Conco Services LLC

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Eddy Current Report
For

East Kentucky Power Cooperative
Spurlock Station
Unit 2

LPFWH-3

June 2021

Conco Job #32764

Prepared By:	
Approved By:	

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1.0 SCOPE OF WORK

During the June 2021 unscheduled maintenance at Spurlock Station, Unit 2, East Kentucky Power Cooperative, an Eddy Current inspection was performed on 100% of the tubes in LPFWH-3. The tube specifications are as follows:

Material	OD Dimension	Wall Thickness	BWG	Length
304 SS	0.750”	0.035”	20	30' ASL

This inspection of Unit 2, LPFWH-3 was performed as part of an ongoing maintenance program at East Kentucky Power Cooperative. The current results will be compared to future inspections to assure performance, monitor for any future damage and trend the progression of previously recorded damage.

Eddy Current Testing is used to inspect a wide range of non-ferrous material for defects and degradation without damaging the test specimen. A digital multi-frequency tester with two-channel mixing was used. The tester is set with high sensitivity to small defects meanwhile still able to size large volume wear.

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2.0 INSPECTION SUMMARY

	Manufacturer	Type	Serial Number
Test System	CoreStar	Omni 200	0007-0901
Analysis Software	CoreStar	EddyVision 8.1	N/A
Calibration Standard	Ecutec	ASME	CSC-434
Calibration Standard	Ecutec	Wall Thinning	CSC-432
Probe	CoreStar	630 ESH/HF	N/A
Probe	CoreStar	610 ESH/HF	N/A

Unit 2 LPFWH-3

Outlet

The results of this inspection are summarized in the Results Summary Table and on the Results Map. At the time of this inspection, there were no previous test results available.

A 100% Eddy Current inspection was performed on the Unit 2, LPFWH-3. Of the 741 Outlet-end tubes inspected, there were 22 tubes that recorded damage ranging from 21% - 93% wall loss. There were 19 tubes recording dents. There were 2 tubes that were restricted (Row 15 Tube 35 and Row 16 Tube 34) and retested with a downsized probe, after the retests, they remained restricted.

Inlet

A 100% Eddy Current inspection was performed on the Unit 2, LPFWH-3. Of the 741 Inlet-end tubes inspected, there were 9 tubes that recorded damage ranging from 33% - 66% wall loss. There were 2 tubes recording dents. There was 1 tube that was restricted and retested with a downsized probe, after the retests, the restriction remained. This restricted tube is located in Row 18 Tube 30 (a peripheral tube) and is the photographed (supplied by the plant) tube that showed wear at the support. The restriction did not allow the probe to reach this region of concern.

There was no evidence of tube-to-tube wear or steam erosion during this inspection. There was no evidence of degradation of the tube-to-tubesheet joints.

No plugging criteria was specified at the time of this inspection, however, based on Eddy Current testing results, it was decided to plug 3 tubes (6 U-Bend tubes), these tube locations are provided on the To Be Plugged Map.

Keeping these tubes as clean as possible will help enhance the performance of this heat exchanger. Re-inspect this heat exchanger 1 to 2 operating cycles to assure performance, monitor for any future damage, and trend the progression of previously recorded damage.

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ESTABLISHED 1923

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Data Management Codes*

Condition Abbreviations

ADR	Absolute Drift	**DNT**	Dent	**RES**	Restricted Tube
ADI	Absolute Drift with Indication	**BLG**	Bulge	**OBS**	Obstructed Tube
CRK	Crack(s)	**DSM**	Dissimilar Metals	**RBD**	Retest - Bad Data
DSI	Distorted Support Indication	**STC**	Stuck Cleaner	**RNC**	Retest - Number Count
EPE	End Plate Erosion	**PVN**	Permeability Variation	**RNT**	Retest - No Test
GEN	General Pitting	**PLG**	Plugged Tube	**INC**	Incomplete Test
IDI	ID Indication	**NDD**	No Detectable Defects >20%	**BTS**	Bottom Tube Sheet
NQI	Non-Quantifiable Indication	**COR**	Corrosion	**TTS**	Top Tube Sheet
MUL	Multiple Indications	**ERO**	Erosion	**INA**	Inaccessible
ODI	OD Indication	**ERI**	Erosion with Impingement		
WAR	OD Fretting Wear	**PIT**	Pitting		

Location Abbreviations

ITE	Inlet Tube End	**NTE**	North Tube End	**BA**	Baffle
OTE	Outlet Tube End	**STE**	South Tube End	**TS**	Tube Support Plate
IO	Inlet/Outlet Tube End	**ETE**	East Tube End	**LA**	Land Area
CTE	Common Tube End	**WTE**	West Tube End	**ID**	Inside Diameter
UB	U-Bend	**RTE**	Return Tube End	**OD**	Outside Diameter
SEP	Support End Plate	**Hxx**	Hot Leg Structure	**Cxx**	Cold Leg Structure

*See the Examination Technique Specification Sheet for all applicable codes.

DATA REPORT
LEGEND

CHANNEL
Channel the indication was sized on
Channel 1 typically for freespan indications
Channel M# typically for tubesupport indications
Channel 6 typically for wear type indications

SECTION

ROW

TUBE

PERCENT
Amount of wall loss

Nearest support structure

Distance off of that structure

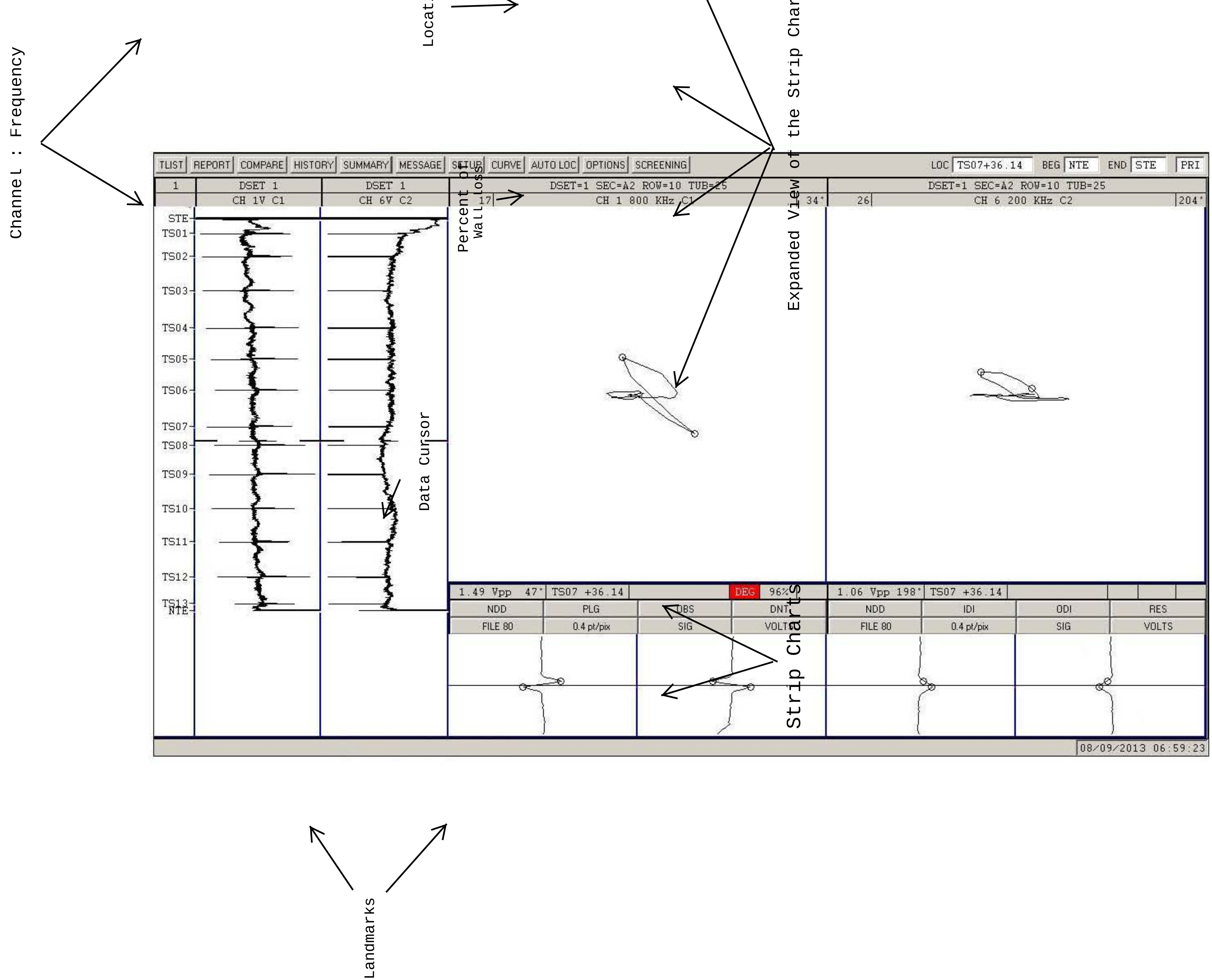
sec	row	tub	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
B	1	14				NDD				NTE	STE
B	1	15	4.49	9	23	IDI	1	TS1	79.91	NTE	STE
B	1	16				PLG					

VOLTS
Volume of lost material

INDICATION CODE

PHASE
Measured in degrees
<40 typically indicates an ID defect
>40 typically indicates an OD defect

Directionally indicates the tube test. In this case the tube was tested from the North tube end to the South tube end



Channel : Frequency
Percent of Wall loss
Data Cursor
Strip Charts
Landmarks
TLIST
REPORT
COMPARE
HISTORY
SUMMARY
MESSAGE
SETUP
CURVE
AUTO LOC
OPTIONS
SCREENING
LOC TS07+36.14
BEG NTE
END STE
PRI
DSET 1
CH 1V C1
DSET 1
CH 6V C2
DSET=1 SEC=A2 ROW=10 TUB=25
17 CH 1 800 KHz C1 34°
DSET=1 SEC=A2 ROW=10 TUB=25
26 CH 6 200 KHz C2 204°
STE
TS01
TS02
TS03
TS04
TS05
TS06
TS07
TS08
TS09
TS10
TS11
TS12
TS13
NTE
1.49 Vpp 47° TS07 +36.14
DEG 96%
1.06 Vpp 198° TS07 +36.14
NDD
PLG
DBS
DNT
FILE 80
0.4 pt/pix
SIG
VOLTS
NDD
IDI
ODI
RES
FILE 80
0.4 pt/pix
SIG
VOLTS
08/09/2013 06:59:23

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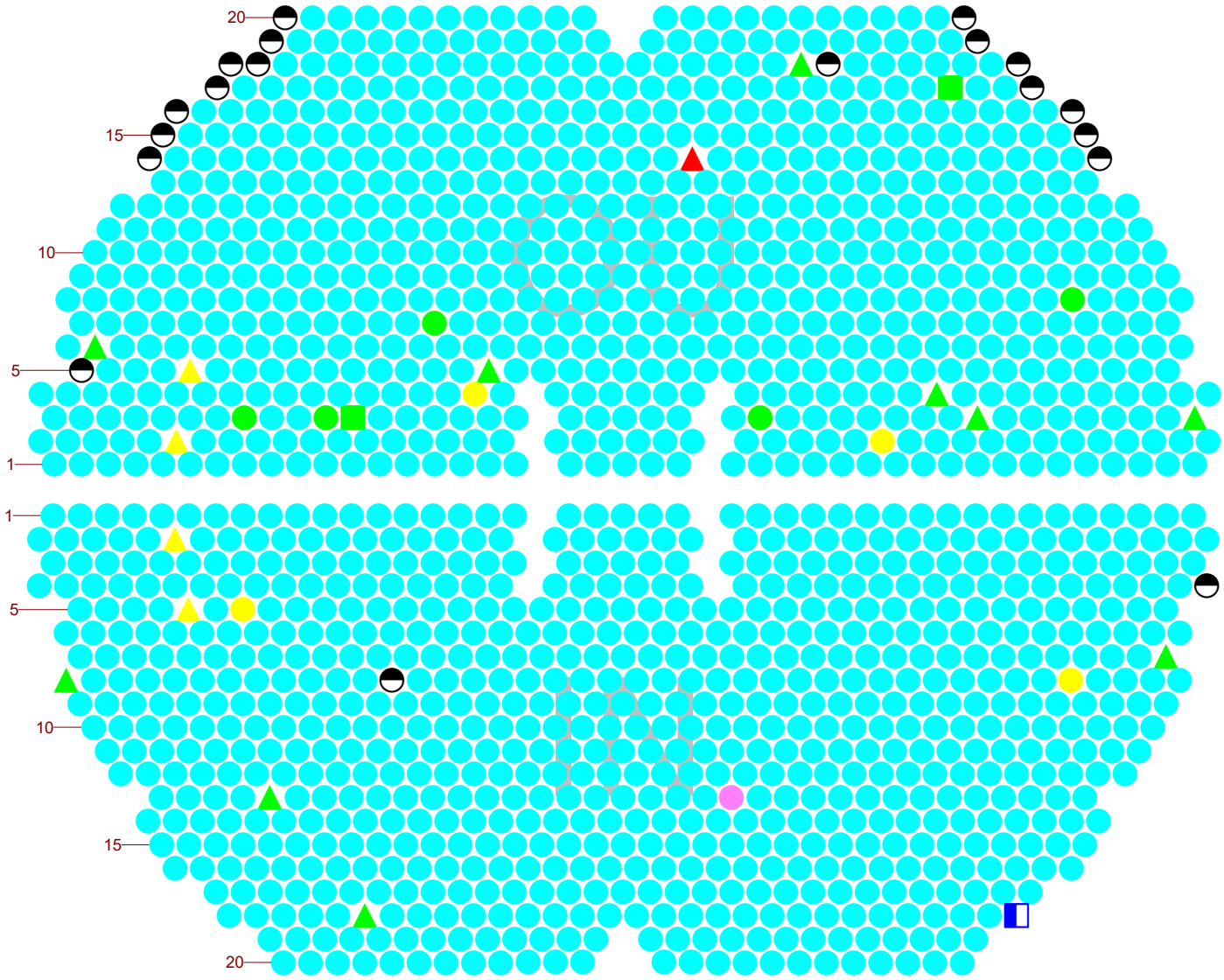
Results Summary
East Kentucky Power Cooperative
Spurlock Station
Unit 2
LPFWH-3

	06-2021 Inspection		
Total Tubes in Component (U-Tubes)	**741**		
Total Tubes Inspected (Straight Lengths)	**1482**		
Tubes Recording Damage:	**Totals**	Inlet	Outlet
Approx. Wall Loss 90% & Greater	**0**	0	1
Approx. Wall Loss 80% to 89%	**0**	0	0
Approx. Wall Loss 70% to 79%	**0**	0	0
Approx. Wall Loss 60% to 69%	**0**	1	0
Approx. Wall Loss 50% to 59%	**0**	2	2
Approx. Wall Loss 40% to 49%	**0**	2	2
Approx. Wall Loss 30% to 39%	**0**	4	5
Approx. Wall Loss 20% to 29%	**0**	0	12
Tubes Recording Dents	**0**	2	17
Tubes Recording Permeability Variations (PVN)			
Restricted Tubes (Complete Inspection Not Possible)	**0**	1	2
Obstructed Tubes (No Test Possible)	**0**	0	0
Previously Plugged U-Tubes	0		
U-Tubes Recommended for Plugging	3 SL (6 U-Tubes)		
Total of Previously Plugged U-Tubes & U-Tubes Recommended for Plugging	3 SL (6 U-Tubes)		

RESULTS MAP

EAST KENTUCKY POWER COOPERATIVE
SPURLOCK STATION
UNIT 2
LPFWH-3
06-2021

VIEW FROM:INLET/OUTLET



SYM	HITS	TUBES	VIS	TYPE	DESCRIPTION
	0	0	0	QUERY	OBS_RESULTS.qry
	3	3	1	QUERY	RES_RESULTS.qry
	1437	1437	1435	QUERY	NDD_RESULTS.qry
	2	2	2	QUERY	PVN_RESULTS
	21	19	19	QUERY	DNT_RESULTS.qry
	5	5	5	QUERY	20-29%_RESULTS.qry
	10	10	10	QUERY	30-39%_RESULTS.qry
	4	4	4	QUERY	40-49%_RESULTS.qry
	2	2	4	QUERY	50-59%_RESULTS.qry
	1	1	1	QUERY	60-69%_RESULTS.qry
	0	0	0	QUERY	70-79%_RESULTS.qry
	0	0	0	QUERY	80-89%_RESULTS.qry
	1	1	1	QUERY	90-100%_RESULTS.qry
	0	0	0	QUERY	PLUG_RESULTS.qry
	1,486	1,484	1,482		

Model LPFWH-3 (1,482 tubes)
0 open tubes

Data Report
East Kentucky Power Cooperative
Spurlock Station
Unit 2
LPFWH-3
06-2021

sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
IN	1	1				NDD				UB	IO
IN	1	2				NDD				UB	IO
IN	1	3				NDD				UB	IO
IN	1	4				NDD				UB	IO
IN	1	5				NDD				UB	IO
IN	1	6				NDD				UB	IO
IN	1	7				NDD				UB	IO
IN	1	8				NDD				UB	IO
IN	1	9				NDD				UB	IO
IN	1	10				NDD				UB	IO
IN	1	11				NDD				UB	IO
IN	1	12				NDD				UB	IO
IN	1	13				NDD				UB	IO
IN	1	14				NDD				UB	IO
IN	1	15				NDD				UB	IO
IN	1	16				NDD				UB	IO
IN	1	17				NDD				UB	IO
IN	1	18				NDD				UB	IO
IN	1	19				NDD				UB	IO
IN	1	20				NDD				UB	IO
IN	1	21				NDD				UB	IO
IN	1	22				NDD				UB	IO
IN	1	23				NDD				UB	IO
IN	1	24				NDD				UB	IO
IN	1	25				NDD				UB	IO
IN	1	26				NDD				UB	IO
IN	1	27				NDD				UB	IO
IN	1	28				NDD				UB	IO
IN	1	29				NDD				UB	IO
IN	1	30				NDD				UB	IO
IN	1	31				NDD				UB	IO
IN	1	32				NDD				UB	IO
IN	1	33				NDD				UB	IO
IN	1	34				NDD				UB	IO
IN	1	35				NDD				UB	IO
IN	1	36				NDD				UB	IO
IN	1	37				NDD				UB	IO
IN	1	38				NDD				UB	IO
IN	1	39				NDD				UB	IO
IN	1	40				NDD				UB	IO
IN	1	41				NDD				UB	IO

Data Report
East Kentucky Power Cooperative
Spurlock Station
Unit 2
LPFWH-3
06-2021

sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
IN	2	1				NDD				UB	IO
IN	2	2				NDD				UB	IO
IN	2	3				NDD				UB	IO
IN	2	4				NDD				UB	IO
IN	2	5				NDD				UB	IO
IN	2	6				NDD				UB	IO
IN	2	7				NDD				UB	IO
IN	2	8				NDD				UB	IO
IN	2	9				NDD				UB	IO
IN	2	10				NDD				UB	IO
IN	2	11				NDD				UB	IO
IN	2	12				NDD				UB	IO
IN	2	13				NDD				UB	IO
IN	2	14				NDD				UB	IO
IN	2	15				NDD				UB	IO
IN	2	16				NDD				UB	IO
IN	2	17				NDD				UB	IO
IN	2	18				NDD				UB	IO
IN	2	19				NDD				UB	IO
IN	2	20				NDD				UB	IO
IN	2	21				NDD				UB	IO
IN	2	22				NDD				UB	IO
IN	2	23				NDD				UB	IO
IN	2	24				NDD				UB	IO
IN	2	25				NDD				UB	IO
IN	2	26				NDD				UB	IO
IN	2	27				NDD				UB	IO
IN	2	28				NDD				UB	IO
IN	2	29				NDD				UB	IO
IN	2	30				NDD				UB	IO
IN	2	31				NDD				UB	IO
IN	2	32				NDD				UB	IO
IN	2	33				NDD				UB	IO
IN	2	34				NDD				UB	IO
IN	2	35				NDD				UB	IO
IN	2	36				NDD				UB	IO
IN	2	37				NDD				UB	IO
IN	2	38				NDD				UB	IO
IN	2	39				NDD				UB	IO
IN	2	40				NDD				UB	IO
IN	2	41				NDD				UB	IO

Data Report
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Spurlock Station
Unit 2
LPFWH-3
06-2021

sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
IN	2	42				NDD				UB	IO
IN	3	1				NDD				UB	IO
IN	3	2				NDD				UB	IO
IN	3	3				NDD				UB	IO
IN	3	4				NDD				UB	IO
IN	3	5				NDD				UB	IO
IN	3	6				NDD				UB	IO
IN	3	7				NDD				UB	IO
IN	3	8				NDD				UB	IO
IN	3	9				NDD				UB	IO
IN	3	10				NDD				UB	IO
IN	3	11				NDD				UB	IO
IN	3	12				NDD				UB	IO
IN	3	13				NDD				UB	IO
IN	3	14				NDD				UB	IO
IN	3	15				NDD				UB	IO
IN	3	16				NDD				UB	IO
IN	3	17				NDD				UB	IO
IN	3	18				NDD				UB	IO
IN	3	19				NDD				UB	IO
IN	3	20				NDD				UB	IO
IN	3	21				NDD				UB	IO
IN	3	22				NDD				UB	IO
IN	3	23				NDD				UB	IO
IN	3	24				NDD				UB	IO
IN	3	25				NDD				UB	IO
IN	3	26				NDD				UB	IO
IN	3	27				NDD				UB	IO
IN	3	28				NDD				UB	IO
IN	3	29				NDD				UB	IO
IN	3	30				NDD				UB	IO
IN	3	31				NDD				UB	IO
IN	3	32				NDD				UB	IO
IN	3	33				NDD				UB	IO
IN	3	34				NDD				UB	IO
IN	3	35				NDD				UB	IO
IN	3	36				NDD				UB	IO
IN	3	37				NDD				UB	IO
IN	3	38				NDD				UB	IO
IN	3	39				NDD				UB	IO
IN	3	40				NDD				UB	IO

Data Report
East Kentucky Power Cooperative
Spurlock Station
Unit 2
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sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
IN	3	41				NDD				UB	IO
IN	4	1				NDD				UB	IO
IN	4	2				NDD				UB	IO
IN	4	3				NDD				UB	IO
IN	4	4				NDD				UB	IO
IN	4	5				NDD				UB	IO
IN	4	6				NDD				UB	IO
IN	4	7				NDD				UB	IO
IN	4	8				NDD				UB	IO
IN	4	9				NDD				UB	IO
IN	4	10				NDD				UB	IO
IN	4	11				NDD				UB	IO
IN	4	12				NDD				UB	IO
IN	4	13				NDD				UB	IO
IN	4	14				NDD				UB	IO
IN	4	15				NDD				UB	IO
IN	4	16				NDD				UB	IO
IN	4	17				NDD				UB	IO
IN	4	18				NDD				UB	IO
IN	4	19				NDD				UB	IO
IN	4	20				NDD				UB	IO
IN	4	21				NDD				UB	IO
IN	4	22				NDD				UB	IO
IN	4	23				NDD				UB	IO
IN	4	24				NDD				UB	IO
IN	4	25				NDD				UB	IO
IN	4	26				NDD				UB	IO
IN	4	27				NDD				UB	IO
IN	4	28				NDD				UB	IO
IN	4	29				NDD				UB	IO
IN	4	30				NDD				UB	IO
IN	4	31				NDD				UB	IO
IN	4	32				NDD				UB	IO
IN	4	33				NDD				UB	IO
IN	4	34				NDD				UB	IO
IN	4	35				NDD				UB	IO
IN	4	36				NDD				UB	IO
IN	4	37				NDD				UB	IO
IN	4	38				NDD				UB	IO
IN	4	39				NDD				UB	IO
IN	4	40				NDD				UB	IO

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sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
IN	4	41				NDD				UB	IO
IN	4	42	32.26	188		DNT	1	IN	198.64	UB	IO
IN	5	1				NDD				UB	IO
IN	5	2				NDD				UB	IO
IN	5	3				NDD				UB	IO
IN	5	4				NDD				UB	IO
IN	5	5				NDD				UB	IO
IN	5	6				NDD				UB	IO
IN	5	7	4.12	16	41	IDI	1	IN	168.72	UB	IO
IN	5	8				NDD				UB	IO
IN	5	9				NDD				UB	IO
IN	5	10				NDD				UB	IO
IN	5	11				NDD				UB	IO
IN	5	12				NDD				UB	IO
IN	5	13				NDD				UB	IO
IN	5	14				NDD				UB	IO
IN	5	15				NDD				UB	IO
IN	5	16				NDD				UB	IO
IN	5	17				NDD				UB	IO
IN	5	18				NDD				UB	IO
IN	5	19				NDD				UB	IO
IN	5	20				NDD				UB	IO
IN	5	21				NDD				UB	IO
IN	5	22				NDD				UB	IO
IN	5	23				NDD				UB	IO
IN	5	24				NDD				UB	IO
IN	5	25				NDD				UB	IO
IN	5	26				NDD				UB	IO
IN	5	27				NDD				UB	IO
IN	5	28				NDD				UB	IO
IN	5	29				NDD				UB	IO
IN	5	30				NDD				UB	IO
IN	5	31				NDD				UB	IO
IN	5	32				NDD				UB	IO
IN	5	33				NDD				UB	IO
IN	5	34				NDD				UB	IO
IN	5	35				NDD				UB	IO
IN	5	36				NDD				UB	IO
IN	5	37				NDD				UB	IO
IN	5	38				NDD				UB	IO
IN	5	39				NDD				UB	IO

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sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
IN	5	40				NDD				UB	IO
IN	5	41				NDD				UB	IO
IN	6	1				NDD				UB	IO
IN	6	2				NDD				UB	IO
IN	6	3				NDD				UB	IO
IN	6	4				NDD				UB	IO
IN	6	5				NDD				UB	IO
IN	6	6				NDD				UB	IO
IN	6	7				NDD				UB	IO
IN	6	8				NDD				UB	IO
IN	6	9				NDD				UB	IO
IN	6	10				NDD				UB	IO
IN	6	11				NDD				UB	IO
IN	6	12				NDD				UB	IO
IN	6	13				NDD				UB	IO
IN	6	14				NDD				UB	IO
IN	6	15				NDD				UB	IO
IN	6	16				NDD				UB	IO
IN	6	17				NDD				UB	IO
IN	6	18				NDD				UB	IO
IN	6	19				NDD				UB	IO
IN	6	20				NDD				UB	IO
IN	6	21				NDD				UB	IO
IN	6	22				NDD				UB	IO
IN	6	23				NDD				UB	IO
IN	6	24				NDD				UB	IO
IN	6	25				NDD				UB	IO
IN	6	26				NDD				UB	IO
IN	6	27				NDD				UB	IO
IN	6	28				NDD				UB	IO
IN	6	29				NDD				UB	IO
IN	6	30				NDD				UB	IO
IN	6	31				NDD				UB	IO
IN	6	32				NDD				UB	IO
IN	6	33				NDD				UB	IO
IN	6	34				NDD				UB	IO
IN	6	35				NDD				UB	IO
IN	6	36				NDD				UB	IO
IN	6	37				NDD				UB	IO
IN	6	38				NDD				UB	IO
IN	6	39				NDD				UB	IO

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Unit 2
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06-2021

sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
IN	6	40				NDD				UB	IO
IN	6	41				NDD				UB	IO
IN	6	42				NDD				UB	IO
IN	7	1				NDD				UB	IO
IN	7	2				NDD				UB	IO
IN	7	3				NDD				UB	IO
IN	7	4				NDD				UB	IO
IN	7	5				NDD				UB	IO
IN	7	6				NDD				UB	IO
IN	7	7				NDD				UB	IO
IN	7	8				NDD				UB	IO
IN	7	9				NDD				UB	IO
IN	7	10				NDD				UB	IO
IN	7	11				NDD				UB	IO
IN	7	12				NDD				UB	IO
IN	7	13				NDD				UB	IO
IN	7	14				NDD				UB	IO
IN	7	15				NDD				UB	IO
IN	7	16				NDD				UB	IO
IN	7	17				NDD				UB	IO
IN	7	18				NDD				UB	IO
IN	7	19				NDD				UB	IO
IN	7	20				NDD				UB	IO
IN	7	21				NDD				UB	IO
IN	7	22				NDD				UB	IO
IN	7	23				NDD				UB	IO
IN	7	24				NDD				UB	IO
IN	7	25				NDD				UB	IO
IN	7	26				NDD				UB	IO
IN	7	27				NDD				UB	IO
IN	7	28				NDD				UB	IO
IN	7	29				NDD				UB	IO
IN	7	30				NDD				UB	IO
IN	7	31				NDD				UB	IO
IN	7	32				NDD				UB	IO
IN	7	33				NDD				UB	IO
IN	7	34				NDD				UB	IO
IN	7	35				NDD				UB	IO
IN	7	36				NDD				UB	IO
IN	7	37				NDD				UB	IO
IN	7	38				NDD				UB	IO

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sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
IN	7	39				NDD				UB	IO
IN	7	40				NDD				UB	IO
IN	7	41	0.76	14	35	IDI	1	IN	233.52	UB	IO
IN	8	1	2.32	14	35	IDI	1	IN	93.97	UB	IO
IN	8	2				NDD				UB	IO
IN	8	3				NDD				UB	IO
IN	8	4				NDD				UB	IO
IN	8	5				NDD				UB	IO
IN	8	6				NDD				UB	IO
IN	8	7				NDD				UB	IO
IN	8	8				NDD				UB	IO
IN	8	9				NDD				UB	IO
IN	8	10				NDD				UB	IO
IN	8	11				NDD				UB	IO
IN	8	12				NDD				UB	IO
IN	8	13	84.99	190		DNT	1	IN	232.87	UB	IO
IN	8	14				NDD				UB	IO
IN	8	15				NDD				UB	IO
IN	8	16				NDD				UB	IO
IN	8	17				NDD				UB	IO
IN	8	18				NDD				UB	IO
IN	8	19				NDD				UB	IO
IN	8	20				NDD				UB	IO
IN	8	21				NDD				UB	IO
IN	8	22				NDD				UB	IO
IN	8	23				NDD				UB	IO
IN	8	24				NDD				UB	IO
IN	8	25				NDD				UB	IO
IN	8	26				NDD				UB	IO
IN	8	27				NDD				UB	IO
IN	8	28				NDD				UB	IO
IN	8	29				NDD				UB	IO
IN	8	30				NDD				UB	IO
IN	8	31				NDD				UB	IO
IN	8	32				NDD				UB	IO
IN	8	33				NDD				UB	IO
IN	8	34				NDD				UB	IO
IN	8	35				NDD				UB	IO
IN	8	36				NDD				UB	IO
IN	8	37				NDD				UB	IO
IN	8	38	2.27	16	41	IDI	3	IN	132.68	UB	IO

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sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
IN	8	39				NDD				UB	IO
IN	8	40				NDD				UB	IO
IN	8	41				NDD				UB	IO
IN	8	42				NDD				UB	IO
IN	9	1				NDD				UB	IO
IN	9	2				NDD				UB	IO
IN	9	3				NDD				UB	IO
IN	9	4				NDD				UB	IO
IN	9	5				NDD				UB	IO
IN	9	6				NDD				UB	IO
IN	9	7				NDD				UB	IO
IN	9	8				NDD				UB	IO
IN	9	9				NDD				UB	IO
IN	9	10				NDD				UB	IO
IN	9	11				NDD				UB	IO
IN	9	12				NDD				UB	IO
IN	9	13				NDD				UB	IO
IN	9	14				NDD				UB	IO
IN	9	15				NDD				UB	IO
IN	9	16				NDD				UB	IO
IN	9	17				NDD				UB	IO
IN	9	18				NDD				UB	IO
IN	9	19				NDD				UB	IO
IN	9	20				NDD				UB	IO
IN	9	21				NDD				UB	IO
IN	9	22				NDD				UB	IO
IN	9	23				NDD				UB	IO
IN	9	24				NDD				UB	IO
IN	9	25				NDD				UB	IO
IN	9	26				NDD				UB	IO
IN	9	27				NDD				UB	IO
IN	9	28				NDD				UB	IO
IN	9	29				NDD				UB	IO
IN	9	30				NDD				UB	IO
IN	9	31				NDD				UB	IO
IN	9	32				NDD				UB	IO
IN	9	33				NDD				UB	IO
IN	9	34				NDD				UB	IO
IN	9	35				NDD				UB	IO
IN	9	36				NDD				UB	IO
IN	9	37				NDD				UB	IO

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sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
IN	9	38				NDD				UB	IO
IN	9	39				NDD				UB	IO
IN	9	40				NDD				UB	IO
IN	9	41				NDD				UB	IO
IN	10	1				NDD				UB	IO
IN	10	2				NDD				UB	IO
IN	10	3				NDD				UB	IO
IN	10	4				NDD				UB	IO
IN	10	5				NDD				UB	IO
IN	10	6				NDD				UB	IO
IN	10	7				NDD				UB	IO
IN	10	8				NDD				UB	IO
IN	10	9				NDD				UB	IO
IN	10	10				NDD				UB	IO
IN	10	11				NDD				UB	IO
IN	10	12				NDD				UB	IO
IN	10	13				NDD				UB	IO
IN	10	14				NDD				UB	IO
IN	10	15				NDD				UB	IO
IN	10	16				NDD				UB	IO
IN	10	17				NDD				UB	IO
IN	10	18				NDD				UB	IO
IN	10	19				NDD				UB	IO
IN	10	20				NDD				UB	IO
IN	10	21				NDD				UB	IO
IN	10	22				NDD				UB	IO
IN	10	23				NDD				UB	IO
IN	10	24				NDD				UB	IO
IN	10	25				NDD				UB	IO
IN	10	26				NDD				UB	IO
IN	10	27				NDD				UB	IO
IN	10	28				NDD				UB	IO
IN	10	29				NDD				UB	IO
IN	10	30				NDD				UB	IO
IN	10	31				NDD				UB	IO
IN	10	32				NDD				UB	IO
IN	10	33				NDD				UB	IO
IN	10	34				NDD				UB	IO
IN	10	35				NDD				UB	IO
IN	10	36				NDD				UB	IO
IN	10	37				NDD				UB	IO

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sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
IN	10	38				NDD				UB	IO
IN	10	39				NDD				UB	IO
IN	10	40				NDD				UB	IO
IN	11	1				NDD				UB	IO
IN	11	2				NDD				UB	IO
IN	11	3				NDD				UB	IO
IN	11	4				NDD				UB	IO
IN	11	5				NDD				UB	IO
IN	11	6				NDD				UB	IO
IN	11	7				NDD				UB	IO
IN	11	8				NDD				UB	IO
IN	11	9				NDD				UB	IO
IN	11	10				NDD				UB	IO
IN	11	11				NDD				UB	IO
IN	11	12				NDD				UB	IO
IN	11	13				NDD				UB	IO
IN	11	14				NDD				UB	IO
IN	11	15				NDD				UB	IO
IN	11	16				NDD				UB	IO
IN	11	17				NDD				UB	IO
IN	11	18				NDD				UB	IO
IN	11	19				NDD				UB	IO
IN	11	20				NDD				UB	IO
IN	11	21				NDD				UB	IO
IN	11	22				NDD				UB	IO
IN	11	23				NDD				UB	IO
IN	11	24				NDD				UB	IO
IN	11	25				NDD				UB	IO
IN	11	26				NDD				UB	IO
IN	11	27				NDD				UB	IO
IN	11	28				NDD				UB	IO
IN	11	29				NDD				UB	IO
IN	11	30				NDD				UB	IO
IN	11	31				NDD				UB	IO
IN	11	32				NDD				UB	IO
IN	11	33				NDD				UB	IO
IN	11	34				NDD				UB	IO
IN	11	35				NDD				UB	IO
IN	11	36				NDD				UB	IO
IN	11	37				NDD				UB	IO
IN	11	38				NDD				UB	IO

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sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
IN	11	39				NDD				UB	IO
IN	12	1				NDD				UB	IO
IN	12	2				NDD				UB	IO
IN	12	3				NDD				UB	IO
IN	12	4				NDD				UB	IO
IN	12	5				NDD				UB	IO
IN	12	6				NDD				UB	IO
IN	12	7				NDD				UB	IO
IN	12	8				NDD				UB	IO
IN	12	9				NDD				UB	IO
IN	12	10				NDD				UB	IO
IN	12	11				NDD				UB	IO
IN	12	12				NDD				UB	IO
IN	12	13				NDD				UB	IO
IN	12	14				NDD				UB	IO
IN	12	15				NDD				UB	IO
IN	12	16				NDD				UB	IO
IN	12	17				NDD				UB	IO
IN	12	18				NDD				UB	IO
IN	12	19				NDD				UB	IO
IN	12	20				NDD				UB	IO
IN	12	21				NDD				UB	IO
IN	12	22				NDD				UB	IO
IN	12	23				NDD				UB	IO
IN	12	24				NDD				UB	IO
IN	12	25				NDD				UB	IO
IN	12	26				NDD				UB	IO
IN	12	27				NDD				UB	IO
IN	12	28				NDD				UB	IO
IN	12	29				NDD				UB	IO
IN	12	30				NDD				UB	IO
IN	12	31				NDD				UB	IO
IN	12	32				NDD				UB	IO
IN	12	33				NDD				UB	IO
IN	12	34				NDD				UB	IO
IN	12	35				NDD				UB	IO
IN	12	36				NDD				UB	IO
IN	12	37				NDD				UB	IO
IN	12	38				NDD				UB	IO
IN	13	1				NDD				UB	IO
IN	13	2				NDD				UB	IO

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sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
IN	13	3				NDD				UB	IO
IN	13	4				NDD				UB	IO
IN	13	5	1.02	13	33	IDI	1	IN	198.45	UB	IO
IN	13	6				NDD				UB	IO
IN	13	7				NDD				UB	IO
IN	13	8				NDD				UB	IO
IN	13	9				NDD				UB	IO
IN	13	10				NDD				UB	IO
IN	13	11				NDD				UB	IO
IN	13	12				NDD				UB	IO
IN	13	13				NDD				UB	IO
IN	13	14				NDD				UB	IO
IN	13	15				NDD				UB	IO
IN	13	16				NDD				UB	IO
IN	13	17				NDD				UB	IO
IN	13	18				NDD				UB	IO
IN	13	19				NDD				UB	IO
IN	13	20				NDD				UB	IO
IN	13	21				NDD				UB	IO
IN	13	22	10.54	26	66	IDI	1	IN	6.73	UB	IO
IN	13	23				NDD				UB	IO
IN	13	24				NDD				UB	IO
IN	13	25				NDD				UB	IO
IN	13	26				NDD				UB	IO
IN	13	27				NDD				UB	IO
IN	13	28				NDD				UB	IO
IN	13	29				NDD				UB	IO
IN	13	30				NDD				UB	IO
IN	13	31				NDD				UB	IO
IN	13	32				NDD				UB	IO
IN	13	33				NDD				UB	IO
IN	13	34				NDD				UB	IO
IN	13	35				NDD				UB	IO
IN	14	1				NDD				UB	IO
IN	14	2				NDD				UB	IO
IN	14	3				NDD				UB	IO
IN	14	4				NDD				UB	IO
IN	14	5				NDD				UB	IO
IN	14	6				NDD				UB	IO
IN	14	7				NDD				UB	IO
IN	14	8				NDD				UB	IO

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sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
IN	14	9				NDD				UB	IO
IN	14	10				NDD				UB	IO
IN	14	11				NDD				UB	IO
IN	14	12				NDD				UB	IO
IN	14	13				NDD				UB	IO
IN	14	14				NDD				UB	IO
IN	14	15				NDD				UB	IO
IN	14	16				NDD				UB	IO
IN	14	17				NDD				UB	IO
IN	14	18				NDD				UB	IO
IN	14	19				NDD				UB	IO
IN	14	20				NDD				UB	IO
IN	14	21				NDD				UB	IO
IN	14	22				NDD				UB	IO
IN	14	23				NDD				UB	IO
IN	14	24				NDD				UB	IO
IN	14	25				NDD				UB	IO
IN	14	26				NDD				UB	IO
IN	14	27				NDD				UB	IO
IN	14	28				NDD				UB	IO
IN	14	29				NDD				UB	IO
IN	14	30				NDD				UB	IO
IN	14	31				NDD				UB	IO
IN	14	32				NDD				UB	IO
IN	14	33				NDD				UB	IO
IN	14	34				NDD				UB	IO
IN	14	35				NDD				UB	IO
IN	14	36				NDD				UB	IO
IN	15	1				NDD				UB	IO
IN	15	2				NDD				UB	IO
IN	15	3				NDD				UB	IO
IN	15	4				NDD				UB	IO
IN	15	5				NDD				UB	IO
IN	15	6				NDD				UB	IO
IN	15	7				NDD				UB	IO
IN	15	8				NDD				UB	IO
IN	15	9				NDD				UB	IO
IN	15	10				NDD				UB	IO
IN	15	11				NDD				UB	IO
IN	15	12				NDD				UB	IO
IN	15	13				NDD				UB	IO

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sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
IN	15	14				NDD				UB	IO
IN	15	15				NDD				UB	IO
IN	15	16				NDD				UB	IO
IN	15	17				NDD				UB	IO
IN	15	18				NDD				UB	IO
IN	15	19				NDD				UB	IO
IN	15	20				NDD				UB	IO
IN	15	21				NDD				UB	IO
IN	15	22				NDD				UB	IO
IN	15	23				NDD				UB	IO
IN	15	24				NDD				UB	IO
IN	15	25				NDD				UB	IO
IN	15	26				NDD				UB	IO
IN	15	27				NDD				UB	IO
IN	15	28				NDD				UB	IO
IN	15	29				NDD				UB	IO
IN	15	30				NDD				UB	IO
IN	15	31				NDD				UB	IO
IN	15	32				NDD				UB	IO
IN	15	33				NDD				UB	IO
IN	15	34				NDD				UB	IO
IN	15	35				NDD				UB	IO
IN	16	1				NDD				UB	IO
IN	16	2				NDD				UB	IO
IN	16	3				NDD				UB	IO
IN	16	4				NDD				UB	IO
IN	16	5				NDD				UB	IO
IN	16	6				NDD				UB	IO
IN	16	7				NDD				UB	IO
IN	16	8				NDD				UB	IO
IN	16	9				NDD				UB	IO
IN	16	10				NDD				UB	IO
IN	16	11				NDD				UB	IO
IN	16	12				NDD				UB	IO
IN	16	13				NDD				UB	IO
IN	16	14				NDD				UB	IO
IN	16	15				NDD				UB	IO
IN	16	16				NDD				UB	IO
IN	16	17				NDD				UB	IO
IN	16	18				NDD				UB	IO
IN	16	19				NDD				UB	IO

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sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
IN	16	20				NDD				UB	IO
IN	16	21				NDD				UB	IO
IN	16	22				NDD				UB	IO
IN	16	23				NDD				UB	IO
IN	16	24				NDD				UB	IO
IN	16	25				NDD				UB	IO
IN	16	26				NDD				UB	IO
IN	16	27				NDD				UB	IO
IN	16	28				NDD				UB	IO
IN	16	29				NDD				UB	IO
IN	16	30				NDD				UB	IO
IN	16	31				NDD				UB	IO
IN	16	32				NDD				UB	IO
IN	16	33				NDD				UB	IO
IN	16	34				NDD				UB	IO
IN	17	1				NDD				UB	IO
IN	17	2				NDD				UB	IO
IN	17	3				NDD				UB	IO
IN	17	4				NDD				UB	IO
IN	17	5				NDD				UB	IO
IN	17	6				NDD				UB	IO
IN	17	7				NDD				UB	IO
IN	17	8				NDD				UB	IO
IN	17	9				NDD				UB	IO
IN	17	10				NDD				UB	IO
IN	17	11				NDD				UB	IO
IN	17	12				NDD				UB	IO
IN	17	13				NDD				UB	IO
IN	17	14				NDD				UB	IO
IN	17	15				NDD				UB	IO
IN	17	16				NDD				UB	IO
IN	17	17				NDD				UB	IO
IN	17	18				NDD				UB	IO
IN	17	19				NDD				UB	IO
IN	17	20				NDD				UB	IO
IN	17	21				NDD				UB	IO
IN	17	22				NDD				UB	IO
IN	17	23				NDD				UB	IO
IN	17	24				NDD				UB	IO
IN	17	25				NDD				UB	IO
IN	17	26				NDD				UB	IO

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sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
IN	17	27				NDD				UB	IO
IN	17	28				NDD				UB	IO
IN	17	29				NDD				UB	IO
IN	17	30				NDD				UB	IO
IN	17	31				NDD				UB	IO
IN	18	1				NDD				UB	IO
IN	18	2				NDD				UB	IO
IN	18	3				NDD				UB	IO
IN	18	4				NDD				UB	IO
IN	18	5				NDD				UB	IO
IN	18	6	4.20	13	33	IDI	1	IN	98.68	UB	IO
IN	18	7				NDD				UB	IO
IN	18	8				NDD				UB	IO
IN	18	9				NDD				UB	IO
IN	18	10				NDD				UB	IO
IN	18	11				NDD				UB	IO
IN	18	12				NDD				UB	IO
IN	18	13				NDD				UB	IO
IN	18	14				NDD				UB	IO
IN	18	15				NDD				UB	IO
IN	18	16				NDD				UB	IO
IN	18	17				NDD				UB	IO
IN	18	18				NDD				UB	IO
IN	18	19				NDD				UB	IO
IN	18	20				NDD				UB	IO
IN	18	21				NDD				UB	IO
IN	18	22				NDD				UB	IO
IN	18	23				NDD				UB	IO
IN	18	24				NDD				UB	IO
IN	18	25				NDD				UB	IO
IN	18	26				NDD				UB	IO
IN	18	27				NDD				UB	IO
IN	18	28				NDD				UB	IO
IN	18	29				NDD				UB	IO
IN	18	30				RES	1	IN	35.58	UB	IO
IN	18	30				RES	1	IN	60.21	UB	IO
IN	19	1				NDD				UB	IO
IN	19	2				NDD				UB	IO
IN	19	3				NDD				UB	IO
IN	19	4				NDD				UB	IO
IN	19	5				NDD				UB	IO

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sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
IN	19	6				NDD				UB	IO
IN	19	7				NDD				UB	IO
IN	19	8				NDD				UB	IO
IN	19	9				NDD				UB	IO
IN	19	10				NDD				UB	IO
IN	19	11				NDD				UB	IO
IN	19	12				NDD				UB	IO
IN	19	13				NDD				UB	IO
IN	19	14				NDD				UB	IO
IN	19	15				NDD				UB	IO
IN	19	16				NDD				UB	IO
IN	19	17				NDD				UB	IO
IN	19	18				NDD				UB	IO
IN	19	19				NDD				UB	IO
IN	19	20				NDD				UB	IO
IN	19	21				NDD				UB	IO
IN	19	22				NDD				UB	IO
IN	19	23				NDD				UB	IO
IN	19	24				NDD				UB	IO
IN	19	25				NDD				UB	IO
IN	19	26				NDD				UB	IO
IN	20	1				NDD				UB	IO
IN	20	2				NDD				UB	IO
IN	20	3				NDD				UB	IO
IN	20	4				NDD				UB	IO
IN	20	5				NDD				UB	IO
IN	20	6				NDD				UB	IO
IN	20	7				NDD				UB	IO
IN	20	8				NDD				UB	IO
IN	20	9				NDD				UB	IO
IN	20	10				NDD				UB	IO
IN	20	11				NDD				UB	IO
IN	20	12				NDD				UB	IO
IN	20	13				NDD				UB	IO
IN	20	14				NDD				UB	IO
IN	20	15				NDD				UB	IO
IN	20	16				NDD				UB	IO
IN	20	17				NDD				UB	IO
IN	20	18				NDD				UB	IO
IN	20	19				NDD				UB	IO
IN	20	20				NDD				UB	IO

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sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
IN	20	21				NDD				UB	IO
IN	20	22				NDD				UB	IO
IN	20	23				NDD				UB	IO
IN	20	24				NDD				UB	IO
OU	1	1				NDD				UB	IO
OU	1	2				NDD				UB	IO
OU	1	3				NDD				UB	IO
OU	1	4				NDD				UB	IO
OU	1	5				NDD				UB	IO
OU	1	6				NDD				UB	IO
OU	1	7				NDD				UB	IO
OU	1	8				NDD				UB	IO
OU	1	9				NDD				UB	IO
OU	1	10				NDD				UB	IO
OU	1	11				NDD				UB	IO
OU	1	12				NDD				UB	IO
OU	1	13				NDD				UB	IO
OU	1	14				NDD				UB	IO
OU	1	15				NDD				UB	IO
OU	1	16				NDD				UB	IO
OU	1	17				NDD				UB	IO
OU	1	18				NDD				UB	IO
OU	1	19				NDD				UB	IO
OU	1	20				NDD				UB	IO
OU	1	21				NDD				UB	IO
OU	1	22				NDD				UB	IO
OU	1	23				NDD				UB	IO
OU	1	24				NDD				UB	IO
OU	1	25				NDD				UB	IO
OU	1	26				NDD				UB	IO
OU	1	27				NDD				UB	IO
OU	1	28				NDD				UB	IO
OU	1	29				NDD				UB	IO
OU	1	30				NDD				UB	IO
OU	1	31				NDD				UB	IO
OU	1	32				NDD				UB	IO
OU	1	33				NDD				UB	IO
OU	1	34				NDD				UB	IO
OU	1	35				NDD				UB	IO
OU	1	36				NDD				UB	IO
OU	1	37				NDD				UB	IO

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sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
OU	1	38				NDD				UB	IO
OU	1	39				NDD				UB	IO
OU	1	40				NDD				UB	IO
OU	1	41				NDD				UB	IO
OU	2	1				NDD				UB	IO
OU	2	2				NDD				UB	IO
OU	2	3				NDD				UB	IO
OU	2	4				NDD				UB	IO
OU	2	5				NDD				UB	IO
OU	2	6	3.03	21	53	IDI	1	OU	198.58	UB	IO
OU	2	7				NDD				UB	IO
OU	2	8				NDD				UB	IO
OU	2	9				NDD				UB	IO
OU	2	10				NDD				UB	IO
OU	2	11				NDD				UB	IO
OU	2	12				NDD				UB	IO
OU	2	13				NDD				UB	IO
OU	2	14				NDD				UB	IO
OU	2	15				NDD				UB	IO
OU	2	16				NDD				UB	IO
OU	2	17				NDD				UB	IO
OU	2	18				NDD				UB	IO
OU	2	19				NDD				UB	IO
OU	2	20				NDD				UB	IO
OU	2	21				NDD				UB	IO
OU	2	22				NDD				UB	IO
OU	2	23				NDD				UB	IO
OU	2	24				NDD				UB	IO
OU	2	25				NDD				UB	IO
OU	2	26				NDD				UB	IO
OU	2	27				NDD				UB	IO
OU	2	28				NDD				UB	IO
OU	2	29				NDD				UB	IO
OU	2	30	7.24	19	48	IDI	1	OU	160.27	UB	IO
OU	2	31				NDD				UB	IO
OU	2	32				NDD				UB	IO
OU	2	33				NDD				UB	IO
OU	2	34				NDD				UB	IO
OU	2	35				NDD				UB	IO
OU	2	36				NDD				UB	IO
OU	2	37				NDD				UB	IO

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sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
OU	2	38				NDD				UB	IO
OU	2	39				NDD				UB	IO
OU	2	40				NDD				UB	IO
OU	2	41				NDD				UB	IO
OU	2	42				NDD				UB	IO
OU	3	1				NDD				UB	IO
OU	3	2				NDD				UB	IO
OU	3	3				NDD				UB	IO
OU	3	4				NDD				UB	IO
OU	3	5				NDD				UB	IO
OU	3	6				NDD				UB	IO
OU	3	7				NDD				UB	IO
OU	3	8	2.54	11	29	IDI	1	OU	219.00	UB	IO
OU	3	9				NDD				UB	IO
OU	3	10				NDD				UB	IO
OU	3	11	3.23	10	25	IDI	1	OU	77.63	UB	IO
OU	3	12	21.90	32		PVN	1	0U	-0.04	UB	IO
OU	3	13				NDD				UB	IO
OU	3	14				NDD				UB	IO
OU	3	15				NDD				UB	IO
OU	3	16				NDD				UB	IO
OU	3	17				NDD				UB	IO
OU	3	18				NDD				UB	IO
OU	3	19				NDD				UB	IO
OU	3	20				NDD				UB	IO
OU	3	21				NDD				UB	IO
OU	3	22				NDD				UB	IO
OU	3	23				NDD				UB	IO
OU	3	24				NDD				UB	IO
OU	3	25	0.82	11	27	IDI	1	OU	72.19	UB	IO
OU	3	26				NDD				UB	IO
OU	3	27				NDD				UB	IO
OU	3	28				NDD				UB	IO
OU	3	29				NDD				UB	IO
OU	3	30				NDD				UB	IO
OU	3	31				NDD				UB	IO
OU	3	32				NDD				UB	IO
OU	3	33	5.34	12	31	IDI	1	OU	232.78	UB	IO
OU	3	34				NDD				UB	IO
OU	3	35				NDD				UB	IO
OU	3	36				NDD				UB	IO

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sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
OU	3	37				NDD				UB	IO
OU	3	38				NDD				UB	IO
OU	3	39				NDD				UB	IO
OU	3	40				NDD				UB	IO
OU	3	41	4.13	12	31	IDI	1	OU	130.84	UB	IO
OU	4	1				NDD				UB	IO
OU	4	2				NDD				UB	IO
OU	4	3				NDD				UB	IO
OU	4	4				NDD				UB	IO
OU	4	5				NDD				UB	IO
OU	4	6				NDD				UB	IO
OU	4	7				NDD				UB	IO
OU	4	8				NDD				UB	IO
OU	4	9				NDD				UB	IO
OU	4	10				NDD				UB	IO
OU	4	11				NDD				UB	IO
OU	4	12				NDD				UB	IO
OU	4	13				NDD				UB	IO
OU	4	14				NDD				UB	IO
OU	4	15				NDD				UB	IO
OU	4	16				NDD				UB	IO
OU	4	17	2.19	17	44	IDI	1	OU	157.06	UB	IO
OU	4	18				NDD				UB	IO
OU	4	19				NDD				UB	IO
OU	4	20				NDD				UB	IO
OU	4	21				NDD				UB	IO
OU	4	22				NDD				UB	IO
OU	4	23				NDD				UB	IO
OU	4	24				NDD				UB	IO
OU	4	25				NDD				UB	IO
OU	4	26				NDD				UB	IO
OU	4	27				NDD				UB	IO
OU	4	28				NDD				UB	IO
OU	4	29				NDD				UB	IO
OU	4	30				NDD				UB	IO
OU	4	31				NDD				UB	IO
OU	4	32	4.86	12	3	IDI	1	OU	171.23	UB	IO
OU	4	33				NDD				UB	IO
OU	4	34				NDD				UB	IO
OU	4	35				NDD				UB	IO
OU	4	36				NDD				UB	IO

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sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
OU	4	37				NDD				UB	IO
OU	4	38				NDD				UB	IO
OU	4	39				NDD				UB	IO
OU	4	40				NDD				UB	IO
OU	4	41				NDD				UB	IO
OU	4	42				NDD				UB	IO
OU	5	1	27.91	185		DNT	1	OU	176.75	UB	IO
OU	5	2				NDD				UB	IO
OU	5	3				NDD				UB	IO
OU	5	4				NDD				UB	IO
OU	5	5	3.53	20	5	IDI	1	OU	118.26	UB	IO
OU	5	6				NDD				UB	IO
OU	5	7				NDD				UB	IO
OU	5	8				NDD				UB	IO
OU	5	9				NDD				UB	IO
OU	5	10				NDD				UB	IO
OU	5	11				NDD				UB	IO
OU	5	12				NDD				UB	IO
OU	5	13				NDD				UB	IO
OU	5	14				NDD				UB	IO
OU	5	15				NDD				UB	IO
OU	5	16	2.90	14	36	IDI	1	OU	56.47	UB	IO
OU	5	17				NDD				UB	IO
OU	5	18				NDD				UB	IO
OU	5	19				NDD				UB	IO
OU	5	20				NDD				UB	IO
OU	5	21				NDD				UB	IO
OU	5	22				NDD				UB	IO
OU	5	23				NDD				UB	IO
OU	5	24				NDD				UB	IO
OU	5	25				NDD				UB	IO
OU	5	26				NDD				UB	IO
OU	5	27				NDD				UB	IO
OU	5	28				NDD				UB	IO
OU	5	29				NDD				UB	IO
OU	5	30				NDD				UB	IO
OU	5	31				NDD				UB	IO
OU	5	32				NDD				UB	IO
OU	5	33				NDD				UB	IO
OU	5	34				NDD				UB	IO
OU	5	35				NDD				UB	IO

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sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
OU	5	36				NDD				UB	IO
OU	5	37				NDD				UB	IO
OU	5	38				NDD				UB	IO
OU	5	39				NDD				UB	IO
OU	5	40				NDD				UB	IO
OU	5	41				NDD				UB	IO
OU	6	1				NDD				UB	IO
OU	6	2	6.75	0	38	WAR	6	OU	75.56	UB	IO
OU	6	3				NDD				UB	IO
OU	6	4				NDD				UB	IO
OU	6	5				NDD				UB	IO
OU	6	6				NDD				UB	IO
OU	6	7				NDD				UB	IO
OU	6	8				NDD				UB	IO
OU	6	9				NDD				UB	IO
OU	6	10				NDD				UB	IO
OU	6	11				NDD				UB	IO
OU	6	12				NDD				UB	IO
OU	6	13				NDD				UB	IO
OU	6	14				NDD				UB	IO
OU	6	15				NDD				UB	IO
OU	6	16				NDD				UB	IO
OU	6	17				NDD				UB	IO
OU	6	18				NDD				UB	IO
OU	6	19				NDD				UB	IO
OU	6	20				NDD				UB	IO
OU	6	21				NDD				UB	IO
OU	6	22				NDD				UB	IO
OU	6	23				NDD				UB	IO
OU	6	24				NDD				UB	IO
OU	6	25				NDD				UB	IO
OU	6	26				NDD				UB	IO
OU	6	27				NDD				UB	IO
OU	6	28				NDD				UB	IO
OU	6	29				NDD				UB	IO
OU	6	30				NDD				UB	IO
OU	6	31				NDD				UB	IO
OU	6	32				NDD				UB	IO
OU	6	33				NDD				UB	IO
OU	6	34				NDD				UB	IO
OU	6	35				NDD				UB	IO

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sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
OU	6	36				NDD				UB	IO
OU	6	37				NDD				UB	IO
OU	6	38				NDD				UB	IO
OU	6	39				NDD				UB	IO
OU	6	40				NDD				UB	IO
OU	6	41				NDD				UB	IO
OU	6	42				NDD				UB	IO
OU	7	1				NDD				UB	IO
OU	7	2				NDD				UB	IO
OU	7	3				NDD				UB	IO
OU	7	4				NDD				UB	IO
OU	7	5				NDD				UB	IO
OU	7	6				NDD				UB	IO
OU	7	7				NDD				UB	IO
OU	7	8				NDD				UB	IO
OU	7	9				NDD				UB	IO
OU	7	10				NDD				UB	IO
OU	7	11				NDD				UB	IO
OU	7	12				NDD				UB	IO
OU	7	13				NDD				UB	IO
OU	7	14	2.10	11	28	IDI	1	OU	195.03	UB	IO
OU	7	15				NDD				UB	IO
OU	7	16				NDD				UB	IO
OU	7	17				NDD				UB	IO
OU	7	18				NDD				UB	IO
OU	7	19				NDD				UB	IO
OU	7	20				NDD				UB	IO
OU	7	21				NDD				UB	IO
OU	7	22				NDD				UB	IO
OU	7	23				NDD				UB	IO
OU	7	24				NDD				UB	IO
OU	7	25				NDD				UB	IO
OU	7	26				NDD				UB	IO
OU	7	27				NDD				UB	IO
OU	7	28				NDD				UB	IO
OU	7	29				NDD				UB	IO
OU	7	30				NDD				UB	IO
OU	7	31				NDD				UB	IO
OU	7	32				NDD				UB	IO
OU	7	33				NDD				UB	IO
OU	7	34				NDD				UB	IO

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sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
OU	7	35				NDD				UB	IO
OU	7	36				NDD				UB	IO
OU	7	37				NDD				UB	IO
OU	7	38				NDD				UB	IO
OU	7	39				NDD				UB	IO
OU	7	40				NDD				UB	IO
OU	7	41				NDD				UB	IO
OU	8	1				NDD				UB	IO
OU	8	2				NDD				UB	IO
OU	8	3				NDD				UB	IO
OU	8	4				NDD				UB	IO
OU	8	5				NDD				UB	IO
OU	8	6				NDD				UB	IO
OU	8	7				NDD				UB	IO
OU	8	8				NDD				UB	IO
OU	8	9				NDD				UB	IO
OU	8	10				NDD				UB	IO
OU	8	11				NDD				UB	IO
OU	8	12				NDD				UB	IO
OU	8	13				NDD				UB	IO
OU	8	14				NDD				UB	IO
OU	8	15				NDD				UB	IO
OU	8	16				NDD				UB	IO
OU	8	17				NDD				UB	IO
OU	8	18				NDD				UB	IO
OU	8	19				NDD				UB	IO
OU	8	20				NDD				UB	IO
OU	8	21				NDD				UB	IO
OU	8	22				NDD				UB	IO
OU	8	23				NDD				UB	IO
OU	8	24				NDD				UB	IO
OU	8	25				NDD				UB	IO
OU	8	26				NDD				UB	IO
OU	8	27				NDD				UB	IO
OU	8	28				NDD				UB	IO
OU	8	29				NDD				UB	IO
OU	8	30				NDD				UB	IO
OU	8	31				NDD				UB	IO
OU	8	32				NDD				UB	IO
OU	8	33				NDD				UB	IO
OU	8	34				NDD				UB	IO

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sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
OU	8	35				NDD				UB	IO
OU	8	36				NDD				UB	IO
OU	8	37				NDD				UB	IO
OU	8	38	2.96	9	23	IDI	1	OU	196.13	UB	IO
OU	8	39				NDD				UB	IO
OU	8	40				NDD				UB	IO
OU	8	41				NDD				UB	IO
OU	8	42				NDD				UB	IO
OU	9	1				NDD				UB	IO
OU	9	2				NDD				UB	IO
OU	9	3				NDD				UB	IO
OU	9	4				NDD				UB	IO
OU	9	5				NDD				UB	IO
OU	9	6				NDD				UB	IO
OU	9	7				NDD				UB	IO
OU	9	8				NDD				UB	IO
OU	9	9				NDD				UB	IO
OU	9	10				NDD				UB	IO
OU	9	11				NDD				UB	IO
OU	9	12				NDD				UB	IO
OU	9	13				NDD				UB	IO
OU	9	14				NDD				UB	IO
OU	9	15				NDD				UB	IO
OU	9	16				NDD				UB	IO
OU	9	17				NDD				UB	IO
OU	9	18				NDD				UB	IO
OU	9	19				NDD				UB	IO
OU	9	20				NDD				UB	IO
OU	9	21				NDD				UB	IO
OU	9	22				NDD				UB	IO
OU	9	23				NDD				UB	IO
OU	9	24				NDD				UB	IO
OU	9	25				NDD				UB	IO
OU	9	26				NDD				UB	IO
OU	9	27				NDD				UB	IO
OU	9	28				NDD				UB	IO
OU	9	29				NDD				UB	IO
OU	9	30				NDD				UB	IO
OU	9	31				NDD				UB	IO
OU	9	32				NDD				UB	IO
OU	9	33				NDD				UB	IO

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sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
OU	9	34				NDD				UB	IO
OU	9	35				NDD				UB	IO
OU	9	36				NDD				UB	IO
OU	9	37				NDD				UB	IO
OU	9	38				NDD				UB	IO
OU	9	39				NDD				UB	IO
OU	9	40				NDD				UB	IO
OU	9	41				NDD				UB	IO
OU	10	1				NDD				UB	IO
OU	10	2				NDD				UB	IO
OU	10	3				NDD				UB	IO
OU	10	4				NDD				UB	IO
OU	10	5				NDD				UB	IO
OU	10	6				NDD				UB	IO
OU	10	7				NDD				UB	IO
OU	10	8				NDD				UB	IO
OU	10	9				NDD				UB	IO
OU	10	10				NDD				UB	IO
OU	10	11				NDD				UB	IO
OU	10	12				NDD				UB	IO
OU	10	13				NDD				UB	IO
OU	10	14				NDD				UB	IO
OU	10	15				NDD				UB	IO
OU	10	16				NDD				UB	IO
OU	10	17				NDD				UB	IO
OU	10	18				NDD				UB	IO
OU	10	19				NDD				UB	IO
OU	10	20				NDD				UB	IO
OU	10	21				NDD				UB	IO
OU	10	22				NDD				UB	IO
OU	10	23				NDD				UB	IO
OU	10	24				NDD				UB	IO
OU	10	25				NDD				UB	IO
OU	10	26				NDD				UB	IO
OU	10	27				NDD				UB	IO
OU	10	28				NDD				UB	IO
OU	10	29				NDD				UB	IO
OU	10	30				NDD				UB	IO
OU	10	31				NDD				UB	IO
OU	10	32				NDD				UB	IO
OU	10	33				NDD				UB	IO

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sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
OU	10	34				NDD				UB	IO
OU	10	35				NDD				UB	IO
OU	10	36				NDD				UB	IO
OU	10	37				NDD				UB	IO
OU	10	38				NDD				UB	IO
OU	10	39				NDD				UB	IO
OU	10	40				NDD				UB	IO
OU	11	1				NDD				UB	IO
OU	11	2				NDD				UB	IO
OU	11	3				NDD				UB	IO
OU	11	4				NDD				UB	IO
OU	11	5				NDD				UB	IO
OU	11	6				NDD				UB	IO
OU	11	7				NDD				UB	IO
OU	11	8				NDD				UB	IO
OU	11	9				NDD				UB	IO
OU	11	10				NDD				UB	IO
OU	11	11				NDD				UB	IO
OU	11	12				NDD				UB	IO
OU	11	13				NDD				UB	IO
OU	11	14				NDD				UB	IO
OU	11	15				NDD				UB	IO
OU	11	16				NDD				UB	IO
OU	11	17				NDD				UB	IO
OU	11	18				NDD				UB	IO
OU	11	19				NDD				UB	IO
OU	11	20				NDD				UB	IO
OU	11	21				NDD				UB	IO
OU	11	22				NDD				UB	IO
OU	11	23				NDD				UB	IO
OU	11	24				NDD				UB	IO
OU	11	25				NDD				UB	IO
OU	11	26				NDD				UB	IO
OU	11	27				NDD				UB	IO
OU	11	28				NDD				UB	IO
OU	11	29				NDD				UB	IO
OU	11	30				NDD				UB	IO
OU	11	31				NDD				UB	IO
OU	11	32				NDD				UB	IO
OU	11	33				NDD				UB	IO
OU	11	34				NDD				UB	IO

Data Report
East Kentucky Power Cooperative
Spurlock Station
Unit 2
LPFWH-3
06-2021

sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
OU	11	35				NDD				UB	IO
OU	11	36				NDD				UB	IO
OU	11	37				NDD				UB	IO
OU	11	38				NDD				UB	IO
OU	11	39				NDD				UB	IO
OU	12	1				NDD				UB	IO
OU	12	2				NDD				UB	IO
OU	12	3				NDD				UB	IO
OU	12	4				NDD				UB	IO
OU	12	5				NDD				UB	IO
OU	12	6				NDD				UB	IO
OU	12	7				NDD				UB	IO
OU	12	8				NDD				UB	IO
OU	12	9				NDD				UB	IO
OU	12	10				NDD				UB	IO
OU	12	11				NDD				UB	IO
OU	12	12				NDD				UB	IO
OU	12	13				NDD				UB	IO
OU	12	14				NDD				UB	IO
OU	12	15				NDD				UB	IO
OU	12	16				NDD				UB	IO
OU	12	17				NDD				UB	IO
OU	12	18				NDD				UB	IO
OU	12	19				NDD				UB	IO
OU	12	20				NDD				UB	IO
OU	12	21				NDD				UB	IO
OU	12	22				NDD				UB	IO
OU	12	23				NDD				UB	IO
OU	12	24				NDD				UB	IO
OU	12	25				NDD				UB	IO
OU	12	26				NDD				UB	IO
OU	12	27				NDD				UB	IO
OU	12	28				NDD				UB	IO
OU	12	29				NDD				UB	IO
OU	12	30				NDD				UB	IO
OU	12	31				NDD				UB	IO
OU	12	32				NDD				UB	IO
OU	12	33				NDD				UB	IO
OU	12	34				NDD				UB	IO
OU	12	35				NDD				UB	IO
OU	12	36				NDD				UB	IO

Data Report
East Kentucky Power Cooperative
Spurlock Station
Unit 2
LPFWH-3
06-2021

sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
OU	12	37				NDD				UB	IO
OU	12	38				NDD				UB	IO
OU	13	1				NDD				UB	IO
OU	13	2				NDD				UB	IO
OU	13	3				NDD				UB	IO
OU	13	4				NDD				UB	IO
OU	13	5				NDD				UB	IO
OU	13	6				NDD				UB	IO
OU	13	7				NDD				UB	IO
OU	13	8				NDD				UB	IO
OU	13	9				NDD				UB	IO
OU	13	10				NDD				UB	IO
OU	13	11				NDD				UB	IO
OU	13	12				NDD				UB	IO
OU	13	13				NDD				UB	IO
OU	13	14				NDD				UB	IO
OU	13	15				NDD				UB	IO
OU	13	16				NDD				UB	IO
OU	13	17				NDD				UB	IO
OU	13	18				NDD				UB	IO
OU	13	19				NDD				UB	IO
OU	13	20				NDD				UB	IO
OU	13	21				NDD				UB	IO
OU	13	22				NDD				UB	IO
OU	13	23				NDD				UB	IO
OU	13	24				NDD				UB	IO
OU	13	25				NDD				UB	IO
OU	13	26				NDD				UB	IO
OU	13	27				NDD				UB	IO
OU	13	28				NDD				UB	IO
OU	13	29				NDD				UB	IO
OU	13	30				NDD				UB	IO
OU	13	31				NDD				UB	IO
OU	13	32				NDD				UB	IO
OU	13	33				NDD				UB	IO
OU	13	34				NDD				UB	IO
OU	13	35				NDD				UB	IO
OU	14	1	76.95	186		DNT	M1	OU	255.55	UB	IO
OU	14	2				NDD				UB	IO
OU	14	3				NDD				UB	IO
OU	14	4				NDD				UB	IO

Data Report
East Kentucky Power Cooperative
Spurlock Station
Unit 2
LPFWH-3
06-2021

sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
OU	14	5				NDD				UB	IO
OU	14	6				NDD				UB	IO
OU	14	7				NDD				UB	IO
OU	14	8				NDD				UB	IO
OU	14	9				NDD				UB	IO
OU	14	10				NDD				UB	IO
OU	14	11				NDD				UB	IO
OU	14	12				NDD				UB	IO
OU	14	13				NDD				UB	IO
OU	14	14				NDD				UB	IO
OU	14	15				NDD				UB	IO
OU	14	16				NDD				UB	IO
OU	14	17				NDD				UB	IO
OU	14	18				NDD				UB	IO
OU	14	19				NDD				UB	IO
OU	14	20				NDD				UB	IO
OU	14	21	1.17	59	93	ODI	1	OU	74.92	UB	IO
OU	14	22				NDD				UB	IO
OU	14	23				NDD				UB	IO
OU	14	24				NDD				UB	IO
OU	14	25				NDD				UB	IO
OU	14	26				NDD				UB	IO
OU	14	27				NDD				UB	IO
OU	14	28				NDD				UB	IO
OU	14	29				NDD				UB	IO
OU	14	30				NDD				UB	IO
OU	14	31				NDD				UB	IO
OU	14	32				NDD				UB	IO
OU	14	33				NDD				UB	IO
OU	14	34				NDD				UB	IO
OU	14	35				NDD				UB	IO
OU	14	36	45.94	186		DNT	M1	OU	225.00	UB	IO
OU	14	36	38.48	187		DNT	M1	OU	135.00	UB	IO
OU	15	1	48.81	188		DNT	M1	OU	225.00	UB	IO
OU	15	2				NDD				UB	IO
OU	15	3				NDD				UB	IO
OU	15	4				NDD				UB	IO
OU	15	5				NDD				UB	IO
OU	15	6				NDD				UB	IO
OU	15	7				NDD				UB	IO
OU	15	8				NDD				UB	IO

Data Report
East Kentucky Power Cooperative
Spurlock Station
Unit 2
LPFWH-3
06-2021

sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
OU	15	9				NDD				UB	IO
OU	15	10				NDD				UB	IO
OU	15	11				NDD				UB	IO
OU	15	12				NDD				UB	IO
OU	15	13				NDD				UB	IO
OU	15	14				NDD				UB	IO
OU	15	15				NDD				UB	IO
OU	15	16				NDD				UB	IO
OU	15	17				NDD				UB	IO
OU	15	18				NDD				UB	IO
OU	15	19				NDD				UB	IO
OU	15	20				NDD				UB	IO
OU	15	21				NDD				UB	IO
OU	15	22				NDD				UB	IO
OU	15	23				NDD				UB	IO
OU	15	24				NDD				UB	IO
OU	15	25				NDD				UB	IO
OU	15	26				NDD				UB	IO
OU	15	27				NDD				UB	IO
OU	15	28				NDD				UB	IO
OU	15	29				NDD				UB	IO
OU	15	30				NDD				UB	IO
OU	15	31				NDD				UB	IO
OU	15	32				NDD				UB	IO
OU	15	33				NDD				UB	IO
OU	15	34				NDD				UB	IO
OU	15	35				RES	1	OU	225.62	TS4	IO
OU	15	35	32.09	187		DNT	M1	OU	135.00	TS4	IO
OU	15	35	120.68	183		PVN	1	OU	225.70	TS6	IO
OU	16	1	65.27	7		DNT	M1	OU	225.00	UB	IO
OU	16	2				NDD				UB	IO
OU	16	3				NDD				UB	IO
OU	16	4				NDD				UB	IO
OU	16	5				NDD				UB	IO
OU	16	6				NDD				UB	IO
OU	16	7				NDD				UB	IO
OU	16	8				NDD				UB	IO
OU	16	9				NDD				UB	IO
OU	16	10				NDD				UB	IO
OU	16	11				NDD				UB	IO
OU	16	12				NDD				UB	IO

Data Report
East Kentucky Power Cooperative
Spurlock Station
Unit 2
LPFWH-3
06-2021

sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
OU	16	13				NDD				UB	IO
OU	16	14				NDD				UB	IO
OU	16	15				NDD				UB	IO
OU	16	16				NDD				UB	IO
OU	16	17				NDD				UB	IO
OU	16	18				NDD				UB	IO
OU	16	19				NDD				UB	IO
OU	16	20				NDD				UB	IO
OU	16	21				NDD				UB	IO
OU	16	22				NDD				UB	IO
OU	16	23				NDD				UB	IO
OU	16	24				NDD				UB	IO
OU	16	25				NDD				UB	IO
OU	16	26				NDD				UB	IO
OU	16	27				NDD				UB	IO
OU	16	28				NDD				UB	IO
OU	16	29				NDD				UB	IO
OU	16	30				NDD				UB	IO
OU	16	31				NDD				UB	IO
OU	16	32				NDD				UB	IO
OU	16	33				NDD				UB	IO
OU	16	34				RES	1	OU	226.61	TS4	IO
OU	16	34	113.19	186		DNT	M1	OU	135.00	TS4	IO
OU	16	34	173.75	183		PVN	1	OU	225.92	TS2	IO
OU	17	1	79.70	186		DNT	M1	OU	225.00	UB	IO
OU	17	2				NDD				UB	IO
OU	17	3				NDD				UB	IO
OU	17	4				NDD				UB	IO
OU	17	5				NDD				UB	IO
OU	17	6				NDD				UB	IO
OU	17	7				NDD				UB	IO
OU	17	8				NDD				UB	IO
OU	17	9				NDD				UB	IO
OU	17	10				NDD				UB	IO
OU	17	11				NDD				UB	IO
OU	17	12				NDD				UB	IO
OU	17	13				NDD				UB	IO
OU	17	14				NDD				UB	IO
OU	17	15				NDD				UB	IO
OU	17	16				NDD				UB	IO
OU	17	17				NDD				UB	IO

Data Report
East Kentucky Power Cooperative
Spurlock Station
Unit 2
LPFWH-3
06-2021

sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
OU	17	18				NDD				UB	IO
OU	17	19				NDD				UB	IO
OU	17	20				NDD				UB	IO
OU	17	21				NDD				UB	IO
OU	17	22				NDD				UB	IO
OU	17	23				NDD				UB	IO
OU	17	24				NDD				UB	IO
OU	17	25				NDD				UB	IO
OU	17	26				NDD				UB	IO
OU	17	27				NDD				UB	IO
OU	17	28	24.35	23		PVN	1	OU	10.23	UB	IO
OU	17	29				NDD				UB	IO
OU	17	30				NDD				UB	IO
OU	17	31	60.59	187		DNT	M1	OU	224.58	UB	IO
OU	18	1	126.91	186		DNT	M1	OU	224.86	UB	IO
OU	18	2	77.40	188		DNT	M1	OU	223.61	UB	IO
OU	18	3				NDD				UB	IO
OU	18	4				NDD				UB	IO
OU	18	5				NDD				UB	IO
OU	18	6				NDD				UB	IO
OU	18	7				NDD				UB	IO
OU	18	8				NDD				UB	IO
OU	18	9				NDD				UB	IO
OU	18	10				NDD				UB	IO
OU	18	11				NDD				UB	IO
OU	18	12				NDD				UB	IO
OU	18	13				NDD				UB	IO
OU	18	14				NDD				UB	IO
OU	18	15				NDD				UB	IO
OU	18	16				NDD				UB	IO
OU	18	17				NDD				UB	IO
OU	18	18				NDD				UB	IO
OU	18	19				NDD				UB	IO
OU	18	20				NDD				UB	IO
OU	18	21				NDD				UB	IO
OU	18	22	3.54	13	33	IDI	1	OU	199.43	UB	IO
OU	18	23	31.86	186		DNT	1	OU	0.04	UB	IO
OU	18	24				NDD				UB	IO
OU	18	25				NDD				UB	IO
OU	18	26				NDD				UB	IO
OU	18	27				NDD				UB	IO

Data Report
East Kentucky Power Cooperative
Spurlock Station
Unit 2
LPFWH-3
06-2021

sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
OU	18	28				NDD				UB	IO
OU	18	29				NDD				UB	IO
OU	18	30	111.72	187		DNT	M1	OU	224.27	UB	IO
OU	18	30	36.30	189		DNT	M1	OU	134.97	UB	IO
OU	19	1	116.39	188		DNT	M1	OU	225.00	UB	IO
OU	19	2				NDD				UB	IO
OU	19	3				NDD				UB	IO
OU	19	4				NDD				UB	IO
OU	19	5				NDD				UB	IO
OU	19	6				NDD				UB	IO
OU	19	7				NDD				UB	IO
OU	19	8				NDD				UB	IO
OU	19	9				NDD				UB	IO
OU	19	10				NDD				UB	IO
OU	19	11				NDD				UB	IO
OU	19	12				NDD				UB	IO
OU	19	13				NDD				UB	IO
OU	19	14				NDD				UB	IO
OU	19	15				NDD				UB	IO
OU	19	16				NDD				UB	IO
OU	19	17				NDD				UB	IO
OU	19	18				NDD				UB	IO
OU	19	19				NDD				UB	IO
OU	19	20				NDD				UB	IO
OU	19	21				NDD				UB	IO
OU	19	22				NDD				UB	IO
OU	19	23				NDD				UB	IO
OU	19	24				NDD				UB	IO
OU	19	25				NDD				UB	IO
OU	19	26	61.43	189		DNT	M1	OU	225.00	UB	IO
OU	20	1	64.91	187		DNT	M1	OU	225.00	UB	IO
OU	20	2				NDD				UB	IO
OU	20	3				NDD				UB	IO
OU	20	4				NDD				UB	IO
OU	20	5				NDD				UB	IO
OU	20	6				NDD				UB	IO
OU	20	7				NDD				UB	IO
OU	20	8				NDD				UB	IO
OU	20	9				NDD				UB	IO
OU	20	10				NDD				UB	IO
OU	20	11				NDD				UB	IO

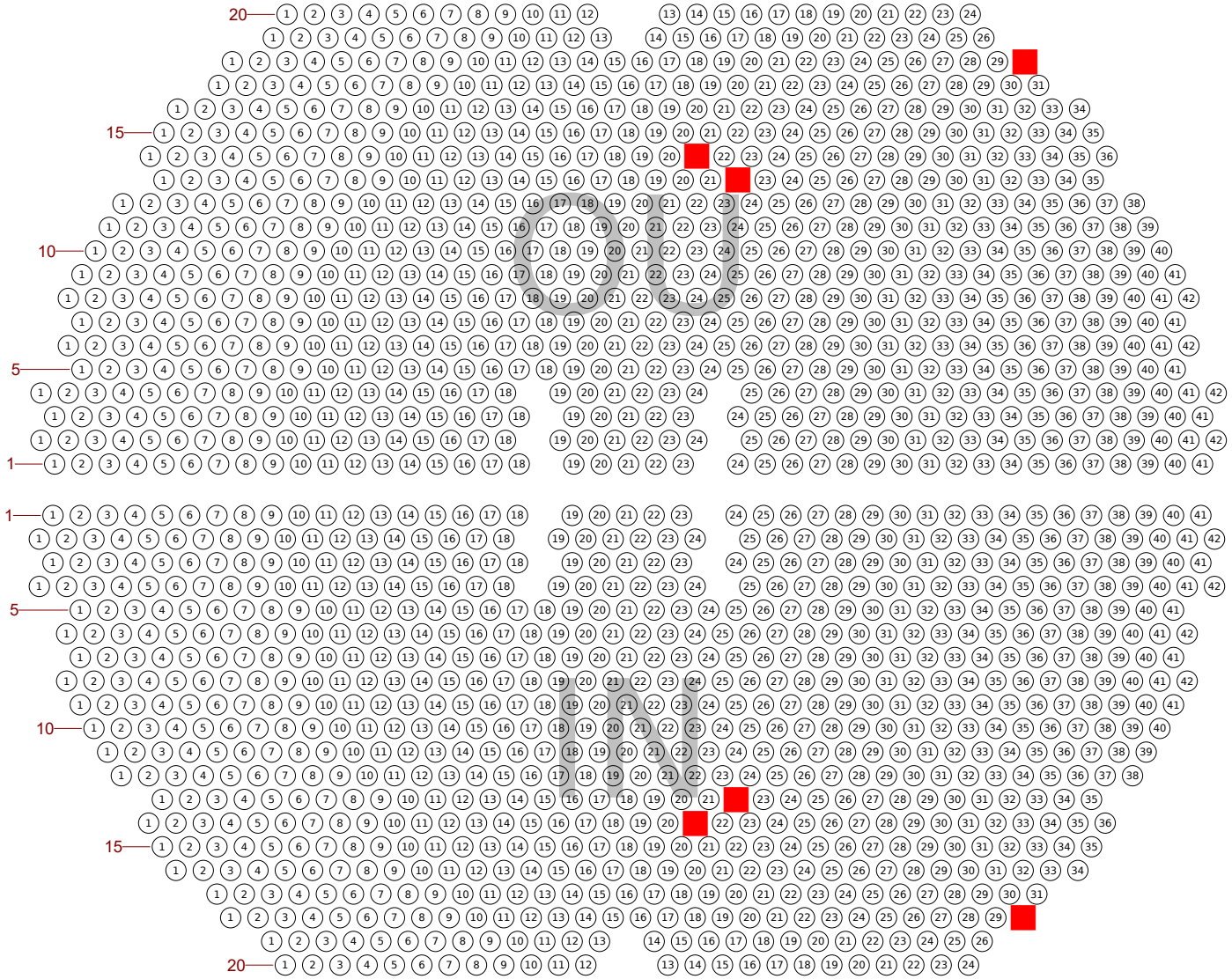
Data Report
East Kentucky Power Cooperative
Spurlock Station
Unit 2
LPFWH-3
06-2021

sec	row	tube	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
OU	20	12				NDD				UB	IO
OU	20	13				NDD				UB	IO
OU	20	14				NDD				UB	IO
OU	20	15				NDD				UB	IO
OU	20	16				NDD				UB	IO
OU	20	17				NDD				UB	IO
OU	20	18				NDD				UB	IO
OU	20	19				NDD				UB	IO
OU	20	20				NDD				UB	IO
OU	20	21				NDD				UB	IO
OU	20	22				NDD				UB	IO
OU	20	23				NDD				UB	IO
OU	20	24	27.71	190		DNT	M1	OU	224.70	UB	IO

TO BE PLUGGED MAP

EAST KENTUCKY POWER COOPERATIVE
SPURLOCK STATION
UNIT 2
LPFWH-3
06-2021

VIEW FROM: INLET/OUTLET



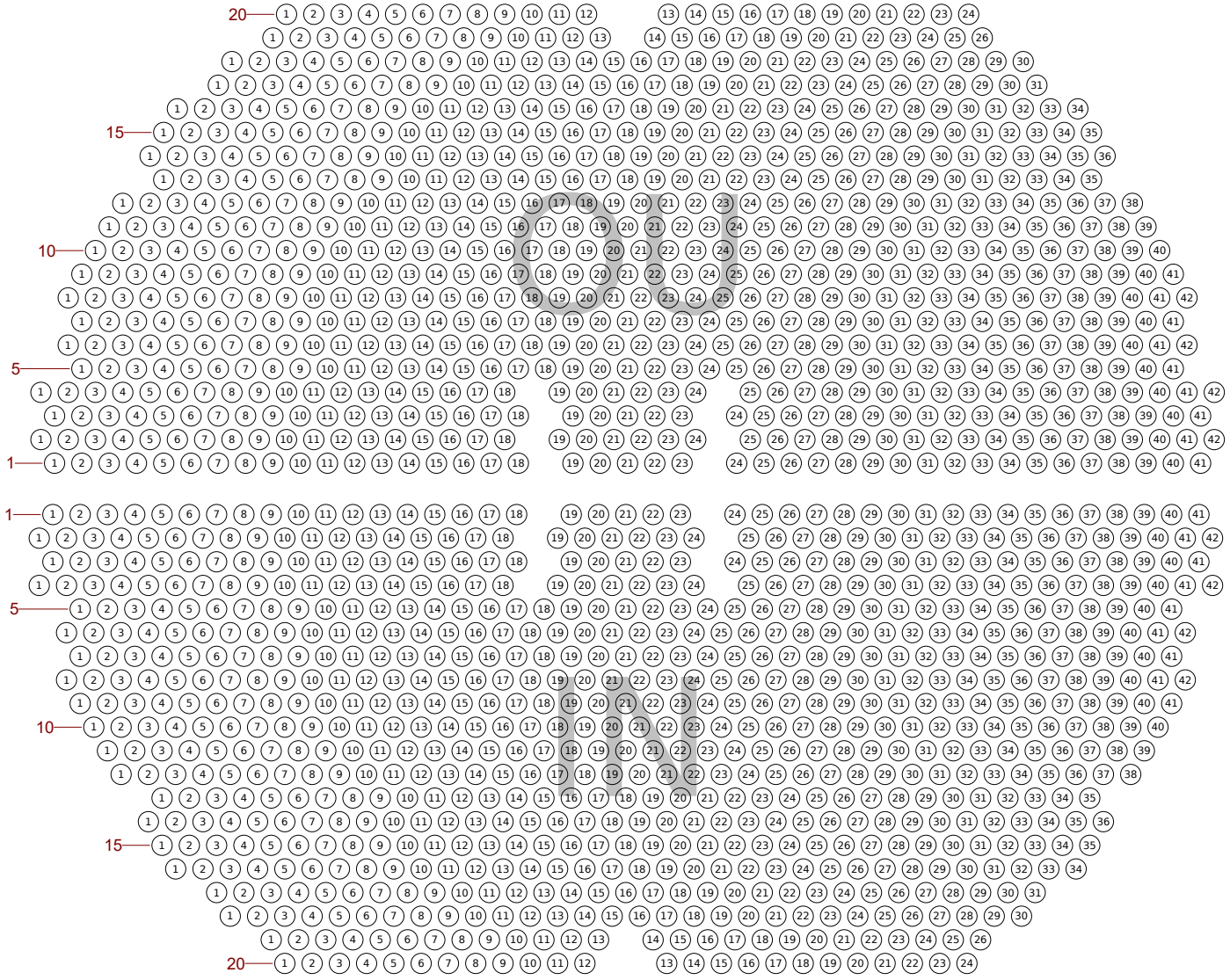
SYM	HITS	TUBES	VIS	TYPE	DESCRIPTION
■	6	6	6	LIST FILL	To Be Plugged Map
	6	6	6		

Model LPFWH-3 (1,482 tubes)
1,476 open tubes

TUBESHEET LAYOUT MAP

EAST KENTUCKY POWER COOPERATIVE
SPURLOCK STATION
UNIT 2
LPFWH-3

VIEW FROM:INLET/OUTLET



Model LPFWH-3 (1,482 tubes)
1,482 open tubes

530 Jones Street
Verona, PA 15147 U.S.A.
Tel: 1-800-345-3476
Fax: 412-826-8255
www.conco.net

3.0 INSPECTION PROCEDURE

Technicians

Conco EC technicians are certified to CSC-QAP-9.1 (SNT-TC-1A guidelines, CP-189) and also trained in confined space, first aid, and CPR. All Conco Analysts have passed an industry recognized Data-Analysis level IIA or level IIIA class.

Process

All inspections are performed in accordance with CSC-NDE-11.0 Rev 4 Data Acquisition and Analysis. Conco will use CoreStar equipment recording data with 4 frequencies and on 8 channels (4-differential channels and 4-absolute channels). The data will be recorded on medium consistent with the tester used (Magnetic Optical disk, compact flash disk, or USB flash drive). The data will be interpreted by qualified data analyst using the CoreStar analysis software. The results will be stored in the CoreStar DBMS software. This will enable future trending and inspection planning of the unit. While on site, Conco will visually inspect the tube sheet and they will generate a list of plugged tubes to be included on the tube sheet maps. All test equipment will be visually inspected prior to use to ensure the equipment is suitable for the inspection. All test equipment will also be within calibration as per manufacture specifications.

Eddy Current probes are purchased to conform to specific metallurgical characteristics, inside diameter and wall thickness of the tubes in this proposal. The probe diameter is calculated to achieve a fill-factor of approximately 85% between the probe head diameter and the tube ID.

We propose to use our services on a "best effort" basis. The detection of particular defect or variable in the material tested cannot be guaranteed.

CONCO SERVICES LLC
530 JONES STREET·VERONA, PA 15147
(412) 828-1166 · FAX: (412) 826-8255

ESTABLISHED 1923

Form No	1085
Title	Examination Technique Specification Sheet OMNI
Revision:	2
Date:	January 3, 2017
Page 1 of 4	

Utility/Site/Unit: East Kentucky Power Cooperative/Spurlock/Unit 2	ETSS Version: 1 Date: 06/10/2021
Component: LPFWH	Component ID: 3
Examination Scope	
Applicability: This technique is for the bobbin examination of 0.750" x .035" wall 304 SS tubes	
Instrument	**Tubing**
Manufacturer/Model: CoreStar OMNI 200/100	Material Type: 304 SS
	# Of Tubes: 741 U-Bend (1482 Straight Length)
	OD/Wall (inch): 0.75" / 0.035"
Data Recording Equipment	Length: ~30'
Manuf./Media: Hard drive / Network or Equiv	**Calibration Standard(s)**
Software	Type/SN: ASME CSC-434 Type/SN: Wall Thinning CSC-432 Type/SN: Internal Reference
Manufacturer: Corestar	**Analog Signal Path**
Version/Revision: 8.1	Probe Shaft /Length: 40"
Examination Procedure	Extension Type & Length N/A
Number/Revision: CSC-NDE-11.0 Rev 4	Slip Ring Model Number: N/A

Scan Parameters				
Scan Direction: Pull				
Digitization Rate, Samples Per Inch (minimum): ≥ 30 SPI	Axial Direction: Pull	N/A	Circ. Direction	N/A

Probe Speed	Sample Rate	RPM Set	RPM Min	RPM Max
46 inches / second	2000 (Max.)	N/A	N/A	N/A
30 inches / second	1200 (Min.)	N/A	N/A	N/A

Probe/Motor Unit		
Description (Model/Diameter/Frequency/Coil Dimensions)	Manufacturer	Length
630 ESH/MF	Corestar	N/A
610 ESH/MF	Corestar	N/A

Data Acquisition

Calibration Coil 1 Channels

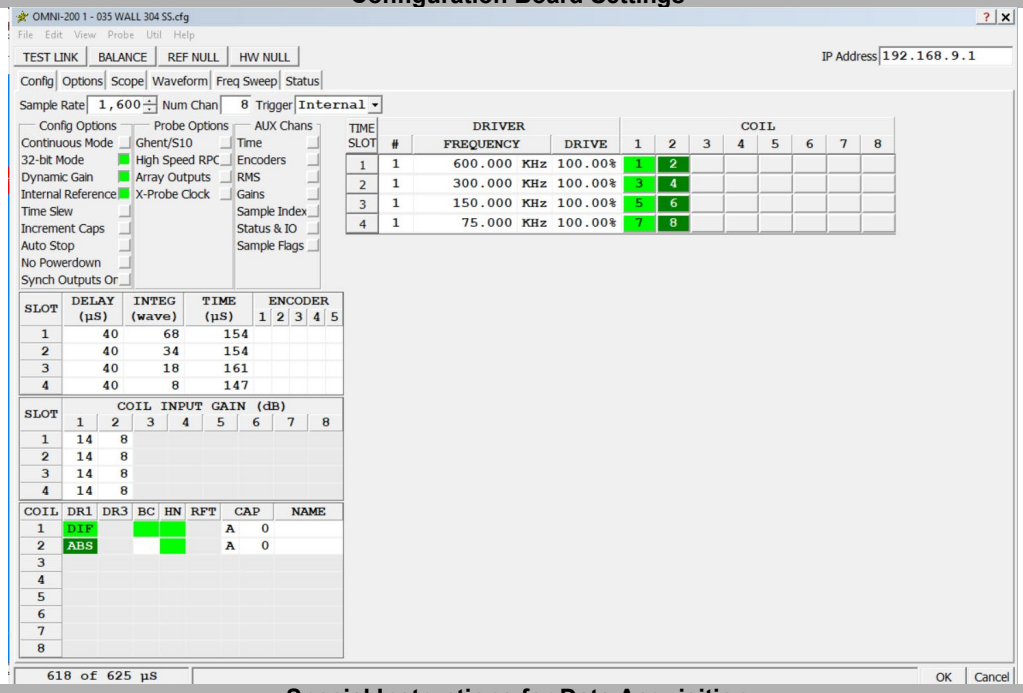
Channel & Frequency	Channel #1 600 kHz	Channel #3 300 kHz	Channel #5 150 kHz	Channel #7 75 kHz
Phase Rotation	100% TWH 40 degrees ± 3	100% TWH 40 degrees ± 3	100% TWH 40 degrees ± 3	100% TWH 40 degrees ± 3
Span Setting	4 x 20% FBH's @ 3 divisions	4 x 20% FBH's @ 3 divisions	4 x 20% FBH's @ 3 divisions	4 x 20% FBH's @ 3 divisions
Drive Voltage	75%	75%	75%	75%
Gain Setting	14	14	14	14

Calibration Coil 2 Channels

Channel & Frequency	Channel #2 600 kHz	Channel #4 300 kHz	Channel #6 150 kHz	Channel #8 75 kHz
Phase Rotation	Probe Motion Horiz. Flaws Up	Probe Motion Horiz. Flaws Up	Probe Motion Horiz. Flaws Up	Probe Motion Horiz. Flaws Up
Span Setting	4 x 20% FBH's @ 1.5 divisions	4 x 20% FBH's @ 1.5 divisions	4 x 20% FBH's @ 1.5 divisions	4 x 20% FBH's @ 1.5 divisions
Drive Voltage	75%	75%	75%	75%
Gain setting	8	8	8	8

Examination Technique Specification Sheet

Configuration Board Settings



Special Instructions for Data Acquisition

1. Probes should be pulled @ 40 inches/second or less.
2. Review each data channel and ensure that adequate/expected signal responses are achieved before recording the calibration. Do not record data until the proper spans and rotations have been set.
3. Monitor the data by setting the left strip chart to channel 1 vertical, right strip chart to channel 6 vertical and the lissajous display set to channel 1 as a minimum. The operator will determine the specific strip chart settings and lissajous display to verify the system is functioning properly and that data quality is acceptable.
4. Follow the Conco NDE procedure CSC-NDE-11.0 Rev 4.
5. Encode the tube ID's as per map for respective sections.
6. The initial exam attempt shall be performed with the 630 ESH/HF probe.
7. Tubes that will not allow the probe to enter, report as "Obstructed".
8. Tubes unable to be examine the desired extent, report as "Restricted".
9. Write a message for all tubes that are unable to be examined full length explaining the reason.
10. Encode the ASME Std. as "999", Thinning Std as "999" with a message.
11. Perform "System Null" only if "Display Null" is ineffective in balancing the signal.

Examination Technique Specification Sheet

Data Analysis				
Calibration Differential Channels				
Channel & Frequency	Channel #1 600 kHz	Channel #3 300 kHz	Channel #5 150 kHz	Channel #7 75 kHz
Phase Rotation	100% TWH 40 degrees ± 3	100% TWH 40 degrees ± 3	100% TWH 40 degrees ± 3	100% TWH 40 degrees ± 3
Span Setting Minimum	100% TWH @ 4 divisions	100% TWH @ 4 divisions	100% TWH @ 4 divisions	100% TWH @ 4 divisions
Calibration Absolute Channels				
Channel & Frequency	Channel #2 600 kHz	Channel #4 300 kHz	Channel #6 150 kHz	Channel #8 75 kHz
Phase Rotation	Probe Motion Horiz. Flaws Up	Probe Motion Horiz. Flaws Up	Probe Motion Horiz. Flaws Up	Probe Motion Horiz. Flaws Up
Span Setting Minimum	100% TWH @ 1.5 divisions	100% TWH @ 1.5 divisions	100% TWH @ 1.5 divisions	100% TWH @ 1.5 divisions
Calibration Process and Other Channels				
Channel & Frequency	M-1 1/5 Diff	M-2 4/6 Abs.	M-3 / Diff.	M-4 / Diff.
Phase Rotation	100% TWH 40 degrees ± 3	Probe Motion Horiz. Flaws Up		
Span Setting Minimum	100% TWH @ 1.5 divisions	100% TWH @ 1.5 divisions		
Suppress On	Support Ring	Support Ring		

Voltage Normalization				Calibration Curves		
CH	Signal	Set	Normalize	Type	CH	Set Points
1	4x20% FBH	4 Vp-p	Save/Store to all	Phase Curve	1, 3, 5, M1	100,60,20%
1	4x20% FBH	4 Vp-p	Save/Store to all	Magnitude Curve	6, M2	75, 50,25%

Data Screening				
Left Strip Chart	Center Strip Chart	Right Strip Chart	Left Lissajous	Right Lissajous
Channel M1 Vertical	Channel 1 Vertical	Channel 6 Vertical	Channel 1	Channel 6

Special Instructions for Analysis

1. Calibration curves shall be constructed using the “As-Built” dimensions from the calibration standard drawings.
2. Normalize to 4 volts on the 4 X 20% flat bottom holes using channel #1 differential and store to all channels.
3. All Quantifiable indications of tube wall degradation ≥ 20% TW and 1 Volt shall be reported (however, not to exceed 6 reportable ID defects).
4. Locate all defect indications in inches measured from the test end.
5. Previously reported indications shall be addressed by the primary analyst. Report previously reported Inds. In same channel as history. Report previous indications that are not found as “INF” and indications not recordable as “INR”.
6. If test data appears to be un-interpretable shall be report as “RBD”.

Job Lead Approval	Customer Approval (if required)
Signature /Date: Tom Dolgas Level IIA / 06-10-2021	Signature /Date

Additional Component Information

Examination Technique Specification Sheet

Reporting Requirements							
Code	**Description**	**Meas.**	**%**	**Volts**	**Ch**	**Loc**	**Ext.**
ADR	Absolute Drift	Y	N	Any	6	Y	Y
CRK	Crack-Like Indication	Y	N	Any	5, 6	Y	Y
DNT	Dent	Y	N	20 >	1, M1	Y	Y
DTS	Distorted Support Indication	Y	N	Any	M1	Y	Y
ERI	Erosion With Indication	Y	20% >	Any	6	Y	Y
ERO	Erosion	Y	20% >	Any	6	Y	Y
GEN	General Pitting / Wall Loss	N	N	N	N	N	Y
IDC	ID Chatter	Y	N	20 >	1	Y	Y
IDI	ID Indication	Y	20% >	Any	1, M1	Y	Y
INA	Inaccessible	N	N	N	N	N	N
INF	Indication Not Found	N	N	N	N	Y	Y
INR	Indication Not Recordable	N	N	N	N	Y	Y
NDD	No Degradation Detected	N	N	N	N	N	Y
NQI	Non Quantifiable Indication	Y	N	Any	1, M1	Y	Y
OBS	Obstructed	N	N	N	N	N	N
ODI	OD Indication	Y	20% >	Any	1, M1	Y	Y
PID	Positive Identification	Y	N	Y	Y	Y	Y
PLG	Plug	N	N	N	N	N	N
PVN	Permeability Variation	Y	N	20 >	1, M1	Y	Y
RAD	Retest Analyst Discretion	N	N	N	N	N	N
RBD	Retest Bad Data	N	N	N	N	N	N
RES	Restricted	N	N	N	N	Y	Y
RIC	Retest Incomplete	N	N	N	N	N	N
STC	Stuck Cleaner	N	N	N	N	N	N
WAR	Wear	Y	20% >	Any	6, M2	Y	Y

Refer to the Data Management Code list in the report for landmark abbreviations.

Site

Owner	EKPC		
Site Code	SPURLOCK	Unit	2
Comp	LP_FWH-3	Model	default
Outage	06-2021	Date	06/10/2021

Cal

Cal Num	2	Disk		Leg	INLET
Material	304 SS	ID	0.750	OD	0.750

Operators

Operator ID	W4524	Level	II
Operator ID	B6068	Level	I

Standards

Type	ASME	SN	CSC-434
Type	W/T	SN	CSC-432
Type		SN	

Probe

Model	630 ESH/HF	Vendor	CORESTAR
Ext Type		Vendor	
Head Size	630	Head SN	
Shaft Length	65	Shaft SN	
Ext Length	0	Ref Head SN	
Slip SN		Ref Shaft SN	

Tester Config

IDX	TYPE	CHAN	FREQ	SPAN	Y/X	ROT	COIL	CTX
1	DATA32	1	600 KHz	90		210°	1 DIF	1
2	DATA32	2	600 KHz	40		227°	2 ABS	1
3	DATA32	3	300 KHz	136		52°	1 DIF	2
4	DATA32	4	300 KHz	40		64°	2 ABS	2
5	DATA32	5	150 KHz	60		321°	1 DIF	3
6	DATA32	6	150 KHz	204		339°	2 ABS	3
7	DATA32	7	75 KHz	40		262°	1 DIF	4
8	DATA32	8	75 KHz	40		282°	2 ABS	4

Config	035 WALL 304 SS				
Auto Mode	Manual				
Sample Rate	1,600	Num Cha	8	Offset	1,734
Acq Speed	24.00	RPC RPM		Acq Di	PULL

File

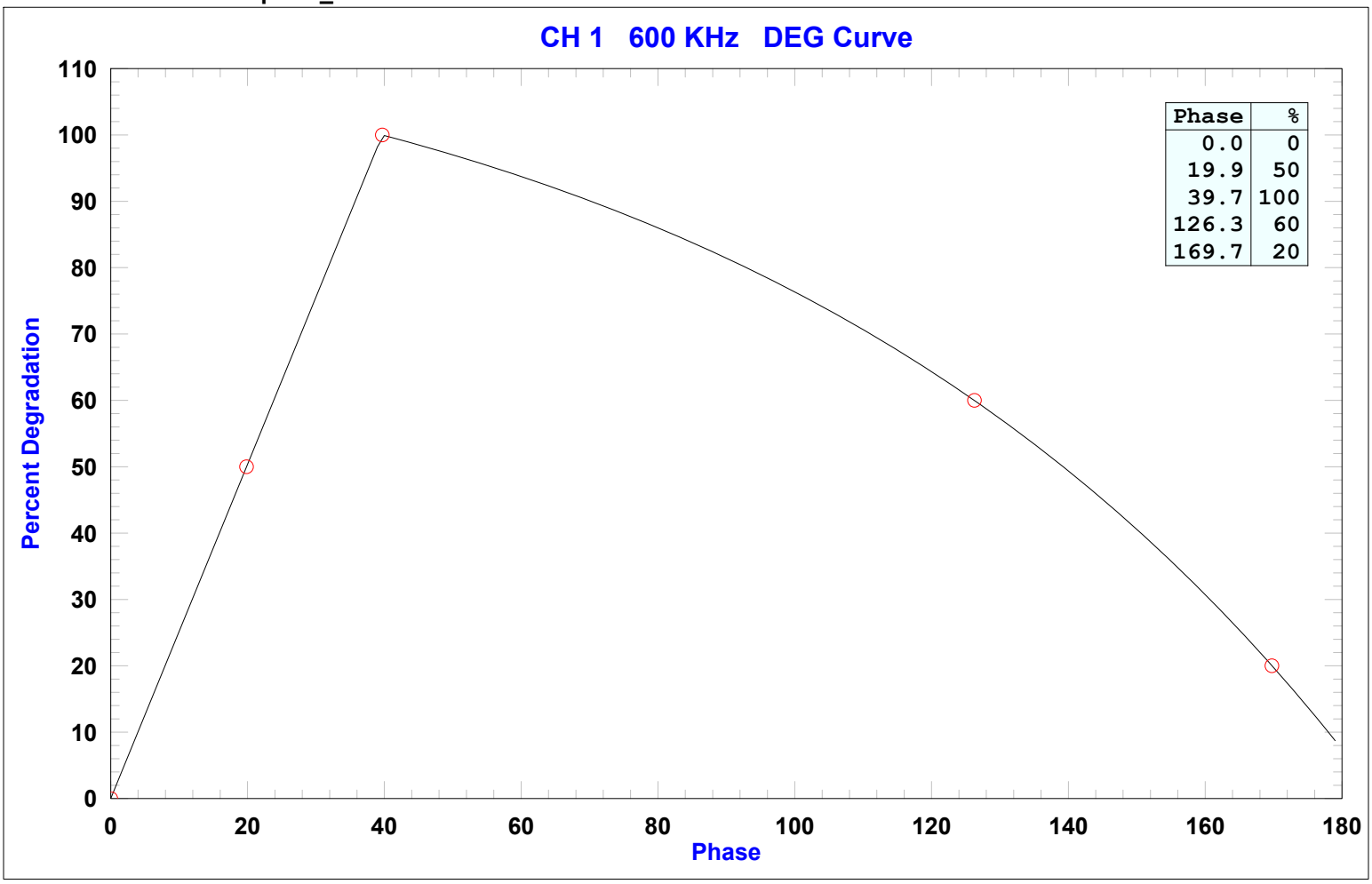
Source	CoreStar	Samples	28,960
Procedure			
Software	CoreStar EddyVision 8.1		

Equipment

Tester	OMNI-200	SN	0007-0910
Pusher		SN	
Fixture		SN	

OMNI 200 SN 0007-0910 CAL DUE 20JULY2021

Site: SPURLOCK Comp: LP_FWH-3 Cal: 2 Date: 06/15/2021 07:59:53



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1.0	3	34.0	86	67.0	91	100.0	76	133.0	55	166.0	24
2.0	5	35.0	88	68.0	91	101.0	76	134.0	54	167.0	23
3.0	8	36.0	91	69.0	90	102.0	75	135.0	53	168.0	22
4.0	10	37.0	93	70.0	90	103.0	75	136.0	53	169.0	21
5.0	13	38.0	96	71.0	90	104.0	74	137.0	52	170.0	20
6.0	15	39.0	98	72.0	89	105.0	74	138.0	51	171.0	19
7.0	18	40.0	100	73.0	89	106.0	73	139.0	50	172.0	17
8.0	20	41.0	100	74.0	88	107.0	72	140.0	49	173.0	16
9.0	23	42.0	99	75.0	88	108.0	72	141.0	49	174.0	15
10.0	25	43.0	99	76.0	88	109.0	71	142.0	48	175.0	14
11.0	28	44.0	99	77.0	87	110.0	71	143.0	47	176.0	13
12.0	30	45.0	98	78.0	87	111.0	70	144.0	46	177.0	11
13.0	33	46.0	98	79.0	86	112.0	69	145.0	45	178.0	10
14.0	35	47.0	98	80.0	86	113.0	69	146.0	44	179.0	9
15.0	38	48.0	98	81.0	86	114.0	68	147.0	43		
16.0	40	49.0	97	82.0	85	115.0	68	148.0	42		
17.0	43	50.0	97	83.0	85	116.0	67	149.0	41		
18.0	45	51.0	97	84.0	84	117.0	66	150.0	41		
19.0	48	52.0	96	85.0	84	118.0	66	151.0	40		
20.0	50	53.0	96	86.0	83	119.0	65	152.0	39		
21.0	53	54.0	96	87.0	83	120.0	64	153.0	38		
22.0	55	55.0	95	88.0	82	121.0	64	154.0	37		
23.0	58	56.0	95	89.0	82	122.0	63	155.0	36		
24.0	60	57.0	95	90.0	81	123.0	62	156.0	35		
25.0	63	58.0	94	91.0	81	124.0	62	157.0	34		
26.0	65	59.0	94	92.0	80	125.0	61	158.0	33		
27.0	68	60.0	94	93.0	80	126.0	60	159.0	32		
28.0	71	61.0	93	94.0	79	127.0	59	160.0	31		
29.0	73	62.0	93	95.0	79	128.0	59	161.0	30		
30.0	76	63.0	93	96.0	78	129.0	58	162.0	29		
31.0	78	64.0	92	97.0	78	130.0	57	163.0	28		
32.0	81	65.0	92	98.0	77	131.0	57	164.0	26		

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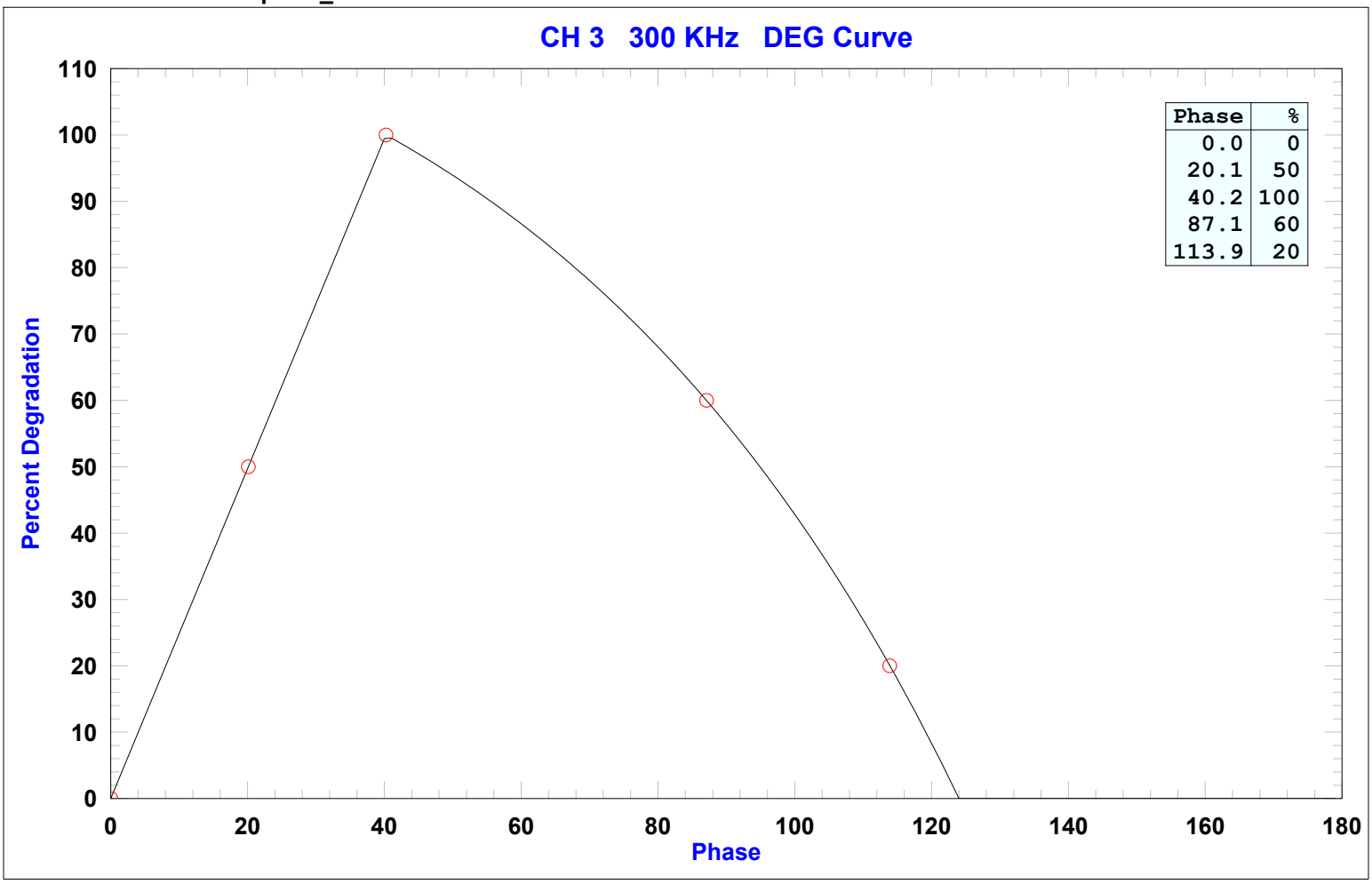

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2.0	5	35.0	87	68.0	80	101.0	41	134.0	0	167.0	0
3.0	7	36.0	89	69.0	79	102.0	40	135.0	0	168.0	0
4.0	10	37.0	92	70.0	78	103.0	38	136.0	0	169.0	0
5.0	12	38.0	94	71.0	77	104.0	37	137.0	0	170.0	0
6.0	15	39.0	97	72.0	76	105.0	35	138.0	0	171.0	0
7.0	17	40.0	99	73.0	75	106.0	34	139.0	0	172.0	0
8.0	20	41.0	100	74.0	74	107.0	32	140.0	0	173.0	0
9.0	22	42.0	99	75.0	73	108.0	30	141.0	0	174.0	0
10.0	25	43.0	98	76.0	72	109.0	29	142.0	0	175.0	0
11.0	27	44.0	98	77.0	71	110.0	27	143.0	0	176.0	0
12.0	30	45.0	97	78.0	70	111.0	25	144.0	0	177.0	0
13.0	32	46.0	97	79.0	69	112.0	23	145.0	0	178.0	0
14.0	35	47.0	96	80.0	68	113.0	22	146.0	0	179.0	0
15.0	37	48.0	95	81.0	67	114.0	20	147.0	0		
16.0	40	49.0	95	82.0	66	115.0	18	148.0	0		
17.0	42	50.0	94	83.0	65	116.0	16	149.0	0		
18.0	45	51.0	93	84.0	64	117.0	14	150.0	0		
19.0	47	52.0	93	85.0	62	118.0	12	151.0	0		
20.0	50	53.0	92	86.0	61	119.0	10	152.0	0		
21.0	52	54.0	91	87.0	60	120.0	8	153.0	0		
22.0	55	55.0	90	88.0	59	121.0	6	154.0	0		
23.0	57	56.0	90	89.0	58	122.0	4	155.0	0		
24.0	60	57.0	89	90.0	56	123.0	2	156.0	0		
25.0	62	58.0	88	91.0	55	124.0	0	157.0	0		
26.0	65	59.0	87	92.0	54	125.0	0	158.0	0		
27.0	67	60.0	87	93.0	53	126.0	0	159.0	0		
28.0	70	61.0	86	94.0	51	127.0	0	160.0	0		
29.0	72	62.0	85	95.0	50	128.0	0	161.0	0		
30.0	75	63.0	84	96.0	49	129.0	0	162.0	0		
31.0	77	64.0	83	97.0	47	130.0	0	163.0	0		
32.0	80	65.0	82	98.0	46	131.0	0	164.0	0		

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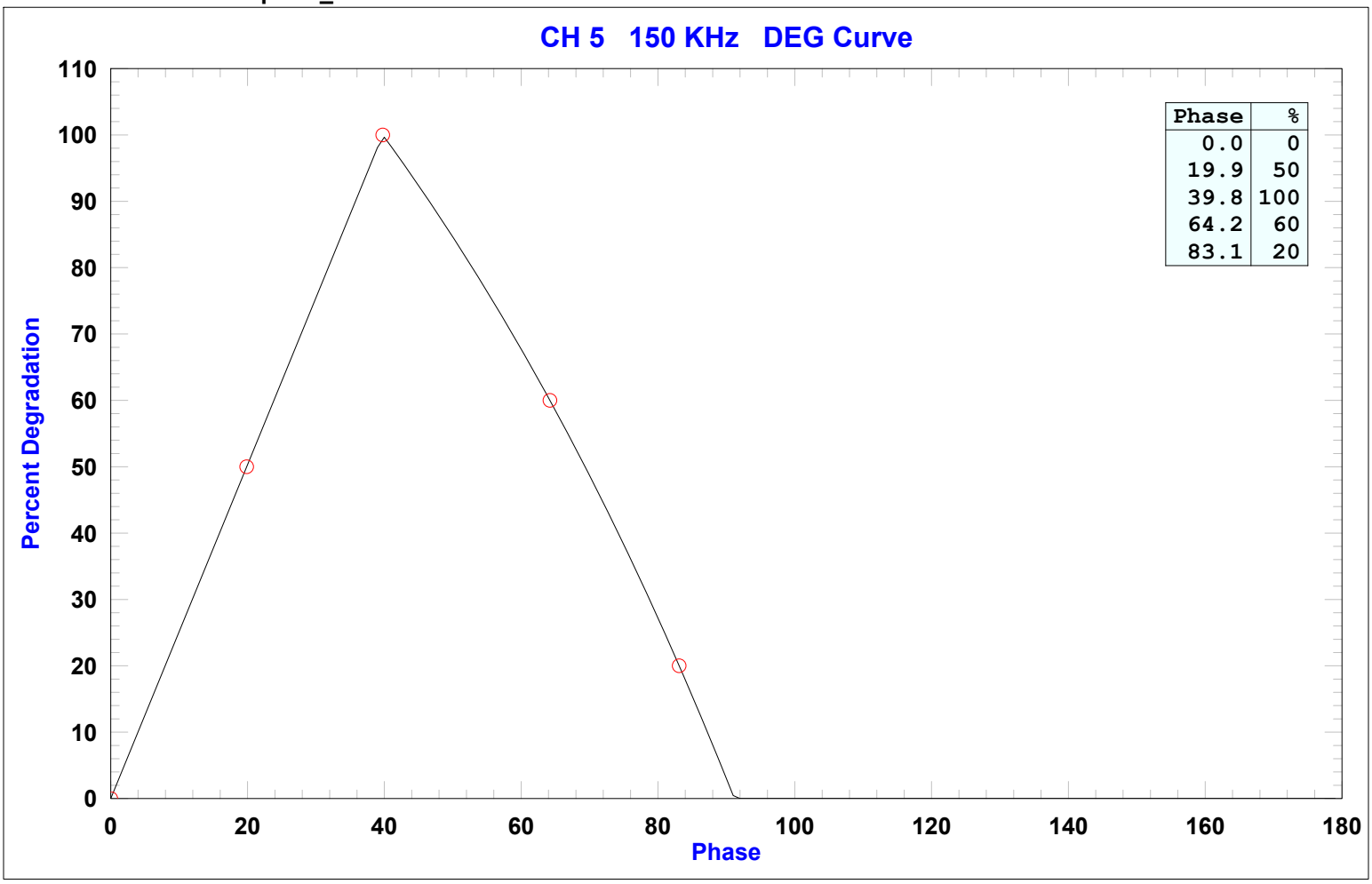

Phase	%	Phase	%	Phase	%	Phase	%	Phase	%	Phase	%
0.0	0	33.0	83	66.0	57	99.0	0	132.0	0	165.0	0
1.0	3	34.0	86	67.0	55	100.0	0	133.0	0	166.0	0
2.0	5	35.0	88	68.0	53	101.0	0	134.0	0	167.0	0
3.0	8	36.0	91	69.0	51	102.0	0	135.0	0	168.0	0
4.0	10	37.0	93	70.0	49	103.0	0	136.0	0	169.0	0
5.0	13	38.0	96	71.0	47	104.0	0	137.0	0	170.0	0
6.0	15	39.0	98	72.0	45	105.0	0	138.0	0	171.0	0
7.0	18	40.0	100	73.0	42	106.0	0	139.0	0	172.0	0
8.0	20	41.0	98	74.0	40	107.0	0	140.0	0	173.0	0
9.0	23	42.0	97	75.0	38	108.0	0	141.0	0	174.0	0
10.0	25	43.0	95	76.0	36	109.0	0	142.0	0	175.0	0
11.0	28	44.0	94	77.0	34	110.0	0	143.0	0	176.0	0
12.0	30	45.0	92	78.0	32	111.0	0	144.0	0	177.0	0
13.0	33	46.0	91	79.0	29	112.0	0	145.0	0	178.0	0
14.0	35	47.0	89	80.0	27	113.0	0	146.0	0	179.0	0
15.0	38	48.0	88	81.0	25	114.0	0	147.0	0		
16.0	40	49.0	86	82.0	23	115.0	0	148.0	0		
17.0	43	50.0	85	83.0	20	116.0	0	149.0	0		
18.0	45	51.0	83	84.0	18	117.0	0	150.0	0		
19.0	48	52.0	81	85.0	15	118.0	0	151.0	0		
20.0	50	53.0	80	86.0	13	119.0	0	152.0	0		
21.0	53	54.0	78	87.0	11	120.0	0	153.0	0		
22.0	55	55.0	76	88.0	8	121.0	0	154.0	0		
23.0	58	56.0	75	89.0	6	122.0	0	155.0	0		
24.0	60	57.0	73	90.0	3	123.0	0	156.0	0		
25.0	63	58.0	71	91.0	0	124.0	0	157.0	0		
26.0	65	59.0	70	92.0	0	125.0	0	158.0	0		
27.0	68	60.0	68	93.0	0	126.0	0	159.0	0		
28.0	70	61.0	66	94.0	0	127.0	0	160.0	0		
29.0	73	62.0	64	95.0	0	128.0	0	161.0	0		
30.0	75	63.0	62	96.0	0	129.0	0	162.0	0		
31.0	78	64.0	60	97.0	0	130.0	0	163.0	0		
32.0	80	65.0	58	98.0	0	131.0	0	164.0	0		

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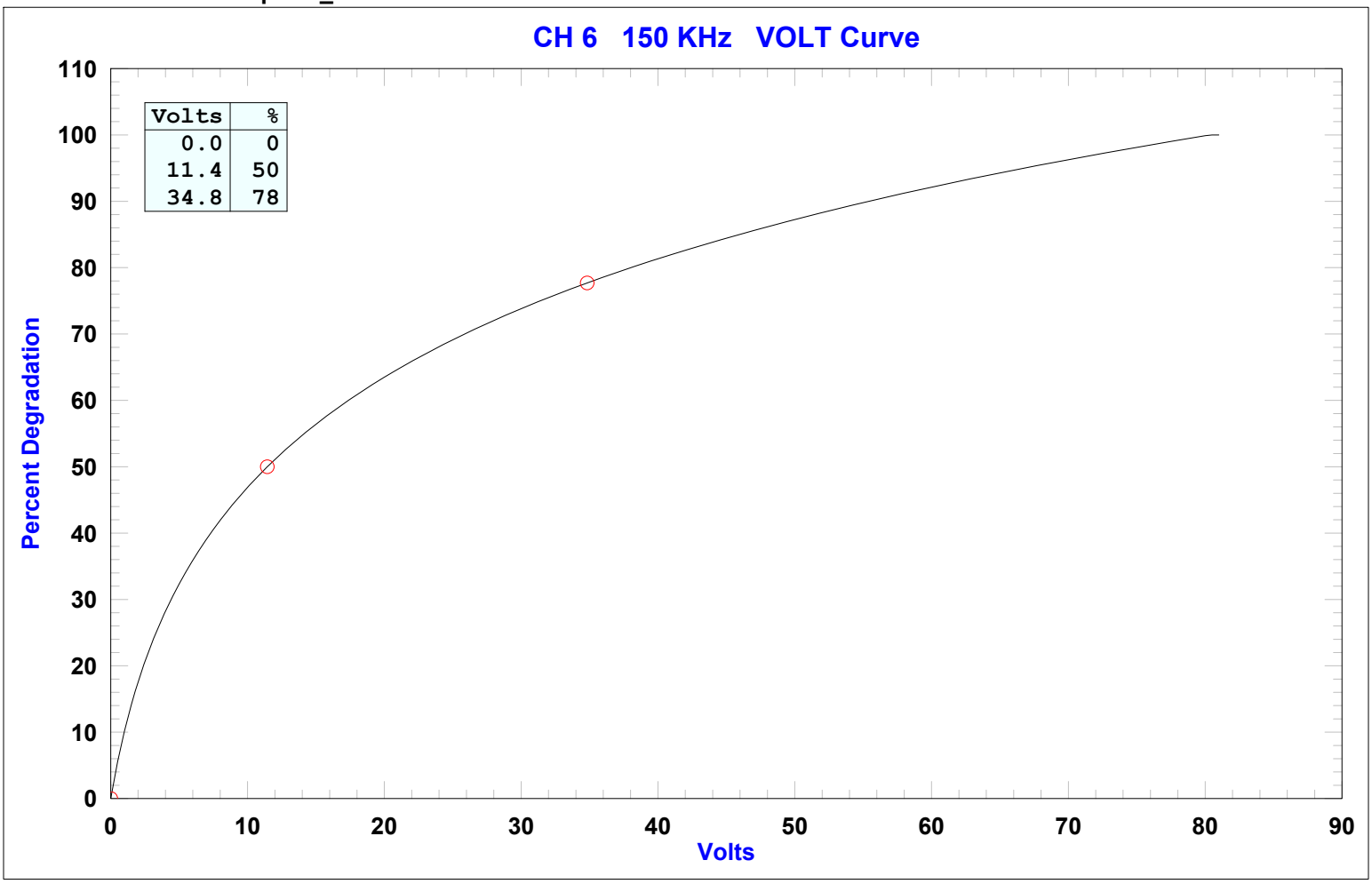

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1.0	10	17.5	60	34.0	77	50.5	88	67.0	95
1.5	14	18.0	61	34.5	77	51.0	88	67.5	95
2.0	18	18.5	62	35.0	78	51.5	88	68.0	95
2.5	21	19.0	62	35.5	78	52.0	88	68.5	96
3.0	23	19.5	63	36.0	79	52.5	89	69.0	96
3.5	26	20.0	63	36.5	79	53.0	89	69.5	96
4.0	28	20.5	64	37.0	79	53.5	89	70.0	96
4.5	30	21.0	65	37.5	80	54.0	89	70.5	96
5.0	32	21.5	65	38.0	80	54.5	90	71.0	97
5.5	34	22.0	66	38.5	80	55.0	90	71.5	97
6.0	36	22.5	66	39.0	81	55.5	90	72.0	97
6.5	38	23.0	67	39.5	81	56.0	90	72.5	97
7.0	39	23.5	68	40.0	81	56.5	91	73.0	97
7.5	41	24.0	68	40.5	82	57.0	91	73.5	98
8.0	42	24.5	69	41.0	82	57.5	91	74.0	98
8.5	43	25.0	69	41.5	82	58.0	91	74.5	98
9.0	45	25.5	70	42.0	83	58.5	91	75.0	98
9.5	46	26.0	70	42.5	83	59.0	92	75.5	98
10.0	47	26.5	71	43.0	83	59.5	92	76.0	98
10.5	48	27.0	71	43.5	84	60.0	92	76.5	99
11.0	49	27.5	72	44.0	84	60.5	92	77.0	99
11.5	50	28.0	72	44.5	84	61.0	93	77.5	99
12.0	51	28.5	72	45.0	84	61.5	93	78.0	99
12.5	52	29.0	73	45.5	85	62.0	93	78.5	99
13.0	53	29.5	73	46.0	85	62.5	93	79.0	100
13.5	54	30.0	74	46.5	85	63.0	93	79.5	100
14.0	55	30.5	74	47.0	86	63.5	94	80.0	100
14.5	56	31.0	75	47.5	86	64.0	94	80.5	100
15.0	56	31.5	75	48.0	86	64.5	94	81.0	100
15.5	57	32.0	75	48.5	86	65.0	94		
16.0	58	32.5	76	49.0	87	65.5	94		

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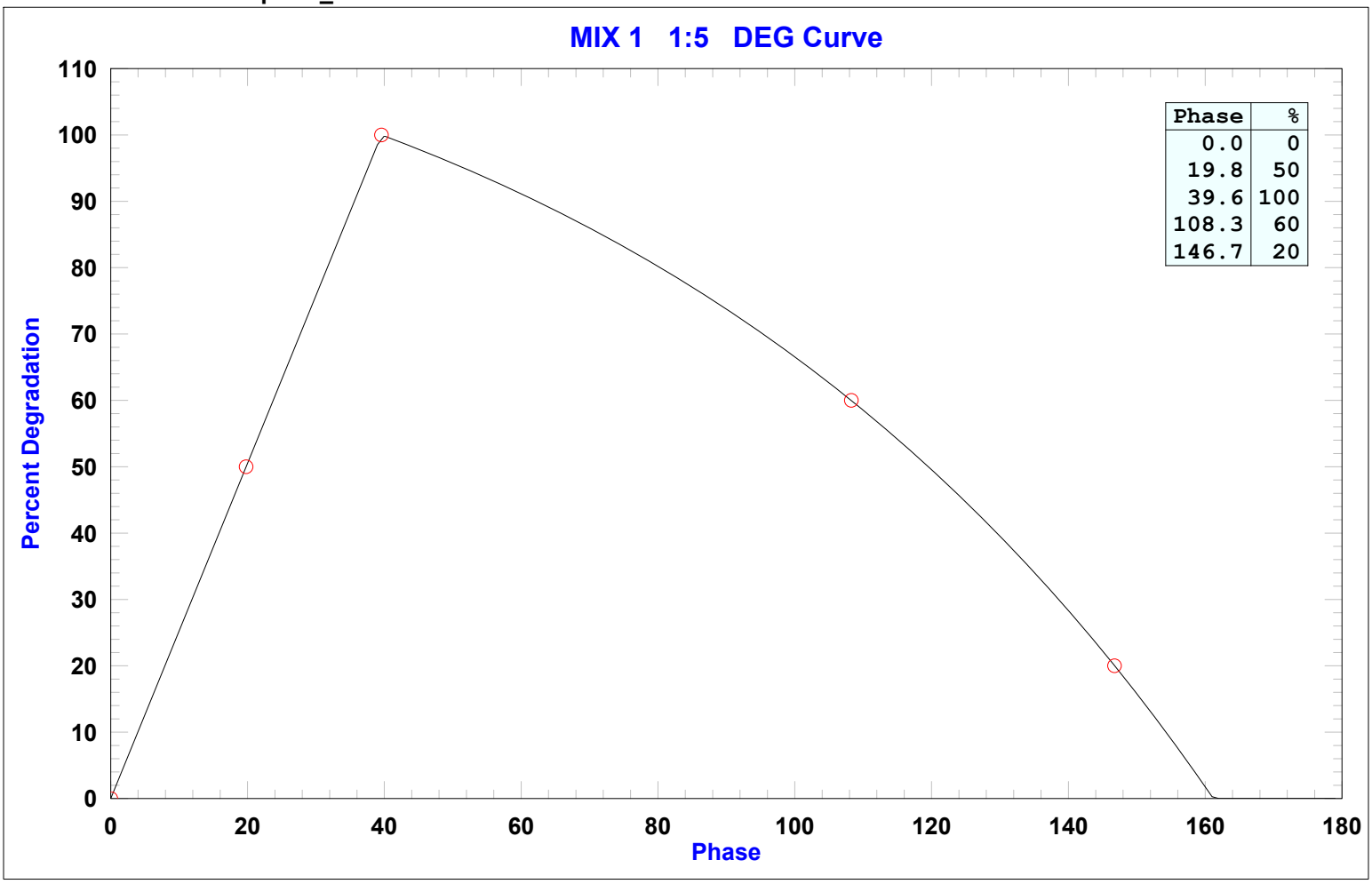
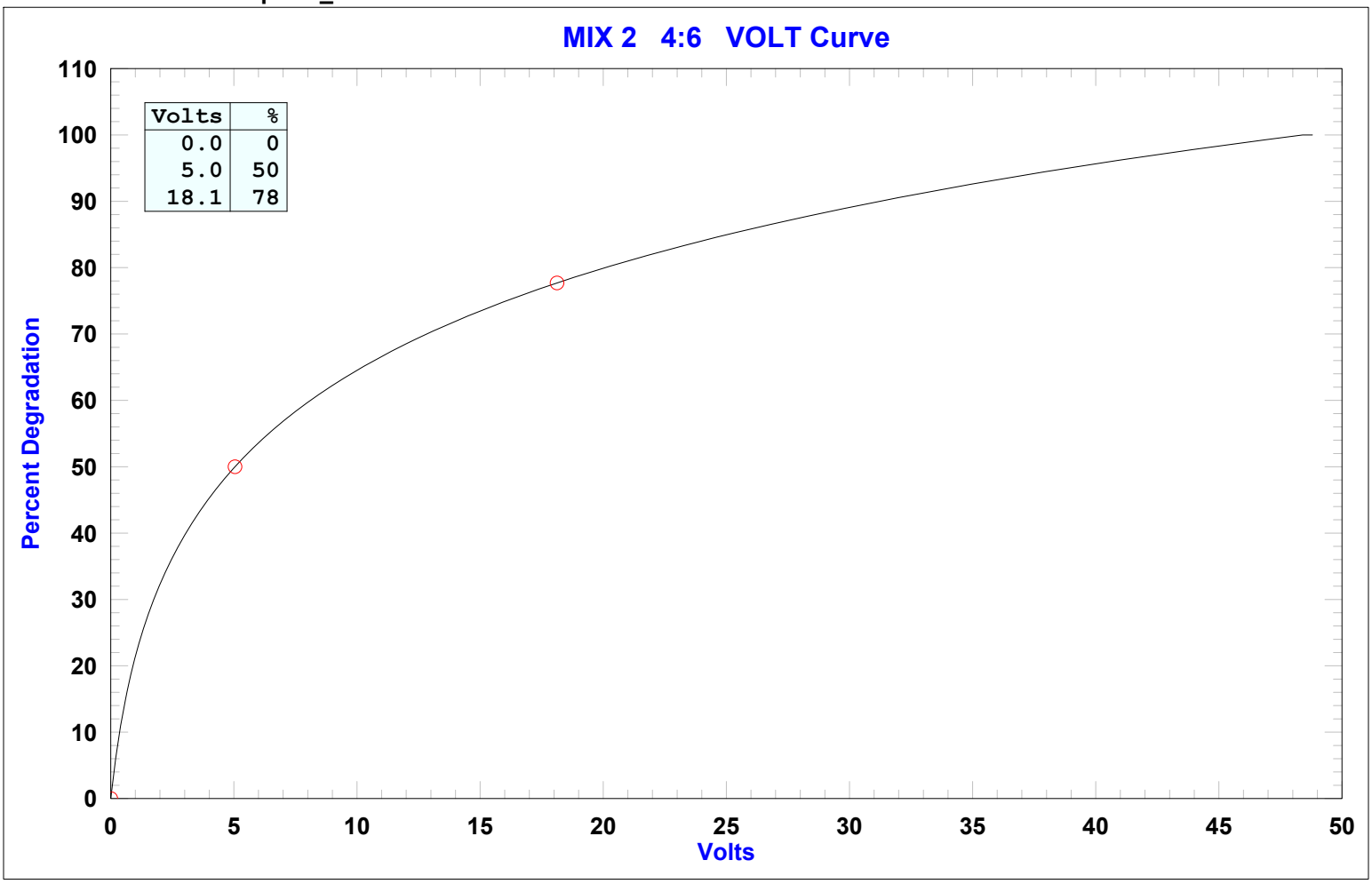


Phase	%	Phase	%	Phase	%	Phase	%	Phase	%	Phase	%
0.0	0	33.0	83	66.0	88	99.0	67	132.0	37	165.0	0
1.0	3	34.0	86	67.0	88	100.0	67	133.0	36	166.0	0
2.0	5	35.0	88	68.0	87	101.0	66	134.0	35	167.0	0
3.0	8	36.0	91	69.0	86	102.0	65	135.0	34	168.0	0
4.0	10	37.0	93	70.0	86	103.0	64	136.0	33	169.0	0
5.0	13	38.0	96	71.0	85	104.0	63	137.0	32	170.0	0
6.0	15	39.0	99	72.0	85	105.0	63	138.0	31	171.0	0
7.0	18	40.0	100	73.0	84	106.0	62	139.0	29	172.0	0
8.0	20	41.0	99	74.0	84	107.0	61	140.0	28	173.0	0
9.0	23	42.0	99	75.0	83	108.0	60	141.0	27	174.0	0
10.0	25	43.0	99	76.0	83	109.0	59	142.0	26	175.0	0
11.0	28	44.0	98	77.0	82	110.0	59	143.0	25	176.0	0
12.0	30	45.0	98	78.0	81	111.0	58	144.0	23	177.0	0
13.0	33	46.0	97	79.0	81	112.0	57	145.0	22	178.0	0
14.0	35	47.0	97	80.0	80	113.0	56	146.0	21	179.0	0
15.0	38	48.0	97	81.0	80	114.0	55	147.0	20		
16.0	40	49.0	96	82.0	79	115.0	54	148.0	18		
17.0	43	50.0	96	83.0	78	116.0	53	149.0	17		
18.0	45	51.0	95	84.0	78	117.0	52	150.0	16		
19.0	48	52.0	95	85.0	77	118.0	51	151.0	14		
20.0	51	53.0	94	86.0	76	119.0	51	152.0	13		
21.0	53	54.0	94	87.0	76	120.0	50	153.0	12		
22.0	56	55.0	93	88.0	75	121.0	49	154.0	10		
23.0	58	56.0	93	89.0	74	122.0	48	155.0	9		
24.0	61	57.0	93	90.0	74	123.0	47	156.0	8		
25.0	63	58.0	92	91.0	73	124.0	46	157.0	6		
26.0	66	59.0	92	92.0	72	125.0	45	158.0	5		
27.0	68	60.0	91	93.0	72	126.0	44	159.0	3		
28.0	71	61.0	91	94.0	71	127.0	43	160.0	2		
29.0	73	62.0	90	95.0	70	128.0	42	161.0	0		
30.0	76	63.0	90	96.0	70	129.0	41	162.0	0		
31.0	78	64.0	89	97.0	69	130.0	40	163.0	0		
32.0	81	65.0	89	98.0	68	131.0	38	164.0	0		

Site: SPURLOCK Comp: LP_FWH-3 Cal: 2 Date: 06/15/2021 08:01:52



Volts	%	Volts	%	Volts	%	Volts	%	Volts	%	Volts	%	Volts	%	Volts	%
0.0	0	6.6	56	13.2	71	19.8	80	26.4	86	33.0	91	39.6	95	46.2	99
0.2	6	6.8	56	13.4	71	20.0	80	26.6	86	33.2	91	39.8	96	46.4	99
0.4	11	7.0	57	13.6	71	20.2	80	26.8	87	33.4	92	40.0	96	46.6	99
0.6	15	7.2	57	13.8	72	20.4	80	27.0	87	33.6	92	40.2	96	46.8	99
0.8	18	7.4	58	14.0	72	20.6	81	27.2	87	33.8	92	40.4	96	47.0	99
1.0	21	7.6	59	14.2	72	20.8	81	27.4	87	34.0	92	40.6	96	47.2	99
1.2	24	7.8	59	14.4	73	21.0	81	27.6	87	34.2	92	40.8	96	47.4	100
1.4	26	8.0	60	14.6	73	21.2	81	27.8	87	34.4	92	41.0	96	47.6	100
1.6	29	8.2	60	14.8	73	21.4	81	28.0	88	34.6	92	41.2	96	47.8	100
1.8	30	8.4	61	15.0	73	21.6	82	28.2	88	34.8	92	41.4	96	48.0	100
2.0	32	8.6	61	15.2	74	21.8	82	28.4	88	35.0	93	41.6	97	48.2	100
2.2	34	8.8	62	15.4	74	22.0	82	28.6	88	35.2	93	41.8	97	48.4	100
2.4	36	9.0	62	15.6	74	22.2	82	28.8	88	35.4	93	42.0	97	48.6	100
2.6	37	9.2	63	15.8	75	22.4	82	29.0	88	35.6	93	42.2	97	48.8	100
2.8	38	9.4	63	16.0	75	22.6	83	29.2	88	35.8	93	42.4	97		
3.0	40	9.6	64	16.2	75	22.8	83	29.4	89	36.0	93	42.6	97		
3.2	41	9.8	64	16.4	75	23.0	83	29.6	89	36.2	93	42.8	97		
3.4	42	10.0	65	16.6	76	23.2	83	29.8	89	36.4	93	43.0	97		
3.6	43	10.2	65	16.8	76	23.4	83	30.0	89	36.6	94	43.2	97		
3.8	44	10.4	65	17.0	76	23.6	84	30.2	89	36.8	94	43.4	98		
4.0	45	10.6	66	17.2	77	23.8	84	30.4	89	37.0	94	43.6	98		
4.2	46	10.8	66	17.4	77	24.0	84	30.6	90	37.2	94	43.8	98		
4.4	47	11.0	67	17.6	77	24.2	84	30.8	90	37.4	94	44.0	98		
4.6	48	11.2	67	17.8	77	24.4	84	31.0	90	37.6	94	44.2	98		
4.8	49	11.4	67	18.0	78	24.6	85	31.2	90	37.8	94	44.4	98		
5.0	50	11.6	68	18.2	78	24.8	85	31.4	90	38.0	94	44.6	98		
5.2	51	11.8	68	18.4	78	25.0	85	31.6	90	38.2	95	44.8	98		
5.4	51	12.0	69	18.6	78	25.2	85	31.8	90	38.4	95	45.0	98		
5.6	52	12.2	69	18.8	79	25.4	85	32.0	91	38.6	95	45.2	98		
5.8	53	12.4	69	19.0	79	25.6	85	32.2	91	38.8	95	45.4	99		
6.0	54	12.6	70	19.2	79	25.8	86	32.4	91	39.0	95	45.6	99		
6.2	54	12.8	70	19.4	79	26.0	86	32.6	91	39.2	95	45.8	99		
6.4	55	13.0	70	19.6	79	26.2	86	32.8	91	39.4	95	46.0	99		

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Procedure No	CSC-NDE-11.0
Title	Data Acquisition & Analysis
Revision:	4
Date:	January 7, 2021
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Title: Data Acquisition & Analysis

	Name	Date	Initials
Written	Frank Jerina	June 15, 2010	On File
Revised	James Kocher	January 7, 2021	JAK
Reviewed	James Halloran	January 8, 2021	
Approved	Regina Godish	Jan 8, 2021	
Approved	Edward Saxon	JAN 8, 2021	EJS
LIII Approval	Jeff Pomarico	1/8/2021	

1. Purpose/ Scope
   This procedure establishes the techniques for performing multi-frequency eddy current (ET) examination of non-ferromagnetic heat exchanger tubing. This includes magnetic saturation techniques for mildly ferritic thin walled tubing. All personnel utilizing the procedure shall follow each manufacturer's instructions and operations of the applicable instrumentation used.

2. Attachments
   2.1. Sample Examination Technique Specification Sheet (ETSS)

3. References
   3.1. ASME Boiler and Pressure Vessel Code, Section XI (2007 edition, through 2009 addenda).

   3.2. ASME Boiler and Pressure Vessel Code, Section V, Article 8 (2007 edition, through 2009 addenda).

   3.3. CSC-QAP-9.1 – "Certification of NDE Personnel"

   3.4. CSC-QAP-12.1 – "Control of M&TE"

   3.5. CSC-NDE-3.4 – "Optimum Test Frequency Manual"

4. Definitions
   4.1. ASME – American society of Mechanical Engineers.

   4.2. Absolute Test (external-reference) – An eddy current test utilizing one inspection coil in the test material, which references against another single coil in a reference material.

   4.3. Differential Test (self-comparison) – An eddy current test arrangement utilizing, two or more inspection coils electrically connected in series opposition, which compares a section of the test specimen against another section of the same test specimen.

   4.4. ASME Calibration Standard – A specimen of the same material, size, wall thickness, and heat treatment, as the material being inspected. This standard may contain artificial discontinuities used for system set-up.

   4.5. Reference Standard – A material of the same size, wall thickness, and heat treatment, as the material being inspected. This standard shall be free from defects and used for comparison purposes.

4.6. Examination Technique Specification Sheet (ETSS) – Documentation completed by the Lead Analyst (or designee), that outlines the eddy current parameters for a particular inspection. The ETSS contains specific information regarding the test subject, frequency selection, setup parameters, proper probes and test equipment required to complete the inspection. The ETSS also outlines the analysis parameters such as voltage settings, reporting channels, curves (phase or magnitude), reporting thresholds and applicable codes for defects and other conditions encountered.

5. Responsibilities

5.1. Level IT personnel may operate equipment under the direct supervision of a Level II or Level III. Level IT personnel shall not evaluate or accept the results of a nondestructive examination.

5.2. Level I personnel shall use written procedures when performing specific setups, calibrations, and examinations and when recording data. The activities shall be conducted under the direct guidance of Level II or Level III personnel. Level I NDE personnel shall not evaluate or accept the results of a nondestructive examination.

5.3. Level II personnel shall be familiar with the operation of the equipment, applicable examination techniques, and recording or the examination data. Level II personnel shall be familiar with the codes, standards, and specifications of any inspection being performed.

5.4. Level IIA personnel shall be responsible for data interpretation or evaluation and give guidance to Level II personnel as needed. The Data Analyst has the right to request a retest on any tube with an unusual condition. The Lead Analyst may alter the original inspection technique or plans to address any special condition encountered. The Lead Analyst is responsible for the correct inspection probes, calibration standards, and any other information on the ETSS sheet.

5.5. Level III personnel shall hold the same responsibilities as Level IIA. The Level III, with approval of the customer, may alter the original inspection technique or plans to address any special condition encountered. The Level III is responsible for the correct inspection probes, calibration standards, and any other information on the ETSS sheet.

6. Procedure

6.1. Code and Procedure Requirements – All Eddy Current technicians shall be familiar with this procedure and examination program prior to the start of the examination.

6.2. Personnel Criteria – Personnel performing Eddy Current examinations shall be certified in accordance with the Quality Assurance Procedure CSC-QAP-9.1, “Certification of NDE Personnel” or their employers, written practice that has been approved by Conco Services Corporation.

6.3. Heat Exchangers under inspection must be shut down or isolated and the system drained. Manways shall be opened and sufficient time should be allowed for cool down prior to the start of the job.

6.4. All personnel engaging in eddy current at operating nuclear facilities shall receive instructions and understand radiation rules and guidelines in effect at the plant site.

6.5. Equipment

6.5.1. Eddy current test instrument

6.5.1.1. The eddy current test instrument shall be capable of multi-frequency inspection in multiplexed mode, simultaneous injection mode and operation in the differential and/or absolute mode.

6.5.1.2. The eddy current test instrument shall be capable of recording and playing back data, real time, in a format suitable for evaluation and archival storage.

6.5.1.3. The test instrument outputs shall provide phase and amplitude information.

6.5.1.4. The eddy current inspection system shall be capable of detecting and recording dimensional changes, metallurgical changes, deposits and determine if discontinuities are ID or OD initiated.

6.5.1.5. Testing equipment shall hold current calibration in accordance with CSC-QAP-12.1 and the interval shall not exceed one year or whenever the equipment has been overhauled or repaired as a result of malfunction or damage.

6.5.2. The acceptable eddy current probes for an inspection shall be listed on the ETSS and may include bobbin coil, cross-wound and pancake coil designs from various manufacturers. The sensitivity for the differential bobbin probes technique shall be sufficient to produce a response from the 20% flat bottom holes with a minimum peak to peak response of 30% screen height of the Lissajous. A minimum fill factor of 80% should be used. For special interest regions (i.e. obstructions and restrictions), a lower fill factor may be used. If the minimum sensitivity requirements can not be met, the test will be considered a best effort examination. Customer approval shall be obtained prior to examination. Customer requirements for higher fill factor values will be followed and documented on the ETSS.

6.5.3. ASME Calibration Standards

6.5.3.1. The ASME calibration standard shall be manufactured in accordance with the specifications of the ASME Boiler and Pressure Vessel Code, Section V, Article 8. The standard shall contain the following artificial discontinuities at a minimum: 100% through wall hole, 60% through wall flat bottom hole, and four 20% through wall flat bottom holes spaced 90 degrees apart in a single plane around the tube circumference.

6.5.3.2. A simulated support ring should be used to simulate a support plate in the unit being inspected. If an “artificial” ring cannot be obtained, a support plate in the unit can be used for mixing/process channels.

6.5.3.3. Each standard shall be identified by a unique serial number and have an associated drawing or data sheet showing the actual flaw depths. The eddy current system response shall become part of the permanent record of the standard.

6.5.3.4. Other calibration standards may be used in addition to the ASME standard for unique applications.

6.5.4. Digital Data Analysis System

6.5.4.1. The eddy current data analysis system shall be capable of displaying and evaluating the recorded data from all frequency channels.

6.5.4.2. The system shall have multi-parameter mixing capability.

6.5.4.3. The system shall have a minimum resolution of 12 bits per data point.

6.5.4.4. The Lissajous display shall have a minimum resolution of 7 bits full scale.

6.5.4.5. The strip chart display shall have a minimum resolution of 6 bits full scale.

6.5.4.6. The strip chart display shall be selectable to display either the X or Y component of the raw or processed (mixed) data.

6.5.4.7. In addition, the system shall meet the "General System Requirements", stated in ASME Boiler and Pressure Vessel Code, Section V, Article 8, II-830.5.1.

6.6. System Set-up

6.6.1. Preparation

6.6.1.1. Review all safety and radiological procedures with plant personnel as applicable (i.e. air sample, radiation surveys, confined space requirements, etc.)

6.6.1.2. Review all Foreign Material Exclusion (FME) procedures with plant personnel as necessary.

6.6.1.3. Examine work area for any potential hazards or interference and resolve any problems.

6.6.1.4. Establish location of the test station and placement of the test instrument.

6.6.1.5. Locate 110 VAC power source. (Clean power source)

6.6.1.6. Establish location of cable routing.

6.6.1.7. Acquire copies of the ETSS and all applicable procedures from the Lead Analyst (or designee). Verify the probes and standards listed on the ETSS are appropriate for the component or material to be examined.

6.6.1.8. Acquire copies of the inspection plan and tubesheet maps if available. Verify that the tubesheet map is correct for the component and the view or test end is correct.

6.6.2. Equipment Set-up

6.6.2.1. Connect and power-up eddy current system per owners manual

6.6.2.2. Attach probe extensions, of equal length, and probes to the test instrument

6.6.2.3. Establish communication for personnel engaging in the examination

6.6.2.4. Set configurations for channels and gain setting on test instrument.

6.6.2.5. Verify recording path

6.6.2.6. Set and verify pull speed (if a probe pusher is being used).

6.6.3. Acquisition Set-Up (Configuration)

6.6.3.1. Test Parameters

6.6.3.1.1. Set the frequencies, drives, and gains in the configuration of the test instrument, per the ETSS. The primary frequency shall be set to obtain a response of the 4X20% FBH's to fall within 90° to 120° from the 100% thruwall hole set at 40°.

6.6.3.1.2. Set the proper sample rate, in the test instrument, per the ETSS. The sample rate should meet the minimum of 30 samples per inch of tubing per ASME Section V, Article 8.

6.6.3.1.3. With the proper settings, a signal-to-noise ratio of 3:1 or higher shall be obtained.

6.6.3.1.4. Assure the reference probe has been placed in the reference tubing or the component. Test systems with internal reference capabilities can be used in lieu of a reference probe.

6.6.3.1.5. Place the test probe in the end of the ASME Calibration standard assuring that none of the coils are influenced by the flaws in the standard and perform a hardware null.

6.6.3.1.6. Open a calibration group, with the proper recording path, to allow the calibration standard data to be recorded.

6.6.3.1.7. Turn on the acquire function of the tester and assure data is in the strip charts, on the left of the acquisition screen.

6.6.3.1.8. Assure both the reference, and test probes are in good metal and center the data in the Lissajous.

6.6.3.1.9. Push the test probe out of the end of the ASME Calibration standard.

6.6.3.1.10. Start recording the data and pull the probe back through the calibration. (If a probe pusher is being used for the inspection, it should be used to pull the calibration standards also. If this is the case, care should be taken to minimize snap of the probe as it is retracted through the calibration standard.)

6.6.3.1.11. Stop recording data and review the calibration standard to ensure compliance with the ETSS.

6.6.3.1.12. Set spans and rotations on all absolute and differential channels for the ASME standard, identified on the approved ETSS.

6.6.3.1.13. Store the set-up with the new values for the spans and rotations of the calibration standard.

6.6.3.1.14. Repeat steps from above, (6.6.3.1 – (6.6.3.1.6) through (6.6.3.1.9)) for all calibration standards being used for the inspection.

Note: If Wear Scar and/or Thinning Standards are being used, check all channels to assure that none of the signals are saturated. If any signals are saturated, adjust the gains in the configuration screen, notify the Level IIA/III of changes needed to ETSS, and repeat the entire calibration process with the updated ETSS settings.

6.7. Examination

6.7.1. Summary Form

6.7.1.1. Select the "Summary Form" and complete all designated input areas. The summary form shall be written to the storage media and contain the following information as a minimum:

- Owner
- Plant site and unit number
- Heat Exchanger identification and test end
- Recording media identification (i.e. calibration group)
- Date of examination
- Serial number of the calibration standard(s)
- Operator's identification and certification level
- Examination frequencies
- Lengths of probe and probe extension cables
- Size and type of probes
- Probe manufacturer's name and manufacturer's part number or probe description
- Serial number of the eddy current test instrument
- Calibration "Due Date", from the test instrument being used

6.7.2. Record Calibration Standards

6.7.2.1. Identify the ASME standard run as Row 999 Tube 999 or as stated on the ETSS. If other standards are utilized refer to the ETSS for identification.

6.7.2.2. Place the test probe in a defect-free portion of the standard and balance the tester.

6.7.2.3. Record a minimum of three standard runs in the direction and at the speed that the inspection will be performed.

6.7.2.4. Retrieve a standard run from the storage media to verify proper system operation.

6.7.2.5. Calibration standard runs shall be recorded for the following conditions:

6.7.2.5.1. At the beginning and end of a directory/cal group or when changing storage media

6.7.2.5.2. At the beginning and end of a work shift

6.7.2.5.3. When changing equipment, including probes and cables

6.7.2.5.4. When four hours time has elapsed since the last calibration verification

6.7.2.5.5. When a power failure or system lockup has occurred

6.7.2.5.6. At anytime the operator deems it necessary to check the system integrity

6.7.2.6. A written message to the data disk should precede or follow a calibration run stating

the reason the calibration run is being performed.

6.7.2.7. If a system is found out of tolerance, recalibration is required. This should be noted by recording an updated summary and message to the recording media. In addition to this, if any part of the test system is changed, due to damage or any other issue, recalibration is required.

6.7.2.8. The analyst will determine if any or all tubes need to be retested.

6.7.2.9. The "End of Calibration" standard run shall be performed at the same pull speed used during the examination.

6.7.2.10. If a calibration run cannot be performed at the four-hour interval, a detailed message shall be recorded on the recording media stating the reason for the "missed" standard run and the site lead shall be notified. A calibration standard run shall then be performed at the first opportunity and prior to the continuation of the inspection.

6.7.3. Typical examination process

6.7.3.1. Identify and encode the tube identification using the appropriate identification/numbering scheme.

6.7.3.2. Insert the probe into the tube to be examined, check balance of the data and rebalance if required.

6.7.3.3. Insert the Probe to the intended examination extent.

6.7.3.4. Initiate data recording.

6.7.3.5. Withdraw the probe at the speed noted on the ETSS.

6.7.3.6. Monitor the data quality during the recording process. Ensure that acceptable data is being acquired in all channels.

6.7.3.7. Stop recording data when the examination is complete.

6.7.4. If the probe cannot traverse the entire length of the scheduled examination and the tube is considered restricted, record a message identifying the tube number or group of tubes. Include an explanation as to why the tubes(s) cannot be examined over the entire length (if known).

6.7.5. When an error in tube identification occurs, the operator shall clearly identify which tube entries are incorrect with a recorded message.

6.8. Data Analysis and Reporting

6.8.1. Evaluate the recorded digital data from the acquisition process.

6.8.2. Evaluate any indications. Indication types that must be reported shall be characterized using the frequencies or frequency mixes and analysis curves (Phase or Magnitude) appropriate for the damage mechanism as identified in the Examination Technique Specification Sheet (ETSS).

6.8.3. Provide a preliminary report following the examination. Include in the report a record indicating the tube(s) examined, any scanning limitations, the location and depth (or descriptive code) of each reported flaw, and any specific reporting requirements identified by the customer.

6.8.4. Unless otherwise requested by the customer, only the deepest flaw in each tube will be identified.

6.8.5. Graphic printouts of typical and questionable defect types shall be added at the customer's request.

6.8.6. Report all obstructions restrictions, or conditions known to limit the desired extent of test for all tubes on the examination plan (e.g. dents, tube cleanliness, foreign material).

6.8.7. Report any addition conditions deemed necessary.

7. Records

7.1. Records and documentation are handled in accordance to CSC-QAP-17.1.

7.2. A copy of this procedure, personnel certifications and equipment certifications shall be submitted to the customer upon request.

7.3. The examination results and technical information regarding test parameters and inspection requirements shall be included in the final report.

Attachment 2.1 Sample ETSS

CONCO SERVICES LLC
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Form No	1085
Title	Examination Technique Specification Sheet OMNI
Revision:	2
Date:	January 3, 2017
Page 1 of 4	

Utility/Site/Unit: **Sample ETSS**			ETSS Version: Date:	
Component:			Component ID:	
Examination Scope				
Applicability:				
Instrument			**Tubing**	
Manufacturer/Model: CoreStar OMNI 200/100			Material Type:	
			# Of Tubes:	
			OD/Wall (inch):	
Data Recording Equipment			Length:	
Manuf./Media: Hard drive / Network or Equiv			**Calibration Standard(s)**	
Software			Type/SN: ASME Type/SN: Wall Thinning Type/SN: Reference	
Manufacturer: Corestar			**Analog Signal Path**	
Version/Revision: 8.0			Probe Shaft /Length:	
Examination Procedure			Extension Type & Length N/A	
Number/Revision: CSC-NDE-11.0 Rev 3			Slip Ring Model Number: N/A	
Scan Parameters				
Scan Direction: Pull				
Digitization Rate, Samples Per Inch (minimum): ≥ 30 SPI		Axial Direction: Pull	N/A	Circ. Direction N/A

Probe Speed	Sample Rate	RPM Set	RPM Min	RPM Max
46 inches / second	2000 (Max.)	N/A	N/A	N/A
30 inches / second	1200 (Min.)	N/A	N/A	N/A

Probe/Motor Unit		
Description (Model/Diameter/Frequency/Coil Dimensions)	Manufacturer	Length

Data Acquisition				
Calibration Coil 1 Channels				
Channel & Frequency	Channel #1 kHz	Channel #3 kHz	Channel #5 kHz	Channel #7 kHz
Phase Rotation	100% TWH 40 degrees ± 3	100% TWH 40 degrees ± 3	100% TWH 40 degrees ± 3	100% TWH 40 degrees ± 3
Span Setting	4 x 20% FBH's @ 3 divisions	4 x 20% FBH's @ 3 divisions	4 x 20% FBH's @ 3 divisions	4 x 20% FBH's @ 3 divisions
Drive Voltage	75%	75%	75%	75%
Gain Setting	14	14	14	14
Calibration Coil 2 Channels				
Channel & Frequency	Channel #2 kHz	Channel #4 kHz	Channel #6 kHz	Channel #8 kHz
Phase Rotation	Probe Motion Horiz. Flaws Up	Probe Motion Horiz. Flaws Up	Probe Motion Horiz. Flaws Up	Probe Motion Horiz. Flaws Up
Span Setting	4 x 20% FBH's @ 1.5 divisions	4 x 20% FBH's @ 1.5 divisions	4 x 20% FBH's @ 1.5 divisions	4 x 20% FBH's @ 1.5 divisions
Drive Voltage	75%	75%	75%	75%
Gain setting	8	8	8	8

01/08/21, 9:04 AM

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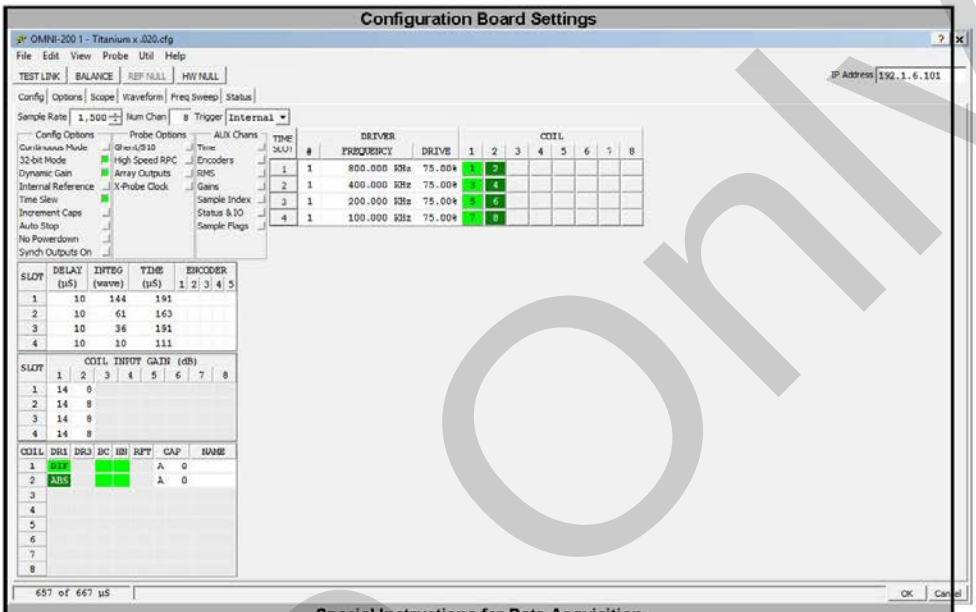
Examination Technique Specification Sheet

Configuration Board Settings



Special Instructions for Data Acquisition

1. Probes should be pulled @ 40 inches/second or less.
2. Review each data channel and ensure that adequate/expected signal responses are achieved before recording the calibration. Do not record data until the proper spans and rotations have been set.
3. Monitor the data by setting the left strip chart to channel 1 vertical, right strip chart to channel 6 vertical and the lissajous display set to channel 1 as a minimum. The operator will determine the specific strip chart settings and lissajous display to verify the system is functioning properly and that data quality is acceptable.
4. Follow the Conco NDE procedure CSC-NDE-11.0 Rev 3.
5. Encode the tube ID's as per map for respective sections.
6. The initial exam attempt shall be performed with the XXX ESH/HF probe.
7. Tubes that will not allow the probe to enter report as "Obstructed".
8. Tubes that are unable to examine the desired extent report as "Restricted".
9. Write a message for all tubes that are unable to be examined full length explaining the reason.
10. Encode the ASME Std. as "999", Thinning Std as "999" with a message.
11. Perform "System Null" only if "Display Null" is ineffective in balancing the signal.

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Examination Technique Specification Sheet

Data Analysis				
Calibration Differential Channels				
Channel & Frequency	Channel #1 kHz	Channel #3 kHz	Channel #5 kHz	Channel #7 kHz
Phase Rotation	100% TWH 40 degrees ± 3	100% TWH 40 degrees ± 3	100% TWH 40 degrees ± 3	100% TWH 40 degrees ± 3
Span Setting Minimum	100% TWH @ 4 divisions	100% TWH @ 4 divisions	100% TWH @ 4 divisions	100% TWH @ 4 divisions
Calibration Absolute Channels				
Channel & Frequency	Channel #2 kHz	Channel #4 kHz	Channel #6 kHz	Channel #8 kHz
Phase Rotation	Probe Motion Horiz. Flaws Up	Probe Motion Horiz. Flaws Up	Probe Motion Horiz. Flaws Up	Probe Motion Horiz. Flaws Up
Span Setting Minimum	100% TWH @ 1.5 divisions	100% TWH @ 1.5 divisions	100% TWH @ 1.5 divisions	100% TWH @ 1.5 divisions
Calibration Process and Other Channels				
Channel & Frequency	M-1 / Diff	M-2 / Abs.	P-3 / Diff.	P-4 / Diff.
Phase Rotation	100% TWH 40 degrees ± 3	Probe Motion Horiz. Flaws Up		
Span Setting Minimum	100% TWH @ 1.5 divisions	100% TWH @ 1.5 divisions		
Suppress On	Support Ring	Support Ring		

Voltage Normalization				Calibration Curves		
CH	Signal	Set	Normalize	Type	CH	Set Points
1	4x20% FBH	4 Vp-p	Save/Store to all	Phase Curve	1, 3, 5, M1	100,60,20%
1	4x20% FBH	4 Vp-p	Save/Store to all	Magnitude Curve	6,M2	75, 50,25%

Data Screening				
Left Strip Chart	Center Strip Chart	Right Strip Chart	Left Lissajous	Right Lissajous
Channel P1 Vertical	Channel 1 Vertical	Channel 6 Vertical	Channel 1	Channel 3

Special Instructions for Analysis

1. Calibration curves shall be constructed using the "As-Built" dimensions from the calibration standard drawings.
2. Normalize to 4 volts on the 4 X 20% flat bottom holes using channel #1 differential and store to all channels.
3. All Quantifiable indications of tube wall degradation ≥ 20% TW and 1 Volt shall be reported (however, not to exceed 6 reportable ID defects).
4. Locate all defect indications in inches measured from the test end.
5. Previously reported indications shall be addressed by the primary analyst. Report previously reported Inds. In same channel as history. Report previous indications that are not found as "INF" and indications not recordable as "INR".
6. If test data appears to be un-interpretable shall be report as "RBD".

Job Lead Approval	Customer Approval (if required)
Signature /Date	Signature /Date

Additional Component Information

01/08/21, 9:04 AM

Examination Technique Specification Sheet

Reporting Requirements							
Code	Description	Meas.	%	Volts	Ch	Loc	Ext.
ADR	Absolute Drift	Y	N	Any	6	Y	Y
CRK	Crack-Like Indication	Y	N	Any	5, 6	Y	Y
DNT	Dent	Y	N	20 >	1, M1	Y	Y
DTS	Distorted Support Indication	Y	N	Any	M1	Y	Y
ERI	Erosion With Indication	Y	20% >	Any	6	Y	Y
ERO	Erosion	Y	20% >	Any	6	Y	Y
GEN	General Pitting / Wall Loss	N	N	N	N	N	Y
IDC	ID Chatter	Y	N	20 >	1	Y	Y
IDI	ID Indication	Y	20% >	Any	1, M1	Y	Y
INA	Inaccessible	N	N	N	N	N	N
INF	Indication Not Found	N	N	N	N	Y	Y
INR	Indication Not Recordable	N	N	N	N	Y	Y
NDD	No Degradation Detected	N	N	N	N	N	Y
NQI	Non Quantifiable Indication	Y	N	Any	1, M1	Y	Y
OBS	Obstructed	N	N	N	N	N	N
ODI	OD Indication	Y	20% >	Any	1, M1	Y	Y
PID	Positive Identification	Y	N	Y	Y	Y	Y
PLG	Plug	N	N	N	N	N	N
PVN	Permeability Variation	Y	N	20 >	1, M1	Y	Y
RAD	Retest Analyst Discretion	N	N	N	N	N	N
RBD	Retest Bad Data	N	N	N	N	N	N
RES	Restricted	N	N	N	N	Y	Y
RIC	Retest Incomplete	N	N	N	N	N	N
STC	Stuck Cleaner	N	N	N	N	N	N
WAR	Wear	Y	20% >	Any	6, M2	Y	Y

Refer to the Data Management Code list in the report for landmark abbreviations.

530 Jones Street
Verona, PA 15147 U.S.A.
Tel: 1-800-345-3476
Fax: 412-826-8255
www.conco.net

4.0 CERTIFICATIONS

The following personnel were involved with this inspection:

Tom Dolgas	ET IIA	Conco Services
Kevin Willyard	ECT II	Conco Services
Mike Berkoben	ECT I	Conco Services

The following testers were used on this inspection:

Corestar OMNI 200 S/N	0007-0910

The following calibration standards were used on this inspection:

ASME	CSC-434
Wall Thinning	CSC-432

Note: see following pages for a copy of all certifications and standard drawings

NDE CERTIFICATION

Name: Dolgas, Thomas SSN: XXX-XX-9803 Method / Level: ECT-IIA

EDUCATION & TRAINING

Date(s)	School / Facility	Location	Subject	Term	Certification
5-27-75	Windber Area HS	Windber, PA	N/A	N/A	Diploma
9-18-09	System One	Cheswick, PA	NDE	448 Hours	Transcript
2-22-11	Conco Services Corp.	Verona, PA	ECT-I	40 Hours	Attn. Record
6-18-12	Conco Services Corp.	Verona, PA	ECT-II	40 Hours	Attn. Record
1-19-15	JECNDT, LLC	Verona, PA	ECT-IIA	80 Hours	Attn. Record
1-9-18	Conco Services Corp.	Verona, PA	ECT-IIA	24 Hours	Attn. Record
11-17-20	Conco Services, LLC	Verona, PA	ECT-IIA	24 Hours	Attn. Record

NDE EXPERIENCE

Date(s)	Company	NDE Method / Highest Level
2-28-11	Conco Services Corp.	ECT-IT
5-25-11	Conco Services Corp.	ECT-I
6-22-12	Conco Services Corp.	ECT-II
2-3-15	Conco Services Corp.	ECT-IIA

EXAMINATION GRADES

General: 96%	Date:11-17-20	Basic: N/A	Date:	Specific: 88%	Date:11-18-20
Method: N/A	Date:	Practical 99.7%	Date: 11-18-20	LIII Practical:N/A	Date:
Demonstration 100%	Date:11-19-20	ASNT: N/A	Date:	ASNT No.	
Composite Grade: 95.9%					

LIMITATIONS / REMARKS:
Demonstration exam is the L-II acquisition practical for data collection in the field.
Tom Dolgas is a certified receipt inspector.

This certifies that the above-named individual has satisfactorily completed the physical and technical qualifications required by the current Conco Procedure CSC-QAP-9.1 Rev.13, Certification of NDE Personnel.

CERTIFICATION DATE: 11-20-2020 EXPIRATION DATE: 11-17-2023

Certified By: _____ Title: ET Level III-A

Printed Name: James A. Kocher

☐ Initial Certification X Re-Certification

NDE CERTIFICATION

Name: Willyard, Kevin D. SSN: XXX-XX-4524 Method / Level: ECT-II

EDUCATION & TRAINING

Date(s)	School / Facility	Location	Subject	Term	Certification
6-1983	Freeport Area High School	Freeport, PA	N/A	N/A	Diploma
8-1998	Master Lee Energy Svcs.	Latrobe, PA	ECT-I	40 Hrs	Attn. Record
1-17-02	Conco Services Corp.	Verona, PA	ECT-I	8 Hrs	Attn. Record
1-22-05	Conco Services Corp.	Verona, PA	ECT-I	9 Hrs	Attn. Record
1-19-09	Conco Services Corp.	Verona, PA	ECT-I	24 Hrs	Attn. Record
1-3-11	Conco Services Corp.	Verona, PA	ECT-II	40 Hrs	Attn. Record
7-18-16	Conco Services Corp.	Verona, PA	ECT-II	24 Hrs	Attn. Record
7-8-19	Conco Services Corp.	Verona, PA	ECT-II	24 Hrs	Attn. Record

NDE EXPERIENCE

Date(s)	Company	NDE Method / Highest Level
8-14-98	Conco Services Corp.	ECT-IT
12-4-99	Conco Services Corp.	ECT-I
1-24-11	Conco Services Corp.	ECT-II

EXAMINATION GRADES

General: 94%	Date: 7-8-19	Basic: N/A	Date:	Specific: 96%	Date: 7-8-19
Method: N/A	Date:	Practical: 100%	Date: 7-10-19	LIII Practical:N/A	Date:
Demonstration:N/A	Date:	ASNT: N/A	Date:	ASNT No.	
Composite Grade: 96.6%					

LIMITATIONS / REMARKS:

This certifies that the above-named individual has satisfactorily completed the physical and technical qualifications required by the current Conco Procedure CSC-QAP-9.1 Rev.13, Certification of NDE Personnel.

CERTIFICATION DATE: 7-11-2019 EXPIRATION DATE: 7-8-2022

Certified By: _____ Title: ET L-IIIA

Printed Name: James A. Kocher

☐ Initial Certification X Re-Certification

NDE CERTIFICATION

Name: Berkoben, Michael SSN: XXX-XX-6068 Method / Level: ECT-I

EDUCATION & TRAINING

Date(s)	School / Facility	Location	Subject	Term	Certification
3-14-16	Commonwealth of PA	Harrisburg, PA	N/A	N/A	Diploma
9-4-18	Conco Services Corp.	Verona, PA	ECT-I	40 Hours	Attn. Record

NDE EXPERIENCE

Date(s)	Company	NDE Method / Highest Level
9-10-18	Conco Services Corp.	ECT-IT
11-21-19	Conco Services Corp.	ECT-I

EXAMINATION GRADES

General: 90%	Date: 9-6-18	Basic: N/A	Date:	Specific: 100%	Date: 9-6-18
Method: N/A	Date:	Practical: 100%	Date: 9-7-18	LIII Practical:N/A	Date:
Demonstration:N/A	Date:	ASNT: N/A	Date:	ASNT No.	
Composite Grade: 96.6 %					

LIMITATIONS / REMARKS:

This certifies that the above-named individual has satisfactorily completed the physical and technical qualifications required by the current Conco Procedure CSC-QAP-9.1 Rev.12, Certification of NDE Personnel.

CERTIFICATION DATE: 11-21-2019 EXPIRATION DATE: 9-6-2021

Certified By: Title: ET L-IIIA

Printed Name: James A. Kocher

X Initial Certification ☐ Re-Certification

CORESTAR INTERNATIONAL CORPORATION
EQUIPMENT CALIBRATION CERTIFICATE

INSTRUMENT **LAB TEMP: 75.0 °F**

Certificate Number:	CB-200220	**Instrument S/N:**	**0007-0910**
Instrument:	OMNI-200™ AM201R1-10	**Calibration Date:**	**21-Jul-2020**
Customer:	**Conco**	**Calibration Due:**	20-Jul-2021
Instruction Number:	CIC-HI002, Rev 5	**Calibration Interval:**	1 Year

VOLTAGE SPECIFICATION

Instrument:	Agilent Model 34401A Digital Multimeter	**Instrument S/N:**	US36141491
		Calibration Date:	**07-Feb-2020**
Calibration Interval:	1 year	**Calibration Due:**	07-Feb-2021

Voltage (Vdc)	Measured Value (Vdc)	Tolerance
+3.3	**+3.304**	+/- 0.100
+15.0	**+15.116**	+/- 0.200
-15.0	**-15.070**	+/- 0.200

FREQUENCY SPECIFICATION

Instrument:	Agilent Model 53131A Universal Counter	**Instrument S/N:**	MY40003653
		Calibration Date:	**07-Feb-2020**
Calibration Interval:	1 year	**Calibration Due:**	07-Feb-2021

Frequency (Hz)	Measured Value (Hz)	Tolerance
100	**100**	+/- 5
2,000	**2,000**	+/- 100
30,000	**30,000**	+/- 1,500
400,000	**399,999**	+/- 20,000
2,000,000	**1,999,997**	+/- 100,000

COIL GAIN CALIBRATION SPECIFICATION

Calibration Frequencies:	5 kHz to 1 MHz	**Calibration Module SN:**	0269-0307
Test Parameters:	See instructions		

NOTE: The complete table of measured values for each frequency, gain setting, and coil number is permanently stored in the instrument hardware. To view and print the report, go to the Calibration menu in the Tester Config screen.

Gain Step (decibels)	Average Value (Volt/Volt)	Tolerance	Pass	Fail
-22 db	0.087	.087 ±.002 V/V	X	
-16 db	0.174	.173 ±.005 V/V	X	
-10 db	0.335	.337 ±.010 V/V	X	
-4 db	0.661	.664 ±.019 V/V	X	

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(724)744-4094

CORESTAR INTERNATIONAL CORPORATION
EQUIPMENT CALIBRATION CERTIFICATE

INSTRUMENT

Certificate Number: CB-200220	**Instrument S/N:** 0007-0910

COIL GAIN CALIBRATION SPECIFICATION (continued)

Gain Step (decibels)	Average Value (Volt/Volt)	Tolerance	Pass	Fail
2 db	1.315	1.312 ±.039 V/V	X	
8 db	2.647	2.652 ±.079 V/V	X	
14 db	5.104	5.141 ±.154 V/V	X	
20 db	10.000	10.000 V/V Reference	n/a	n/a

COIL FUNCTIONAL CHECK

Test Frequency: 400 kHz **Probe SN:** 0045-0806
Test Parameters: See instructions **Standard SN:** AS-034-03

Coil	TSP Volt	Measured	Tolerance	TSP Phase	Measured	Tolerance
1	4.58 V	4.81	± .45 V	21°	21	± 2.0°
2	4.58 V	4.88	± .45 V	21°	21	± 2.0°
3	4.58 V	4.84	± .45 V	21°	21	± 2.0°
4	4.58 V	4.87	± .45 V	21°	20	± 2.0°
5	4.80 V	4.98	± .48 V	23°	22	± 2.0°
6	4.80 V	5.01	± .48 V	23°	22	± 2.0°
7	4.80 V	5.04	± .48 V	23°	23	± 2.0°
8	4.80 V	5.01	± .48 V	23°	22	± 2.0°

QA RELEASE

All measurement ratios between the standards referenced on this certificate and the M&TE calibrated are greater than or equal to 4:1. _X_ Yes ___ No

All of the equipment used in the calibration of this instrument is traceable to NIST. _X_ Yes ___ No

All test requirements have been met and the checklist is complete. _X_ Yes ___ No

Technician Signature: David Thomas David Thomas Date: 7-21-2020

QA Signature: Rebecca Casano Rebecca Casano Date: 7-21-2020

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(724)744-4094

CORESTAR INTERNATIONAL CORPORATION
AS FOUND EQUIPMENT CALIBRATION CERTIFICATE

INSTRUMENT **LAB TEMP: 74.6 °F**

Certificate Number:	CB-200219	**Instrument S/N:**	**0007-0910**
Instrument:	OMNI-200™ AM201R1-10	**Date:**	**21-Jul-2020**
Customer:	**Conco**		
Instruction Number:	CIC-HI002, Rev. 5		

VOLTAGE SPECIFICATION

Instrument:	Agilent Model 34401A Digital Multimeter	**Instrument S/N:**	US36141491
		Calibration Date:	**07-Feb-2020**
Calibration Interval:	1 year	**Calibration Due:**	07-Feb-2021

Voltage (Vdc)	Measured Value (Vdc)	Tolerance (Vdc)	As Found (Vdc)
+3.3	**+3.308**	+/- 0.100	**+3.304**
+15.0	**+15.117**	+/- 0.200	**+15.116**
-15.0	**-15.070**	+/- 0.200	**-15.070**

FREQUENCY SPECIFICATION

Instrument:	Agilent Model 53131A Universal Counter	**Instrument S/N:**	MY40003653
		Calibration Date:	**07-Feb-2020**
Calibration Interval:	1 year	**Calibration Due:**	07-Feb-2021

Frequency (Hz)	Measured Value (Hz)	Tolerance (Hz)	As Found (Hz)
100	**100**	+/- 5	**100**
2,000	**2,000**	+/- 100	**2,000**
30,000	**30,000**	+/- 1,500	**30,000**
400,000	**399,999**	+/- 20,000	**399,999**
2,000,000	**1,999,997**	+/- 100,000	**1,999,997**

COIL GAIN CALIBRATION SPECIFICATION

Calibration Frequencies:	5 kHz to 1 MHz	**Calibration Module SN:**	0269-0307
Test Parameters:	See instructions		

NOTE: The complete table of measured values for each frequency, gain setting, and coil number is permanently stored in the instrument hardware. To view and print the report, go to the Calibration menu in the Tester Config screen.

Gain Step (decibels)	Average Value (Volt/Volt)	Tolerance	As Found (Volt/Volt)
-22 db	0.087	.087 ±.002 V/V	0.087
-16 db	0.174	.173 ±.005 V/V	0.174
-10 db	0.335	.337 ±.010 V/V	0.335
-4 db	0.661	.664 ±.019 V/V	0.661

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CORESTAR INTERNATIONAL CORPORATION
AS FOUND EQUIPMENT CALIBRATION CERTIFICATE

INSTRUMENT

Certificate Number: CB-200219 **Instrument S/N:** 0007-0910

COIL GAIN CALIBRATION SPECIFICATION (continued)

Gain Step (decibels)	Average Value (Volt/Volt)	Tolerance	As Found (Volt/Volt)
2 db	1.315	1.312 ±.039 V/V	1.315
8 db	2.647	2.652 ±.079 V/V	2.647
14 db	5.104	5.141 ±.154 V/V	5.104
20 db	10.000	10.000 V/V Reference	10.000

COIL FUNCTIONAL CHECK

Test Frequency: 400 kHz **Probe SN:** 0045-0806
Test Parameters: See instructions **Standard SN:** AS-034-03

Coil	TSP Volt	Measured	As Found	Tolerance	TSP Phase	Measured	As Found	Tolerance
1	4.58 V	4.86	4.81	± .45 V	21°	22	21	± 2.0°
2	4.58 V	4.85	4.88	± .45 V	21°	21	21	± 2.0°
3	4.58 V	4.86	4.84	± .45 V	21°	19	21	± 2.0°
4	4.58 V	4.84	4.87	± .45 V	21°	20	20	± 2.0°
5	4.80 V	4.97	4.98	± .48 V	23°	23	22	± 2.0°
6	4.80 V	5.00	5.01	± .48 V	23°	24	22	± 2.0°
7	4.80 V	5.04	5.04	± .48 V	23°	23	23	± 2.0°
8	4.80 V	4.99	5.01	± .48 V	23°	24	22	± 2.0°

All measurement ratios between the standards referenced on this certificate and the M&TE calibrated are greater than or equal to 4:1. _X_ Yes ___ No

All of the equipment used in the calibration of this instrument is traceable to NIST. _X_ Yes ___ No

All test requirements have been met and the checklist is complete. _X_ Yes ___ No

Technician Signature: David Thomas David Thomas Date: 7-21-2020

QA Signature: Rebecca Casaro Rebecca Casaro Date: 7-21-2020

1044 Sandy Hill Road, Irwin, PA 15642
(724)744-4094

CSC-434

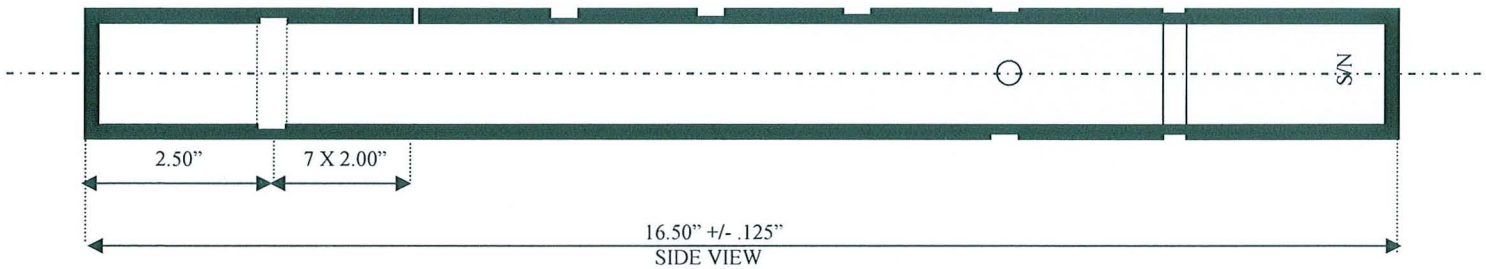
ECUTEC

CALIBRATION STANDARD CERTIFICATION

REV. 01
DATE: 02/10/10

SPECIFIED DEPTH 20% 100% 80% 60% 40% 20% 10%

LOCATION	A	B	C	D	E	F	G	H	I	J
ACTUAL DEPTH	.007"	THRU	.028"	.021"	.014"	.007"	.0035"			
% OF WALL LOSS	20%	100%	80%	60%	40%	20%	10%			
DIA OF DEFECT +/- .005	.062"	see note	.078"	.109"	.187"	.187"	.125"			



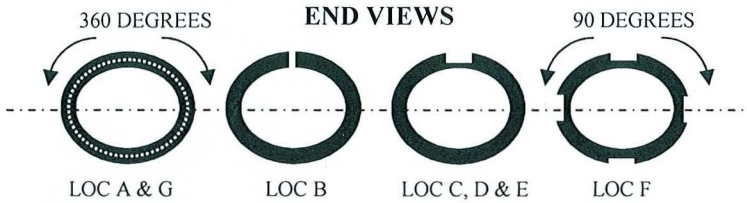
MATERIAL	304 STAINLESS STEEL
O D CONFIGURATION	PRIME
I D CONFIGURATION	PRIME
O D DIAMETER	.750"
NOMINAL WALL	.035"
F P I	N/A
MEASURMENT	INCH
DATE MACHINED	09/30/10
Q A APPROVAL	T MC

NOTE: HOLE DIAMETER AT LOCATION B IS .052" IN TUBES .750" IN DIAMETER AND LESS, .067" IN TUBES ABOVE .750" IN DIAMETER.

NOTE: DUE TO TUBE GEOMETRY 360 DEGREE O D & I D GROOVES MAY BE LESS THAN 360 DEGREES ON SHALLOW DEPTHS AND ARE AS MACHINED

NOTE: MEASURMENT GIVEN FOR 4 FLAT BOTTOM HOLES 90 DEGREES APART IS AN AVERAGE TAKEN FROM ALL 4 MEASURMENTS

LOCATION A SHOWS AN I D GROOVE X 360 DEGREES
LOCATION B SHOWS A THRU WALL HOLE
LOCATIONS C, D, & E SHOW O D FLAT BOTTOM HOLES
LOCATION F SHOWS 4 OD FLAT BOTTOM HOLES 90 DEGREES APART
LOCATION G SHOWS AN O D GROOVE X 360 DEGREES



UNLESS OTHERWISE SPECIFIED
DIM. ARE AS FOLLOWES:

DECIMAL	FRACT. +/- 1/16
XXXX	+/- .003
XXX	+/- .015
XX	+/- .05
ANGULAR	+/- 5 DEGREES

DEFECT DEPTHS ARE +/- .003 OR 20% WHICH EVER IS LESS

SCALE:
NONE
DRAWN BY:
T MCNABB

ECUTEC INC.
ASME CODE CAL. STD.

DRAWN FOR:
CONCO
S/N EU010768
ALL MEASURING DEVICES ARE NIST CERTIFIED

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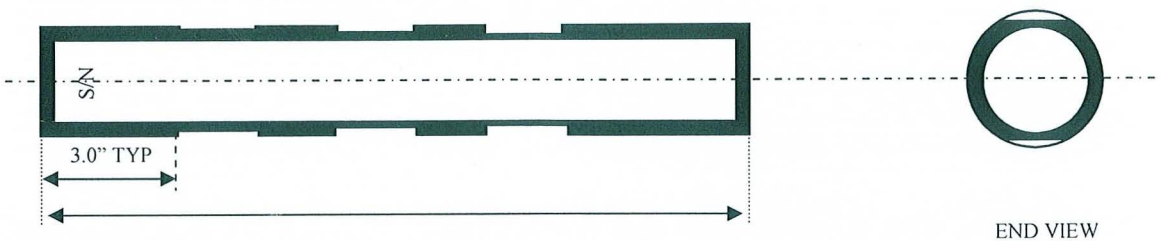
CSC-432

ECUTEC

CALIBRATION STANDARD CERTIFICATION

SPECIFIED DEPTH 25% 50% 75%

LOCATION	A	B	C	D	E	F	G	H	I	J
ACTUAL DEPTH	.0092"	.0185"	.0287"							
% OF WALL LOSS	25%	50%	77.7%							
FLAW WIDTH/DIA. +/- .005"	1.0"	1.0"	1.0"							



15.00" +/- .125"
SIDE VIEW

END VIEW

ALL LOCATIONS SHOW O D FLATS 1.00" IN LENGTH AXIALLY MILLED @ 0 DEG. & 180 DEG.

MATERIAL	304 STAINLESS STEEL
O D CONFIGURATION	PRIME
I D CONFIGURATION	PRIME
O D DIAMETER	.750"
NOMINAL WALL	.037"
F P I	N/A
MEASURMENT	INCH
DATE MACHINED	09/30/10
Q A APPROVAL	T MC

NOTE: MEASUREMENT GIVEN FOR O D FLATS IS AN AVERAGE TAKEN FROM BOTH SIDES

UNLESS OTHERWISE SPECIFIED
DIM. ARE AS FOLLOWES:

DECIMAL	FRACT. +/- 1/16
XXXX	+/- .003
XXX	+/- .015
XX	+/- .05
ANGULAR	+/- 5 DEGREES

DEFECT DEPTHS ARE +/- .003 OR 20% WHICH EVER IS LESS

SCALE:
NONE
DRAWN BY:

T MCNABB

ECUTEC INC.
180 DEGREE THINNING STD.02

DRAWN FOR:
CONCO

S/N EU010943
ALL MEASURING DEVICES ARE NIST CERTIFIED

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