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Report 11185
July 1998

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Integrated Advanced Microwave Sounding Unit-A (AMSU-A)

Performance Verification Report

Subassembly and Complete Instrument Assembly

EOS AMSU-A2 Antenna Drive Subassembly,

P/N 1356006-1, S/N 202

Contract No. NAS 5-32314
CDRL 208

Submitted to:

National Aeronautics and Space Administration
Goddard Space Flight Center
Greenbelt, Maryland 20771

Submitted by:

Aerojet
1100 West Hollyvale Street
Azusa, California 91702

Aerojet

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AMSU-A VERIFICATION TEST REPORT

TEST ITEM:	EOS AMSU- A2 ANTENNA DRIVE SUBSYSTEM PART OF P/N: 1356006-1 SERIAL NUMBER: 202	
LEVEL OF ASSEMBLY:	SUBASSEMBLY AND COMPLETE INSTRUMENT ASSEMBLY	
TYPE HARDWARE:	FLIGHT	
VERIFICATION: PROCEDURE NO.	AE-26002/2C	
TEST DATE:		
ASSEMBLIES:	START DATE:	27 January 1998
SUBSYSTEM:	START DATE:	19 March 1998

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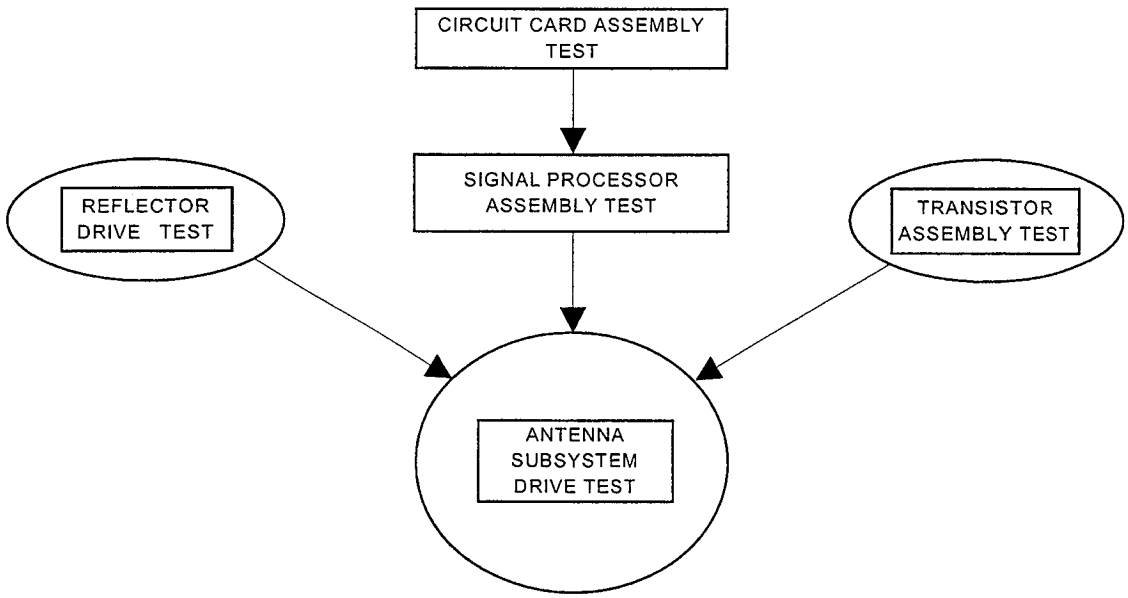
1.0 INTRODUCTION

An antenna drive subsystem test was performed on the AMSU-A2 S/N 202 instrument. The objective of the test was to demonstrate compliance with applicable paragraphs of AMSU-A specifications S-480-80. Tests were conducted at both the subassembly and instrument level.

2.0 SUMMARY

The antenna drive subsystem of the EOS AMSU-A2 S/N 202, P/N 1356006-1, completed acceptance testing per AES Test Procedure AE-26002/2C. The test included: Scan Motion and Jitter, Noisy Bus Peak Current and Rise Time, Resolver Reading and Position Error, Gain/ Phase Margin, and Operational Gain Margin.

The drive motor and electronic circuitry were also tested at the component level. The drive motor test includes: Starting Torque Test, Motor Commutation Test, Resolver Operation/ No-Load Speed Test, and Random Vibration. The electronic circuitry was tested at the Circuit Card Assembly (CCA) level of production; each test exercised all circuit functions. The transistor assembly was tested during the W3 cable assembly (1356433-1) test. Refer to Figure 1 for test flow.



Antenna Subsystem and Subsystem Component Test Flow
Figure 1.

The antenna drive subsystem satisfactorily passed all of the performance requirements. There were no failures in any of the antenna drive components during subsystem testing.

The results of the subsystem and component level testing are discussed in more detail in the following sections:

Reflector Drive Assembly..... 5.1
Circuit Card Assemblies 5.2
Signal Processor..... 5.3
Transistor Assembly 5.4
Antenna Drive Subsystem..... 5.5

3.0 TEST CONFIGURATION

The ***Reflector Drive Assembly Tests*** confirm the operability of the motor under test. The test configuration includes, the motor, motor shaft, bearings, and a supporting housing.

The ***Circuit Card Assembly (CCA) Tests*** confirm the operability of each CCA. Each test includes the CCA under test, electronic test fixtures, and the necessary loads.

A segment of the ***Signal Processor Tests*** ensures the scan drive electronics are functioning properly prior to it's assembly into the instrument. The test configuration includes:

- Timing and Control CCA
- Scan Control Interface CCA
- Mux/ Relay Control CCA
- Interface Converter CCA
- Resolver Data Isolator CCA
- R/D Converter CCA
- Motor Driver CCA
- Test fixture and cabling to simulate the 1553 bus interface
- Test fixture and cabling to interrogate and analyze positional data
- Test motor and inertia wheel

The ***Transistor Assembly Test*** verifies the correct wiring of the transistor assembly and associated cabling. Test configuration includes the CKT 1000 (continuity and Hi-Pot tester), and test fixtures.

The Antenna Drive Subsystem Tests:

- Are configured with the same motor control CCA's used in the signal processor test, interconnecting wiring, the power transistor assembly, and the drive assembly with reflector.
- The antenna drive subsystem components were all installed in the instrument when the subsystem test was performed.
- DC power for the motor control circuit cards was provided by a DC/DC converter simulator P/N: 1359322-1. The simulator operates on 120VAC facility supplied

power. The power for the reflector motor drive circuits however was provided directly by the STE Noisy Bus power supply.

4.0 TEST SETUP

The antenna drive subsystem tests are performed during system integration. During system integration testing, the instrument is proven electrically safe via ground isolation, and power distribution checks. Next, the communication link is exercised to ensure commands are received and interpreted correctly. The Antenna Drive Subsystem Test is then performed.

5.0 TEST RESULTS

The Antenna Drive Subsystem components designated for use in the EOS AMSU-A2 instrument are shown in Table 1. During preliminary testing of these components (in preparation for the antenna drive subsystem test), several component failures occurred. The component failures and system related dispositions are listed below:

- ***Reflector Drive Motor*** - replaced a suspected failed (or weakened) bearing after vibration testing.
- ***Reflector Drive Motor*** - replaced a broken stator clamp. The clamp was replaced with a more robust design.

CCA	S/N
Resolver Data Isolator Assembly	F19
Interface Converter Assembly	F21
Motor Driver Assembly	F10
R/D Converter/ Oscillator Assembly	F07

OTHER	S/N
Reflector Drive Motor (A2)	F03
Signal Processor	F01
Transistor Assembly (W3 cable)	N/A

Table 1.
EOS AMSU-A2 S/N:202 Antenna Subsystem Component S/N Designations

All other components designated for use in the EOS AMSU-A2 instrument (pertaining to the scan drive circuitry) passed on the first time through component testing.

5.1 REFLECTOR DRIVE ASSEMBLY

The tests performed on this unit are: Starting Torque Test, Motor Commutation Test, Resolver Operation/ No-Load Speed Test, and Random Vibration. The Motor Commutation and Resolver Operation tests are performed both pre and post-vibration.

Starting Torque
The starting torque test is performed on the rotating segment of the drive assembly to verify the torque associated with bearing friction. The reflector drive assembly (F03) passed the starting torque test at ambient temperature as well as at the colder plateaus.

Motor Commutation Test
This test is performed to determine the commutation characteristics of the motor under test. The reflector drive assembly (F03) passed the motor commutation test both pre- and post-vibration tests without incident.

Resolver Operation/ No-Load Speed Test
This test is performed to verify resolver operation as well as speed characteristics and back electromotive force of the motor. The reflector drive assembly (F03) passed the resolver operation/ no-load speed test both pre- and post-vibration tests without incident.

Random Vibration
During the -6db level random vibration a significant change in resonant frequency was observed. An anomaly was found relating to the bearing installation; although the bearing was installed properly, it was determined that the torque value is too low. The process was changed to increase the torque on the bearing during installation.

When reassembled, the motor was re-vibrated without incident.

The reflector drive assembly passed the pre- and post-vibration electronic tests as well as the post-vibration visual inspection without incident.

5.2 CIRCUIT CARD ASSEMBLIES

Test procedures were prepared for each motor control circuit card; document revision status is controlled by reference in the shop order. The cards were individually tested to the procedures and results were recorded on data sheets found in Appendix A. The following list indexes the CCA Test Data Sheets:

- *Appendix A1 ..... Resolver Data Isolator Assembly*
- *Appendix A2 ..... Interface Converter Assembly*
- *Appendix A3 ..... Motor Driver Assembly*
- *Appendix A4 ..... R/D Converter/ Oscillator Assembly*

All circuit card assemblies passed testing the first time through. The assembly build shop orders contain the part number and accept tag record the of test and select resistors.

5.3 SIGNAL PROCESSOR

For the first time, the entire antenna drive motor electronics is mated together. The test instrumentation commands and interrogates the electronics during this segment of testing. The instrumentation sends position commands to the Interface Converter CCA. The Interface Converter D/A's the command and provides inputs to the Motor Driver CCA. The test motor (instrumentation) responds to the drive signal and feeds back positional data via resolver outputs. The instrumentation then interrogates the Resolver Data Isolator CCA for position data. A comparison is made in the instrumentation between the position command sent and the actual position received. The pass/ fail indication is presented to the operator for test data sheet recording.

The signal processor assembly (F01) passed all scan drive tests.

5.4 TRANSISTOR ASSEMBLY

All transistor assemblies are tested along with their respective W3 cable. The cable is continuity, then hi-pot tested prior to attaching the transistor circuitry. Each transistor pair is exercised validating the turn on voltage, current drawn, and cable wiring as well.

Prior to applying power to the transistor assembly designated for the EOS AMSU-A2 instrument, it was noted that the transistors were wired improperly. The assembly was rewired in accordance with the corrected planning. Tests results were positive; all components operated as designed.

5.5 ANTENNA SUBSYSTEM DRIVE TESTS

The antenna drive motor electronics mates with the instrument microprocessor for the first time during this segment of testing. The microprocessor sends position commands from the memory CCA to the Interface Converter CCA. The Interface Converter D/A's the command and provides inputs to the Motor Driver CCA. The Reflector Drive Motor responds to the drive signals and feeds back positional data via the resolver outputs. The microprocessor then interrogates the Resolver Data Isolator CCA for position data.. The microprocessor in turn communicates with the 1553 interface which subsequently relays positional data to the STE.

During other segments of the test, positional data is monitored via a potentiometer attached to the shaft of the reflector drive assembly. This provides scan characteristic information in regard to overshoot, jitter, and beam position transition timing.

The remaining paragraphs in this section discuss tests that ensures the instrument complies with specific operating parameters. Prior to conducting these tests there is a

series of preliminary checks that are run to select component values that customize the operating parameters of the instrument. These checks perform the following functions:

- Program "on board" memory with Beam Position Pointing Angles
- Adjust for peak Motor Current Limits
- Observe Preliminary Scan Dynamics
- Identify Mechanical Resonant Frequencies

Beam Position Pointing Angles are calculated from Nadir pointing direction which is determined on the antenna range. The instrument's EPROMs (EPROMs for testing; PROMs for final configuration) are programmed to reflect the position commands. The initial programming may require fine tuning; fine tuning is determined during the remaining segments of the test procedure. (Subsequent tests showed the EOS AMSU-A2 instrument required beam pointing direction correction at only one position.)

Motor Current Limits were adjusted, via selecting "test and select" resistors, to comply with the specification requirement; less than 1 amp peak current.

Preliminary Scan Dynamics looked good; transition times, overshoot and jitter were all acceptable at the sampled pointing directions (5).

The ***Mechanical Resonant Frequencies*** were identified; notch filters were calculated and installed to compensate for these resonant frequencies.

5.5.1 SCAN MOTION AND JITTER

In this test, the antenna position was measured in a series of five 8-sec full scans. The measurement was made with a 1-turn test potentiometer temporarily affixed to the rear end of the motor shaft. A Dynamic Signal Analyzer (DSA) was connected to the pot wiper to record the antenna position data. Five scans were captured and stored on the AMSU-A2 Test Data File disc. One representative waveform is presented in Appendix B1.

Each 3.33 degrees scene step was expanded and checked for a 42 msec max step time, and the 158 msec integration period. Expanded waveforms were plotted and are presented in Appendix B2 thru B30. All of the scene steps meet the step response requirement for transition time, overshoot, and jitter.

Slew periods to the cold and warm calibration stations were measured and met requirements. A time of 0.21 sec is allocated for the 35.0 degree slew to cold cal, and 0.40 sec for the 96.67 degree slew to warm cal. Calibration station jitter was less than the $\pm$ 5 % maximum permitted. Expanded waveforms were plotted and are presented in Appendix B31 thru B34. The waveforms are also stored on the AMSU-A2 Test Data File disc. The test data sheet is presented in Appendix B35

5.5.2 NOISY BUS PEAK CURRENT AND RISE TIME

The noisy pulse load bus peak current and the rate of change of current were measured. The peak current must be less than 1A at any beam position along the scan. Peak current along the scan is .984A. The current rate of change while transitioning from one beam position to the next (including the transition to the cold calibration and warm calibration targets) should be greater than 70 microseconds. A random 3.33° step was selected; the transition to the next step was 1.2 ms. The transition to the warm cal position start and stop was significantly longer than the required 70 ms; 1.95 and 2.30 ms respectively.

The peak bus current was measured across the entire scan and met the requirement. The full scan waveform was plotted and is presented in Appendix C1. The waveform is also stored on the AMSU-A2 Test Data File disc. The test data sheet is presented in Appendix C2

5.5.3 RESOLVER READING AND POSITION ERROR

The 14-bit command position word is stored in the "on-board" memory and is read to the motor drive circuitry under microprocessor program control. The microprocessor also reads the resolver output at each of the thirty scene stations, and at the cold and warm calibration positions. The readings are made at the start of integration (LOOK 1), and halfway into the integration period (LOOK 2). The resolver data is sent to the 1553 bus interface for subsequent transmission to the STE.

The purpose of this portion of the test is to demonstrate that the antenna is meeting beam pointing requirements.

If the antenna is out of the pointing tolerance of $> \pm 10$ counts at LOOK 1 or $> \pm 5$ counts at LOOK 2 , the EPROM is reprogrammed to bring the pointing direction to within the prescribe tolerances. A copy of the STE computer print out showing the pointing direction is shown in Figure 2.

		Actual		Difference*	
BP	Command	Look 1	Look2	Look 1	Look2
1	8035	8033	8033	2	2
2	7883	7882	7882	1	1
3	7731	7730	7730	1	1
4	7580	7579	7581	1	-1
5	7428	7426	7428	2	0
6	7276	7276	7277	0	-1
7	7125	7124	7125	1	0
8	6973	6969	6974	4	-1
9	6821	6817	6821	4	0
10	6670	6665	6670	5	0
11	6518	6517	6519	1	-1
12	6366	6365	6367	1	-1
13	6215	6214	6217	1	-2
14	6063	6063	6065	0	-2
15	5911	5910	5912	1	-1
16	5760	5758	5760	2	0

		Actual		Difference*	
BP	Command	Look 1	Look2	Look 1	Look2
17	5608	5605	5610	3	-2
18	5456	5452	5457	4	-1
19	5305	5300	5305	5	0
20	5153	5152	5154	1	-1
21	5001	5000	5002	1	-1
22	4850	4848	4851	2	-1
23	4698	4697	4699	1	-1
24	4546	4545	4547	1	-1
25	4395	4393	4394	2	1
26	4243	4238	4243	5	0
27	4091	4088	4092	3	-1
28	3940	3936	3939	4	1
29	3788	3786	3788	2	0
30	3636	3635	3637	1	-1
CC 1	2043	2042	2043	1	0
WC	14028	14029	14028	-1	0

* Difference between Command and Actual

Figure 2. Beam Position Pointing Directions and Error Calculation

5.5.4 GAIN/PHASE MARGIN

A gain/phase margin test was performed on the antenna drive subsystem. The test was performed by obtaining a Bode plot of the control loop and measuring the gain at 180° phase differential and the phase margin at the 0db crossover point.

The Dynamic Signal Analyzer (DSA) was used to make the measurement operating in the swept sine mode. Three separate Bode plots were made on the antenna and the gain and phase margins were determined from each plot. The gain margin measured was 12.2 db (average of three) and the phase margin measured was 65 degrees (average of three). These margins exceed the specification requirements of 12 db and 25 degrees and therefore are acceptable. The three Bode waveforms were plotted and are presented in Appendix D1 thru D3. The waveforms are also stored on the AMSU-A2 Test Data File disc. The test data sheet is presented in Appendix D4.

5.5.5 OPERATIONAL GAIN MARGIN

An operational gain margin test was performed on the instrument three times. This test consists of increasing the gain of the control loop until oscillation occurs. The gain increase and frequency of oscillation are measured. An increase in gain greater than 9 db is required; the frequency of oscillation is an observation.

A 50K pot was connected in series with the R58 feedback resistor on amplifier AR8. The resistance of the test pot was slowly added to the feedback resistor while observing the reflector for oscillations.

The reflector begins to produce an audible sound as gain is increased. The following added resistance values are calculated to have the following gain margins:

Resistance	Gain
38.23	9.1 db
40.70	9.4 db
38.47	9.1 db

The first mode mechanical resonance of the shaft and reflector is about 164 Hz as shown in the power spectrum. The power spectrum waveform was plotted and is presented in Appendix E1. The waveform is also stored on the AMSU-A2 Test Data File disc. The test data sheet is presented in Appendix E2.

6.0 CONCLUSION

Based on the test results, it can be concluded that the EOS AMSU-A2 S/N 202 antenna drive subsystem meets the AMSU-A specification requirements.

7.0 TEST DATA

Test data for the AMSU-A2 S/N 202 obtained in the antenna drive subsystem test is attached. Data sheet number and type of test is shown in the following Appendix Index.

APPENDIX INDEX

Appendix A1 .....Resolver Data Isolator CCA TDS

Appendix A2 ..... Interface Converter CCA TDS

Appendix A3 ..... Motor Driver CCA TDS

Appendix A4 .....R/D Converter/ Oscillator CCA TDS

Appendix B1 .....Full Scan Step Response

Appendix B2 thru B30.....Single Step Responses

Appendix B31 and B32.....Cold Calibration Step Response

Appendix B33 and B34.....Warm Calibration Step Response

Appendix B35 .....Scan Motion Jitter Test TDS

Appendix C1 .....Peak Pulse Load Bus Current Waveform

Appendix C2.....Pulse Load Bus Current TDS

Appendix D1 thru D3 .....Gain/ Phase Margin Bode Plots

Appendix D4.....Gain/ Phase Margin TDS

Appendix E1 .....Operational Gain Margin Power Spectrum

Appendix E2 .....Operational Gain Margin TDS

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TEST DATA SHEET B-6 (Sheet 1 of 2)

RESOLVER DATA ISOLATOR CCA (P/N 1334972) (Paragraph 6.6.7)

Date: 4/14/97
S/N: F19
1334972-1

6.6.7.1 Supply Voltages

Supply*	Measured Value (V)	Limits (Vdc)	Pass/Fail
+5 V (I)	5.00	± 0.25	P
+5 V (U)	5.03	± 0.25	P

6.6.7.2 Supply Currents

Steps 1 and 2:

Supply*	Measured Value (mA)	Limits (mA)	Pass/Fail
+5 V (I)	53.19	100 max	P
+5 V (U)	320.00	400 max	P

Steps 3 and 4: DL

Supply*	Measured Value (mA)	Limits (mA)	Pass/Fail
+5 V (I)	83.28	150 max	P
+5 V (U)	12.01	30 max	P

* I = Isolated, U = Unisolated

6.6.7.3 Resolver Data

Bit No.	Pass/Fail
API 0 - AP Bit 0	P
API 1 - AP Bit 1	P
API 2 - AP Bit 2	P
API 3 - AP Bit 3	P
API 4 - AP Bit 4	P
API 5 - AP Bit 5	P
API 6 - AP Bit 6	P
API 7 - AP Bit 7	P
API 8 - AP Bit 8	P
API 9 - AP Bit 9	P
API 10 - AP Bit 10	P
API 11 - AP Bit 11	P
API 12 - AP Bit 12	P
API 13 - AP Bit 13	P

6.6.7.4 Converter Busy Pulse

Converter Busy Pulse	Measured Value (µsec)	Limits (µsec)	Pass/Fail
15.0	~~13.6~~ 15.15	± 3.0	P

DLW
4/16/97

TEST DATA SHEET B-6 (Sheet 2 of 2)

RESOLVER DATA ISOLATOR CCA (P/N 1334972) (Paragraph 6.6.7)

Comments:
NONE

Conducted by: Dennis Lew — Test Engineer — Date 4/14/97

Verified by: Judie Herrera (7A 269) — Quality Control Inspector — Date 4/16/97

Approved by: [signature] — DCMC — Date 4/16/97

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TEST DATA SHEET B-13 (Sheet 1 of 3)

INTERFACE/CONVERTER CCA (P/N 1331697) (Paragraph 6.13.7)

Date: 5/7/97
CCA S/N: F21
1331697-1

6.13.7.1 Supply Voltages

Supply	Measured Value (Vdc)	Limits (Vdc)	Pass/Fail
+5V (U)	+4.98V	+5V± 0.05	P
+15V (I)	+15.03V	+15V± 0.15	P
-15V (I)	-15.02V	-15V± 0.15	P
+5V (I)	+5.00V	+5V± 0.05	P

6.13.7.2 Supply Currents

Step 1 (CP and API Low):

Supply	Measured Value (mA)	Limits (mA)	Pass/Fail
+5V (U)	86.31 mA	70 - 110	P
+5V (I)	3.33 mA	1.5 - 5.5	P
+15V (I)	17.75 mA	15 - 23	P
-15V (I)	20.50 mA	18 - 26	P

Step 2 (CP and API High):

Supply	Measured Value (mA)	Limits (mA)	Pass/Fail
+5V (U)	56.32 mA	40 - 70	P
+5V (I)	23.75 mA	18 - 30	P
+15V (I)	17.74 mA	15 - 23	P
-15V (I)	20.50 mA	18 - 26	P

6.13.7.3 Amplifier Offsets

Amplifier	Measured Value (mV)	Limits (mV)	Pass/Fail
AR1	- 0.05 mV	0.0 ±0.15	P
AR2	- 0.42 mV	0.0 ±2.0	P

TEST DATA SHEET B-13 (Sheet 2 of 3)

INTERFACE/CONVERTER CCA (P/N 1331697) (Paragraph 6.13.7)

6.13.7.4 Subtraction and D-A Conversion

Step 1:

Actual Position (API) MSB LSB	Command Position (CP) MSB LSB	AR1 Output* Voltage Required (Vdc)	Test Result (Vdc)	Pass/Fail
00000000000000	00000000000000	0.00000	-0.00005	P
00000000000001	00000000000000	-0.00061	-0.00067	P
00000000000010	00000000000000	-0.00122	-0.00131	P
00000000000011	00000000000000	-0.00184	-0.00196	P
00000000000100	00000000000000	-0.00245	-0.00259	P
00000000001000	00000000000000	-0.00490	-0.00513	P
00000000010000	00000000000000	-0.00979	-0.01023	P
00000000100000	00000000000000	-0.01958	-0.02043	P
00000001000000	00000000000000	-0.03917	-0.04083	P
00000010000000	00000000000000	-0.07834	-0.08163	P
00000100000000	00000000000000	-0.15667	-0.16324	P
00001000000000	00000000000000	-0.31334	-0.32649	P
00010000000000	00000000000000	-0.62669	-0.65305	P
00100000000000	00000000000000	-1.25338	-1.3061	P
01000000000000	00000000000000	-2.50675	-2.6123	P
10000000000000	**00000000000000**	**-5.01350**	-5.2247	P

* Tolerance on output voltage is ± 10%

Step 2:

Actual Position (API) MSB LSB	Command Position (CP) MSB LSB	AR1 Output* Voltage Required (Vdc)	Test Result (Vdc)	Pass/Fail
00000000000000	00000000000000	0.00000	-0.00004	P
00000000000000	00000000000001	0.00061	+0.00055	P
00000000000000	00000000000010	0.00122	+0.00116	P
00000000000000	00000000000011	0.00184	+0.00173	P
00000000000000	00000000000100	0.00245	+0.00243	P
00000000000000	00000000001000	0.00490	+0.00498	P
00000000000000	00000000010000	0.00979	+0.01012	P
00000000000000	00000000100000	0.01958	+0.02031	P
00000000000000	00000001000000	0.03917	+0.04073	P
00000000000000	00000010000000	0.07834	+0.08153	P
00000000000000	00000100000000	0.15667	+0.16322	P
00000000000000	00001000000000	0.31334	+0.32653	P
00000000000000	00010000000000	0.62669	+0.65309	P
00000000000000	00100000000000	1.25338	+1.3061	P
00000000000000	01000000000000	2.50675	+2.6122	P
00000000000000	**10000000000000**	**-5.01350**	-5.2248	P

* Tolerance on output voltage is ± 10%

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TEST DATA SHEET B-13 (Sheet 3 of 3)

INTERFACE/CONVERTER CCA (P/N 1331697) (Paragraph 6.13.7)

6.13.7.5 Strobe Function

Step 1: Strobe Low

	Pass/Fail
No E11 Change with Input CP Changes	P

Step 2: Strobe High

	Pass/Fail
E11 Change with Input CP Changes	P

6.13.7.6 Amplifier Gain

	Measured Value (Vdc)	Limits (Vdc)	Pass/Fail
E11	0.32652	-	P
E10	3.5899	-	P
E10 Voltage / E11 Voltage	11.0	10.7 - 11.3	P

6.13.7.7 Ground Isolation

	Measured Value (MΩ)	Limits (MΩ)	Pass/Fail
Pin 91 to Pin 7 DC Resistance	520MΩ	>20	P

Comments: NONE

Conducted by: Dennis Lum — Test Engineer — Date 5/7/97

Verified by: Judith Hervey (7A 269) — Quality Control Inspector — Date 5/8/97

Approved by: [signature] — DCMC — Date 5/13/97

TEST DATA SHEET B-4 (Sheet 1 of 2)

MOTOR DRIVER 3-HALL SENSOR CCA (P/N 1331694) (Paragraph 6.4.3)

S/N: F10
Date: 4/17/97
1331694-4

6.4.3.2 Input Signal Offset

Step No.	Test Results	Limits
4	1.35 mV	0.0 ±1 mVdc
6	1.29 mV	0.0 ±1 mVdc
8	1.24 mV	0.0 ±1 mVdc

Step No.	Test Resistor	Resistance Measured
13	E7-E8 (R25)	3.4K
	E9-E10 (R52)	5.48K
	E11-E12 (R33)	3.40K
	E13-E14 (R53)	5.50K
	E15-E16 (R42)	3.40K
	E17-E18 (R54)	5.30K

Step No.	Resistors	Selected Trim Resistors
14	R25	RNC55J3401FS
	R52	RNC55J5621FS
	R33	RNC55J3401FS
	R53	RNC55J5621FS
	R42	RNC55J3401FS
	R54	RNC55J5231FS

Step No.	E Point	Test Results	Limits	Pass/Fail
19	E19	-0.09 mV	0.0 ±1 mVdc	P
	E20	-0.08 mV	0.0 ±1 mVdc	P
	E21	+0.07 mV	0.0 ±1 mVdc	P

6.4.3.3 Motor Driver Operation

Clockwise Rotation:

Step No.	Test Results	Limits	Pass/Fail
2	5.001 V	+5V±0.05Vdc	P
	49 mA	70mAdc max	P
	15.074 V	+15V±0.15Vdc	P
	1 mA	3.0mAdc max	P
	-15.001 V	-15V±0.15Vdc	P
	18 mA	25mAdc max	P
	28.033 V	+28V±0.5Vdc	P
	6 mA	8mAdc max	P
3	242 mV	400mVdc max	P
4	41 mA	50mAdc max	P
5	47 mA	50mAdc max	P

AE-26693A
10 Feb 97

TEST DATA SHEET B-4 (Sheet 2 of 2)

MOTOR DRIVER 3-HALL SENSOR CCA (P/N 1331694) (Paragraph 6.4.3)

Counter Clockwise Rotation:

Step No.	Test Results	Limits	Pass/Fail
3	270 mV	400mVdc max	P
4	36 mA	50mAdc max	P
5	39 mA	50mAdc max	P

6.4.3.4 Current Limit Test

Step No.	Test Results	Limits	Pass/Fail
2	435 mA	350-500mAdc	P

Comments:
NONG

Conducted by: Dennis Lum — Test Engineer — Date 4/17/97

Verified by: Judia Harvey (7A 269) — Quality Control Inspector — Date 04/28/97

Approved by: [signature] — DCMC — Date 4/29/97

TEST DATA SHEET B-5 (Sheet 1 of 3)

R-D CONVERTER/OSCILLATOR CCA (P/N 1337739) (Paragraph 6.5.7)

Date 5/14/97
CCA S/N F07
1337739-2

6.5.7.1 UUT Pre-Test

Step 2:

Supply Currents (Without UUT)

Supply (Vdc)	(Baseline) Measured Value (mA) (Without UUT)	Limits (mA)	Pass/Fail
+15	0.06	0-1	P
-15	-0.28	-1 - 0	P
+5	0.06	0-1	P

Supply Voltages (Without UUT)

Supply	Measured Value (V)	Limits (V)	Pass/Fail
+15V (I)	15.02V	± 0.50	P
-15V (I)	-15.01V	± 0.50	P
+5V (I)	5.03V	±0.25	P

Step 6:

Supply Currents (UUT Installed)

Supply (Vdc)	Measured Value (mA) (UUT Installed)	Difference (mA) (Measured - Baseline)	Limits (mA)	Pass/Fail
+15	31.96 mA	31.9 mA	20-40	P
-15	-36.74 mA	-36.46 mA	-30 - -50	P
+5	50.85mA	50.79 mA	30-70	P

6.5.7.2 Supply Voltages (UUT Installed)

Supply	Measured Value (V)	Limits (V)	Pass/Fail
+15V (I)	15.01V	± 0.50	P
-15V (I)	-14.91V	± 0.50	P
+5V (I)	5.02V	±0.25	P

6.5.7.3 Oscillator Frequency, Duty Cycle, and Output Voltage

Parameter	Measured Value	Limits	Pass/Fail
Frequency	1603 Hz	1550-1650 Hz	P
Duty Cycle	52 %	45-55 %	P
Output Voltage	8.04 VRMS	7.6-8.4 Vrms	P

AE-26693A
10 Feb 97

TEST DATA SHEET B-5 (Sheet 2 of 3)

R-D CONVERTER/OSCILLATOR CCA (P/N 1337739) (Paragraph 6.5.7)

6.5.7.4 R-D Converter Operation

Step 1:

Bit Number/ Test Fixture Label	CW Pass/Fail	CCW Pass/Fail
API 0/1	P	P
API 1/2	P	P
API 2/3	P	P
API 3/4	P	P
API 4/5	P	P
API 5/6	P	P
API 6/7	P	P
API 7/8	P	P
API 8/9	P	P
API 9/10	P	P
API 10/11	P	P
API 11/12	P	P
API 12/13	P	P
API 13/14	P	P
Converter Busy	P	P

Step 2: wmthummel 3-4-97 (QC 16)

~~PES-RS~~ RS (E10)	Measured Value (Vdc)	Calculated Value (Vdc) * CCA -1 Assy	Calculated Value (Vdc) * CCA -2 Assy	Pass/Fail
CW Rotation**	+1.7100	N/A	+1.7896	P
CCW Rotation**	-1.7120	N/A	-1.7896	P

* Signal level function of test and calibration gain resistors. Record calculated value and measured value. Measured value shall be within ±10 percent of calculated value. The equation is as follows:

$$V = \pm 0.155 \left(\frac{R20}{R17}\right) \pm \frac{23\%}{10}$$

R20 = 59K
R17 = 5.11K
Plan 5/14/97

6.5.7.5 Amplifier Gain

wmthummel 5-15-97 (QC 229)

PES-RS	Measured Value (Vdc)	Limits (Vdc)	Pass/Fail
PES = +0.300 Vdc	1.111V	1.00 to1.30	P
PES = -0.300 Vdc	1.116V	1.00 to 1.30	P

6.5.7.6 Direction Control Signal

wmthummel 5-15-97 (QC 229)

DIR CNTRL	Measured Value (Vdc)	Limits (Vdc)	Pass/Fail
CCW Rotation	5.0V	4.5 to 5.5	P
CCW Rotation	0.12V	0.0 to 0.4	P

TEST DATA SHEET B-5 (Sheet 3 of 3)

R-D CONVERTER/OSCILLATOR CCA (P/N 1337739) (Paragraph 6.5.7)

6.5.7.7 Notch Filter Frequency Response

Frequency	Measured Value (Hz)	Calculated Value (Hz) * CCA -1 Assy	Calculated Value (Hz) * CCA -2 Assy	Pass/Fail
AR3 Notch	N/A	N/A	N/A	N/A
AR4 Notch		N/A	N/A	N/A
AR5 Notch	N/A	N/A	N/A	N/A

* Notch frequencies shall be within ±3 percent of values determined by test and calibration resistors. Record calculated and measured values.

Comments: NONE

Note

This test shall be performed at the system level during antenna drive subsystem ~~level~~ testing.

QC 16

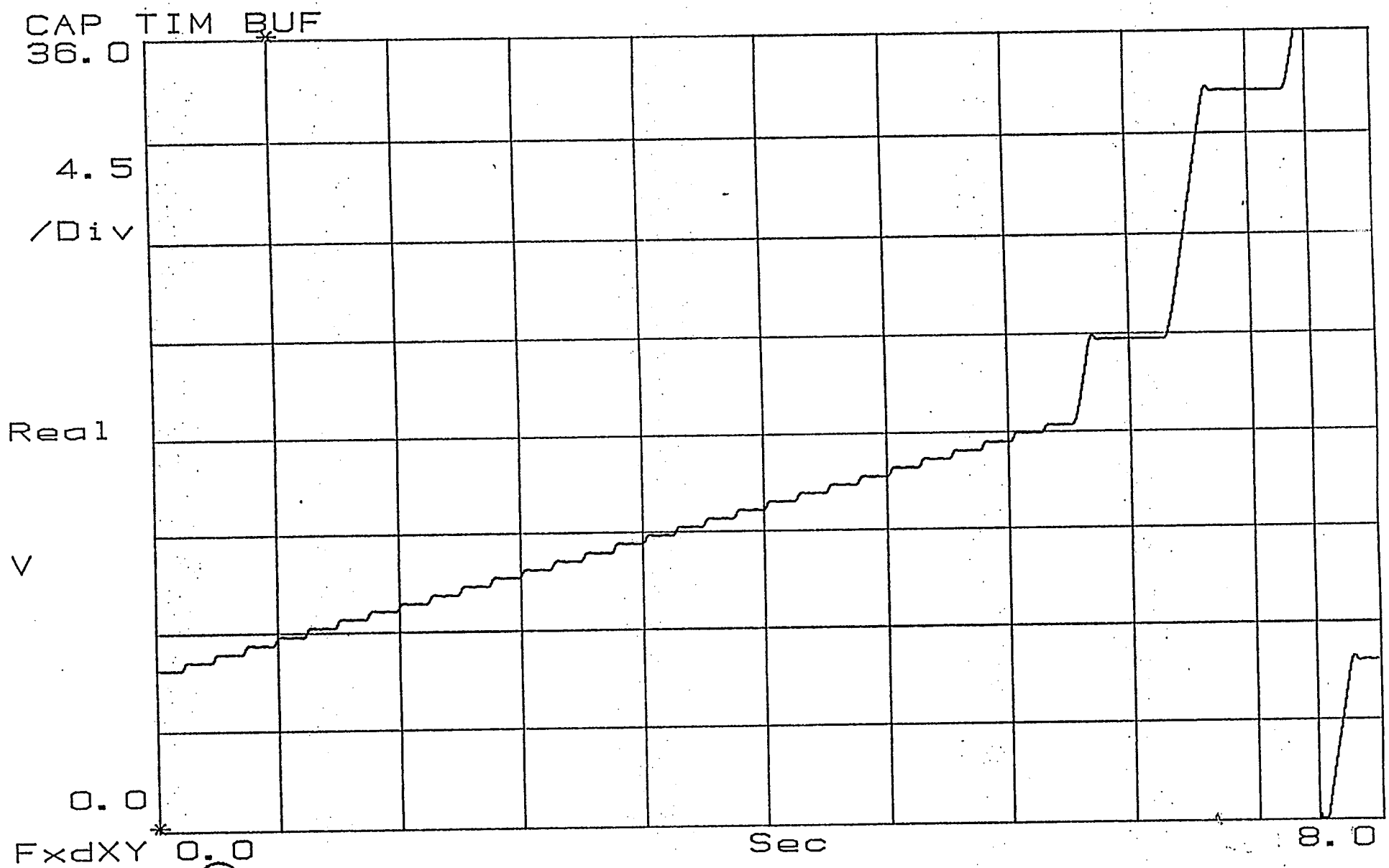
WM Hummel
3-4-97

Conducted by: Dennis Lew 5/14/97
Test Engineer Date

Verified by: Judie Harvey 5/15/97
Quality Control Inspector Date

Approved by: Tonya L. Ignowski-Clark 5/15/97
DCMC Date

SHOP ORDER: 323737 FILE NAME: 7AP_FS1 P/N: 1356006-1-IT DATE: 2-11-98



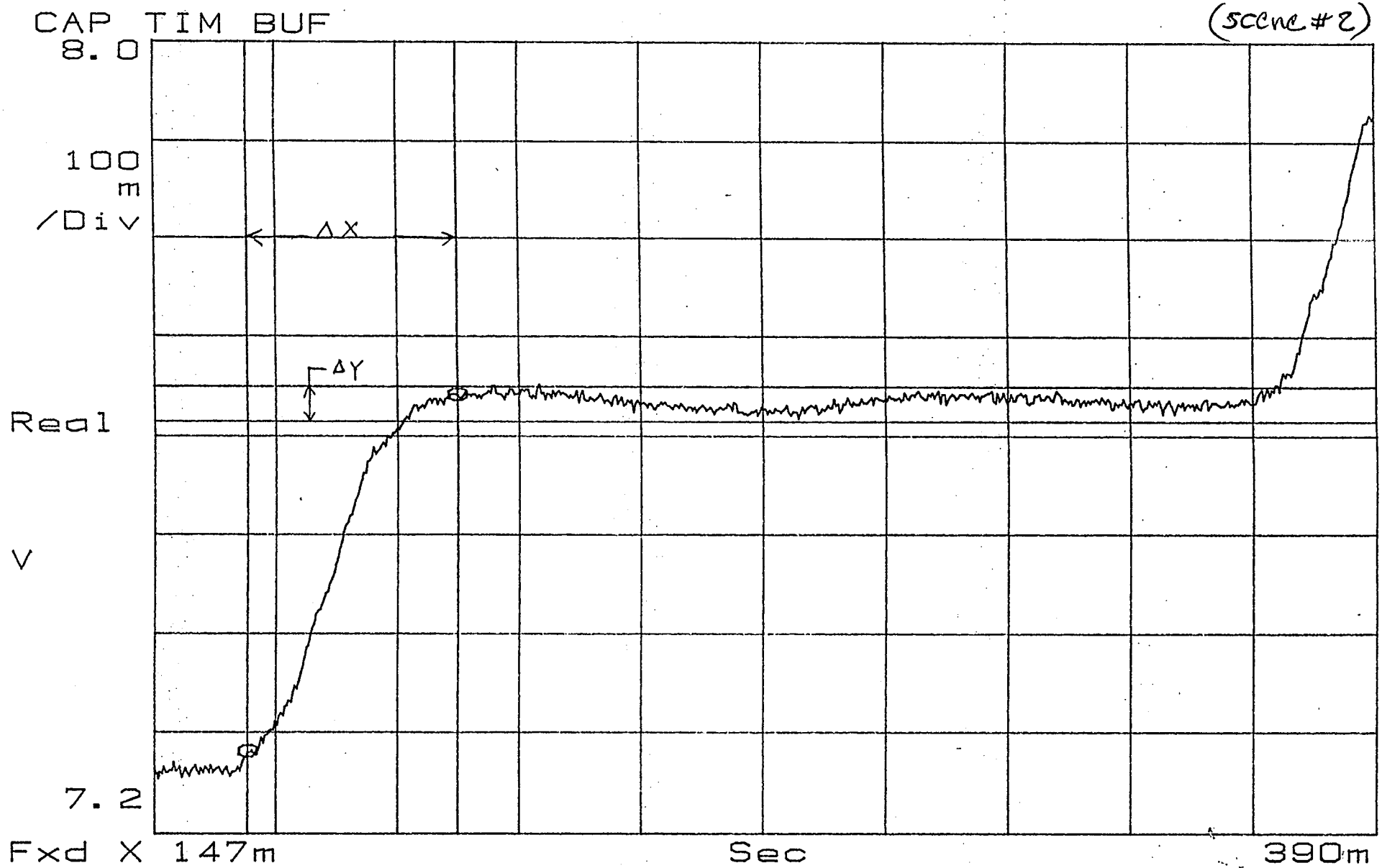
ENG 252

TEST ENG. : _____ QUALITY ENG.: _____ PARA: 3.4.4.5 step 7j PAGE 1 of 1

81

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=166.0mS ΔX=41.8mS Y=7.64945 ΔY=35.39mV
Ya=7.28037 ΔYa=360.0mV



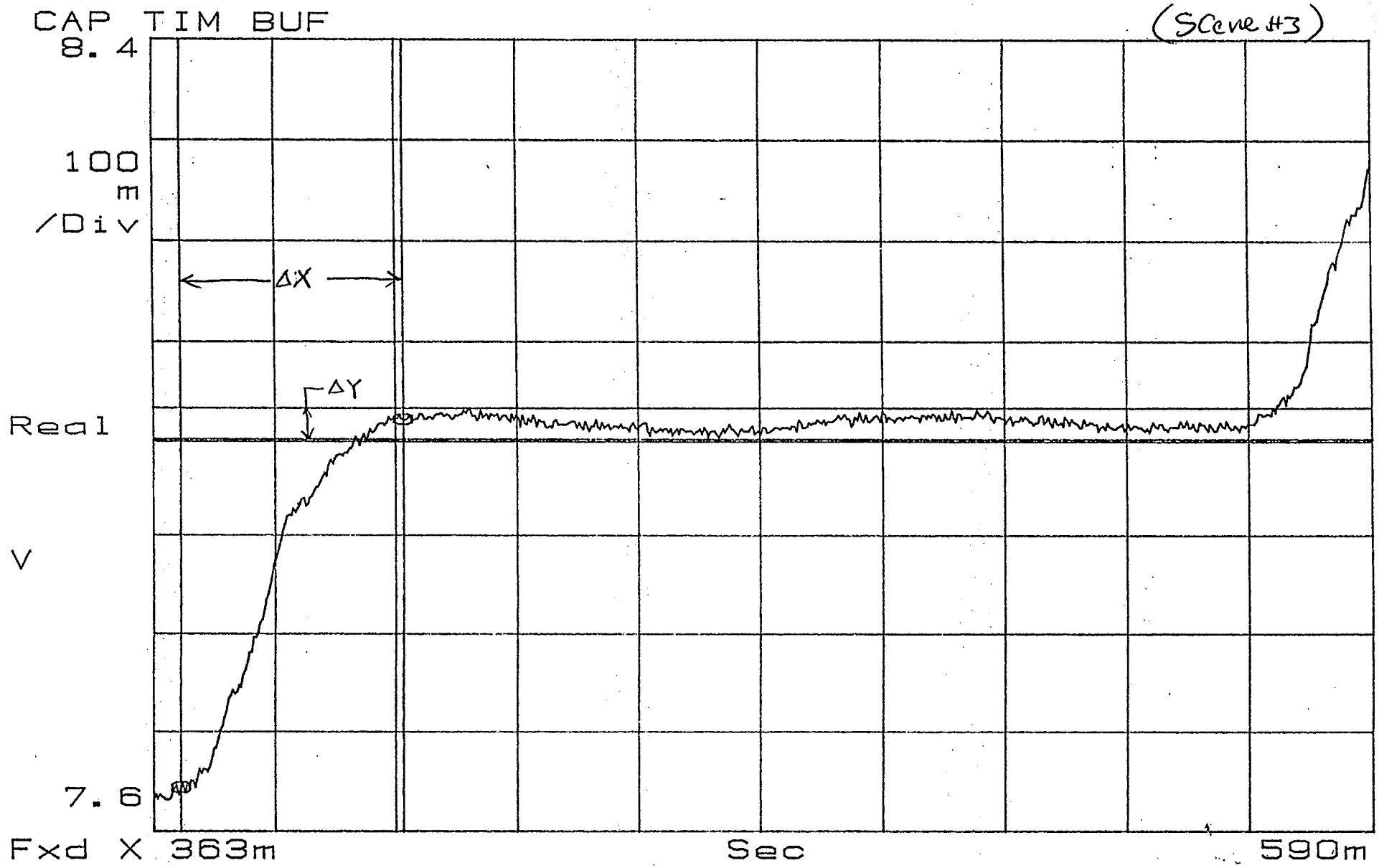
TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.5 step 9 PAGE 1 of 1

step #

B7

SHOP ORDER: 323737 FILE NAME: n/A P/N: 1356006-1-IT DATE: 2-11-98

X=368.4mS ΔX=41.8mS Y=8.03297 ΔY=35.88mV
Ya=7.64366 ΔYa=376.3mV



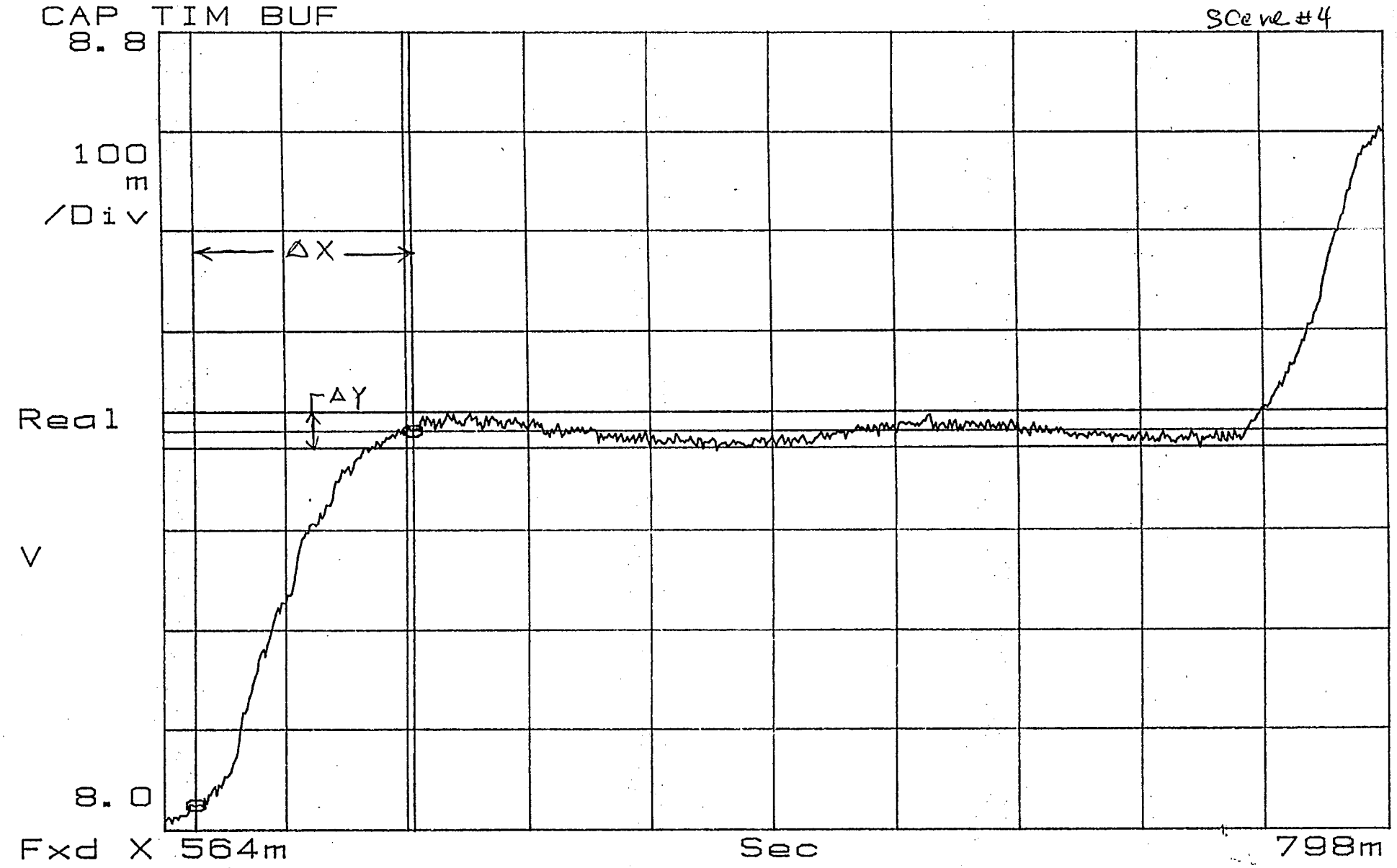
TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.5 step 10 PAGE 1 of 1

step#

B3

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=570.7mS ΔX=41.8mS Y=8.38254 ΔY=35.88mV
Ya=8.02479 ΔYa=374.6mV



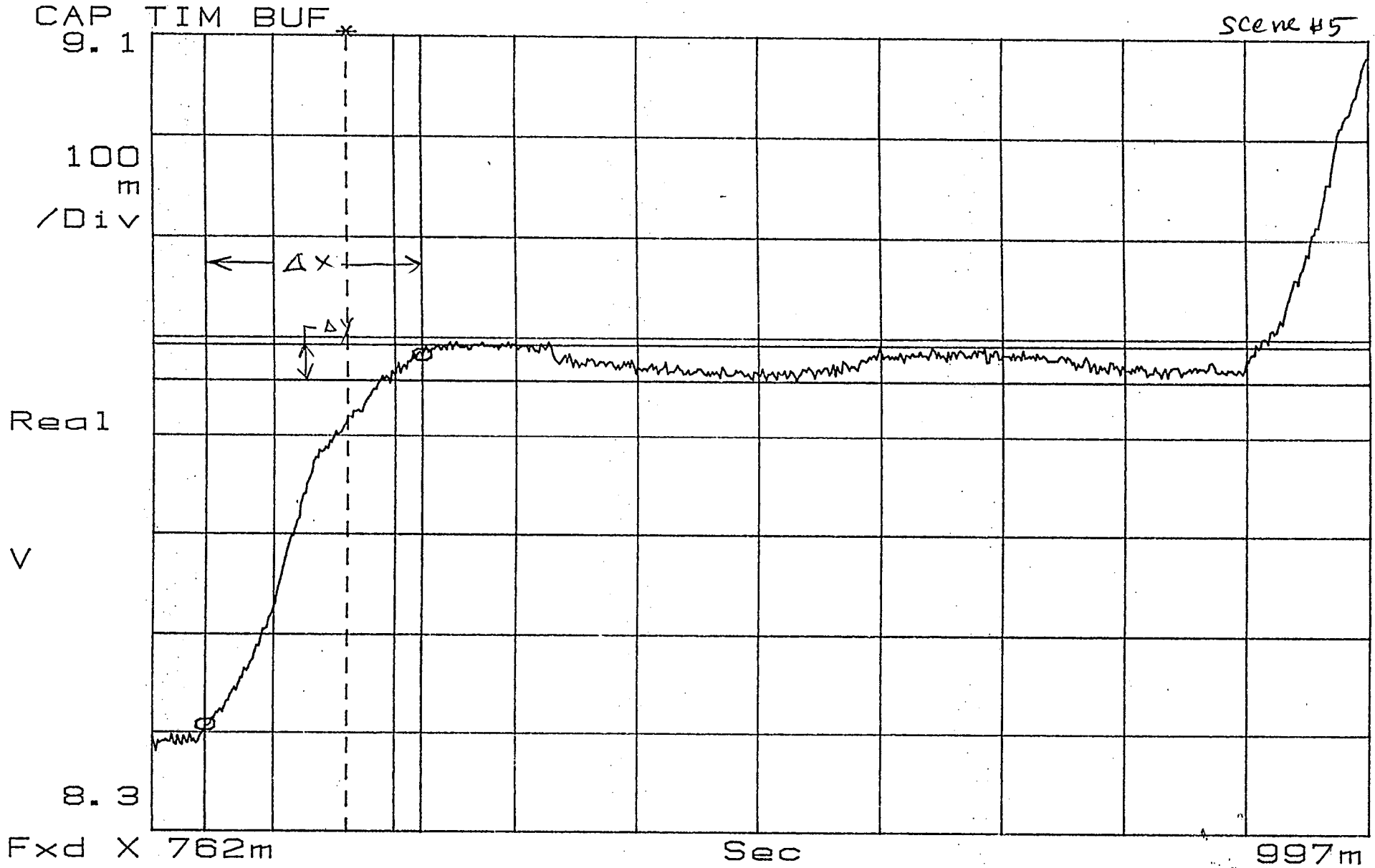
TEST ENG.: _____ QUALITY ENG.: _____ PARA: 3.4.4.5 step 11 PAGE 1 of 1

Step#1

B4

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=772.7mS ΔX=41.8mS Y=8.75624 ΔY=35.88mV
Ya=8.40754 ΔYa=374.6mV



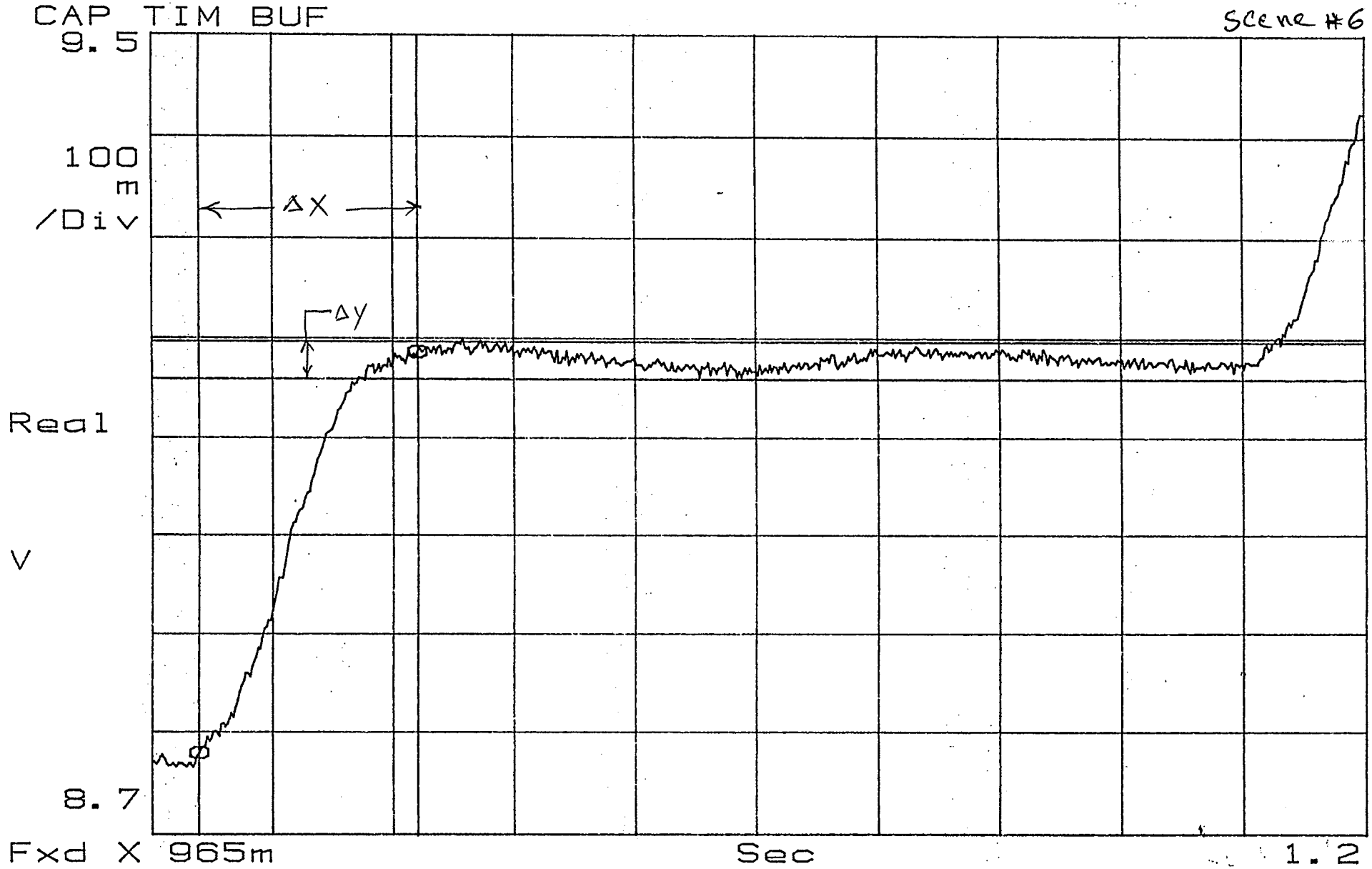
TEST ENG.: _____ QUALITY ENG.: _____ PARA: 3.4.4.5 step 12 PAGE 1 of 1

Step #5

B.

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=974.2mS ΔX=41.8mS Y=9.16012 ΔY=35.88mV
Ya=8.77893 ΔYa=407.1mV



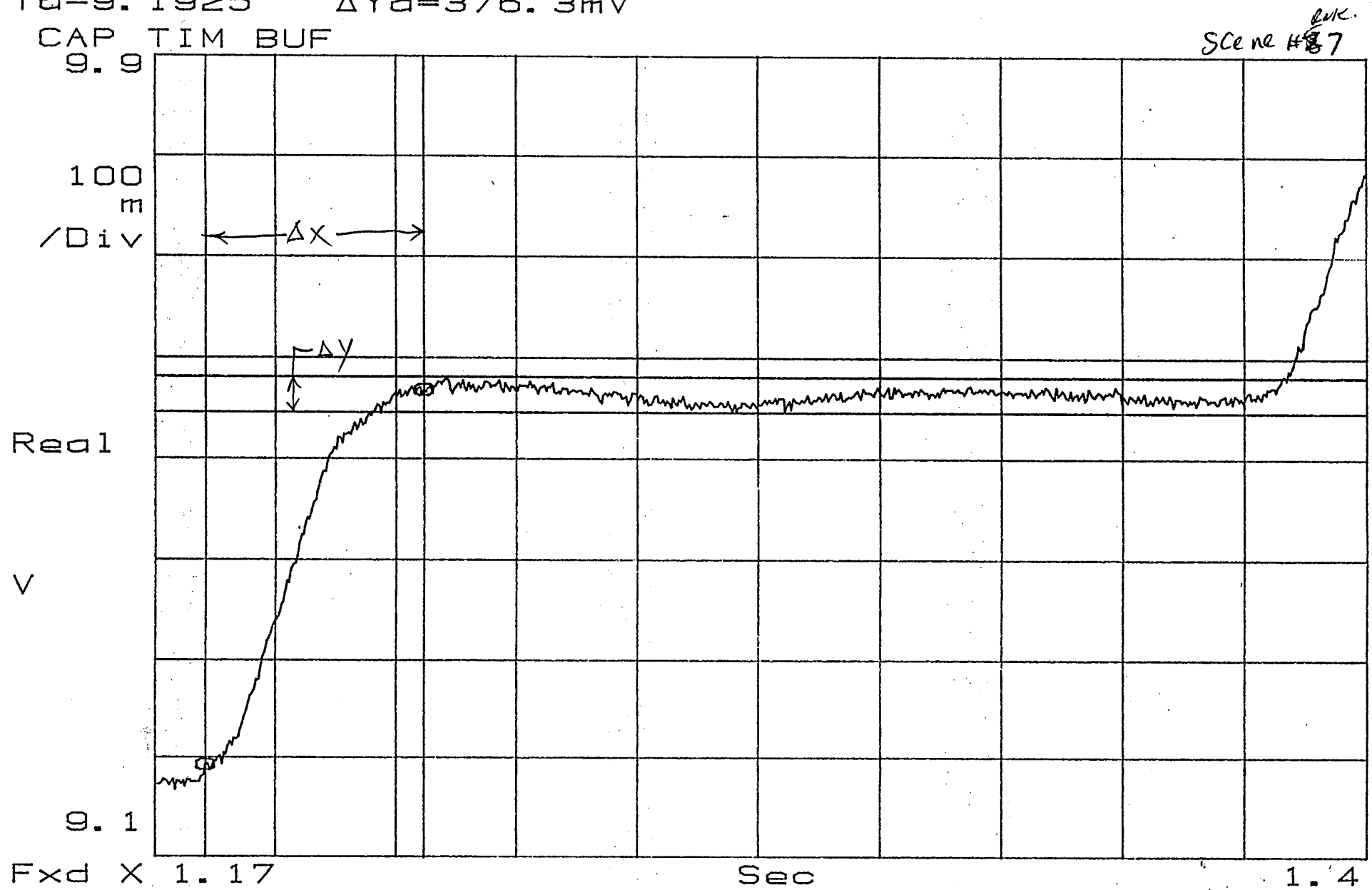
TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.5 step 13 PAGE 1 of 1

Ste, #6

B

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=1.177 S ΔX=41.8mS Y=9.54557 ΔY=35.88mV
Ya=9.1925 ΔYa=376.3mV



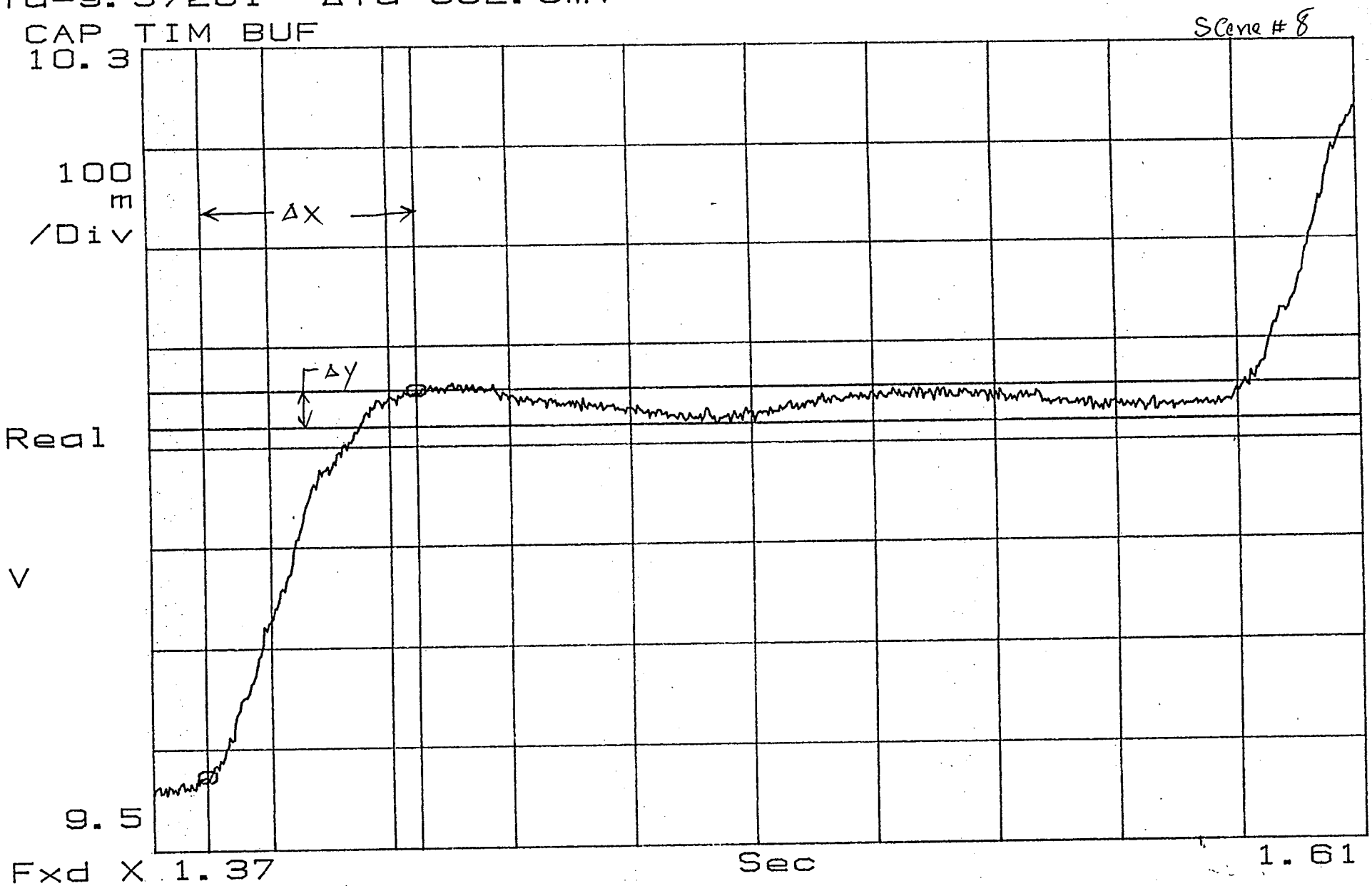
TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.5 step 14 PAGE 1 of 1

S-1 p#7

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=1.381 S ΔX=41.8mS Y=9.91891 ΔY=35.88mV

Ya=9.57201 ΔYa=382.8mV



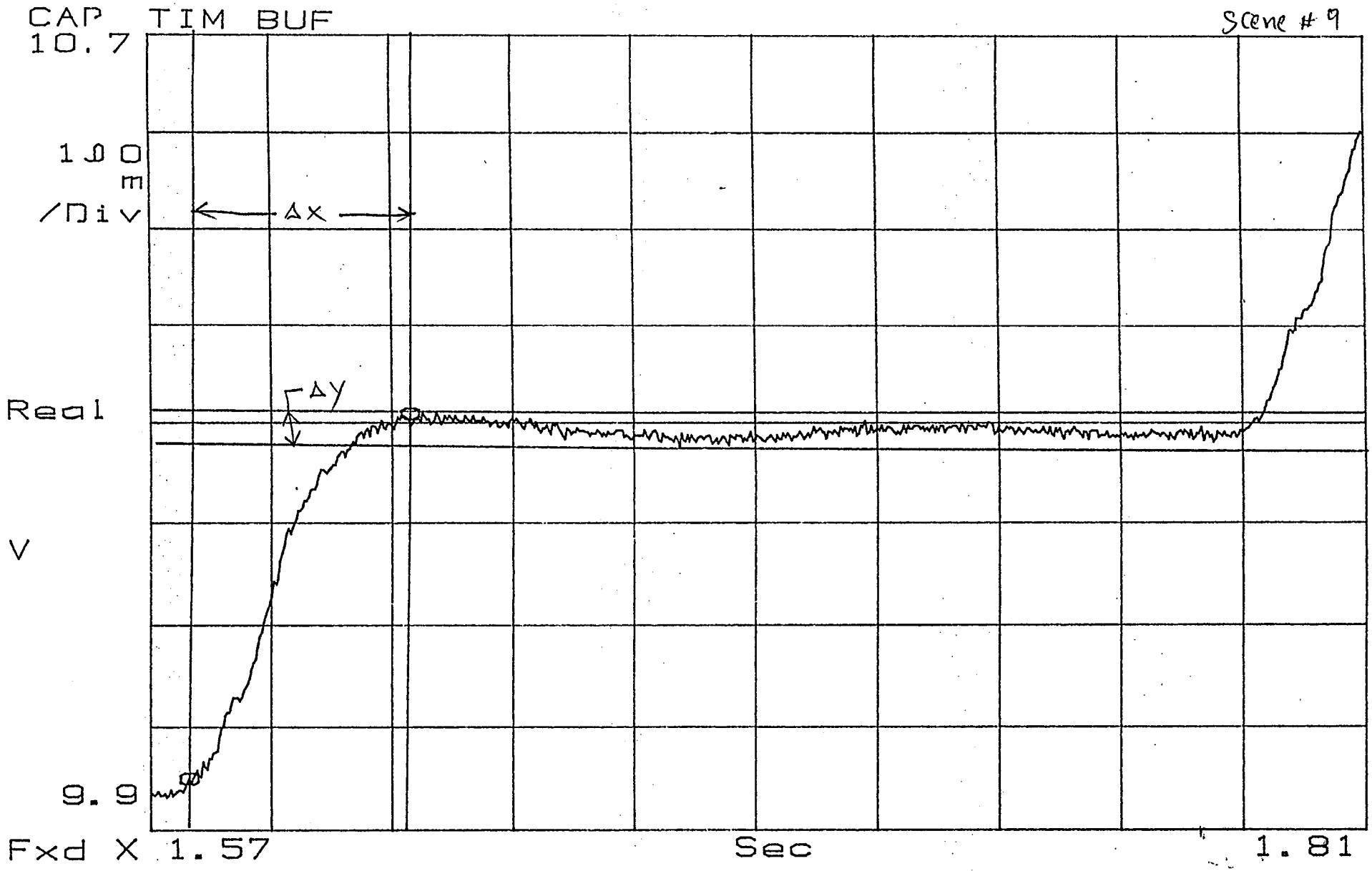
TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.5 step 15 PAGE 1 of 1

Step #8

B8

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=1.581 S ΔX=41.8mS Y=10.3107 ΔY=35.88mV
Ya=9.94503 ΔYa=361.7mV



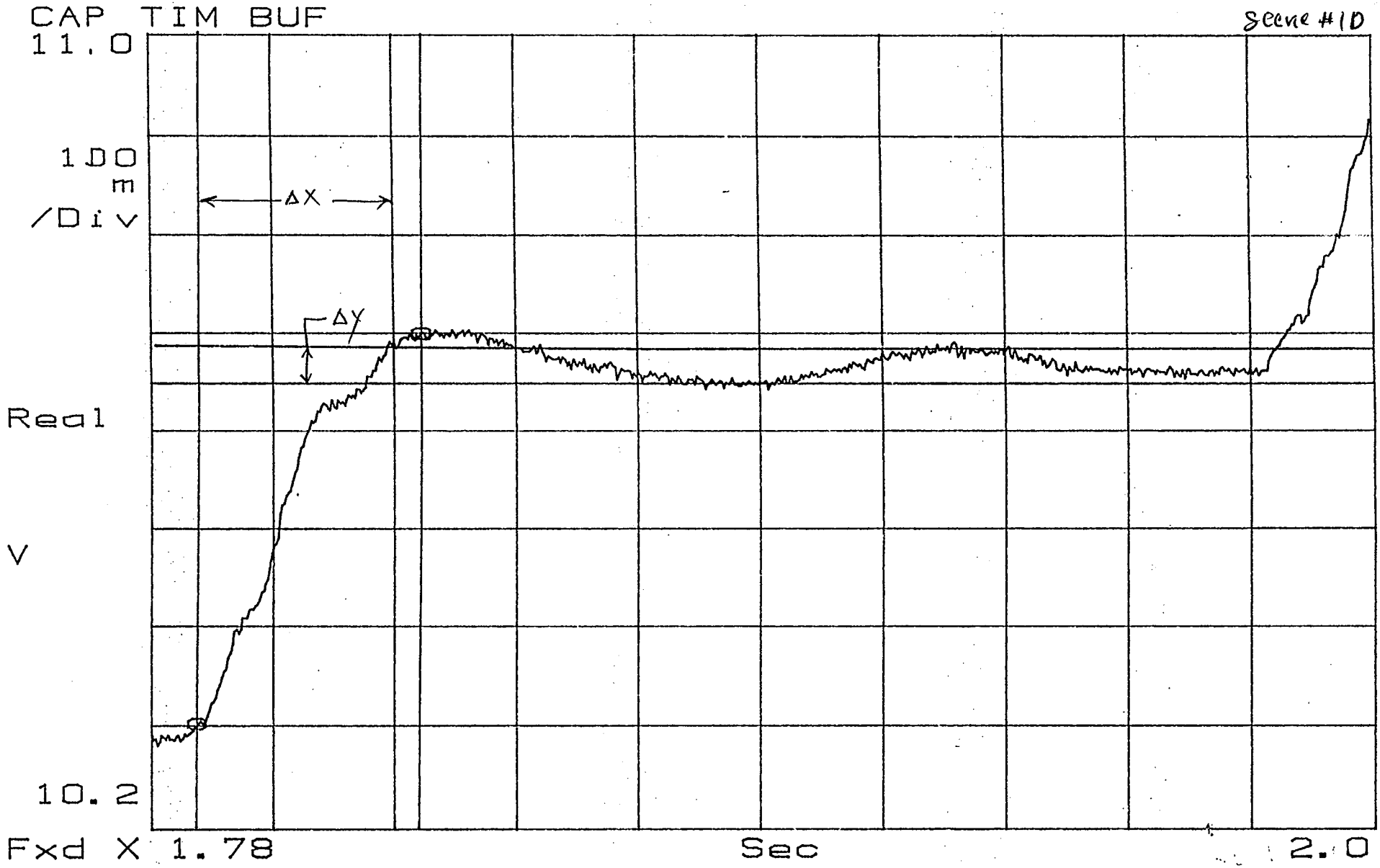
TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.5 step 16 PAGE 1 of 1

Sc #9

B

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=1.785 S ΔX=41.8mS Y=10.648 ΔY=35.88mV
Ya=10.2986 ΔYa=399.0mV



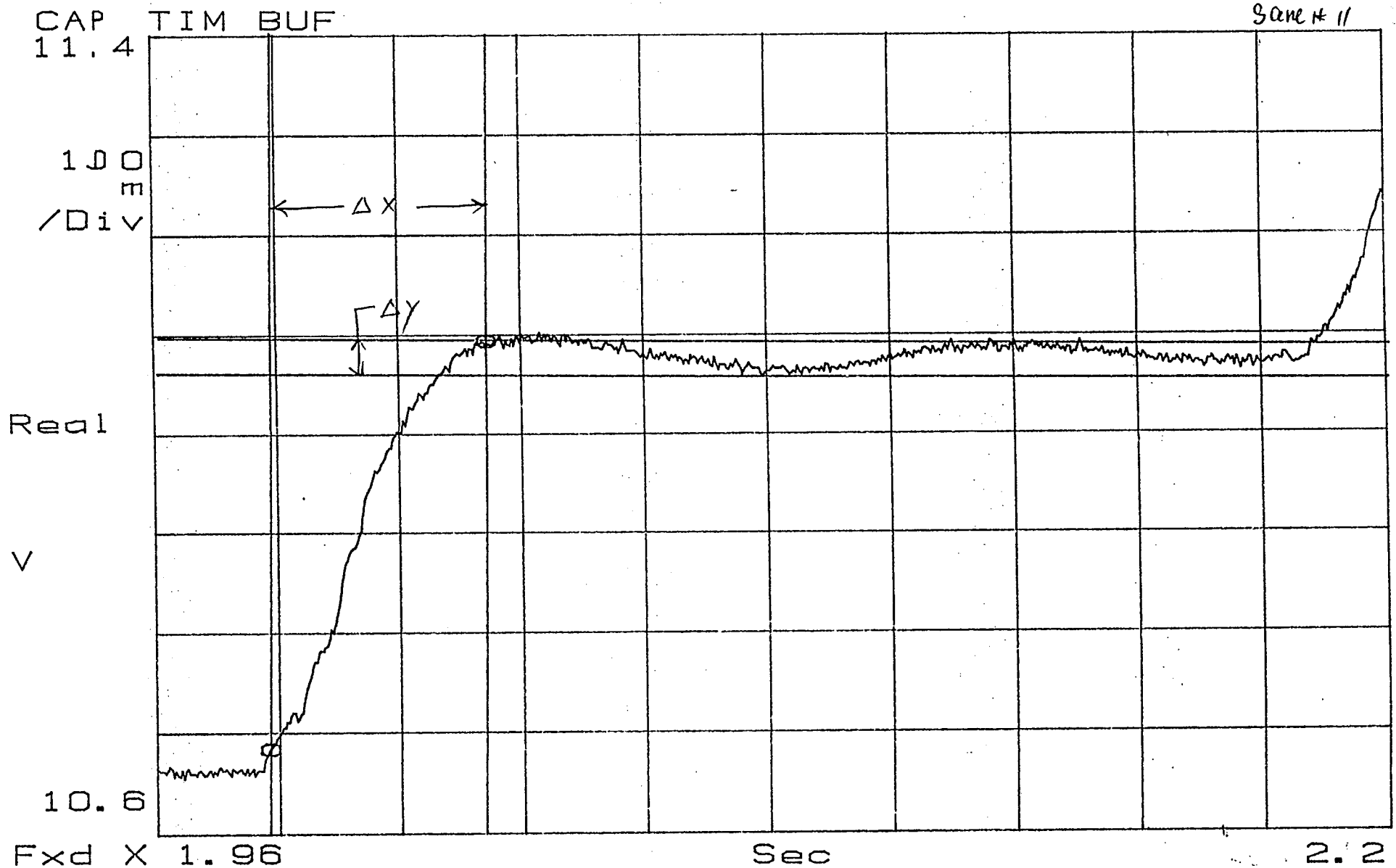
TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.5 step 17 PAGE __ of __

Sht #10

B4

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=1.986 S ΔX=41.8mS Y=11.0577 ΔY=35.88mV
Ya=10.6813 ΔYa=410.3mV



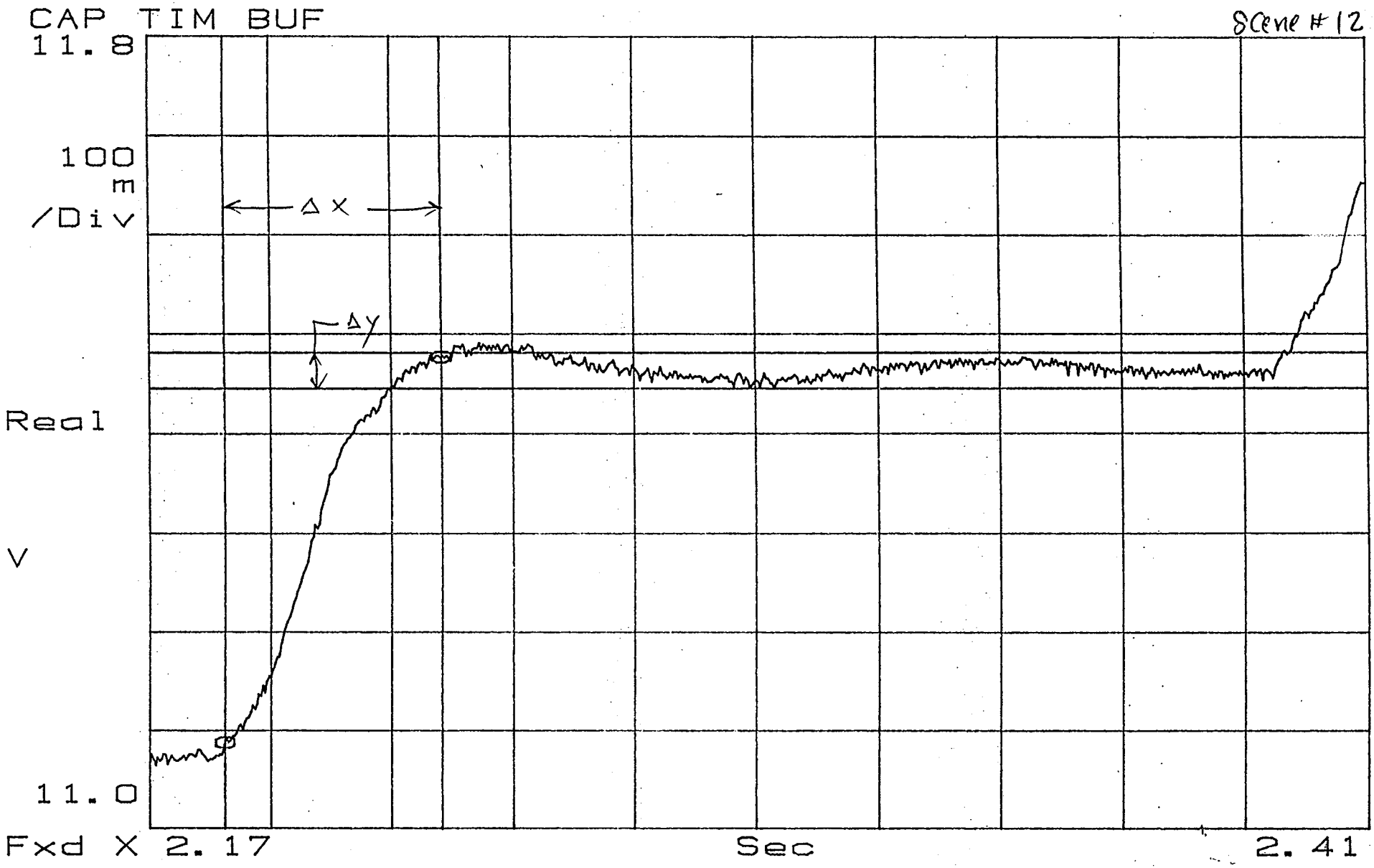
TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.5 step 18 PAGE 1 of 1

step #11

B1

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=2.188 S ΔX=41.8mS Y=11.4446 ΔY=35.88mV
Ya=11.0868 ΔYa=389.2mV

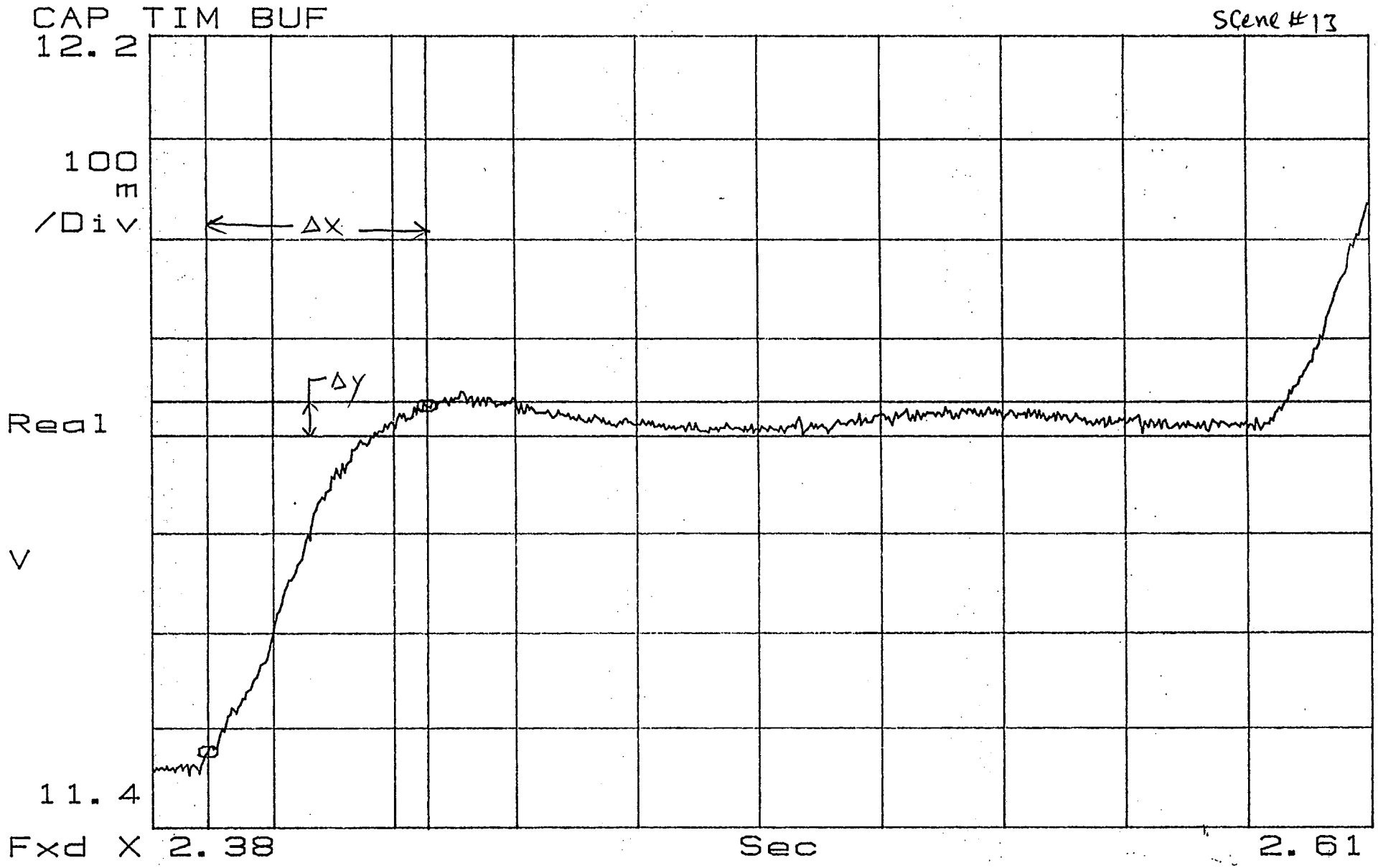


TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.5 step 19 PAGE 1 of 1

Sp 12

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=2.391 S ΔX=41.8mS Y=11.7995 ΔY=35.88mV
Ya=11.476 ΔYa=355.2mV

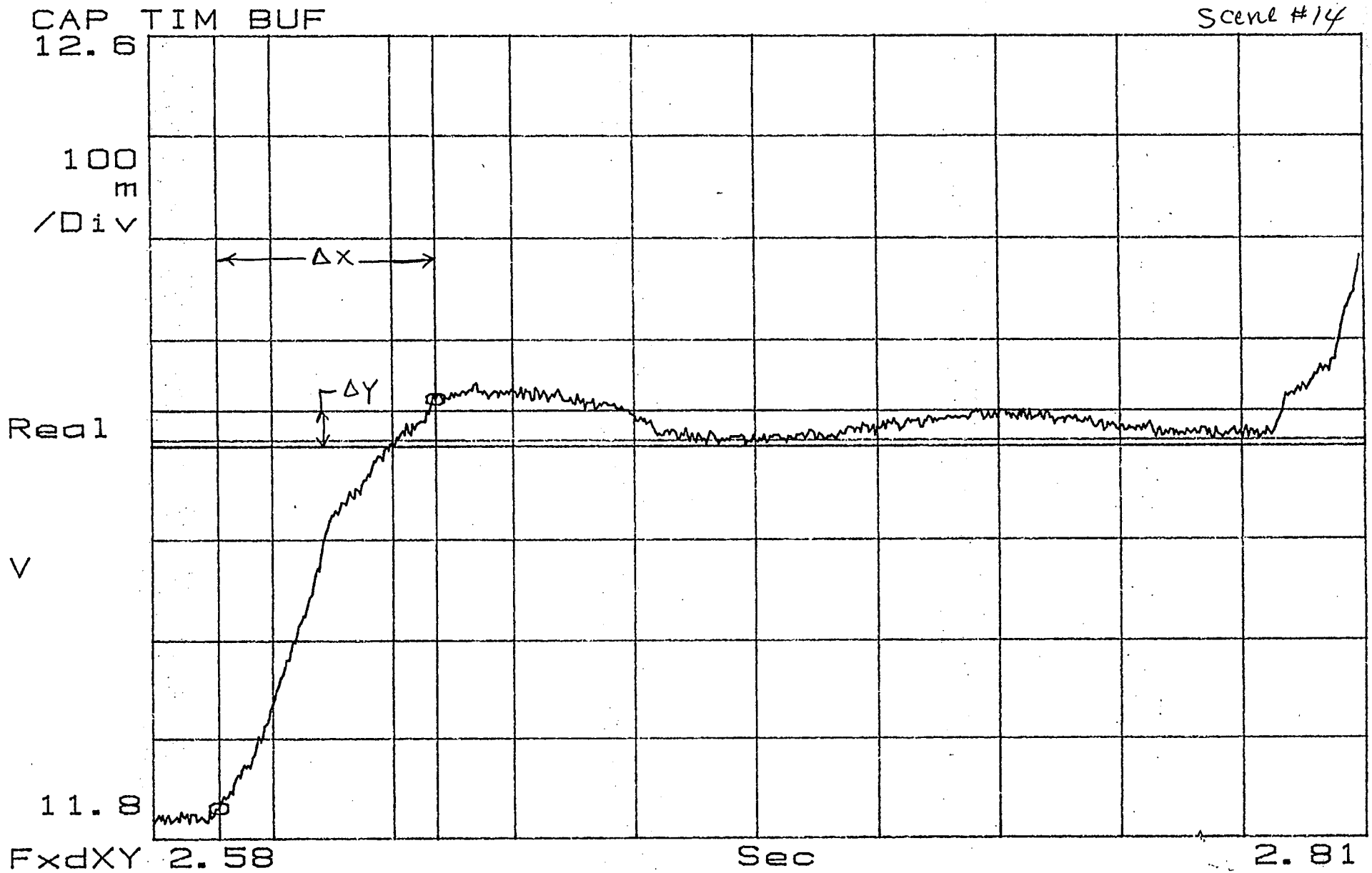


TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.5 step 20 PAGE 1 of 1

S1, #13

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=2.593 S ΔX=41.8mS Y=12.1937 ΔY=35.88mV
Ya=11.8296 ΔYa=411.9mV



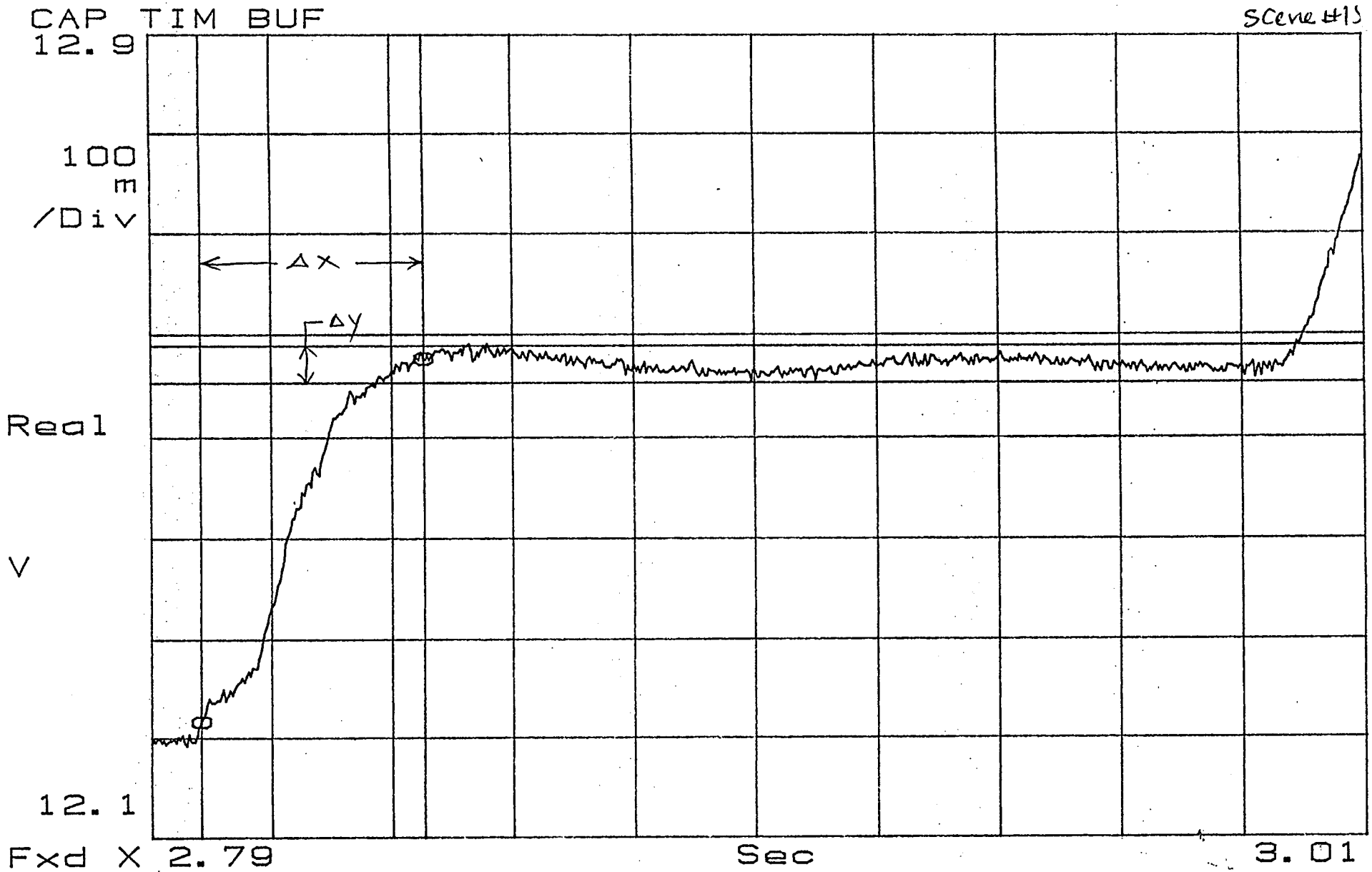
TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.5 step 21 PAGE 1 of 1

Sp #14

B1

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=2.795 S ΔX=41.8mS Y=12.5524 ΔY=35.88mV
Ya=12.2156 ΔYa=360.0mV

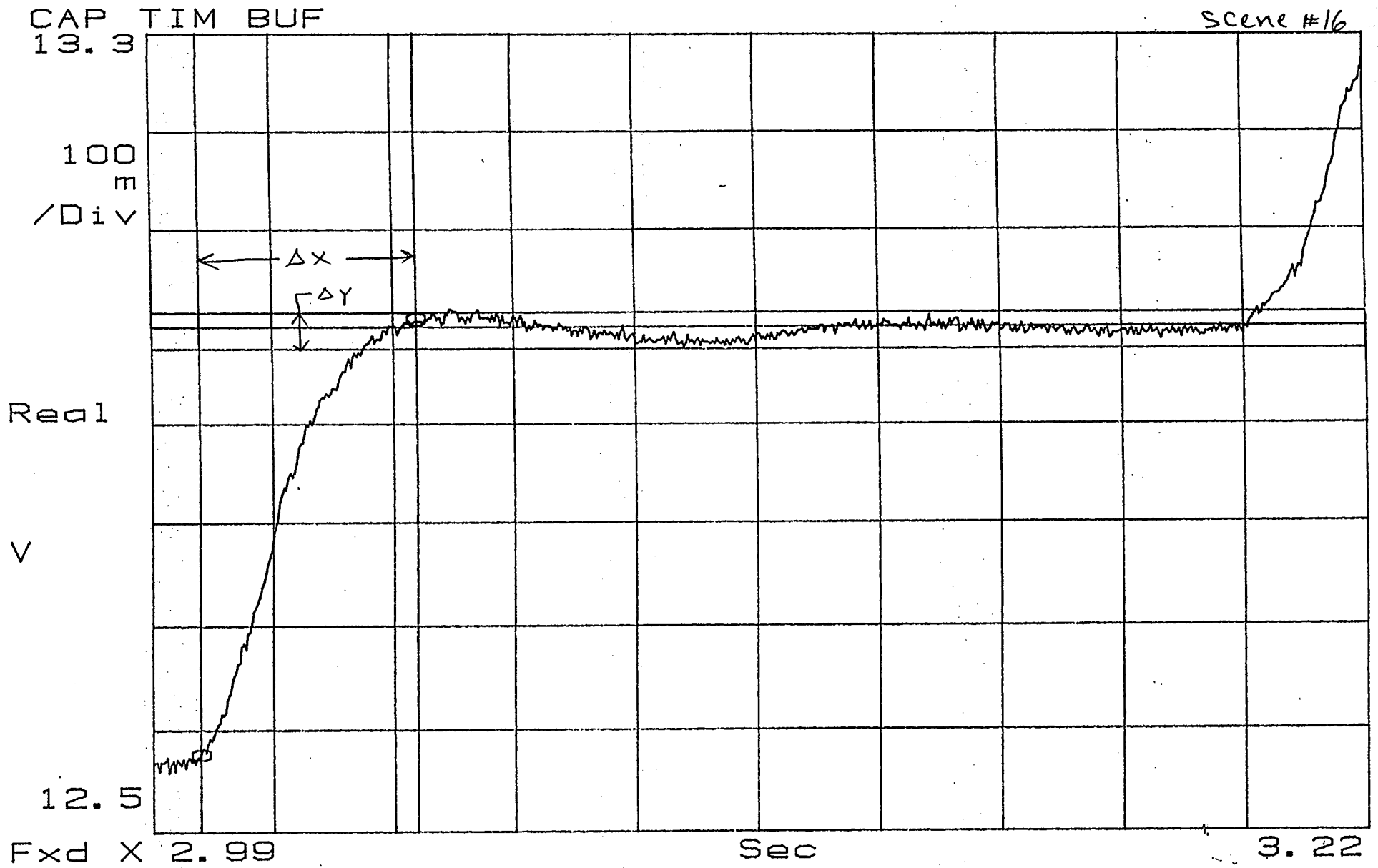


TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.5 step 22 PAGE 1 of 1

step #15 Bill

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=2.998 S ΔX=41.8mS Y=12.9766 ΔY=35.88mV
Ya=12.574 ΔYa=431.4mV

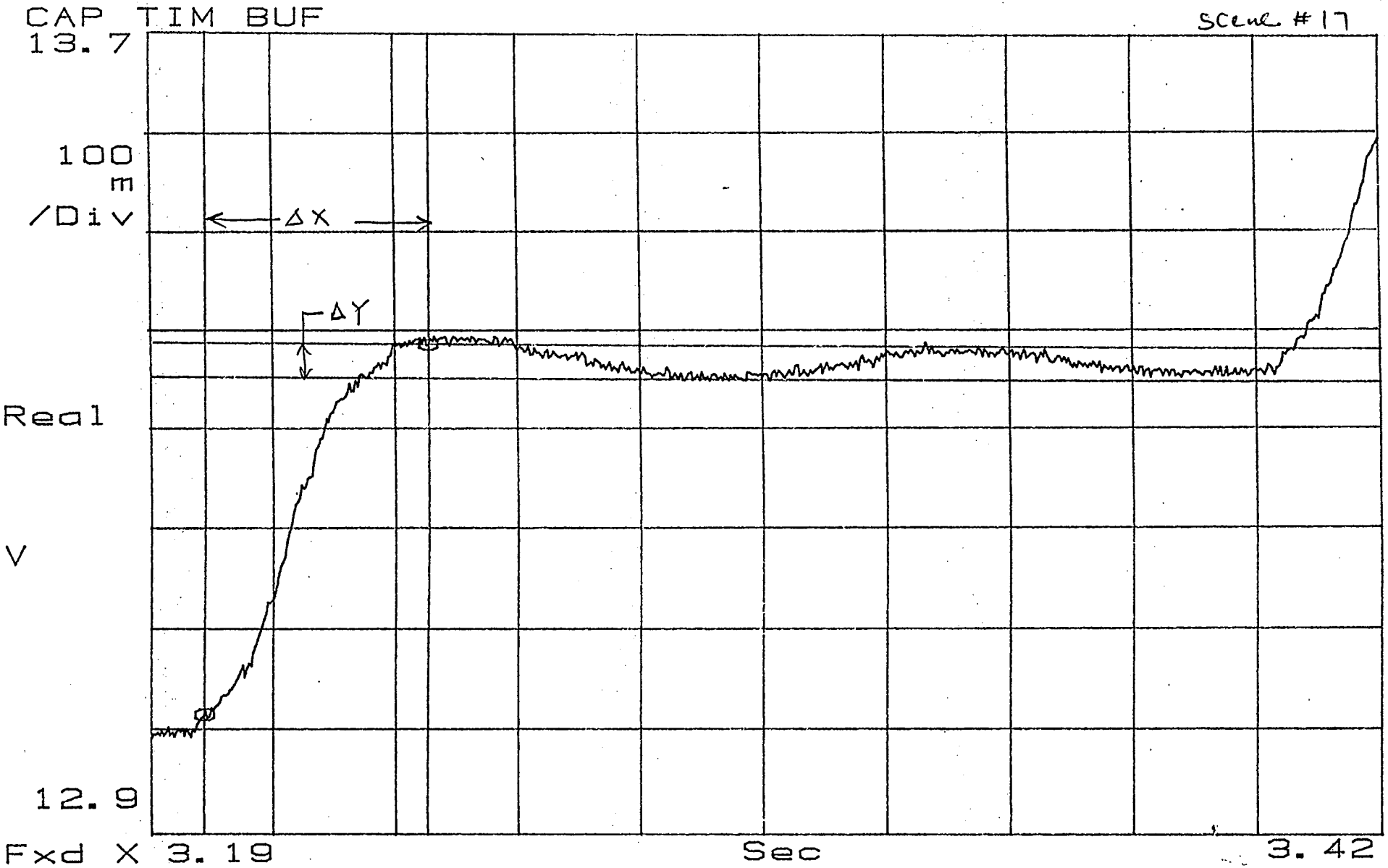


TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.5 step 23 PAGE 1 of 1

B16
Step #16

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=3.2 S ΔX=41.8mS Y=13.348 ΔY=35.88mV
Ya=13.0119 ΔYa=371.4mV

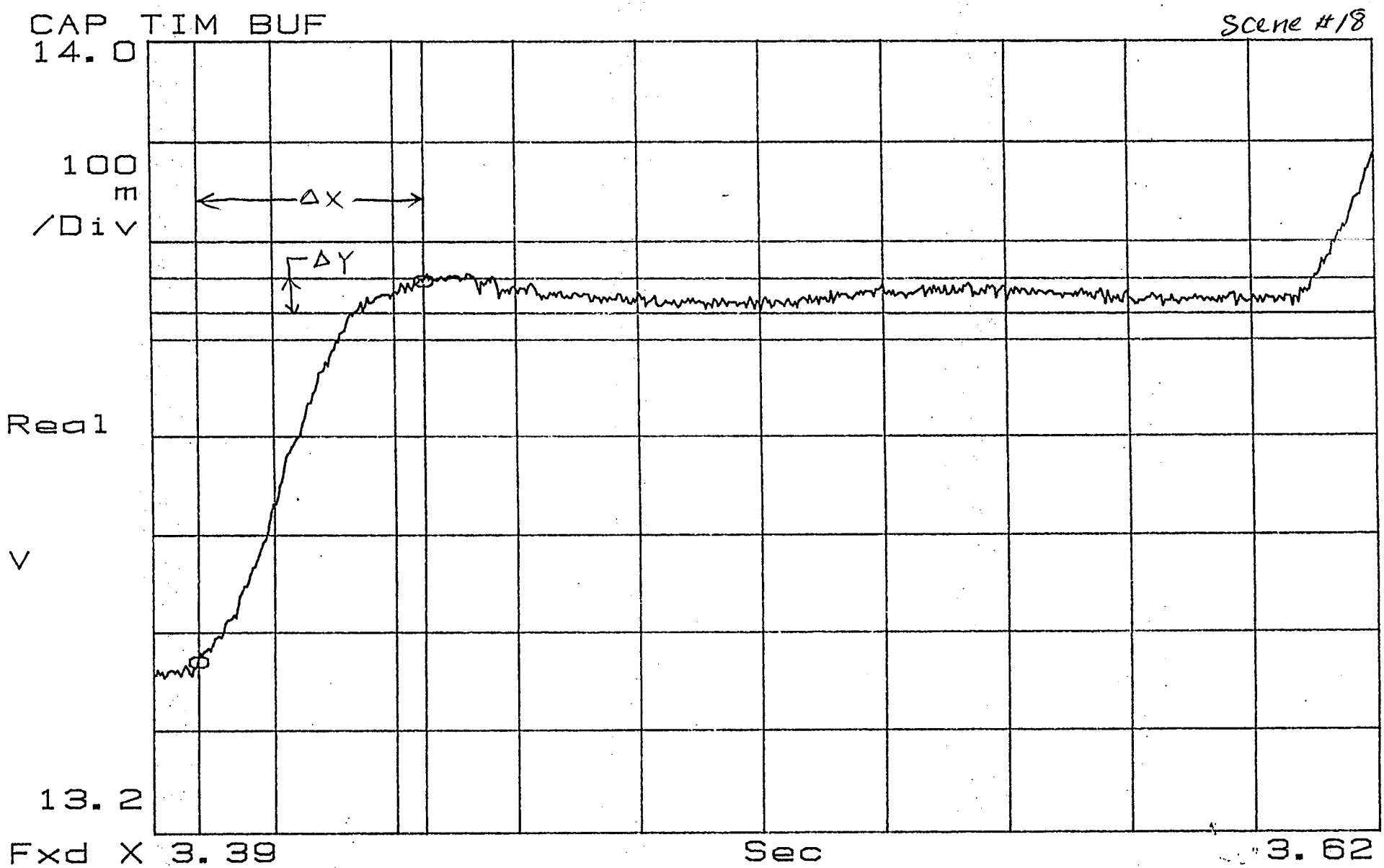


TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.3 step 24 PAGE 1 of 1

B17
step #17

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=3.401 S ΔX=41.8mS Y=13.727 ΔY=35.88mV
Ya=13.3687 ΔYa=390.9mV

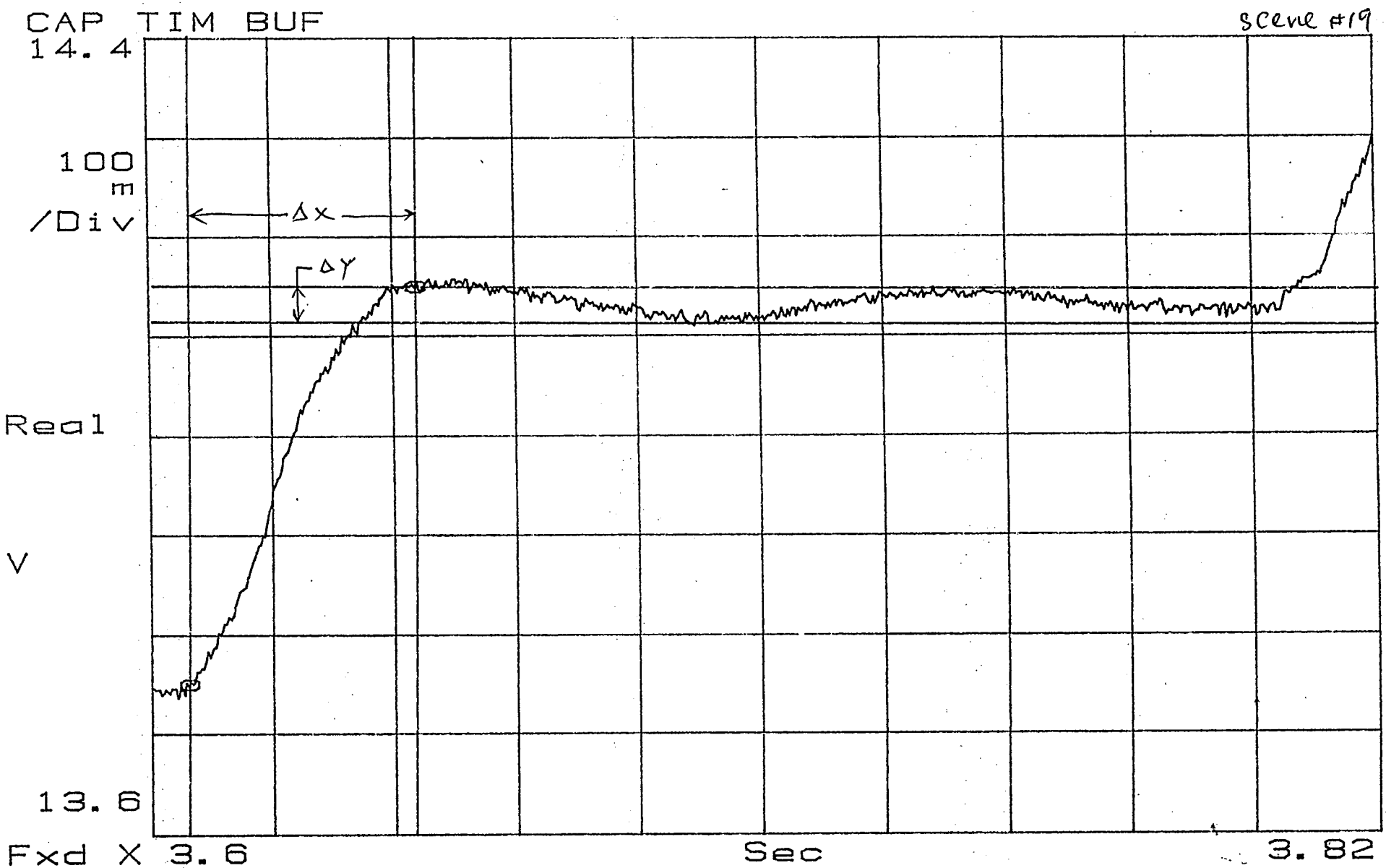


TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.5 step 25 PAGE 1 of 1

step # 18 B

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-95

X=3.604 S ΔX=41.8mS Y=14.1115 ΔY=35.88mV
Ya=13.7482 ΔYa=399.0mV

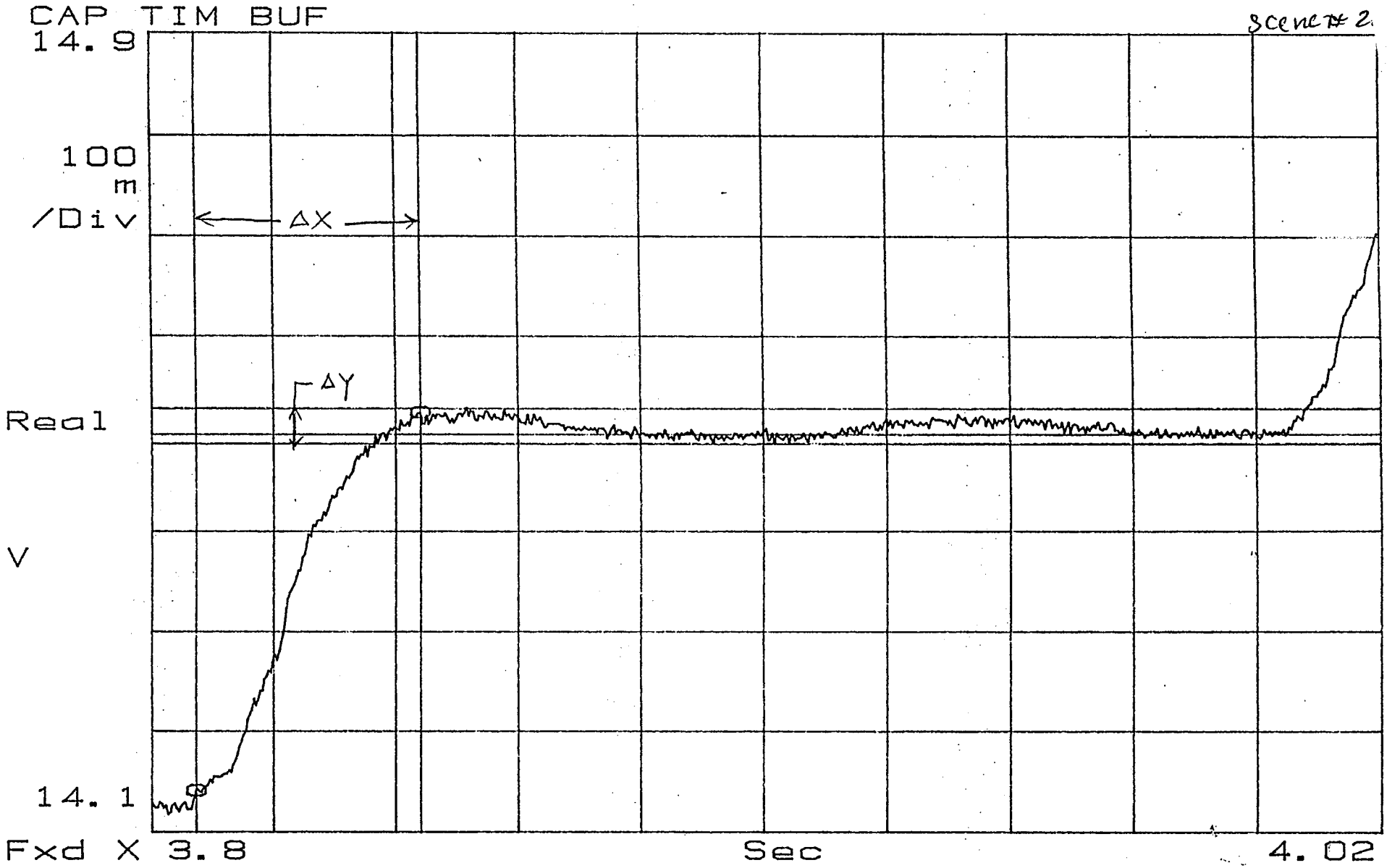


TEST ENG.: ENG 252 QUALITY ENG.: PARA: 3.4.4.5 step 26 PAGE 1 of 1

step #19

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=3.805 S ΔX=41.8mS Y=14.4898 ΔY=35.88mV
Ya=14.1407 ΔYa=381.1mV

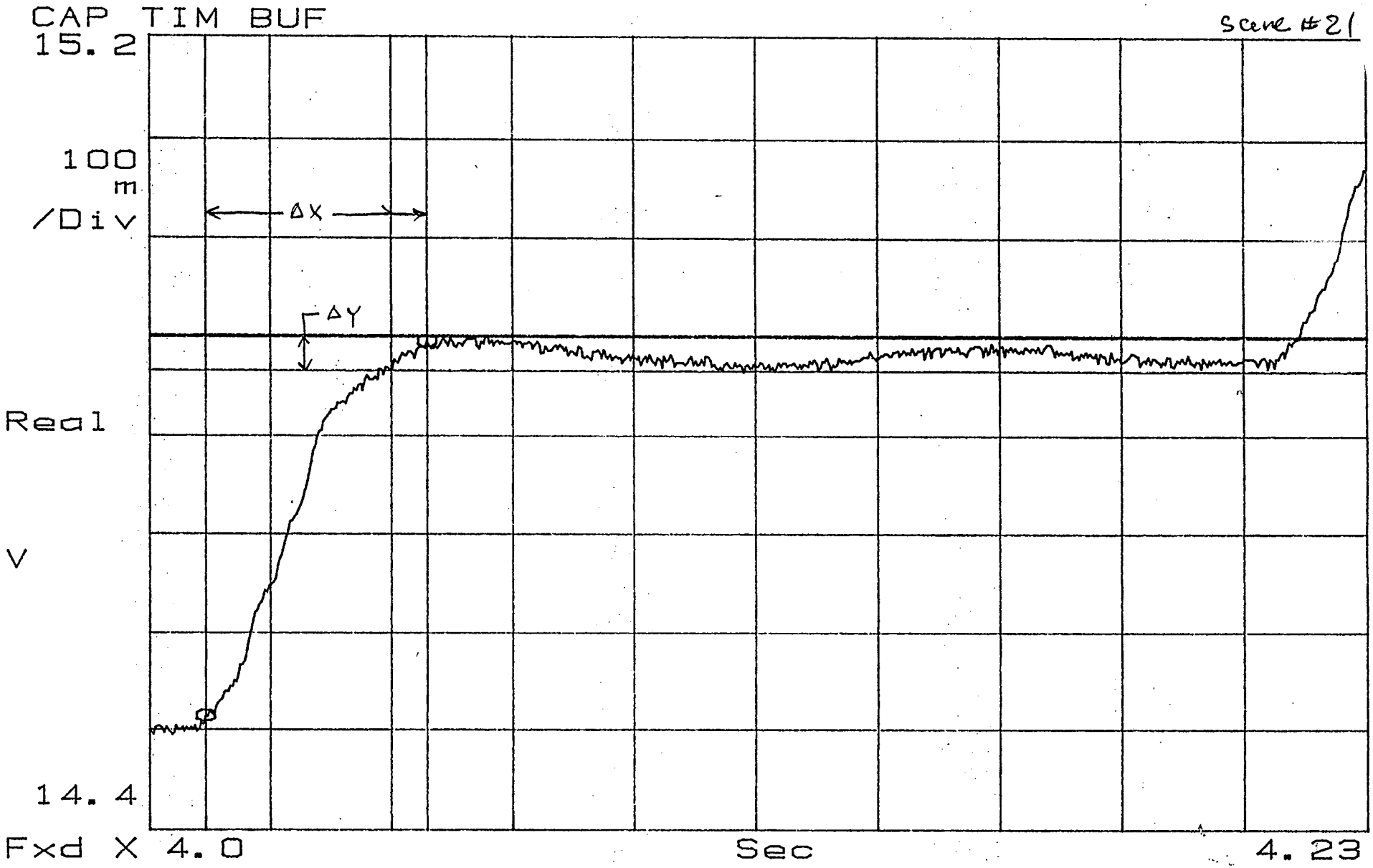


TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.5 step 27 PAGE 1 of 1

Step # 20

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=4.009 S ΔX=41.8mS Y=14.865 ΔY=35.88mV
Ya=14.5137 ΔYa=381.1mV

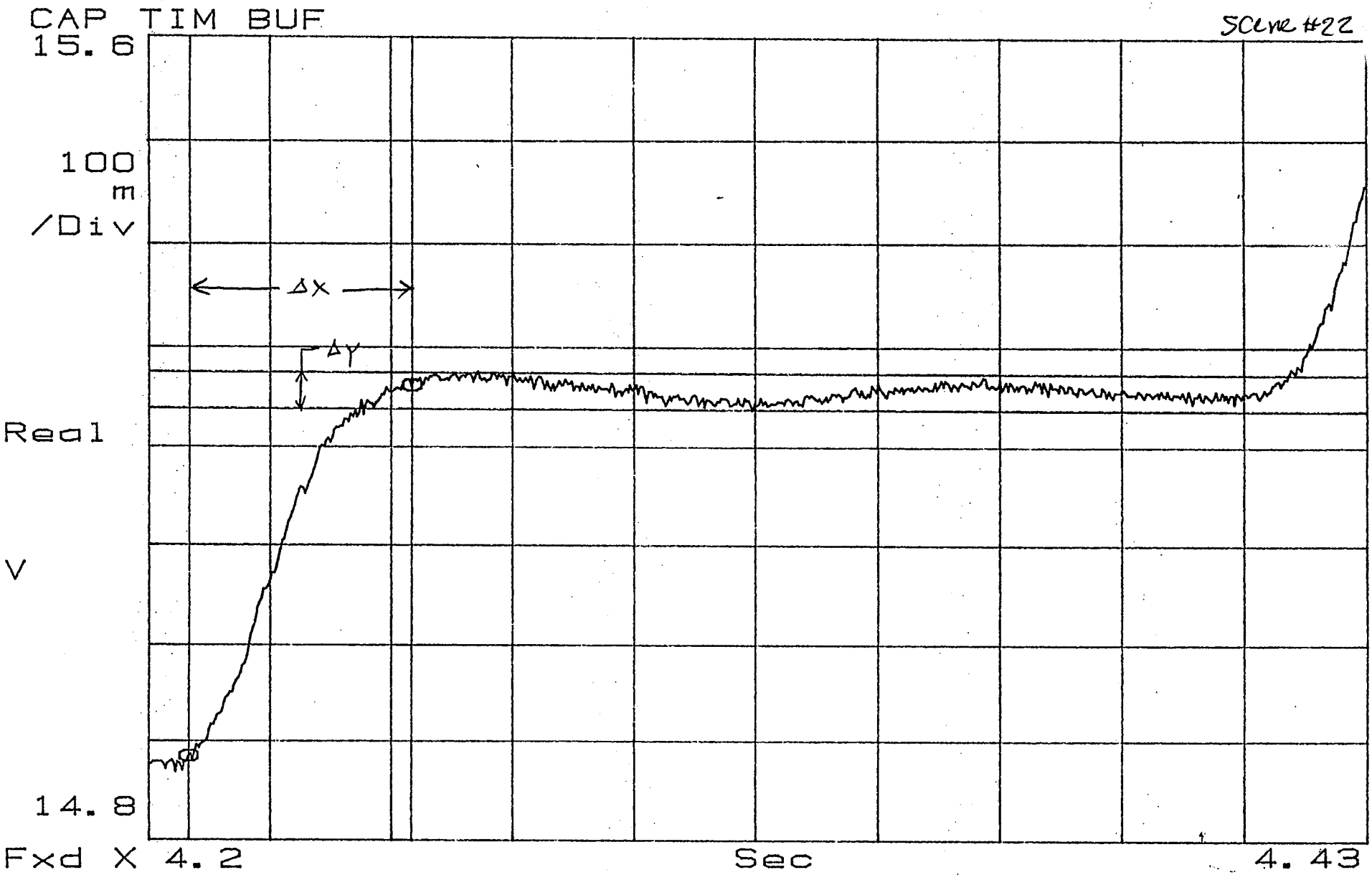


TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.5 step 28 PAGE 1 of 1

Step #

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=4.21 S ΔX=41.8mS Y=15.2368 ΔY=35.88mV
Ya=14.8835 ΔYa=376.3mV



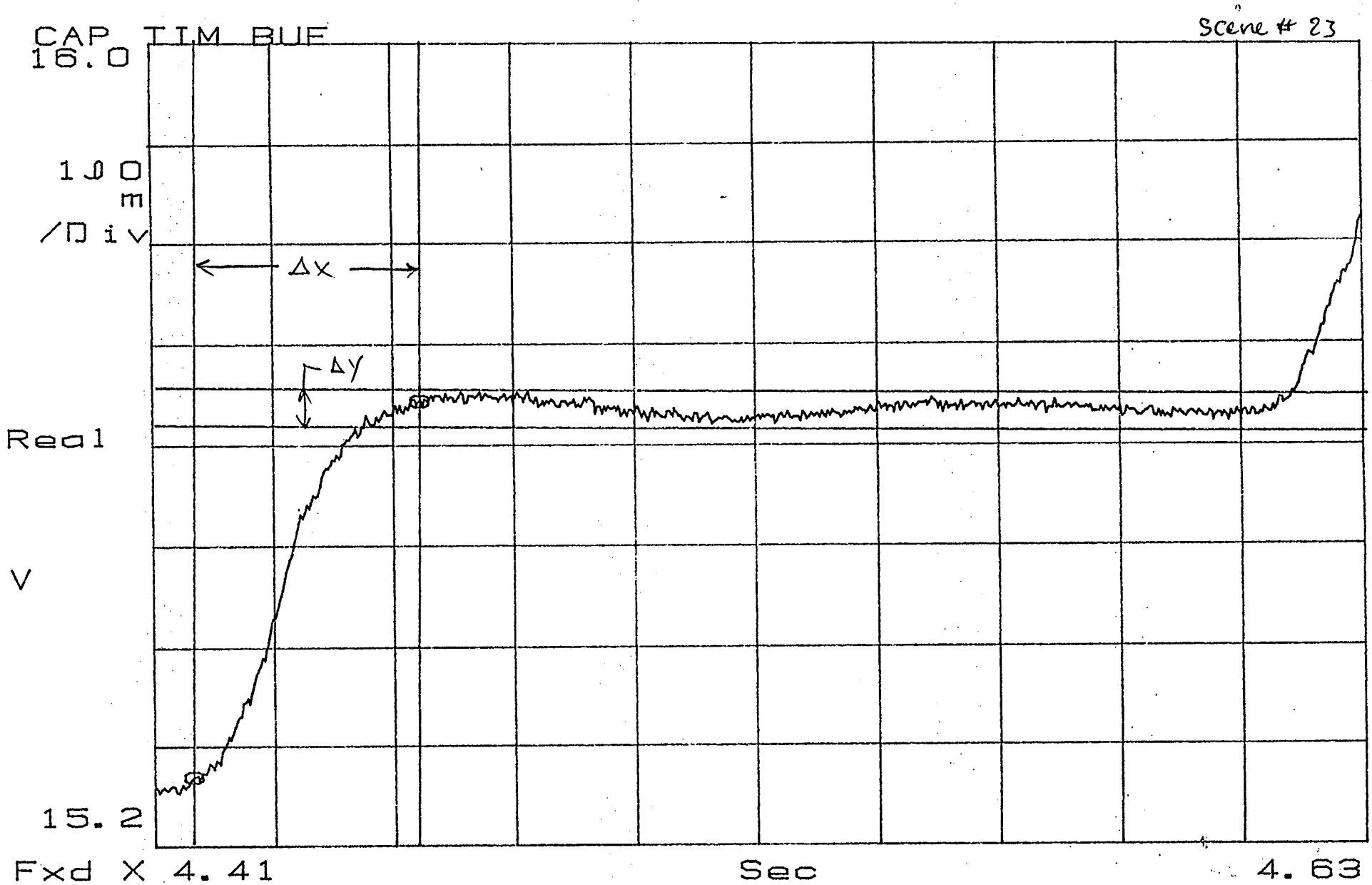
TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.5 step 29 PAGE 1 of 1

S1 #22

22

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=4.413 S ΔX=41.8mS Y=15.617 ΔY=35.88mV
Ya=15.2646 ΔYa=376.3mV

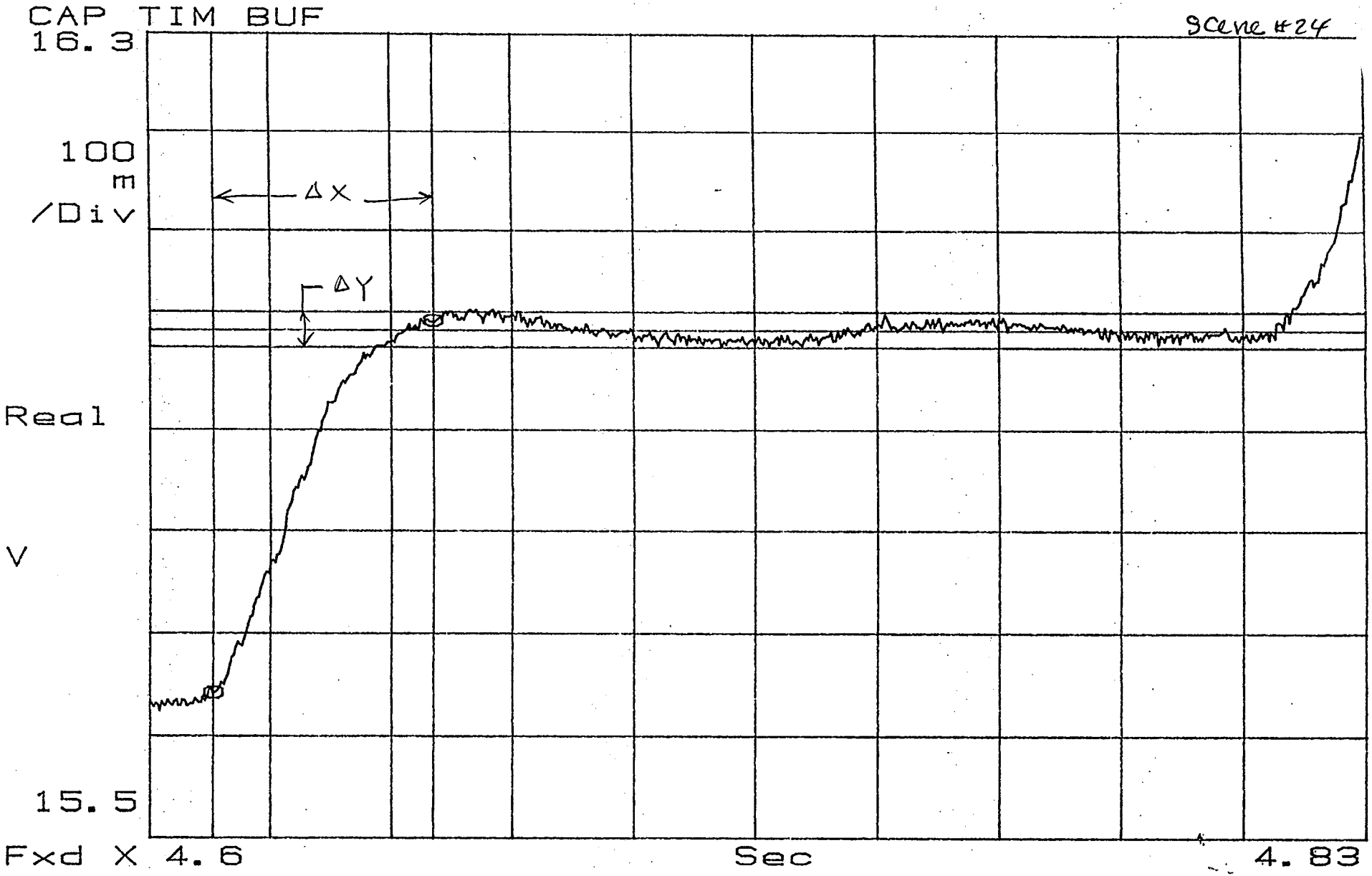


TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.5 step 30 PAGE 1 of 1

Step # 23

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=4.616 S ΔX=41.8mS Y=15.9819 ΔY=35.88mV
Ya=15.6409 ΔYa=368.2mV



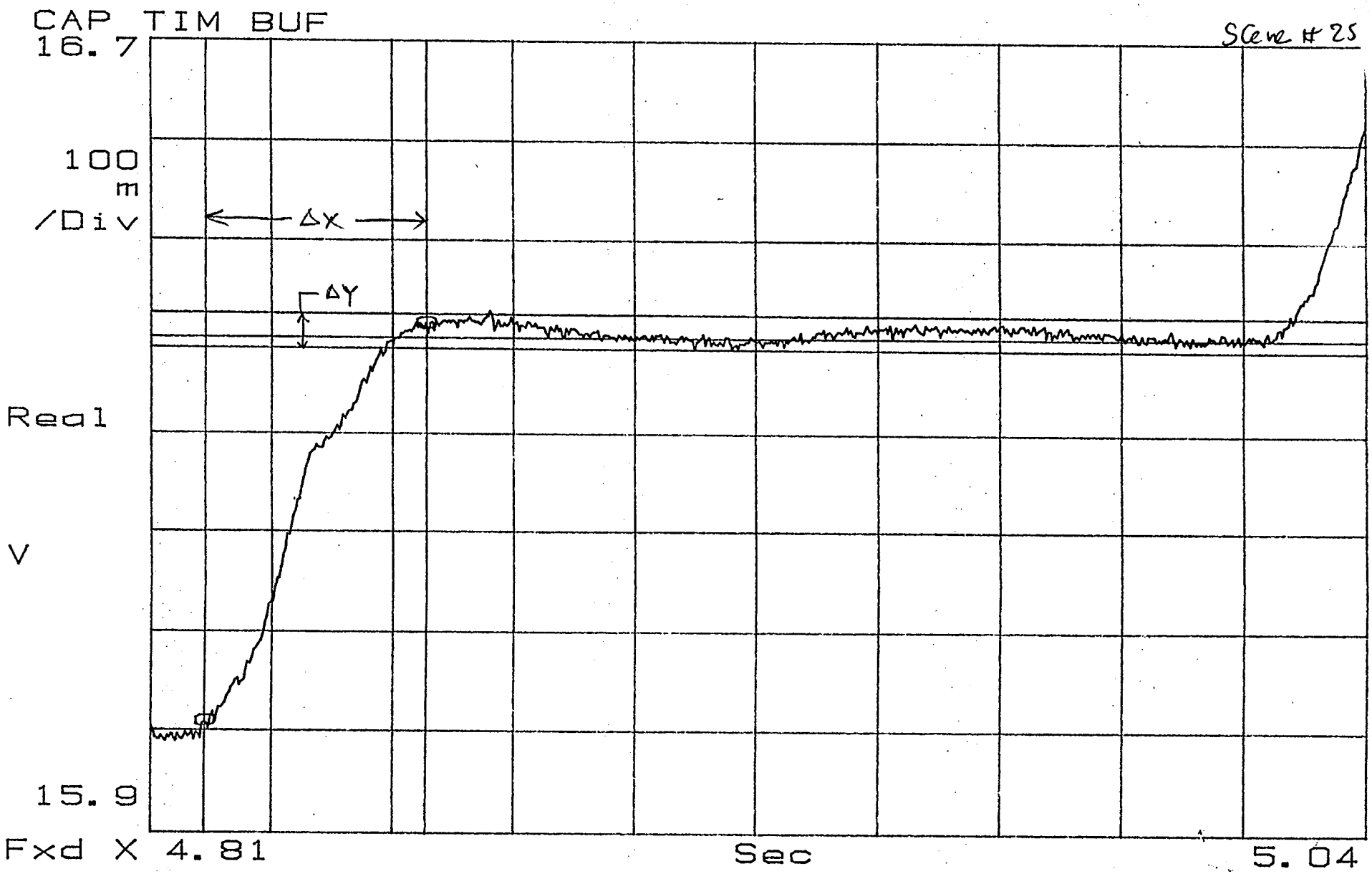
TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.5 step 31 PAGE 1 of 1

B24

step #2

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=4.817 S ΔX=41.8mS Y=16.3878 ΔY=35.88mV
Ya=16.009 ΔYa=405.5mV



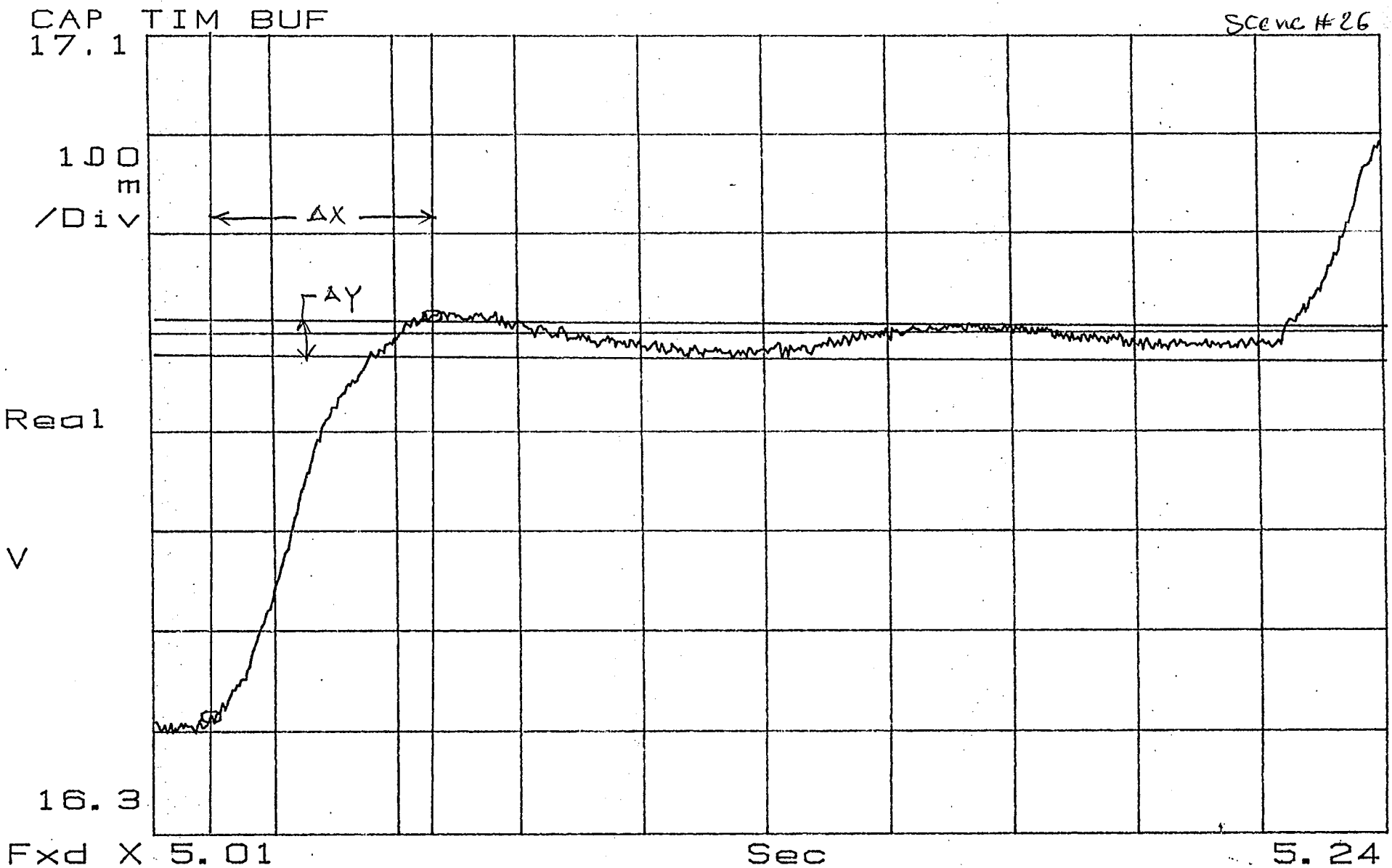
TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.5 step 32 PAGE 1 of 1

325

Step #25

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=5.019 S ΔX=41.8mS Y=16.7742 ΔY=35.88mV
Ya=16.4112 ΔYa=403.8mV



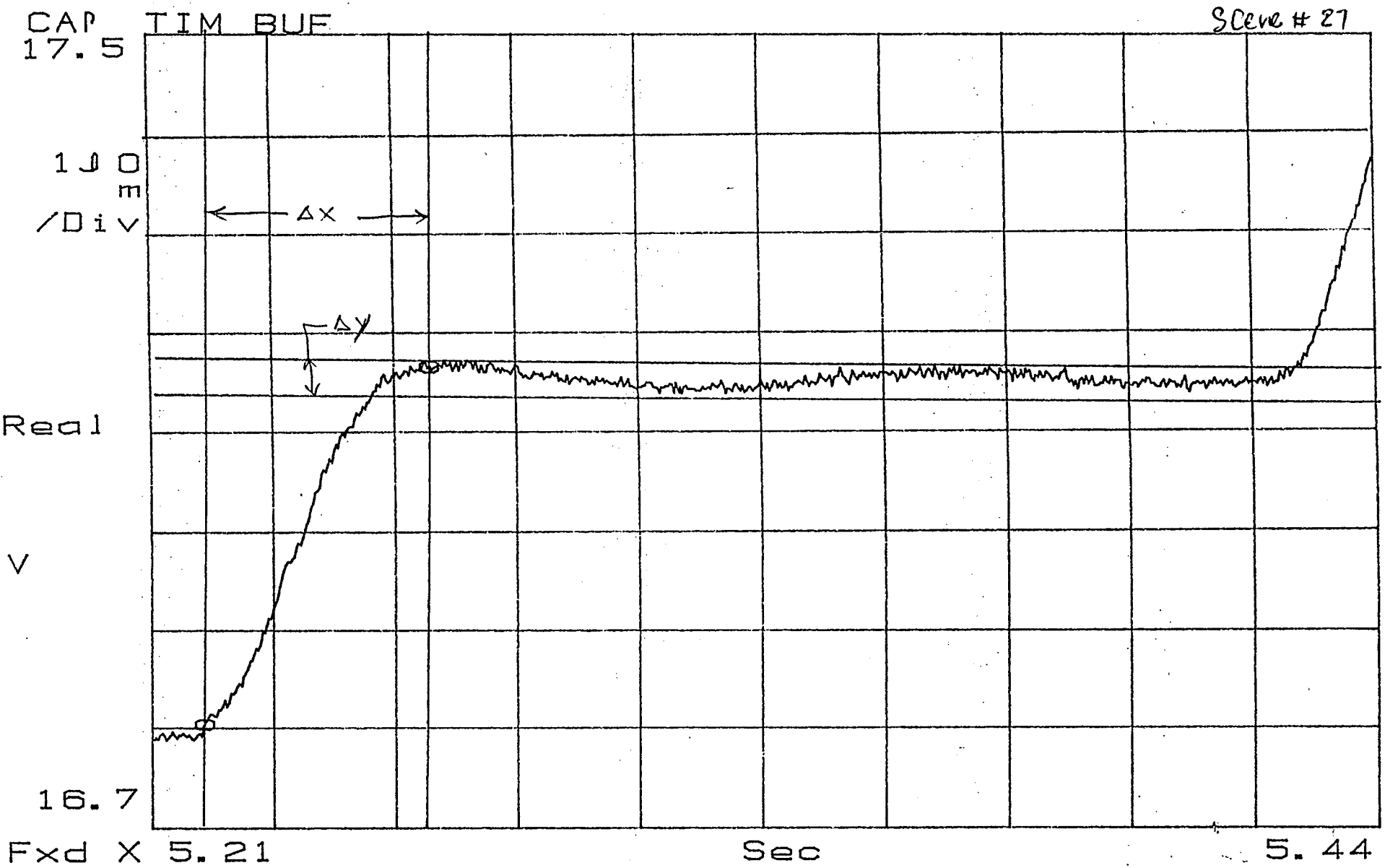
TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.5 step 33 PAGE 1 of 1

step: 6

821

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=5.221 S ΔX=41.8mS Y=17.1334 ΔY=35.88mV
Ya=16.7989 ΔYa=363.3mV

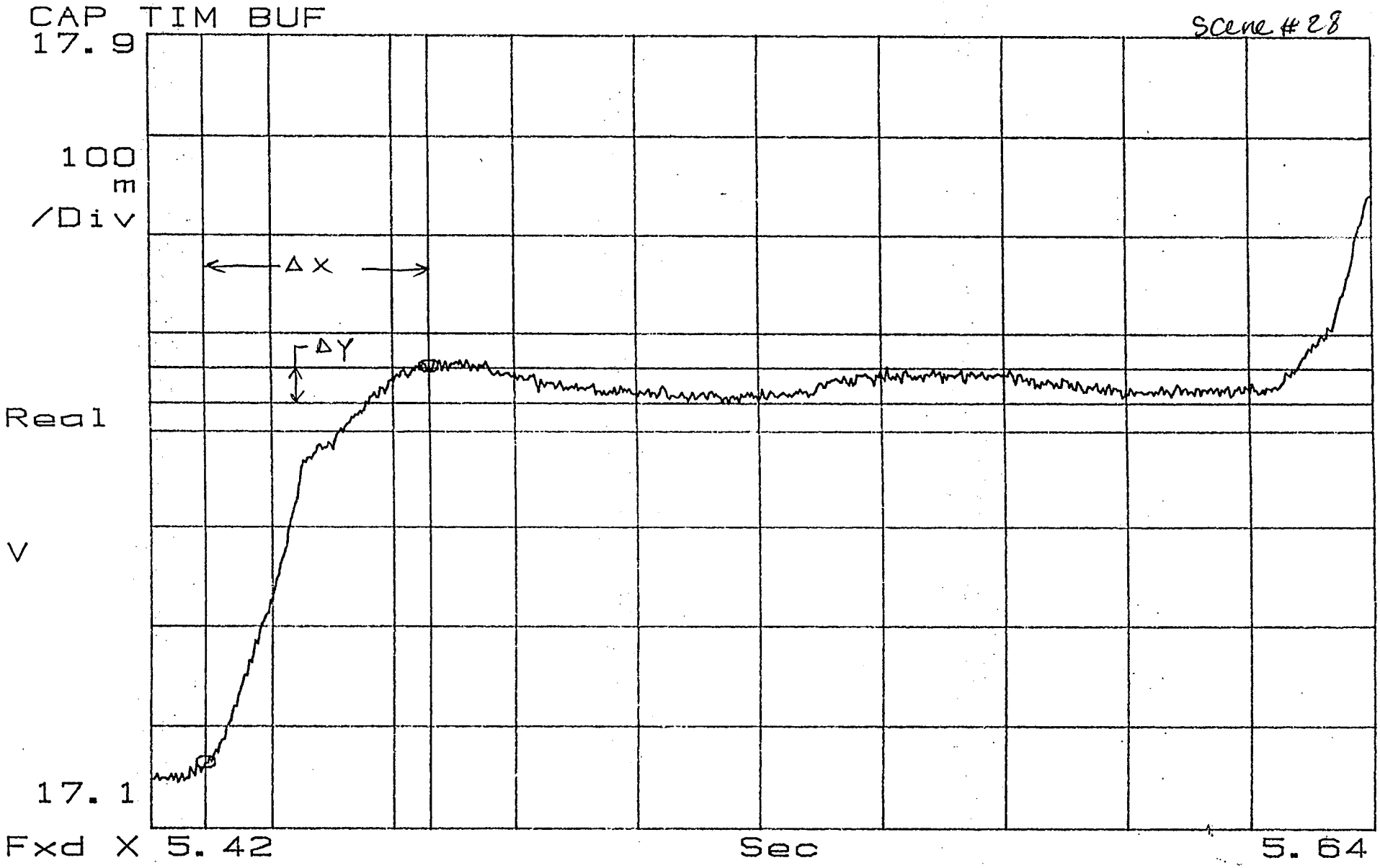


TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.5 step 34 PAGE 1 of 1

step 17 B

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=5.426 S ΔX=41.8mS Y=17.5286 ΔY=35.88mV
Ya=17.1638 ΔYa=402.2mV

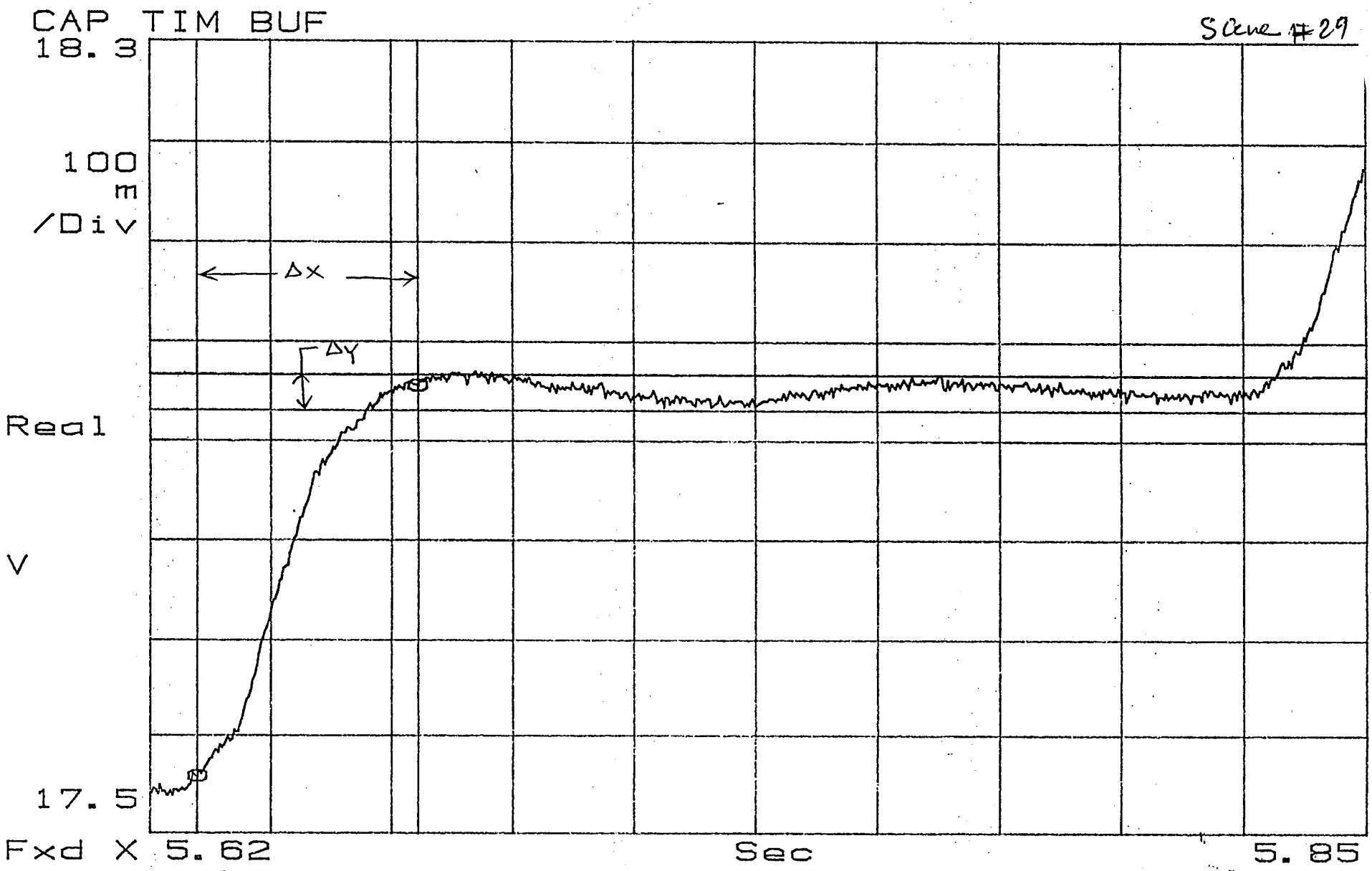


TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.5 step 35 PAGE 1 of 1

Step #28 B1

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=5.627 S ΔX=41.8mS Y=17.9301 ΔY=35.88mV
Ya=17.5579 ΔYa=397.3mV

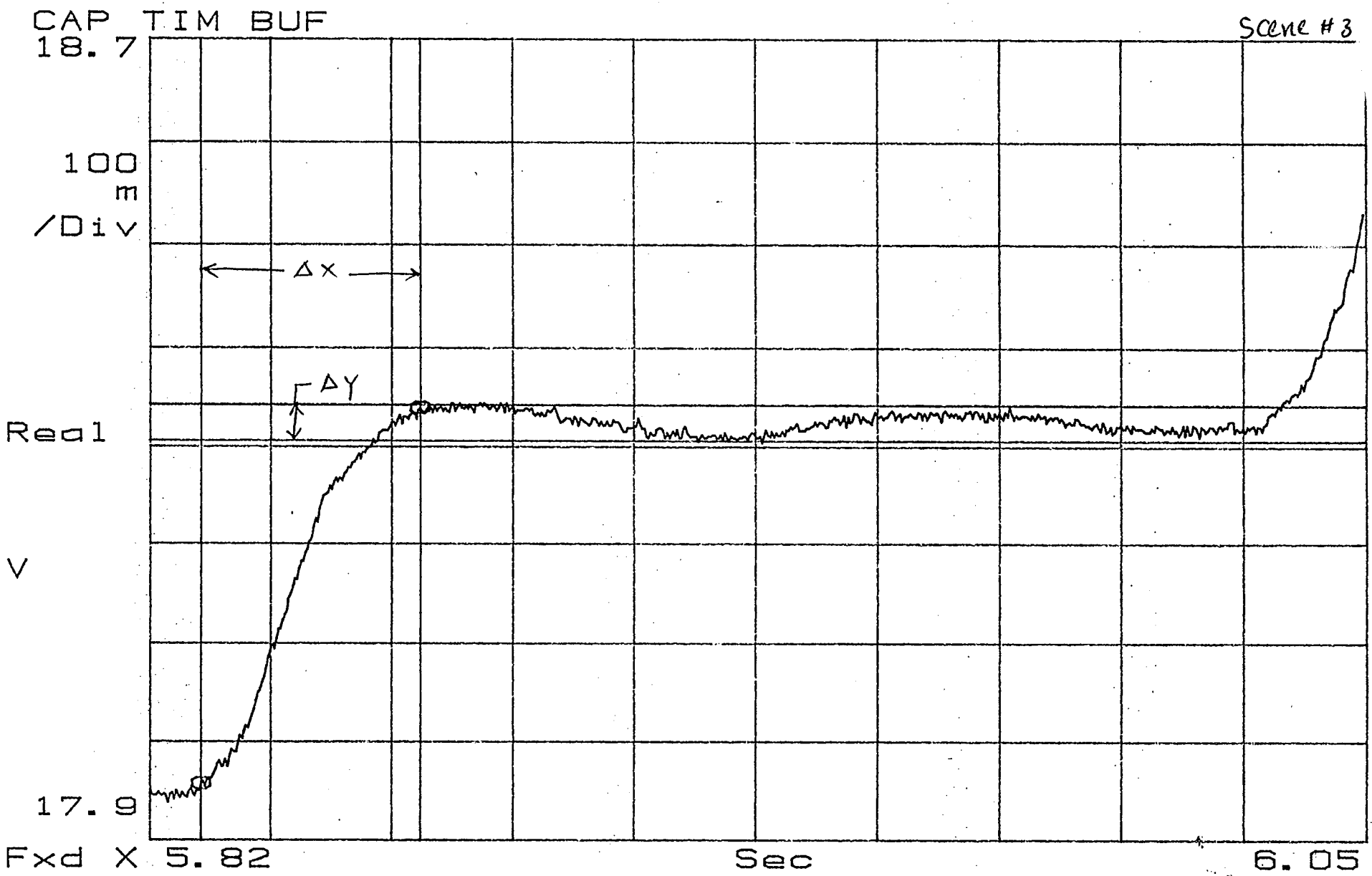


TEST ENG.: _____ QUALITY ENG.: _____ PARA: 3.4.4.5 step 36 PAGE 1 of 1

Step # 29 B2

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=5.828 S ΔX=41.8mS Y=18.3053 ΔY=35.88mV
Ya=17.9585 ΔYa=379.5mV

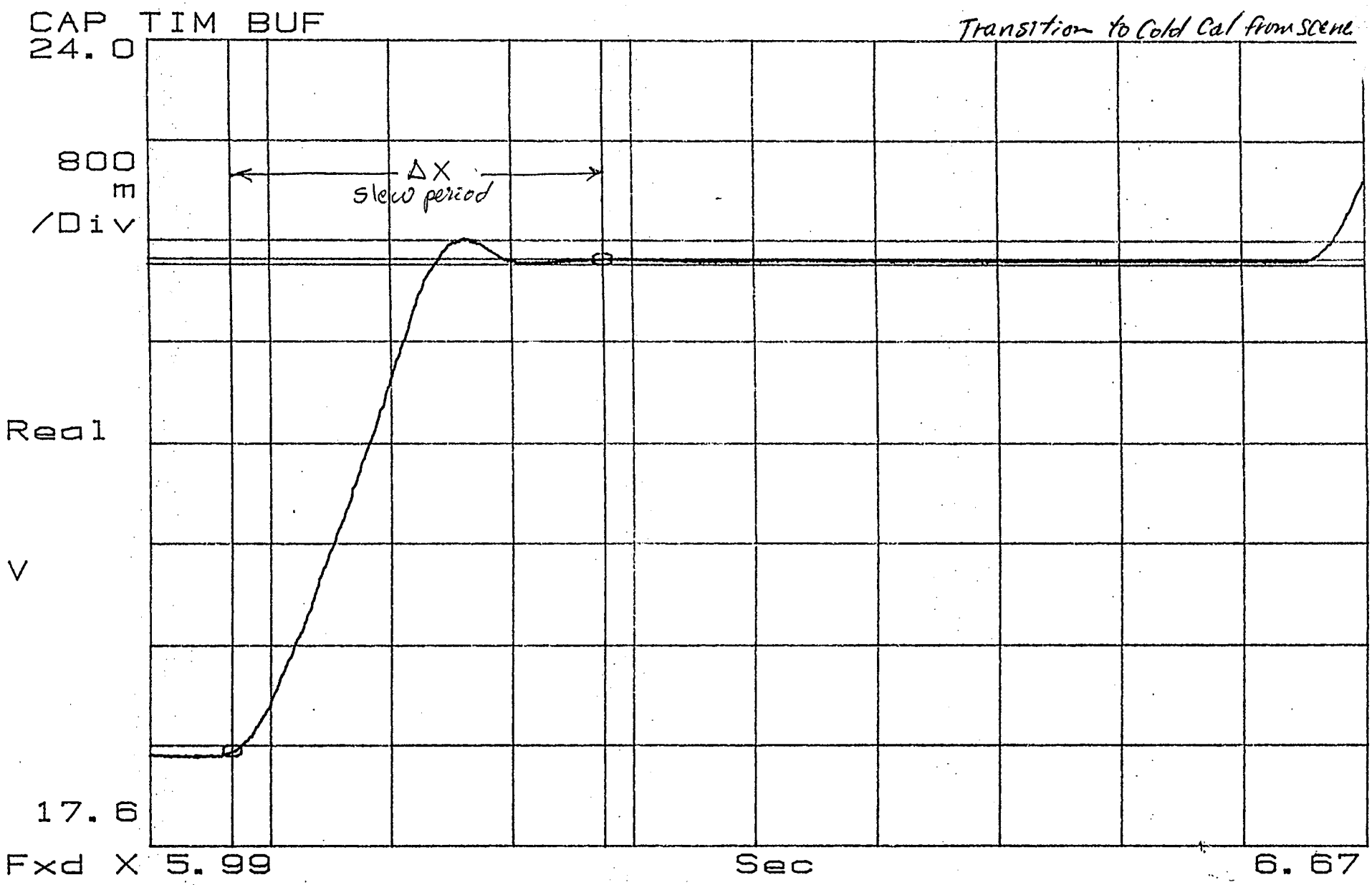


TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.5 step 37 PAGE 1 of 1

step #30

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=6.035 S ΔX=210.2mS Y=22.2274 ΔY=46.55mV
Ya=18.3542 ΔYa=3.894 V



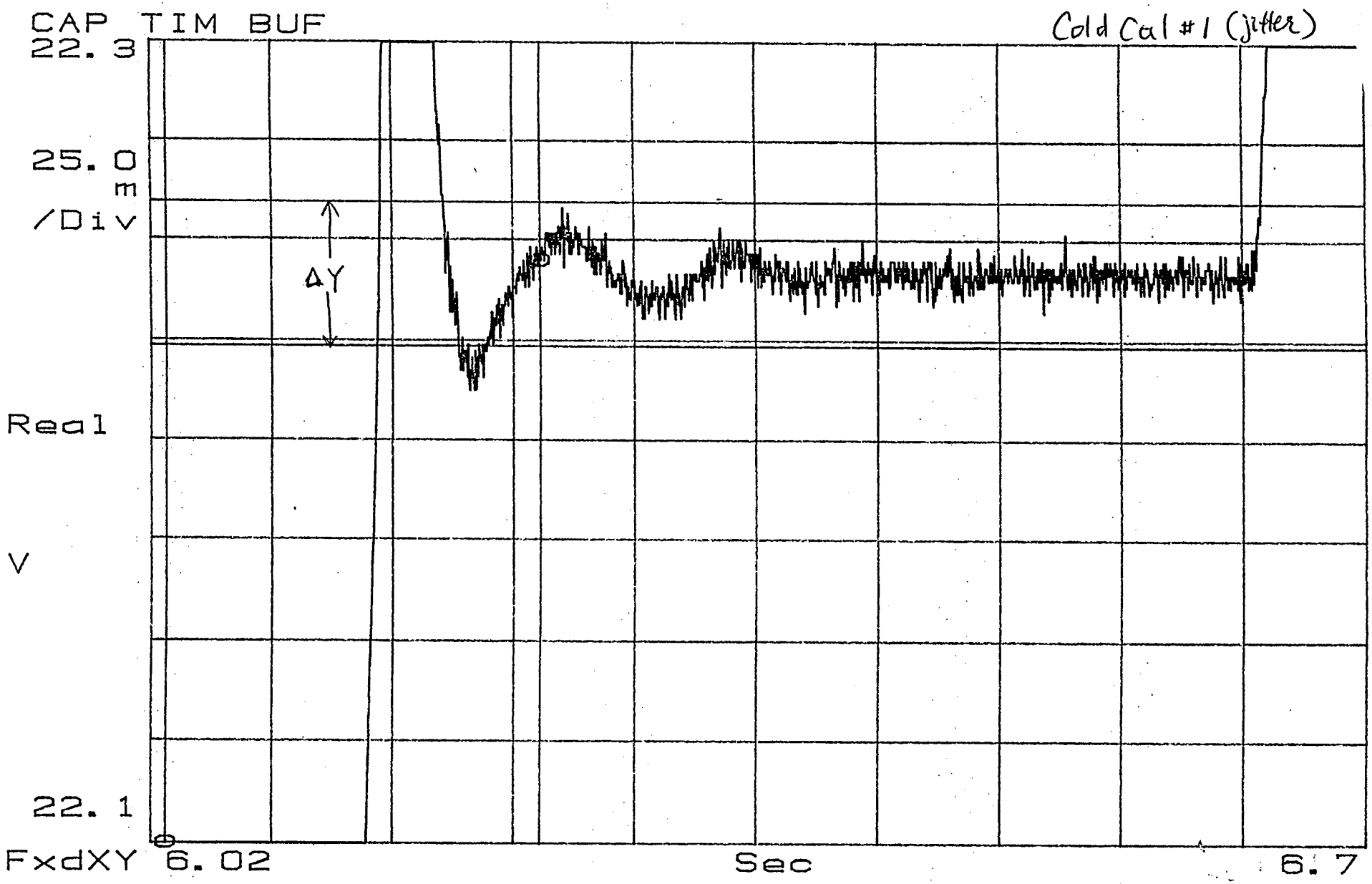
TEST ENG.: ENG 252 QUALITY ENG.: ? PARA: 3.4.4.5 step 38 PAGE 1 of 1

TRANSition to C to Cal from *

B1

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=6.032 S ΔX=209.8mS Y=22.2415 ΔY=36.0mV
Ya=18.3396 ΔYa=3.905 V



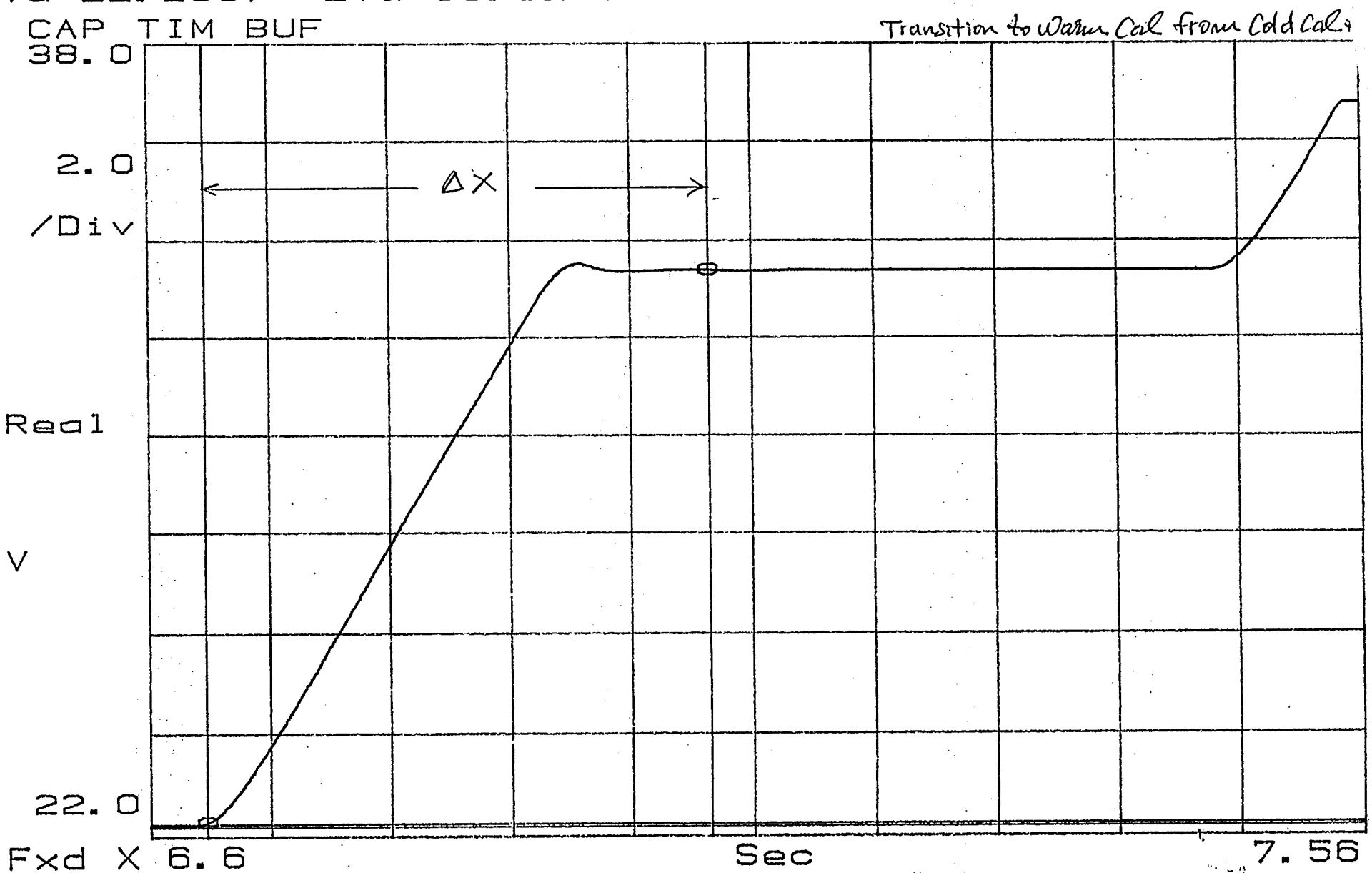
TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.5 step 38 PAGE 1 of 1

Cold Cal # (jitter)

B

SHOP ORDER: 323737 FILE NAME: N/A P/N: 1356006-1-IT DATE: 2-11-98

X=6.647 S ΔX=399.6mS Y=22.223 ΔY=58.18mV
Ya=22.2887 ΔYa=11.12 V



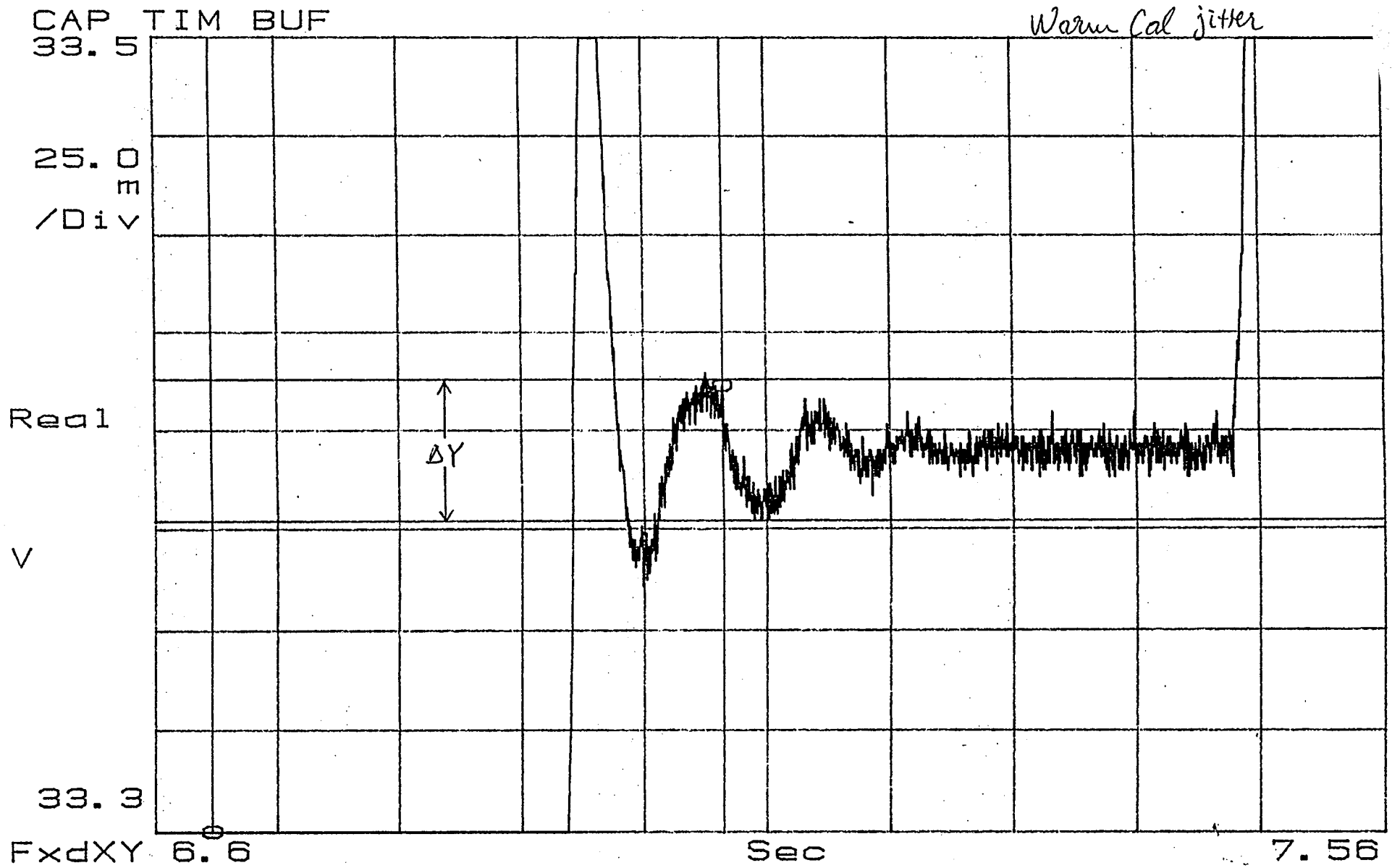
TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.8.5 RWK step 39 PAGE 1 of 1

TRANSITION from Warm Cal to Cold Cal

533

SHOP ORDER: 323737 FILE NAME: _____ P/N: 1356006-1-IT DATE: 2-11-98

X=6.647 S ΔX=399.6mS Y=33.3949 ΔY=36.0mV
Ya=22.2887 ΔYa=11.12 V



TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.~~5~~ RNK step 39 PAGE 1 of 1

WARM CF (jitter) B34

TEST DATA SHEET 7 (SHEET 1 OF 4)
3.4.4.5: Scan Motion and Jitter Test

Test Setup Verified: _____ Signature Shop Order No. 323737

QC 222 ENG 252 R. Johnson 2/11/98

Step No.	Description	Requirement	Test Result	Pass/Fail
7	--	Stepping Slewing <8 sec period per Figure ~~8~~ 8	< 8 SEC	PASS
9	Scene 1-2 3.33° step	<42 msec rise time per Figure 7 9	< 42 msec	PASS
		< ±5% jitter per Figure 7 9 < +4% overshoot for 19 msec	< ±5% jitter < +4 % overshoot	PASS
10	Scene 2-3 3.33° step	<42 msec rise time per Figure 7 9	< 42 msec.	PASS
		< ±5% jitter per Figure 7 9 < +4% overshoot for 19 msec	< ±5% jitter < +4 % overshoot	PASS
11	Scene 3-4 3.33° step	<42 msec rise time per Figure 7 9	< 42 msec	PASS
		< ±5% jitter per Figure 7 9 < +4% overshoot for 19 msec	< ±5% jitter < +4 % overshoot	PASS
12	Scene 4-5 3.33° step	<42 msec rise time per Figure 7 9	< 42 msec	PASS
		< ±5% jitter per Figure 7 9 < +4% overshoot for 19 msec	< ±5% jitter < +4 % overshoot	PASS
13	Scene 5-6 3.33° step	<42 msec rise time per Figure 7 9	< 42 msec.	PASS
		< ±5% jitter per Figure 7 9 < +4% overshoot for 19 msec	< ±5% jitter < +4 % overshoot	PASS
14	Scene 6-7 3.33° step	<42 msec rise time per Figure 7 9	< 42 msec.	PASS
		< ±5% jitter per Figure 7 9 < +4% overshoot for 19 msec	< ±5% jitter < +4 % overshoot	PASS
15	Scene 7-8 3.33° step	<42 msec rise time per Figure 7 9	< 42 msec.	PASS
		< ±5% jitter per Figure 7 9 < +4% overshoot for 19 msec	< ±5% jitter < +4 % overshoot	PASS
16	Scene 8-9 3.33° step	<42 msec rise time per Figure 7 9	< 42 msec	PASS
		< ±5% jitter per Figure 7 9 < +4% overshoot for 19 msec	< ±5% jitter < +4 % overshoot	PASS

Pass = P
Fail = F

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16 Dec 97

TEST DATA SHEET 7 (SHEET 2 OF 4)
3.4.4.5: Scan Motion and Jitter Test

Step No.	Description	Requirement	Test Result	Pass/Fail
17	Scene 9-10 3.33° step	<42 msec rise time per Figure 7-9	< 42 msec.	PASS
		< ±5% jitter per Figure 7-9 < +4% overshoot for 19 msec	< ± 5% < 4%	PASS
18	Scene 10-11 3.33° step	<42 msec rise time per Figure 7-9	< 42 msec	PASS
		< ±5% jitter per Figure 7-9 < +4% overshoot for 19 msec	< ±5% < +4%	PASS
19	Scene 11-12 3.33° step	<42 msec rise time per Figure 7-9	< 42 msec	PASS
		< ±5% jitter per Figure 7-9 < +4% overshoot for 19 msec	< ±5% < +4%	PASS
20	Scene 12-13 3.33° step	<42 msec rise time per Figure 7-9	< 42 msec	PASS
		< ±5% jitter per Figure 7-9 < +4% overshoot for 19 msec	< ±5% < +4%	PASS
21	Scene 13-14 3.33° step	<42 msec rise time per Figure 7-9	< 42 msec	PASS
		< ±5% jitter per Figure 7-9 < +4% overshoot for 19 msec	< ±5% < +4%	PASS
22	Scene 14-15 3.33° step	<42 msec rise time per Figure 7-9	< 42 msec	PASS
		< ±5% jitter per Figure 7-9 < +4% overshoot for 19 msec	< ±5% < +4%	PASS
23	Scene 15-16 3.33° step	<42 msec rise time per Figure 7-9	< 42 msec	PASS
		< ±5% jitter per Figure 7-9 < +4% overshoot for 19 msec	< ±5% < +4%	PASS
24	Scene 16-17 3.33° step	<42 msec rise time per Figure 7-9	< 42 msec	PASS
		< ±5% jitter per Figure 7-9 < +4% overshoot for 19 msec	< ±5% < +4%	PASS

R. McInerney
ENG 252
2/11/98
QC 226

Pass = P
Fail = F

TEST DATA SHEET 7 (SHEET 3 OF 4)
3.4.4.5: Scan Motion and Jitter Test

Step No.	Description	Requirement	Test Result	Pass/Fail
25	Scene 17-18 3.33° step	<42 msec rise time per Figure 7 9	< 42 msec	PASS
		< ±5% jitter per Figure 7 9 < +4% overshoot for 19 msec	< ±5% < +4%	PASS
26	Scene 18-19 3.33° step	<42 msec rise time per Figure 7 9	< 42 msec.	PASS
		< ±5% jitter per Figure 7 9 < +4% overshoot for 19 msec	< ±5% < +4%	PASS
27	Scene 19-20 3.33° step	<42 msec rise time per Figure 7 9	< 42 msec	PASS
		< ±5% jitter per Figure 7 9 < +4% overshoot for 19 msec	< ±5% < +4%	PASS
28	Scene 20-21 3.33° step	<42 msec rise time per Figure 7 9	< 42 msec.	PASS
		< ±5% jitter per Figure 7 9 < +4% overshoot for 19 msec	< ±5% < +4%	PASS
29	Scene 21-22 3.33° step	<42 msec rise time per Figure 7 9	< 42 msec	PASS
		< ±5% jitter per Figure 7 9 < +4% overshoot for 19 msec	< ±5% < +4%	PASS
30	Scene 22-23 3.33° step	<42 msec rise time per Figure 7 9	< 42 msec	PASS
		< ±5% jitter per Figure 7 9 < +4% overshoot for 19 msec	< ±5% < +4%	PASS
31	Scene 23-24 3.33° step	<42 msec rise time per Figure 7 9	< 42 msec	PASS
		< ±5% jitter per Figure 7 9 < +4% overshoot for 19 msec	< ±5% < +4%	PASS
32	Scene 24-25 3.33° step	<42 msec rise time per Figure 7 9	< 42 msec	PASS
		< ±5% jitter per Figure 7 9 < +4% overshoot for 19 msec	< ±5% < +4%	PASS

QC 226 ENG 252 2/11/98

Pass = P
Fail = F

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TEST DATA SHEET 7 (SHEET 4 OF 4)
3.4.4.5: Scan Motion and Jitter Test

Step No.	Description	Requirement	Test Result	Pass/Fail
33	Scene 25-26 3.33° step	<42 msec rise time per Figure ~~7~~ 9	< 42 msec	PASS
		< ±5% jitter per Figure ~~7~~ 9 < +4% overshoot for 19 msec	< ±5% < +4%	PASS
34	Scene 26-27 3.33° step	<42 msec rise time per Figure ~~7~~ 9	< 42 msec	PASS
		< ±5% jitter per Figure ~~7~~ 9 < +4% overshoot for 19 msec	< ±5% < +4%	PASS
35	Scene 27-28 3.33° step	<42 msec rise time per Figure ~~7~~ 9	< 42 msec	PASS
		< ±5% jitter per Figure ~~7~~ 9 < +4% overshoot for 19 msec	< ±5% < +4%	PASS
36	Scene 28-29 3.33° step	<42 msec rise time per Figure ~~7~~ 9	< 42 msec	PASS
		< ±5% jitter per Figure ~~7~~ 9 < +4% overshoot for 19 msec	< ±5% < +4%	PASS
37	Scene 29-30 3.33° step	<42 msec rise time per Figure ~~7~~ 9	< 42 msec	PASS
		< ±5% jitter per Figure ~~7~~ 9 < +4% overshoot for 19 msec	< ±5% < +4%	PASS
38	Scene 30 Cold Cal 35.0° slew	<0.21 sec slew time per Figure ~~10~~ 12	< 0.21 sec.	PASS
		< ~~±0.165°~~ 5% jitter per Figure ~~10~~ 13	< ±5%	PASS
39	Cold Cal - Warm Cal 96.67° slew	<0.40 sec slew time per Figure ~~11~~ 14	< 0.40 sec	PASS
		< ~~±0.165°~~ 5% jitter per Figure ~~12~~ 15	< ±5%	PASS

QC 226 ENG 252 R. Khoury 2/11/98

Pass = P
Fail = F

Unit: EOS-A2

Serial No.: 202

Date: Feb. 11, 1998

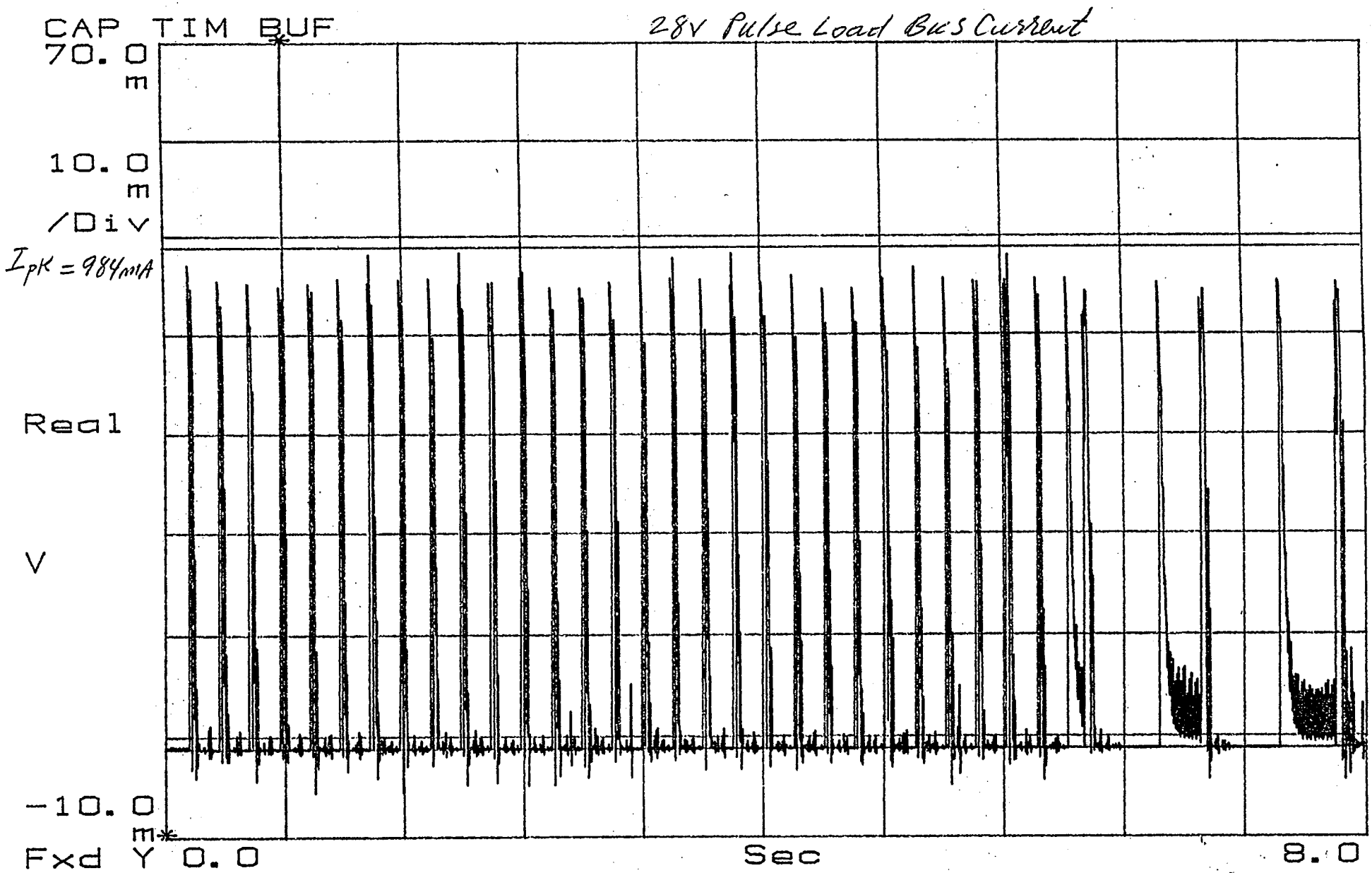
Test Engineer: Roger F. Khoury ENG 252

Quality Assurance: QC 226

Customer Representative: 3-19-98

SHOP ORDER: 323737 FILE NAME: ~~356446-4P~~ 4PLB_C P/N: 1356006-1-IT DATE: 2/11/98

Y=-1.1758m ΔY=49.99mV



TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.6 step 4j PAGE 1 of 1

C

TEST DATA SHEET 8
3.4.4.6: Pulse Load Bus Current

Test Setup Verified: _____ Shop Order No. 323737
Signature

3.4.4.6: 28V Bus Peak Current and Rise Time Test

Step No.	Requirement	Test Result	Pass/Fail
4	< 2 A peak any place in the scan	984ma	PASS
5	> 70 µsec rise time, 3.33° step	1.2ms	PASS
6	> 70 µsec rise time, start of WC slew	1.95ms	PASS
6	> 70 µsec rise time, end of WC slew	2.30ms	PASS

Pass = P
Fail = F

Unit: EOS-AZ

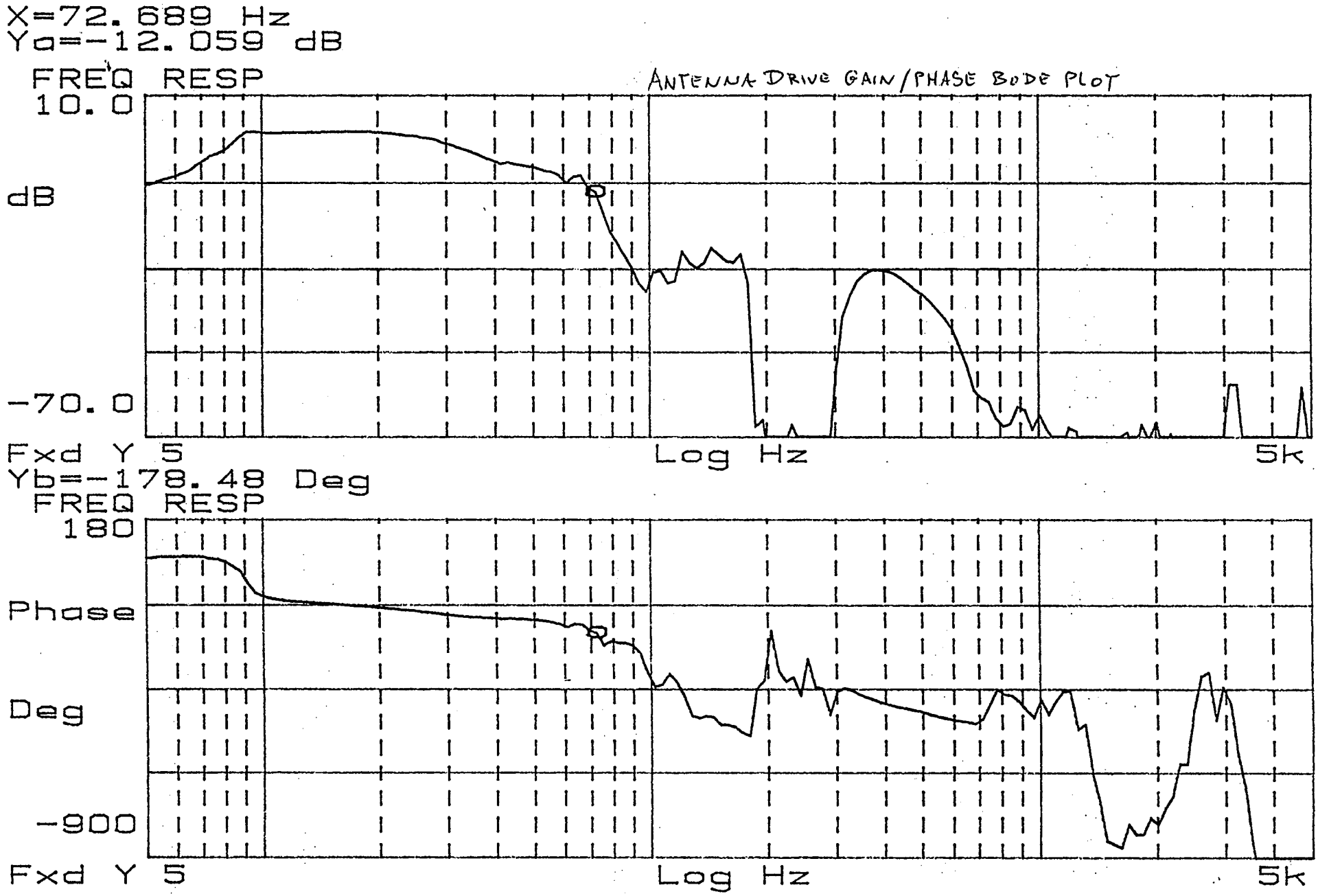
Serial No.: 202

Test Engineer: _____

Quality Assurance: _____

Date: MAR 19 '98

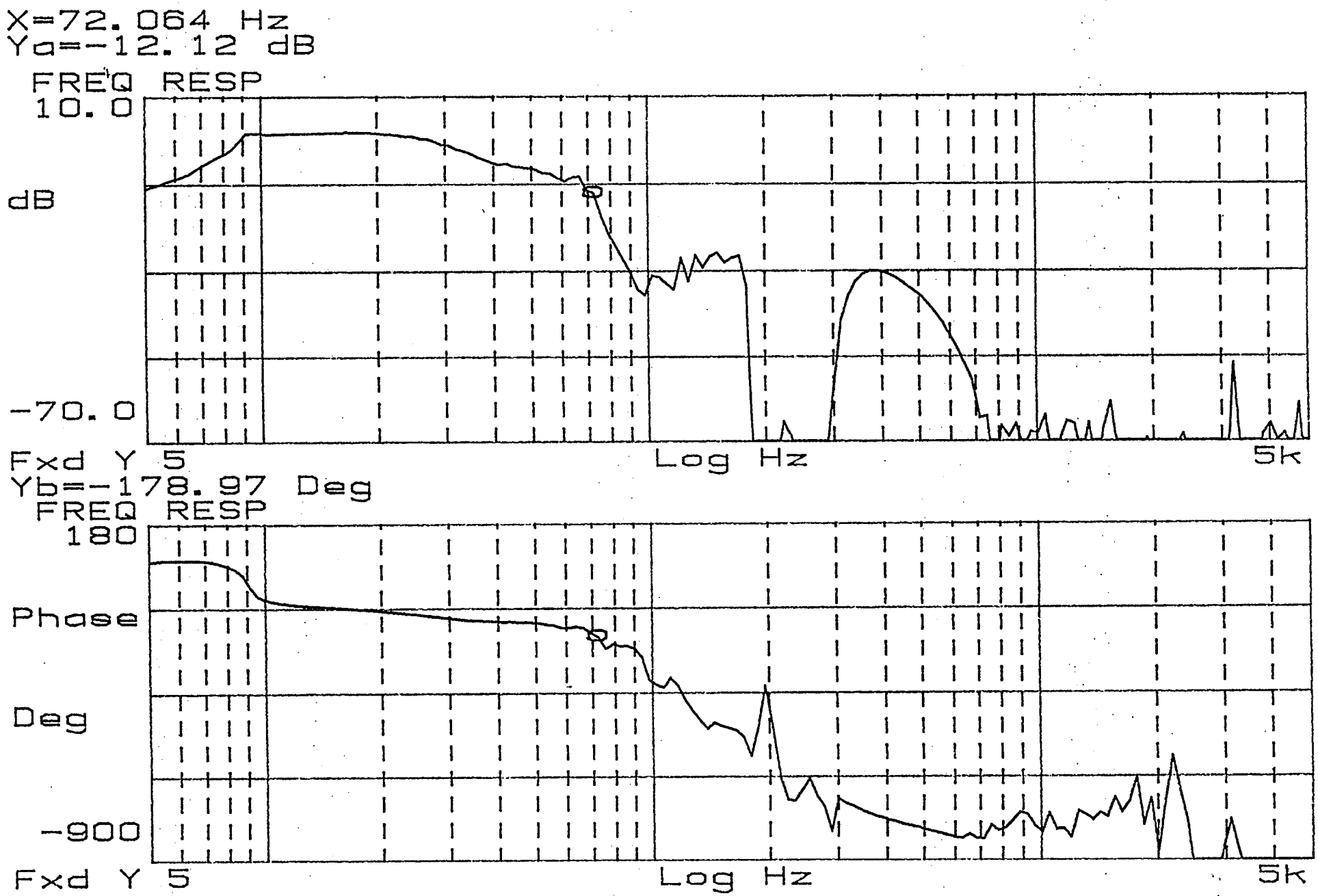
SHOP ORDER: 323737 FILE NAME: 11GP_BP1 P/N: 1356006-1-IT DATE: 2/12/98



TEST ENG.: ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.8 step 12b PAGE 1 of 1

D

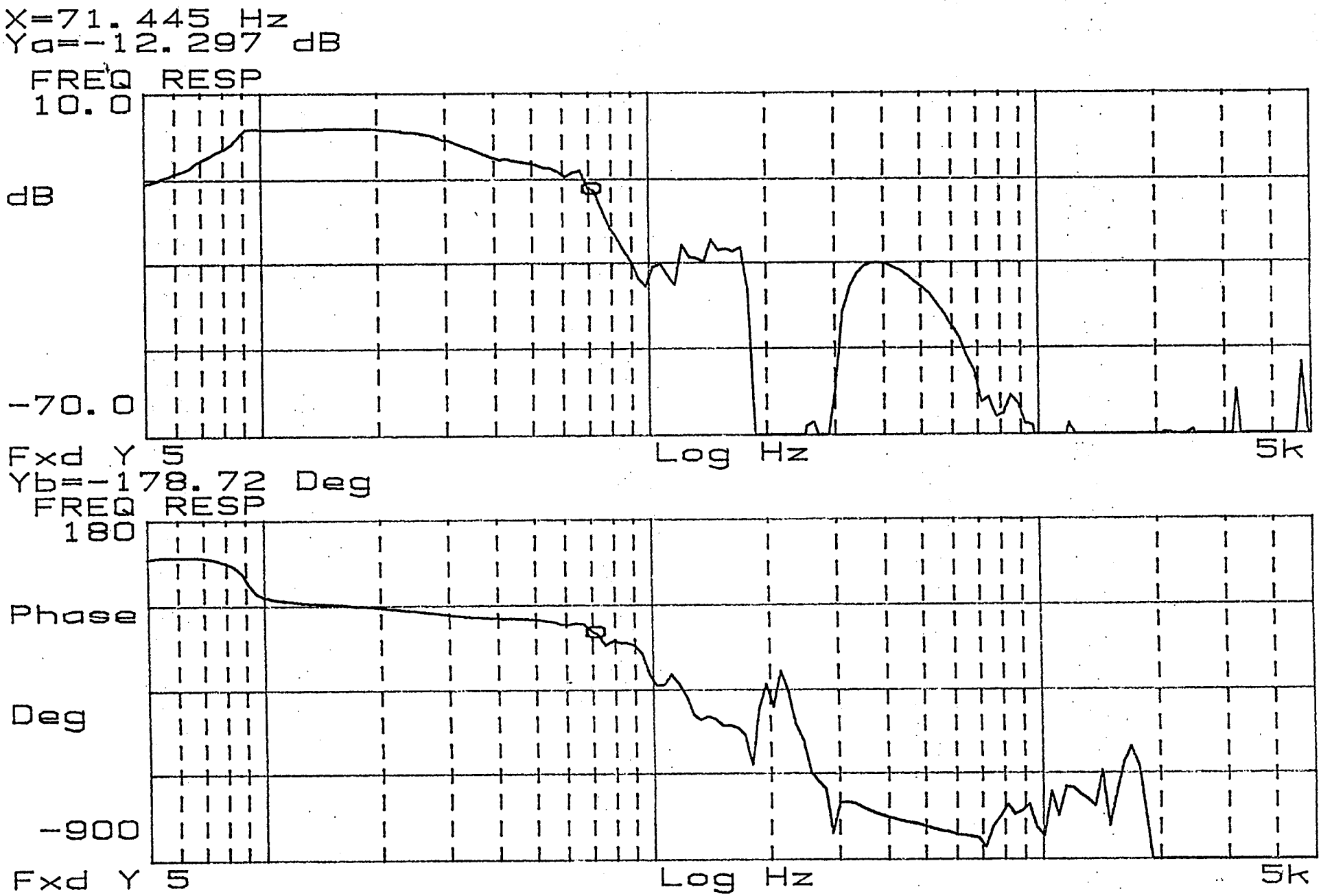
SHOP ORDER: 323737 FILE NAME: 12GP_BP2 P/N: 1356006-1-IT DATE: 2-12-98



TEST ENG. : ENG 252 QUALITY ENG.: _____ PARA: 3.4.4.8 step 12d PAGE 1 of 1

D2

SHOP ORDER: 323737 FILE NAME: 12GP_BP3 P/N: 1356006-1-IT DATE: 2-12-98



TEST ENG. : ENG 252 QUALITY ENG.: _____ PARA: 3.3.4.8 step 12d PAGE 1 of 1

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TEST DATA SHEET 9
3.4.4.8 : Gain/Phase Margin Test

Test Setup Verified: _____ Signature Shop Order No. 323737

Temperature: 25 °C

3.4.4.8 Step 12: Gain/Phase Margin Test

Requirement		Test Result	Pass/Fail	
12 dB minimum	1	-12.059 db	PASS	
	2	-12.12 db	PASS	
	3	-12.297 db	PASS	
	~~4~~			*
	~~5~~			
25 degrees minimum	1	65°	PASS	
	2	67°	PASS	
	3	62°	PASS	
	~~4~~			*
	~~5~~			

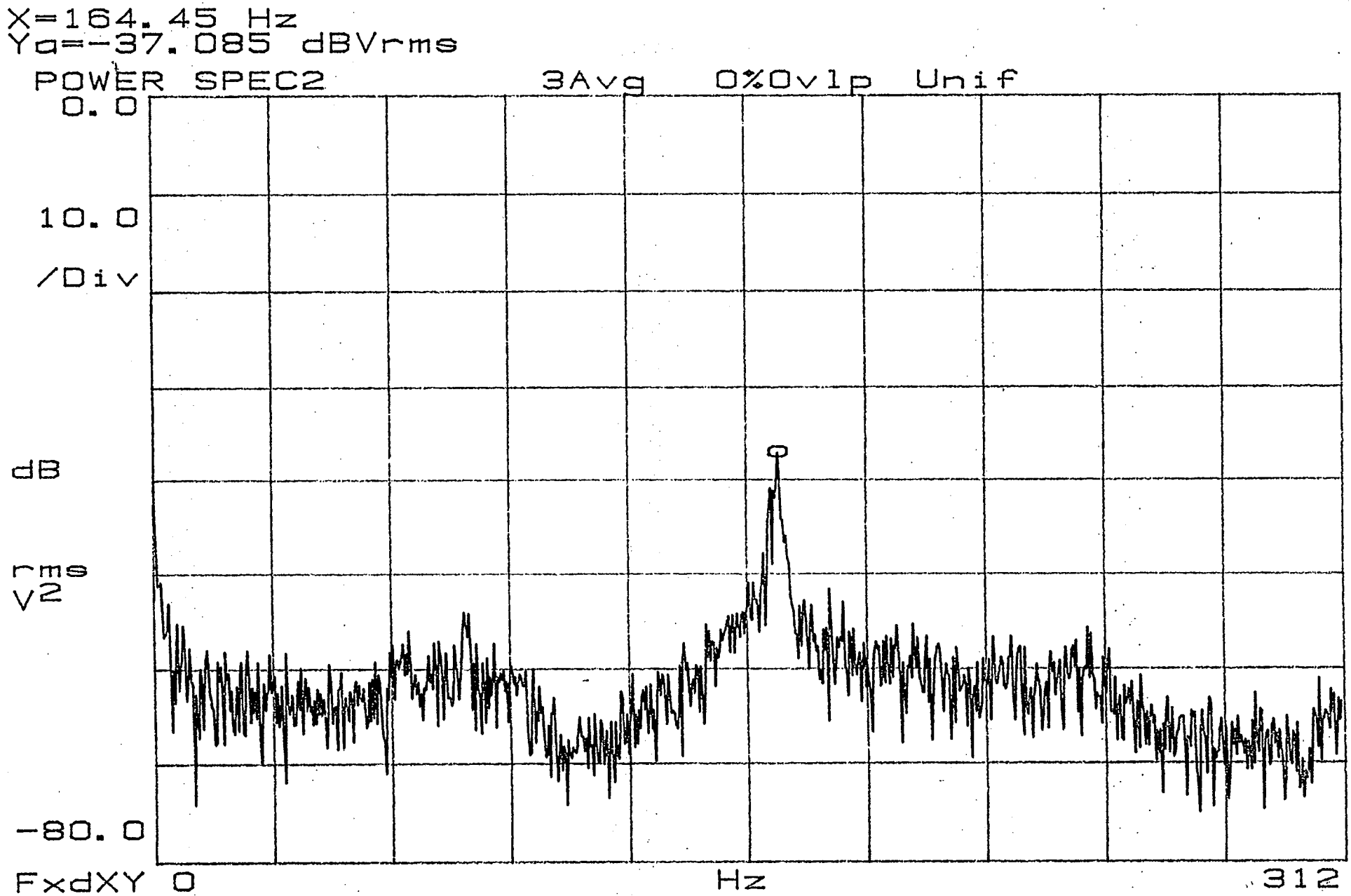
*Deleted two measurement cycles per customer request.
2/12/98

Pass = P
Fail = F

Unit: EOS-AZ
Serial No.: 202
Date: 2/16/98

Test Engineer: _____
Quality Assurance: _____ MAR 19 '98
Customer Representative: _____ 3-19-98

SHOP ORDER: 323737 FILE NAME: 120F_PSI P/N: 1356006-1-IT DATE: 2/12/98



TEST ENG.: _____ QUALITY ENG.: _____ PARA: 3.4.4.9 step 12d PAGE 1 of 1

TEST DATA SHEET 10
3.4.4.9: Operational Gain Margin Test

Test Setup Verified: Roger W. Khoury Shop Order No. 323737
Signature

Temperature: 25 °C

3.4.4.9: Operation Gain Margin Test

Step No.	Requirement	Test Result		Pass/Fail
11	R58 Resistance (Kohms)			PASS
	Test Pot Resistance (Kohms)	1	38.23K	
		2	40.70K	
		3	38.47K	
12	Oscillation Frequency (Hz)	1	162HZ	Pass
		2	164HZ	
		3	165 HZ	
16	Gain Margin, 9 dB minimum	1	9.1 db	PASS
		2	9.4 db	
		3	9.1 db	

Pass = P
Fail = F

Unit: EOS AZ

Serial No.: 202

Test Engineer: [signature]

Quality Assurance: [signature]

Date: 2/12/98

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Report Documentation Page

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	10. Work Unit No.: ---
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15. Supplementary Notes: ---

16. ABSTRACT (*Maximum 200 words*)

This is the Performance Verification Report, EOS AMSU-A2 Antenna Drive Subassy, P/N 1356006-1, S/N 202 for the Integrated Advanced Microwave Sounding Unit-A (AMSU-A).

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6. AUTHOR(S)
A. Nieto

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Aerojet
1100 W. Hollyvale
Azusa, CA 91702

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11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT

12b. DISTRIBUTION CODE
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13. ABSTRACT (*Maximum 200 words*)

This is the Performance Verification Report, EOS AMSU-A2 Antenna Assy, P/N 1356006-1, S/N 202 for the Integrated Advanced Microwave Sounding Unit-A (AMSU-A).

14. SUBJECT TERMS
EOS
Microwave System

15. NUMBER OF PAGES

16. PRICE CODE
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17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	SAR

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A. Nieto	208	

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