Manual Part Number: 21568
Revision: F
Print Date: March 2008

Series 8035XA Peak Power Sensors Operation & Maintenance Manual

8035XA

CE.....Certified Product ISO 9001..... Certified Process
Registrar: BSI, Certification No. FM 34226 v Registered 04 June 1996 v Amended 01 March 2000

Giga-tronics Incorporated v 4650 Norris Canyon Road v San Ramon, California 94583
925.328.4650 or 800.726.4442 v 925.328.4700 (Fax) v 800.444.2878 (Customer Service) v 925.328.4702 (CS Fax)
www.gigatronics.com

All technical data and specifications in this manual are subject to change without prior notice and do not represent a commitment on the part of Giga-tronics Incorporated.

© 2001 Giga-tronics Incorporated. All rights reserved.

Printed in the USA

WARRANTY

Giga-tronics Series 8035XA Peak Power Sensors are warranted against defective materials and workmanship for one years from date of shipment. Giga-tronics will at its option repair or replace products that are proven defective during the warranty period. This warranty DOES NOT cover damage resulting from improper use, nor workmanship other than Giga-tronics service. There is no implied warranty of fitness for a particular purpose, nor is Giga-tronics liable for any consequential damages. Specification and price change privileges are reserved by Giga-tronics.

Declaration of Conformity

Application of Council Directive(s)

Standard(s) to which Conformity is Declared:

89/336/EEC and 73/23/EEC	EMC Directive and Low Voltage Directive
EN61010-1 (1993)	Electrical Safety
EN61326-1 (1997)	EMC - Emissions & Immunity

Manufacturer's Name:

Giga-tronics, Incorporated

Manufacturer's Address:

4650 Norris Canyon Road
San Ramon, California 94583
U.S.A.

Type of Equipment:

Peak Power Sensors

Model Series Number:

8035XA

Model Numbers In Series:

80350A, 80351A, 80352A,
80353A, 80354A, 80355A

Declaration of Conformity on file. Contact Giga-tronics, Inc.

4650 Norris Canyon Rd.
San Ramon, CA 94583

Ph: 1-925-328-4650
Fx: 1-925-328-4700

Table of Contents

About This Manual 1-vii
Conventions 1-viii
Record of Manual Changes 1-x
Special Configurations 1-xi

1

Introduction

1.1 Description 1-1
1.1.1 Accessories 1-1
1.1.2 Product Returns 1-1
1.2 Specifications 1-2
1.2.1 Performance Specifications 1-3
1.2.2 Compatible Power Meters 1-5

2

Operation

2.1 Introduction 2-1
2.2 Power Sweep Calibration 2-1
2.2.1 5, 25 and 50 Watt Peak Power Sensors 2-2
2.2.2 Triggering 2-3
2.2.3 Zeroing 2-4
2.2.4 Sensor Triggering 2-5
2.3 Sample Delay 2-6
2.3.1 Sample Delay Display 2-7
2.3.2 Setting Sample Delay 2-8
2.3.3 Sample Delay Limits 2-9
2.3.4 Setting Sample Delay Offset 2-10
2.3.5 Single Peak Sample Measurements 2-10
2.3.6 Real Time Pulse Profile and Sample Position Display 2-11
2.3.7 Sample Delay Offset 2-12
2.3.8 Measuring Pulse Droop 2-13
2.3.9 Measuring 3 dB Pulse Width 2-14
2.3.10 Measuring Rise-Time 2-15
2.4 GPIB Commands 2-15
2.4.1 Setting Trigger Modes 2-15
2.4.2 Setting Delays 2-16
2.4.3 Reading Values 2-17
2.4.4 Commands for the 58542 2-18

3

Theory of Operation

3.1 Introduction....3-1

3.2 Analog Assembly Description....3-2

3.3 Digital Assembly Description....3-5

3.3.1 Overview....3-5
3.3.2 Description....3-6

Calibration and Testing

4.1 Introduction....4-1

4.2 Equipment Required....4-1

4

4.3 Power Linearity Test....4-2

4.3.1 CW Linearity Test....4-2
4.3.2 Peak Linearity Test....4-3

4.4 Trigger Modes Tests....4-4

4.4.1 Detector Output Test....4-4
4.4.2 Trigger Level Test....4-4
4.4.2.1 100 mW Power Peak Sensors....4-4
4.4.2.2 High Power Peak Sensors....4-5
4.4.3 Delay Test....4-6

5.1 Introduction....5-1

5.1.1 Rise-Time Adjustments....5-1

Maintenance

5

5.1.2 Zero Adjustment....5-2

5.2 Troubleshooting....5-2

5.2.1 Sensor Not Present....5-4
5.2.2 Calibration....5-4
5.2.3 INTernal....5-5
5.2.4 EXTernal....5-6
5.2.5 Delay....5-6
5.2.6 Output Problems....5-6

5.3 Sensor Element Replacement....5-7

5.3.1 Disassembly of the Sensor....5-7
5.3.2 Replacing the Sensor Element....5-7
5.3.3 Reassembly of the Sensor....5-8

6

Parts Lists

6.1 Introduction....6-1

80350A PEAK POWER SENSOR, TYPE N, Rev. F....6-1
80351A HI PWR PEAK POWER SENSOR, 5W, Rev. C....6-2
80352A HI PWR PEAK POWER SENSOR, 25W, Rev. C....6-3
80353A PEAK POWER SENSOR, TYPE K, Rev. D....6-4
80354A PEAK POWER SENSOR, TYPE K, Rev. E....6-5
80355A HI PWR PEAK POWER SENSOR, 50W, Rev. C....6-6
32133 SENSOR-S-CLOCK-BUFFER PCA, Rev. A....6-6
21471 SENSOR HOUSING ASSY, Rev. C....6-7

21350 ANALOG PCB ASSY (A1), Rev. P..... 6-8
21353 DIGITAL PCB ASSY (A2), Rev. Z..... 6-10

6.2 List of Manufacturers 6-12

7

Diagrams

7.1 Introduction 7-1

Index

Series 8035XA Peak Power Sensors Index.....Index-1

Illustrations

Figure 2-1: Sensor Setup Menu Tree 2-2
Figure 2-2: Internal Triggering Levels 2-3
Figure 2-3: 8035XA Sensor Timing Diagram 2-4
Figure 2-4: Sample Delay Adjustment Display 2-6
Figure 2-5: Channel A Default Sample Delay 2-7
Figure 2-6: Channel B Default Sample Delay 2-7
Figure 2-7: Channel A & B Default Sample Delay 2-7
Figure 2-8: Sample Delay with Uncalibrated Sensor 2-7
Figure 2-9: Sample Delay with No Trigger Display 2-9
Figure 2-10: Sample Dely Over-Range Indication 2-9
Figure 2-11: Sample Delay Over-Range Offset Display 2-10
Figure 2-12: Pulse Profile and Sample Delay Test Setup 2-11
Figure 2-13: Sample Delay 2-12
Figure 2-14: Using SD to Offset a 0 ns Time Reference 2-12
Figure 2-15: SD Setting for Measuring Pulse Droop 2-13
Figure 2-16: Using SD to Measure a 3 dB Pulse Width 2-14
Figure 3-1: 8035XA High Level Block Diagram 3-2
Figure 3-2: Analog PC Assembly Block Diagram 3-3
Figure 3-3: Analog Circuit Timing Diagram 3-4
Figure 3-4: Digital PC Assembly Block Diagram 3-5
Figure 3-5: Digital Timing Diagram, INT/EXT Trig Mode 3-7
Figure 3-6: Digital Timing Diagram, CW Mode 3-8
Figure 3-7: Digital Serial Data Cycle Timing Diagram 3-8
Figure 4-8: Power Linearity Test Setup 4-2
Figure 4-9: Detector Output and Trigger Level Setup 4-4
Figure 5-10: Principal Test Component Locations 5-2

Tables

Table 1-1: Peak Power Sensor Selection Guide 1-2
Table 1-2: Power Sensor Cal Factor Uncertainties 1-5
Table 6: Sample Delay Limits 4-6
Table 7: 80350A, 80353A, 80354A Trigger Test 4-9
Table 8: 80351A Trigger Test 4-9
Table 9: 80352A, 80355A Trigger Verification 4-9
Table 10: External Trigger Verification 4-9
Table 11: Sample Delay Test 4-10
Table 5-1: Sensor Malfunction Symptoms 5-3
Table 5-2: Digital Board Components and Signals 5-6
Table 6-1: List of Manufacturers 6-12

About This Manual

This manual contains the following chapters and appendices to describe the operation and maintenance of Giga-tronics Series 8035XA Peak Power Sensors:

Preface:

In addition to a comprehensive Table of Contents and general information about the manual, the Preface also contains a record of changes made to the manual since its publication, and a description of Special Configurations. If you have ordered a user-specific manual, please refer to page xi for a description of the special configuration.

Chapter 1 – Introduction:

This chapter contains a brief introduction to the instrument and its performance parameters.

Chapter 2 – Operation:

This chapter is a guide to operating the sensor with the Series 8540X Universal Power Meters and the Model 58542 VXIbus Universal Power Meters.

Chapter 3 – Theory of Operation:

This chapter provides a block diagram level description and its circuits for maintenance and applications.

Chapter 4 – Calibration & Testing:

Procedures for inspection, calibration and performance testing are outlined in this chapter.

Chapter 5 – Maintenance:

This chapter contains procedures for maintenance and troubleshooting.

Chapter 6 – Parts Lists:

This chapter lists all components and parts and their sources.

Chapter 7 – Diagrams:

This chapter contains schematics and parts placement diagrams for all circuits.

Index:

A comprehensive word index of the various elements of the 8035XA manual.

Changes that occur after publication of the manual, and Special Configuration data will be inserted as loose pages in the manual binder. Please insert and/or replace the indicated pages as detailed in the Technical Publication Change Instructions included with new and replacement pages.

Conventions

The following conventions are used in this product manual. Additional conventions not included here will be defined at the time of usage.

Warning

WARNING

The WARNING statement is encased in gray and centered in the page. This calls attention to a situation, or an operating or maintenance procedure, or practice, which if not strictly corrected or observed, could result in injury or death of personnel. An example is the proximity of high voltage.

Caution

CAUTION

The CAUTION statement is enclosed with single lines and centered in the page. This calls attention to a situation, or an operating or maintenance procedure, or practice, which if not strictly corrected or observed, could result in temporary or permanent damage to the equipment, or loss of effectiveness.

Notes

✻ ***NOTE:*** *A NOTE Highlights or amplifies an essential operating or maintenance procedure, practice, condition or statement.*

Logic Not

A logic NOT or LOW condition used in text will be indicated by an overscore, such as $\overline{\text{LOAD-CTR}}$. Elsewhere, such as in schematics, a logic NOT or LOW condition may be indicated by a forward slash bar, such as /LOAD-CTR.

Key Press Commands

Commands requiring specific keys to be pressed on the supporting device, such as power meter, are indicated by square brackets. For example, [ENTER] means to press the Enter Key.

Record of Manual Changes

This table is provided for your convenience to maintain a permanent record of manual change data. Corrected replacement pages will be issued as Technical Publication Change Instructions, and will be inserted at the front of the binder. Remove the corresponding old pages, insert the new pages, and record the changes here.

Change Instruction Number	Change Instruction Date	Date Entered	Comments

Special Configurations

When the accompanying product has been configured for user-specific application(s), supplemental pages will be inserted at the front of the manual binder. Remove the indicated page(s) and replace it (them) with the furnished Special Configuration supplemental page(s).

1

Introduction

1.1 Description

The 8035XA Series Peak Power Sensors perform true sample-based peak power measurements on pulsed signals. The sensors are compatible with Giga-tronics Series 8540, and the 8650 series Universal Power Meters and the Model 58542 VXIbus Universal Power Meter (see Section 1.2.2). The sensors operate from 45 MHz to 18, 26.5, and 40 GHz. High power versions of 5, 25 and 50 Watts, are available to 18 GHz. (see Table 1-1).

Peak Power sensors have three modes of operation: (1) CW, (2) Peak, internally triggered, and (3) Peak, externally triggered. When operated in the peak modes, trigger-point to sample-point delay (sample delay) is adjustable from -20 ns to 100 ms in 0.5 ns steps. Trigger levels are also adjustable.

The Giga-tronics proprietary power sweep calibration system provides excellent linearity from -20 dBm to +20 dBm in Peak modes, and from -30 dBm to +20 dBm in CW mode. Cal Factors stored in EEPROMs in the power sensors automatically compensate for sensor frequency response variations. This unique approach can be configured for automatic frequency response correction. A detector output signal is provided for viewing the detected envelope of the pulsed RF waveform on an oscilloscope. Use of a digital oscilloscope is recommended.

1.1.1 Accessories

Included:	3 each SMB (plug) to BNC (m) cables, 2 m (6 ft) long 3 each Cable Harness Wraps, 1.2 m (4 ft) long
Optional:	Option 02: 12 ft SMB (plug) to BNC cable Option 03: SMB (plug) to SMA (jack) adapter

1.1.2 Product Returns

Should it be necessary to return the product to Giga-tronics, use the original shipping container. If this is not possible, use a strong carton (350 lbs/in^2 bursting strength), or a wooden box. Wrap the instrument in heavy paper or plastic before placing it in the shipping container. Completely fill the areas on all sides of the instrument with packaging material, taking extra precautions to protect the front and rear panels. Seal the package with strong tape or metal bands. Mark the outside of the package “FRAGILE — DELICATE INSTRUMENT”.

If corresponding with the factory or the local Giga-tronics sales office regarding a product return, please refer to the full model number and serial number. If the instrument is being

shipped for repair, be sure to enclose all available pertinent data regarding the problem that has been found.

***** ***NOTE:*** *If you are returning an instrument to Giga-tronics for service, first contact Customer Service so that a return authorization number (RMA) can be assigned via e-mail at repairs@gigatronics.com or at 800.227-9764 (The 800 number is only valid within the US). You may also try our domestic line at 925.328.4650 or Fax at 925.328.4702.*

1.2 Specifications

Table 1-1: Peak Power Sensor Selection Guide

Model	Freq. Range/ Power Range	Max. Power	Power Linearity[4]	RF Conn	Dimensions		Wgt	VSWR
					Ln.	Dia.		
Standard Peak Power Sensors								
80350A	45 MHz to 18 GHz -20 to +20 dBm, Peak -30 to +20 dBm, CW	+23 dBm (200 mW) CW or Peak	-30 to -20 dBm ±0.00 dB -20 to +20 dBm ±0.05 dB/10 dB	Type N(m) 50Ω	165 mm (6.5 in)	37 mm 1.25 in)	0.3 kg (0.7 lb)	1.12:0.045 - 2 GHz 1.22:2 - 12.4 GHz 1.37:12.4 -18 GHz
80353A	45 MHz to 26.5 GHz -20 to +20 dBm, Peak -30 to +20 dBm, CW		-30 to -20 dBm ±0.00 dB -20 to +20 dBm ±0.1 dB/10 dB	Type K(m)[1] 50Ω				1.12:0.045 - 2 GHz 1.22:2 - 12.4 GHz 1.37:12.4 -18 GHz 1.50:18 - 26.5 GHz
80354A	45 MHz to 40 GHz -20 to +0.0 dBm, Peak -30 to +0.0 dBm, CW		-30 to -20 dBm ±0.00 dB -20 to 0.0 dBm ±0.2 dB/10dB					1.12:0.045 - 2 GHz 1.22:2 - 12.4 GHz 1.37:12.4 -18 GHz 1.50:18 - 26.5 GHz 1.92:26.5 - 40 GHz
5W Peak Power Sensor [2,5]								
80351A	45 MHz to 18 GHz 0.0 to +40 dBm, Peak -10 to +37 dBm, CW	CW: +37 dBm (5 W Avg.) Peak: +43 dBm	-10 to +0 dBm ±0.00 dB +0 to +40 dBm ±0.05 dB/10 dB	Type N(m) 50Ω	200 mm (7.9 in)	37 mm (1.25 in)	0.4 kg (0.9 lb)	1.15:0.045 - 4 GHz 1.25:4 - 12.4 GHz 1.35:12.4 -18 GHz
25W Peak Power Sensor [3,5]								
80352A	45 MHz to 18 GHz +10 to +50 dBm, Peak 0.0 to +44 dBm, CW	CW: +44 dBm (25 W Avg.) Peak: +53 dBm	0.0 to +10 dBm ±0.00 dB +10 to +50 dBm ±0.05 dB/10 dB	Type N(m) 50Ω	229.6mm (9.05 in)	41.15 mm (1.62 in)	0.4 kg (0.9 lb)	1.20:0.045 - 6 GHz 1.30:6 - 12.4 GHz 1.40:12.4 -18 GHz
50W Peak Power Sensor[3,5]								
80355A	45 MHz to 18 GHz +10 to +50 dBm, Peak 0.0 to +47 dBm, CW	CW: +47 dBm (50 W Avg.) Peak: +53 dBm	0.0 to +10 dBm ±0.00 dB +10 to +50 dBm ±0.05 dB/10 dB	Type N(m) 50Ω	287.7 mm (11.35 in)	41.15 mm (1.62 in)	0.9 kg (1.1 lb)	1.25:0.045 - 6 GHz 1.35:6 - 12.4 GHz 1.45:12.4 -18 GHz

Notes:

1. The K connector is electrically and mechanically compatible with the APC-3.5 and SMA connectors.
2. Power coefficient equals <0.01 dB/Watt (AVG).
3. Power coefficient equals <0.015 dB/Watt (AVG).
4. For frequencies above 8 GHz, add power linearity to system linearity.
5. Peak operating range above CW maximum range is limited to <10% duty cycle.

1.2.1 Performance Specifications

Performance specifications describe warranted performance. Typical performance shown in italics is non-warranted. Specifications are subject to change without notice.

Rise-Time	(10% to 90%, 0 dBm = 100%) < 100 ns
Fall Time	(90% to 10%, 0 dBm = 100%) < 250 ns
System Linearity	(50 MHz for Standard Peak Power Sensors:) ±0.13 dB from -30 to +16 dBm ±0.13 dB +(+0 dB, -0.05 dB/dB) from +16 to +20 dBm

Zero Accuracy

Applies to 80350A, 80353A and 80354; 80351A = 100x larger, 80352A = 1000x larger

Zero Set:	< ±*1.0* m*W*, Peak; < ±0.05 mW, CW
Zero Drift:	< ±*1.0* m*W*, Peak < ±*0.05* m*W*, CW in 1 hour at constant temperature, 24 hour warmup
Noise Uncertainty:	< ±*1.0* m*W*, Peak; < ±*0.05* m*W*, CW at constant temperature, measured over a 1 minute interval, 24 hour warmup

Sample Delay Timing

Delay Range:	-20 ns to 104 ms
Delay Resolution:	0.5 ns
Delay Jitter:	±*2.0* ns

Trigger Level Set Range:

Internal:	-30 to +20 dBm
Resolution:	±*0.01* dB
External:	0.0V to 4.0V Resolution to 0.01V
Trigger Jitter:	< ±2.0 *ns*
Settling Time:	(50% to within 3%) < 250 ns

Control Inputs and Outputs

Trigger Input:	[SMB (jack) connector] TTL External Trigger Input (absolute maximum = 10 V) 110 kΩ Impedance.
Detector Out:	[SMB (jack) connector] Monitor real time pulse waveform on an oscilloscope with this voltage output (uncalibrated) (High Impedance - Do Not Terminate)
Sample Delay:	[SMB (jack) connector] High, 5 V, between trigger and sample points. Connect to digital oscilloscope channel 2 for triggering and sample point identification (High Impedance - Do Not Terminate) Maximum cable length = 3 meters

Table 1-2: Power Sensor Cal Factor Uncertainties

Freq. (GHz)		Sum of Uncertainties (%)[1]					Probable Uncertainties (%)[2]		
Lower	**Upper**	**8035XA**	**80353A 80354A**	**80351A[3]**	**80352A[3]**	**80355A[3]**	**8035XA**	**80353A 80354A**	**80351A[3] 80352A[3] 80355A[3]**
0.1	1	1.61	3.06	9.09	9.51	10.16	1.04	1.64	4.92
1	2	1.95	3.51	9.43	9.85	10.50	1.20	1.73	5.04
2	4	2.44	4.42	13.10	13.57	14.52	1.33	1.93	7.09
4	6	2.67	4.74	13.33	13.80	14.75	1.41	2.03	7.17
6	8	2.86	4.94	13.52	13.99	14.94	1.52	2.08	7.25
8	12.4	3.59	6.04	14.25	14.72	15.67	1.92	2.55	7.56
12.4	18	4.09	6.86	19.52	20.97	21.94	2.11	2.83	12.37
18	26.5	——	9.27	——	——	——	——	3.63	——
26.5	40	——	15.19	——	——	——	——	6.05	——

Notes:

1. Includes uncertainty of reference standard and transfer uncertainty. Directly traceable to NIST.
2. Square root of sum of the individual uncertainties squared (RSS).
3. Cal Factor numbers allow for 3% repeatability when connecting attenuator to sensor, and 3% for attenuator measurement uncertainty and mismatch of sensor/pad combination. Attenuator frequency response is added to the Sensor Cal Factors which are stored in the sensor's EEPROM.

1.2.2 Compatible Power Meters

8541X Single Channel Universal Power Meter
8542X Dual Channel Universal Power Meter
8651A Single Channel Universal Power Meter
8652A Dual Channel Universal Power Meter
58542 Dual Channel VXI Universal Power Meter

NOTE: *If the Series 8035XA sensors will be used with a Model 8542 (dual channel) Power Meter, the 8542 must be configured to code 06 or higher, or an asterisk (*) must be appended to the code number. The code number is printed next to the serial number on the label located on the rear panel of the 8542.*

2

Operation

2.1 Introduction

When a sensor is first connected to a Model 8540 or 8650 Series Universal Power Meter or to a Model 58542 VXIbus Universal Power Meter, it is necessary to calibrate the sensor to the meter's sensor input, using the meter's power sweep calibration system. The power meter will not allow measurements to be performed until this calibration is completed successfully. It is a good practice to repeat the calibration whenever the ambient operating temperature of the sensor varies by more than ±5 °C (±9 °F), and whenever any external connections or external loads are added or removed from the sensor. Always allow a 30 minute warm-up period before calibrating the sensor.

* ***NOTE:*** *These instructions show the Series 8540 Power Meter front panel keys in brackets [ ] and menu displays in bold print.*

The operational description of the 8035XA Peak Power Sensor applies to applications with either the Series 8540 or 8650 Universal Power Meters (8541/2, B and C) or the Model 58542 VXIbus Universal Power Meter. Except where noted, the front panel descriptions apply only to the Series 8540 Power Meters, and SCPI command sequences apply to the Model 58542 VXIbus Power Meter. The Series 8650 Power Meter display lines vary from the Series 8540 but include the same parameters.

2.2 Power Sweep Calibration

Procedures for calibrating sensors to the meter are detailed in the specific power meter manual. The 8035XA Peak Power Sensors are calibrated to the meter using the same procedure as other sensors used with the 8540, 8650 Series Power Meters or the 58542 VXI Power Meter. Connect the channel A sensor to the calibrator port, and press [ZERO/CAL].

Following the successful completion of Power Sweep Calibration, the 8541/2 will automatically display the current value of sample delay for your 8035XA Series Peak Power Sensor. If the sample delay does not appear, press [RECALL], select PRESET, and press [ENTER].

If you are using the dual channel 8542 Universal Power Meter, verify that only one 8035XA Series Peak Power Sensor is connected. The 8542 will automatically display peak power on one line and sample delay on the other. When two sensors are attached, the display will default to display the two power levels. Some test procedures, such as A/B ratio measurements, will be easier after performing some configuration of the display parameters. Press [MENU], select A, B, A/B . . . B-A with the arrow keys, and press [ENTER]. This menu will allow you to select various power measurements as well as DLY_A and DLY_B for the two line display.

2.2.1 5, 25 and 50 Watt Peak Power Sensors

Power Sweep Calibration of the 5, 25 and 50 W Peak Power Sensors (80351A, 80352A and 80355A, respectively) require you to disconnect the high power attenuator before you connect the sensor directly to the front panel calibrator connector. When power sweep calibration is completed, reconnect the high power attenuator to the sensor.

Proper connector alignment is shown by small black arrows printed on the attenuator and sensor labels. The serial number on the sensor housing and the serial number on the high power attenuator should match. During manufacture, the frequency response of the attenuator is calibrated and entered into the peak power sensor EEPROM as frequency calibration factors. This technique improves the accuracy and repeatability of your measurements.

CAUTION

Do not exceed 200 mW (+23 dBm) Peak or Average. Excessive input power will damage or destroy the power sensor element.

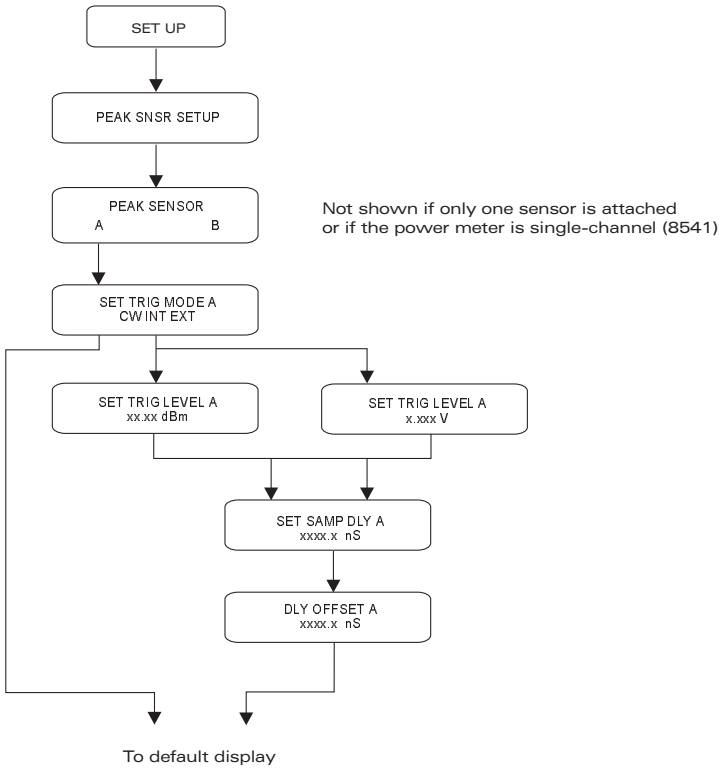


Figure 2-1: Sensor Setup Menu Tree

2.2.2 Triggering

The 8540 power meters will not display a new peak power reading until the 8035XA sensor is triggered. The default configuration is internal triggering (INT) at -20 dBm. Press [MENU], select SETUP MENU, select PEAK SNSR SETUP, (select sensor A or B if necessary), and then select INT triggering. You can then enter a new internal trigger level. Be sure that the value is 3 dB or greater below the peak power level of the signal being measured. If you are attempting to trigger at excessively low power levels, measurement repeatability and noise performance can be improved by using external (EXT) triggering.

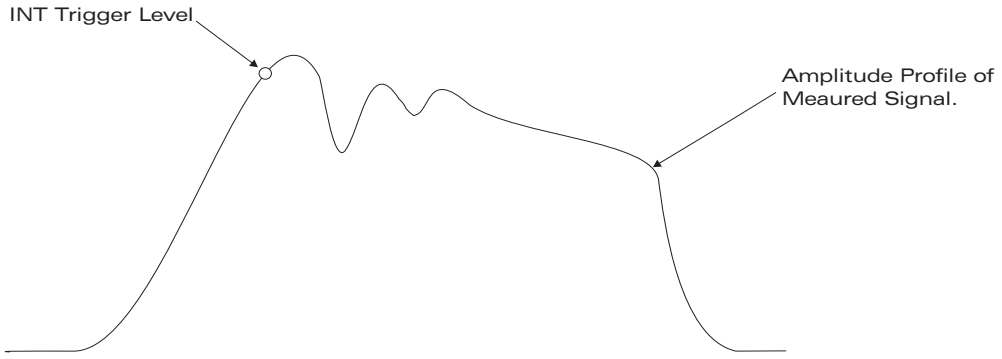


Figure 2-2: Internal Triggering Levels

2.2.3 Zeroing

Zero the sensor before taking critical measurements in the bottom 10 dB of the peak power sensor's dynamic range. For standard peak power sensors, this level is -10 dBm.

When making dual channel power measurements, zero the sensors whenever another sensor is attached or disconnected. Use the following steps:

1. Turn off the RF source.

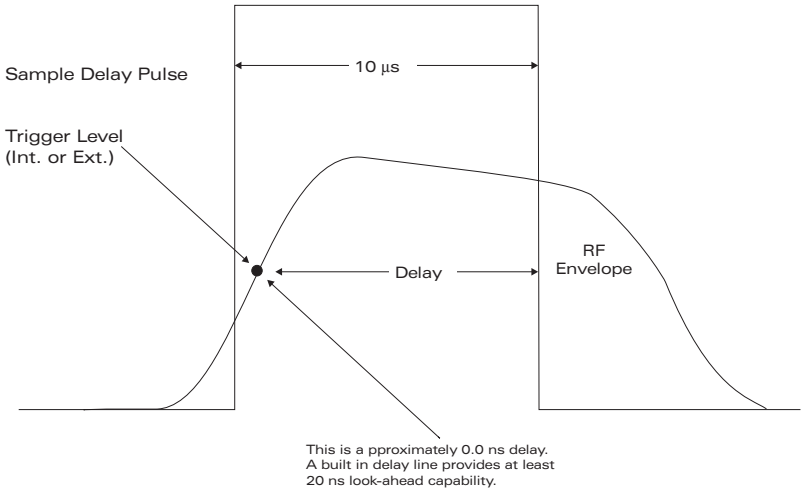
2. Press [CAL/ZERO].

The sensors will zero automatically. The 8540 power meters detect when a sensor is attached to the calibrator port. When a sensor is not attached to the power sweep calibrator, the power meter automatically initiates the zeroing procedure (if only one sensor is connected to the meter). Be sure to deactivate the RF source for zeroing. Leaving the sensor attached to your measurement test ports during zeroing properly accounts for test setup ground noise and metal to metal contact thermal EMF.

The 8035XA Series EXT trigger port is on the back of the sensor, not the power meter. A set of three SMB(f) to BNC(m) cables are included with each 8035XA Series sensor. The EXT trigger input impedance is 110 kΩ. This allows you to use TTL level signals without damaging the input circuit. However, the input impedance match might cause triggering line reflections and potential false triggering when fast (50 Ω) trigger sources are used.

This can be resolved by setting the EXT trigger level (see Figure 2-1).

The CW power measurement mode is also selected in the Peak Sensor Setup menu. CW measurements are automatically performed on a continuous basis.



58542 VXIbus Power Meter SCPI Compatible Commands

```
OUTPUT @Pwr_MTR;SENS1:TRIG:SOUR INT      ! Selects Internal Triggering
OUTPUT @Pwr_mtr, SENS1: TRIG: DEL 10E-06  ! Sets Sample Delay Position to 10 µs
WAIT 200                                  ! Wait  200 ms for Sample Time Set
OUTPUT @Pwr_mtr, MEAS1?                   ! Take a Measurement
ENTER @Pwr_mtr: Peak_pwr_rdg
```

Figure 2-3: 8035XA Sensor Timing Diagram

2.2.4 Sensor Triggering

A measurement will not be possible until the peak power sensor is triggered. The Series 8540 Power Meters will display NO TRIG until a valid trigger is received. The following trigger verification technique is valid for both Series 8540 and 58542 VXI Power Meters:

1. If you need to verify triggering, connect the Sample Delay output on the back of the 8035XA Series sensor to an oscilloscope using one of the SMB(plug) to BNC(m) cables provided with the sensor. Set the scope channel to dc coupling, 1.0 μs per division. Use rising edge (Normal) triggering at about 0.5 V trigger level. Set the sensor sample delay to 2.0 μs.

2. The sample delay pulse will appear each time the sensor is triggered. If a pulse does not appear on the scope display, the sensor is not triggering. Check the triggering configuration and adjust it if necessary. An analog oscilloscope may show a dim trace when the repetition rate is low.

3. A quick check that can be made on the 8540 power meter for triggering without using an oscilloscope is to press [dB/mW] twice. This will clear the current reading and display NO TRIG until a valid trigger is received.

2.3 Sample Delay

Sample Delay is the time value in nano-, micro-, or milliseconds that appears on the Series 8540 display after an 8035XA Series sensor has been calibrated. This is the length of time between the trigger point and the sample point on the pulsed signal. This capability allows you to measure the power level of your pulsed signal at any time point along its amplitude path. The power level displayed is the true, sampled signal level at the time position that you specified; the pulse level is not interpolated from two adjacent samples as is common in random sampling oscilloscope-type peak power meters.

Sample delay is fully adjustable from -20 ns to 100 ms. On the 8541/2 front panel, use the arrow keys to position the cursor and adjust the time values. Seven digits, four to the left of the decimal and three to the right of the decimal, can be edited in the microsecond (ns) and millisecond (ms) ranges (see Figure 2-4 for an example.) The nanosecond range allows four digits to the left of the decimal, but only a .0 or .5 to the right of the decimal.

The 0.0 ns time delay setting will be close to the trigger level when internal triggering is used. If your measurements require definition of the 0.0 ns position, use *Sample Delay Offset* to adjust for small triggering variations.

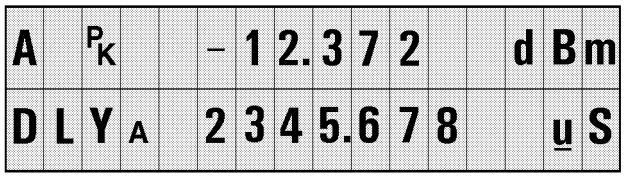


Figure 2-4: Sample Delay Adjustment Display

Full 0.5 ns resolution is always possible regardless of the front panel units display. On the millisecond ranges, small nanosecond level increments in sample delay can be performed by incrementing *Sample Dly Offset* in the Peak Sensor Setup menu tree. In addition to allowing control of small nanosecond range sample delay increments while currently displaying millisecond ranges, sample delay offsets allow you to compensate for cabling and circuit time delays in your test setup. The sensor delay is the sum of DLY_A and DLY $OFFSET_A$ (or DLY_B and DLY $OFFSET_B$)

2.3.1 Sample Delay Display

With a single peak power sensor attached, the default display after attachment and calibration of the sensor will have the power displayed on one line and the sample delay displayed on the other line. The default for channel A will be as shown in Figure 2-5.

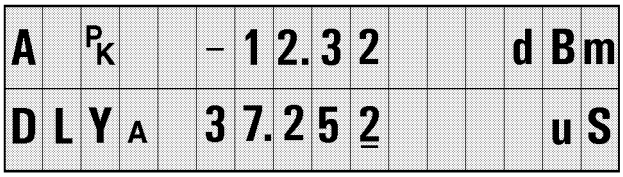


Figure 2-5: Channel A Default Sample Delay

The default for channel B will be as shown in Figure 2-6.

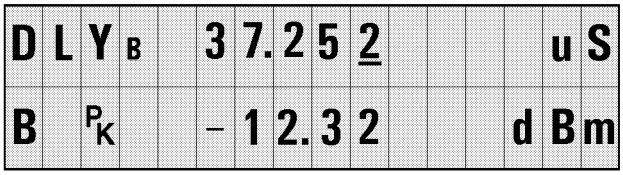


Figure 2-6: Channel B Default Sample Delay

The default displays will also be used when the meter is preset. The default for two sensors will display power readings on both lines as shown in Figure 2-7.

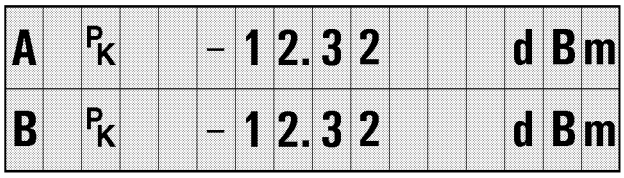


Figure 2-7: Channel A & B Default Sample Delay

If a sensor is uncalibrated, the word UNCALIBRATED will be displayed for the channel as shown in Figure 2-8.

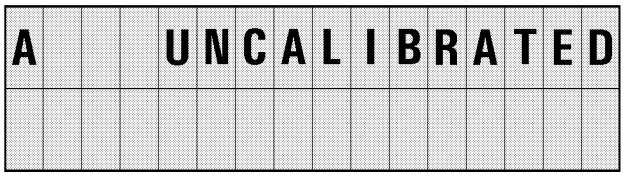


Figure 2-8: Sample Delay with Uncalibrated Sensor

The default display will be presented after attachment of a new sensor. Sample delay offsets are available for each sensor. The use of a non-zero offset will be indicated by an asterisk between the last digit and the units as shown below. The delay displayed is the sample delay before the application of any offset.

DLYA 56.345*uS

The Sample Delay display line interacts with the Min/Max display line. If Min/Max is turned on for a line that Sample Delay was tracking, Min/Max will be displayed instead of Sample Delay.

2.3.2 Setting Sample Delay

The sample delay can be set from two locations within the menu structure. One location is at the default display where sample delay information is displayed. The other is in the menu structure where the peak sensor setup is configured.

Sample Delay Operation

You will be presented with a display with a decimal point fixed in the display. Normally, four digits are available to the left of the decimal point and three digits to the right as shown below. Leading zeros will be suppressed.

XXXX.XXX uS

When the units are set to nS, only one digit will be available to the right of the decimal.

The right and left arrow keys move a cursor to select a digit or unit to be changed. The cursor will stop only at valid digit or unit locations (valid digits are shown by ^ below). The cursor will stop under valid blank spaces so that large numbers can be entered quickly.

XXXX.XXX uS
^^^^ ^^^ ^

Press the up key to increment the digit value by 1, or the down key to decrement the digit value by 1. If a digit is incremented past 9, a carry is propagated to the next higher digit (odometer mode). Similarly, if a digit is decremented past 0, a borrow will be made from the next higher digit. You can decrement the delay to a negative number.

An exception is made when the cursor is moved to the 10ths of nanoseconds range. The up or down arrows will change the display in .5 nS increments. This is the maximum resolution of the sensor.

Press the up or down keys while the cursor is under the units display to cycle through the units. You will be offered a choice of nS, uS, or mS. The units display does not wrap around.

The units selected will be used in all displays for the delay for the sensor to which they are assigned.

If a peak measurement parameter is changed, e.g. sample delay or trigger level, the power display will display NO TRIG (see Figure 2-9) until a new measurement is made with the new parameters in effect. If the sensor triggers quickly, the message may not be seen. In the TR2

mode, the display may show MEAS* with the asterisk lines rotating as each measurement is made.

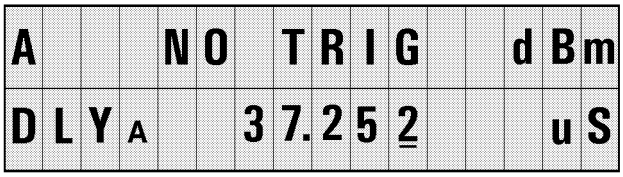


Figure 2-9: Sample Delay with No Trigger Display

The GPIB will return numerical data in the No Trig state, depending on the GPIB measurement mode. See the GPIB Commands in Section 2.4 for more details on Trigger Modes.

2.3.3 Sample Delay Limits

There is no automatic units scaling for the sample display. You can enter any number up to 9999.999 and then set the units, with the exception of the nS range, which allows only one digit to the right of the decimal. If the sample delay plus the offset exceed the range of the attached sensor, the S at the end of the line will be replaced with an arrow indicating a range error (see Figure 2-10). An up arrow indicates that a delay is too high, a down arrow indicates that a delay is too low.

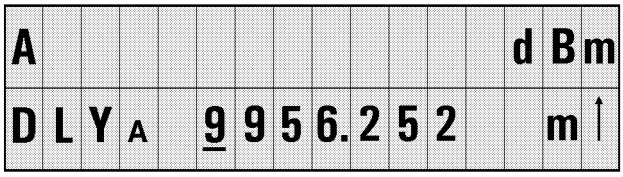


Figure 2-10: Sample Dely Over-Range Indication

When the arrow keys are used to change the units, the digits in the display will simply use the new units. The only exception is going from µS to nS. The digits to the right of the decimal point will be reduced to one digit, and that last digit will be either 0 or 5 as shown in the following example:

Starting Display	Action	Resulting Display
15.678 µS	↓	**15.5 nS**

Setting Delay from the Default Display

A cursor will be displayed on the sample delay in the default display. When you change the sample delay by pressing an up or down arrow key, the associated sensor will be immediately programmed with the new delay. The power display may be replaced with NO TRIG until a new power measurement can be made with the new sample delay.

If an over-range sample delay is entered, no measurement will be made until the over-range condition is corrected (over-range includes delay plus offset).

If there is more than one delay display line, the left and right arrows will move the cursor off the end of one display line and onto the next.

Setting Delay from the Peak Setup Menu

The cursor will be available immediately upon entering this menu. The sensor will not be updated with the new delay setting until the peak menu sequence is completed. This requires selecting the trigger mode, setting the trigger level, setting the sample delay, and setting the sample delay offset. The display will exit to the default measurement display when you press [ENTER] on the last menu in the sequence.

2.3.4 Setting Sample Delay Offset

The sample delay offset is settable from the menu following the SET SAMP DLY menu (see the Menu Tree in Figure 2-1). The method to enter the delay offset will be the same as the method to enter the sample delay. You can change a set of digits (XXXX.XXX), plus units.

The offset will be range checked together with the sample delay so that the total of sample delay plus offset does not exceed the range of the sensor. If the range of the sensor is exceeded, a beep may sound and an arrow will replace the S at the end of the line (see Figure 2-11) to indicate an out of range condition. If you exit the menu without correcting the out of range condition, no power measurement will be made.

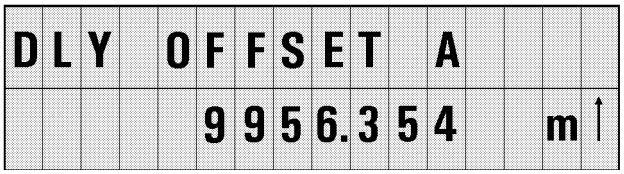


Figure 2-11: Sample Delay Over-Range Offset Display

For example, if the max delay available from a sensor is 100 mS and the sample delay is set to 75 mS, the maximum offset permitted is 25 mS. Anything larger will cause an arrow to be displayed.

Each sensor has its own delay offset parameter.

2.3.5 Single Peak Sample Measurements

Measurements for a peak sensor will be performed over a number of single samples. A single sample is defined as follows:

1. The sensor is armed.

2. A pulse is triggered and sampled by the sensor. The sensor informs the meter via handshaking that a measurement voltage is available.

3. The meter measures the voltage and computes the power from this one trigger sample.

When averaging is turned on, the averaging will be done over a number of single samples. Auto averaging will use an increasing averaging number as the power level being measured declines. For example, the number of samples required for measurements at 20 dBm is 1. At -20 dBm, the number of samples will be about 32 (this could change depending on mode or software version).

2.3.6 Real Time Pulse Profile and Sample Position Display

The Detector Out connector on the rear of the 8035XA Series Peak Power Sensor can be connected to any common oscilloscope for a real-time amplitude profile of your signal, delayed by about 120 ns.

Connect the SMB to BNC cables to your oscilloscope (digital scope preferred - especially for sample delay setting >500 μs) as shown in Figure 2-12.

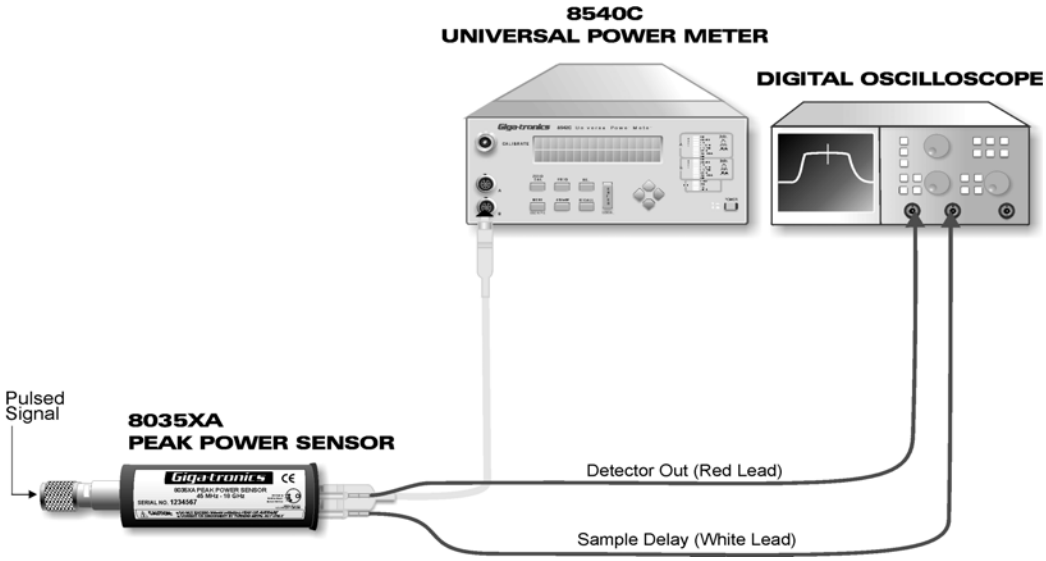


Figure 2-12: Pulse Profile and Sample Delay Test Setup

Use the Sample Delay output as an oscilloscope trigger source. This waveform rises at the trigger point and falls at the sample point; thus, it provides both a stable scope trigger source and a precise indicator of the trigger point and sample point.

The time length of the sample delay pulse is the sum of the sample delay which is displayed on the Series 8540 power meter front panel, and the sample delay offset which is available through the menu.

2.3.7 Sample Delay Offset

In addition to compensating for delay line triggering variations or external triggering cables, sample delay offset can be used to set a 0.0 ns time reference point after the trigger point (see Figure 2-13).

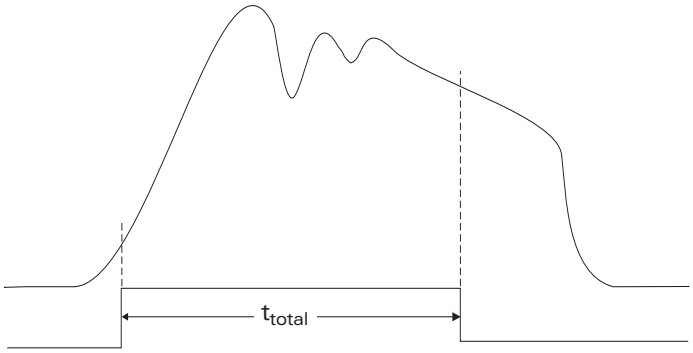


Figure 2-13: Sample Delay

The use of a digital oscilloscope can permit better viewing of data. There are two small markers injected onto this waveform. The first is a small triggering marker which is added slightly after the trigger point. The second marker on the waveform is the sample marker. The sample marker is located slightly behind the actual sample point. There may be small markers at the end of the sample transfer and when the trigger signal occurs. Because the visibility of these markers varies greatly with signal level and horizontal sweep rate, the use of the SAMPLE DELAY output is recommended.

In Figure 2-14, triggering occurs at the frame start of a pulsed TDMA communications signal. The trigger level is set such that triggering can only occur on the highest amplitude pulse; this provides stable triggering. A sample delay offset is used to set a 0.0 ns reference point at the start of the third data burst pulse.

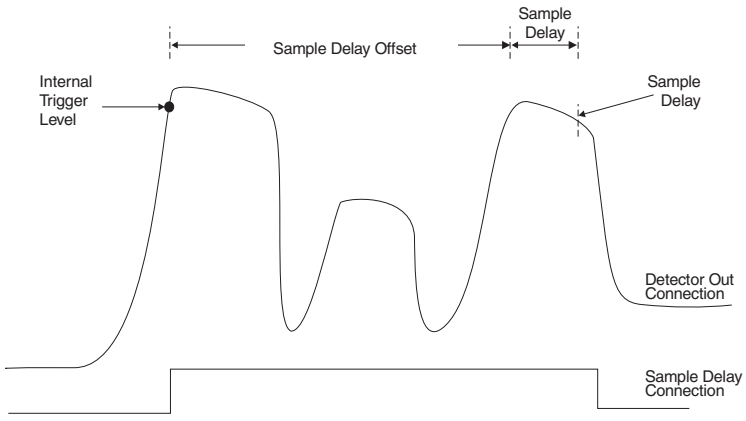


Figure 2-14: Using SD to Offset a 0 ns Time Reference

2.3.8 Measuring Pulse Droop

Pulse characteristics such as droop, ripple, and overshoot can be measured quickly using referenced measurements. This involves the use of the front panel REL key for the Series 8540 power meter users, or the CALC#:REF:COLL function for 58542 power meters.

1. Connect the 8035XA Peak Power Sensor to the power meter and the CALIBRATOR output.
2. Press [CAL/ZERO] to calibrate the sensor to the meter.
3. Upon successful completion of power sweep calibration, connect the sensor to a pulsed signal source. The power level must be above the trigger level.
4. Connect the 8035XA Detector Out and Sample Delay leads to a digital oscilloscope.
5. Set the sample delay (DLY_A) to the t_1 position just after the rising edge as shown in Figure 2-15.
6. Press [REL]. The display should now read approximately 0.00 dBm or 100%.
7. Set the sample delay to the t_2 position just before the falling edge of the pulse.

The display is now reading the pulse-top amplitude variation.

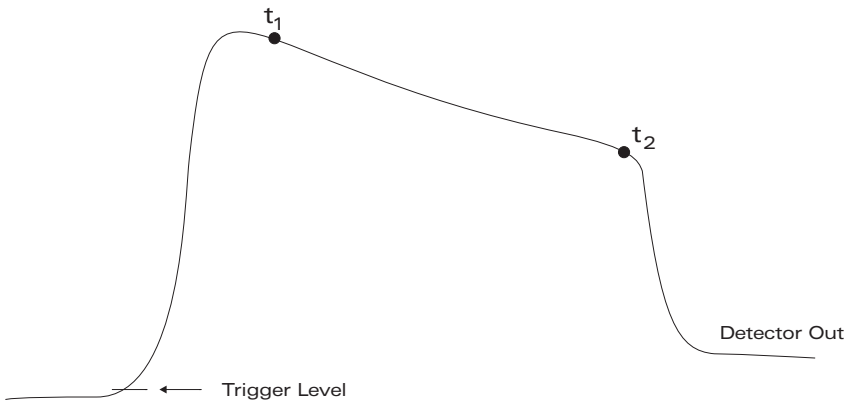


Figure 2-15: SD Setting for Measuring Pulse Droop

2.3.9 Measuring 3 dB Pulse Width

Pulse width and other pulse timing parameters can be measured using the REL key and the sample delay offset control (see Figure 2-16).

1. Preset the delay offset to 0 nS.
2. Set the sample delay equal to about half the pulse width.
3. Press [REL] to set the 0.0 dB reference level (100% for Watts display).
4. Set the sample delay to a position on the rising edge of the pulse. Increment or decrement the sample delay value until the power level display reads approximately -3.00 dBr.
5. Remember or write down the sample delay value.
6. Press [MENU], and use the up/down arrow keys to display SETUP MENU. Press [ENTER]. Select PEAK SNSR SETUP, then select the current triggering method (INT or EXT). When DLY Offset appears, set the offset value to the same time value from Step 4. This sets the 3 dB down time point to a 0.0 ns reference position.
7. Press [ENTER] to return to the measurement display.
8. Set the sample delay to a position on the falling edge of the pulse. Increment or decrement the sample delay value until the display again reads approximately -3.00 dBr.

The sample delay currently displayed is the signal's 3 dB pulse width.

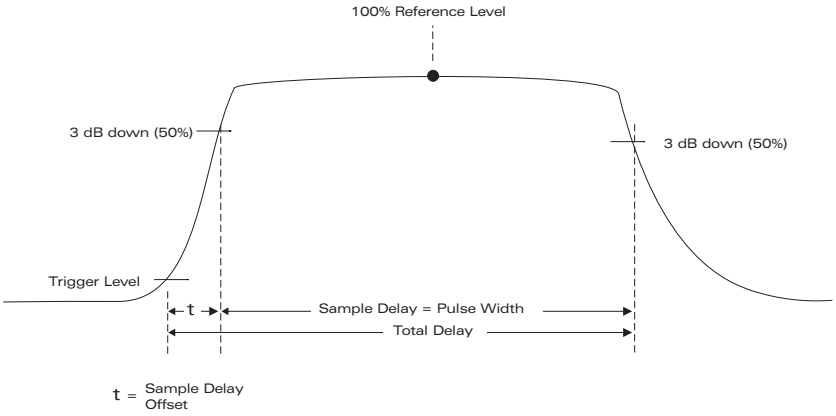


Figure 2-16: Using SD to Measure a 3 dB Pulse Width

2.3.10 Measuring Rise-Time

Rise time measurements can be performed using a technique similar to the pulse width measurement. This example uses a linear Watts display readout rather than the more common logarithmic dBm readout for convenient identification of the 10% and 90% levels.

1. Preset the delay offset to 0 ns.
2. Press [dBm/mW] to obtain a linear, Watt, display readout.
3. Set the sample delay equal to about half the pulse width.
4. Press [REL] to set the 100% reference level.
5. Set the sample delay to a position on the rising edge of the pulse. Increment or decrement the sample delay value until the power level display reads approximately 10%.
6. Remember or write down the sample delay value.
7. Press [MENU]. Select SETUP MENU then PEAK SNSR SETUP. Proceed to the SAMPLE DELAY OFFSET selection. Set the offset value to the same value from Step 6.
8. Return to the measurement display and increment the sample delay until the display reads approximately 90%.

The sample delay currently displayed is the 10% to 90% rise time.

2.4 GPIB Commands

These commands supplement the commands given in the Series 8540C Universal Power Meter Operation and Maintenance Manual.

2.4.1 Setting Trigger Modes

These commands set the trigger method for the 8035XA sensor. The sensor can be set to trigger on the rising RF envelope of the power signal. This is the internal trigger mode. An external TTL trigger can be used, or the sensor can “free run” and allow a CW measurement mode with no trigger required.

The terms digital filter (as used in some instrument instructions) and averaging buffer (as used here) are interchangeable.

Examples:

```
OUTPUT 713;PEAK A INT TRIG -10.00      ! Configure sensor A for internal trigger at
                                       ! -10.00 dBm trigger level

OUTPUT 713;PEAK B EXT TRIG 1.50        ! Configure sensor B for external trigger at
                                       ! 1.50 Vdc trigger level

OUTPUT 713;PEAK A CW                   ! Configure sensor A for CW measurements
```

In this example, the address 713 means "Type 7" GPIB instrument, and address 13 for the power meter. The GPIB control command (the portion to the left of the semicolon) may vary.

Trigger Modes With a Peak Sensor

Examples:

```
OUTPUT 713;TR3          ! Last measured value will be returned
OUTPUT 713;TR2          ! Refill averaging buffer before measurement display
OUTPUT 713;TR1          ! Wait for trigger before returning measurement
OUTPUT 713;TR0          ! Measure, but no display
```

TR0

The meter will measure power, but the display of measured data will be suppressed and the GPIB bus will not be updated with measurement data.

TR1

This mode will wait until the sensor triggers before returning a measurement. The measurement returned will be after the application of any averaging. The display for the channel will follow the TR1 mode. When TR1 is received over the bus, NO TRIG will be displayed until the sensor has triggered and measurement data is available.

TR2

This mode will wait until enough measurements are made to completely refill the averaging buffer. The measurement returned will be the average of all measurements in the buffer. MEAS* will display with one of the asterisk lines rotating for each measurement) while the averaging buffer is being filled.

TR3

The last measured value will be returned. This mode will not wait for the peak sensor to trigger.

2.4.2 Setting Delays

When the sensor is configured for internal triggering, the delay from trigger to measurement sample must be set. The valid range of delays is -20 ns to 100 ms, expressed in a floating point number. The smallest delay increment is 0.5 ns. Setting delays in CW trigger mode are invalid and ignored.

Examples:

```
OUTPUT 713;PEAK A DELAY 1.20E-6      ! Configure sensor A for a delay of 1.20 µs
OUTPUT 713;PEAK B DELAY 33.5E-9      ! Configure sensor B for a delay of 33.5 ns
```

The offset command adds a known offset to the trigger delay value. The actual value of delay would be the DELAY set plus the OFFSET set. The default value of offset is 0. The valid range of offset is -20 ns to 100 ms, expressed in a floating point number.

Example:

```
OUTPUT 713;PEAK A OFFSET 1.00E-6     ! Configure sensor A for a delay offset of 1.00 µs
```

2.4.3 Reading Values

These commands read the current settings of delay or offset.

Examples:

```
OUTPUT 713;PEAK A?          ! Query the current sensor A trigger setting

ENTER 713;TRIG$             ! Query the trigger mode setting of the sensor, and return:

CW
or
INT_TRIG
or
EXT_TRIG

OUTPUT 713;PEAK A DELAY?            ! Query the current sensor A delay setting

ENTER 713;Delay

OUTPUT 713;PEAK B OFFSET?           ! Query the current sensor B offset

ENTER 713;Offset
```

2.4.4 Commands for the 58542

The following peak power sensor GPIB commands are used with the Model 58542 VXI Universal Power Meter. Refer also to the Model 58542 Operation and Maintenance Manual for additional details.

SENSe<sensor 1 or 2>:TRIGger:SOURce<INTernal|EXTernal|CW>

This command sets the sensor (1 or 2) peak trigger mode to either the INTernal, EXTernal, or CW mode.

SENSe<sensor 1 or 2>:TRIGger:DELay[:MAGnitude]<1e-6, -20e-9,100e-3>

This command sets the sensor (1 or 2) peak delay value to any desired time from -20e-9 to 100e-3 seconds, with 1e-6 seconds being the default setting.

SENSe<sensor 1 or 2>TRIGger:OFFSet[:MAGnitude]<0, -20e-9,100e-3>

This command sets the sensor (1 or 2) trigger offset time to any desired value from -20e-9 to 100e-3 seconds, with 0 seconds being the default setting.

SENSe<sensor 1 or 2>TRIGger:LEVel[:MAGnitude]<-10 dBm, -30 dBm, 20 dBm>

When the INTernal trigger mode is in use, this command sets the trigger level to any desired power level setting from -30 to +20 dBm. Default is -20 dBm.

SENSe<sensor 1 or 2>TRIGger:LEVel[:MAGnitude]<1.700, -0.100, 5.000>

When the EXTernal trigger mode is in use, this command sets the trigger level to any desired voltage level from -0.100 to 5.000 V. Default is 1.700 V.

3

Theory of Operation

3.1 Introduction

This chapter describes the electrical operation of the Series 8035XA Peak Power Sensors.

Refer to the block diagram in Figure 3-1 to follow the general function of the sensor. The RF signal is rectified in the sensor element, and the video envelope is buffered and delayed by the input amplifier and delay buffers. This buffered envelope is available at the Detector Out connector. The Track and Hold (T&H) function tracks and follows the signal and then holds it for hundreds of microseconds. The Sample and Hold (S&H) function acquires the S&H output and holds it for hundreds of milliseconds.

The timing circuitry generates the sample pulses from the trigger input or, if the sensor is in the free run mode, from an internal oscillator.

The block diagrams, circuit descriptions, and the troubleshooting information in Chapter 4 are written around the circuit test points. The delay lines shown in Figure 3-1 are illustrated in the Analog Timing Diagram in Figure 3-3. Delay lines match the delay through the analog channel to the sample point, and the delay through the timing circuitry to the sample generator. Since fixed lumped constant delay lines are used, the match is not perfect. The delay through the

INTernal trigger is slightly longer than the delay through the EXTernal trigger due to the delay of the input differential preamp.

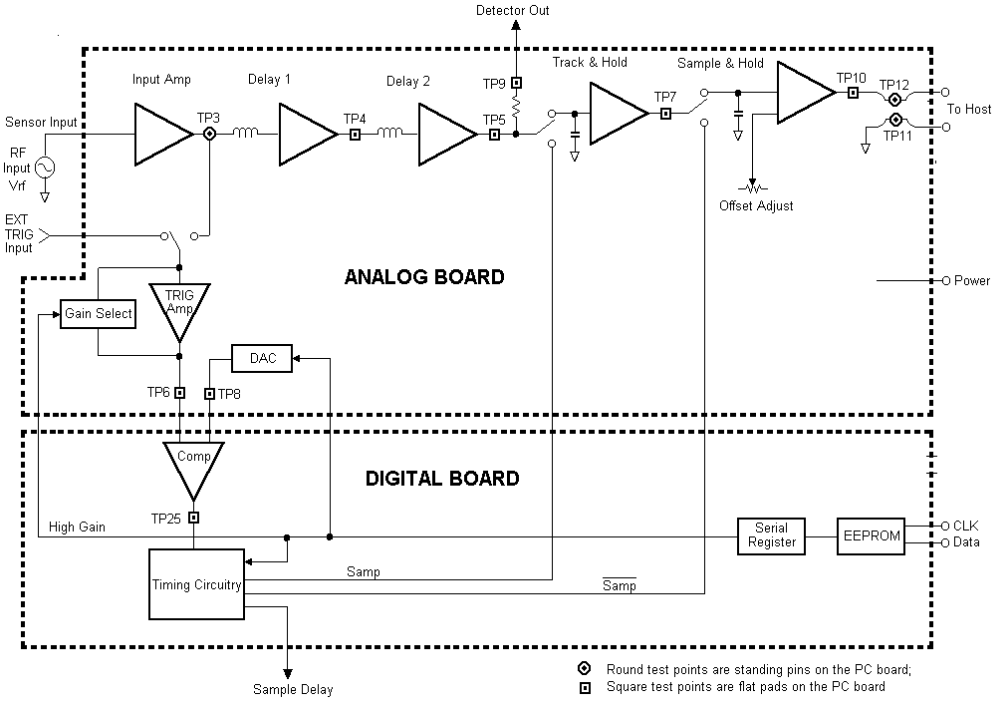


Figure 3-1: 8035XA High Level Block Diagram

3.2 Analog Assembly Description

Refer to Figure 3-2, the Analog Timing Diagram in Figure 3-3, and schematic diagram #21351 in Chapter 7 to follow the discussion of the Analog PC assembly circuit operation.

The rectified signal from the detector goes into the resistors R1 or R2 (TP1 and TP2). The signal sees 2 kΩ to ground from either input (the negative input sees 2 kΩ to a virtual ground inside R100). R3 helps to balance the input bias current. U1 and U2 delay the signal so the trigger output and video output may be viewed close together. U4 and U5 are buffers for the delay lines (TP3).

U10C and U7A provide a fast Track and Hold (T&H). U7A buffers the T&H capacitor C21, and U7B buffers the S&H capacitors, C1 & C2.

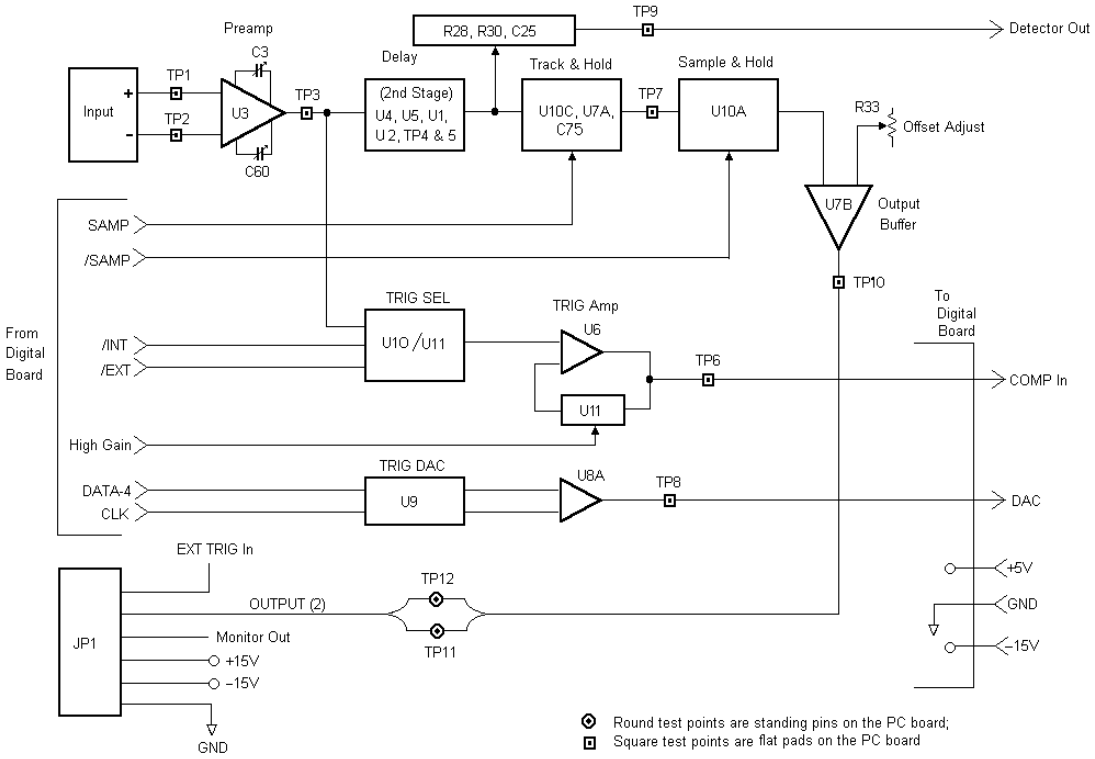


Figure 3-2: Analog PC Assembly Block Diagram

A track and hold differs from a sample and hold in the manner in which the signal prior to the hold is manipulated. In a sample and hold, the sample gate turns on and the holding capacitor is charged to the signal potential, then the sample gate turns off and the hold capacitor maintains the value of the input at the time of the sample. In a track and hold circuit, the voltage on the hold capacitor is the same as the input (tracks) until the track gate goes off, after which the level is held until the track goes on and the hold capacitor again follows the input.

The INTernal or EXTernal trigger source is selected by U10D and U11A. U11B functions as an inverter for HIGHGAIN. U6 amplifies the trigger signal by 1 or 41. Trigger DAC U9 is loaded with a count from the serial chain. The DAC needs the data signal held after the clock for at least 80 ns. A2R12 and A2C25 on the Digital board take care of that requirement. That count gets translated into a voltage between -0.1 V and about +5 V by U8A. Digital board comparator A2U18 provides the TRIG-IN pulse (A2TP25). A2R42 provides hysteresis for A2U18.

* ***NOTE:*** *All times shown in Figure 3-3 are referenced to TP3, and are not to scale.*

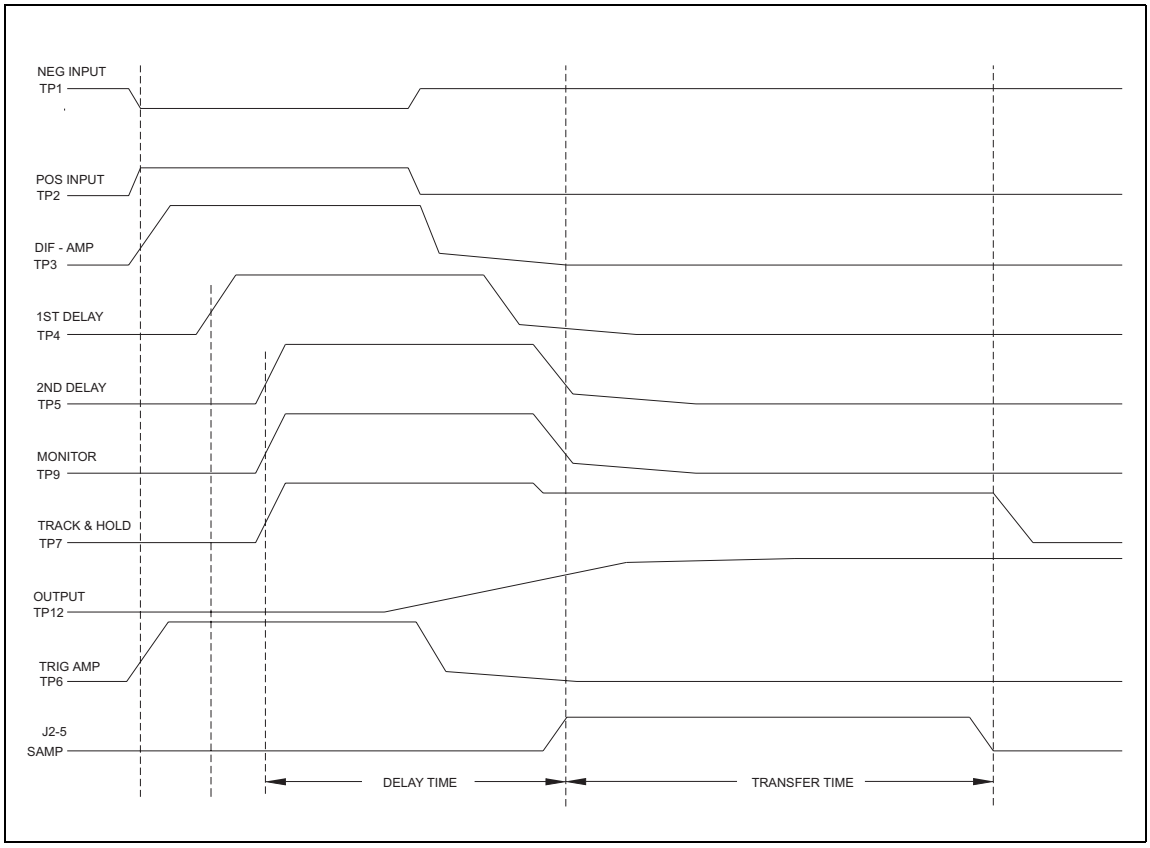


Figure 3-3: Analog Circuit Timing Diagram

3.3 Digital Assembly Description

3.3.1 Overview

Refer to the Digital PC block diagram in Figure 3-4, and the Digital Timing Diagrams in Figures 3-5, 3-6 and 3-7.

The digital board provides the timing functions for delays between a small negative time (with respect to either the video monitor, or the sampled pulse) and >100 ms. In the CW mode, the digital board is not reset, but continues to generate clocks and samples at about 70 μs intervals. In either the INTernal or EXTernal modes, an acquisition is requested by the host (the power meter to which the sensor is connected is the host) which causes READY to be set. When an input trigger is received, it is latched and delayed by a FINE delay, and then starts a 10-MHz clock. The clock increments a COARSE counter until it reaches FFFFF or all ones, and then outputs a Ripple Carry Out (RCO) signal. This is latched as SAMPle, delayed by one count, and then compared to the count of 51μs out of the counter to allow the SAMPle to be 51μs wide. Then the COARSE counter is reLOADed for about 5μs, the 10-MHz clock is stopped for about 5μs, the LOAD unasserted, and the TRIGger, SAMPle, and READY flip-flops reset for about 1μs. A 48-bit serial stream provides the 80350A configuration information. When the serial clock is running, CLKHOLD resets the TRIG loop and loads the counter.

* ***NOTE:*** *Over-score indicates a logic-NOT condition.*

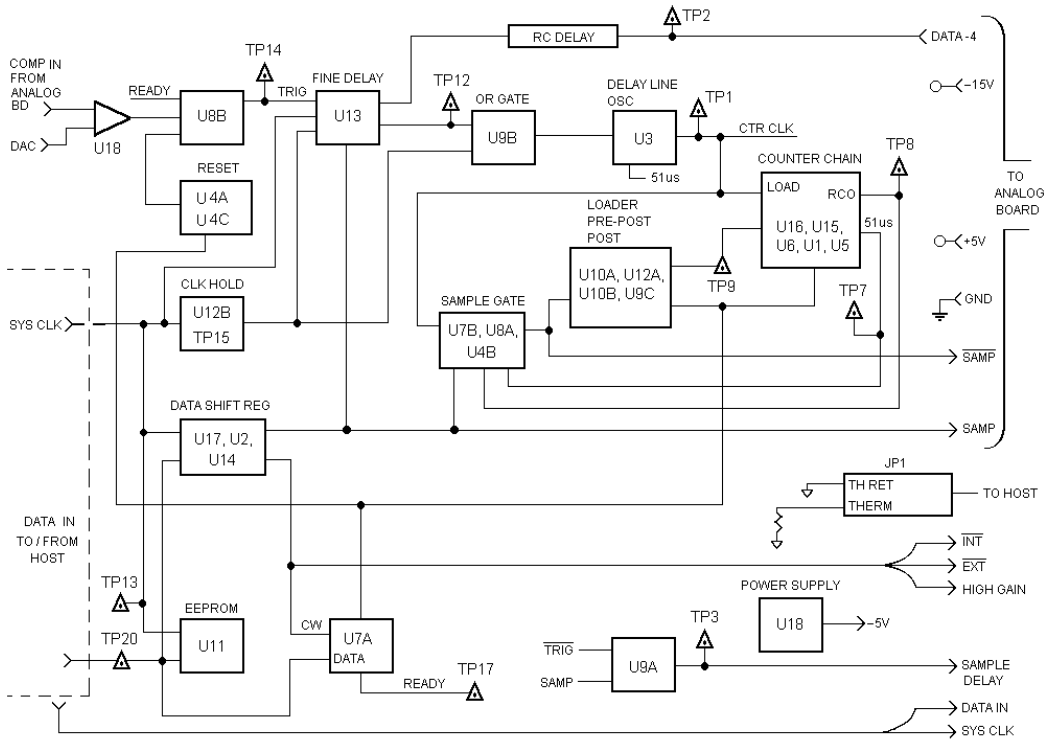


Figure 3-4: Digital PC Assembly Block Diagram

3.3.2 Description

When READY (TP17) is true, U8B flip-flop (TP14 - TRIG) is set after TRIG-IN goes high. U13 delays the TRIGgered signal by a delay programmed in 1/2 ns intervals. U3 is a 10-MHz gated delay line oscillator which, when enabled by the fine delay, clocks (TP1) the coarse counter U1, U5, U6, U15 and U16, and the SAMPLE flip-flops U7B and U8A. Unlike conventional oscillators which free run, a gated delay line oscillator beginning time period is the same length as all of its other time periods with the possible exception of the last period when enable is unasserted. When RCO (TP8) is true for one clock cycle (ignores pulses less than 100 ns), U7B is latched as SAMPle (TP11). SAMPle is delayed by one count because 51μs (TP7) can still be true when SAMPle goes true, and AND'd with 51μs from U1. When true (when SAMPle has been on for 51μs), the U10A loader receives a negative edge clock. $\overline{\text{LOAD}}$ for the COARSE counter is asserted and held low via U9C, R34, and C27 until the 10-MHz clock (U3) stops via U12A, U10B, (TP9), U4A, and U4C. Note the sequence:

1. CTR-CLK (TP1) must be running.

2. $\overline{\text{LOAD-CTR}}$ (TP9) goes low and stays low while CTR-CLK continues for at least one cycle. This loads the COARSE counter.

3. CTR-CLK (TP1) stops. $\overline{\text{LOAD-CTR}}$ is still low. CTR-CLK continues in the CW mode.

4. $\overline{\text{LOAD-CTR}}$ returns high at least 200 ns before $\overline{\text{POST}}$ (TP5) returns high. The same FINE delay which delayed the start of the 10-MHz clock now works against turning the 10-MHz clock off.

SAMP (TP11) going high turns the Track and Hold (T&H) to Hold on the Analog board, and turns the Sample and Hold (S&H) to Sample. When it goes low, the T&H goes back to tracking the input and the S&H holds the sampled signal level. U10B POST (TP5), the major reset circuit, resets READY (TP17) to prevent the trigger circuit from restarting, continues to reset TRIG (TP14) (except in the CW mode) which started in PRE-POST, and resets SAMP (TP11). When the host has read the data, the DATA-IN line is momentarily pulsed low by the host which sets READY (TP17), and pulls the DATA-IN line (TP20) low via diode CR3. Note that the DATA-IN — READY handshake does not occur in the CW mode.

EEPROM U11 stores the sensor type, serial number, and calibration constants. This IC is only accessed by the host. Except for device start and stop conditions, DATA-IN can change states only when CLK is low. After device stop has been sent, the host sends a 48-bit serial stream to set up the 80350A sensor. Four zeros are sent followed by the 12 DAC trigger bits, followed by the fine counter 8 bits, 20 bits for the COARSE counter (with FFFFF meaning zero delay), and finally the 4 control bits (INTernal, EXTernal, CW, and HIGHGAIN). Because the serial DAC on the ANALOG board has a data hold requirement of 80 ns minimum, DATA-4 (TP2) must be delayed by R12 and C25.

Incoming CLK turns on U3 (10 MHz - TP1) and U9C ($\overline{\text{LOAD}}$) (TP9) via U12B (CLKHOLD) which loads the COARSE counter with the new delay.

The test points are essentially in order across the length of both the Analog and Digital boards in the approximate order of signal progression to aid in troubleshooting. In addition, the between-the-board connectors can be used as test points.

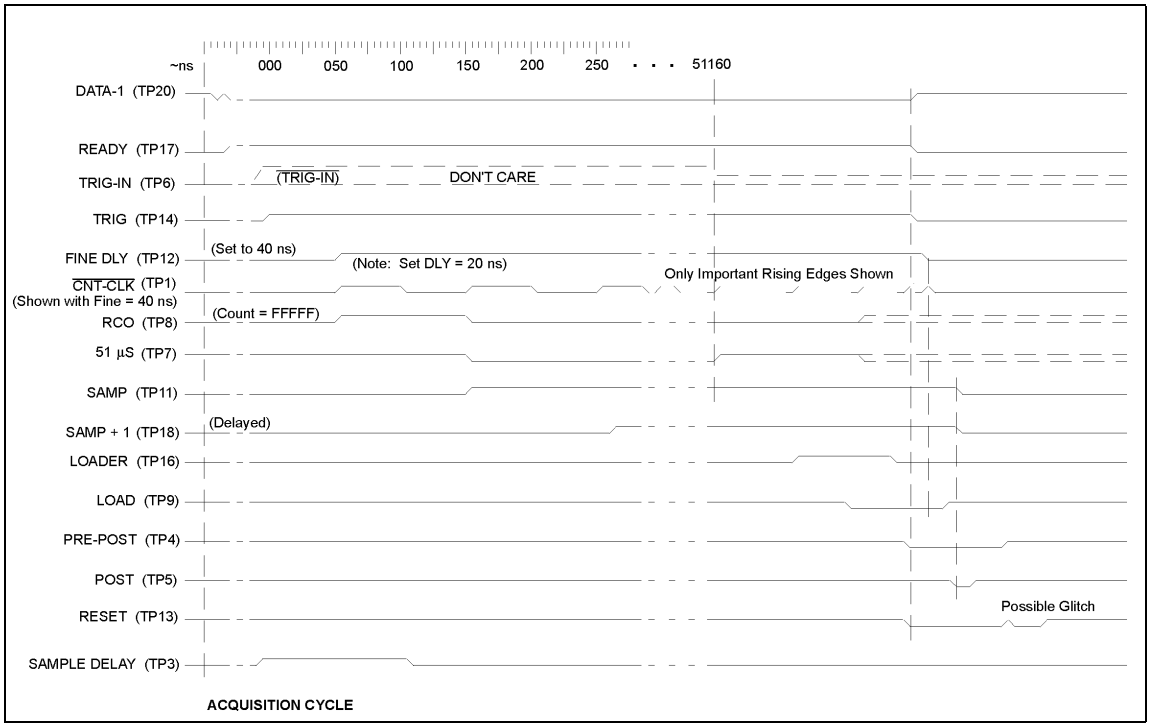


Figure 3-5: Digital Timing Diagram, INT/EXT Trig Mode

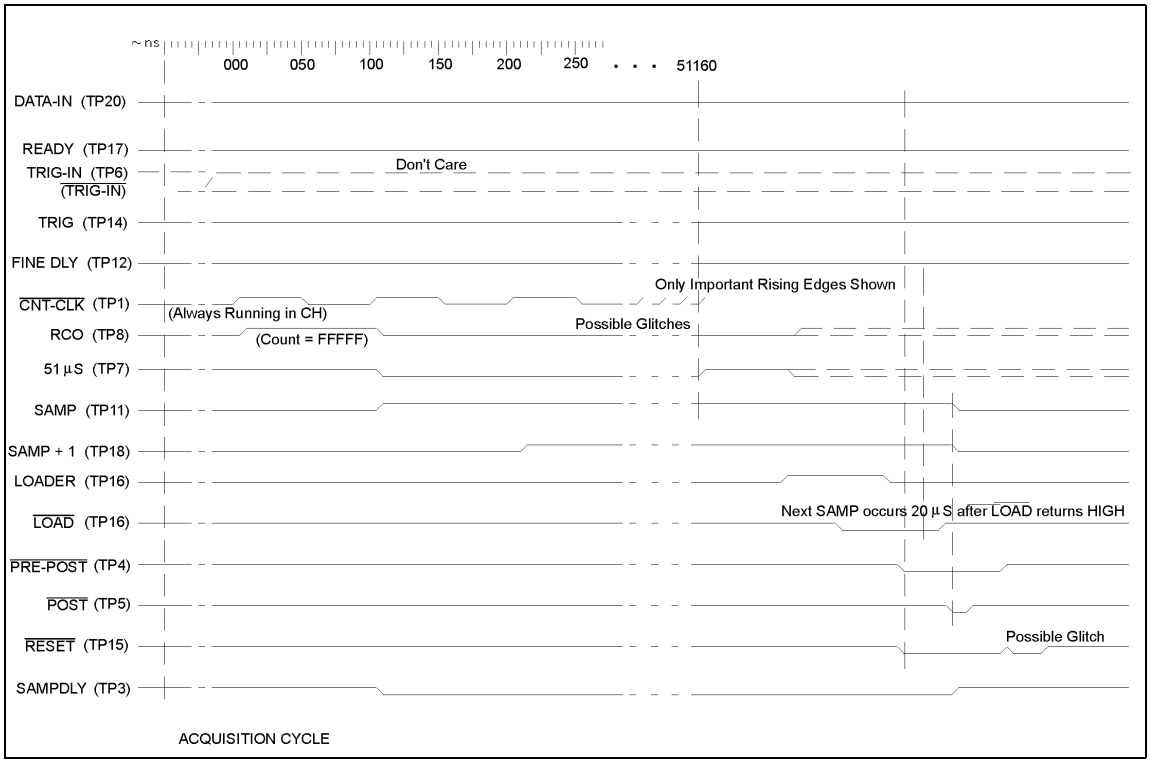


Figure 3-6: Digital Timing Diagram, CW Mode

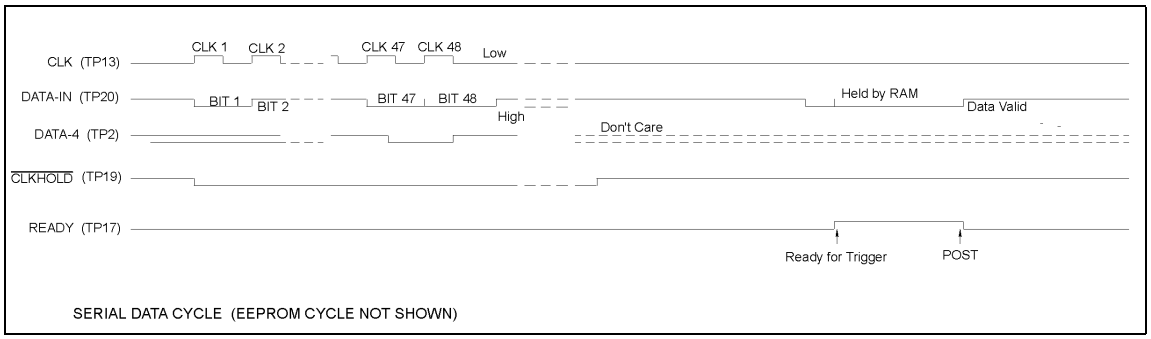


Figure 3-7: Digital Serial Data Cycle Timing Diagram

4

Calibration and Testing

4.1 Introduction

Information in this section is useful for periodic evaluation of the performance and/or receiving inspection testing of the 8035XA Series Peak Power Sensors. These tests assume that the operation of the particular 8540, 8650, Series Power Meter or Model 58542 VXI Power Meter being used with the sensor has already been verified as described in the power meter's Operation & Maintenance Manual. Verifying the Frequency Cal factors stored in the sensor EEPROM is not covered in this procedure. If necessary, the Cal Factors should be verified with a Vector Network Analyzer using similar procedures as for standard power meter sensors.

Before starting these tests, connect the Peak Power Sensor(s) to the compatible power meter, and allow at least 24 hours for warm-up. These tests will only be valid if the power meter and the sensor(s) have been calibrated at an ambient temperature between +20 °C and +30 °C (+68 °F to +86 °F), and are operating within ±3 °C (±5.4 °F) of the calibration temperature.

4.2 Equipment Required

The following items of test equipment (or equivalent) are required for completing the Performance Tests described in this chapter.

	Instrument Model	Requirements
Power Meter	Giga-tronics 8650, 8540 or 58542 Series	Compatible with 8035XA Sensor
RF Source	Wavetek Model 2510 (Hi Power Opt.) or equivalent	+20 dBm @ 50 MHz
Oscilloscope (DSO)	LeCroy 9400	Bandwidth 125 MHz
CW Thermistor Power Meter	Agilent/HP Model 432B	Inst. Acc. of at least 0.5%
Thermistor Mount	Agilent/HP 478A-H75	0 to +10 dBm range <1.1 SWR
Pulse Generator	Wavetek Model 278 or equivalent	Delay and pulse width control
Attenuators 10, 20, 30 and 40 dBm	Weinschel Model AC118A-90-33	Type N, 0.5 dB accuracy VSWR <1.20 @ 50 MHz
Directional Coupler	Narda Model 3002, 10 dB	
Low Pass Filter	Integrated Microwave Model 904 881	>50 dB Atten. @ 100 MHz

4.3 Power Linearity Test

The linearity will be tested in a series of 10 dB steps over the range of the sensor. At low power levels, the measurements will reflect the uncertainty due the noise and zeroing specifications. Make a copy of the Performance Verification Data Sheets at the end of this chapter to record the data from this test.

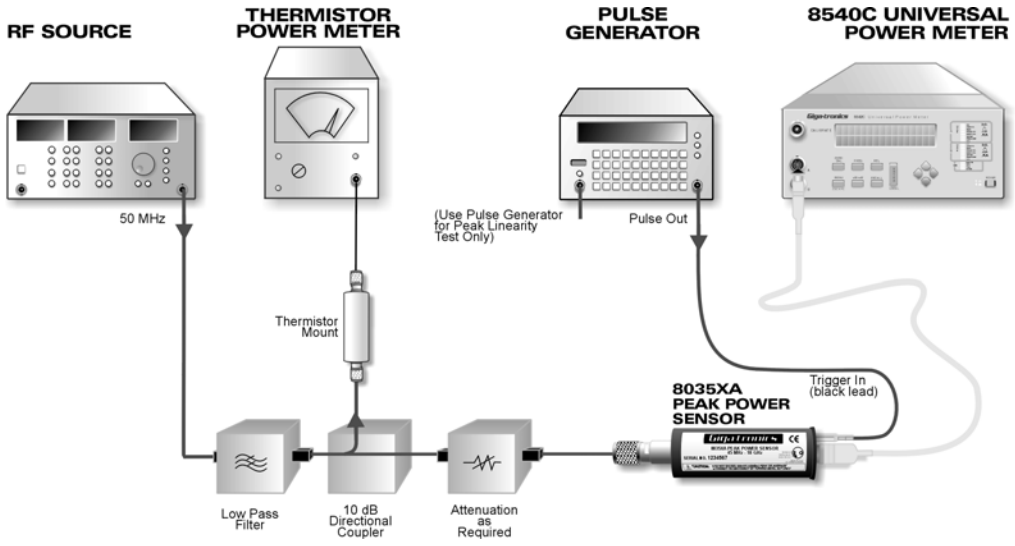


Figure 4-8: Power Linearity Test Setup

4.3.1 CW Linearity Test

1. Connect the test setup as shown in Figure 4-8. Set the RF source to 50 MHz. Be sure the sensor has had at least 24 hours of warm-up time. To take accurate measurements, it is essential to take out any drift that might occur.

   a. Calibrate the Peak Power Sensor as described in the applicable Power Meter Operation and Maintenance manual.

   b. Place the peak sensor into the CW mode.

   c. Set the power meter to display power in linear units (mW).

   d. Set Averaging to 4.

   e. Set the CW frequency to 50 MHz.

2. Start with no attenuation between the coupler and the Peak Power Sensor. Record results on the first row of the linearity data recording sheet. If the sensor being tested is an 80351A, 80352A or 80355A model, remove the attenuator from the sensor.

3. Turn the RF source off and zero the Peak Power Sensor by pressing [ZERO/CAL].

4. Zero the thermistor power meter.

5. Turn the RF source on.

6. Adjust the RF source until the thermistor power meter reads 10.0 mW ±0.25 mW.

7. Record the thermistor power meter reading, P1, and the power meter reading, R1, on the data sheet.

8. Adjust the RF source until the thermistor power meter reads 1.0 mW ±0.025 mW.

9. Record the power meter reading, P2, and the power meter reading, R2, on the data sheet.

10. Calculate and record the reference power ratio P1/P2, and the DUT reading ratio, R1/R2.

11. Calculate and record the Linearity Error using the formula:

$$\text{Linearity Error} = \left[\left(\frac{R1}{R2}\right) / \left(\frac{P1}{P2}\right) - 1\right] \times 100$$

12. Add an additional -10 dB of attenuation between the coupler and the Peak Power Sensor and repeat Steps 3 through 9, filling in the 10 dB through 40 dB (through 30 dB in Peak Mode) attenuation rows of the data sheet. On these rows, add the current linearity error to the accumulated linearity error in the row above. Verify that this accumulated error is less than the specified values given on the data sheet.

4.3.2 Peak Linearity Test

Set the sensor to EXT, 1.7 V, 10 μs, 0 offset, and connect the TRIGGER IN (black lead) to the pulse generator. Set the pulse generator to 1 kHz, and repeat all of the steps in the CW Linearity Test for this Peak Linearity verification test. Record the readings on the Peak Linearity Data recording sheet at the end of this chapter.

4.4 Trigger Modes Tests

Connect the test setup as shown in Figure 4-9. Set the pulse generator for a 100 Hz pulse repetition frequnecy. Set the RF source to generate a 2 ms wide pulse. Set the power meter to display power in linear units (mW). Set teh source to 50 MHz with a power output to approximately 1 mW (0 dBm).

1. Set the delay of the pulse generator to 0 ms.
2. Set the peak Power Sensor to EXT trigger mode with the following parameters:
   Trigger level: 1 V_{DC}
   Trigger Delay: 1 mS
   Delay Offset: 0 mS

NOTE: If the sensor under test is has an external attenuator, remove it before connecting to the sensor to the RF source.

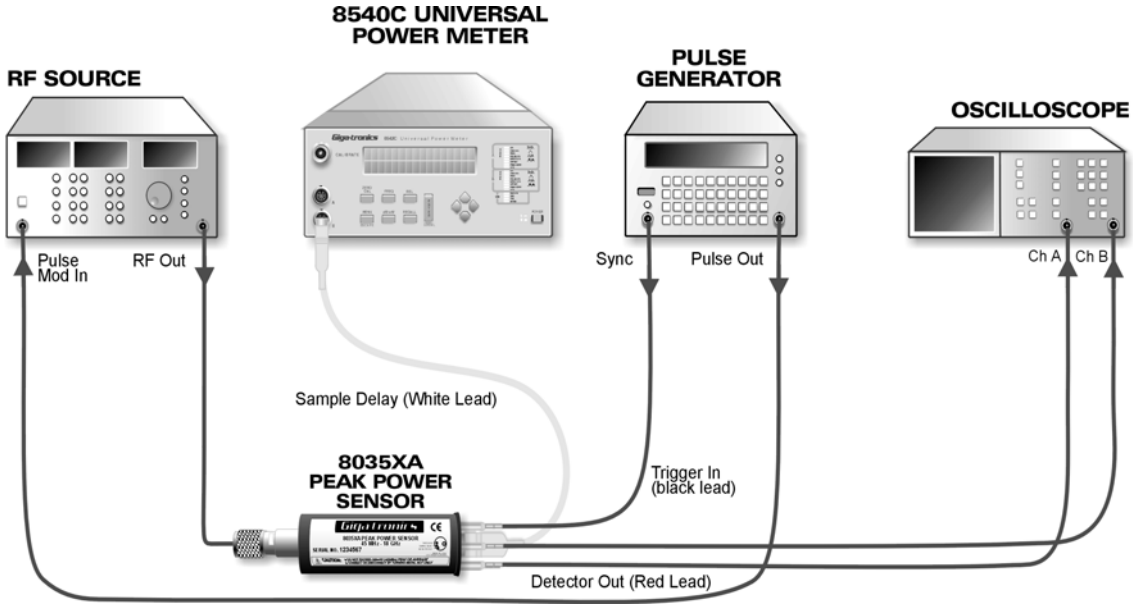


Figure 4-9: Detector Output and Trigger Level Setup

4.4.1 Detector Output Test

Leave the test setup as shown in Figure 4-9. Connect the 1 MΩ oscilloscope input to the Detector Output. Verify that the pulse has an amplitude of approximately 200 mV peak to peak for an applied signal level of 0 dBm.

4.4.2 Trigger Level Test

The following tests check for trigger sensitivity. Each section refers to a specific sensor group arranged by power capability. Refer to the appropriate section based on the sensor model being verified.

4.4.2.1 100 mW Power Peak Sensors

Set the RF source to the following settings:

50 MHz, -30 dBm
Pulse output settings:
PRF 100 Hz
Width: 2 msec
Pulse State: ON

NOTE: Applies to 80350A, 80353A and 80354A sensors only.

1. Set the Pulse Sensor trigger to Internal and sample delay to 1 ms.
2. Set the sensor trigger level to -5 dBm. Set the pulse amplitude of the RF source to 0 dBm and verify triggering by noting that the sample delay pulse is present
3. Set the RF source level to -20 dBm verify triggering does not occur.
4. Set the sensor trigger level to -10 dBm and set the RF source level to 0 dBm and verify trigger operation.
5. Set the Pulse Sensor to external trigger (EXT TRIG). Set the sensor external trigger level to 1.7 V_{DC}. Verify triggering with +5 V pulse input. Set the input level to 0 dBm. Verify that the sensor is triggered and the meter displays a valid power reading.
6. Disable the external trigger then set the input level to -10 dBm. Verify that the sensor is not triggered. The peak sensor should not trigger.

4.4.2.2 High Power Peak Sensors

Set the RF source to the following settings:

50 MHz, -30 dBm
Pulse output settings:
PRF 100 Hz
Width: 2 msec
Pulse State: ON

NOTE: Applies to 80351A, 80352A or 80355A sensors only.

1. Remove the attentuator before connecting the sensor to the pulse source. **Do not exceed +23 dBm peak input power to the sensor.**
2. Set the Pulse Sensor trigger to Internal and sample delay to 1 ms.
3. Select the appropriate table on the datasheet based on the model number of the sensor being tested.
4. Set the sensor trigger level to +15 dBm for the 80351A sensor and +25 dBm for the 80352A and 80355A sensors. Set the syntehsizer level to 0 dBm and verify trigger operation.
5. Set the RF source level to -20 dBm and verify triggering does not occur.
6. Set the trigger level to +10 dBm for the 80351A sensor and +20 dBm for the 80352A and 80355A sensors. Set the RF source level to 0 dBm and verify trigger operation..
7. Set the Pulse Sensor to external trigger (EXT TRIG). Set the external trigger to 1.7 V_{DC}. Verify triggering with +5 V pulse input. Set the input level to 0 dBm. Verify that the sensor is triggered and the meter displays a valid power reading.
8. Disable the external input trigger then set the RF source level to -10 dBm. Verify that the sensor is not triggered. The peak sensor should not trigger.

NOTE: Reset the sensor trigger when testing for a non-triggered state after the sensor has been triggered. Resetting the sensor trigger can be acheived by varying the sample delay by

0.1 nsec on the 8650A or 58542 power meters or by pressing the Enter button on the 8540C power meter.

4.4.3 Delay Test

The Upper and Lower Limits in Table 4-8 are the minimum tolerances to test Delay functionality.

NOTE: The following test is suggested to verify sensor delay functionality. Sensor delay accuracy is unspecified.

1. Connect sensor to channel A of the power meter, and then calibrate the sensor. If an 80351A, 80352A or 80355A sensor is being tested, remove the attenuator.
2. Select **PRESET** from the RECALL menu.
3. Connect the sensor to a pulse generator with a 0 dBm, 50 MHz, 2 ms pulse.
4. Use an oscilloscope or a frequency/width counter and measure the pulse width of the SAMPLE DELAY output at the settings listed in Table 6. The sample delay measurements in the chart are referenced at 1.7 V:

Table 6: Sample Delay Limits

Delay Setting	Lower Limit	Upper Limit
-20 ns	10 ns	30 ns
60 ns	40 ns	110 ns
1 μs	900 ns	1100 ns
10 μs	9 μs	11 μs
100 μs	90 μs	110 μs
1 ms	900 μs	1100 μs
100 ms	90 ms	110 ms

5. Record the test results in Table 11 and circle the appropriate Pass/Fail test status.

This completes the Specification and Performance Verification Tests for the 8035XA Peak Power Sensor. If the Sensor has performed as described in the preceding tests, it is functional and correctly calibrated.

If the sensor fails to meet the criteria defined in these tests, refer to the Maintenance and Troubleshooting chapters of this manual, or contact your local Giga-tronics Sales Representative for assistance.

Series 8035XA Peak Power Sensors Performance Verification Test Data Recording Sheet			
Date:		Model 8035_A:	
Operator:		Peak Power Sensor S/N: (if required)	
Test Number:			

CW Linearity Data							
Step Attenuator Value	**Power Set Point**	**Power Meter Reading (P)**	**power meter Reading (R)**	**Power Ratio**	**Reading Ratio**	**[1]Linearity Error (%)**	
						[3]Linearity Specification	**[2]Accumulated Linearity Error**
0 dB	10.00 mW ±0.25%	P1 =	R1 =	P1/P2 =	R1/R2 =		
	1.0 mW ±0.025%	P2 =	R2 =			±4% (±0.17 dB)	Same as Lin error above
10 dB	10.00 mW ±0.25%	P1 =	R1 =	P1/P2 =	R1/R2 =		
	1.0 mW ±0.025%	P2 =	R2 =			±4% (±0.17 dB)	
20 dB	10.00 mW ±0.25%	P1 =	R1 =	P1/P2 =	R1/R2 =		
	1.0 mW ±0.025%	P2 =	R2 =			±4% (±0.17 dB)	
30 dB	10.00 mW ±0.25%	P1 =	R1 =	P1/P2 =	R1/R2 =		
	1.0 mW ±0.025%	P2 =	R2 =			±4% (±0.17 dB)	
40 dB	10.00 mW ±0.25%	P1 =	R1 =	P1/P2 =	R1/R2 =		
	1.0 mW ±0.025%	P2 =	R2 =			±9% (±0.37 dB)	

Notes:

1. Linearity Error (%) = [(R1/R2) / (P1/P2) - 1] x 100
2. Accumulated error is the sum of the current 10 dB segment linearity error plus the previous accumulated error.
3. System linearity + power meter uncertainty + zero settability.

Peak Linearity Data							
Step Attenuator Value	**Power Set Point**	**Power Meter Reading (P)**	**power meter Reading (R)**	**Power Ratio**	**Reading Ratio**	**[1]Linearity Error (%)**	
						[3]Linearity Specification	**[2]Accumulated Linearity Error**
0 dB	10.00 mW ±0.25%	P1 =	R1 =	P1/P2 =	R1/R2 =		
	1.0 mW ±0.025%	P2 =	R2 =			±4% (±0.17 dB)	Same as Lin error above
10 dB	10.00 mW ±0.25%	P1 =	R1 =	P1/P2 =	R1/R2 =		
	1.0 mW ±0.025%	P2 =	R2 =			±4% (±0.17 dB)	
20 dB	10.00 mW ±0.25%	P1 =	R1 =	P1/P2 =	R1/R2 =		
	1.0 mW ±0.025%	P2 =	R2 =			±4.5% (±0.20 dB)	
30 dB	10.00 mW ±0.25%	P1 =	R1 =	P1/P2 =	R1/R2 =		
	1.0 mW ±0.025%	P2 =	R2 =			±9% (±0.37 dB)	

Notes:

1. Linearity Error (%) = [(R1/R2) / (P1/P2) - 1] x 100.
2. Accumulated error is the sum of the current 10 dB segment linearity error plus the previous accumulated error.
3. System linearity + power meter uncertainty + zero settability.

Table 7: 80350A, 80353A, 80354A Trigger Test

Trigger Level Setting (dBm)	Pulsed Input Level (dBm)	Meter Trigger State	Pass/Fail
-5	0	Triggered	Pass/Fail
-5	-20	Not Triggered	Pass/Fail
-10	0	Triggered	Pass/Fail

80351A Trigger Test

Table 8: 80351A Trigger Test

Trigger Level Setting (dBm)	Pulsed Input Level (dBm)	Meter Trigger State	Pass/Fail
+15	0	Triggered	Pass/Fail
+15	-20	Not Triggered	Pass/Fail
+10	0	Triggered	Pass/Fail

Table 9: 80352A, 80355A Trigger Verification

Trigger Level Setting (dBm)	Pulsed Input Level (dBm)	Meter Trigger State	Pass/Fail
+25	0	Triggered	Pass/Fail
+25	-20	Not Triggered	Pass/Fail
+20	0	Triggered	Pass/Fail

Table 10: External Trigger Verification

Trigger Level Setting (Volts)	Pulse Trigger Input (V)	Meter Trigger State	Pass/Fail
1.7	+5	Triggered	Pass/Fail
1.7	0.5	Not Triggered	Pass/Fail

Table 11: Sample Delay Test

Delay Setting	Lower/Upper Limit	Measured	Pass/Fail
-20 ns	10 - 30 ns		Pass/Fail
60 ns	40 - 110 ns		Pass/Fail
1 μs	900 - 1100 ns		Pass/Fail
10 μs	9 - 11 μs		Pass/Fail
1 ms	900 - 1100 μs		Pass/Fail
100 ms	90 - 110 ms		Pass/Fail

5

Maintenance

5.1 Introduction

There is no regularly scheduled maintenance required for the Peak Power Sensors. Utilize the normal operation calibration procedure in Chapter 2, Section 2.2 to ensure that the sensor is operating within its specified linearity.

It is recommended that the sensor rise-time, overshoot, and zero be calibrated at 6-month intervals as follows:

5.1.1 Rise-Time Adjustments

It is important that the rise time of the RF pulse be fast (about 10 ns), and without overshoot. Care is necessary to get repeatable results.

Connect the test setup as shown in Figure 4-8 of the Performance Verification Test procedure. Set the pulse generator for a 5 kHz pulse repetition frequency. Set the RF source to make a 2 μs wide pulse. Set the 8541/2 to display power in mW. Set the source to a fixed frequency at a power level near 10 dBm. Set the RF frequency to 50 MHz.

1. Set the delay of the pulse generator to 0 ns. Set the Peak Power Sensor to the delay triggered mode by pressing

   [MENU] (step to) [PEAK SNSR SETUP] [ENTER] [A] (or B) [ENTER] [EXT] [1.7] [ENTER] (Set Delay to 1μs) [ENTER] (Set Delay Offset to 0.00) [ENTER]

2. The 8541/2 will read the settled power of the pulse, approximately 10 mW.

3. Press [REL].

4. Increase the delay of the pulse generator to 900 ns. Vary the delay until the maximum power is found. Subtract 100% from this number to calculate the overshoot.

5. Increase the delay of the pulse generator until the reading drops to 90 ±1%. Note this time.

6. Increase the delay of the pulse generator until the reading drops to 10 ±1%. Note this time.

7. Subtract the time noted in Step 4 from the time noted in Step 5. The result is the 10% to 90% power rise time.

8. C3, C59 and C63 are factory select components chosen for optimum rise-time, fall-time, and overshoot. If it is necessary to change these parts, C59 and C63 should have the same value. The detector out signal on the oscilloscope will indicate the direction of change in the rise time and overshoot, but is not suitable for quantitative measurements. For best results, profile the pulse by stepping the measurements using small (about 10 ns or less) delay increments.

5.1.2 Zero Adjustment

1. This test requires that no RF is present, and that the instrument is in the CW mode. Be sure that the system is allowed to warm up at least 30 minutes. The measurement should be made quickly to prevent cooling of the circuit. Refer to Figure 5-10.

2. Remove the cover of the sensor and connect a dc millivolt meter between TP11 (Common) and TP12 (High) on the Analog Board.

3. Adjust R33 (OFFSET ADJ) for 0.00 Vdc ±100 mV.

4. Replace the cover and calibrate the sensor.

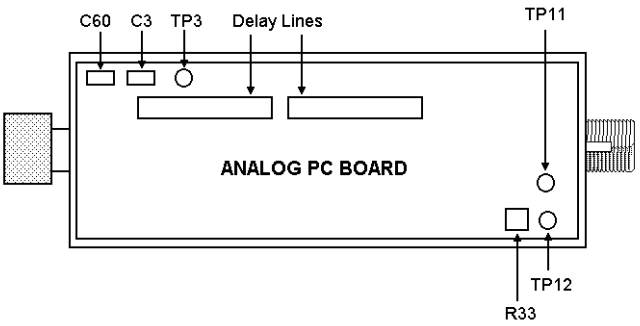


Figure 5-10: Principal Test Component Locations

5.2 Troubleshooting

Refer to the Analog and Digital PC Board schematics on pages 7-12 and 7-15, the block diagrams on pages 3-3 and 3-5, and the timing diagrams on pages 3-4, 3-7, and 3-8 for assistance in performing the following procedures.

Use a pulsed 1 GHz waveform of about 0 dBm for troubleshooting to trace the signal through the sensor. The waveform should have a rep rate of about 1 kHz, pulse width about 100 μs to start, INT trigger at -20 dBm, and delay = 0.

At times it may be required to carefully check voltages at IC pins. Since the PC boards are surface mount, careless probing can: short two pins, break leads, damage boards and, in extreme cases, cause the components to break away from the board taking pads and traces with them.

CAUTION

Static sensitive components. Use proper techniques including, but not limited to, wrist straps, anti-static mats, tools, soldering irons, desoldering tools, and proper non-static clothing.

The most common cause of failure is the application of too much power (more than +23 dBm) which destroys the diode element. This will most likely manifest itself as a non-successful completion of the sensor calibration routine. (See Chapter 2). Verifying that another sensor will calibrate successfully will isolate the fault to the peak power sensor and not the instrument.

A1TP1 should measure about -0.2V, and A1TP2 should measure about +0.2V with a 0 dB CW input. If either of these voltages are absent, the element is probably bad and should be replaced.

The following table lists problems that can occur with the sensor in the logical order that these problems might become evident. Go to the first described symptom, and then follow the instructions given in the section covering that symptom. Symptom descriptions assume that everything preceding that symptom in the table is functioning properly.

Table 5-1: Sensor Malfunction Symptoms

Symptom	Section
Sensor is not recognized as being present	5.2.1
Will not calibrate / zero	5.2.2
INTernal will not trigger or level error	5.2.3
EXTernal will not trigger or level error	5.2.4
Delay error	5.2.5

In these procedures, the component prefix A1 designates parts located on the Analog PC Board. The prefix A2 is for parts located on the Digital PC Board. Voltage levels at Monitor Out and at test points are approximate. These values vary from sensor to sensor. To ensure that proper levels are present, increase or decrease the measured input or trigger level. The measured point should change correspondingly. Certain supplies (A1U3, 4, 5, 6, and A2U18 and A2 5 V line) are isolated by 10 ohm resistors which decouple noise and can act as fuses. If one of these resistors (A1R108, 109, 110, 111, or 112, or A2R42 or A2R45) is open, replace the corresponding tantalum capacitor (A1C51, 52, 53, 54, or A1C30 or A2C19).

5.2.1 Sensor Not Present

Note that this type of failure indication is usually caused by a bad cable or a faulty temperature sensing thermistor (RT1).

With the sensor disconnected from the power meter, check the resistance from Digital board J1 pin 4 to ground. Is it about 10 kΩ?

No — A2RT1 bad.

(If A2RT1 must be replaced, be sure to install the new RT1 using heat sink compound. RT1 should protrude 0.13" above the PC board.)

Yes — Cable bad.

5.2.2 Calibration

Calibration failures are generally caused by a damaged diode element. Ensure that the system is in the CW mode. Steps 1 and 2 refer to the Analog board.

A1TP3, TP4, TP5, and TP6 should be checked for oscillation, especially if drifting occurs.

* ***NOTE:*** *Over-score indicates a logic-NOT condition.*

1. Check for a signal present at MONITOR OUT or A1TP9. (Should be near 0 mV with no signal input, and about +3 Vdc at +20 dBm.)

   No — Check as appropriate, A1TP4, then A1TP5, or A1TP3, A1TP1, and A1TP2. Replace as required (as isolated by test points and supply tests) A1U3, A1U4, or A1U5.

   Yes — Continue to Step 2.

2. (A1TP9 OK) Check for toggling signal at J2 pins 4 and 5 (SAMP and SAMP). Toggling?

   No — Continue to Step 3.

   Yes — Check A1TP7, A1TP10, and the DC OFFSET adjustment (A1R33). A1TP10 should be 0 with no signal input, and about 0.6 with +20 dBm. See Zero Adjustment in Section 5.1.2.

3. (SAMP not toggling) Refer to the Digital board. Check TRIG (A2TP14) Is it High?

   No — A2U17, A2U8, A2CR4, or A2R35 bad

   Yes — Continue to Step 4

4. (TRIG high) A2TP1 toggling? (10 MHz CTR-CLK)

   No — A2U13 (A2TP12), A2U9, or A2U3 bad

   Yes — Continue to Step 5

5. (A2TP1 OK) A2TP9 high?

   No A2U9, A2U10, or A2U12B bad

   Yes Continue to Step 6

6. (A2TP9 high) A2TP11 stuck high?

   No A2U7 bad, or the coarse counter A2U1, U5, U6, or U16. Note that A2TP8 and TP10 check the ICs on the back of the board for RCOs (Ripple Carry Outs). Note that the RCOs of the counters will glitch (Ignore pulses less than 50 ns. Adjusting the scope trigger level generally allows glitch rejection.) A pulse of approximately one clock width is necessary for the next stage to count.

   Yes A2U10, U12, U1, or U4 Check A2TP16, A2TP5, and A2TP7

5.2.3 INTernal

Internal problems are generally due to trigger problems. A1U9 has a programming peculiarity in that it requires an 80 ns hold time. A2R12 and A2C25 satisfy that requirement. If the DAC appears not to program, check A1CR1 before checking the DATA-4 timing or replacing the IC.

1. Set the trigger level to +20 dBm. Check the voltage at A1TP8. >4 Vdc.

   No A1CR1 A1U6, A1U8, A1R12, or A1C25 bad.

   Yes Continue to Step 2.

2. Set the trigger level to -30 dBm. Check the voltage at A1TP8. <+0.1 Vdc.

   No A1U6, A1U8, A1R12, or A1C25 bad.

   Yes Continue to Step 3.

3. Check for pulses (about 4 ±2 V peak) at A1TP6 with 0 dB, 1 kHz repetition rate.

   No Continue to Step 4.

   Yes Go to Step 5.

4. (A1TP6 bad) J2 pin 13 low?

   No A2U17 or A2R32 bad.

   Yes A1U10, A1U11, A1U6. Check for about 400 ±200 mV pulses at U6 pin 3. If not present, A1U10 is bad. Otherwise, replace A1U11 or A1U6.

5. Check voltage at A1TP8. Should be about +40 mVdc, about +4 Vdc with trigger level at +20 dBm, and about 0 Vdc with trigger level at -30 dBm.

   No A1CR1, A1U9, A1U8.

   Yes Check A2TP17 (READY - should be high) and A2TP6. If A2TP6 does not toggle, replace A2U18. Otherwise, replace A2U4, A2U12, or A2U8.

5.2.4 EXTernal

Check A1R127, A1R128, EXT (J2 pin 11 - A2U17 is bad if EXT is high). Otherwise, replace A1U10.

5.2.5 Delay

Delay problems are caused by the coarse counter, the fine delay, or the serial data link. Problems can be grouped by checking in order the delays shown in the table below.

This is a stuck or missing bit test. The next two digit number can be used, such as 26 ms for 25.6 ms, or 3.3 ms for 3.27 ms. The accuracy, while typically within ±2% ±5 ns, only needs to be verified to ±25% to ensure that there are no stuck bits.

Monitor the width of the SAMPLE DELAY output pulse. This signal is about 40 ns wider than the delay setting. For the first line of the table below, verify that each step is about 25 ns wider than the previous step.

All of the components listed in Table 5-2 are located on the Digital (A2) board.

Table 5-2: Digital Board Components and Signals

Signal	Comp	Signal	Comp	Signal	Comp	Signal	Comp
0 ns	U13	25 ns	U13	50 ns	U13	75 ns	U5
200 ns	U5	400 ns	U5	800 ns	U5	1.6 ns	U5
3.2 μs	U6	6.4 μs	U6	12.8 μs	U6	25.6 μs	U6
51.2 μs	U1	102.4 μs	U1	204.8 μs	U1	409.6 μs	U1
819.2 μs	U16	1.6384 ms	U16	3.2768 ms	U16	6.5536 ms	U16
13.1072 ms	U15	26.2144 ms	U15	52.4288 ms	U15	100 ms ±2%	U15

Also check the programming ICs, especially the carry pins (pin 13) of A2U17, A2U2, and A2U14.

5.2.6 Output Problems

Check A2U9 for SAMPLE DELAY, A1R28 for MONITOR OUT. Also check J1 wiring.

5.3 Sensor Element Replacement

This section describes how to disassemble the 80350A Peak Power Sensors, how to replace sensor elements, and then to reassemble the Sensors. Refer to the diagrams on pages 7-3 through 7-7, as applicable, while performing the following steps.

CAUTION

The 80350A Sensor contains Static sensitive components. Use proper techniques including wrist straps, anti-static mats, tools, soldering irons, desoldering tools, and proper non-static clothing.

5.3.1 Disassembly of the Sensor

1. Remove screws (1) and (2). Take off the sleeve holder plate and slide the sleeve off of the cap assembly.

2. Position the sensor so that the Analog PC Board (Assembly #21350) is visible, and locate the sensor element leads. They are located on the end of the PC board nearest to the sensor housing assembly. Remove the solder from the leads of the sensor element, and remove the leads from the holes in the PC board. Straighten the leads.

3. Remove the two PC boards.

4. Unscrew the sensor housing assembly from the cap assembly. Use the wrench flats on the Housing Assembly which are located closest to the cap assembly to remove the Housing Assembly. The sensor element will stay attached to the Housing Assembly.

   If the Spring Washers fall out when the sensor housing assembly is removed, they should be replaced as shown in the diagram on page 7-5.

5.3.2 Replacing the Sensor Element

CAUTION

Removal of the sensor element invalidates EEPROM calibration factors.

(Cal Factors can be verified with a Vector Network Analyzer using procedures similar to standard power meter sensors.)

1. Remove the old sensor element from the Sensor housing assembly by pulling the element straight out from the assembly. Ensure that the center pin was removed with the element. If not, carefully remove it with a pair of tweezers.

CAUTION

Do not twist the sensor element as it is being removed. Doing so may damage the center conductor of the sensor housing assembly.

2. Take the new sensor element out of its protective packaging, and carefully straighten the leads. Do not pull sharply on the leads or they may come off.

3. Carefully insert the new sensor element into the sensor housing assembly. Gently push on the sensor element to press the sensor element pin into the center conductor contact of the sensor housing assembly. Once the element has been inserted, gently try to pull it back out of the housing assembly. If there is resistance, the element is inserted correctly. If the element comes out easily, then it has not been correctly inserted into the center conductor. Remove the sensor element, make sure that the center conductor is centered in the housing, and then reinsert the element.

5.3.3 Reassembly of the Sensor

CAUTION

The 80350A Sensor contains static sensitive components. Use proper techniques including wrist straps, anti-static mats, tools, soldering irons, desoldering tools, and proper non-static clothing.

(Refer to the diagram on page 7-3)

1. Make sure that the sensor element leads are straight. Screw the sensor housing assembly into the cap assembly. Be very careful not to damage the leads of the Element.

2. Place the element leads onto the proper pads on the Analog PC board (see page 7-3). The lead from the Center pin goes to Pad 1, and the other lead goes to Pad 2. Solder the leads in place.

3. Replace the PC boards. Take care not to damage the sensor element wires.

4. After the element has been installed, it may be necessary to readjust the pulse response of the amplifier due to a possible difference in the video resistance of the new element's diodes in relationship to the old element's diodes. See Section 5.1.1 for checking and adjustment information.

5. Slide the sleeve onto the cap assembly. Replace the sleeve holder plate. Insert and tighten screws (1) and (2), and return the sensor to service.

6

Parts Lists

6.1 Introduction

This chapter contains the parts lists for major and minor assemblies in the Series 8035XA Peak Power Sensors. A list of component manufacturers is Section 6.2.

Item	Part Number	Qty	Cage	Mfr's Part Number	Description
	31554	REF	58900	31554	80350A OUTLINE DRAWING
	31670	REF	58900	31670	ATTENUATOR OUTLINE DRAWING
1	21472	REF	58900	21472	MDL 80350A SENSOR,N,18GHZ
2	21497	REF	58900	21497	SCHEMATIC,80350 SENSOR
3	16718	REF	05AJ8	COMPOUND 340	THERMAL GREASE
4	HT00-10809	4	58900	HT00-10809	8 NYLON CABLE TIE
5	17274-001	3	58900	17274-001	SPRING, DISC, BELLEVILLE, MOD.
6	PS00-00004	1	53387	2110-8X10	STATIC SHIELDING BAG
7	21469	1	58900	21469	SLEEVE
8	21470	1	58900	21470	PLATE,HOUSING END
9	21484	1	58900	21484	LABEL,80350A,18GHZ
10	HIWP-00250	4	06383	T25N-M	.25 OD SPIRAL WRAP
11	AT00-00007	1	06915	HRT-1	SPIRAL WRAPPING TOOL
12	21568	1	58900	21568	MANUAL,80350A
13	21569	1	58900	21569	PSD,MDL 80350A,SENSOR
14	21575	1	58900	21575	SCD,MDL 80350A,SENSOR
15	60338	REF	58900	60338	8035x SERIES TEST PROC
16	32114	1		32114	CODE LABEL, W/2-DIGIT
102	HBFP-25604	2	58900	HBFP-25604	2-56 X 1/4 FLAT
103	HBPP-25608	2	58900	HBPP-25608	2-56 X 1/2 PAN
A1	21350	1	58900	21350	PCB ASSY,ANALOG
A2	21353	1	58900	21353	PCB ASSY,DIGITAL. Rev Z
A3	15183	1	58900	15183	TYPE N 18.5GHZ DET.HSG.ASSY
A4	21471	1	58900	21471	SENSOR HOUSING ASSY
A5	21563	1	58900	21563	DET ELEMENT,UNTESTED,80350A
W1	21460-001	1	74970	21460-XXX	6 FT WHITE SMB-BNC CABLE
W2	21460-002	1	74970	21460-002	6 FT RED SMB-BNC CABLE
W3	21460-003	1	74970	21460-XXX	6 FT BLACK SMB-BNC CABLE

Item	Part Number	Qty	Cage	Mfr's Part Number	Description
1	21473	REF	58900	21473	MDL 80351A SENSOR,N,18GHZ,5W
2	21497	REF	58900	21497	SCHEMATIC,80350 SENSOR
3	16718	REF	05AJ8	COMPOUND 340	THERMAL GREASE
4	HT00-10809	4	58900	HT00-10809	8 NYLON CABLE TIE
5	17274-001	3	58900	17274-001	SPRING, DISC, BELLEVILLE, MOD.
6	PS00-00004	1	53387	2110-8X10	STATIC SHIELDING BAG
7	21426	1	64671	18N5W-20DB	ATTEN,5W,20DB
8	21469	1	58900	21469	SLEEVE
9	21470	1	58900	21470	PLATE,HOUSING END
10	21485	1	58900	21485	LABEL,80351A,18GHZ,5W
11	HIWP-00250	4	06383	T25N-M	.25 OD SPIRAL WRAP
12	AT00-00007	1	06915	HRT-1	SPIRAL WRAPPING TOOL
13	21568	1	58900	21568	MANUAL,80350A
14	21570	1	58900	21570	PSD,MDL 80351A,SENSOR
15	21576	1	58900	21576	SCD,MDL 80351A,SENSOR
16	60338	REF	58900	60338	8035x SERIES TEST PROC
101	HWSS-20200	2	58900	HWSS-20200	#2 X 1/8 SPLIT LOCK
102	HBFP-25604	2	58900	HBFP-25604	2-56 X 1/4 FLAT
103	HBPP-25608	2	58900	HBPP-25608	2-56 X 1/2 PAN
A1	21350	1	58900	21350	PCB ASSY,ANALOG
A2	21353	1	58900	21353	PCB ASSY,DIGITAL
A3	15183	1	58900	15183	TYPE N 18.5GHZ DET.HSG.ASSY
A4	21471	1	58900	21471	SENSOR HOUSING ASSY
A5	21563	1	58900	21563	DET ELEMENT,UNTESTED,80350A
W1	21460-001	1	74970	21460-XXX	6 FT WHITE SMB-BNC CABLE
W2	21460-002	1	74970	21460-002	6 FT RED SMB-BNC CABLE
W3	21460-003	1	74970	21460-XXX	6 FT BLACK SMB-BNC CABLE

Item	Part Number	Qty	Cage	Mfr's Part Number	Description
1	21474	REF	58900	21474	MDL 80352A SENSOR,N,18GHZ,25W
2	21497	REF	58900	21497	SCHEMATIC,80350 SENSOR
3	16718	REF	05AJ8	COMPOUND 340	THERMAL GREASE
4	HT00-10809	4	58900	HT00-10809	8 NYLON CABLE TIE
5	17274-001	3	58900	17274-001	SPRING, DISC, BELLEVILLE, MOD.
6	PS00-00003	1	53387	2110-11X15	STATIC SHIELDING BAG
7	21425	1	64671	18N25W-30DB	ATTEN,25W,30DB
8	21469	1	58900	21469	SLEEVE
9	21470	1	58900	21470	PLATE,HOUSING END
10	21486	1	58900	21486	LABEL,80352A,18GHZ,25W
11	HIWP-00250	4	06383	T25N-M	.25 OD SPIRAL WRAP
12	AT00-00007	1	06915	HRT-1	SPIRAL WRAPPING TOOL
13	21568	1	58900	21568	MANUAL,80350A
14	21571	REF	58900	21571	PSD,MDL 80352A,SENSOR
15	21577	REF	58900	21577	SCD,MDL 80352A,SENSOR
16	60338	REF	58900	60338	8035x SERIES TEST PROC
101	HWSS-20200	2	58900	HWSS-20200	#2 X 1/8 SPLIT LOCK
102	HBFP-25604	2	58900	HBFP-25604	2-56 X 1/4 FLAT
103	HBPP-25608	2	58900	HBPP-25608	2-56 X 1/2 PAN
A1	21350	1	58900	21350	PCB ASSY,ANALOG
A2	21353	1	58900	21353	PCB ASSY,DIGITAL
A3	15183	1	58900	15183	TYPE N 18.5GHZ DET.HSG.ASSY
A4	21471	1	58900	21471	SENSOR HOUSING ASSY
A5	21563	1	58900	21563	DET ELEMENT,UNTESTED,80350A
W1	21460-001	1	74970	21460-XXX	6 FT WHITE SMB-BNC CABLE
W2	21460-002	1	74970	21460-002	6 FT RED SMB-BNC CABLE
W3	21460-003	1	74970	21460-XXX	6 FT BLACK SMB-BNC CABLE

Item	Part Number	Qty	Cage	Mfr's Part Number	Description
1	21475	REF	58900	21475	MDL 80353A SENSOR,K,26.5GHZ
2	21497	REF	58900	21497	SCHEMATIC,80350 SENSOR
3	16718	REF	05AJ8	COMPOUND 340	THERMAL GREASE
4	HT00-10809	4	58900	HT00-10809	8 NYLON CABLE TIE
5	17274-001	3	58900	17274-001	SPRING, DISC, BELLEVILLE, MOD.
6	PS00-00004	1	53387	2110-8X10	STATIC SHIELDING BAG
7	21469	1	58900	21469	SLEEVE
8	21470	1	58900	21470	PLATE,HOUSING END
9	21487	1	58900	21487	LABEL,80353A,26.5GHZ
10	HIWP-00250	4	06383	T25N-M	.25 OD SPIRAL WRAP
11	AT00-00007	1	06915	HRT-1	SPIRAL WRAPPING TOOL
12	21568	1	58900	21568	MANUAL,80350A
13	21572	1	58900	21572	PSD,MDL 80353A,SENSOR
14	21578	1	58900	21578	SCD,MDL 80353A,SENSOR
15	60338	REF	58900	60338	8035x SERIES TEST PROC
101	HWSS-20200	2	58900	HWSS-20200	#2 X 1/8 SPLIT LOCK
102	HBFP-25604	2	58900	HBFP-25604	2-56 X 1/4 FLAT
103	HBPP-25608	2	58900	HBPP-25608	2-56 X 1/2 PAN
A1	21350	1	58900	21350	PCB ASSY,ANALOG
A2	21353	1	58900	21353	PCB ASSY,DIGITAL
A3	20706-001	1	58900	20706-001	8500/SAM DET HSG ASSY,TYPE K
A4	21471	1	58900	21471	SENSOR HOUSING ASSY
A5	21563	1	58900	21563	DET ELEMENT,UNTESTED,80350A
W1	21460-001	1	74970	21460-XXX	6 FT WHITE SMB-BNC CABLE
W2	21460-002	1	74970	21460-002	6 FT RED SMB-BNC CABLE
W3	21460-003	1	74970	21460-XXX	6 FT BLACK SMB-BNC CABLE

Item	Part Number	Qty	Cage	Mfr's Part Number	Description
	31597	REF	59800	31597	80354A PK PWR SENSOR DWG
	31670	REF	59800	31670	ATTENUATOR OUTLINE DWG
1	21476	REF	58900	21476	MDL 80354A SENSOR,K,40GHZ
2	21497	REF	58900	21497	SCHEMATIC,80350 SENSOR
3	16718	REF	05AJ8	COMPOUND 340	THERMAL GREASE
4	HT00-10809	4	58900	HT00-10809	8 NYLON CABLE TIE
5	17274-001	3	58900	17274-001	SPRING, DISC, BELLEVILLE, MOD.
6	PS00-00004	1	53387	2110-8X10	STATIC SHIELDING BAG
7	21469	1	58900	21469	SLEEVE
8	21470	1	58900	21470	PLATE,HOUSING END
9	21488	1	58900	21488	LABEL,80354A,40GHZ
10	HIWP-00250	4	06383	T25N-M	.25 OD SPIRAL WRAP
11	AT00-00007	1	06915	HRT-1	SPIRAL WRAPPING TOOL
12	21568	1	58900	21568	MANUAL,80350A
13	21573	REF	58900	21573	PSD,MDL 80354A,SENSOR
14	21579	REF	58900	21579	SCD,MDL 80354A
15	60338	REF	58900	60338	8035x SERIES TEST PROC
101	HWSS-20200	2	58900	HWSS-20200	#2 X 1/8 SPLIT LOCK
102	HBFP-25604	2	58900	HBFP-25604	2-56 X 1/4 FLAT
103	HBPP-25608	2	58900	HBPP-25608	2-56 X 1/2 PAN
A1	21350	1	58900	21350	PCB ASSY,ANALOG
A2	21353	1	58900	21353	PCB ASSY,DIGITAL
A3	20706-001	1	58900	20706-001	8500/SAM DET HSG ASSY,TYPE K
A4	21471	1	58900	21471	SENSOR HOUSING ASSY
A5	21563	1	58900	21563	DET ELEMENT,UNTESTED,80350A
W1	21460-001	1	74970	21460-XXX	6 FT WHITE SMB-BNC CABLE
W2	21460-002	1	74970	21460-002	6 FT RED SMB-BNC CABLE
W3	21460-003	1	74970	21460-XXX	6 FT BLACK SMB-BNC CABLE

Item	Part Number	Qty	Cage	Mfr's Part Number	Description
1	21477	REF	58900	21477	MDL 80355A SENSOR,N,18GHZ,50W
2	21497	REF	58900	21497	SCHEMATIC,80350 SENSOR
3	16718	REF	05AJ8	COMPOUND 340	THERMAL GREASE
4	HT00-10809	4	58900	HT00-10809	8 NYLON CABLE TIE
5	17274-001	3	58900	17274-001	SPRING, DISC, BELLEVILLE, MOD.
6	PS00-00003	1	53387	2110-11X15	STATIC SHIELDING BAG
7	21424	1	64671	18N50W-30DB	ATTEN,50W,30DB
8	21469	1	58900	21469	SLEEVE
9	21470	1	58900	21470	PLATE,HOUSING END
10	21489	1	58900	21489	LABEL,80355A,18GHZ,50W
11	HIWP-00250	4	06383	T25N-M	.25 OD SPIRAL WRAP
12	AT00-00007	1	06915	HRT-1	SPIRAL WRAPPING TOOL
13	21568	1	58900	21568	MANUAL,80350A
14	21574	1	58900	21574	PSD,MDL 80355A,SENSOR
15	21580	1	58900	21580	SCD,MDL 80355A,SENSOR
16	60338	1	58900	60338	8035x SERIES TEST PROC
101	HWSS-20200	2	58900	HWSS-20200	#2 X 1/8 SPLIT LOCK
102	HBFP-25604	2	58900	HBFP-25604	2-56 X 1/4 FLAT
103	HBPP-25608	2	58900	HBPP-25608	2-56 X 1/2 PAN
A1	21350	1	58900	21350	PCB ASSY,ANALOG
A2	21353	1	58900	21353	PCB ASSY,DIGITAL
A3	15183	1	58900	15183	TYPE N 18.5GHZ DET.HSG.ASSY
A4	21471	1	58900	21471	SENSOR HOUSING ASSY
A5	21563	1	58900	21563	DET ELEMENT,UNTESTED,80350A
W1	21460-001	1	74970	21460-XXX	6 FT WHITE SMB-BNC CABLE
W2	21460-002	1	74970	21460-002	6 FT RED SMB-BNC CABLE
W3	21460-003	1	74970	21460-XXX	6 FT BLACK SMB-BNC CABLE

32133	**SENSOR-S-CLOCK-BUFFER PCA, Rev. A**				
Item	Part Number	Qty	Cage	Mfr's Part Number	Description
1	32132	1	59800	32132	SENSOR-S-CLK-BUFFER PCB
2	32134	REF	59800	32134	SENSOR-S-CLK-BUFFER SCH
R1	RK40-11000	1	91637	CRCW06031001FRT1	1.0K OHM 1% FILM SMT
R2	RK40-31000	1	04222	CRCW06031003FRT1	100K OHM 1% FILM SMT
U1	UTD3-00322	1	58900	UTD3-00322	MC74HC1G32DFT2 SGL OR SM

Item	Part Number	Qty	Cage	Mfr's Part Number	Description
1	WSPC-2891X	0	04569	N304-736U-91	28 GA PVC COLOR 91
2	WSPC-2892X	0	04569	N304-736U-92	28 GA PVC COLOR 92
3	WSPC-2893X	0	04569	N304-736U-93	28 GA PVC COLOR 93
4	WSPC-2894X	0	04569	N304-736U-94	28 GA PVC COLOR 94
5	WSPC-288XX	0	04569	N304-736U-8	28 GA PVC COLOR 8
6	WSPC-289XX	0	1E584	UL1429	28 GA PVC COLOR 9
7	WSPC-281XX	0	29005	1061-28-7/36-1	28 GA PVC COLOR 1
8	WSPC-282XX	0	04569	N304-736U-2	28 GA PVC COLOR 2
9	WSPC-283XX	0	04569	N304-736-3	28 GA PVC COLOR 3
10	WSPC-284XX	0	04569	N304-736U-4	28 GA PVC COLOR 4
11	WSPC-285XX	0	04569	N304-736U-5	28 GA PVC COLOR 5
12	WSPC-286XX	0	29005	1061-28-7/36-6	28 GA PVC COLOR 6
13	WSPC-287XX	0	29005	1061-28-7/36-7	28 GA PVC COLOR 7
17	21467	1	58900	21467	HOUSING
18	16939-001	REF	58900	16939-001	THREAD LOCKING ADHESIVE-MLID
J1	20248	1	58900	20248	MOD., CONN RCPT AUDIO 14 CONT
J2	JRBM-00000	1	58900	JRBM-00000	SMB M BULK MOUNT
J3	JRBM-00000	1	58900	JRBM-00000	SMB M BULK MOUNT
J4	JRBM-00000	1	58900	JRBM-00000	SMB M BULK MOUNT
P1	JIB1-07169	1	58900	JIB1-07169	7 PIN STRIPLINE SOCKET
P2	JIB1-06169	1	58900	JIB1-06169	6 PIN STRIPLINE SOCKET

21350 ANALOG PCB ASSY (A1), Rev. P					
Item	Part Number	Qty	Cage	Mfr's Part Number	Description
1	21349	1	58900	21349	PCB,ANALOG
2	60340	REF	58900	60340	80350 ANALOG PCA TEST PROC
C1	CF63-R3100	1	68919	MKS2-0.01UF-5%-63	.01UF 63V POLYESTER
C2	CF63-R4100	1	68919	MKS2-0.1UF-10%-63	.1UF 63V POLYESTER
C3	CK50-00047	1	72982	GRH708C0G4R7D200AL	4.7PF COG CHIP CERAMIC
C5	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C6	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C7	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C8	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C9	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C10	CK50-00047	1	72982	GRH708C0G4R7D200AL	4.7PF COG CHIP CERAMIC
C11	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C12	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C13	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C14	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C15	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C16	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C21	CK50-02101	1	04222	08055A102JTN	1000 PF NPO CHIP CERAMIC
C22	CK50-00047	1	72982	GRH708C0G4R7D200AL	4.7PF COG CHIP CERAMIC
C23	CK50-00047	1	72982	GRH708C0G4R7D200AL	4.7PF COG CHIP CERAMIC
C24	CK50-00047	1	72982	GRH708C0G4R7D200AL	4.7PF COG CHIP CERAMIC
C31	CK60-04100	1	04222	12105C104KTN	.1 UF X7R CHIP CERAMIC
C51	CT25-S6101	1	04222	TAJD106M025R	10 UF 25V TANTALUM SMT
C52	CT25-S6101	1	04222	TAJD106M025R	10 UF 25V TANTALUM SMT
C53	CT25-S6101	1	04222	TAJD106M025R	10 UF 25V TANTALUM SMT
C54	CT25-S6101	1	04222	TAJD106M025R	10 UF 25V TANTALUM SMT
C58	CK50-00470	1	04222	08055A470JATMA	47PF COG CHIP CERAMIC
C59	CK50-00470	1	04222	08055A470JATMA	47PF COG CHIP CERAMIC
C63	CK50-00470	1	04222	08055A470JATMA	47PF COG CHIP CERAMIC
C66	CK50-00047	1	72982	GRH708C0G4R7D200AL	4.7PF COG CHIP CERAMIC
C67	CK50-00047	1	72982	GRH708C0G4R7D200AL	4.7PF COG CHIP CERAMIC
C68	CK50-00047	1	72982	GRH708C0G4R7D200AL	4.7PF COG CHIP CERAMIC
C70	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C71	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C72	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C73	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C74	CF63-R4100	1	68919	MKS2-0.1UF-10%-63	.1UF 63V POLYESTER
C75	CK50-01100	1	58900	CK50-01100	100 PF CERAMIC NPO
C76	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C80	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C81	CK50-00100	1	54583	CC0805HNPO15150J	10 PF NPO CHIP
CR1	DZCA-05231	1	04713	MMBZ5231B	MMBZ5231B 5.1V ZENER SMT
CR2	DSC0-00914	1	04713	MMBD914L	MMBD914L SW. DIODE SMT
CR3	DSC0-00914	1	04713	MMBD914L	MMBD914L SW. DIODE SMT
CR8	DZCA-05240	1	04713	MMBZ5240B	MMBZ5240B 10V ZENER SMT
CR9	DZCA-05240	1	04713	MMBZ5240B	MMBZ5240B 10V ZENER SMT
J1	JIA1-07118	1	58900	JIA1-07118	7 PIN STRIPLINE PLUG
J2	JIA1-13125	1	55322	BBL-113-T-E	13 PIN PLUG STRIP
R1	RK45-11000	1	65940	MCR10EZFHFX1001	1.00K OHM 1% FILM SMT
R2	RK45-11000	1	65940	MCR10EZFHFX1001	1.00K OHM 1% FILM SMT
R3	RK45-11000	1	65940	MCR10EZFHFX1001	1.00K OHM 1% FILM SMT
R7	RK45-12210	1	——-	RK73H2AT2211F	2.21K OHM 1% FILM SMT
R8	RK45-41000	1	59124	RN73K2A1004F	1M OHM 1% FILM SMT
R9	RK45-11000	1	65940	MCR10EZFHFX1001	1.00K OHM 1% FILM SMT
R10	RK45-01000	1	——-	RK73H2AT1000F	100 OHM 1% FILM SMT
R11	RK45-21000	1	——-	RK73H2AT1002F	10.0K OHM 1% FILM SMT
R12	RK45-21000	1	——-	RK73H2AT1002F	10.0K OHM 1% FILM SMT
R14	RK45-13010	1	——-	RK73H2AT3011F	3.01K OHM 1% FILM SMT

21350 ANALOG PCB ASSY (A1), Rev. P (Continued)					
Item	Part Number	Qty	Cage	Mfr's Part Number	Description
R18	RK45-11000	1	65940	MCR10EZFHFX1001	1.00K OHM 1% FILM SMT
R19	RK45-41000	1	59124	RN73K2A1004F	1M OHM 1% FILM SMT
R21	RK45-11000	1	65940	MCR10EZFHFX1001	1.00K OHM 1% FILM SMT
R27	RK45-11000	1	65940	MCR10EZFHFX1001	1.00K OHM 1% FILM SMT
R28	RK45-00499	1	——-	RK73H2AT49R9F	49.9 OHM 1% FILM SMT
R32	RK45-00000	1	——-	RM73Z2AT	0 OHM JUMPER SMT
R33	RASD-31000	1	5Y491	84PR100K	100K OHM POT 15T SURF MT
R37	RK45-11000	1	65940	MCR10EZFHFX1001	1.00K OHM 1% FILM SMT
R38	RK45-01000	1	——-	RK73H2AT1000F	100 OHM 1% FILM SMT
R39	RK45-01000	1	——-	RK73H2AT1000F	100 OHM 1% FILM SMT
R40	RK45-11000	1	65940	MCR10EZFHFX1001	1.00K OHM 1% FILM SMT
R42	RK45-11000	1	65940	MCR10EZFHFX1001	1.00K OHM 1% FILM SMT
R46	RK45-04990	1	——-	RK73H2AT4990F	499 OHM 1% FILM SMT
R47	RK45-04990	1	——-	RK73H2AT4990F	499 OHM 1% FILM SMT
R53	RK45-00000	1	——-	RM73Z2AT	0 OHM JUMPER SMT
R54	RK45-11000	1	65940	MCR10EZFHFX1001	1.00K OHM 1% FILM SMT
R55	RK45-04530	1	——-	RK73H2AT4530F	453 OHM 1% FILM SMT
R56	RK45-04530	1	——-	RK73H2AT4530F	453 OHM 1% FILM SMT
R59	RK45-01000	1	——-	RK73H2AT1000F	100 OHM 1% FILM SMT
R64	RK45-01000	1	——-	RK73H2AT1000F	100 OHM 1% FILM SMT
R77	RK45-31000	1	——-	RK73H2AT1003F	100K OHM 1% FILM SMT
R78	RK45-31000	1	——-	RK73H2AT1003F	100K OHM 1% FILM SMT
R79	RK45-31000	1	——-	RK73H2AT1003F	100K OHM 1% FILM SMT
R80	RK45-31000	1	——-	RK73H2AT1003F	100K OHM 1% FILM SMT
R81	RK45-21000	1	——-	RK73H2AT1002F	10.0K OHM 1% FILM SMT
R100	RK45-12000	1	——-	RK73H2AT2001F	2.00K OHM 1% FILM SMT
R101	RK45-31000	1	——-	RK73H2AT1003F	100K OHM 1% FILM SMT
R103	RK45-21000	1	——-	RK73H2AT1002F	10.0K OHM 1% FILM SMT
R104	RK45-11000	1	65940	MCR10EZFHFX1001	1.00K OHM 1% FILM SMT
R105	RK45-02430	1	——-	RK73H2AT2430F	243 OHM 1% FILM SMT
R106	RK45-11000	1	65940	MCR10EZFHFX1001	1.00K OHM 1% FILM SMT
R107	RK45-01000	1	——-	RK73H2AT1000F	100 OHM 1% FILM SMT
R108	RK45-00499	1	——-	RK73H2AT49R9F	49.9 OHM 1% FILM SMT
R109	RK45-00499	1	——-	RK73H2AT49R9F	49.9 OHM 1% FILM SMT
R110	RK45-00499	1	——-	RK73H2AT49R9F	49.9 OHM 1% FILM SMT
R111	RK45-00499	1	——-	RK73H2AT49R9F	49.9 OHM 1% FILM SMT
R118	RK45-04990	1	——-	RK73H2AT4990F	499 OHM 1% FILM SMT
R119	RK45-12000	1	——-	RK73H2AT2001F	2.00K OHM 1% FILM SMT
R120	RK45-22000	1	——-	RK73H2AT2002F	20.0K OHM 1% FILM SMT
R121	RK45-31000	1	——-	RK73H2AT1003F	100K OHM 1% FILM SMT
R125	RK45-11000	1	65940	MCR10EZFHFX1001	1.00K OHM 1% FILM SMT
R126	RK45-21000	1	——-	RK73H2AT1002F	10.0K OHM 1% FILM SMT
R127	RK45-31000	1	——-	RK73H2AT1003F	100K OHM 1% FILM SMT
R128	RK45-21000	1	——-	RK73H2AT1002F	10.0K OHM 1% FILM SMT
R134	RK45-14990	1	——-	RK73H2AT4991F	4.99K OHM 1% FILM SMT
TP3	ETI0-10018	1	58900	ETI0-10018	BLACK TEST POINT
TP11	ETI0-10018	1	58900	ETI0-10018	BLACK TEST POINT
TP12	ETI0-10018	1	58900	ETI0-10018	BLACK TEST POINT
U1	LD0S-00500	1	58900	LD0S-00500	50 NS FIXED DELAY LINE
U2	LD0S-00500	1	58900	LD0S-00500	50 NS FIXED DELAY LINE
U3	UFD0-00829	1	24355	AD829JR	AD829JR VIDEO OP AMP
U4	UFD0-00829	1	24355	AD829JR	AD829JR VIDEO OP AMP
U5	UFD0-00829	1	24355	AD829JR	AD829JR VIDEO OP AMP
U6	UFD0-00829	1	24355	AD829JR	AD829JR VIDEO OP AMP
U7	UFD0-00648	1	24355	AD648JR	AD648JR BIFET OP AMP
U8	UFD0-00648	1	24355	AD648JR	AD648JR BIFET OP AMP
U9	UID0-08043	1	58900	UID0-08043	DAC8043FS 12 BIT D/A
U10	ULD0-00611	1	17856	DG611DY	DG611DY QUAD SPST SWITCH
U11	ULD0-00611	1	17856	DG611DY	DG611DY QUAD SPST SWITCH

21353	DIGITAL PCB ASSY (A2), Rev. Z				
Item	Part Number	Qty	Cage	Mfr's Part Number	Description
1	21352	1	58900	21352	PCB,DIGITAL
2	21354	REF	58900	21354	SCHEMATIC,DIGITAL
3	60339	REF	58900	60339	80350 DIGITAL PCA TEST PROC
4	60339	REF	58900	60339	80350 DIGITAL PCA TEST PROC
5	20772-002	2	46384	KFS2-256	FSTNR, PRCB 2-56 X .065
6	32133	1	58900	32133	SENSOR-S-CLK-BUFFER PCA
C1	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C2	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C3	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C4	CK50-01100	1	58900	CK50-01100	100 PF CERAMIC NPO
C5	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C6	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C7	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C8	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C9	CK50-01100	1	58900	CK50-01100	100 PF CERAMIC NPO
C10	CK50-01100	1	58900	CK50-01100	100 PF CERAMIC NPO
C12	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C13	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C14	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C15	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C16	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C17	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C18	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C25	CK50-00470	1	04222	08055A470JATMA	47PF COG CHIP CERAMIC
C26	CK50-03100	1	31433	C0805C103K5RAC	.01 UF X7R CHIP
C27	CK50-01100	1	58900	CK50-01100	100 PF CERAMIC NPO
C30	CT15-S6100	1	31433	CWR11HH106MM	10 UF 15V TANTALUM SMT
C31	CT15-S6100	1	31433	CWR11HH106MM	10 UF 15V TANTALUM SMT
C32	CK50-00100	1	54583	CC0805HNPO15150J	10 PF NPO CHIP
CR2	DSC0-00914	1	04713	MMBD914L	MMBD914L SW. DIODE SMT
CR3	DSC0-00914	1	04713	MMBD914L	MMBD914L SW. DIODE SMT
CR4	DSC0-00914	1	04713	MMBD914L	MMBD914L SW. DIODE SMT
CR5	DPAB-00040	1	18041	SD103A	MBR040 .5A 40V RECTIFIER
CR6	DZCA-05231	1	04713	MMBZ5231B	MMBZ5231B 5.1V ZENER SMT
CR7	DSC0-00914	1	04713	MMBD914L	MMBD914L SW. DIODE SMT
J1	JIA1-06119	1	58900	JIA1-06119	6 PIN STRIPLINE PLUG
P1	JIB1-13125	1	63058	SBU-1X13-STGT-118	13 PIN SOCKET STRIP
R1	RK45-21000	1	——-	RK73H2AT1002F	10.0K OHM 1% FILM SMT
R2	RK45-21000	1	——-	RK73H2AT1002F	10.0K OHM 1% FILM SMT
R3	RK45-21000	1	——-	RK73H2AT1002F	10.0K OHM 1% FILM SMT

21353	DIGITAL PCB ASSY (A2), Rev. Z				
Item	Part Number	Qty	Cage	Mfr's Part Number	Description
R5	RK45-31000	1	——-	RK73H2AT1003F	100K OHM 1% FILM SMT
R8	RK45-41000	1	59124	RN73K2A1004F	1M OHM 1% FILM SMT
R9	RK45-31000	1	——-	RK73H2AT1003F	100K OHM 1% FILM SMT
R10	RK45-32000	1	——-	RK73H2AT2003F	200K OHM 1% FILM SMT
R12	RK45-21000	1	——-	RK73H2AT1002F	10.0K OHM 1% FILM SMT
R15	RK45-01000	1	——-	RK73H2AT1000F	100 OHM 1% FILM SMT
R16	RK45-01000	1	——-	RK73H2AT1000F	100 OHM 1% FILM SMT
R17	RK45-00499	1	——-	RK73H2AT49R9F	49.9 OHM 1% FILM SMT
R30	RK45-11000	1	65940	MCR10EZFHFX1001	1.00K OHM 1% FILM SMT
R32	RK45-11000	1	65940	MCR10EZFHFX1001	1.00K OHM 1% FILM SMT
R33	RK45-31000	1	——-	RK73H2AT1003F	100K OHM 1% FILM SMT
R34	RK45-14990	1	——-	RK73H2AT4991F	4.99K OHM 1% FILM SMT
R35	RK45-11000	1	65940	MCR10EZFHFX1001	1.00K OHM 1% FILM SMT
R37	RK45-11000	1	65940	MCR10EZFHFX1001	1.00K OHM 1% FILM SMT
R40	RK45-00100	1	——-	RK73H2AT10R0F	10.0 OHM 1% FILM SMT
R41	RK45-11000	1	65940	MCR10EZFHFX1001	1.00K OHM 1% FILM SMT
R42	RK45-41000	1	59124	RN73K2A1004F	1M OHM 1% FILM SMT
R43	RK45-11000	1	65940	MCR10EZFHFX1001	1.00K OHM 1% FILM SMT
R44	RK45-11000	1	65940	MCR10EZFHFX1001	1.00K OHM 1% FILM SMT
R46	RK45-21000	1	——-	RK73H2AT1002F	10.0K OHM 1% FILM SMT
RT1	RTC2-21000	1	56866	QTMC-14	10 K OHM THERMISTOR
U1	UTD0-01636	1	04713	MC74ACT163D	74ACT163D BIN COUNTER SMT
U2	UTD0-01642	1	04713	MC74HC164D	MC74HC164D SHIFT REGISTER
U3	21526	1	58900	21526	DELAY LINE ASSY
U4	UTD0-00102	1	58900	UTD0-00102	74HC10D 3 INPUT NAND SMT
U5	UTD0-01636	1	04713	MC74ACT163D	74ACT163D BIN COUNTER SMT
U6	UTD0-01636	1	04713	MC74ACT163D	74ACT163D BIN COUNTER SMT
U7	UTD0-00749	1	04713	MC74AC74D	74VHC74M DUAL D FF SMT
U8	UTD0-00749	1	04713	MC74AC74D	74VHC74M DUAL D FF SMT
U9	UTD0-00024	1	04713	MC74F02D	74F02D QUAD 2IN NOR
U10	UTD0-45382	1	66958	M74HC4538M1	MM74HC4538M DUAL MULTI
U11	UMD1-02404	1	60395	X24C04S14 (SM)	X24C04S14 512 x 8 EEPROM
U12	UTD0-45382	1	66958	M74HC4538M1	MM74HC4538M DUAL MULTI
U13	UIN1-01020	1	0B0A9	DS1020S-50	DS1020S-25 PROG DELAY
U14	UTD0-01642	1	04713	MC74HC164D	MC74HC164D SHIFT REGISTER
U15	UTD0-01636	1	04713	MC74ACT163D	74ACT163D BIN COUNTER SMT
U16	UTD0-01636	1	04713	MC74ACT163D	74ACT163D BIN COUNTER SMT
U17	UTD0-01642	1	04713	MC74HC164D	MC74HC164D SHIFT REGISTER
U18	ULD0-01016	1	64155	LT1016CS8	LT1016CS8 COMPARATOR

6.2 List of Manufacturers

The names and addresses of manufacturers cited in the preceding parts lists are shown in Table 6-1. Each manufacturer is listed under its CAGE number (COMMERCIAL AND GOVERNMENT ENTITY), as noted in the parts lists. In a few cases, no CAGE number has been assigned.

Table 6-1: List of Manufacturers

Cage	Supplier	Name	Address	City	State
53387	3M	3M Electronics Products Division	6801 River Pl. Blvd.	Austin	TX
53387	ITWPAN	3M Electronics Products Division	309 E. Crossroads Prkwy.	Bolingbrook	IL
-----	A&J	A&J Manufacturing Co. Inc.	11121 Hindry Ave.	Los Angeles	CA
53387	APWELE	APW Electronic Solutions	14100 Danielson St.	Poway	CA
53387	ARC	ARC Technology, Inc.	11 Chestnut St.	Amesbury	MA
-----	ATP	ATP Technologies, Inc.			
04222	AVX	AVX Ceramics	19th Ave. S.	Myrtle Beach	SC
30161	AAVID	Aavid	1 Kool Path	Lacona	NH
-----	ADVPWR	Advance Power, Inc.	11035 Switzer Ave.	Dallas	TX
61638	ADVANC	Advanced Interconnections	5 Energy Wy.	West Warwick	RI
34335	AMD	Advanced Micro Devices	910 Thompson Pl.	Sunnyvale	CA
4U751	ADV/SE	Advanced Semiconductor, Inc.	7525 Ethel Ave., Unit G	North Hollywood	CA
00656	AEROVO	Aerovox	740 Belleville Ave.	New Bedford	MA
OH379	AEROWA	Aerowave Inc.	344 Salem St.	Medford	MA
9Y422	AIR	Air Filtration Products Inc.	707 N. Main Ave.	Tucson	AZ
52750	ALAN	Alan Industries	745 Greenway Dr.	Columbus	IN
56563	ALATEC	Alatec Products	21123 Nordhoff St.	Chatsworth	CA
-----	ALCO	Alco Electronics Products Inc.	1551 Osgood St.	North Andover	MA
0EUK7	ALLAME	All American Transistor Corp.	369 VanNess Wy.	Torrance	CA
01121	ALLEN	Allen Bradley Co.	1201 S. Second St.	Milwaukee	WI
-----	ALLIED	Allied Electronics, Inc.	2105 Lundy Ln.	San Jose	CA
-----	ALLSWI	Allied Swiss Screw Products, Inc.	2636 Vista Pacific Dr.	Oceanside	CA
-----	ALLSTR	Allstar Magnetics			
-----	ALMAGU	Almaguer Precession Manufacturing	1240 Yard Ct., Bldg. J	San Jose	CA
17540	ALPIND	Alpha Industries	20 Sylvan Rd.	Woburn	MA
92194	ALPSEM	Alpha Semiconductor Inc.	1031 Serpentine Ln.	Pleasanton	CA
92194	ALPHA	Alpha Wire Corp.	711 Lidgerwood Ave.	Elizabeth	NJ
67183	ALTERA	Altera Corp.	2610 Orchard Prkwy.	San Jose	CA
06540	AMATOM	Amatom Div. of New Haven Mfg. Co	446 Blake St.	New Haven	CT
99800	DELEVA	American Precision Ind. Delevan Div.	270 Quaker Rd.	East Aurora	NY
1HY41	AMER R	American Relays Inc.	10306 Norwalk Blvd.	Sante Fe Springs	CA
84411	AM SHI	American Shizuki Corp.	301 W. O St.	Ogallaia	NE
-----	SKYNET	American Skynet Electronic	1474 Gladding Ct.	Milpitas	CA
29990	ATC	American Technical Ceramics	1 Norden Ln.	Huntington Station	NY
09769	AMP	Amp Inc.	2800 Fulling Rd.	Harrisburg	PA
34553	AMPERE	Amperex Electronics Corp.		Hauppauge	NY
74868	AMPHEN	Amphenol Corp.	One Kennedy Ave.	Danbury	CT

Table 6-1: List of Manufacturers (Continued)

Cage	Supplier	Name	Address	City	State
24355	ANALOG	Analog Devices, Inc.	1 Technology Wy.	Norwood	MA
04ZM0	APPLIE	Applied Thin-Film Products	3439 Edison Wy.	Fremont	CA
-----	ARCO	Arco Electronics	400 Moreland Rd.	Commack	NY
1HYW5	ARDIN	Ardin Frequency Control, Inc.	150 Paularino Ave # 166	Costa Mesa	CA
51167	ARIES	Aries Electronics Inc.	62 Trenton Ave.	Frenchtown	NJ
61529	AROMAT	Aromat Corp.	629 Central Ave.	New Providence	NJ
46467	AROW	Arow Fasteners Inc.	31012 Huntwood Ave.	Hayward	CA
-----	ASSOCC	Associated Components Technology	11576 Trask Ave.	Garden Grove	CA
4J995	ASSOCS	Associated Spring	401 E. Stadium Blvd.	Ann Arbor	MI
62277	ATLAS	Atlas Wire and Cable Corp.	133 S. Van Norman Rd.	Montebello	CA
1FN41	ATMEL	Atmel	2325 Orchard Prkwy.	San Jose	CA
91506	AUGAT	Augat Inc.	452 John Dietsch Blvd.	Attleboro Falls	MA
24539	AVANTE	Avantek, Inc. (HP Components)	3175 Bowers Ave.	Santa Clara	CA
65517	AYER	Ayer Engineering	1250 W. Roger Rd.	Tucson	AZ
21604	BRDE00	Brothers Electronics	438 S. Military Trail	Deerfield Beach	FL
53387	BROTHE				
1E584	BAY	Bay Associates	150 Jefferson Dr.	Menlo Park	CA
52683	BAYTRO	Baytron Co. Inc.	344 Salem St.	Medford	MA
13150	BEAU	Beau Interconnect	4 Aviation Dr.	Gilford	NH
5Y491	BECKMA	Beckman Industrial	4141 Palm St.	Fullerton	CA
16428	BELDEN	Belden Corp.	350 NW. 'N' St.	Richmond	IN
55285	BERQUI	Berquist Co. Inc.	5300 Edina Industrial Blvd.	Minneapolis	MN
0Y1C7	BIPOLA	Bipolarics Inc.	108 Albright Wy.	Los Gatos	CA
32559	BIVAR	Bivar Inc.	4 Thomas St.	Irvine	CA
71034	BLILEY	Bliley Electric Co.	2545 W. Grandview Blvd.	Erie	PA
32997	BOURNS	Bourns Inc.	1200 Columbia Ave.	Riverside	CA
57834	BRIM	Brim Electronics Inc.	120 Home Pl.	Lodi	NJ
21604	BUCKEY	Buckeye Stamping	555 Marion Rd.	Columbus	OH
71218	BUD	Bud Industries	4605 E. 355th St.	Willoughby	OH
09922	BURNDY	Burndy Corp.	1 Richards Ave.	Norwalk	CT
13919	BURR B	Burr Brown Research Corp.	6730 S. Tucson Blvd.	Tucson	AZ
-----	BUSSMA	Bussmann Manufacturing	114 Old St. Rd.	St. Louis	MO
0RF16	C&D	C&D Electronics	28 Appleton St.	Holyoke	MA
09353	C&K	C&K Components	57 Stanley Ave.	Watertown	MA
46381	CALRAD	California Radomes	364 Reed St.	Santa Clara	CA
53387	CAPLUG	Caplugs	2150 Elmwood Ave.	Buffalo	NY
53387	CENSEM	Central Semi			
----	CLIPPR	Clipper			
53387	COMPAS	Compass Components	48502 Kato Rd.	Fremont	CA
53387	CPCLAI	CP Claire			
71450	CTS	CTS Corp.	1201 Cumberland Ave.	West Lafayette	IN
16733	CABLEW	Cablewave Systems Inc.	60 Dodge Ave.	North Haven	CT

Table 6-1: List of Manufacturers (Continued)

Cage	Supplier	Name	Address	City	State
09CW5	CALCHP	Cal Chip Electronics	59 Steamwhistle Dr.	Ivyland	PA
56427	CALMIC	California Micro Devices	215 Topaz St.	Milpitas	CA
0N0K0	CALOGI	Calogic Corp.	237 Whitney Pl.	Fremont	CA
53387	CAPAX	Capax Technologies, Inc.	24842 Ave. Tibbitts	Valencia	CA
65664	CATAMO	Catamount Manufacturing Inc.	158 Governor Dr.	Orange	MA
2J873	CELERI	Celeritek Inc.	3236 Scot Blvd.	Santa Clara	CA
51642	CENTRE	Centre Capacitor Inc.	2820 E. College Ave.	State College	PA
56988	CENTRY	Century Spring Corp.	P.O. Box 15287, 222 E. 16th St.	Los Angeles	CA
01963	CHERRY	Cherry Electrical Products	3600 Sunset Ave.	Waukegan	IL
8W262	CHOMER	Chomerics Inc.	16 Flagstone Dr.	Hudson	NY
52072	CIR AS	Circuit Assembly Corp.	18 Thomas St.	Irvine	CA
-----	CIREXX	Cirexx Corp.	3391 Keller Street	Santa Clara	CA
12697	CLAROS	Clarostat Sensors and Controls	12055 Rojas Dr., Ste. K	El Paso	TX
-----	CODI/S	Codi Semiconductor	144 Market St.	Kenilworth	NJ
02113	COILCR	Coilcraft Inc.	1102 Silver Lake Rd.	Cary	IL
0NFL0	COILTR	Coiltronics Inc.	6000 Park of Commerce Blvd.	Boca Raton	FL
62839	COMLIN	Comlinear	4800 Wheaton Dr.	Fort Collins	CO
-----	COMPAR	Compar Corp.	85 Spy Ct.	Markham, Ontario, Canada	
55801	COMP D	Compensated Devices	166 Tremont St.	Melrose	MA
0ABX4	COMPTE	Comptec International LTD	7837 Custer School Rd.	Custer	WA
18310	CONCOR	Concord Electronics Corp.	30 Great Jones St.	New York	NY
08MU3	CONDUC	Conductive Rubber Technology, Inc.	22125 17th Ave.	Bothell	WA
26923	CONTRO	Control Master Products	1062 Shary Cr.	Concord	CA
05245	CORCOM	Corcom Inc.	1600 Winchester Rd.	Libertyville	IL
14655	CORNEL	Cornell Dublier Electronics	1605 E. Rodney French Blvd.	New Bedford	MA
14674	CORNIN	Corning Glass Works	Houghton Pk.	Corning	NY
34808	CUSTCO	Custom Coils Inc.	109 S. Iowa St.	Alcester	SD
65786	CYPRES	Cypress Semiconductor Corp.	3901 N. First St.	San Jose	CA
-----	DCELEC	DC Electronics	1870 Little Orchard St.	San Jose	CA
53387	DCSU00	DC Machine	220 Humboldt Crt.	Sunnyvale	CA
53387	DIALAC	DialAct Corp.	45979 Warm Springs Blvd., Ste. 1	Fremont	CA
57032	DADEN	Daden Associates Inc.	1001 Calle Amanacer	San Clemente	CA
91637	DALE	Dale Electronics Inc.	1122 Twenty Third St.	Columbus	NE
0B0A9	DALLAS	Dallas Semiconductor Corp.	6350 Beltwood Pkwy. S.	Dallas	TX
-----	DATCIR	Data Circuits Systems, Inc.			
50721	DATEL	Datel Inc.	11 Cabot Blvd.	Mansfield	MA
34785	DEK	Dek Inc.	3480 Swenson Ave.	St. Charles	IL
0JBU8	DELNET	Delnetics	521 Wilbur Ave.	Antioch	CA
1JB33	DEXTER	Dexter Corp.	1 Dexter Dr.	Seabrook	NH
83330	DIALIG	Dialight Corp.	1913 Atlantic Ave.	Manasquan	NJ
55153	DIEL L	Dielectric Laboratories	69 Albany St.	Cazenovia	NY
18041	DIODEI	Diode Inc.	21243 Ventura Blvd.	Woodland Hills	CA

Table 6-1: List of Manufacturers (Continued)

Cage	Supplier	Name	Address	City	State
0AX52	DITOM	Ditom Microwave Inc.	1180 Coleman Ave. #103	San Jose	CA
05AJ8	DOW	Dow Corning Corp.	Wolverine Building	Midland	MI
0JNR4	DUPONT	Dupont Electronics	825 Old Trail Rd.	Wilmington	DE
2J899	DYNAWA	Dynawave Inc.	94 Searle St.	Georgetown	MA
74970	EFJOHN	E. F. Johnson Co.	299 Johnson Ave.	Waseca	MN
72825	EBY	EBY Co.	4300 H St.	Philadelphia	PA
53387	ECMETL	EC Metal Plating	3005 Copper Rd.	Santa Clara	CA
-----	EDT	EDT	2680 Walnut Ave., Unit C	Tustin	CA
05820	WAKEFI	EG&G Wakefield Engineering	60 Audubon Rd.	Wakefield	MA
-----	EL CAP	EL Cap	116 Depot Ave.	Elgin	TX
2J899	EXCELF	Excelfab	1020 Morse Ave.	Sunnyvale	CA
78553	EATON	Eaton Corp.	1060 W. 130th St.	Brunswick	OH
0GUG6	ECLIPT	Ecliptek	18430 Bandilier Cr.	Fountain Valley	CA
31781	EDAC	Edac Inc.	40 Tiffield Rd.	Scarborough, Ontario, Canada	
91662	ELCO	Elco Corp.	801 Seventeenth Ave. S.	Myrtle Beach	SC
-----	ELEFIL	Electro-Films Inc.	111 Gilbane St.	Warwick	RI
-----	EE&I	Electronic Eyelet & Interconnect	911 Bern Ct.	San Jose	CA
14604	ELMWOO	Elmwood Sensors Inc.	500 Narragansett Pk. Dr.	Pawtucket	RI
64013	ELNA	Elna America, Inc.	5770 Warland Dr.	Cypress	CA
0JMR7	EMERSO	Emerson & Cuming	61 Holton St.	Worburn	MA
-----	ENVIRO	Enviro Tech International	P.O. Box 5052	Alameda	CA
33246	EPOTEK	Epoxy Technology Inc.	14 Fortune Dr.	Billerica	MA
0HAF7	EPSON	Epson America, Inc.	20770 Madrona Ave.	Torrance	CA
72982	ERIE	Erie Technological	645 W. Eleventh St.	Erie	PA
8B808	EVAPOR	Evaporated Coatings, Inc.	2365 Maryland Rd.	Willow Grove	PA
65964	EVOX	Evox-Rifa Inc.	100 Tri-State International	Lincolnshire	IL
52063	EXAR	Exar Integrated Systems	2222 Qume Dr.	San Jose	CA
	FAIRCH	Fairchild			
73734	FED SC	Federal Screw Products Inc.	3917 N. Kedzie Ave.	Chicago	IL
1BH13	FENWAL	Fenwal Electronics Inc.	64 Fountain St.	Framingham	MA
02114	FERROX	Ferroxcube/Division of Amperex	5083 Kings Hwy.	Saugerties	NY
60204	FLECK	Fleck Co.	3410 A St. SE.	Auburn	WA
53387	FOSC00	Force Electronics	477 Gianni St.	Santa Clara	CA
61429	FOX	Fox Electronics Inc.	5570 Enterprise Prkwy.	Ft. Myers	FL
26629	FREQ S	Frequency Sources, Inc.	15 Maple Rd.	Chelmsford	MA
-----	FUJI P	Fujipoly	365 Carnegie Ave.		
9Z397	FUJITS	Fujitsu Component of America	3320 Scott Blvd.	Santa Clara	CA
0HFH6	FUTABA	Futaba Corp. of America	555 W. Victoria St.	Compton	CA
14936	GENERA	General Instrument Corp.	10 Melville Pk. Rd.	Melville	NY
0J9P9	GEROME	Gerome Manufacturing Co, Inc.	403 N. Main St.	Newburg	OR
58900	GIGA	Giga-tronics Inc.	4650 Norris Canyon Rd.	San Ramon	CA
3T059	GILWAY	Gilway Technical Lamps Inc.	800 W. Cummings Prk.	Woburn	MA

Table 6-1: List of Manufacturers (Continued)

Cage	Supplier	Name	Address	City	State
1BX85	GLOBAL	Global Computer Supplies	2318 E. Del Amo Blvd., Dpt. 75	Compton	CA
-----	GOLDEN	Golden Pacific Quality Products	23585 Connecticut St., #18	Hayward	CA
95348	GORDOS	Gordos Corp.	1000 N. 2nd St.	Rogers	AZ
17217	GORE	Gore & Associates Inc., W.L.	1901 Barksdale Rd.	Newark	DE
81073	GRAYHI	Grayhill Inc.	561 Hillgrove Ave.	La Grange	IL
2R182	SMITH	H.H. Smith Co.	325 N. Illinois St.	Indianapolis	IN
63542	HAMILT	Hamilton Hallmark			
9Z740	HNL	HNL Inc.	3250 Victor St., Bldg C	Santa Clara	CA
4F708	HAMMON	Hammond Manufacturing Co.	1690 Walden Dr.	Buffalo	NY
2M881	HARRIS	Harris Semiconductor	883 Sterling Rd., Ste. 8120	Mountain View	CA
67297	HEROTE	Herotek Inc.	222 N. Wolfe Rd.	Sunnyvale	CA
28480	HP	Hewlett Packard Co.	3000 Hanover St.	Palo Alto	CA
28520	HEYCO	Heyco Molded Products	750 Blvd.	Kenilworth	NJ
0AG18	HIROSE	Hirose Electric	2688 W. Hills Ct.	Simi Valley	CA
61485	HITACH	Hitachi Denshi America Ltd.	175 Crossways Prkwy. W.	Woodbury	NY
-----	HITECH	Hitech Die Casting, Inc.	2245 S. Vasco Rd.	Livermore	CA
-----	SUHNER	Hubner Suhner Ltd.	Tumbleinstrass 20	Pfaffikon, Switz	
55536	HUNTER	Hunter Technology Corp.	3305 Kifer Rd.	Santa Clara	CA
58558	ICS	ICS Electronics	473 Los Coches St.	Milpitas	CA
32293	INTER	Interconnect System	2501 Mission St.	Santa Cruz	CA
4J532	IOTECH	IOtech, Inc.	25971 Cannon Rd.	Cleveland	OH
71468	ITT CA	ITT Cannon Electric	666 E. Dyer Rd.	Santa Anna	CA
98291	ITT SE	ITT Cannon RF Products	585 E. Main St.	New Britain	CT
05276	ITT PO	ITT Pomona Electronics	1500 E. Ninth St.	Pomona	CA
31918	ITT SH	ITT Schadow Inc.	8081 Wallace Rd.	Eden Prarie	MN
04426	ITW SW	ITW Switches	6615 W. Irving Pk. Rd.	Chicago	IL
51705	ICO RL	Ico-Rally Corp.	2575 E. Bayshore Rd.	Palo Alto	CA
0FY98	IDAHO	Idaho Circuit Technologies	401 E. 1st St.	Glenns Ferry	ID
74840	ILLCAP	Illinois Ccpacitor Inc.	3757 W. Touhy Ave.	Lincolnwood	IL
-----	INDUIM	Induim Corp. of America	1676 Lincoln Ave.	Utica	NY
64671	INMET	Inmet Corp.	300 Dino Dr.	Ann Arbor	MI
58202	INNOWA	Innowave Inc.	955/975 Benecia Ave.	Sunnyvale	CA
9Z890	INTCIR	Integrated Circuit Systems	525 Race St.	San Jose	CA
61772	IDT	Integrated Device Technology, Inc.	2975 Stender Wy.	Santa Clara	CA
34649	INTEL	Intel Corp.	2200 Mission College Blvd.	Santa Clara	CA
0RMV0	INTELL	Intelligent Instrumentation	6550 S. Bay Colony Dr., MS 130	Tucson	AZ
5J927	INT.TE	Interface Technology Inc.	300 S. Lemon Creek Dr.	Walnut	CA
4S177	IMS	International Mfg Services	50 Schoolhouse Ln.	Portsmouth	RI
59993	INT RE	International Rectifier	233 Kansas St.	El Segundo	CA
32293	INTERS	Intersil Inc.	2450 Walsh Ave.	Santa Clara	CA
-----	ITEM	Item	1249 Quarry Ln., Ste. 150	Pleasanton	CA
-----	J&J	J&J Electronics Inc.	6 Faraday	Irvine	CA

Table 6-1: List of Manufacturers (Continued)

Cage	Supplier	Name	Address	City	State
0K971	JAE	JAE Electronics	142 Technology Dr., Ste. 100	Irvine	CA
91293	JOHANS	Johanson Mfg. Co.	400 Rockway Valley Rd.	Boonton	NJ
30035	JOLO I	Jolo Industries Inc.	13921 Nautilus Dr.	Garden Grove	CA
05236	JONATH	Jonathan Manufacturing Co.	1101 S. Acacia Ave.	Fullerton	CA
23499	JUDD	Judd Wire and Cable	870 Los Vallecitos Rd.	San Marcos	CA
66126	KDI	KDI Precision Products	3975 McMann Rd.	Cincinnati	OH
-----	KINKOS	KINKO'S			
08EW3	KMW	KMW Inc.	9970 Bell Ranch Dr.	Santa Fe Springs	CA
-----	KOA	KOA SPEER	6801 River Pl. Blvd.	Austin	TX
59124	KOASPE	KOA Speer Electronics Inc.	Bolivar Dr.	Bradford	PA
3M918	KANEMA	Kanematsu-Gosho USA, Inc.	3335 Hope St., Ste. 2800	Los Angeles	CA
31433	KEMET	Kemet Electronics Corp.	2835 Kemet Wy.	Simpsonville	SC
75263	KEYSTO	Keystone Carbon Co.	1935 State St.	St. Marys	PA
91836	KING E	Kings Electronics	40 Marbledale Rd.	Tuckahoe	NY
62331	KRYTAR	Krytar Inc.	1292 Anvilwood Ct.	Sunnyvale	CA
2P953	LEMO	Lemo USA Inc.			
8Z313	LMS	LMS Electronics	34101 Monroe Rd.	Charlotte	NC
55261	LSI SY	LSI Computer Systems	1235 Walt Whitman Rd.	Melville	NY
4J674	LEADER	Leader Tech	14100 McCormick Dr.	Tampa	FL
24759	LENOX	Lenox-Fugal Electronics Inc.	1071 N. Grandview Ave.	Nogales	AZ
24759	LENXFU	Lenox-Fugle International, Inc.	P.O. Box 1448	Nogales	AZ
34333	LINFIN	LinFinity Microelectronics, Inc.	11861 Western Ave.	Garden Grove	CA
64155	LIN TE	Linear Technology Corp.	1630 McCarthy Blvd.	Milpitas	CA
75915	LITTLE	Littelfuse Tracor Inc.	800 E. Northwest Hwy.	Des Plaines	IL
93459	LUCAS	Lucas Weinschel Inc.	5305 Spectrum Dr.	Frederick	MD
0C7W7	MPULSE	M-Pulse Microwave	576 Charcot Ave.	San Jose	CA
96341	M/A CO	M/A Com	1011 Pawtucket Blvd.	Lowell	MA
53387	MICR00	Micro-Ohm Corpporation	1088 Hamilton Rd.	Duarte	CA
53387	MILL-M	Mill-Max	190 Pine Hollow Rd.		NY
2T737	MOUSER	Mouser Electronics			
53387	MULTIF	Multiflex Inc.	282 Browkaw Rd.	Santa Clara	CA
94696	MAGCRA	Magnecraft	1910 Techny Rd.	Northbrook	IL
90201	MALLOR	Mallory Capacitor Co.	4760 Kentucky Ave.	Indianapolis	IN
0H1N5	MARCON	Marcon America Corp.	998 Forest Edge Dr.	Vernon Hills	IL
0UC32	MARKI	Marki Microwave	2320 B Walsh Ave.	Santa Clara	CA
1ES66	MAXIM	Maxim Integrated Products	510 N. Pastoria Ave.	Sunnyvale	CA
00136	MCCOY	McCoy/Oak Frequency Control Grp.	100 Watts St.	Mount Holly Springs	PA
63058	MCKENZ	McKenzie Technology	44370 Old Warm Springs Blvd.	Fremont	CA
3A054	MCMAST	McMaster-Carr Supply Co.	9630 Norwalk Blvd.	Santa Fe Springs	CA
65249	MEMORY	Memory Protection Devices Inc.	320 Broad Hollow Rd.	Farmingdale	NY
0D3V2	MENLO	Menlo Industries Inc.	44060 Old Warm Springs Blvd.	Fremont	CA
12457	MERRIM	Merrimac Industries Inc.	41 Fairfield Pl.	West Caldwell	NJ

Table 6-1: List of Manufacturers (Continued)

Cage	Supplier	Name	Address	City	State
59365	METELI	Metelics Corp.	975 Stewart Dr.	Sunnyvale	CA
0RN63	MICRLA	Micro Lambda, Inc.	4037 Clipper Ct.	Fremont	CA
-----	MICROC	Micro-Chem Inc.			
00929	MICROL	Microlab/FXR	10 Microlab Rd.	Livingston	NJ
54487	MICRNE	Micronetics	26 Hampshire Dr.	Hudson	NH
0HFJ2	MICPLA	Microplastic Inc.	9180 Gazette Ave.	Chatsworth	CA
54186	MICROP	Micropower Systems Inc.	48720 Kato Rd.	Fremont	CA
14552	MICRSE	Microsemi Corp.	2830 S. Fairview St.	Santa Ana	CA
66449	MICROS	Microsource Inc.	1269 Corporate Center Prkwy.	Santa Rosa	CA
6Y341	MTI	Microwave Technology Inc.	4268 Solar Wy.	Fremont	CA
34078	MIDWES	Midwest Microwave Inc.	6564 S. State Rd.	Saline	MI
0S5P0	MILLWA	Milliwave Technology Corp.	6425-C Capital Ave.	Diamond Springs	CA
15542	MINI C	Mini Circuits Laboratory	13 Neptune Ave.	Brooklyn	NY
33592	MITEQ	Miteq Inc.	100 Davids Dr.	Huappauge	NY
0D2A6	MITSUB	Mitsubishi Electronics Inc.	5665 Plaza Dr.	Cypress	CA
27264	MOLEX	Molex, Inc.	2222 Wellington Ct.	Lisle	IL
54331	MONITO	Monitor Products Co. Inc.	502 Via Del Monte	Oceanside	CA
-----	MOTION	Motion Industries, Inc.	2705 Lafayette St.	Santa Clara	CA
04713	MOT	Motorola Semiconductor Products	5005 E. McDowell Rd.	Phoenix	AZ
04713	MOTO	Motorola Semiconductor Products	5005 E. McDowell Rd.	Phoenix	AZ
0YP31	MULTIC	Multicore Solders	1751 Jay Ell Dr.	Richardson	TX
72982	MURATA	Murata Erie N. America	645 W. 11th St.	Erie	PA
4T165	NEC	NEC Electronics USA Inc.	401 Ellis Street	Mountain View	CA
-----	NIC	NIC			
0D1M6	NMB	NMB Technologies Inc.	9730 Independence Ave.	Chatsworth	CA
7T184	NTE	NTE ELectronics	44 Farrand St.	Bloomfield	NJ
60583	NARDA	Narda Microwave Corp.	11040 White Rock Rd., Ste 200	Rancho Cordova	CA
54516	NATCAB	National Cable Molding Co.	136 San Fernando Rd.	Los Angeles	CA
58377	NATELE	National Electronics	11731 Markon Dr.	Garden Grove	CA
64667	NATINS	National Instruments Corp.	6504 Bridge Point Prkwy.	Austin	TX
27014	NATION	National Semiconductor Corp.	2900 Semiconductor Dr.	Santa Clara	CA
04569	NATWIR	National Wire & Cable	136 San Fernando Rd.	Los Angeles	CA
55680	NICHIC	Nichicon America Corp.	927 E. State Prkwy.	Schaumburg	IL
-----	NIDEC	Nidec	152 Will Dr.	Canton	MA
0LU72	NORITA	Noritake, Electronics Division	23820 Hawthorne Blvd. #100	Torrance	CA
3K718	NOVATR	Nova-Tronix Inc.	4781 Patrick Henry Dr.	Santa Clara	CA
65238	NOVACA	Novacap	25111 Anza Dr.	Valencia	CA
26233	NYLOK	Nylok Fastener Corp.	1161 Sandhill Ave., Bldg. D	Carson	CA
72259	NYTRON	Nytronics Inc.	475 Pk. Ave. S.	New York	NY
5W060	OLANDE	Olander Co., Inc.	144 Commercial St.	Sunnyvale	CA
61964	OMRON	Omron Electronics Inc.	1E Commerce	Schaumburg	IL
12020	OVENAI	Ovenaire Division	100 Watts St.	Mount Holly Springs	PA

Table 6-1: List of Manufacturers (Continued)

Cage	Supplier	Name	Address	City	State
63345	OVERLA	Overland Products Co.	1867 Airport Rd.	Fremont	NE
61964	PHASE	PHASE II			
0DJ29	PSELEC	PSElect	520 Mercury Dr.	Sunnyvale	CA
0HS44	PAC MI	Pacific Millimeter	169 Linbrook Dr.	San Diego	CA
55387	PAMTEC	Pamtech	4053 Calle Tesoro	Camarillo	CA
61058	PANSON	Panasonic Industrial Division	2 Panasonic Wy.	Secaucus	NJ
06383	PANDUI	Panduit Corp.	17301 Ridgeland	Tinley Park	IL
-----	PAPST	Papst Mechatronic Corp.	Aquidneck Industrial Pk.	Newport	RI
53919	PASTER	Pasternack Enterprises	P.O. Box 16759	Irvine	CA
-----	PEGASU	Pegasus Electronics, Inc.	2240 Lundy Ave.	San Jose	CA
46384	PENN	Penn Engineering and Mfg Co.	5190 Old Easton Rd.	Danboro	PA
-----	PERFOR	Performance Semiconductor Corp.	610 E. Weddell Dr.	Sunnyvale	CA
3W023	PHILLI	Phillips Components	5083 Kings Hwy.	Saugerties	NY
5Z179	PLANAR	Planar Systems Inc.	1400 NW. Compton Dr.	Beaverton	OR
82199	POLARA	Polarad Electronics Inc.	5 Delaware Dr.	Lake Success	NY
60046	POWDY	Power Dynamics, Inc.	59 Lakeside Ave.	West Orange	NJ
60393	PRECIS	Precision Resistive Products	202 Mack Ln.	Mediapolis	IA
57177	PROMPT	Promptus Electronic Hardware	520 Homestead Ave.	Mount Vernon	NY
53387	QRM	Quick Reponse Mfg. Inc.	793 Ames Ave.	Milpitas	CA
1DN14	QUALCO	Qualcomm Inc.	6455 Lusk Blvd.	San Diego	CA
56866	QTI	Quality Thermistor Inc.	2147 Centurion Pl.	Boise	ID
-----	RFMICR	R.F. Micro Devices, Inc.	7625 Thorndike Rd.	Greensboro	NC
55566	RAF EL	RAF Electronic Hardware	95 Silvermine Rd.	Seymour	CT
53387	RICHO	Richo Inc.	5825 N Tripp Ave.	Chicago	IL
53387	RLCU00	RLC Elect. C/O Dura	21710 Stevens Creek, Bldg. 240	Cupertino	CA
0GP12	RADIAL	Radiall Inc.	150 Long Beach Blvd.	Stratford	CT
0VUE0	RALTRO	Raltron Electronics Corportion	10651 NW. 19th St.	Miami	FL
06090	RAYCHE	Raychem Corp.	300 Constitution Dr.	Menlo Park	CA
06915	RICHCO	Richco Plastic Co.	5825 N. Tripp Ave.	Chicago	IL
06776	ROBINS	Robinson Nugent Inc.	800 E. Eighth St.	New Albany	IN
34576	ROCKWE	Rockwell International Corp.	4311 Jamboree Rd.	Newport Beach	CA
4U402	ROEDER	Roederstein Electronics	2100 W. Front St.	Statesville	NC
86797	ROGAN	Rogan Corp.	3455 Woodhead Dr.	Northbrook	IL
65032	ROGERS	Rogers Corp.	100 N. Dobson Rd.	Chandler	AZ
65940	ROHM	Rohm Corp.	111 Pacifica	Irvine	CA
82877	ROTRON	Rotron Inc.	7 Hasbrouck Ln.	Woodstock	NY
98159	RUB-CR	Rubber Craft	15627 S. Broadway	Gardena	CA
98159	RUB-TE	Rubber Teck	15627 S. Broadway	Gardena	CA
0FB81	SMOS	S-MOS Systems Inc.	2460 N. First St.	San Jose	CA
31586	SAFT	SAFT America Inc.	107 Beaver Ct.	Cockeysville	MD
53387	SEI	SEI Electronics	P.O. Box 58789	Raleigh	NC
66958	SGS	SGS Thompson Microelectronics	1000 E. Bell Rd.	Phoenix	AZ

Table 6-1: List of Manufacturers (Continued)

Cage	Supplier	Name	Address	City	State
53387	STMICR	ST Microelectronics			
53387	SYNSEM	Synergy Semiconductor	3250 Scott Blvd.	Santa Clara	CA
07180	SAGE	Sage Laboratories Inc.	E. Natick Industrial Pk.	Natick	MA
55322	SAMTEC	Samtec Inc.	810 Progress Blvd.	New Albany	IN
96733	SAN FE	San Fernando Electric Mfg	1501 First St.	San Fernando	CA
62559	SCHROF	Schroff Inc.	170 Commerce Dr.	Warwick	RI
70561	SCITEQ	Sciteq Communications, Inc.	9990 Mesa Rim Rd.	San Diego	CA
7U905	SEASTR	Seastrom Inc.	2351 Kentucky Ave.	Indianapolis	IN
61394	SEEQ	Seeq Technology Inc.	47131 Bayside Prkwy.	Fremont	CA
59270	SELCO	Selco Products	7580 Stage Rd.	Buena Park	CA
55989	SEMICO	Semicon Inc.	8810 Frost Ave.	St. Louis	MO
4W070	SHARP	Sharp Electronics Corp.	Sharp Plaza Blvd.	Memphis	TN
0B549	SIEMEN	Siemens Components	10950 N. Tantau Ave.	Cupertino	CA
1CY63	SMT	Sierra Microwave Technology Inc.	One Sierra Wy.	Georgetown	TX
17856	SILICO	Siliconix Inc.	2201 Laurelwood Rd.	Santa Clara	CA
5L401	SSI	Solid State, Inc.	46 Farrand St.	Bloomfield	NJ
95077	SOLITR	Solitron/Vector Microwave	3301 Electronics Wy.	West Palm Beach	FL
66049	SWMICR	Southwest Microwave	2922 S. Roosevelt	Tempe	AZ
1W232	SPACEK	Spacek Labs	528 Santa Barbara St.	Santa Barbara	CA
24931	SPECIA	Speciality Connector Co., Inc.	2100 Earlywood Dr.	Franklin	IN
56289	SPRAGU	Sprague Electric Co.	68 Main St.	Sanford	ME
51791	STATEK	Statek Corp	512 N. Main St.	Orange	CA
0GAA9	STATIC	Static Control Components	330 Wicker St.	Sanford	NC
0KA21	STETCO	Stetco Inc.	3344 Schierhorn Ct.	Franklin Park	IL
57771	STIMPS	Stimpson Co.	900 Sylvan Ave.	Bayport	NY
29005	STORM	Storm Products Co.	112 S. Glasglow Ave.	Inglewood	CA
1U930	SUPER	Supertex	2231 Colby Ave.	Los Angeles	CA
63155	SYNERG	Synergy Microwave Corp.	483 McLean Blvd.	Patterson	NJ
54583	TDK	TDK of America	12 Harbor Pk. Dr.	Port Washington	NY
-----	TEMIC	TEMIC			
2W053	TARGET	Target Electronics	715A Pastoria Ave.	Sunnyvale	CA
3Z990	TECH P	Tech Pro Inc.	6243 E. US. Hwy. 98	Panama City	FL
52814	TECH-E	Tech-Etch	45 Adlrin Rd.	Plymouth	MA
00RB0	TECHNI	Techni-tool	1575 University Dr.	Tempe	AZ
15818	TELCOM	TelCom Semiconductor	1300 Terra Bella Ave.	Mountain View	CA
11532	TELEDY	Teledyne Relays	12525 Daphne Ave.	Hawthorne	CA
15915	EPRO	Tepro of Florida Inc.	2608 Enterprise Rd.	Clearwater	FL
01295	TI	Texas Instruments	8505 Forrest Ln.	Dallas	TX
13103	THRMLL	Thermalloy Co, Inc.	2021 W. Valley View Ln.	Dallas	TX
58090	THERMO	Thermometrics	808 US. Hwy. #1	Edison	NJ
56501	T&B	Thomas & Betts Corp.	1555 Lynnfield Rd.	Memphis	TN
0HHH5	THUNDE	Thunderline Z, Inc.	11 Hazel Dr.	Hampstead	NH

Table 6-1: List of Manufacturers (Continued)

Cage	Supplier	Name	Address	City	State
OB3G8	TOKIN	Tokin America Inc.	2261 Fortune Dr.	San Jose	CA
06049	TOPAZ	Topaz Inc.	1660 Scenic Ave.	Costa Mesa	CA
61802	TOSHIB	Toshiba International	13131 W. Little York Rd.	Houston	TX
82152	TRANSC	Transco Products Inc.	200 W. Los Angeles Ave.	Simi Valley	CA
59660	TUSONI	Tusonix Inc.	7741 N. Business Pk. Dr.	Tucson	AZ
53421	TYTON	Tyton Corp.	7930 N. Faulkner Rd.	Milwaukee	WI
53387	UNITED	United Mfg. Assy.	42680 Christy St.	Fremont	CA
0TAZ2	UNION	Union Carbide	39 Old Ridgebury Rd.	Danbury	CT
62643	UNCHEM	United Chemicon Inc.	9806 Higgins St.	Rosemont	IL
52847	USCRYS	United States Crystal Corp.	3605 McCart St.	Fort Worth	TX
3S125	UNITRO	Unitrode Corp.	5 Forbes Rd.	Lexington	MA
-----	VALMAR	Valmark Industries Incorp.	3393 W. Warren Avenue	Fremont	CA
95275	VISION	Vision Electronics	1175 Spring Ctr. S BLVB	Altamont Springs	FL
53387	VPR	VPR			
27802	VECTRO	Vectron Laboratories, Inc.	166 Gover Ave.	Norwalk	CT
95275	VITRAM	Vitramon Inc.	10 Rte. 25	Monroe	CT
18736	VOLTRO	Voltronics Corp.	100-10 Ford St.	Denville	NJ
53387	WARDBA	Ward Bagby	1360 Piper Dr.	Milpitas	CA
66579	WAFER	WaferScale Integration	47280 Kato Rd.	Fremont	CA
00443	WAVELI	Waveline Inc.	160 Passaic Ave.	Fairfield	NJ
0AN50	WESTEC	Westec Plastics Corp.	2044 Concourse Dr.	San Jose	CA
52840	WEST.D	Western Digital Corp.	3128 Red Hill Ave.	Costa Mesa	CA
16453	WEST/M	Western Microwave Inc.	495 Mercury Dr.	Sunnyvale	CA
20944	WILTRO	Wiltron Co.	685 Jarvis Dr., Ste. F	Morgan Hill	CA
68919	WIMA	Wima (Intertechnical Group)	2269 Saw Mill River Rd.	Elmsford	NY
60395	XICOR	Xicor Inc.	1151 Buckeye Dr.	Milpitas	CA
68994	XILINX	Xilinx Inc.	2100 Logic Dr.	San Jose	CA
58758	ZAMBRE	Zambre Co.	2134M Old Middlefield Wy.	Mountain View	CA
79963	ZIERIC	Zierick Manufacturing Co.	Radio Cr.	Mt. Kisco	NY
-----	ZOLTAR	Zoltar Engineering, LLC	32 Galli Dr., Ste. A	Novato	CA

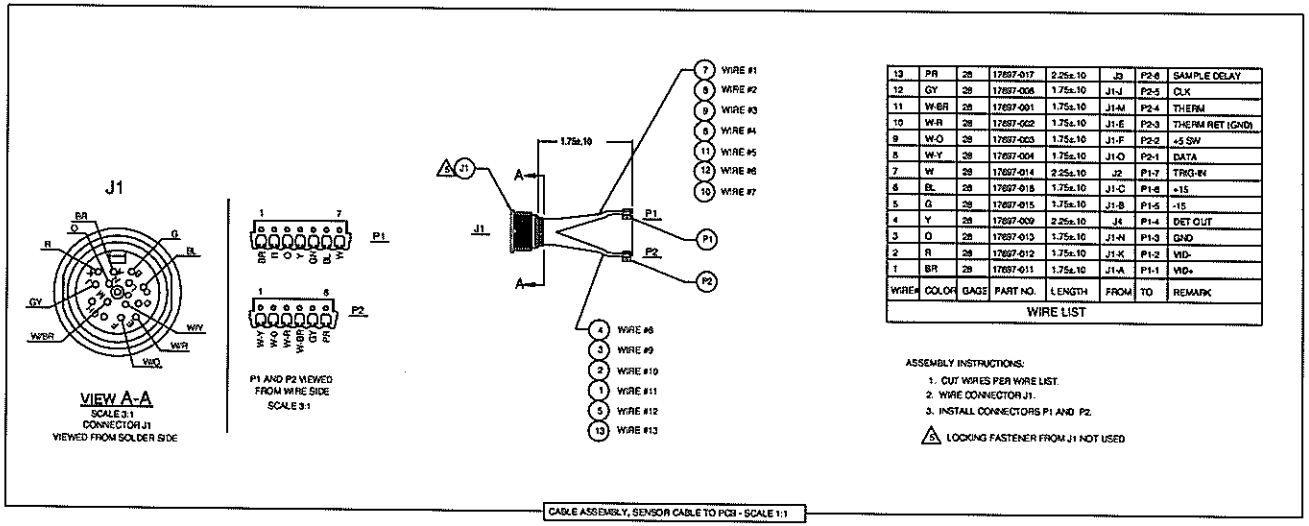
7

Diagrams

7.1 Introduction

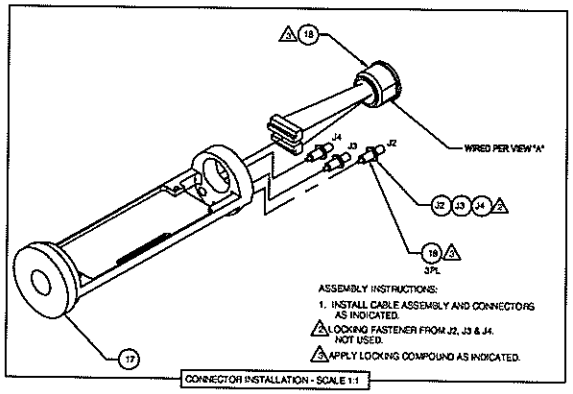
This chapter contains assembly drawings and circuit schematics for the Series 8035XA Peak Power Sensors.

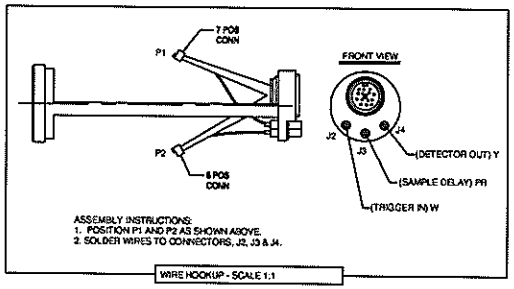
Parts Lists for all assemblies are contained in Chapter 6.



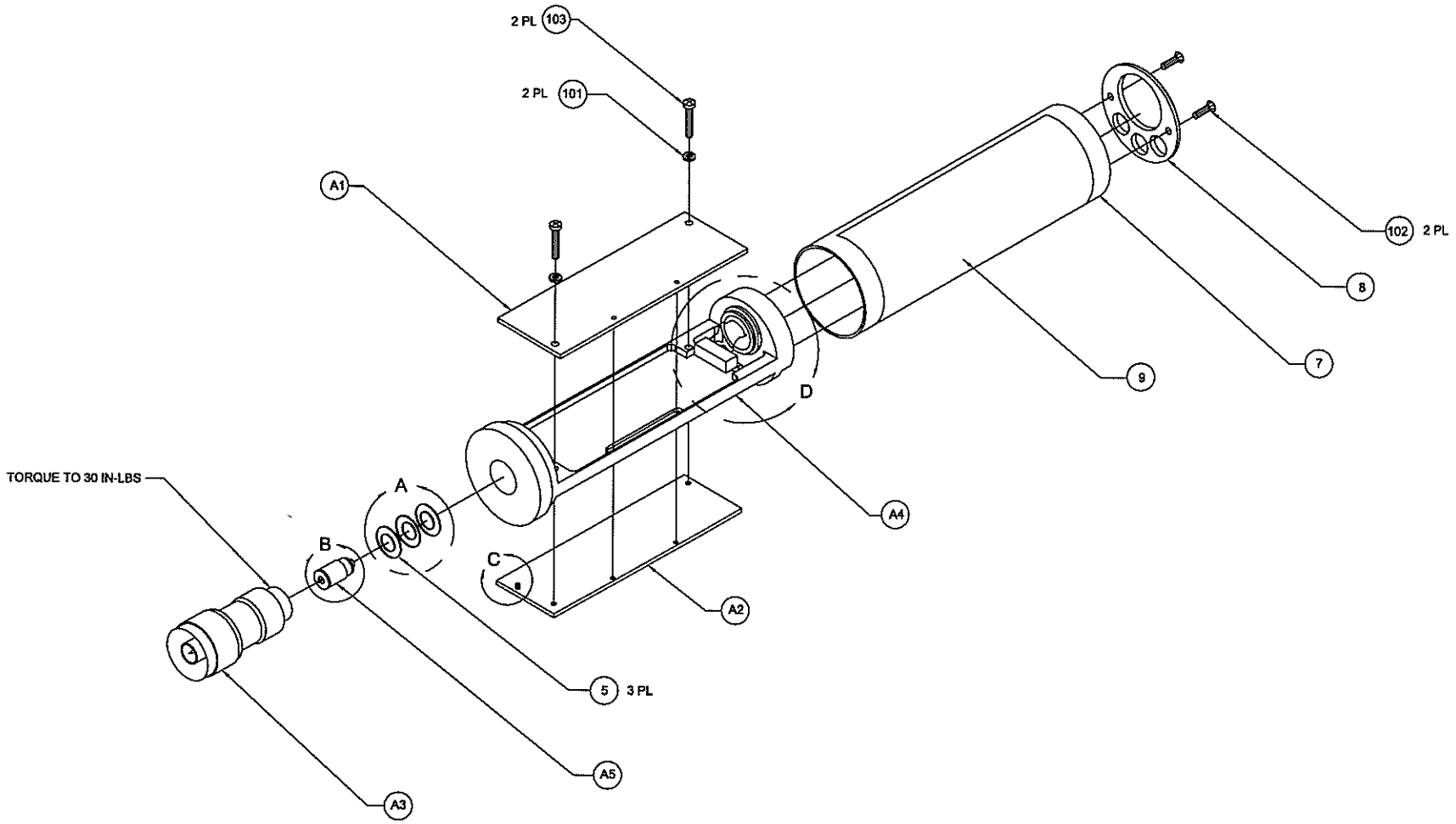
WIRE#	COLOR	GAGE	PART NO.	LENGTH	FROM	TO	REMARK
13	PR	28	17697-017	2.25±.10	J3	P2-6	SAMPLE DELAY
12	GY	28	17697-006	1.75±.10	J1-J	P2-5	CLK
11	W-BR	28	17697-001	1.75±.10	J1-M	P2-4	THERM
10	W-R	28	17697-002	1.75±.10	J1-E	P2-3	THERM RET (GND)
9	W-O	28	17697-003	1.75±.10	J1-F	P2-2	+5 SW
8	W-Y	28	17697-004	1.75±.10	J1-O	P2-1	DATA
7	W	28	17697-014	2.25±.10	J2	P1-7	TRIG-IN
6	BL	28	17697-015	1.75±.10	J1-C	P1-6	+15
5	G	28	17697-015	1.75±.10	J1-B	P1-5	-15
4	Y	28	17697-009	2.25±.10	J4	P1-4	DET OUT
3	O	28	17697-013	1.75±.10	J1-N	P1-3	GND
2	R	28	17697-012	1.75±.10	J1-K	P1-2	VID-
1	BR	28	17697-011	1.75±.10	J1-A	P1-1	VID+

WIRE LIST

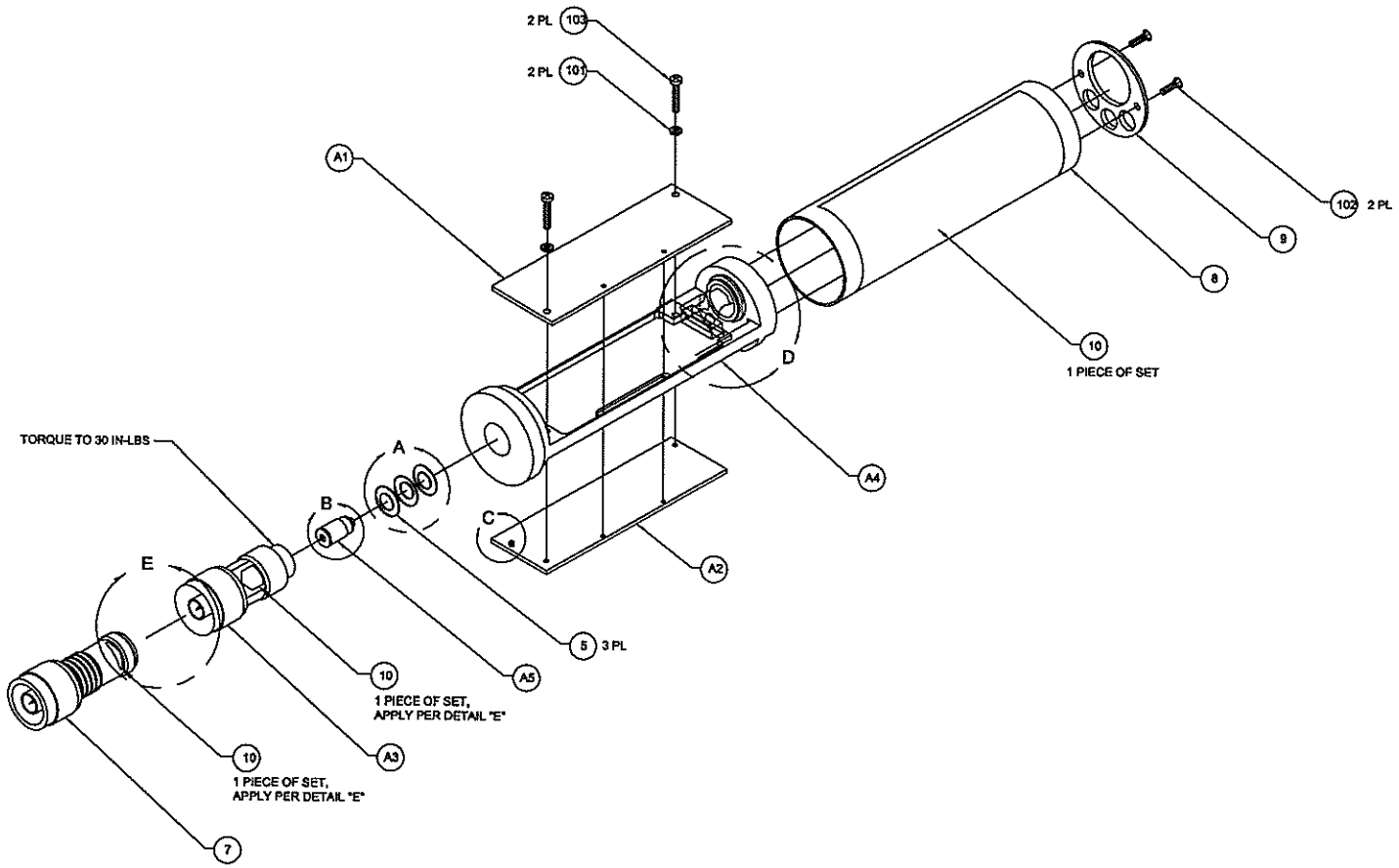




Sensor Housing Assembly, DWG 21471 Rev. C (1 of 1)

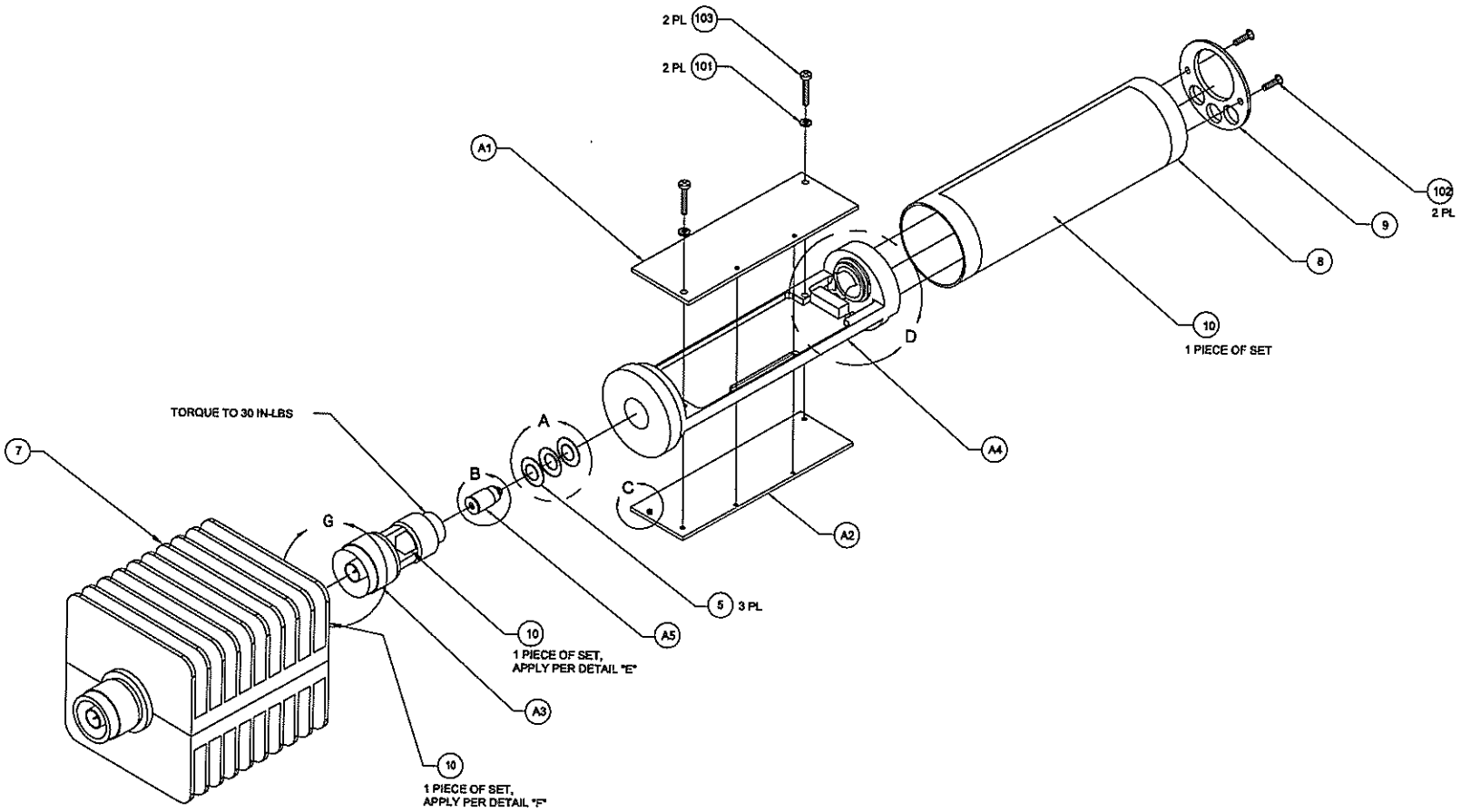


Model 80350A Sensor, DWG 21472, Rev. B (1 of 1)



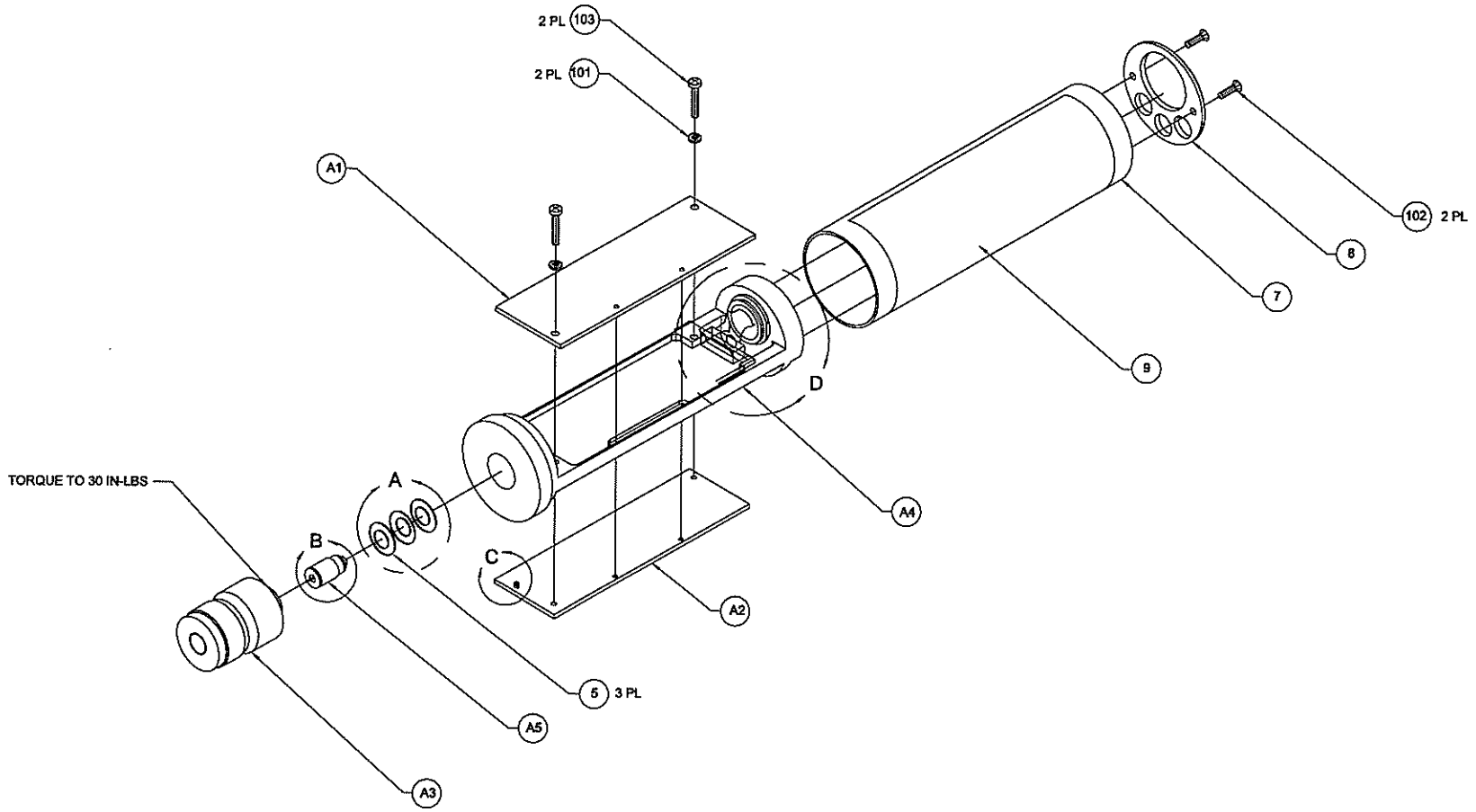
MODEL 80351A, SENSOR,
TYPE-N, 18GHz, 5W

Model 80351A Sensor, DWG 21473, Rev. B (1 of 1)



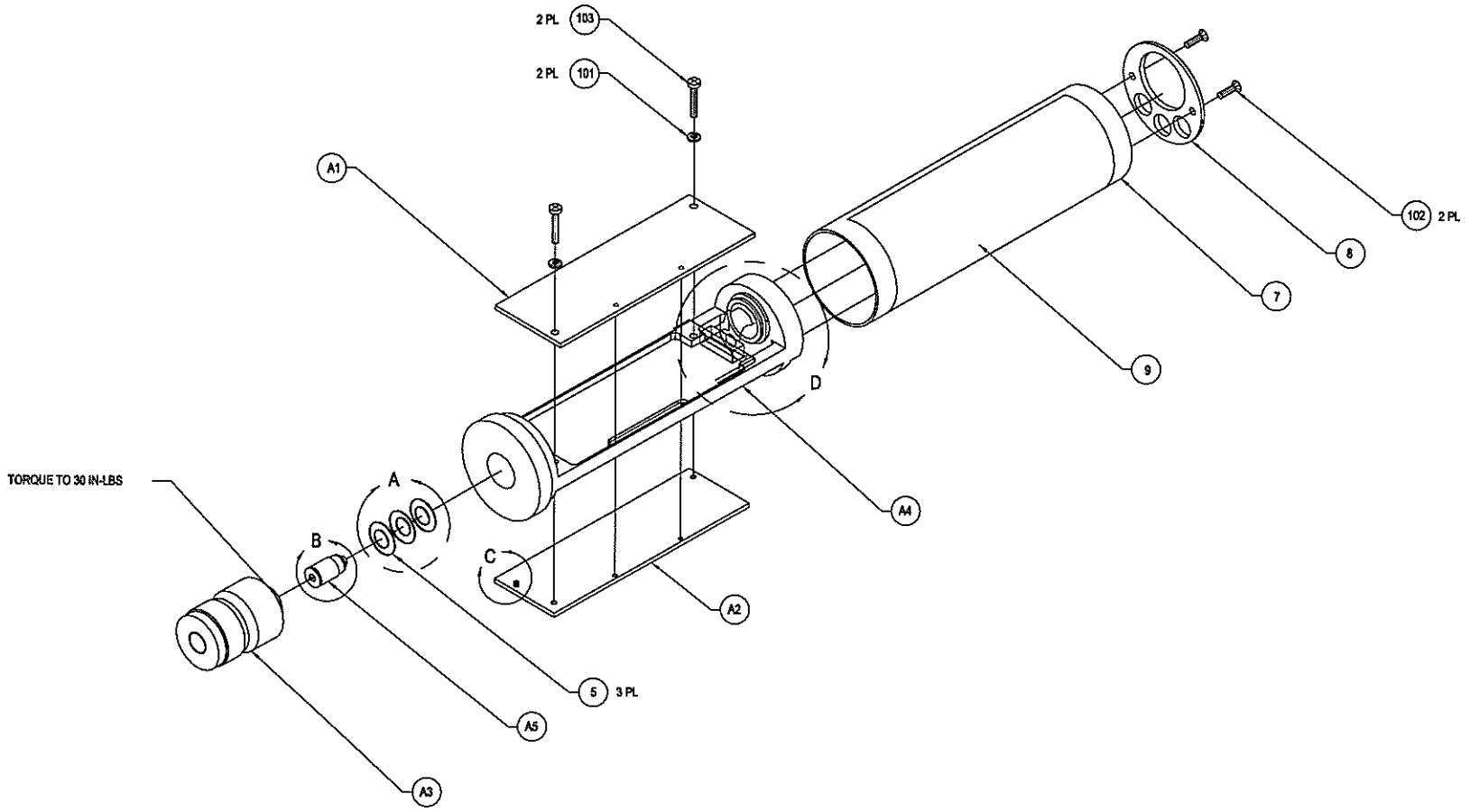
MODEL 80352A, SENSOR,
TYPE-N, 18GHz, 25W

Model 80352A Sensor, DWG 21474, Rev. B (1 of 1)



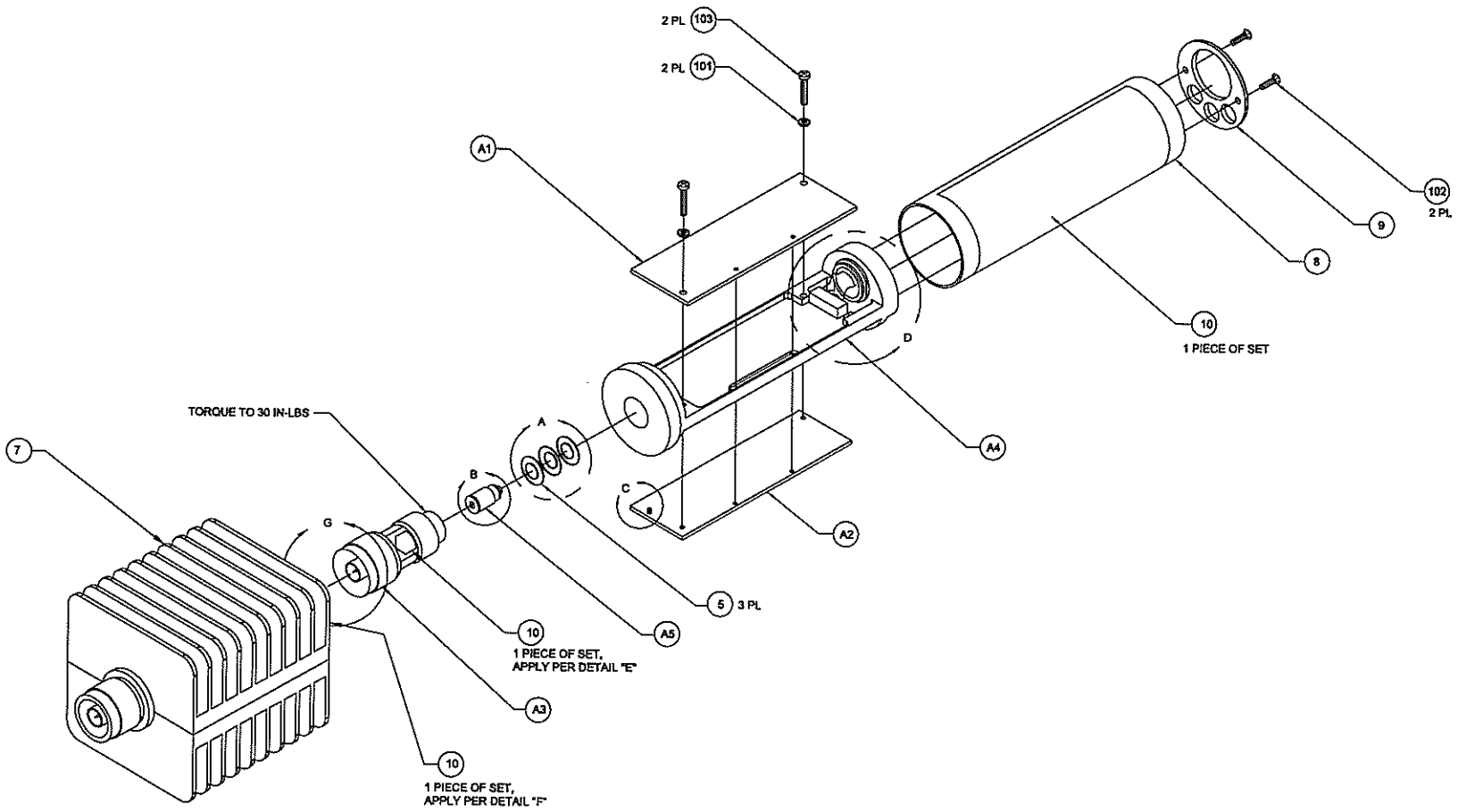
MODEL 80353A, SENSOR,
K-TYPE, 26.5GHz

Model 80353A Sensor, DWG 21475, Rev. B (1 of 1)



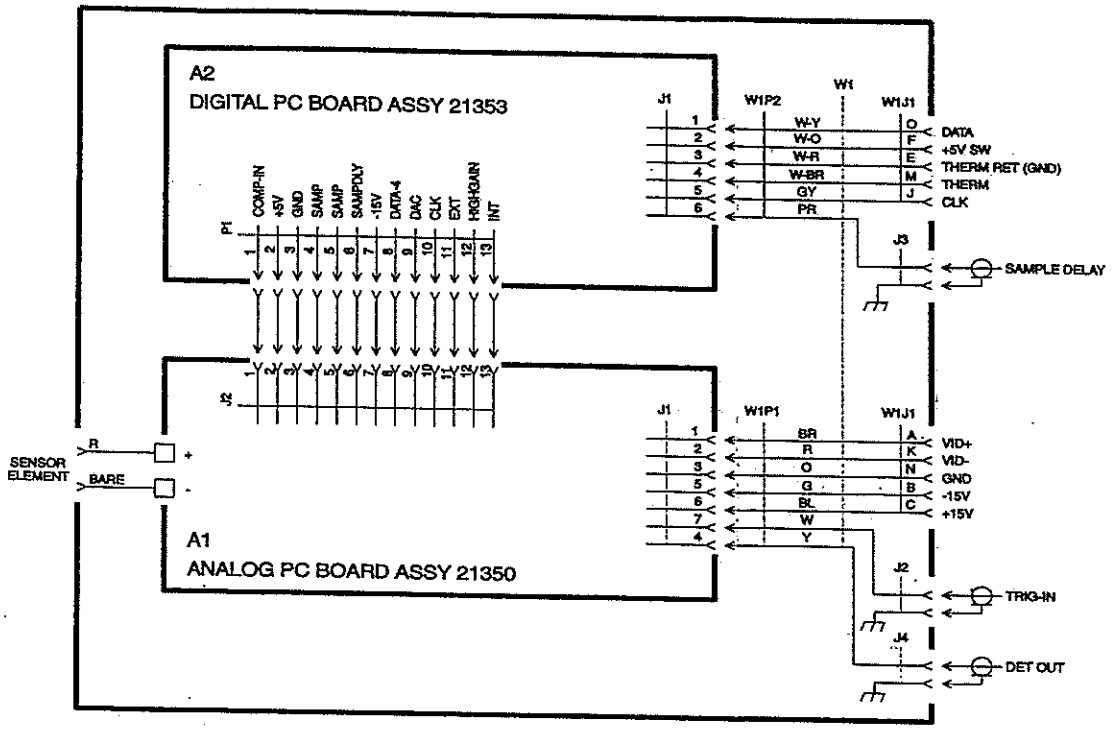
MODEL 80354A, SENSOR,
K-TYPE, 40GHz

Model 80354A Sensor, DWG 21476, Rev. B (1 of 1)

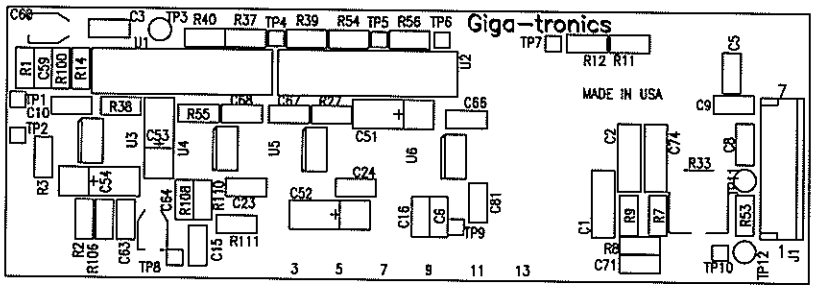


MODEL 80355A, SENSOR,
TYPE-N, 18GHz, 50W

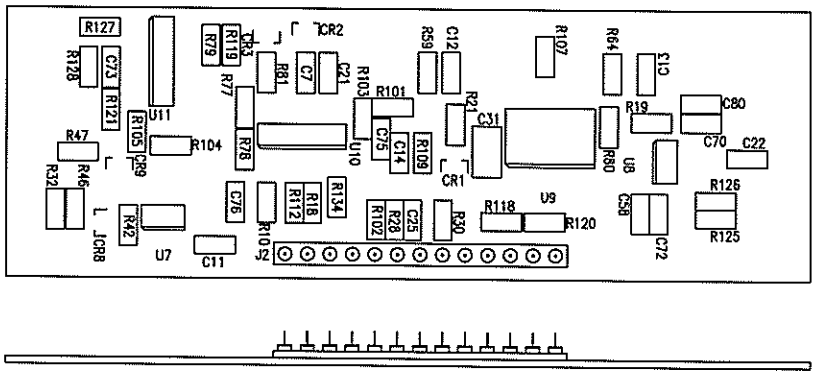
Model 80355A Sensor, DWG 21477, Rev. B (1 of 1)



SCH 80350A Series - Trig. Sensor, DWG 21497, Rev. C (1 of 1)

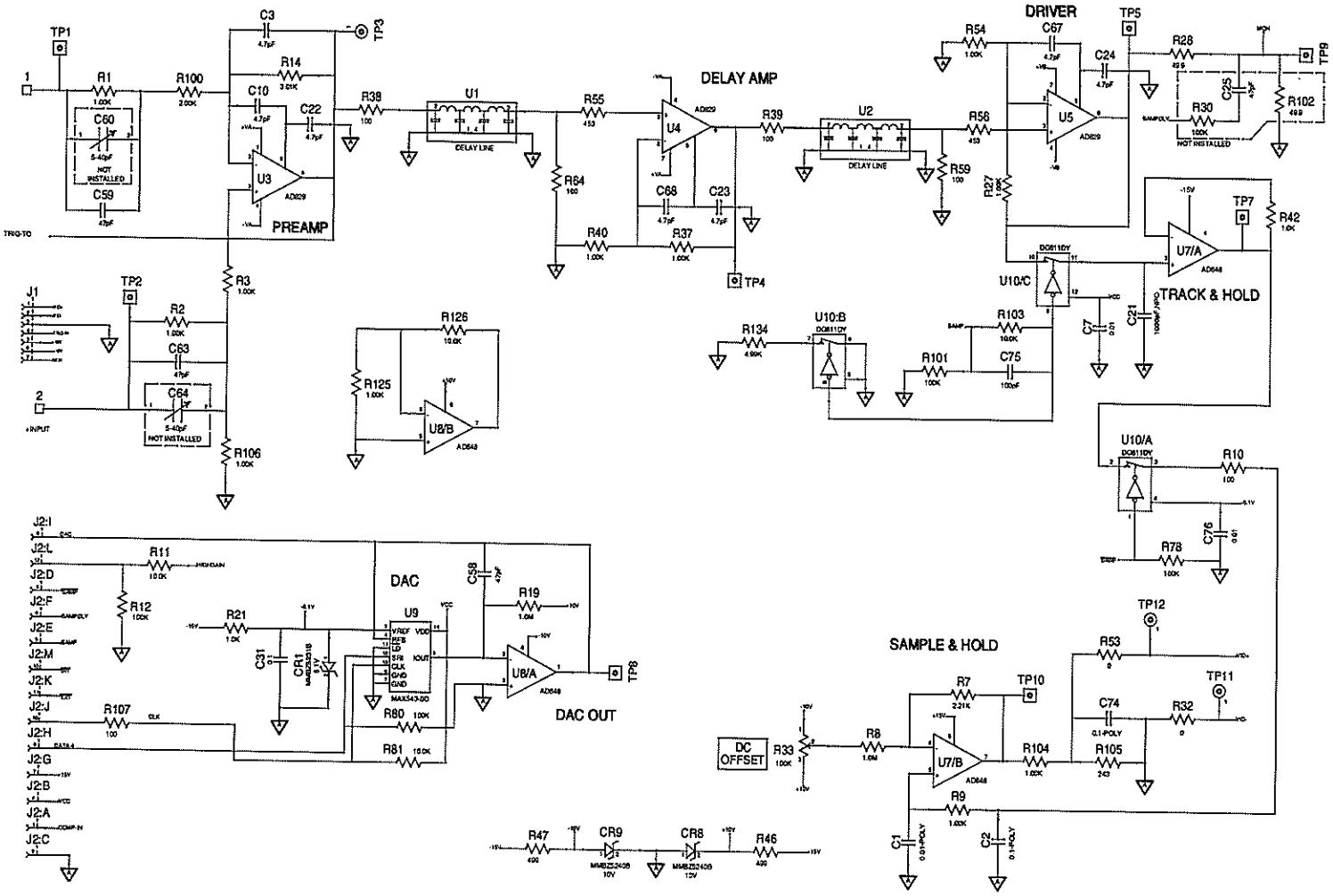


TOP SIDE

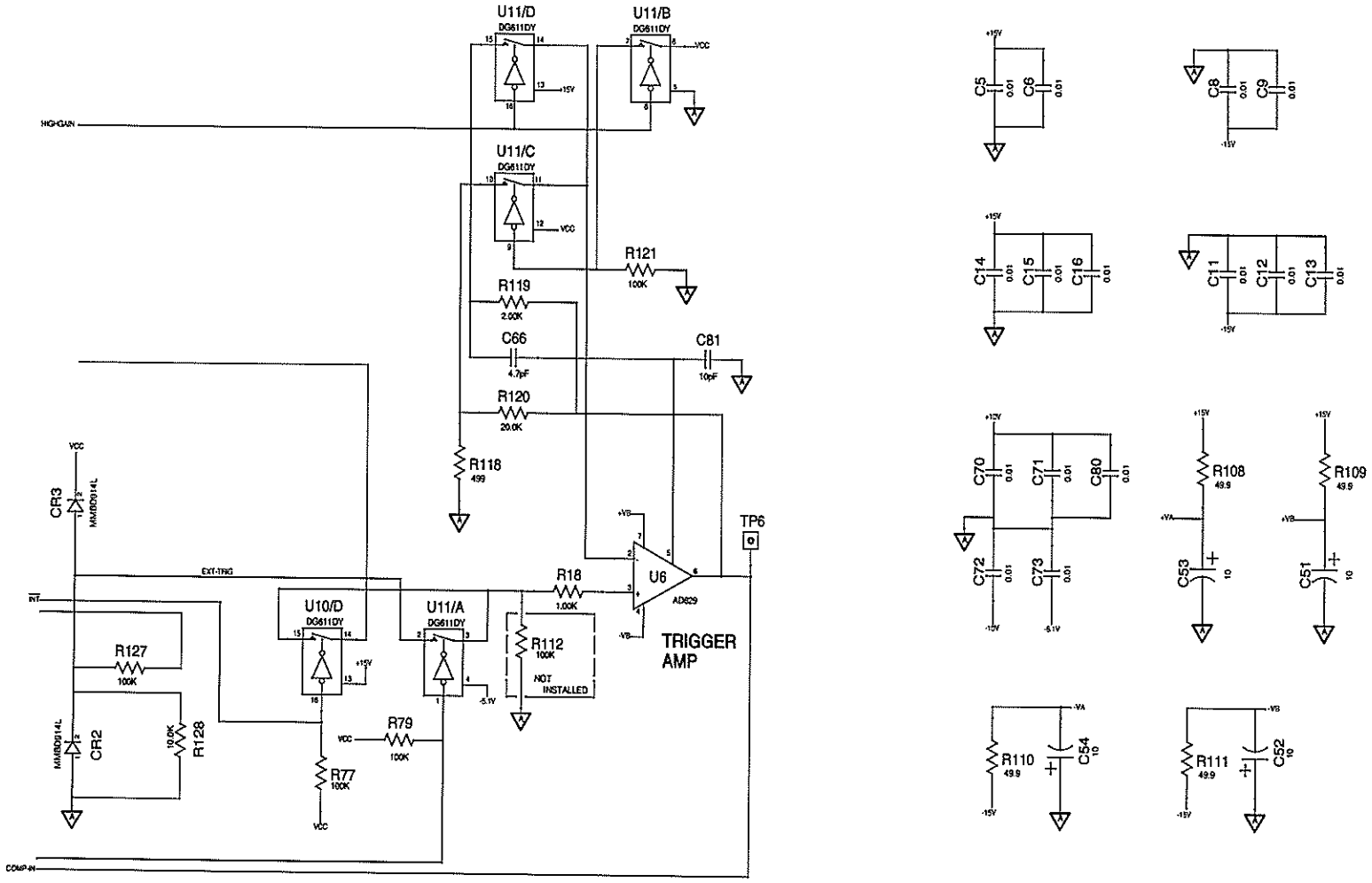


BOTTOM SIDE

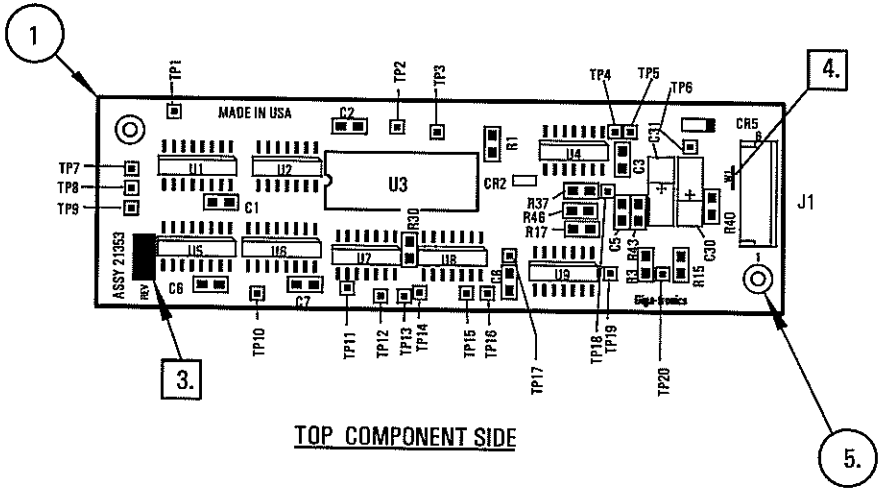
Analog PC Assy (A1), DWG 21350 P (1 of 1)



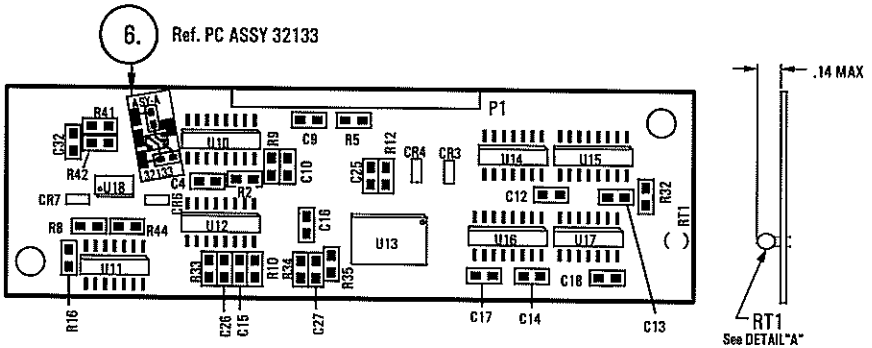
Analog Circuit SCH (A1), DWG 21351, Rev. G (1 of 2)



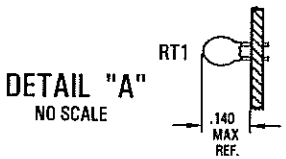
Analog Circuit SCH (A1), DWG 21351, Rev. G (2 of 2)



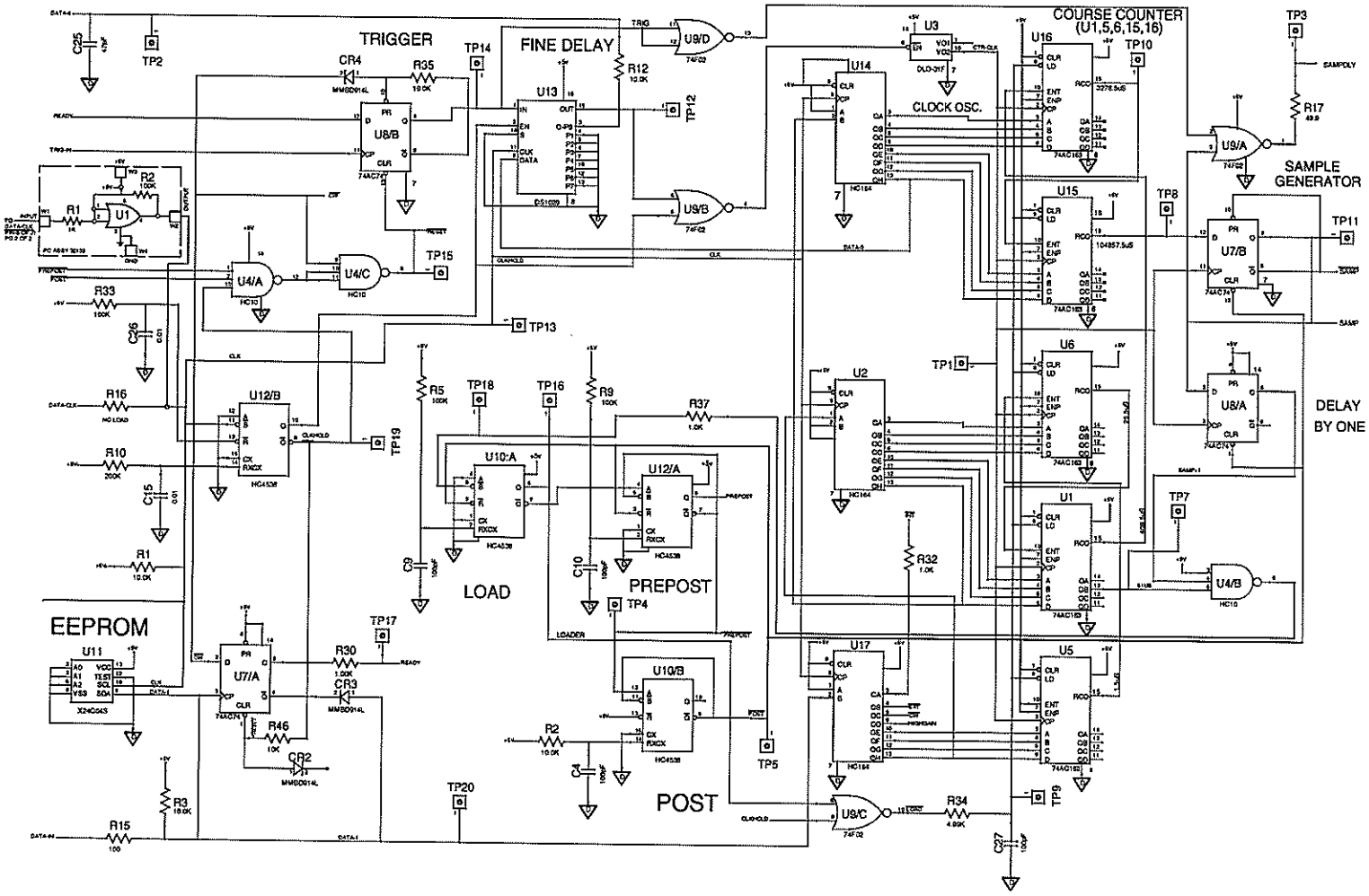
TOP COMPONENT SIDE



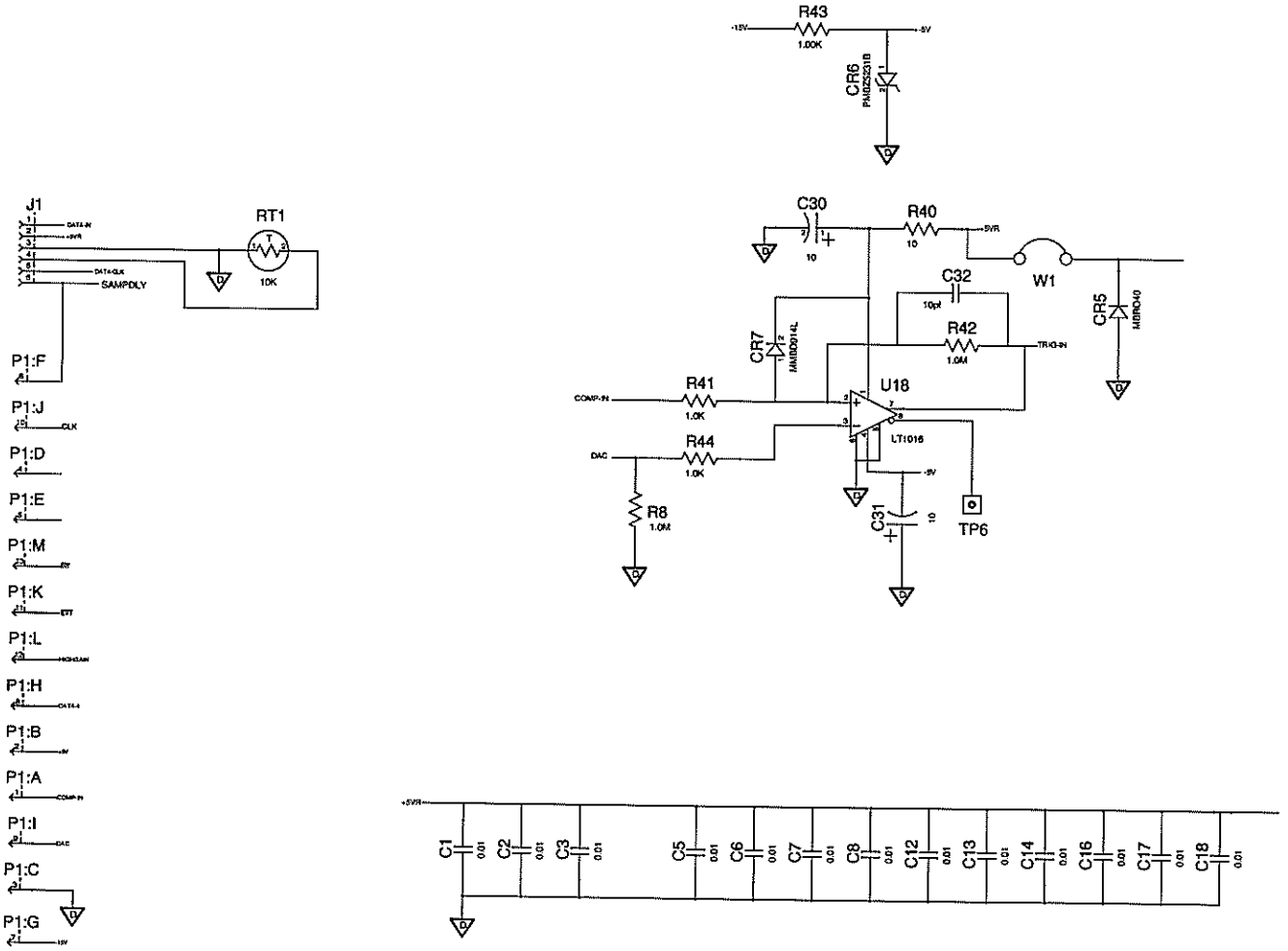
BOTTOM COMPONENT SIDE



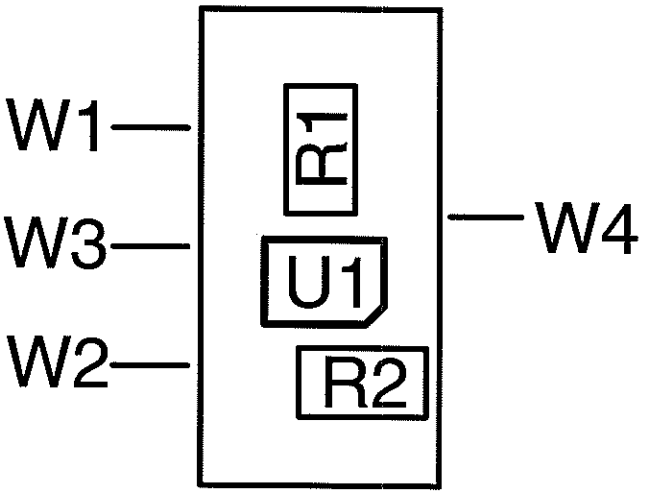
Digital PC Assy (A2), DWG 21353, Rev. W (1 of 1)



Digital Circuit SCH (A2), DWG 21354, Rev. W (1 of 2)



Digital Circuit SCH (A2), DWG 21354, Rev. W (2 of 2)



Sensor-S-Clock-Buffer Assy, DWG 32133, Rev. A (1 of 1)

Special 11" x 17" landscape diagrams/schematics follow this page continuing
Chapter 7 of the Series 8035XA Peak Power Sensors Operation & Maintenance manual.

Index

Series 8035XA Peak Power Sensors Index

Numerics

5, 25 and 50 Watt Peak Power Sensors 2-2

A

About This Manual 1-vii
Accessories 1-1
Analog Assembly Description 3-2
Analog Timing Diagram 3-4

C

Calibration Problems 5-4
Circuit Description
    Analog Assembly Descriptions 3-2
    Analog Timing Diagram 3-4
    Digital Assembly Description 3-5
    Digital Serial Data Cycle Timing Diagram 3-8
    Digital Timing Diagram, CW Mode 3-8
    Digital Timing Diagram, INT/EXT Trig Mode 3-7
Commands for the 58542 2-18
Compatible Power Meters 1-5
Conventions Used in This Manual 1-viii
CW Linearity Test 4-2

D

Delay 5-6
Delay Test 4-6
Description 1-1
Detector Output Test 4-4
Diagrams 7-1
Digital Assembly Description 3-5
    Description 3-6
    Digital Serial Data Cycle Timing Diagram 3-8
    Digital Timing Diagram, CW Mode 3-8
    Digital Timing Diagram, INGT/EXT Trig Mode 3-7
    Overview 3-5
Disassembly of the Sensor 5-7

E

Equipment Required 4-1
EXTernal 5-6

G

GPIB Commands 2-15
    Commands for the 58542 2-18
    Reading Values 2-17
    Setting Delays 2-16
    Setting Trigger Modes 2-15

I

INTernal 5-5

L

List of Manufacturers 6-12

M

Maintenance
    Diagrams 7-1
    Dissembly of the Sensor 5-7
    Reassembly of the Sensor 5-8
    Replacing the Sensor Element 5-7
    Rise-Time Adjustments 5-1
    Sensor Element Replacement 5-7
    Troubleshooting 5-2
    Zero Adjustment 5-2
Measuring 3 dB Pulse Width 2-14
Measuring Pulse Droop 2-13
Measuring Rise-Time 2-15

O

Operation
    GPIB Commands 2-15
    Power Sweep Calibration 2-1
    Sample Delay 2-6
Output Problems 5-6
Overview 3-5

P

Parts Lists 6-1
Peak Linearity Test 4-3
Performance Specifications 1-3
Performance Verification Tests 4-1, 5-1
    CW Linearity Test 4-2
    Delay Test 4-6
    Detector Output Test 4-4
    Equipment Required 4-1
    Peak Linearity Test 4-3
    Trigger Level Test 4-4
    Trigger Modes Test 4-4
Power Linearity Test 4-2
    CW Linearity Test 4-2
    Peak Linearity Test 4-3
Power Sweep Calibration 2-1
    5,25, and 50 Watt Peak Power Sensors 2-2
    Sensor Triggering 2-5
    Trigger 2-3
    Zeroing 2-4
Product Returns 1-1

R

Reading Values 2-17
Real Time Pulse Profile and Sample Position Display 2-11
Reassembly of the Sensor 5-8
Record of Manual Changes 1-x
Replacing the Sensor Element 5-7
Rise-Time AdjustmentsMaintenance
    Rise-Time Adjustments 5-1

S

Sample Delay 2-6
    3 dB Pulse Width 2-14
    Measuring 3 dB Pulse Width 2-14
    Measuring Pulse Droop 2-13
    Measuring Rise-Time 2-15
    Offset 2-12
    Pulse Droop 2-13
    Real Time Pulse Profile and Sample Position Display 2-11
    Rise-Time 2-15
    Sample delay operation 2-8
    Sample Position 2-11
    Setting Delay from Peak Setup Menu 2-10
    Setting Sample Delay 2-8
    Setting Sample Delay Offset 2-10
    Single Peak Sample Measurements 2-10
Sample Delay Display 2-7
Sample Delay Limits 2-9
Sample Delay Offset 2-12
Sensor Element Replacement 5-7
    Dissembly of the Sensor 5-7
    Reassembly of the Sensor 5-8
    Replacing the Sensor Element 5-7
Sensor Not Present 5-4
Sensor Triggering 2-5
Setting 2-10
Setting Delays 2-16
Setting Sample Delay 2-8
Setting Sample Delay Offset 2-10
Setting Trigger Modes 2-15
Single Peak Sample Measurements 2-10
Special Configurations 1-xi
Specifications 1-2
    Performance Specifications 1-3

T

Theory of Operation 3-1
    Analog Assembly Description 3-2
    Digital Assembly Descripgtion Circuit 3-5
Trigger 2-3
    Zeroing 2-4
Trigger Level Test 4-4
Trigger Modes Test 4-4
Triggering 2-3
Troubleshooting 5-2
    Calibration Problems 5-4
    Delay problems 5-6
    EXTernal problems 5-6
    INTernal problems 5-5
    Output problems 5-6
    Sensor Not Present 5-4

Z

Zero Adjustment 5-2
Zeroing 2-4