TEST FOLDER # 75.002.I
Equipment Name 2UBB-UPSIC
Equipment Mark # 2UBB-UPSIC

OT-[redacted]-91

CIRCLE APPROP. CAT. 26

QA. CAT. I (N)

PROCEDURE COVER SHEET

NIAGARA MOHAWK POWER CORPORATION

Job Book #A0 75.08

(#11)

PROCEDURE TYPE	APPROVAL AUTHORITY	PROCEDURE NO.
ELECTRICAL TEST PROCEDURE	JTG	ES.0071.003
PROCEDURE TITLE		AUTHOR
75 KVA UNINTERRUPTIBLE POWER SUPPLIES		B. CRANDALL

REVIEWED and APPROVED

rev. no.	approved by	date	JTG mtg no.	reviewed-QA Nuclear (POTS only)
0	[signature]	5/10/85	85-29	N/A
1				
2				
3				
4				
5				
6				

RELEASE FOR PERFORMANCE (required for POT's and AT's only)

Pretest review completed by _____ date _____

Approved for performance _____ date _____

RESULTS REVIEW and APPROVAL (required for specific Prelim., POT and AT only)

Conducted by R.J. Crandall (ROBERT J. CRANDALL) date 5/14/85 (5/13/85 et Rein - 10-14-85

Reviewed by [signature] date 10-7-85

QA Review by N/A date _____
(POTS only)

Approved by [signature] date 5-20-86

Title Asst. Group Mgr. JTG mtg no. NA

OPERATIONAL ACCEPTANCE (required for POT's and AT's only)

Review and Accepted _____ date _____
SORC Chairman SORC mtg. no. _____

System Operational _____ date _____
Station Superintendent

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1.0 PURPOSE

This procedure establishes a method for verifying that the uninterruptible power supply (UPS) conforms with referenced drawings and is capable of performing in accordance with specification requirements in all modes of operation.

2.0 SCOPE

This procedure will test the Uninterruptible Power Supply (UPS). This includes testing the alternate supply source A.C. Power Transformer and regulator as well as the uninterruptible power supply itself. This procedure is designed to test all five 75 KVA UPS. These may be tested in any order. Although it is advantageous to test the regulated alternate power source equipment and the UPS at one time this is not a requirement for acceptability of this procedure.

3.0 GENERAL TEST METHOD

The procedure will test the alternate source transformer/regulator for distortion and regulation - full load versus no load. It will then check for initial operation of the Uninterruptible Power Supply (UPS) including starting the unit up and verifying the mimic light indication. UPS regulation will be tested - no load versus full load and full load transfers will be attempted. During full load transfers it will be verified that there is no loss of load. For full load operation a temporary load bank will be connected to the UPS. A transfer without loss of load will mean a transfer in less than 1/4 cycle. The ability for the UPS to operate using only DC power will be verified. The control room annunciation from the UPS will be verified as it occurs as well as unit installed meter response. For any unit installed meter that is past calibration, out of calibration or in some way inoperable a portable piece of test equipment may be used as long as the model of the equipment and the manner in which it is used is recorded on the test summary. It is assumed that if a meter is inoperable, the portable meter will be connected as close to the actual installed equipment meter connection as is possible.

The end of the test will include a 24 - hour load test of the UPS. Upon satisfactory completion of the test the test load will be removed and the unit put in service.

4.0 TEST EQUIPMENT

4.1 Megger, Biddle Model No. 21359 or equivalent

4.2 Digital Multimeter, Fluke Model No. 8060A or equivalent

4.3 Knopp, K-3 Phase Sequence Tester or equivalent.

4.4 Phase angle meter, Dranetz Model No. 314 or equivalent

4.5 Dranetz Model 626 disturbance analyzer or equivalent

4.6 Thermometer, capable of reading 32°F to 104°F

4.7 Three phase load bank suitable for 75 KVA.

4.8 Harmonic distortion analyzer, Hewlett Packard Model 339A or equivalent.

4.9 For 75KVA UPS testing, clamp-on ammeter capable of reading at least 225 amps.

4.10 Hewlett-Packard H.P. 3400A, or equivalent.

5.0 PREREQUISITES

NOTE: This procedure is written for testing five 75 KVA uninterruptible power supplies the individual UPS may be tested in any order. Therefore prior to testing a particular UPS not all prerequisites listed below need to be satisfied. Only those prerequisites that directly apply to the particular UPS being tested need to be satisfied. Indicate "N/A" (non-applicable) on those that do not apply.

5.1 No preliminary tests are required to be complete prior to performing this test.

5.2 No special environmental conditions are required for this test.

5.3 Permanent plant power is connected to and supplying power to the following equipment:

		Initials/Date
5.3.1	For 2VBB-UPS1A:	
	1) 2VBB-PNL301, BKR #1	N/A /
	2) 2NJS-US5, BKR #8-D	N/A /
	3) 2BYS-SWG001A, BKR #2-C	N/A /
5.3.2	For 2VBB-UPS1B:	
	1) 2VBB-PNL301, BKR #2	N/A /
	2) 2NJS-US6, BKR #4-B	N/A /
	3) 2BYS-SWG001B, BKR #2-C	N/A /
5.3.3	For 2VBB-UPS1C:	
	1) 2LAT-PNL300, BKR#SUB-FEED	RJC 1 5/12/05
	2) 2NJS-US5, BKR #4-D	RJC 1 5/12/05
	3) 2BYS-SWG001A, BKR #2-D	RJC 1 5/12/05

(ROBERT J CRANDALL - RJC)

5.3.4 For 2VBB-UPS1D:

		Initial/Date
1)	2NJS-MCC006, BKR #8-A	N/A /
2)	2NJS-US6, BKR #6-C	N/A /
3)	2BYS-SWG001B, BKR #2-D	N/A /

5.3.5 For 2VBB-UPS1G:

		Initial/Date
1)	2VBB-PNL301, BKR #7	N/A /
2)	2NJS-US6, BKR #6-D	N/A /
3)	2BYS-SWG001C, BKR #2-C	N/A /

5.4 System Status

5.4.1 Note any temporary modifications on the particular UPS under test in the test summary and indicate their effect on the test. See Summary Pg 1

Verified By: [signature] / Date: 5/13/85

5.4.2 Verify from Attachment 12.3 that the annunciators for the particular unit under test are in service. Note any exception to this on test summary.

Verified By: [signature] / Date: 5/13/85

5.4.3 Verify from Attachment 12.4 that the computer points for the particular unit under test are in service. Note any exception to this on the test summary.

Verified By: [signature] / Date: 5/13/85

5.5 There are no other prerequisites required for this test.

6.0 INITIAL CONDITIONS

6.1 CB #5 on the alternate supply transformer is open.

Verified By: [signature] / Date: 5/13/85

6.2 CB #4 on the particular UPS is closed.

Verified By: [signature] / Date: 5/13/85

6.3 CB #1 and CB #2 on the particular UPS are open.

Verified By: [signature] / Date: 5/13/85

6.4 The three phase load bank is connected to the UPS output terminals E13(neutral), E14(Phase A), E15(Phase B), E16(Phase C).

Robt J Calle / 5/13/85
Verified By Date

6.5 The normal source feed breaker is closed on the applicable switchgear or panel.

Robt J Calle / 5/13/85
Verified By Date

6.6 The D.C. source feed breaker is closed on the applicable D.C. switchgear.

Robt J Calle / 5/13/85
Verified By Date

7.0 PRECAUTIONS & LIMITATIONS

7.1 Do not work on UPS output bus without shutting off normal, alternate and backup D.C. power to unit (taking readings on bus with voltmeter does not necessitate open input power).

7.2 In case of smoke, fire, electrical shorts or other circumstances that would damage the unit shutdown unit as follows:

1) Place transfer switch into bypass position
2) Open battery breaker (CB #2)
3) Open AC input breaker (CB #1)

7.3 Do not open CB #5 on alternate supply transformer with A27CB1 and A27-Switch #1 closed.

7.4 Ensure to all personnel involved in the test understand that there are multiple feeds to the UPS, where they enter and how each should be isolated.

7.5 Prior to using a megger in any portion of the UPS system verify that all control circuits, solid state components, relays & meters are sufficiently isolated.

7.6 Applicable safety precautions, as outlined in the NMPC Accident Prevention Rules, apply. Record applicable mark-up numbers on test summary.

8.0 PROCEDURE

NOTE: All percent (%) of full load values required in this procedure are approximate. The load bank used is not a continuously variable unit - it is energized in distinct steps of approximately 41 amps for each breaker closed.

NOTE: Where the actual measured values are out of tolerance the recorded values shall be "As Left" values. Note in the test summary when adjustments are made.

NOTE: Record all test equipment data on Attachment 12.2 as each item of test equipment is used.

8.1 Step Deleted.

8.2 Verify all UPS meters are calibrated or attach temporary test meter(s) as necessary and note M&TE No., Cal. Due Date, and manner it was used in test summary.

Robert J Cellar 1 5/12/85
Verified By Date

8.3 Equipment Mark # 2VBB-UPS1C
KVA 75 KVA
AC Input 575 VAC
DC Input 125 VDC
AC Output 120/209 VAC

Serial #77223-3

8.4 Step Deleted.

8.5 Perform a visual inspection of the UPS as follows:

8.5.1 Visually verify the exterior of the UPS and associated transformer /regulator for proper installation. Robert J Cellar (yc) ROBERT J. CELLAR
yc 1 5/13/85

8.5.2 Open or remove doors or inspection panels, as required. Verify the following.

8.5.3 No loose tools within UPS. yc 1 5/13/85

8.5.4 UPS interior clean and free of debris. yc 1 5/13/85

8.5.5 Wire terminations tight. yc 1 5/13/85

8.5.6 Cables tied properly. yc 1 5/13/85

8.5.7 No evidence of overheating or other mechanical damage.
yc 1 5/13/85

8.5.8 Circuit boards are properly secured. yc 1 5/13/85

8.5.9 Ventilation filters are clean and secured properly.
yc 1 5/13/85

7

RECORD COPY

3 8 7 8 3 1 6 8 9

Initials/Date

8.5.10 Replace all removed doors or inspection panels. yc 1 5/13/85

8.6 Read and record the ambient air temperature in the vicinity of the UPS and transformer/regulator.

MDTE * IC 2604
CAL DUE 9/29/85

71 °F yc 1 5/13/85

8.7 Verify continuity of the UPS grounding connection by using a multimeter on resistance scale and obtaining a resistance reading of approximately zero between the UPS housing and the nearest plant ground.

yc 1 5/13/85

8.8 Read and record the elapsed time meter reading.

104.8 HOURS yc 1 5/13/85

8.9 Check Normal AC supply voltage and phase rotation as follows:

8.9.1 Read and record the AC input voltage at the line side (top) of CB #1 within the UPS. * SEE TEST SUMMARY PG 1

E-1

1-2 616.5 vac, 2-3 615.5 vac, 1-3 ~~615.5~~ 608.1 yc 5/13/85 vac, yc 1 5/13/85

MDTE * IC 7255
CAL DUE - 11/10/85

(575 ± 10%, 517.5 to 632.5)

E-1 8.9.2 Attach phase sequence meter to top of CB #1 within UPS phase A to C, Left to Right, & Read record phase rotation.

Rotation ABC (ABC). * SEE TEST SUMMARY PG 1 yc 1 5/13/85

MDTE = MT 2007
CAL DUE - 5/16/85

8.10 Check alternate AC supply voltage and phase rotation at the associated transformer/regulator as follows:

8.10.1 Read and record voltage at the transformer/regulator input breaker CB5.

1-2 610.1 vac, 2-3 617.0 vac, 1-3 608.1 vac, yc 1/13/85

(575 vac ± 10% - 517.5 to 632.5 vac)

MDTE - IC 7255
CAL DUE - 11/10/85

8.10.2 Attach phase sequence meter to top of CB#5 at transformer regulator Left to Right read phase Rotation ABC (ABC).

MDTE - MT 2007
CAL DUE - 5/16/85

yc 1 5/13/85

8.11 Test the alternate AC supply transformer/regulator as follows:

8.11.1 Close the alternate AC supply breaker CB5 at the transformer/regulator.

yc 1 5/13/85

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8707831690

8.11.2 Verify that there are no unusual sounds or odors coming from the transformer/regulator.

MK 1 5/13/85

8.11.3 Using the H.P. 3400A read the alternate AC supply voltage phase to neutral on the line side (top) of CB #3 within the UPS.

1-N 121 vac, 2-N 122 vac, 3-N 121 vac, MK 1 5/13/85
(120 ± 2%, 117.6 - 122.4 vac) MTE - IC2101
CAL DUE - 11/2/85

NOTE: This is regulator no-load voltage.

8.11.4 Read and record the alternate AC supply phase rotation on the line side of CB #3 within the UPS. Attach phase sequence meter to top of CB#3, Left to Right & read phase rotation.
Rotation ABC (ABC).
MTE - MT 2007
CAL DUE - 5/16/85

MK 1 5/13/85

8.11.5 Set the test load bank to 25% of rated UPS capability (41 amps/phase) by closing one breaker on load unit distribution panel.

MK 1 5/13/85

8.11.6 Verify that the UPS bypass circuit breaker - CB 4; is closed to energize the test load from the alternate AC supply.

MK 1 5/13/85

8.11.7 Disconnect power cable to the motor operator on CB-4.

MK 1 5/13/85

8.11.8 Raise the test load to 100 percent of rated UPS capacity (166 amps/phase) in 25 percent steps (41 amps/phase), allowing current to stabilize between steps. Measure and record voltage phase to neutral, and current at each step using clamp on ammeter and H.P. 3400A.

CLAMP - ON: EH
MTE IC2139
CAL - 9/6/85
USED WITH FLUKE IC2239
CAL - 10/17/85

H.P 3400A # IC2101
CAL DUE - 11/2/85

	Percent Rated Load			
	25%	50%	75%	100%
Current (Clamp On)	43.5	88.0	132.5	175.5
Phase A Voltage (H.P.3400A)	121	121	120	120
Phase B Voltage	122	122	121	121
Phase C Voltage	121	121	120	120

(120 ± 2%, 117.6 - 122.4 vac)

Summary PS1

MK 1 5/13/85

8.11.9 Reduce the test load to 25 percent of rated UPS capacity in 25 percent steps, allowing current to stabilize between steps.

MK 1 5/13/85

8.11.10 Calculate and record voltage regulation (VR) of the transformer/ regulator using the formula:

NOTE: Show calculation on worst regulation of three phase.

$$VR = \frac{V_{NL} - V_{FL}}{V_{NL}} \times 100 \text{ percent}$$

Where: V_{NL} = Transformer/regulator voltage at no load (measured in Section 8.11.3)

V_{FL} = Transformer/regulator voltage at full load (measured in Section 8.11.8)

VR= $\frac{121 - 120}{121}$ X 100%= 0.8 (± 2% Max) yk 5/13/85

8.12 Start up the UPS, as follows: verified [signature] 10-7

NOTE: UPS DC input breaker cannot be closed until UPS normal AC breaker is closed and the UPS rectifier is energized.

8.12.1 Place the transfer control switch on the UPS control panel in the MANUAL RESTART position. yk 5/13/85

8.12.2 Place the CB3, OPEN/CLOSED switch on the UPS control panel in the OPEN position.

yk 5/13/85
Initial/Date

8.12.3 Read logic power supply battery voltage, at panel A27-CB1.

(+) 19.8 vdc (>16.5 vdc) (-) 20.05 vdc (>16.5 vdc) yk 5/13/85

mate - IC7255
cm dec - 11/13/85

8.12.4 Close circuit breaker A27CB1 and place control switch A27-S1 (located on A27 panel in the rear of the UPS is in the ON position.

yk 5/13/85

8.12.5 Verify the following status lights:

1) "CB-4 Bypass Breaker" closed light is lit
2) "CB-3" open light is lit
3) "Bypass Input" light is lit
4) "Critical Bus" green light is lit

yk 5/13/85

8.12.6 Push the lamp test button on the card cage alarm card (A13A21) and verify that all alarm lamps on the card light.

yk 5/13/85

8.12.7 Verify that the alarms are unstored when button is released.

yc 1 5/13/05

8.12.8 Push the lamp test buttom on the static switch control card (A13A34) and verify that all alarm lamps on card light.

yc 1 5/13/05

8.12.9 Push its associated reset button on card and verify all lamps are reset to original state.

yc 1 5/13/05

8.12.10 Push the lamp test button on module control panel and verify that all status and alarm lamps on the control panel light.

yc 1 5/13/05

8.12.11 Release pushbutton and verify that all lamps reset to original state.

yc 1 5/13/05

NOTE: Push horn silence button as necessary.

8.12.12 Verify that the MODULE OFF lamp is energized.

yc 1 5/13/05

8.12.13 Verify that the Normal AC Source Voltmeter M1 indicates 575 V ± 10% (517.5 - 632.5 vac)

610 vac yc 1 5/13/05

8.12.14 Manually close the UPS normal AC input breaker (CB1).

yc 1 5/13/05

8.12.15 Verify the following status lights:

1) "Module - Off" lamp is lit. yc 1 5/13/05
2) "CB-1" closed lamp is lit. yc 1 5/13/05
3) "Module -OK" lamp is lit. yc 1 5/13/05

N/A

8.12.16 Reconnect the power cable to the motor operator on bypass breaker CB-4.

yc 1 5/13/05

8.12.17 Depress the MODULE ON pushbutton.

yc 1 5/13/05

8.12.18 Observe the following sequence of events:

8.12.18.1 MODULE OFF lamp deenergizes. yc 1 5/13/85

8.12.18.2 DC Voltmeter M3 slowly increases to 103-140 VDC. yc 5/13/85 1 SEE SUMMARY.

8.12.18.3 AC Output Voltmeter M5 increases to 120V ± 2%. (117.6 - 122.4 vac)

120.7 vac yc 1 5/13/85

8.12.18.4 AC Output Frequency Meter M9 indicates 60 Hertz ± .5HZ (59.5 to 60.5 HZ).

60.0 HZ yc 1 5/13/85

8.12.18.5 Battery Ammeter M4 indicates 0 Amperes. yc 1 5/13/85

8.12.18.6 AC Output Ammeter M6 indicates approx. 41 Amperes. yc 1 5/13/85

8.12.18.7 Charger Output Current Meter M8 indicates current flow. 30 yc 5/13/85 ~~30~~ 30 AMPS yc 1 5/13/85

8.12.18.8 MODULE ON lamp energizes. yc 1 5/13/85

8.12.18.9 NO BREAK TRANSFER READY, TO UPS lamp energizes. yc 1 5/13/85

8.12.19 Verify the following status lights:

8.12.19.1 "CB2" open lamp is lit. yc 1 5/13/85

8.12.19.2 "No External DC" lamp is lit. yc 1 5/13/85

8.12.19.3 "Util. Sync OK" lamp is lit. yc 1 5/13/85

8.~~12~~13/14 FRF* ES.0071.003-1 yc. Adjust UPS rectifier DC output voltage to 103 VDC ± 2 volts. Record the no load ~~UPS~~ rectifier voltage. OR AS LOW AS POT R71 ON HLSA2 WILL ADJ.

105.8 Vdc more* IC7255 CMC due- 11/0/85. yc 1 5/13/85

8.~~13~~13 Verify that the UPS control module will automatically restart when transfer control switch is in the "Auto Restart" mode as follows:

8.~~13.1~~13.1 Place the transfer control to "Auto Restart" position.

yc 1 5/13/85

8.~~13.2~~13.2 On the control module panel push the OFF position.

yc 1 5/13/85

8.~~14.3~~ 13.3 Verify the following status:

8.~~14.3.1~~ 13.3.1 Module OFF lamp is lit. yc 1 5/13/05

8.~~14.3.2~~ 13.3.2 AC output voltage decreases to zero. yc 1 5/13/05

Verify that the UPS automatically restarts after a time delay (Approximately 40 sec.) as follows:

8.~~14.4.1~~ 13.4.1 Rectifier/Charger "Walks Up" to approx. 103 V dc 1 * SEE SUMMARY PG 1

8.~~14.4.2~~ 13.4.2 AC output frequency returns to 60 Hz. yc 1 5/13/05

8.~~14.4.3~~ 13.4.3 AC output volts returns to 120 V ac. yc 1 5/13/05

8.~~14.4.4~~ 13.4.3 "Module-On" lamp relights. yc 1 5/13/05

8.15 Check UPS no-load output voltage and fequency as follows:

8.15.1 Using the AC output voltmeter on the UPS read the UPS No-Load output voltage and record.

1 121.5 vac, 2 121.0 vac, 3 121.0 vac, yc 1 5/13/05
(120 ± 2%, 117.6 - 122.4 vac)

8.15.2 Using the AC output frequency meter mounted on the UPS read the UPS No-Load output frequency and record.

ØA 60.0
ØB 60.0
ØC 60.0 HZ .5 yc 5/13/05 yc 1 5/13/05
(60 ± .5, 59.5 - 60.5 HZ)

8.16 Verify that the UPS output and alternate (bypass) supply output are "in phase" as follows:

8.16.1 Within the UPS read the voltage between the bottom of circuit breakers CB-3 and CB-4, Phase A to Phase A, Phase B to Phase B, Phase C to Phase C.

NOTE "IC 7255 CAL DUE - 11/10/05

A-A 8.0 vac
B-B 9.5 vac (≤ 10Vac)
C-C 9.1 vac yc 1 5/13/05

8.17 Transfer the test load which is at 25 percent load (41 amp/phase) to the UPS inverter as follows:

yc 1 5/13/05

8.17.1 Verify that the "UTIL SYNC OK" lamp is energized. yc 1 5/13/05

8.17.2 Verify that the "No Break Transfer Ready to UPS" lamp is energized.

yc 1 5/13/05

8.17.3 PLACE the inverter output circuit breaker (CB3) switch in the closed position.

yc 1 5/13/05

8.17.4 Verify the following:

8.17.4.1 The "CB-3" closed lamp is lit. yc 1 5/13/05

8.17.4.2 The "CB-4" open lamp is lit. yc 1 5/13/05

8.17.4.3 NO BREAK TRANSFER TO BYPASS lamp energizes. yc 1 5/13/05

8.17.4.4 Normal AC source ammeter M2 indicates increased input current.

yc 1 5/13/05

8.17.4.5 Charger output current meter M8 indicates increased current.

yc 1 5/13/05

8.17.4.6 Battery Ammeter M4 indicates 0 amperes. yc 1 5/13/05

8.17.4.7 AC output ammeter M6 indicates approximately the same current as the load test unit.

yc 1 5/13/05

8.17.4.8 Load test the UPS as follows:

8.18.1 With the UPS supplied from the normal source, raise the test load to 100 percent of rated UPS capacity (166 anps/phase) in 25 percent steps. Measure and record load voltage and current at each step using the UPS meters. Record full load output inverter frequency as indicated on UPS meters.

E-4

	Percent Rated Load			
	25%	50%	75%	100%
Current	43.0*	80-85 amps	125-130	166
b1 Voltage	121.3	121.0	120.8	120.5
b2 Voltage	121.0	120.8	120.5	120.0
b3 Voltage	121.0	120.9	120.6	120.5

(120 ± 2%, 117.6 - 122.4 vac)

Summary pg 1

* READ WITH CLAMP-ON. yc. 50-100 READ ON UPS. yc 5/13

MATE" (CALCS IC 1139 (9/6/8 IC 1139 (10/17/8

Full load frequency Q1 60.0 HZ (59.5 - 60.5 HZ)
Q2 60.0 HZ
Q3 60.0 HZ

yc 1 5/13/05

8.18.2 Decrease load to 0% in 25 percent steps allowing current to stabilize between steps.

yc 1 5/13/05

8.19 Manually transfer load to the alternate AC supply as follows:

8.19.1 Verify that the "UTIL SYNC OK" lamp is lit. yc 1 5/13/05

8.19.2 Verify that the "No-Break Transfer, to Bypass" lamp is lit.

yc 1 5/13/05

8.19.3 Place the transfer control switch in the bypass position.

yc 1 5/13/05

8.19.4 Release the switch and allow it to spring back to the "Manual Restart" position.

yc 1 5/13/05

8.19.5 Move switch "CB-3" to the open position. yc 1 5/13/05

8.20 22 Restart the UPS ~~(and adjust UPS rectifier DC output voltage to 140 VDC ± 1 volt.)~~ PER FRF ES.0071.003-2 yc 5/13/05 yc 1 5/13/05

8.21 26 ADJUST UPS ... (PER FRF ES.0071.003-2 yc 5/13/05)
Measure and record the No-Load UPS rectifier output voltage.
140.16 Vdc MDTE # 7255 CAL DUE - 11/10/05 yc 1 5/13/05

8.22 27 Measure and record the No-Load AC output voltage and frequency of the inverter as indicated on UPS panel meters.

Q1 120.5, Q2 120.5, Q3 120.5 vac(117.6 - 122.3vac)
Q1 60.0, Q2 60.0, Q3 60.0 HZ(59.5 - 60.5HZ).

yc 1 5/13/05

8.23 20 Close the DC supply breaker at the associated switchgear.

15 yc 1 5/13/05

8.~~24~~ 21 Verify that battery polarity at the UPS is in accordance with Exide 75 KVA UPS manual.

yc 1 5/13/05
Initial/Date

8.~~25~~ 23 Close the UPS molded case DC supply breaker. yc 1 5/13/05

8.~~26~~ 24 Observe the following:

8.~~26.1~~ 24.1 The CB2 (DC battery breaker) OPEN lamp denergized and the CLOSED lamp energizes.

yc 1 5/13/05

8.~~26.2~~ 24.2 NO EXTERNAL DC lamp deenergizes. yc 1 5/13/05

8.~~26.3~~ 24.3 BLOCKING DIODE CONDUCTING, BATTERY GROUND, BATTERY DISCHARGE, and BATTERY UNDERVOLTAGE lamps are deenergized.

yc 1 5/13/05

8.~~27~~ 25 Measure the DC backup supply voltage at the UPS on the battery input bus on left side inside UPS cabinet. Record voltage.

133.45 Vdc mate # IC 7255 cal due - 11/10/05 yc 1 5/13/05

8.28 Transfer the test load, which is set at 25 percent load, 41 amps/phase, to the UPS inverter output as follows:

8.28.1 Place the transfer control switch in the AUTO RESTART postion.

yc 1 5/13/05

8.28.2 Verify that the "UTIL SYNC OK" lamp is energized.

yc 1 5/13/05

8.28.3 Verify that the "No Break Transfer Ready to UPS" lamp is energized.

yc 1 5/13/05

8.28.4 PLACE the inverter output circuit breaker (CB3) switch in the closed position.

yc 1 5/13/05

8.28.5 Verify the following:

8.28.5.1 The "CB-3" closed lamp is lit. yc 1 5/13/05

8.28.5.2 The "CB-4" open lamp is lit. 16 yc 1 5/13/05

8.28.5.3 NO BREAK TRANSFER TO BYPASS lamp energizes. yc 1 5/13/85
Initial/Date

8.28.5.4 Normal AC source ammeter M2 indicates increased input current.

yc 1 5/13/85

8.28.5.5 Charger output current meter M8 indicates increased current.

yc 1 5/13/85

8.28.5.6 Battery Ammeter M4 indicates 0 amperes. yc 1 5/13/85

E-5 8.28.5.7 AC output ammeter M6 indicates the same current as the clamp-on ammeter indicating test load current (read at load unit).

yc 1 5/13/85

8.29 Load test the UPS at 140 Vdc rectifier voltage as follows:

With the UPS supplied from the normal AC source, raise the test load to 100 percent of rated UPS capacity (166 amps/phase) in 25-percent steps (41 amps/phase), allowing current to stabilize between steps. measure and record load voltage and current at each step using the UPS meters. Measure and record full-load output inverter AC current, voltage, and frequency as indicated on the UPS meters.

E-5

	Percent Rated Load			
	25%	50%	75%	100%
Current (Amps)	* 43	85	130	175
Ø1 Voltage	120.5	121.0	120.75	120.5
Ø2 Voltage	120.5	120.5	120.75	120.5
Ø3 Voltage	120.5	120.5	120.75	120.5

* SEE SUMMARY PG 2
METER (CHG DUE IC2139 (9/6/85, IC2239 (10/17/85

Full load output frequency Ø1 60.0 HZ (59.5 - 60.5 HZ)
Ø2 60.0
Ø3 60.0

yc 1 5/13/85

8.30 Measure and record the full load output phase angle difference between each output phase using the phase angle meter.

1-2 120.3 o, 2-3 120.1 o, 1-3 119.9 o, yc 1 5/13/85 yc 5/15/85

(119 - 1210) / 17

METER # MT 35 2034 CHG DUE 9/20/85

8.31 Operationally test the static switch and UPS control circuits at full rated test load as follows:

8.31.1 Attach disturbance analyzer to UPS output and monitor UPS output voltage.

yc 1 5/13/85

8.31.2 Manually transfer full rated load from the inverter to the alternate AC supply as follows:

8.31.2.1 Verify that the "UTIL SYNC OK" lamp is lit. yc 1 5/13/85

8.31.2.2 Verify that the "NO-BREAK TRANSFER, TO BYPASS" lamp is lit.

yc 1 5/13/85

8.31.2.3 Place the transfer control switch in the bypass position.

yc 1 5/13/85
Initial/Date

8.31.2.4 Release the switch and allow it to spring back to the "Manual Restart" position.

yc 1 5/13/85

NOTE: This transfers load to the bypass source.

8.31.2.5 Observe the disturbance analyzer printout during transfer. Attach printout to the procedure and number it to reference this step number. summary pg 2

yc 1 5/13/85

8.31.2.6 Read and record the total harmonic distortion with (THD) UPS on bypass source. * SEE summary pg 3 NOTE FC 3014 CAL DUE 9/20/85

Q1 6.8%
Q2 [illegible] 6.6%
Q3 6.8% % THD
(≤ 5% THD)

Q1 TO Q2 2.2 %
Q2 TO Q3 2.1 0.8 %
Q1 TO Q3 0.8 %THD (≤ 5% THD)
yc 5/22/85

(ERFC ES.0071.003-3)

yc 1 5/13/85

8.31.3 Manually transfer full rated load from the alternate supply to the inverter (UPS) as follows:

8.31.3.1 Restart the UPS and then verify that the "UTIL SYNC OK" lamp is lit.

yc 1 5/13/85

8.31.3.2 Verify that the "NO BREAK TRANSFER READY - TO UPS" lamp is lit.

yc 1 5/13/85

8.31.3.3 Place the "CB-3" switch in the closed position. yc 1 5/13/85

NOTE: This transfers load to the inverter.

8.31.3.4 Observe the disturbance analyzer printout during transfer. Attach printout to the procedure and number it to reference this step number. Summary pg 3

yc 1 5/13/85

8.32 Verify that the blocking diode will not conduct when the DC supply voltage is raised to 140 V (when equalizing the batterties) as follows:

8.32.1 With the UPS supplying full load, move the float/equalize switch on the associated charger to the equalize position.

yc 1 5/13/85

8.32.2 On the UPS DC voltmeter, read the battery input voltage and record.

139.0 vdc yc 1 5/13/85

8.32.3 Confirm that the blocking diode is not conducting by verifying the following:

8.32.3.1 Verify that the battery ammeter on the UPS reads approximately zero amps.

yc 1 5/13/85

8.32.3.2 Read and record the battery current on Data Sheet.

0 adc yc 1 5/13/85

8.32.3.3 Verify that the "Blocking Diode Conducting" mimic light is not lit. Summary pg 3

yc 1 5/13/85

8.32.4 Return the float/equalize switch to the float position.

yc 1 5/13/85

8.33 Operate UPS off DC power as follows:

8.33.1 With full rated load supplied from the inverter and the UPS supplied from the normal AC supply, open the normal AC supply breaker at the switchgear.

19

yc 1 5/13/85

8.33.2 Read and record the full load DC input amperes from the UPS battery ammeter.

540 adc yc 1 5/13/85

8.33.3 Observe the distrubance analyzer printout during transfer. Attach printout to the procedure and number it to reference this step number.

yc 1 5/13/85

8.33.4 With the UPS supplied from the DC source, measure and record full load output inverter AC current, voltage, and frequency, as indicated on the UPS meters.

Full load AC Output Current 167 adc
AC Output Voltage 120.7 vac(117.6 - 122.4 vac)
Output Frequency 60.0 HZ(59.5 - 60.5 HZ)

yc 1 5/13/85

8.34 Simulate an inverter failure with automatic transfer as follows:

8.34.1 With the UPS supplied form the DC source, open the DC supply breaker at its associated switchgear.

yc 1 5/13/85
Initial/Date

8.34.2 Observe the distrubance analyzer printout during transfer. Attach printout to the procedure and number it to reference this step number.

yc 1 5/13/85

8.34.3 Verify transfer by verifying the following:

8.34.3.1 The "CB-3" open lamp is lit. yc 1 5/13/85

8.34.3.2 The "CB-4" closed lamp is lit. yc 1 5/13/85

8.34.3.3 The "No External DC Closed" lamp is lit. yc 1 5/13/85

8.34.3.4 Verify that the normal AC source ammeter reads approximately zero amps.

yc 1 5/13/85

8.34.3.5 Verify that the battery ammeter reads approximately zero amps.

yc 1 5/13/85

8.35 Place breaker CB3 switch in the open position. yc 1 5/13/85

8.36 Verify the transfer control switch is in the Manual Restart Position and complete the following:

yc 1 5/13/05

8.36.1 Close the normal AC source breaker at the switchgear.

yc 1 5/13/05

8.36.2 Verify that all alarms are cleared and the audible alarm is silenced.

yc 1 5/13/05

8.36.3 Start the UPS by pushing the Module On switch. yc 1 5/13/05

8.36.4 When the DC link reaches open-circuit voltage, close DC supply Circuit Breaker at its associated switchgear, allowing the charger to walk-up to float voltage.

yc 1 5/13/05

8.36.5 Manually transfer the critical bus load to the UPS by closing breaker CB3.

yc 1 5/13/05

8.36.6 Verify that the UPS is supplying the critical bus and Breaker CB4 is open.

yc 1 5/13/05

8.37 Reduce the test load to 25 percent of rated UPS capacity in 25 percent steps, allowing current to stabilize between steps.

yc 5/13/05

8.38 Calculate inverter output AC voltage regulation (VR), with the rectifier voltage at 103 V dc using the following formula:

NOTE: Show calculation on worst of three phases

$$VR = \frac{VNL-VFL}{V_{NL}} \times 100 \text{ percent}$$

Where: VNL = UPS inverter output AC voltage at no load (measured in Section 8.15 for rectifier DC set at 103 VDC)

V_{FL} = UPS inverter output AC voltage at full load (measured in section 8.18.1 for rectifier DC set at 103 Vdc).

Phase A (Ø1) VR= $\frac{121.5-120.5}{121.5}$ X 100% = .82 % (± 2% Max)

yc 5/13/05

VERIFIED 10-7-05

8.39 Step Deleted.

8.40 Calculate and record inverter output AC voltage regulation (VR), with the rectifier voltage at 140 V dc using the following formula:

NOTE: Show calculation of worst of three phases.

$$VR = \frac{V_{NL} - V_{FL}}{V_{NL}} \times 100 \text{ percent}$$

Where: V_{NL} = UPS inverter output AC voltage at no load (measured in Section 8.22 for rectifier DC set at 140 VDC)

V_{FL} = UPS inverter output AC voltage at full load (measured in Section 8.29 for rectifier DC set at 140 VDC)

Phase A (a1) VR= $\frac{120.5 - 120.5}{120.5} \times 100\% = \frac{0\%}{(\pm 2\% \text{ Max})}$ % yc/5/13/95

VERIFIED EJS 10-7-95

8.41 Step Deleted.

8.42 Calculate and record inverter frequency regulation (FR), with the rectifier voltage set at 103 V dc using the following formula:

NOTE: Show calculation of worst phase frequency regulation.

$$\text{Frequency Regulation} = \frac{F_{NL} - F_{FL}}{F_{NL}} \times 100 \text{ percent}$$

Where: F_{NL} = UPS inverter frequency at no load (measured in Section 8.15.2 for rectifier DC set at 103 VDC)

F_{FL} = UPS inverter frequency at full load (measured in Section 8.18.1 for rectifier DC set at 103 VDC)

FR = $\frac{60 - 60}{60} \times 100\% = \frac{0}{(\pm .833\% \text{ Max})}$ %

yc/5/13/95

VERIFIED EJS 10-7-95

8.43 Step Deleted.

8.44 Calculate and record inverter frequency regulation (FR), with the rectifier voltage set at 140 V dc using the following formula:

$$FR = \frac{F_{NL} - F_{FL}}{F_{NL}} \times 100 \text{ percent}$$

Where: FNL = UPS inverter frequency at no load (measured in Section 8.22 for rectifier DC set at 140 V DC)

F_{NL} = UPS inverter frequency at no load (measured in Section 8.29 for rectifier DC set at 140 V DC)

yc 5/13/85

FR = $\frac{60-60}{60}$ X 100% = $\frac{0}{(\pm .833\% \text{ Max})}$ %

VERIFIED SJS 10-7-85

8.45 Step Deleted.

8.46 Raise the test load 100% of rated UPS capacity in 25% steps, allowing current to stabilize between steps. Commence 24 hour load test. Choose phase used in calculation in step 8.40 and take readings hourly and record data on Attachment 12.2

yc 5/13/85 5/14/85 5/15/85

* SEE SUMMARY #3 Thomas Ostman yc 5/14/85

8.47 At the end of 24 hours attach harmonic distortion analyzer to UPS output. Read and record the UPS output harmonic distortion with UPS on normal power.

METER IC3014
CAL DUE - 11/13/85

Ø1 2.6 % THD
Ø2 2.9 %
Ø3 2.5 %
(≤5% THD)

yc 5/14/85

8.48 Reduce load to 0 amps in 25% steps, allowing current and voltage to stabilize between steps.

yc 5/14/85

8.49 Replace UPS output cables as follows:

8.49.1 Verify that the NO-BREAK TRANSFER, READY-TO BYPASS lamp is lit.

yc 5/14/85

8.49.2 Transfer the load to the bypass source by placing the transfer control switch momentarily in the bypass position. (A spring will return the switch to the MANUAL RESTART position).

yc 5/14/85

8.49.3 Open the inverter output breaker (CB3) by placing the Inverter Output Switch in the open position.

yc 5/14/85

8.49.4 Manually, open the battery breaker (CB2). yc 5/14/85

8.49.5 Manually, open the AC input breaker (CB1). yc 5/14/85

8.49.6 After one minute, open A27CB1 and A27S1. yc 5/14/85

8.49.7 De-energize the AC feed to the UPS at the associated switchgear.

23 yc 5/14/85

8.49.8 De-energize the DC feed to the UPS at the appropriate switchgear.

yc 1 5/14/85

8.49.9 Open CB5 on the alternate supply transformer. yc 1 5/14/85

8.49.10 Disconnect the load test unit from terminals E13, E14, E15, and E16 and reconnect the output feeder cable(s).

yc 1 5/14/85

8.50 Read and record elapsed time meter reading. Verify that elapsed time meter reading has changed from its initial reading in Step 8.8.

131.2 Hours yc 1 5/14/85

8.51 Close the AC feed to the UPS at the associated switchgear. yc 1 5/14/85

8.52 Close the DC feed to the UPS at the associated switchgear. yc 1 5/14/85

8.53 Energize the associated UPS output panels by closing CB-5 on the alternate supply transformer.

yc 1 5/14/85

8.54 Start-up UPS and transfer output load to UPS.

yc 1 5/14/85

8.55 Verify phase rotation to be A-B-C at associated UPS output panels and record on data sheet.

(FRF # E3.0071.003-3)

8.56 WITH UPS OPERATING NORMALLY OFF AC POWER TRANSMIT ON A PORTABLE RADIO WHILE STANDING WITH TWO FEET OF FRONT, BACK AND EACH SIDE OF UPS VERIFY THAT UPS DOES NOT TRIP AND NO ALARMS ARE ACTIVATED yc 1 5/14/85

9.0 ACCEPTANCE CRITERIA yc 1 5/17/85

9.1 For UPS rectifier voltages of 103 to 140 VDC, the UPS output voltage shall be:

117.6 - 122.4 vac (Step 8.15.1, 8.18.1, 8.22, 8.29).

9.2 The UPS output frequencies shall be 59.5 to 60.5 Hz. (Steps 8.15.2, 8.18.1, 8.22, 8.29).

9.3 The UPS output phase separation with balanced loads shall be 119° to 121°. (Step 8.30).

9.4 Transient AC output voltage deviation, averaged over one-half cycle shall not exceed +10% (approx. +12 VAC.) or -25% (Approx. -30 VAC) for 100% load application or removal and shall return to within ± 2% (Approx. 2.4 VAC) within 3 cycles. (Steps 8.31.2.5, 8.31.3.4, 8.34.2).

9.5 Output voltage regulation shall be less than or equal to ±2 percent from no load to full load. (Steps 8.11.10, 8.38, 8.40).

9.6 Output frequency regulation shall be less than or equal to ±0.833 percent of 60 HZ from no load to full load. (Step 8.42, 8.44).

9.7 Logic power supply voltage shall be greater than 16.5 Vdc. (Step 8.12.3).

9.8 Transfer time ≤ 1/4 cycle (Step 8.31.2.5, 8.31.3.4, 8.34.2).

9.9 Total harmonic distortion ≤ 5% of the fundamental. (Steps 8.31.2.6, 8.47).

10.0 RESTORATION OF EQUIPMENT TO NORMAL STATUS

10.1 Disconnect and remove all test equipment as necessary.

JK 1 5/14/85

10.2 Replace panels and doors as necessary. JK 1 5/14/85

10.3 Systems and/or components shall be placed in a configuration to support operational and/or test requirements.

JK 1 5/14/85

11.0 REFERENCE

11.1 Manufacturers' Manuals:

Exide 75 KVA UPS NMP2-E035A (101-710-343-77223), 10/28/81

11.2 Uninterruptible Power Supply Equipment Specification NMP2-E035A, Rev. 1 including Addendum 1-4.

12.0 ATTACHMENTS

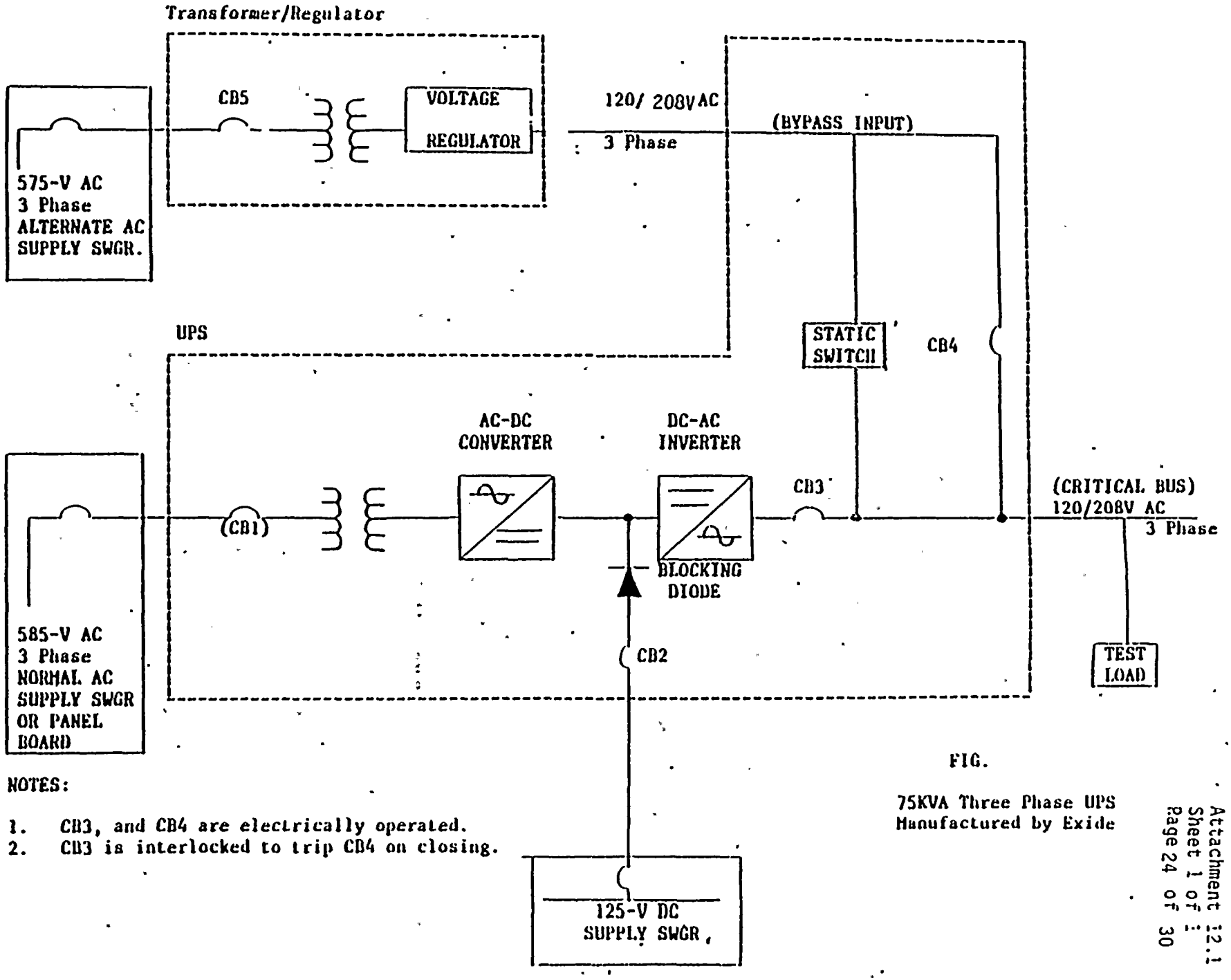
12.1 75 KVA Uninterruptible Power Supply Block Diagram

12.2 Uninterruptible Power Supply Inspection and Test Record - 75KVA UPS

12.3 Annunciator List

12.4 Computer Point List

12.5 Test Summary



NOTES:

1. CB3, and CB4 are electrically operated.
2. CB3 is interlocked to trip CB4 on closing.

FIG.

75KVA Three Phase UPS
Manufactured by Exide

Test Folder No. 75.002.I

Equipment Name 2VBB-UPS1C

Equipment Mark No. 2VBB-UPS1C.

UNINTERRUPTIBLE POWER SUPPLY
INSPECTION AND TEST RECORD
75KVA UPS

Reference Documents E035A/UI/101 to 345 77223 Rev. 10/81
Rev.
Rev.

UPS Nameplate Data Mark #- 2VBB-UPS1C
Serial #- RL 77223-3

8.46 24 Hour Load Test

- Take Readings on Phase A :

Time	Volts	Amps	Time	Volts	Amps	Time	Volts	Amps
4:40PM	120.0	171.8	00:40	120.0	169.8	8:40	120.0	170.4
5:40	120.0	170.5	1:40AM	120.0	169.7	9:40	120.0	170.1
6:40	120.0	170.8	2:40	120.0	170.1	10:40	120.0	170.5
7:40	120.0	170.8	3:40	120.0	169.8	11:40	120.0	170.6
8:40	120.0	170.7	4:40	120.0	169.6	12:40	120.0	170.4
9:40	120.0	170.6	5:40	120.0	170.5	1:40	120.0	170.5
10:40	120.0	170.4	6:40	120.0	170.6	2:40	120.0	170.5
11:40	120.8	169.8	7:40	120.0	169.8	3:40	120.0	170.6
						4:40PM	120.0	170.7

VOLTS MATE# IC2101 CAL DUE - 11/2/85

AMPS- IC2139 (9/6/85) IC 2239 (10/17/85)

8.55 Phase rotation for UPS output panels after removal of test load cables:

Panel Number	Rotation
2LAT-PNL017	AB-C
—	—
—	—

KNOPP K-3 # MT-2007 CAL-DUE- 5/16/85

TEST EQUIPMENT	M&TE NO.	CAL. DUE DATE
FLUKE 8060A	IC 7255	11/10/85
CLAMP-ON	IC 2139	9/6/85
H.P. 3400A	IC 2101	11/2/85
PRANCE 314	M.T. 2034	9/20/85
H.P 339A	IC 3014	11/13/85
KNOPP K-3	MT 2007	5/16/85
OSCILLOSCOPE	IC 3203	8/5/85
PYROMETER	IC 2604	9/29/85
FLUKE 9062A	IC 2239	10/17/85 → USED FOR AMPS- 24HR LOAD TEST.

ANNUNCIATOR LIST

Location/ Number	Description (Name)
For 2VBB-UPS1A =	
1) Main Control Room Panel 2CEC-PNL852/#852503	"UPS1A System Trouble"
2) Main Control Room Panel 2CEC-PNL852/#852504	"UPS1A On Battery Power"
For 2VBB-UPS1B =	
1) Main Control Room Panel 2CEC-PNL852/#852513	"UPS1B System Trouble"
2) Main Control Room Panel 2CEC-PNL852/#852514	"UPS1B On Battery Power"

ANNUNCIATOR LIST

Location/ Number	Description
For 2VBB-UPS1C =	
1) Main Control Room Panel 2CEC-PNL 852/#852523	"UPS1C System Trouble"
2) Main Control Room Panel 2CEC-PNL 852/#852524	"UPS1C On Battery Trouble"
For 2VBB-UPS1D =	
1) Main Control Room Panel 2CEC-PNL 852/#852533	"UPS1D System Trouble"
2) Main Control Room Panel 2CEC-PNL 852/#852534	"UPS1D On Battery Power"

ANNUNCIATOR LIST

Location/ Number	Description (Name)
For 2VBB-UPS1G =	
1) Main Control Room Panel 2CEC-PNL852/#852543	"UPS1G System Trouble"
2) Main Control Room Panel 2CEC-PNL852/#852544	"UPS1G On Battery Power"

COMPUTER POINT LIST

CP Ident. Number	Description (Name)
For 2VBB-UPS1A =	
1) VBB TC09	"UPS1A System Trouble"
2) VBB TC10	"UPS1A On Battery Power"
For 2VBB-UPS1B =	
1) VBB TC11	"UPS1B System Trouble"
2) VBB TC12	"UPS1B On Battery Power"
For 2VBB-UPS1C =	
1) VBB TC05	"UPS1C System Trouble"
2) VBB TC06	"UPS1C On Battery Power"
For 2VBB-UPS1D =	
1) VBB TC07	"UPS1D System Trouble"
2) VBB TC08	"UPS1D On Battery Power"
For 2VBB-UPS1G =	
1) VBB TC01	"UPS1G System Trouble"
2) VBB TC02	"UPS1G On Battery Power"

NIAGARA MOHAWK POWER CORP.

TEST SUMMARY

NOTE: EXCEPTIONS ARE INDICATED AT (E-1), (E-2), ETC.

REMARKS

5.4.1 - TEMPORARY MODIFICATION # 85-5-063, A13A1 BOARD MODIFIED TO CORRECT GROUND DETECTION PROBLEM, MKulik 5/13/85. NO AFFECT ON TEST RESULTS MKulik 5/14/85

7.6 - BLUE MARK-UP # 013393 ON INFEED BREAKERS AND OUTPUT DISTRIBUTION PANEL MKulik 5/13/85

(E-1) 8.9.1, 8.9.2 - AC FEED TO UPS ENTERS BOTTOM OF CB #1 - READINGS TAKEN AT THAT POINT MKulik 5/13/85

(E-2) 8.12.19.2 DC VOLTMETER M-3 READS 0 VOLTS - THIS IS NORMAL M-3 SHOW BATTERY INPUT VOLTS MKulik 5/13/85 - DC BREAKER IS OPEN AT THIS POINT MKulik 5/13/85

(E-3) 8.13.4.1 ~~D.V~~ JC 5/13/85 DC VOLTS READS 125 VOLTS - PER FRF ES.71.003-1, DC VOLTS ARE NOT ADJUSTED TO 103 YET. MKulik 5/13/85,

8.14 - WITH UNIT AT 105.8 VDC DC LINK VOLTAGE FOLLOWING ALARMS EXIST - BATTERY DISCHARGE
BATTERY UNDER VOLTAGE
CHARGER JC 5/13/85
~~INVERTER~~ LOGIC MKulik 5/13/85

(E-4) 8.18.1, 8.11.8 25% READING DONE WITH CLAMP - 50 - 100% WITH UPS METER. 25% TOO LOW TO READ ON UPS MKulik 5/13/85
cont. on pg 4.

NIAGARA MOHAWK POWER CORP.

TEST SUMMARY

REMARKS

8.18.1 WHEN FULL LOAD (GOING FROM 75% TO 100%) IS APPLIED (LINK) DC BUS DECAYS TO BELOW 103 TURNING UNIT OFF. UNIT WAS RESTARTED AT 120 V DC LINK VOLTAGE, FULL LOADED & THEN DC LINK WAS BROUGHT TO LOW LIMIT OF 105.7 VDC — UNIT STAYED ON yk 5/13/85

8.18.1 UNIT WOULD NOT ACCEPT LOAD WITHOUT CB-2 CLOSED — UNIT WAS BROUGHT UP & CB-2 CLOSED, FULL LOADED, THEN CB-2 WAS OPEN & UNIT DC LINK ADJUSTED DOWN TO 105.8 WITH THUMBWHEEL POT ON FRONT OF UNIT. FULL LOAD yk 5/13/85 ~~READ~~ READINGS TAKEN AT THIS POINT. *see page 4 of Test Summary. yk 5/13/85

8.28.5.7 yk
(E-5) 8.29 CURRENT READ WITH CLAMP-ON, UNIT METER GRADUATIONS DIFFICULT TO READ BELOW 50 AMPS yk 5/13/85
CONT ON PG 4

8.29 50, 75 100 AMPS READINGS DONE WITH UPS METER yk 5/13/85

8.31.2.5 THIS STEP DONE TWICE — ONCE WHILE OBSERVING PHASE 1 & 2 AND ONCE FOR PHASE 1 & 3. yk 5/13/85

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NIAGARA MOHAWK POWER CORP.

TEST SUMMARY

REMARKS

8.31.3.4 TRANSFER DONE ONCE MONITORING PHASE 1 AND 2; AND ONCE MONITORING 1 & 3 yc 5/13/85

8.32.3.3 BLOCKING DIODE WORKED FINE BUT failed CFR1/2 RELAY PICKED UP & LIGHT LIT. CFR1 WAS ADJUSTED & BLOCKING DIODE TEST WAS RERUN SUCCESSFULLY yc. 5/13/85

8.46 LOAD TEST VOLTAGE REDOINGS TAKEN USING H.P 3400A. yc 5/13/85

8.31.2.6 THE PHASE TO NEUTRAL "TWO" WAS RECORDED IN ERROR. THIS IS SUPPOSED TO BE "A TWO" PHASE TO PHASE. THIS DATA WAS RECORDED PRIOR TO ISSUANCE OF FRF ES.0071.003-3 yc 5/24/85

(E-4, E-5) - EXCEPTION DONE TO ALLOW GREATER ACCURACY OF DATA. ACCEPTANCE CRITERIA - ALL CRITERIA MET AS SHOWN IN INDIVIDUAL TEST. PICTURES SHOW EXCELLENT TRANSFER TIMES WITH MINIMAL TRANSIENTS, TEST SATISFACTORY RT CLW 6/24/85

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08783 1716

NIAGARA MOHAWK POWER CORP.

"ES" SUMMARY

EXCEPTIONS E-1 THROUGH E-5 — VERBAL APPROVAL WAS RECEIVED FOR THESE DURING TEST — FINAL WRITTEN APPROVAL NOT DONE UNTIL 5/19/86 — RJF CLC 5/19/86 5/19

APPROVED BRIAN PARRY

REMARKS

BECAUSE OSCILLOSCOPE PICTURES WERE NOT CONCLUSIVE EVIDENCE OF TRANSFER PER 9/21/85 CAE CRITERIA, THAT PORTION OF THE TEST WAS REDONE USING A UISICORDER TO SHOW TRANSFERS. THIS IS ATTACHED (TRACES & TEST ITSELF) AS ATTACHMENT 12.7 & 12.8

RJF JCLC 9/21/85

~~AT TIME OF RETEST~~ + RJF 5/19/86

ACCEPTANCE CRITERIA — TRANSFER TIME REQUIREMENT OF 4 MSEC OR LESS WAS MET. WORST CASE WAS 3.0 MSEC, SHEET 4 OF 4 ATTACHMENT 12.8, STEP 8.34.2 — THIS IS ACCEPTABLE RJF JCLC 9/21/85

TEST RESULTS WITH RETEST RESULTS ARE SATISFACTORY FOR ENTIRE TEST RJF JCLC 9/21/85

STEP 8.1 The changes accomplished should have been a test exception but was not noted as such. The action taken was technically correct and satisfies the requirements of this procedure therefore the action is considered approved.

RECORD COPY

10-17-85

NIAGARA MOHAWK POWER CORPORATION
NMP2

FIELD REVISION FORM

TEST FOLDER NUMBER	FRF NO.
71.809/75.001/75.002	ES.0071.003-1

PROCEDURE TITLE	NO.	REV.
75KVA UNINTERRUPTIBLE POWER SUPPLIES	ES.0071.003	0

PROCEDURE REVISION REQUIRED X yes __ no BOB CRANDALL

DESCRIPTION OF CHANGE

CHANGE STEP 8.13 TO 8.14
8.14 TO 8.13
8.14.1 – 8.13.1
8.14.2 – 8.13.2
8.14.3 – 8.13.3
8.14.3.1 – 8.13.3.1
8.14.3.2 – 8.13.3.2
8.14.4.1 – 8.13.4.1
8.14.4.2 – 8.13.4.2
8.14.4.3 – 8.13.4.3
8.14.4.4 – 8.13.4.4

ON NEW STEP 8.14 (OLD STEP 8.13) CHANGE WORDING TO READ THUS – "ADJUST UPS RECTIFIER DC OUTPUT VOLTAGE TO 103 ± 2 VOLTS DC OR AS LOW AS POT R71 ON A13A2 WILL ALLOW. RECORD THE NO-LOA

REASON FOR CHANGE RECTIFIER VOLTAGE

POT R-71 WILL NOT ALLOW ADJUSTMENT TO 103.
(IT ADJUSTS TO 105.8 VDC ON UPSIC)

0 0 7 8 3 1 7 1 8

R J Culo 5/13/85

AUTHORIZED BY
1: E. J Hochman date 5-13-85 2. N/A date N/A
SSS (if applicable)

APPROVED X yes __ no date 5-15-85 JTG mtg no. 85-30

RETEST REQUIRED specify N/A DR No. ____

REVISION INCORPORATED (if applicable) date

36

RECORD COPY

NIAGARA MOHAWK POWER CORPORATION
NMP2

FIELD REVISION FORM

TEST FOLDER NUMBER: 71.809/75.001/75.002
FRF NO.: ES.0071.003-2
PROCEDURE TITLE: 75 KVA UNINTERRUPTIBLE POWER SUPPLIES
NO.: ES.0171.003
REV.: 0
PROCEDURE REVISION REQUIRED: X yes __ no
BOB CRANDALL
DESCRIPTION OF CHANGE

CHANGE STEP 8.23 TO STEP 8.20
8.24 STEP 8.21
8.20 ⟶ 8.22 DELETE "AND ADJUST... VOLT".
8.25 ⟶ 8.23
8.26 ⟶ 8.24
8.27 ⟶ 8.25
8.21 ⟶ 8.26 ADD WORDS "ADJUST UPS RECTIFIER DC OUTPUT VOLTAGE TO 140 VDC ± 1 VOLT. RECORD THE NO-LOAD UPS RECTIFIER OUTPUT VOLTAGE.
_____ VDC _____ "
8.22 ⟶ 8.27

REASON FOR CHANGE

1) STEPS ARE OUT OF SEQUENCE
2) CB-2 CANNOT BE CLOSED UNTIL UPS IS STARTED.
3) RECTIFIER OUTPUT CANNOT BE ADJUSTED UNTIL CB-2 IS CLOSED

R.A. J. Call 5/13/85

AUTHORIZED BY
1. E.J. Mochan date 5-13-85 2. N/A date N/A

APPROVED X yes __ no date 5-15-85 JTG mtg no. 85-30

RETEST REQUIRED specify N/A DR No. _____

REVISION INCORPORATED (if applicable) . date

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8708310719

NIAGARA MOHAWK POWER CORPORATION
NMP2

FIELD REVISION FORM

TEST FOLDER NUMBER	FRF NO.
71.B09/75.001/75.002	ES.0071.003-3

PROCEDURE TITLE	NO.	REV.
75 KVA UNINTERRUPTIBLE POWER SUPPLIES	ES.0071.003	0

PROCEDURE REVISION REQUIRED yes X no

DESCRIPTION OF CHANGE

1) FOR STEP 8.31.2.6:
CHANGE "Q1" TO READ "Q1 TO Q2"
CHANGE "Q2" TO READ "Q2 TO Q3"
CHANGE "Q3" TO READ "Q1 TO Q3"

2) ADD "STEP 8.56."
"WITH UPS OPERATING NORMALLY OFF AC POWER TRANSM
ON A PORTABLE RADIO WHILE STANDING WITHIN TWO
FEET OF THE FRONT, BACK AND EACH SIDE OF
UPS. VERIFY THAT UPS DOES NOT TRIP
AND NO ALARMS ARE ACTIVATED." ____/____"

REASON FOR CHANGE

1) PROCEDURE STEP TYPED IN ERROR- READINGS
ARE TAKEN PHASE TO PHASE FOR
REGULATOR DISTORTION.

2) CHANGE WILL VERIFY THE ABILITY TO OPERATE
RADIOS NEAR UPS.

5/16/85

AUTHORIZED BY 1. _____ date 5-16-85 SSS(if applicable) 2. N/A date _____

APPROVED X yes no date 5-22-85 JTG mtg no. 85-31

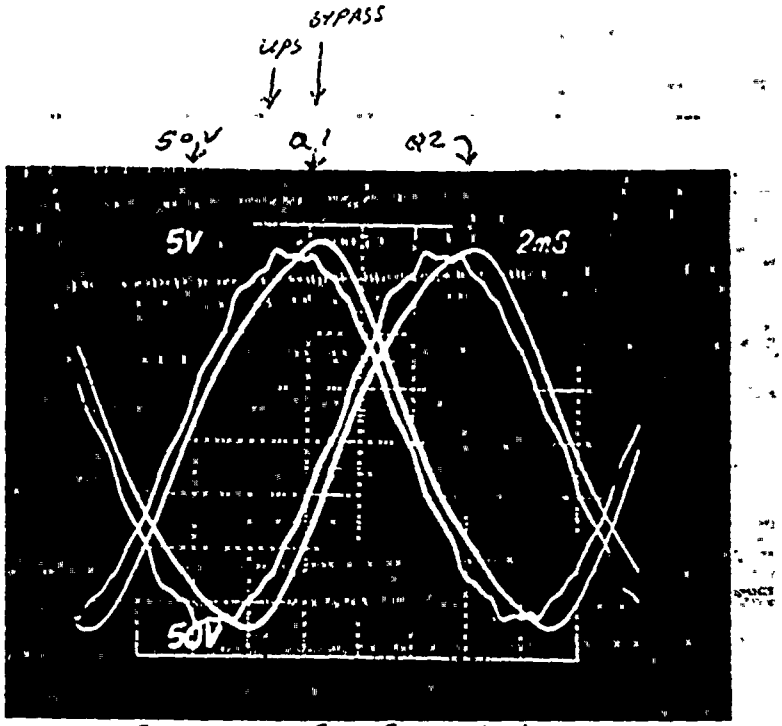
RETEST REQUIRED specify N/A DR No. _____

REVISION INCORPORATED (if applicable) date

37

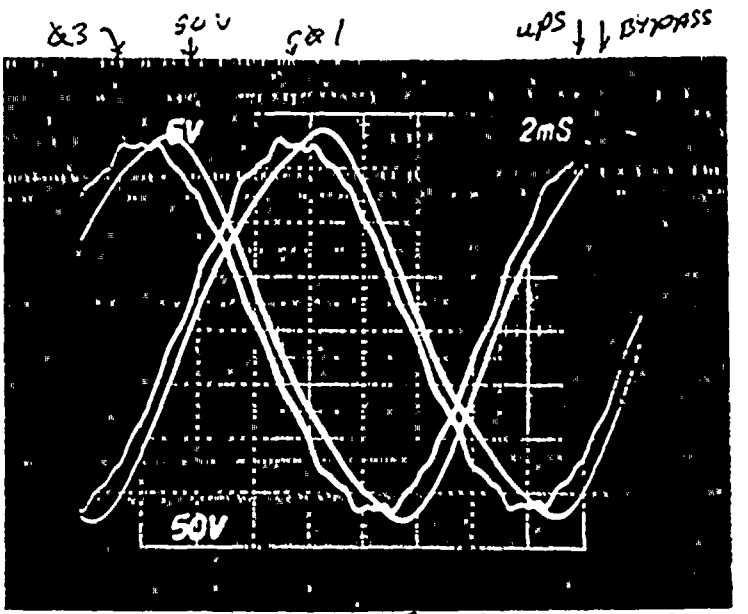
RECORD COPY

8708311720



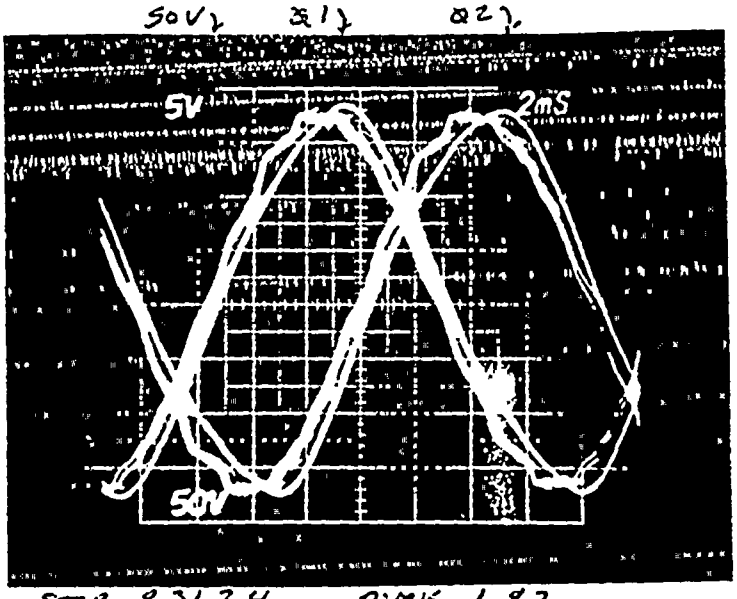
STEP 8.3L2.5 PHASE 1 #2

FULL LOAD TRANSFER (MANUALLY) FROM UPS. INVERTER TO ALTERNATE SUPPLY Q1 & Q2 SHOWN — NO INTERRUPTION OF POWER., SLIGHT PHASE SHIFT.



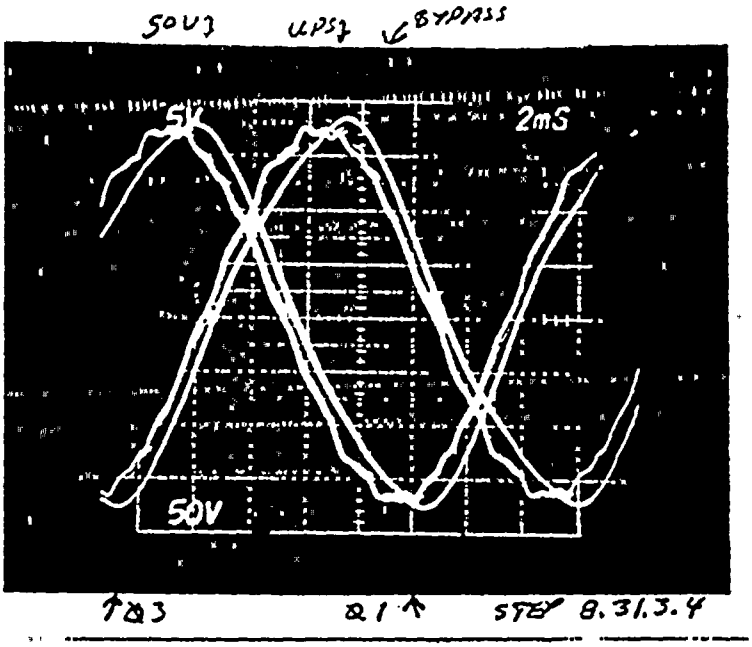
STEP 8.31.2.5, PHASE 1 & 3

FULL LOAD TRANSFER (MANUALLY) FROM UPS INVERTER TO ALTERNATE SUPPLY. Ø1 & Ø3 SHOULD— NO INTERRUPTION OF POWER, SLIGHT PHASE SHIFT.



STEP 8.31.3.4 PHASE 1 & 2

MANUAL TRANSFER FROM BYPASS POWER TO UPS INVERTER. PHASE 1 & 2 SHOWN - NO INTERRUPTION OF POWER, SLIGHT PHASE SHIFT.

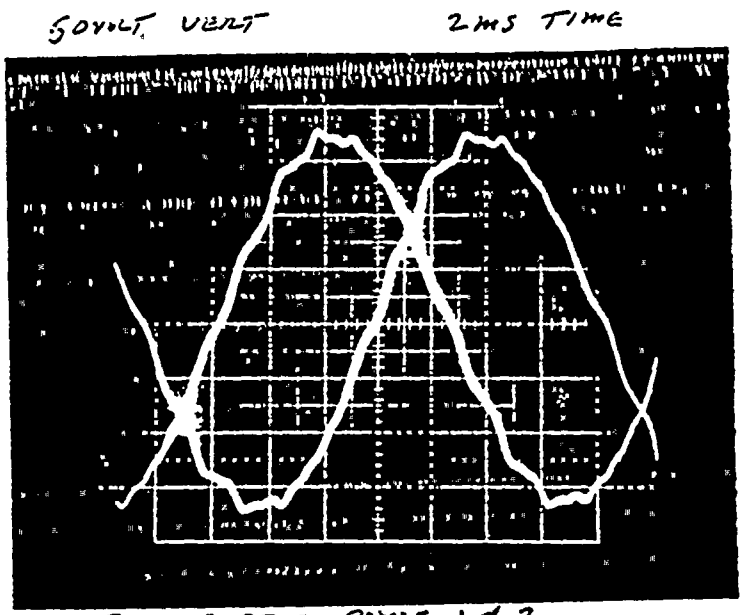


MANUAL TRANSFER FROM BYPASS POWER TO UPS INVERTER.

PHASE 1 & 3 SHOWN -

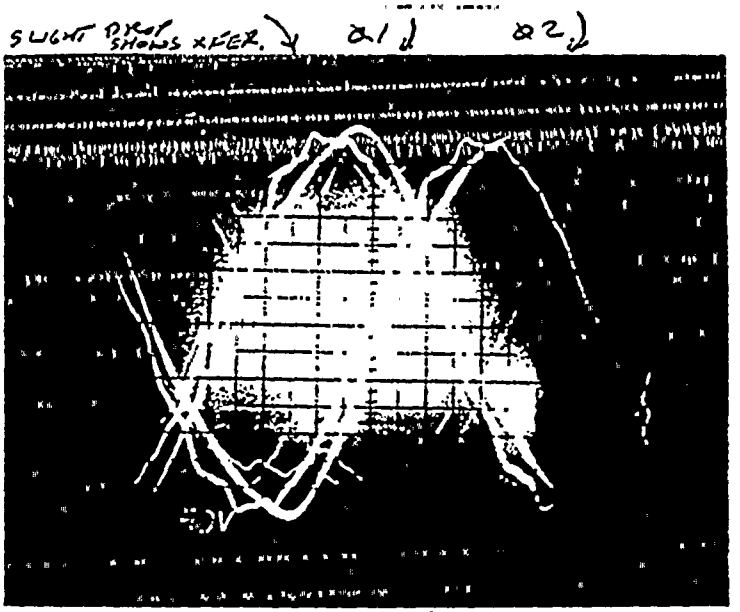
NO INTERRUPTION OF POWER,

SLIGHT PHASE SHIFT.



STEP 8.33.3 PHASE 1 & 2

UPS ON FULL LOAD, AC (NORMAL) BREAKER TO UPS OPENED. INVERTER CONTINUED TO OPERATE USING BATTERY POWER - NO TRANSFER, NO INTERRUPTION.



8, 34.2 PHASE 1 of 2

FULL LOAD "CRASH" TRANSFER FROM UPS TO BYPASS PHASE 1 of 2 SHOWN. NORMAL AC & DC FEEDS OPENED. UPS TRANSFER TO BYPASS.

NOTE, SLIGHT DROP OF VOLTAGE LEVEL ON PHASE 1 FOR 2 MSECONDS. THIS IS WELL WITHIN ACCEPTANCE CRITERIA

TEST FOLDER # 75.002.F
Equipment Name 2UBB-UPSIC
Equipment Mark # 2UBB-UPSIC

WPPSS
Doc. 8703170727
Rev. 3
Attachment ~~12.5~~ 12.7
Sheet 1 of 1
~~Page 30 of 30~~
p. 1 of 2

MARGINAL QUALITY

REMARKS

NOTE: THE OSCILLOSCOPE PICTURES TAKEN OF TRANSFER DO NO CLEARLY SHOW TRANSFERS. THEREFORE A RETEST OF THAT PORTION OF THE TEST USING A VISICORDER WILL BE PERFORMED TO SHOW TRANSFERS - SEE ATTACHED RETEST SHEETS (ATTACHMENT 12.7 & 12.8) RJC 9/4/85

PRIOR TO RETEST UNIT WAS SHUTDOWN, MAIN BREAKERS FEEDING UPSIC WERE OPENED, LOAD UNIT WAS ATTACHED TO OUTPUT OF UPSIC AS DESCRIBED IN STEP 6.4. TEST EQUIPMENT RECORDED ON ATTACHMENT 12.7 RJC 9/4/85

PRIOR TO RETEST UNIT WAS BROUGHT UP TO FULL LOAD AS SHOWN BY FOLLOWING -

AMPS ON UPS AC CURRENT (OUTPUT) METER ON UPS - 170 AMPS AC

VOLTAGE ON UPS AC OUTPUT VOLTMETER - 120.5 VAC

RJC 9/4/85

- UNIT WAS OPERATIONAL AT TIME OF RETEST SO NO PREREQUISITES WERE REQUIRED TO BE REVERIFIED RJC 5/19/86

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Verify Prior To Use
Verified By yellb Date 9/4/85

45

8703170727

TEST FOLDER # 75.002.E
Equipment Name 2VBB-UPSIC
Equipment Mark # 2VBB-UPSIC

8.31 Operationally test the static switch and UPS control circuits at full rated test load as follows:

8.31.1 Attach disturbance analyzer to UPS output and monitor UPS output voltage. Refcell (FORGOT J- CRIMPER) JC 1 9/4/85

8.31.2. Manually transfer full rated load from the inverter to the alternate AC supply as follows:

8.31.2.1 Verify that the "UTIL SYNC OK" lamp is lit. JC 1 9/4/85

8.31.2.2 Verify that the "NO-BREAK TRANSFER, TO BYPASS" lamp is lit.

JC 1 9/4/85

8.31.2.3 Place the transfer control switch in the bypass position.

JC 1 9/4/85
Initial/Date

8.31.2.4 Release the switch and allow it to spring back to the "Manual Restart" position.

JC 1 9/4/85

NOTE: This transfers load to the bypass source.

8.31.2.5 Observe the disturbance analyzer printout during transfer. Attach printout to the procedure and number it to reference this step number.

JC 1 9/4/85

8.31.2.6 Read and record the total harmonic distortion with (THD) UPS on bypass source.

Ø1 N/A
Ø2 N/A
Ø3 N/A % THD (previously measured JC 9/4/85)
(≤ 5% THD)

N/A 1

8.31.3 Manually transfer full rated load from the alternate supply to the inverter (UPS) as follows:

8.31.3.1 Restart the UPS and then verify that the "UTIL SYNC OK" lamp is lit.

JC 1 9/4/85

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Verify Prior To Use
Verified By RE Kelly Date 9/4/85

8.31.3.2 Verify that the "NO BREAK TRANSFER READY - TO UPS" lamp is lit.

yc / 9/4/85

8.31.3.3 Place the "CB-3" switch in the closed position. yc / 9/4/85

NOTE: This transfers load to the inverter.

8.31.3.4 Observe the disturbance analyzer printout during transfer. Attach printout to the procedure and number it to reference this step number.

yc / 9/4/85

8.32 Verify that the blocking diode will not conduct when the DC supply voltage is raised to 140 V (when equalizing the batterties) as follows:

8.32.1 With the UPS supplying full load, move the float/equalize switch on the associated charger to the equalize position.

N/A / (STEPS PREVIOUSLY DONE)

8.32.2 On the UPS DC voltmeter, read the battery input voltage and record.

N/A vdc N/A /

8.32.3 Confirm that the blocking diode is not conducting by verifying the following:

8.32.3.1 Verify that the battery ammeter on the UPS reads approximately zero amps.

N/A /

8.32.3.2 Read and record the battery current on Data Sheet.

N/A adc N/A /

8.32.3.3 Verify that the "Blocking Diode Conducting" mimic light is not lit.

N/A /

8.32.4 Return the float/equalize switch to the float position.

N/A /

8.33 Operate UPS off DC power as follows:

8.33.1 With full rated load supplied from the inverter and the UPS supplied from the normal AC supply, open the normal AC supply breaker at the switchgear.

yc / 9/4/85

8.33.2 Read and record the full load DC input amperes from the UPS battery ammeter.

520 adc

8.33.3 Observe the distrubance analyzer printout during transfer. Attach printout to the procedure and number it to reference this step number.

8.33.4 With the UPS supplied from the DC source, measure and record full load output inverter AC current, voltage, and frequency, as indicated on the UPS meters.

Full load AC Output Current 170 adc
AC Output Voltage 120.5 vac(117.6 - 122.4 vac)
Output Frequency N/A HZ(59.5 - 60.5 HZ)
(PREVIOUSLY VERIFIED)

8.34 Simulate an inverter failure with automatic transfer as follows:

8.34.1 With the UPS supplied form the DC source, open the DC supply breaker at its associated switchgear.

Initial/Date

8.34.2 Observe the distrubance analyzer printout during transfer. Attach printout to the procedure and number it to reference this step number.

8.34.3 Verify transfer by verifying the following:

8.34.3.1 The "CB-3" open lamp is lit.

8.34.3.2 The "CB-4" closed lamp is lit.

8.34.3.3 The "No External DC Closed" lamp is lit.

8.34.3.4 Verify that the normal AC source ammeter reads approximately zero amps.

8.34.3.5 Verify that the battery ammeter reads approximately zero amps.

8.35 Place breaker CB3 switch in the open position.

F_{NL} = UPS inverter frequency at no load (measured in Section 8.29 for rectifier DC set at 140 V DC)

FR = N/A X 100% = N/A %
(± .833% Max)

(STEPS PREVIOUSLY VERIFIED — JRL 9/4/85)

8.45 Step Deleted.

8.46 Raise the test load 100% of rated UPS capacity in 25% steps, allowing current to stabilize between steps. Commence 24 hour load test. Choose phase used in calculation in step 8.40 and take readings hourly and record data on Attachment 12.2

N/A / _____

8.47 At the end of 24 hours attach harmonic distortion analyzer to UPS output. Read and record the UPS output harmonic distortion with UPS on normal power.

Ø1 N/A % THD
Ø2 N/A %
Ø3 N/A %
(≤5% THD)

N/A / _____

8.48 Reduce load to 0 amps in 25% steps, allowing current and voltage to stabilize between steps.

N/A / _____

8.49 Replace UPS output cables as follows:

8.49.1 Verify that the NO-BREAK TRANSFER, READY-TO BYPASS lamp is lit.

N/A / _____

8.49.2 Transfer the load to the bypass source by placing the transfer control switch momentarily in the bypass position. (A spring will return the switch to the MANUAL RESTART position).

N/A / _____

8.49.3 Open the inverter output breaker (CB3) by placing the Inverter Output Switch in the open position.

N/A / _____

8.49.4 Manually, open the battery breaker (CB2). JRL / 9/4/85

8.49.5 Manually, open the AC input breaker (CB1). JRL / 9/4/85

8.49.6 After one minute, open A27CB1 and A27S1. JRL / 9/4/85

8.49.7 De-energize the AC feed to the UPS at the associated switchgear. JRL / 9/4/85

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Verify Prior To Use
Verified By Ray Kuhn Date 9/4/85

8.49.8 De-energize the DC feed to the UPS at the appropriate switchgear.

JC 1 9/4/85

8.49.9 Open CB5 on the alternate supply transformer. JC 1 9/4/85

8.49.10 Disconnect the load test unit from terminals E13, E14, E15, and E16 and reconnect the output feeder cable(s).

JC 1 9/4/85

8.50 Read and record elapsed time meter reading. Verify that elapsed time meter reading has changed from its initial reading in Step 8.8.

2514.8 JC 1 9/4/85

8.51 Close the AC feed to the UPS at the associated switchgear. JC 1 9/4/85

8.52 Close the DC feed to the UPS at the associated switchgear. JC 9/4/85

8.53 Energize the associated UPS output panels by closing CB-5 on the alternate supply transformer.

JC 1 9/4/85

8.54 Start-up UPS and transfer output load to UPS.

JC 1 9/4/85

8.55 Verify phase rotation to be A-B-C at associated UPS output panels and record on data sheet.

N/A. 1 (OUTPUT CABLES LEFT ON DURI TEST, ROTATION PREVIOUSLY VERIFIED) RTJ CLL 9/4/85

9.0 ACCEPTANCE CRITERIA

9.1 For UPS rectifier voltages of 103 to 140 VDC, the UPS output voltage shall be:

117.6 - 122.4 vac (Step 8.15.1, 8.18.1, 8.22, 8.29).

The UPS output frequencies shall be 59.5 to 60.5 Hz. (Steps 8.15.2, 8.18.1, 8.22, 8.29).

The UPS output phase separation with balanced loads shall be 119° to 121°. (Step 8.30).

Transient AC output voltage deviation, averaged over one-half cycle shall not exceed +10% (approx. +12 VAC.) or -25% (Approx. -30 VAC) for 100% load application or removal and shall return to within ± 2% (Approx. 2.4 VAC) within 3 cycles. (Steps 8.31.2.5, 8.31.3.4, 8.34.2).

9.5 Output voltage regulation shall be less than or equal to ±2 percent from no load to full load. (Steps 8.11.10, 8.38, 8.40).

9.6 Output frequency regulation shall be less than or equal to ±0.833 percent of 60 HZ from no load to full load. (Step 8.42, 8.44).

9.7 Logic power supply voltage shall be greater than 16.5 Vdc. (Step 8.12.3).

9.8 Transfer time ≤ 1/4 cycle (Step 8.31.2.5, 8.31.3.4, 8.34.2).

9.9 Total harmonic distortion ≤ 5% of the fundamental. (Steps 8.31.2.6, 8.47).

10.0 RESTORATION OF EQUIPMENT TO NORMAL STATUS

10.1 Disconnect and remove all test equipment as necessary.

JCL 9/4/85

10.2 Replace panels and doors as necessary. JCL 9/4/85

10.3 Systems and/or components shall be placed in a configuration to support operational and/or test requirements.

JCL 9/4/85

11.0 REFERENCE

11.1 Manufacturers' Manuals:

Exide 75 KVA UPS NMP2-E035A (101-710-343-77223), 10/28/81

11.2 Uninterruptible Power Supply Equipment Specification NMP2-E035A, Rev. 1 including Addendum 1-4.

12.0 ATTACHMENTS

12.1 75 KVA Uninterruptible Power Supply Block Diagram

12.2 Uninterruptible Power Supply Inspection and Test Record - 75KVA UPS

12.3 Annunciator List

12.4 Computer Point List

12.5 Test Summary

Test Folder No. 75.002.I

Equipment Name 2U53-UPSIC

Equipment Mark No. 2U53-UPSIC

NMP2
ES.0071.003
Rev. 0
Attachment ~~12.2~~ 12.7
~~Sheet 1 of 1~~
~~Page 25 of 30~~ PAGE 8 of 9 Jcla 9/91

UNINTERRUPTIBLE POWER SUPPLY
INSPECTION AND TEST RECORD
75KVA UPS

Reference Documents E035A/UI/1.01 710343 77223 Rev. 10/81
Rev.
Rev.

UPS Nameplate Data Mark #- 2U53B-UPSIC
Serial #- RL 77223-3

8.46. 24 Hour Load Test.

- Take Readings on Phase N/A :

N/A

Time	Volts	Amps	Time	Volts	Amps	Time	Volts	Amps

N/A

8.55 Phase rotation for UPS output panels after removal of test load cables:

N/A

Panel Number	Rotation

N/A

TEST EQUIPMENT	M&TE NO.	CAL. DUE DATE
VISICORDER (MAIN)	8404	8/7/86
" (MODULE (#1)	8398	8/7/86
" (MODULE (#2)	8395	8/7/86

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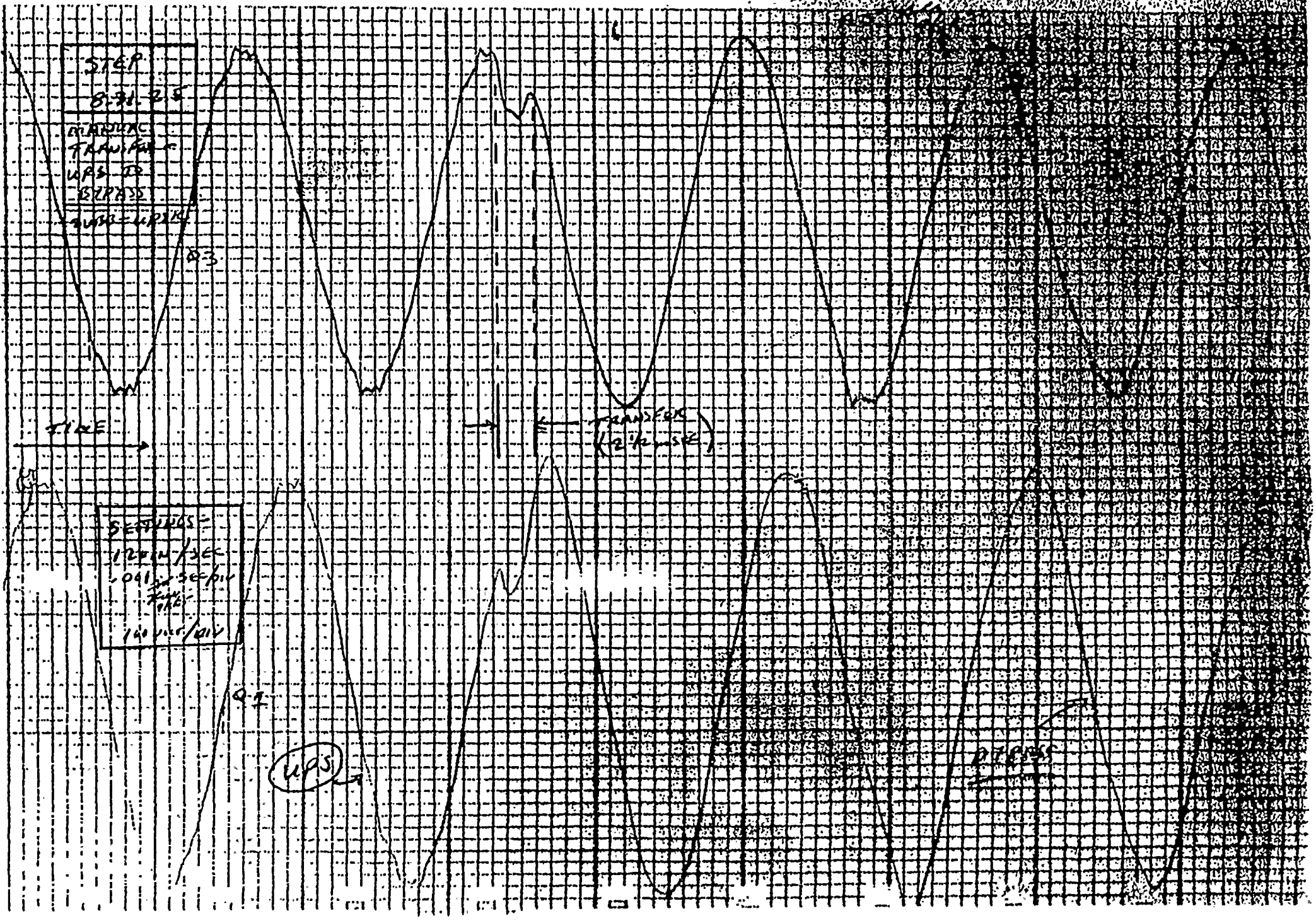
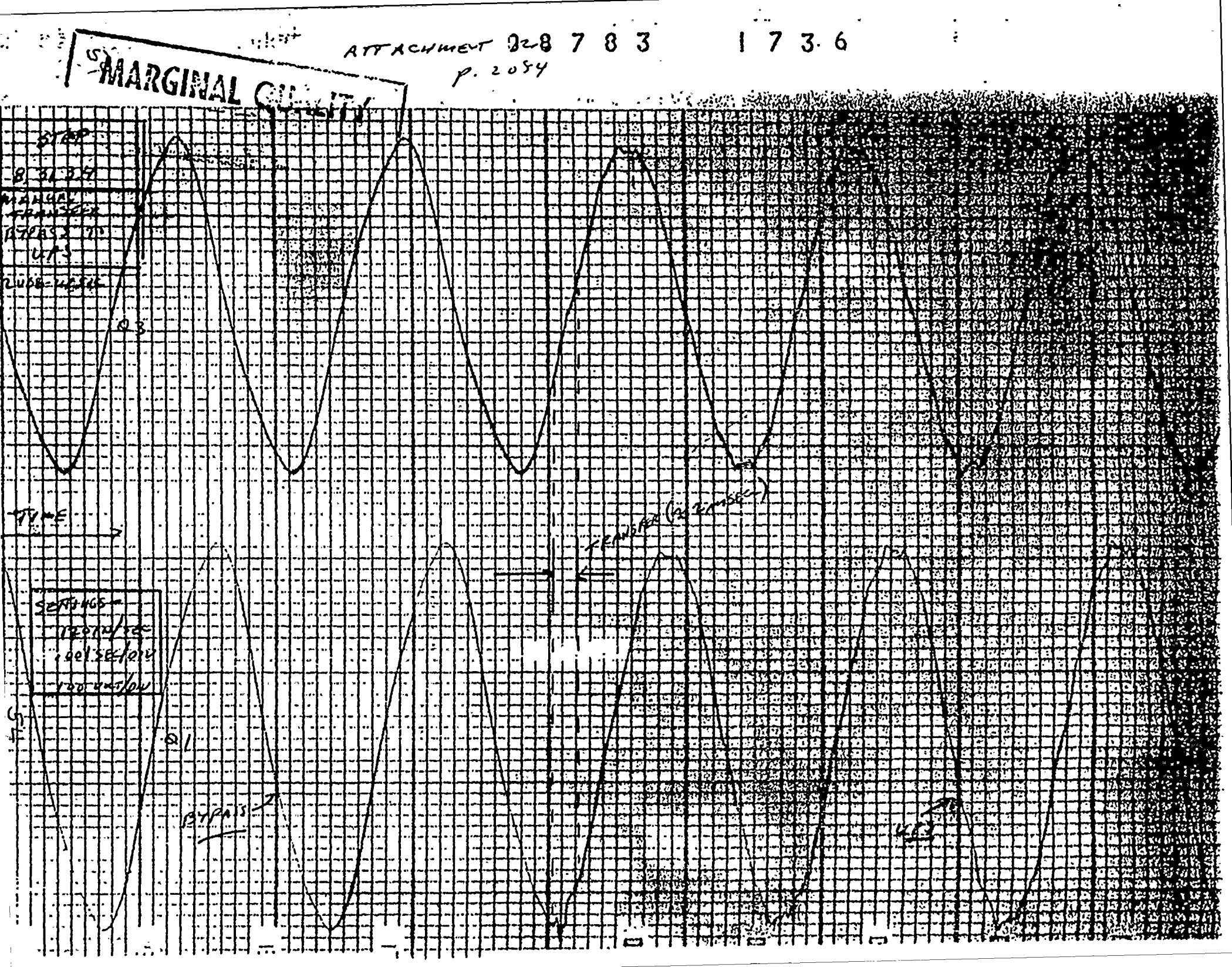
ATTACHMENT 12B8
p. 1 of 4

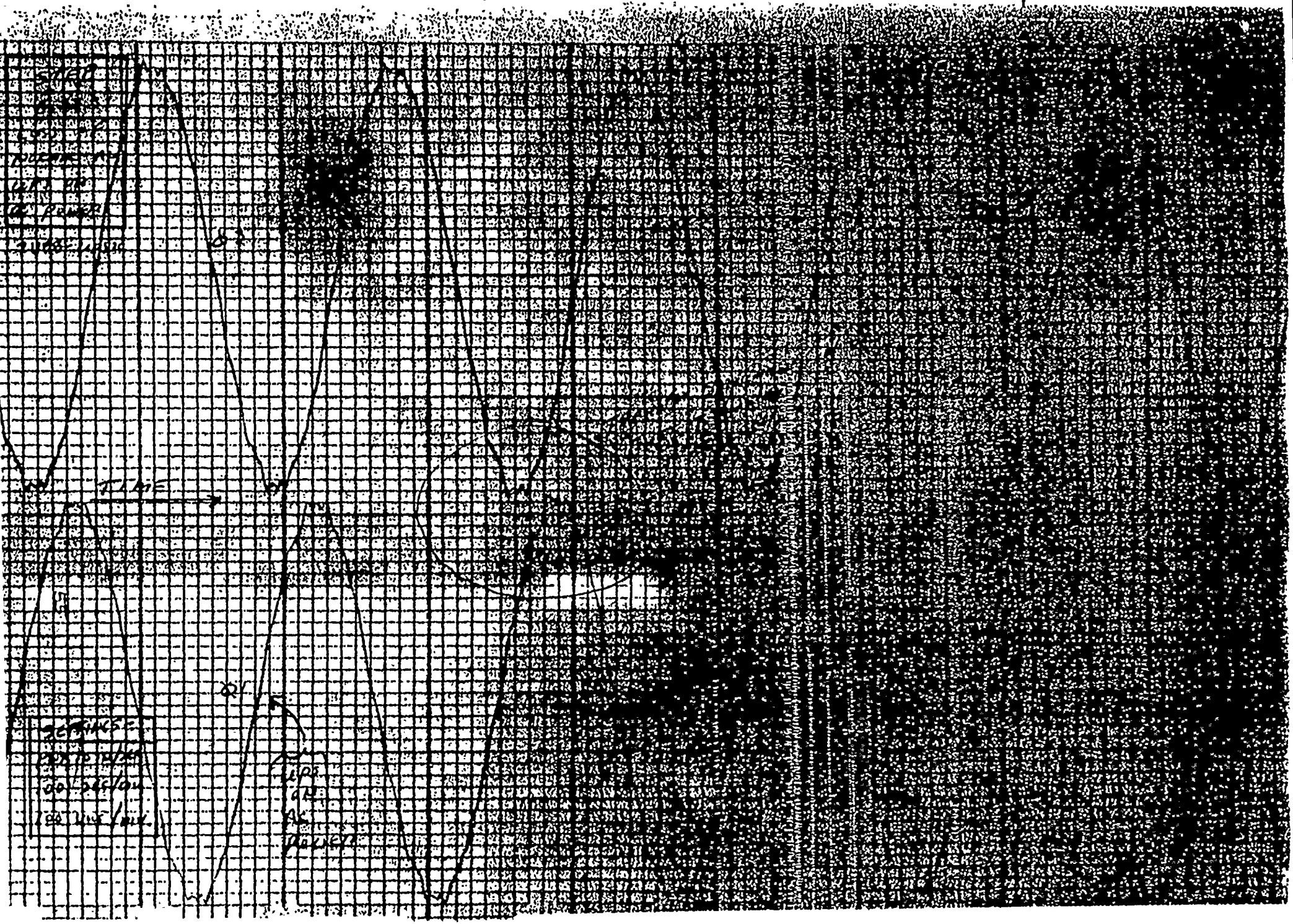


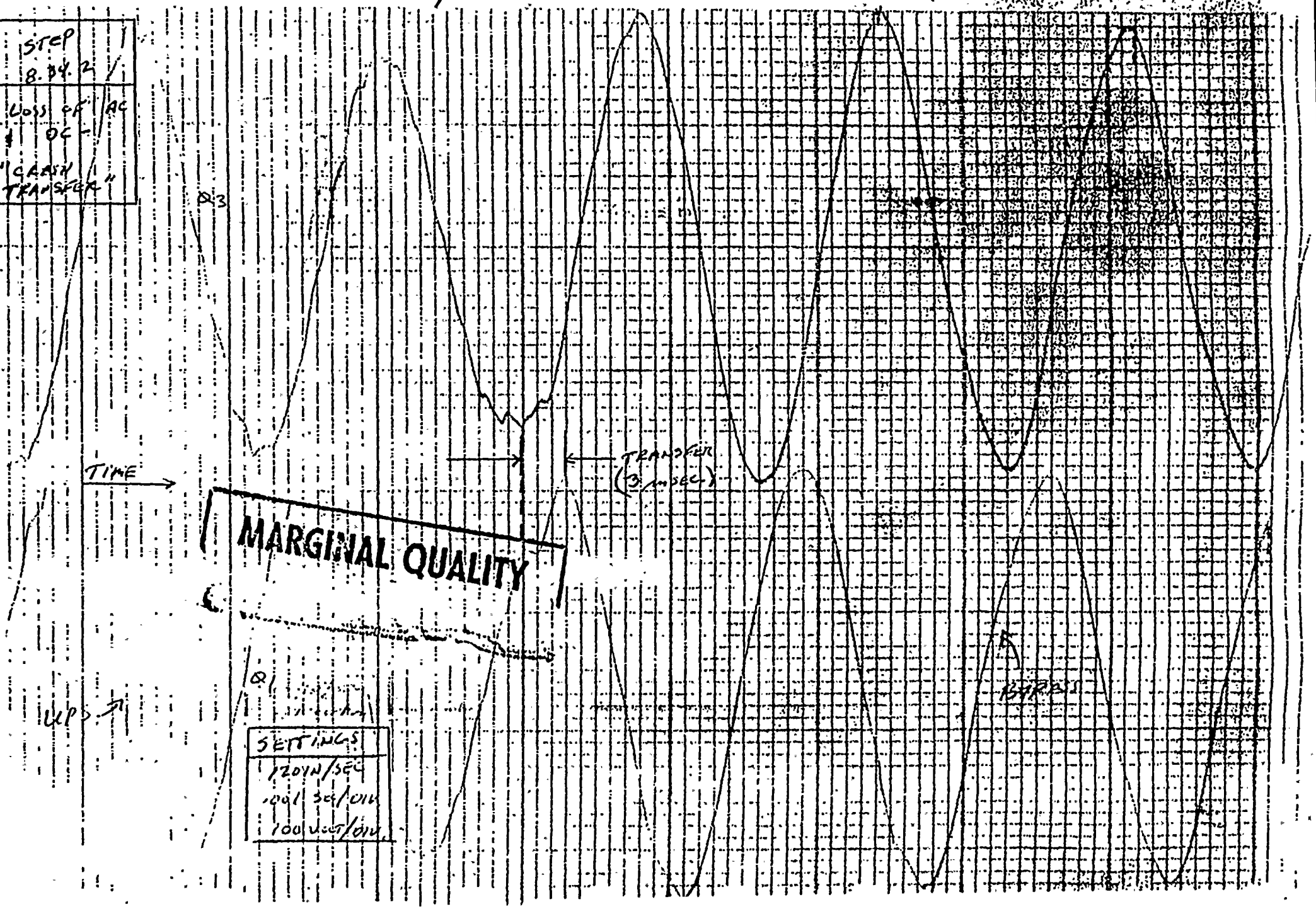
MARGINAL CIRCUIT



ATTACHMENT 12878
p. 3 of 4.

MARGINAL QUALITY




STEP
8.34.2
LOSS OF AC
OR
CRASH
TRANSFER
Q3
TIME
TRANSFER
(3 msec)
MARGINAL QUALITY
Q1
UP
SETTINGS
120 V/SEC
.001 SEC/DIV
100 VOLT/DIV
BYPASS

TEST FOLDER # 75.002.F
Equipment Name 2UBB-UPS1C
Equipment Mark # 2UBB-UPS1C

07-[illegible]-91

CIRCLE APPROP. CAT.

QA. CAT. 1 (2) 3

PROCEDURE COVER SHEET

NIAGARA MOHAWK POWER CORPORATION

Job Book #A07508

(#17)

PROCEDURE TYPE	APPROVAL AUTHORITY	PROCEDURE NO.
ELECTRICAL TEST PROCEDURE	JTG	ES.0071.003

PROCEDURE TITLE	AUTHOR
75 KVA UNINTERRUPTIBLE POWER SUPPLIES	B. CRANDALL

REVIEWED and APPROVED

rev. no.	approved by	date	JTG mtg no.	reviewed-QA Nuclear (POTS only)
0	[signature]	5/10/85	85-29	N/A
1				
2				
3				
4				
5				
6				

RELEASE FOR PERFORMANCE (required for POT's and AT's only)

Pretest review completed by _____ date _____

Approved for performance _____ date _____

RESULTS REVIEW and APPROVAL (required for specific Prelim., POT and AT only)

Conducted by R.J. Crandall (ROBERT J. CRANDALL) et Rich - date 5/14/85 (5/13/85 - 10-14-85

Reviewed by [signature] date 10-7-85

QA Review by N/A date _____
(POTS only)

Approved by [signature] date 5-20-86

Title Asst. Group Mgr. JTG mtg no. NA

OPERATIONAL ACCEPTANCE (required for POT's and AT's only)

Review and Accepted _____ date _____
SORC Chairman SORC mtg. no. _____

System Operational _____ date _____
Station Superintendent

1-62

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TABLE OF CONTENTS

1.0 PURPOSE

This procedure establishes a method for verifying that the uninterruptible power supply (UPS) conforms with referenced drawings and is capable of performing in accordance with specification requirements in all modes of operation.

2.0 SCOPE

This procedure will test the Uninterruptible Power Supply (UPS). This includes testing the alternate supply source A.C. Power Transformer and regulator as well as the uninterruptible power supply itself. This procedure is designed to test all five 75 KVA UPS. These may be tested in any order. Although it is advantageous to test the regulated alternate power source equipment and the UPS at one time this is not a requirement for acceptability of this procedure.

3.0 GENERAL TEST METHOD

The procedure will test the alternate source transformer/regulator for distortion and regulation - full load versus no load. It will then check for initial operation of the Uninterruptible Power Supply (UPS) including starting the unit up and verifying the mimic light indication. UPS regulation will be tested - no load versus full load and full load transfers will be attempted. During full load transfers it will be verified that there is no loss of load. For full load operation a temporary load bank will be connected to the UPS. A transfer without loss of load will mean a transfer in less than 1/4 cycle. The ability for the UPS to operate using only DC power will be verified. The control room annunciation from the UPS will be verified as it occurs as well as unit installed meter response. For any unit installed meter that is past calibration, out of calibration or in some way inoperable a portable piece of test equipment may be used as long as the model of the equipment and the manner in which it is used is recorded on the test summary. It is assumed that if a meter is inoperable, the portable meter will be connected as close to the actual installed equipment meter connection as is possible.

The end of the test will include a 24 - hour load test of the UPS. Upon satisfactory completion of the test the test load will be removed and the unit put in service.

4.0 TEST EQUIPMENT

4.1 Megger, Biddle Model No. 21359 or equivalent

4.2 Digital Multimeter, Fluke Model No. 8060A or equivalent

4.3 Knopp, K-3 Phase Sequence Tester or equivalent.

4.4 Phase angle meter, Dranetz Model No. 314 or equivalent

4.5 Dranetz Model 626 disturbance analyzer or equivalent

4.6 Thermometer, capable of reading 32°F to 104°F

4.7 Three phase load bank suitable for 75 KVA.

4.8 Harmonic distortion analyzer, Hewlett Packard Model 339A or equivalent.

4.9 For 75KVA UPS testing, clamp-on ammeter capable of reading at least 225 amps.

4.10 Hewlett-Packard H.P. 3400A, or equivalent.

5.0 PREREQUISITES

NOTE: This procedure is written for testing five 75 KVA uninterruptible power supplies the individual UPS may be tested in any order. Therefore prior to testing a particular UPS not all prerequisites listed below need to be satisfied. Only those prerequisites that directly apply to the particular UPS being tested need to be satisfied. Indicate "N/A" (non-applicable) on those that do not apply.

5.1 No preliminary tests are required to be complete prior to performing this test.

5.2 No special environmental conditions are required for this test.

5.3 Permanent plant power is connected to and supplying power to the following equipment:

		Initials/Date
5.3.1	For 2VBB-UPS1A:	
	1) 2VBB-PNL301, BKR #1	N/A /
	2) 2NJS-US5, BKR #8-D	N/A /
	3) 2BYS-SWG001A, BKR #2-C	N/A /
5.3.2	For 2VBB-UPS1B:	
	1) 2VBB-PNL301, BKR #2	N/A /
	2) 2NJS-US6, BKR #4-B	N/A /
	3) 2BYS-SWG001B, BKR #2-C	N/A /
5.3.3	For 2VBB-UPS1C:	
	1) 2LAT-PNL300, BKR#SUB-FEED	RJC 1 5/15/95
	2) 2NJS-US5, BKR #4-D	RJC 1 5/15/95
	3) 2BYS-SWG001A, BKR #2-D	RJC 1 5/15/95

4

(ROBERT J CRANDALL - RJC).

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5.3.4 For 2VBB-UPS1D:

		Initial/Date
1)	2NJS-MCC006, BKR #8-A	N/A /
2)	2NJS-US6, BKR #6-C	N/A /
3)	2BYS-SWG001B, BKR #2-D	N/A /

5.3.5 For 2VBB-UPS1G:

		Initial/Date
1)	2VBB-PNL301, BKR #7	N/A /
2)	2NJS-US6, BKR #6-D	N/A /
3)	2BYS-SWG001C, BKR #2-C	N/A /

5.4 System Status

5.4.1 Note any temporary modifications on the particular UPS under test in the test summary and indicate their effect on the test. See marginal note

Verified By / Date: 5/13/85

5.4.2 Verify from Attachment 12.3 that the annunciators for the particular unit under test are in service. Note any exception to this on test summary.

Verified By / Date: 5/13/85

5.4.3 Verify from Attachment 12.4 that the computer points for the particular unit under test are in service. Note any exception to this on the test summary.

Verified By / Date: 5/13/85

5.5 There are no other prerequisites required for this test.

6.0 INITIAL CONDITIONS

6.1 CB #5 on the alternate supply transformer is open.

Verified By / Date: 5/13/85

6.2 CB #4 on the particular UPS is closed.

Verified By / Date: 5/13/85

6.3 CB #1 and CB #2 on the particular UPS are open.

Verified By / Date: 5/13/85

6.4 The three phase load bank is connected to the UPS output terminals E13(neutral), E14(Phase A), E15(Phase B), E16(Phase C).

Rt J Cull / 5/13/85
Verified By Date

6.5 The normal source feed breaker is closed on the applicable switchgear or panel.

Rt J Cull / 5/13/85
Verified By Date

6.6 The D.C. source feed breaker is closed on the applicable D.C. switchgear.

Rt J Cull / 5/13/85
Verified By Date

7.0 PRECAUTIONS & LIMITATIONS

7.1 Do not work on UPS output bus without shutting off normal, alternate and backup D.C. power to unit (taking readings on bus with voltmeter does not necessitate open input power).

7.2 In case of smoke, fire, electrical shorts or other circumstances that would damage the unit shutdown unit as follows:

1) Place transfer switch into bypass position
2) Open battery breaker (CB #2)
3) Open AC input breaker (CB #1)

7.3 Do not open CB #5 on alternate supply transformer with A27CB1 and A27-Switch #1 closed.

7.4 Ensure to all personnel involved in the test understand that there are multiple feeds to the UPS, where they enter and how each should be isolated.

7.5 Prior to using a megger in any portion of the UPS system verify that all control circuits, solid state components, relays & meters are sufficiently isolated.

7.6 Applicable safety precautions, as outlined in the NMPC Accident Prevention Rules, apply. Record applicable mark-up numbers on test summary.

8.0 PROCEDURE

NOTE: All percent (%) of full load values required in this procedure are approximate. The load bank used is not a continuously variable unit - it is energized in distinct steps of approximately 41 amps for each breaker closed.

NOTE: Where the actual measured values are out of tolerance the recorded values shall be "As Left" values. Note in the test summary when adjustments are made.

NOTE: Record all test equipment data on Attachment 12.2 as each item of test equipment is used.

8.1 Step Deleted.

8.2 Verify all UPS meters are calibrated or attach temporary test meter(s) as necessary and note M&TE No., Cal. Due Date, and manner it was used in test summary.

Robert J Cell 1 5/12/85
Verified By Date

8.3 Equipment Mark # 2VBB-UPS1C
KVA 75 KVA
AC Input 575 VAC
DC Input 125 VDC
AC Output 120/208 VAC

Serial #77223-3

8.4 Step Deleted.

8.5 Perform a visual inspection of the UPS as follows:

8.5.1 Visually verify the exterior of the UPS and associated transformer /regulator for proper installation. Robt J Cell (yc) ROBERT J. CELLUCCI yc 1 5/13/85

8.5.2 Open or remove doors or inspection panels, as required. Verify the following.

8.5.3 No loose tools within UPS. yc 1 5/13/85

8.5.4 UPS interior clean and free of debris. yc 1 5/13/85

8.5.5 Wire terminations tight. yc 1 5/13/85

8.5.6 Cables tied properly. yc 1 5/13/85

8.5.7 No evidence of overheating or other mechanical damage. yc 1 5/13/85

8.5.8 Circuit boards are properly secured. yc 1 5/13/85

8.5.9 Ventilation filters are clean and secured properly. yc 1 5/13/85

7

RECORD COPY

3 8 7 8 3 . 1 6 8 9

Initials/Date

8.5.10 Replace all removed doors or inspection panels. yc 1 5/13/85

8.6 Read and record the ambient air temperature in the vicinity of the UPS and transformer/regulator.

MTE # IC 2604
CAL DUE 5/29/85

71 °F yc 1 5/13/85

8.7 Verify continuity of the UPS grounding connection by using a multimeter on resistance scale and obtaining a resistance reading of approximately zero between the UPS housing and the nearest plant ground.

yc 1 5/13/85

8.8 Read and record the elapsed time meter reading.

104.8 HOURS yc 1 5/13/85

8.9 Check Normal AC supply voltage and phase rotation as follows:

8.9.1 Read and record the AC input voltage at the line side (top) of CB #1 within the UPS.

* SEE TEST SUMMARY PG 1

E-1

1-2 616.5 vac, 2-3 615.5 vac, 1-3 ~~615.5~~ 608.1 yc 5/13/85 vac, yc 1 5/13/85

MTE # IC 7255
CAL DUE - 11/10/85

(575 ± 10%, 517.5 to 632.5)

E-1 8.9.2 Attach phase sequence meter to top of CB #1 within UPS phase A to C, Left to Right, & Read record phase rotation.

Rotation ABC (ABC). * SEE TEST SUMMARY PG 1 yc 1 5/13/85

MTE # MT 2007
CAL DUE - 5/16/85

8.10 Check alternate AC supply voltage and phase rotation at the associated transformer/regulator as follows:

8.10.1 Read and record voltage at the transformer/regulator input breaker CB5.

1-2 610.1 vac, 2-3 617.0 vac, 1-3 608.1 vac, yc 1 5/13/85

(575 vac ± 10% - 517.5 to 632.5 vac)

MTE - IC 7255
CAL DUE - 11/10/85

8.10.2 Attach phase sequence meter to top of CB#5 at transformer regulator Left to Right read phase Rotation ABC (ABC).

MTE - MT 2007
CAL DUE - 5/16/85

yc 1 5/13/85

8.11 Test the alternate AC supply transformer/regulator as follows:

8.11.1 Close the alternate AC supply breaker CB5 at the transformer/regulator.

yc 1 5/13/85

8.11.2 Verify that there are no unusual sounds or odors coming from the transformer/regulator.

yc 1 5/13/85

8.11.3 Using the H.P. 3400A read the alternate AC supply voltage phase to neutral on the line side (top) of CB #3 within the UPS.

1-N 121 vac, 2-N 122 vac, 3-N 121 vac, yc 1 5/13/85
(120 ± 2%, 117.6 - 122.4 vac) mate - IC2101
cal due - 11/2/85

NOTE: This is regulator no-load voltage.

8.11.4 Read and record the alternate AC supply phase rotation on the line side of CB #3 within the UPS. Attach phase sequence meter to top of CB#3, Left to Right & read phase rotation.
Rotation ABC (ABC).
mate MT 2007
cal due - 5/16/85
yc. 1 5/13/85

8.11.5 Set the test load bank to 25% of rated UPS capability (41 amps/phase) by closing one breaker on load unit distribution panel.

yc 1 5/13/85

8.11.6 Verify that the UPS bypass circuit breaker - CB 4, is closed to energize the test load from the alternate AC supply.

yc 1 5/13/85

8.11.7 Disconnect power cable to the motor operator on CB-4.

yc 1 5/13/85

8.11.8 Raise the test load to 100 percent of rated UPS capacity (166 amps/phase) in 25 percent steps (41 amps/phase), allowing current to stabilize between steps. Measure and record voltage phase to neutral, and current at each step using clamp on ammeter and H.P. 3400A.

CLAMP - ON: mate IC2139 cal - 9/6/85 used with FLUKE IC2239 cal - 10/17/85

H.P 3400A # IC2101 CAL due - 11/2/85

	Percent Rated Load			
	25%	50%	75%	100%
Current (Clamp On)	43.5	88.0	132.5	175.5
Phase A Voltage (H.P.3400A)	121	121	120	120
Phase B Voltage	122	122	121	121
Phase C Voltage	121	121	120	120

(120 ± 2%, 117.6 - 122.4 vac)

SUMMARY PS 1

yc 1 5/13/85

8.11.9 Reduce the test load to 25 percent of rated UPS capacity in 25 percent steps, allowing current to stabilize between steps.

yc 1 5/13/85

8.11.10 Calculate and record voltage regulation (VR) of the transformer/ regulator using the formula:

NOTE: Show calculation on worst regulation of three phase.

$$VR = \frac{V_{NL} - V_{FL}}{V_{NL}} \times 100 \text{ percent}$$

Where: V_{NL} = Transformer/regulator voltage at no load (measured in Section 8.11.3)

V_{FL} = Transformer/regulator voltage at full load (measured in Section 8.11.8)

VR= 121 - 120 / 121 X 100%= 0.8 (± 2% Max) yk 5/13/85

8.12 Start up the UPS, as follows: verified 10-7

NOTE: UPS DC input breaker cannot be closed until UPS normal AC breaker is closed and the UPS rectifier is energized.

8.12.1 Place the transfer control switch on the UPS control panel in the MANUAL RESTART position. yk 5/13/85

8.12.2 Place the CB3, OPEN/CLOSED switch on the UPS control panel in the OPEN position.

yk 5/13/85
Initial/Date

8.12.3 Read logic power supply battery voltage, at panel A27-CB1.

(+) 19.8 vdc (>16.5 vdc) (-) 20.05 vdc (>16.5 vdc) yk 5/13/85

mate - IC 7255 CR Dec - 11/10/85

8.12.4 Close circuit breaker A27CB1 and place control switch A27-S1 (located on A27 panel in the rear of the UPS is in the ON position.

yk 5/13/85

8.12.5 Verify the following status lights:

1) "CB-4 Bypass Breaker" closed light is lit
2) "CB-3" open light is lit
3) "Bypass Input" light is lit
4) "Critical Bus" green light is lit

yk 5/13/85

8.12.6 Push the lamp test button on the card cage alarm card (A13A21) and verify that all alarm lamps on the card light.

yk 5/13/85

8.12.7 Verify that the alarms are unstored when button is released.

yc 1 5/13/05

8.12.8 Push the lamp test buttom on the static switch control card (A13A34) and verify that all alarm lamps on card light.

yc 1 5/13/05

8.12.9 Push its associated reset button on card and verify all lamps are reset to original state.

yc 1 5/13/05

8.12.10 Push the lamp test button on module control panel and verify that all status and alarm lamps on the control panel light.

yc 1 5/13/05

8.12.11 Release pushbutton and verify that all lamps reset to original state.

yc 1 5/13/05

NOTE: Push horn silence button as necessary.

8.12.12 Verify that the MODULE OFF lamp is energized.

yc 1 5/13/05

8.12.13 Verify that the Normal AC Source Voltmeter M1 indicates 575 V ± 10% (517.5 - 632.5 vac)

610 vac yc 1 5/13/05

8.12.14 Manually close the UPS normal AC input breaker (CB1).

yc 1 5/13/05

8.12.15 Verify the following status lights:

1) "Module - Off" lamp is lit. yc 1 5/13/05
2) "CB-1" closed lamp is lit. yc 1 5/13/05
3) "Module -OK" lamp is lit. yc 1 5/13/05

N/A

8.12.16 Reconnect the power cable to the motor operator on bypass breaker CB-4.

yc 1 5/13/05

8.12.17 Depress the MODULE ON pushbutton.

yc 1 5/13/05

8.12.18 Observe the following sequence of events:

8.12.18.1 MODULE OFF lamp deenergizes. yc 1 5/13/85

8.12.18.2 DC Voltmeter M3 slowly increases to 103-140 VDC. yc 5/13/85 1 SEE SUMMARY

8.12.18.3 AC Output Voltmeter M5 increases to 120V ± 2%. (117.6 - 122.4 vac)

120.7 vac yc 1 5/13/85

8.12.18.4 AC Output Frequency Meter M9 indicates 60 Hertz ± .5HZ (59.5 to 60.5 HZ).

60.0 HZ yc 1 5/13/85

8.12.18.5 Battery Ammeter M4 indicates 0 Amperes. yc 1 5/13/85

8.12.18.6 AC Output Ammeter M6 indicates approx. 41 Amperes. yc 1 5/13/85

8.12.18.7 Charger Output Current Meter M8 indicates current flow. 30 AMPS yc 5/13/85 yc 1 5/13/85

8.12.18.8 MODULE ON lamp energizes. yc 1 5/13/85

8.12.18.9 NO BREAK TRANSFER READY, TO UPS lamp energizes. yc 1 5/13/85

8.12.19 Verify the following status lights:

8.12.19.1 "CB2" open lamp is lit. yc 1 5/13/85

8.12.19.2 "No External DC" lamp is lit. yc 1 5/13/85

8.12.19.3 "Util. Sync OK" lamp is lit. yc 1 5/13/85

8.12.14 FRF# ES.0071.003-1 yc. Adjust UPS rectifier DC output voltage to 103 VDC ± 2 volts. Record the no load ~~UPS~~ rectifier voltage. OR AS LOW AS POT R71 ON A13A2 WILL ALLOW

105.8 Vdc MADE IC7255 CHG DWG-11/6/85 yc 1 5/13/85

8.12.13 Verify that the UPS control module will automatically restart when transfer control switch is in the "Auto Restart" mode as follows:

8.12.13.1 Place the transfer control to "Auto Restart" position. yc 1 5/13/85

8.12.13.2 On the control module panel push the OFF position. yc 1 5/13/85

13.3
8. ~~14.3~~ Verify the following status:

13.3.1
8. ~~14.3.1~~ Module OFF lamp is lit. yc 1 5/13/05

13.3.2
8. ~~14.3.2~~ AC output voltage decreases to zero. yc 1 5/13/05

Verify that the UPS automatically restarts after a time delay (Approximately 40 sec.) as follows:

13.4.1
E-3 8. ~~14.4.1~~ Rectifier/Charger "Walks Up" to approx. 103 V dc 1 * SEE SUMMARY

13.4.2
8. ~~14.4.2~~ AC output frequency returns to 60 Hz. yc 1 5/13/05

13.4.3
8. ~~14.4.3~~ AC output volts returns to 120 V ac. yc 1 5/13/05

13.4.3
8. ~~14.4.4~~ "Module-On" lamp relights. yc 1 5/13/05

8.15 Check UPS no-load output voltage and fequency as follows:

8.15.1 Using the AC output voltmeter on the UPS read the UPS No-Load output voltage and record.

1 121.5 vac, 2 121.0 vac, 3 121.0 vac, yc 1 5/13/05
(120 ± 2%, 117.6 - 122.4 vac)

8.15.2 Using the AC output frequency meter mounted on the UPS read the UPS No-Load output frequency and record.

ØA 60.0
ØB 60.0
ØC 60.0 HZ .5 pm 5/13/05 yc 1 5/13/05
(60 ± ~~.5~~, 59.5 - 60.5 HZ)

8.16 Verify that the UPS output and alternate (bypass) supply output are "in phase" as follows:

8.16.1 Within the UPS read the voltage between the bottom of circuit breakers CB-3 and CB-4, Phase A to Phase A, Phase B to Phase B, Phase C to Phase C.

wrote "IC 7255 cal due - 11/10/05

A-A 8.0 vac
B-B 9.5 vac (≤ 10Vac)
C-C 9.1 vac yc 1 5/13/05

8.17 Transfer the test load which is at 25 percent load (41 amp/phase) to the UPS inverter as follows:

yc 1 5/13/05

8.17.1 Verify that the "UTIL SYNC OK" lamp is energized. yc 1 5/13/05

8.17.2 Verify that the "No Break Transfer Ready to UPS" lamp is energized.

yc 1 5/13/05

8.17.3 PLACE the inverter output circuit breaker (CB3) switch in the closed position.

yc 1 5/13/05

8.17.4 Verify the following:

8.17.4.1 The "CB-3" closed lamp is lit. yc 1 5/13/05

8.17.4.2 The "CB-4" open lamp is lit. yc 1 5/13/05

8.17.4.3 NO BREAK TRANSFER TO BYPASS lamp energizes. yc 1 5/13/05

8.17.4.4 Normal AC source ammeter M2 indicates increased input current.

yc 1 5/13/05

8.17.4.5 Charger output current meter M8 indicates increased current.

yc 1 5/13/05

8.17.4.6 Battery Ammeter M4 indicates 0 amperes. yc 1 5/13/05

8.17.4.7 AC output ammeter M6 indicates approximately the same current as the load test unit.

yc 1 5/13/05

8.17.4.8 Load test the UPS as follows:

8.18.1 With the UPS supplied from the normal source, raise the test load to 100 percent of rated UPS capacity (166 amps/phase) in 25 percent steps. Measure and record load voltage and current at each step using the UPS meters. Record full load output inverter frequency as indicated on UPS meters.

E-4

	Percent Rated Load			
	25%	50%	75%	100%
Current	43.0*	80-85 amps	125-130	166
Ø1 Voltage	121.3	121.0	120.8	120.5
Ø2 Voltage	121.0	120.8	120.5	120.0
Ø3 Voltage	121.0	120.9	120.6	120.5

(120 ± 2%, 117.6 - 122.4 vac)

Summary pg 1

* READ WITH CLAMP-ON yc 5/13

50-100 READ ON UPS yc 5/13

METER (CAL DUE IC 2139 (9/6/05) IC 2139 (10/17/05)

Full load frequency Q1 60.0 HZ (59.5 - 60.5 HZ)
Q2 60.0 HZ
Q3 60.0 HZ

yc 1 5/13/05

8.18.2 Decrease load to 0% in 25 percent steps allowing current to stabilize between steps.

yc 1 5/13/05

8.19 Manually transfer load to the alternate AC supply as follows:

8.19.1 Verify that the "UTIL SYNC OK" lamp is lit. yc 1 5/13/05

8.19.2 Verify that the "No-Break Transfer, to Bypass" lamp is lit.

yc 1 5/13/05

8.19.3 Place the transfer control switch in the bypass position.

yc 1 5/13/05

8.19.4 Release the switch and allow it to spring back to the "Manual Restart" position.

yc 1 5/13/05

8.19.5 Move switch "CB-3" to the open position. yc 1 5/13/05

8.20 22 Restart the UPS ~~(and adjust UPS rectifier DC output voltage to 140 VDC ± 1 volt.)~~ PER FRF ES.0071.003-2 yc 5/13/05

yc 1 5/13/05

8.21 26 APRIS UPS ... (PER FRF ES.0071.003-2 yc 5/13/05)
Measure and record the No-Load UPS rectifier output voltage.

140.16 Vdc mate "FL 7255 CAL DUE - 11/10/05 yc 1 5/13/05

8.22 27 Measure and record the No-Load AC output voltage and frequency of the inverter as indicated on UPS panel meters.

Q1 120.5, Q2 120.5, Q3 120.5 vac(117.6 - 122.3vac)
Q1 60.0, Q2 60.0, Q3 60.0 HZ(59.5 - 60.5HZ).

yc 1 5/13/05

8.23 20 Close the DC supply breaker at the associated switchgear.

15

yc 1 5/13/05

8.24 21 Verify that battery polarity at the UPS is in accordance with Exide 75 KVA UPS manual.

yc 1 5/13/85
Initial/Date

8.25 23 Close the UPS molded case DC supply breaker. yc 1 5/13/85

8.26 24 Observe the following:

8.~~26.1~~ 24.1 The CB2 (DC battery breaker) OPEN lamp denergized and the CLOSED lamp energizes. yc 1 5/13/85

8.~~26.2~~ 24.2 NO EXTERNAL DC lamp deenergizes. yc 1 5/13/85

8.~~26.3~~ 24.3 BLOCKING DIODE CONDUCTING, BATTERY GROUND, BATTERY DISCHARGE, and BATTERY UNDERVOLTAGE lamps are deenergized. yc 1 5/13/85

8.27 25 Measure the DC backup supply voltage at the UPS on the battery input bus on left side inside UPS cabinet. Record voltage.

133.45 Vdc mWTE # IC 7255 CAL DUE - 11/10/85 yc 1 5/13/85

8.28 Transfer the test load, which is set at 25 percent load, 41 amps/phase, to the UPS inverter output as follows:

8.28.1 Place the transfer control switch in the AUTO RESTART postion. yc 1 5/13/85

8.28.2 Verify that the "UTIL SYNC OK" lamp is energized. yc 1 5/13/85

8.28.3 Verify that the "No Break Transfer Ready to UPS" lamp is energized. yc 1 5/13/85

8.28.4 PLACE the inverter output circuit breaker (CB3) switch in the closed position. yc 1 5/13/85

8.28.5 Verify the following:

8.28.5.1 The "CB-3" closed lamp is lit. yc 1 5/13/85

8.28.5.2 The "CB-4" open lamp is lit. 16 yc 1 5/13/85

8.28.5.3 NO BREAK TRANSFER TO BYPASS lamp energizes. yc 1 5/13/85
Initial/Date

8.28.5.4 Normal AC source ammeter M2 indicates increased input current.

yc 1 5/13/85

8.28.5.5 Charger output current meter M8 indicates increased current.

yc 1 5/13/85

8.28.5.6 Battery Ammeter M4 indicates 0 amperes. yc 1 5/13/85

E.S 8.28.5.7 AC output ammeter M6 indicates the same current as the clamp-on ammeter indicating test load current (read at load unit).

yc 1 5/13/85

8.29 Load test the UPS at 140 Vdc rectifier voltage as follows:

With the UPS supplied from the normal AC source, raise the test load to 100 percent of rated UPS capacity (166 amps/phase) in 25-percent steps (41 amps/phase), allowing current to stabilize between steps. measure and record load voltage and current at each step using the UPS meters. Measure and record full-load output inverter AC current, voltage, and frequency as indicated on the UPS meters.

E.S.

	Percent Rated Load			
	25%	50%	75%	100%
Current (AMPS)	* 43	85	130	175
Ø1 Voltage	120.5	121.0	120.75	120.5
Ø2 Voltage	120.5	120.5	120.75	120.5
Ø3 Voltage	120.5	120.5	120.75	120.5

* SEE SUMMARY PG 2
MDTE (CMC DUE IC2139 (9/6/85 IC2239 (10/17/85

Full load output frequency Ø1 60.0 HZ (59.5 - 60.5 HZ)
Ø2 60.0
Ø3 60.0

yc 1 5/13/85

8.30 Measure and record the full load output phase angle difference between each output phase using the phase angle meter.

1-2 120.3 o, 2-3 120.1 o, 1-3 119.9 o. yc 1 5/13/85 (119 - 1210) 17
MDTE = MT 32 2034 CMC DUE 9/20/85

8.31 Operationally test the static switch and UPS control circuits at full rated test load as follows:

8.31.1 Attach disturbance analyzer to UPS output and monitor UPS output voltage.

yc 1 5/13/85

8.31.2 Manually transfer full rated load from the inverter to the alternate AC supply as follows:

8.31.2.1 Verify that the "UTIL SYNC OK" lamp is lit. yc 1 5/13/85

8.31.2.2 Verify that the "NO-BREAK TRANSFER, TO BYPASS" lamp is lit.

yc 1 5/13/85

8.31.2.3 Place the transfer control switch in the bypass position.

yc 1 5/13/85
Initial/Date

8.31.2.4 Release the switch and allow it to spring back to the "Manual Restart" position.

yc 1 5/13/85

NOTE: This transfers load to the bypass source.

8.31.2.5 Observe the disturbance analyzer printout during transfer. Attach printout to the procedure and number it to reference this step number. summary Ref 2

yc 1 5/13/85

8.31.2.6 Read and record the total harmonic distortion with (THD) UPS on bypass source. *SEE summary pg 3 NOTE EC 3014 CAL DUE 9/20/85

(REF ES.0071.003-3)

Ø1 6.8%
Ø2 yc 1 5/13/85 6.6%
Ø3 6.8% % THD
(≤ 5% THD)

Ø1 TO Ø2 2.2 %
Ø2 TO Ø3 2.1 0.8 yc %
Ø1 TO Ø3 0.8 yc %THD (≤ 5% THD) yc 5/22/85

yc 1 5/13/85

8.31.3 Manually transfer full rated load from the alternate supply to the inverter (UPS) as follows:

8.31.3.1 Restart the UPS and then verify that the "UTIL SYNC OK" lamp is lit.

yc 1 5/13/85

8.31.3.2 Verify that the "NO BREAK TRANSFER READY - TO UPS" lamp is lit.

yc 1 5/13/85

8.31.3.3 Place the "CB-3" switch in the closed position. yc 1 5/13/85

NOTE: This transfers load to the inverter.

8.31.3.4 Observe the disturbance analyzer printout during transfer. Attach printout to the procedure and number it to reference this step number. Summary pg 3

yc 1 5/13/85

8.32 Verify that the blocking diode will not conduct when the DC supply voltage is raised to 140 V (when equalizing the batteries) as follows:

8.32.1 With the UPS supplying full load, move the float/equalize switch on the associated charger to the equalize position.

yc 1 5/13/85

8.32.2 On the UPS DC voltmeter, read the battery input voltage and record.

139.0 vdc yc 1 5/13/85

8.32.3 Confirm that the blocking diode is not conducting by verifying the following:

8.32.3.1 Verify that the battery ammeter on the UPS reads approximately zero amps.

yc 1 5/13/85

8.32.3.2 Read and record the battery current on Data Sheet.

0 adc yc 1 5/13/85

8.32.3.3 Verify that the "Blocking Diode Conducting" mimic light is not lit. Summary pg 3

yc 1 5/13/85

8.32.4 Return the float/equalize switch to the float position.

yc 1 5/13/85

8.33 Operate UPS off DC power as follows:

8.33.1 With full rated load supplied from the inverter and the UPS supplied from the normal AC supply, open the normal AC supply breaker at the switchgear.

19

yc 1 5/13/85

8.33.2 Read and record the full load DC input amperes from the UPS battery ammeter.

540 adc yc 1 5/13/85

8.33.3 Observe the distrubance analyzer printout during transfer. Attach printout to the procedure and number it to reference this step number.

yc 1 5/13/85

8.33.4 With the UPS supplied from the DC source, measure and record full load output inverter AC current, voltage, and frequency, as indicated on the UPS meters.

Full load AC Output Current 167 adc
AC Output Voltage 120.7 vac(117.6 - 122.4 vac)
Output Frequency 60.0 HZ(59.5 - 60.5 HZ)

yc 1 5/13/85

8.34 Simulate an inverter failure with automatic transfer as follows:

8.34.1 With the UPS supplied form the DC source, open the DC supply breaker at its associated switchgear.

yc 1 5/13/85
Initial/Date

8.34.2 Observe the distrubance analyzer printout during transfer. Attach printout to the procedure and number it to reference this step number.

yc 1 5/13/85

8.34.3 Verify transfer by verifying the following:

8.34.3.1 The "CB-3" open lamp is lit. yc 1 5/13/85

8.34.3.2 The "CB-4" closed lamp is lit. yc 1 5/13/85

8.34.3.3 The "No External DC Closed" lamp is lit. yc 1 5/13/85

8.34.3.4 Verify that the normal AC source ammeter reads approximately zero amps.

yc 1 5/13/85

8.34.3.5 Verify that the battery ammeter reads approximately zero amps.

yc 1 5/13/85

8.35 Place breaker CB3 switch in the open position. yc 1 5/13/85

8.36 Verify the transfer control switch is in the Manual Restart Position and complete the following:

yc 1 5/13/95

8.36.1 Close the normal AC source breaker at the switchgear.

yc 1 5/13/95

8.36.2 Verify that all alarms are cleared and the audible alarm is silenced.

yc 1 5/13/95

8.36.3 Start the UPS by pushing the Module On switch. yc 1 5/13/95.

8.36.4 When the DC link reaches open-circuit voltage, close DC supply Circuit Breaker at its associated switchgear, allowing the charger to walk-up to float voltage.

yc 1 5/13/95

8.36.5 Manually transfer the critical bus load to the UPS by closing breaker CB3.

yc 1 5/13/95

8.36.6 Verify that the UPS is supplying the critical bus and Breaker CB4 is open.

yc 1 5/13/95

8.37 Reduce the test load to 25 percent of rated UPS capacity in 25 percent steps, allowing current to stabilize between steps.

yc 5/13/95

8.38 Calculate inverter output AC voltage regulation (VR), with the rectifier voltage at 103 V dc using the following formula:

NOTE: Show calculation on worst of three phases

$$VR = \frac{VNL-VFL}{V_{NL}} \times 100 \text{ percent}$$

Where: VNL = UPS inverter output AC voltage at no load (measured in Section 8.15 for rectifier DC set at 103 VDC)

V_{FL} = UPS inverter output AC voltage at full load (measured in section 8.18.1 for rectifier DC set at 103 Vdc).

Phase A (Ø1) VR= $\frac{121.5-120.5}{121.5}$ X 100% = .82 % (± 2% Max)

yc 5/13/95

VERIFIED EJH 10-9-95

8.39 Step Deleted.

8.40 Calculate and record inverter output AC voltage regulation (VR), with the rectifier voltage at 140 V dc using the following formula:

NOTE: Show calculation of worst of three phases.

$$VR = \frac{V_{NL} - V_{FL}}{V_{NL}} \times 100 \text{ percent}$$

Where: V_{NL} = UPS inverter output AC voltage at no load (measured in Section 8.22 for rectifier DC set at 140 VDC)

V_{FL} = UPS inverter output AC voltage at full load (measured in Section 8.29 for rectifier DC set at 140 VDC)

Phase A (a1) VR = $\frac{120.5 - 120.5}{120.5} \times 100\% = \frac{0\ \%}{(\pm\ 2\%\ \text{Max})}$ % yc/5/13/95

8.41 Step Deleted. VERIFIED EJB 10-7-95

8.42 Calculate and record inverter frequency regulation (FR), with the rectifier voltage set at 103 V dc using the following formula:

NOTE: Show calculation of worst phase frequency regulation.

$$\text{Frequency Regulation} = \frac{F_{NL} - F_{FL}}{F_{NL}} \times 100 \text{ percent}$$

Where: F_{NL} = UPS inverter frequency at no load (measured in Section 8.15.2 for rectifier DC set at 103 VDC)

F_{FL} = UPS inverter frequency at full load (measured in Section 8.18.1 for rectifier DC set at 103 VDC)

FR = $\frac{60 - 60}{60} \times 100\% = \frac{0\ \%}{(\pm\ .833\%\ \text{Max})}$ yc/5/13/95

VERIFIED EJB 10-7-95

8.43 Step Deleted.

8.44 Calculate and record inverter frequency regulation (FR), with the rectifier voltage set at 140 V dc using the following formula:

$$FR = \frac{F_{NL} - F_{FL}}{F_{NL}} \times 100 \text{ percent}$$

Where: F_{NL} = UPS inverter frequency at no load (measured in Section 8.22 for rectifier DC set at 140 V DC)

F_{NL} = UPS inverter frequency at no load (measured in Section 8.29 for rectifier DC set at 140 V DC)

yc 1 5/13/85

FR = $\frac{60-60}{60}$ X 100% = $\frac{0}{(\pm .833\% \text{ Max})}$ %

VERIFIED SJB 10-7-85

8.45 Step Deleted.

8.46 Raise the test load 100% of rated UPS capacity in 25% steps, allowing current to stabilize between steps. Commence 24 hour load test. Choose phase used in calculation in step 8.40 and take readings hourly and record data on Attachment 12.2

yc 5/13/85
5/14/85 / 5/15/85

* SEE SUMMARY #3 Thomas Dykman yc 1 5/14/85

8.47 At the end of 24 hours attach harmonic distortion analyzer to UPS output. Read and record the UPS output harmonic distortion with UPS on normal power.

METER IC3014
CAL DUE - 11/13/85

Ø1 2.6 % THD
Ø2 2.9 %
Ø3 2.5 %
(≤5% THD)

yc 1 5/14/85

8.48 Reduce load to 0 amps in 25% steps, allowing current and voltage to stabilize between steps.

yc 1 5/14/85

8.49 Replace UPS output cables as follows:

8.49.1 Verify that the NO-BREAK TRANSFER, READY-TO BYPASS lamp is lit.

yc 1 5/14/85

8.49.2 Transfer the load to the bypass source by placing the transfer control switch momentarily in the bypass position. (A spring will return the switch to the MANUAL RESTART position).

yc 1 5/14/85

8.49.3 Open the inverter output breaker (CB3) by placing the Inverter Output Switch in the open position.

yc 1 5/14/85

8.49.4 Manually, open the battery breaker (CB2). yc 1 5/14/85

8.49.5 Manually, open the AC input breaker (CB1). yc 1 5/14/85

8.49.6 After one minute, open A27CB1 and A27S1. yc 1 5/14/85

8.49.7 De-energize the AC feed to the UPS at the associated switchgear.

23 yc 1 5/14/85

8.49.8 De-energize the DC feed to the UPS at the appropriate switchgear.

yc 1 5/14/85

8.49.9 Open CB5 on the alternate supply transformer. yc 1 5/14/85

8.49.10 Disconnect the load test unit from terminals E13, E14, E15, and E16 and reconnect the output feeder cable(s).

yc 1 5/14/85

8.50 Read and record elapsed time meter reading. Verify that elapsed time meter reading has changed from its initial reading in Step 8.8.

131.2 Hours yc 1 5/14/85

8.51 Close the AC feed to the UPS at the associated switchgear. yc 1 5/14/85

8.52 Close the DC feed to the UPS at the associated switchgear. yc 1 5/14/85

8.53 Energize the associated UPS output panels by closing CB-5 on the alternate supply transformer.

yc 1 5/14/85

8.54 Start-up UPS and transfer output load to UPS.

yc 1 5/14/85

8.55 Verify phase rotation to be A-B-C at associated UPS output panels and record on data sheet.

(IPRF # ES.0071.003-3)

8.56 WITH UPS OPERATING NORMALLY OFF AC POWER TRANSMIT ON A PORTABLE RADIO WHILE STANDING WITH TWO FEET OF FRONT, BACK AND EACH SIDE OF UPS VERIFY THAT UPS DOES NOT TRIP AND NO ALARMS ARE ACTIVATED yc 1 5/14/85

9.0 ACCEPTANCE CRITERIA yc 1 5/17/85

9.1 For UPS rectifier voltages of 103 to 140 VDC, the UPS output voltage shall be:

117.6 - 122.4 vac (Step 8.15.1, 8.18.1, 8.22, 8.29).

9.2 The UPS output frequencies shall be 59.5 to 60.5 Hz. (Steps 8.15.2, 8.18.1, 8.22, 8.29).

9.3 The UPS output phase separation with balanced loads shall be 119° to 121°. (Step 8.30).

9.4 Transient AC output voltage deviation, averaged over one-half cycle shall not exceed +10% (approx. +12 VAC.) or -25% (Approx. -30 VAC) for .100% load application or removal and shall return to within ± 2% (Approx. 2.4 VAC) within 3 cycles. (Steps 8.31.2.5, 8.31.3.4, 8.34.2).

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9.5 Output voltage regulation shall be less than or equal to ±2 percent from no load to full load. (Steps 8.11.10, 8.38, 8.40).

9.6 Output frequency regulation shall be less than or equal to ±0.833 percent of 60 HZ from no load to full load. (Step 8.42, 8.44).

9.7 Logic power supply voltage shall be greater than 16.5 Vdc. (Step 8.12.3).

9.8 Transfer time ≤ 1/4 cycle (Step 8.31.2.5, 8.31.3.4, 8.34.2).

9.9 Total harmonic distortion ≤ 5% of the fundamental. (Steps 8.31.2.6, 8.47).

10.0 RESTORATION OF EQUIPMENT TO NORMAL STATUS

10.1 Disconnect and remove all test equipment as necessary.

JC 1 5/14/85

10.2 Replace panels and doors as necessary. JC 1 5/14/85

10.3 Systems and/or components shall be placed in a configuration to support operational and/or test requirements.

JC 1 5/14/85

11.0 REFERENCE

11.1 Manufacturers' Manuals:

Exide 75 KVA UPS NMP2-E035A (101-710-343-77223), 10/28/81

11.2 Uninterruptible Power Supply Equipment Specification NMP2-E035A, Rev. 1 including Addendum 1-4.

12.0 ATTACHMENTS

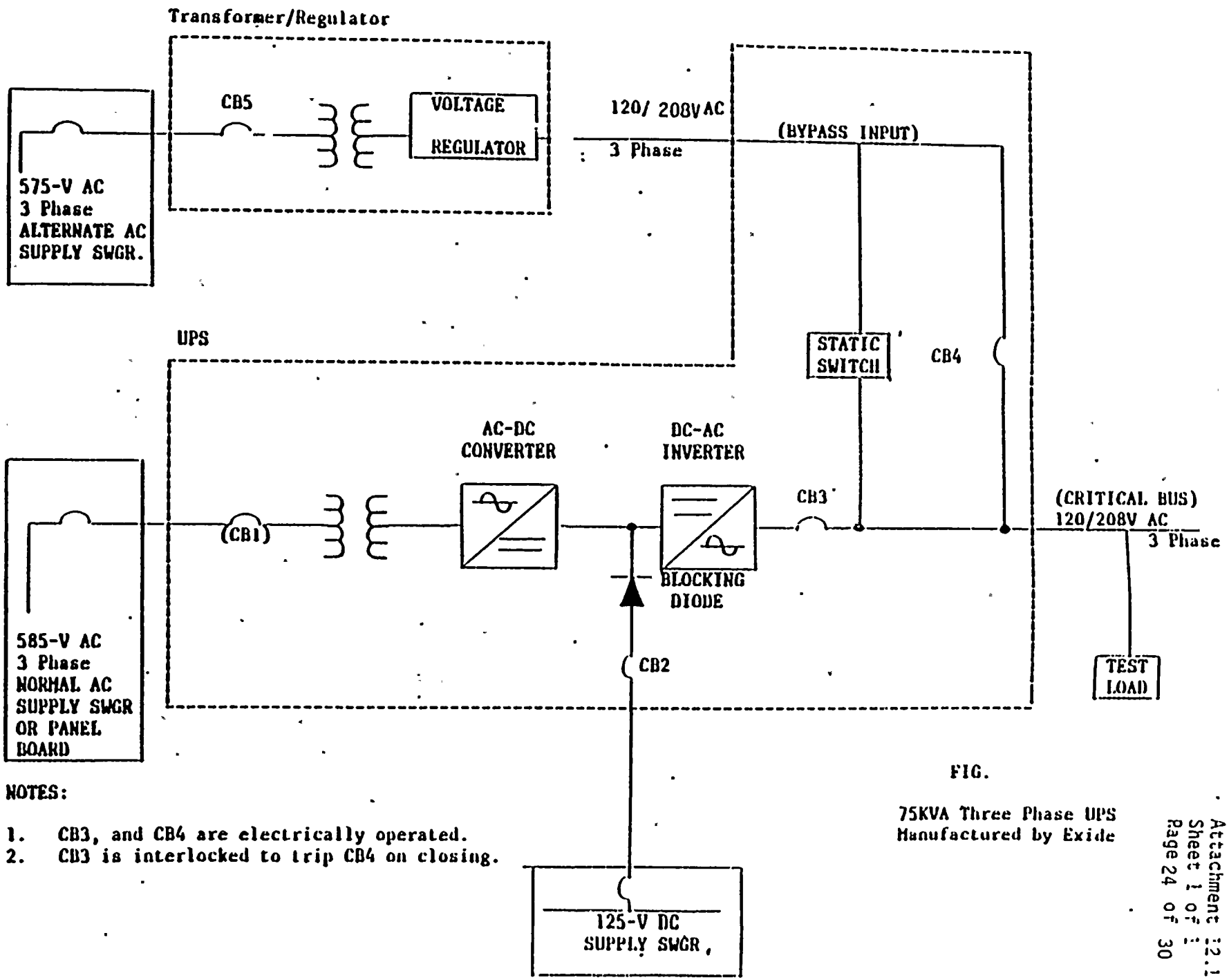
12.1 75 KVA Uninterruptible Power Supply Block Diagram

12.2 Uninterruptible Power Supply Inspection and Test Record - 75KVA UPS

12.3 Annunciator List

12.4 Computer Point List

12.5 Test Summary



NOTES:

1. CB3, and CB4 are electrically operated.
2. CB3 is interlocked to trip CB4 on closing.

FIG.

75KVA Three Phase UPS
Manufactured by Exide

Test Folder No. 75.002.I

Equipment Name 2VBB-UPS1C

Equipment Mark No. 2VBB-UPS1C

NMP2
ES.0071.003
Rev. 0
Attachment 12.2
Sheet 1 of 1
Page 25 of 30

UNINTERRUPTIBLE POWER SUPPLY
INSPECTION AND TEST RECORD
75KVA UPS

Reference Documents E035A/VI/101 to 141 77227 Rev. 10/21
Rev.
Rev.

UPS Nameplate Data Mark #- 2VBB-UPS1C
Serial #- RL 77223-3

8.46 24 Hour Load Test

- Take Readings on Phase A :

Time	Volts	Amps	Time	Volts	Amps	Time	Volts	Amps
4:40PM	120.0	171.8	00:40	120.0	169.8	8:40	120.0	170.4
5:40	120.0	170.5	1:40AM	120.0	169.7	9:40	120.0	170.1
6:40	120.0	170.8	2:40	120.0	170.1	10:40	120.0	170.5
7:40	120.0	170.8	3:40	120.0	169.8	11:40	120.0	170.6
8:40	120.0	170.7	4:40	120.0	169.6	12:40	120.0	170.4
9:40	120.0	170.6	5:40	120.0	170.5	1:40	120.0	170.5
10:40	120.0	170.4	6:40	120.0	170.6	2:40	120.0	170.5
11:40	120.8	169.8	7:40	120.0	169.8	3:40	120.0	170.6
						4:40PM	120.0	170.7

VOLTS MATER IC2101 CAL DUE - 11/2/85

AMPS- IC2139 (9/6/85) IC 2239 (10/17/85)

8.55 Phase rotation for UPS output panels after removal of test load cables:

Panel Number	Rotation
2LAT-PNL017	AB-C
—	—
—	—

KNOPP K-3 MT=2007 CAL-DUE- 5/16/85

TEST EQUIPMENT	M&TE NO.	CAL. DUE DATE
FLUKE 8060A	IC 7255	11/10/85
CLAMP-ON	IC 2139	9/6/85
H.P. 3400A	IC 2101	11/2/85
PRAMET 314	M.T. 2034	9/20/85
H.P 339A	IC 3014	11/13/85
KNOPP K-3	MT 2007	5/16/85
OSCILLOSCOPE	IC 3203	8/5/85
PYROMETER	IC 2604	9/29/85
FLUKE 8062A	IC 2239	10/17/85 → USED FOR AMPS- 24HR LOAD TEST.

ANNUNCIATOR LIST

Location/ Number	Description (Name)
For 2VBB-UPS1A =	
1) Main Control Room Panel 2CEC-PNL852/#852503	"UPS1A System Trouble"
2) Main Control Room Panel 2CEC-PNL852/#852504	"UPS1A On Battery Power"
For 2VBB-UPS1B =	
1) Main Control Room Panel 2CEC-PNL852/#852513	"UPS1B System Trouble"
2) Main Control Room Panel 2CEC-PNL852/#852514	"UPS1B On Battery Power"

ANNUNCIATOR LIST

Location/ Number	Description
For 2VBB-UPS1C =	
1) Main Control Room Panel 2CEC-PNL 852/#852523	"UPS1C System Trouble"
2) Main Control Room Panel 2CEC-PNL 852/#852524	"UPS1C On Battery Trouble"
For 2VBB-UPS1D =	
1) Main Control Room Panel 2CEC-PNL 852/#852533	"UPS1D System Trouble"
2) Main Control Room Panel 2CEC-PNL 852/#852534	"UPS1D On Battery Power"

ANNUNCIATOR LIST

Location/ Number	Description (Name)
For 2VBB-UPS1G =	
1) Main Control Room Panel 2CEC-PNL852/#852543	"UPS1G System Trouble"
2) Main Control Room Panel 2CEC-PNL852/#852544	"UPS1G On Battery Power"

COMPUTER POINT LIST

CP Ident. Number	Description (Name)
For 2VBB-UPS1A =	
1) VBB TC09	"UPS1A System Trouble"
2) VBB TC10	"UPS1A On Battery Power"
For 2VBB-UPS1B =	
1) VBB TC11	"UPS1B System Trouble"
2) VBB TC12	"UPS1B On Battery Power"
For 2VBB-UPS1C =	
1) VBB TC05	"UPS1C System Trouble"
2) VBB TC06	"UPS1C On Battery Power"
For 2VBB-UPS1D =	
1) VBB TC07	"UPS1D System Trouble"
2) VBB TC08	"UPS1D On Battery Power"
For 2VBB-UPS1G =	
1) VBB TC01	"UPS1G System Trouble"
2) VBB TC02	"UPS1G On Battery Power"

NIAGARA MOHAWK POWER CORP.

TEST SUMMARY

NOTE: EXCEPTIONS ARE INDICATED AT (E-1), (E-2), ETC.

REMARKS

5.4.1 - TEMPORARY MODIFICATION #85-5-063, A13A1 BOARD MODIFIED TO CORRECT GROUND DETECTION PROBLEM, MKulik 5/13/85. NI ON AS-FOUND TEST RESULTS MKulik 5/14/85

7.6 - BLUE MARK-UP * 013393 ON INFEED BREAKERS AND OUTPUT DISTRIBUTION PANEL MKulik 5/13/85

(E-1) 8.9.1 8.9.2 - AC FEED TO UPS ENTERS BOTTOM OF CB #1 - READINGS TAKEN AT SAME POINT MKulik 5/13/85

(E-2) 8.12.19.2 DC VOLTMETER M-3 READS 0 VOLTS - THIS IS NORMAL M-3 SHOW BATTERY INPUT VOLTS MKulik 5/13/85 - DC BREAKER IS OPEN AT THIS POINT MKulik 5/13/85

(E-3) 8.13.4.1 ~~D.K.~~ YC 5/13/85 DC VOLTS READS 125 VOLTS - PER ERF ES.71.003-1, DC VOLTS ARE NOT ADJUSTED TO 103 YET. MKulik 5/13/85,

8.14 - WITH UNIT AT 105.8 VDC DC LINK VOLTAGE FOLLOWING ALARMS EXIST - BATTERY DISCHARGE

BATTERY UNDER VOLTAGE
CHARGER
~~INVERTER~~ LOGIC MKulik 5/13/85

(E-4) 8.18.1 8.11.8 25% READING DONE WITH CLAMP - 50 - 100% WITH UPS METER. 25% TOO LOW TO READ ON UPS MKulik 5/13/85

cont. on pg 4.

NIAGARA MOHAWK POWER CORP.

TEST SUMMARY

REMARKS

8.18.1 WHEN FULL LOAD (GOING FROM 75% TO 100%) IS APPLIED (LINK) DC BUS DECAYS TO BELOW 103 TURNING UNIT OFF. UNIT WAS RESTARTED AT 120 V DC LINK VOLTAGE, FULL LOADED & THEN DC LINK WAS BROUGHT TO LOW LIMIT OF 105.7 VDC — UNIT STAYED ON yc 5/13/65

8.18.1 UNIT WOULD NOT ACCEPT LOAD WITHOUT CB-2 CLOSED — UNIT WAS BROUGHT UP & CB-2 CLOSED, FULL LOADED, THEN CB-2 WAS OPEN & UNIT DC LINK ADJUSTED DOWN TO 105.8 WITH THUMBWHEEL POT ON FRONT OF UNIT. FULL LOAD ~~RATE~~ yc 5/13/65 READINGS TAKEN AT THIS POINT. *See page 4 of Test Summary. yc 5/13/65

8.28.5.7 yc
8.29 CURRENT READ WITH CLAMP-ON, UNIT METER CALCULATIONS DIFFICULT TO READ BELOW 50 AMPS yc 5/13/65
CONT ON PG 4

8.29 50, 75 100 AMPS READINGS DONE WITH UPS METER yc 5/13/65

8.31.2.5 THIS STEP DONE TWICE — ONCE WHILE OBSERVING PHASE 1 & 2 AND ONCE FOR PHASE 1 & 3. yc 5/13/65

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NIAGARA MOHAWK POWER CORP.

TEST SUMMARY

REMARKS

8.31.3.4 TRANSFER DONE ONCE MONITORING PHASE 1 AND 2; AND ONCE MONITORING 1 & 3 yc 5/13/85

8.32.3.3 BLOCKING DIODE WORKED FINE, BUT FAULT CFR1/2 RELAY PICKED UP & LIGHT LIT. CFR1 WAS ADJUSTED & BLOCKING DIODE TEST WAS RERUN SUCCESSFULLY yc. 5/13/85

8.46 LOAD TEST VOLTAGE READINGS TAKEN USING H.P 34.0A. yc 5/13/85

8.31.2.6 THE PHASE TO NEUTRAL "TNO" WAS RECORDED IN ERROR. THIS IS SUPPOSED TO BE "2 TWO" PHASE TO PHASE. THIS DATA WAS RECORDED PRIOR TO ISSUANCE OF FRF ES.0071.003-3 yc 5/24/85

(E-4, E-5) - EXCEPTION DONE TO ALLOW GREATER ACCURACY OF DATA. ACCEPTANCE CRITERIA - ALL CRITERIA MET AS SHOWN IN INDIVIDUAL TEST. PICTURES SHOW EXCELLENT TRANSFER TIMES WITH MINIMAL TRANSIENTS, TEST SATISFACTORY yc 6/24/85

RECORD COPY

NIAGARA MOHAWK POWER CORP.

TEST SUMMARY

EXCEPTIONS E-1 THROUGH E-5 — VERBAL APPROVAL WAS RECEIVED FOR THESE DURING TEST — FINAL WRITTEN APPROVAL NOT DONE UNTIL 5/10/86 — RT JCC 5/10/86 5/1

APPROVED
BRIAN PARRY

REMARKS

BECAUSE OSCILLOSCOPE PICTURES WERE NOT CONCLUSIVE EVIDENCE OF TRANSFER PER CRITERIA 7.9.1.1.05, THAT PORTION OF THE TEST WAS REDONE USING A VISICORDER TO SHOW TRANSFER). THIS IS ATTACHED (TRACE & TEST ITSELF) AS ATTACHMENT 12.7 & 12.8

RT JCC 9/21/85

~~AT TIME OF RETEST~~ + JCC 5/10/86

ACCEPTANCE CRITERIA — TRANSFER TIME REQUIREMENT OF 4 MSEC OR LESS WAS MET. WORST CASE WAS 3.0 MSEC, SHEET 4 OF 4, ATTACHMENT 12.8, STEP 8.3.4.2 — THIS IS ACCEPTABLE RT JCC 9/21/85

TEST RESULTS WITH RETEST RESULTS ARE SATISFACTORY FOR ENTIRE TEST RT JCC 9/21/85

Step 8.1 The changes accomplished, should have been a test exception but was not noted as such. The action taken was technically correct and satisfies the requirements. This procedure therefore the action is considered to be proved.

RECORD COPY

10/17-85

NIAGARA MOHAWK POWER CORPORATION
NMP2

FIELD REVISION FORM

TEST FOLDER NUMBER	FRF NO.
71.809/75.001/75.002	ES.0071.003-1

PROCEDURE TITLE	NO.	REV.
75KVA UNINTERRUPTIBLE POWER SUPPLIES	ES.0071.003	0

PROCEDURE REVISION REQUIRED X yes __ no BOB CRANDALL

DESCRIPTION OF CHANGE

CHANGE STEP 8.13 TO 8.14
8.14 TO 8.13
8.14.1 – 8.13.1
8.14.2 – 8.13.2
8.14.3 – 8.13.3
8.14.3.1 – 8.13.3.1
8.14.3.2 – 8.13.3.2
8.14.4.1 – 8.13.4.1
8.14.4.2 – 8.13.4.2
8.14.4.3 – 8.13.4.3
8.14.4.4 – 8.13.4.4

ON NEW STEP 8.14 (OLD STEP 8.13) CHANGE WORDING TO READ THUS –
"ADJUST UPS RECTIFIER DC OUTPUT VOLTAGE TO 103 ± 2 VOLTS DC OR AS LOW AS POT R71 ON A13A2 WILL ALLOW. RECORD THE HI-LOW RECTIFIER VOLTAGE

REASON FOR CHANGE

POT R-71 WILL NOT ALLOW ADJUSTMENT TO 103.
(IT ADJUSTS TO 105.8 VDC ON UPSIC)

R J Cullo 5/13/85

AUTHORIZED BY SSS (if applicable)
1. E J Stockmann date 5-13-85 2. N/A date N/A

APPROVED X yes no date JTG mtg no.
5-15-85 85-30

RETEST REQUIRED specify N/A DR No. ____

REVISION INCORPORATED (if applicable) date

30

RECORD COPY

0 0 8 7 8 3 1 7 1 8

NIAGARA MOHAWK POWER CORPORATION
NMP2

FIELD REVISION FORM

TEST FOLDER NUMBER	FRF NO.
71.809/75.001/75.002	ES.0071.003-2

PROCEDURE TITLE	NO.	REV.
75 KVA UNINTERRUPTIBLE POWER SUPPLIES	ES.0171.003	0

PROCEDURE REVISION REQUIRED X yes __ no BOB CEANDALL

DESCRIPTION OF CHANGE

CHANGE STEP 8.23 TO STEP 8.20
8.24 STEP 8.21
8.20 ⟶ 8.22 DELETE "AND ADJUST... VOLT".
8.25 ⟶ 8.23
8.26 ⟶ 8.24
8.27 ⟶ 8.25
8.21 ⟶ 8.26 ADD WORDS "ADJUST UPS RECTIFIER DC OUTPUT VOLTAGE TO 140 VDC ±1 VOLT. RECORD THE NO-LOAD UPS RECTIFIER OUTPUT VOLTAGE.
_____ VDC _____"
8.22 ⟶ 8.27

REASON FOR CHANGE

1) STEPS ARE OUT OF SEQUENCE
2) CB-2 CANNOT BE CLOSED UNTIL UPS IS STARTED.
3) RECTIFIER OUTPUT CANNOT BE ADJUSTED UNTIL CB-2 IS CLOSED

R A J Call 5/13/85

AUTHORIZED BY SSS(if applicable)
1. E. J. Stockman date 5-13-85 2. N/A date N/A

APPROVED yes no date JTG mtg no.
5-15-85 85-30

RETEST REQUIRED specify N/A DR No. _____

REVISION INCORPORATED (if applicable) date

RECORD COPY

NIAGARA MOHAWK POWER CORPORATION
NMP2

FIELD REVISION FORM

TEST FOLDER NUMBER	FRF NO.
71.B09/75.001/75.002	ES.0071.003-3

PROCEDURE TITLE	NO.	REV.
75 KVA UNINTERRUPTIBLE POWER SUPPLIES	ES.0071.003	0

PROCEDURE REVISION REQUIRED yes X no

DESCRIPTION OF CHANGE

1) FOR STEP 8.31.2.6:
CHANGE "Q1" TO READ "Q1 TO Q2"
CHANGE "Q2" TO READ "Q2 TO Q3"
CHANGE "Q3" TO READ "Q1 TO Q3"

2) ADD "STEP 8.56."
"WITH UPS OPERATING NORMALLY OFF AC POWER TRANSM
ON A PORTABLE RADIO WHILE STANDING WITHIN TWO
FEET OF THE FRONT, BACK AND EACH SIDE OF
UPS. VERIFY THAT UPS DOES NOT TRIP
AND NO ALARMS ARE ACTIVATED." / "

REASON FOR CHANGE

1) PROCEDURE STEP TYPED IN ERROR- READINGS
ARE TAKEN PHASE TO PHASE FOR
REGULATOR DISTORTION.

2) CHANGE WILL VERIFY THE ABILITY TO OPERATE
RADIOS NEAR UPS.

5/16/85

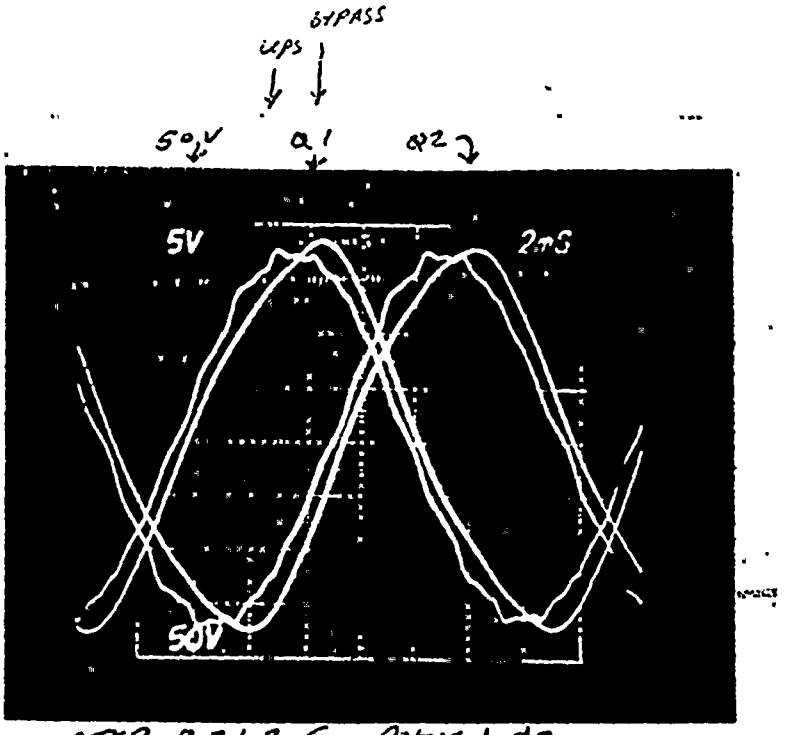
AUTHORIZED BY
1. [signature] date 5-16-85 2. N/A date

APPROVED X yes no date JTG mtg no.
5-22-85 85-31

RETEST REQUIRED specify N/A DR No.

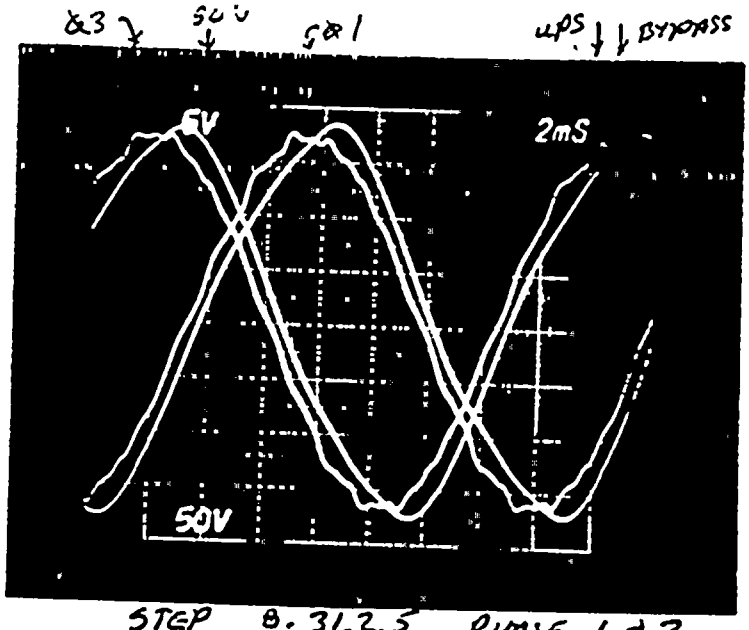
REVISION INCORPORATED (if applicable) date

RECORD COPY



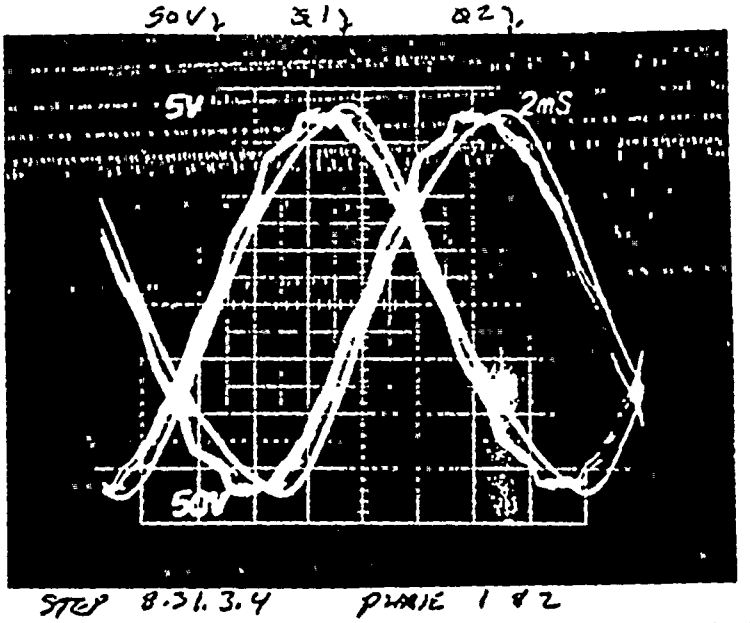
STEP 8-3L2.5 PHASE 1 & 2

FULL LOAD TRANSFER (MANUAL) FROM UPS. INVERTER TO ALTERNATE SUPPLY Q1 & Q2 SHOWN — NO INTERRUPTION OF POWER, SLIGHT PHASE SHIFT.



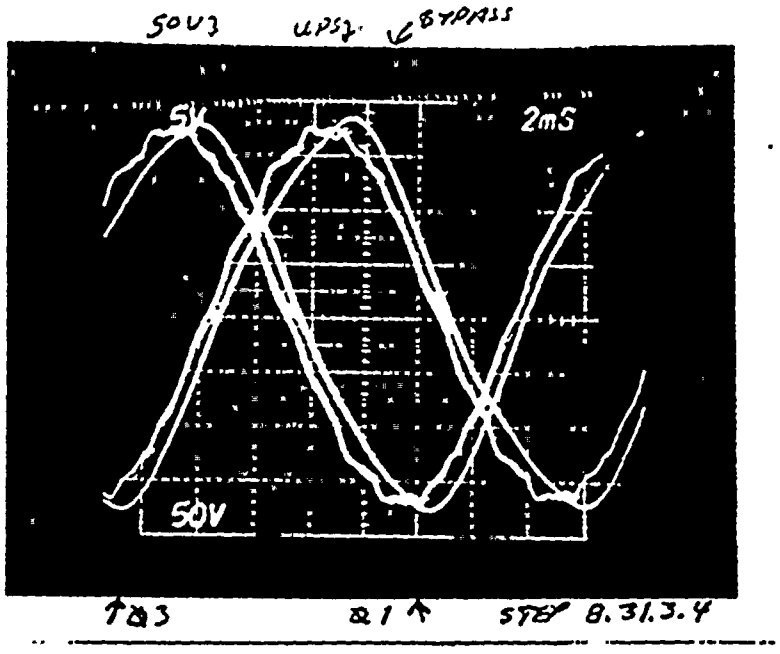
STEP 8.31.2.5, PHASE 1 & 3

FULL LOAD TRANSFER (MANUALLY) FROM UPS INVERTER TO ALTERNATE SUPPLY. Ø1 & Ø3 SHOWN — NO INTERRUPTION OF POWER, SLIGHT PHASE SHIFT.



STEP 8.31.3.4 PHASE 1 & 2

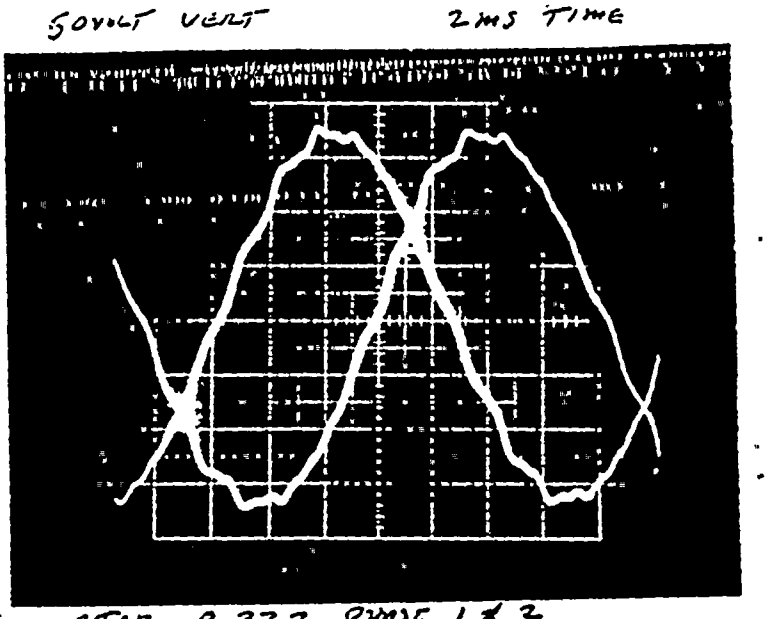
MANUAL TRANSFER FROM BYPASS POWER TO UPS INVERTER. PHASE 1 & 2 SHOWN — NO INTERRUPTION OF POWER, SLIGHT PHASE SHIFT.



MANUAL TRANSFER FROM BYPASS POWER TO UPS INVERTER.

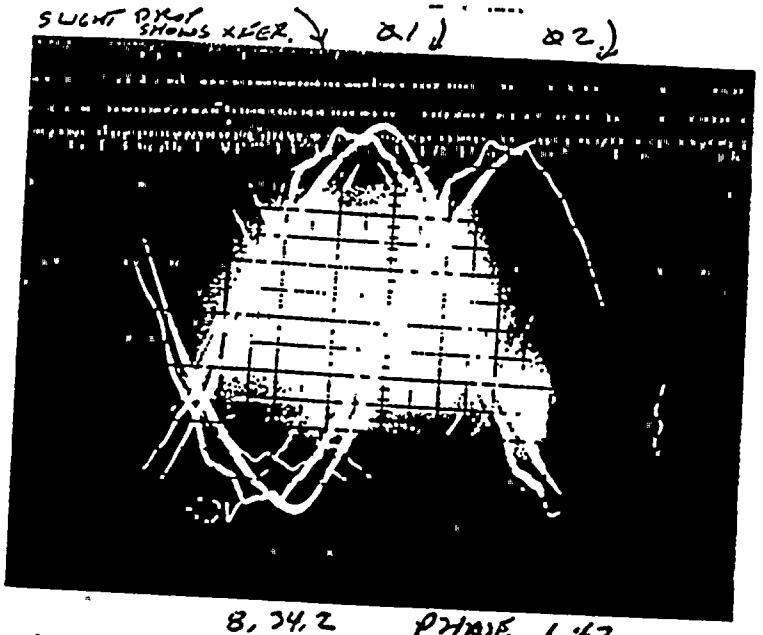
PHASE 1 & 3 SHOWN -

NO INTERRUPTION OF POWER, SLIGHT PHASE SHIFT.



STEP 8.33.3 PHASE 1 & 2

UPS ON FULL LOAD, AC (NORMAL) BREAKER TO UPS OPENED. INVERTER CONTINUED TO OPERATE USING BATTERY POWER - NO TRANSFER, NO INTERRUPTION.



FULL LOAD "CRASH" TRANSFER FROM UPS TO BYPASS PHASE 1 Ø2 SHOWN. NORMAL AC + DC FEEDS OPENED. UPS TRANSFER TO BYPASS.

NOTE, SLIGHT DROP OF VOLTAGE LEVEL ON PHASE 1 FOR 2 MSECONDS. THIS IS WELL WITHIN ACCEPTANCE CRITERIA

TEST FOLDER # 75.002.E
Equipment Name 2UBB-UPSIC
Equipment Mark # 2UBB-UPSIC

Attachment 12.7
Page 33 of 33
P. 1 of 2

MARGINAL QUALITY

REMARKS

NOTE: THE OSCILLOSCOPE PICTURES TAKEN OF TRANSFER DO NOT CLEARLY SHOW TRANSFERS. THEREFORE A RETEST OF THAT PORTION OF THE TEST USING A VISICORDER WILL BE PERFORMED TO SHOW TRANSFERS - SEE ATTACHED RETEST SHEETS (ATTACHMENT 12.7 & 12.8) RJC 9/4/85

PRIOR TO RETEST UNIT WAS SHUTDOWN, MAIN BREAKERS FEEDING UPSIC WERE OPENED, LOAD UNIT WAS ATTACHED TO OUTPUT OF UPSIC AS DESCRIBED IN STEP 6.4. TEST EQUIPMENT RECORDED ON ATTACHMENT 12.7 RJC 9/4/85

PRIOR TO RETEST UNIT WAS BROUGHT UP TO FULL LOAD AS SHOWN BY FOLLOWING -

AMPS ON UPS AC CURRENT (OUTPUT) METER ON UPS - 170 AMPS AC

VOLTAGE ON UPS AC OUTPUT VOLTMETER - 120.5 VAC

RJC 9/4/85

- UNIT WAS OPERATIONAL AT TIME OF RETEST SO NO PREREQUISITES WERE REQUIRED TO BE REVERIFIED RJC 5/13/86

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Verified By yellb Date 9/4/85

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TEST FOLDER # 75.00.2.E
Equipment Name 2VBB-UPSIC
Equipment Mark # 2VBB-UPSIC

8.31 Operationally test the static switch and UPS control circuits at full rated test load as follows:

8.31.1 Attach disturbance analyzer to UPS output and monitor UPS output voltage. per J Cullen (Nonsafety-Related) JC 1 9/4/85

8.31.2 Manually transfer full rated load from the inverter to the alternate AC supply as follows:

8.31.2.1 Verify that the "UTIL SYNC OK" lamp is lit. JC 1 9/4/85

8.31.2.2 Verify that the "NO-BREAK TRANSFER, TO BYPASS" lamp is lit.

JC 1 9/4/85

8.31.2.3 Place the transfer control switch in the bypass position.

JC 1 9/4/85
Initial/Date

8.31.2.4 Release the switch and allow it to spring back to the "Manual Restart" position.

JC 1 9/4/85

NOTE: This transfers load to the bypass source.

8.31.2.5 Observe the disturbance analyzer printout during transfer. Attach printout to the procedure and number it to reference this step number.

JC 1 9/4/85

8.31.2.6 Read and record the total harmonic distortion with (THD) UPS on bypass source.

Ø1 N/A
Ø2 N/A
Ø3 N/A % THD (previously measured per 9/4/85)
(≤ 5% THD)

N/A 1

8.31.3 Manually transfer full rated load from the alternate supply to the inverter (UPS) as follows:

8.31.3.1 Restart the UPS and then verify that the "UTIL SYNC OK" lamp is lit.

JC 1 9/4/85

8.31.3.2 Verify that the "NO BREAK TRANSFER READY - TO UPS" lamp is lit.

JKL 7/4/95 JKL 9/4/95

8.31.3.3 Place the "CB-3" switch in the closed position. JKL 9/4/95

NOTE: This transfers load to the inverter.

8.31.3.4 Observe the disturbance analyzer printout during transfer. Attach printout to the procedure and number it to reference this step number.

JKL 7/4/95

8.32 Verify that the blocking diode will not conduct when the DC supply voltage is raised to 140 V (when equalizing the batteries) as follows:

8.32.1 With the UPS supplying full load, move the float/equalize switch on the associated charger to the equalize position.

N/A (STEPS PREVIOUSLY DONE)

8.32.2 On the UPS DC voltmeter, read the battery input voltage and record. JKL 9/4/95

N/A vdc N/A

8.32.3 Confirm that the blocking diode is not conducting by verifying the following:

8.32.3.1 Verify that the battery ammeter on the UPS reads approximately zero amps.

N/A

8.32.3.2 Read and record the battery current on Data Sheet.

N/A adc N/A

8.32.3.3 Verify that the "Blocking Diode Conducting" mimic light is not lit.

N/A

8.32.4 Return the float/equalize switch to the float position.

N/A

8.33 Operate UPS off DC power as follows:

8.33.1 With full rated load supplied from the inverter and the UPS supplied from the normal AC supply, open the normal AC supply breaker at the switchgear.

JKL 9/4/95

8.33.2 Read and record the full load DC input amperes from the UPS battery ammeter.

520 adc JC 1 9/4/85

8.33.3 Observe the distrubance analyzer printout during transfer. Attach printout to the procedure and number it to reference this step number.

JC 1 9/4/85

8.33.4 With the UPS supplied from the DC source, measure and record full load output inverter AC current, voltage, and frequency, as indicated on the UPS meters.

Full load AC Output Current 170 adc
AC Output Voltage 120.5 vac(117.6 - 122.4 vac)
Output Frequency N/A HZ(59.5 - 60.5 HZ)
(PREVIOUSLY VERIFIED JCH 9/4/85) JC 1 9/4/85

8.34 Simulate an inverter failure with automatic transfer as follows:

8.34.1 With the UPS supplied form the DC source, open the DC supply breaker at its associated switchgear.

JC 1 9/4/85
Initial/Date

8.34.2 Observe the distrubance analyzer printout during transfer. Attach printout to the procedure and number it to reference this step number.

JC 1 9/4/85

8.34.3 Verify transfer by verifying the following:

8.34.3.1 The "CB-3" open lamp is lit. JC 1 9/4/85

8.34.3.2 The "CB-4" closed lamp is lit. JC 1 9/4/85

8.34.3.3 The "No External DC Closed" lamp is lit. JC 1 9/4/85

8.34.3.4 Verify that the normal AC source ammeter reads approximately zero amps.

JC 1 9/4/85

8.34.3.5 Verify that the battery ammeter reads approximately zero amps.

JC 1 9/4/85

35 Place breaker CB3 switch in the open position. JC 1 9/4/85

F_{NL} = UPS inverter frequency at no load (measured in Section 8.29 for rectifier DC set at 140 V DC)

FR = N/A X 100% = N/A % (± .833% Max)

(STEPS PREVIOUSLY VERIFIED — [illegible] 9/4/85)

8.45 Step Deleted.

8.46 Raise the test load 100% of rated UPS capacity in 25% steps, allowing current to stabilize between steps. Commence 24 hour load test. Choose phase used in calculation in step 8.40 and take readings hourly and record data on Attachment 12.2

N/A /

8.47 At the end of 24 hours attach harmonic distortion analyzer to UPS output. Read and record the UPS output harmonic distortion with UPS on normal power.

Ø1 N/A % THD
Ø2 N/A %
Ø3 N/A %
(≤5% THD)

N/A /

8.48 Reduce load to 0 amps in 25% steps, allowing current and voltage to stabilize between steps.

N/A /

8.49 Replace UPS output cables as follows:

8.49.1 Verify that the NO-BREAK TRANSFER, READY-TO BYPASS lamp is lit.

N/A /

8.49.2 Transfer the load to the bypass source by placing the transfer control switch momentarily in the bypass position. (A spring will return the switch to the MANUAL RESTART position).

N/A /

8.49.3 Open the inverter output breaker (CB3) by placing the Inverter Output Switch in the open position.

N/A /

8.49.4 Manually, open the battery breaker (CB2). [illegible] 9/4/85

8.49.5 Manually, open the AC input breaker (CB1). [illegible] 9/4/85

8.49.6 After one minute, open A27CB1 and A27S1. [illegible] 9/4/85

8.49.7 De-energize the AC feed to the UPS at the associated switchgear. [illegible] 9/4/85

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8.49.8 De-energize the DC feed to the UPS at the appropriate switchgear.

JK 1 9/4/85

8.49.9 Open CB5 on the alternate supply transformer. JK 1 9/4/85

8.49.10 Disconnect the load test unit from terminals E13, E14, E15, and E16 and reconnect the output feeder cable(s).

JK 1 9/4/85

8.50 Read and record elapsed time meter reading. Verify that elapsed time meter reading has changed from its initial reading in Step 8.8.

2514.8 JK 1 9/4/85

8.51 Close the AC feed to the UPS at the associated switchgear. JK 1 9/4/85

8.52 Close the DC feed to the UPS at the associated switchgear. JK 9/4/85

8.53 Energize the associated UPS output panels by closing CB-5 on the alternate supply transformer.

JK 1 9/4/85

8.54 Start-up UPS and transfer output load to UPS.

JK 1 9/4/85

8.55 Verify phase rotation to be A-B-C at associated UPS output panels and record on data sheet.

(OUTPUT CABLES LEFT ON DURING TEST, ROTATION PREVIOUSLY VERIFIED)

N/A. 1 TMJ CLC 9/4/85

9.0 ACCEPTANCE CRITERIA

9.1 For UPS rectifier voltages of 103 to 140 VDC, the UPS output voltage shall be:

117.6 - 122.4 vac (Step 8.15.1, 8.18.1, 8.22, 8.29).

The UPS output frequencies shall be 59.5 to 60.5 Hz. (Steps 8.15.2, 8.18.1, 8.22, 8.29).

The UPS output phase separation with balanced loads shall be 119° to 121°. (Step 8.30).

Transient AC output voltage deviation, averaged over one-half cycle shall not exceed +10% (approx. +12 VAC.) or -25% (Approx. -30 VAC) for 100% load application or removal and shall return to within ± 2% (Approx. 2.4 VAC) within 3 cycles. (Steps 8.31.2.5, 8.31.3.4, 8.34.2).

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1.7.3 2
0 8 7 8 3

9.5 Output voltage regulation shall be less than or equal to ±2 percent from no load to full load. (Steps 8.11.10, 8.38, 8.40).

9.6 Output frequency regulation shall be less than or equal to ±0.833 percent of 60 HZ from no load to full load. (Step 8.42, 8.44).

9.7 Logic power supply voltage shall be greater than 16.5 Vdc. (Step 8.12.3).

9.8 Transfer time ≤ 1/4 cycle (Step 8.31.2.5, 8.31.3.4, 8.34.2).

9.9 Total harmonic distortion ≤ 5% of the fundamental. (Steps 8.31.2.6, 8.47).

10.0 RESTORATION OF EQUIPMENT TO NORMAL STATUS

10.1 Disconnect and remove all test equipment as necessary.

JCL 9/4/85

10.2 Replace panels and doors as necessary. JCL 9/4/85

10.3 Systems and/or components shall be placed in a configuration to support operational and/or test requirements.

JCL 9/4/85

11.0 REFERENCE

11.1 Manufacturers' Manuals:

Exide 75 KVA UPS NMP2-E035A (101-710-343-77223), 10/28/81

11.2 Uninterruptible Power Supply Equipment Specification NMP2-E035A, Rev. 1 including Addendum 1-4.

12.0 ATTACHMENTS

12.1 75 KVA Uninterruptible Power Supply Block Diagram

12.2 Uninterruptible Power Supply Inspection and Test Record - 75KVA UPS

12.3 Annunciator List

12.4 Computer Point List

12.5 Test Summary

Test Folder No. 75.002.I

Equipment Name 2VB3-UPS1C

Equipment Mark No. 2VB3-UPS1C

NMP2
ES.007I.003
Rev. 0
Attachment ~~12.2~~ 12.7
~~Sheet 1 of 1~~
~~Page 25 of 30~~ PAGE 8 of 8
Julie 9/11

UNINTERRUPTIBLE POWER SUPPLY INSPECTION AND TEST RECORD 75KVA UPS

Reference Documents E035A/VE/101 710343 77223 Rev. 10/81
Rev.
Rev.

UPS Nameplate Data Mark #- 2VB3-UPS1C
Serial #- RL 77223-3

8.46. 24 Hour Load Test

- Take Readings on Phase N/A :

N/A

Time	Volts	Amps	Time	Volts	Amps	Time	Volts	Amps

N/A

8.55 Phase rotation for UPS output panels after removal of test load cables:

N/A

Panel Number	Rotation

N/A

TEST EQUIPMENT	M&TE NO.	CAL. DUE DATE
VISICORDER (MAIN)	8404	8/7/86
" (MODULE (#1)	8398	8/7/86
" (MODULE (#2	8395	8/7/86

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ATTACHMENT 1208
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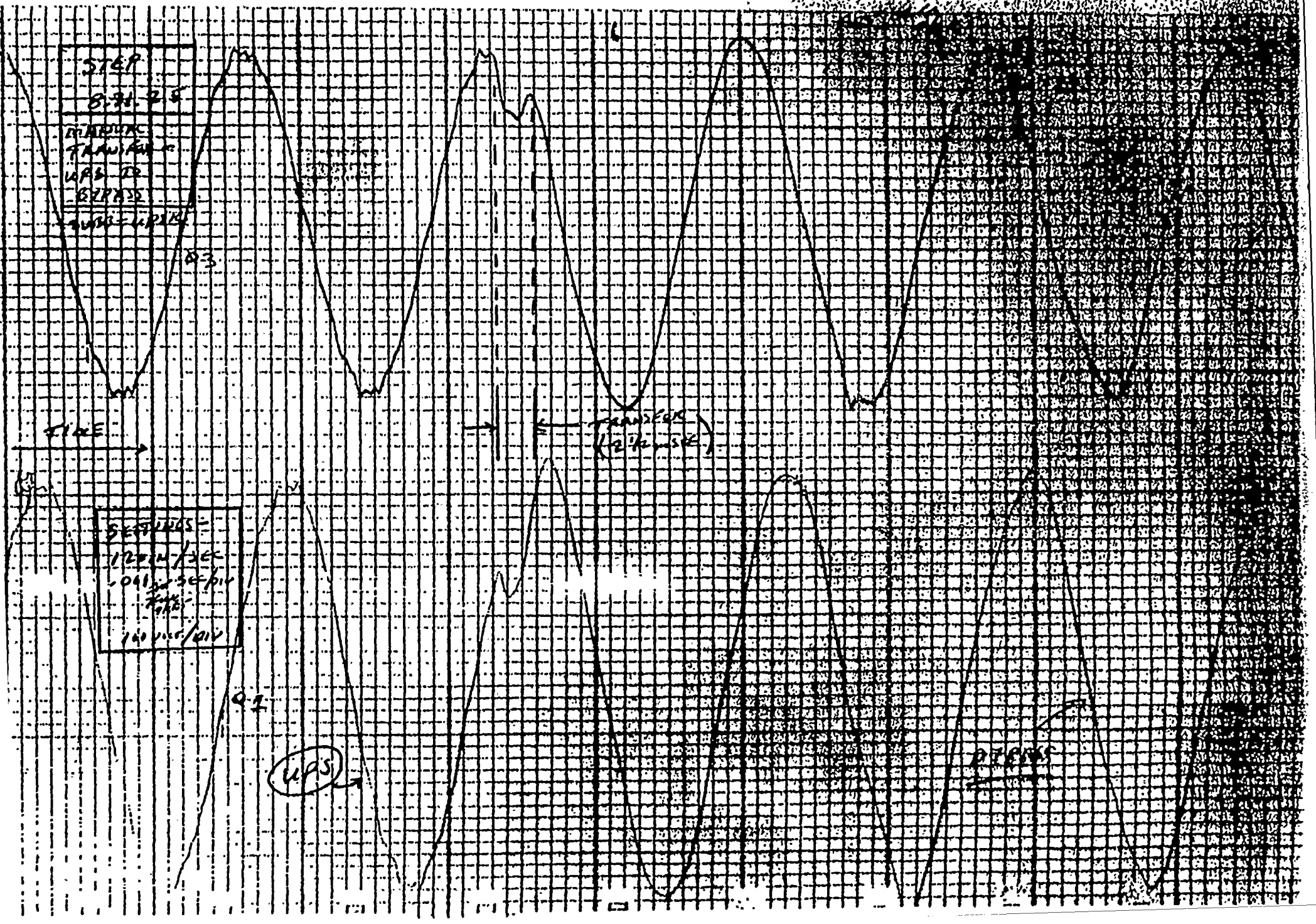
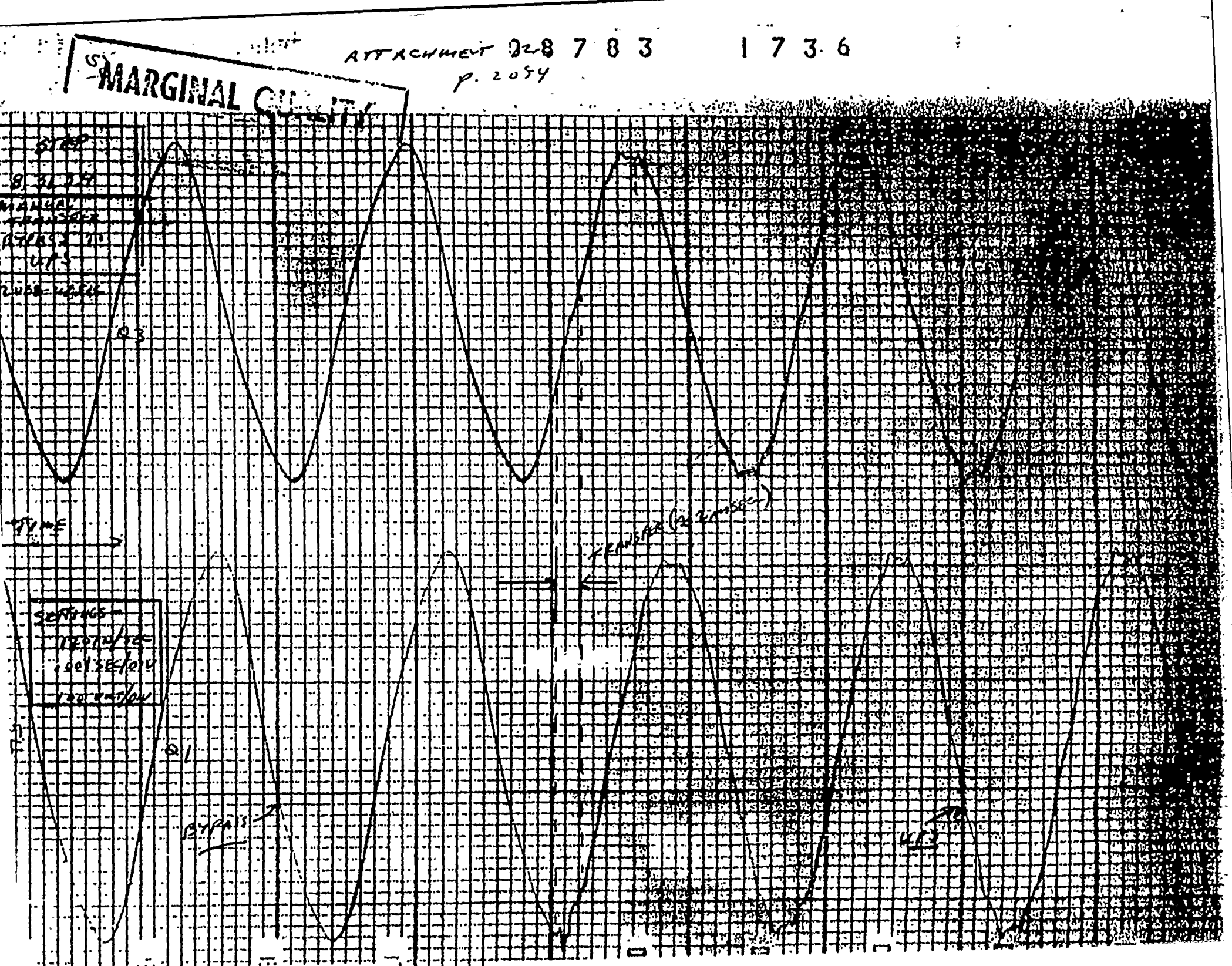
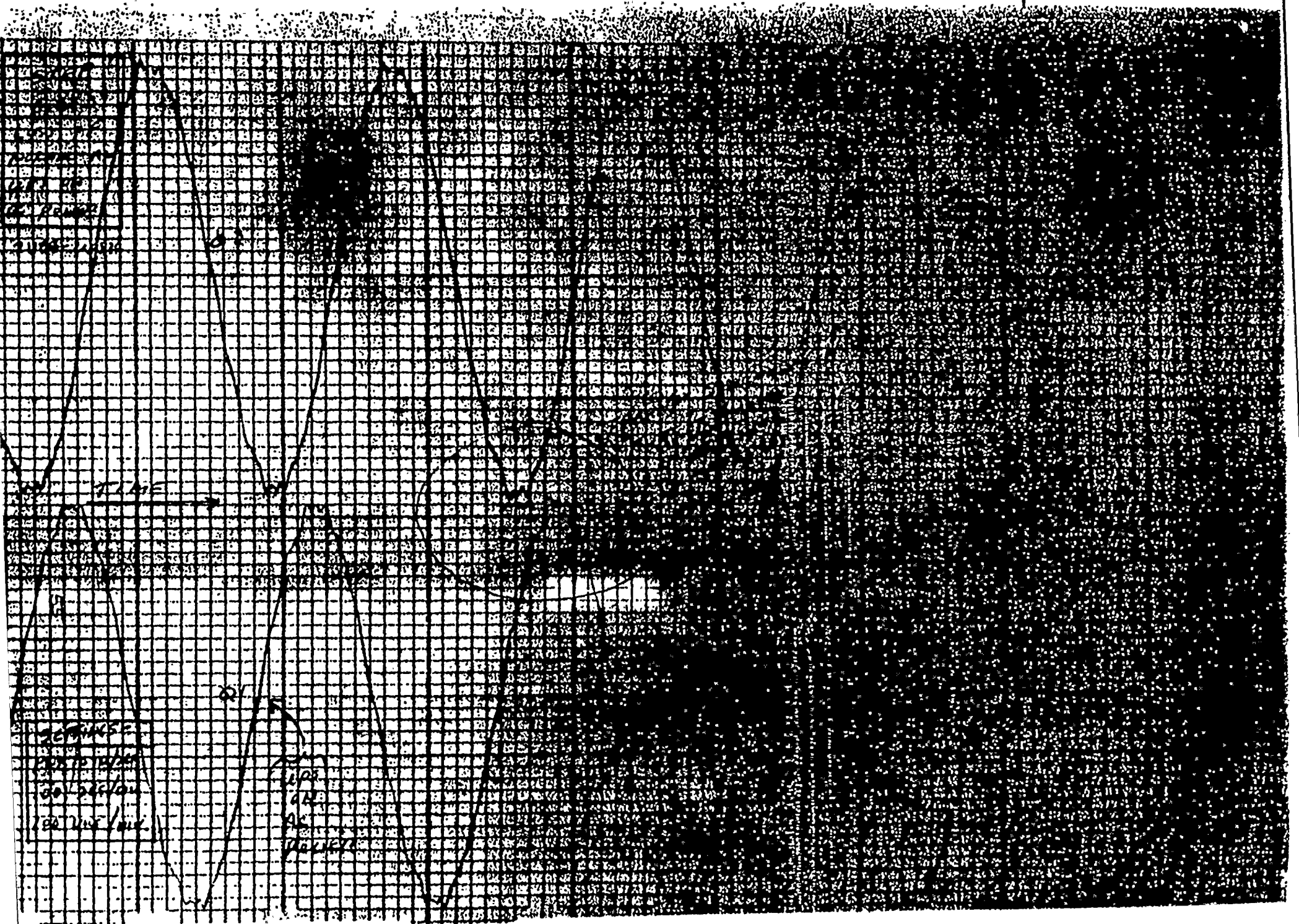
83 1735

MARGINAL QUALITY



ATTACHMENT 2 8 7 8 3 1 7 3 6
P. 2054





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ATTACHMENT 12-B
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