

APPLICATION NOTE

CSI Hardware and Software and the Year 2000



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CSI Hardware and Software and the Year 2000

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This application note lists the year 2000 compliance status of our hardware and software, provides correction procedures for some products that are designated as non-compliant, and discusses the testing methods used to determine the compliance status. Most of our products are compliant; many of our non-compliant products can be corrected without the purchase of additional hardware or software. To the best of our knowledge, the information provided in this document is correct; please contact us if you are aware of circumstances that are inconsistent with this note. Older products might not be included.

Year 2000 Compliance Definition and Disclosure Statement

We define our products to be year 2000 compliant if, when used in accordance with their associated documentation, they are capable of correctly processing, providing, and/or receiving date data before, during, and after January 1, 2000. This is assuming that all other products (i.e., computer software and hardware) used with the product are year 2000 compliant and properly exchange date data with it.

For our products to pass our year 2000 testing, they did not experience any inoperability, abnormal endings, invalid and/or incorrect results when processing, providing, and/or receiving date-related information, including key transitional dates. This includes recognizing February 29, 2000 as a legitimate date value, correctly performing leap year testing and determination, and correctly using leap year dates. See Appendix A for specific test procedures.

Compliance Status Definitions

Compliant – No Dates Used: This product neither processes nor uses dates.

Compliant – No Year Used: This product has a 24-hour clock and a counter used for days but does not process nor use years.

Compliant – Tested: This product passed the testing procedures provided in Appendix A.

Compliant – Not Tested: We believe this product is compliant because it processes or uses dates in a similar manner as a tested product.

Non-compliant – Fix Provided: This product is non-compliant but can be corrected after December 31, 1999 by following a procedure provided in this document.

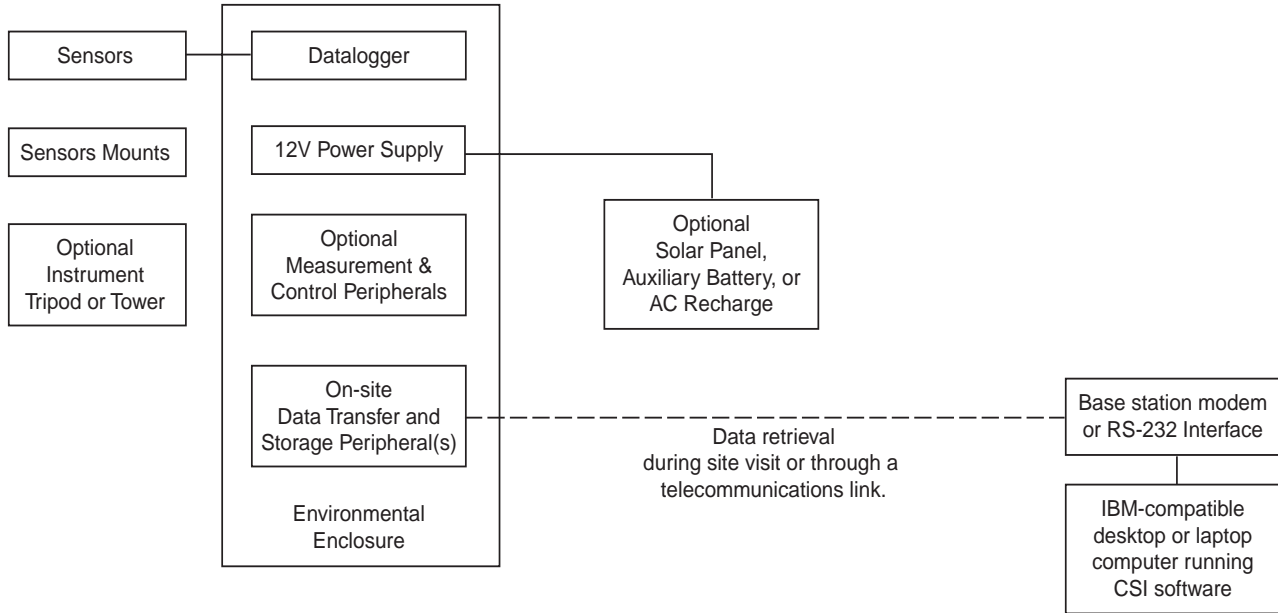
Non-compliant – Upgrade Required: Contact an applications engineer at Campbell Scientific for a product upgrade.

Unknown – Still to Test: We do not know the compliance status of this product but we plan to test it.

Discontinued – Not Tested: This product has been discontinued. We have not tested its compliance status and no testing is planned.

System Overview

Data acquisition systems consist of:



Our dataloggers, software, and the PC use date/time information and therefore could be affected by the year 2000. Most sensors, power supplies, measurement and control peripherals, and data storage and transfer peripherals do not process nor use dates and therefore are classified as Compliant – No Dates Used.

Dataloggers, Operating Systems, and EEPROMs

Our dataloggers convey date information in one of two ways. The first way is through the datalogger's real-time display. Most of our non-compliance status issues are due to erroneous date fields being displayed by the real-time display. The display is accessed either through the datalogger's *5 mode (keyboard display) or through a PC running our software. The erroneous visual displays can be corrected after 31 December 1999 on-site using the keyboard display or remotely via telecommunications with a few keystrokes (procedures are outlined on page 5).

The second way the datalogger conveys date information is with the dates stored in with the datalogger's Final Storage data. The data will be correct for most of our dataloggers (i.e., the datalogger will automatically make the transition and begin outputting 2000 in the year field as of January 1, 2000). Typically no interaction is required since the year field is stored as a four-digit number in most of our dataloggers. Most dataloggers recognize the difference between 1900 and 2000, and recognize leap years well into the 21st century (see Appendix A for details).

Standard Dataloggers

<u>Datalogger</u> ¹	<u>Operating System</u> ² <u>or PROM</u>	<u>Stored Data</u> <u>(including date)</u>	<u>Displayed Date</u>
CR10X ³	Standard	Compliant – Tested	Compliant – Tested
	Modbus	Compliant – Tested	Compliant – Tested
	Table Format	Compliant – Not Tested	Compliant – Not Tested
CR23X ³	Standard	Compliant – Tested	Compliant – Tested
	Table Format	Compliant – Not Tested	Compliant – Not Tested
CR510 ³	Standard	Compliant – Tested	Compliant – Tested
	Modbus	Compliant – Not Tested	Compliant – Not Tested
	Table Format	Compliant – Not Tested	Compliant – Not Tested
CR7 (700(X))	OS7 series PROMs	Compliant – Tested	Non-compliant – Fix Provided
	Other PROMs shipped from CSI after 8/5/91 ⁴	Compliant – Tested	Non-compliant – Fix Provided
	PROMs shipped from CSI before 8/5/91 ⁴	Non-compliant – Upgrade Required	Non-compliant – Upgrade Required
CR9000(C)	All operating systems	Compliant – Tested	Compliant – Tested

Notes:

- Many of our dataloggers have extended temperature testing options (e.g., CR10X-XT, CR510-XT). The compliance status of dataloggers with these options is the same as for the standard product.
 - The signatures of the Operating System or PROM versions tested are provided in Appendix B.
 - This datalogger has expanded memory versions. The compliance status of these versions is the same as for the standard product.
 - If you're not sure when the PROM was shipped or if it has ever been upgraded, press *B on the CR7's keyboard. If you can scroll through only five windows instead of ten, the CR7 was shipped before 8/5/91 and requires an upgrade. Although these older dataloggers do store the date as a four digit number and will wrap properly to the next year, if you turn the datalogger off and enter 00 for the year, the datalogger will assume the year is 1900 instead of 2000.
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Specialized or Retired Dataloggers

<u>Datalogger</u> ¹	<u>Operating System² or PROM</u>	<u>Stored Data (including date)</u>	<u>Displayed Date</u>
21X(L)	OSX series PROMs	Compliant – Tested	Non-compliant – Fix Provided
	Other PROMs shipped from CSI after 8/90 ³	Compliant – Tested	Non-compliant – Fix Provided
	PROMs shipped from CSI before 8/90 ³	Non-compliant – Upgrade Required	Non-compliant – Upgrade Required
BDR301	All PROMs	Compliant – Not Tested	Compliant – Not Tested
BDR320	All PROMs	Compliant – Tested	Compliant – Tested
CR10	OS10 series PROMs	Compliant – Tested	Non-compliant – Fix Provided
	All others	Compliant – Not Tested	Non-compliant – Fix Provided
CR10QM	All PROMs	Compliant – Not Tested	Non-compliant – Fix Provided
CR10T	All PROMs	Compliant – Tested	Compliant – Tested
CR21	All PROMs	Compliant – No Year Used	Compliant – No Year Used
CR5	All PROMs	Compliant – No Year Used	Compliant – No Year Used
CR500	Standard	Compliant – Tested	Compliant – Tested
	Table Format	Compliant – Not Tested	Compliant – Not Tested

Notes:

1. Many of our dataloggers have extended temperature testing options. The compliance status of dataloggers with these options is the same as for the standard product.
 2. The signatures of the Operating System or PROM versions tested are provided in Appendix B.
 3. If you're not sure when the PROM was shipped or if it has ever been upgraded, press *B on the 21X(L)'s keyboard. If you can scroll through only four windows instead of nine, the 21X(L) was shipped before 8/90 and requires an upgrade. The oldest non-compliant dataloggers store the year as either a one or two digit number. The other non-compliant dataloggers do store the date as a four digit number and will wrap properly to the next year. However, if you turn the datalogger off and enter 00 for the year, the datalogger will assume the year is 1900 instead of 2000.
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Procedure for Updating the Datalogger Clock (after 31 December 1999)

You have a choice of three procedures for correcting erroneous displays. One of the procedures uses the datalogger's keyboard display; the other two use a PC and our software. All of these procedures can be done on-site. The last two procedures can also be done using telecommunications. These procedures must be performed after December 31, 1999.

Caution:

If using DOS PC208/Telcom software, use only Telcom versions 7.5 or higher to set the datalogger's date and time to the PC's date and time. Earlier versions of Telcom recreate the "erroneous display" after it has been fixed. See note 5 on page 6 for more information.

Procedure 1 (uses the Keyboard Display)

Step 1 – Access Datalogger Time Mode

Press *5 A

Step 2 – Make the change

Press 00 A (We're assuming you're correcting the display in the year 2000. If you're correcting the display during a later year, key in the last two digits of that year instead.)

Step 3 – Go back into Log Mode

Press *0 or *6 (see datalogger manual for an explanation of the difference)

-- OR --

Procedure 2 (uses a PC and Campbell Scientific Software)

You can correct erroneous displays by using our computer software to update the datalogger time with the PC's time. This can be accomplished using standard functions in PC208W, PC208E, or GraphTerm; PC208E and GraphTerm are part of the PC208 Software Package. If your Telcom (part of PC208) version is 7.5 or higher, you can also use Telcom to update the times. However, DO NOT use earlier versions of Telcom since a non-compliance issue prevents it from fixing the display (see note 5 on page 6). See the PC208W or PC208 manuals for information about updating the clocks.

Caution:

Before resetting the datalogger's time to the PC's time, verify that the PC's date and time are correct.

-- OR --

Procedure 3 (uses a PC and Campbell Scientific Software)

Step 1 – Enter PC208W or PC208's Terminal mode

See the PC208W or PC208 manual for the steps to enter this mode.

Step 2 – Access Datalogger Time Mode

At the "*" prompt, type in 2718H and press the enter key. When the ">" symbol appears, press *5 A.

Step 3 – Make the change

Press 00 A (We're assuming you're correcting the display in the year 2000. If you're correcting the display during a later year, key in the last two digits of that year instead.)

Step 4 – Go back into Log Mode

Press *0 or *6 (see datalogger manual for an explanation of the difference)

Software

The information in this section assumes the operating systems in your datalogger and PC are year 2000 compliant. Please verify this since both the datalogger and PC can affect what our software displays. Datalogger compliance status and any fixes are provided in the previous section(s) of this document. For compliance information about your PC, contact the manufacturer.

Datalogger Support Software Packages

<u>Package</u>	<u>Programs Included</u> ¹	<u>Package Number</u> ² <u>or Version</u>	<u>Package Compliance Status</u>
PC208	CSMCOM, DOC2CSI,	6306-18	Compliant – Tested ³
	Edlog, GT (GraphTerm) ⁴ ,	6306-17	Compliant – Tested ^{3,5}
	PC208E, SMCOM,	6306-16 to -13	Compliant – Not Tested ^{3,5}
	SMCRead, Split ⁶ ,	6306-12 to -09	Non-Compliant – Upgrade Required ⁷
	Term, Telcom ⁴ ,	6306-08	Compliant – Tested ⁵
	WakeTime	6306-07 to -05	Compliant – Not Tested ⁵
		6306-04	Compliant – Tested ⁵
		6306-03 to -00	Compliant – Not Tested ⁵
		5348-02	Compliant – Tested ⁵
		5348-01 to -00	Compliant – Not Tested ⁵
	536, 536A, 536B	Discontinued – Not Tested	
PC208W	DOC2CSI, EdlogW,	3.0 - 3.01	Compliant – Tested
	PC208W, PCSetup, SMS, SplitR ⁶ , SplitW ⁶ , TCOM, View, Xlate	1.0 - 2.3	Compliant – Not Tested
PC9000	PC9000, CRBASIC, ConvGen, CSIO, GSW, Pserver, Reset	All	Compliant – Tested

Notes:

1. Not all of the programs listed may be included in all versions of the software package.
 2. PC208's package number is printed on the first diskette's label.
 3. In the PC208E program, the Reported Datalogger Time in the Clock Set/Check tool uses the PC's century (e.g., if 1999 is displayed, "19" came from the PC and "99" came from the datalogger). This may not be a problem since you typically set the PC and the datalogger to the same time. If for some reason, you don't have the PC and datalogger set to the same time (e.g., datalogger and PC are in different time zones), interpret the datalogger clock display with the above in mind.
 4. BDR301/BDR320 users, after December 31, 1999, GraphTerm or Telcom might not collect BDR301/BDR320's data on the first attempt. However, upon repeated attempts, the data can be successfully retrieved.
 5. This package includes a version of Telcom that is prior to 7.5. When used to set the datalogger's date and time to the PC's date and time, versions prior to 7.5 send "100" to the datalogger for the year 2000 instead of "00". For many of the dataloggers, this will cause the error message "Communications or security error while fixing clock". However, the datalogger's date and time will be updated, after which the datalogger's *5 mode will display a "9-" for a CR10 or CR7, "100" for a 21X, or "2000" for a CR10X, CR510, or CR500. To deal with the problem, either upgrade your Telcom to version 7.5 or use GraphTerm or PC208E to update the clocks.
 6. Split does not process date values across yearly boundaries. Therefore the year 2000 is not processed differently than any other year.
 7. This package is non-compliant because when using the PC208E program, the datalogger clock always displays "19" for the datalogger century. Also, the package includes Telcom version 7.3 which has the problems described in note 5. Programs other than PC208E and Telcom are compliant in this package.
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Starter or Tutorial Software

<u>Software</u>	<u>Version</u>	<u>Compliance Status</u>
PC200W	1.1 Versions prior to 1.1	Compliant – Tested Non-Compliant – Upgrade Required ¹
PC300	All	Compliant – Tested ²
PCTour (Windows and DOS)	All	Compliant – No Dates Used
Short Cut	All	Compliant – No Dates Used

Notes:

1. Displayed "Logger" date and time freezes on 2/28/00 11:59:59. Attempts to set the datalogger clock or disconnect and reconnect result in the error message "02/29/00 00:01:22 is not a valid date & time". Also, the datalogger clock always displays "19" for the century even when the Windows Regional Settings are set to display a four digit number. The displayed PC date and time are error free. Version 1.1 is compliant and a free copy of it can be downloaded from our Web site at www.campbellsci.com/resource.html.
 2. After December 31, 1999, PC300 might not collect the BDR301/BDR320's data on the first attempt. However, upon repeated attempts, the data can be successfully retrieved.
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Data Graphics and Analysis Software

<u>Software</u>	<u>Version</u>	<u>Compliance Status</u>
ID-2000W	All	contact Interface Design (http://www.mcadamsinc.com)
ID-2000	All	contact Interface Design (http://www.mcadamsinc.com)
RTDM	1.4 All others	Compliant – Tested Compliant – Not Tested

Software for Downloading New Operating System into Dataloggers

<u>Software</u>	<u>Version</u>	<u>Compliance Status</u>
CSOS	All	Compliant – No Dates Used
CSOSD	All	Compliant – No Dates Used
OSDTect	All	Compliant – No Dates Used

Support Software for Systems

<u>Software</u>	<u>Version</u>	<u>Compliance Status</u>
PC120	All	Compliant – No Dates Used
PC121	All	Compliant – No Dates Used
PC151	All	Unknown – Still to Test
PCPST	All	Compliant – No Dates Used

Retired Products

<u>Software</u>	<u>Version</u>	<u>Compliance Status</u>
CSI16COM.DLL	1.8.1	Compliant – Tested
	All others	Compliant – Not Tested
DLDMOD	All	Discontinued – Not Tested
PC100	All	Discontinued – Not Tested
PC201	All	Discontinued – Not Tested
PC205	All	Discontinued – Not Tested
PC206	All	Discontinued – Not Tested
PC210	All	Compliant – Not Tested
PC301	All	Discontinued – Not Tested
PC500	All	Discontinued – Not Tested
RTMS	With RTM 1.04	Compliant – Tested
	All others	Compliant – Not Tested

Data Storage and Transfer Peripherals

Data Storage and Transfer Peripherals

Compliance Status

Direct

SC32A
SC929

Compliant – No Dates Used
Compliant – No Dates Used

Displays

CR10KD
DSP4 Heads Up Display

see CR10X, CR10, CR510, or CR500's Displayed Data column in the Datalogger section
Unknown – Still to Test

Multidrop modems

MD9

Compliant – No Dates Used

Phone modems

COM100
COM200
DC103
DC112
DC1765
VS1

Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used

Radiotelemetry

DC95
HT90
P50 radios
PS232
RF100
RF200
RF232(A)
RF300 series radios
RF95(A)

Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used

Satellite transmitters/transceivers

Galaxy Inmarsat TNL-7002
ST-13
TGT1
Trimble Model SV6 GPS Receiver

contact Trimble Navigation (<http://www.trimble.com>)
contact Telonics (<http://www.telonics.com>)
contact Telonics (<http://www.telonics.com>)
contact Trimble Navigation (<http://www.trimble.com>)

Short-haul modems

SC932(C)
SC95A
SC95C
SRM-5A
SRM-6A

Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used

Solid-state and card storage modules

CSM1
MCR1
SM16
SM192
SM64
SM716

Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used

Measurement and Control Peripherals

Measurement and Control Peripherals

Multiplexers

AM25T
AM32(A)
AM416

Compliance Status

Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used

Synchronous Devices for Measurement (SDMs)

SDM-AO4
SDM-CD16
SDM-CD16AC
SDM-INT8
SDM-SIO4
SDM-SW8(A)

Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used

Completion Resistors and Sensor Interfaces

3WHB10K
4WFB120, 4WFB350, or 4WFB1K
4WHB10K
4WPB100 or 4WPB1K
A21REL-12 or A6REL-12
A5B40
ACL1
AVW1, AVW4, or AVW100
BCC1
CURS100
CVD20
QD1
VDIV10.1 or VDIV2.1

Compliant – No Dates Used
Compliant – No Dates Used
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Compliant – No Dates Used

Power Supplies

Power Supply

10ALK/C
BPALK
CH12R
CH512R
PS12ALK
PS12LA
PS34
PS35
PS512M

Compliance Status

Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used

Sensors

Sensor

Compliance Status

Air, Soil, or Water Temperature

105T
107(B) or 108(B)
43347
A3537
ASPTC
FW3, FW1, or FW05
TCAV

Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used

Air Temperature and Relative Humidity

CS500
HMP35C
HMP45C
XN217 or XN218

Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used

Barometric Pressure

CS105
PTA427(A)
SBP270

Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used

Conductivity

247 or 247W

Compliant – No Dates Used

Distance

SR50
UDG01

Compliant – No Dates Used
Compliant – No Dates Used

Heat and Vapor Flux

127
CA27
CSAT3
KH20

Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used

Leaf Wetness

237 or 237F

Compliant – No Dates Used

Precipitation

380
385
CS700
CS705
TE525, TE525WS, or TE525MM

Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used

Soil Heat Flux, Potential, or Volumetric Water Content

227 or 223
229
257 or 253
CS615
CS620 or CD620
HFT3 or HFT1

Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used

Sensor

Solar Radiation

CM3
LI200X, LI200S, or LI190SB
Q7.1, Q7, Q6, Q5, or Q4

Wind Speed and/or Direction

014A
024A
03101 or 03001
034A
05103 or 05305
CS800

Compliance Status

Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used

Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used
Compliant – No Dates Used

Systems

The compliance status of a system is determined by the status of the system's datalogger. Therefore, in this section, instead of designating the compliance status of the system, we list the dataloggers used so that you can look up the appropriate device in the datalogger section.

<u>System</u>	<u>Datalogger</u>
Bowen Ratio	
023	21X
023A	21X or CR23X ¹
023A/CO2	21X or CR23X ¹
ETo or Weather Stations	
ET101	CR10X
ET106	CR10X
MetData1	CR10 or CR10X ²
Retired Weather Stations	
PMS	CR10
W2000	CR10 or CR10X ²
Stations Supplied to Other Companies (e.g., Toro, Rain Bird)	
010	CR10
011	CR10
012	CR10
Agriweather	CR10
CIMIS	CR10 or CR10X ²
LTC system	CR10
NW8000	CR10
NW8001	CR10
NW8002	CR10
OSMAC system	CR10
QDR10	CR10
T.Weather 106	CR10X
WS100	CR10
WS200	CR10
Water Resource Systems	
PST3	CR10 or CR10X ²
PST8	CR10 or CR10X ²
SWD1	CR10 or CR10X ²

Notes

1. If you do not know whether you have a 21X or CR23X, open the enclosure and remove the faceplate to find the datalogger. The datalogger will be clearly labeled as a 21X or CR23X.
 2. If you do not know whether you have a CR10 or CR10X, open the enclosure and remove the faceplate to find the datalogger. A CR10X will have a red sticker on its canister that clearly states it's a CR10X; the CR10 will have a blue/gray sticker on its canister that clearly states it's a CR10.
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Appendix A. Testing Procedures

Testing procedures were developed and coordinated by Rachel Burton, Mike Adams, Dave Braithwaite, and Glen Lyon

CR510, CR500, CR10(X), CR10T, 21X(L), CR23X, and CR7 Testing

We tested several date transitions by setting the datalogger clock to at least one minute before midnight and allowed the clock to roll over for at least one minute into the next day. The clock transitions tested varied from datalogger to datalogger. All of the dataloggers were tested for the transitions from 12/31/1999 to 1/1/2000 and from 02/28/2000 to 02/29/2000. We tested clock transitions up to the latest year the datalogger could successfully handle.

Specifically we tested the following transitions:

21X(L), CR7 Transitions

Wraps from 12/31/1996 to 1/1/1997
Wraps from 12/31/1997 to 1/1/1998
Wraps from 12/31/1998 to 1/1/1999
Wraps from 12/31/1999 to 1/1/2000
Wraps from 2/28/2000 to 2/29/2000
Wraps from 12/31/2000 to 1/1/2001
Wraps from 12/31/2004 to 1/1/2005
Wraps from 12/31/2087 to 1/1/2088 (failed)

CR10 Transitions

Wraps from 12/31/1996 to 1/1/1997
Wraps from 12/31/1997 to 1/1/1998
Wraps from 12/31/1998 to 1/1/1999
Wraps from 12/31/1999 to 1/1/2000
Wraps from 2/28/2000 to 2/29/2000
Wraps from 12/31/2000 to 1/1/2001
Wraps from 12/31/2004 to 1/1/2005
Wraps from 12/31/2084 to 1/1/2085 (failed)

CR10X, CR23X, CR510,

CR500 Transitions

Wraps from 12/31/1996 to 1/1/1997
Wraps from 12/31/1997 to 1/1/1998
Wraps from 12/31/1998 to 1/1/1999
Wraps from 12/31/1999 to 1/1/2000
Wraps from 2/28/2000 to 2/29/2000
Wraps from 12/31/2000 to 1/1/2001
Wraps from 12/31/2004 to 1/1/2005
Wraps from 12/31/2099 to 1/1/2100
Wraps from 12/31/2150 to 1/1/2151
Wraps from 12/31/2154 to 1/1/2155
Wraps from 12/31/2155 to 1/1/2156 (failed)

CR10T Transitions

Wraps from 12/31/1996 to 1/1/1997
Wraps from 12/31/1997 to 1/1/1998
Wraps from 12/31/1998 to 1/1/1999
Wraps from 12/31/1999 to 1/1/2000
Wraps from 2/28/2000 to 2/29/2000
Wraps from 12/31/2000 to 1/1/2001
Wraps from 12/31/2004 to 1/1/2005
Wraps from 12/31/2089 to 1/1/2090 (failed)

Verification

The same person ran the same tests on the same unit and PC but used multiple PROMs or Operating Systems. The tests were later verified by at least two other people who tested the same PROMs or Operating Systems on different units and PCs.

Tests Performed on the CR500, CR10, CR10T, 21X(L), and CR7

These dataloggers were tested using both of the following procedures.

Procedure 1

1. Powered up the datalogger
2. Manually set the date to at least one minute before midnight on the pre-transition day and waited for at least one minute after the transition to the next day
3. Checked the datalogger keyboard display's *5 mode and the PC's display using GraphTerm (GT), PC208E, or PC208W

Procedure 2

1. Powered up the datalogger
2. Manually set the date to at least one minute before midnight on the pre-transition day
3. Loaded the test program¹
4. Ran the test program until at least one minute after the transition to the next day
5. Collected data using GraphTerm (GT), PC208E, or PC208W
6. Checked the datalogger keyboard display's *5 mode and the PC's display using GraphTerm (GT), PC208E, or PC208W
7. Examined the data files to ensure the transitions occurred without error.

Note:

1. This program or a similar one was used for the test program:

01:	1	Execution Interval (seconds)
1:		Battery Voltage (P10)
1:	1	Loc [BatteryV]
2:		Internal or Panel Temperature (P17)
1:	2	Loc [TempC]
3:		Z=Z+1 (P32)
1:	3	Loc [Data]
4:		DO (P86)
1:	10	Set flag 0 high
5:		Real Time (P77)
1:	1111	Year, Day, Hour/Minute, Seconds (midnight = 0000)
6:		Sample (P70)
1:	3	Reps
2:	1	Loc [BatteryV]

Tests Performed on the CR510, CR10X, and CR23X

Four procedures were performed on each of these dataloggers:

Procedure 1

1. Powered up the datalogger's 12 V power supply
2. Manually set the date to at least one minute before midnight on the pre-transition day
3. Loaded the test program¹
4. Ran the test program until at least one minute after the transition to the next day
5. Checked the datalogger keyboard display's *5 mode and the PC's display using GraphTerm (GT), PC208E, or PC208W (GraphTerm and PC208E are included in PC208)
6. Collected data using one of the above software programs
7. Examined the data files to ensure the transitions occurred without error.

Procedure 2

1. Powered up the datalogger's 12 V power supply
2. Manually set the date to at least one minute before midnight on the pre-transition day
3. Loaded the test program¹
4. Ran the test program until at least one minute after the transition to the next day
5. Powered down the datalogger's 12 V power supply for at least one minute
6. Powered up the datalogger's 12 V power supply
7. Checked the datalogger keyboard display's *5 mode and the PC's display using GraphTerm (GT), PC208E, or PC208W
8. Collected data using one of the above software programs
9. Examined the data files to ensure the transitions occurred without error.

Note:

1. This program or a similar one was used for the test program:

01:	1	Execution Interval (seconds)
1:		Battery Voltage (P10)
1:	1	Loc [BatteryV]
2:		Internal or Panel Temperature (P17)
1:	2	Loc [TempC]
3:		Z=Z+1 (P32)
1:	3	Loc [Data]
4:		DO (P86)
1:	10	Set flag 0 high
5:		Real Time (P77)
1:	1111	Year, Day, Hour/Minute, Seconds (midnight = 0000)
6:		Sample (P70)
1:	3	Reps
2:	1	Loc [BatteryV]

Procedure 3

1. Manually set the date to at least one minute before midnight on the pre-transition day
2. Powered down the datalogger's 12 V power supply and had the datalogger's clock running on the lithium battery for at least a minute after the clock rolled over to the next day
3. Powered up the datalogger's 12 V power supply
4. Checked the datalogger keyboard display's *5 mode and the PC's display using GraphTerm (GT), PC208E, or PC208W (GraphTerm and PC208E are included in PC208)

Procedure 4

1. Manually set the date to at least one minute before midnight on the pre-transition day
2. Loaded the test program¹
3. Powered down the datalogger's 12 V power supply and had the datalogger's clock running on the lithium battery for at least a minute after the clock rolled over to the next day
4. Powered up the datalogger's 12 V power supply for at least one minute
5. Powered down the datalogger's 12 V power supply for at least one minute
6. Powered up the datalogger's 12 V power supply
7. Checked the datalogger keyboard display's *5 mode and the PC's display using GraphTerm (GT), PC208E, and PC208W
8. Collected data using one of the above software programs
9. Examined the data files to ensure the transitions occurred uneventfully and without error.

Note:

1. This program or a similar one was used for the test program:

01:	1	Execution Interval (seconds)
1:		Battery Voltage (P10)
1:	1	Loc [BatteryV]
2:		Internal or Panel Temperature (P17)
1:	2	Loc [TempC]
3:		Z=Z+1 (P32)
1:	3	Loc [Data]
4:		DO (P86)
1:	10	Set flag 0 high
5:		Real Time (P77)
1:	1111	Year, Day, Hour/Minute, Seconds (midnight = 0000)
6:		Sample (P70)
1:	3	Reps
2:	1	Loc [BatteryV]

CR9000 Testing

Transition from December 31, 1999 to January 1, 2000

1. Set the PC's clock to 23:50:00 December 31, 1999.
2. Used PC9000 (Program Generator) software to set the datalogger's Real Time Clock to the PC's clock time. (With the CR9000, you can only set the CR9000 clock to the PC's clock time since the CR9000 has no *5 mode.)
3. Returned the PC's clock to the correct (current) date and time. (This was to prevent any possible computer problems affecting the CR9000's performance during the year 2000 test.)
4. Downloaded our standard Demo.DLD program file in which data was written to non-volatile Flash memory at the rate of 8 bytes per 2 milliseconds.
5. After the CR9000 had run for an hour, collected data.
6. Reviewed the data file. All time stamps were correct before, during, and after rolling over to the year 2000.

Transition from February 28, 2000 to February 29, 2000

1. Set the PC's clock to 23:50:00 February 28, 2000.
2. Used PC9000 (Program Generator) software to set the datalogger's Real Time Clock to the PC's clock time. (With the CR9000, you can only set the CR9000 clock to the PC's clock time since the CR9000 has no *5 mode.)
3. Returned the PC's clock to the correct (current) date and time. (This was to prevent any possible computer problems affecting the CR9000's performance during the test.)
4. Downloaded our standard Demo.DLD program file in which data was written to non-volatile Flash memory at the rate of 8 bytes per 2 milliseconds.
5. After the CR9000 had run for an hour, collected data.
6. Reviewed the data file. All time stamps were correct before, during, and after rolling over to February 29, 2000.

The Last Year the CR9000 will Roll-Over Properly

Since the CR9000 is relatively new, time zero for the CR9000 is January 1, 1990. With this start time intact, the last year the CR9000 will roll-over properly was then calculated. The CR9000 stores the Real Time Clock in a long integer format (four byte number). This value is 2E32 (4.294967 X 10 E 9) which used in units of seconds translates to approximately 135.30 years. From time zero (1990), this computes to the year 2125. In calculating this value, the number of seconds per hour (60*60=3600) was multiplied by 24 hours to find the number of seconds in a day (3600*24 = 86,400 seconds). This value (86,400) was divided into the four byte number (4.294967 X 10 E 9) to derive the number of days at 49,710.26. In computing the number of years, the number of days per year was selected to be 366 to account for leap years. Thus dividing 49710.26 by 366, the number of years equal 135.82. This value was added to the year 1990 to derive the approximate year of 2125.

BDR320 Testing

The latest year the BDR320 can handle is the year 2099 which is Windows 95's limit. The BDR320 year is only two digits (e.g., 25 versus 2025) making it impossible to distinguish between 1925 and 2025.

Below is an outline of the date transitions testing procedures. More detailed information follows the outline.

1. Datalogger Clock
 - a) Powered up BDR320 datalogger
 - b) Set PC time two minutes before the desired transition date
 - c) Watched datalogger time advance through year 2000¹ then 2/29/2000² via:
 - i) TERM3 (part of PC300), terminal mode, pressing C
 - ii) GT, pressing C

2. Date/Time Stamp in Datalogger Data
 - a) Powered up BDR320
 - b) Prompt programmed datalogger using TERM3 to measure battery and temperature
 - c) Saved program from datalogger as "Y2K-test.dld" (see program on page 24)
 - d) Set datalogger time to 23:58:00 December 31, 1999
 - e) Allowed data to store in the datalogger for two minutes after the year 2000 transition
 - f) Collected data using:
 - i) TERM3 (part of PC300)
 - ii) GT
 - iii) Telcom
 - g) Examined data files in Microsoft Word to verify the transitions were good

3. Date/Time Stamp in Storage Module Data
 - a) Powered up BDR320
 - b) Downloaded program file Y2K-test.dld using TERM3
 - c) Set datalogger time to 23:58:00 December 31, 1999
 - d) Allowed data to store in BDR320 for two minutes after the year 2000 transition
 - e) Connected SM192 to datalogger to obtain data
 - f) Collected SM192 data using PC208W in binary format
 - g) Converted data to ASCII using BTOA.exe³
 - h) Examined data file in Microsoft Word to verify the date/time transitions were good

Test 1: Test the BDR320 clock date transition from 12/31/1999 to 1/1/2000

Procedure

1. Synchronized datalogger time to PC time; PC time has been set two minutes before the year 2000 point
2. Observed the datalogger time advance in TERM3 (Terminal mode) using the C command

Result

The date/time advanced correctly through the year 2000 transition and thereafter.

¹ "year 2000 point" is the instant of transition from 12/31/1999 to 1/1/2000.

² "2/29/2000 point" is the instant of transition from 2/28/2000 to 2/2/2000.

³ BTOA.exe is an executable file that converts binary BDR data to the ASCII format.

Test 2: Test the date/time transition through the 2/29/2000 point

Procedure

1. Synchronized datalogger time to PC time; PC time had been set two minutes before the 2/29/2000 transition
2. Observed the datalogger clock advancing in Terminal mode using C command

Result

The date/time advanced correctly through the 2/29/2000 transition and thereafter.

Test 3: Store data in Data Table then collect it via Term3

Procedure

1. Used TERM3/Prompt Programming to create a simple battery/temperature program (Y2K-test.dld) which stored table data every 10 seconds
2. Set the PC's date/time to two minutes before the year 2000 transition
3. Powered the BDR320 off/on
4. Loaded the PC date/time to the datalogger using the K command in TERM3
5. Downloaded Y2K-test.dld to the datalogger
6. Allowed the BDR320 to store data through the transition until two minutes afterwards

Result

We were unable to collect at first by using the "U" command. However when the "R" command was used, there was no problem. Thereafter we could use the "U" command. The need to collect data using the "R" command for the first time after downloading the program existed regardless of the date. Viewing the datalogger data in Microsoft Word showed the dates and times to be correct on both sides of the year 2000 transition.

Data Stored Before Transition	12/31/99 23:59:10	23.88	12.67
	12/31/99 23:59:20	23.88	12.67
	12/31/99 23:59:30	23.88	12.67
	12/31/99 23:59:40	23.88	12.67
	12/31/99 23:59:50	23.88	12.67
Year 2000 Point	01/01/00 00:00:00	23.88	12.66
Data Stored After Transition	01/01/00 00:00:10	23.88	12.67
	01/01/00 00:00:20	23.88	12.67
	01/01/00 00:00:30	23.89	12.67
	01/01/00 00:00:40	23.89	12.67
	01/01/00 00:00:50	23.89	12.67

Test 4: Store BDR320 data that includes the year 2000 point in an SM192 Storage Module

Procedure

1. Collected the data "As Stored" via SMS
2. Converted the binary file to ASCII using BTOA.exe⁴
3. Examined the data in Microsoft Word to see if the date/time was correct

⁴ BTOA.exe is an executable file that converts binary BDR data to the ASCII format.

Results

Data Stored Before Transition	12/31/99 23:59:10	21.71	13.18
	12/31/99 23:59:20	21.71	13.18
	12/31/99 23:59:30	21.72	13.18
	12/31/99 23:59:40	21.72	13.18
	12/31/99 23:59:50	21.72	13.18
Year 2000 Point	01/01/00 00:00:00	21.73	13.18
Data Stored After Transition	01/01/00 00:00:10	21.73	13.18
	01/01/00 00:00:20	21.73	13.18
	01/01/00 00:00:30	21.73	13.18
	01/01/00 00:00:40	21.74	13.18
	01/01/00 00:00:50	21.74	13.18

SN:1220 NotesLog: TimeSetLog: 01/01/89 00:01:00 12/31/99 23:55:08 ErrorLog: *
--

Test 5: Store data in Data Table then collect it via GT

Procedure A

1. Opened a DOS window in Windows 95 to access GT for collecting data
2. Created a station named BDR
3. Pressed H
4. Selected 300 Series datalogger
5. Chose “As Stored in Datalogger” file format
6. Pressed U to collect uncollected data
7. Ran BTOA.exe⁵ on the files that were generated

Results of Procedure A

Data Stored Before Transition	12/31/99 23:59:10	21.71	13.18
	12/31/99 23:59:20	21.71	13.18
	12/31/99 23:59:30	21.72	13.18
	12/31/99 23:59:40	21.72	13.18
	12/31/99 23:59:50	21.72	13.18
Year 2000 Point	01/01/00 00:00:00	21.73	13.18
Data Stored After Transition	01/01/00 00:00:10	21.73	13.18
	01/01/00 00:00:20	21.73	13.18
	01/01/00 00:00:30	21.73	13.18
	01/01/00 00:00:40	21.74	13.18
	01/01/00 00:00:50	21.74	13.18

⁵ BTOA.exe is an executable file that converts binary BDR data to the ASCII format.

```

SN:1220
NotesLog:
*
TimeSetLog:
01/01/89 00:01:00 12/31/99 23:55:08
*
ErrorLog:
*

```

Procedure B

1. Opened a DOS window in Windows 95 to access GT for collecting data
2. Created a station named BDR
3. Pressed H
4. Selected 300 Series datalogger
5. Chose “**Space Delimited ASCII**” file format
6. Pressed U to collect uncollected data

Results of Procedure B

Data Stored Before Transition	12/31/99 23:59:10	23.36	13.11
	12/31/99 23:59:20	23.36	13.11
	12/31/99 23:59:30	23.37	13.11
	12/31/99 23:59:40	23.37	13.11
	12/31/99 23:59:50	23.38	13.11
Year 2000 Point	01/01/00 00:00:00	23.37	13.09
Data Stored After Transition	01/01/00 00:00:10	23.39	13.08
	01/01/00 00:00:20	23.38	13.11
	01/01/00 00:00:30	23.39	13.11
	01/01/00 00:00:40	23.4	13.1
	01/01/00 00:00:50	23.4	13.08

```

SN:1220
NotesLog:
*
TimeSetLog:
01/01/89 00:01:34 12/31/99 23:56:49
*
ErrorLog:
*

```

Test 6: Store data in Data Table then collect it via Telcom

Procedure

1. Opened a DOS window in Windows 95
2. Ran Telcom
3. Created a station named BDR
4. Selected “300 Series” datalogger
5. Chose the “**Printable ASCII**” file format
6. Entered bdr /c /g to call and collect all data

Microsoft Word Results

Data Stored Before Transition	12/31/99 23:59:10	23.36	13.11
	12/31/99 23:59:20	23.36	13.11
	12/31/99 23:59:30	23.37	13.11
	12/31/99 23:59:40	23.37	13.11
	12/31/99 23:59:50	23.38	13.11
Year 2000 Point	01/01/00 00:00:00	23.37	13.09
Data Stored After Transition	01/01/00 00:00:10	23.39	13.08
	01/01/00 00:00:20	23.38	13.11
	01/01/00 00:00:30	23.39	13.11
	01/01/00 00:00:40	23.4	13.1
	01/01/00 00:00:50	23.4	13.08

Conclusions of Tests 1 - 6

1. The BDR320 date/time clock incorporates a two-digit year counter
2. The BDR320 clock date/time correctly handled the following transitions:
 - a) year 2000
 - b) 2/29/2000
3. The collection of year 2000 transition data was handled correctly using:
 - a) TERM3
 - b) GT
 - c) Telcom
4. The storage modules successfully collected BDR320 data
5. The conversion of binary data to ASCII data using BTOA.exe⁶ was successful
6. The inability to collect data using the "U" command instead of "R" is related to collection since download not the year 2000.

⁶ BTOA.exe is an executable file that converts binary BDR data to the ASCII format.

Y2K-TEST.DLD

MODE 1

Program Table Interval 0-

1:P92 If Time
1:0 Delay
2:1-- Interval (seconds)
3:30 Then Do

2:P10 Battery Voltage
1:1 Input Loc

3:P17 Internal Temperature
1:2 Input Loc

4:P95 End

5:P84 Data Table Interval
1:10-- Seconds
2:15423 Storage Space Allocated

6:P92 If Time
1:0 Delay
2:1-- Interval (seconds)
3:29 Set Flag 9 low

7:P74 Minimize
1:1 Reps
2:0 Time of Min
3:2 Input Loc

8:P71 Average
1:1 Reps
2:1 Input Loc

Status

Time 01/01/00 23:18:14
NextExe 23:18:15
Battery:+13.140
Input Locs:0028
Prgm Bytes:0201
Storage:+30847.
Unused:+1.0000
Data Tables:0001
Prgm Sig:+39950.
EE Sig:+51410.
EE Ver:01
Cal:05/08/93
Prom Sig:+2307.0
Errors:0015
Prom ID:+6661.0
OBJSrlNo:0008
SN:+1220.0

H = Help; errors:0015

*

Note: After setting the datalogger clock back, the "Errors" value incremented the first time the datalogger outputs data.

9:P0

MODE 10

1:28

MODE 12

1:0

1:0

1:0

Software Testing

To ensure accuracy, CSI:

- Assigned personnel who were familiar with the individual software to perform the tests.
- Used computers, operating systems, communications equipment, dataloggers, storage modules, etc. that were year 2000 compliant.

Before testing could begin, we needed to identify points of concern where the software processed, provided, and/or received date/time information. We identified points of concern by cycling through every program, menu, and option available in the software. These points of concern included but were not limited to scheduled calls/tasks, datalogger clock checks, and date/time displays. Once we identified the points of concern, we tested each of them for year 2000 compliance.

The testing procedure used depended on where the date/time information originated from:

PC and/or Datalogger Clock

1. Set the PC and datalogger clocks to at least a minute before midnight on December 31, 1999
2. Opened the software
3. Checked the points of concern when the clocks rolled over to the next day
4. Closed the software
5. Opened the software
6. Checked the points of concern again
7. Set the PC and datalogger clocks to at least a minute before midnight on February 28, 2000
8. Repeated steps 2 - 6

Campbell Scientific Data File on a PC

1. Created a data file that contained hourly time stamped data from 1:00 a.m., October 1, 1999 to 1:00 p.m., March 11, 2000.
2. Used the software to read, process, display, print, and/or store results from the data file.
3. Examined the results to ensure the transitions from December 31, 1999 to January 1, 2000 and from February 28, 2000 to February 29, 2000 occurred uneventfully and without error.

Appendix B. Products Tested

CR10X, CR510, CR500, and CR23X Downloadable Operating Systems Tested

Use your datalogger's keyboard display to determine the signature and Operating System version and revision:

Signature

Press *B A (this accesses the 2nd window)

Operating System Version

After accessing the signature window, advance to the 6th window by pressing A four times

Operating System Revision

After accessing the Operating System Version window, advance to the 7th window by pressing A

<u>Datalogger</u>	<u>OS Version</u>	<u>Revision</u>	<u>Signature</u>	<u>Compliant¹</u>
CR10X	1.	9	35198	Yes
	1.	7	26114	Yes
	1.	5	3035	Yes
	1.	0	56630	Yes
CR10X-MB	10145	0	37895	Yes
CR510	1.	0	31662	Yes
CR500	1.	5	20086	Yes
	1.	0	29655	Yes
CR23X	1.	0	17493	Yes

Note:

1. This indicates whether the stored data is compliant. See the datalogger section for the compliance status of the displayed date.
-

CR9000 Systems Tested

For testing the year 2000 compliance status of the CR9000, the following software and operating system versions were used:

<u>Program</u>	<u>Version</u>	<u>Date</u>
PC9000.EXE	3.31	03/25/99
OS.OBJ	2.04	03/27/99
CR9000.DLL	2.60	10/05/98
CRBASIC.DLL	1.38	07/29/98

CR10, 21X, and CR7 PROMs Tested

Press *B A on your datalogger's keyboard display to determine the signature.

Datalogger	PROM	Version/Revision	Signature	Compliant¹
CR10	OS10-0.1	6174-01	51903	Yes
	OS10-2.1	8929-00	53676	Yes
	OS10-0.1	6174-00	8372	Yes
	613.1	613.1	5951	Yes
	527 (added SDMs)	527	29316	Yes
	475C	475C	50383	Yes
21X	OSX-0.1	6145-3	57298	Yes
	OSX-0.1	6146-5	55405	Yes
	OSX-0.1	6147-6	63585	Yes
	OSX-2.1	6145-3	57298	Yes
	OSX-2.1	6146-5	55405	Yes
	OSX-2.1	6161-6	51307	Yes
	OSX-0.1	6145-2	14441	Yes
	OSX-0.1	6146-4	14436	Yes
	OSX-0.1	6147-5	50721	Yes
	574.2	574.2	65053	No ²
	575.3	575.3	62515	No ²
	576.3	576.3	2444	No ²
	391B	391B	33080	No ²
	392E	392E	9722	No ²
	400D	400D	36855	No ²
CR7 (700(X))	OS7.1	6122-03	28088	Yes
	OS7.1	6123-04	33665	Yes
	OS7.1	6124-04	39807	Yes
	OS7.1	6122-01	52281	Yes
	OS7.1	6123-01	35851	Yes
	OS7.1	6124-01	46181	Yes
	405B	405B	21136	No ²
	406D	406D	15318	No ²
	407E	407E	5352	No ²

Notes:

1. This indicates whether the stored data is compliant. See the datalogger section for the Compliance Status of the displayed date.
 2. For the 21X(L) and CR7, if when you scroll through the windows in the *B mode of the datalogger's keyboard display, you cannot locate windows 5 through 9, the datalogger is Non-Compliant – Upgrade Required.
-

BDR320 Systems Tested

For testing the year 2000 compliance status of the BDR320, the following software and operating system versions were used:

Windows 95
T4700CT Toshiba
486

TERM3 (part of PC300)	07-14-98
GT	05-21-98
BTOA.exe	03-11-92
Telcom	08-27-96

DATE Tested: 21-Oct-99

Setup

T4700CT—BDR320
SM192—BDR320

Appendix C. Revision History

<u>Revision Number</u>	<u>Description</u>
4.0	Major revision – made note more comprehensive, listing most of our equipment and testing procedures. Revision date: April 22, 1999.
4.1	Minor revision – changed compliant status of PC120 and PC121 from <i>Unknown – Still to Test</i> to <i>Compliant – No Dates Used</i> . Revision date: April 29, 1999.
4.2	Minor revision – added compliant status of PC200W version 1.1 since that version has been released. Version 1.1 is compliant whereas earlier versions were not. Revision date: June 1, 1999.
5.0	Major revision – added a discussion about problems with using Telcom versions prior to Telcom is part of PC208 Software. Revision date: August 1999.
5.1	Minor revision – changed compliant status of our BDR301, BDR320 and PC300. These products were previously listed as <i>Unknown – Still to Test</i> . Revision date: October 1999.