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ACCESSION NBR:9010090189 DOC.DATE: 90/09/19 NOTARIZED: NO DOCKET #  
 FACIL:STN-50-528 Palo Verde Nuclear Station, Unit 1, Arizona Publi 05000528  
 STN-50-529 Palo Verde Nuclear Station, Unit 2, Arizona Publi 05000529  
 STN-50-530 Palo Verde Nuclear Station, Unit 3, Arizona Publi 05000530

AUTH.NAME AUTHOR AFFILIATION  
 CONWAY,W.F. Arizona Public Service Co. (formerly Arizona Nuclear Power R  
 RECIP.NAME RECIPIENT AFFILIATION  
 MARTIN,J.B. Region 5 (Post 820201) I

SUBJECT: Forwards addl info re Holophane & Exide power supplies,per  
 telcon request. D

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WILLIAM F. CONWAY  
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161-03484-WFC/ACR/RAB  
September 19, 1990

Docket Nos. STN 50-528/529/530

Mr. John B. Martin  
Regional Administrator, Region V  
U. S. Nuclear Regulatory Commission  
1450 Maria Lane, Suite 210  
Walnut Creek, CA 94596-5368

Reference: Letter to J. B. Martin, NRC, from W. F. Conway, APS,  
dated August 15, 1990; Subject: Response to Request  
for Additional Information - Emergency Lighting.

Dear Mr. Martin:

Subject: Palo Verde Nuclear Generating Station (PVNGS)  
Units 1, 2 and 3  
Response to Request for Additional Information -  
Holophane and Exide Power Supplies  
File: 90-019-026; 90-056-026

The attachment to this letter provides the data for the Holophane and Exide power supplies, as requested by members of your staff, Messrs. D. Kirsch and R. Huey, during recent phone conversations with APS staff. The requested information concerns voltage adjustments which may have been made during preventive maintenance testing and additional battery charging performed immediately prior to discharge tests, as reported in the referenced letter.

Please contact Mr. A. C. Rogers, at (602) 340-4041, if you have any further questions concerning this information.

Sincerely,

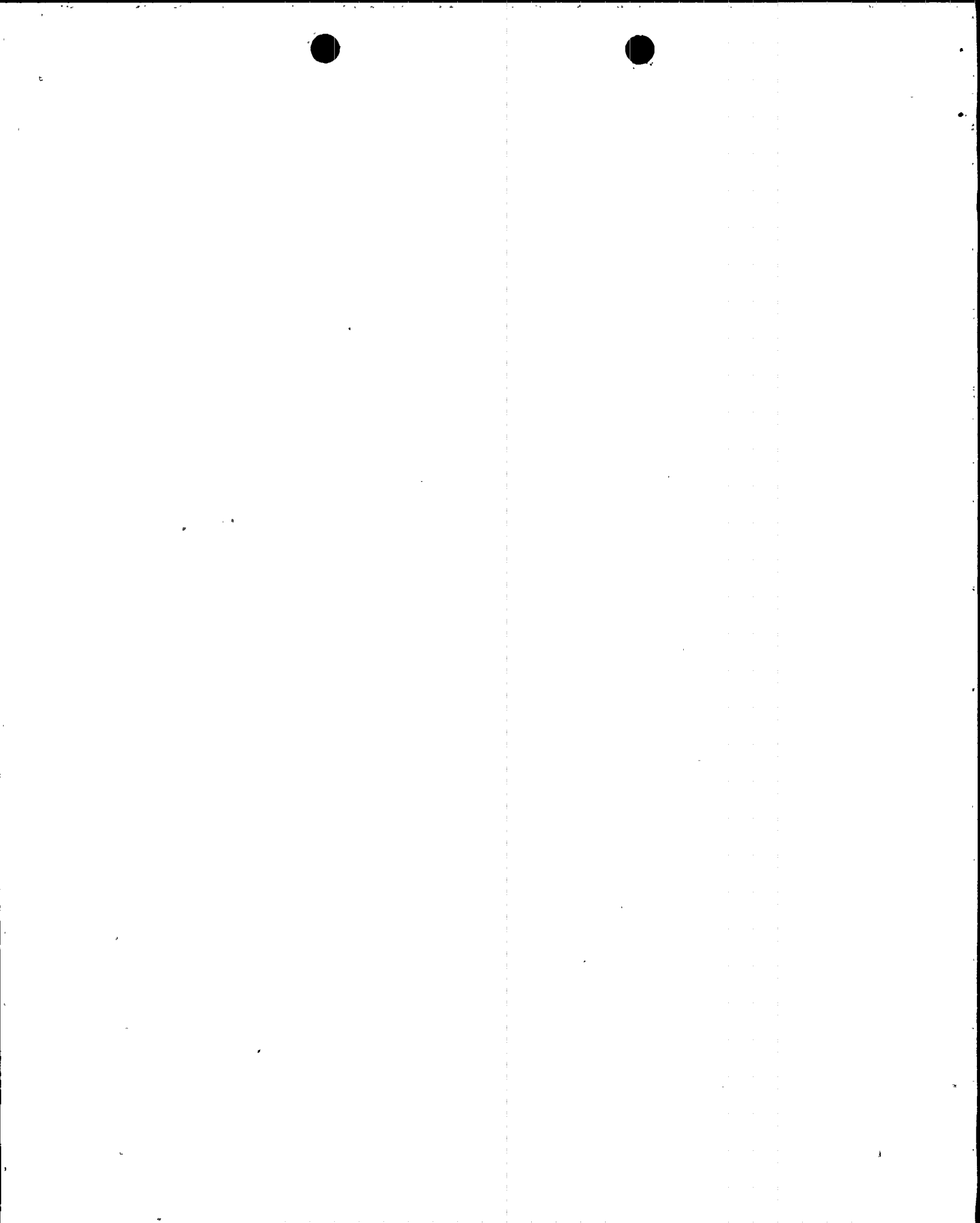
*James M. Levine for WFC*

03087

WFC/ACR/RAB  
Attachment

cc: Document Control Desk  
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HOLOPHANE AND EXIDE  
PRECONDITIONING REVIEW  
SUMMARY

Two questions were raised concerning preconditioning of batteries in Emergency Lighting Inverter Systems prior to the performance of eight hour discharge tests. The first question was whether adjustments were made to the inverters or the batteries immediately prior to the performance of a successful discharge test. Tables 1 and 2 provide the results of the review performed to address this issue. This was a review of the successful Holophane and Exide 8-hour discharge tests that were previously identified in the APS August 15, 1990 submittal (161-03406).

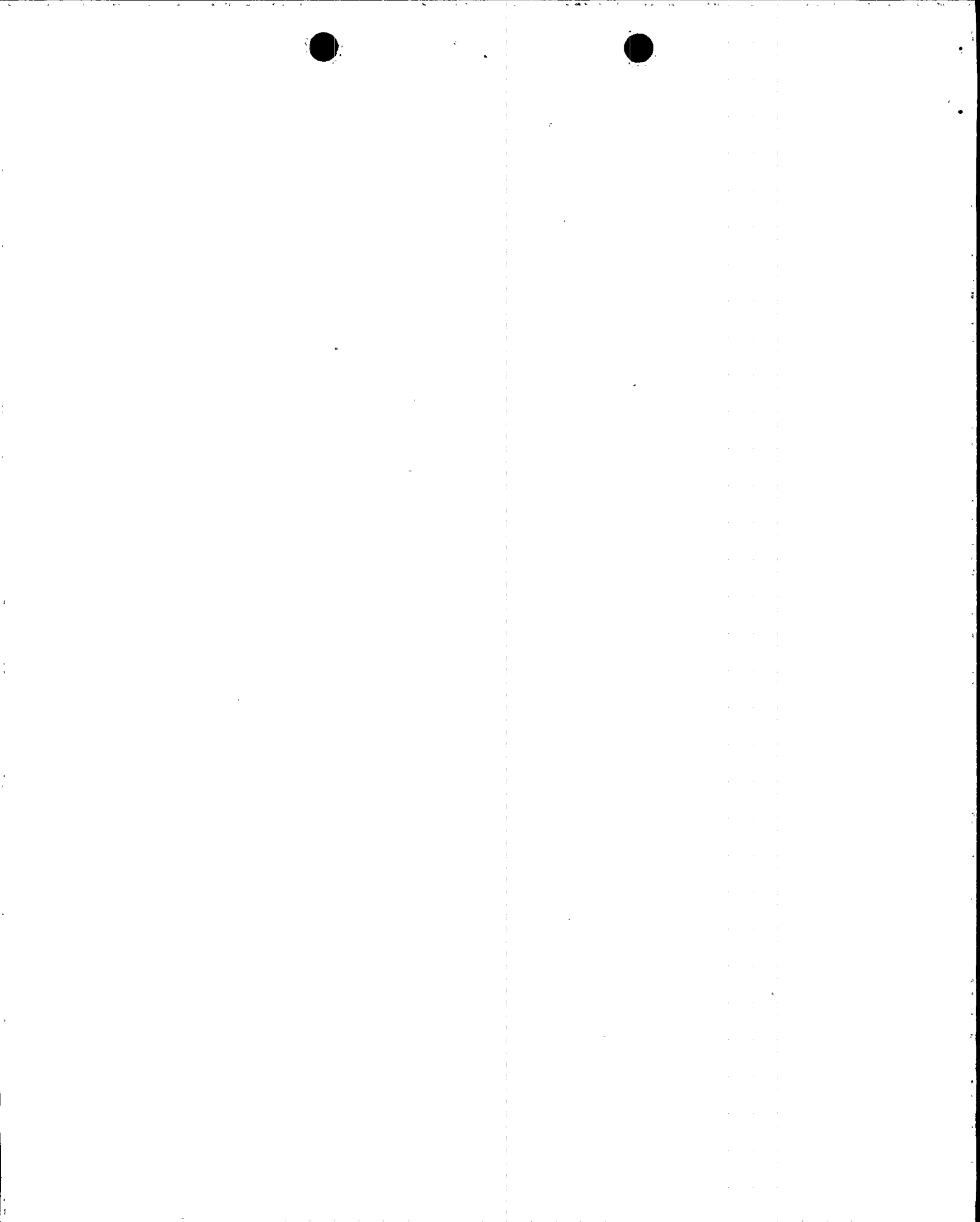
The review included both Preventive Maintenance (PM) and Corrective Maintenance (CM) WOs and was conducted to determine if the activities associated with the PM or CM constituted a preconditioning activity.

Since it is required by APS programs and vendor recommendations to prepare equipment and components for initial service and to perform the discharge test to verify the design function, this review assumed that the maintenance activities performed prior to initial service did not constitute a preconditioning activity. The majority of new battery installation was performed for a modification or an Engineering Evaluation Request (EER) resolution. This assumption is reflected in Tables 1 and 2 and the associated maintenance activities are described in the comment area.

The results of the WO review for both the Holophane and Exide successful discharge tests indicate the preconditioning prior to the performance of a discharge test is not a common practice. Out of the 78 total successful discharge tests, preconditioning activities, prior to the discharge test performance, were conducted in only 3 instances.

The second question raised was if, as a common practice, it was necessary to adjust the Battery Bank Float Voltage (BBFV) during the performance of Preventive Maintenance (PM) Tasks that were not 8-hour discharge tests. The thrust of this question was to determine if the float voltages were stable or if frequent adjustment was necessary to keep the voltage within specification. Tables 3 and 4 provide the results of this review. To conduct this review Holophane data sheets created from the hardcopy PM task Work Order review, conducted in July 1990, were examined to determine if the BBFV had been adjusted during any monthly PMs performed from July 1, 1989 to June 30, 1990.

Where the review of the data sheets indicated the BBFV outside acceptance criteria, the hardcopy of the Work Order was reviewed to provide positive verification of an adjustment. To provide confidence that the process identified BBFV adjustments, a random sample review of Work Orders from each equipment ID, not indicating a change to the BBFV on the data sheet, was performed. The random sample of Work Orders reviewed ultimately represented 15.3% of the PM task Work Order data sheets examined, and confirmed the validity of the original review.



The data sheets for the Exide PMs did not contain enough information to clearly identify adjustments to BBFV. Therefore, a 100% hardcopy review of Exide PM Work Orders was conducted for PMs performed from July 1, 1989 to June 30, 1990.

The review determined that only 7.6% of the Holophane and only 5.8% of the Exide PM task work orders document BBFV adjustments during the performance of a PM. These numbers do not appear to be excessive or identify an area of concern.

From the Holophane and Exide PM data presented, it can be concluded that it is not common practice for personnel to make adjustments to the BBFV during the performance of a PM task which allows such adjustments, and that such adjustments are infrequently necessary.

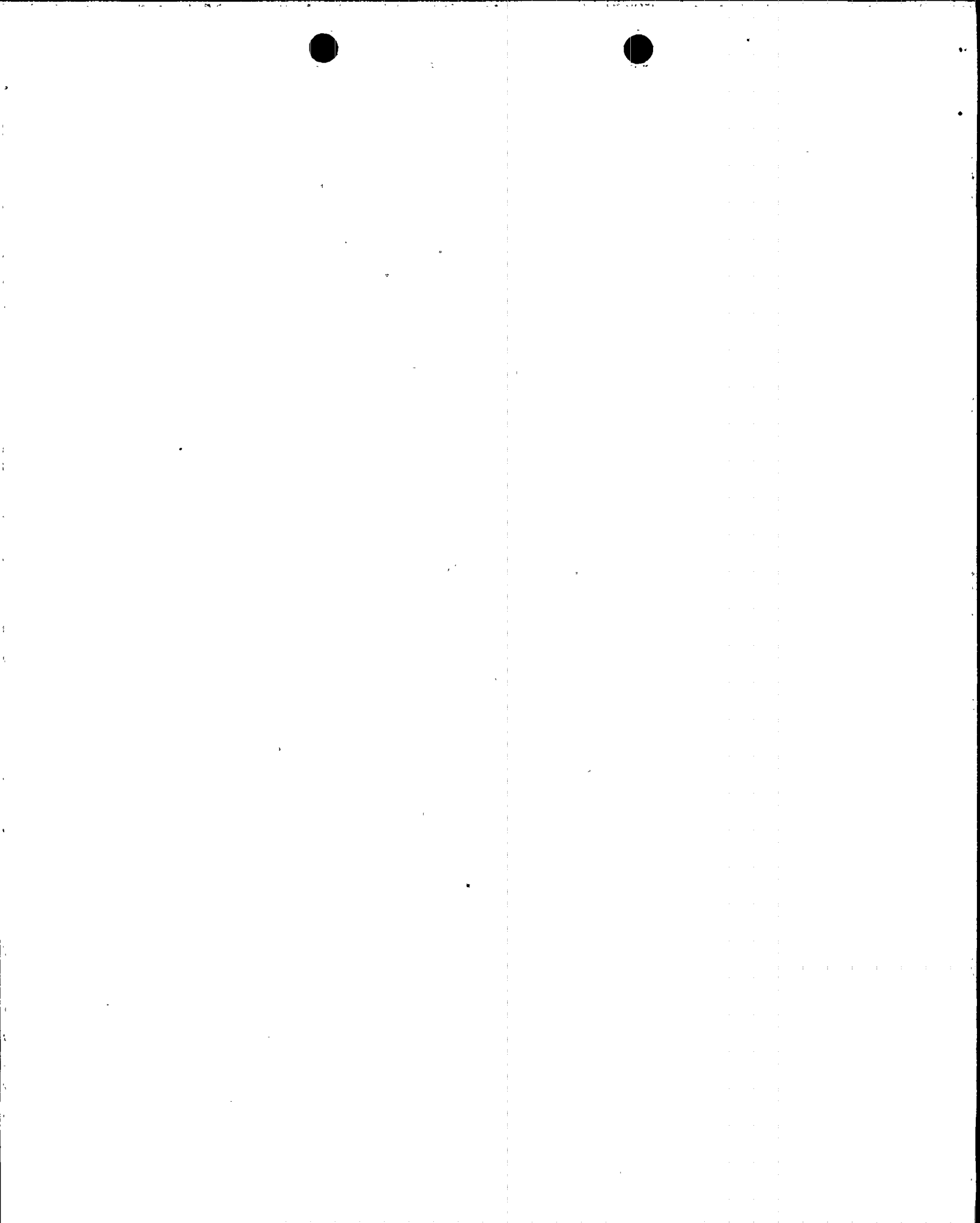




TABLE 1

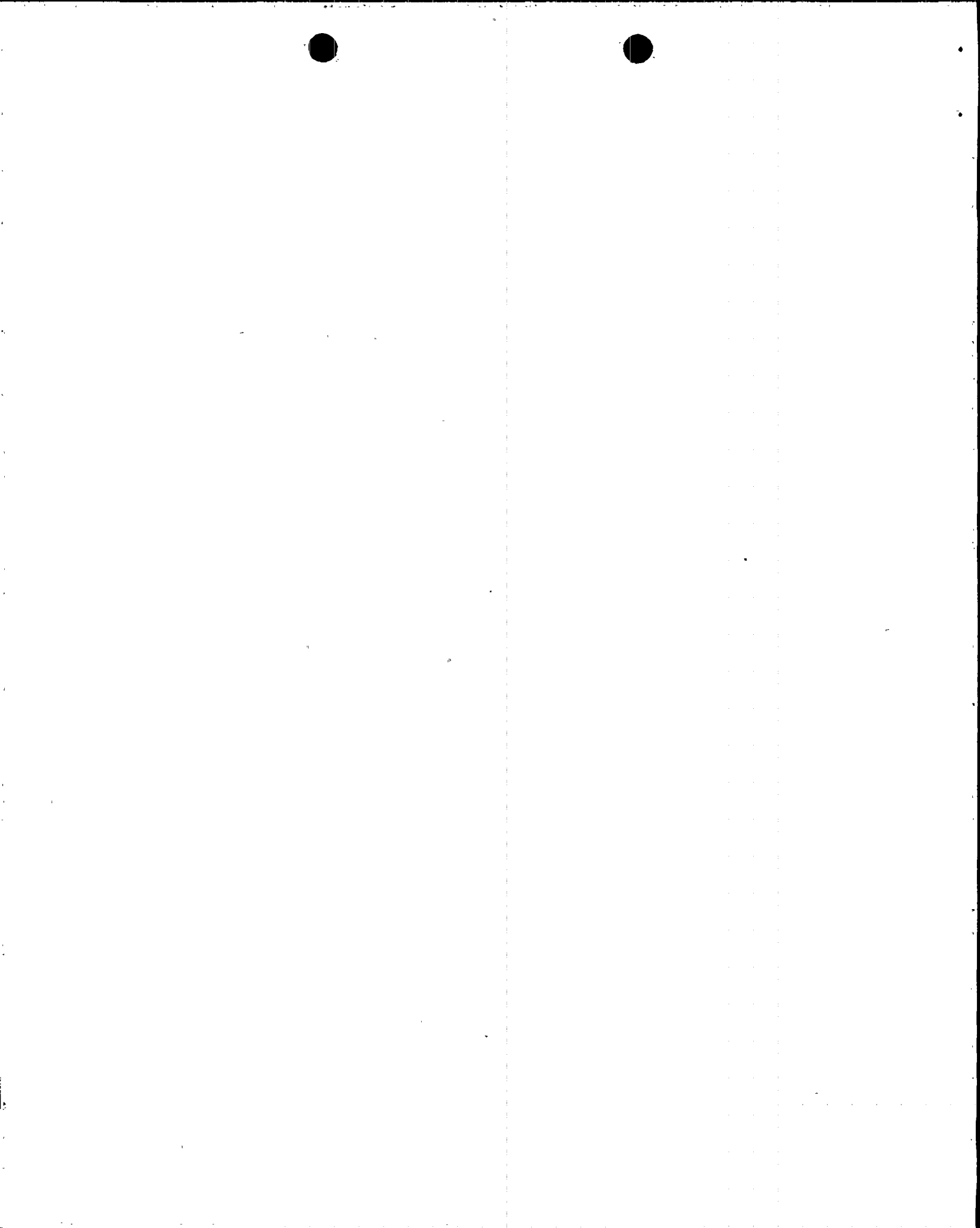
## HOLOPHANE

1-E-QBN-001

| DATE     | PRE-COND | FLOAT AS FOUND | VOLTAGE AS LEFT | 24 HR. PRE-CHARGE | COMMENTS  |
|----------|----------|----------------|-----------------|-------------------|---|
| 01/07/87 | NO       | ----           | 28.0            | YES               | New batteries were installed and allowed to charge. Voltage was adjusted during the charging.   |
| 04/22/88 | NO       | 27.9           | 27.9            | NO                | No adjustment or cleaning was performed.  |
| 12/02/88 | NO       | 27.7           | 27.7            | NO                | No adjustment or cleaning was performed.  |
| 03/26/90 | YES      | 25.3           | ----            | YES               | Low BBFV found on 3/26/90. Worked stopped until 3/31/90. New BBFV reading prior to test was not recorded on WO. Batteries were cleaned. |
| 04/30/90 | NO       | 27.8           | 27.8            | NO                | Batteries were cleaned.   |
| 06/15/90 | NO       | 27.0           | 27.0            | NO                | New batteries were charged prior to installation. Test began within a few hours of installation.  |

1-E-QBN-002

| DATE     | PRE-COND | FLOAT AS FOUND | VOLTAGE AS LEFT | 24 HR. PRE-CHARGE | COMMENTS                                 |
|----------|----------|----------------|-----------------|-------------------|--|
| 01/14/88 | NO       | 27.8           | 27.8            | NO                | No adjustment or cleaning was performed. |
| 12/01/88 | NO       | 27.9           | 27.9            | NO                | No adjustment or cleaning was performed. |
| 03/26/90 | NO       | 27.6           | 27.6            | NO                | Batteries were cleaned.                  |
| 05/21/90 | NO       | 27.9           | 27.9            | NO                | Batteries were cleaned.                  |

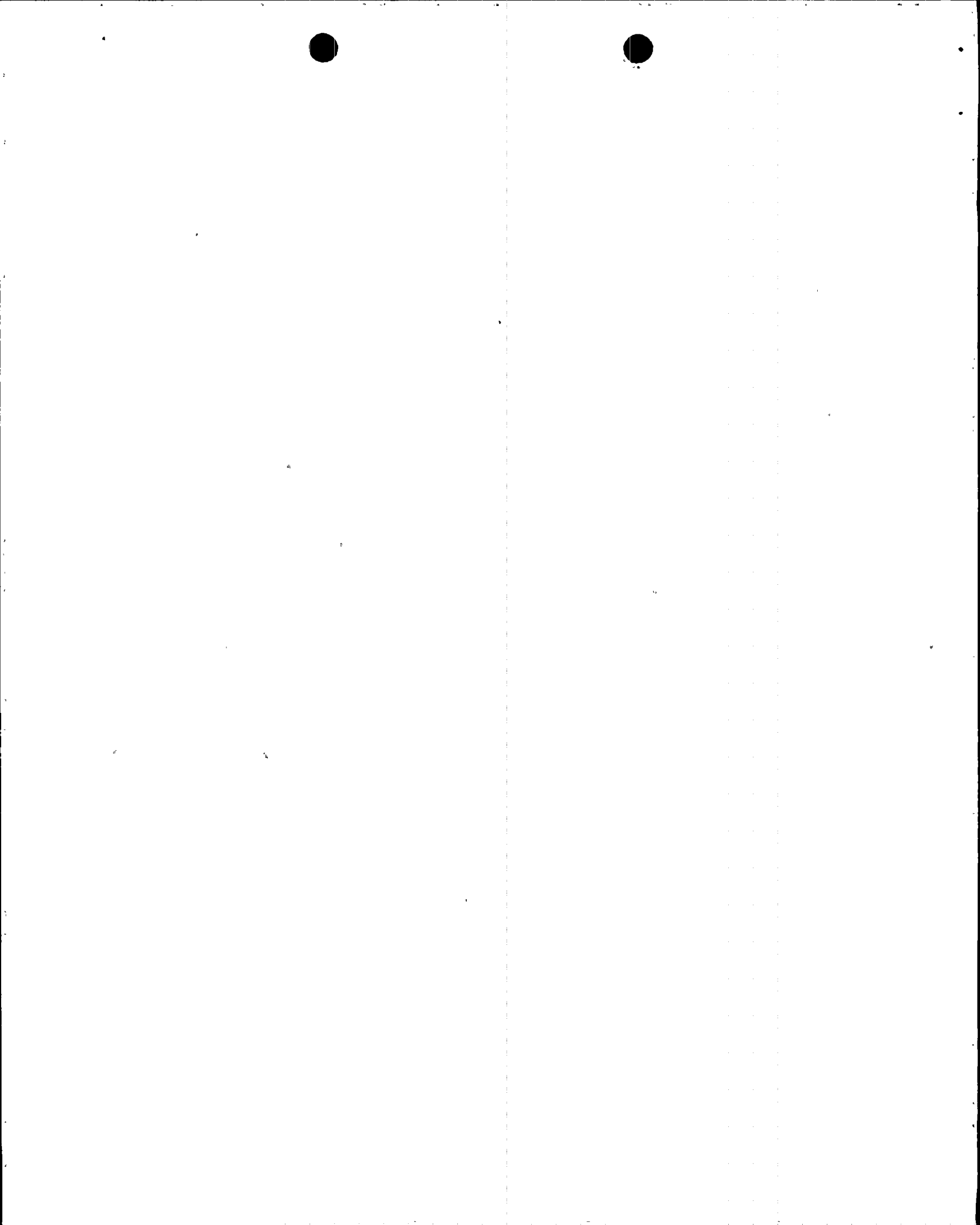


1-E-QBN-003

| DATE     | PRE-COND | FLOAT AS FOUND | VOLTAGE AS LEFT | 24 HR. PRE-CHARGE | COMMENTS   |
|----------|----------|----------------|-----------------|-------------------|--|
| 02/02/88 | NO       | 28.1           | 28.1            | NO                | Batteries were cleaned.  |
| 12/5/88  | NO       | 27.9           | 27.9            | NO                | No adjustment or cleaning was performed.   |
| 01/17/90 | NO       | 27.8           | 27.8            | NO                | No adjustment or cleaning was performed.   |
| 02/27/90 | NO       | 27.9           | 27.9            | NO                | No adjustment or cleaning was performed.   |
| 06/16/90 | NO       | ----           | 27.1            | YES               | New batteries were installed and charged approximately 24 hours prior to test. BBFV was taken just prior to test and no voltage adjustment was made prior to test. |
| 07/06/90 | NO       | 25.5           | 27.1            | YES               | New batteries were installed. Voltage was adjusted and batteries were charged prior to test.   |

1-E-QBN-004

| DATE     | PRE-COND | FLOAT AS FOUND | VOLTAGE AS LEFT | 24 HR. PRE-CHARGE | COMMENTS   |
|----------|----------|----------------|-----------------|-------------------|--|
| 02/02/88 | NO       | 27.8           | 27.8            | NO                | No adjustment or cleaning was performed.   |
| 12/14/88 | NO       | 27.8           | 27.8            | NO                | No adjustment or cleaning was performed.   |
| 03/01/90 | YES      | 27.4           | 27.9            | YES               | Voltage was adjusted and batteries were charged. However, the test was not actually performed until a month later. |
| 05/08/90 | NO       | 28.1           | 28.1            | NO                | Batteries were cleaned.  |

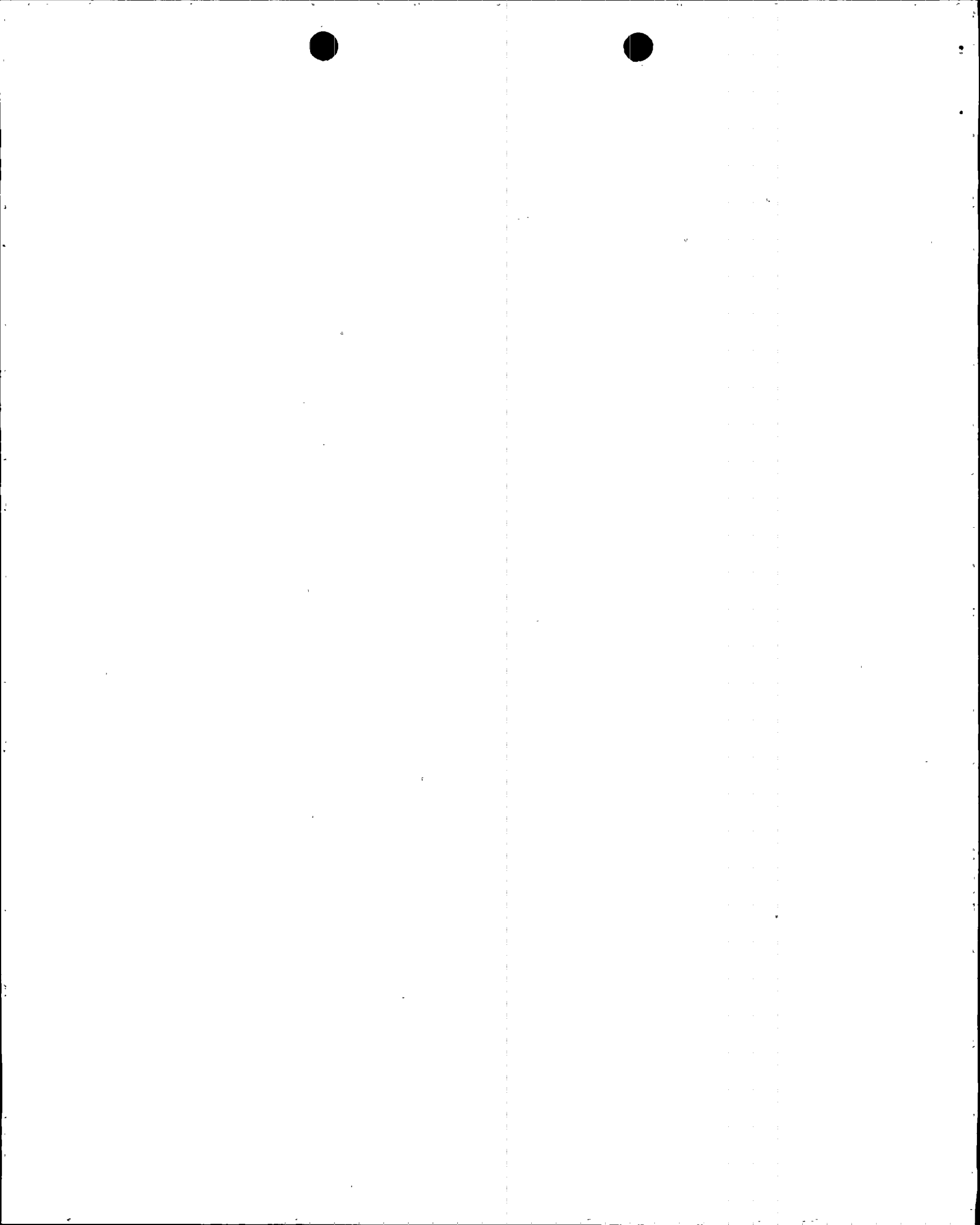


2-E-QBN-001

| DATE     | PRE-COND | FLOAT AS FOUND | VOLTAGE AS LEFT | 24 HR. PRE-CHARGE | COMMENTS   |
|----------|----------|----------------|-----------------|-------------------|--|
| 06/01/87 | NO       | 27.8           | 27.8            | NO                | Batteries were cleaned.  |
| 05/04/88 | NO       | 27.9           | 27.9            | NO                | Batteries were cleaned.  |
| 03/29/89 | NO       | 27.8           | 27.8            | NO                | No adjustment or cleaning was performed.   |
| 11/20/89 | NO       | 27.8           | 27.8            | NO                | Batteries were cleaned.  |
| 03/12/90 | NO       | ----           | 27.9            | YES               | New batteries were installed and allowed to charge. No adjustment was made to charger voltage.                 |
| 07/01/90 | NO       | ----           | 27.1            | YES               | New batteries were installed. Charger was adjusted and batteries were allowed to charge on float for 48 hours. |

2-E-QBN-002

| DATE     | PRE-COND | FLOAT AS FOUND | VOLTAGE AS LEFT | 24 HR. PRE-CHARGE | COMMENTS  |
|----------|----------|----------------|-----------------|-------------------|---|
| 07/03/89 | NO       | 27.8           | 27.8            | NO                | Batteries were cleaned.   |
| 01/11/90 | NO       | 27.8           | 27.8            | NO                | Batteries were cleaned.   |
| 03/13/90 | NO       | 26.5           | 27.9            | YES               | New batteries were installed. Charger was adjusted and batteries were charged for 24 hours. |
| 07/04/90 | NO       | 27.1           | 27.1            | NO                | Batteries were cleaned.   |

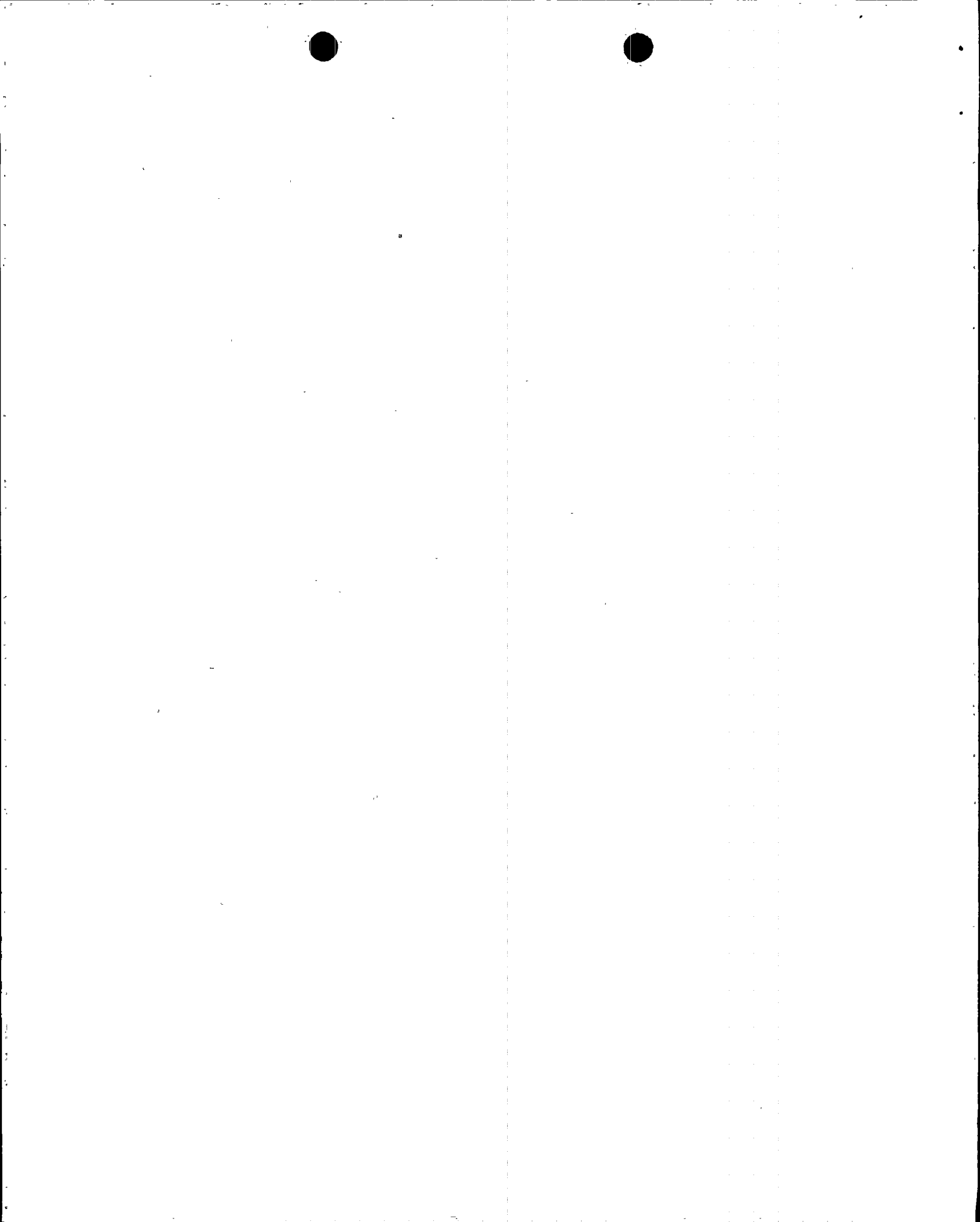


2-E-QBN-003

| DATE     | PRE-COND | FLOAT AS FOUND | VOLTAGE AS LEFT | 24 HR. PRE-CHARGE | COMMENTS   |
|----------|----------|----------------|-----------------|-------------------|--|
| 08/09/87 | NO       | 27.9           | 27.9            | NO                | Batteries were cleaned.                                |
| 06/05/89 | NO       | 27.9           | 27.9            | NO                | Batteries were cleaned.                                |
| 12/03/89 | NO       | 27.8           | 27.8            | NO                | No adjustment or cleaning was performed.               |
| 03/13/90 | NO       | ----           | 27.9            | YES               | New batteries were installed and charged for 24 hours. |
| 04/03/90 | NO       | 27.8           | 27.8            | NO                | Batteries were cleaned.                                |
| 05/16/90 | NO       | 27.9           | 27.9            | NO                | Batteries were cleaned.                                |

2-E-QBN-004

| DATE     | PRE-COND | FLOAT AS FOUND | VOLTAGE AS LEFT | 24 HR. PRE-CHARGE | COMMENTS                                 |
|----------|----------|----------------|-----------------|-------------------|--|
| 07/12/87 | NO       | 28.0           | 28.0            | NO                | Batteries were cleaned.                  |
| 05/05/88 | NO       | 27.9           | 27.9            | NO                | No adjustment or cleaning was performed. |
| 03/29/89 | NO       | 27.9           | 27.9            | NO                | No adjustment or cleaning was performed. |
| 11/16/89 | NO       | 27.9           | 27.9            | NO                | No adjustment or cleaning was performed. |
| 05/11/90 | NO       | 27.9           | 27.9            | NO                | Batteries were cleaned.                  |



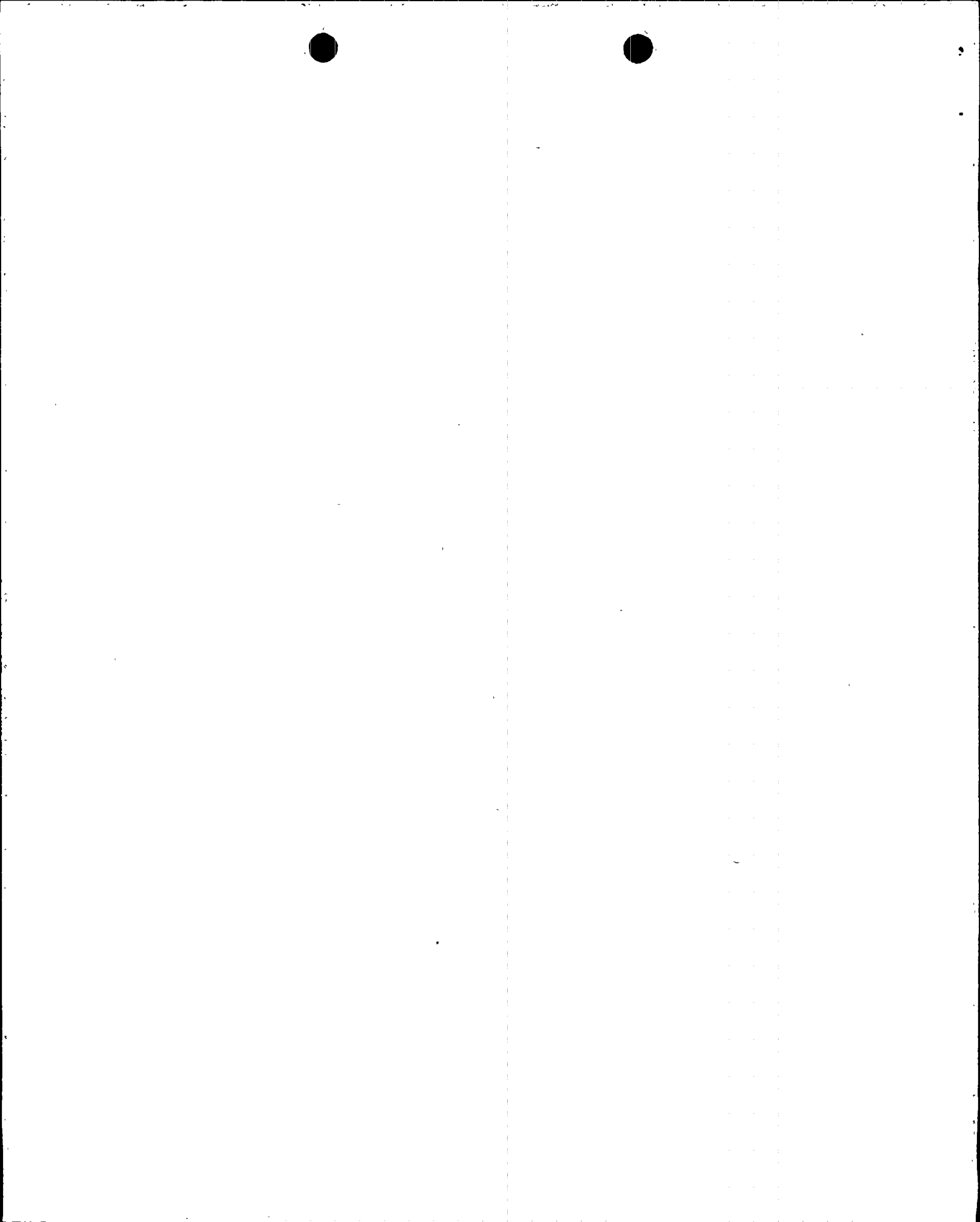


3-E-QBN-001

| DATE     | PRE-<br>COND | FLOAT<br>AS FOUND | VOLTAGE<br>AS LEFT | 24 HR.<br>PRE-CHARGE | COMMENTS   |
|----------|--------------|-------------------|--------------------|----------------------|--|
| 01/19/89 | NO           | 28.0              | 28.0               | NO                   | No adjustment or cleaning was performed.               |
| 07/22/89 | NO           | 27.7              | 27.7               | NO                   | Batteries were cleaned.                                |
| 10/06/89 | NO           | 27.7              | 27.7               | NO                   | No adjustment or cleaning was performed.               |
| 03/09/90 | NO           | 27.7              | 27.7               | NO                   | Batteries were cleaned.                                |
| 06/16/90 | NO           | 26.1              | 27.0               | YES                  | New batteries were installed and charged for 24 hours. |

3-E-QBN-002

| DATE     | PRE-<br>COND | FLOAT<br>AS FOUND | VOLTAGE<br>AS LEFT | 24 HR.<br>PRE-CHARGE | COMMENTS   |
|----------|--------------|-------------------|--------------------|----------------------|--|
| 04/15/88 | NO           | 27.9              | 27.9               | NO                   | Water was added to batteries (9/11/87). Batteries were cleaned (4/15/88). No adjustment or charging was performed immediately prior to the discharge test. |
| 10/12/88 | NO           | 27.9              | 27.9               | NO                   | Batteries were cleaned.  |
| 04/01/89 | NO           | 27.8              | 27.8               | NO                   | Batteries were cleaned.  |
| 10/05/89 | NO           | 27.8              | 27.8               | NO                   | Batteries were cleaned.  |
| 04/13/90 | NO           | 27.8              | 27.8               | NO                   | Batteries were cleaned.  |



3-E-QBN-003

| DATE     | PRE-COND | FLOAT AS FOUND | VOLTAGE AS LEFT | 24 HR. PRE-CHARGE | COMMENTS   |
|----------|----------|----------------|-----------------|-------------------|--|
| 04/18/88 | NO       | 28.1           | 28.1            | NO                | Batteries were cleaned.  |
| 01/19/89 | NO       | 27.9           | 27.9            | NO                | Batteries were cleaned.  |
| 06/19/89 | NO       | 27.9           | 27.9            | NO                | Batteries were cleaned.  |
| 10/05/89 | NO       | 27.8           | 27.8            | NO                | No adjustment or cleaning was performed.                             |
| 06/18/90 | NO       | ----           | 27.0            | YES               | New batteries were installed and charged for 24 hours prior to test. |

3-E-QBN-004

| DATE     | PRE-COND | FLOAT AS FOUND | VOLTAGE AS LEFT | 24 HR. PRE-CHARGE | COMMENTS   |
|----------|----------|----------------|-----------------|-------------------|--|
| 05/02/88 | NO       | See Comment    |                 | NO                | Page showing float voltage was missing from WO. Other pages showed that no adjustment was made to voltage and no charging was conducted prior to the discharge test. |
| 01/19/89 | NO       | 27.8           | 27.8            | NO                | Batteries were cleaned.  |
| 06/19/89 | NO       | 27.9           | 27.9            | NO                | Batteries were cleaned.  |
| 02/06/90 | NO       | 27.8           | 27.8            | NO                | Batteries were cleaned.  |

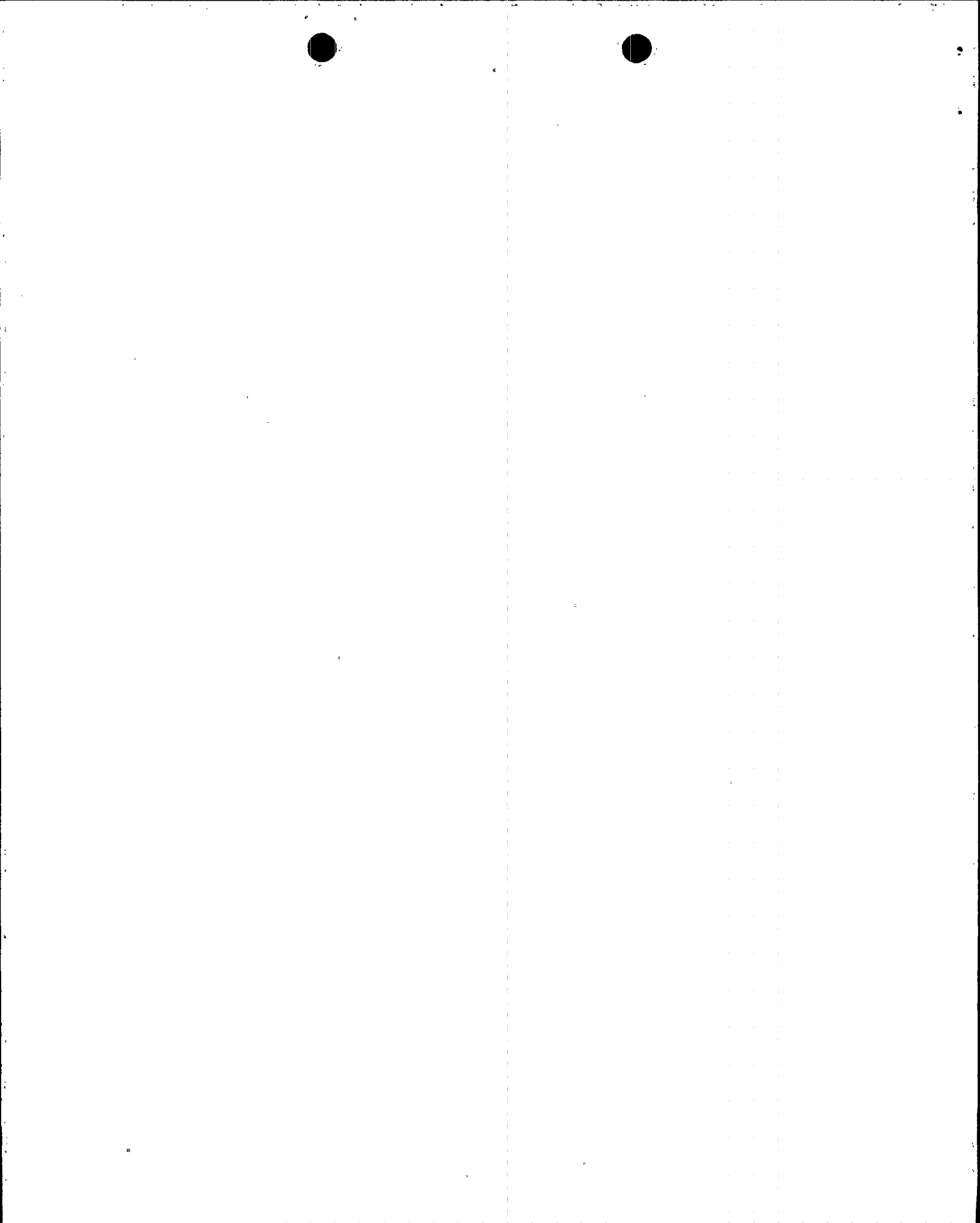


TABLE 2

EXIDE

1-E-QDN-F01 and 1-E-QDN-N01

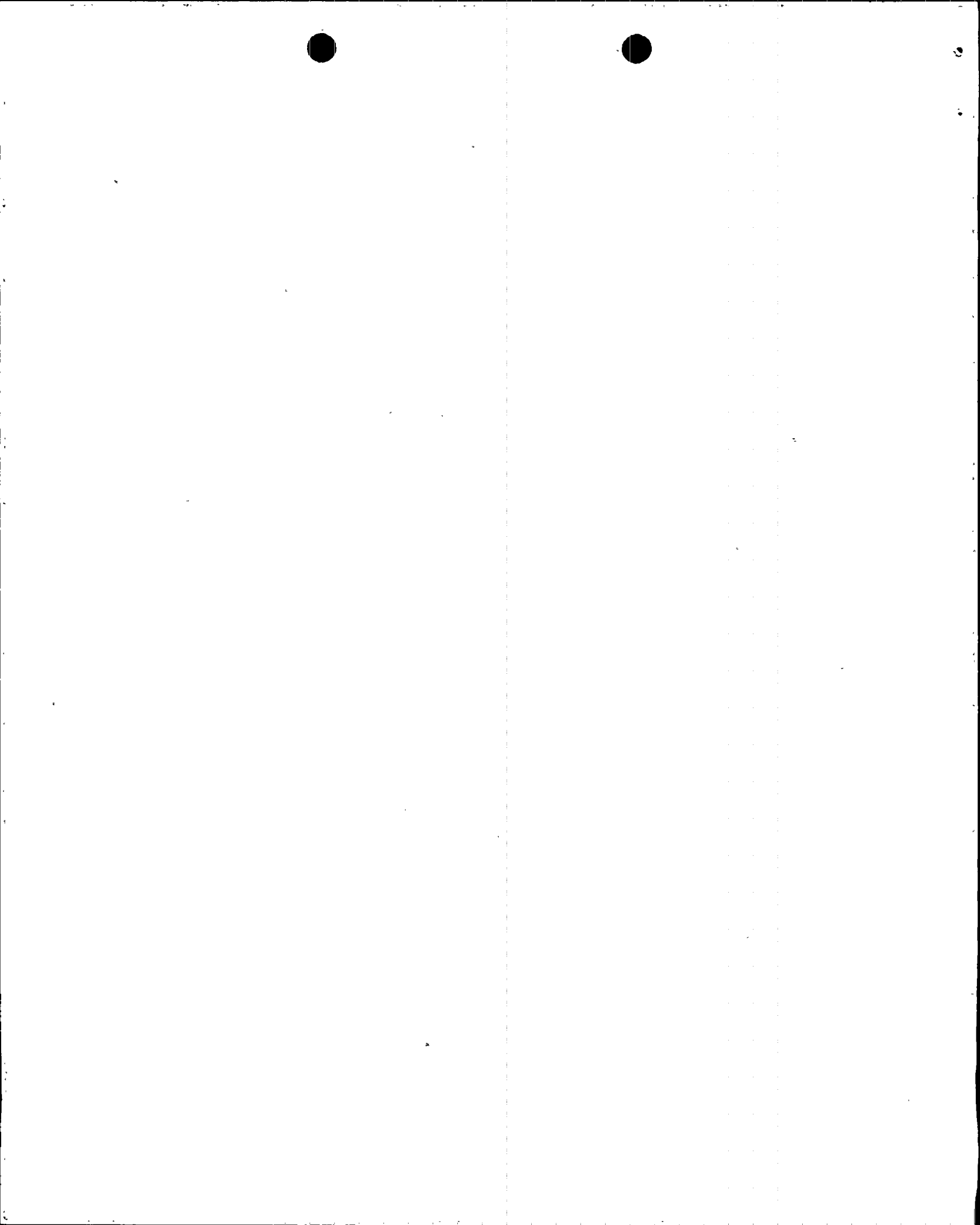
| DATE     | PRE-<br>COND | COMMENTS   |
|----------|--------------|--|
| 02/03/87 | NO           | No adjustment or charging was performed prior to the discharge test. |
| 01/29/88 | NO           | No adjustment or charging was performed prior to the discharge test. |
| 02/27/90 | NO           | No adjustment or charging was performed prior to the discharge test. |

1-E-QDN-F02 and 1-E-QDN-N02

| DATE     | PRE-<br>COND | COMMENTS   |
|----------|--------------|--|
| 02/05/87 | NO           | No adjustment or charging was performed prior to the discharge test. |
| 01/29/88 | NO           | No adjustment or charging was performed prior to the discharge test. |
| 02/27/90 | NO           | No adjustment or charging was performed prior to the discharge test. |

2-E-QDN-F01 and 2-E-QDN-N01

| DATE     | PRE-<br>COND | COMMENTS   |
|----------|--------------|--|
| 04/20/87 | NO           | No adjustment or charging was performed prior to the discharge test. (This discharge test was previously reported on 02/20/87 due to a typographical error.) |
| 01/07/89 | NO           | No adjustment or charging was performed prior to the discharge test.   |



2-E-QDN-F02 and 2-E-QDN-N02

| DATE     | PRE-<br>COND | COMMENTS  |
|----------|--------------|---|
| 04/20/87 | NO           | No adjustment or charging was performed prior to the discharge test.  |
| 01/07/89 | NO           | No adjustment or charging was performed prior to the discharge test.  |
| 01/02/90 | NO           | 2-E-QDN-N02 successfully completed 8-hour discharge test (N01 failed) with no adjustment or charging being performed prior to the discharge test. |
| 03/12/90 | NO           | No adjustment or charging was performed prior to the discharge test.  |

3-E-QDN-F01 and 3-E-QDN-N01

| DATE     | PRE-<br>COND | COMMENTS   |
|----------|--------------|--|
| 08/01/89 | NO           | Test failed three (3) times due to breaker tripping. Final test on 8/1/89 was successful. No adjustment or charging was performed prior to the discharge tests.  |
| 02/28/90 | YES          | Float voltage was adjusted from 134.5 VDC to 135.0 VDC. Charge current was 3.2 amps. Batteries were not charged prior to the discharge test. Test was initiated shortly after the adjustment was made. |
| 03/31/90 | NO           | No adjustment or charging was performed prior to the discharge test. (NOTE: This discharge test had not been previously identified due to the WO being misplaced in Unit 3.)                           |

3-E-QDN-F02 and 3-E-QDN-N02

| DATE     | PRE-<br>COND | COMMENTS  |
|----------|--------------|---|
| 06/12/89 | NO           | 3-E-QDN-N02 successfully completed 8-hour discharge test (N01 failed) with no adjustment or charging being performed prior to the discharge test. |
| 07/24/89 | NO           | 3-E-QDN-N02 successfully completed 8-hour discharge test (N01 failed) with no adjustment or charging being performed prior to the discharge test. |
| 08/01/89 | NO           | No adjustment or charging was performed prior to the discharge test.  |

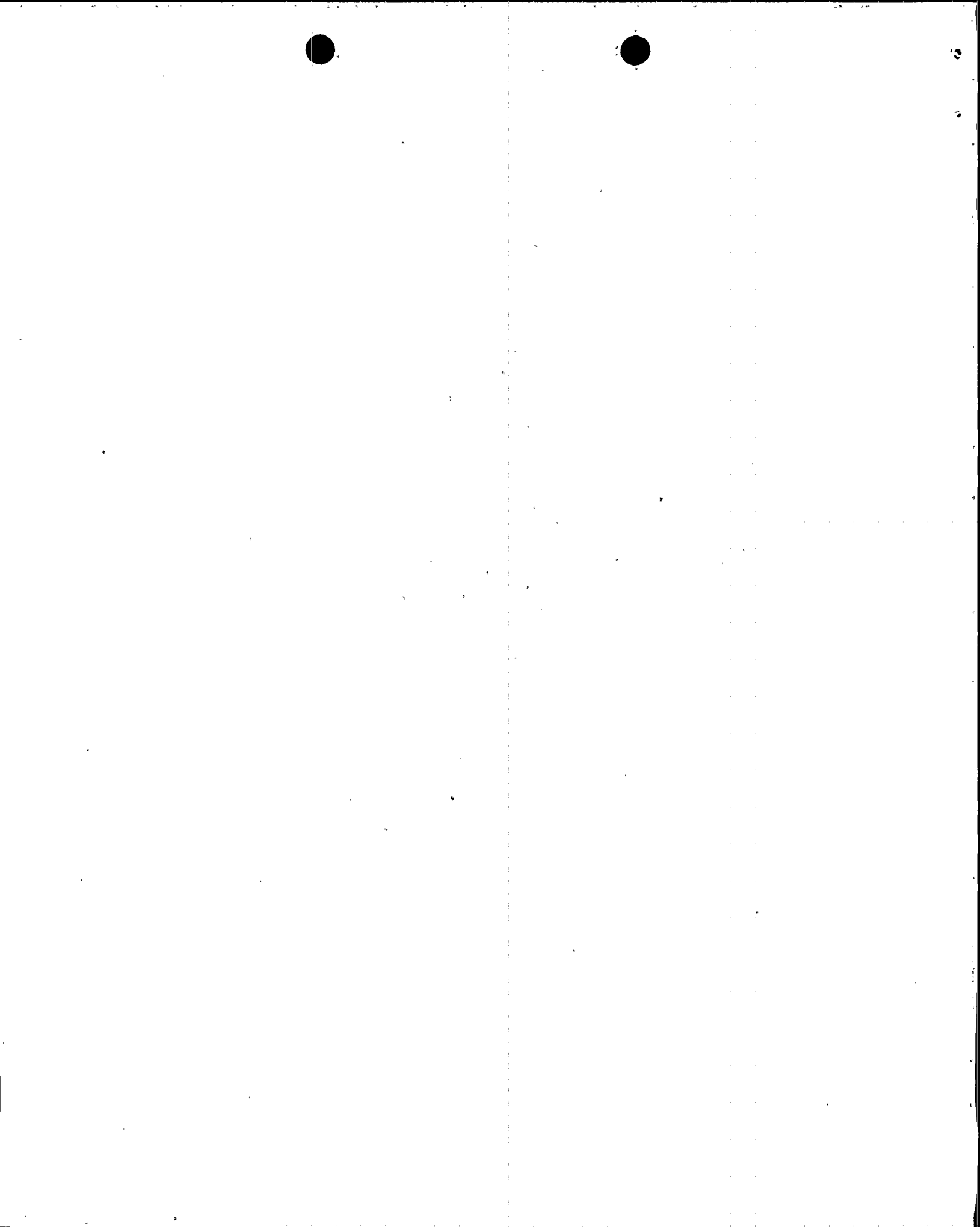




TABLE 3  
HOLOPHANE

| <u>EQUIP. ID.</u> | <u>WO<br/>Data Sheets<br/>Reviewed</u> | <u>WOs With<br/>Adjustments<br/>To BBFV</u> | <u>WOs<br/>Sampled</u> |
|-------------------|--|---|------------------------|
| 1-E-QBN-001       | 12                                     | 3   | 2                      |
| 1-E-QBN-002       | 14                                     | 0   | 2                      |
| 1-E-QBN-003       | 12                                     | 1   | 2                      |
| 1-E-QBN-004       | 10                                     | 1   | 2                      |
| 2-E-QBN-001       | 11                                     | 0   | 2                      |
| 2-E-QBN-002       | 12                                     | 0   | 2                      |
| 2-E-QBN-003       | 11                                     | 1   | 2                      |
| 2-E-QBN-004       | 13                                     | 3   | 2                      |
| 3-E-QBN-001       | 12                                     | 1   | 2                      |
| 3-E-QBN-002       | 12                                     | 0   | 1                      |
| 3-E-QBN-003       | 12                                     | 0   | 1                      |
| 3-E-QBN-004       | 13                                     | 1   | 2                      |
|                   | <hr/>                                  | <hr/>                                       | <hr/>                  |
| Totals            | 144                                    | 11  | 22                     |

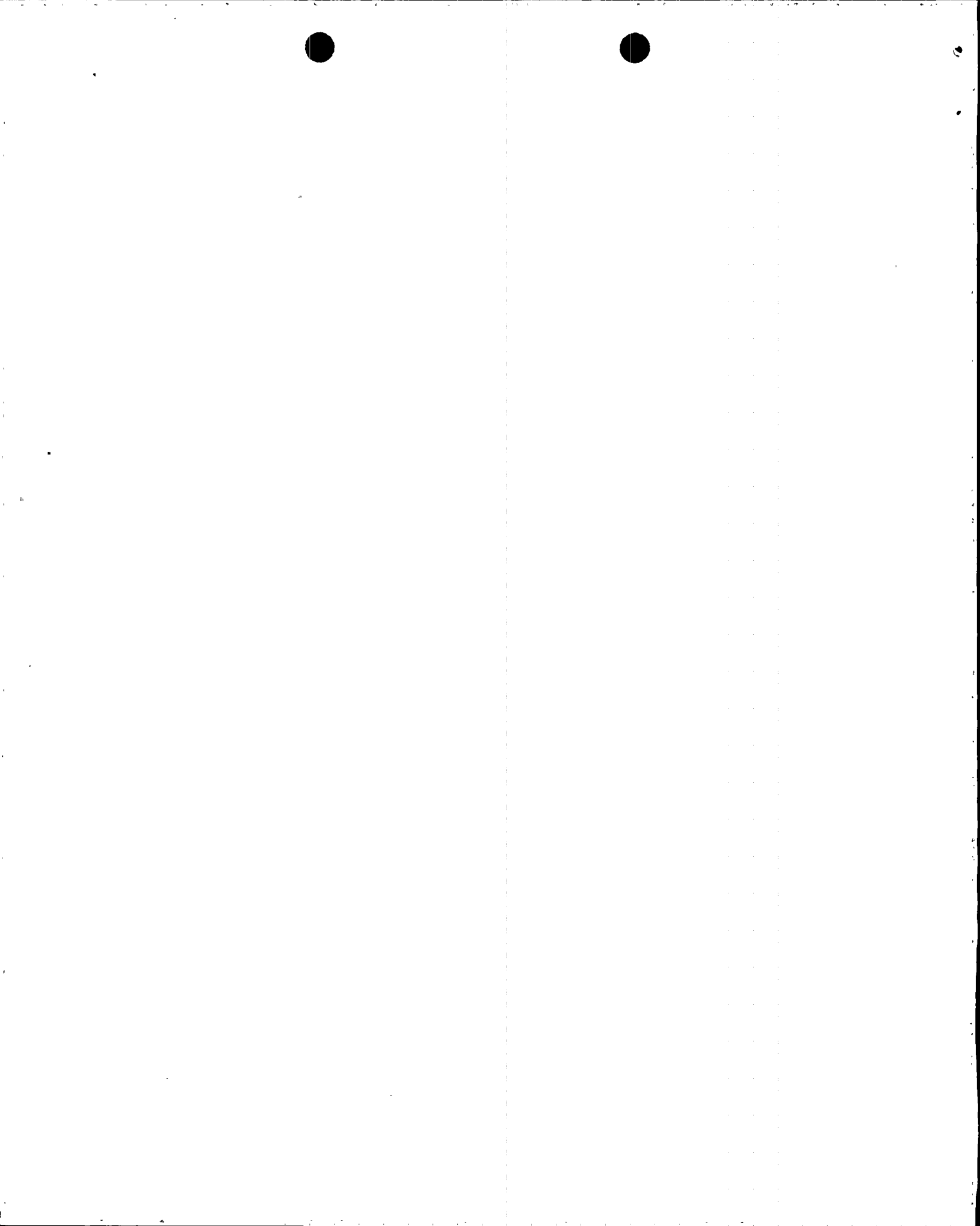


TABLE 4

EXIDE

| <u>EQUIP. ID.</u> | <u>WOs<br/>Reviewed</u> | <u>WOs With<br/>Adjustments</u> |
|-------------------|-------------------------|---------------------------------|
| 1-E-QDN-F01/N01   | 30                      | 1                               |
| 1-E-QDN-F02/N02   | 36                      | 3                               |
| 2-E-QDN-F01/N01   | 38                      | 1                               |
| 2-E-QDN-F02/N02   | 37                      | 2                               |
| 3-E-QDN-F01/N01   | 33                      | 2                               |
| 3-E-QDN-F02/N02   | 30                      | 3                               |
|                   | <hr/>                   | <hr/>                           |
| Totals            | 204                     | 12                              |

