. The tipping mechanism must be replaced to work with a TE525 or TE525MM funnel. Send the rain bucket into the Campbell Scientific repair department for modifications. Contact Campbell Scientific to obtain an RMA (see Assistance).

Limited warranty

Covered equipment is warranted/guaranteed against defects in materials and workmanship under normal use and service for the period listed on your sales invoice or the product order information web page. The covered period begins on the date of shipment unless otherwise specified. For a repair to be covered under warranty, the following criteria must be met:

1. There must be a defect in materials or workmanship that affects form, fit, or function of the device.

2. The defect cannot be the result of misuse.

3. The defect must have occurred within a specified period of time; and

4. The determination must be made by a qualified technician at a Campbell Scientific Service Center/ repair facility.

The following is not covered:

1. Equipment which has been modified or altered in any way without the written permission of Campbell Scientific.

2. Batteries; and

3. Any equipment which has been subjected to misuse, neglect, acts of God or damage in transit.

Campbell Scientific regional offices handle repairs for customers within their territories. Please see the back page of the manual for a list of regional offices or visit www.campbellsci.com/contact to determine which Campbell Scientific office serves your country. For directions on how to return equipment, see Assistance.

Other manufacturer's products, that are resold by Campbell Scientific, are warranted only to the limits extended by the original manufacturer.

CAMPBELL SCIENTIFIC EXPRESSLY DISCLAIMS AND EXCLUDES ANY IMPLIED WARRANTIES OF

MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Campbell Scientific hereby disclaims, to the fullest extent allowed by applicable law, any and all warranties and conditions with respect to the products, whether express, implied, or statutory, other than those expressly provided herein.

Campbell Scientific will, as a default, return warranted equipment by surface carrier prepaid. However, the method of return shipment is at Campbell Scientific's sole discretion. Campbell Scientific will not reimburse the claimant for costs incurred in removing and/or reinstalling equipment. This warranty and the Company's obligation thereunder is in lieu of all other

warranties, expressed or implied, including those of suitability and fitness for a particular purpose. Campbell Scientific is not liable for consequential damage.

In the event of any conflict or inconsistency between the provisions of this Warranty and the provisions of Campbell Scientific's Terms, the provisions of Campbell Scientific's Terms shall prevail. Furthermore, Campbell Scientific's Terms are hereby incorporated by reference into this Warranty. To view Terms and conditions that apply to Campbell Scientific, Logan, UT, USA, see Terms and Conditions. To view terms and conditions that apply to Campbell Scientific offices outside of the United States, contact the regional office that serves your country.

Assistance

Products may not be returned without prior authorization. Please inform us before returning equipment and obtain a **return material authorization (RMA) number** whether the repair is under warranty/guarantee or not. See Limited warranty for information on covered equipment.

Campbell Scientific regional offices handle repairs for customers within their territories. Please see the back page of the manual for a list of regional offices or visit www.campbellsci.com/contact to determine which Campbell Scientific office serves your country.

When returning equipment, a RMA number must be clearly marked on the outside of the package. Please state the faults as clearly as possible. Quotations for repairs can be given on request.

It is the policy of Campbell Scientific to protect the health of its employees and provide a safe working environment. In support of this policy, when equipment is returned to Campbell Scientific, Logan, UT, USA, it is mandatory that a "Declaration of Hazardous Material and Decontamination" form be received before the return can be processed. If the form is not received within 5 working days of product receipt or is incomplete, the product will be returned to the customer at the customer's expense. For details on decontamination standards specific to your country, please reach out to your regional Campbell Scientific office.

> NOTE:
> All goods that cross trade boundaries may be subject to some form of fee (customs clearance, duties or import tax). Also, some regional offices require a purchase order upfront if a product is out of the warranty period. Please contact your regional Campbell Scientific office for details.

Safety

DANGER — MANY HAZARDS ARE ASSOCIATED WITH INSTALLING, USING, MAINTAINING, AND WORKING ON OR AROUND TRIPODS, TOWERS, AND ANY ATTACHMENTS TO TRIPODS AND TOWERS SUCH AS SENSORS, CROSSARMS, ENCLOSURES, ANTENNAS, ETC. FAILURE TO PROPERLY AND COMPLETELY ASSEMBLE, INSTALL, OPERATE, USE, AND MAINTAIN TRIPODS, TOWERS, AND ATTACHMENTS, AND FAILURE TO HEED WARNINGS, INCREASES THE RISK OF DEATH, ACCIDENT, SERIOUS INJURY, PROPERTY DAMAGE, AND PRODUCT FAILURE. TAKE ALL REASONABLE PRECAUTIONS TO AVOID THESE HAZARDS. CHECK WITH YOUR ORGANIZATION'S SAFETY COORDINATOR (OR POLICY) FOR PROCEDURES AND REQUIRED PROTECTIVE EQUIPMENT PRIOR TO PERFORMING ANY WORK.

Use tripods, towers, and attachments to tripods and towers only for purposes for which they are designed. Do not exceed design limits. Be familiar and comply with all instructions provided in product manuals. Manuals are available at www.campbellsci.com You are responsible for conformance with governing codes and regulations, including safety regulations, and the integrity and location of structures or land to which towers, tripods, and any attachments are attached. Installation sites should be evaluated and approved by a qualified engineer. If questions or concerns arise regarding installation, use, or maintenance of tripods, towers, attachments, or electrical connections, consult with a licensed and qualified engineer or electrician.

General

- Protect from over-voltage.
- Protect electrical equipment from water.
- Protect from electrostatic discharge (ESD).
- Protect from lightning.
- Prior to performing site or installation work, obtain required approvals and permits. Comply with all governing structure-height regulations, such as those of the FAA in the USA.
- Use only qualified personnel for installation, use, and maintenance of tripods and towers, and any attachments to tripods and towers. The use of licensed and qualified contractors is highly recommended.
- Read all applicable instructions carefully and understand procedures thoroughly before beginning work.
- Wear a hardhat and eye protection, and take other appropriate safety precautions while working on or around tripods and towers.
- Do not climb tripods or towers at any time, and prohibit climbing by other persons. Take reasonable precautions to secure tripod and tower sites from trespassers.
- Use only manufacturer recommended parts, materials, and tools.

Utility and Electrical

- You can be killed or sustain serious bodily injury if the tripod, tower, or attachments you are installing, constructing, using, or maintaining, or a tool, stake, or anchor, come in contact with overhead or underground utility lines.
- Maintain a distance of at least one-and-one-half times structure height, 6 meters (20 feet), or the distance required by applicable law, whichever is greater, between overhead utility lines and the structure (tripod, tower, attachments, or tools).
- Prior to performing site or installation work, inform all utility companies and have all underground utilities marked.
- Comply with all electrical codes. Electrical equipment and related grounding devices should be installed by a licensed and qualified electrician.
- Only use power sources approved for use in the country of installation to power Campbell Scientific devices.

Elevated Work and Weather

- Exercise extreme caution when performing elevated work.
- Use appropriate equipment and safety practices.
- During installation and maintenance, keep tower and tripod sites clear of un-trained or non-essential personnel. Take precautions to prevent elevated tools and objects from dropping.
- Do not perform any work in inclement weather, including wind, rain, snow, lightning, etc.

Internal Battery

- Be aware of fire, explosion, and severe-burn hazards.
- Misuse or improper installation of the internal lithium battery can cause severe injury.

- Do not recharge, disassemble, heat above 100 °C (212 °F), solder directly to the cell, incinerate, or expose contents to water. Dispose of spent batteries properly.

Use and disposal of batteries

- Where batteries need to be transported to the installation site, ensure they are packed to prevent the battery terminals shorting which could cause a fire or explosion. Especially in the case of lithium batteries, ensure they are packed and transported in a way that complies with local shipping regulations and the safety requirements of the carriers involved.
- When installing the batteries follow the installation instructions very carefully. This is to avoid risk of damage to the equipment caused by installing the wrong type of battery or reverse connections.
- When disposing of used batteries, it is still important to avoid the risk of shorting. Do not dispose of the batteries in a fire as there is risk of explosion and leakage of harmful chemicals into the environment. Batteries should be disposed of at registered recycling facilities.

Avoiding unnecessary exposure to radio transmitter radiation

- Where the equipment includes a radio transmitter, precautions should be taken to avoid unnecessary exposure to radiation from the antenna. The degree of caution required varies with the power of the transmitter, but as a rule it is best to avoid getting closer to the antenna than 20 cm (8 inches) when the antenna is active. In particular keep your head away from the antenna. For higher power radios (in excess of 1 W ERP) turn the radio off when servicing the system, unless the antenna is installed away from the station, e.g. it is mounted above the system on an arm or pole.

Maintenance

- Periodically (at least yearly) check for wear and damage, including corrosion, stress cracks, frayed cables, loose cable clamps, cable tightness, etc. and take necessary corrective actions.
- Periodically (at least yearly) check electrical ground connections.

WHILE EVERY ATTEMPT IS MADE TO EMBODY THE HIGHEST DEGREE OF SAFETY IN ALL CAMPBELL SCIENTIFIC PRODUCTS, THE CUSTOMER ASSUMES ALL RISK FROM ANY INJURY RESULTING FROM IMPROPER INSTALLATION, USE, OR MAINTENANCE OF TRIPODS, TOWERS, OR ATTACHMENTS TO TRIPODS AND TOWERS SUCH AS SENSORS, CROSSARMS, ENCLOSURES, ANTENNAS, ETC.

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