Centeron™ Controller Instruction Manual

Model # TCXXXXXXXXXXXXX

Document # 040004A0001

Revision # C

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List of Acronyms

Acronym	Defined
AC/DC	Alternating current/Direct current
bps	Bits per Second
C	Celsius
ESD	Electrostatic Discharge
EPA	United States Environmental Protection Agency
FCC	Federal Communications Commission
Ft	Feet
LED	Light Emitting Diode
MHz	Megahertz
NVRAM	Non Volatile Random Access Memory
RF	Radio Frequency
REN	Ringer Equivalence Number
USOC	Universal Service Ordering Codes
V	Volts
Vac	Volts, Alternating Current

1.0 Introduction

This manual describes how to install, test, and service the Centeron® Controller. The Centeron® Controller is part of the Centeron® Level Monitoring System, which includes the Data Collection System and Monitor(s).

This guide does not include how to install, test, maintain or troubleshoot the Monitor or Data Collection System. Refer to these products' respective instruction manuals.

The description herein is based on a standard installation.

2.0 Product Overview

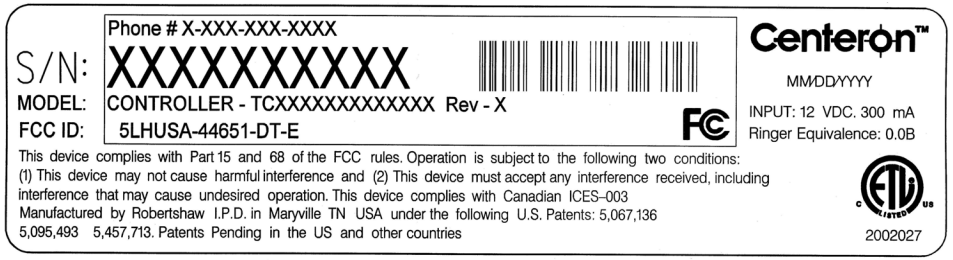
2.1 Description

The Controller is a receiver that contains a local database of monitor information and transfers data over telephone lines to the Data Collection System at preset call intervals and in response to alarm conditions.

2.1.1 Product Markings

Included on the housing of the Controller is a label that contains important information about the product.

Figure 1. Centeron® Controller Label Product Markings



2.1.1.1 Product and Customer Identification Field

This field is used to identify the product or customer depending on application.

2.1.1.2 Phone # Field

This field is optional and may be used to identify the Data Collection System phone number that the Controller is programmed to dial. This number may be used by installers or service personnel to troubleshoot problems with Data Collection System connections.

2.1.1.3 Serial Number Field

This field displays the ten-digit numeric I.D., which uniquely identifies the Controller (and monitoring site) to the Centeron® system. This number is programmed into the micro-controller of the unit at the factory and remains resident in the NVRAM of the device even when power is removed. This number can only be re-programmed at the factory. The serial number is also bar coded in standard 128 Auto-switching Format for easy reading with bar code devices.

2.1.1.4 Model Number Field

This field displays the current model number and revision of the device. Please be sure to identify this number when contacting service or technical support personnel.

2.1.1.5 FCC I.D., Logo, and Text Field

The FCC requires certification information and identification to appear on product labels. See Sections 2.4.1and 2.4.2 for more information on FCC certification.

2.1.1.6 Manufacturing Location and Patent Listing Field

This field identifies the location of manufacturing and patents that apply to the product.

2.2 Operation

The Controller contains an internal dial-out modem with 1200bps carrier rates and can receive transmitted Radio Frequency (RF) signals from one (1) unique Monitor. The Controller communicates with the Data Collection System via serial data communications over a telephone line using its internal modem. The Controller sends monitor data from its internal database and then receives commands and setup information from the Data Collection System. See Figure 4 in Appendix A for an illustration of the Centeron® Level Monitoring System.

The Level Monitoring System utilizes spread spectrum technology for communication in the 902–928 MHz band in accordance with the Federal Communications Commission's (FCC) Rules. The Controller derives its power from a wall-mounted AC/DC power supply that provides an unregulated 12 Volts DC to the device.

2.3 Environmental Specifications

The following environmental specifications should be observed when installing the Controller:

- Temperature Range: 0^{o}C to $+60^{o}$C
- Designed for indoor use.
- The plastic housing is designed to protect the controller circuit board.

- Chemical Exposure: The Controller's plastic housing is not completely sealed and provides only mild splash resistance to fluids.

2.4 Certifications

This equipment complies with Part 68 and Part 15 of the FCC Rules. On the back of this equipment is a label that contains, among other information, the FCC registration number and Ringer Equivalence Number (REN). If requested, provide this information to your telephone company.

2.4.1 FCC Notice—Telephone Communications

The REN is useful to determine the quantity of devices that may be connected to the telephone line. Excessive RENs on the telephone line may result in the devices not ringing in response to an incoming call. In most, but not all areas, the sum of RENs of all devices should not exceed five (5). To be certain of the number of devices that may be connected to a line, as determined by the total RENs, contact the local telephone company.

The registration jack USOC for the equipment is **RJ11C**.

This equipment is designed to be connected to the telephone network or premises wiring using a compatible modular jack which is FCC Part 68 compliant. A FCC compliant telephone cord is provided with this equipment.

If the installed Centeron® Controller causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice is not practical, you will be notified as soon as possible. You will be advised of your right to file a complaint with the FCC if you believe it is necessary.

Your telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the installed Centeron® Controller. If they do, you will be given advance notice so as to give you an opportunity to maintain uninterrupted service.

2.4.2 FCC Notice—Radio Frequency Communications

The Controller generates and uses radio frequency energy. If not installed and used in accordance with the manufacturer's instructions, it may cause interference to radio and television reception. The Controller board has been tested and found to comply with the specifications in Part 15 of Radiators and FCC Rules for Class B Computing Devices.

CAUTION: Robertshaw Industrial Products Division does not support field changes or modifications to any of the Centeron® Level Monitoring System equipment unless they are specifically covered in this manual. All adjustments must be made at the factory

under the specific guidelines set forth in our manufacturing processes. Any modification to the equipment will void the manufacturer's warranty and could void the user's authority to operate the equipment and render the equipment in violation of FCC Part 15, Subpart C, 15.247.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

2.4.3 Canada

This Class B digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

"**NOTICE:** The Industry Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. The Industry Canada does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, it present, are connected together. This precaution may be particularly important in rural areas.

Caution: Users should not attempt to make connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate".

"**NOTICE:** The **Ringer Equivalence Number (REN)** assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Numbers of all the devices does not exceed 5."

2.4.4 Safety and Regulatory

The Centeron® Controller complies with Fire Retardant and Electrical Surge Protection Rules UL60950-ITE equipment.

3.0 Installation

3.1 RF Site Guidelines

The Controller may either be placed horizontally or vertically. The unique internal antenna design automatically compensates for variations in signal strength.

- Direct line of sight between the Centeron® Monitor and Controller will provide optimum radio reception.

- The Centeron® Monitor and Controller can communicate at distances up to one mile under optimum line-of-sight conditions.

- When obstructions such as walls, buildings, and vehicles exist between the Centeron® Monitor and Controller the distance between these units should be limited to less than 500 feet.

- Multiple obstructions (such as two or more walls or a tank and a wall) between the Monitor and Controller should be avoided, if possible.

- Electrically conductive objects such as metal buildings, concrete reinforcement rods, tanks, silos, and vehicles reflect radio signals. This reflection can be either an advantage or disadvantage to good radio reception at a particular installation site:

    1. Metal objects between the Monitor and Controller may reflect and scatter RF energy and reduce radio signal strength at the Controller.

    2. Metal objects behind the Monitor or Controller may increase the radio signal strength at the Controller by reflecting radio signals toward the Controller.

- Even small metal objects such as tank vents or toolboxes between the Monitor and Controller can significantly reduce radio signal strength if they are within a few feet of the Monitor or Controller. These objects can reflect radio signals and cause a RF "shadow" which may prevent radio signals from reaching the Controller.

- Objects which are not electrically conductive such as wooden or fiberglass buildings, non reinforced masonry, trees, plastic, and glass have less effect on radio signals than metal objects.

- Windows and wooden doors can provide radio signals access into otherwise closed metal buildings. However, "low-E" window glass may have a thin metallic coating which can reflect radio signals.

- Strong electromagnetic fields such as those found in close proximity to power lines, large electric motors, generators, electric fences, and transmitter antennas may interfere with the radio signals received by the Centeron® Controller.

- The Centeron® Controller should be mounted as high as is reasonably possible to improve its ability to receive radio signals. For example, placing the Controller on a high shelf would be preferable to setting the unit on a floor near ground level. Installing the Controller on the second floor of a two-story structure would be more desirable than installing it on the ground floor. Installing the Controller in an underground basement should be avoided.

  Warning: For maximum Monitor reception, mount the Monitor within 500 feet of the Controller, avoid mounting Monitor inside a fully closed metal building, and avoid close proximity to large electrical equipment.

3.2 Handling Guidelines

The Controller is a delicate piece of electronic equipment and should be handled carefully. Avoid rough handling of connectors and switches. Do not handle the Controller board outside of its enclosure. Do not take the Controller housing apart.

3.3 Setup

After the Data Collection System has been successfully setup (including adding the Controller and Monitor serial numbers into the database), the Controller can be installed by following the instructions outlined in the following sections.

3.3.1 Inactive Monitor(s)

Ensure that no Monitors have been activated prior to Controller installation. (Monitors are shipped inactive with an external slide magnet in the upper housing.)

3.3.2 Controller Removal

Remove the Controller from the box and set it down on a flat surface. If the site where you are installing the Controller uses TouchTone service and normal dialing mode (no outside dialing prefix required), skip to Section 3.4.

3.3.3 Tone/Pulse Dialing

The Controller is shipped with the Touch Tone service mode. If the site where this Controller is being installed uses Touch Tone service, skip to the next section.

If your telephone line uses Pulse service, the controller will have to be reprogrammed by qualified personnel via the five pin connector located next to the RJ11 connector. Programming instructions can be found in Robertshaw Document ES02055A01.

3.3.4 Outside Line Dialing Prefix

Unless ordered with a dial prefix, controllers are set up for standard dialing mode (i.e., 1 + pause + area code + seven digit number). If the site where this Controller is being installed does not require an outside line dialing prefix (e.g., "9,"), skip to Section 3.4. Otherwise, the controller will have to be reprogrammed per Appendix F, or by qualified personnel to the required dial prefix via the five pin connector located next to the RJ11 connector. Programming instructions can be found in Robertshaw Document ES02055A01.

3.4 Mounting

3.4.1 Site Selection

Select an area for mounting with an available power supply and telephone line in the same physical proximity. (Follow the RF site guidelines outlined in Section 3.1).

If necessary, obtain a longer telephone cord and locate the Controller close enough to the power source to accommodate the supplied 6-ft transformer cable.

The recommended mounting is wall-mount. Controllers are shipped with wall-mounting slots on back of Controller housing,

3.4.2 Wall-Mount

To mount the Controller to a wall, follow these steps:

1. Select an appropriate location for the Controller on a wood or sheet-rock wall considering radio reception and close proximity to a telephone jack and power outlet. There should be at least 8 inches of cord slack at the connector end of the Controller to provide a strain relief.

2. Secure the Controller in this position using two Phillips head screws.

3.4.3 Table Top Mount

To mount on a flat surface, simply ensure that all four (4) raised feet are placed on a flat surface. A fold out bracket (kickstand) is also provided on the back of the housing for angle desk mount.

3.4.4 Telephone Cord Plug-In

Warning: Only connect phone line into an Analog phone system. Connecting to a Digital phone system may damage the Controller board.

Locate the two (2) phone jacks on the side of the Controller (next to the Power Connector) (see Appendix C). Plug one end of the phone cord into either of the two (2) phone jacks (the other jack may be used to connect a standard analog phone if desired). Plug the other end of the phone cord into the phone jack on the wall.

3.5 Activation

Following Controller installation, the unit can be activated by following these steps:

1. Locate the 12-volt power supply. Plug the transformer into an AC wall outlet and secure using the supplied mounting screw and washer (see Appendix D).

2. Locate the 12-volt power connection on the side of the Controller (see Appendix C).

3. Plug the 12-volt power supply into the Controller. The Controller will go through a test cycle (2–3 seconds) and return to Ready mode (indicated by the Power and Connection OK LED remaining Green). If the dial prefix was reprogrammed as described in Section 3.3.4, the Controller must be reset. To reset the Controller,

depress the white button on the side of the Controller until you see a sequence of rapidly flashing green LED lights. The Controller should initiate a telephone call and then return to Ready mode (indicated by the Power and Connection OK LED remaining green).

Note: If the Controller does not return to this state, see Troubleshooting in Section 4.0.

The Controller is now ready to receive Monitor transmissions. Refer to the Monitor Instruction Manual for installation of a Monitor.

3.6 Site Survey

Appendix E contains a Site Survey Form, which should be filled out by the installer.

Supply the following information:

- Contact Name
- Contact Address
- Contact Telephone Number
- Model Number
- Serial Number
- Dial-out Prefix Required (0-9)
- Wall or Desk Mounted?
- Approximate Height of Controller from Ground Level
- Building Construction (e.g., wood, metal, masonry, fiberglass, etc.)
- Multiple Line Adapters Used
- Auxiliary Phone Jack Used

See Figure 3 for Example of Site Survey Form

Figure 3. Example Completed Site Survey Form

Robertshaw Centeron® Level Monitoring System Controller Site Survey Form	
Contact Name:	John Smith
Contact Address:	12345 Elm Street Anywhere, USA 12345
Contact Telephone Number:	(123) 456-7890
Model Number:	1234567A123 REV A
Serial Number:	1234567
Dial-out Prefix Required (0-9):	No
Wall or Desk Mounted?	Wall
Approximate Height of Controller from Ground Level:	4 ft
Building Construction (e.g., wood, metal, masonry, fiberglass, etc.)?	Masonry
Multiple Line Adapters Used?	No
Auxiliary Phone Jack Used?	No

4.0 Troubleshooting and Testing

If the Controller is not operating properly, locate the solution below:

Question	Solution
Is the Data Collection System correctly configured and currently operating?	If Not: Verify correct Controller and Monitor

Question	Solution
	serial numbers for the installation site. Verify that the Data Collection System is up and running. To do this, either call the system operator or perform the test described in Section 4.1 Data Collection System Link Test.
Do any of the Controller LED's turn on when power is applied?	If Not: Verify 110 VAC at the outlet where the supplied 12 VDC transformer is located. Verify that the plug on the supplied 12 VDC transformer is fully inserted into the mating connector on the Controller.
Upon the initial application of power, did the Controller ever reach ready mode? (Ready mode is indicated by the Power and Connection OK LED's remaining Green.)	If Not: First perform Data Collection System link test in Section 4.1. Next perform the Controller test in Section 4.2. If this does not correct the problem, then continue with troubleshooting or refer to technical support in Section 5.4. If Yes: The Controller has powered up properly.
After performing the Controller test in Section 4.2, does the Connection OK light turn Red?	If Yes: This indicates that the Controller is attempting to Dial the Data Collector without a dial prefix. If the phone line requires a Dial prefix, then refer to Section 3.3.4. If the phone line does not require a Dial prefix, the Controller still fails to connect or return to Ready mode, and the Data Collection Link test was performed successfully, then refer to technical support in Section 5.4.

Question	Solution
After dialing, does the Connection OK LED turn Green, Amber or Red and does the LED remain solid or blink.	See below for color indication: Green (Solid): Successful communication with Data Collector Center Amber (Solid): Timeout, CRC error, Data overrun, No communication from Data Collector. Red (Solid): No dial tone, Busy signal detected or No answer. Verify the following: Correct Dial prefix setting, operational analog phone line (can be verified by plugging in a standard analog phone), and that all phone line connectors are fully inserted into their mating jacks. Red (Blinking): Digital Phone line detected.
After power is applied, does the Controller constantly cycle through a sequence of rapidly flashing LED lights?	If Yes: This usually indicates damage to the internal modem on the Controller board. Refer to service in Section 5.4.

4.1 Data Collection System Link Test

One method of verifying that the Data Collection System is up and running is to call the Data Collection System phone access number by using an Analog telephone connected to the same line that the Controller is using. This access number is sometimes printed on the label of the Controller housing (refer to Section 2.1.1). After dialing the access number, a high pitch modem tone should sound through the headset. If there is no tone, there is either a problem with the phone line or with the connection at the Data Collection System. If there is a busy signal, try back at a later time. If it is a wrong number, refer to technical support in Section 5.4.

4.2 Controller Test

The following test should only be performed if one of the following occur:

- The Controller did not power up into Ready mode at time of installation (Ready mode is indicated by the Power and Connection OK LED remaining Green).
- The Controller has not been reporting to the Data Collection System;
- The Controller has been causing telephone problems;

If necessary, perform the following test procedure for the Controller:

1. Remove power and any telephone line connections from the Controller.
2. Connect only the main telephone line to the Controller.
3. Plug the 12-volt power supply into the Controller while holding down the small white Reset button (see Appendix C). Continue depressing the white Reset button for approximately four to six seconds.
4. Release the white Reset button.

The Controller should initiate a telephone call to the Data Collection System, receive data, hang up, and then return to Ready mode (indicated by the Power and Connection OK LED remaining Green).

Refer to Section 5.4 if the Controller does not complete this test successfully.

5.0 Warranty and Service

5.1 Warranty

Seller warrants title and that products sold to Buyer shall be free from defects in material and workmanship and shall conform to specifications for a period of one (1) year from purchase date for complete units and parts and subassemblies. Warranties on goods sold but not manufactured by the seller are expressly limited to the terms of warranties of the manufacturer of such goods.

Seller makes no representation or warranty of any kind, express or implied, as to merchantability, fitness for particular purpose or any other matter. Upon receipt of

definite shipping instructions, Buyer shall return, transportation prepaid, all defective material, or material not conforming to specifications, to Seller, after inspection by Seller, or at Seller's election, subject to inspection by Seller. Material returned by Buyer must be returned in same condition as when received by Buyer. Defective material, or material not conforming to specifications, so returned shall be replaced or repaired by Seller and returned, freight prepaid, without any additional charge, or in lieu of such replacement or repair, Seller, may, at Seller's option, refund the purchase price applicable to such material. Seller agrees to pay return freight charges not exceeding the lowest rail or truck rate which would apply from the original destination on all defective material, or material not meeting specifications. However, Seller shall not be obligated for such charges when material returned proves to be free from defect and to meet specifications. Material which proves to be free from defect and to meet specifications shall be held by Seller for shipping instructions and Buyer shall furnish such instructions promptly upon request. Seller's liability shall be limited solely to the replacement or repair or to refunding the purchase price applicable to the defective material or material not meeting specifications. Seller shall not be liable for any consequential damages nor any loss, damages or expenses directly or indirectly arising from the use of the material.

5.2 Unit Disposal

The U.S. Environmental Protection Agency regulates the disposal of waste products in the United States. The EPA Regulations are listed in the "Code of Federal Regulations," CFR40, entitled "Protection of Environment." Individual states and local communities also may establish regulations covering the disposal of waste products. These may be more stringent than the federal regulations and may cover the disposal of household waste, which is not included in the federal regulation. Thus, state and local agencies should be contacted for their disposal guidelines.

5.3 Service Parts List

Robertshaw Part Number	Description	Quantity
039952A0001	12 VDC Power Supply	1
039927A0001	Power Supply Screw	1
039928A0001	Power Supply Washer	1
039929A0001	Phone Cord (6 ft.)	1
039930A0001	2 Outlet Adapter	1

5.4 Service and Technical Support

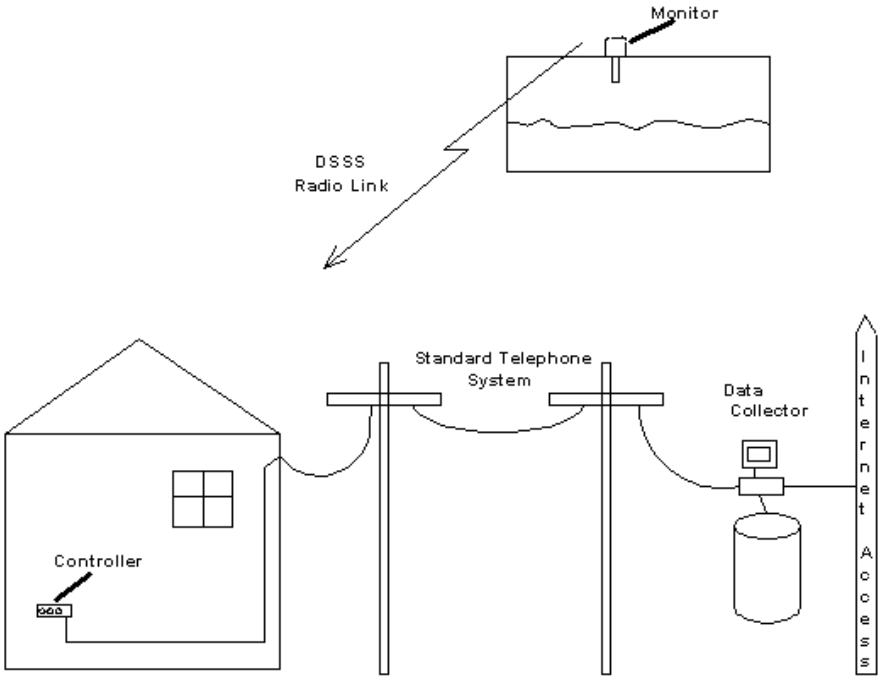
If you experience trouble with this equipment, please contact **Robertshaw Industrial Products Division Service Center at (865) 981-3103, Monday through Friday, EST 8:00 a.m. to 5:00 p.m**. If the equipment is causing harm to the telephone network, the telephone company may request that you disconnect the equipment until the problem is resolved.

This unit is to be serviced by certified service personnel only.

This equipment may not be used on public coin service provided by the telephone company. Connection to party lines is subject to state tariffs. (Contact your state public utility commission or corporation commission for information.)

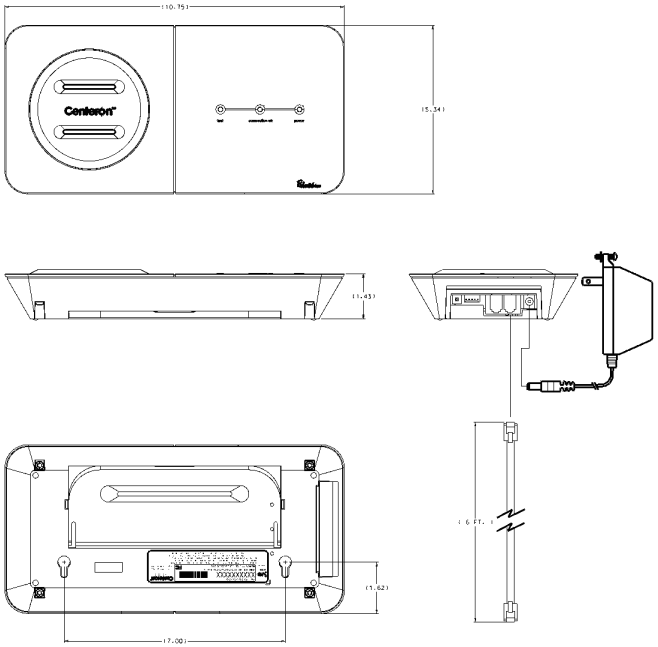
Appendix A: Centeron® Level Monitoring System

Figure 4. Centeron® Level Monitoring System



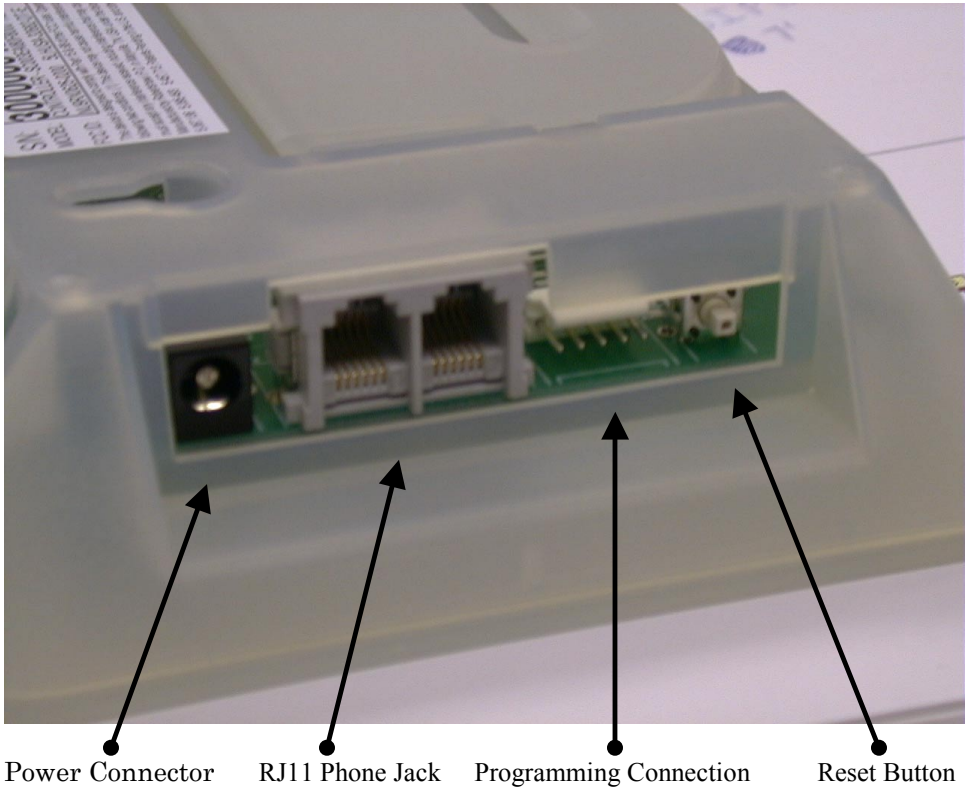
Appendix B: Product Drawing

Figure 5. Centeron® Controller Product Drawing



Appendix C: Power and Modem Connections

Figure 6. Centeron® Controller



Appendix D: Power Supply Mounting

Figure 7. Power Supply Mounting

Appendix E: Controller Site Survey Form

Figure 8. Centeron® Controller Site Survey Form

Robertshaw Centeron® Level Monitoring System Controller Site Survey Form	
Contact Name:	
Contact Address:	
Contact Telephone Number:	
Model Number:	
Serial Number:	
Dial-out Prefix Required (0-9)?	
Wall or Desk Mounted?	
Height of Controller from Ground Level?	
Building Construction (e.g., wood, metal, masonry, fiberglass, etc.)?	
Multiple Line Adapters Used?	
Auxiliary Phone Jack Used?	

Appendix F: Dial Prefix Selection

Figure 9. Centeron® Dial Prefix Programming

The dial prefix can be changed by pushing in and holding the reset button while applying power to the controller. During the first three seconds, the controller will go through its standard red, yellow, and green LED initialization sequence. After the initialization sequence, all three LED's will turn off, then all LED's will turn green, then yellow. When all LED's turn yellow, release the reset button and the controller will automatically search for the proper dial prefix. After the dial prefix has been selected, the controller will automatically call the Data center then return to ready mode. Once the controller has reached ready mode, perform a long reset on the controller by pushing in and holding the reset button for 6 seconds. Please note this procedure will only write None, 9, and 8, dial prefixes. If dial prefixes 1 thru 7 are desired, refer to Robertshaw document ES02055A01.Table A1 details the function and LED combination.

Table A1: LED combinations for dial prefix selection

Test LED	Connection LED	Power LED	Selected function when reset button is released after power is applied
Off	Off	Off	Exits test (without modification)
Green	Green	Green	Runs modem communication test
Yellow	Yellow	Yellow	Tries to communicate with the data center using prefixes sequentially: • None • 9, • 8, The first prefix, which gives an access to data center, will be stored in the EEPROM.

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