

Attachment 5
Test 001-09, 3/1/96

Materials contained in attachment 5

Test data tracking forms

Test engineer's notes

Test sequences

Time-history data plots for:

Conditions B1.39.0928.301-.324

Condition B1.39.0928.302.1

Conditions B1.39.0928.311.1-311.2

Condition B1.39.0928.321.1

Conditions B1.39.0928.401-.412

Condition B1.39.0928.438

Conditions B1.39.0928.501-.512

Condition B1.39.0928.538

1 of 3

737 FLIGHT CONTROLS DATA TRACKING FORM

(WRITE IN BLACK INK OR PHOTOCOPY BEFORE TRANSMITTING)

PRIORITY:

DESCRIPTION 737-200 Rudder Ground Testing

TEST NO. 001-09

PILOT/AIRPLANE 1 PG 309

PARAM. SET # SPS 20

TEST DATE 3/1/96

AIRPORT/RUNWAY

PLOT FORMAT # WINDS

MANEUVER CODE

FC STAFF Ben Smith

PHONE 294-7923

FLT TEST STAFF P. Nagel

DATA REQUEST NUMBER	EKS DATE	STAT. SOURCE	CONDITION NUMBER	SEQUENCE NUMBER	IRIG TIME		ALT MC	REMARKS
					START	END		
08AS.8974			81.39.0928. 311		08:05:20	08:06:45		
			. 311.1		08:13:10	08:14:45		
			. 301		08:18:50	08:19:45		
			. 302		08:24:25	08:25:30		
			. 302.1		08:29:10	08:30:00		
			. 303		08:31:15	08:32:35		
			. 304		08:33:40	08:33:50		
			. 312		08:41:00	08:42:05		
			. 313		08:42:30	08:43:45		
			. 305		08:44:35	08:46:25		
			. 306		08:47:50	08:48:50		
			. 307		08:50:15	08:52:10		
			. 308		08:54:40	08:55:20		
			. 309		08:56:25	08:57:30		
			. 310		08:58:30	09:00:05		
			. 311.2		09:05:50	09:06:55		
08A6.8975			81.39.0928. 314		10:26:30	10:27:15		
			. 316		10:28:50	10:30:15		
			. 315		10:30:30	10:32:10		
			. 317		11:23:00	11:28:20		
			. 320		12:05:00	12:06:20		
			. 318		12:07:30	12:08:35		
			. 319		12:09:00	12:10:35		
			. 321		12:24:50	12:25:45		
			. 321.1		12:27:50	12:28:50		
			. 322		12:30:00	12:31:00		
			. 323		12:31:10	12:33:00		
			. 324		12:54:50	12:55:55		

086Q. 9032

08758. 9032

FILE RECEIVED

FAST

TINKER/FILTER

ADDATA

ADDKEY

DATABASE
PACK

587

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2

737 FLIGHT CONTROLS DATA TRACKING FORM

(WRITE IN BLACK INK OR PHOTOCOPY BEFORE TRANSMITTING)

PRIORITY:

DESCRIPTION 737-200 Rudder Ground Testing SPS 20
TEST NO. 001-09 PILOT/AIRPLANE / PG349 PARAM. SET # WINDS
TEST DATE 3/1/96 AIRPORT/RUNWAY PLOT FORMAT # GW/CGI
MANEUVER CODE FC STAFF Ben Smith PHONE 294-7923 FLT TEST STAFF P. Noyes

DATA REQUEST NUMBER	EKS DATE	STAT. SOURCE	CONDITION NUMBER	SEQUENCE NUMBER	IRIG TIME		ALT MC	REMARKS
					START	END		
/PA7.8978			BL.39.0928.401		14:20:25	14:23:15		
			.438		14:24:45	14:26:20		
			.402/3		14:26:25	14:27:50		
			.404		14:28:20	14:28:40		
			.405		14:28:50	14:29:20		
			.406/7		14:29:25	14:30:40		
			.408		14:32:00	14:33:10		
			.409		14:34:20	14:35:35		
			.410		14:35:35	14:35:50		
			.411		14:36:00	14:36:40		
			.412		14:36:40	14:37:30		
/PA8.8979			BL.39.0928.501		15:19:35	15:22:30		
			.538		15:25:05	15:25:55		
			.502/3		15:26:30	15:27:30		
			.504		15:27:30	15:28:00		
			.505		15:28:00	15:28:30		
			.506/7		15:28:35	15:29:50		
			.508		15:30:45	15:31:45		
			.509		15:32:40	15:34:00		
			.510		15:34:50	15:35:10		
			.511		15:35:40	15:36:40		
			.512		15:36:35	15:37:20		

FILE RECEIVED FAST TINKER/FILTER
ADDATA ADDKEY

DATABASE
PACK

3043

3

737 FLIGHT CONTROLS DATA TRACKING FORM

(WRITE IN BLACK INK OR PHOTOCOPY BEFORE TRANSMITTING)

PRIORITY:

DESCRIPTION 737-200 Rudder Ground Test SPS 20
TEST NO. 001-09 PILOT/AIRPLANE PG309 PARAM. SET # WINDS
TEST DATE 3/1/96 AIRPORT/RUNWAY PLOT FORMAT # GW/CGI
MANEUVER CODE FC STAFF Ben Smith PHONE 294-7923 FLT TEST STAFF D. Nagel

DATA REQUEST NUMBER	EKS DATE	STAT. SOURCE	CONDITION NUMBER	SEQUENCE NUMBER	IRIG TIME		ALT MC	REMARKS
					START	END		
ØPA9.8980			B1.39.0928.613		15:59:10	16:00:00		
			.614		16:01:20	16:02:30		
			.615		16:02:50	16:03:50		
			.620/1		16:12:20	16:13:50		
			.622/3		16:14:05	16:15:30		
			.624		16:15:50	16:16:55		
			.625		16:17:10	16:18:45		
ØPI0.8981			↓ .626		16:19:30	16:20:00		
			↓ .627		16:20:05	16:21:05		
			B1.39.0928.616		16:40:45	16:41:50		
			.617		16:42:25	16:43:15		
ØPI1.8982			.618		16:43:40	16:44:10		
			FEEL SYS CHECK		16:59:50	17:00:50		
ØK05.9037								
ØK02.9038								

FILE RECEIVED FAST ADDKEY
TINKER/FILTER

DATABASE PACK

			NOTE: Both the torque tube positions are very questionable because the R & L are being swapped in and out so often...	
B1.39.0928.				
NOTE:	Currently, the "USAR" standby actuator is installed. This actuator has a clamping arrangement over the input rod. This clamp has been set to simulate 60 lbs of force.			
TAPE ON	08:03:35			
B1.39.0928 .311	08:05:30	Cmd ON	• A & B Hyd. OFF	
	1:06:13	Neutral	• Pedal sweep to verify "galling"	
	1:06:27	R. Rudder	forces	
	08:06:35	End	• Forces on input rod were 60-70 lbs.	
B1.39.0928 .311	08:13:15	Cmd ON		
		End		
B1.39.0928 .301	08:17:17	A & B ON	Yaw Dump ON	
	18:00	Begin Pedal Sweep		
	19:11	L Rudder		
	19:19	Neutral		
	19:26	R Rudder		
	09:19:32	Neutral	Pilot Comment: "Forces slightly higher"	
Time	08:20:10	Pedal Sweep for Pilot		
	08:20:17	End		
B1.39.0928 .302	08:24:35	Dwell, $\pm 3^\circ$ da, 0.3 Hz	"Slight non-lineararity in forces"	
	08:25:15	End		
B1.39.0928 .302	08:29:19	Dwell, $\pm 3^\circ$ da, 0.3 Hz	"fairly steady rise at the beginning"	
	08:29:50	End, with Pilot's feet on pedal		
B1.39.0928 .303	08:31:25	Dwell		
	31:47	Pedal Sweep		
	31:57	L Rudder		
	31:57	Neutral		
	32:00	R Rudder		
	32:07	Neutral		
	08:32:25	End Dwell		

B1.39.0928.304 08:33:46

SHEET 1 OF 8

RECORDER D. Nage

TEST NO. 001-09

DATE 3/1/96

TITLE 737-200 Rudder

Ground Testing

BOEING

MODEL

AIRPLANE

DOC. NO.

PAGE

81.39.0928.312	08:41:20	L Rudder Hardover (+ Hard)	
	1:41:25	Center Rudder with pedal	
	08:41:55	End	
81.39.0928.313	08:42:45	R Rudder Hardover (- Hard)	
	1:42:57	Center Rudder with pedal	
	08:43:25	End	
81.39.0928.305	08:44:28	A & Standby Hydraulics on, 3100 psi chock	
	1:45:45	Begin Pedal Sweep	
	08:46:15	End	
81.39.0928.306	08:48:00	Begin $\pm 3^\circ$ de Dwell @ 0.3Hz	Pilot Comments: "Felt more natural or standard than .301." "Felt normal, less anomalous"
	08:48:28	End	
81.39.0928.307	08:50:25	Begin $\pm 1^\circ$ de Dwell @ 0.3Hz	
	1:50:45	Pedal Sweep	
	1:51:08	End Pedals	
	08:52:00	End Dwell	
81.39.0928.308	08:54:50	Begin Pedal Sweep	Pilot Comments: "Standard sweep, no anomalies noted"
	1:55:58	L Rudder	
	1:55:03	N	
	1:55:09	R Rudder	
	08:55:13	End	
81.39.0928.309	08:56:35	Dwell $\pm 3^\circ$ de, 0.3Hz	
	08:57:20	End	
81.39.0928.310	08:58:45	Begin Dwell, $\pm 1^\circ$ de, 0.3Hz	
	1:59:05	Begin Pedal Sweep	
	1:59:25	End Pedals	
	08:59:50	End Dwell	
81.39.0928.311.1	09:06:05	Begin Pedal Sweep	A & B Standby OFF (This condition checks the "galling" force of 60 pounds and can be compared to Gnd .311)
	09:06:40	End	
TAPE OFF	09:07:36		

SHEET 2 OF 8	TITLE 737-200 Rudder	MODEL
RECORDER P. Nagel	Ground Testing	AIRPLANE
TEST NO. 001-09	51.1	DOC. NO.
DATE 3/1/96	BOEING	PAGE

TAPE ON	10:05:38	NOTE:
TAPE OFF	10:16:39	Conds. 314, 315, & 316 were called by Parker Hamilton Personnel for checks planned - log out 1 hr instead on 0.3 Hz rudder dwell...
TAPE ON	10:21:25	
B1.39.0928-314	10:25:59	125 knots Confirmed
	1:25:59	A&B ON
	1:26:45	Pedal Sweep
	10:27:07	End Sweep
B1.39.0928-316	10:29:00	1° Sr, @ 1 Hz Dwell, A&B ON
	10:29:55	End
B1.39.0928-315	10:31:55	3° Sr @ 1 Hz Dwell, A&B ON
	10:31:55	End
		Next will be the "Mika Marx" condition
		• Confirm 125 kts on pilot
		• Cap off "B" Hyd to Main PCU for rubber feel
		• Turn ON "B" for rubber feel
		• Input rudder pedals until Main PCU input lever hits its stop (no pressure to PCU)
		• Turn standby Hyd "ON"
		• Note response of rudder system
TAPE OFF	11:08:30	
TAPE ON	11:14:XX	
B1.39.0928-317	11:18:50	ON cond (No Rod loads, w/Rubber movement)
	1:21:15	A&B ON
	1:23:09	ON cond
	1:23:36	Standby ON
	11:25:45	Center the Rudder w/Pedals
	11:26:52	End, Standby OFF
TAPE OFF	11:29:08	

SHEET 3 OF 8	TITLE 737-200 Rudder	MODEL
RECORDER D. Nage	Command Test	AIRPLANE
TEST NO. 001-09	BOEING	DOC. NO.
DATE 3/1/96		PAGE

Next will be the "Tom Nacaster" conditions

- Normal Hyd config
- Clamp down on the standby rudder force inputs as much as possible to simulate a "soft jam"
- Conduct a pedal sweep with A & B off to find out what the forces are on the standby PCU input
- Conduct Yaw Damper Hardover to the Left & Right

TAPED ON 11:55:30

B1.39.0928.320 12:05:15 Manual Pedal Sweep A & B OFF
12:06:11 End

A & B Hyd ON

B1.39.0928.318 12:07:40 L Hardover Yaw Damper (+ Hard)
12:07:08 Manually Center Rudder
12:08:24 End Hardover

B1.39.0928.319 12:09:10 Hard over
12:09:30 Center Rudder w/ pedals
12:09:50 End

"Different feedback during Hardover"

"Same forces as before"

"20 to 40 pounds"

B1.39.0928.321 12:25:00 A & B ON, Manual Pedal Sweep
12:25:31 End Sweep

"Forces higher to right"

B1.39.0928.322 12:28:00 Manual Sweep
12:28:40 End Sweep

B1.39.0928.322 12:30:10 Dwell 0.3 Hz @ 3° Ea command
12:30:50 End Dwell

B1.39.0928.323 12:31:20 Dwell
1:32:05 Manual Pedal input
1:32:34 End

12:32:50 End Dwell

"Similar to before"

"Feel the variation in force"

"Only small difference"

SHEET 4 of 8	TITLE T37-200 Rudder Command Test	MODEL
RECORDER D. Nagel		AIRPLANE
TEST NO. 001-09	BOEING	DOC. NO.
DATE 3/1/95		PAGE

		12:34:00	Hyd OFF
TAPE OFF		12:35:00	
TAPE ON		12:43:26	Next will be B & Standby ON, with the current MAX clamping force
B1.39.0928.324		12:53:21	B & Standby ON
		:55:00	Dwell, 0.3 Hz, 3° Gr
		12:55:45	End Dwell
		12: — —	Hyd OFF
TAPE OFF		12:58:00	TAPE OFF
TAPE ON		14:09:30	TAPE ON
B1.39.0928.401		14:20:34	A & B ON, 125Kts on Pitot to rubber feel
		14:23:06	Rudder at -0.02°
B1.39.0928.438		14:25:00	Manual Rudder Pedal Sweep
		14:30:00	End Pedal sweep
B1.39.0928.402		14:26:35	Yaw Damper Hardover
B1.39.0928.403		14:27:00	Center Pedals
		14:27:40	End Yaw Damper Hardover
B1.39.0928.404		14:28:32	0 Command
B1.39.0928.405		14:29:00	Zero Rudder
B1.39.0928.406		:29:35	-3° Gr Yaw Damper Hard
B1.39.0928.407		:29:51	Center Rudder
		:30:28	Hard over on t
B1.39.0928.408		:32:20	Dwell, ±3° Gr @ 0.3 Hz
		14:32:56	End Dwell
B1.39.0928.409		14:34:30	Input Dwell, ±1° Gr @ 0.3 Hz
		:34:50	Begin Pedal Cycle
		:35:25	End Pedal Cycle
		:35:33	End Dwell
B1.39.0928.410		:35:39	0 Yaw Damper Command
B1.39.0928.411		:36:27	Centered pedals
B1.39.0928.412		14:36:50	Use trim
TAPE OFF		14:49:55	

Note: We cannot complete the other 400 series because the Standby return ports are open. The return port is used to check the location of the valve when jammed.

SHEET 5 OF 8	TITLE 737-200 Rudder	MODEL
RECORDER D. Nangel	Ground Test	AIRPLANE
TEST NO. 001-07	BOEING	DOC. NO.
DATE 3/1/95		PAGE

FLIGHT TEST DATA SHEET

IMPORTANT: DO NOT USE BLUE INK AS IT WILL NOT REPRODUCE FROM THE ORIGINAL

TAPE ON 15 05:57			
B1.39.0928.501	15:19:45	A & B ON	
	22:20	Center rudder w/ pedals (condition)	
B1.39.0928.502	23:15	Manual Pedal Sweep	
	25:44	End pedal sweep	
B1.39.0928.503	26:40	3° Yaw Damper Handler	
B1.39.0928.504	27:00	Center the rudder	
B1.39.0928.505	27:30	End Yaw Damper Handler / Command	
B1.39.0928.506	28:10	Centered 20 lbs force	
B1.39.0928.507	28:48	-3° for Command, Handler	
B1.39.0928.508	29:05	Center Rudder, 25 lbs to center rudder	
	29:40	End Handler	
B1.39.0928.509	30:55	± 3° for @ 0.3 Hz Duell;	
	31:38	End Duell	
B1.39.0928.510	32:50	+ 1° for @ 0.3 Hz Duell	
	33:10	Begin Pedal sweep	
	33:43	End Pedal Sweep	
	33:47	End Duell	
B1.39.0928.511	34:56	3° Yaw Damper Cmd	Comments
B1.39.0928.512	35:50	Center Rudder with	"Left Ramped up a bit"
	36:00	Pedals	"Right was easier"
	15:36:30	End	
B1.39.0928.513	15:36:45	Trim up rudder w/ trim	
	15:37:07	Rudder zeroed	
B1.39.0928.514	15:38:35	Angies on T.E. / 125 kts on fuel pitot	
	15:39:20	A & B OFF	
TAPE OFF 15 40:48			
Note: Again, we could not complete the rest of the .500 series of conditions because the standby PCU return parts are open and the standby PCU cannot be pressurize.			

SHEET 6 OF 8	TITLE 737-200 Rudder	MODEL
RECORDER D. Nagel	Ground Test	AIRPLANE
TEST NO. 001-09	BOEING	DOC. NO.
DATE 3/1/96		PAGE

IMPORTANT: DO NOT USE BLUE INK AS IT WILL NOT REPRODUCE FROM THE ORIGINAL

TAPE ON	15 57:25	
BL 39.0298 .613	15 59:25	4° dr when A/B were turned on
BL 39.0298 .617	16:01:30	Begin Pedal sweep to 100 lbs force
	16:02:17	End
	16:02:24	Feet off pedals, 4.4° dr
BL 39.0298 .615	16:03:10	Pedal force to center rudder : ~50 pounds
	16:03:37	
	16:03:41	Feet off pedals, 5.2° dr
BL 39.0298 .620	16:12:35	L Hand over (+ Hand)
BL 39.0298 .620	16:13:05	Center Rudder w/ Pedals
	16:13:41	End
BL 39.0298 .620	16:14:20	R Handover (- Hand)
BL 39.0298 .620		Center Rudder w/ Pedals
	16:15:15	End
BL 39.0298 .624	16:16:10	±30° dr Dwell @ 0.3 Hz
	16:16:40	End
BL 39.0298 .625	16:17:25	±1° dr Dwell @ 0.3 Hz
	16:17:45	Pedal Sweep
	16:18:27	End Pedal Sweep
	16:18:35	End Dwell
BL 39.0298 .626	16:19:35	Yaw Damper Zero
	16:19:50	End
BL 39.0298 .627	16:20:15	Rudder Trim to Center the rudder
	16:20:55	End
		Trim back to zero
	16:21:15	A/B OFF
TAPE OFF	16:25:30	

Note: The testing on this page is with a -30 rudder hard jam.

SHEET 7 OF 8

RECORDER D. Wager

TEST NO. 001-09 S.I.

DATE 3/1/96

TITLE 737-200 Rudder

Ground Test

BOEING

MODEL

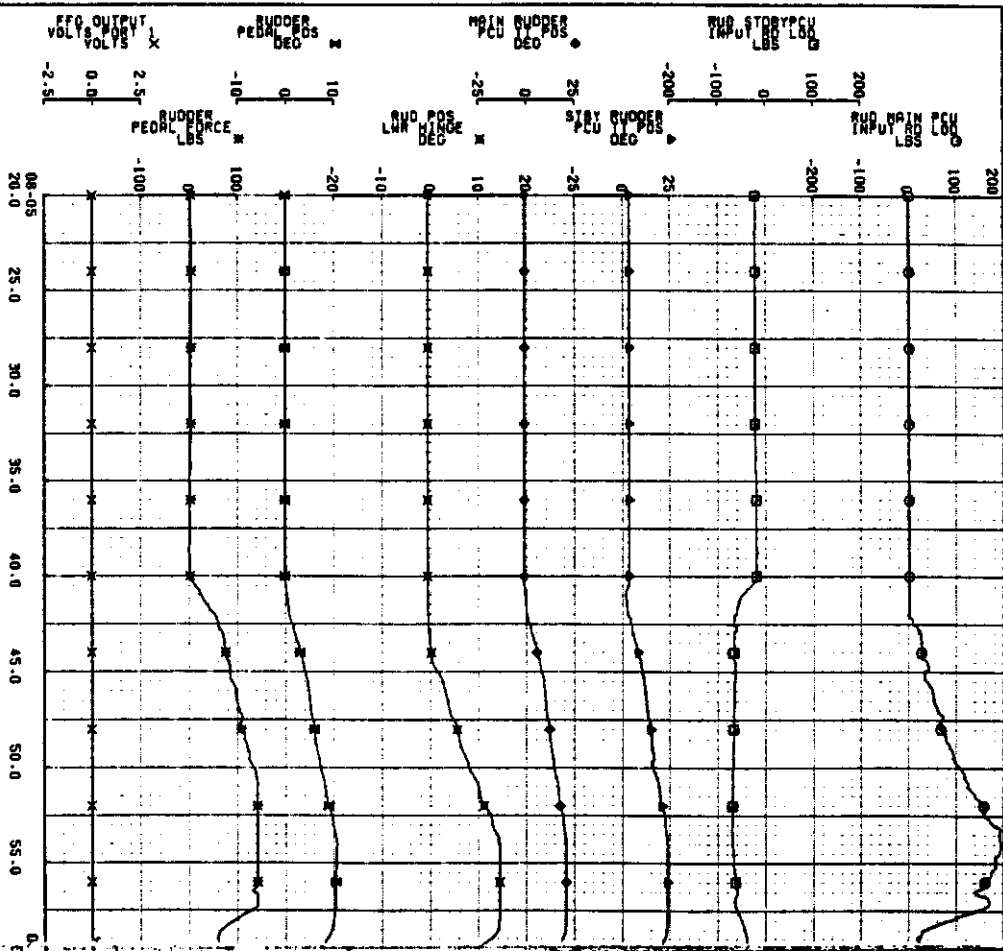
AIRPLANE

DOC. NO.

PAGE

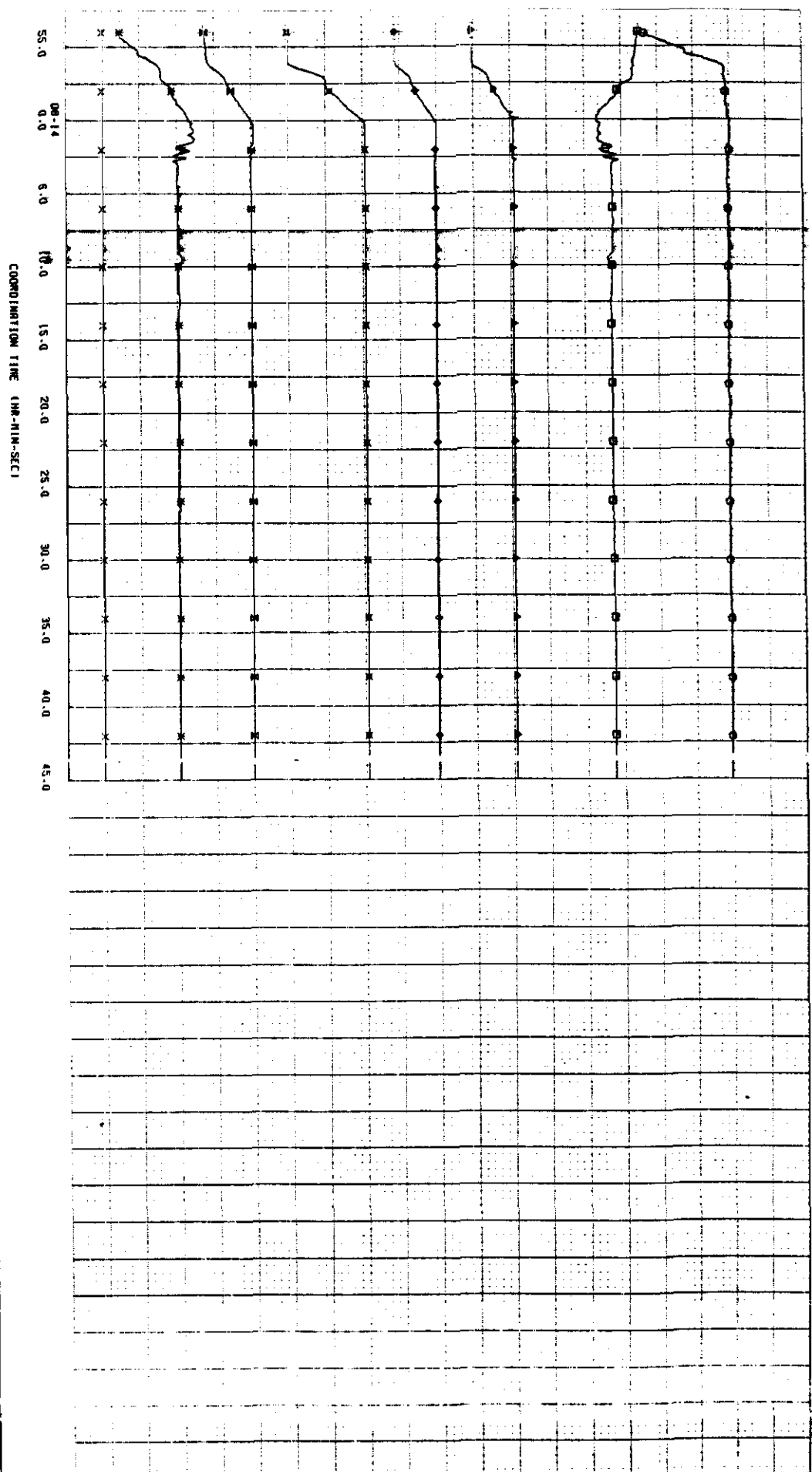
IMPORTANT: DO NOT USE BLUE INK AS IT WILL NOT REPRODUCE FROM THE ORIGINAL

SHEET 8 OF 8	TITLE 737-200 Rubber	MODEL
RECORDER D. Nagel	Ground Test	AIRPLANE
TEST NO. 00109	BOEING	DOC. NO.
DATE 3/1/96		PAGE

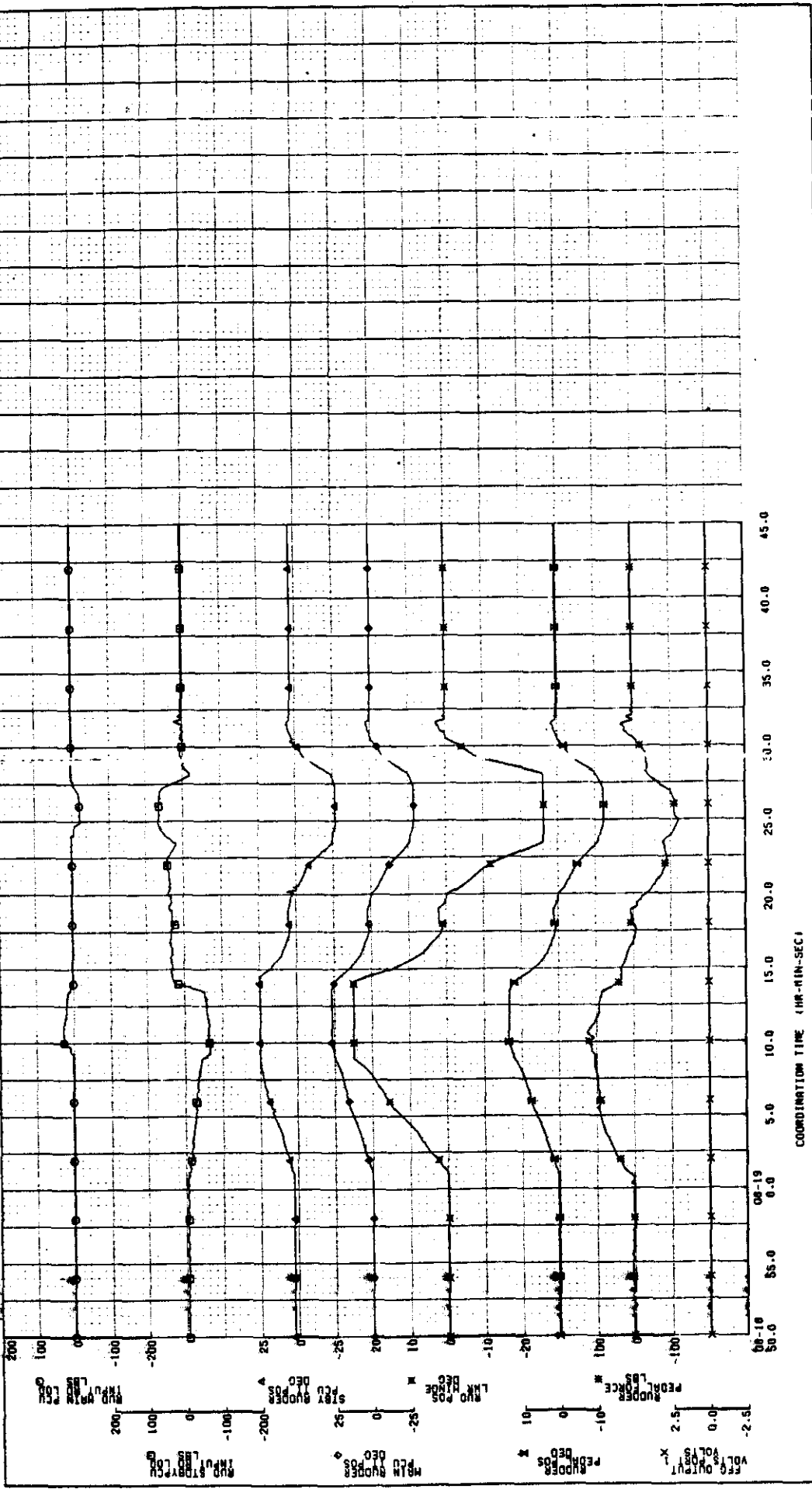


03/05/96 1624	REQ DH60-9170	737-200 RUDDER GRND TEST	737-200
CALC	REVISED DATE	TIME HISTORY PLOT	PO309
CHECK		CONDITION NO. BL-39-0928-311	
RPR		TEST DATE 03/01/96	BL-39-0928
RPR		THE BOEING COMPANY	PRCE

FORM 1
737-200, PO309, RUDDER SYSTEM GROUND TESTING

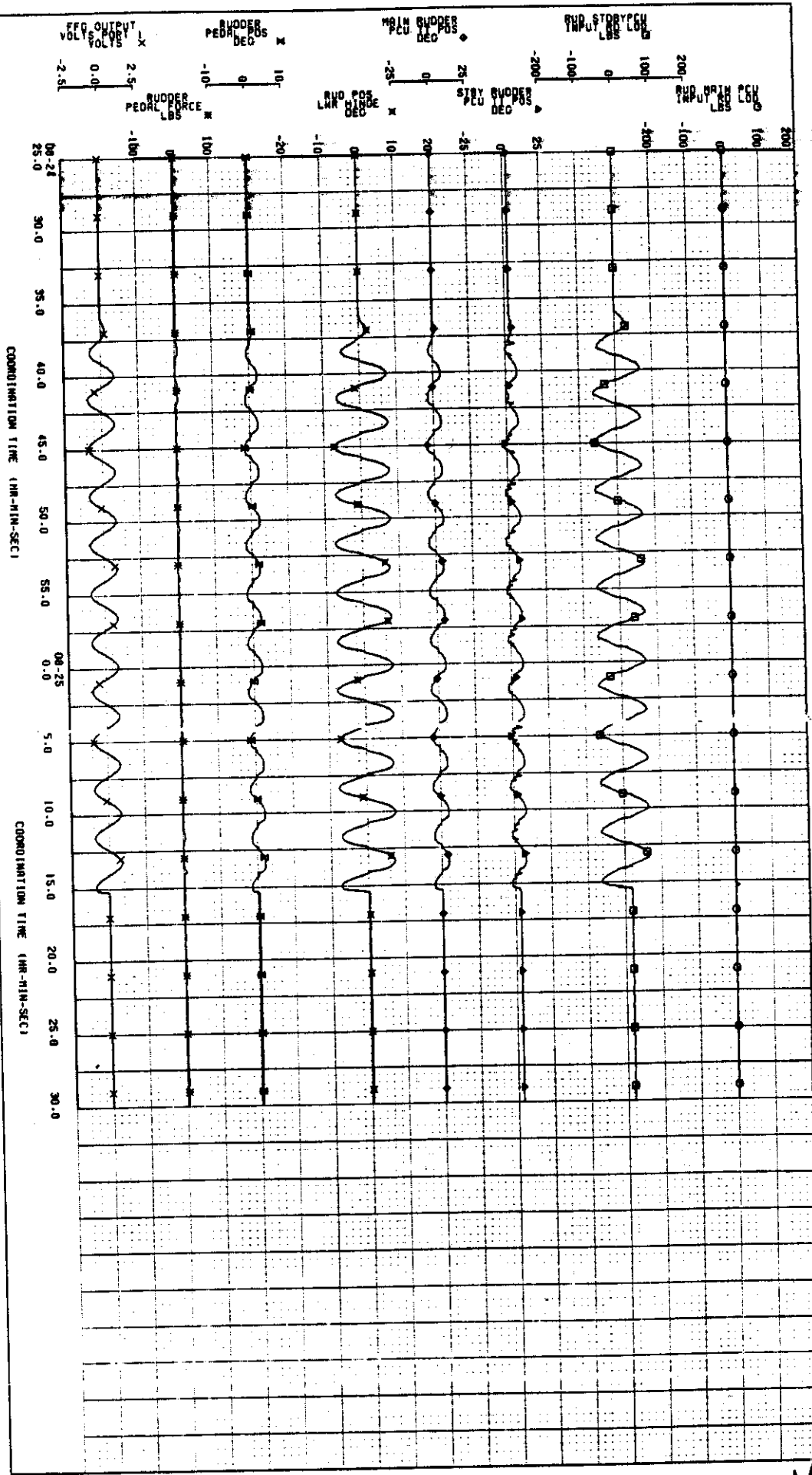


51



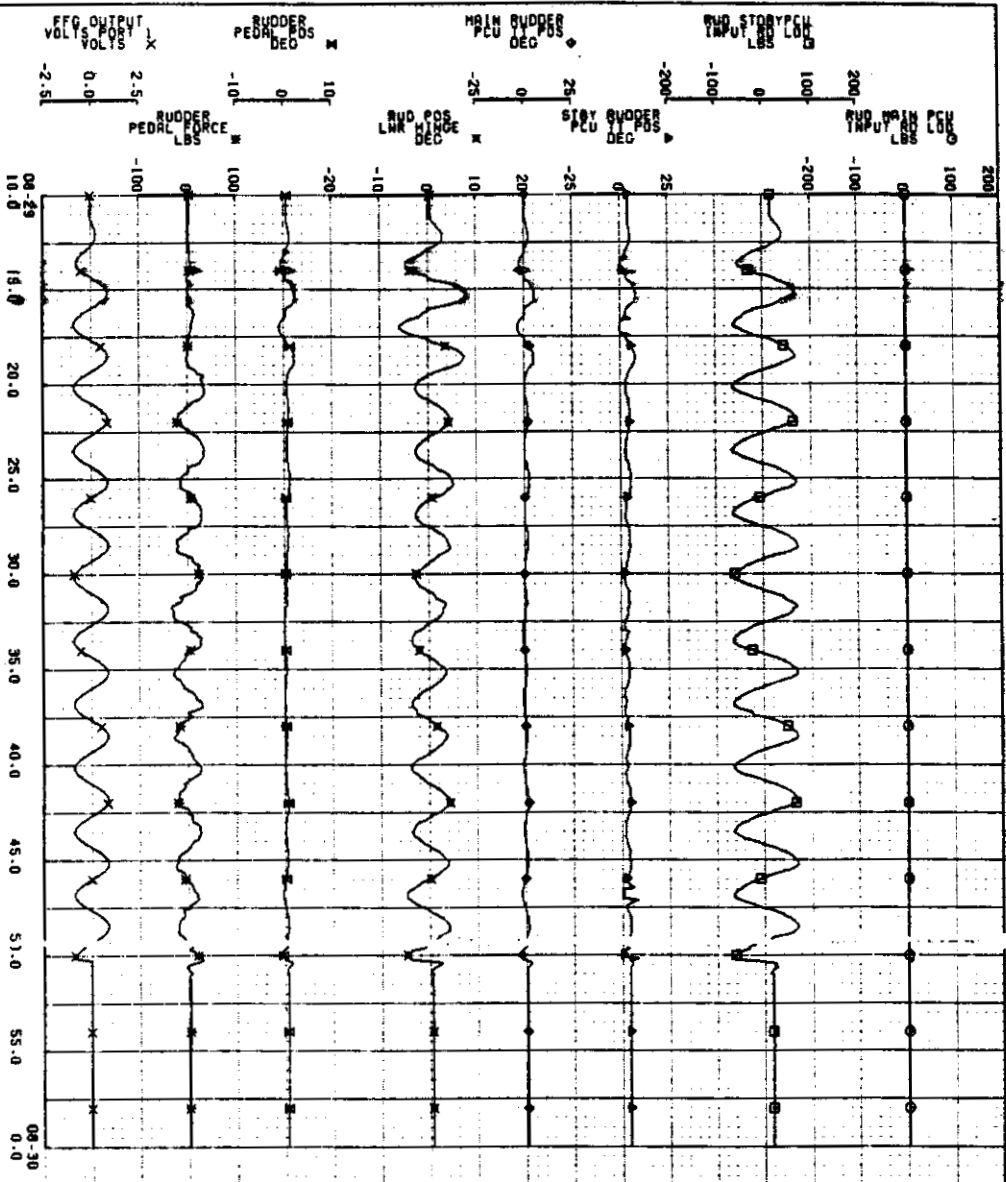
03/05/96 1624	REQ DRWD 9170	737-200 RUDDER GRND TEST	737-200
CALC	REVISED DATE	TIME HISTORY PLOT	PC309
CHECK		CONDITION NO. 81.39.0928.301	BI.39.0928
APR		TEST 001-09 TEST DATE 03/01/96	
APR		THE BOEING COMPANY	PAGE

FORMAT 1
737-200, PC309, RUDDER SYSTEM GROUND TESTING



03/05/96 1624		RED DRD. 9170	737-200 RUDDER GRND TEST	737-200
CRLC		REVIEWED DATE	TIME HISTORY PLOT	PG309
CHECK		CONDITION NO. B1.39.0928.302		
APR		TEST 001-09 TEST DATE 03/01/96 B1.39.0928		
APR		THE BOEING COMPANY PRCE		

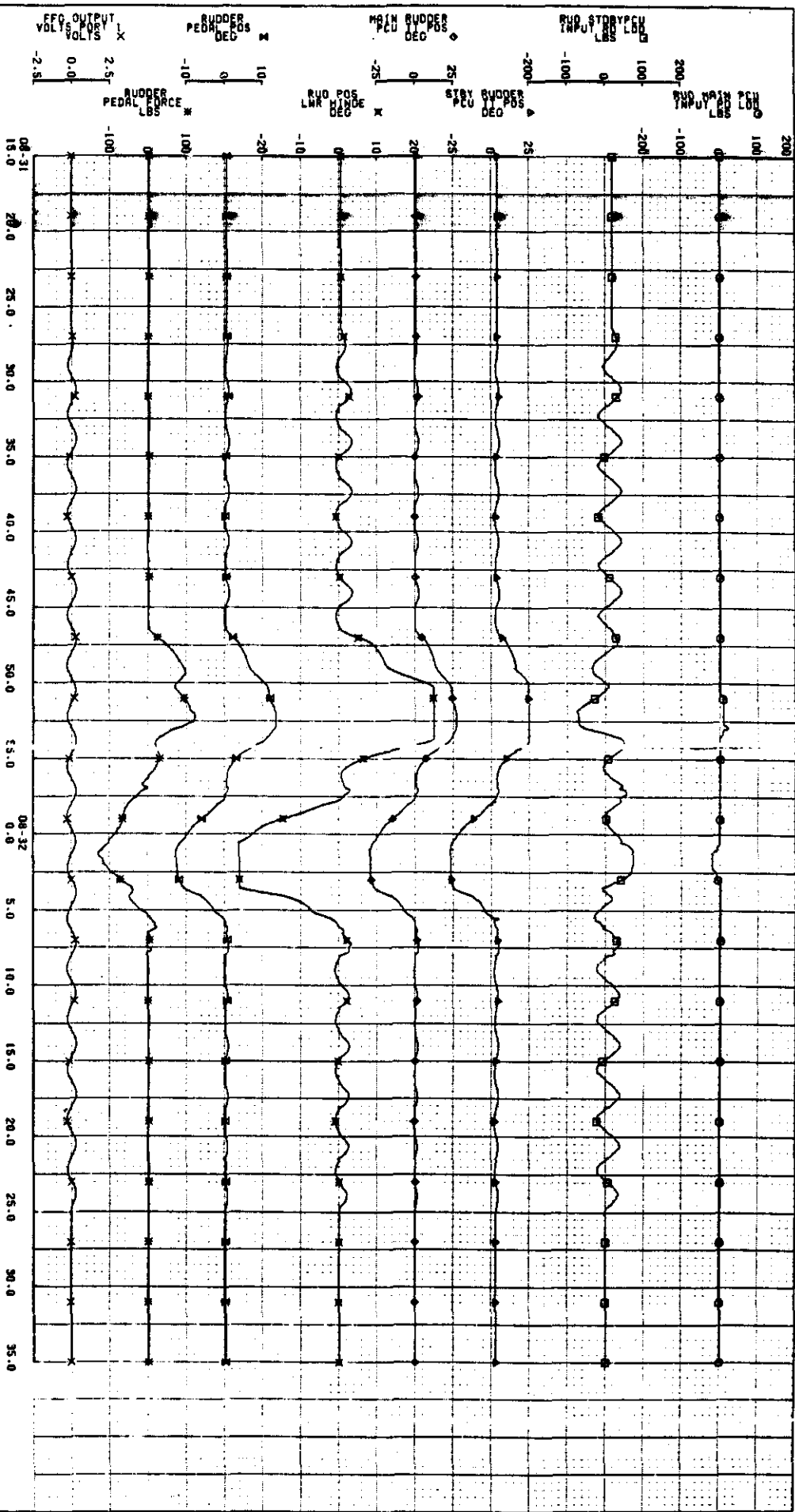
FORMAT 1
737-200, PG309, RUDDER SYSTEM GROUND TESTING



COORDINATION TIME (HR-MIN-SEC)

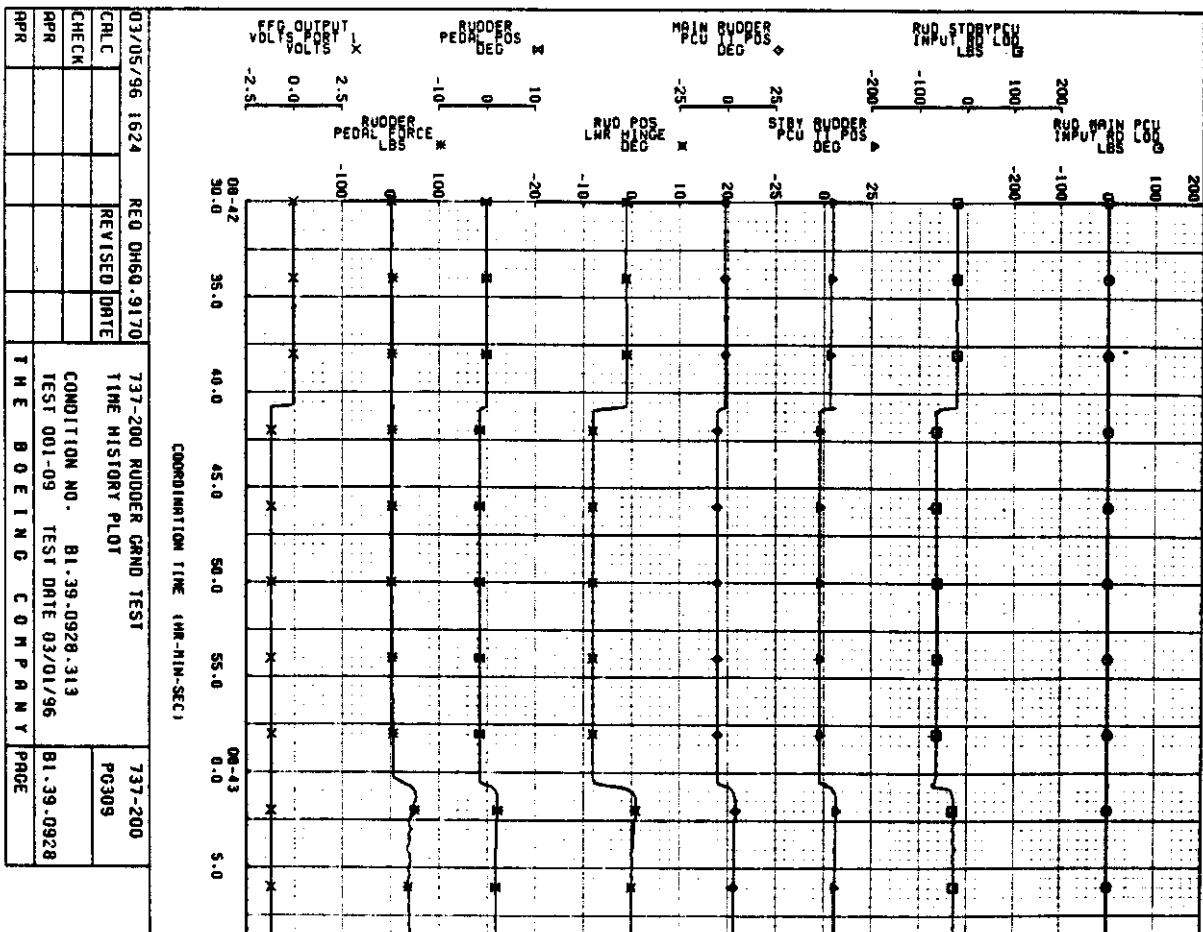
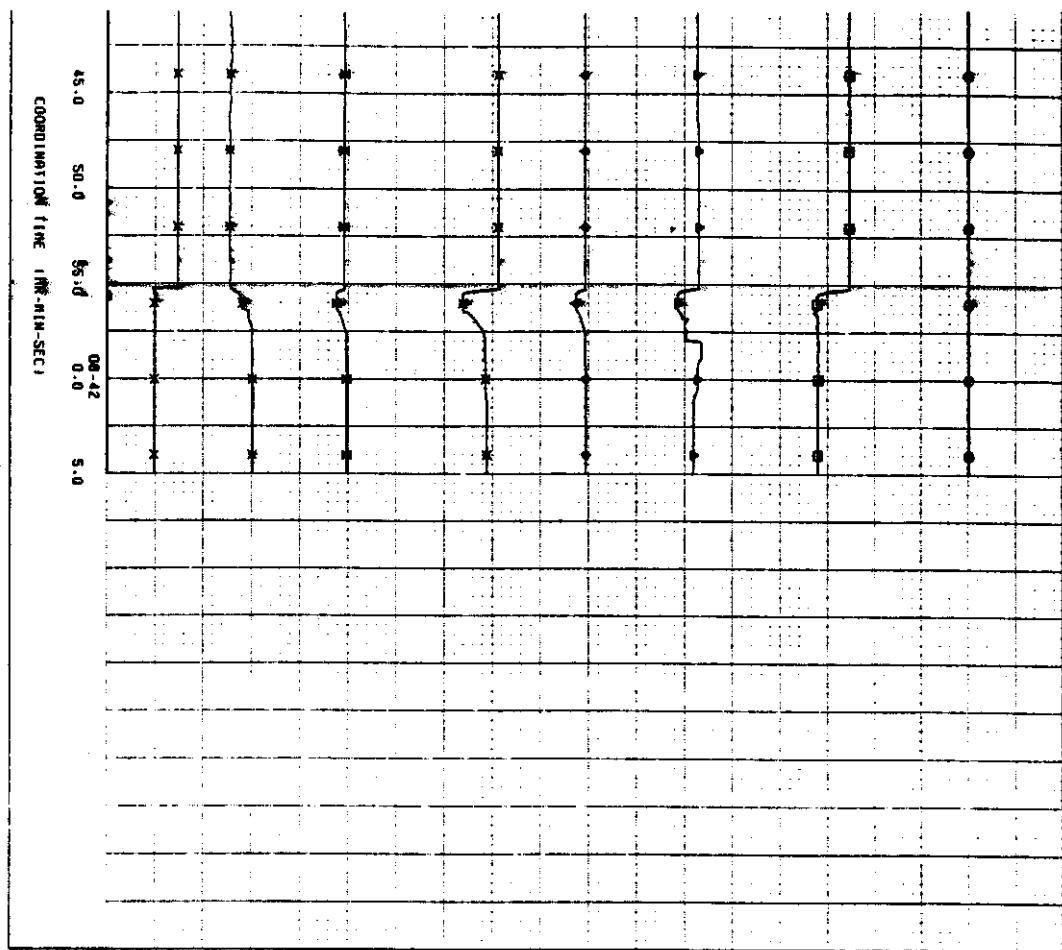
03/05/96 1624	REQ OH60.5170	737-200 RUDDER GRND TEST	737-200
CALC	REVISED DATE	TIME HISTORY PLOT	PG309
CHECK		CONDITION NO. 81.39.0928.302.1	
PPR		TEST 001-09 TEST DATE 03/01/96	81.39.0928
PPR		THE BOEING COMPANY	PAGE

FORMAT 1
737-200. PG309. RUDDER SYSTEM GROUND TESTING



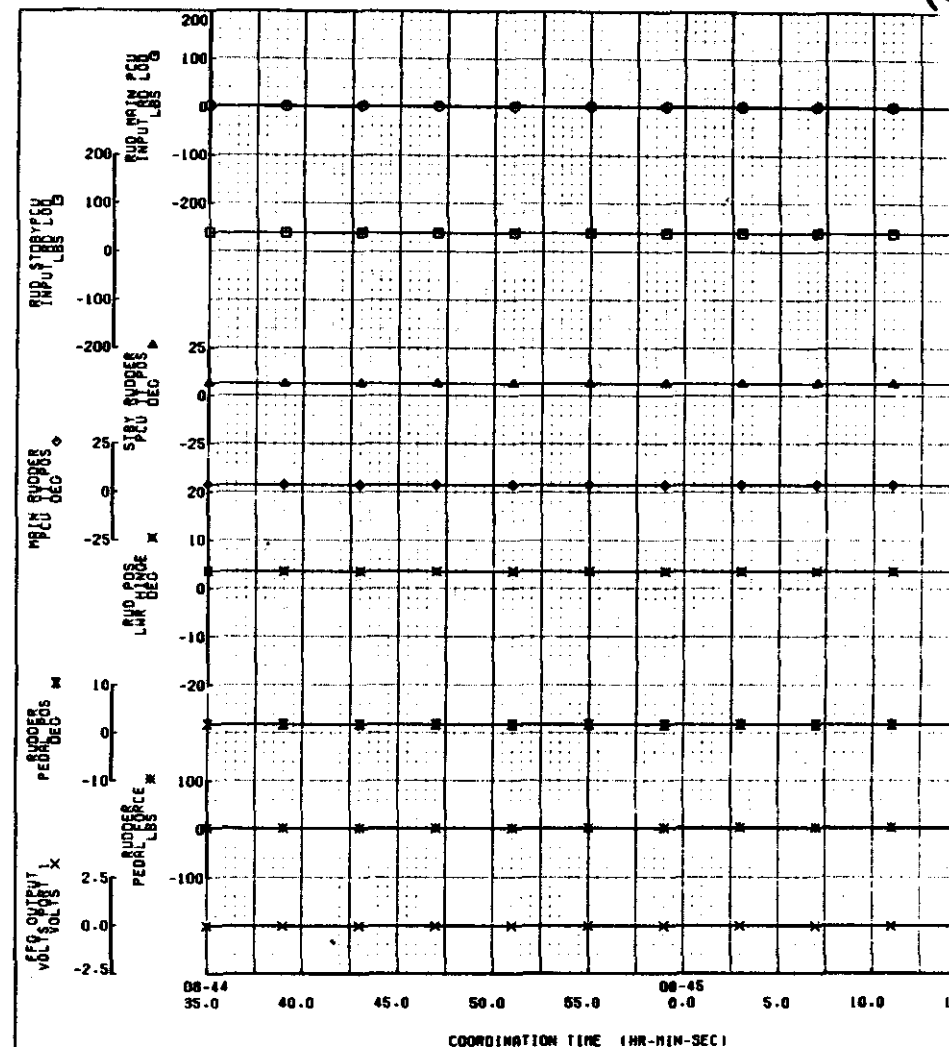
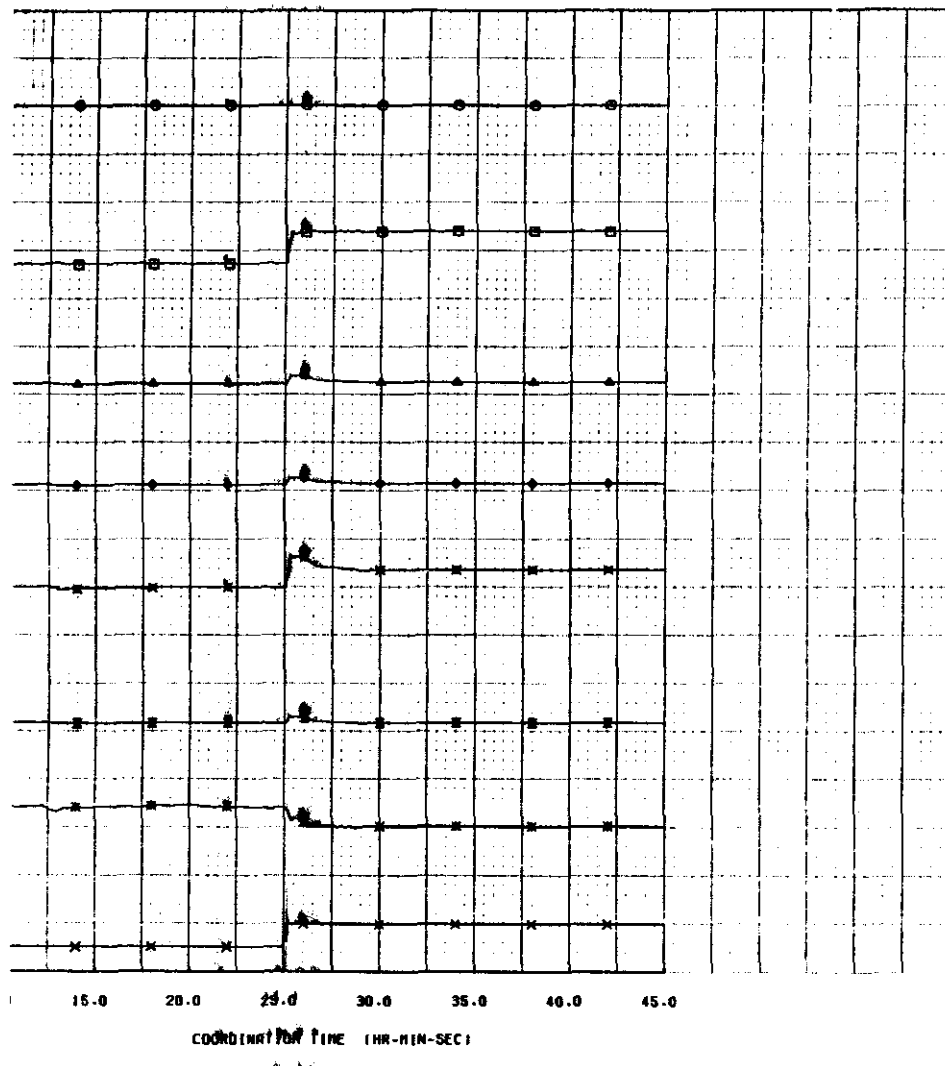
03/05/96 1624		REQ DHDG 9170		737-200 RUDDER GRND TEST		737-200	
CALC		REVISED DATE		TIME HISTORY PLOT		PG309	
CHECK				CONDITION NO. - 81.39.0928.303			
RPR				TEST 001-09 TEST DATE 03/01/96		81.39.0928	
RPR				THE BOEING COMPANY		PAGE	

FORMAT 1
737-200, PG309, RUDDER SYSTEM GROUND TESTING



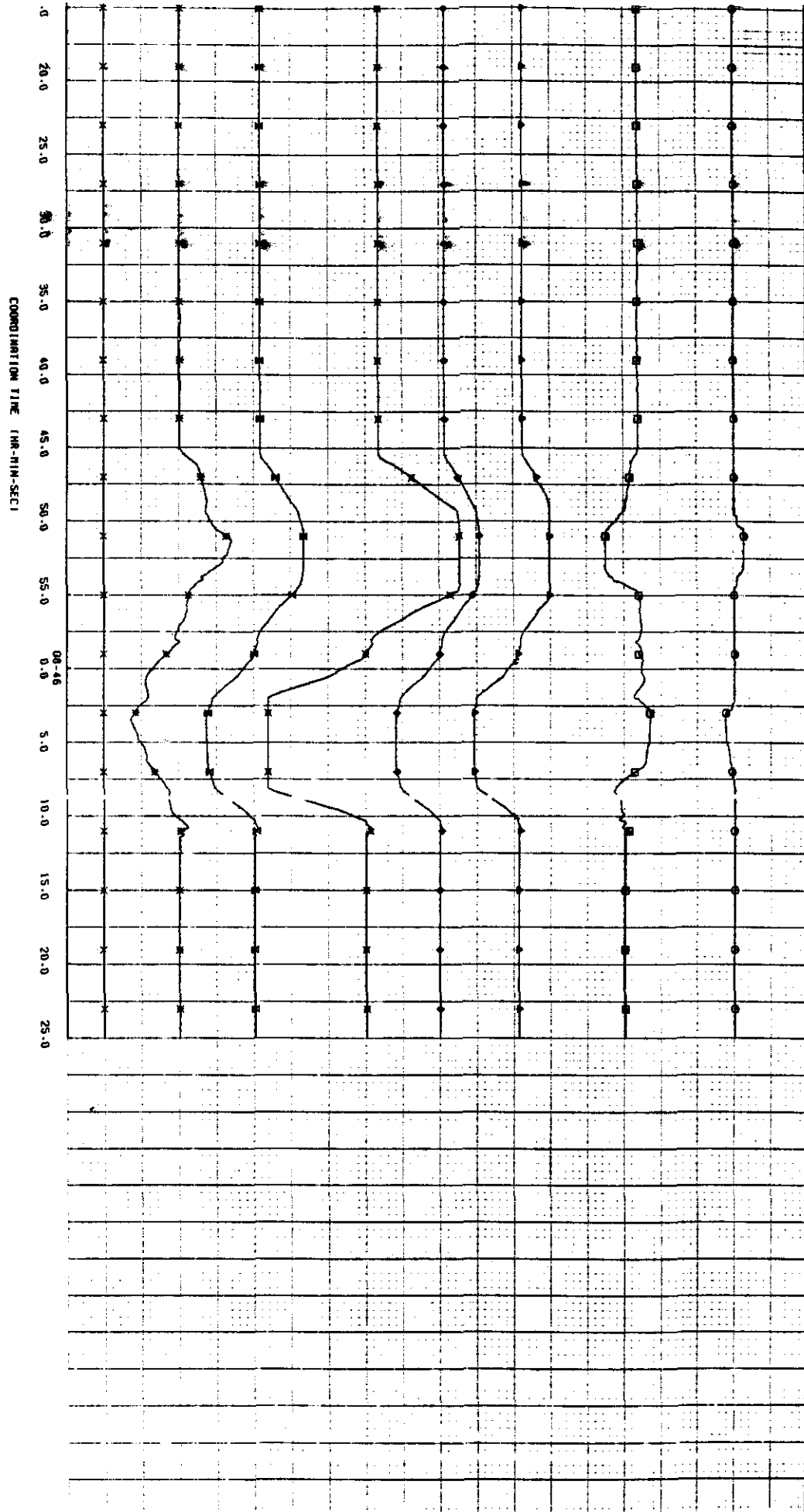
FORM 1
737-200, PG309, RUDDER SYSTEM GROUND TESTING

03/05/96 1624	REQ OH60, 9170	737-200 RUDDER GRND TEST	737-200
CALC	REVISED DATE	TIME HISTORY PLOT	PG309
CHECK		CONDITION NO. B1-39-0928-313	
RPR		TEST 001-09 TEST DATE 03/01/96	B1-39-0928
RPR		THE BOEING COMPANY	PRGE

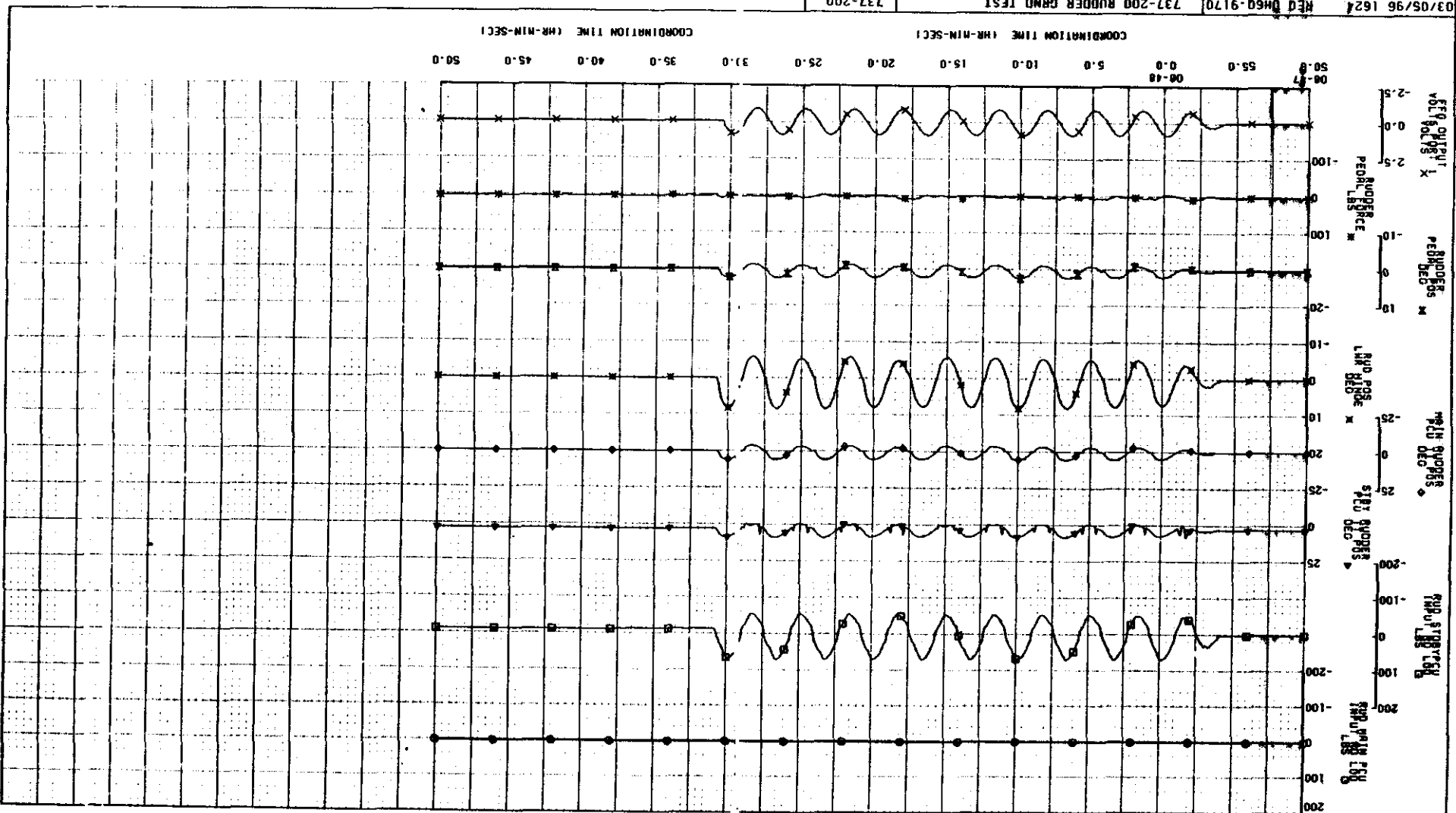


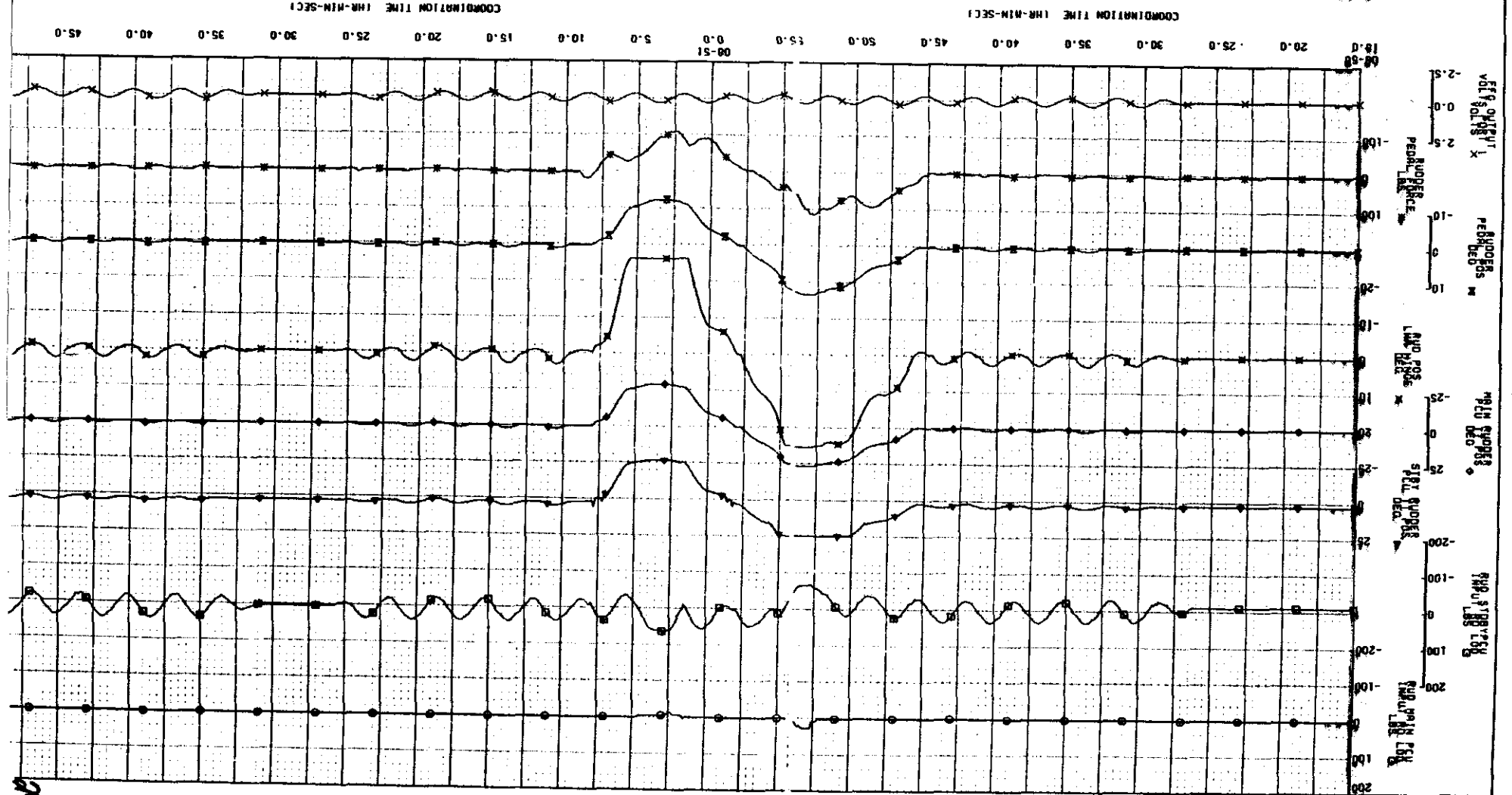
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CALC	REVISED DATE	TIME HISTORY PLOT	PG309
CHECK		CONDITION NO. B1-39-0928.305	
APR		TEST 001-09 TEST DATE 03/01/96	B1-39-0928
APR		THE BOEING COMPANY	PAGE

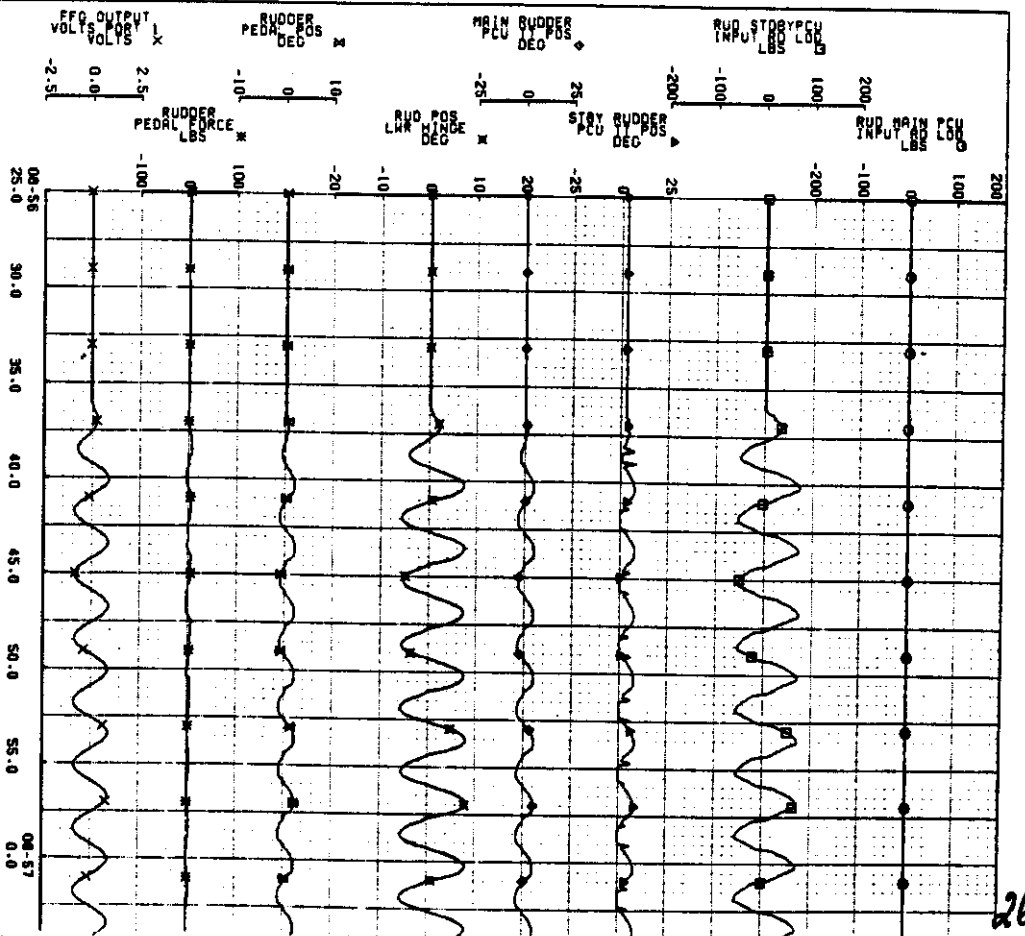
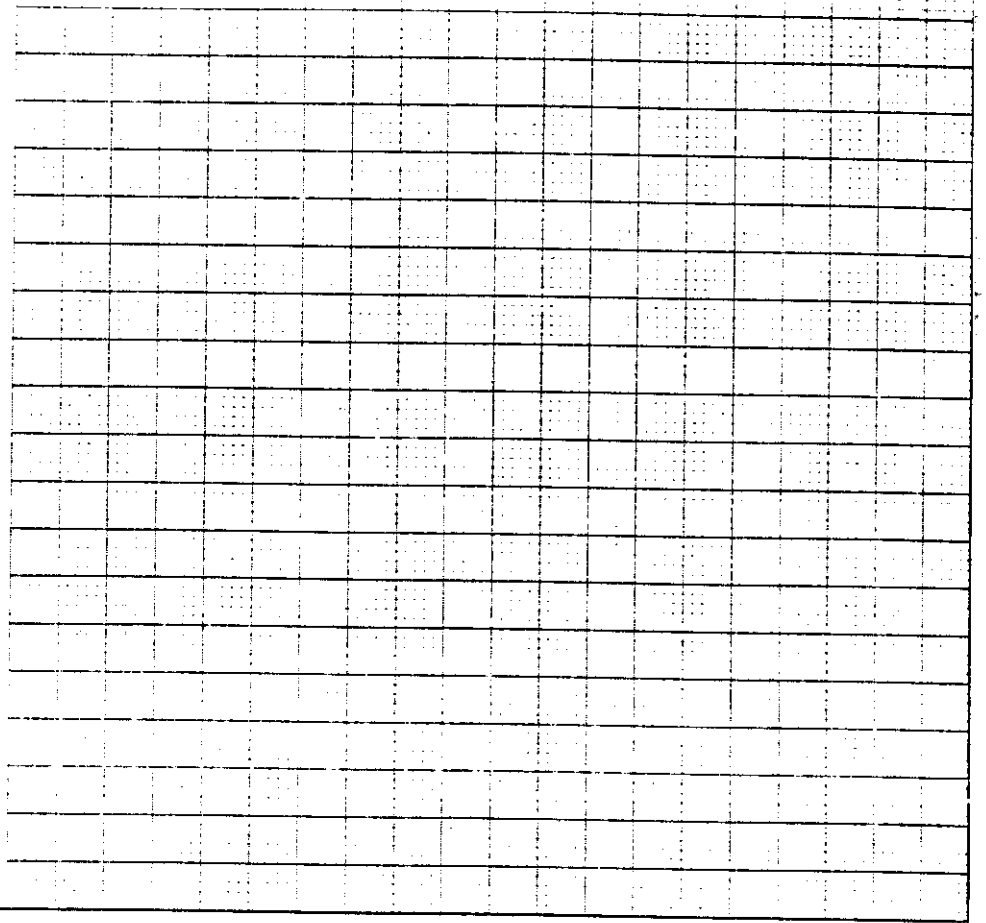
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737-200, PG309, RUDDER SYSTEM GROUND TESTING



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CALC	REVISED DATE	CONDITION NO. B1-39-0928.306	TEST DATE 03/01/96	TEST 001-09	B1-39-0928
CHECK		THE BOEING COMPANY	PRGE		
RPR					
RPR					





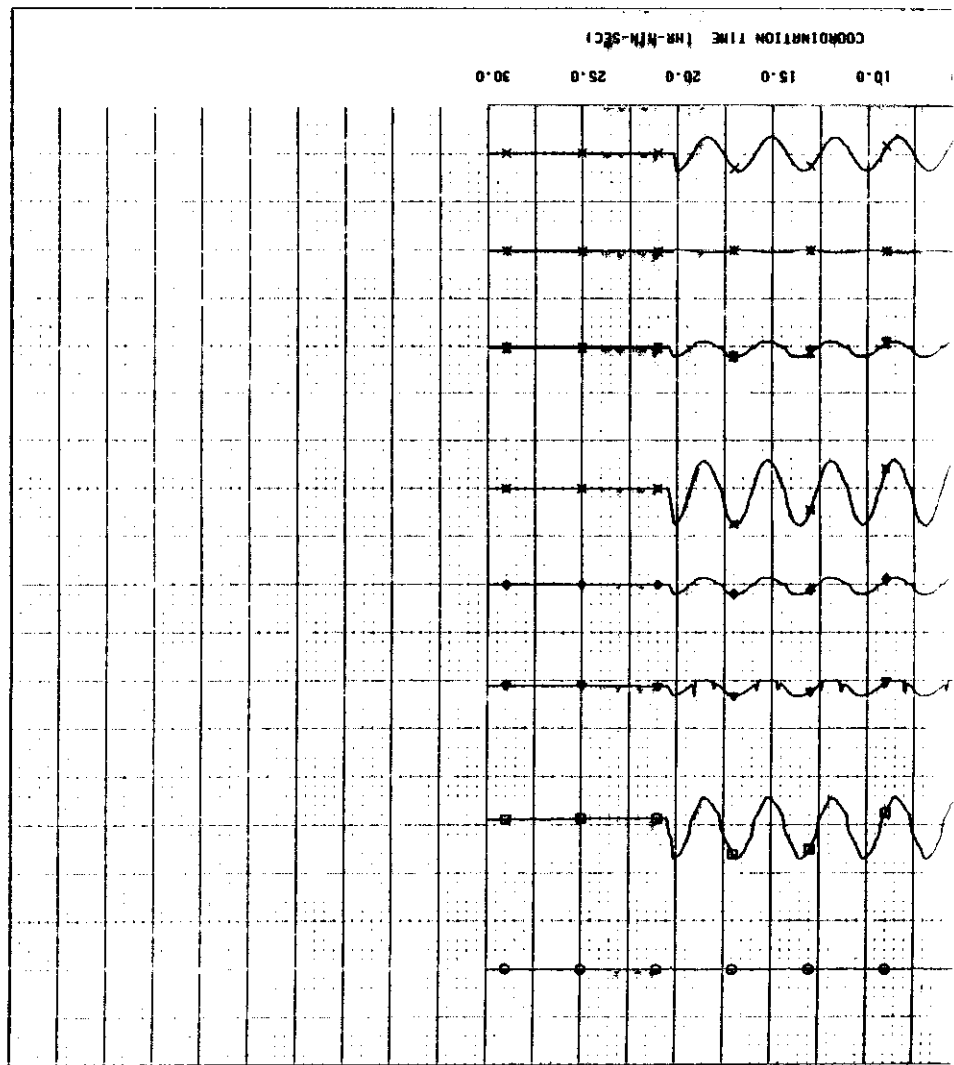
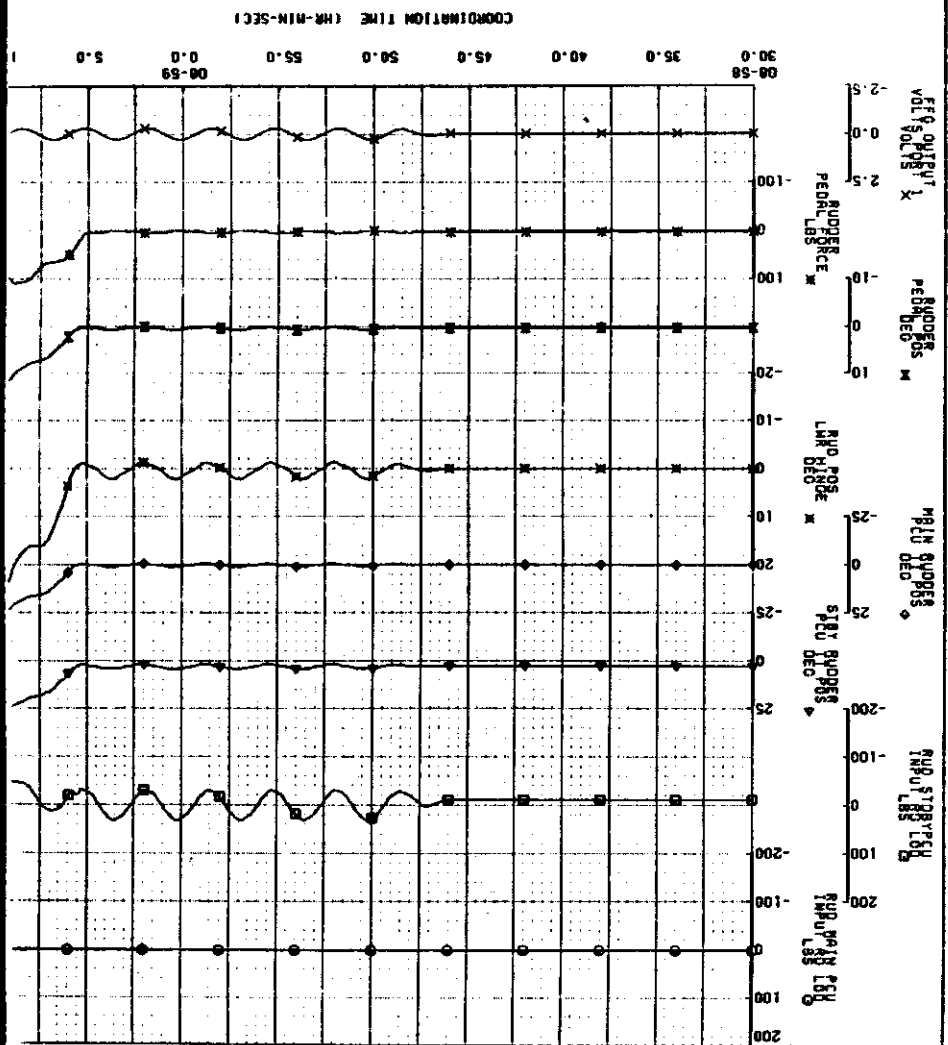


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CALC	REVIS	DATE	PG309
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RPR		TEST DATE 03/01/96	81-39-0928
RPR		THE BOEING COMPANY	PRG

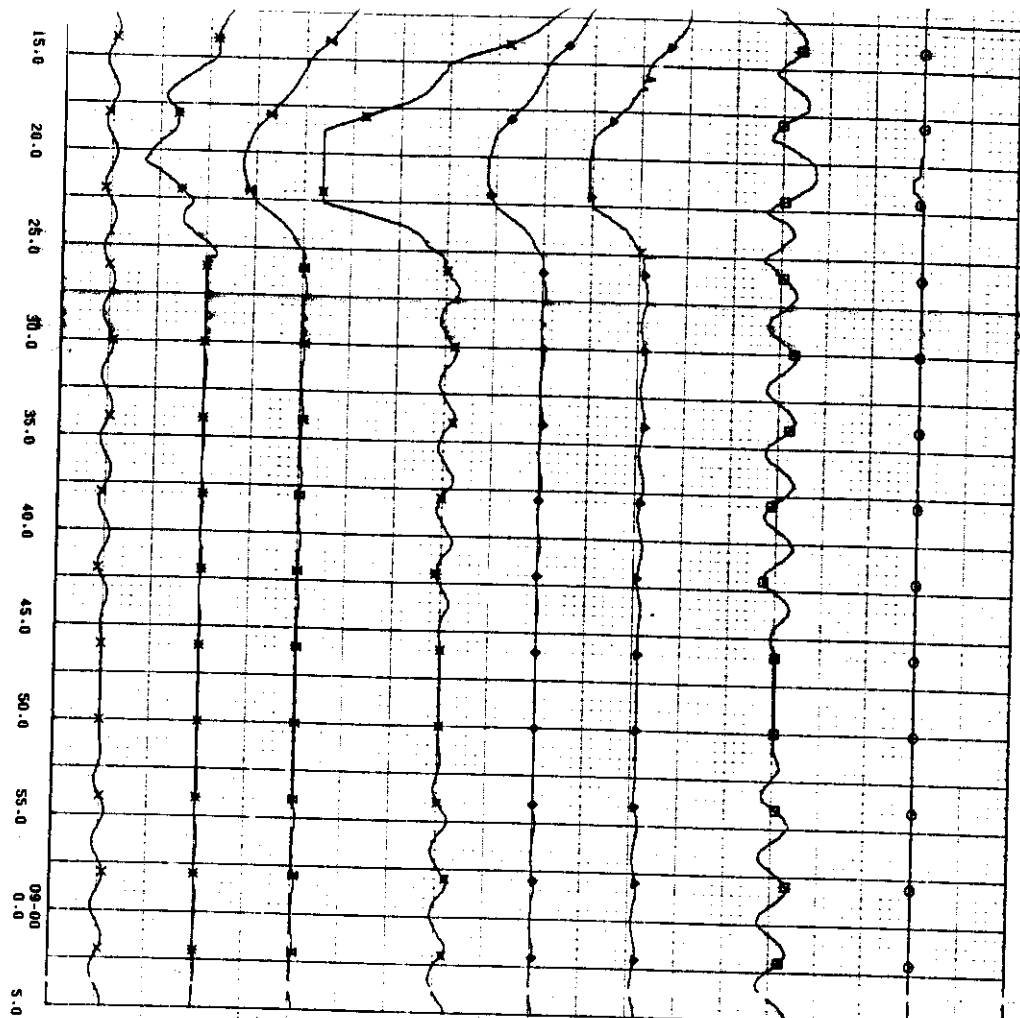
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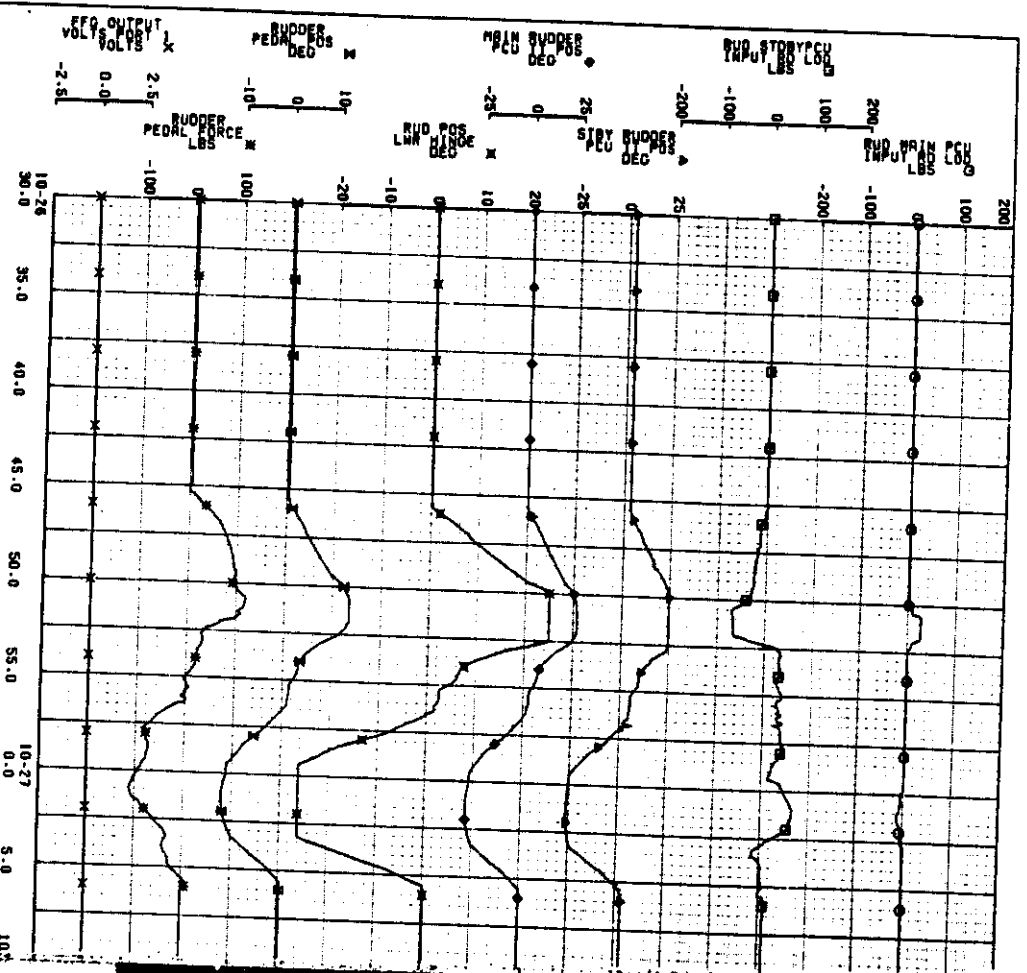
737-200. RUDDER SYSTEM GROUND TESTING

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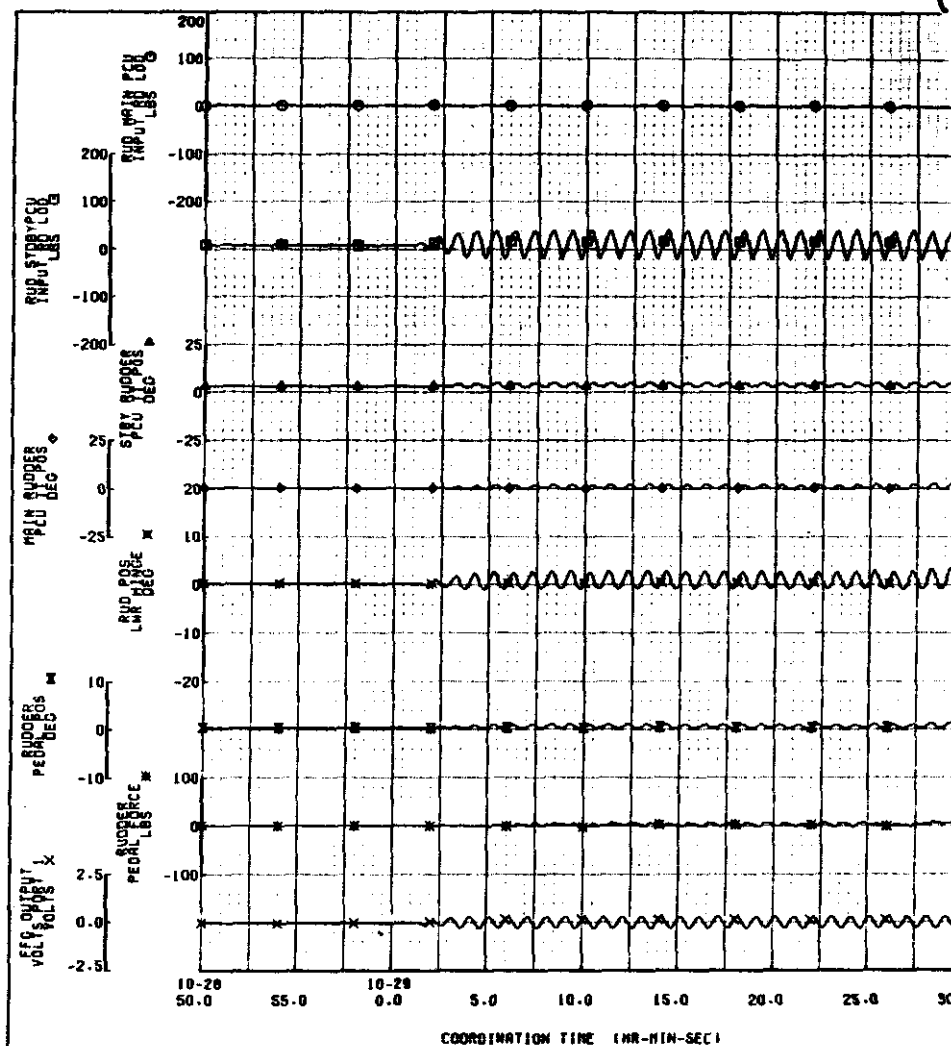
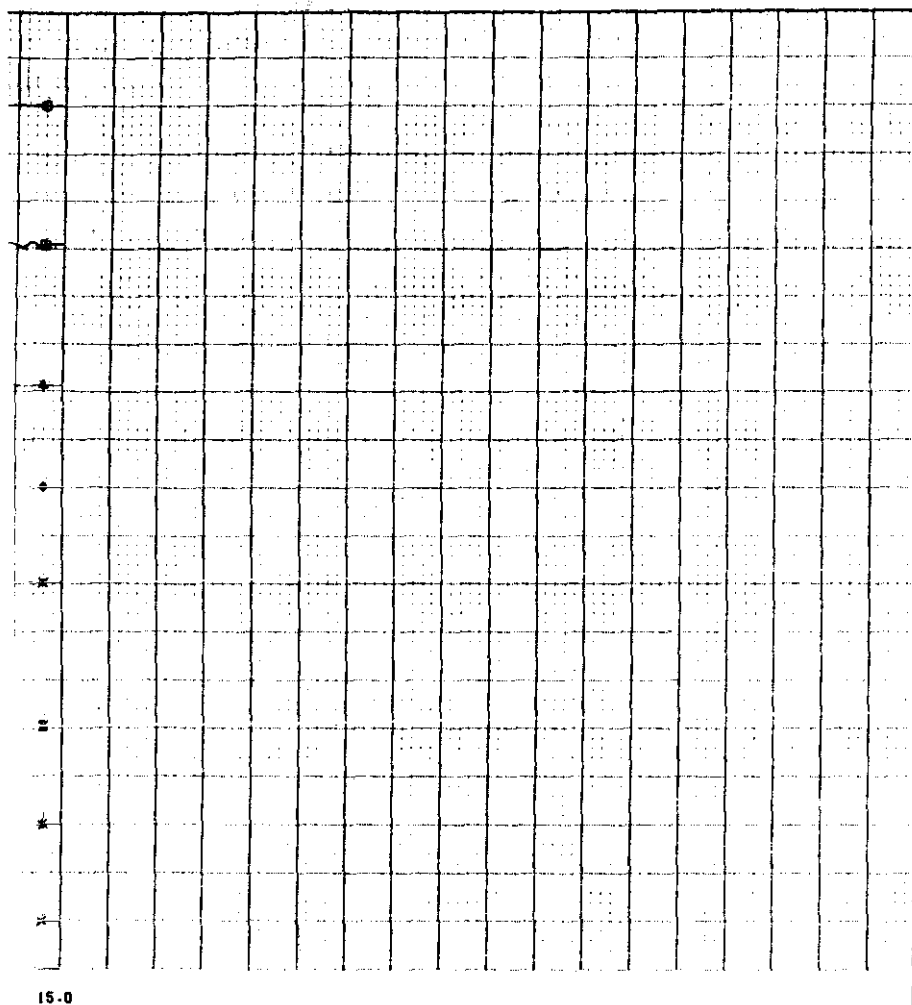
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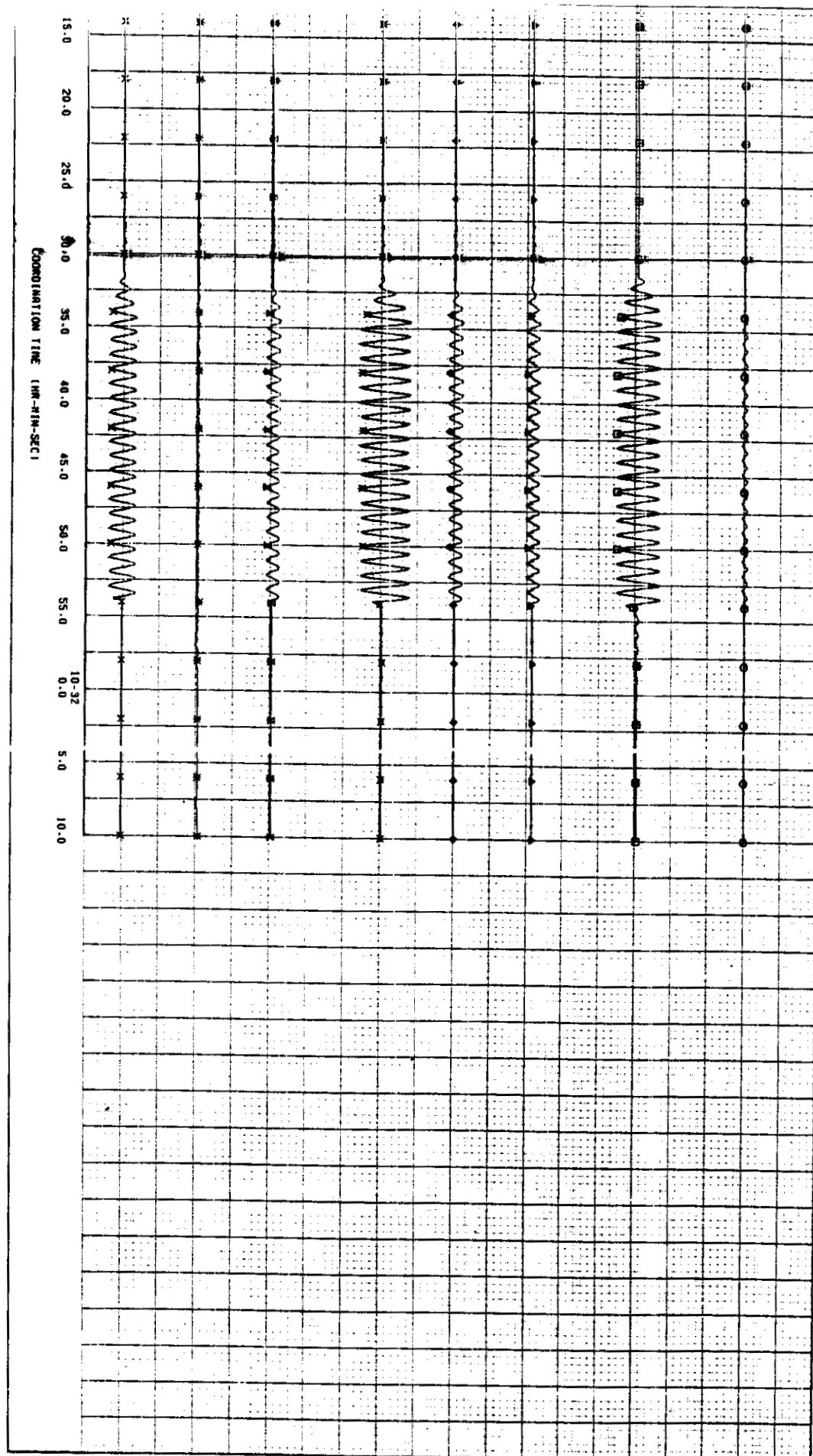


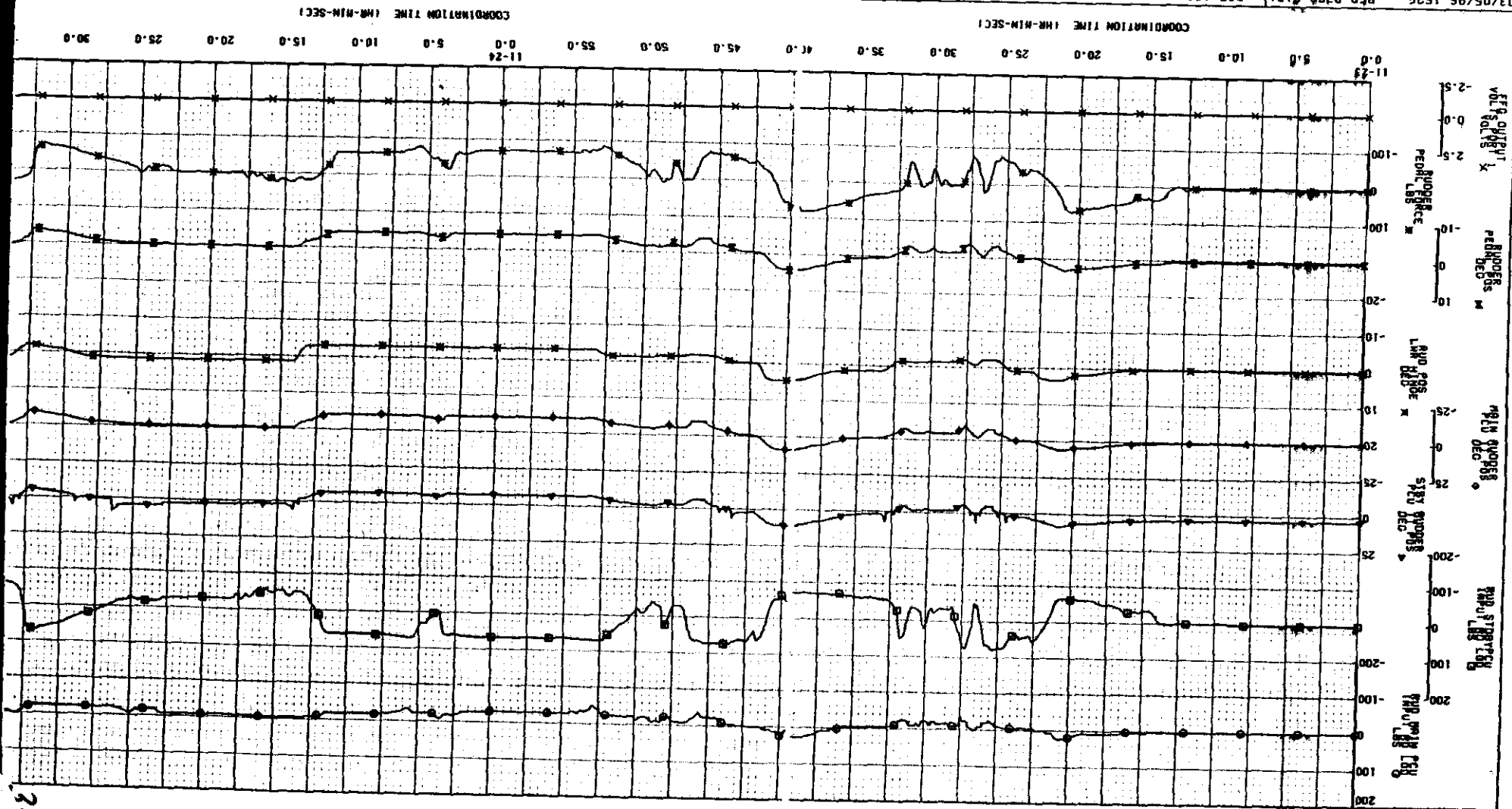
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CRLC		REVISID	DATE	TIME HISTORY PLOT	
CHECK				CONDITION NO. B1-39-0928-314	
RPR				TEST 001-09 TEST DATE 03/01/96	
RPR				THE BOEING COMPANY	
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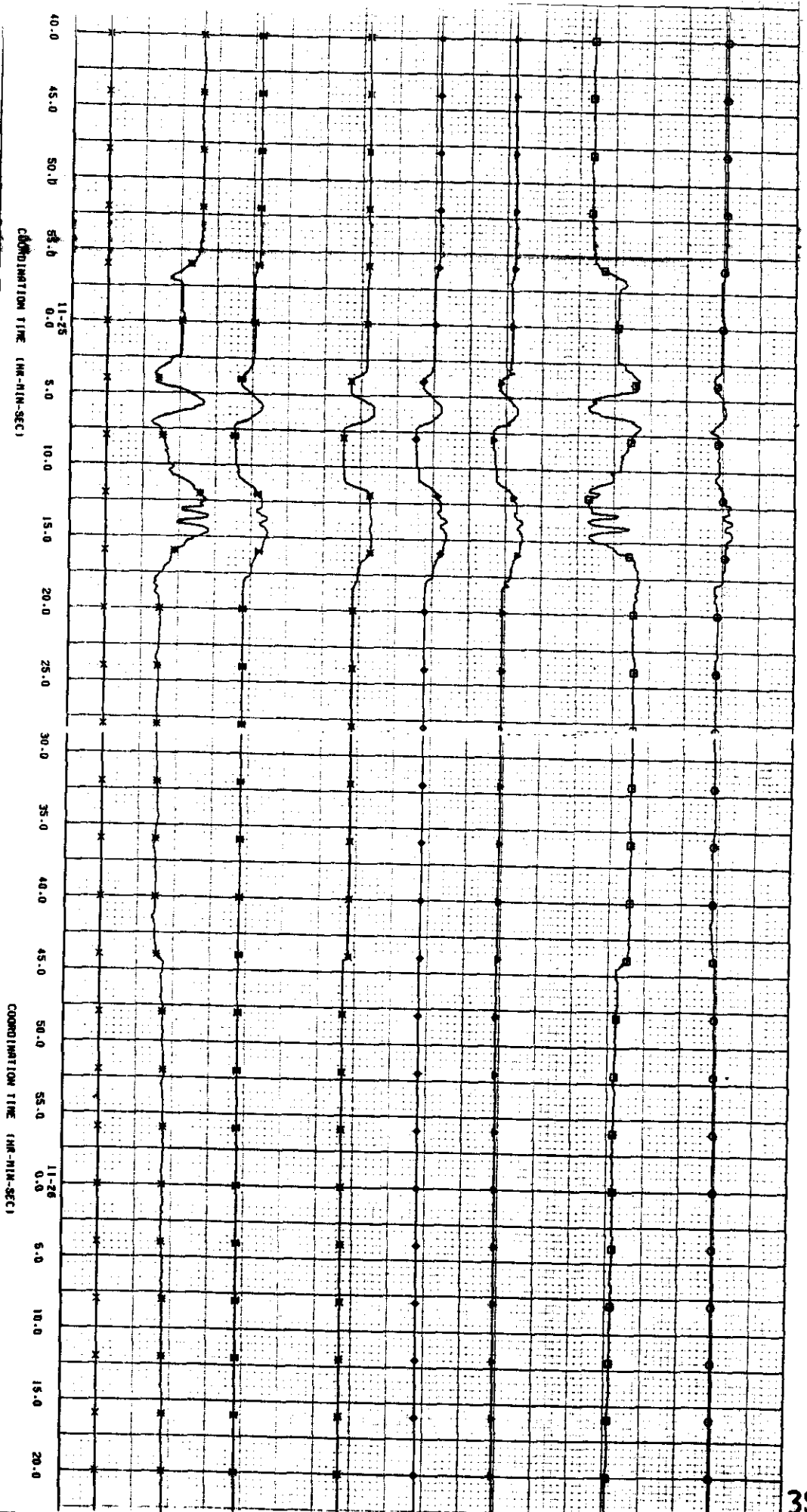
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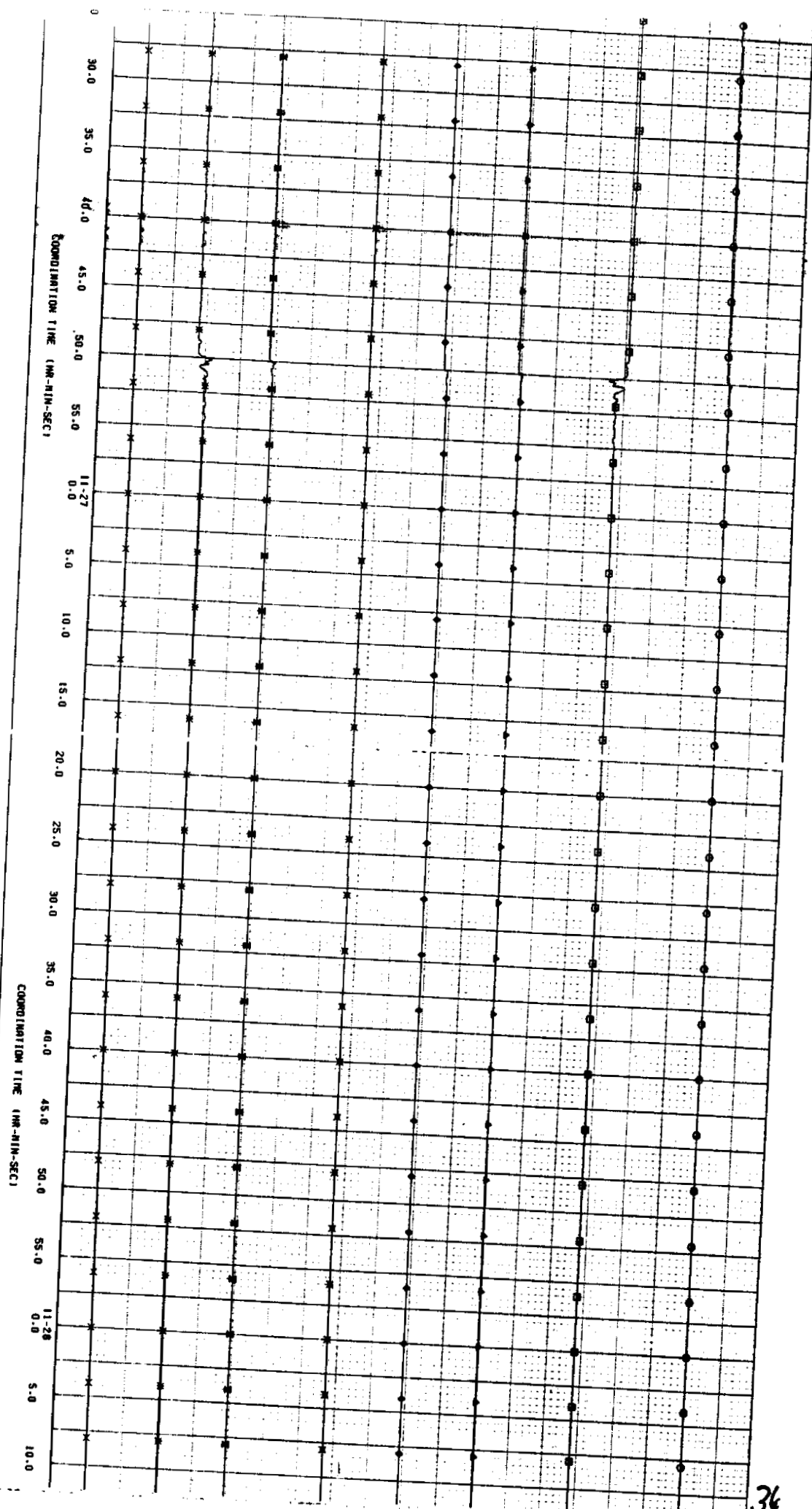


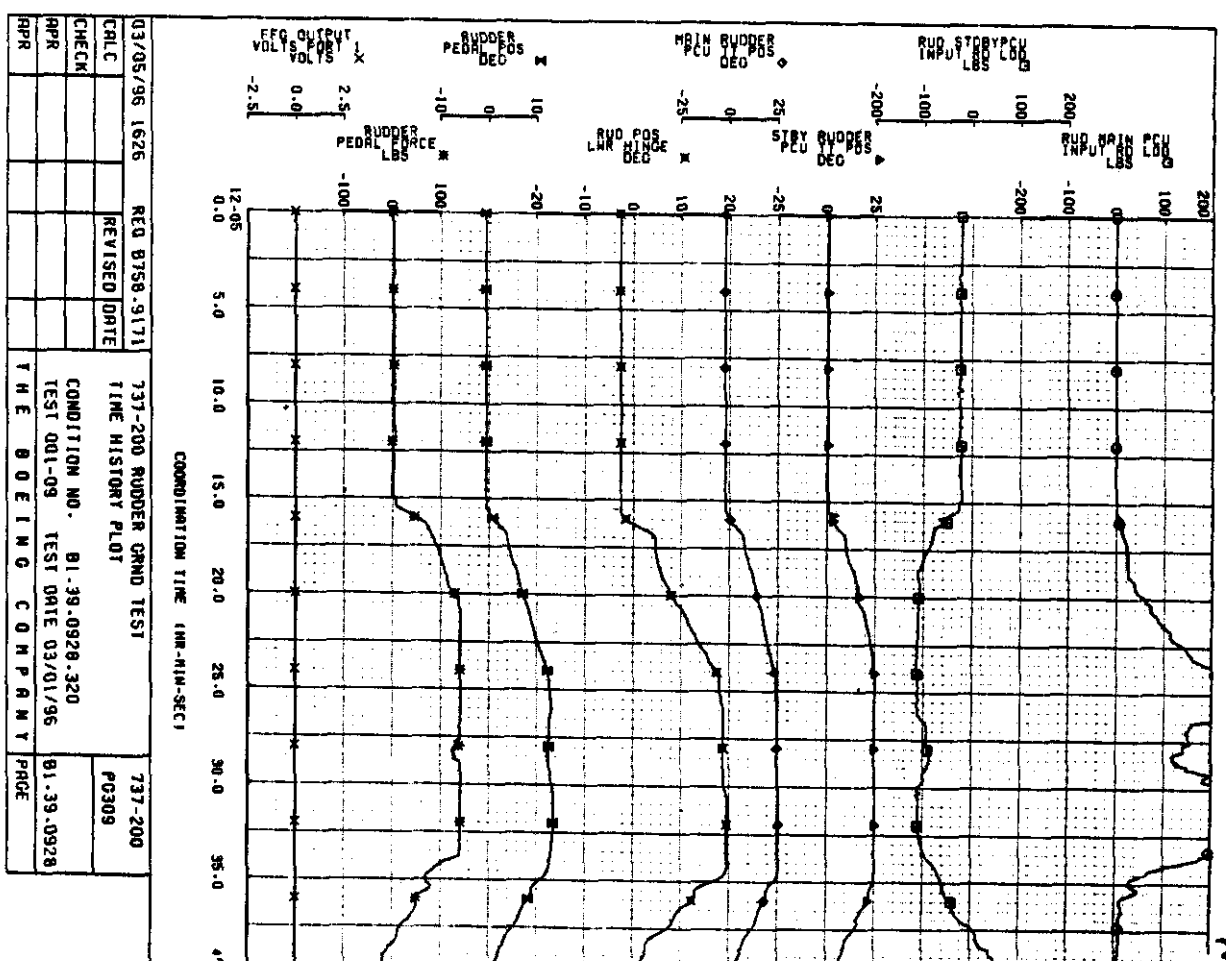
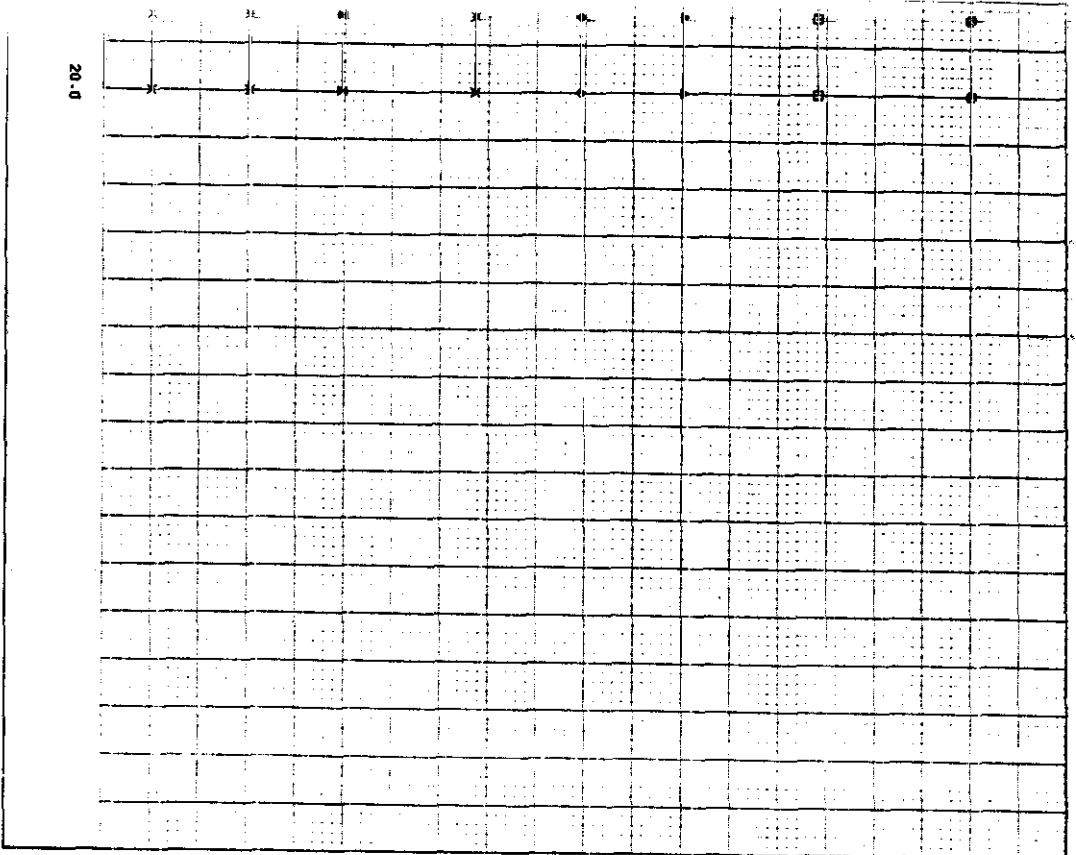
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CALC		REVISED DATE		TIME HISTORY PLOT		PG309	
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APR				TEST 001-09 TEST DATE 03/01/96		81-39-0928	
APR				THE BOEING COMPANY		PAGE	





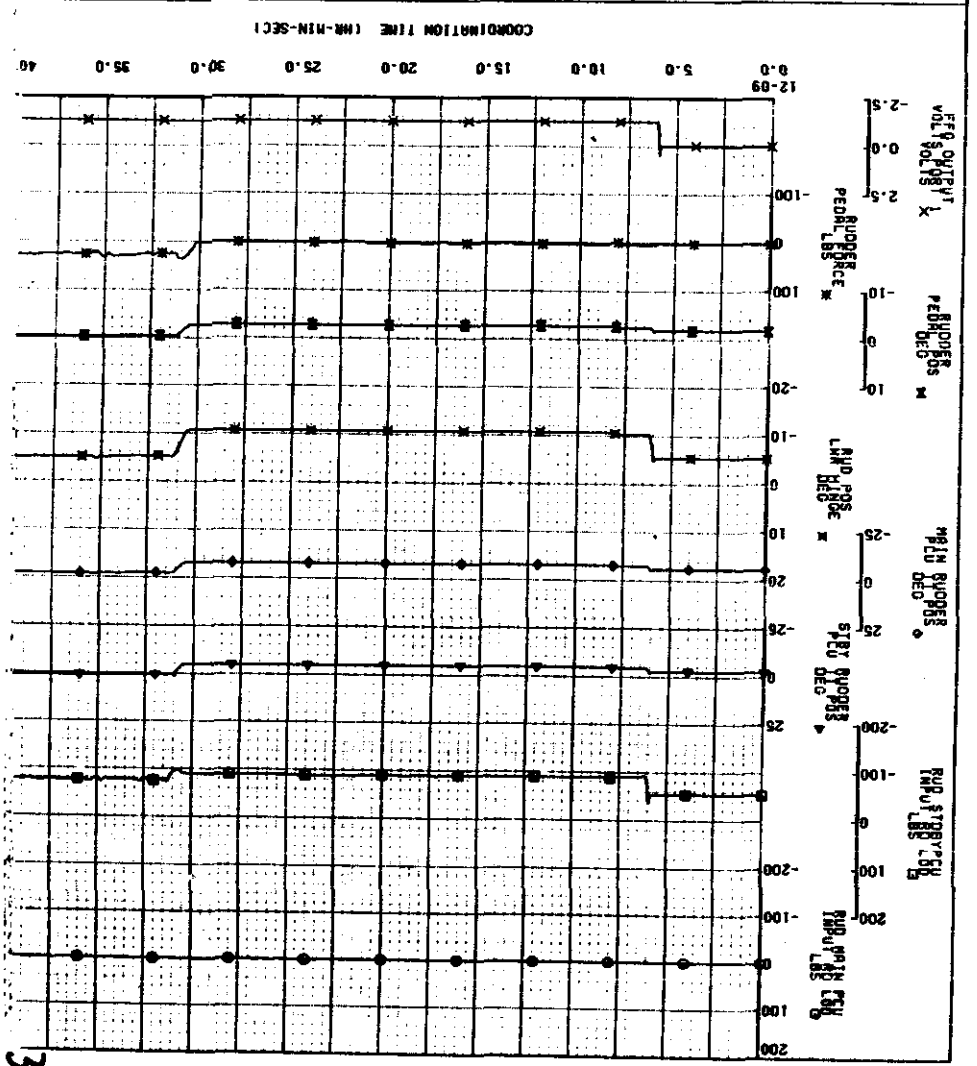
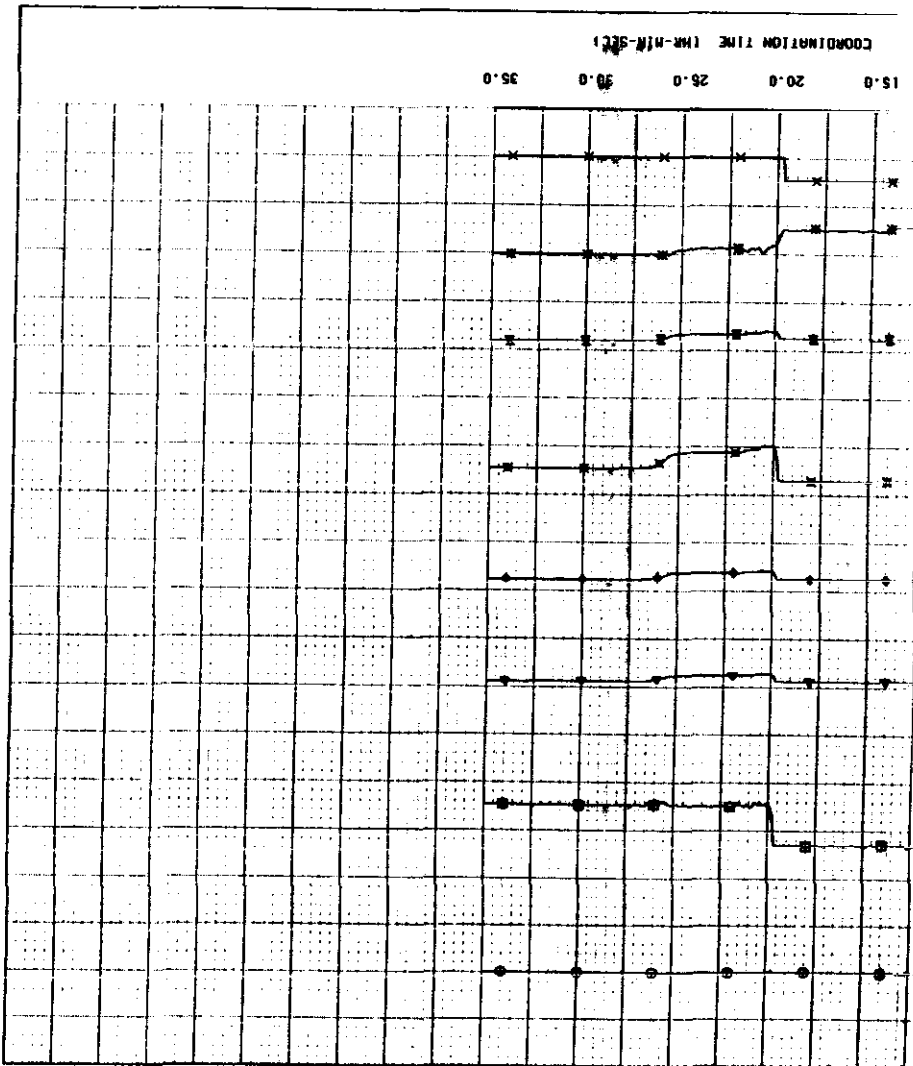






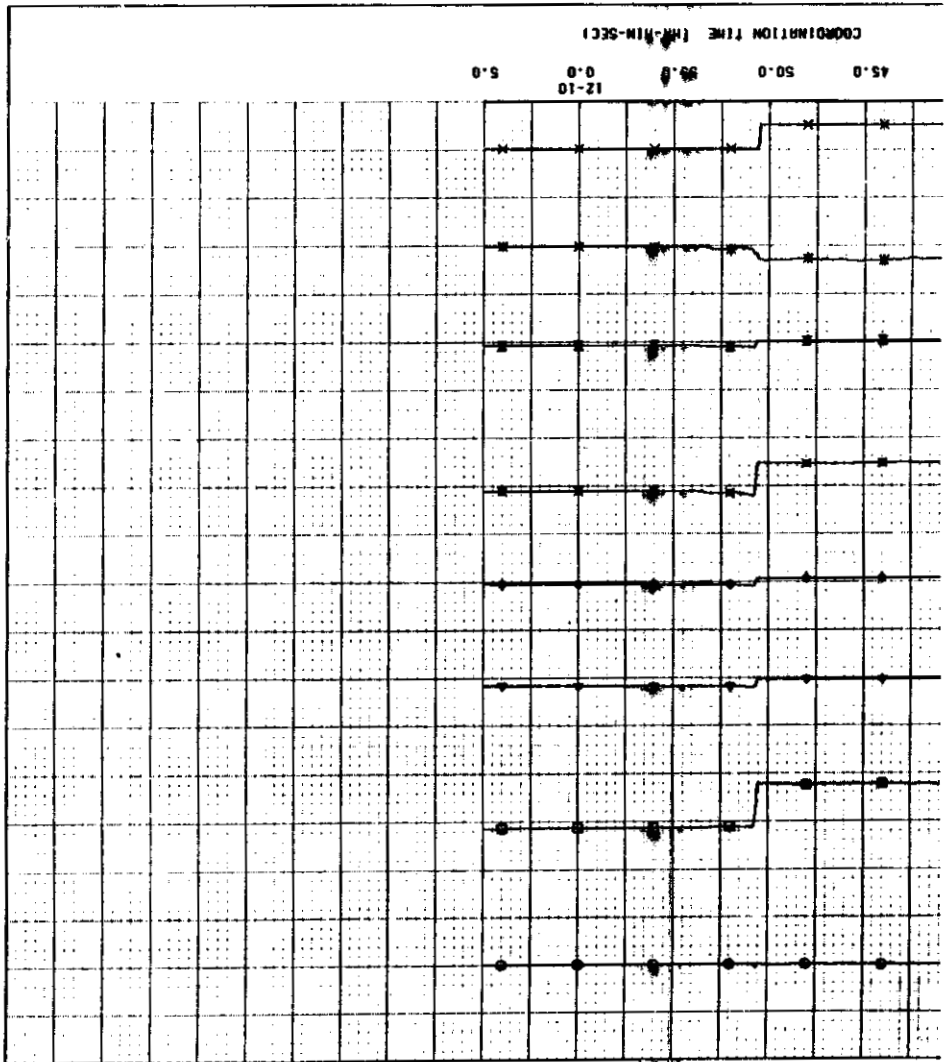
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CHECK		CONDITION NO. 81-39-0928-320	
RPR		TEST 001-09 TEST DATE 03/01/96	81-39-0928
		THE BOEING COMPANY	PRGE

FORMAT 1
737-200, PG309, RUDDER SYSTEM GROUND TESTING



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							THE BOEING COMPANY
							PAGE
							81-39-0928
							737-200
							PG309

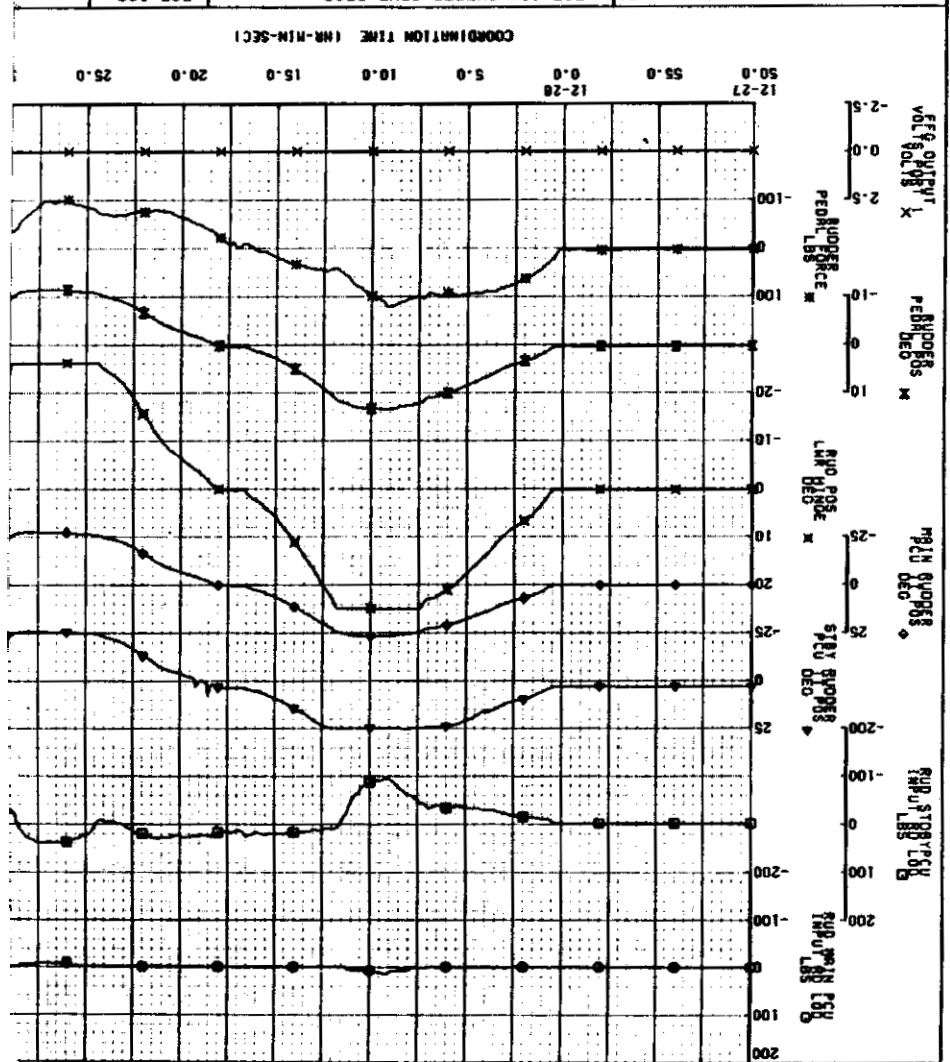
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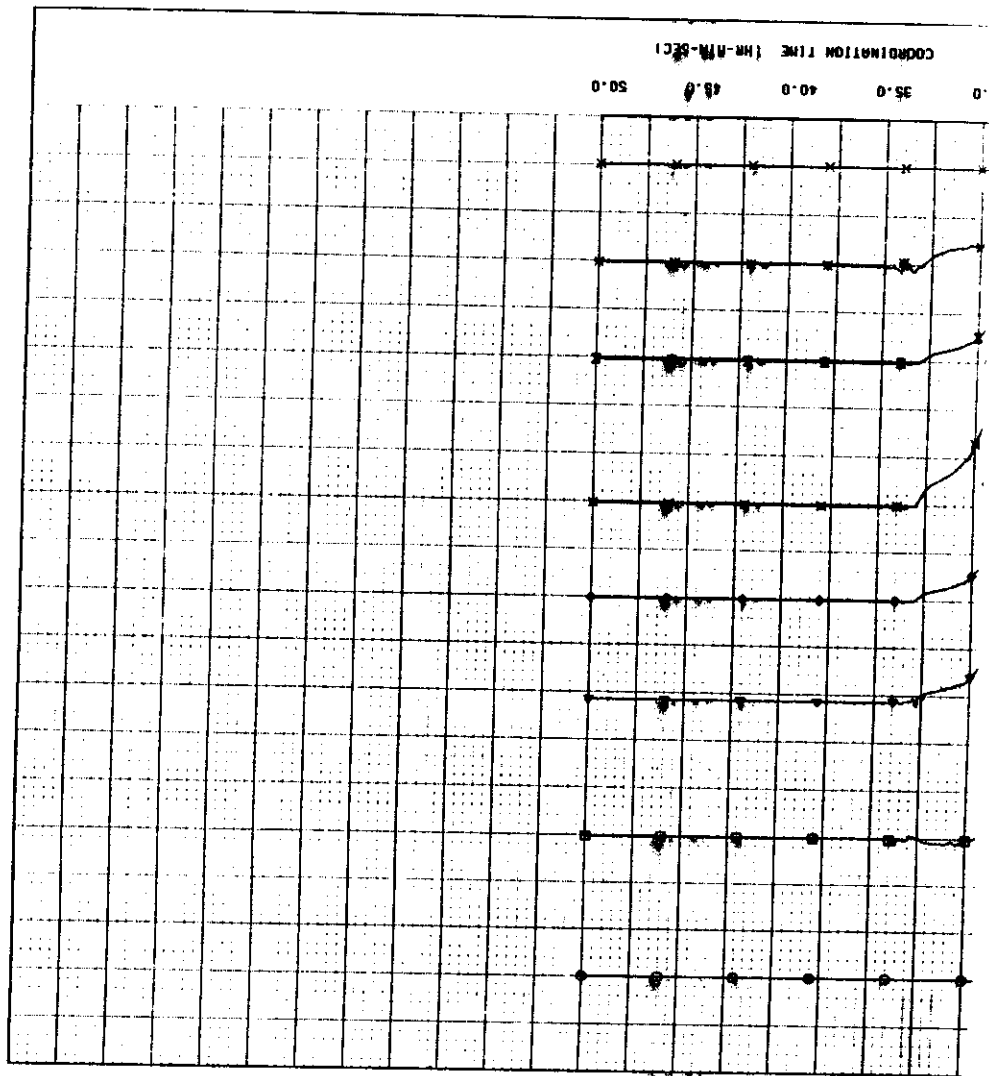


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CALC	REVISED DATE					
CHECK						
APR			TEST 001-09	TEST DATE 03/01/96	81.39.0928	
APR			CONDITION NO.	81.39.0928.321.1		
			THE BOEING COMPANY			
			PROG			

737-200, PG309, RUDDER SYSTEM GROUND TESTING

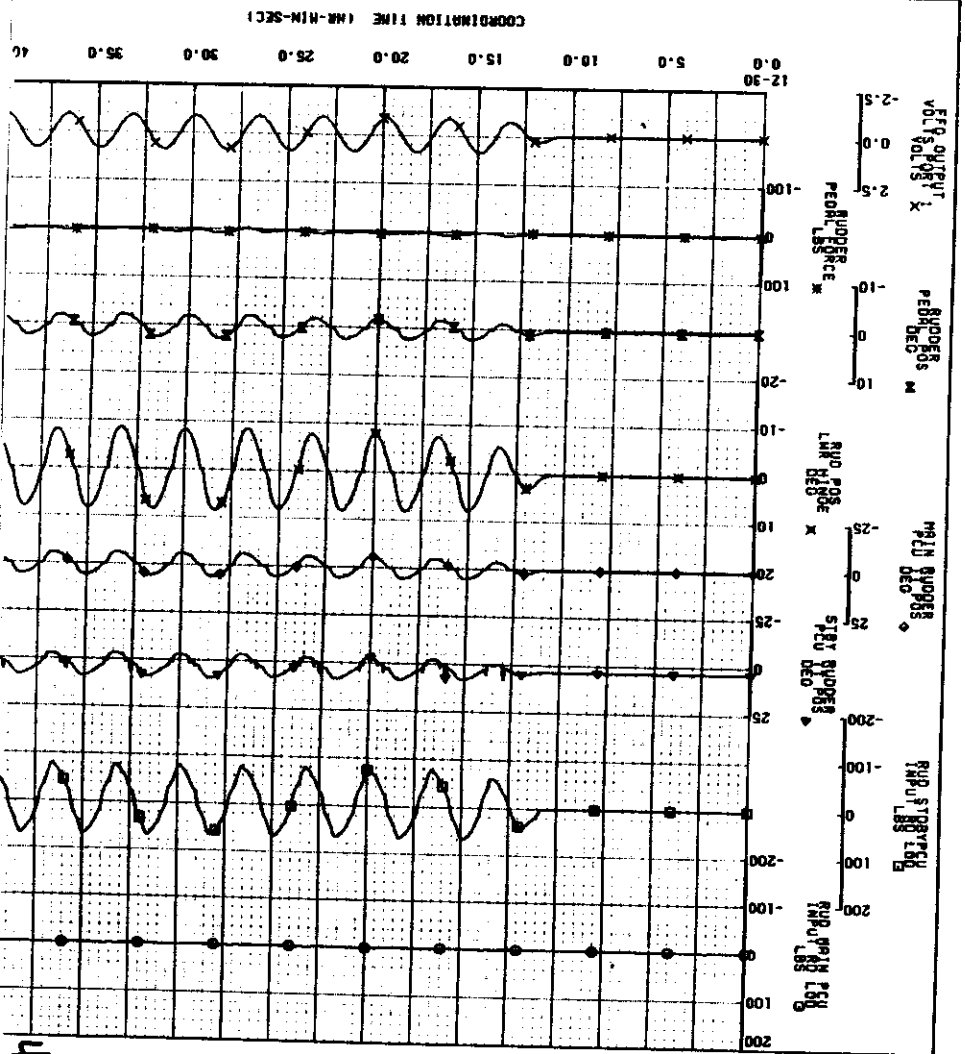
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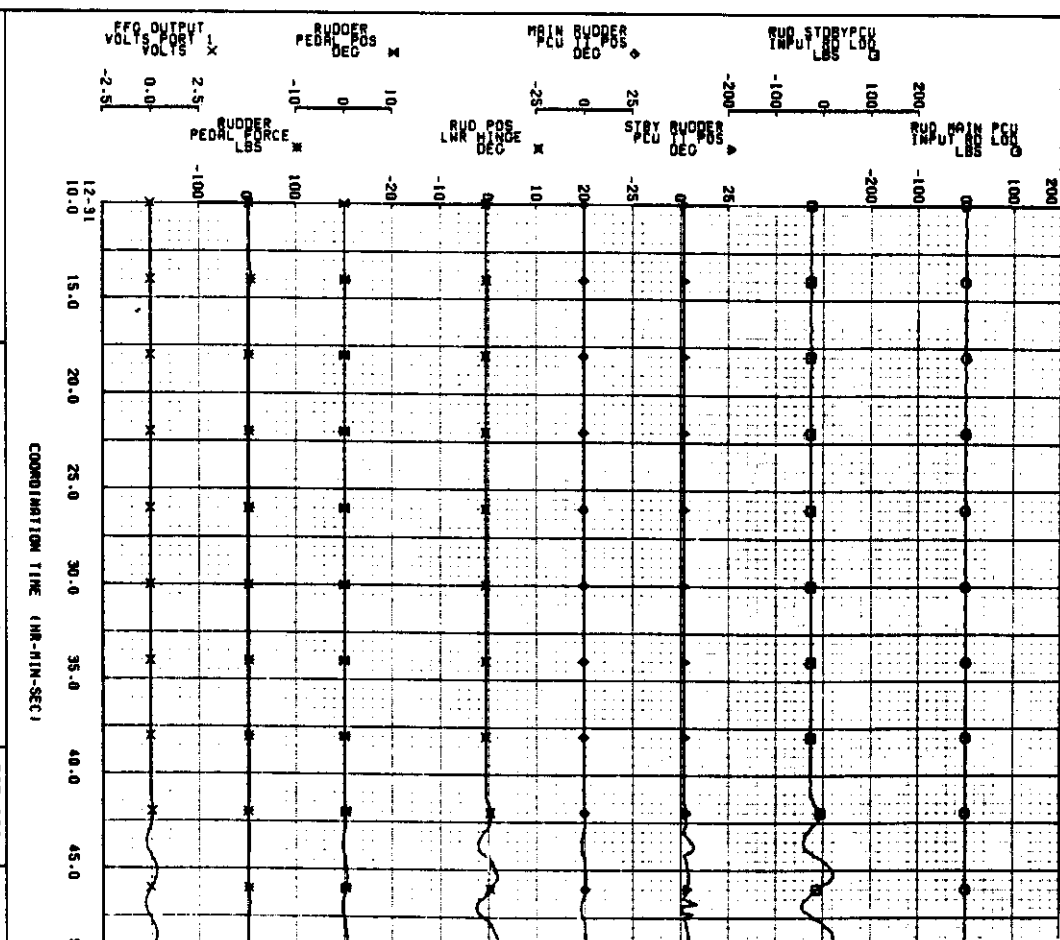
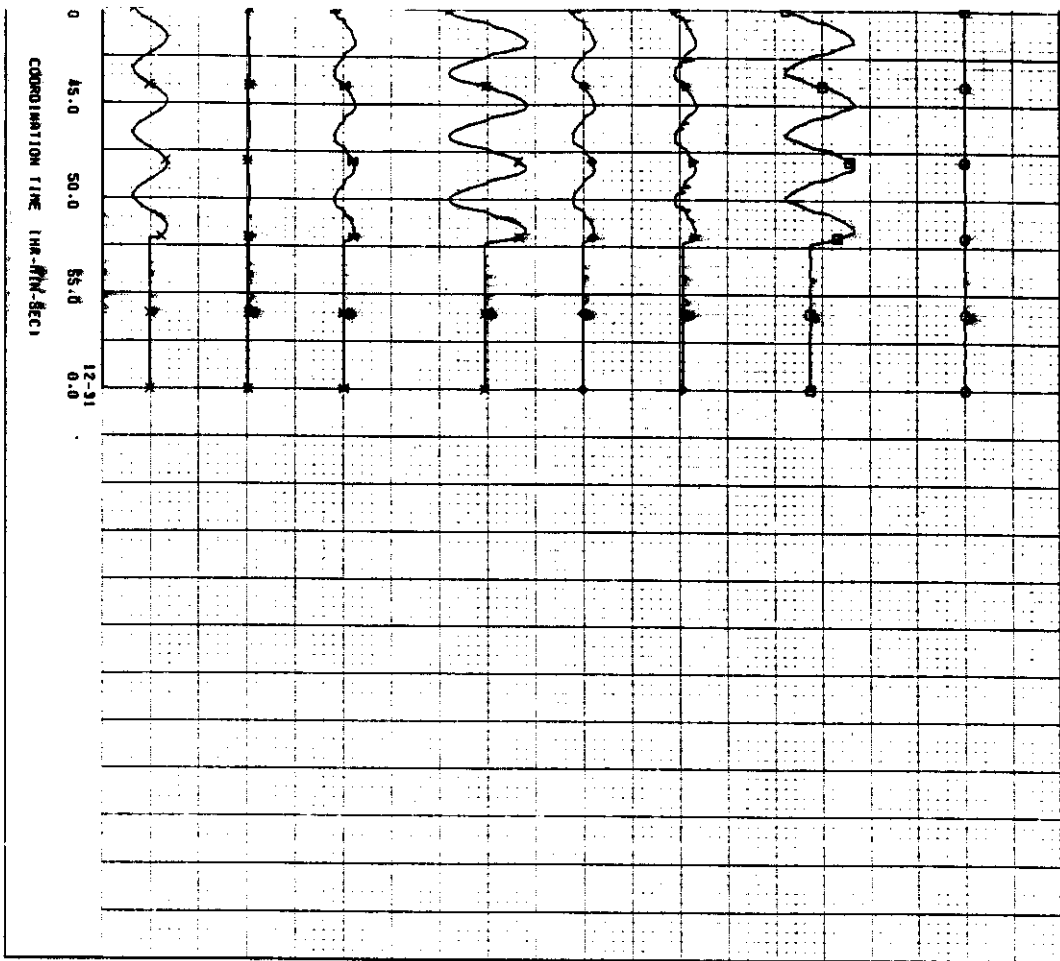




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CALC	REVISED DATE	TIME HISTORY PLOT	737-200	PG309	
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RPR		THE BOEING COMPANY	PAGE		

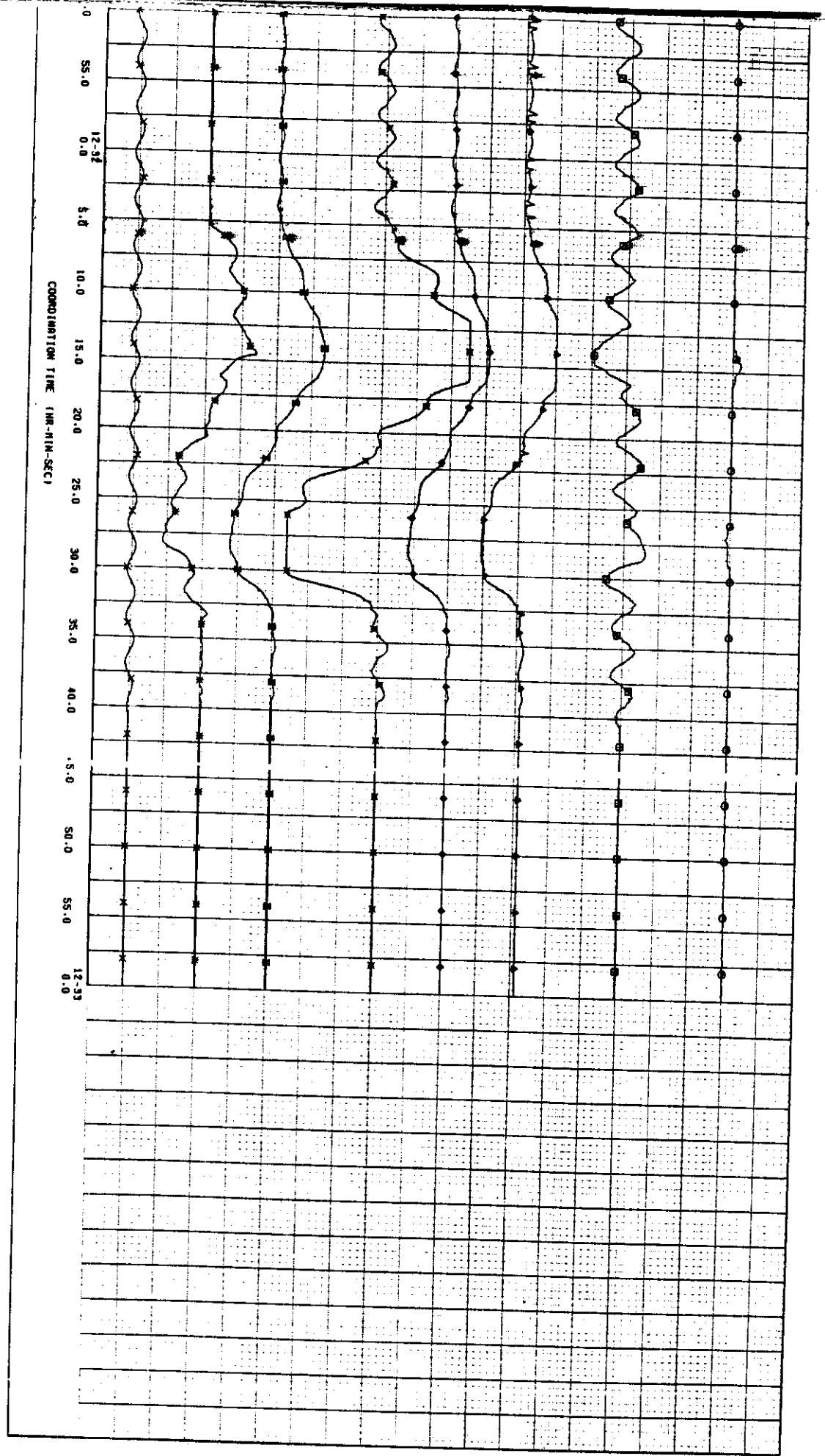
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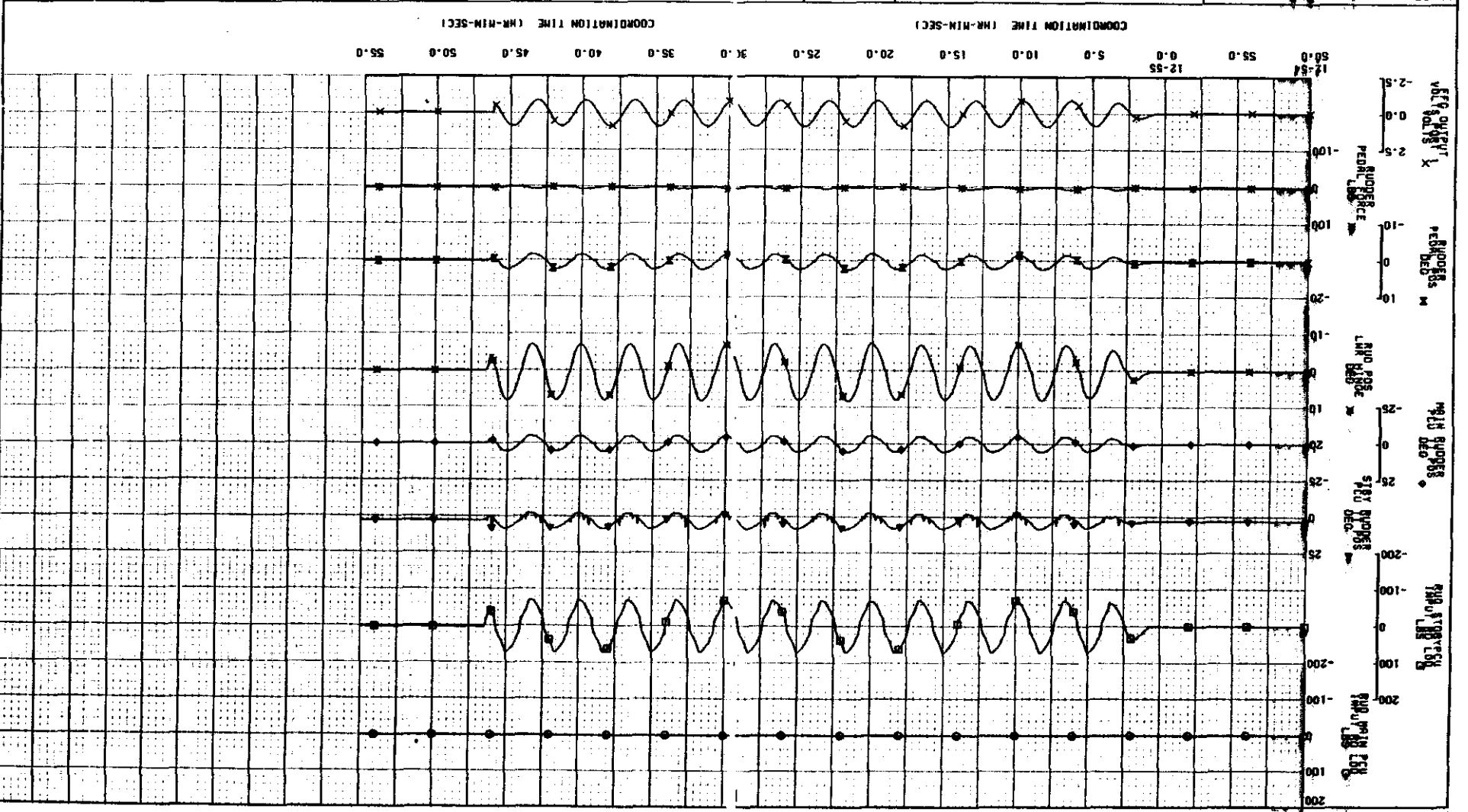


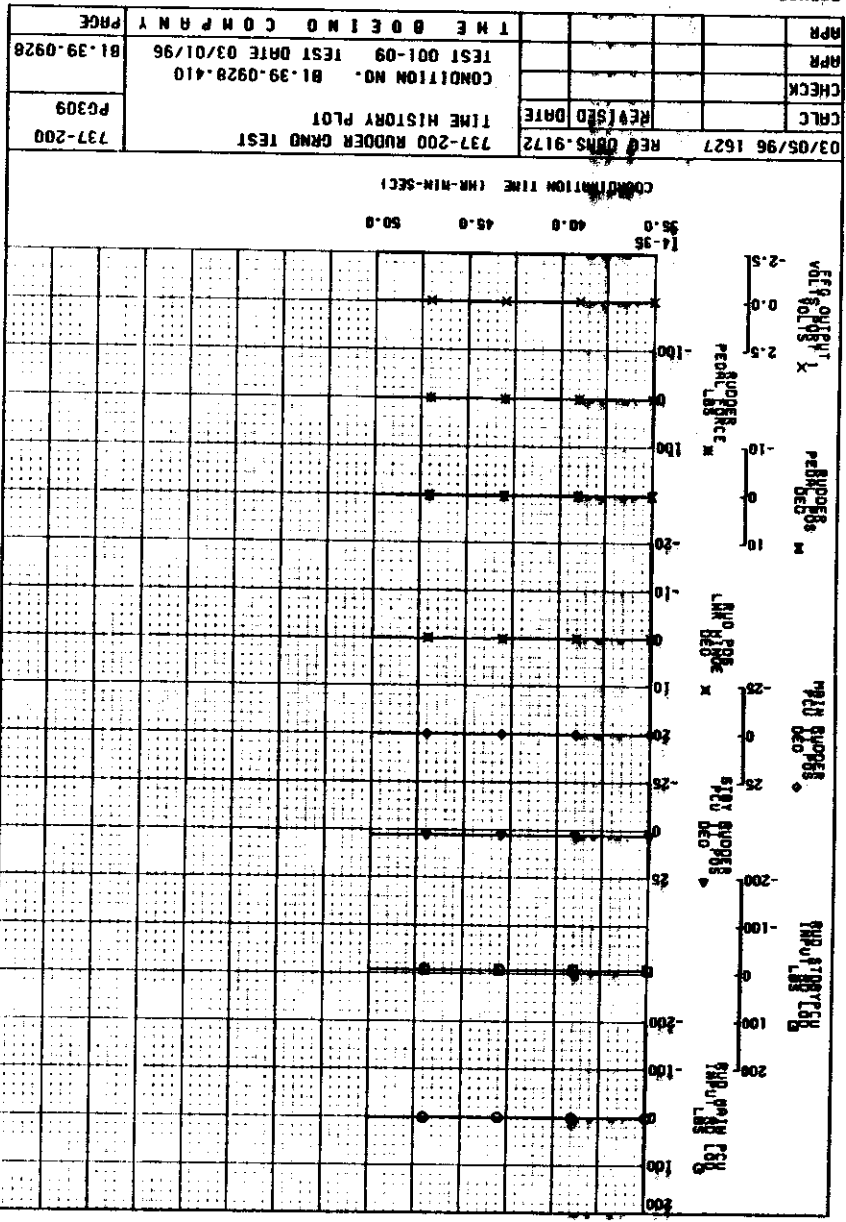
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CRLC	REVISID DATE	TIME HISTORY PLOT	PG309
CHECK		CONDITION NO. 81.39.0928-323	
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RPR		THE BOEING COMPANY	PADE

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737-200, PG309, RUDDER SYSTEM GROUND TESTING

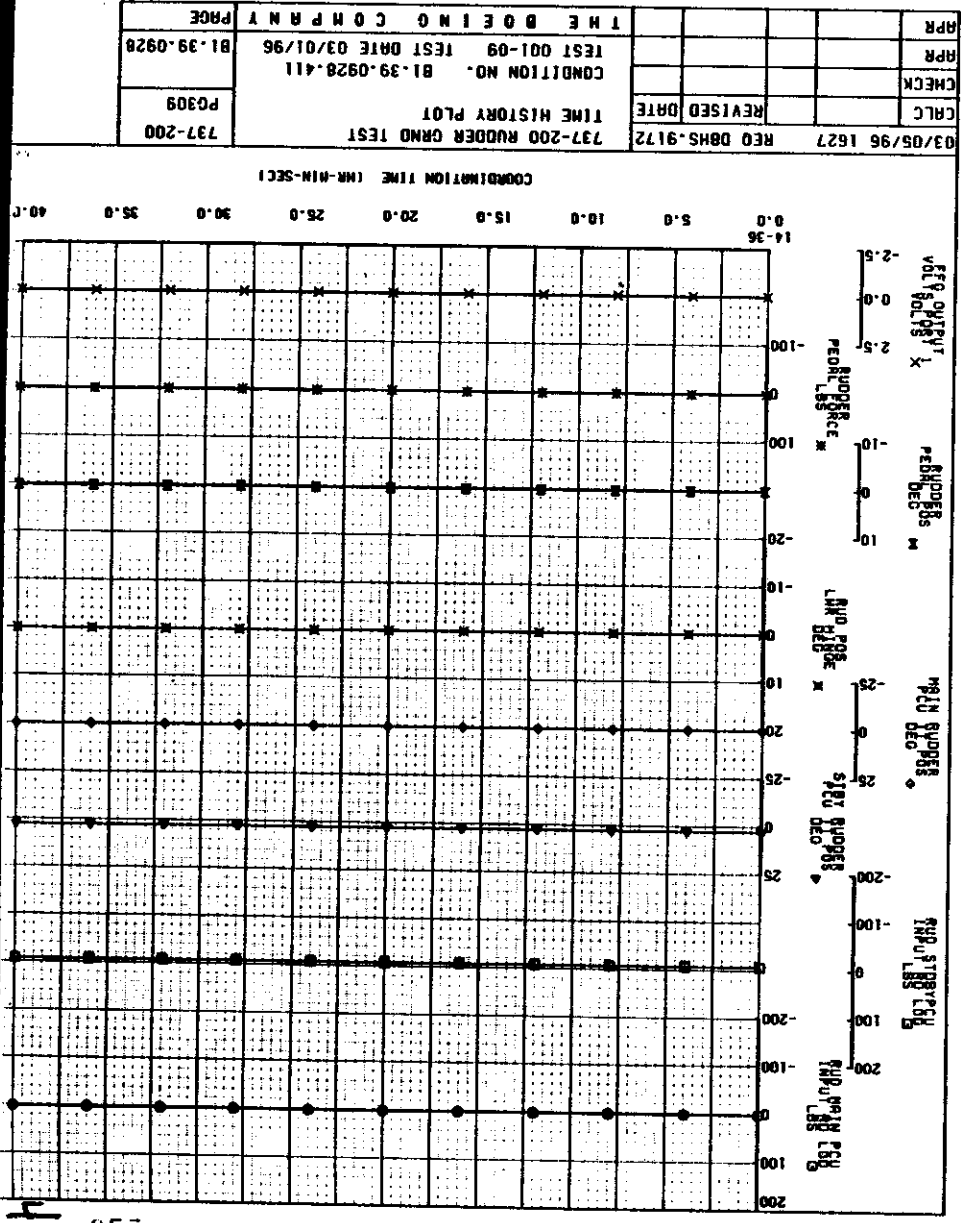


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737-200 RUDDER GRND TEST	TIME HISTORY PLOT	PG309	
CONDITION NO. 81.39.0928.324	TEST DATE 03/01/96	81.39.0928	
THE BOEING COMPANY	PAGE		





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737-200, PG309, RUDDER SYSTEM GROUND TESTING

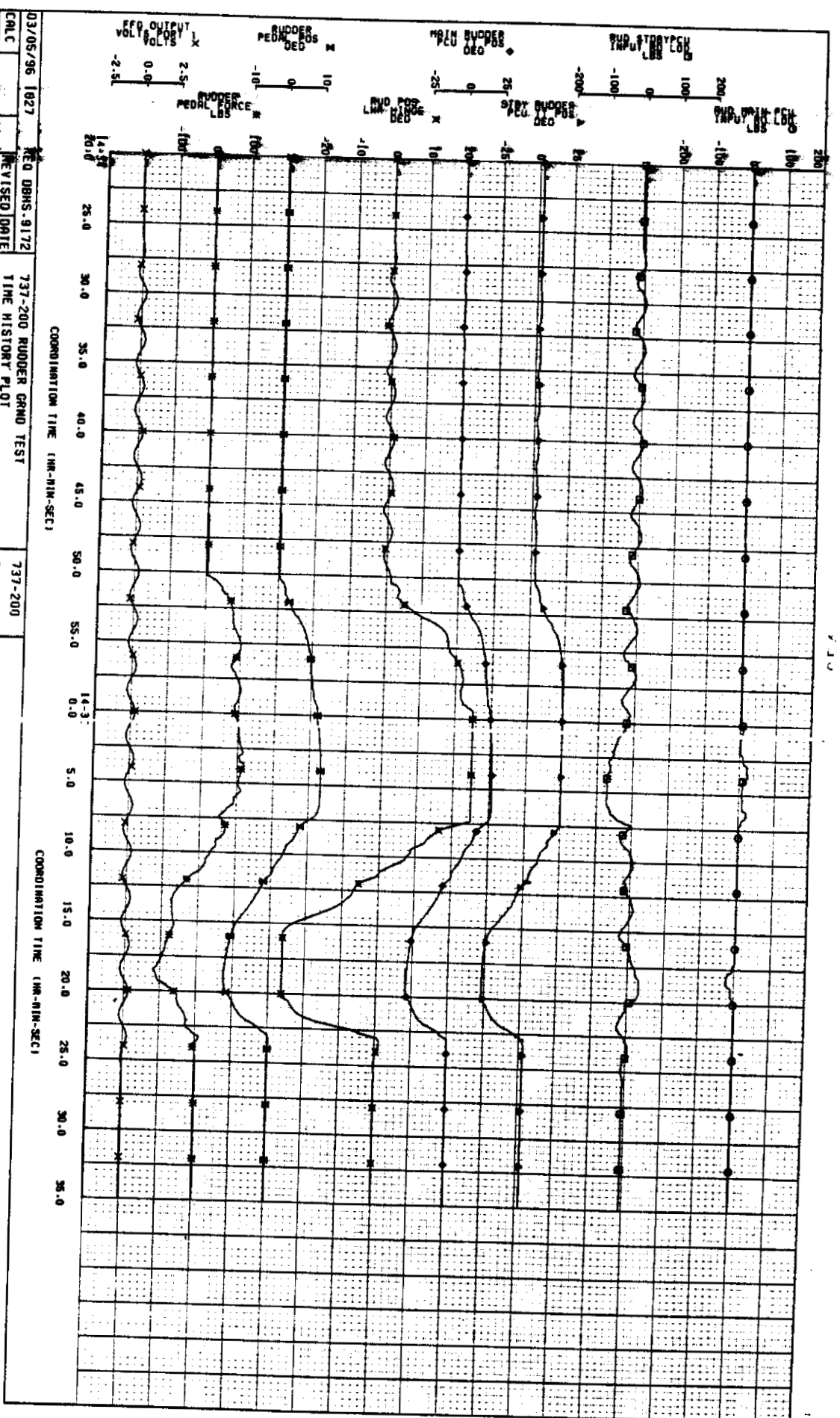


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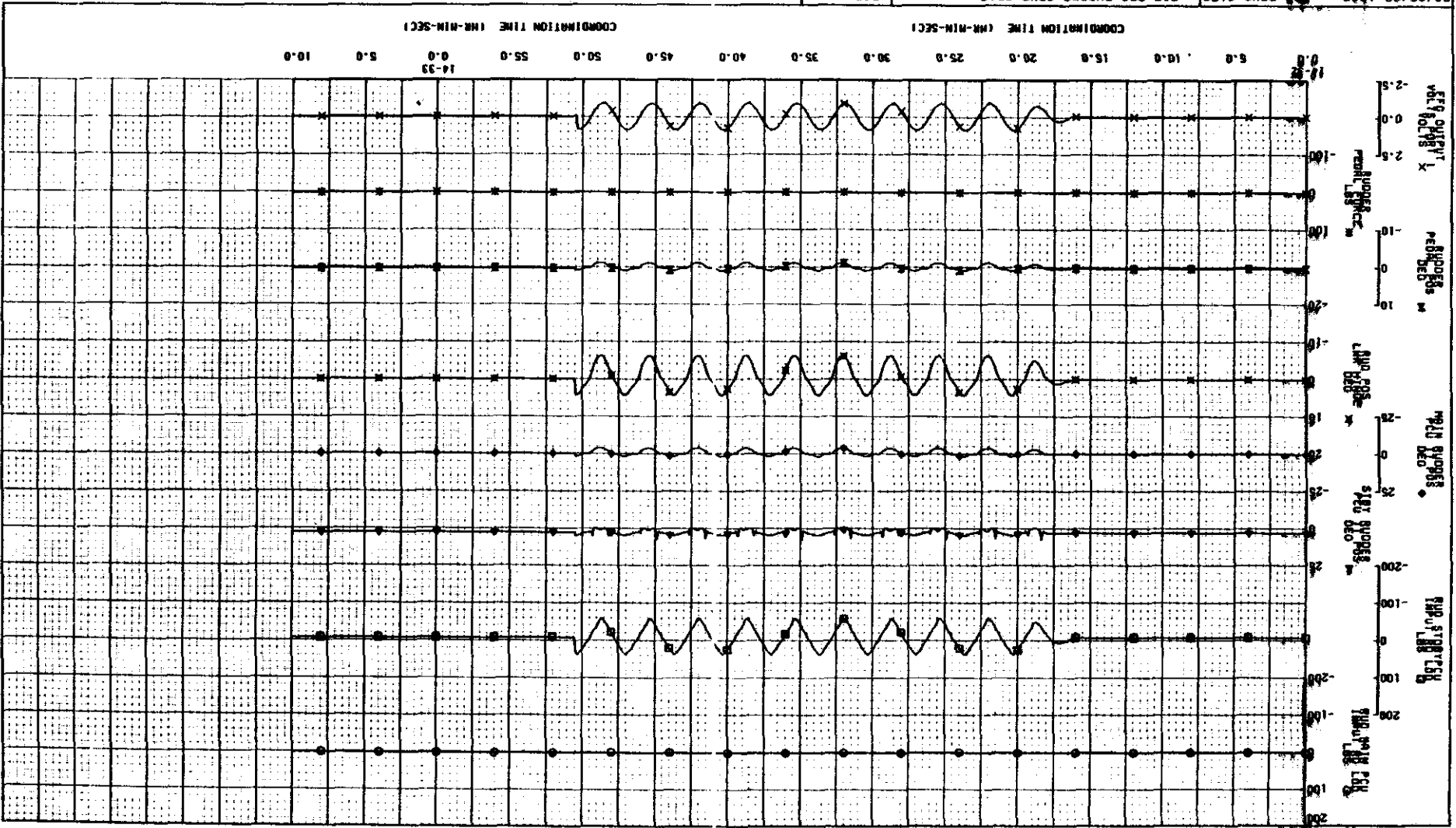
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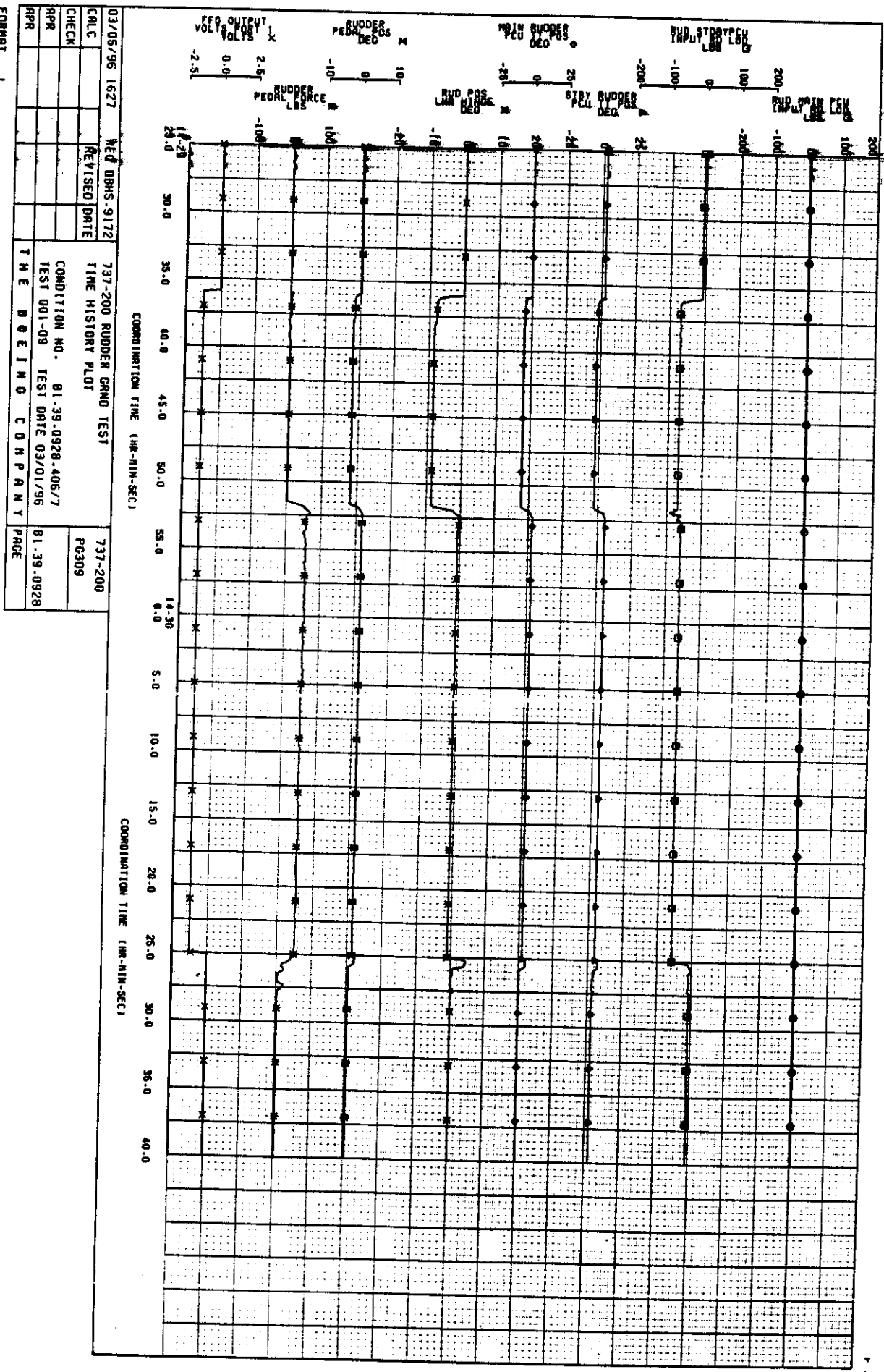
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CALC		REVISED DATE		TIME HISTORY PLOT		PG309	
CHECK				CONDITION NO. 81.39.0928.409			
RPR				TEST DATE 03/01/96		81.39.0928	
RPR				THE BOEING COMPANY		PAGE	

FORMAT 737-200, PG309, RUDDER SYSTEM GROUND TESTING



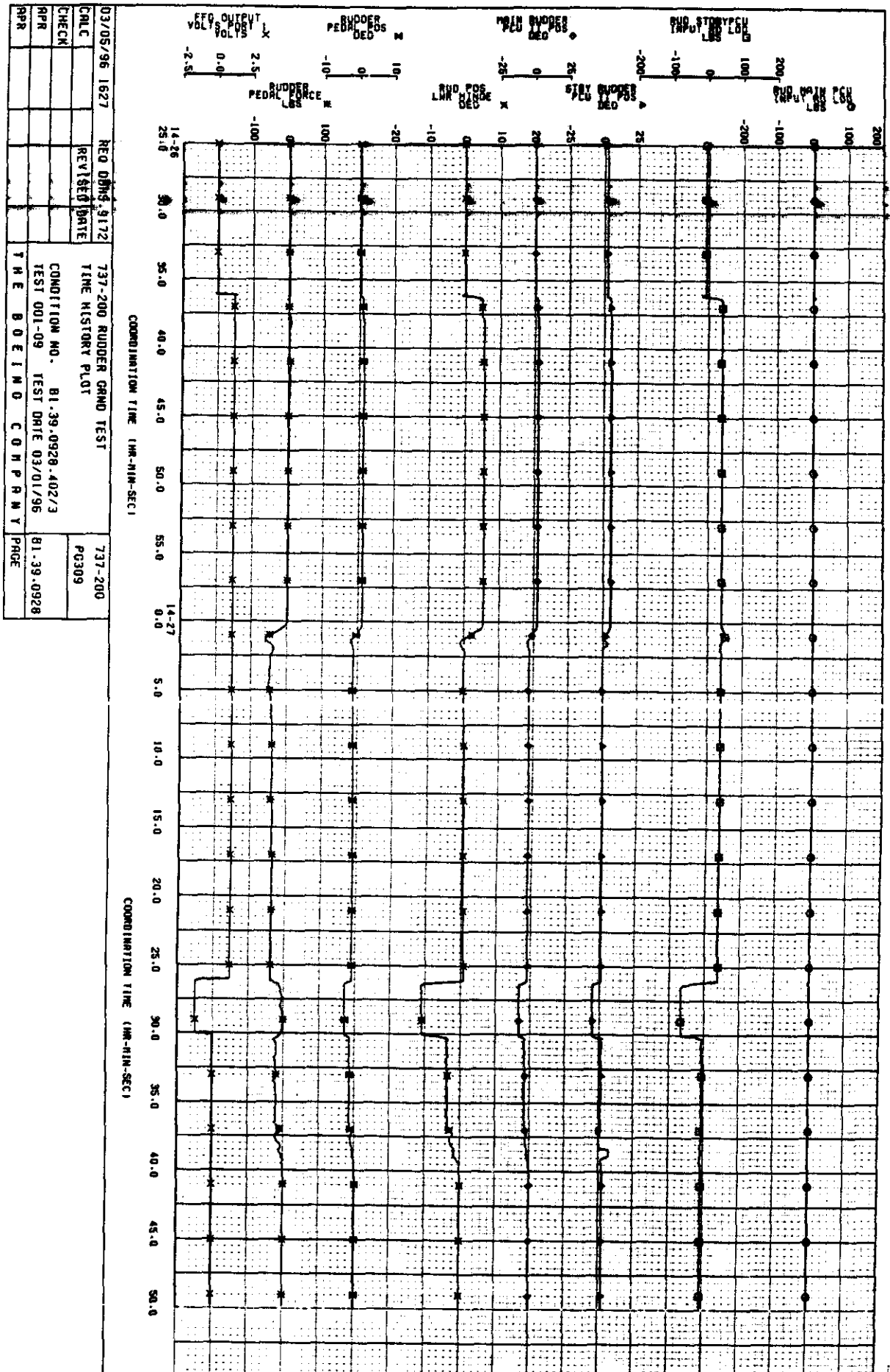
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CHECK		TEST 001-09	81-39-0928
APR		THE BOEING COMPANY	





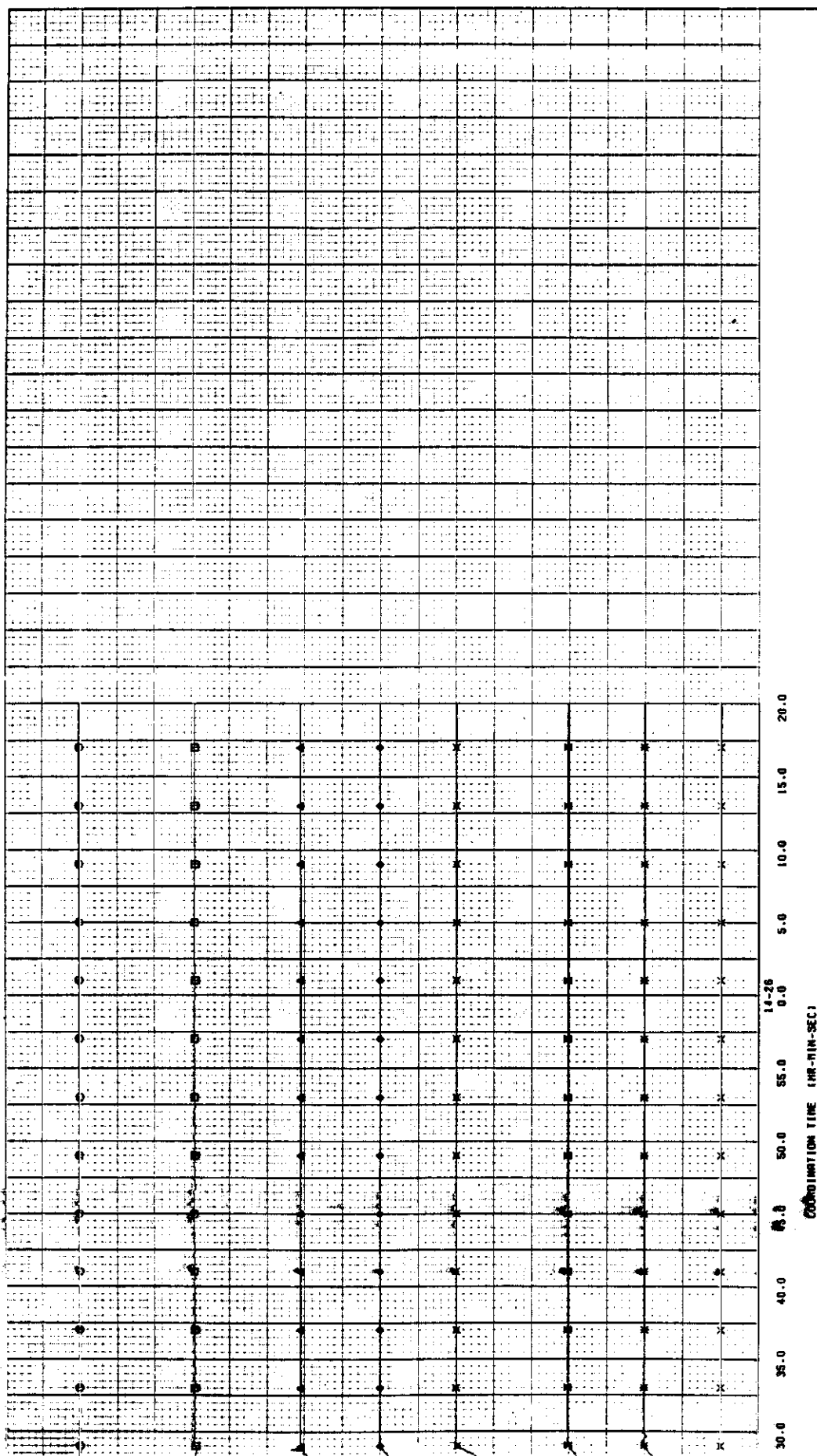
FORM 1
 737-200, PG309, RUDDER SYSTEM GROUND TESTING

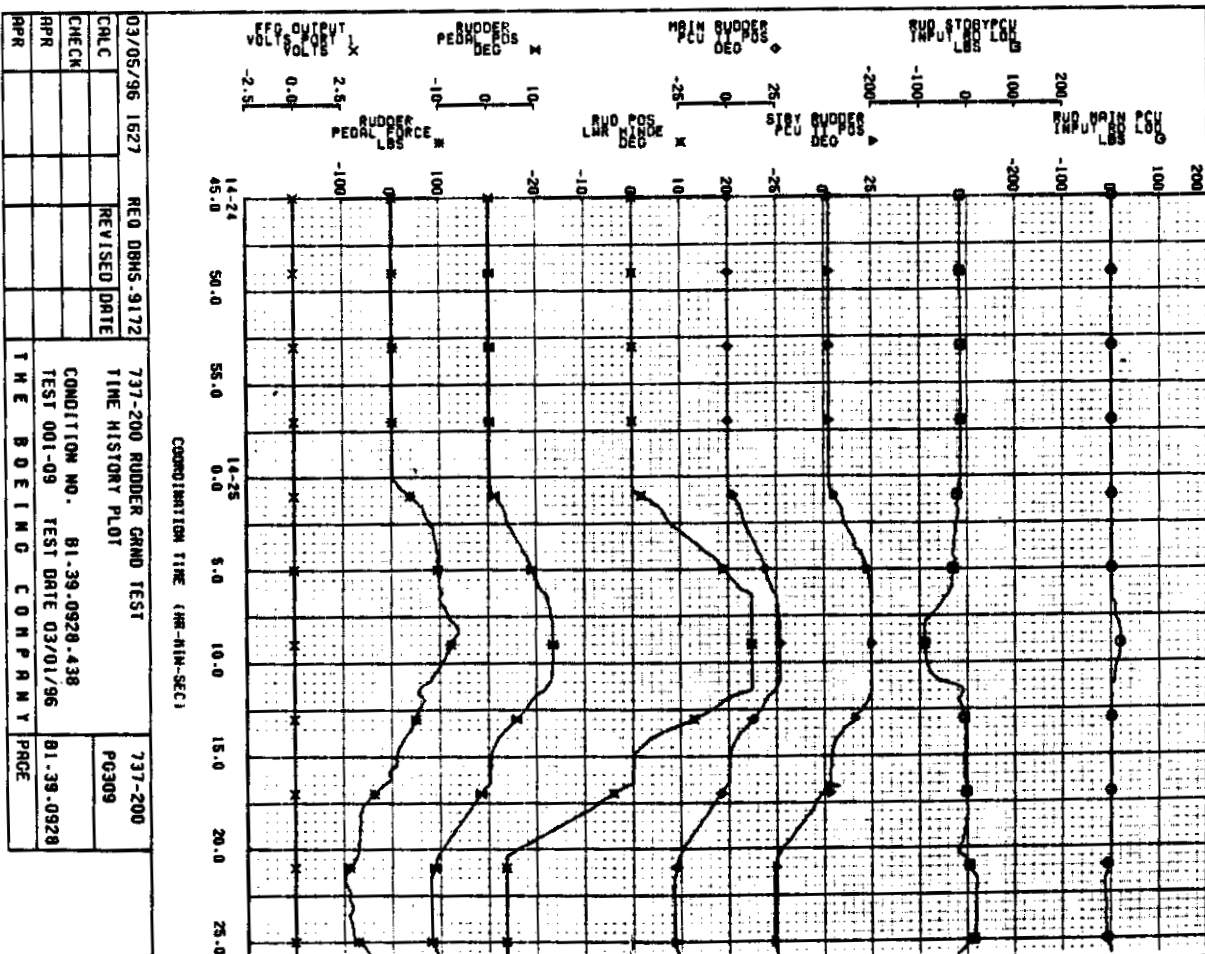
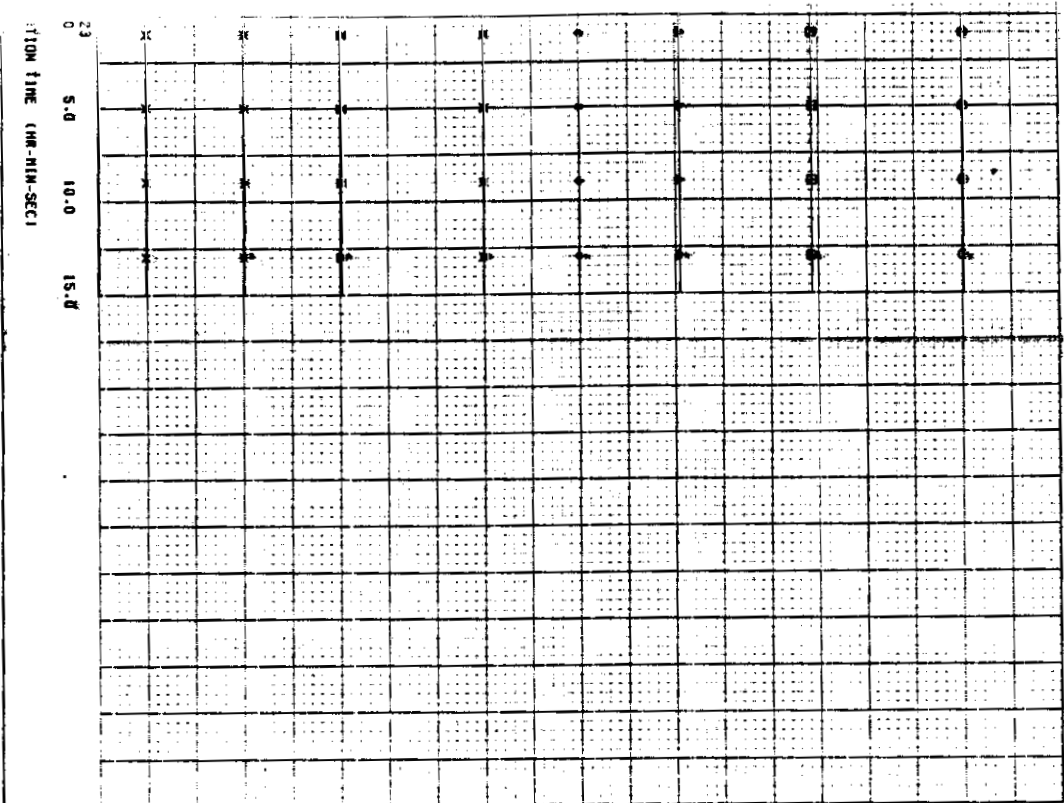
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FORM 1
 737-200, PG309, RUDDER SYSTEM GROUND TESTING

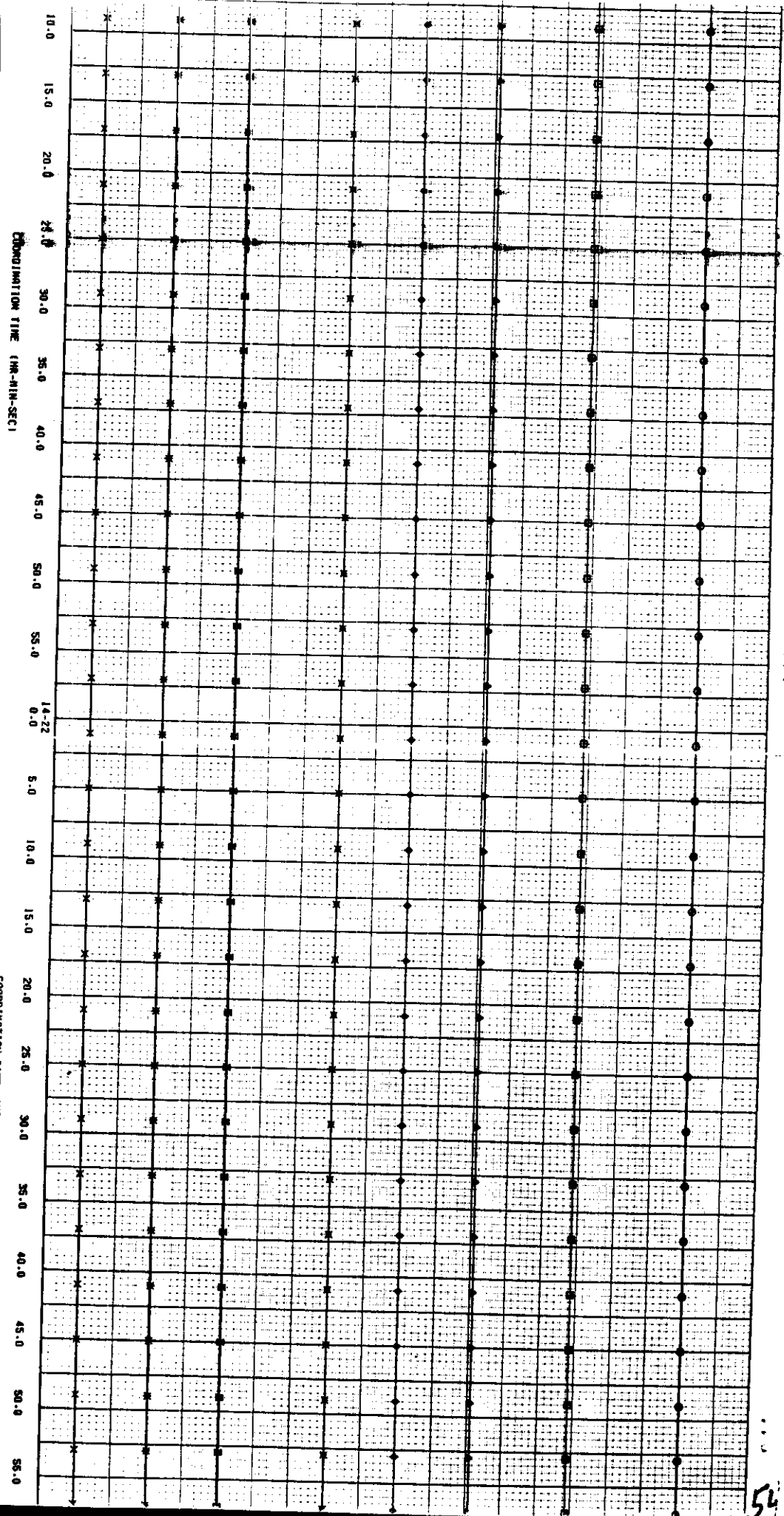
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	REVISED DATE	TIME HISTORY PLOT	PG309
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CHECK		TEST 001-09 TEST DATE 03/01/96	
APR		THE BOEING COMPANY	
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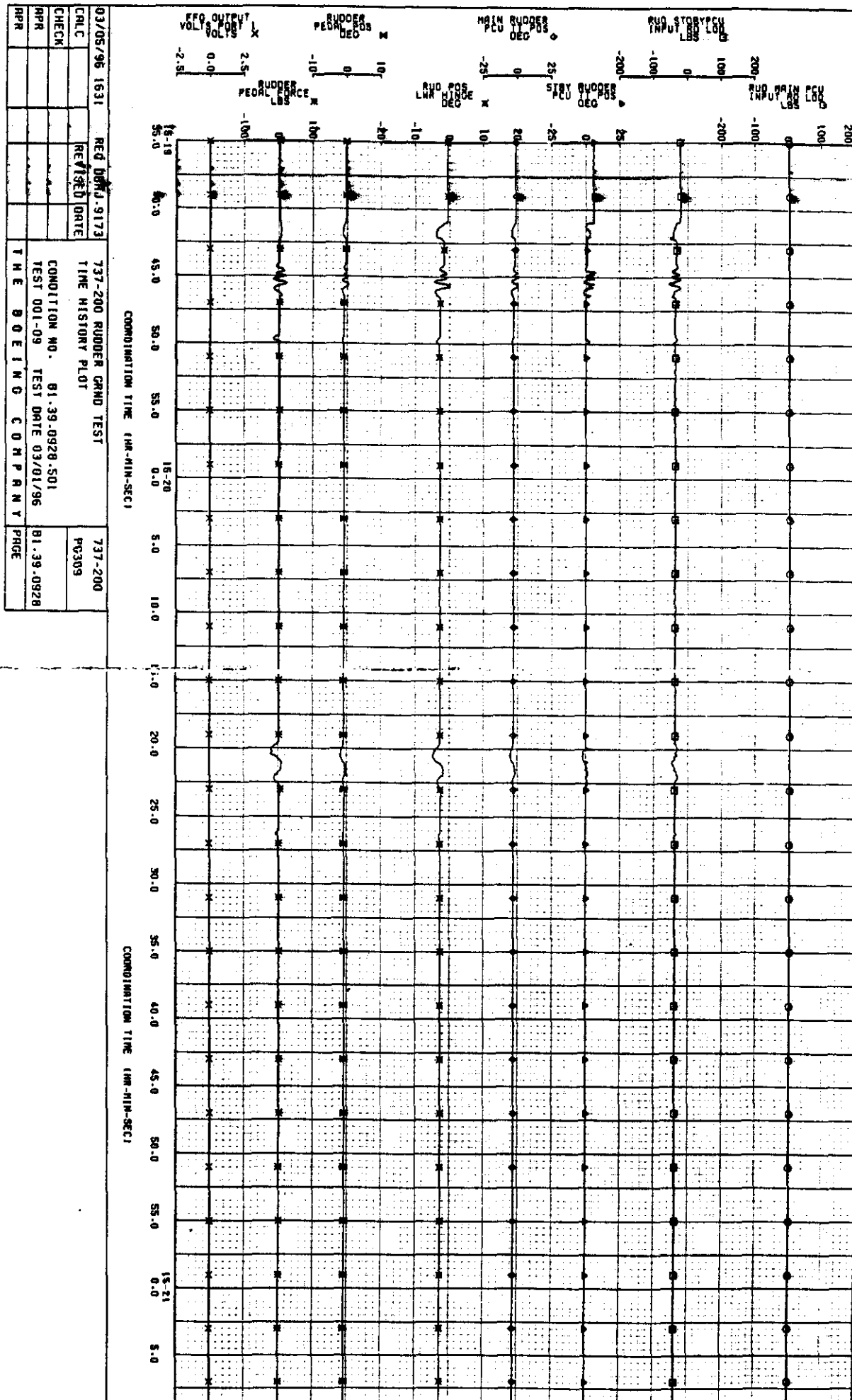


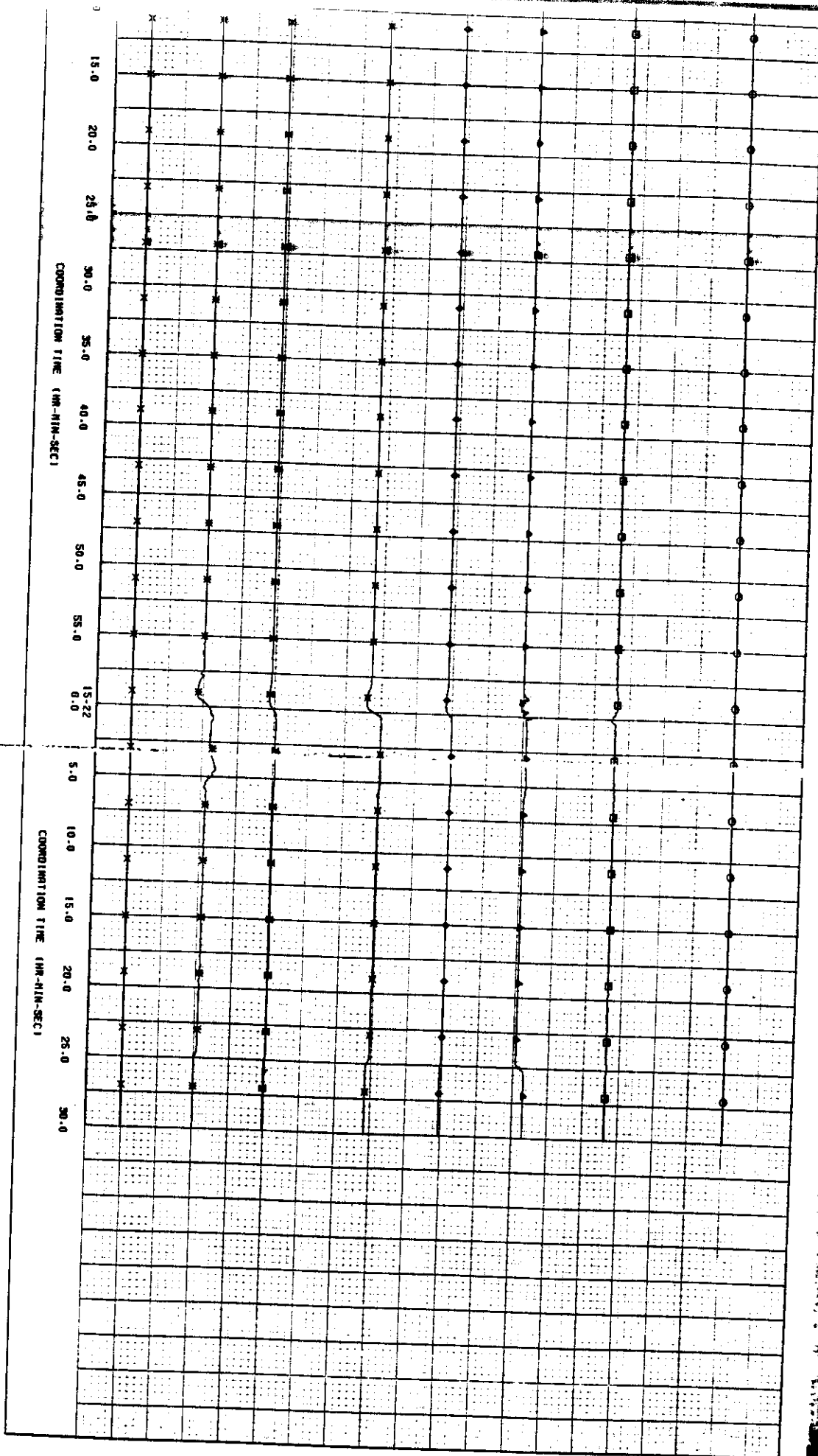


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737-200, PC309, RUDDER SYSTEM GROUND TESTING

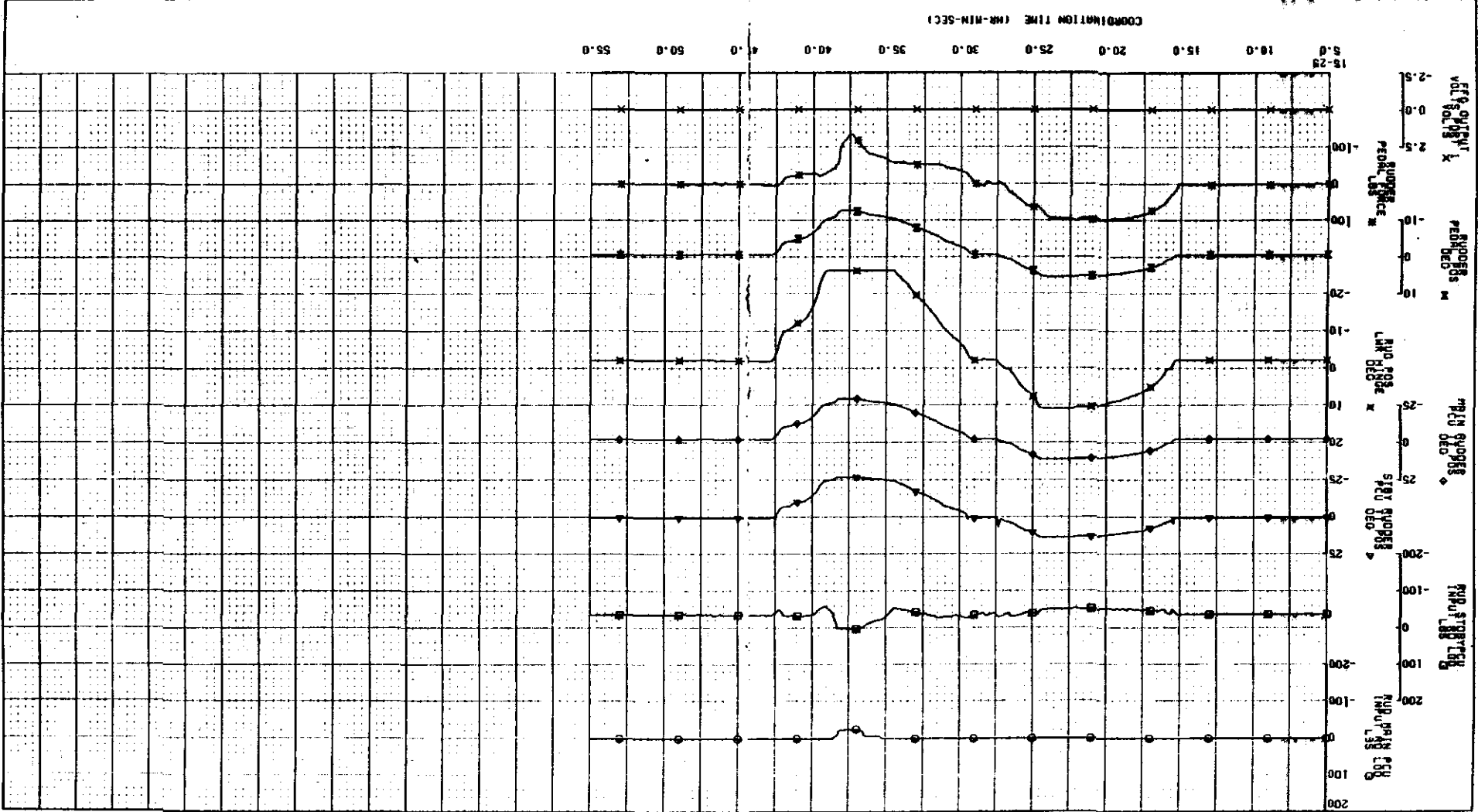
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CALC	REVIS	TIME HISTORY PLOT	PC309
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RPR		TEST 001-09 TEST DATE 03/01/96	81-39-0928
RPR		THE BOEING COMPANY	PRCE

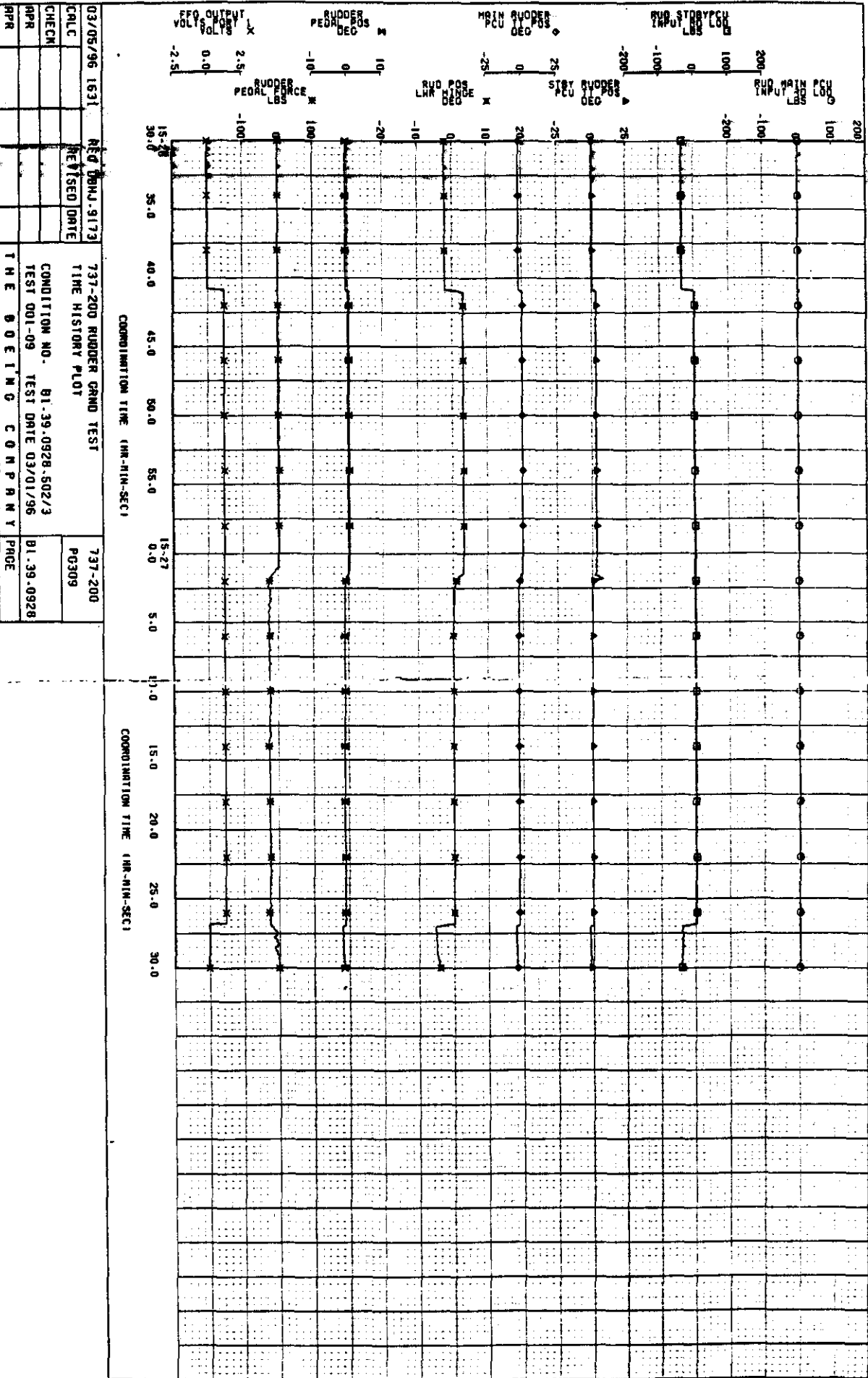




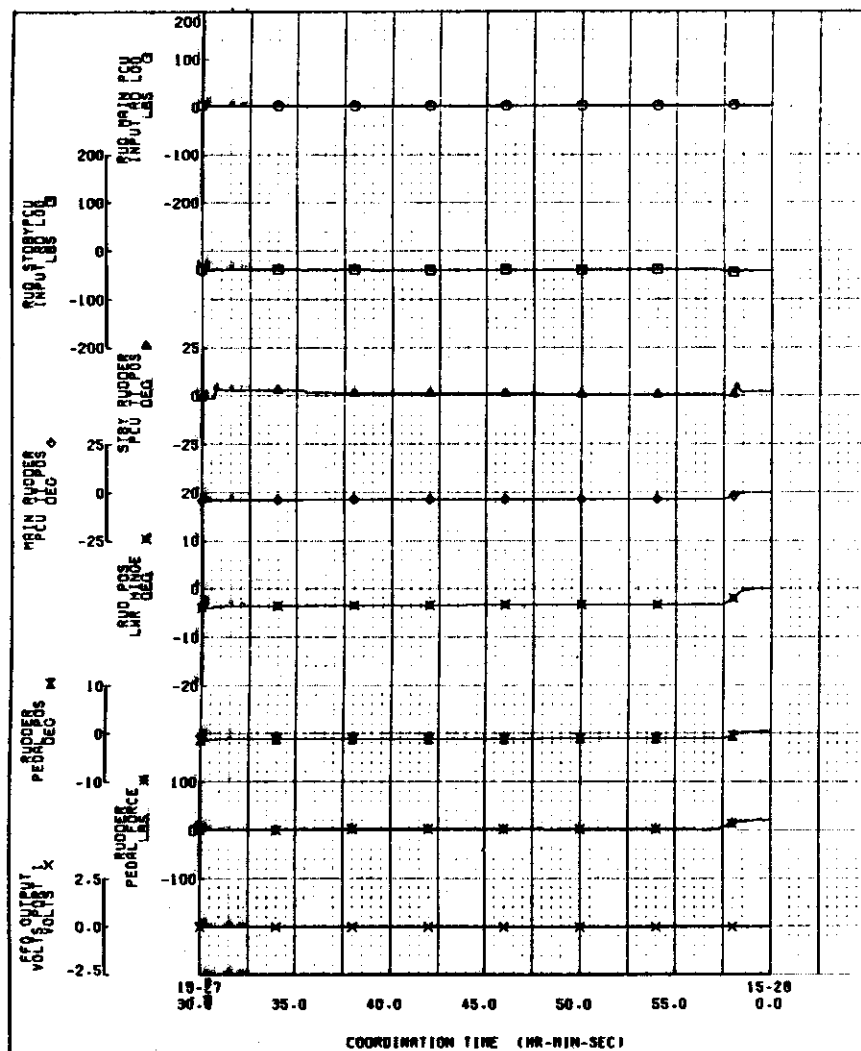


FORM 1	TIME BOEING COMPANY	PAGE
REVISION 9173	CONDITION NO. B1-39-0928-538	BL-39-0928
TEST DATE 03/01/96	TIME HISTORY PLOT	PG309
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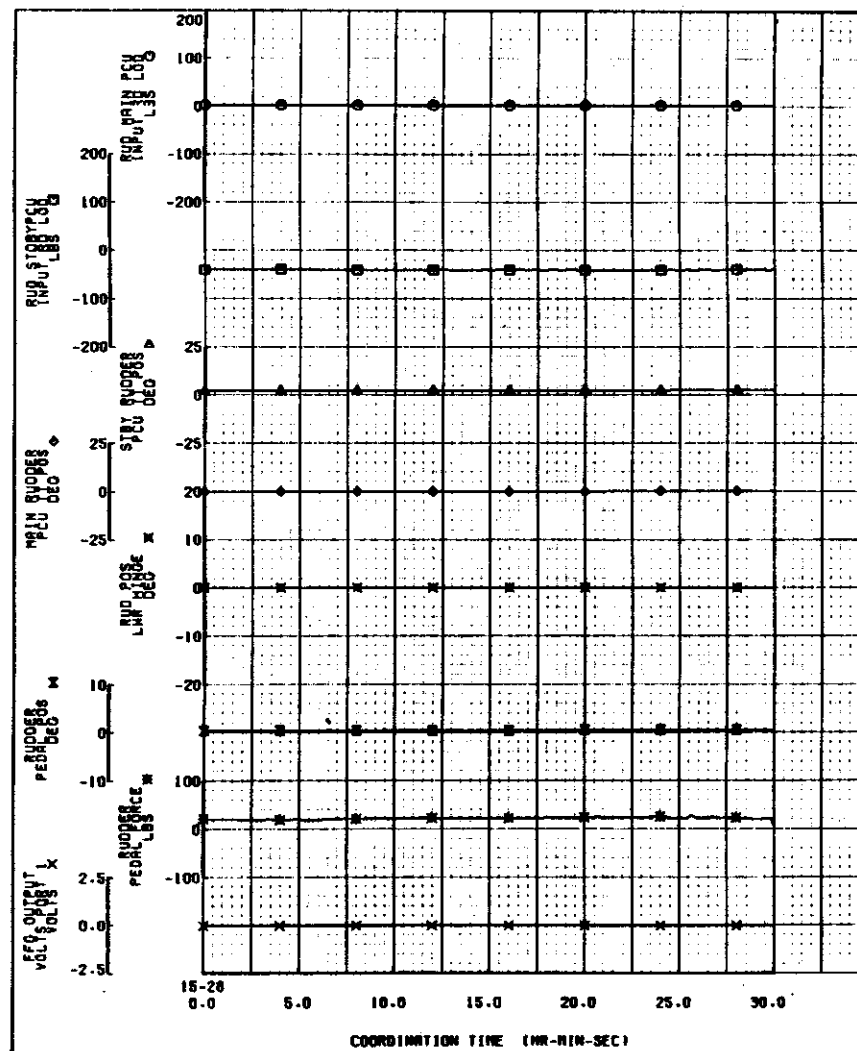


FORMAT 1
737-200. PG309. RUDDER SYSTEM GROUND TESTING



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CHECK		CONDITION NO. 81.39.0928.504	
APR		TEST 001-09 TEST DATE 03/01/96	81.39.0928
APR		THE BOEING COMPANY	PAGE

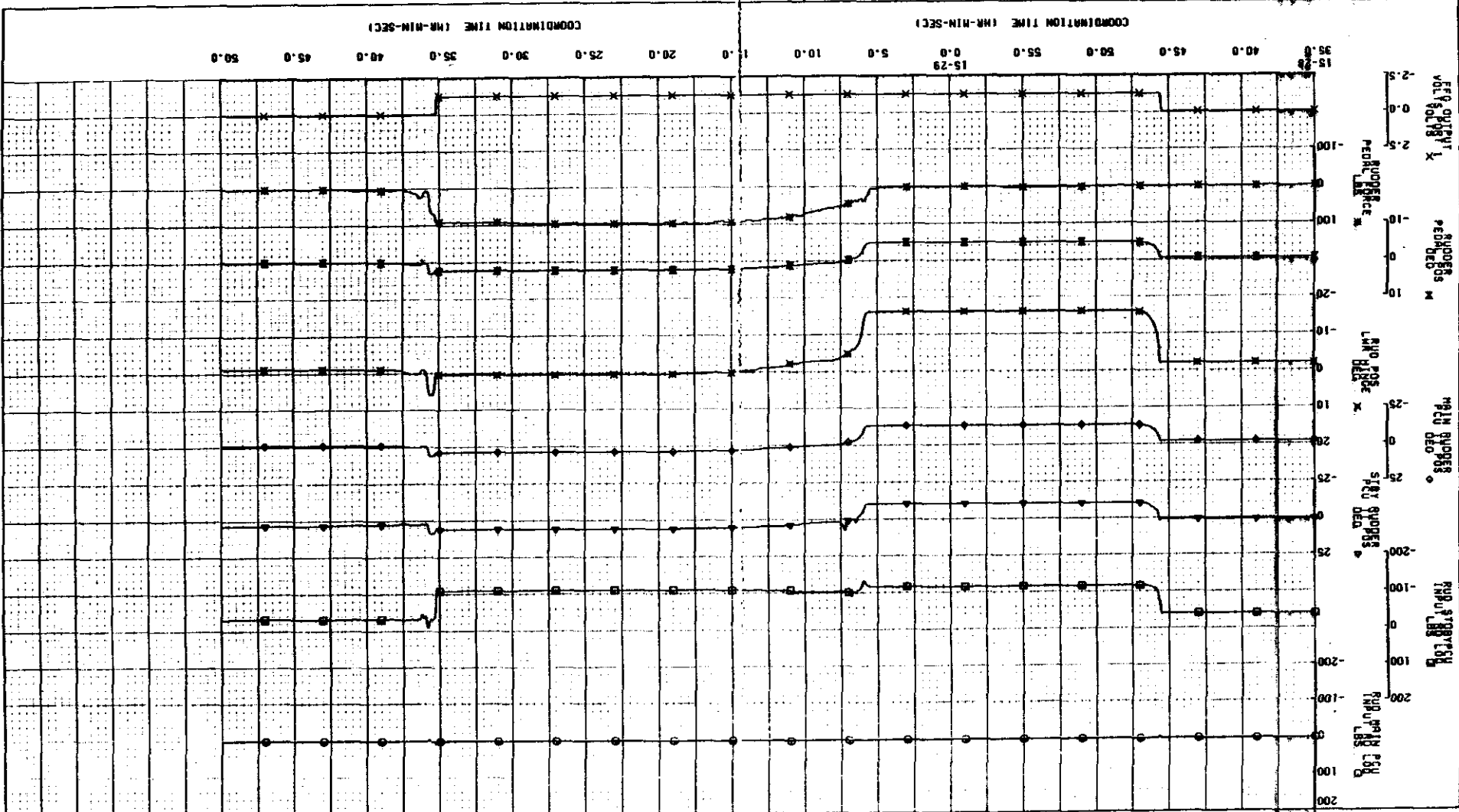
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737-200, PG309, RUDDER SYSTEM GROUND TESTING

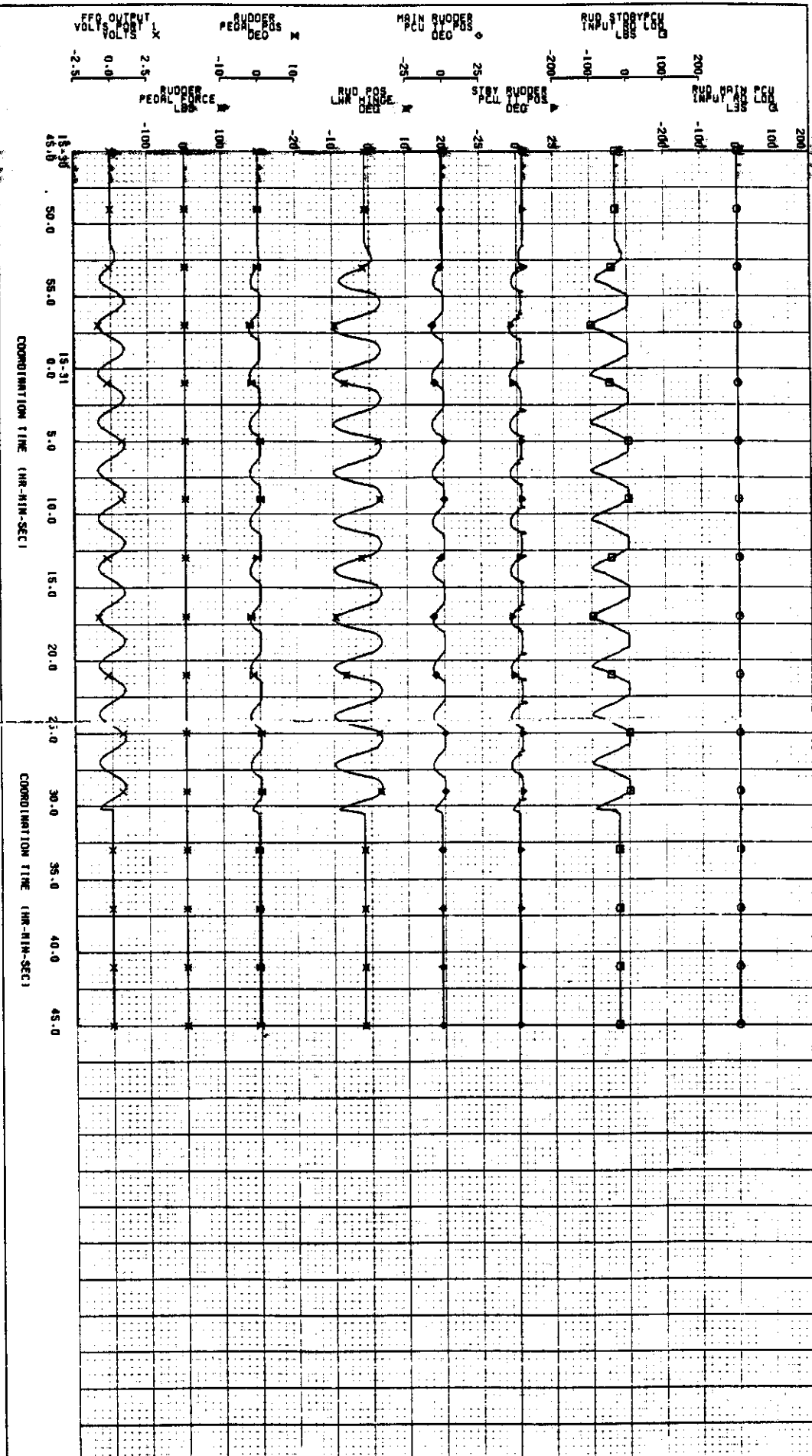


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CALC	REVISED DATE	TIME HISTORY PLOT	PG309
CHECK		CONDITION NO. 81.39.0928.505	
APR		TEST 001-09 TEST DATE 03/01/96	81.39.0928
APR		THE BOEING COMPANY	PAGE

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737-200, PG309, RUDDER SYSTEM GROUND TESTING

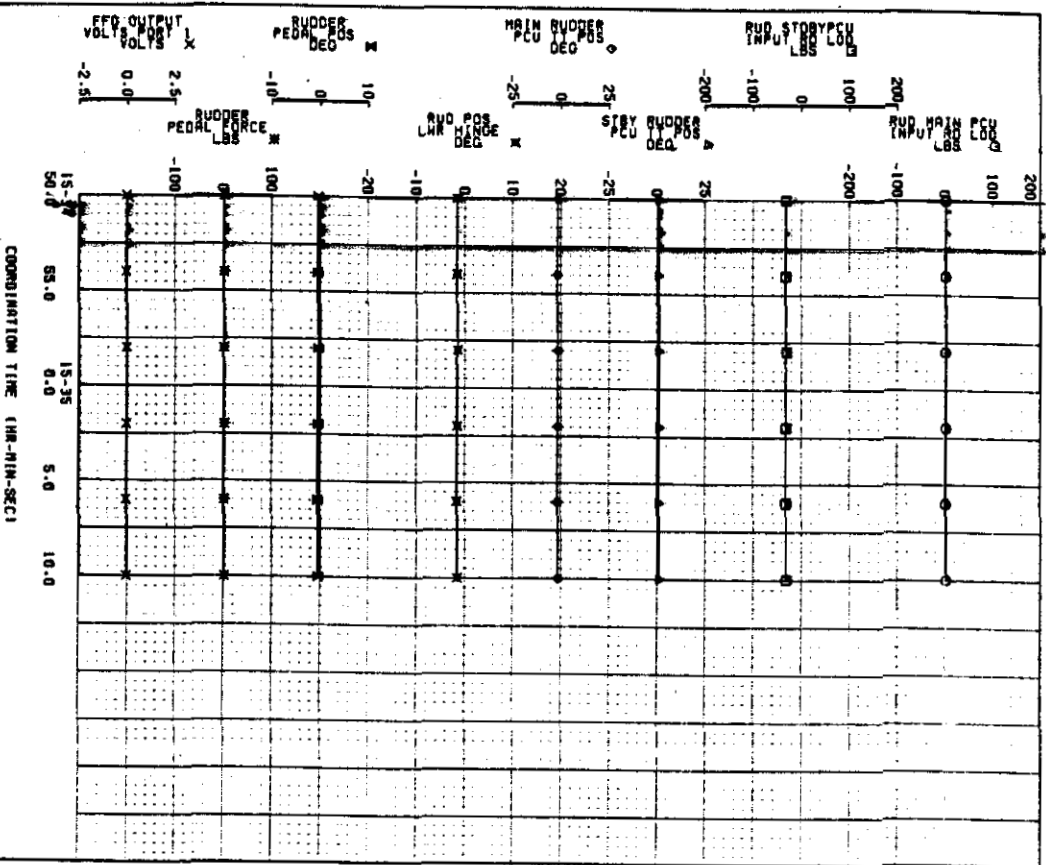
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CALC	TEST DATE	TIME HISTORY PLOT	PG309
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APR		TEST 001-09 TEST DATE 03/01/96	PAGE
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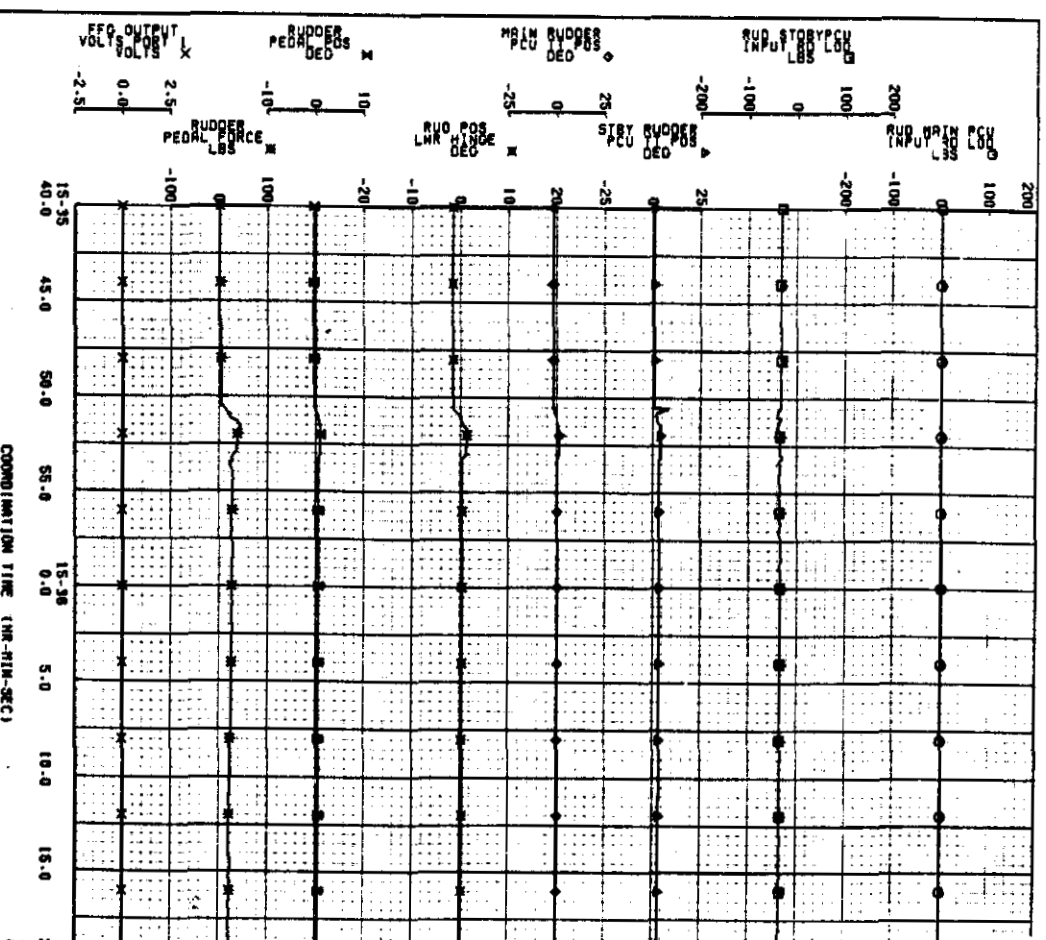
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CALC		REVISED DATE		TIME HISTORY PLOT		PG309	
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RPR				TEST 001-09 TEST DATE 03/01/96		B1-39-0928	
RPR				THE BOEING COMPANY		PAGE	

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737-200, PG309, RUDDER SYSTEM GROUND TESTING



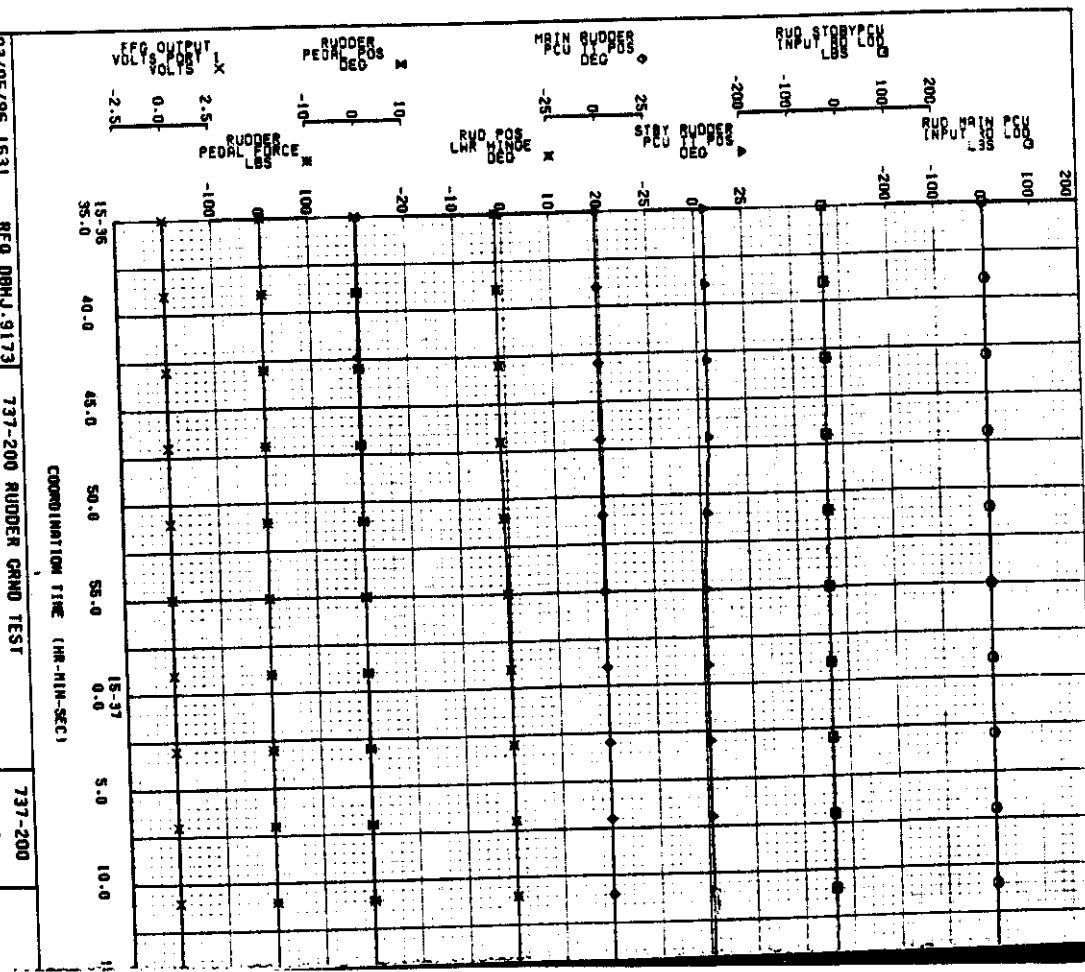
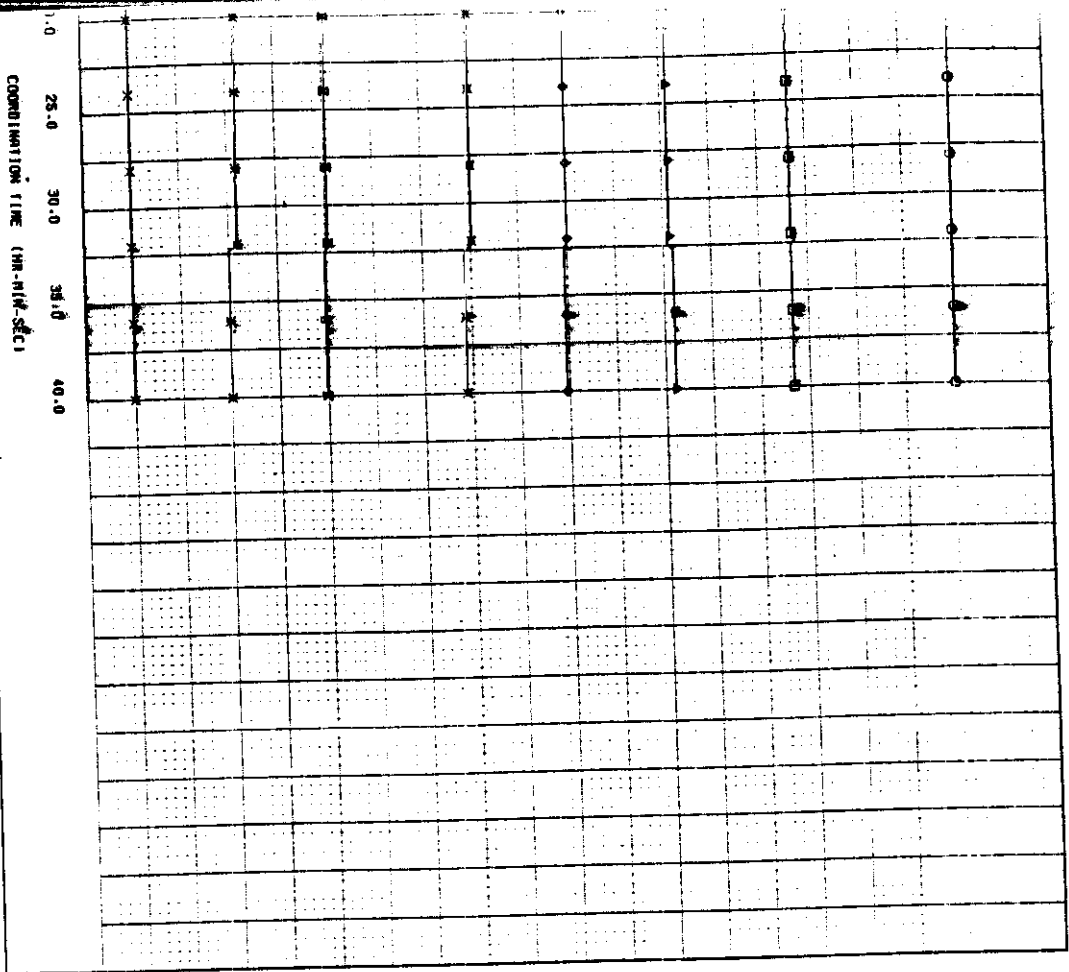
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CALC	REVISED DATE	TIME HISTORY PLOT	PG309
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FORMAT 1
737-200, PG309, RUDDER SYSTEM GROUND TESTING



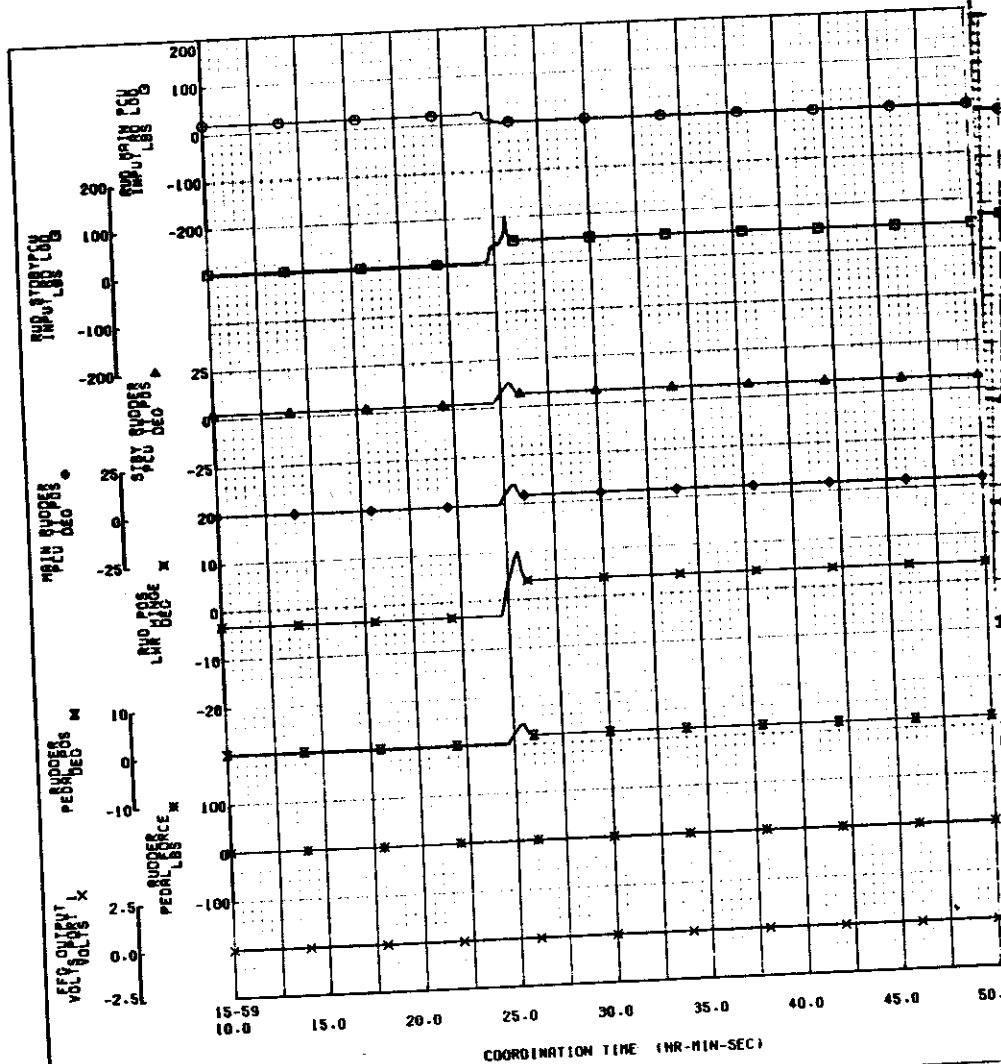
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CALC	REVISED DATE	TIME HISTORY PLOT	PG309
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737-200, PG309, RUDDER SYSTEM GROUND TESTING



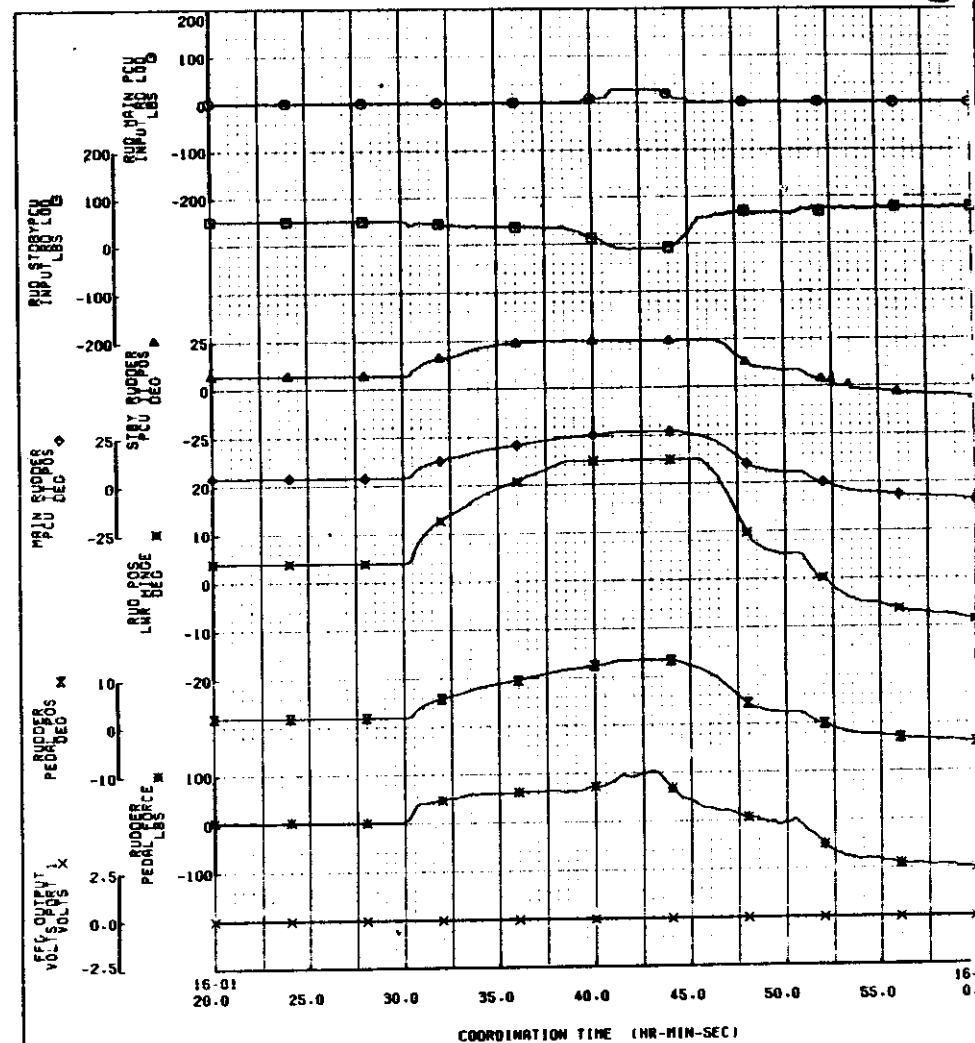
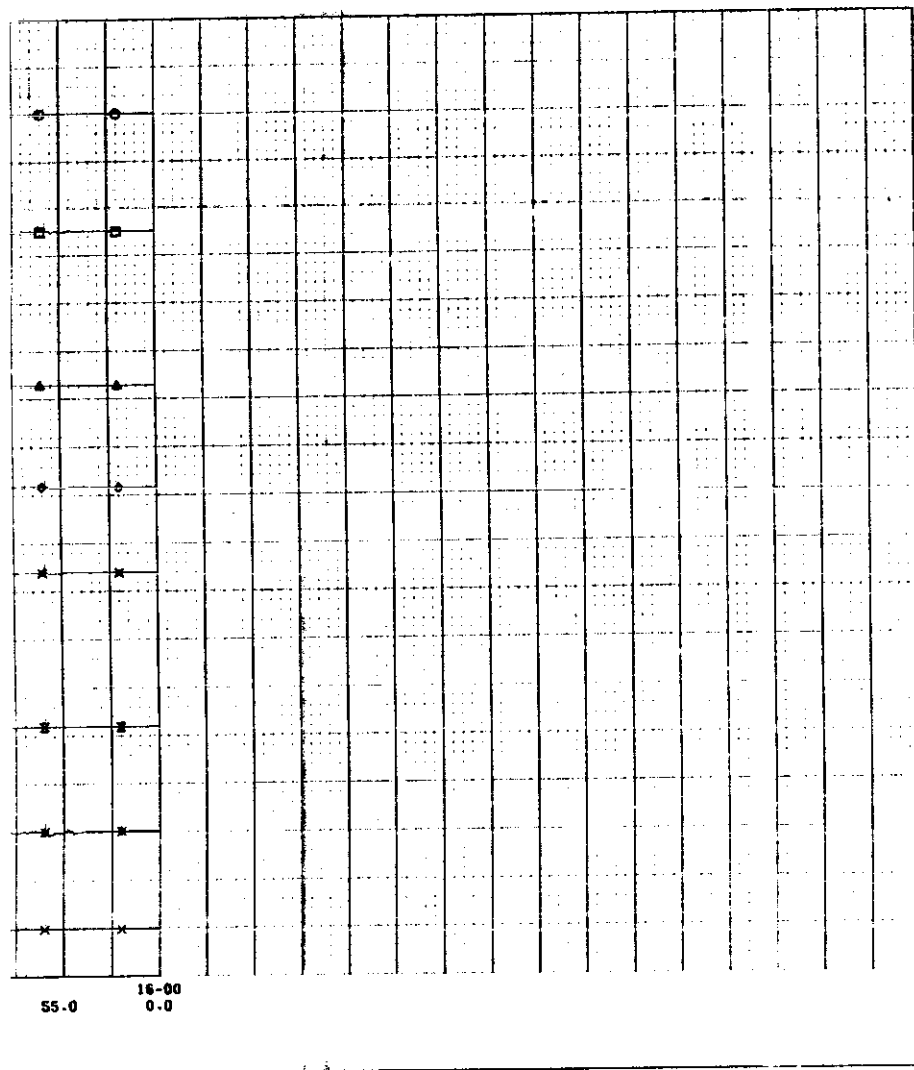
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APR				THE BOEING COMPANY			

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737-200, PG309, RUDDER SYSTEM GROUND TESTING



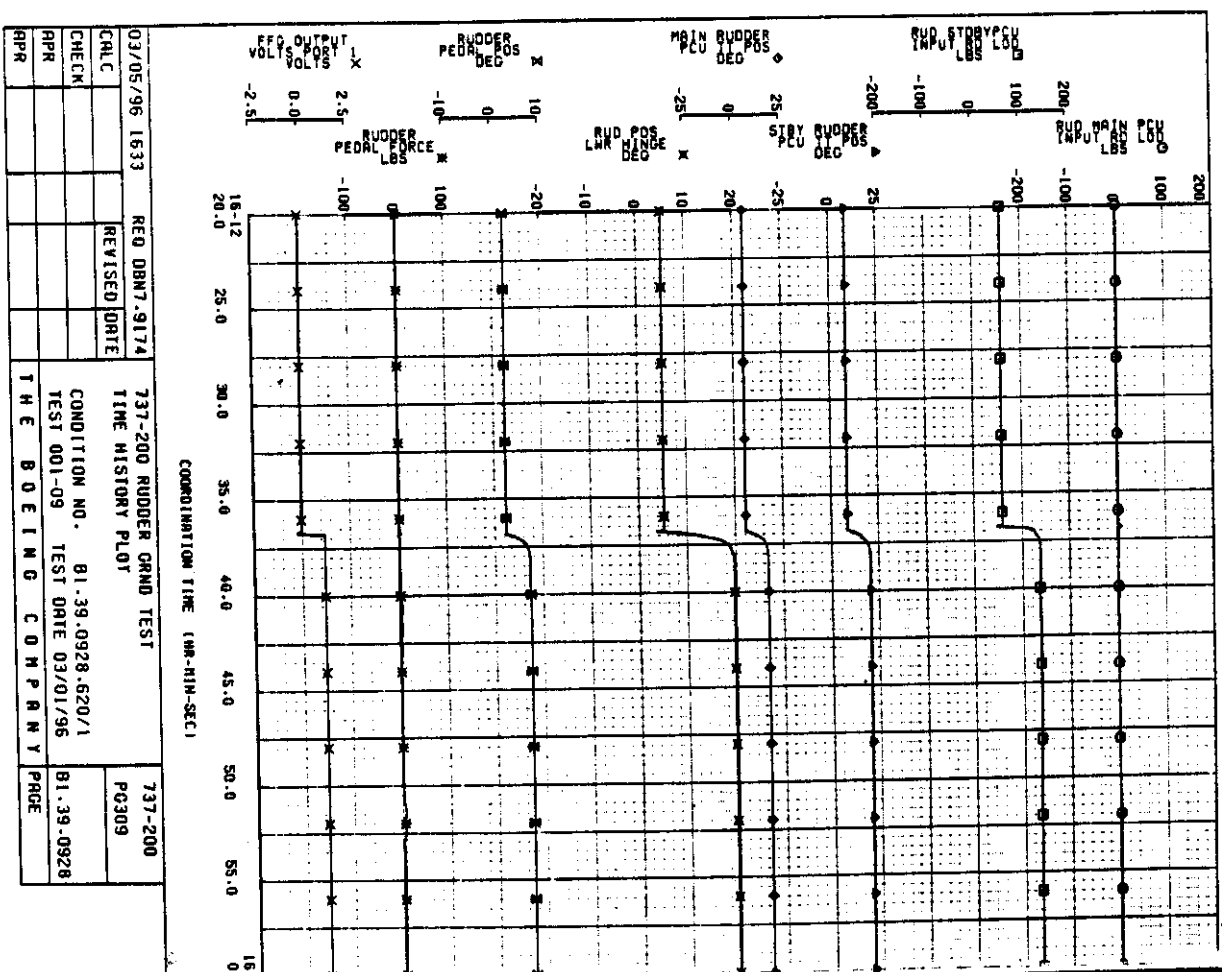
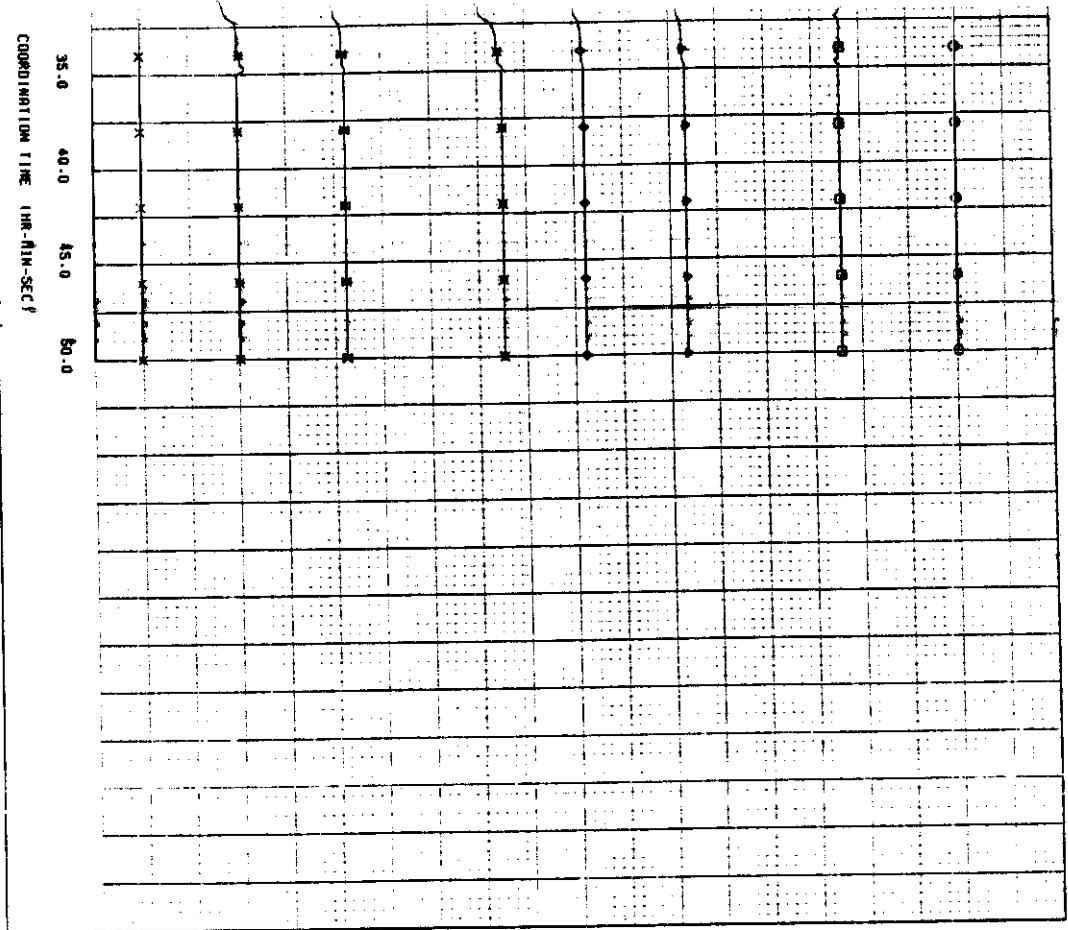
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CALC	REVISED DATE	CONDITION NO. B1.39.0928.613	
CHECK		TEST 001-09 TEST DATE 03/01/96	B1.39.0928
APR		THE BOEING COMPANY	PAGE
APR			

FORMAT 1
137-2000-70000 RUDDER SYSTEM GROUND TESTING



03/05/96 1633	REQ DBN7.9174	737-200 RUDDER GRND TEST	737-200
CALC	REVISED	TIME HISTORY PLOT	PG309
CHECK		CONDITION NO. 81.39-0928.614	
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APR		THE BOEING COMPANY	PAGE

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737-200, PG309, RUDDER SYSTEM GROUND TESTING

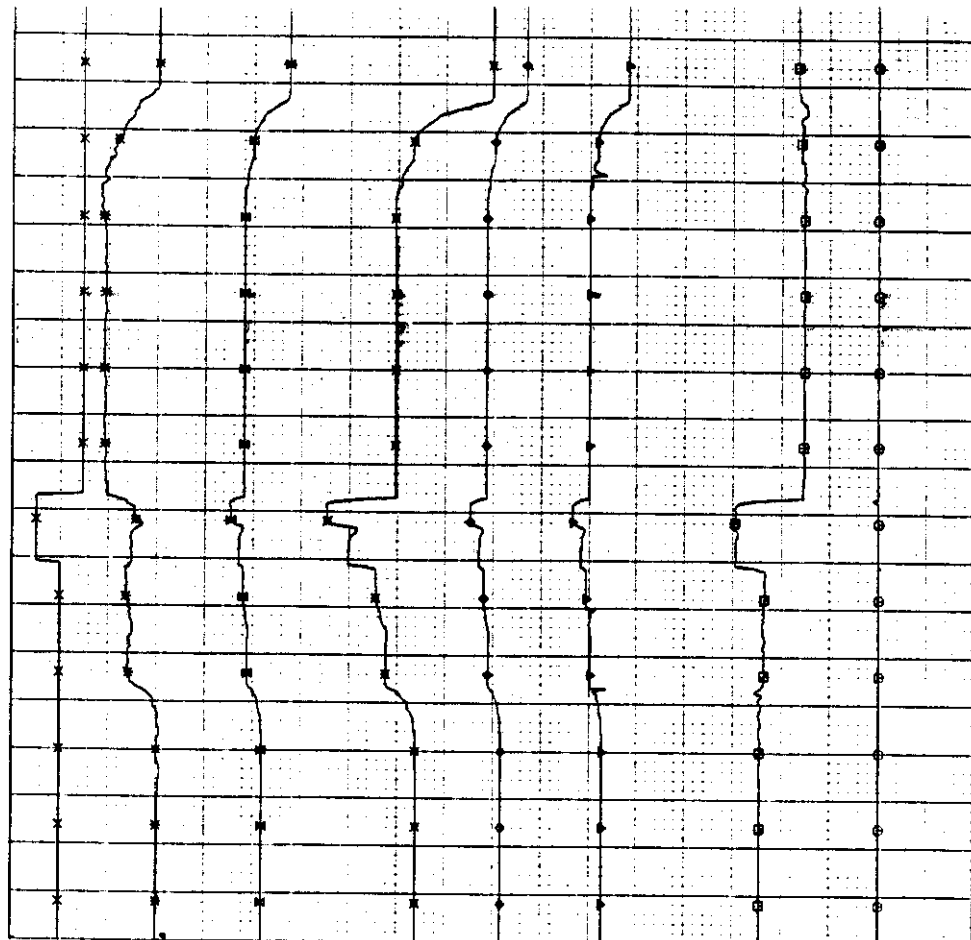


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737-200, PG309, RUDDER SYSTEM GROUND TESTING

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CHECK		CONDITION NO. 81.39.0928.620/1	
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APR		THE BOEING COMPANY	PRG

COORDINATION TIME (HR-MIN-SEC)

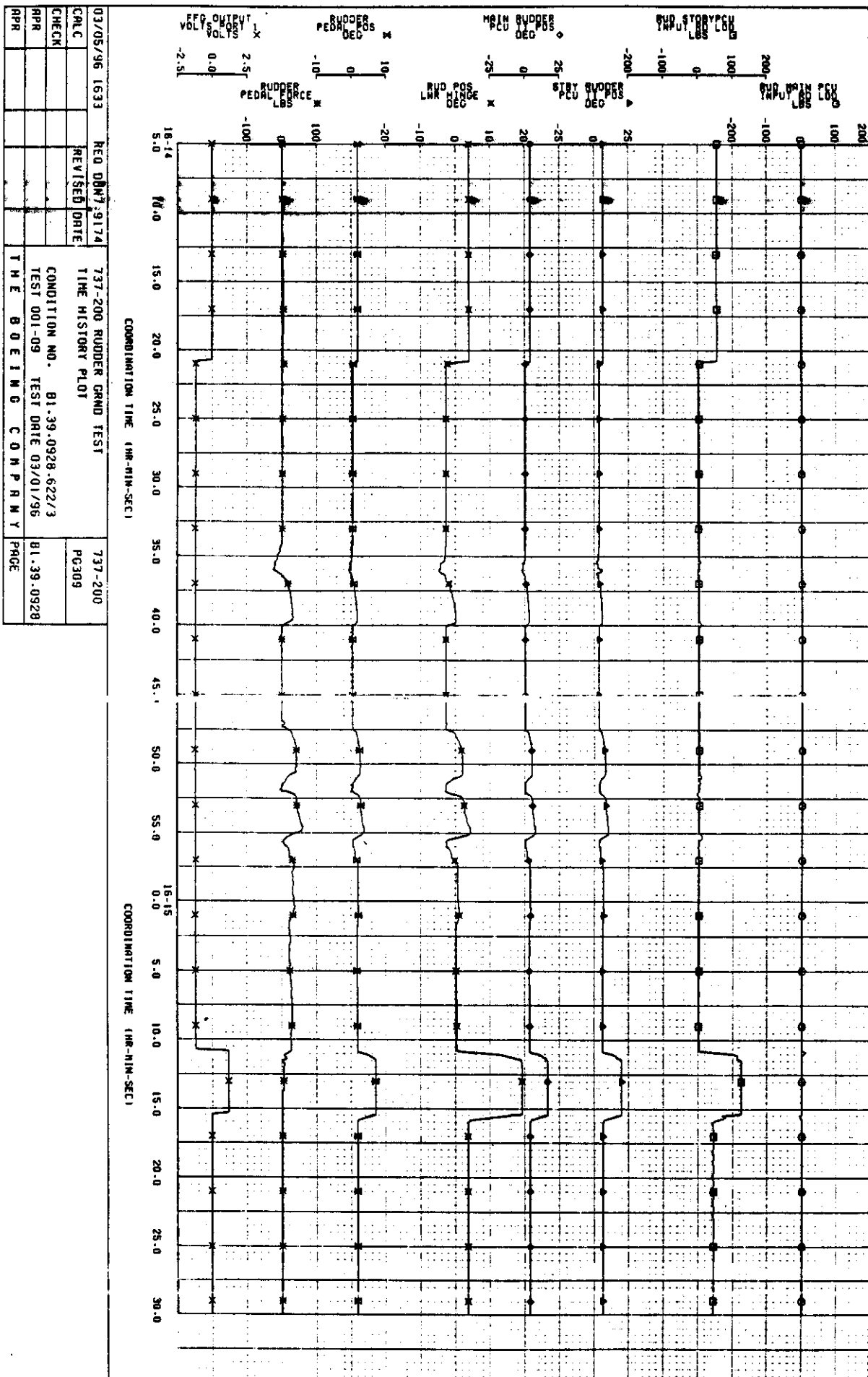
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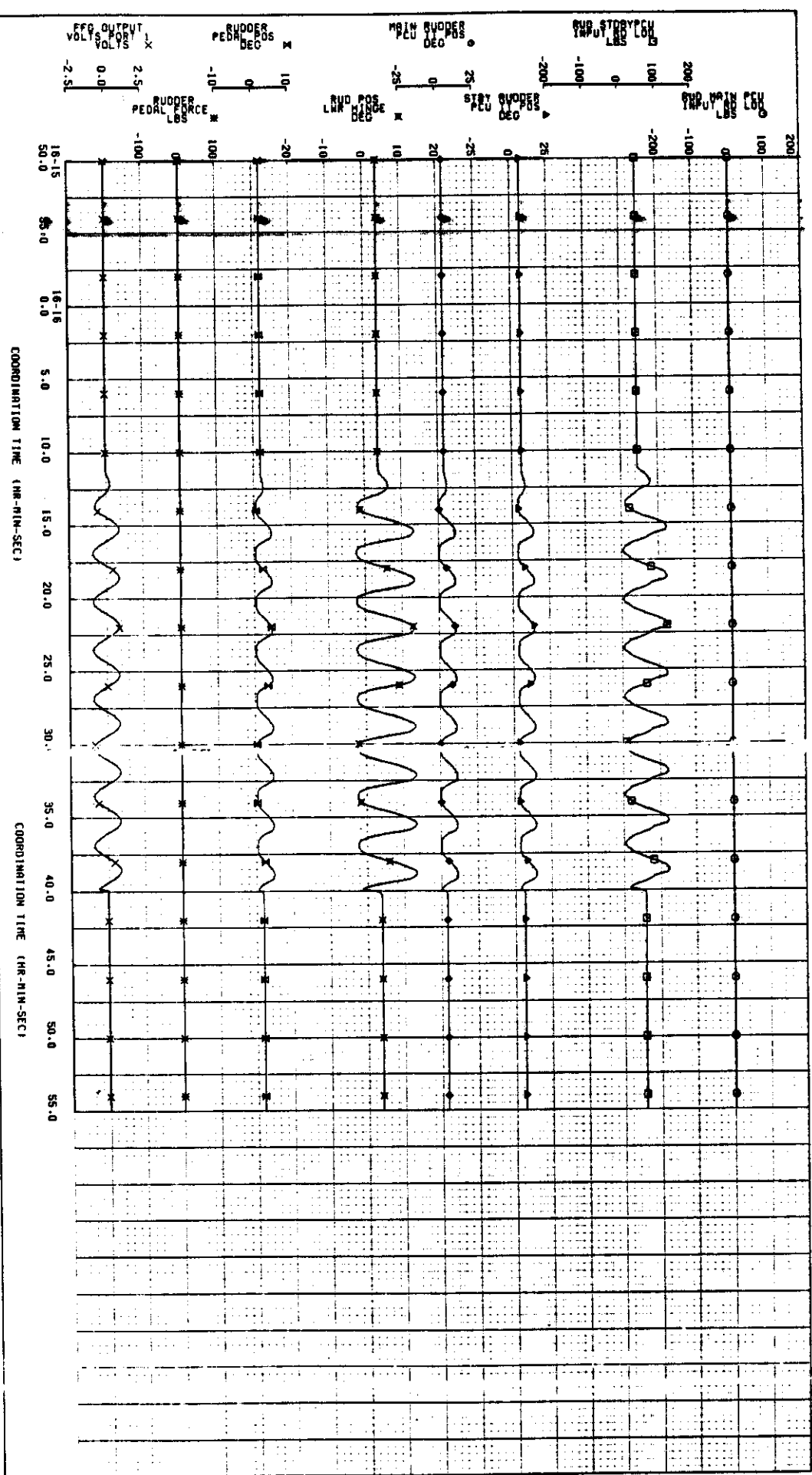
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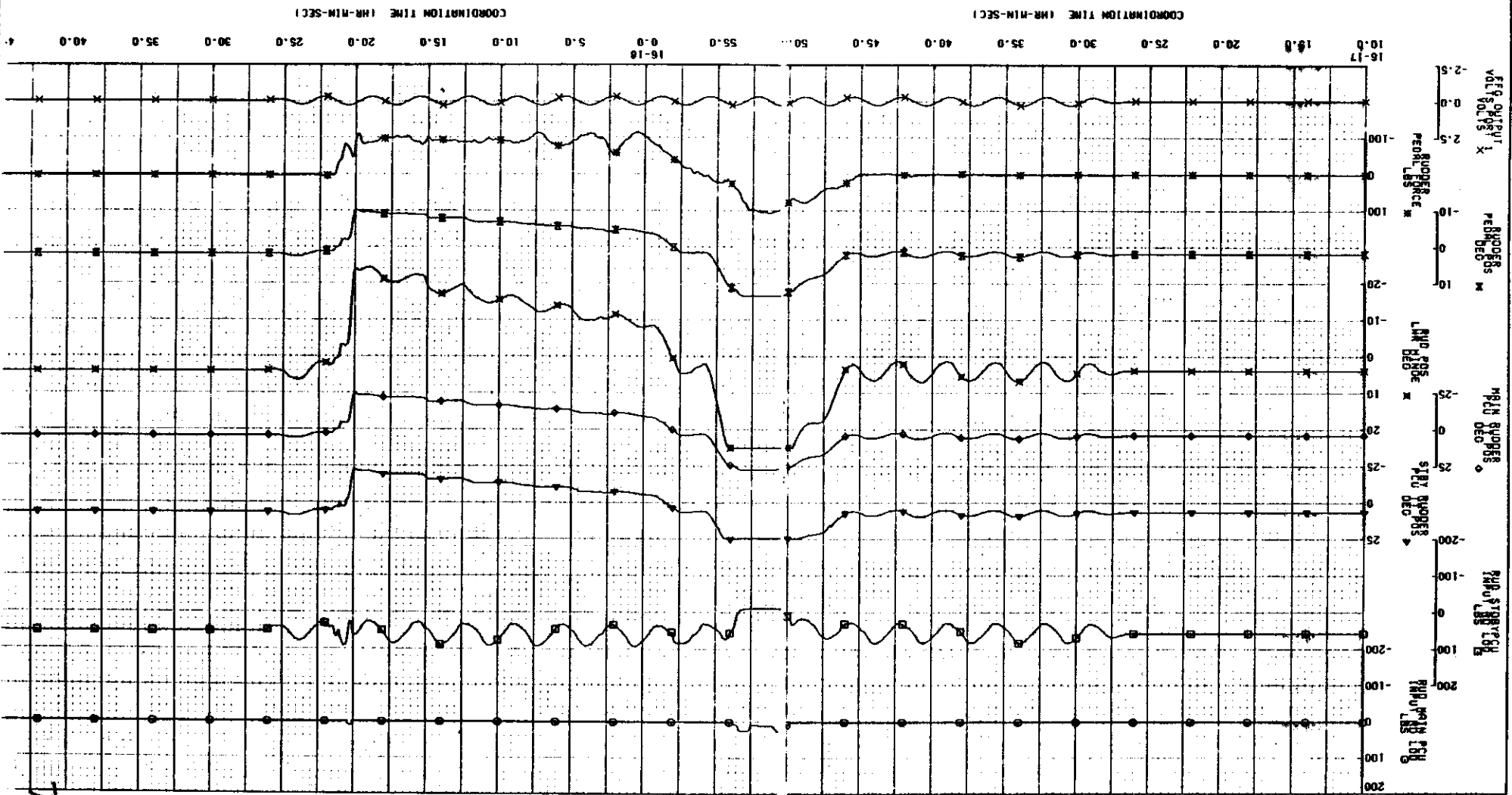
FORM 1
737-200, PG309, RUDDER SYSTEM GROUND TESTING

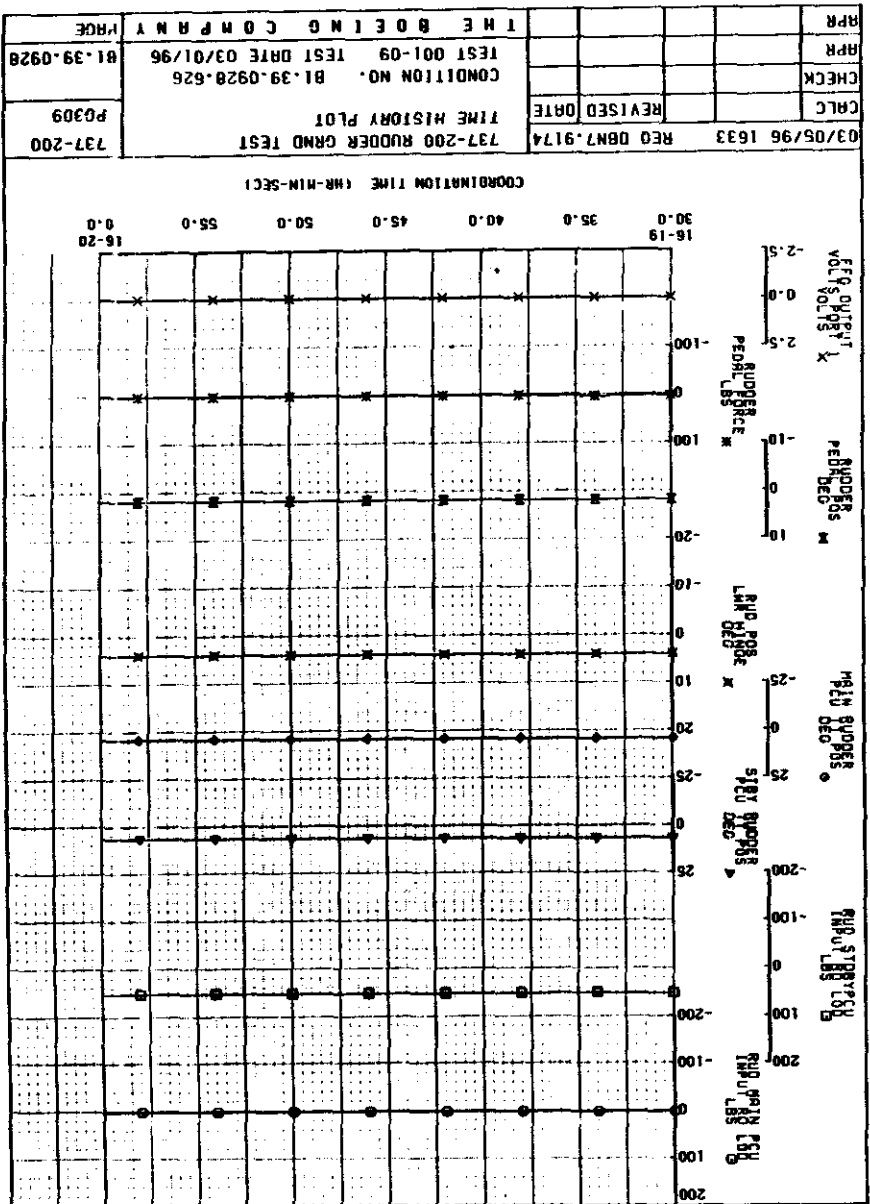
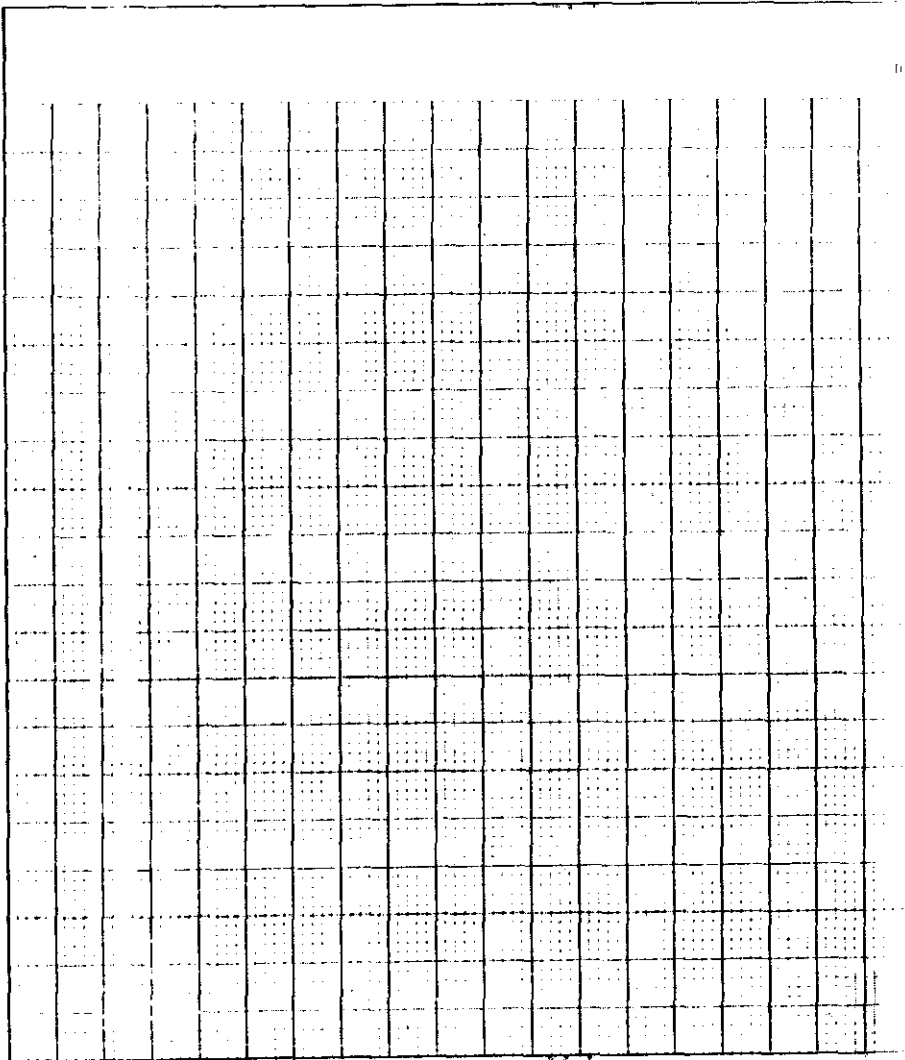
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RPR		TEST 001-09 TEST DATE 03/01/96	81-39-0928
RPR		THE BOEING COMPANY	PAGE



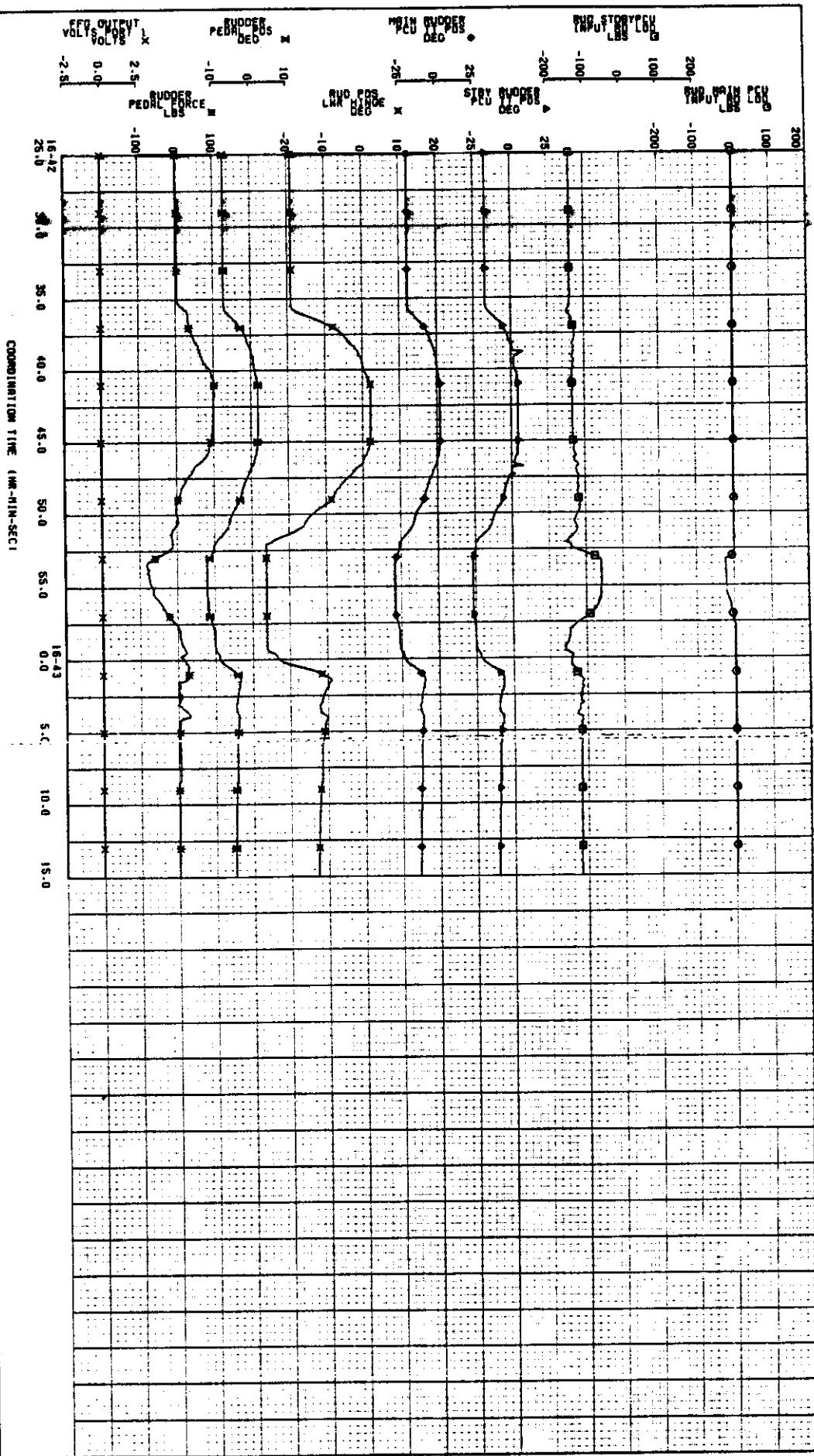
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FORM 1
737-200. PG309. RUDDER SYSTEM GROUND TESTING



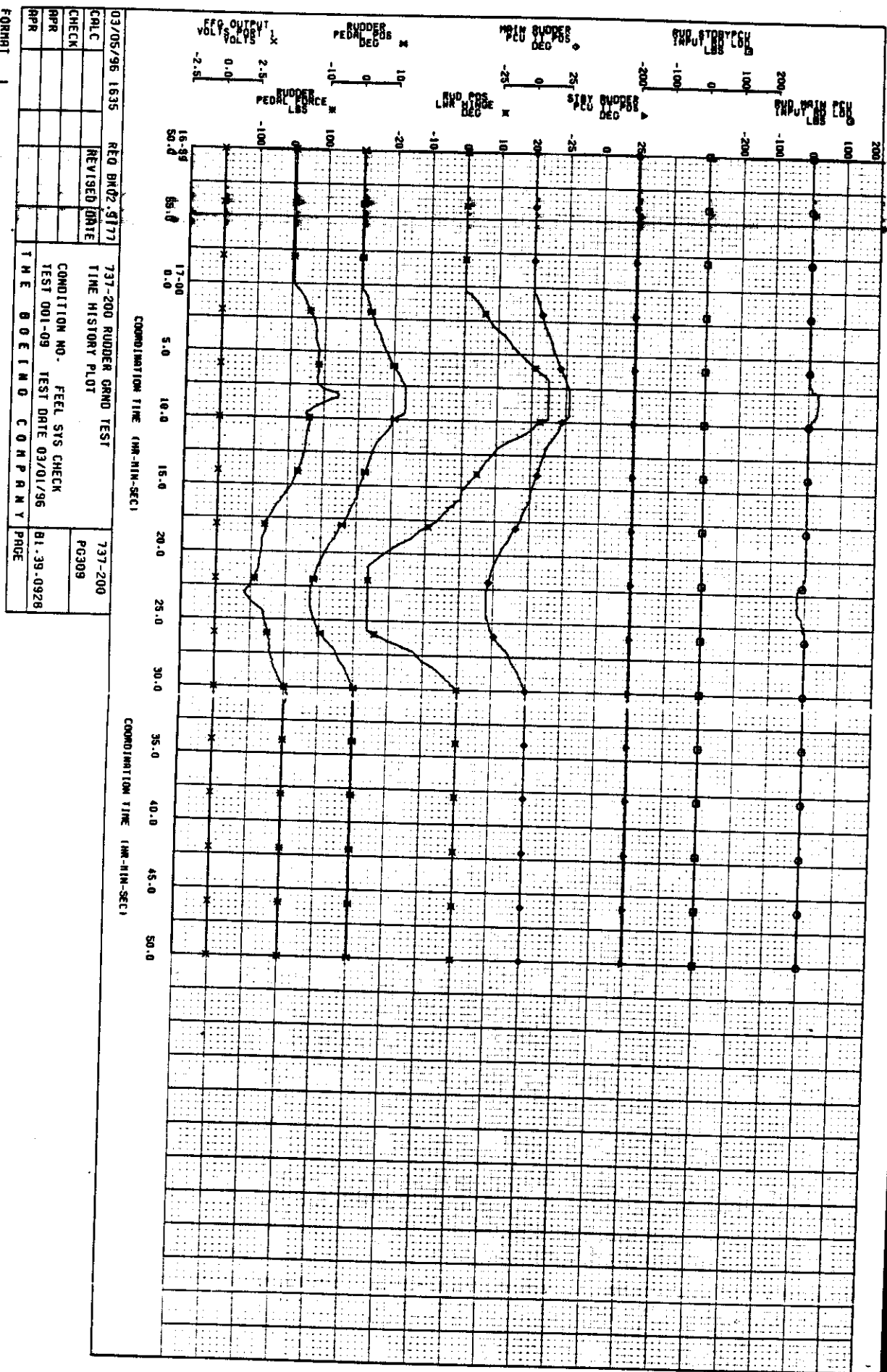


FORMAT 1
737-200, PG309, RUDDER SYSTEM GROUND TESTING

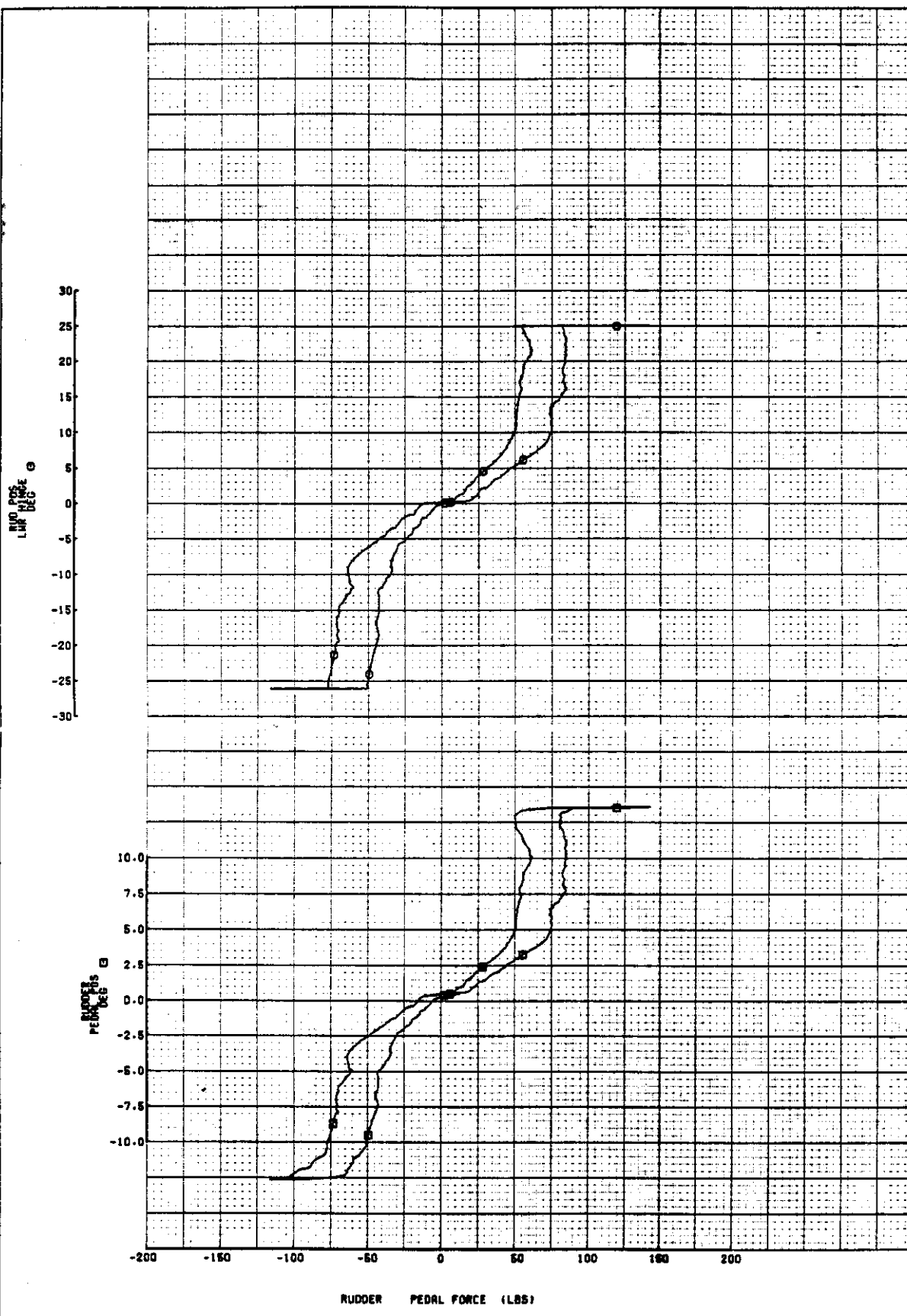


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CHECK		CONDITION NO. 81.39.0928.617	
RPR		TEST OUT-09 TEST DATE 03/01/96	81.39.0928
RPR		THE BOEING COMPANY	PRICE

FORMAT 1
737-200, PG309, RUDDER SYSTEM GROUND TESTING



FORMAT 1
 737-200, PG309, RUDDER SYSTEM GROUND TESTING



03/05/96 1635	REQ 8K02-9177	737-200 RUDDER GRND TEST	737-200
CALC	REVISED DATE	CROSS PLOT	P0309
CHECK		CONDITION NO. FEEL SYS CHECK	
APR		TEST 001-09 TEST DATE 03/01/96	81.39.0928
APR		THE BOEING COMPANY	PAGE

FORMAT 2
737-200, P0309, RUDDER SYSTEM GROUND TESTING

SCHEDULED TESTING

FILE #	Test Item Title
B1.39.0928	737-200 STANDBY RUDDER ACTUATOR FAILURE GROUND TEST - B

PURPOSE OF TEST

Jams of the standby rudder PCU control valve lever will be introduced on the ground. The resulting rudder control system operational characteristics will be investigated with various initial conditions and subsequent yaw damper, rudder pedal, and rudder trim inputs. The intent is to allow evaluation of these characteristics with an actual airplane's flight control system compliance, backlash, control valve flow, and pressure gains.

TEST PARAMETERS

- ☐ Hydraulic Power - Supplied to the A & B systems.
- ☐ Electrical Power - ON
- ☐ Nosewheel Steering - Disabled (either install nose gear steering lockout pin in nose gear steering depressurization valve per maintenance manual 32-00-01, or pull the nose gear air/ground circuit breaker on the P-6 panel).

TEST CONDITIONS

System Effects with a Galled Standby Rudder PCU Bearing

- A Standby PCU with a galled input linkage bearing will be installed. The bearing will be galled to about 60 pounds of input lever force.
- Set the Hydraulic System as noted.
- Minimize rudder pedal application with the galled bearing. Additional pedal cycles may increase the galling force and jeopardize the test results.

Condition No.	Hyd Pressure	Operation
☒ B1.39.0928.301	A & B	Cycle the rudder pedals through full deflection and note the system response.
☒ 302	A & B	Input a ± 3.0 degree yaw damper command at 0.3 Hz. Record the system response.
☒ 303	A & B	Input a ± 1.0 degree Yaw Damper Command at 0.3 Hz. Cycle the rudder pedals through full displacement during the frequency input. Record system response.
☒ 304	----	Confirm a simulated airload has been applied to the rudder trailing edge.
☒ 305	B & Stby	Cycle the rudder pedals through full deflection and note the system response.

Condition No.	Hyd Pressure	Operation
☒ 306	B & Stby	Input a ± 3.0 degree yaw damper command at 0.3 Hz. Record the system response.
☒ 307	B & Stby	Input a ± 1.0 degree Yaw Damper Command at 0.3 Hz. Cycle the rudder pedals through full displacement during the frequency input. Record system response.
☒ 308	A, B & Stby	Cycle the rudder pedals through full deflection and note the system response.
☒ 309	A, B & Stby	Input a ± 3.0 degree yaw damper command at 0.3 Hz. Record the system response.
☒ 310	A, B & Stby	Input a ± 1.0 degree Yaw Damper Command at 0.3 Hz. Cycle the rudder pedals through full displacement during the frequency input. Record system response.

Yaw Damper Inputs with Standby Rudder PCU and Hydraulic System Failures - Standby PCU Input Arm Jammed at Neutral

- Jam the Standby rudder PCU input arm at neutral.
- Verify Jam is at neutral
- Set the hydraulic system as noted.
- Perform the noted conditions.

Condition No.	Hyd Pressure	Procedure
☒ B1.39.0928.401	A & B	Record initial state of rudder system.
☒ 402	A & B	Input a 3 degree Yaw Damper Command.
☒ 403	A & B	Center the rudder using the pedals.
☒ 404	A & B	Input a Neutral Yaw Damper Command.
☒ 405	A & B	Center the rudder using the pedals.
☒ 406	A & B	Input a -3 degree Yaw Damper Command.
☒ 407	A & B	Center the rudder using the pedals.
☒ 408	A & B	Input a ± 3 degree Yaw Damper Command at 0.3 Hz.
☒ 409	A & B	Input a ± 1 degree Yaw Damper Command at 0.3 Hz. Cycle the rudder pedals to ± 100 pounds during the frequency input.
☒ 410	A & B	Command the Yaw Damper to 0.0 degree rudder.
☒ 411	A & B	Center the rudder using the pedals.
☒ 412	A & B	Use the trim system to center the rudder.

Yaw Damper Inputs with Standby Rudder PCU and Hydraulic System Failures - Standby PCU Input Arm Jammed at 3 Degrees Rudder Command

- ~~Jam the Standby Rudder PCU lever 0.236 inches from its up position.~~
- Verify by manually displacing the rudder surface until the aft quadrant is at neutral. The rudder should be at 3 degrees.
- Set the hydraulic system as noted.
- Perform the noted conditions.

Condition No.	Hyd Pressure	Procedure
☒ B1.39.0928.501	A & B	Record initial state of rudder system.
☒ .502	A & B	Input a 3 degree Yaw Damper Command.
☒ .503	A & B	Center the rudder using the pedals.
☒ .504	A & B	Input a Neutral Yaw Damper Command.
☒ .505	A & B	Center the rudder using the pedals.
☒ .506	A & B	Input a -3 degree Yaw Damper Command.
☒ .507	A & B	Center the rudder using the pedals.
☒ .508	A & B	Input a ± 3 degree Yaw Damper Command at 0.3 Hz.
☒ .509	A & B	Input a ± 1 degree Yaw Damper Command at 0.3 Hz. Cycle the rudder pedals to ± 100 pounds during the frequency input.
☒ .510	A & B	Command the Yaw Damper to 0.0 degree rudder.
☒ .511	A & B	Center the rudder using the pedals.
☒ .512	A & B	Use the trim system to center the rudder.
☒ .513	--	Confirm that a simulated air load has been applied to the rudder trailing edge.

Hard Jam at -3.0 Degrees Rudder Command (0.314" Standby PCU Valve Lever Offset) - Slow Pedal Cycles

- Adjust the Standby Rudder PCU Valve lever 0.236 inch from its rig position.
- Verify by manually displacing the rudder surface until the aft quadrant is at neutral. The rudder should be at -3 degrees.
- Apply full hydraulic pressure to the A & B hydraulic systems.
- Perform noted conditions.
- Remove hydraulic pressure from the flight controls.

<u>Condition No.</u>	<u>Hyd Pressure</u>	<u>Operation</u>
☒ B1.39.0928.613	A & B	Record the initial response of the rudder system.
☒ .614	A & B	Conduct slow pedal cycles to approximately full rudder travel.
☒ .615	A & B	Apply rudder pedal force to center the rudder.

Hard Jam at Full Rudder Command - Slow Pedal Cycles

- Adjust the Standby Rudder PCU Valve lever so that the main PCU lever is against its manifold stop.
- Apply full hydraulic pressure to the A & B hydraulic systems.
- Perform noted conditions.
- Remove hydraulic pressure from the flight controls.

<u>Condition No.</u>	<u>Hyd Pressure</u>	<u>Operation</u>
☒ B1.39.0928.616	A & B	Record the initial response of the rudder system.
☒ .617	A & B	Conduct slow pedal cycles to approximately full rudder travel.
☒ .618	A & B	Apply rudder pedal force to center the rudder.

CONDITIONS 001 THRU 021 HAVE BEEN PREVIOUSLY COMPLETED AND ARE OPTIONAL.

Rigging Check and Functional Test

<u>Condition No.</u>	<u>Operation</u>
☒ B1.39.0928.001	Perform various rigging checks of the rudder control system. Note rudder control cable rig loads, rig pin fit, PCU force fight, and control surface alignment with the index mark.
☐ .002	Disable the nose wheel steering.
☐ .003	Perform rudder system functional testing, paragraphs 5.0 through 5.11, of document D6-17554:27-21:0003B.
☐ .004	Turn A and B hydraulic systems ON with 3000 psi, pressurize the tail, and set the rudder trim to zero.
☐ .005	Confirm that the yaw damper is OFF.
☐ .006	Note instrumentation data with the rudder pedals centered.
☐ .007	Note instrumentation data with full left pedal.
☐ .008	Note instrumentation data with full right pedal.

Instrument Verification

<u>Condition No.</u>	<u>Operation</u>
☒ B1.39.0928.009	With the rudder pedal in its detent, apply full left rudder trim. Note instrumentation.
☐ .010	With the rudder pedal in its detent, apply full right rudder trim. Note instrumentation.
☐ .011	Turn OFF all hydraulic power, cycle the flight controls to bleed pressure, and set all FLT CTRL switches to OFF.
☐ .012	Remove the Standby Rudder PCU input rod.
☐ .013	Remove the Rudder Feel unit input rods from the rudder torque tube.
☐ .014	Perform a slow rudder pedal cycle with no hydraulic power. Note the response of the Main Rudder PCU rod force.
☐ .015	Connect the Standby Rudder PCU input rod.
☐ .016	Remove the Main PCU rudder input rod.
☐ .017	Using the blocking tool, Jam the Standby Rudder PCU Valve lever at a ± 0.0 degree input arm position.
☐ .018	Slowly apply rudder pedal force. Note the response of the Standby Rudder PCU rod force.
☐ .019	Connect the Main PCU input rod.
☐ .020	Connect the Rudder Feel unit input rod.
☐ .021	Conduct other verification tests as requested by Engineering.

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