

**MASTER**

TECHNICAL PROGRESS REPORT

Contract No. EF-77-R-01-2771

**NOTICE**  
This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Department of Energy, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

For Period: FY-79, Second Quarter, Ending March 31, 1979

A. The following activity has been accomplished during the Second Quarter of this contract:-

- 1.1 Project planning complete - see revised Management Plan.
- 1.2 The Welding Process Review is continuing with five processes. (GTAW, GMAW, SAW, ESW, EBW) under review to varying degrees.
- 2.2 Facility rearrangement reported complete in 1st Quarterly Report. See photographs 2-1 (general arrangement), 2-2 (gas quality measurement), and 2-3 (gas distribution system).
- 2.3 All base plate to be procured under task 3.1.
- 2.4 Torch design \* complete - prototype built (see photograph 2-4).
- 2.5 LVDT proximity probe and LVDT seam trackers probe demonstrated (see photograph 2-5). Eddy current seam tracker (photograph 2-6) rearranged for program test.
- 2.6 Joint Design: 1G position spanning bead verified in 4" deep grooves.
- 2.7 Identified available commercial filler wire heats and chemistries.
- 2.10 Parameter development begun on 4" plate.
- 2.14 Quarterly report written in conjunction with task 3.15.
- 3.1 Plate specification written, quotes/mill comments reviewed, plate ordered.
- 3.2 Determination of functional requirements for equipment specification underway.
- 3.3 Field assembly service requirements under evaluation.
- 3. (See 2.7). A small but insufficient amount of acceptable wire has been obtained. The search for an acceptable and adequate source is still underway.
- 3.15 Second quarterly report written.

During the third quarter of the contract, activity will be accomplished on the following tasks:-

1.2	2.6	2.11	3.2
2.3	2.7	2.13	3.3
2.4	2.8	2.14	3.5
2.5	2.10	3.1	3.15

\* Independent W narrow groove torch design under separate W funding - same design will be built now from W design for DOE.

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## **DISCLAIMER**

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U. S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION  
MILESTONE PLAN AND MANAGEMENT REPORT

<b>1. Contract Identification</b> DEVELOPMENT OF AUTOMATED WELDING PROCESS FOR FIELD FABRICATION OF THICK WALLED PRESSURE VESSELS	<b>2. Reporting Period</b> 12-29-78 through 03-29-79	<b>3. Contract Number</b> EF-78-C-01-2771
<b>4. Contractor (name, address)</b> WESTINGHOUSE ELECTRIC CORPORATION NUCLEAR EQUIPMENT DIVISIONS P.O. BOX 19218 TAMPA, FLA. 33626		<b>5. Contract Start Date</b> 09-29-78
		<b>6. Contract Completion Date</b> 09-28-81

7. Identification Number	8. Reporting Category (e.g., contract line item or work breakdown structure element)	9. Fiscal Years and Months																10. Percent Complete
		FY 79				FY 80				FY 81								
		01	02	03	04	01	02	03	04	01	02	03	04					
2.11	Horiz. Position Parameters				▬△													
2.12	Vert. Position Parameters								▬△									
2.13	Mechanical Testing & Qual.												▬△					
2.14	Quarterly Report & Final Task Report	▲	▲	△	△	△	△	△	△	△	△	△	△	△	△	△	△	
3.0	FIELD DEMONSTRATIONS																	
3.1	Material Procurement																	50
3.2	Demonstration Facility																	15
3.3	Field Assembly Assessment																	80
3.4	Post Weld Heat Treatment																	
3.5	Procure Filler Wire																	10
3.6	Equipment Qualification																	
3.7	Full Section Process Refinements																	
3.8	Finalize Demonstration Procedures																	
3.9	Field Site Preparation																	

11. Remarks

12. Signature of Contractor's Project Manager and Date

13. Signature of Government Technical Representative and Date



MILESTONE LOG

TASK	DESCRIPTION	PLANNED COMPLETION DATE	ACTUAL COMPLETION DATE	COMMENTS
1.0	REVIEW OF CURRENTLY AVAILABLE WELD PROC. AND PROJ. PLANNING			
1.1	Project Planning	4/1/79	3/20/79	
1.2	Welding Processes Review	8/1/79		
2.0	DEVELOPMENT OF PROC. AND LABORATORY DEMONSTRATION			
2.1	Consultation	4/1/80		
2.2	Facility Rearrangement	2/1/79	12/31/78	
2.3	Materials Procurement	10/1/79		
2.4	Torch and Shield Adaptation	6/1/79		
2.5	Process Mechanical Control	11/1/79		
2.6.	Joint Design Evaluation	11/1/79		
2.7	Filler Wire Optimization	7/1/80		
2.8	Non Destructive Evaluation	11/1/79		
2.9	Repair Techniques	5/1/80		
2.10	Flat Position Parameters	8/1/79		
2.11	Horiz. Position Parameters	10/1/79		
2.12	Vert. Position Parameters	7/1/80		
2.13	Mechanical Testing & Qual.	8/1/80		
2.14	Quarterly Report & Final Task Report	As Req'd	As Req'd	Quarterly Reports: Jan., April, July, Oct. Final Report: 10/1/80

MILESTONE LOG

TASK	DESCRIPTION	PLANNED COMPLETION DATE	ACTUAL COMPLETION DATE	COMMENTS
3.0	FIELD DEMONSTRATION			
3.1	Material Procurement	6/1/80		
3.2	Demonstration Facility	1/1/80		
3.3	Field Assembly Assessment	4/1/79		
3.4	Post Weld Heat Treatment	5/1/80		
3.5	Procure Filler Wire	4/1/80		
3.6	Equipment Qualification	9/1/80		
3.7	Full Section Process Refinements	1/1/81		
3.8	Finalize Demonstration Procedures	4/1/81		
3.9	Field Site Preparation	1/1/81		
3.10	Horiz. Position Welding PWHT	6/1/81		
3.11	Vert. Position Welding PWHT	8/1/81		
3.12	Non Destructive Evaluation	9/1/81		
3.13	Mechanical Testing - Demonstration Welds	9/1/81		
3.14	Weld Demonstration Report	9/28/81		
3.15	Quarterly Reports	As Req'd		Quarterly Reports: Jan., April, July, Oct.
4.0	WELDING PROCESS PROCEDURE HANDBOOK			
4.1	Process Specification	6/1/81		
4.2	Operation Manual	9/28/81		

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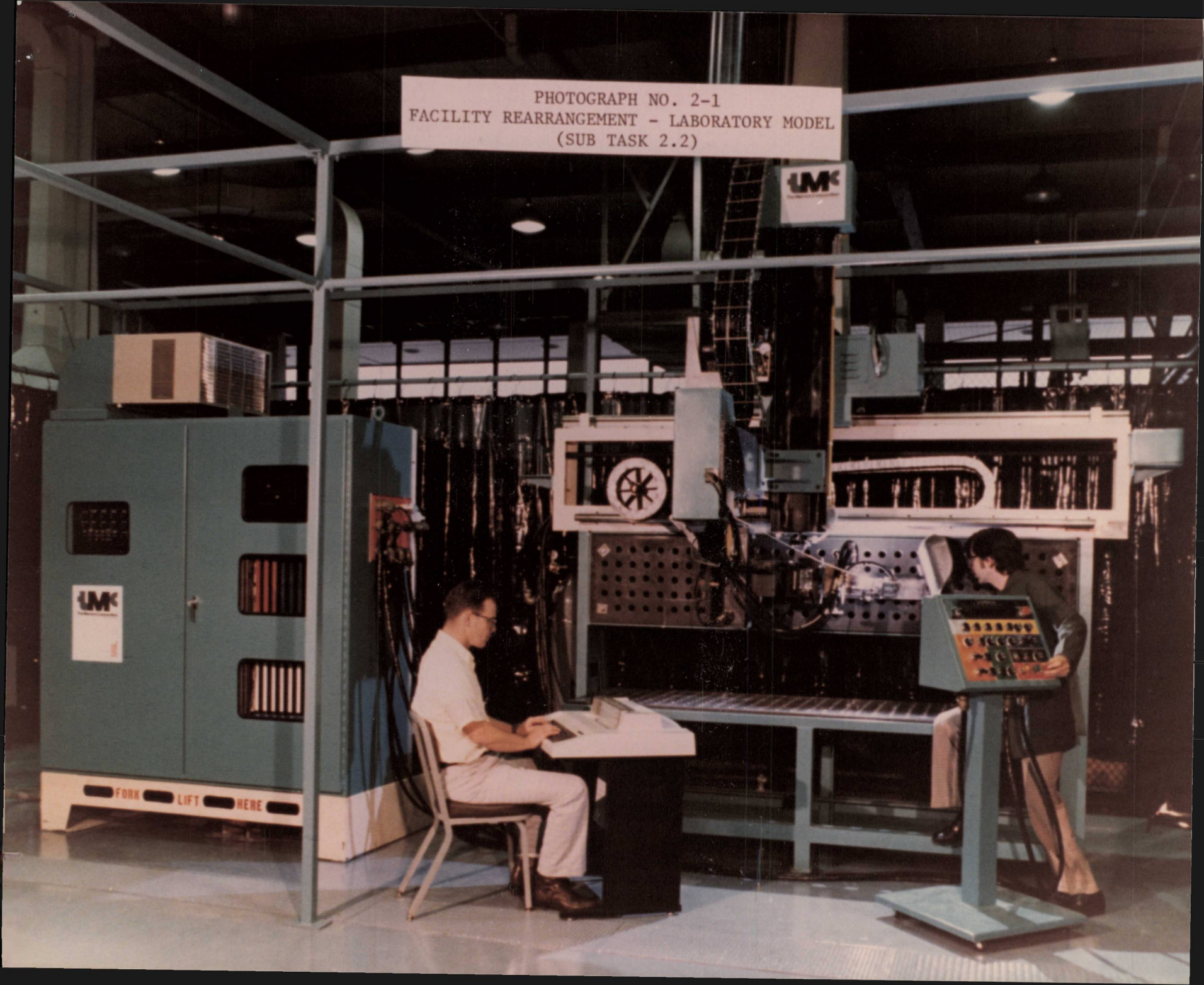
B. Milestone Schedule and Status Report

Attached is a Milestone Schedule with appropriate progress signified as required.

C. Milestone Log

Attached is a Milestone Log showing appropriate progress.

PHOTOGRAPH NO. 2-1  
FACILITY REARRANGEMENT - LABORATORY MODEL  
(SUB TASK 2.2)

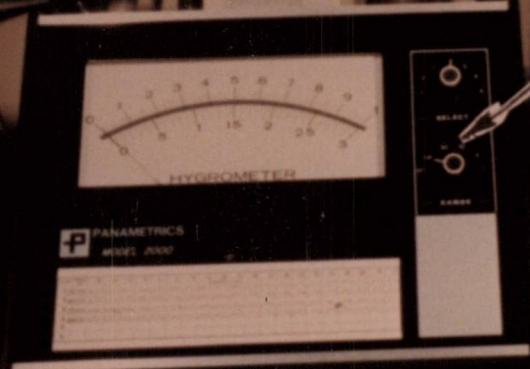


PHOTOGRAPH NO. 2-2  
GAS QUALITY CONTINUOUS MONITORING  
(FACILITY REARRANGEMENT, SUB TASK 2.2)

FLOW CONTROL



MOISTURE



OXYGEN



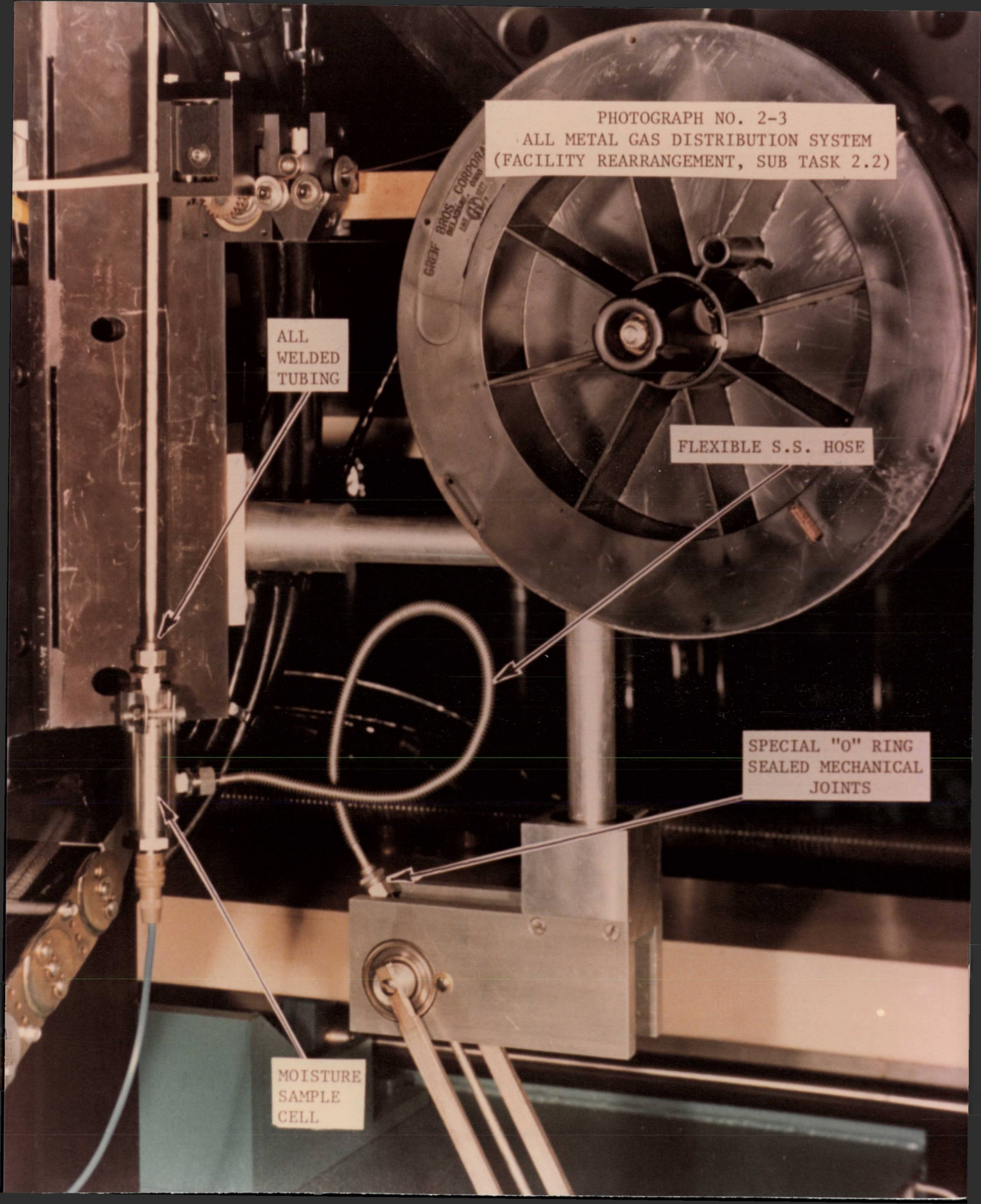
PHOTOGRAPH NO. 2-3  
ALL METAL GAS DISTRIBUTION SYSTEM  
(FACILITY REARRANGEMENT, SUB TASK 2.2)

ALL  
WELDED  
TUBING

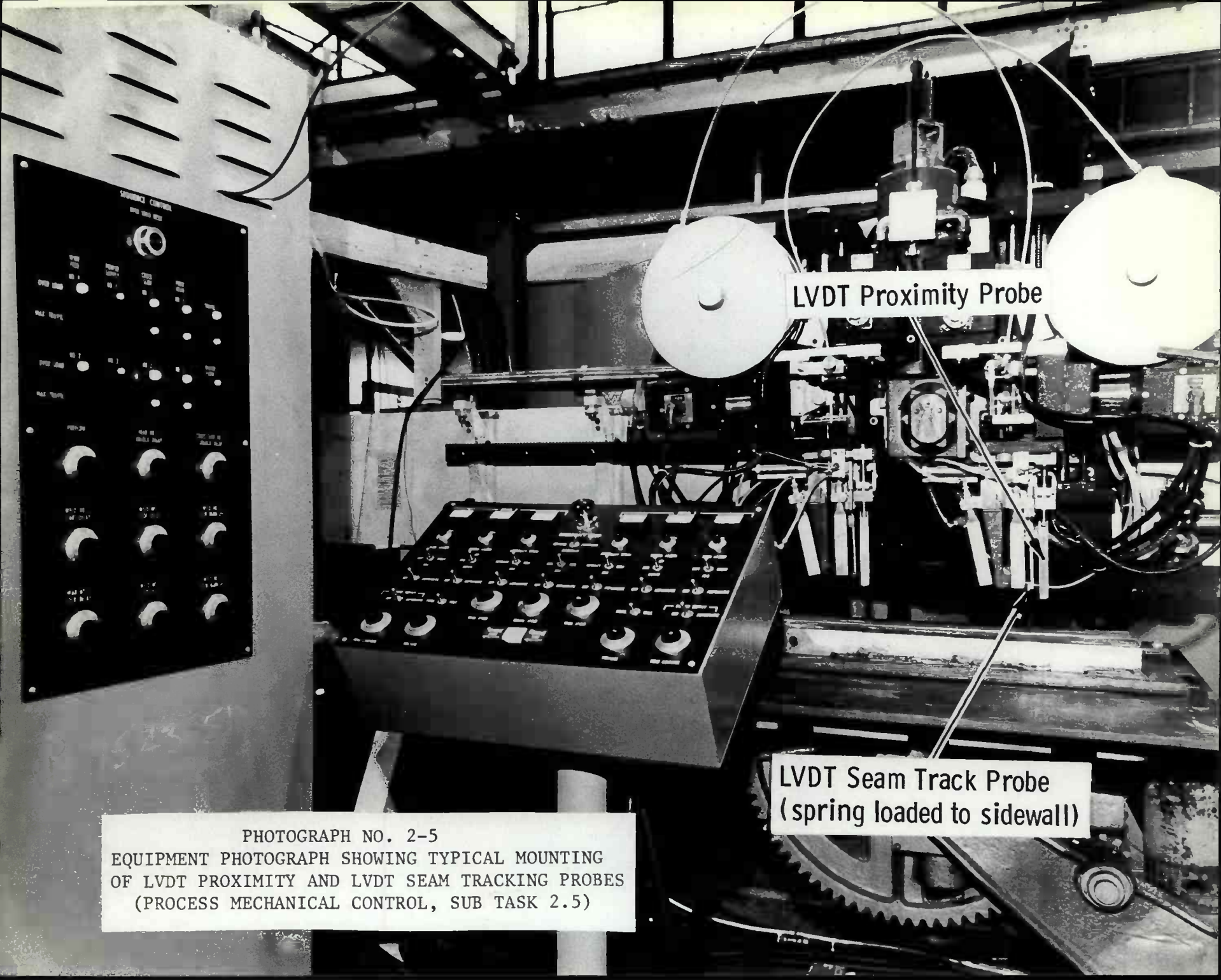
FLEXIBLE S.S. HOSE

SPECIAL "O" RING  
SEALED MECHANICAL  
JOINTS

MOISTURE  
SAMPLE  
CELL





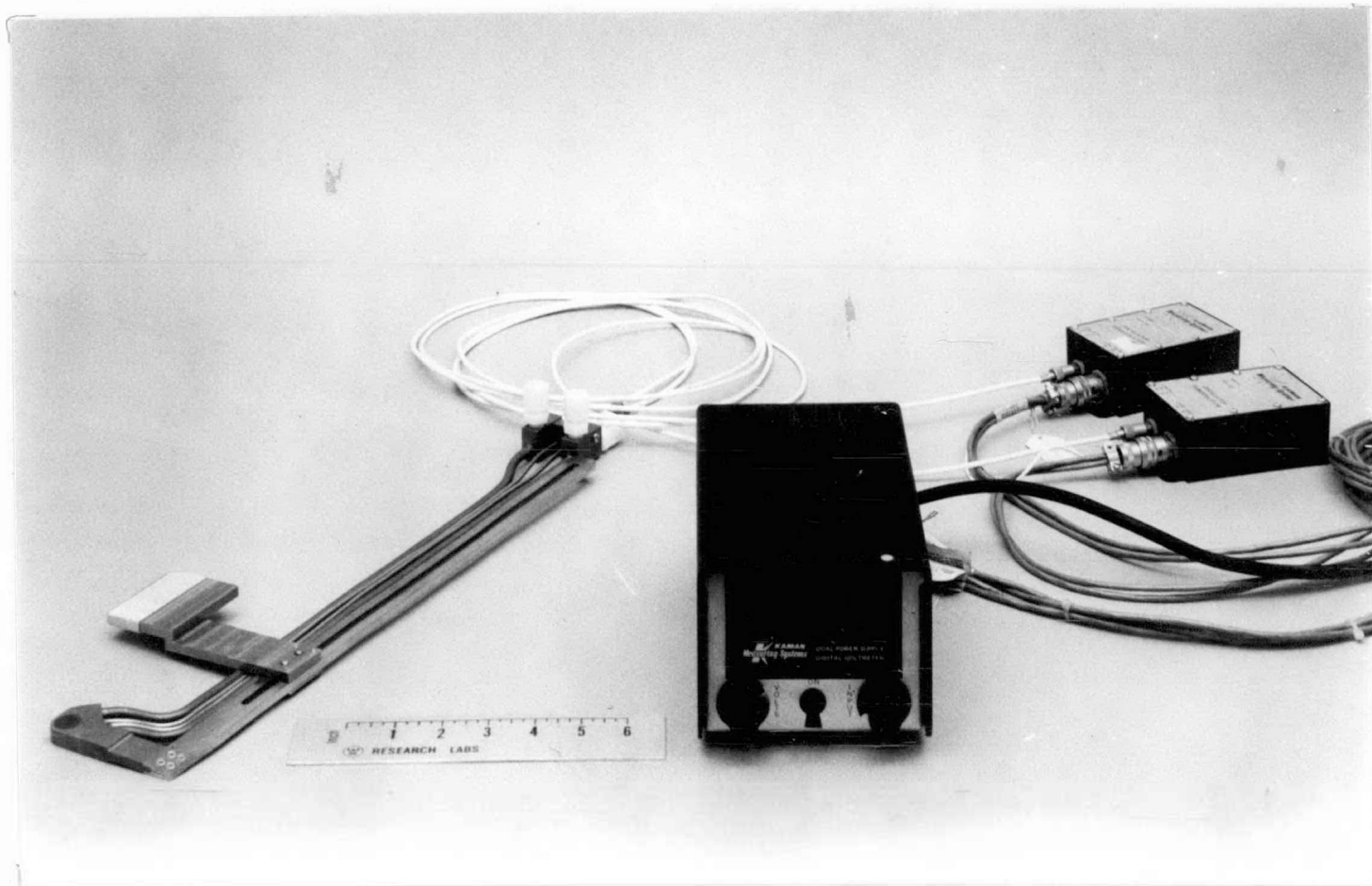


LVDT Proximity Probe

LVDT Seam Track Probe  
(spring loaded to sidewall)

PHOTOGRAPH NO. 2-5  
EQUIPMENT PHOTOGRAPH SHOWING TYPICAL MOUNTING  
OF LVDT PROXIMITY AND LVDT SEAM TRACKING PROBES  
(PROCESS MECHANICAL CONTROL, SUB TASK 2.5)

EQUIPMENT PHOTOGRAPH SHOWING DOUBLE SIDED,  
NON CONTACT EDDY CURRENT FEEDBACK SEAM TRACK  
SYSTEM (PROCESS MECHANICAL CONTROL, SUB TASK 2.5)



Photograph of non-contact feedback seam track system for narrow groove welding. The probe assembly in the left of the figure consists of two water cooled Eddy current sensors mounted back to back. It rides down in the narrow groove as close to the arc as possible. By sensing both joint sidewalls and balancing the signals it keeps the narrow groove torch equidistant from each wall. The two boxes in the back right are oscillator demodulators for each Eddy current probe. The central box is a dual power supply digital voltmeter. The output signal from the system is input to the seam track servo motor which responds to center the probe assembly and balance the signal to each Eddy current probe.

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MILESTONE PLAN AND MANAGEMENT REPORT

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1.0	REVIEW OF CURRENTLY AVAILABLE WELD PROC. AND PROJ. PLANNING																	
1.1	Project Planning	█	△															100
1.2	Welding Processes Review	█	△															60
2.0	DEVELOPMENT OF PROCESS AND LABORATORY DEMONSTRATION																	
2.1	Consultation		△	△	△		△											
2.2	Facility Rearrangement	█	△															100%
2.3	Materials Procurement	█			△													50
2.4	Torch and Shield Adaptation	█			△													75
2.5	Process Mechanical Control	█			△													25
2.6	Joint Design Evaluation		█		△													10
2.7	Filler Wire Optimization		█						△									10
2.8	Non Destructive Evaluation			█	△													
2.9	Repair Techniques								█	△								
2.10	Flat Position Parameters	█			△													20
11. Remarks																		
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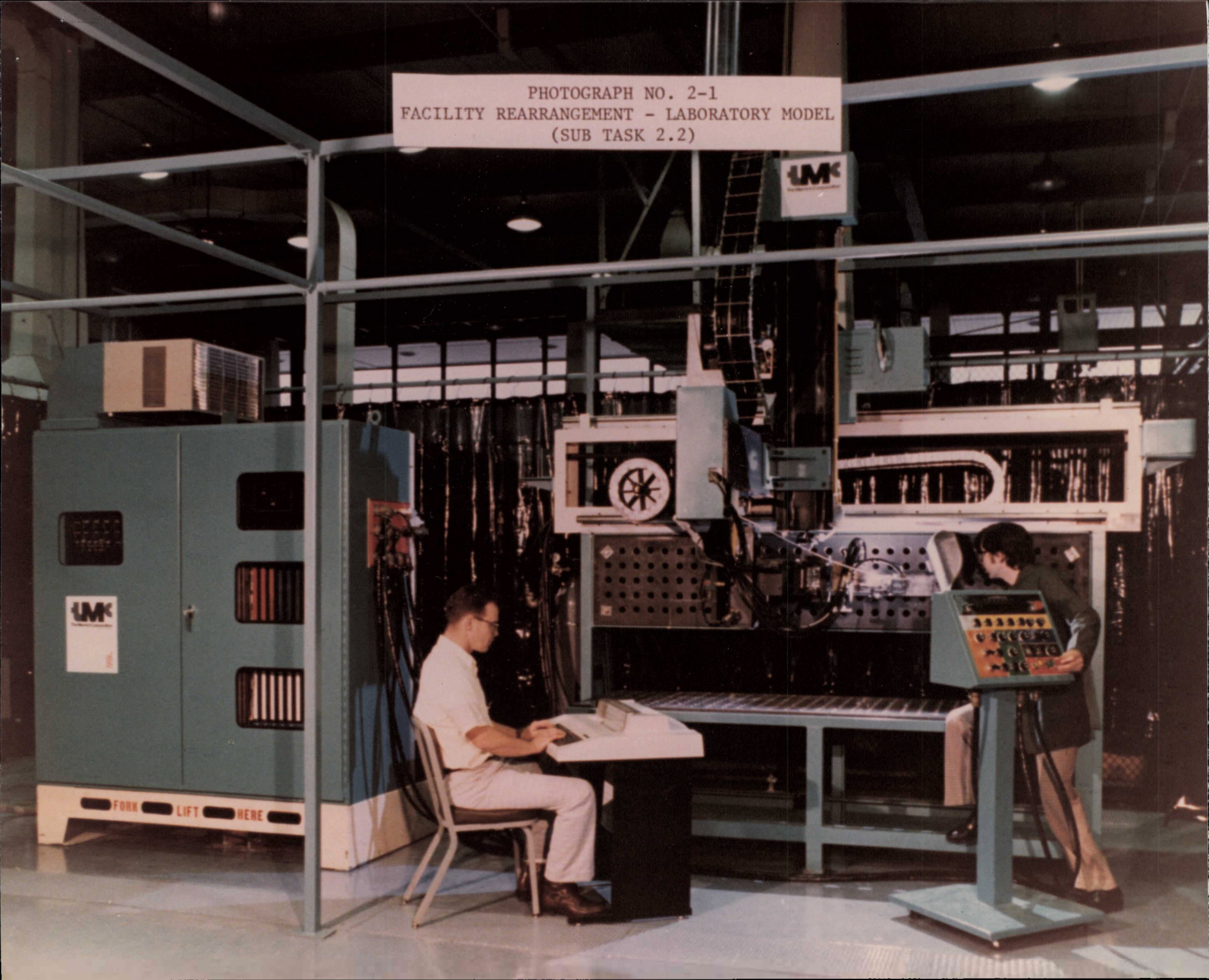
B. Milestone Schedule and Status Report

Attached is a Milestone Schedule with appropriate progress signified as required.

C. Milestone Log

Attached is a Milestone Log showing appropriate progress.

PHOTOGRAPH NO. 2-1  
FACILITY REARRANGEMENT - LABORATORY MODEL  
(SUB TASK 2.2)

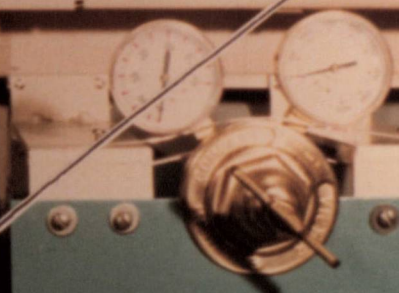


PHOTOGRAPH NO. 2-2  
GAS QUALITY CONTINUOUS MONITORING  
(FACILITY REARRANGEMENT, SUB TASK 2.2)

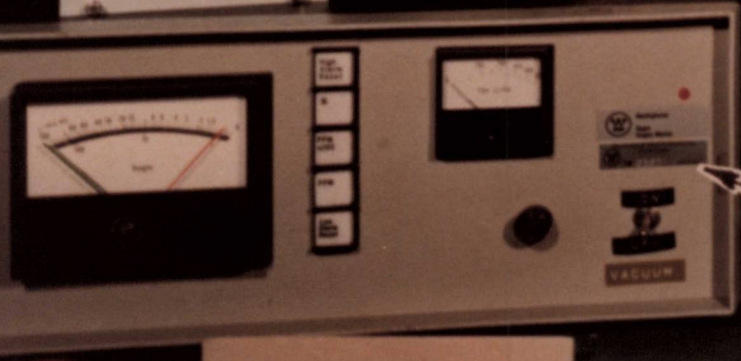
FLOW CONTROL



MOISTURE



OXYGEN



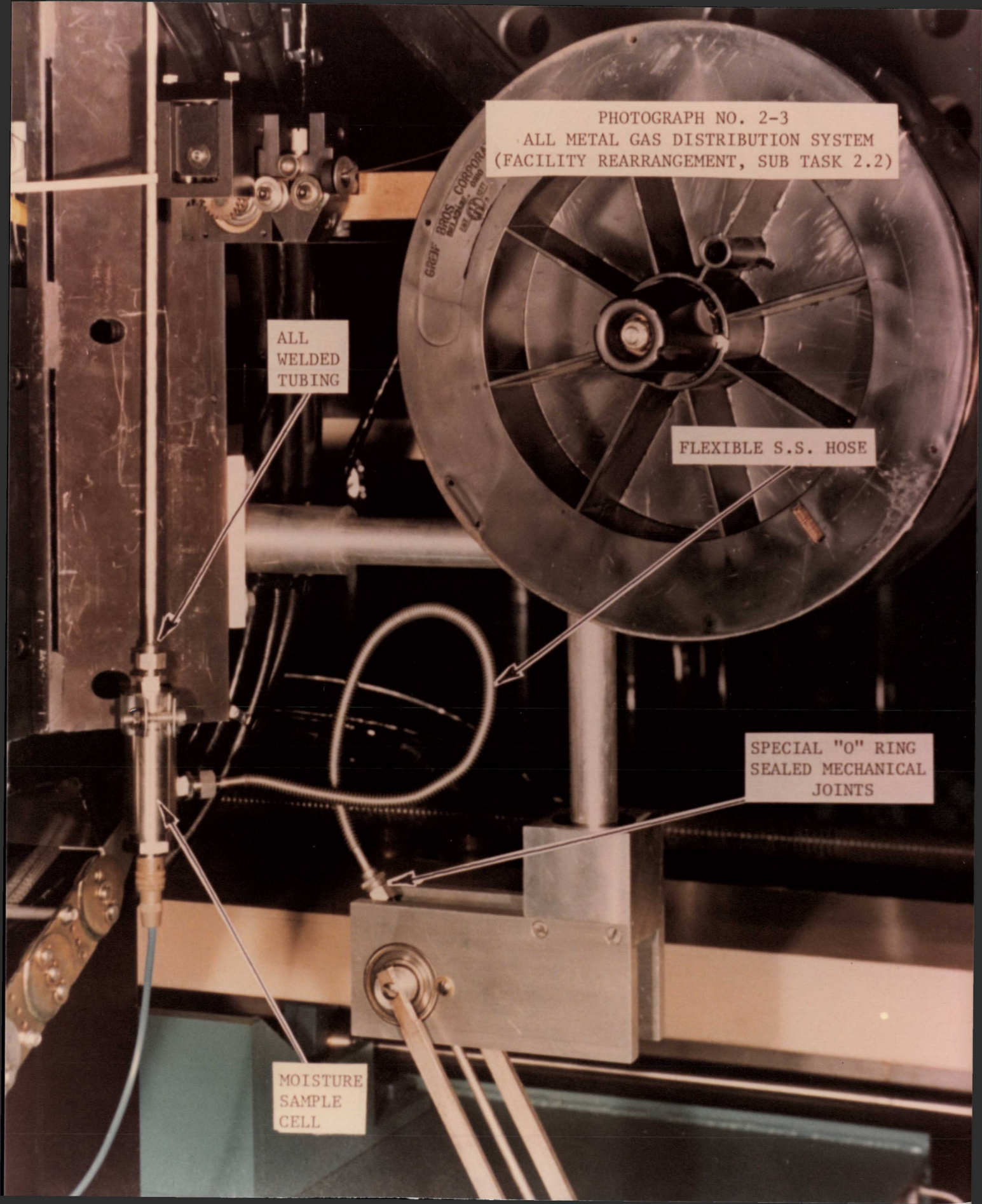
PHOTOGRAPH NO. 2-3  
ALL METAL GAS DISTRIBUTION SYSTEM  
(FACILITY REARRANGEMENT, SUB TASK 2.2)

ALL  
WELDED  
TUBING

FLEXIBLE S.S. HOSE

SPECIAL "O" RING  
SEALED MECHANICAL  
JOINTS

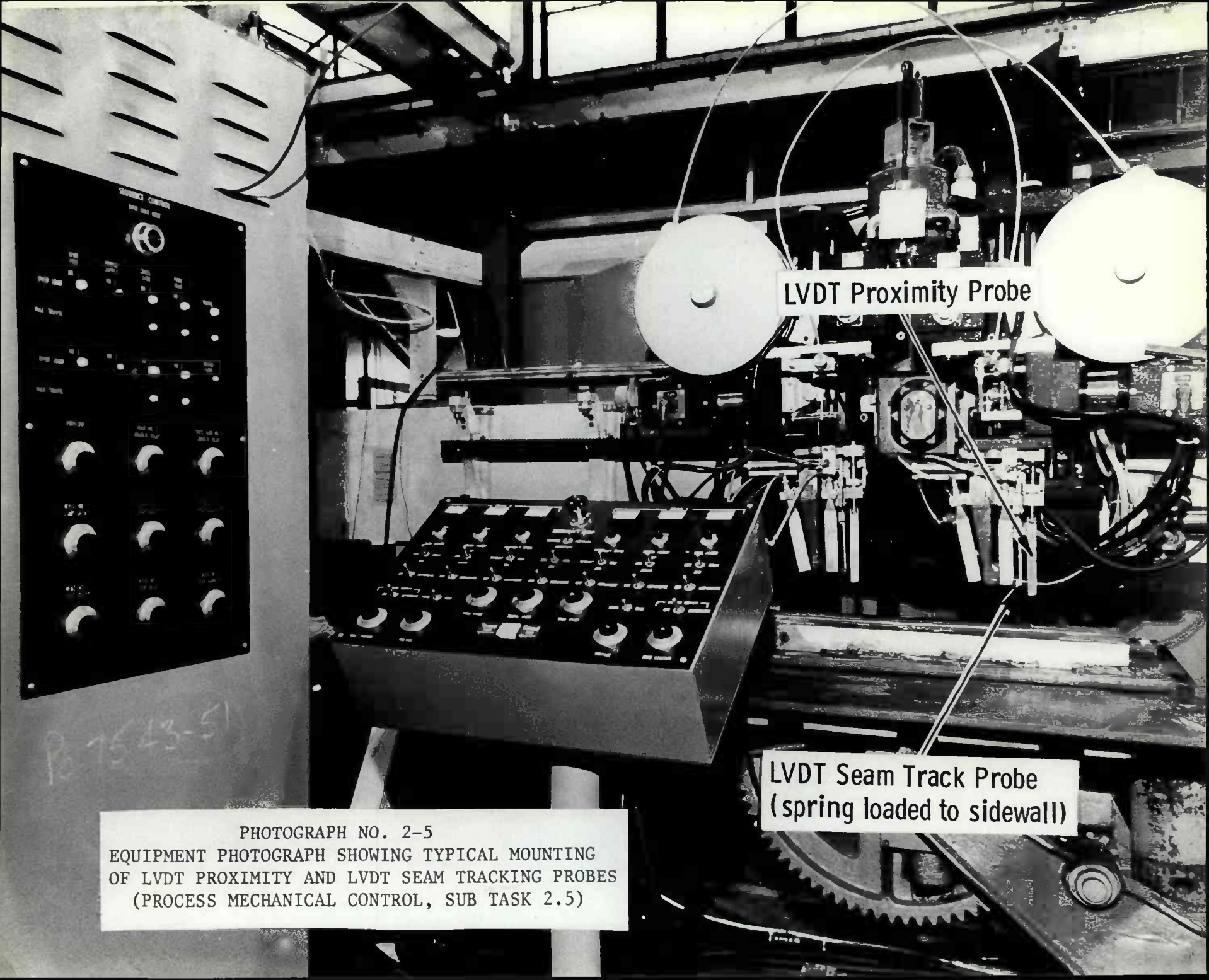
MOISTURE  
SAMPLE  
CELL





TORCH

PHOTOGRAPH NO. 2-4  
GTAW-HW TORCH ADAPTATION  
(SUB TASK 2.4)

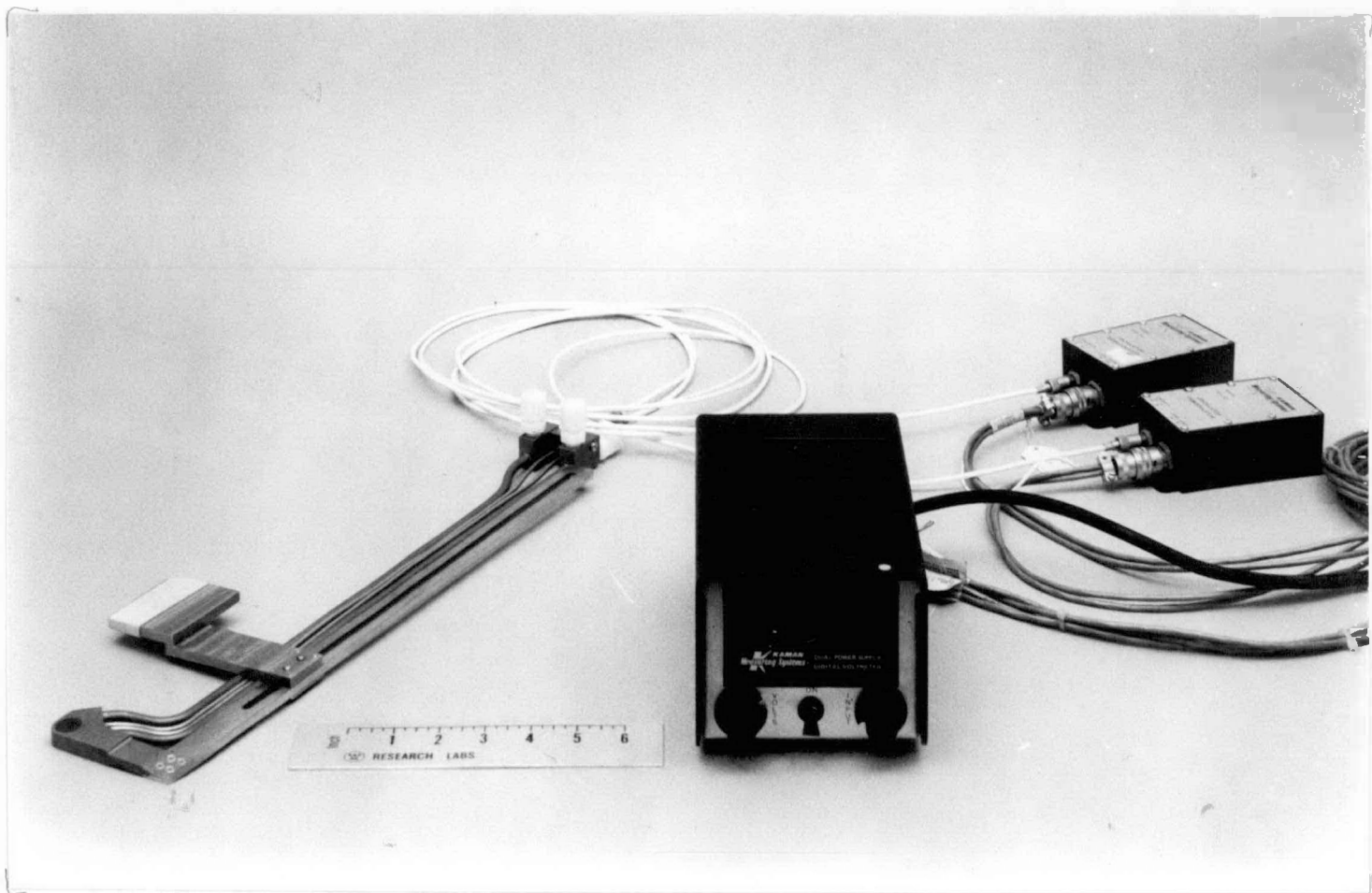


LVDT Proximity Probe

LVDT Seam Track Probe  
(spring loaded to sidewall)

PHOTOGRAPH NO. 2-5  
EQUIPMENT PHOTOGRAPH SHOWING TYPICAL MOUNTING  
OF LVDT PROXIMITY AND LVDT SEAM TRACKING PROBES  
(PROCESS MECHANICAL CONTROL, SUB TASK 2.5)

EQUIPMENT PHOTOGRAPH SHOWING DOUBLE SIDED,  
NON CONTACT EDDY CURRENT FEEDBACK SEAM TRACK  
SYSTEM (PROCESS MECHANICAL CONTROL, SUB TASK 2.5)



Photograph of non-contact feedback seam track system for narrow groove welding. The probe assembly in the left of the figure consists of two water cooled Eddy current sensors mounted back to back. It rides down in the narrow groove as close to the arc as possible. By sensing both joint sidewalls and balancing the signals it keeps the narrow groove torch equidistant from each wall. The two boxes in the back right are oscillator demodulators for each Eddy current probe. The central box is a dual power supply digital voltmeter. The output signal from the system is input to the seam track servo motor which responds to center the probe assembly and balance the signal to each Eddy current probe.