

ACCEPTANCE TEST PLAN SELFTEST For The WATERS CORPORATION VXI TEST SET

**PUBLICATION NO. 12898002
RACAL INSTRUMENTS**

Racal Instruments, Inc.
4 Goodyear St., Irvine, CA 92618-2002
Tel: (800) RACAL-ATE, (800) 722-2528, (949) 859-8999; FAX: (949) 859-7139

Racal Instruments, Ltd.
480 Bath Road, Slough, Berkshire, SL1 6BE, United Kingdom
Tel: +44 (0) 1628 604455; FAX: +44 (0) 1628 662017

Racal Systems Electronique S.A.
18 Avenue Dutartre, 78150 LeChesnay, France
Tel: +33 (1) 3923 2222; FAX: +33 (1) 3923 2225

Racal Systems Elettronica s.r.l.
Strada 2-Palazzo C4, 20090 Milanofiori Assago, Milan, Italy
Tel: +39 (0)2 5750 1796; FAX: +39 (0)2 5750 1828

Racal Elektronik System GmbH.
Technologiepark Bergisch Gladbach, Friedrich-Ebert-Strasse, D-51429 Bergisch Gladbach, Germany
Tel.: +49 2204 8442 00; FAX: +49 2204 8442 19

Racal Australia Pty. Ltd.
3 Powells Road, Brookvale, NSW 2100, Australia
Tel: +612 9936 7000, FAX: +612 9936 7036

Racal Electronics Pte. Ltd.
26 Ayer Rajah Crescent, 04-06/07 Ayer Rajah Industrial Estate, Singapore 0513.
Tel: +65 7792200, FAX: +65 7785400

Racal Instruments, Ltd.
Unit 5, 25F., Mega Trade Center, No 1, Mei Wan Road, Tsuen Wan, Hong Kong, PRC
Tel: +852 2405 5500, FAX: +852 2416 4335

<http://www.racalstruments.com>

RACAL

PUBLICATION DATE: May 7 2001

Copyright 2001 by Racal Instruments, Inc. Printed in the United States of America. All rights reserved.
This book or parts thereof may not be reproduced in any form without written permission of the publisher.

WARRANTY STATEMENT

All Racal Instruments, Inc. products are designed and manufactured to exacting standards and in full conformance to Racal's ISO 9001 procedures.

For the specific terms of your standard warranty, or optional extended warranty or service agreement, contact your Racal customer service advisor. Please have the following information available to facilitate service.

1. Product serial number
2. Product model number
3. Your company and contact information

You may contact your customer service advisor by:

E-Mail:	Helpdesk@racalstruments.com	
Telephone:	+1 800 722 3262	(USA)
	+44(0) 8706 080134	(UK)
	+852 2405 5500	(Hong Kong)
Fax:	+1 949 859 7309	(USA)
	+44(0) 1628 662017	(UK)
	+852 2416 4335	(Hong Kong)

RETURN of PRODUCT

Authorization is required from Racal Instruments before you send us your product for service or calibration. Call your nearest Racal Instruments support facility. A list is located on the last page of this manual. If you are unsure where to call, contact Racal Instruments, Inc. Customer Support Department in Irvine, California, USA at 1-800-722-3262 or 1-949-859-8999 or via fax at 1-949-859-7139. We can be reached at: helpdesk@racalstruments.com.

PROPRIETARY NOTICE

This document and the technical data herein disclosed, are proprietary to Racal Instruments, and shall not, without express written permission of Racal Instruments, be used, in whole or in part to solicit quotations from a competitive source or used for manufacture by anyone other than Racal Instruments. The information herein has been developed at private expense, and may only be used for operation and maintenance reference purposes or for purposes of engineering evaluation and incorporation into technical specifications and other documents which specify procurement of products from Racal Instruments.

TABLE OF CONTENTS

1	SCOPE.....	1
2	TEST LAYOUT	1
2.1	TEST SEQUENCER	1
2.1.1	<i>Racal 4152 Digital Multimeter</i>	<i>1</i>
2.1.2	<i>Racal 1260-114 OC Digital I/O Module.....</i>	<i>1</i>
2.1.3	<i>Racal 1260-150C 200MHz RF Multiplexer</i>	<i>2</i>
2.1.4	<i>Racal 1260-117 52 Channel SPDT, 2A Module</i>	<i>2</i>
2.1.5	<i>Racal 1260-118 80 Channel SPST, 2A Module</i>	<i>2</i>
2.1.6	<i>Racal 1260-120 20 Channel SPST, 13A Module</i>	<i>3</i>
2.1.7	<i>Racal 1260-138 8 1x8 Multiplexer.....</i>	<i>3</i>
2.1.8	<i>TDS460A Tektronix Digital Storage Oscilloscope.....</i>	<i>3</i>
2.1.9	<i>HP66000A Power Supply w/ HP66101A and HP66103A Options.....</i>	<i>3</i>
2.1.10	<i>HP6050A Load Chassis w/ HP60502B Load Module</i>	<i>4</i>
2.1.11	<i>Keithley 236/1938 Source Measurement Unit</i>	<i>4</i>
2.1.12	<i>Racal 3151 100MS/s Waveform Generator</i>	<i>4</i>
2.1.13	<i>Racal 2461cd Universal Timer/Counter.....</i>	<i>4</i>
2.1.14	<i>Racal 6065-8 8 Channel Serial Interface Module</i>	<i>4</i>
3	SUMMARY.....	5
Appendix A	Self Test ITA Drawings	

This page was left intentionally blank.

1 Scope

This Test Plan contains a detailed description of the Operator interface software (Test Sequencer) and the individual instrument selftest programs that make up the selftest suite.

2 Test Layout

The authentication of the Waters VXI Test Set (VTS) will be by using the test stations own VXI and GPIB instrumentation. The software that will perform the testing was developed using LabVIEW 5.1 from National Instruments.

2.1 Test Sequencer

The VTS selftest subsystem is entered by double clicking on the VTS selftest icon on the system desktop. This action will load the Selftest Main Screen. The Self-Test has been developed to allow the operator to select from a menu of available tests. The operator may select "TEST ALL" which will execute all of the individual instrument selftests in sequence and place the results in an all-inclusive file for review or printing. The operator may also select individual instrument selftests to execute. When this option is selected the Self-Test Status Screen, as with the previous option, indicates to the operator which source/sensor instruments are being utilized to perform the test. The VTS selftest is an instrument wrap around test where station test assets are adequate to facilitate wrap around testing.

2.1.1 Racal 4152 Digital Multimeter

The RI 4152A DMM is the main sensor instrument in the VTS system. It is tested using both the BIT test supplied with the instrument and through multiple wrap around tests with the 1260- switch cards. The acceptance test criteria for each of the DMM measurements are contained in the associated switch or instrument test.

2.1.2 Racal 1260-114 OC Digital I/O Module

The 1260-114OC switch card will be self tested by wrapping Ports A-F to Ports G-L. An 8 bit serial byte will then be sent through each line in both directions and the value verified in software. Reference Self Test ITA Drawing sheet 5 of Appendix A for specific setup.

Test Acceptance criteria:

Precise comparison of send and receive words.

2.1.3 Racal 1260-150C 200MHz RF Multiplexer

The 1260-150C relay card will be tested with the aid of the Racal 3151 Waveform Generator, Racal 2461cd Timer/Counter, and the Tektronix TDS460 Digital Scope. Each -150 relay test will be comprised of 4 possible relays. This is made necessary by the impedance matching requirement of 50ohms. By tying the output of the 3151 and the input of both the 2461cd and TDS460 to a single -150 in/out point, the impedance presented at the instruments is a balanced 50ohms. Each -150 relay will be tested in both the open and closed position. Reference Self Test ITA Drawing sheet 10 of Appendix A for specific setup.

Test Acceptance criteria:

Resistance test levels are set at >100Kohms Upper Limit and <5 ohms Lower Limit in both open and closed configurations.

2.1.4 Racal 1260-117 52 Channel SPDT, 2A Module

The 1260-117 switch card is tested using the system DMM (RI 4152A). . The DMM is placed across each relay and a resistance measurement is made. The contacts of the -117 card are tested first in the normally closed configuration, one relay at a time. Each relay is closed and is then tested in the normally closed configuration. As a final test, the relays are opened and tested once more. Since the DMM measurement bus is contained on the RI 1260-138A switch matrix card, the failure universe will also include the -138A relay used to make the measurement. Reference Self Test ITA Drawing sheet 8 of Appendix A for specific setup.

Test Acceptance criteria:

Resistance test levels are set at >100Kohms Upper Limit and <5 ohms Lower Limit in both open and closed configurations.

2.1.5 Racal 1260-118 80 Channel SPST, 2A Module

The 1260-118 switch card is tested using the system DMM (RI 4152A). . The DMM is placed across each relay and a resistance measurement is made. The contacts of the -118 card are tested first in the normally closed configuration, one relay at a time. Each relay is closed and is then tested in the normally closed configuration. As a final test, the relays are opened and tested once more. Since the DMM measurement bus is contained on the RI 1260-138A switch matrix card, the failure universe will also include the -138A relay used to make the measurement. Reference Self Test ITA Drawing sheet 2 of Appendix A for specific setup.

Test Acceptance criteria:

Resistance test levels are set at >100Kohms Upper Limit and <5 ohms Lower Limit in both open and closed configurations.

2.1.6 Racal 1260-120 20 Channel SPST, 13A Module

The 1260-120 switch card is tested using the system DMM (RI 4152A). The DMM is placed across each relay and a resistance measurement is made. The contacts of the -120 card are tested first in the normally closed configuration, one relay at a time. Each relay is closed and is then tested in the normally closed configuration. As a final test, the relays are opened and tested once more. Since the DMM measurement bus is contained on the RI 1260-138A switch matrix card, the failure universe will also include the -138A relay used to make the measurement. Reference Self Test ITA Drawing sheet 11 of Appendix A for specific setup.

Test Acceptance criteria:

Resistance test levels are set at >100Kohms Upper Limit and <5 ohms Lower Limit in both open and closed configurations.

2.1.7 Racal 1260-138 8 1x8 Multiplexer

The 1260-138A relay matrix is used in the system as the primary measurement bus. It is self tested by wrapping the high side of each available multiplexer to the low side of the same multiplexer. Each relay is tested in the normally closed position, normally open position, and again in the normally closed position to isolate to a single relay failure. Reference Self Test ITA Drawing sheet 1 of Appendix A for specific setup.

Test Acceptance criteria:

Resistance test levels are set at >100Kohms Upper Limit and <5 ohms Lower Limit in both open and closed configurations.

2.1.8 TDS460A Tektronix Digital Storage Oscilloscope

The TDS460 Scope will be tested by applying sample waveforms from the Racal 3151 Waveform Generator. The selection of which waveforms to apply will be determined by the UUT TPS requirements. All waveforms required to test the UUT will be tested during Self Test. The waveforms will be routed through the 1260-150 switch card. Reference Self Test ITA Drawing sheet 10 of Appendix A for specific setup. In addition to this test scenario, the TDS460 BIT (Built in Test) will also be run.

Test Acceptance criteria:

Successful completion of the waveform analysis and successful completion of BIT testing.

2.1.9 HP66000A Power Supply w/ HP66101A and HP66103A Options

The HP66000 power supply will be self tested by applying programmed voltages through the 1260-120 switch card and the 1260-138 multiplexer card to the HP Programmable Loads. The loads will be set for a known reference resistance and checked using the measurement capabilities of the load assembly. The accuracy of the measured voltages will be analyzed to form the pass/fail boolean. Reference Self Test ITA Drawing sheet 3 of Appendix A for specific setup.

Test Acceptance criteria:
Successful completion of the voltage analysis.

2.1.10 HP6050A Load Chassis w/ HP60502B Load Module

The HP6050 load chassis and associated electronic loads will be tested by applying known voltages to the electronic loads set at programmed resistances. The electronic loads have the capability of measuring the voltage drops at their sense lines. These voltage drops will be used to determine the pass/fail boolean. Reference Self Test ITA Drawing sheet 3 of Appendix A for specific setup.

Test Acceptance criteria:
Successful completion of the voltage analysis.

2.1.11 Keithley 236/1938 Source Measurement Unit

The two(2) Keithley 236 source measurement instruments will be self tested by wrapping the output of each instrument to the input of the RI4152A DMM instrument. In addition to this test scenario, BIT tests will be run on both instruments.

Acceptance Test criteria:
Successful completion of both wrap back tests and successful completion of BIT tests on both instruments.

2.1.12 Racal 3151 100MS/s Waveform Generator

The Racal 3151 Waveform Generator will be self tested both during the test of the –150 switch card with the RI2461CD and Tektronics TDS460 Scope and through BIT test.

Acceptance Test criteria:
Successful completion of BIT test.

2.1.13 Racal 2461cd Universal Timer/Counter

The Racal 2461cd Counter/Timer will be self tested both during the test of the –150 switch card with the RI2461CD and Tektronics TDS460 Scope and through BIT test.

Acceptance Test criteria:
Successful completion of BIT test.

2.1.14 Racal 6065-8 8 Channel Serial Interface Module

The Racal 6065-8 serial interface module will be tested in a wrap back configuration by tying the transmit and receive lines to each other through the self test adapter wiring. All 8 channels will be tested bi-directionally in this manner. The transmitted data word will be compared to the received

data word to develop the pass/fail boolean. In addition to this test scenario, BIT test will be performed on the instrument. Reference Self Test ITA Drawing sheet 6 of Appendix A for specific setup.

Acceptance Test criteria:

Successful completion of wrap back tests and successful completion of BIT test.

3 Summary

The Waters VTS self test is intended to verify the functionality of every switch in the system. In addition, the ability of source instruments to apply stimulus through the switch and for sensor instruments to measure those stimuli will also be checked. The Self Test ITA Drawing set included as an appendix contains specific test setup information for each self test.

This page was left intentionally blank.

APPENDIX A

Self Test ITA Drawings

