GEC ALSTHOM

ELECTROMECHANICAL

FERMI 2
LP ROTOR INSPECTIONS
NDT REPORTS

CONFIDENTIAL

LARGE STEAM TURBINES
CONSTRUCTION & SERVICE

Telephone : **0788 531954**

Telex : **31463**

Fax : **0788 531949**

2.790 MATERIAL
Withhold From Public Disclosure

Date: 8 June 1994

B/9

QUALITY ASSURANCE PLANNED INSPECTION TRAFFORD PARK	GEC ALSTHOM TURBINE GENERATORS LTD Electromechanical Division	QCA 056/U Page 1 of 9

PROCESS SPEC	ISSUE	CLASS.CODE.QUALITY ETC	REPORT NO
181/0220	4/89	To APPROVED PROCEDURES.	T3366

NOMINAL NO	CONTRACT NAME	ASSEMBLY/SCHEDULE DRG NO	COMB	JOB NO	CLOCK NO
789M5360/93/439012	ENRICO FERMI				

ITEM	DESCRIPTION OF PART	BIN NO	TOTAL MATL	NAME
	LP 1 ROTOR EERF 11968			
PART NO	STAGE 4, 5 AND 6 FRONT AND REAR DISCS	PATT/SECT	MATL SPEC.	TOTAL OFF 1

OP NO & CENTRE & ROUTE	OPERATION
410 N1	ULTRASONIC EXAMINATION OF THE STAGE 4, 5 AND 6 FRONT AND REAR BLADE ROOT FASTENINGS AND STRADDLE ROOT DISC HEIGHTS INLET AND EXHAUST SIDE.

NDT REPORT

DATE OF EXAMINATION 11-5-94

FLAW DETECTOR USD10 USD11 | SENSITIVITIES | SERIAL NO. 2671 AND 5959

1) NORMAL PROBES. ATTENUATOR SETTING FOR F.S.H FROM 25MM THICK ON THE IIW BLOCK.
2) SHEAR WAVE PROBES. ATTENUATOR SETTING FOR F.S.H FROM 100MM RADIUS ON THE IIW BLOCK.

PROBE	SINGLE MHZ		TWIN MHZ		ADDITIONAL PROBES		
					PROBE	MHZ	
	dBS IIW BLOCK	dBS	dBS IIW BLOCK	dBS	STATE IF SINGLE OR TWIN	dBS IIW BLOCK	dBS
NORMAL							
38		REFER TO ATTACHED SHEETS FOR PROBES AND					
45		SENSITIVITIES USED					
60							
70							

COUPLANT ULTRAGEL SURFACE CONDITION ASH BLAST

RESULTS No CRICKLIKE INDICATIONS EVIDENT IN AREAS EXAMINED.

2.790 MATERIAL

DAS NO.

ACCEPTABLE YES/~~NO~~

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OPERATOR: TJG LE WHITE APPROVALS: PCN II DATE: 12-5-94

DATE OF ISSUE	ORIG'L	REV A	REV B	REV C		ISSUED BY
	09.10.80	16.02.81	24.06.82	13.11.91		

NDT REPORT - CONTINUATION SHEET REPORT NO T3366

ENRICO FERMI LP 1 ROTOR. EERF 11988 8/5/94

ULTRASONIC EXAMINATION OF THE STAGE 4, 5 AND 6 FRONT AND REAR BLADE ROOT FASTENINGS AND STRADDLE ROOT DISC HEADS. FOR POSSIBLE CRACKING EMINATING FROM THE PRESSURE FACE RADII.

ALL SCANNING SURFACES HAVE BEEN CLEANED BY ASH BLASTING AND ARE SUITABLE FOR UNIFORM ULTRASONIC COUPLING.

INSPECTIONS WERE CARRIED OUT BY G.E.C ALSTHOM NDT ENGINEERS QUALIFIED TO PCN LEVEL 2. (FORGINGS).

TEST EQUIPMENT

USN10 ULTRASONIC FLAW DETECTOR
USIP11 ULTRASONIC FLAW DETECTOR.

4MHZ 10mm DIA. 45°, 60° AND 70° SHEAR WAVE PROBES. (SINGLE CRYSTAL)
5MHZ 4mm DIA. 55° AND 58° SHEAR WAVE PROBES. (SINGLE CRYSTAL).
B.S. A2 AND A4 CALIBRATION BLOCKS.

TEST SENSITIVITY

FULL PATH LENGTH REFERENCE BLOCKS WERE NOT AVAILABLE AT THE TIME OF TESTING.

REFERENCE SENSITIVITY WAS THE CALIBRATED GAIN SETTING IN dB NECESSARY TO ORTHIN AN 80% FULL SCREEN HEIGHT RESPONSE FROM THE 100mm AND 50mm RADIUS ON THE A2 BLOCK AND A4 BLOCK RESPECTIVLEY

THE CALIBRATED GAIN WAS INCREASED TO ORTHIN A 2 TO 3mm GRASS LEVEL AT MAXIMUM TESTING DISTANCE.

COUPLANT ULTRAGEL

2.790 MATERIAL
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NDT REPORT - CONTINUATION SHEET REPORT NO T3366

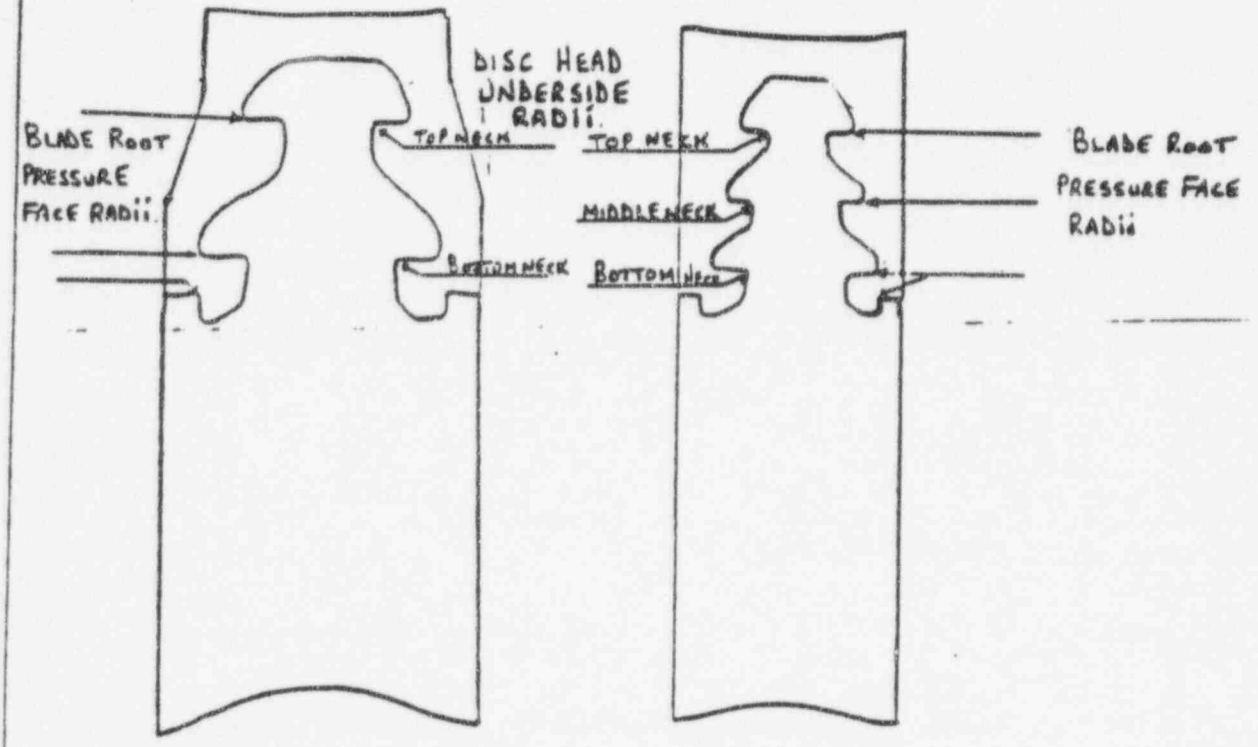
TESTED AT THE WESTINGHOUSE FACILITY CHARLOTTE. N. CAROLINA.

SCANNING

STAGE 4 BLADE ROOTS.	45° PROBE.
STAGE 5 BLADE ROOTS.	45° AND 55° PROBE.
STAGE 6 BLADE ROOTS.	58°, 60° AND 70° PROBE.
STAGE 4 DISC HEADS.	45°, 60° AND 70° PROBE.
STAGE 5 DISC HEADS	45° AND 70° PROBE.
STAGE 6 DISC HEADS	45° AND 70° PROBE.

LIMITATIONS OF TEST

STAGE 4 STRADDLE ROOT DISC HEAD LIMITED EXAMINATION TO THE TOP NECK UNDERSIDE RADII, DUE TO THE POSITION OF THE DISC BALANCE HOLES. COULD NOT BE TESTED IN THESE AREAS ONLY.



STAGE 5 AND 6 DISC HEAD AND BLADE ROOT

STAGE 4 DISC HEAD AND BLADE ROOT

DATE OF ISSUE	ORIG'L	REV A	REV B			ISSUED BY:
	5/77	6/76	11/01			

NDT REPORT - CONTINUATION SHEET REPORT NO T3366

ENRICO FERMI LP 1 ROTOR. EERF 11988 8/5/94

ULTRASONIC EXAMINATION OF THE STAGE 4, 5 AND 6 FRONT AND REAR BLADE ROOT FASTENINGS AND STRADDLE ROOT DISC HEADS. FOR POSSIBLE CRACKING EMINATING FROM THE PRESSURE FACE RADII.

ALL SCANNING SURFACES HAVE BEEN CLEANED BY ASH BLASTING AND ARE SUITABLE FOR UNIFORM ULTRASONIC COUPLING.

INSPECTIONS WERE CARRIED OUT BY G.E.C ALSTHOM N.D.T ENGINEERS QUALIFIED TO PCN LEVEL 2. (FORGINGS).

TEST EQUIPMENT

USN10 ULTRASONIC FLAW DETECTOR
USIP11 ULTRASONIC FLAW DETECTOR.

4MHZ 10mm DIA. 45°, 60° AND 70° SHEAR WAVE PROBES. (SINGLE CRYSTAL)
5MHZ 4mm DIA. 55° AND 58° SHEAR WAVE PROBES. (SINGLE CRYSTAL)
B.S. A2 AND A4 CALIBRATION BLOCKS.

TEST SENSITIVITY

FULL PATH LENGTH REFERENCE BLOCKS WERE NOT AVAILABLE AT THE TIME OF TESTING.

REFERENCE SENSITIVITY WAS THE CALIBRATED GAIN SETTING IN db NECESSARY TO ORTHIN AN 80% FULL SCREEN HEIGHT RESPONSE FROM THE 100mm AND 50mm RADIUS ON THE A2 BLOCK AND A4 BLOCK RESPECTIVLEY

THE CALIBRATED GAIN WAS INCREASED TO ORTHIN A 2 TO 3mm GRASS LEVEL AT MAXIMUM TESTING DISTANCE.

COUPLANT ULTRAGEL

2.790 MATERIAL
Withhold From Public Disclosure

NDT REPORT - CONTINUATION SHEET REPORT NO T3366

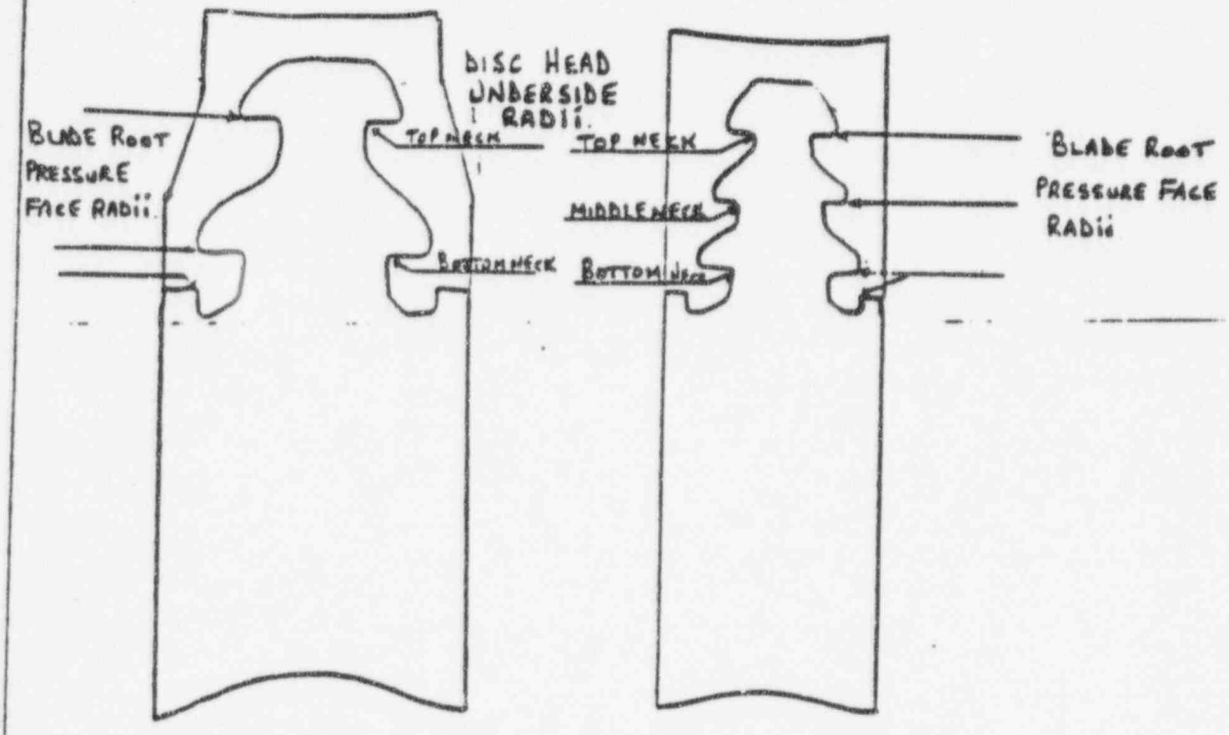
TESTED AT THE WESTINGHOUSE FACILITY CHARLOTTE. N. CAROLINA.

SCANNING

STAGE 4 BLADE ROOTS.	45° PROBE.
STAGE 5 BLADE ROOTS.	45° AND 55° PROBE.
STAGE 6 BLADE ROOTS.	58°, 60° AND 70° PROBE.
STAGE 4 DISC HEADS	45°, 60° AND 70° PROBE.
STAGE 5 DISC HEADS	45° AND 70° PROBE.
STAGE 6 DISC HEADS	45° AND 70° PROBE.

LIMITATIONS OF TEST

STAGE 4 STRADDLE ROOT DISC HEAD LIMITED EXAMINATION TO THE TOP NECK UNDERSIDE RADII, DUE TO THE POSITION OF THE DISC BALANCE HOLES. COULD NOT BE TESTED IN THESE AREAS ONLY.



STAGE 5 AND 6 DISC HEAD AND BLADE ROOT

STAGE 4 DISC HEAD AND BLADE ROOT

DATE OF ISSUE	ORIG'L 5/77	REV A 6/76	REV B 11/81			ISSUED BY:

NDT REPORT - CONTINUATION SHEET REPORT NO T3366

REFERENCE AND TEST SENSITIVITIES. FRONT END.

STAGE 4 BLADE ROOTS

	PROBE	RANGE	A4 BLOCK	SCANNING
45°	116521	50mm	8dbs	30dbs

STAGE 5 BLADE ROOTS

	PROBE	RANGE	A2 BLOCK	SCANNING
116521	45°	100mm	10dbs	32dbs
J164	55°	50mm	A4 8dbs	30dbs

STAGE 6 BLADE ROOTS

	PROBE	RANGE	A2 BLOCK	SCANNING
J212	52°	100mm	10dbs	32dbs
116592	60°	100mm	24dbs	50dbs
109661	70°	100mm	18dbs	44dbs.

STAGE 4 DISC HEAD

	PROBE	RANGE	A2 BLOCK	SCANNING
116521	45°	100mm	10dbs	32dbs
116592	60°	100mm	24dbs	50dbs
109661	70°	200mm	18dbs	44dbs.

STAGE 5 DISC HEAD

	PROBE	RANGE	A2 BLOCK	SCANNING.
116521	45°	100mm	10dbs	32dbs.
109661	70°	200mm	18dbs	44dbs.

STAGE 6 DISC HEAD

	PROBE	RANGE	A2 BLOCK	SCANNING.
116521	45°	200mm	10dbs	32dbs
109661	70°	250mm	18dbs	48dbs

FLAW DETECTOR KRAUTKRAMER USIP 11 N° 5959

NDT REPORT - CONTINUATION SHEET REPORT NO T3366

REFERENCE AND TEST SENSITIVITIES REAR END

STAGE 4 BLADE ROOTS

	PROBE	RANGE	A4 BLOCK	SCANNING
137856	45°	50mm	29dbs	60dbs

STAGE 5 BLADE ROOTS

	PROBE	RANGE	A2 BLOCK	SCANNING
137856	45°	100mm	31dbs	70dbs
J164	55°	50mm	A4 30dbs	66 dbs

STAGE 6 BLADE ROOTS

	PROBE	RANGE	A2 BLOCK	SCANNING
J212	52°	100mm	32dbs	66dbs
145636	60°	100mm	34dbs	70 dbs
109667	70°	100mm	34dbs	72dbs

STAGE 4 DISC HEAD

	PROBE	RANGE	A2 BLOCK	SCANNING
137856	45°	100mm	31dbs	68 dbs
145636	60°	100mm	34dbs	72 dbs
109667	70°	200mm	34dbs	72 dbs.

STAGE 5 DISC HEAD

	PROBE	RANGE	A2 BLOCK	SCANNING
137856	45°	100mm	31dbs	72dbs
109667	70°	200mm	34dbs	74dbs

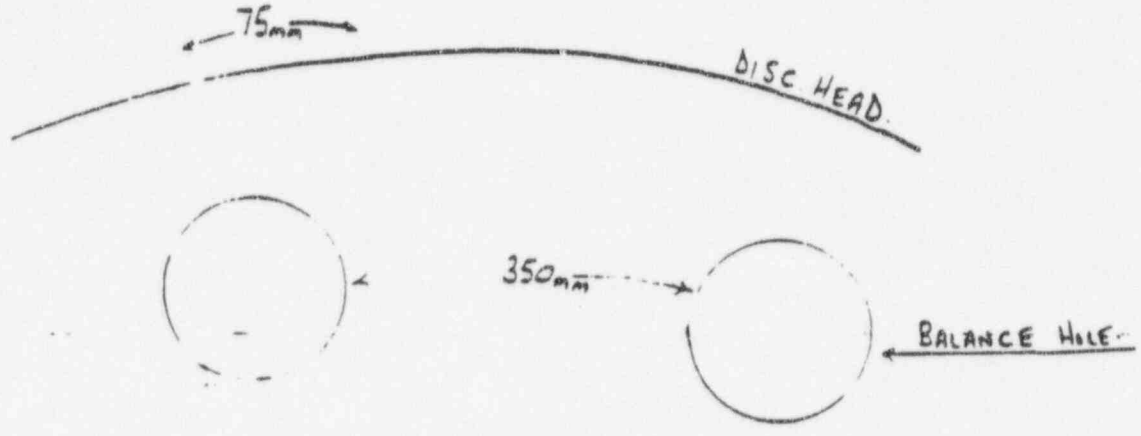
STAGE 6 DISC HEAD

	PROBE	RANGE	A2 BLOCK	SCANNING
137856	45°	200mm	31dbs	74dbs
109667	70°	250mm	34dbs	76dbs

FLAW DETECTOR KRAUTKRAMER USD10 N° 2671

NDT REPORT - CONTINUATION SHEET REPORT NO T3366

TEST LIMITATIONS TO THE STAGE 4 DISC HEADS



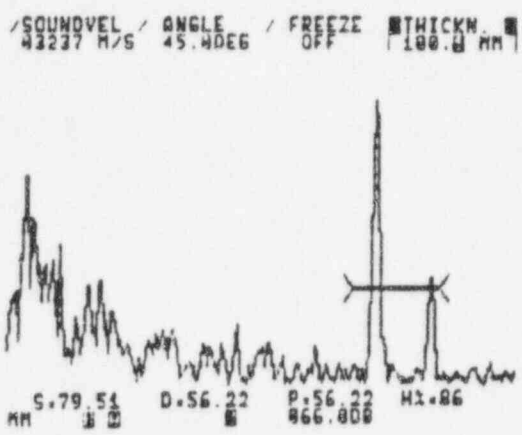
TOP NECK UNDERSIDE RADII COULD NOT BE EXAMINED IN AREAS OF BALANCE HOLES IE. FOR 75mm EVERY 350mm FOR 360° OF THE DISC

DATE OF ISSUE	ORIG'L 5/77	REV A 6/76	REV B	ISSUED BY:

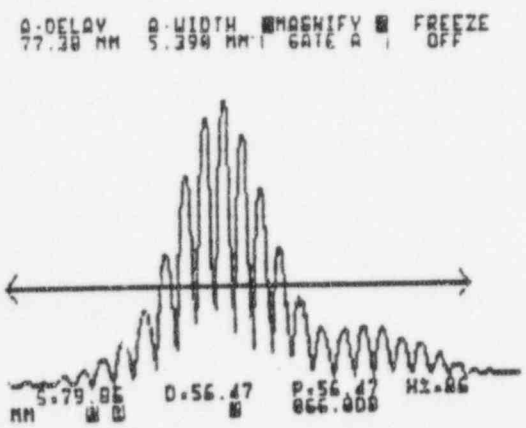
ENRICO FERMI I.P. ROTORS

STAGE 5 DISC HEAD BOTTOM NECK UNDERSIDE RADII.

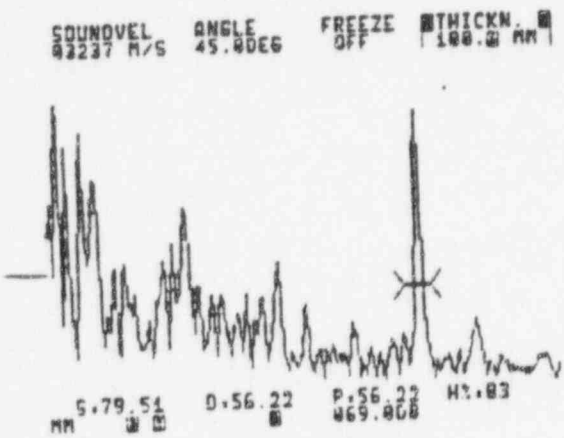
REFERENCE BLOCK.



45° PROBE 86% F.S.H. ECHO FROM 2mm DEEP SAW CUT IN TEST BLOCK AT 66dbs.

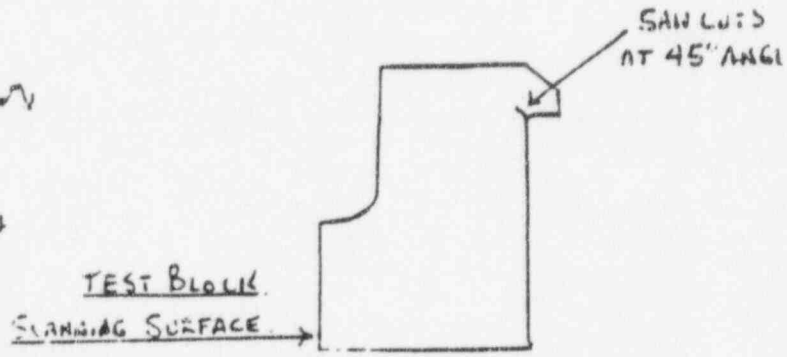


ECHO DYNAMIC ENVELOPE OF ABOVE INDICATION.



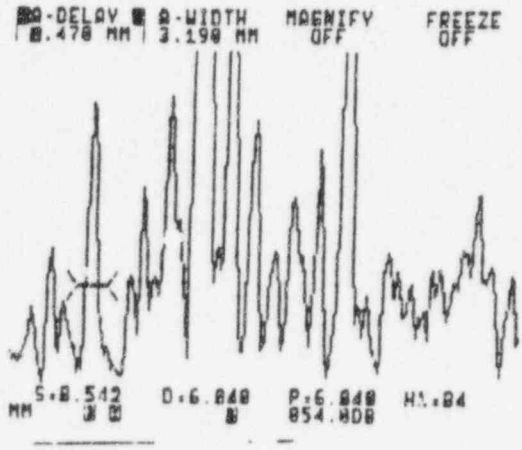
45° PROBE 83% F.S.H. ECHO FROM 1mm DEEP SAW CUT IN TEST BLOCK AT 69 dbs

TEST BLOCKS MADE AVAILABLE ON 12-5-74
HENCE 3 SHEETS ADDED TO DRG T2366



ENRICO FERMI LP ROTORS

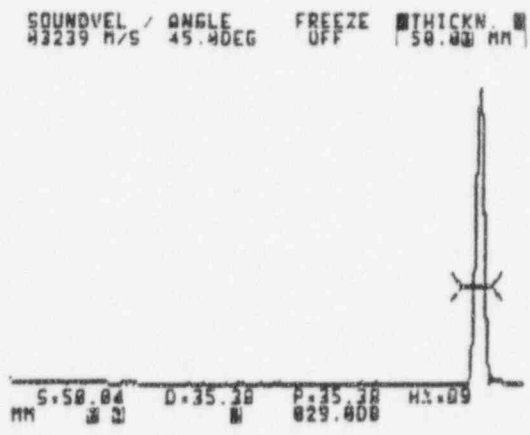
STAGE 4 BLADE ROOT REFERENCE BLOCK. CONTAINING 0.010" DEEP NOTCHE



45° PROBE.

INDICATION FROM 0.010" NOTCH AT POSITION N°1.

84% F.S.H. ECHO AT 54dbs.



50mm RADIUS A4 BLOCK.

89% F.S.H. ECHO AT 29dbs.

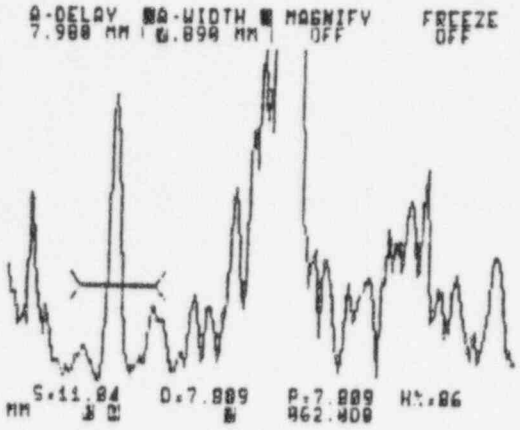
ADDED TO IR J' T3366

2.790 MATERIAL
Withhold From Public Disclosure

ENRICO FERMI LP ROTORS

T3366.

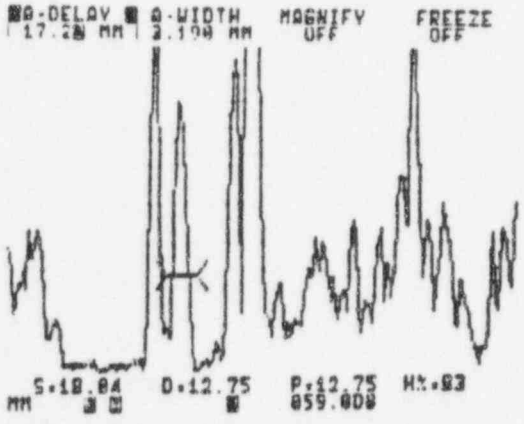
- STAGE 4 BLADE ROOT REFERENCE BLOCK CONTAINING 0.010" DEEP NOTCHES.



45° PROBE.

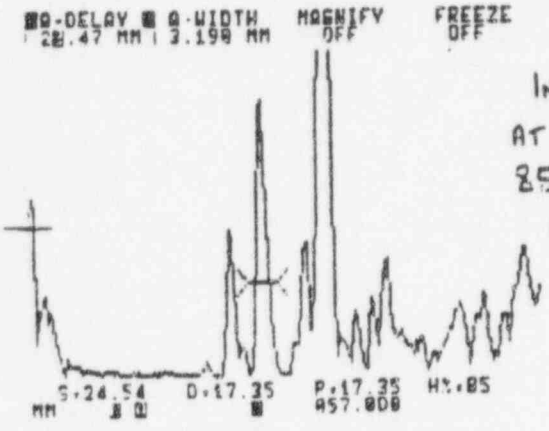
INDICATION FROM 0.010" NOTCH AT POSITION N°2.

86% F.S.H. ECHO AT 62 dbs



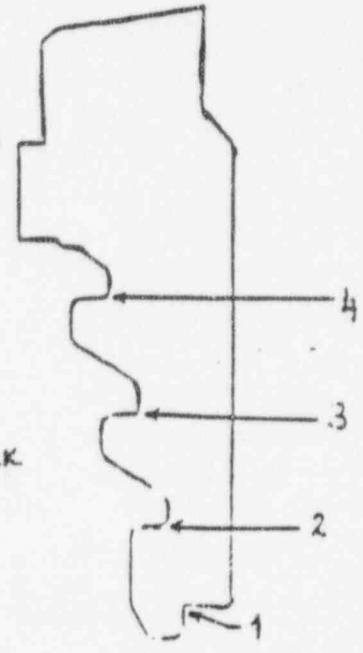
INDICATION FROM 0.010" NOTCH AT POSITION N°3.

83% F.S.H. ECHO AT 59 dbs



INDICATION FROM 0.010" NOTCH AT POSITION N°4.

85% F.S.H. ECHO AT 57 dbs



REFERENCE BLOCK

ADDED TO IR NO T 3366

QUALITY ASSURANCE PLANNED INSPECTION TRAFFORD PARK	GEC ALSTHOM TURBINE GENERATORS LTD Electromechanical Division	QCA 056/U Page 1 of 14

PROCESS SPEC	ISSUE	CLASS.CODE.QUALITY ETC	REPORT NO
181/C220	4/89	TO APPROVED PROCEDURES	T3367.

WORKING NO	CONTRACT NAME	ASSEMBLY/SCHEDULE DRG NO	CDMS	JOB NO	L3 DOCK NO
789M5360/93/L34012	ENRICO FERMI				

ITEM	DESCRIPTION OF PART	DIN NO	TOTAL MATL	NAME
	L.P.2 ROTOR EERF 11969			

PART NO	PATT/SECT	MATL SPEC	TOTAL QTY
STAGE 4, 5 AND 6 FRONT AND REAR DISCS			1.

QTY NO & CENTRE & ROUTE	OPERATION
L1C N.1	ULTRASONIC EXAMINATION OF THE STAGE 4 5 AND 6 FRONT AND REAR BLADE ROOT FASTENINGS AND STRADDLE ROOT DISC HEADS INLET AND EXHAUST SIDE

NDT REPORT

DATE OF EXAMINATION 16-5-94

FLAW DETECTOR USD 10 USIP 11 | SENSITIVITIES | SERIAL NO. 2671 AND 5454

1) NORMAL PROBES. ATTENUATOR SETTING FOR F.S.H FROM 25MM THICK ON THE IIW BLOCK.
2) SHEAR WAVE PROBES. ATTENUATOR SETTING FOR F.S.H FROM 100MM RADIUS ON THE IIW BLOCK.

PROBE	SINGLE MHZ		TWIN MHZ		ADDITIONAL PROBES		
					PROBE	MHZ	
	dBS IIW BLOCK	dBS	dBS IIW BLOCK	dBS	STATE IF SINGLE OR TWIN	dBS IIW BLOCK	dBS
NORMAL							
38	REFER TO ATTACHED SHEETS FOR PROBES						
45	AND SENSITIVITIES USED						
60							
70							

COUPLANT ULTRAGEL SURFACE CONDITION AS GRIT BLAST

RESULTS INDICATIONS LOCATED ON STAGE 4 AND 5 DISC HEADS CONSIDERED TO BE FROM MECHANICAL DAMAGE. NO CRACK LIKE INDICATIONS EVIDENT.

DAS NO. SEE ATTACHED PRINTS FOR TYPICAL RESPONSES.

ACCEPTABLE YES/NO

OPERATOR: [signature] APPROVALS: PCN TI DATE: 17-5-94

DATE OF ISSUE	ORIG'L	REV A	REV B	REV C	ISSUED BY
	09.10.90	16.02.91	24.06.92	13.11.91	[signature]

NDT REPORT - CONTINUATION SHEET REPORT NO T3327

ENRICO FERMI LP2 ROTOR. EERF 11969 8/5/94

ULTRASONIC EXAMINATION OF THE STAGE 4, 5 AND 6 FRONT AND REAR BLADE ROOT FASTENINGS AND STRADDLE ROOT DISC HEADS. FOR POSSIBLE CRACKING EMINATING FROM THE PRESSURE FACE RADII.

ALL SCANNING SURFACES HAVE BEEN CLEANED BY ASH BLASTING AND ARE SUITABLE FOR UNIFORM ULTRASONIC COUPLING.

INSPECTIONS WERE CARRIED OUT BY G.E.C ALSTHOM N.D.T ENGINEERS QUALIFIED TO PCN LEVEL 2. (FORGINGS).

TEST EQUIPMENT

USD10 ULTRASONIC FLAW DETECTOR
USIP11 ULTRASONIC FLAW DETECTOR.
4MHZ 10mm DIA. 45°, 60° AND 70° SHEAR WAVE PROBES. (SINGLE CRYSTAL)
5MHZ 4mm DIA. 55° AND 58° SHEAR WAVE PROBES. (SINGLE CRYSTAL).
B.S. A2 AND A4 CALIBRATION BLOCKS.

TEST SENSITIVITY

FULL PATH LENGTH REFERENCE BLOCKS WERE NOT AVAILABLE AT THE TIME OF TESTING. APART FROM STAGE 4 BLADE ROOT - STAGE 5 DISC HEAD. REFERENCE SENSITIVITY WAS THE CALIBRATED GAIN SETTING IN dB. NECESSARY TO OBTAIN AN 80% FULL SCREEN HEIGHT RESPONSE FROM THE 100mm AND 50mm RADIUS ON THE A2 BLOCK AND A4 BLOCK RESPECTIVELY

THE CALIBRATED GAIN WAS INCREASED TO OBTAIN A 2 TO 3mm GRASS LEVEL AT MAXIMUM TESTING DISTANCE.

COUPLANT ULTRAGEL.

NDT REPORT - CONTINUATION SHEET REPORT NO 13367

ENRICO FERMI LP2 ROTOR. EERF 11969 8/5/94

ULTRASONIC EXAMINATION OF THE STAGE 4, 5 AND 6 FRONT AND REAR BLADE ROOT FASTENINGS AND STRADDLE ROOT DISC HEADS. FOR POSSIBLE CRACKING EMINATING FROM THE PRESSURE FACE RADII.

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COUPLANT ULTRAGEL.

NDT REPORT - CONTINUATION SHEET REPORT NO 13367

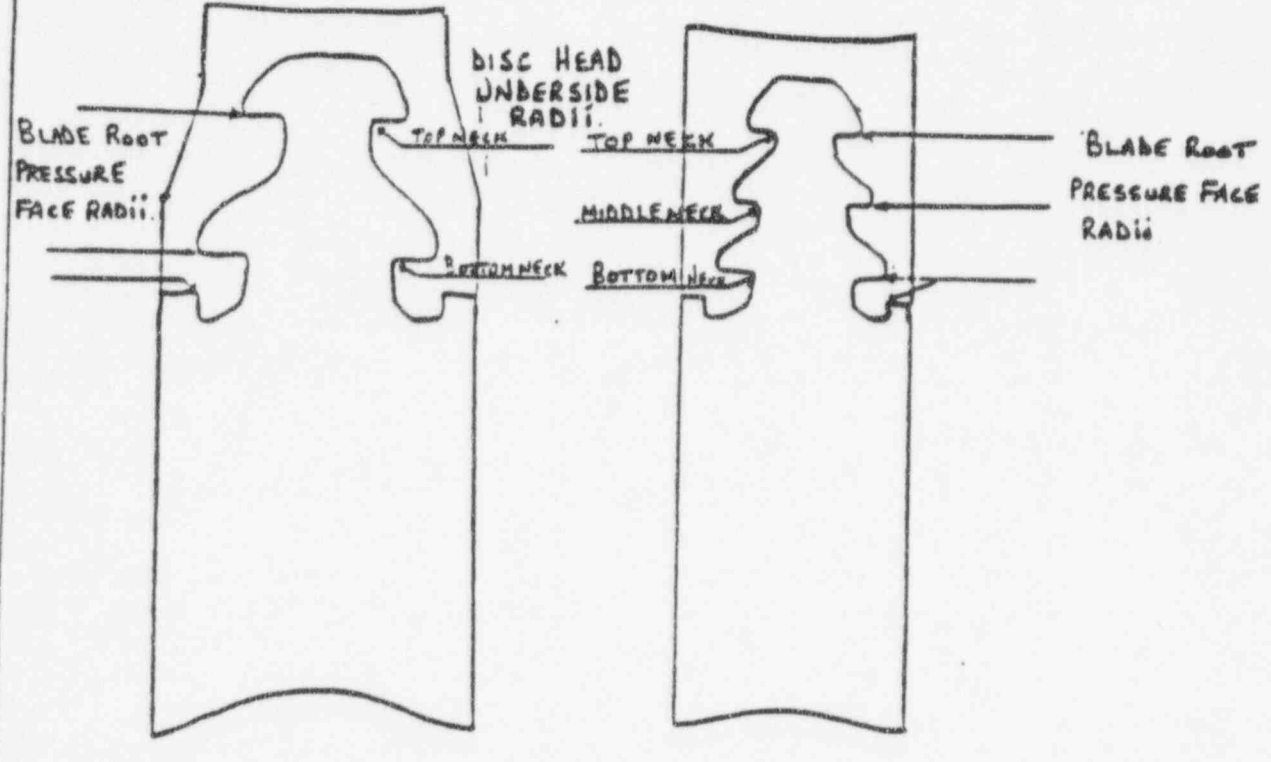
TESTED AT THE WESTINGHOUSE FACILITY CHARLOTTE. N. CAROLINA.

SCANNING

STAGE 4 BLADE ROOTS.	45° PROBE.
STAGE 5 BLADE ROOTS.	45° AND 55° PROBE.
STAGE 6 BLADE ROOTS.	58°, 60° AND 70° PROBE.
STAGE 4 DISC HEADS.	45°, 60° AND 70° PROBE.
STAGE 5 DISC HEADS	45° AND 70° PROBE.
STAGE 6 DISC HEADS	45° AND 70° PROBE.

LIMITATIONS OF TEST

STAGE 4 STRADDLE ROOT DISC HEAD LIMITED EXAMINATION TO THE TOP NECK UNDERSIDE RADII, DUE TO THE POSITION OF THE DISC BALANCE HOLES. COULD NOT BE TESTED IN THESE AREAS ONLY.



STAGE 5 AND 6 DISC HEAD AND BLADE ROOT

STAGE 4 DISC HEAD AND BLADE ROOT

NDT REPORT - CONTINUATION SHEET REPORT NO 13367

REFERENCE AND TEST SENSITIVITIES. FRONT END.

STAGE 4 BLADE ROOTS

PROBE	RANGE	A4 BLOCK	SCANNING
45° 114521	50mm	8dbs	30dbs

STAGE 5 BLADE ROOTS

PROBE	RANGE	A2 BLOCK	SCANNING
114521 45°	100mm	10dbs	32dbs
J164 55°	50mm	A4 8dbs	30dbs

STAGE 6 BLADE ROOTS

PROBE	RANGE	A2 BLOCK	SCANNING
J212 55°	100mm	10dbs	32dbs
116592 60°	100mm	24dbs	50dbs
109661 70°	100mm	18dbs	44dbs.

STAGE 4 DISC HEAD

PROBE	RANGE	A2 BLOCK	SCANNING
114521 45°	100mm	10dbs	32dbs
116592 60°	100mm	24dbs	50dbs
109661 70°	200mm	18dbs	44dbs.

STAGE 5 DISC HEAD

PROBE	RANGE	A2 BLOCK	SCANNING
114521 45°	100mm	10dbs	32dbs.
109661 70°	200mm	18dbs	44dbs.

STAGE 6 DISC HEAD

PROBE	RANGE	A2 BLOCK	SCANNING
114521 45°	200mm	10dbs	32dbs
109661 70°	250mm	18dbs	48dbs

FLAW DETECTOR KRAUTKRAMER USIP 11 N° 5959

NDT REPORT - CONTINUATION SHEET REPORT NO 15367

REFERENCE AND TEST SENSITIVITIES REAR END

STAGE 4 BLADE ROOTS

	PROBE	RANGE	A4 BLOCK	SCANNING
137856	45°	50mm	29dbs	60dbs

STAGE 5 BLADE ROOTS

	PROBE	RANGE	A2 BLOCK	SCANNING
137856	45°	100mm	31dbs	70dbs
J164	55°	50mm	A4 30dbs	66dbs

STAGE 6 BLADE ROOTS

	PROBE	RANGE	A2 BLOCK	SCANNING
J212	52°	100mm	32dbs	66dbs
145636	60°	100mm	34dbs	70dbs
109667	70°	100mm	34dbs	72dbs

STAGE 4 DISC HEAD

	PROBE	RANGE	A2 BLOCK	SCANNING
137856	45°	100mm	31dbs	68dbs
145636	60°	100mm	34dbs	72dbs
109667	70°	200mm	34dbs	72dbs.

STAGE 5 DISC HEAD

	PROBE	RANGE	A2 BLOCK	SCANNING
137856	45°	100mm	31dbs	72dbs
109667	70°	200mm	34dbs	74dbs

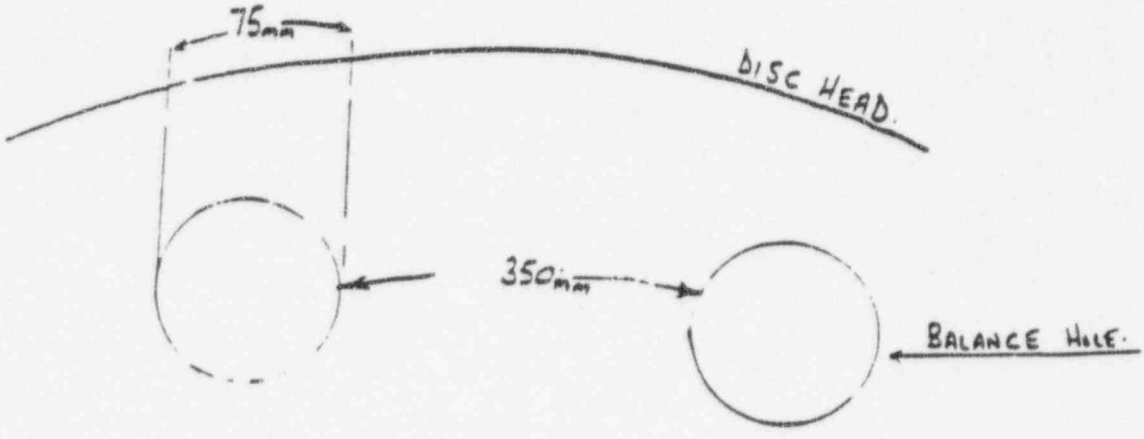
STAGE 6 DISC HEAD

	PROBE	RANGE	A2 BLOCK	SCANNING
137856	45°	200mm	31dbs	74dbs
109667	70°	250mm	34dbs	76dbs

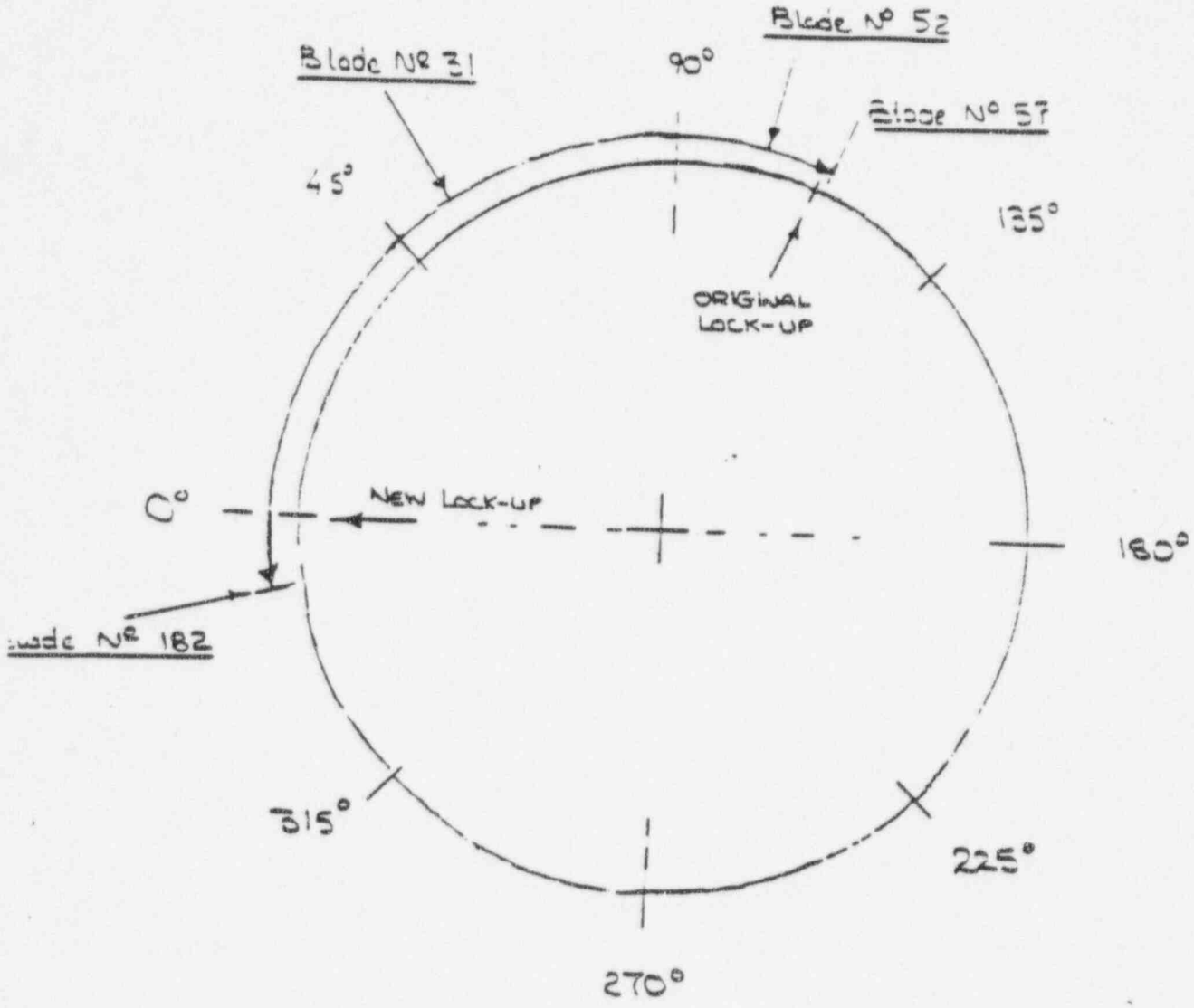
FLAW DETECTOR KRAUTKRAMER USD10 N° 2671

NDT REPORT - CONTINUATION SHEET REPORT NO 13567

TEST LIMITATIONS TO THE STAGE 4 DISC HEADS



THE NECK UNDERSIDE RADII COULD NOT BE EXAMINED IN AREAS OF BALANCE HOLES IE. FOR 75mm EVERY 350mm FOR 360° OF THE DISC.



TOTAL BLADES 189

BLADES NUMBERED ↷ LOOKING FROM F/E ROTOR

BLADE NOS 31 & 52 WERE FINGER-PRINTED THE RESPONSES BEING TYPICAL OF THE INDICATION BETWEEN BLADES Nº 182 & 57

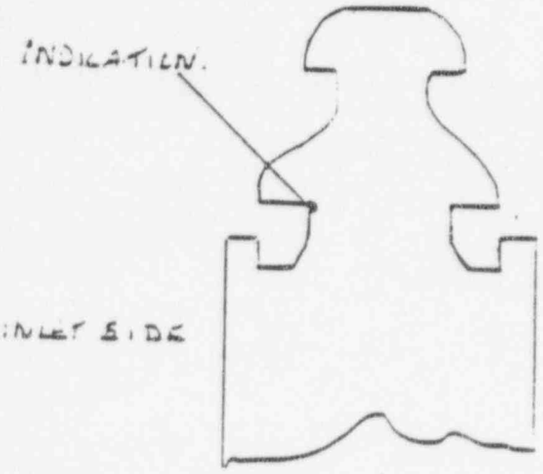
L.P 2 STAGE 5 F/E

NDT REPORT - CONTINUATION SHEET REPORT NO T337

ENRICO FERMI LP2 ROTOR EERF 11969

INDICATIONS EVIDENT ON BOTTOM NECK UNDERSIDE RADII INLET SIDE OF STAGE 5 FRONT STRADDLE ROOT DISC HEAD CONTINUOUS RESPONSE BETWEEN THE TWO LOCKING BLADES CONSIDERED TO BE MECHANICAL DAMAGE.

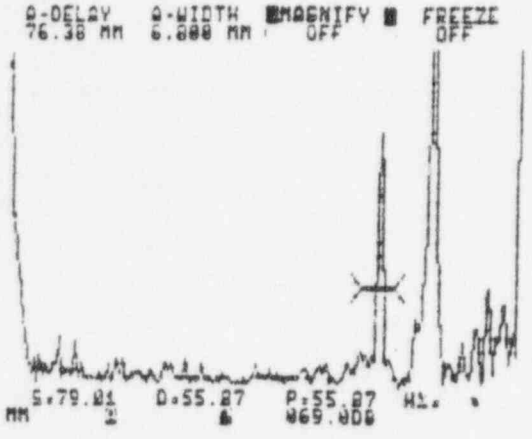
SEE PRINT FOR TYPICAL RESPONSE PATTERN.



STAGE 5 DISC HEAD

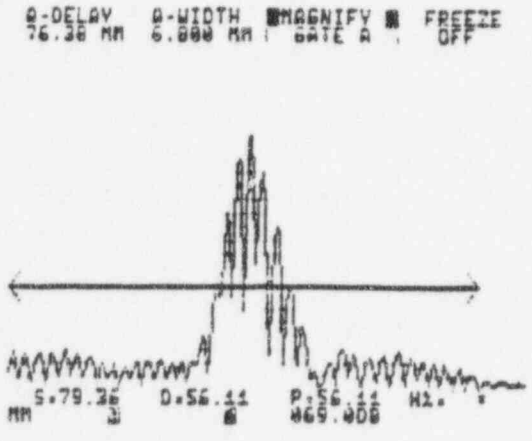
L.P 2 STG 5 F/E DISC HEAD

T3367



BLADE Nº 52 INLET SIDE.

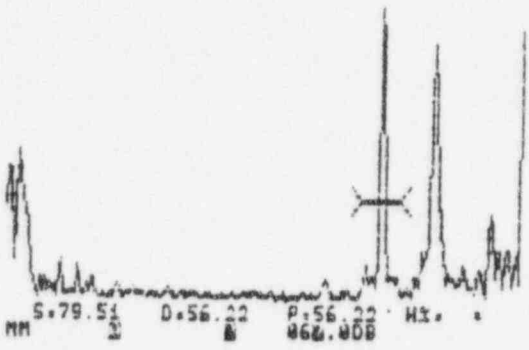
Indication from bottom pressure face radii 75% amplitude at 0 deg.

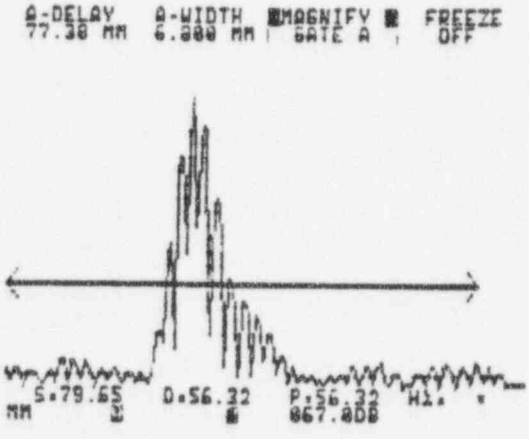


Echo dynamic scatter of above response.

BLADE Nº 31 INLET SIDE

Indication from bottom pressure face, full 80% amplitude at 61dB.





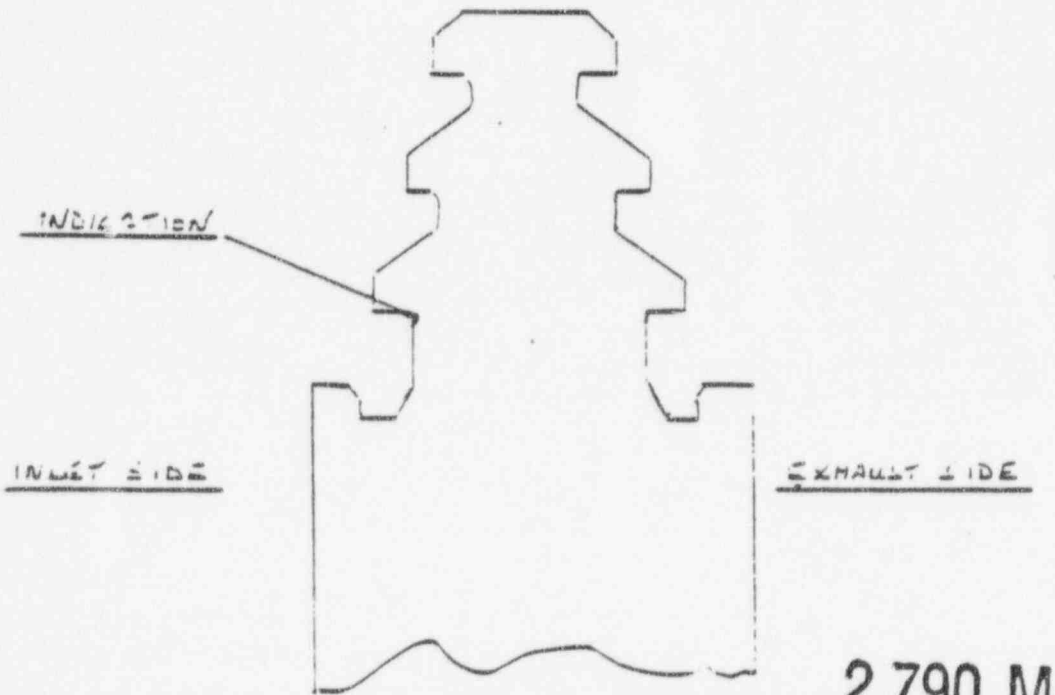
Echo dynamic pattern of above response.

NDT REPORT - CONTINUATION SHEET REPORT NO T3367

ENRICO FERMI LP2 ROTOR FERF 11969

INDICATIONS EVIDENT ON BOTTOM NECK UNDERSIDE RADII.
INLET SIDE OF STAGE 4 FRONT STRADDLE ROOT DISC HEAD
INTERMITTENT SIGNALS FOR 360°.
CONSIDERED TO BE FILM MECHANICAL DAMAGE

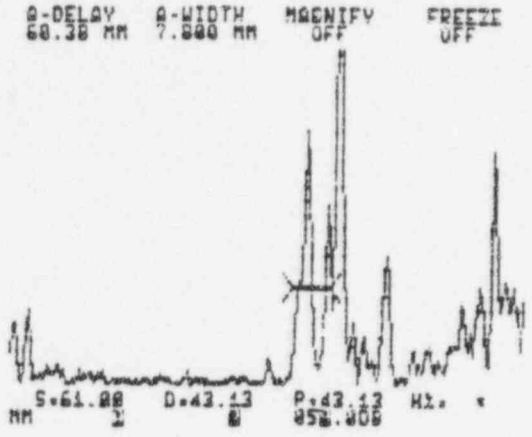
SEE ATTACHED PRINTS FOR TYPICAL RESPONSE PATTERN



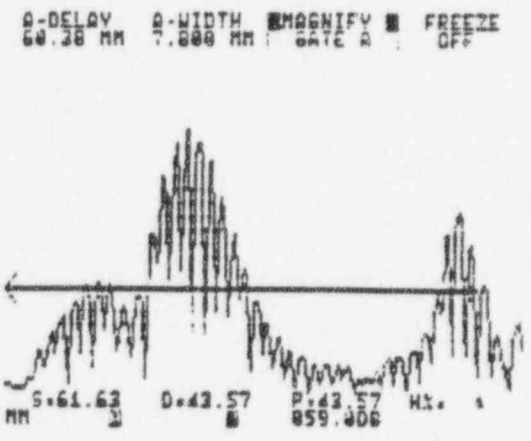
STAGE 4 DISC HEAD

L.P 2. Stg 4 F/E Disc Head

13367

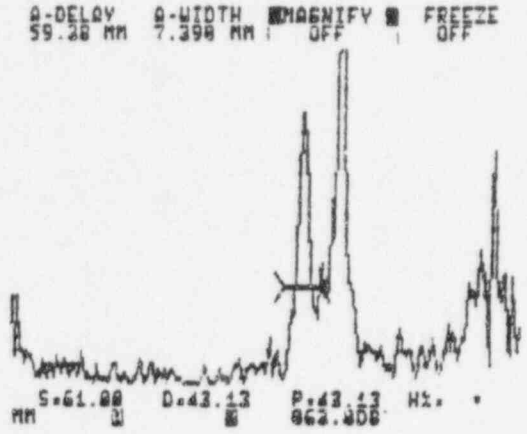


BLADE Nº 198 INLET SIDE.
Indication from bottom edge
face radii 50% amplitude
-59db

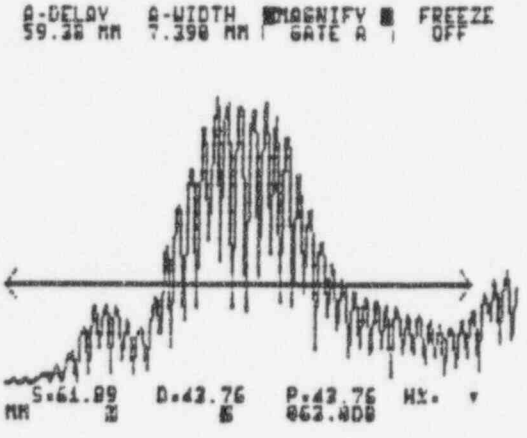


Echo dynamic pattern of ab
response

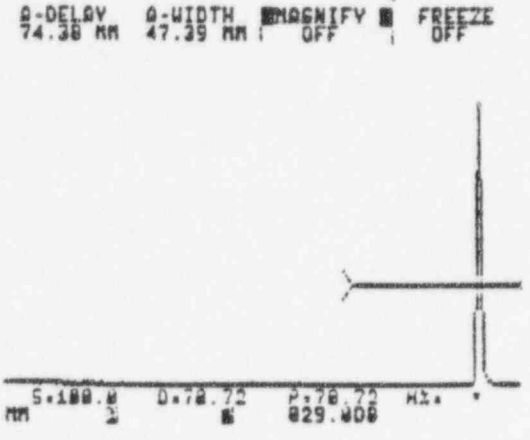
T3367



BLADE N° 180 INLET SIDE
Indication from bottom pre
face radii . 80% amplitude
63db.



Echo dynamic pattern of above
response.

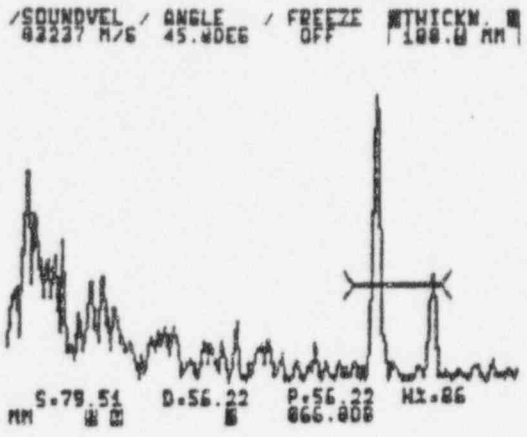


80% response from 100mm radii
on BS. 2704 A2 block.

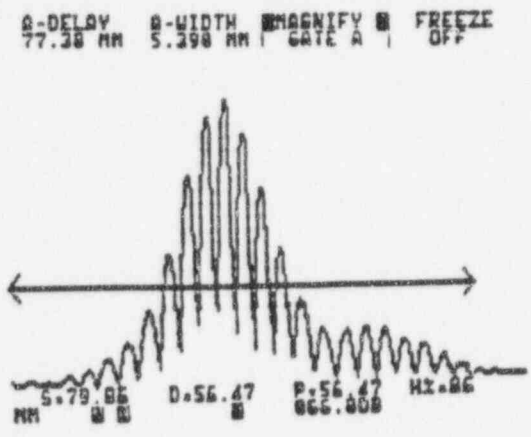
ENRICO FERMI LP ROTORS

STAGE 5 DISC HEAD BOTTOM NECK UNDERSIDE RADII.

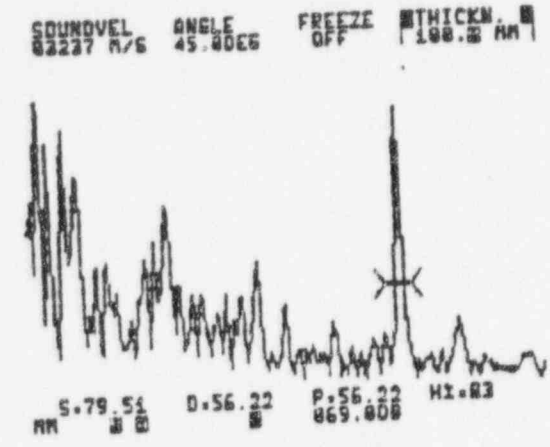
REFERENCE BLOCK.



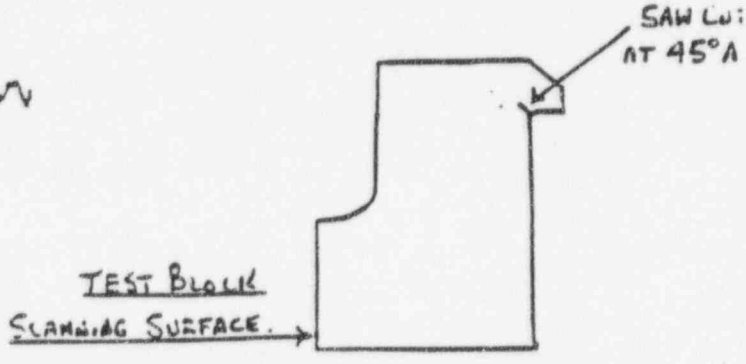
45° PROBE 86% F.S.H. ECHO FROM 2mm DEEP SAW CUT IN TEST BLOCK AT 66dbs.



ECHO DYNAMIC ENVELOPE OF ABOVE INDICATION.

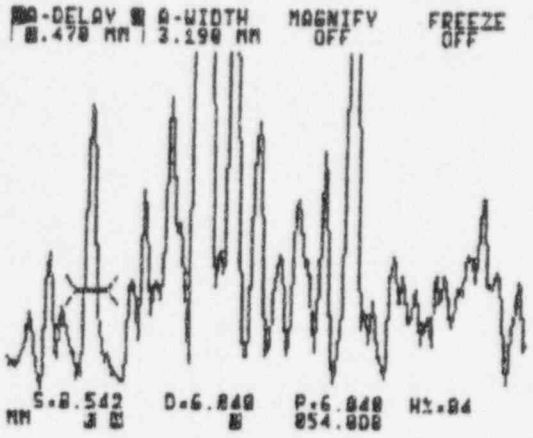


45° PROBE 83% F.S.H. ECHO FROM 1mm DEEP SAW CUT IN TEST BLOCK AT 69 dbs.



ENRICO FERMI LP ROTORS

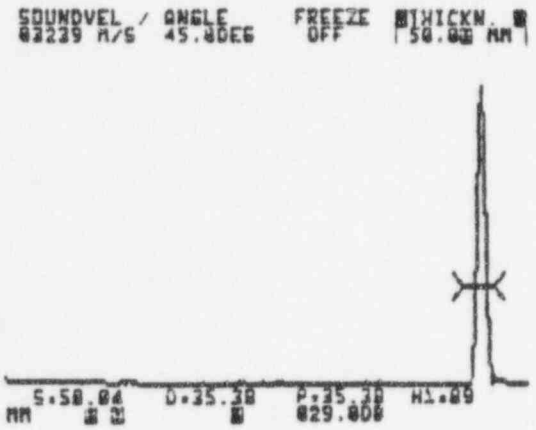
STAGE 4 BLADE ROOT REFERENCE BLOCK. CONTAINING 0.010" DEEP NOTCH



45° PROBE.

INDICATION FROM 0.010" NOTCH AT POSITION N°1.

84% F.S.H. ECHO AT 54dbs.

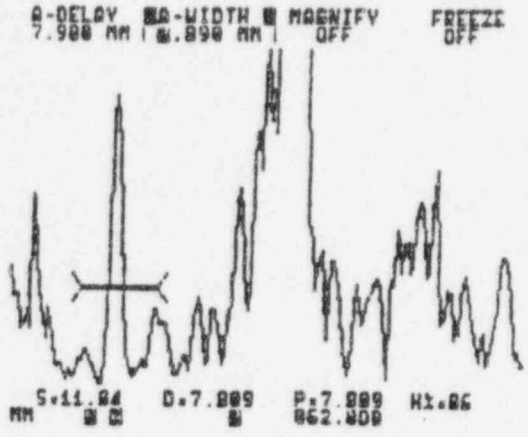


50mm RADIUS A4 BLOCK

89% F.S.H. ECHO AT 29dbs.

ENRICO FERMI LP ROTORS.

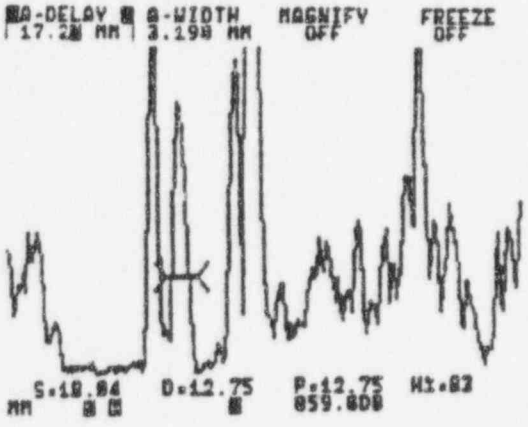
STAGE 4 BLADE ROOT REFERENCE BLOCK CONTAINING 0.010" DEEP NOTCHES.



45° PROBE.

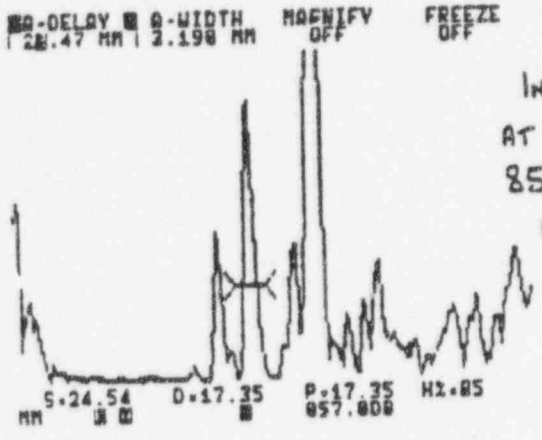
INDICATION FROM 0.010" NOTCH AT POSITION N°2.

86% F.S.H. ECHO AT 62 dbs



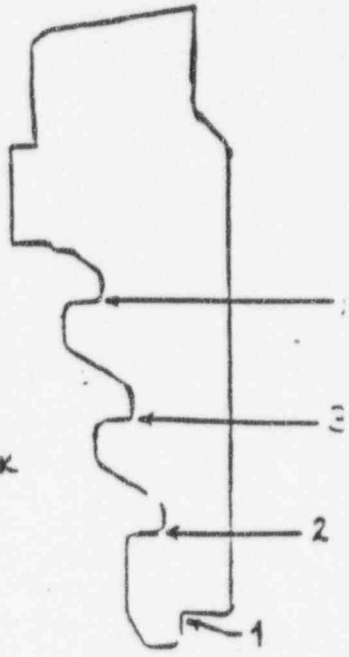
INDICATION FROM 0.010" NOTCH AT POSITION N°3.

83% F.S.H. ECHO AT 59dbs



INDICATION FROM 0.010" NOTCH AT POSITION N°4.

85% F.S.H. ECHO AT 57dbs



REFERENCE BLOCK

2.790 MATERIAL

Withhold From Public Disclosure

TRAFFORD PARK	Electromechanical Division	Page 1 of 13

PROCESS SPEC	ISSUE	CLASS.CODE.QUALITY ETC	REPORT NO
181/0120	4/89	TO APPROVED PROCEDURES	T3365

WORKING NO	CONTRACT NAME	ASSEMBLY/SCHEDULE DRG NO	COMB	JOB NO	ALLOCA NO
789M5360/93/439012	ENRICO FERMI				

ITEM	DESCRIPTION OF PART	DRG NO	TOTAL MATL	NAME
	LP3 ROTOR EERF 11970			

PART NO	PART/SECT	MATL SPEC	TOTAL QTY
STAGE 4.5 AND 6 FRONT AND REAR DISCS			1

OP NO	C CLAIMS	ADJUTS	OPERATION
410	N.I.		ULTRASONIC EXAMINATION OF THE STAGE 4.5 AND 6 FRONT AND REAR BLADE ROOT FASTENINGS AND SADDLE ROOT DISC HEADS INLET AND EXHAUST SIDE.

NDT REPORT

DATE OF EXAMINATION 8-5 94

FLAW DETECTOR USD.10 US1P11 | SENSITIVITIES | SERIAL NO. 2611 AND 5459

1) NORMAL PROBES. ATTENUATOR SETTING FOR F.S.H FROM 25MM THICK ON THE IIW BLOCK.
2) SHEAR WAVE PROBES. ATTENUATOR SETTING FOR F.S.H FROM 100MM RADIUS ON THE IIW BLOCK.

PROBE	SINGLE MHZ		TWIN MHZ		ADDITIONAL PROBES		
					PROBE	MHZ	
	dBS IIW BLOCK	dBS	dBS IIW BLOCK	dBS	STATE IF SINGLE OR TWIN	dBS IIW BLOCK	dBS
NORMAL							
38		REFER TO ATTACHED SHEETS FOR PROBES AND SENSITIVITIES USED					
45							
60							
70							

COUPLANT ULTRAGEL SURFACE CONDITION ASH BLAST

RESULTS CRACKLIKE INDICATIONS LOCATED IN STAGE 5 REAR DISC HEAD REFER TO ATTACHED SHEETS FOR DETAILS

DAS NO. NO CRACKLIKE INDICATIONS EVIDENT IN ALL OTHER AREAS EXAMINED

ACCEPTABLE YES/NO

OPERATOR: T.W.Co — L.E.White APPROVALS: PCN TL DATE: 11-5-94

DATE OF ISSUE	ORIG'L	REV A	REV B	REV C		ISSUED BY
	09.10.80	16.02.81	24.06.82	13.11.91		

NDT REPORT - CONTINUATION SHEET REPORT NO T3365

ENRICO FERMI LP 3 ROTOR. EERF 11970 8/5/94

ULTRASONIC EXAMINATION OF THE STAGE 4, 5 AND 6 FRONT AND REAR BLADE ROOT FASTENINGS AND STRADDLE ROOT DISC HEADS. FOR POSSIBLE CRACKING EMINATING FROM THE PRESSURE FACE RADII.

ALL SCANNING SURFACES HAVE BEEN CLEANED BY ASH BLASTING AND ARE SUITABLE FOR UNIFORM ULTRASONIC COUPLING.

INSPECTIONS WERE CARRIED OUT BY G.E.C. ALSTHOM N.D.T ENGINEERS QUALIFIED TO P.C.N. LEVEL 2. (FORGINGS).

TEST EQUIPMENT

USD10 ULTRASONIC FLAW DETECTOR
USIP11 ULTRASONIC FLAW DETECTOR.

4MHZ 10mm DIA. 45° 60° AND 70° SHEAR WAVE PROBES. (SINGLE CRYSTAL)
5MHZ 4mm DIA. 55° AND 58° SHEAR WAVE PROBES. (SINGLE CRYSTAL).
B.S. A2 AND A4 CALIBRATION BLOCKS.

TEST SENSITIVITY

FULL PATH LENGTH REFERENCE BLOCKS WERE NOT AVAILABLE AT THE TIME OF TESTING.

REFERENCE SENSITIVITY WAS THE CALIBRATED GAIN SETTING IN db. NECESSARY TO OBTAIN AN 80% FULL SCREEN HEIGHT RESPONSE FROM THE 100mm AND 50mm RADIUS ON THE A2 BLOCK AND A4 BLOCK RESPECTIVLEY

THE CALIBRATED GAIN WAS INCREASED TO OBTAIN A 2 TO 3mm GRASS LEVEL AT MAXIMUM TESTING DISTANCE.

COUPLANT ULTRAGEL

NDT REPORT - CONTINUATION SHEET REPORT NO T3365

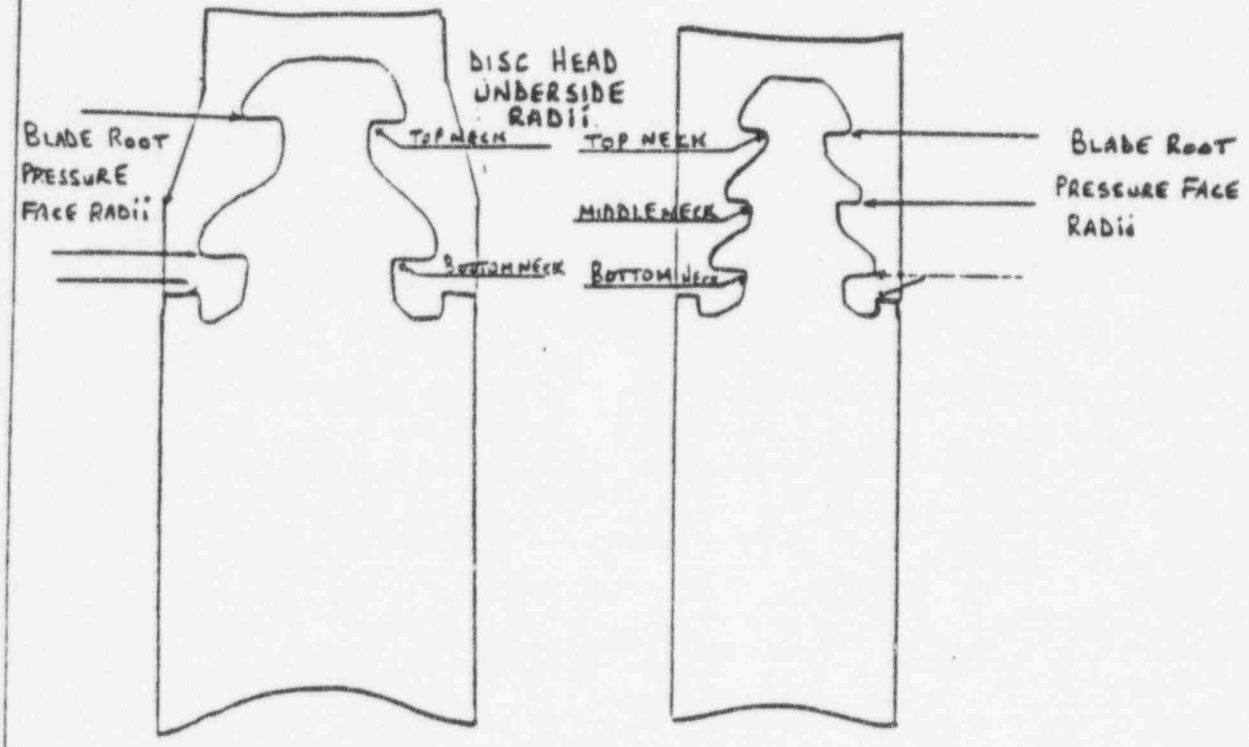
TESTED AT THE WESTINGHOUSE FACILITY CHARLOTTE. N. CAROLINA.

SCANNING

STAGE 4 BLADE ROOTS	45° PROBE
STAGE 5 BLADE ROOTS	45° AND 55° PROBE.
STAGE 6 BLADE ROOTS	58° 60° AND 70° PROBE
STAGE 4 DISC HEADS	45° 60° AND 70° PROBE.
STAGE 5 DISC HEADS	45° AND 70° PROBE
STAGE 6 DISC HEADS	45° AND 70° PROBE

LIMITATIONS OF TEST

STAGE 4 STRADDLE ROOT DISC HEAD LIMITED EXAMINATION TO THE TOP NECK UNDERSIDE RADII. DUE TO THE POSITION OF THE DISC BALANCE HOLES. COULD NOT BE TESTED IN THESE AREAS ONLY.



STAGE 5 AND 6 DISC HEAD AND BLADE ROOT

STAGE 4 DISC HEAD AND BLADE ROOT

DATE OF ISSUE	ORIG'L	REV A 6/76	REV B 11/81			ISSUED BY

NDT REPORT - CONTINUATION SHEET REPORT NO T3665

REFERENCE AND TEST SENSITIVITIES FRONT END

STAGE 4 BLADE ROOTS

	PROBE	RANGE	A4 BLOCK	SCANNING
45°	116521	50mm	8dbs	30dbs

STAGE 5 BLADE ROOTS

	PROBE	RANGE	A2 BLOCK	SCANNING
116521	45°	100mm	10dbs	32dbs
J164	55°	50mm	A4 8dbs	30dbs

STAGE 6 BLADE ROOTS

	PROBE	RANGE	A2 BLOCK	SCANNING
J212	55°	100mm	10dbs	32dbs
116572	60°	100mm	24dbs	50dbs
109661	70°	100mm	18dbs	44dbs

STAGE 4 DISC HEAD

	PROBE	RANGE	A2 BLOCK	SCANNING
116521	45°	100mm	10dbs	32dbs
116572	60°	100mm	24dbs	50dbs
109661	70°	200mm	18dbs	44dbs

STAGE 5 DISC HEAD

	PROBE	RANGE	A2 BLOCK	SCANNING
116521	45°	100mm	10dbs	32dbs
109611	70°	200mm	18dbs	44dbs

STAGE 6 DISC HEAD

	PROBE	RANGE	A2 BLOCK	SCANNING
116521	45°	200mm	10dbs	32dbs
109611	70°	150mm	18dbs	48dbs

FLAW DETECTOR KRAUTKRAMER USIP 11 N° 5959

NDT REPORT - CONTINUATION SHEET REPORT NO T3665

REFERENCE AND TEST SENSITIVITIES REAR END

STAGE 4 BLADE ROOTS

	PROBE	RANGE	A4 BLOCK	SCANNING
137856	45°	50mm	29dbs	60dbs

STAGE 5 BLADE ROOTS

	PROBE	RANGE	A2 BLOCK	SCANNING
137856	45°	100mm	31dbs	70dbs
J1664	55°	50mm	A4 30dbs	66dbs

STAGE 6 BLADE ROOTS

	PROBE	RANGE	A2 BLOCK	SCANNING
J212	52°	100mm	32dbs	66dbs
145636	60°	100mm	34dbs	70dbs
109667	70°	100mm	36dbs	72dbs

STAGE 4 DISC HEAD

	PROBE	RANGE	A2 BLOCK	SCANNING
137856	45°	100mm	31dbs	68dbs
145636	60°	100mm	34dbs	72dbs
109667	70°	200mm	36dbs	72dbs

STAGE 5 DISC HEAD

	PROBE	RANGE	A2 BLOCK	SCANNING
137856	45°	100mm	31dbs	72dbs
109667	70°	200mm	36dbs	74dbs

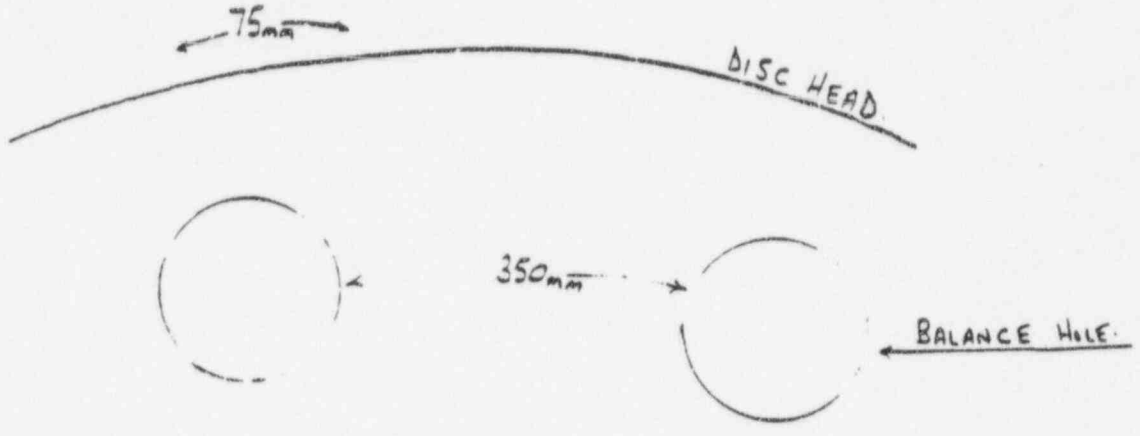
STAGE 6 DISC HEAD

	PROBE	RANGE	A2 BLOCK	SCANNING
137856	45°	200mm	31dbs	74dbs
109667	70°	250mm	36dbs	76dbs

FLAW DETECTOR KRAUTKRAMER USD10 N° 2671

NDT REPORT - CONTINUATION SHEET REPORT NO T3665

TEST LIMITATIONS TO THE STAGE 4 DISC HEADS



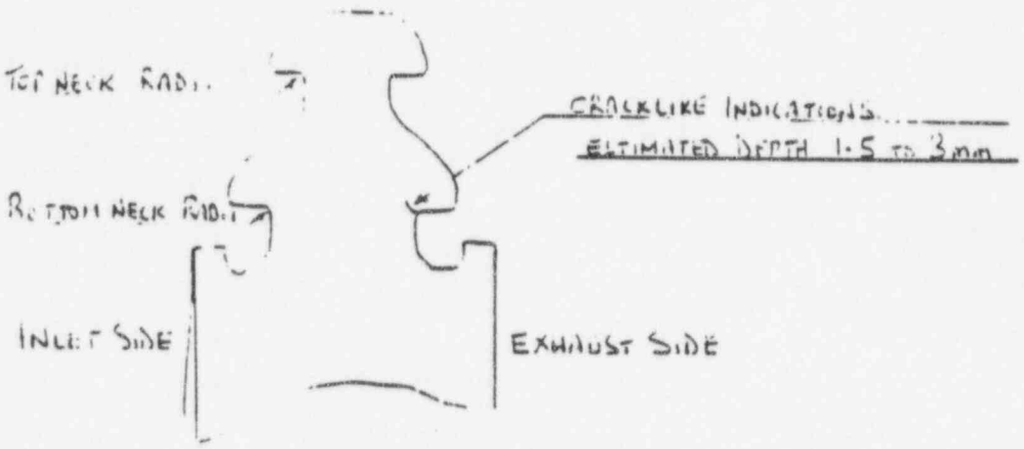
TOP NECK UNDERSIDE RADII COULD NOT BE EXAMINED IN AREAS OF BALANCE HOLES IE FOR 75mm EVERY 350mm FOR 360° OF THE DISC

NDT REPORT - CONTINUATION SHEET REPORT NO T3665

ENRICO FERMI LP3 ROTOR EERF 11970

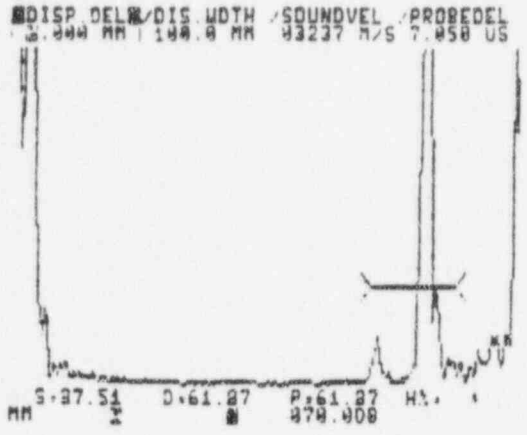
CRACKLIKE INDICATIONS EVIDENT BOTTOM NECK UNDERSIDE RADII EXHAUST SIDE OF STAGE 5 REAR STRADDLE ROOT DISC HEAD. INTERMITTENT SIGNALS RUNNING CIRCUMFERENTIALLY AT BLADE POSITIONS N° 149 TO 163 AND 169 TO 170

BLADES NUMBERED CLOCKWISE WHEN VIEWED FROM REAR END (DIRECTION OF ROTATION) THE CLOSING BLADE BEING N° 1.

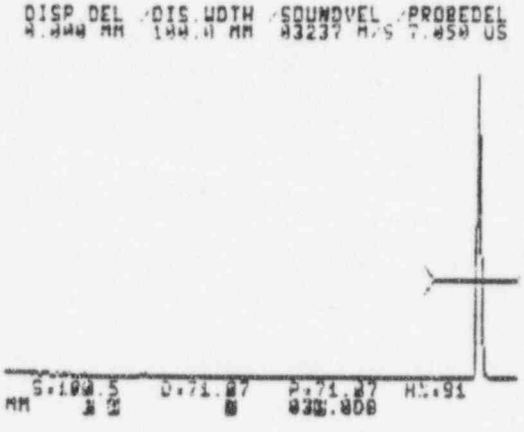


STAGE 5 REAR DISC HEAD

ATTACHED PHOTOS SHOWING TYPICAL EXAMPLE OF THE INDICATIONS



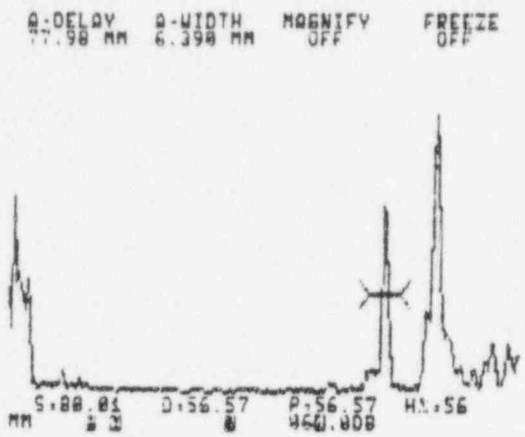
SIGNAL PATTERN OF DEFECT FREE AREA.
45° PROBE.



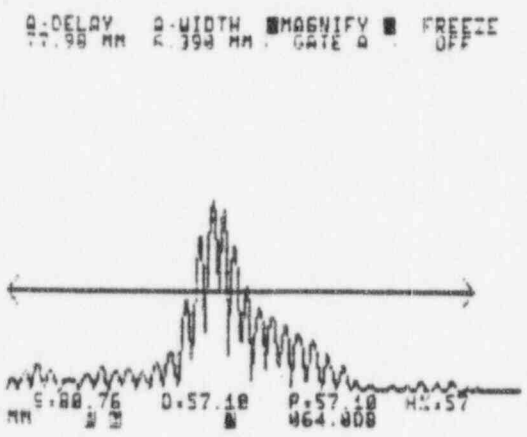
45° PROBE
100mm RADIUS A2 BLOCK

2.790 MATERIAL
Withhold From Public Disclosure

Blade Position Nº 152.



45° Probe. Indications at 80.mm Path Length.
Maximum Amplitude

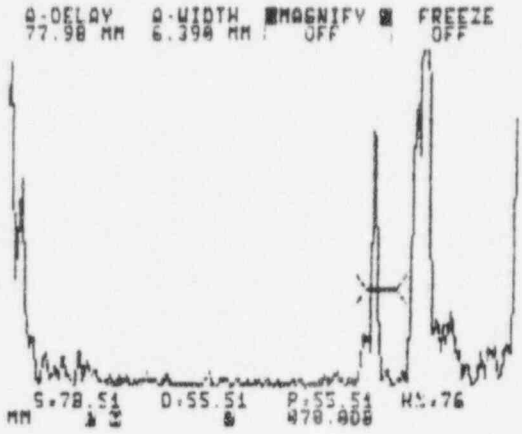


Echo Dynamic Envelope of Above Indication

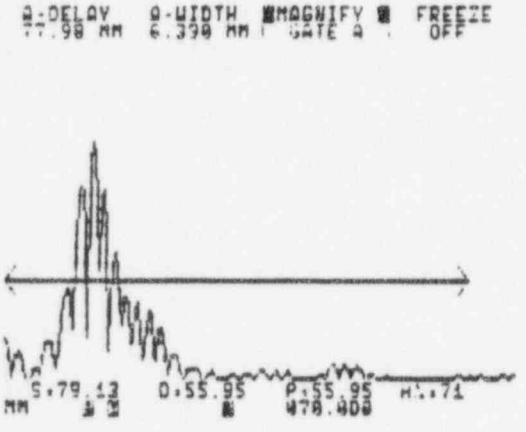
2.790 MATERIAL
Withhold From Public Disclosure

L.P. 5 Rotor Stage 5 Rear Disc Head Exhaust Side.
Bottom Neck Underside Radii

Blade Position N°153.

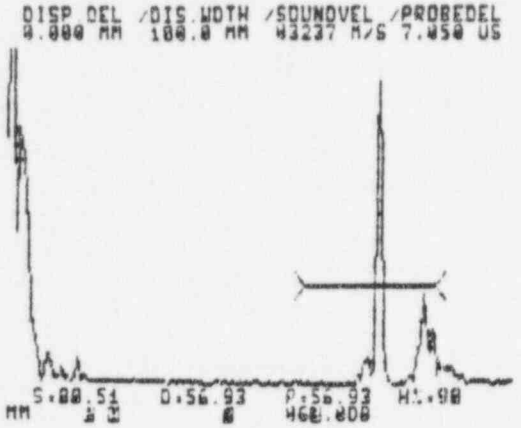


45° Probe. Indication at 78mm Path Length.
Maximum Amplitude

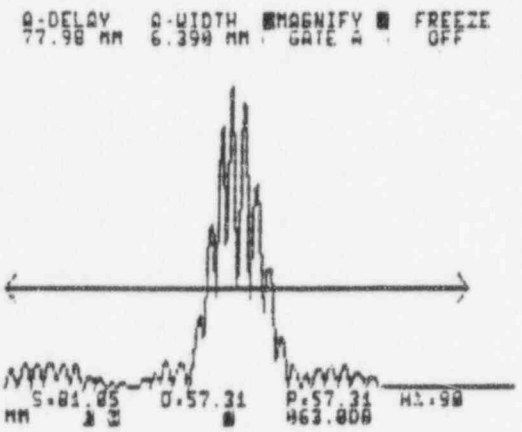


Echo Dynamic Envelope of Above Indication

BLADE POSITION N°155.



45° PROBE INDICATION AT 80mm PATH LENGTH.
MAXIMUM AMPLITUDE.
(80% LOSS OF BACK WALL ECHO).

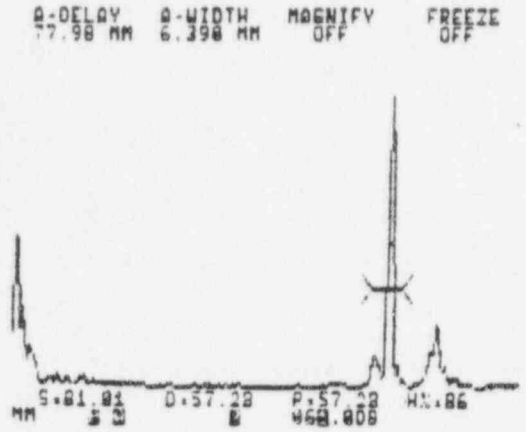


ECHO DYNAMIC ENVELOPE OF ABOVE INDICATION.

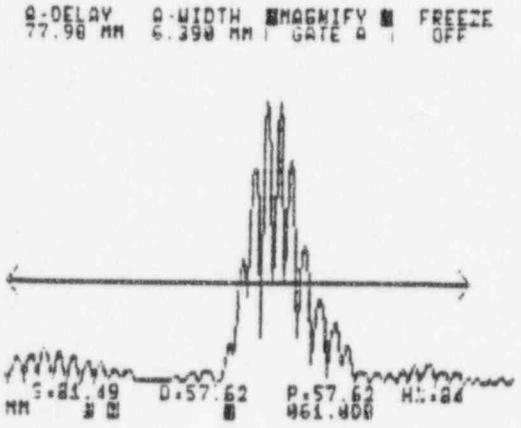
LP 1 R T.E. SINGLE CRACK DISC HEAD EXHAUST SIDE
- BOTTOM NECK UNDERSIDE RADII

IRN° T3665

BLADE POSITION N° 156



45° PROBE. INDICATION AT 81mm PATH LENGTH.
MAXIMUM AMPLITUDE.
(85% LOSS OF BACK WALL ECHO).



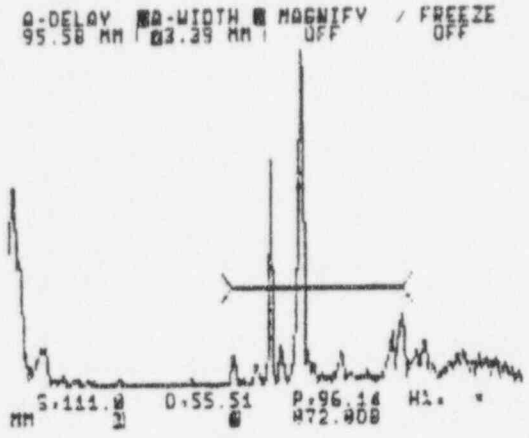
ECHO DYNAMIC ENVELOPE OF ABOVE INDICATION.

LP3 ROTOR STAGE 5 REAR DISC HEAD

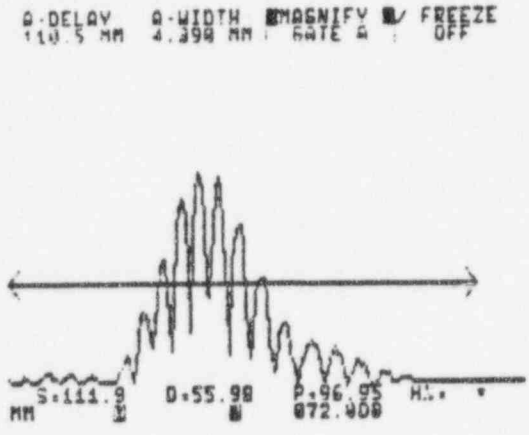
IR N°T366

EXHAUST SIDE UNDERSIDE RADII

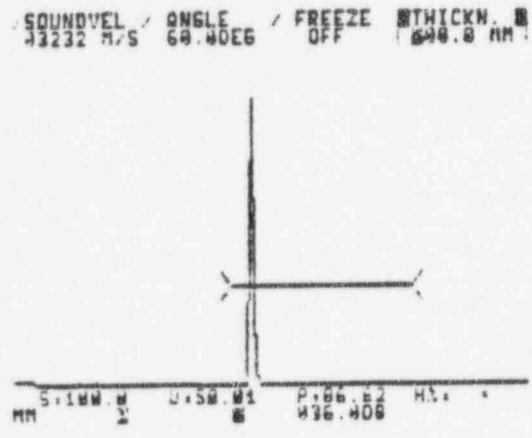
60° PROBE (STAND OFF 78.MM)



INDICATION AT 111mm PATH LENGTH AT BLADE POSITION N°155.



ECHO DYNAMIC ENVELOPE OF ABOVE INDICATION.



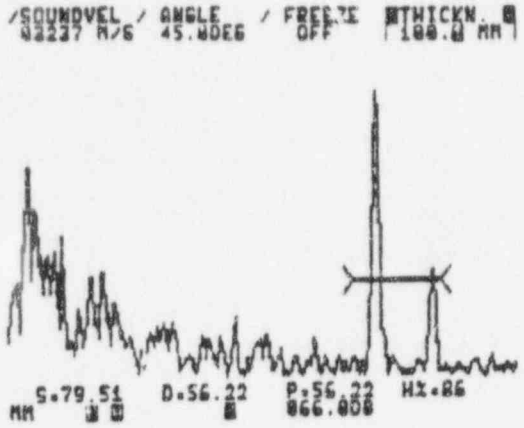
80% F.S.H. 100mm RADIUS A2 BLOCK

36dB

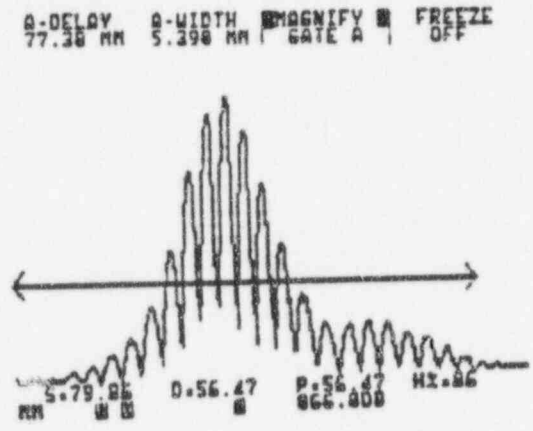
ENRICO FERMI LP ROTORS

STAGE 5 DISC HEAD BOTTOM NECK UNDERSIDE RADII.

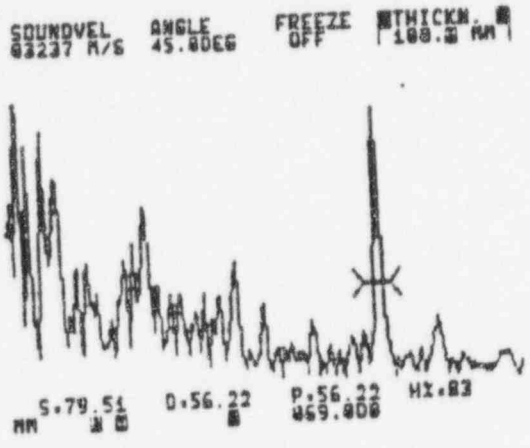
REFERENCE BLOCK.



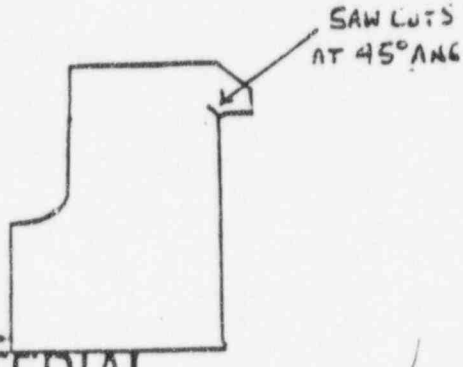
45° PROBE 86% F.S.H. ECHO FROM 2mm DEEP SAW CUT IN TEST BLOCK AT 66dbs.



ECHO DYNAMIC ENVELOPE OF ABOVE INDICATION.



45° PROBE 83% F.S.H. ECHO FROM 1mm DEEP SAW CUT IN TEST BLOCK AT 69 dbs



...T BLOCK MADE AVAILABLE ON 12-5-74

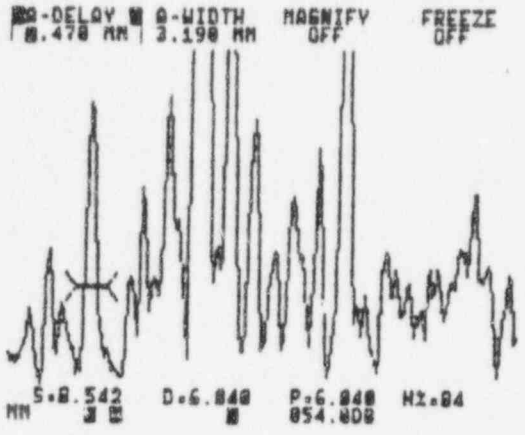
... SHEET ADDED TO IR N° T-5565

2.790 MATERIAL

Withhold From Public Disclosure

ENRICO FERMI LP ROTORS

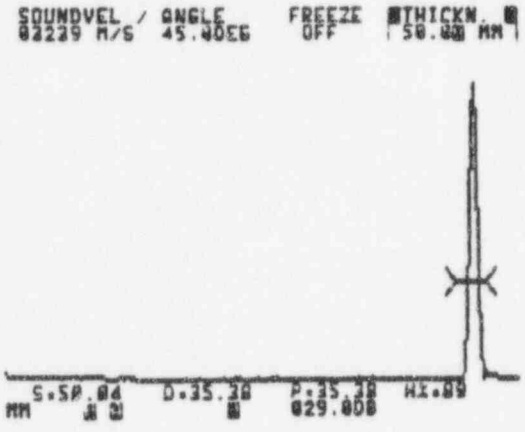
STAGE 4 BLADE ROOT REFERENCE BLOCK. CONTAINING 0.010" DEEP NOTCHE



45° PROBE.

INDICATION FROM 0.010" NOTCH AT POSITION N°1.

84% F.S.H. ECHO AT 54dbs.



50mm RADIUS A4 BLOCK.

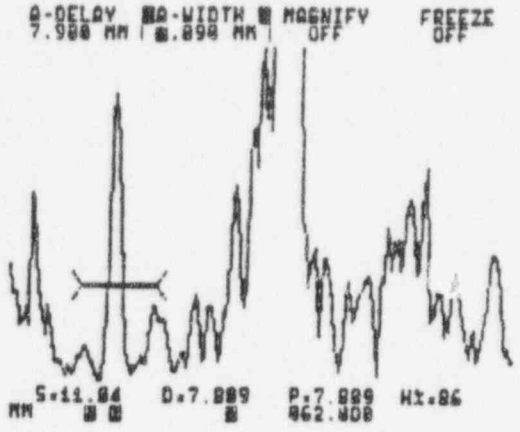
89% F.S.H. ECHO AT 29dbs.

ADDED TO IR N° T3365

2.790 MATERIAL
Withhold From Public Disclosure

ENRICO FERMI LP ROTORS.

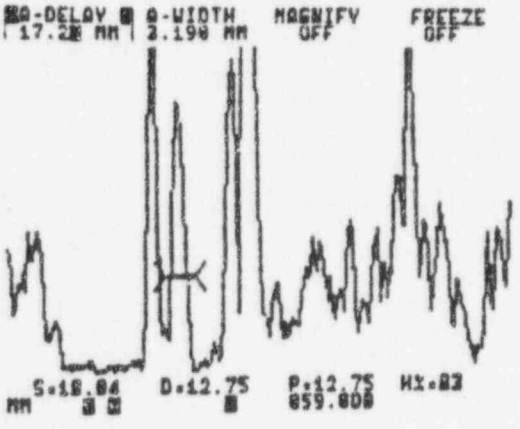
STAGE 4 BLADE ROOT REFERENCE BLOCK CONTAINING 0.010" DEEP NOTCHES.



45° PROBE.

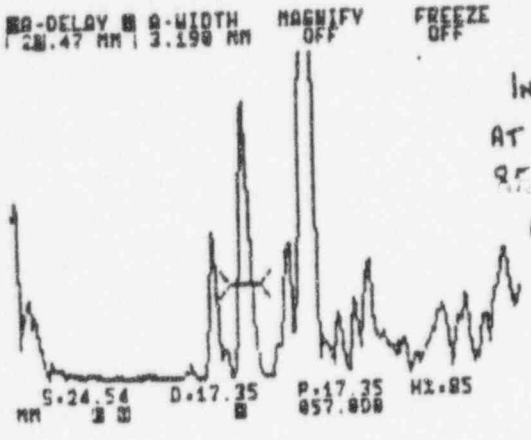
INDICATION FROM 0.010" NOTCH AT POSITION N°2.

86% F.S.H. ECHO AT 62dbs



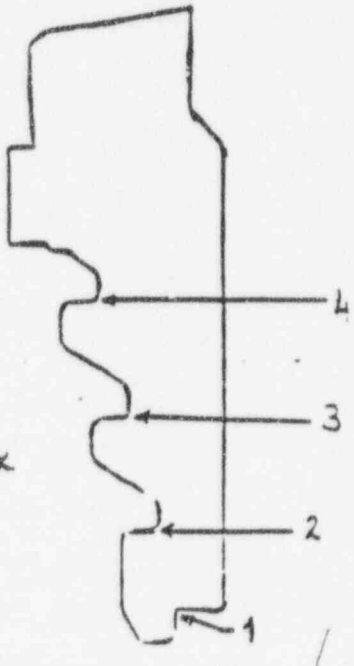
INDICATION FROM 0.010" NOTCH AT POSITION N°3.

83% F.S.H. ECHO AT 59dbs



INDICATION FROM 0.010" NOTCH AT POSITION N°4.

85% F.S.H. ECHO AT 57dbs



REFERENCE BLOCK

ADDED TO IR N° T 3365.