TABLE OF CONTENTS

		Page
1.0	*TECHNICAL SPECIFICATION*	3
2.0	*LIST AND DEFINITION OF SYMBOLS USED*	4
3.0	*PER-UNIT QUANTITIES*	6
4.0	*WINDING RESISTANCE*	7
4.1	Stator Winding Resistance	7
4.2	Rotor Winding Resistance	8
5.0	*INSULATION RESISTANCE*	9
6.0	*FIRST START-UP AND MECHANICAL PARAMETER*	10
6.1	First start-up	10
6.2	Vibration and balancing	10
6.3	Bearing Run-in	10
6.4	Load Rejection	11
7.0	*OPEN AND SHORT CIRCUIT CHARACTERISTICS*	12
8.0	*SYNCHRONOUS CONDENSING MODE*	13
9.0	*HEAT RUN TEST*	14
9.1	General	14
9.2	Rotor Winding T° Rise	14
9.3	Stator Winding T° Rise	16
10.0	*DIELECTRIC TEST*	18

ANNEX - Test data sheets

6.0 *FIRST START UP AND MECHANICAL PARAMETER*

All the temperature were recorded by the C.O.E. temperature monitoring system.

6.1 First start up

After we checked that all oil level were appropriate for a start and everything was working we started the thrust bearing high pressure oil lift pump and we released the brake. Then we slowly open wicket gates to let the unit roll about 5RPM and we close the wicket gates to let the unit coast. No scraping or noise were heard and all sound well.

We increase speed by step of 20 RPM and record vibration at each step for all the three bearings.

Vibration measurement at start up. August 12,'92 (reading in MILS pk-pk for one cycle)

Time	Speed	UGB	LGB	TGB
13:18	20	2.0	1.6	1.6
13:21	40	2.6	3.2	1.6
13:27	60	2.8	3.6	2.8
13:32	80	3.0	5.4	3.2
13:41	100	4.6	6.6	5.2
13:46	120	6.0	9.0	12.0

6.2 Vibration and balancing

Proximity (non-contact) probes IRD403 and transducer IRD14538 were used with IRD Mechanalysis model 350 vibration analyser/dynamic balancer and recorder HIOKI model 8830 for vibration instrumentation.

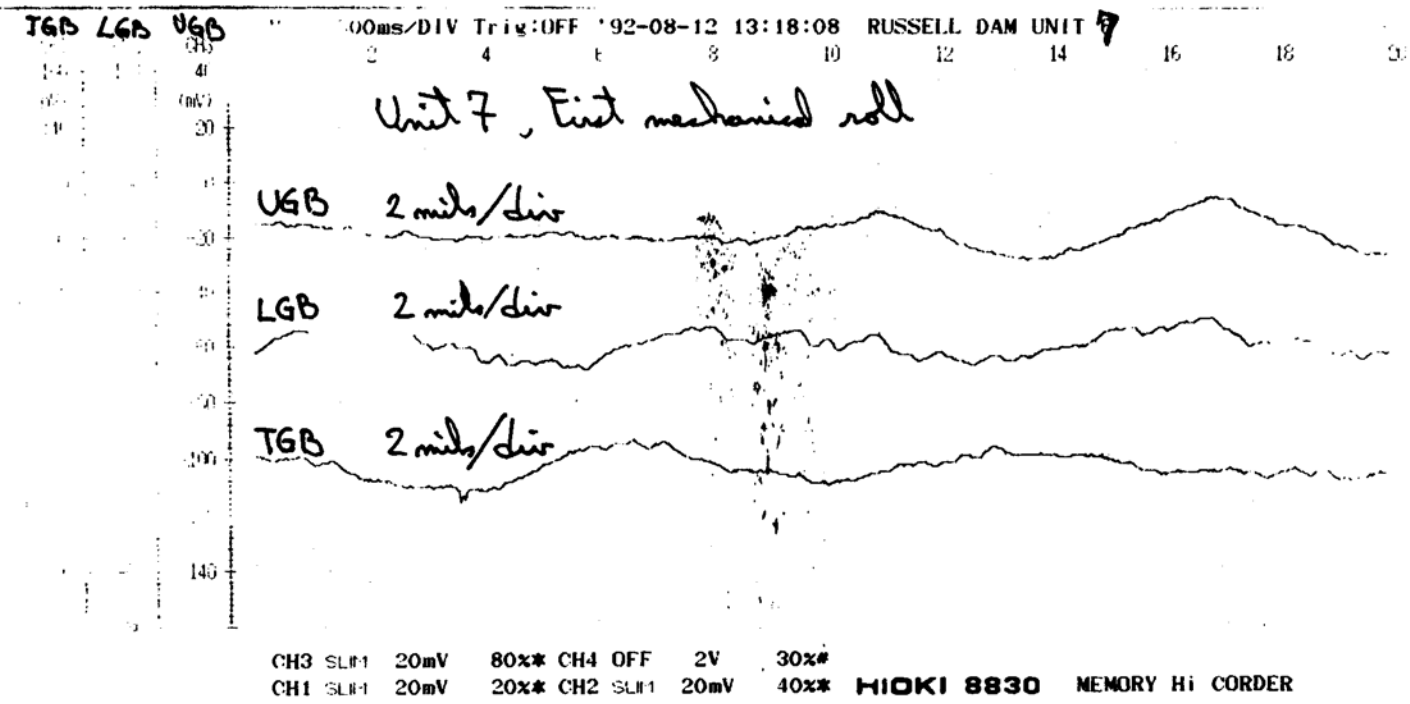
Since during the first start up vibrations were found quite high, it was necessary to add balancing weight into the rotor.

Behavior of the unit was subsequently checked at different load conditions and were found acceptable.

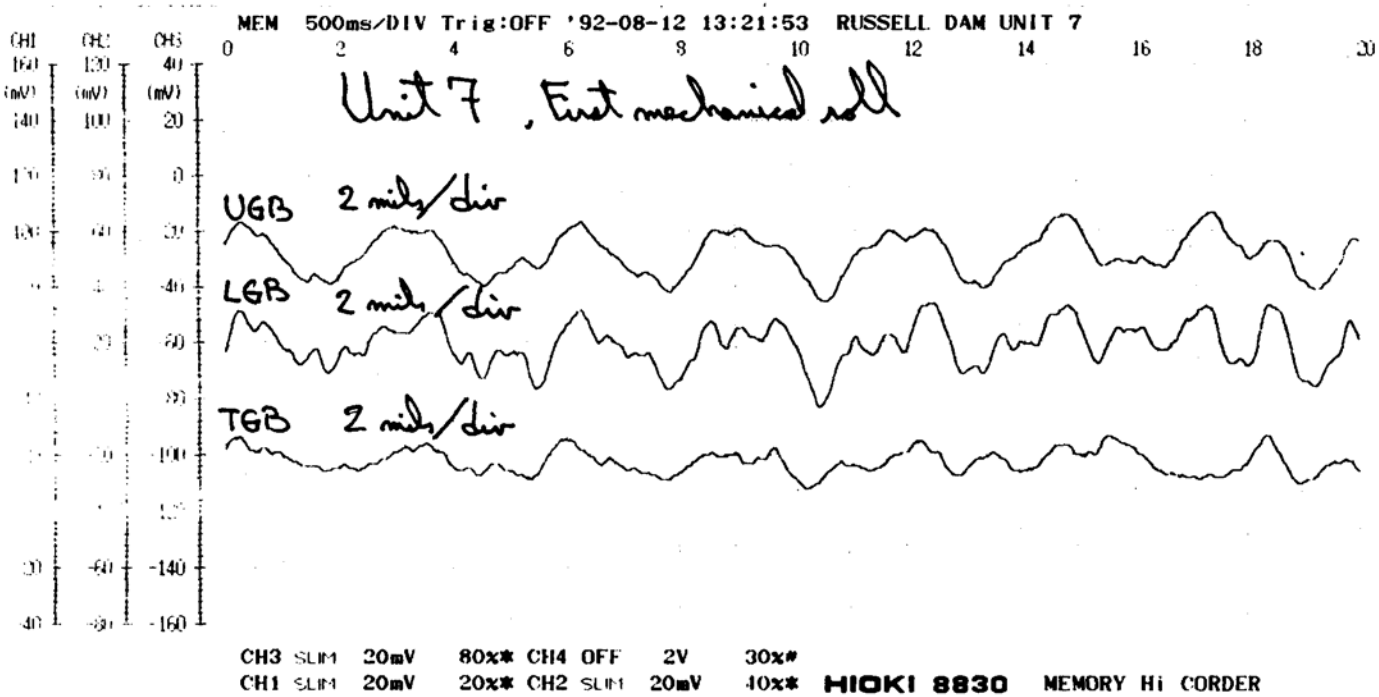
Vibration measurement after balancing, September 2,'92 (reading in MILS pk-pk for on cycle).

Time	MW	MVAR	UGB	LGB	TGB
8:32	0	0	2.8	4.5	6.0
9:03	24	7	2.0	3.0	4.6
9:16	67	22	2.4	5.2	3.2
9:28	75	23	2.8	5.6	3.4
9:19	84	30	2.0	4.8	3.2

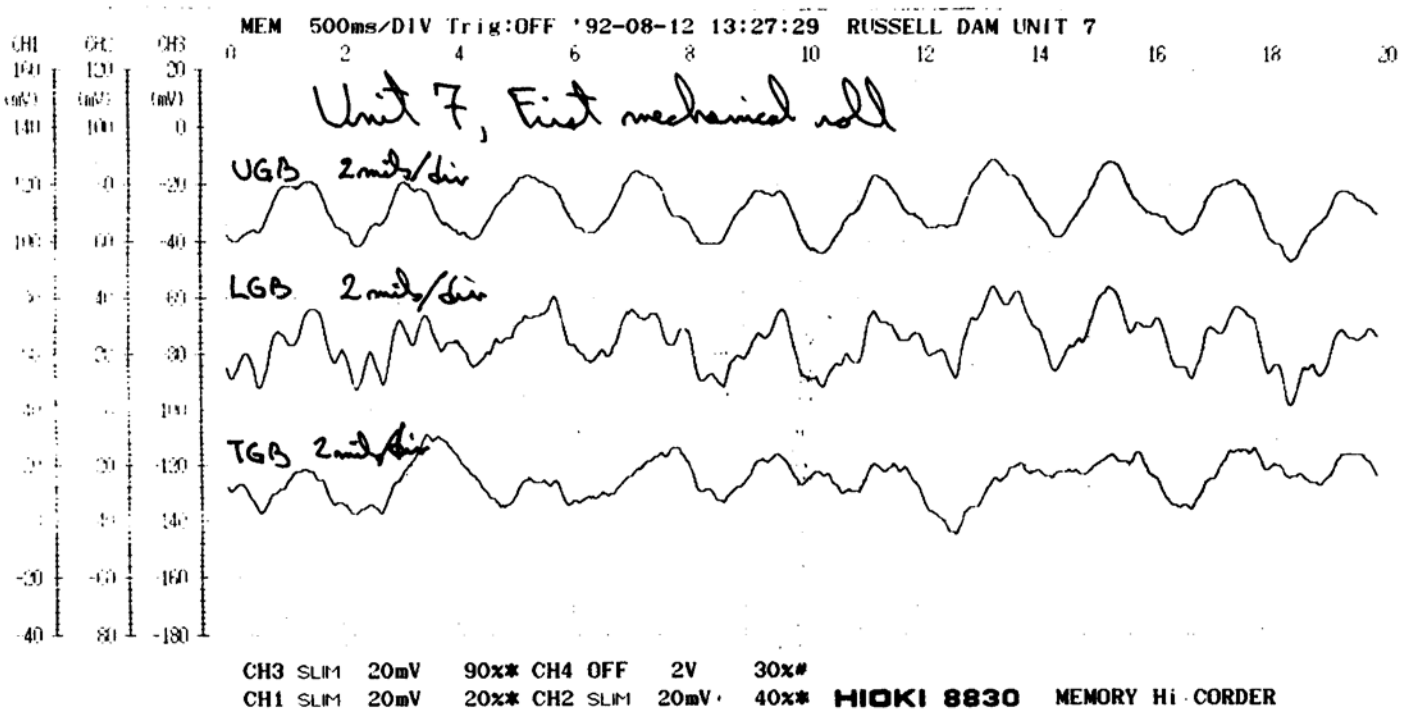
20 RPM


TGB LGB UGB
500ms/DIV Trig:OFF '92-08-12 13:18:08 RUSSELL DAM UNIT 7
Unit 7, First mechanical roll
UGB 2 mils/div
LGB 2 mils/div
TGB 2 mils/div
CH3 SLIM 20mV 80x* CH4 OFF 2V 30x#
CH1 SLIM 20mV 20x* CH2 SLIM 20mV 40x*
HIOKI 8830 MEMORY Hi CORDER

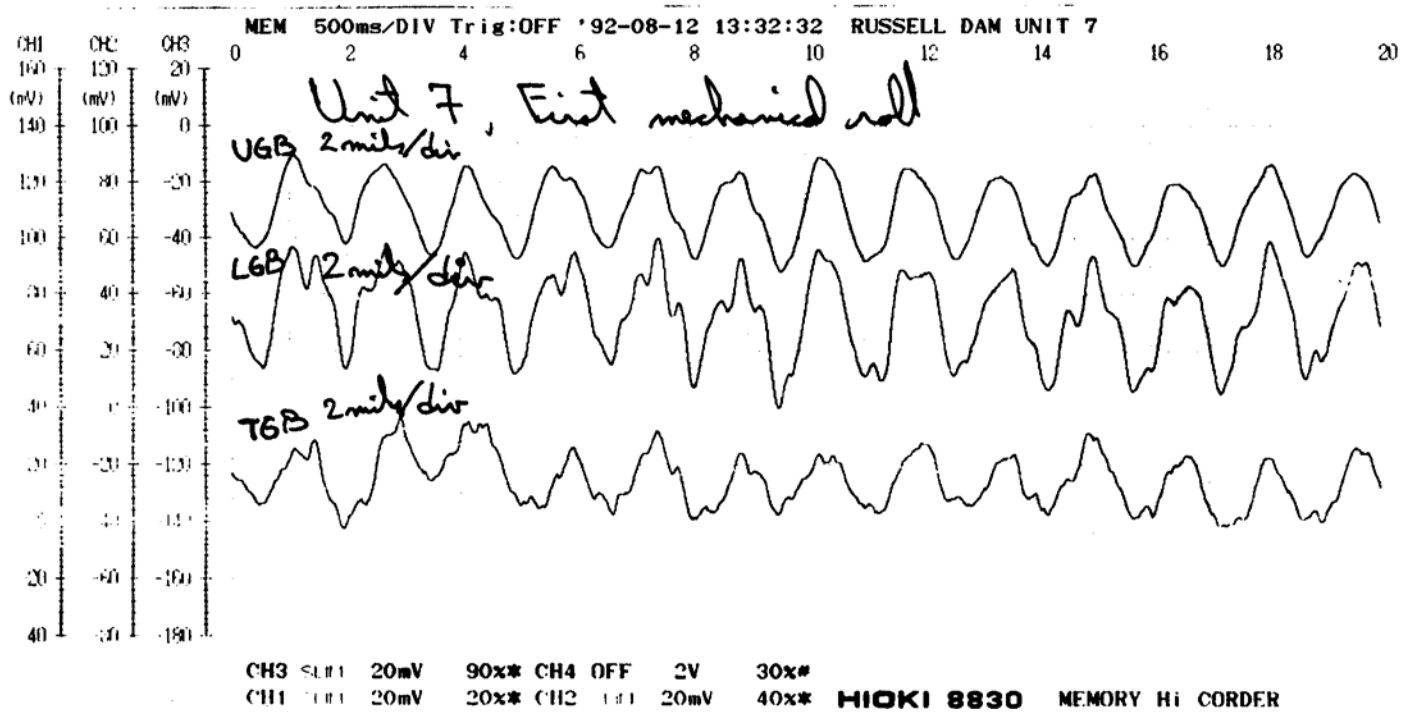
40RPM


MEM 500ms/DIV Trig:OFF '92-08-12 13:21:53 RUSSELL DAM UNIT 7
Unit 7, First mechanical roll
UGB 2 mils/div
LGB 2 mils/div
TGB 2 mils/div
CH3 SLIM 20mV 80x* CH4 OFF 2V 30x#
CH1 SLIM 20mV 20x* CH2 SLIM 20mV 40x*
HIOKI 8830 MEMORY Hi CORDER

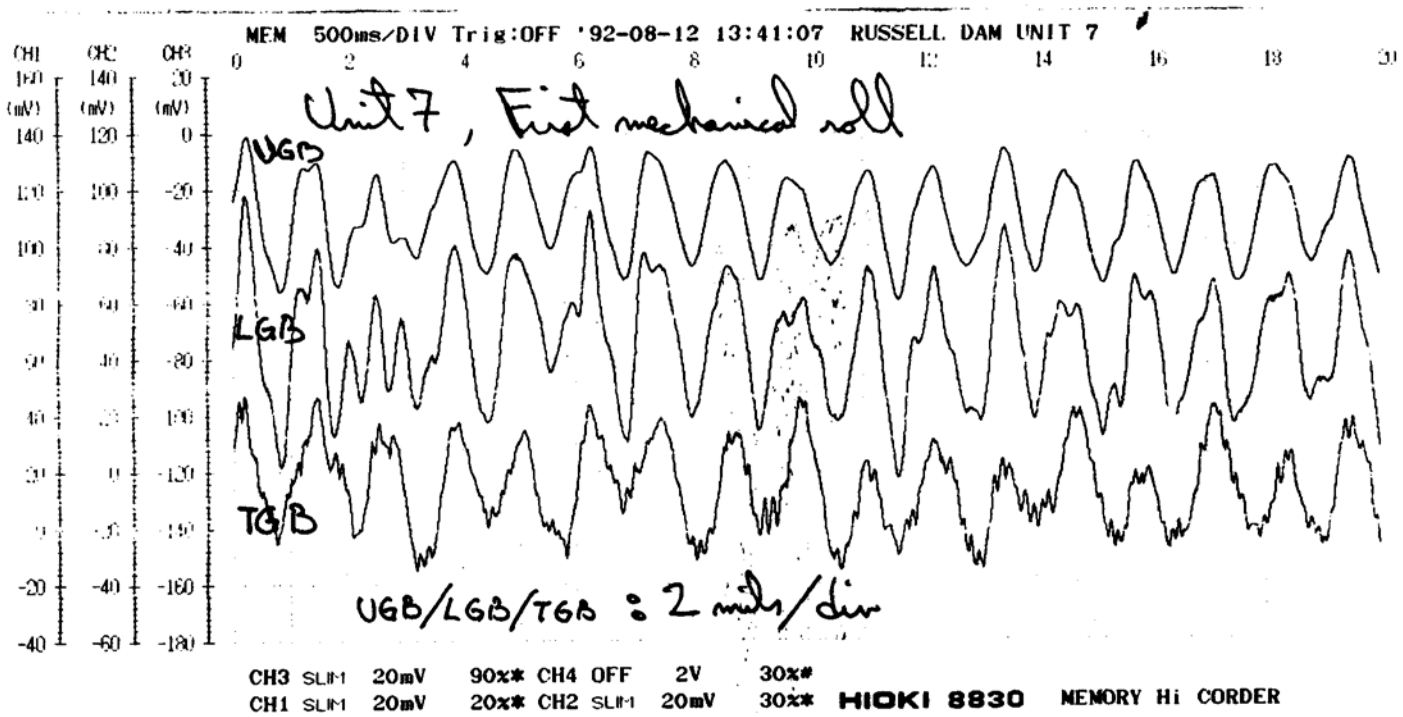
60 RPM


MEM 500ms/DIV Trig:OFF '92-08-12 13:27:29 RUSSELL DAM UNIT 7
Unit 7, First mechanical roll
UGB 2mils/div
LGB 2mils/div
TGB 2mils/div
CH3 SLIM 20mV 90x* CH4 OFF 2V 30x#
CH1 SLIM 20mV 20x* CH2 SLIM 20mV 40x*
HIOKI 8830 MEMORY Hi CORDER

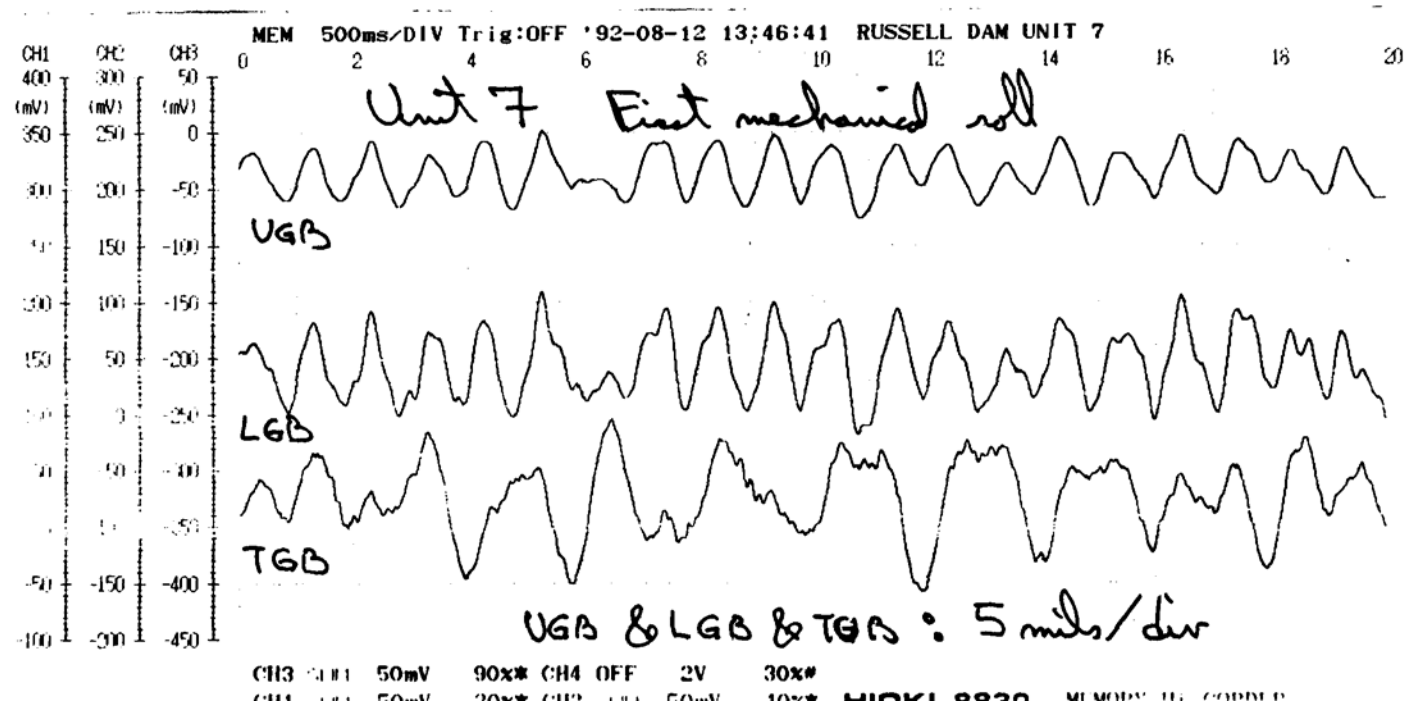
80 RPM


MEM 500ms/DIV Trig:OFF '92-08-12 13:32:32 RUSSELL DAM UNIT 7
Unit 7, First mechanical roll
UGB 2mils/div
LGB 2mils/div
TGB 2mils/div
CH3 SLIM 20mV 90x* CH4 OFF 2V 30x#
CH1 SLIM 20mV 20x* CH2 SLIM 20mV 40x*
HIOKI 8830 MEMORY Hi CORDER

100RPM



120RPM



RUSSELL DAM, UNIT 7

TEST: Bearing Run In

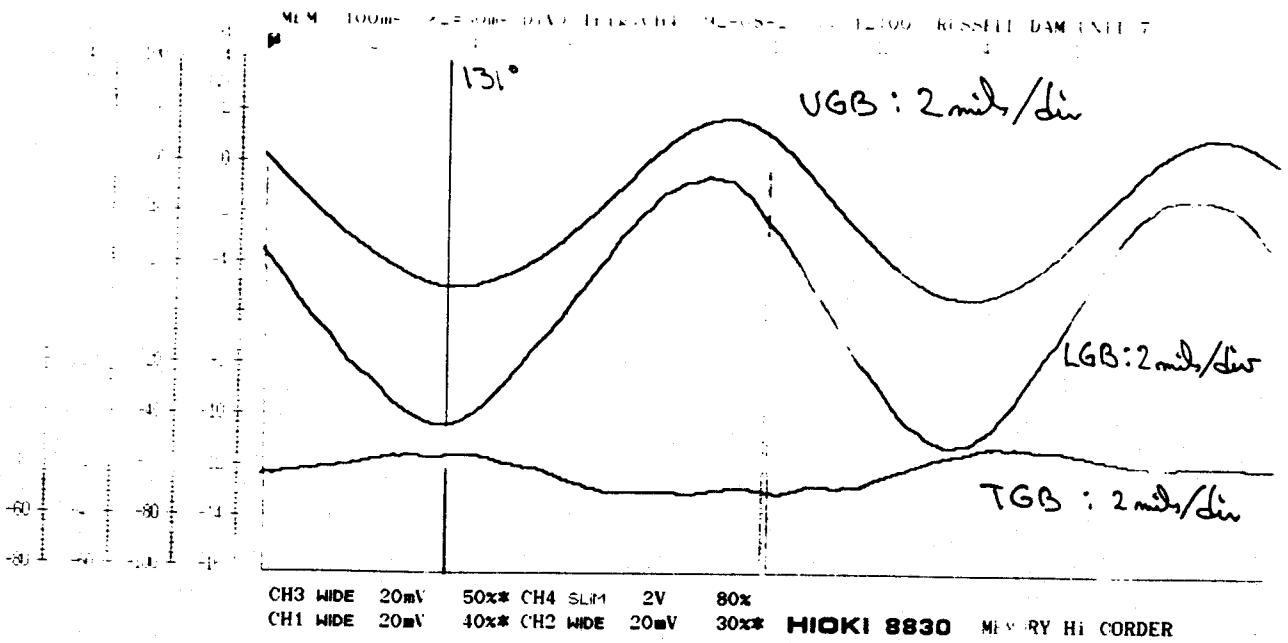
GOVERNOR PANEL INSTRUMENTATION

	Generator Thrust	Generator Lower Guide	Generator Upper Guide	Generator Thrust oil	Gen. Upper Guide oil	Turbine Bearing	Turbine Bearing oil	Spiral Case Pressure	Turbine bearing oil	Speed	Wicket Gate Indicator
Unit	°C	°C	°C	°C	°C	°C	°C	PSI	PSI	RPM	%
Meter I.D. / Time	TIT 106	TIT 109		TIT 107							
16:00	67	44	41	40	35	44	31	65	15	120	18.5
16:30	67.5	44	42	40	36	44	31	65	15	120	18.5
17:00	67.5	44	42	40.1	36	45	31	65	15	120	18.5

10 lbs brass R
300 lbs brass 11
300 lbs brass 10
50 lbs brass 9
Essai 6

85 MW
30 MVAR

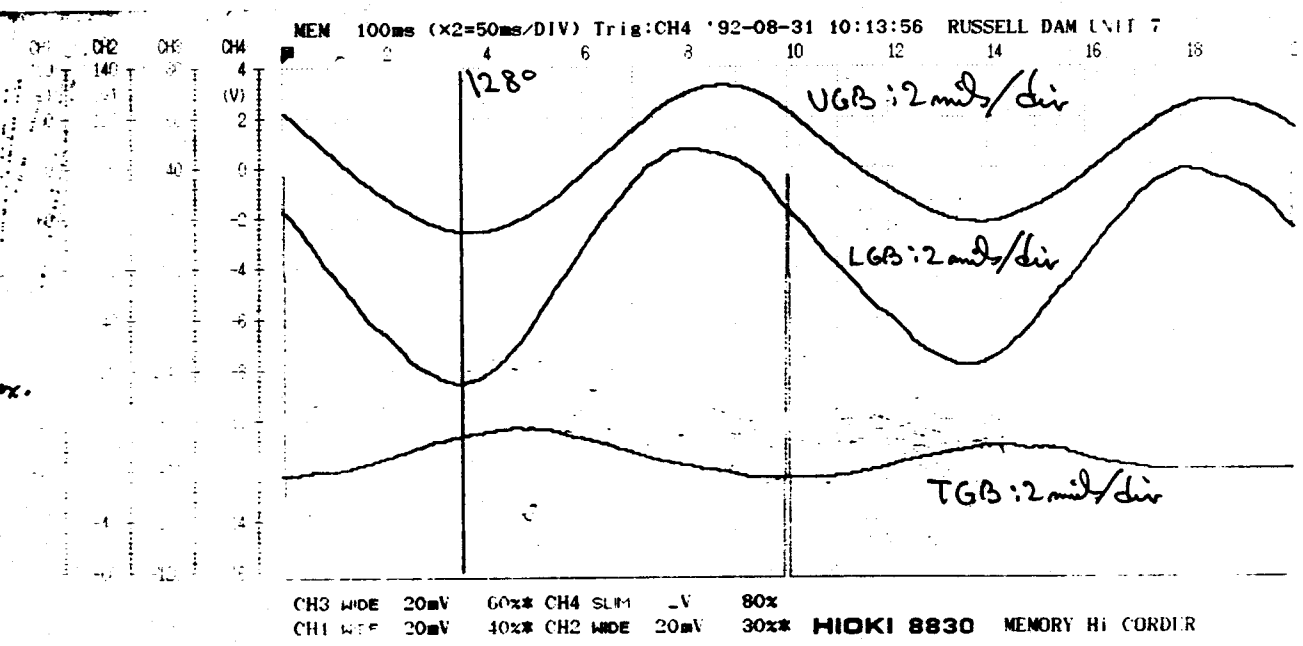
amplitude max
crête-crête
UGB : 7.2
LGB : 10.6
TGB : 1.8



50 lbs brass 12
300 lbs brass 11
275 lbs brass 10
50 lbs brass 9
Essai 7

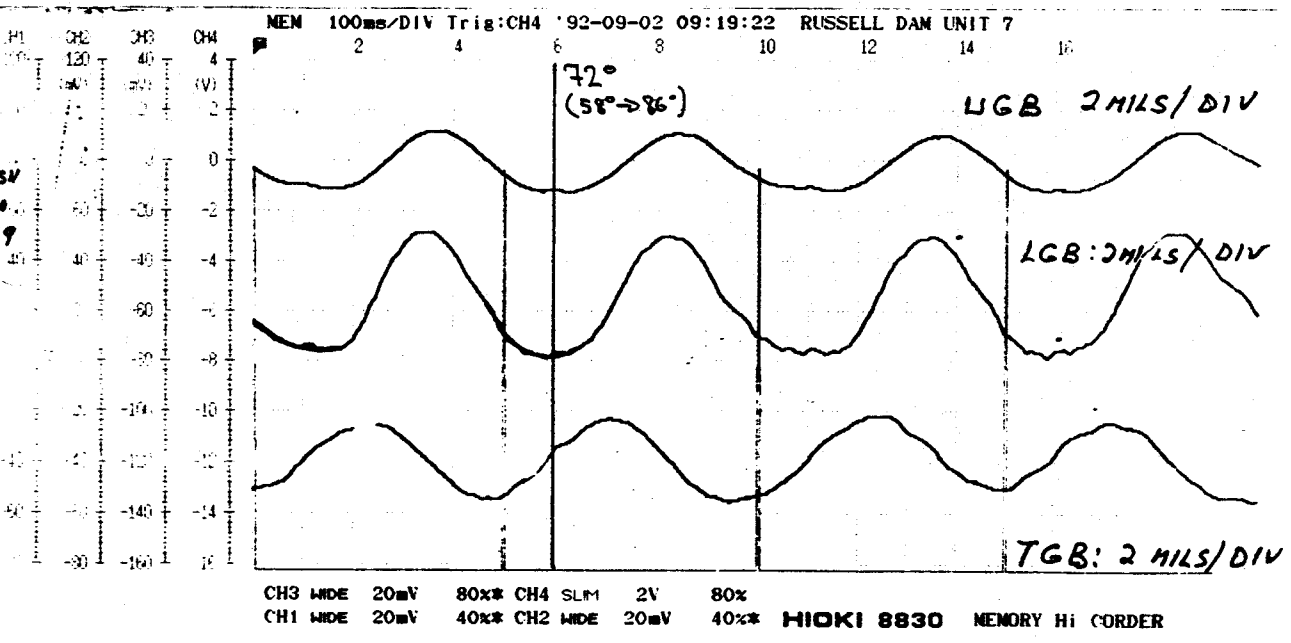
84 MW
27 MVAR

amplitude max.
crête à crête
UGB : [illegible]
LGB : 9.4
TGB : 2.2



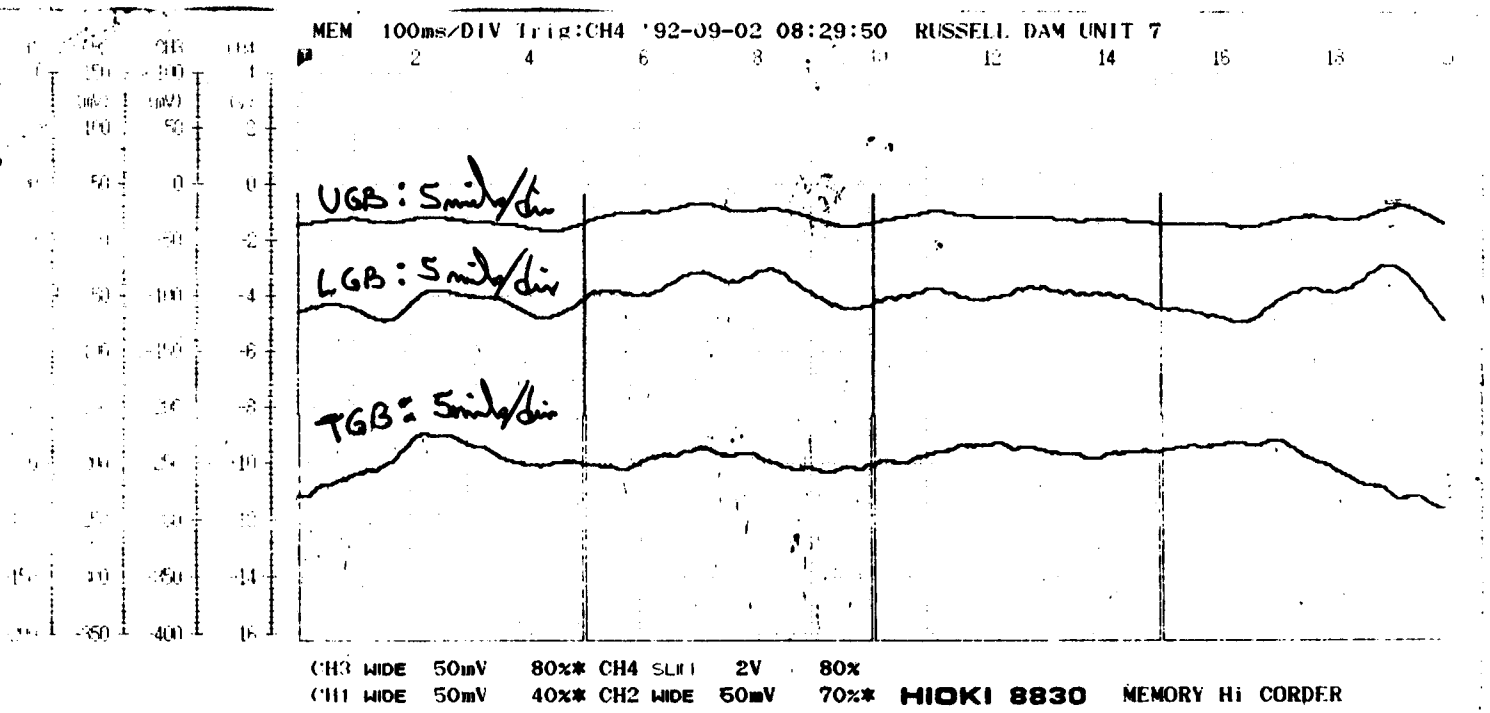
84 MW
30 MVAR
200 LBS BRASS
200 LBS BRASS 10
200 LBS BRASS 9

UGB : 2
LGB : [illegible]
TGB : 3.2



120 RPM
OFF LINE
200 LBS BRAS 11
200 LBS BRAS 10
100 LBS BRAS 9

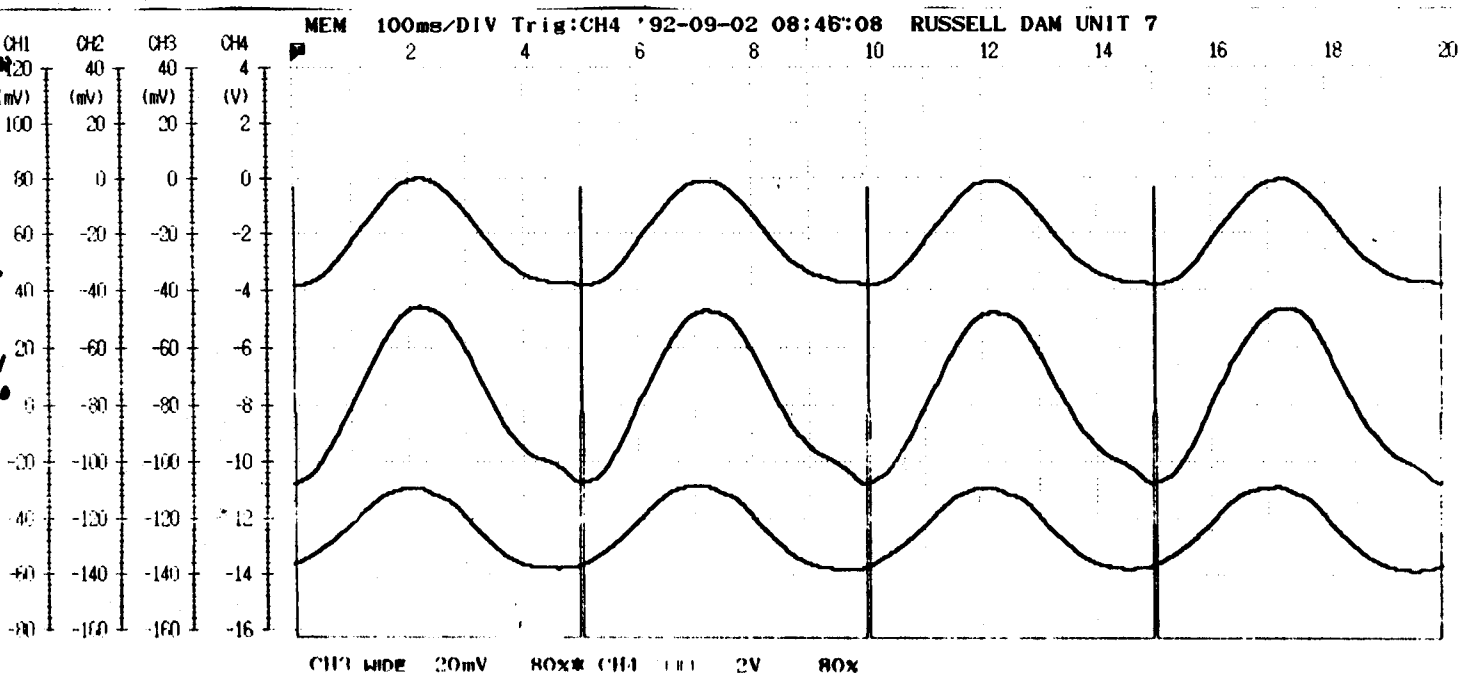
UGB 2.5
LGB 4.5
TGB 6



Speed
No Load

COMPENSATOR
SYNC.
0 MW

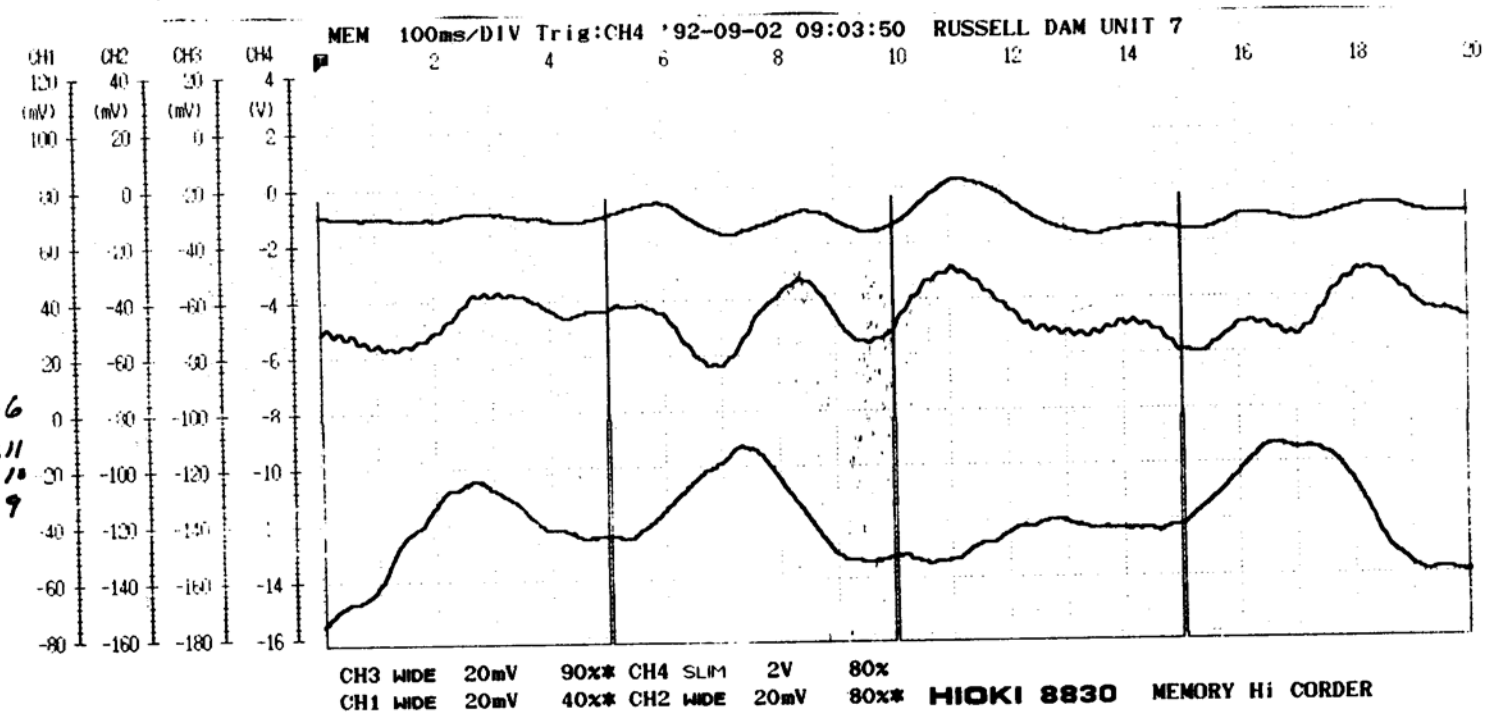
UGB: 2.8
LGB 5.6
TGB 2.8
200 LBS BRAS 11
200 LBS BRAS 10
100 LBS BRAS 9



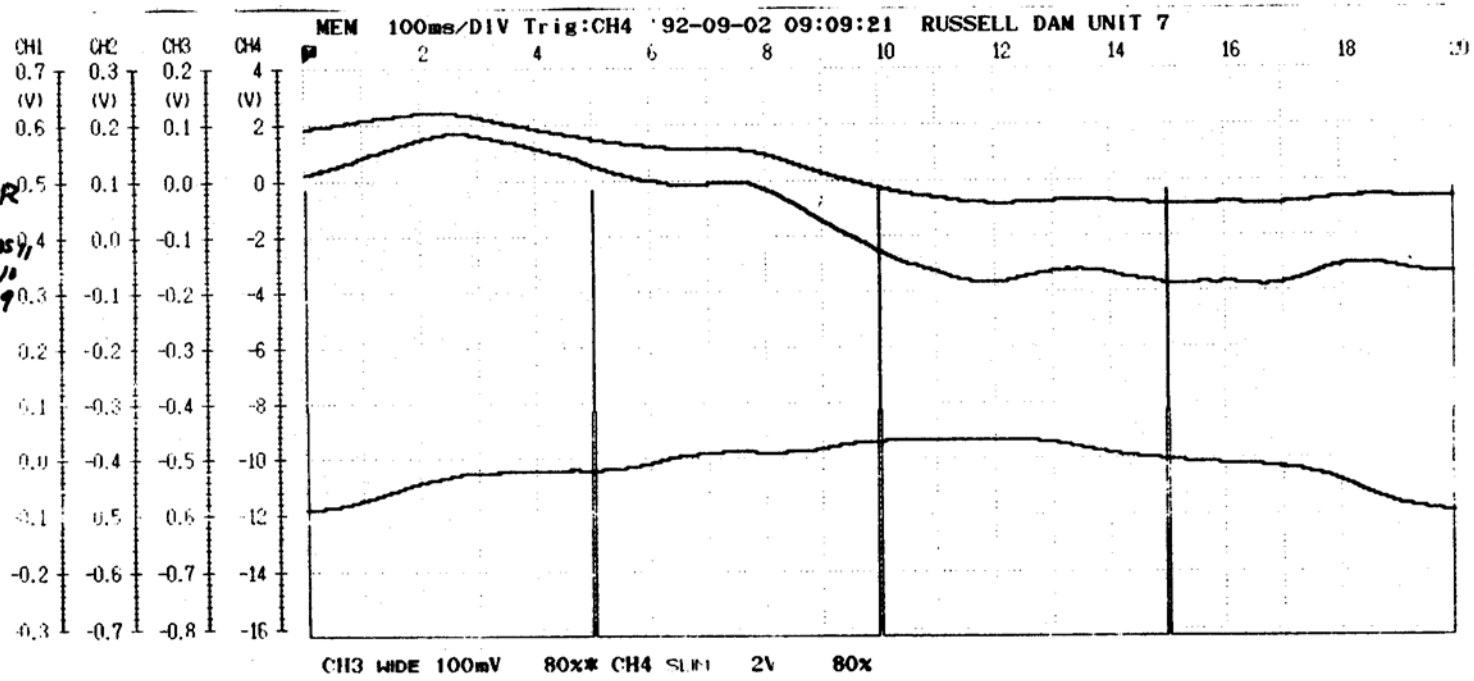
Synchronous
Condenser

24 MW
7 MVAR

LGB: 2
LGB: 3
TGB: 4.6
200LBS BRAS 11
200LBS BRAS 10
100LBS BRAS 9

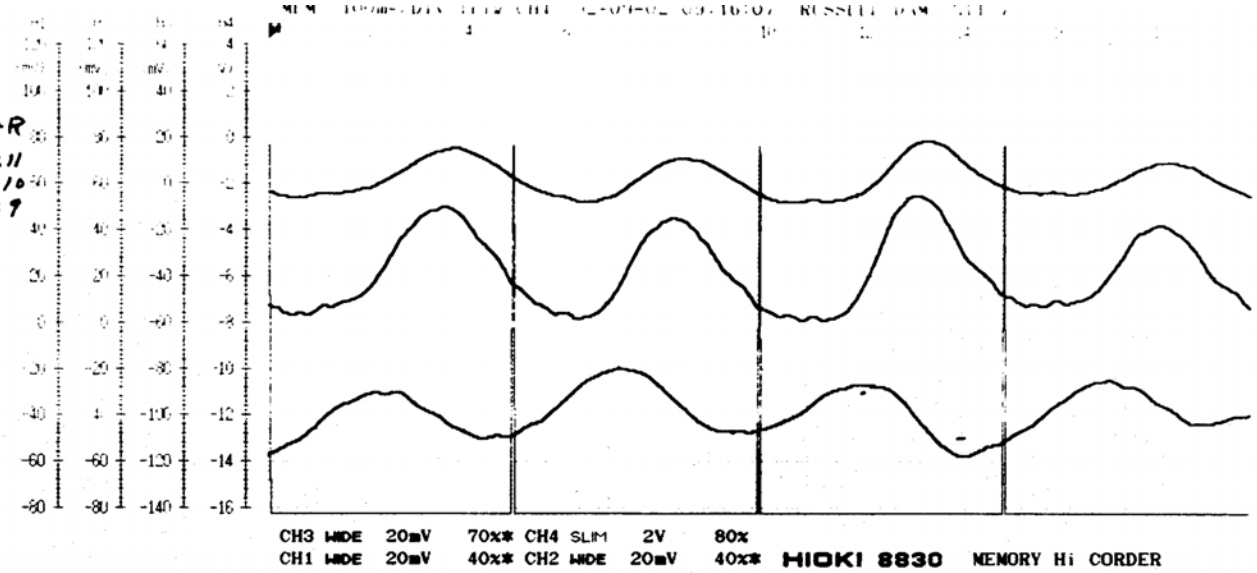


45 MW
15 MVAR
200LBS BRAS 11
200 LBS BRAS 10
100 LBS BRAS 9



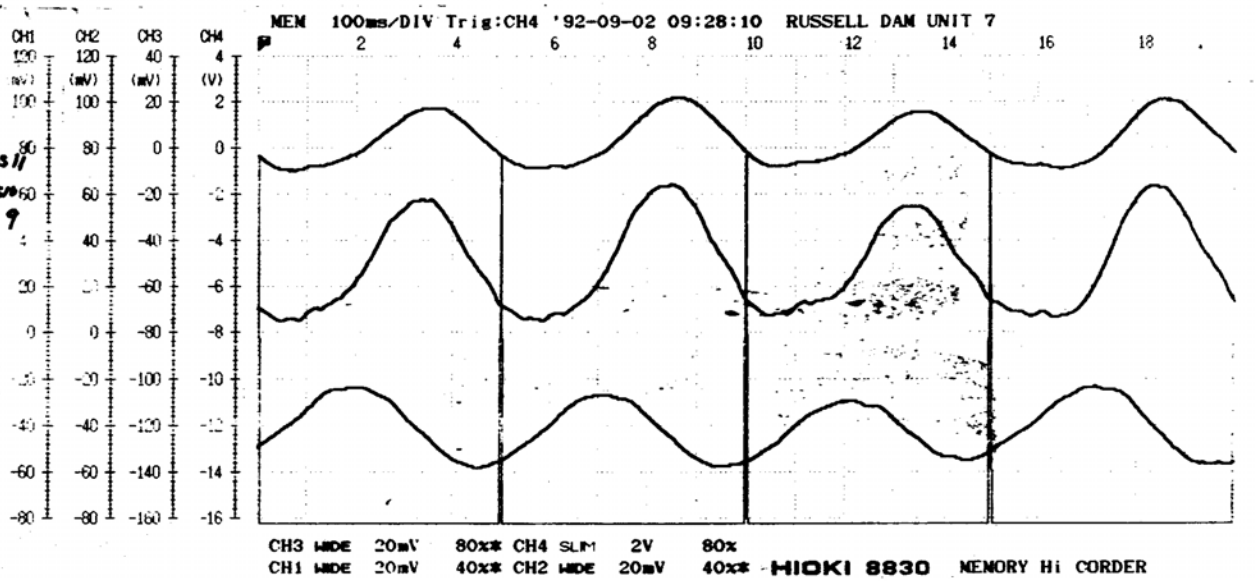
67 MW
22 MVAR
200LBS BRAS 11
200LBS BRAS 10
160LBS BRAS 9

UGB: 2.4
LGB 5.2
TGB 3.2



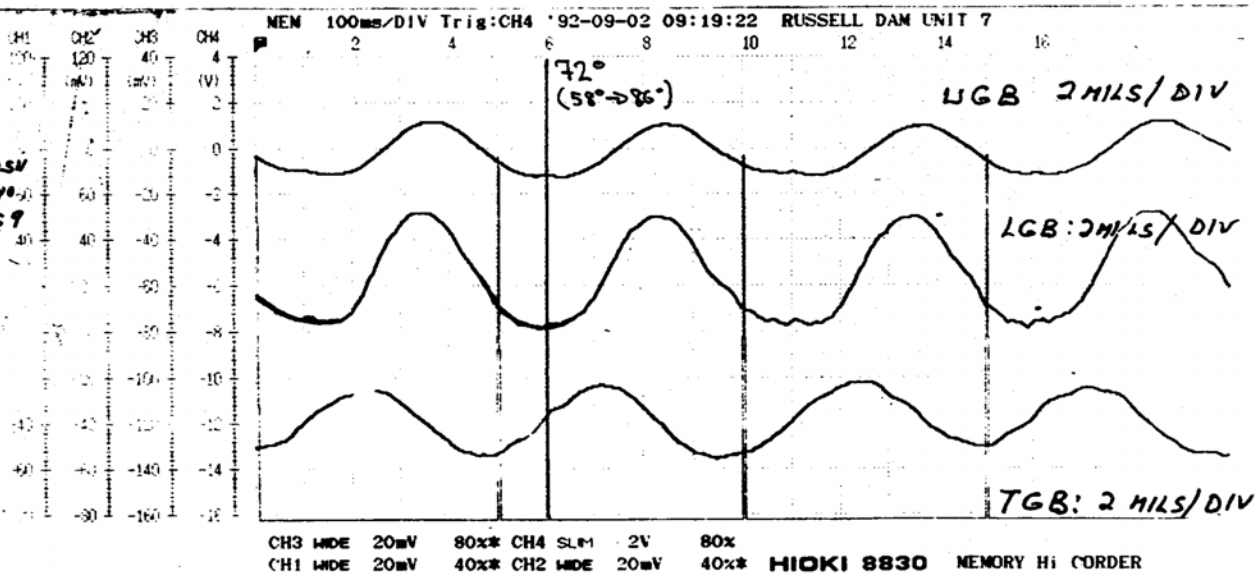
75 MW
23 MVAR
200LBS BRAS 11
200LBS BRAS 10
160LBS BRAS 9

UGB 2.8
LGB 5.6
TGB 3.4



84 MW
30 MVAR
200LBS BRAS 11
200LBS BRAS 10
200LBS BRAS 9

UGB: 2
LGB: 4.5
TGB: 3.2



RUSSELL DAM UNIT-7

TEST LOAD REJECTION 4 SEPT 92

ELECTRICAL INSTRUMENTATION

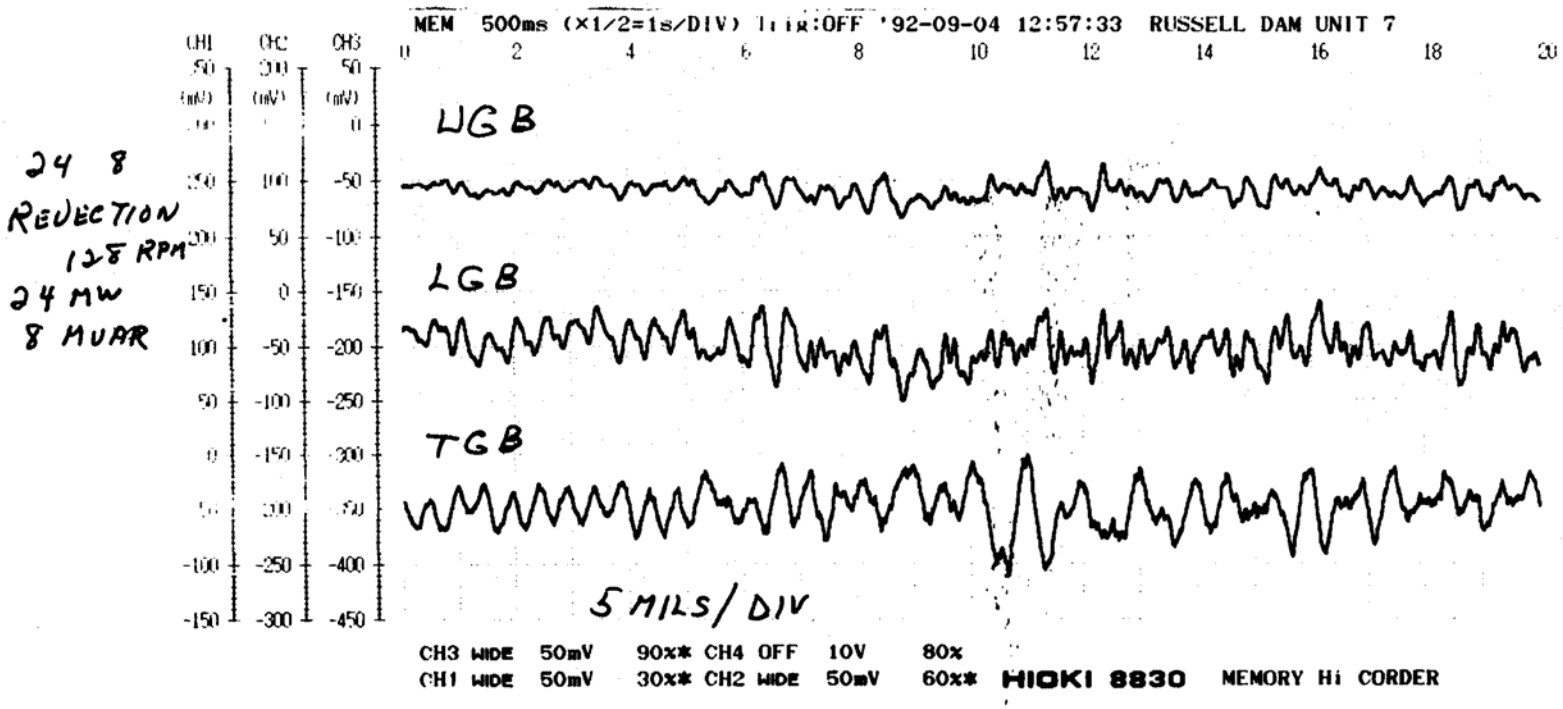
	TIME	ROTOR		STATOR									OUT PUT						
		Voltage	Current	VOLTAGE P.T. ratio = 120			CURRENT C.T. ratio = 1000			POWER METER ratio: 600			CALCULATED				CONTRO-ROOM		
		V_F	I_F	V_{AN}	V_{BN}	V_{CN}	I_A	I_B	I_C	ϕA	ϕB	ϕC	MVA	MW	MVAR	P.F.	MW	MVAR	
LOAD		Volts	mV 1mV=20A	Volts	Volts	Volts	Amps	Amps	Amps	MW	MW	MW							SURVITE
25%	8.35	69.2	47.8	66.0	66.0	66.0	22.5	21.2	22.1	13.9	12.9	13.8	26.1	24.3	9.5	.93	24	+8	129 RPM
50%	8.54	81.7	54.3	66.6	66.6	66.6	43	42	43	27	26	27	51.1	48.0	17.5	.94	40-45	+15	137.8 RPM
75%	9.08	94.6	63.1	67.1	67.0	67.0	61.5	60.9	61.5	39.5	38.5	39.1	74	70.3	23.1	.95	68	22	149 RPM
100%	9.21	102.1	67.9	67.7	67.6	67.6	74.2	73.2	74.1	47.5	46.5	47.5	89.9	84.9	29.6	.94	84	30	164 RPM
25%	13.00	69.5	46.2	65.5	65.4	65.5	22.9	21.2	21.8	13.9	13.1	13.8	25.9	24.5	8.4	.95	24	+8	128 RPM
50%	13.07	82.4	54.5	66.4	66.3	66.3	43	42	42	27	25.5	27	50.5	47.7	16.6	.94	40-45	+15	137 RPM

AVEC POIDS 200 LBS ARM 11

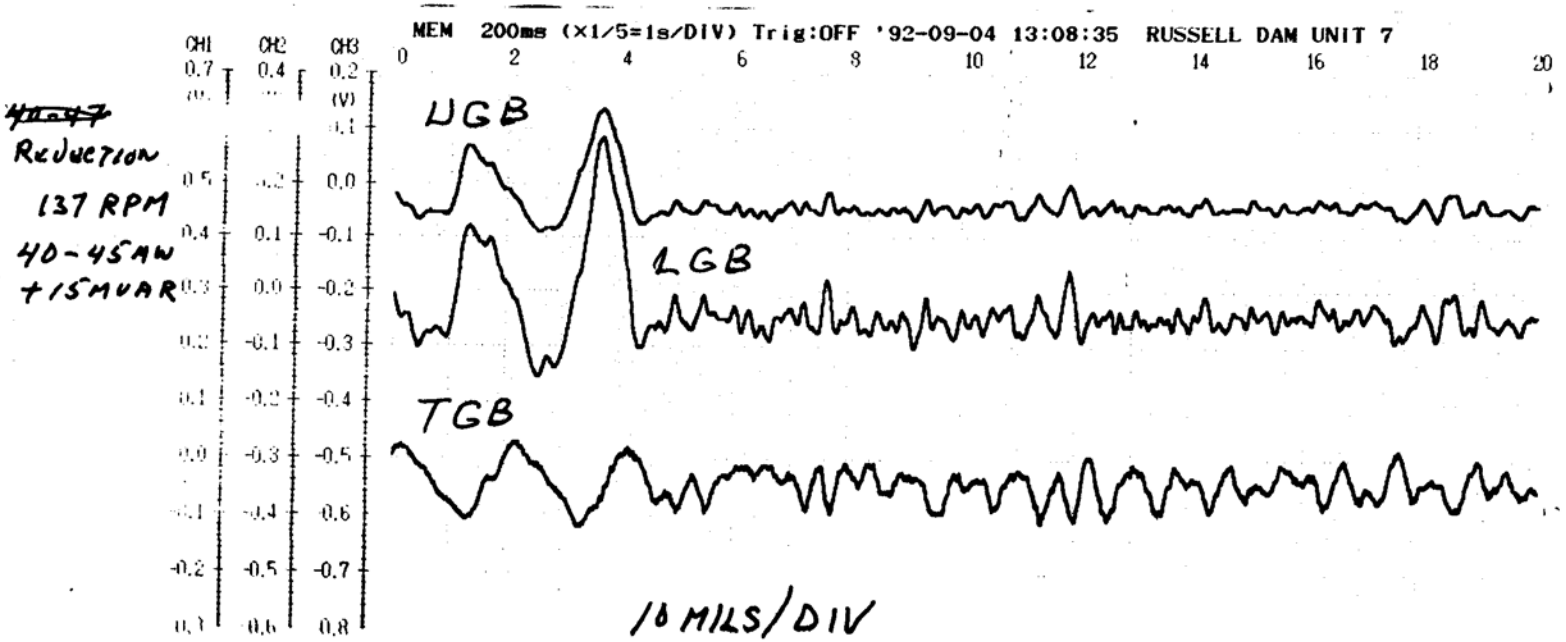
200 LBS ARM 10

100 LBS ARM 9

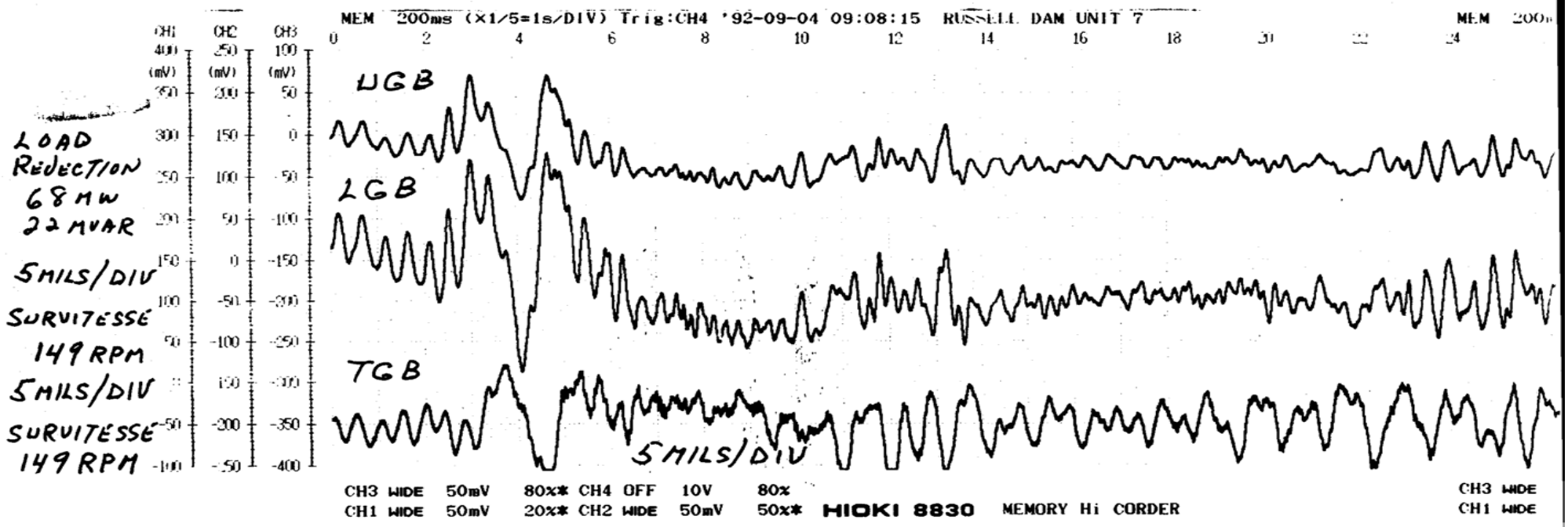
-

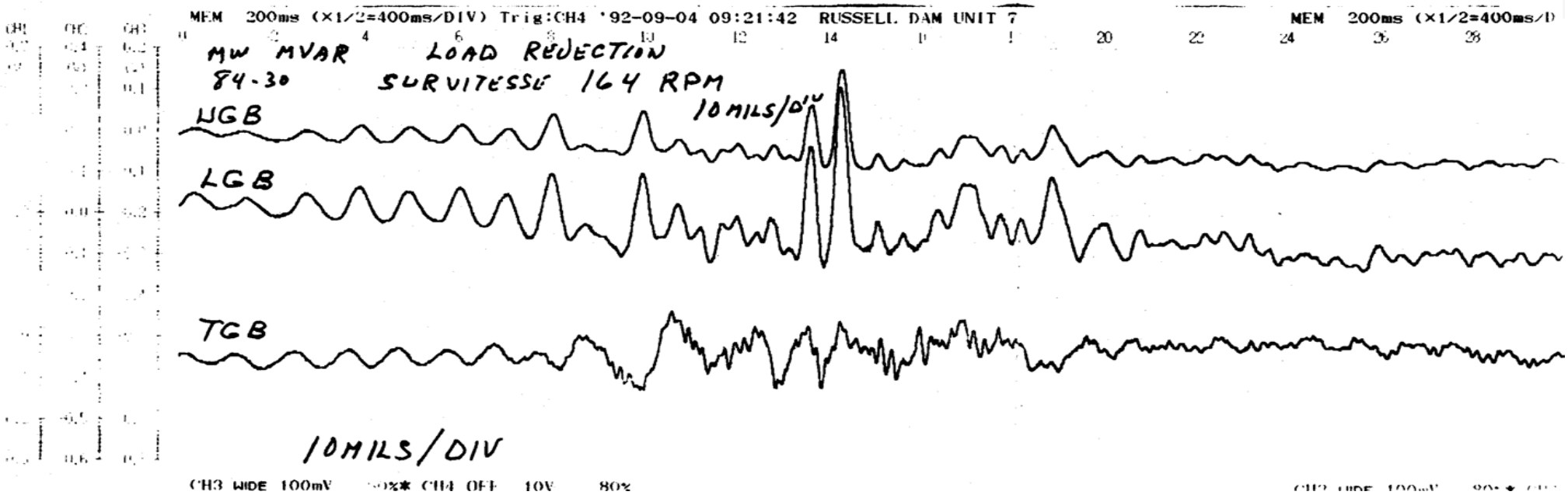


Load Rejection
24MW
8MVAR



Load Rejection
40-45 MW
15 MVAR


MEM 200ms (×1/5=1s/DIV) Trig:CH4 '92-09-04 09:08:15 RUSSELL DAM UNIT 7
CH1 CH2 CH3
(mV) (mV) (mV)
UGB
LGB
TGB
LOAD REDUCTION
68 MW
22 MVAR
5 MILS/DIV
SURVITESSE
149 RPM
5 MILS/DIV
SURVITESSE
149 RPM
5 MILS/DIV
CH3 WIDE 50mV 80%* CH4 OFF 10V 80%
CH1 WIDE 50mV 20%* CH2 WIDE 50mV 50%*
HIOKI 8830 MEMORY Hi CORDER
CH3 WIDE
CH1 WIDE


MEM 200ms (×1/2=400ms/DIV) Trig:CH4 '92-09-04 09:21:42 RUSSELL DAM UNIT 7
MW MVAR
84-30
LOAD REDUCTION
SURVITESSE 164 RPM
10 MILS/DIV
UGB
LGB
TGB
10 MILS/DIV
CH3 WIDE 100mV
CH4 OFF 10V 80%