CT-3500 S2 Digital Circuit Breaker Timer

USER'S MANUAL





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SAFETY SUMMARY

FOLLOW EXACT OPERATING PROCEDURES

Any deviation from the procedures described in this User's Manual may create one or more safety hazards, may damage the CT-3500 S2, or cause errors in the test results. Vanguard Instruments Company, Inc. assumes no liability for unsafe or improper use of the CT-3500 S2.

All safety precautions provided in this manual must be observed during all phases of testing including test preparation, test lead connection, actual testing, and test lead disconnection.

SAFETY WARNINGS AND CAUTIONS

Only trained operators shall use the CT-3500 S2. All devices under test shall be **off-line** and **fully isolated**. Do not perform test procedures or service alone.

DO NOT MODIFY TEST EQUIPMENT

To avoid the risk of introducing additional or unknown hazards, do not install substitute parts or perform any unauthorized modification to any CT-3500 S2 test unit. To ensure that all designed safety features are maintained, it is highly recommended that repairs be performed only by Vanguard Instruments Company factory personnel or by an authorized repair service provider. Unauthorized modifications can cause safety hazards and will void the manufacturer's warranty.

WARNING

Do not remove test leads during a test. Failure to heed this warning can result in electrical shock to personnel and damage to the equipment.

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CONVENTIONS USED IN THIS DOCUMENT

This document uses the following conventions:

- A key, switch, or knob on the CT-3500 S2 is indicated as [KEY], [SWITCH], [KNOB].
- Menu options are referenced as (MENU OPTION).
- The terms "test record" and "test shot" are used interchangeably.
- CT-3500 S2 screen output is shown as:



• When instructions are provided, the menu item that should be selected is shown in **bold** as shown below (option 3 should be selected):



• Warning messages are indicated as:



Important notes are indicated as:



1.0 INTRODUCTION

1.1 General Description and Features

The CT-3500 S2 is Vanguard's second generation, stand-alone, digital, microprocessorcontrolled, circuit-breaker timer. It measures the elapsed time from the instant a breaker coil is energized to the instant of opening or closing of a circuit-breaker's dry contacts. In addition to timing a breaker's contact response time, the CT-3500 S2 can also time relays or other switching functions that use an initiating trigger voltage (24-300 Volts DC or AC). The timertriggering voltage starts three independent electronic timers. Each timer is individually stopped by its respective dry-contact closing or opening. The CT-3500 can fully analyze the timing of all circuit breaker operations (Open, Close, Open – Close, and Close – Open). Timing results are displayed in milliseconds and cycles on the unit's back-lit LCD screen and can be printed on the built-in 2.5-inch wide thermal printer.

Contact Timing Inputs

The CT-3500 S2 features three dry-contact, timer-channel monitoring inputs. The dry-contact channels use an isolated 15 Vdc power supply to monitor the circuit breaker contact states. All inputs are shunted to ground until the instant a test is initiated. All contact timing inputs are protected against static discharge. A contact self-test cable-mode is also available for testing cables or connections to the breaker.

User Interface

The CT-3500 S2 features a back-lit LCD screen (128 x 64 pixels) that is viewable in both bright sunlight and low-light levels. A rugged, 44-key, "QWERTY" membrane keypad is used to control the unit and input data. The unit's built-in 2.5-inch wide thermal printer can be used to print test reports.

Internal Test Record Storage

The CT-3500 S2 can store up to 128 test records in Flash EEPROM. Test records can be retrieved and printed on the built-in thermal printer, or they can be transferred to a PC via the unit's USB interface. The USB interface can also be used for diagnostic testing and for updating firmware. The CT-3500 S2 also features a USB Flash drive interface that can be used to store test records on an external USB Flash drive. A Windows[®]-based Circuit Breaker Analysis application is provided with each unit and can be used to transfer test records to a PC. Test records can also be reviewed, printed or exported in Excel, PDF, and XML formats for further analysis.

1.2 Technical Specifications

Table 1. CT-3500 S2 Technical Specifications

TYPE	portable circuit-breaker analyzer
PHYSICAL SPECIFICATIONS	16"W x 7"H x 13" D (40.6 cm x 17.4 cm x 33 cm); Weight: 14 lbs. (6.4 Kg)
INPUT POWER	100-240 Vac, 50/60 Hz
DRY-CONTACT INPUT	3 channels
TRIGGER INPUT VOLTAGE	open/close: 24-300 V, DC or peak AC
BREAKER OPERATIONS	Open, Close, Open-Close, Close-Open
TIMING RESOLUTION	±0.1 millisecond; accuracy: 0.05% of reading ±0.1 ms
DISPLAY	back-lit LCD screen (128 x 64 pixels); viewable in bright sunlight and low light conditions
KEYPAD	rugged, 44-key "QWERTY"-style membrane keypad
PRINTER	built-in 2.5-inch wide thermal printer
INTERNAL TEST RECORD STORAGE	stores up to 128 timing records
COMPUTER INTERFACE	one USB PC interface, one USB Flash drive interface
PC SOFTWARE	Windows®-based Breaker Analysis software included with purchase price
SAFETY	designed to meet IEC61010 (1995), UL61010A-1, CSA-C22.2 standards
ENVIRONMENT	Operating: -10°C to +50°C (+15°F to +122°F); Storage: -30°C to +70°C (-22°F to +158°F)
HUMIDITY	90% RH @ 40°C (104°F) non-condensing
ALTITUDE	2,000 m (6,562 ft) to full safety specifications
CABLES	furnished with full set of test leads (including 20-foot contact leads, 30-foot contact lead extensions, trigger cable, power cable, and ground cable)
OPTIONS	transportation case
WARRANTY	one year on parts and labor



The above specifications are valid at nominal operating voltage and at a temperature of 25°C (77°F). Specifications may change without prior notice.

NOTE

1.3 CT-3500 S2 Controls and Indicators

The CT-3500 S2's controls and indicators are shown in Figure 1 below. The purpose of the controls and indicators may seem obvious, but users should familiarize themselves with them before using the CT-3500 S2. Accidental misuse of the controls will usually cause no serious harm. Users should also familiarize themselves with the safety summary information found on the front page of this User's Manual.



Figure 1. CT-3500 S2 Controls and Indicators

2.0 PRE-TEST SETUP

2.1 Operating Voltages

The CT-3500 S2 operates on voltages between 100-240 Vac, 50/60 Hz.

2.2 LCD Screen Contrast Control

To increase the LCD screen contrast, press and hold the [\land] key for two seconds. Release the button when the desired contrast level has been reached.

To decrease the LCD screen contrast, press and hold the $[\lor]$ key for two seconds. Release the button when the desired contrast level has been reached.

2.3 Printer Paper Control

To advance the thermal printer paper, press and release the [^] key.

To retract the thermal printer paper, press and release the $[\lor]$ key.

2.4 Printer Paper

The CT-3500 S2's built-in thermal printer uses 2.5-inch wide thermal paper for printing test results. To maintain the highest print quality and to avoid paper jams, the use of thermal paper supplied by Vanguard Instruments Company is highly recommended. Additional paper can be ordered from the following sources:

Vanguard Instruments Co, Inc.

1520 S. Hellman Avenue Ontario, CA 91761 Tel: 909-923-9390 Fax: 909-923-9391 Part Number: VIC TP-3 paper

BG Instrument Co.

13607 E. Trent Avenue Spokane, WA 99216 Tel: 509-893-9881 Fax: 509-893-9803 Part Number: VIC TP-3 paper

3.0 OPERATING PROCEDURES

3.1 Connection Diagrams



Figure 2. Typical CT-3500 S2 Connection Diagram (Trigger Cable with 4 Leads)



Figure 3. Typical CT-3500 S2 Connection Diagram (Trigger Cable with 3 Leads)

3.2 Setting the Date and Time

To set the date and time:

a. Start from the "START-UP" menu:



Press the [3] key (SETUP).

b. The following screen will be displayed:



Press the [4] key (SET DATE & TIME)

c. The following screen will be displayed:



Type in the date using the keypad. The following screen will be displayed:



Enter the time using the alpha-numeric keypad. When the time has been entered, you will be immediately returned to the "START-UP" menu.

3.3 Setting the Frequency

Follow the steps below to set the frequency (50 or 60 Hz):

a. Start from the "START-UP" menu:



Press the [3] key (SETUP).

b. The following screen will be displayed:



Press the [3] key (SET 50/60 HZ).

c. The following screen will be displayed:



Select the preferred frequency by pressing the corresponding key on the keypad ([1] or [2]). The frequency will be set and a confirmation screen will be displayed as shown below:



3.4 Using a PC to Retrieve Test Shots from the CT-3500 S2

The CT-3500 S2 can be connected to a PC, and test records can be retrieved from the unit using the included Vanguard Universal Software (VUS, version 2.05 and above). Follow the steps below to properly connect the CT-3500 S2 and configure the VUS application to recognize the unit.

- a. Install the Vanguard Universal Software.
- b. Connect the CT-3500 S2 to the PC by connecting a USB cable from an open USB port on the PC to the unit's "USB PC" port.
- c. Turn on the power on the CT-3500 S2.
- d. If this is the first time you are connecting the unit to the PC, Windows will recognize it as a new device and automatically install necessary drivers. If using Windows XP, you may be prompted to install drivers. Select the automatic installation option and Windows will locate the generic drivers necessary.
- e. Please note that although the unit is connected via USB, it uses an internal serial interface to communicate with the PC. As such, it will appear in the windows Device Manager as a USB Serial Port. Open the Device Manager from the Windows Control Panel and note the COM port number. For example, in the installation shown below, the CT-3500 S2 is shown as COM10 (USB Serial Port).



f. Launch the VUS application and then click on the "Settings" icon. The following window will be displayed:

Application Setup		
Communications		
Use USB Port	COM10:	
Test Folder		
c: \Vanguard \VUS \Tests		
Application Logo		
c:\Vanguard\VUS\report_logo.bmp		<u></u>
Auto Export		
Export to Excel		
Advanced	ОК	Cancel

Make sure that the "Use USB Port" option is UN-checked. Then, from the drop down menu to the right of the "Use USB Port" checkbox select the COM port that corresponds to the port that the CT-3500 S2 is connected to. In the above example, the CT-3500 S2 is connected to COM10. Then click the OK button.

g. You can now use the VUS software to transfer test records from the CT-3500 S2 to the PC.

3.5 Testing Procedures

3.5.1. Entering Test Record Header Information

You can enter the test record header information before performing tests. The record header includes identifying information such as the company, station, circuit, manufacturer, etc. Once the header information has been set, it will apply to all subsequent test records. Follow the steps below to enter the test header information:

a. Start from the "START-UP" menu:



Press the **[3]** key (SETUP).

b. The following screen will be displayed:



Press the [1] key (SHOT DESCRIPTION).

c. The following screen will be displayed:



Type the company name using the keypad. Press the **[ENTER]** key when you are done typing the company name.

d. The following screen will be displayed:



Type the station name using the keypad and then press the **[ENTER]** key.

e. The following screen will be displayed:



Type the circuit information using the keypad and then press the **[ENTER]** key.

f. The following screen will be displayed:



Type the manufacturer name using the keypad and then press the **[ENTER]** key.

g. The following screen will be displayed:



Type the circuit breaker's model information using the keypad and then press the **[ENTER]** key.

h. The following screen will be displayed:

SERIAL NUMBER:
_
"ENTER" TO ACCEPT

Type the circuit breaker's serial number using the keypad and then press the **[ENTER]** key.

i. The following screen will be displayed:

KVA RATING:
-
↑∕↓ TO POSITION
"ENTER" TO ACCEPT

Type the circuit breaker's KVA rating using the keypad and then press the [ENTER] key.

j. The following screen will be displayed:

OPERATOR:
-
↑⁄↓ TO POSITION
"ENTER" TO ACCEPT

Type the operator's name using the keypad and then press the **[ENTER]** key. All header information will be saved, and you will be returned to the "START-UP" menu.

3.5.2. Timing an OPEN Operation

Follow the steps below to time an OPEN operation:

a. Start from the "START-UP" menu:



Press the [1] key (TIME BRKR).

b. The following screen will be displayed:



Press the [1] key (OPEN).

c. The following screen will be displayed:



Manually open the breaker.

d. The following screen will be displayed:



Press the [1] key (YES) to print the test results on the unit's built-in thermal printer.



You can also view the test results on the unit's LCD screen. Please see section 3.6.1.

e. The test results will be printed (please see Figure 4) and the following screen will be displayed:



Press the **[1]** key (*YES*) to save the test shot.



If a USB Flash drive is connected to the unit's "USB MEM" port, the following screen will be displayed:

```
NOTE
```

1.SAVE 2.SAVE	INT TO	ERNALL THUMB	.Y DRIVE

1. SAVE INTERNALLY

Press the **[1]** key (*SAVE INTERNALLY*) to save the test shot to the unit's internal memory. **Continue to step f.**

2. SAVE TO THUMB DRIVE

Press the **[2]** key (*SAVE TO THUMB DRIVE*) to save the test shot to the connected USB Flash drive. The test record will be saved and the following screen will be displayed:

REC_000 SAVED TO THUMB DRIVE.	
Press any key to return to the "STA	RT-UP" menu.

f. The following screen will be displayed:



TEST	RESL	JLTS		
DATE:05/14/	12 TIM	E:13:27:58		
COMPANY: VANGUARD INSTRUMENT STATION: CIRCUIT: MFR: MODEL: S/N: KVA: OPERATOR:				
NOTES:				
TEST: OPEN				
CONTACT OPEN TIME				
CH TIME (ms) A 23.3 B 22.3 C 21.3	CYCLE 60 Hz 1.398 1.338 1.278	BOUNCE (ms) 0.0 0.0 0.0		
DELTA TIME	(mS) =	2.0		

Figure 4. Sample OPEN Test Results Printout

3.5.3. Timing a CLOSE Operation

Follow the steps below to time a CLOSE operation:

a. Start from the "START-UP" menu:



Press the [1] key (TIME BRKR).

b. The following screen will be displayed



Press the **[2]** key (*CLOSE*).

c. The following screen will be displayed:



Manually close the breaker.

d. The following screen will be displayed:



Press the **[1]** key (YES) to print the test results on the unit's built-in thermal printer.



You can also view the test results on the unit's LCD screen. Please see section 3.6.1.

NOTE

e. The test results will be printed (please see Figure 5) and the following screen will be displayed:

SAVE 1.YES 2.NO	THIS	SHOT?	

Press the **[1]** key (*YES*) to save the test shot.



If a USB Flash drive is connected to the unit's "USB MEM" port, the following screen will be displayed:

NOTE

1.SAVE	INTERNALLY
2.SAVE	TO THUMB DRIVE

1. SAVE INTERNALLY

Press the **[1]** key (*SAVE INTERNALLY*) to save the test shot to the unit's internal memory. **Continue to step f.**

2. SAVE TO THUMB DRIVE

Press the **[2]** key (*SAVE TO THUMB DRIVE*) to save the test shot to the connected USB Flash drive. The test record will be saved and the following screen will be displayed:

REC_000 SAVED THUMB DRIVE.	то	
Press any key to retu	urn to the "STA	l \RT-UP" menu.

f. The following screen will be displayed:



TEST	RESL	ILTS
DATE:05/14/	12 TIME	:13:56:36
COMPANY: STATION: CIRCUIT: MFR: MODEL: S/N: KVA: OPERATOR:	VANGUARD	INSTRUMENT
NOTES:		
TEST: CLOSE		
CONTACT CLO	SE TIME	
CH TIME (ms) A 103.3 B 102.3 C 101.3	CYCLE 60 Hz 6.198 6.138 6.078	BOUNCE (ms) 0.0 0.0 0.0
DELTA TIME	(mS) =	2.0

Figure 5. Sample CLOSE Test Results Printout

3.5.4. Timing an OPEN-CLOSE Operation

Follow the steps below to time an OPEN-CLOSE operation:

a. Start from the "START-UP" menu:



Press the [1] key (TIME BRKR).

b. The following screen will be displayed:



Press the **[3]** key (OPEN-CL).

c. The following screen will be displayed:



Manually initiate an OPEN-CLOSE operation on the breaker.

d. The following screen will be displayed:



Press the [1] key (YES) to print the test results on the unit's built-in thermal printer.



You can also view the test results on the unit's LCD screen. Please see section 3.6.1.

NOTE

e. The test results will be printed (please see Figure 6) and the following screen will be displayed:



Press the **[1]** key (*YES*) to save the test shot.



If a USB Flash drive is connected to the unit's "USB MEM" port, the following screen will be displayed:

NOTE

1.SAVE	INTERNALLY
2.SAVE	TO THUMB DRIVE

1. SAVE INTERNALLY

Press the **[1]** key (*SAVE INTERNALLY*) to save the test shot to the unit's internal memory. **Continue to step f.**

2. SAVE TO THUMB DRIVE

Press the **[2]** key (*SAVE TO THUMB DRIVE*) to save the test shot to the connected USB Flash drive. The test record will be saved and the following screen will be displayed:

REC_000 SAVED TO THUMB DRIVE.	

f. The following screen will be displayed:



TEST	RES	ULTS
DATE:05/15/	12 TI	ME:07:53:46
COMPANY: STATION: CIRCUIT: MFR: MODEL: S/N: KVA: OPERATOR:	VANGUAR	D INSTRUMENT
NOTES:		
TEST: OPEN-	CLOSE	
CONTACT OPE	N TIME	
CH TIME	CYCLE	BOUNCE
(ms)	60 Hz	(ms)
A 845.2	50.712	0.0
B 846.2	50.772	0.0
C 847.2	50.832	0.0
DELTA TIME	(mS) =	2.0
CONTACT CLO	SE TIME	
CH TIME	CYCLE	BOUNCE
(ms)	60 Hz	(ms)
A 1025.2	61.512	0.0
B 1026.2	61.572	0.0
C 1027.2	61.632	0.0
DELTA TIME	(mS) =	2.0
CONTACT DEAL	D TIME	
CH TIME	CYCLE	
(ms)	60 Hz	
A 180.0	10.800	
B 180.0	10.800	
C 180.0	10.800	

Figure 6. Sample OPEN-CLOSE Test Results Printout

3.5.5. Timing a CLOSE-OPEN Operation

Follow the steps below to time a CLOSE-OPEN operation:

a. Start from the "START-UP" menu:



Press the [1] key (TIME BRKR).

b. The following screen will be displayed:



Press the **[4]** key (*CL-OPEN*).

c. The following screen will be displayed:



Manually initiate a CLOSE-OPEN operation on the breaker.

d. The following screen will be displayed:



Press the **[1]** key (YES) to print the test results on the unit's built-in thermal printer.



You can also view the test results on the unit's LCD screen. Please see section 3.6.1.

NOTE

e. The test results will be printed (please see Figure 7) and the following screen will be displayed:

SAVE 1.YES 2.NO	THIS	SHOT?	

Press the **[1]** key (*YES*) to save the test shot.



If a USB Flash drive is connected to the unit's "USB MEM" port, the following screen will be displayed:

NOTE

1.SAVE	INTERNALLY
2.SAVE	TO THUMB DRIVE

1. SAVE INTERNALLY

Press the **[1]** key (*SAVE INTERNALLY*) to save the test shot to the unit's internal memory. **Continue to step f.**

2. SAVE TO THUMB DRIVE

Press the **[2]** key (*SAVE TO THUMB DRIVE*) to save the test shot to the connected USB Flash drive. The test record will be saved and the following screen will be displayed:

REC_000 SAVED TO THUMB DRIVE.	
Press any key to return to the "S	TART-UP" menu

f. The following screen will be displayed:



TEST RESL	ILTS
DATE:05/15/12 TIME	E:08:00:50
COMPANY: VANGUARD STATION: CIRCUIT: MFR: MODEL: S/N: KVA: OPERATOR:	INSTRUMENT
NOTES:	
TEST: CLOSE-OPEN	
CONTACT CLOSE TIME	
CH TIME CYCLE	BOUNCE
(ms) 60 Hz	(ms)
A 2650.4 159.024	0.0
B 2651.4 159.084	0.0
C 2652.4 159.144	0.0
DELTA TIME (mS) =	2.0
CONTACT OPEN TIME	
CH TIME CYCLE	BOUNCE
(ms) 60 Hz	(ms)
A 2710.4 162.624	0.0
B 2711.4 162.684	0.0
C 2712.4 162.744	0.0
DELTA TIME (mS) =	2.0
CONTACT LIVE TIME	
CH TIME CYCLE	
(ms) 60 Hz	
A 60.0 3.600	
B 60.0 3.600	
C 60.0 3.600	

Figure 7. Sample CLOSE-OPEN Test Results Printout

3.5.6. Timing a Special OPEN Operation

Some special circuit breakers are designed in such a way that two of the dry-contacts follow the breaker operation while the third contact operates in the opposite direction. For example, when an OPEN operation is performed, two of the dry-contacts open while the third contact closes. The CT-3500 S2 offers a special OPEN test that can be used to time such a breaker. Follow the steps below to perform a special OPEN operation:

a. Start from the "START-UP" menu:



Press the **[1]** key (*TIME BRKR*).

b. The following screen will be displayed:



Press the **[5]** key (SP OPEN).

c. The following screen will be displayed:



Manually initiate an OPEN operation on the breaker.

d. The following screen will be displayed:



Press the **[1]** key (*YES*) to print the test results on the unit's built-in thermal printer.



You can also view the test results on the unit's LCD screen. Please see section 3.6.1.

e. The test results will be printed (please see Figure 8) and the following screen will be displayed:



Press the [1] key (YES) to save the test shot.



If a USB Flash drive is connected to the unit's "USB MEM" port, the following screen will be displayed:

NOTE

1.SAVE 2.SAVE	INTERNALLY TO THUMB DRIVE

1. SAVE INTERNALLY

Press the **[1]** key (*SAVE INTERNALLY*) to save the test shot to the unit's internal memory. **Continue to step f.**

2. SAVE TO THUMB DRIVE

Press the **[2]** key (*SAVE TO THUMB DRIVE*) to save the test shot to the connected USB Flash drive. The test record will be saved and the following screen will be displayed:



Press any key to return to the "START-UP" menu.

f. The following screen will be displayed



TEST RESULTS	
DATE:05/16/12 TIME:07:19:09	
COMPANY: VANGUARD INSTRUMEN STATION: CIRCUIT: MFR: MODEL: S/N: KVA: OPERATOR:	т
NOTES:	
TEST: SPECIAL OPEN	
CONTACT OPEN TIME	
CH TIME CYCLE BOUNCE (ms) 60 Hz (ms) A 1592.4 95.544 74.2 B 25.3 1.518 0.0 C 24.3 1.458 0.0	
DELTA TIME (mS) = 1568.1	

Figure 8. Sample Special OPEN Test Results Printout

3.6 Working With Test Shots

3.6.1. Viewing the Contents of the Working Memory

Whenever a test is performed and the reading is kept, the data is temporarily stored in the CT-3500 S2's working memory. You can view the test reading in the unit's working memory using the steps below:

a. Start from the "START-UP" menu:



Press the [2] key (GET RSLT).

b. The following screen will be displayed:



1. DISPLAY TEST DATA

Press the **[1]** key (*DISPLAY TEST DATA*) to display the test results on the unit's LCD screen. The following screen will be displayed:



Press any key to view the test results. The following screen will be displayed:

OPE	√ (MS / C	YCLES)	
Ĥ	329.6MS	19.776CY	
В	330.6MS	19.836CY	
С	331.6MS	19.896CY	
BOUNCE TIMES:			
A	0.0MS	0.000CY	
В	0.0MS	0.000CY	
С	0.0MS	0.000CY	

2. PRINT TEST DATA

Press the **[2]** key (*PRINT TEST DATA*) to print the test results on the unit's built-in thermal printer. The test results will be printed and you will be returned to the "START-UP" menu.

3.6.2. Saving Test Results to a Test Shot

After performing a test, the user is presented the option to save the test results to the unit's Flash EEPROM or to a USB Flash Drive. If the test results are not saved immediately after performing a test, they will still remain in the working memory and can be saved later, as long as a new test has not been performed and the unit has not been turned off. Follow the steps below to save the test results from the working memory to a test record (the following procedure can also be used to re-save a restored test record to a new memory location or to a USB Flash Drive):

a. Perform a test or restore a test record to the working memory (see section 3.6.3 and 3.6.4), and then start from the "START-UP" menu:



Press the [3] key (SETUP).

b. The following screen will be displayed:



Press the [2] key (SAVE / RESTORE)

c. The following screen will be displayed:





Option 5 (COPY TO THUMB DRIVE) will be listed only if a USB Flash drive is connected to the CT-3500 S2.

Press the [1] key (SAVE SHOT).

If a USB Flash drive is connected to the unit, continue to step d.

If a USB Flash drive is NOT connected to the unit, continue to step e.

d. The following screen will be displayed:



1. SAVE INTERNALLY

Press the **[1]** key (*SAVE INTERNALLY*) to save the test record to the unit's Flash EEPROM. **Continue to step e.**

2. SAVE TO THUMB DRIVE

Press the **[2]** key (*SAVE TO THUMB DRIVE*) to save the test record to the connected USB Flash drive. The following screen will be displayed:



Press any key to return to the "START-UP" menu.

e. The following screen will be displayed



3.6.3. Restoring a Test Shot From Flash EEPROM

Use the steps below to restore a test record from the CT-3500 S2's internal Flash EEPROM to the working memory:

a. Start from the "START-UP" menu:



Press the [3] key (SETUP).

b. The following screen will be displayed:



Press the [2] key (SAVE / RESTORE).

c. The following screen will be displayed:





Option 5 (*COPY TO THUMB DRIVE*) will be listed only if a USB Flash drive is connected to the unit.

NOTE

Press the **[2]** key (*RESTORE SHOT*).

d. The following screen will be displayed:



1. ENTER SHOT NUMBER

Press the **[1]** key (*ENTER SHOT NUMBER*) if you know the record number that you would like to restore.

1.1. The following screen will be displayed:



Type the shot number using the keypad and then press the **[ENTER]** key.

1.2. The following screen will be displayed:



The test shot will be restored to the unit's working memory. You can then view or print the test shot information using the instructions in section 3.6.1.

Press any key to return to the "START-UP" menu.

2. SCROLL TO SELECT

Press the **[2]** key (*SCROLL TO SELECT*) to scroll through a directory of stored test shots.

2.1. The following screen will be displayed:



Press the $[\land]$ button or the $[\lor]$ key to display the next or previous test record, respectively.

The basic test record information will be displayed as shown:



When you have located the test record that you would like to restore, press the **[ENTER]** key. The test shot will be restored to the unit's working memory. You can then view or print the test shot information using the instructions in section 3.6.1.

3.6.4. Restoring a Test Shot From a USB Flash Drive

Use the steps below to restore a test record from a USB Flash drive to the CT-3500 S2's working memory:

a. Make sure the USB Flash drive containing the test record(s) is inserted in the CT-3500 S2's USB Flash drive port ("USB MEM" port). Then start from the "START-UP" menu:



Press the [3] key (SETUP).

b. The following screen will be displayed:



Press the [2] key (SAVE / RESTORE)

c. The following screen will be displayed:



Press the **[2]** key (*RESTORE SHOT*).

d. The following screen will be displayed:



Press the [2] key (THUMB DRIVE).

e. The following screen will be displayed:



Type the record number that you would like to restore using the alpha-numeric keypad and then press the **[ENTER]** key.

f. The test record will be restored to the unit's working memory and the following screen will be displayed:

REC_001 RESTORED! PRINT RECORD? 1.YES 2.NO

Press the **[1]** key (*YES*) if you would like to print the test record, or press the **[2]** key (*NO*) if you do not want to print the test record. The test record will be restored to the unit's working memory, and you will be returned to the "START-UP" menu.

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3.6.5. Copying Test Records to a USB Flash Drive

Use the steps below to copy one or all test records from the unit's Flash EEPROM to a connected USB Flash drive:

a. Make sure a USB Flash drive is connected to the unit's "USB MEM" port, and then start from the "START-UP" menu:



Press the **[3]** key (SETUP).

b. The following screen will be displayed:



Press the [2] key (SAVE / RESTORE).

c. The following screen will be displayed:



Press the [5] key (COPY TO THUMB DRIVE).

d. The following screen will be displayed:



1. COPY SINGLE RECORD

Press the **[1]** key (*COPY SINGLE RECORD*) to copy a single test record from the unit's Flash EEPROM to the connected USB Flash drive. The following screen will be displayed:



Type the record number using the alpha-numeric keypad and then press the **[ENTER]** key. The test record will be copied to the USB Flash drive and the following screen will be displayed:

REC_013 SAVED THUMB DRIVE	то

2. COPY ALL RECORDS

Press the **[2]** key (*COPY ALL RECORDS*) to copy all test records from the unit's Flash EEPROM to the connected USB Flash drive. All test records will be copied from the unit to the connected USB Flash drive. The following screen will be displayed when the process is finished:



3.6.6. Printing the Test Record Directory

Use the steps below to print a directory of the test records stored in the CT-3500 S2's Flash EEPROM memory or on a connected USB Flash drive:

a. Start from the "START-UP" menu:



Press the [3] key (SETUP).

b. The following screen will be displayed:



Press the [2] key (SAVE / RESTORE).

c. The following screen will be displayed:





Option 5 (*COPY TO THUMB DRIVE*) is listed only if a USB Flash drive is connected to the unit.

Press the [3] key (SHOT DIRECTORY).

If a USB Flash drive is not connected to the unit, a directory of the shots stored in the unit's Flash EEPROM will be printed. You will be returned to the "START-UP" menu when printing is finished.

If a USB Flash drive is connected to the unit, the following screen will be displayed:



1. INTERNAL DIRECTORY

Press the **[1]** key (*INTERNAL DIRECTORY*) to print a directory of test shots stored in the unit's Flash EEPROM. The directory will be printed on the unit's built-in thermal printer, and you will be returned to the "START-UP" menu when printing is finished.

2. THUMB DRIVE DIR

Press the **[2]** key (*THUMB DRIVE DIR*) to print a directory of test shots stored on the connected USB Flash drive. The unit will search the thumb drive for test records and then a directory will be printed on the unit's thermal printer. You will be returned to the "START-UP" menu when printing is finished.

3.6.7. Erasing Test Records from the Flash EEPROM

Follow the steps below to erase test records from the Flash EEPROM

a. Start from the "START-UP" menu:



Press the **[3]** key (SETUP).

b. The following screen will be displayed:



Press the [2] key (SAVE / RESTORE).

c. The following screen will be displayed:



Press the [4] key (ERASE SHOT).

d. The following screen will be displayed:



1. ERASE SINGLE SHOT

Press the **[1]** key (*ERASE SINGLE SHOT*) to erase a single test record from the unit's internal Flash EEPROM. The following screen will be displayed:



Type the record number that you would like to erase using the keypad and then press the **[ENTER]** key. If you do not know the test record number, you can first print the test record directory using the instructions in section 3.6.6.

The following screen will be displayed while the record is being erased:



The following screen will be displayed when the test record has been completely erased:



2. ERASE ALL SHOTS

Press the **[2]** key (*ERASE ALL SHOTS*) to erase all the test records from the unit's internal Flash EEPROM. The following warning screen will be displayed:



You can press the **[STOP]** key to cancel the process and return to the "START-UP" menu.

Press the **[ENTER]** key to proceed with deleting all the test records from the unit's Flash EEPROM. The following screen will be displayed during the erasure process:



The following screen will be displayed when all test records have been completely erased:



3.7 Performing Cable Diagnostics

The CT-3500 S2 can quickly check the test leads and breaker contacts for continuity at each of the three phase contacts. Once all connections are made, use the steps below to check your connections:

a. Start from the "START-UP" menu:



Press the [4] key (DIAGNOSTICS).

b. The following screen will be displayed:



Open the breaker and then press the **[ENTER]** key.

c. The following screen will be displayed:

CABLE TEST		
CH A OPEN	CH B OPEN	CH C OPEN
(ANY	KEY TO) EXIT)

If the proper connections were made, "OPEN" should be displayed for all channels. You can now close the breaker. "CLOSED" should be displayed for all channels.

4.0 Getting the Latest Firmware, Software, and Manuals

The latest firmware, software, and user's manuals can be downloaded from the Vanguard Instruments Company's web site at http://www.vanguard-instruments.com. In order to download these items from our site, you will first need to sign up for a FREE user account on our site. Also, your account must be approved before it can be used to download firmware, software, and user's manuals. Follow the steps below to sign up for an account and download the latest firmware, software and user's manuals:

- a. Visit our site at <u>http://www.vanguard-instruments.com</u>.
- b. On the left hand side of the page, click on the "Create new account" link:

User login	
[Username: *
[Password: *
	(Log in)
O Crea	te new account
Required and Re	est new password

- c. You will be presented with a sign-up form. Please complete all the required fields on the form and click on the "Create new account" button at the bottom of the page.
- d. Once your account has been created, it will be reviewed by our staff and usually approved within the hour during regular business hours.
- Once you have received the account approval email, visit our site again at <u>http://www.vanguard-instruments.com</u> and login to your account using your username and password.
- f. Click on the "Downloads" link at the top of the page:



g. The "Downloads" page will be displayed listing all Vanguard products along with the related firmware, software, and user's manuals. Click on any of these items to download them.



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CT-3500 S2 User's Manual • Revision 1.1 • June 19, 2017 • TA