NWSREP'S

FISCHER–PORTER REBUILD (FPR-D)

OPERATIONS MANUAL

SEP 23, 2011

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service - Cooperative Weather Observer Program
Observing Services Division - W/OS7

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CHAPTER 1 - IMPLEMENTATION RESPONSIBILITIES:

1.1 NWS Headquarters:

The Fischer-Porter Rebuild (FPR-D) is a modified configuration for the existing Fischer & Porter (F&P) gauges and the NWS implementation plan is modeled according to the ***FPU Operational Implementation Plan***. For background on F&P modernization management, you are encouraged to read the ***COOP FPU Implementation Plan Text*, April 28, 2005.** It is accessible on; http://www.nws.noaa.gov/ops2/Surface/coopimplementation.htm in the folder marked, Fischer Porter Upgrade (FPU).

The NWSREP assembles the FPR-D in his/her WFO and then installs it at the designated COOP site. A site installation instruction handbook, ***FPR-D Assembly Procedures,*** shall be used by the NWSREP. It is located via: http://www.nws.noaa.gov/ops2/Surface/coopimplementation.htm, in the folder marked "FPR-D Fischer-Porter Rebuild (Sutron)".

The FPR Kit will come delivered to your WFO with the ***FPR Kit Operations and Maintenance Manual (2010)*** published by Sutron Corporation (Sutron).

The NWS Office of Operational Systems (OPS22) in 2008 implemented an interactive web-based Geographic Information Systems (GIS) to display the locations and COOP Site Identifiers for the F&P network of approximately 2,300 sites. See: http://www.gis.srh.noaa.gov/.

1.2 Regional Headquarters:

Your Regional Cooperative Program Manager (RCPM) coordinates with NWSHQ to identify candidate COOP Stations to receive the FPR-D modification. Changes to the designated site list are authorized by the Observing Services Division (OS7). The OS7 coordinates changes with the RCPM for the selection of sites to receive the FPR-D kit.

The NWS HQ prioritizes WFOs with the greatest number rain gauges to install (i.e., 16 gauges in the Goodland county warning area). The goal of FPR-D implementation is to have delivered and implemented 189 kits by Sep 30, 2012, per agreement with the National Climatic Data Center.

The Regional COOP Managers participate in monthly conference calls with OS7 to learn of engineering, procedural, and schedule issues that affect the rate of deployment. Peak rate of deployment will not exceed 200 FPR Kits per month, nor exceed 21 kits per forecast office.

1.3 Field Offices:

The National Weather Service Representatives (NWSREP) receives from the RCPM a Pre-Implementation Worksheet (PIW) in the form of an Excel spreadsheet, at least one month in advance of the equipment delivery date. Approval of equipment delivery is made in a Conference Call attended by the NWSREP and RCPM, in which the completed PIW is the subject of review and approval. The NWSREP will receive the FPR-D kits within one week of the Conference Call.

The NWSREP coordinates with the Cooperative Observer to schedule a date for the FPR installation work and make time to give the Observer a tutorial in FPR operations. Update your Observer on your planned schedule, at least 14 days in advance. Explain to your Observer how the FPR-D is very easy to operate and how your hands-on tutorial should take just 30 minutes. If practical, mail your Observer a printed copy of the ***FPR-D Observer Instruction*** booklet, two weeks in advance of your visit, so s/he understands the concept of operations.

Receive FPR-D Kit, disassemble F&P gauge, assemble FPR-D gauge in your field office.

Each FPR-D Kit will arrive at your WFO in <u>one</u> cardboard box with an interior box.

- Main box: Data Logger, Solar Panel, and 12V Battery. Enclosed in a 12" zip-lock bag are tools (allen wrenches), washers, screws, and mounting hardware.

- Interior box: Load cell sensor.

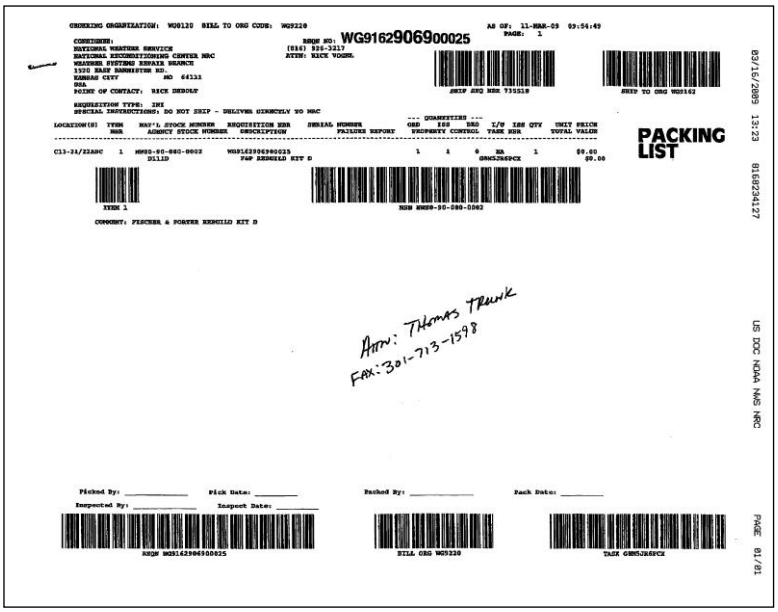

Fig 1.1 NLSC packing slip affixed to each FPR-D Kit.

After you have installed the FPR Kit to the Cooperative Observer site and updated the Station Information Report (Form B-44), transmitted the ZIP file, and confirmed NCDC ingested the individual TXT files, you are ready to certify the FPR-D system as 'operationally implemented.'

MIC signs the ***FPR Operational Implementation*** (OI) Certificate to signal the completion of all FPR upgrade activity and successful operation of data logging in the county warning area.

When all FPR-D rain gauges are installed, the NWSREP may issue a single Public Information Statement (PNS) to inform the user community. Instructions for issuing a PNS are found in NWSI 10-1805, *Service Outreach*. A hypothetical PNS for Elko is given in Figure 1.6.

1.4 Records Retention Policy for FPR:

The following data records and procedural documents for FPR-D shall be saved by the WFO:

- FPR-D monthly files (e.g., 046730_log_20110402.csv) for at least 12 months on the network workstation.

- Any *FPR Log Sheet*, or any *30-Day Evaluation Report*, keep a printed or an electronic copy (i.e., optical scan of printed form) at WFO for 12 months.

- The *30-Day Evaluation Report* and the *Operational Implementation Checklist* – keep at WFO for 6 months.

- Bookmark: http://www.nws.noaa.gov/ops2/Surface/coopimplementation.htm for ready access to FPR-D manuals and FPR-D policy directives issued by NWS headquarters.

1.5 FPR-D CONFIGURATION REQUIREMENTS:

1.5.1 Precipitation Gauge Type:

The modernization to FPR-D (Coastal Environmental Systems, Inc.) configuration shall be made only upon the Fischer-Porter/Belfort punch tape model, as identified in your CSSA equipment description as, "F&P Modification 6, Model 3." There are approximately 940 of the legacy rain gauges sited in the CONUS that are qualified for the FPR-D retrofit.

You may not request an FPR-D modification for any F&P that operates with the following:

- Shaft Encoder with Data Telemetry Device
- Fischer-Porter Rebuild, CES, Inc. (FPR-E)
- Fischer-Porter Upgrade (FPU)

1.5.3 Precipitation Data Transfer:

Instruct your Observer on how to use a Memory Cards to transfer his data to you each month, via United States Postal Service (USPS) mail.

Establish strict logistics management of all your sites Memory Cards through use of a Memory Card Log Sheet posted in your WFO.

Offer your observers the opportunity to email the monthly precipitation data to your NWSREP email address. See qualifications for email participation, found in Section 1.3.10 of this manual.

Note: Each Observer is issued just one Memory Card by the NWSREP at the time of installation when he trains the Observer. The NWSREP must have one spare Memory Card for each Observer who reports data in this mode, and to place it into circulation when needed.

1.5.4 Virus Scanning of External Memory Cards:

Each Weather Forecast Office (WFO) has an Information Technology Officer (ITO) whose responsibility it is to conduct virus/malware scans of all external sourced media. The ITO manages a secure platform and ensures routine updates of the McAfee Active Virus Defense (AVD) dat files.

The Memory Cards submitted by the COOP Observers for delivery of the FPR-D precipitation data are considered externally sourced media.

Therefore, follow your office's ITO security policy as it applies to the FPR-D Memory Cards that arrive each month.

If your ITO scans the Memory Cards, then ensure s/he communicates this action to you. Create an accurate account of which Memory Cards have been scanned and saved to the WFO workstation.

If a Memory Card is detected with malware or a virus, notify your ITO and regional IT system security officer.

If malware or virus is detected, and your ITO authorizes so, you may dispose of the Memory Card according to National Institute of Standards and Technology (NIST) policy, NISTS P800-88, revision 1. The policy directive is accessed: http://csrc.nist.gov/publications/nistpubs/800-88/NISTSP800-88_rev1.pdf .

1.5.5 Precipitation Data File Storage Standard:

Each month, the NWSREP shall copy the most current month's file in the Observer's Memory Card (as determined by the TXT file's filename), onto the WFO workstation. The copied file shall be saved to a dedicated permanent directory with a sub-directory structure that is organized by year and month (e.g., c:\hpd\2011\june\ ) for at least 12 months. See Chapter 2.2.3, in this manual for specific instructions.

1.5.6 Precipitation Data Reporting to NCDC

The NCDC, Climate Data Division, Data Ingest and Processing Branch (E/CC11), instructs each WFO to use these software and network standards to prepare and transmit monthly FPR data:

- File compression (ZIP) software, WINZIP32.EXE
- File Transfer Protocol (FTP) executable file, WSFTP95.EXE
- NOAA/NWS Enterprise Network Connection (NOAA Compliant Terminal in WFO), only

1.5.7 Precipitation Data Quality Assurance NCDC

The NCDC quality controls your station's files to prepare the FPR data for publication so the FPR data appear in the same publication, same quality control flags, and same units of measure as the F&P data.

Note: The NCDC ingests, quality controls, collates and converts FPR data and produces an Hourly Precipitation Data (HPD) product some 6 months after the precipitation was measured. At this later time you may view the precipitation data online in the NCDC monthly, ***Hourly Precipitation Data***, on http://www7.ncdc.noaa.gov/IPS/hpd/hpd.html.

1.6 IMPLEMENTATION CHECKLIST TASKS:

Ensure that you have accessed the June 2011 version of the NWS Operational Implementation Checklist. It is accessible on the NWSHQ webpage, and Click on the document titled, 'OI Check List – FPR-D.' See http://www.nws.noaa.gov/ops2/Surface/coopimplementation.htm .

1.6.1 Training the Observer in Basic FPR Operations and Maintenance

All training for authorized operators and maintenance personnel will be completed prior to operational implementation. Training materials are accessed from NWS Headquarters webpage; http://www.nws.noaa.gov/ops2/Surface/coopimplementation.htm.

The NWSREP delivers to the COOP Observer one printed copy of ***FPR Observer Instructions*** and at least one printed copy of the ***FPR Log Sheet***. The NWSREP may provide additional printed guidance, yet it should follow the instructions made available on the NWSHQ webpage.

No later than the day of operational implementation, NWSREP trains, witnesses, and validates (i.e., documents) that his Observer has been trained on the FPR-D.

Maintenance training for NWSREPS will be the responsibility of the National Weather Service Training Center (NWSTC) and offered through training modules or the COOP training course.

NWSHQ over the course of time may issue specific updates to its 'FPR-D Observer Instructions' or the 'FPR Log Sheet' template to aid the Observer. The NWSREP is authorized to provide on-site observer training in the operation and simple maintenance (i.e., non-electrical) of the FPR-D equipment. If so delegated, the NWSPEP will provide the Observer these documents:

- *FPR-D Operations Manual*, (Sep 2011), printed from headquarters web-site.
- *FPR-D Observer Instructions*, (Aug 2009), printed from headquarters web-site.

National Weather Service - Cooperative Observer Program

FPR-D OPERATIONAL IMPLEMENTATION CHECK LIST

Planned Product Improvement: __Fischer-Porter Rebuild (FPR-D)__.

COOPSite (SID, Name, State): _____

NWSREP Completing this Check List: _____**Date:** _____

Item #	Item Description	OPR	Date
1.	**FPR Operational Support Activities**		
a.	Select F&P sites to rebuild in 'FPR Designated Sites Spreadsheet.'	WFO	
b.	Submit 'FPR Pre-Implementation Worksheet' with projected dates.	WFO	
2.	**FPR Installation Activities**		
a.	Assemble FPR-D Kit in field office, or if necessary at the COOP site.	WFO	
b.	At COOP site retrieve all B-18 punch tape from gauge. Separate the partial month (ended on installation day) from last whole month.	WFO	
c.	Install / Checkout FPR-D according to *FPR-D Assembly Procedures*.	WFO	
3.	**FPR Monitoring and Coordination Activities**		
a.	Generate a Site Inspection Report in CSSA.	WFO	
b.	Submit new B-44 rendition to Workflow within **five days** of installing.	WFO	
c.	Establish a WFO Log Sheet to track Memory Cards/ Emails received.	WFO	
4.	**FPR Post-Installation Activities**		
a.	Dispose of old equipment according to *FPR-D Assembly Procedures*.	WFO	
b.	Transmit first month's precipitation data and verify NCDC received CSV files according to *FPR-D Operations Manual*.	WFO	
c.	Decode partial month F&P tape, enter to Form 79-1D, email to Ncdc.	WFO	
d.	FAX the MIC-signed OI Certificate to Tom Trunk (OS7) only after all FPR-Ds in your CPA have been implemented by steps listed, above.	WFO	
e.	Transmit a public notification message (PNS) on AWIPS.	WFO	

Fig 1.2 Check List for WFO Action

1.6.2 System Assembly, Installation, and Checkout

Installation and checkout of the FPR-D will be performed in accordance with the ***FPR-D Assembly Procedures,*** on: http://www.nws.noaa.gov/ops2/Surface/coopimplementation.htm . The document was issued by NWS Engineering and Acquisition Branch (OPS11) and is similar in purpose to a Modification Note. The implementation work is conducted in two locations; inside the forecast office and at the COOP site. Each activity will require approximately 3 hours, not including the time to transport the F&P gauge to and from the Observer's site.

Key activities include: (a) modify an F&P unit inside WFO* to create one FPR unit, (b) configure and calibrate the FPR in WFO*, (c) transport FPR to site, (d) remove the F&P from site, (e) replace the F&P assemblies with the FPR-D assemblies, (f) check calibration with five inch equivalent weight with Zeno's display reading, (g) train the Observer on monthly download; and (h) witness the Observer download data to Memory Card.

Note *: It may not be possible to pre-assemble and calibrate each rain gauge inside the WFO when two or more rain gauges will be installed on a given road trip. Instead, the NWSREP should work at the COOP site to install the FPR-D hardware, enter SID metadata, and calibrate the sensor.

1.6.3 Ensure Continuity of Precipitation Records – WS Form 79-1D

The National Climatic Data Center (NCDC) has just one method to ingest the precipitation data from the F&P paper tapes when the same observation month will contain electronic data from the FPR-D. The NCDC relies on the WS Form 79-ID to account for what the paper tape recorded in the days or weeks prior to the FPR-D being installed.

If you installed the FPR-D on August 17, then decode just the days August 1 through Aug 17, inclusive. If your installation date was August 5, then you only have to decode August 1 through August 5, inclusive.

Instructions for decoding the paper tape are found on the NWS Training Center's web site.

http://www.nwstc.noaa.gov/DATAACQ/d.CPM/PuncTape.HTML

Obtain the partial-month B-18 and locate the 12AM to 1AM division for the first day of the month. There are four 15-minute records per hour, decode just the one record closest to the top of the hour for each of the 24-hour divisions.

Thus, decode every *fourth* 15-minute record. Subtract the 12AM value from the 1AM value and enter it to the '1AM' cell in the Form 79-1D table. Repeat this process for each hour in the B-18, up to the final full hour's record.

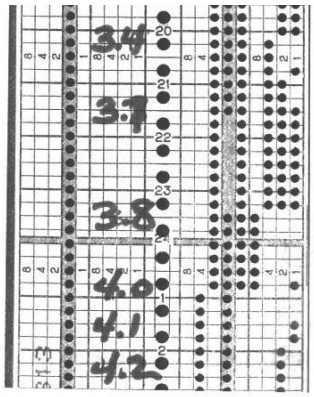

Fig 1.3 WS Form B-18 (Punch Tape)

Obtain a new copy of the WS Form 79-1D from the NWS COOP modernization web site: http://www.nws.noaa.gov/ops2/Surface/Coopimplementation.htm. It is located among the FPR-D assembly and operations documents.

The spreadsheet will add each hour's value, across the row, and produce a daily-total amount in the 'TOTAL' column on the right side of the table.

NOAA Form 79-ID — U.S Department of Commerce — STATION NUMBER 40-5956

August 2001 — National Oceanagraphic and Atmospheric Administration

Environmental Data and Information Service — STATION NAME MemphisWFO

National Climatic Data Center

HOURLY PRECIPITATION — MONTH MAY — YEAR 2005

Recorded by a F&P Weighing Rain Gauge

Date	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	NOON	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	MID	TOTAL	Date
1																									0.00	1
2																									0.00	2
3																									0.00	3
4																									0.00	4
5																									0.00	5
6																									0.00	6
7																									0.00	7
8																									0.00	8
9							0.1					0.1	0.1												0.30	9
10																									0.00	10
11																									0.00	11
12																									0.00	12
13															0.1										0.10	13
14						0.4	0.3																		0.70	14
15											0.1														0.10	15
16																									0.00	16
17																									0.00	17
18																									0.00	18
19																									0.00	19
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27																									0.00	27
28																									0.00	28
29																									0.00	29
30																									0.00	30
31																									0.00	31
Date	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	NOON	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	MID	TOTAL	Date

Amounts in inches,tenths and hundredths for hour ending at observation time; therefore, time distribution of amounts less than one hundredth of an — 1.20

Times are Local Standard Time (LST)

* Amounts included in following measurement; time distribution unknown

M = No Record

Fig 1.4 Example of a Form 79-1D

Edit the Form 79-1D with a notation, 'END', into the cell that corresponds to the Date and Hour of the paper tape's last full hour of 15-minute data perforations.

Name your Excel spreadsheet file according to this convention: 791D_SSnnnn_MonYY.xls

For example: 791D_405956_MAY05.xls

Then e-mail this 79-ID spreadsheet to NCDC: Joseph.E.Kraft@noaa.gov.

The NWS Training Center (NWSTC) provides us detailed instructions for completing the WS Form 79-1D, (see, Fig 1.5). Reference the Remote Training Module (RTM), page 630-60.

RTM 630-60
Page A-36

NOAA Form 79-1 D.1 DATA SHEET, HOURLY RECORD

Description: The 79-1D.1 is the form normally used by the NWSREP to extract hourly precipitation data from punch tapes if it is unlikely that data can be successfully extracted by NCDC's translator. The 79-1 provides a convenient format for manually extracting precipitation data and recording it for processing at NCDC.

Completion:	Fill in the heading of the form as follows, for:
Station Number:	Give same COOP Index Number as on B-44.
Station Name:	Give same COOP Station Name as on B-44.
Month:	Give the month the precipitation was measured.
Year:	Give the year the precipitation was measured.

For partial month data extractions from tape/chart:

Enter "PARTIAL MONTH" on line below HOURLY PRECIPITATION.

Enter BEGINS: Date/Time in Date row before 1st hourly data entry.

Enter ENDS: Date/Time in Date row after last hourly data entry.

For full month data extraction from tape/chart:

Enter "FULL MONTH" on line below HOURLY PRECIPITATION.

Note that DAYS (1-31) are listed vertically while hours (AM & PM) are listed horizontally across the top of the form. Calculate the differences in punch holes on the punch tape for every consecutive hourly punch (Every 4th punch). Enter this difference in tenths (e.g., 0.3) in the appropriate time block corresponding to the hourly precipitation indicated on the punch tape.

Note: Entry instructions on bottom of form ask for amounts in inches and hundredths. Since punch tape gage only records data to the nearest tenth, extracted data are to be entered on form in tenths, only.

Fig 1.5 Description of Form 79-1D

Note: Completing the WS Form-79-1D is a 'Post-Implementation' task that should be done within 3-months of the installation of the FPR-D equipment.

Before you start to decode the paper tape, remove the last month (i.e., partial month) from the full scroll of paper tape you removed from the F&P when the kit was installed. Keep this last portion, the paper tape representing the partial month in your forecast office to decode.

Then, mail the large portion of the scroll containing the months prior to the month the FPR-D installation, to the NCDC Service Center, Rockcastle Industrial Park South, at 618 Progress Drive, Mt. Vernon, Kentucky, 40456.

1.6.4 Open a Site Inspection Report in CSSA

After the NWSREP returns to the forecast office after installing the FPR-D modernization kits, the NWSREP creates a new Site Inspection Report in the CSSA system.

The primary purpose of this Site Inspection Report is to indicate the F&P paper punch was removed and replaced with the FPR-D electronic data logger and weighing sensor. The secondary purpose is to store the FPR-D weighing sensor's calibration coefficients, A, B, and C.

The NWSREP takes these five actions to complete the Site Inspection Report in CSSA.

a. Inspection Data: Describe this trip in terms of date of inspection, staff hours, miles driven, inspection type, supplies cost, and trip cost. Follow procedures described in NWS Manual 10-1313, Appendix E (*Station Inspection*), ***Cooperative Station Service Accountability (CSSA)***. For an example see, Fig 6.4 (CSSA Inspection Report), in Chapter 6 of this FPR-D manual.

   Access the 10-1313: http://www.nws.noaa.gov/directives/010/pd01013013a.pdf

b. Maintenance Performed: Select the one check-box labeled, 'Replaced' to indicate the FPR-D was installed and the old F&P was removed. For an illustration, see Fig 6.4 (*CSSA Inspection Report*); in Chapter 6 of this FPR-D manual.

c. Remarks – General reason for visit: Give the exact reason in plain English in the remarks box at the bottom of the report. The following description should be entered: **' Replaced F&P with FPR-D. Requires SD Memory Card to download monthly data.'**

d. Remarks- Metadata completeness: Enter calibration coefficient metadata to the Remarks field, at the bottom of the Site Inspection Report. Type the information into the free text field to indicate the values of the load cell calibration coefficients A, B, and C. They should appear on a single line:

   Coefficients A=0, B=1286.0523, C= - 4.1076

   Note: These Coefficient values are for example only. Each rain gauge will have unique values. Be careful not to lose the negative sign in front of the numerical value for 'C.'

e. Reviews **Chapter 6** of this *FPR Operations Manual*, to ensure all metadata requirements are being met.

1.6.5 Create new Rendition of WS Form B-44 for NCDC

On the first page of WS Form B-44 the NWSREP ensures the Remarks section states at a minimum: **"Updated Equipment, Changed F&P to FPR-D with SD Memory Card."** See Fig 6.1 (*Remarks Section for Installation*), in Chap 6 of this manual.

Page-down within the Form B-44 to the Observed Element page where it states: '**HOURLY PRECIPITATION REPORT.**' On this page there are five fields that must be revised when an F&P is converted from a paper recorder to an FPR-D electronic rain gauge.

Equipment Code: Ensure the "FPR-D" was selected from the drop-down menu.

Serial Number: Ensure the eight-digit serial number from the load cell's decal is entered. See Fig 6.3 (Load Cell) for a photo.

Equipment Description: Ensure "FPR-D GAUGE WITH MEMORY CARD" is entered. See Fig 6.2 (*Detailed Entries for FPR-D*), in Chap 6 of this manual.

Report Method: Ensure the "ADP" appears in this field.

Data Ingest Via: Ensure the words 'SD Memory Card' appear in this field.

For graphic illustration of the WS Form B-44, see Chapter 6, in this manual and Fig 6.1 (*B-44 Remarks Section for Installation*) and Fig 6.2 (*Detailed Entries for FPR-D*).

Due to the large number of COOP sites being retrofit in 2011 and 2012 and the need for timely updates of the NCDC master station inventory (MSI), all parties involved in the B44 workflow have been instructed to expedite their review and approval, to ensure the new rendition arrives in the CSSA data base in less than half the time than it would have ordinarily.

Important: Review **Chapter 6** (Metadata Requirements) in this ***FPR-D Operations Manual***, to learn ways to organize and create accurate metadata for each of your FPR-D systems.

1.6.6 CSSA Fast Track for B-44 Approval

Within five (5) days of successful installation of the FPR-D you will update the CSSA rendition of the respective site's B-44 (Site Inspection Report).

As soon as practical after entering the new B-44 rendition to CSSA workflow, report to the MIC (or the designated approver) and the RCPM, that you have updated a Fischer-Porter Rebuild Rendition. Inform them of the Site Name and SID and ask them to "fast-track approve" the document, so it advances to NCDC.

1.6.7 Start-Up Monitoring and Evaluation

There are three operational areas each NWSREP shall monitor. First, is FPR data representative of meteorological conditions? Second, is the data complete based on nominal system operations? Third, can you describe any system component that will require maintenance or a situation that might lead to discrepancies in precipitation measurement or the generation of non-valid precipitation records?

For each FPR system conduct an ongoing monitoring and retrospective evaluation of the first 30-days of system and data performance. Write a short summary to outline the general performance

of the FPR system. If precipitation events occurred then account for them, including variations in local precipitation amounts, and possible non-representative values attributed to mesoscale phenomena.

1.6.8 Policy for COOP Observers to Email FPR data files

The NWSHQ has approved the use of observer email for the delivery of FPR precipitation data files as the means to replace U.S. postal service method of delivery. The email method is an optional way to report and not a requirement of the observer.

This email reporting method will save the NWS substantial expense from the postal mailing of the FPR monthly record.

The Observer must meet the following requirements:

- Ability to read the data file on the computer.
- Access to the internet.
- Ability to send an email with a file attachment.
- Knowledge for how to attach a file to an email message
- Understanding that the NWS can/will **not** be able to offer any IT support for doing this.

As NWSREP you will provide these observers with a one-page instruction guide (see *FPR Observer Instructions*, Appendix D).

The Observer E-Mail Instructions Sheet will require you as NWSREP to fill in your NOAA email address and the observer's COOP Station Number.

The email 'subject' naming convention is not critical. The example in the E-Mail Instruction Sheet states: "FPR Data: <COOP station number>, and this is intended to make it easier for NWSREPS to sort through the inbox messages.

After you receive the observer's emailed precipitation file, save it to the same permanent workstation directory designated for all other FPR data files, as instructed in Chapter 2, of this *FPR Operations Manual*.

1.7 POST-IMPLEMENTATION ACTIONS:

1.7.1 Post-Implementation Packet to RCPM

Review the *FPR Operational Implementation Checklist* (see Appendix B of this manual) to see if there are any uncompleted administrative actions, or if there is a performance issue with either the transfer of the monthly data, or the data quality itself. Review any questions your Observers have or any discrepancies reported, attempt to answer and resolve the issues at the WFO level. If questions remain or if Sterling Field Support Center (SFSC) was consulted then report this to your RCPM and draft a self prepared, ***30-Day Evaluation Report***.

Ensure these five actions are completed prior to completing the operational implementation of all the FPR-D rain gauges. Keep these documents and emails on station for 12-months.

a. Sign the ***FPR-D Implementation Checklist*** (Appendix A) that vouches for the proper installation, calibration, and initial operation of the FPR-D.

b. Print a copy of NCDC inventory of ingested HPD files as a confirmation receipt: **http://www1.ncdc.noaa.gov/pub/data/hpd/inv/HPD_Received201107.txt**

c. Email your ***'30-Day Evaluation Report***', to your RCPM if any one of the FPR systems experienced a significant discrepancy as defined in Section 1.3.7, above.

d. Email your RCPM if you journalled to an ***FPR Log Sheet***, or an ***FPR Trouble Report***; or to account for the ***30-Day Evaluation Report***.

e. Fax to NWS headquarters the, ***FPR Operational Implementation (OI) Certification form,*** after your MIC signed this form. Fax #301-713-1598.

1.7.2 Discrepancies: Submit the 30-Day Evaluation Report

Only if one of your FPR-D gauges experienced a significant operational anomaly in the first 30 days of FPR-D field operation, then elaborate them in your *'30-Day Evaluation Report*' and e-mail it to your RCPM. If needed, ask the Observer to submit his '*FPR Log Sheet*.'

This report shall include COOP Station Name, Number, Observer, date of problem and names of anyone who performed maintenance on the FPR system. The final version of the *30-Day Evaluation Report* must give a description of how the discrepancy was resolved or who repaired or replaced any components (i.e., NWSREP, ET, IT, SFSC, NRC, or Engineering (W/OPS11).

Next, inform the Sterling Field Support Center (SFSC) with an email of your *30-Day Evaluation Report*, use nws.sfsc@noaa.gov. You may also phone SFSC on 703-661-1259 to discuss the report.

Finally, email or fax (301-713-1598) your *30-Day Evaluation Report* to NWSHQ (ask for the current point of contact) as soon as practical, or within one month of informing your RCPM and SFSC.

1.7.3 Operational Quality Control

Beyond the initial 30-day evaluation period, continue to monitor the FPR system performance; look at the TXT data file before you send it to NCDC. Follow the guidelines in Section 2.2.6, of this *FPR Operations Manual*, "Examine TXT to Confirm Collection Month is Present'. If an extreme meteorological condition occurred scroll through the data file to the date of the event and examine for any ambiguous or discrepant precipitation data. If any anomalous data is found, journal it to the Special Notes column of the *FPR Log Sheet*. Lastly, visit the NCDC inventory webpage and ensure your monthly ZIP file is present and is not flagged for errors.

1.7.4 Dispose of Old Equipment

No equipment is to be returned to the National Reconditioning Center (NRC) or the National Logistics Supply Center (NLSC). Rather, the WFO may choose to retain used, undamaged F&P equipment at the WFO.

Follow policy in Appendix B in the ***FPR Assembly Procedures (Jul 2011)***, on web site: http://www.nws.noaa.gov/ops2/Surface/coopimplementation.htm. It calls for you to save eight pieces for any legacy F&P rain gauges that require these parts in your Region.

Otherwise, the WFO may dispose of any used F&P 'old equipment' only after NWS headquarters has stated the FPR-D Operational Implementation (OI) has officially concluded.

1.7.5 Public Information Statement (PNS)

Upon completion of all your FPR-D sites in your Cooperative Program Area (CPA), prepare and transmit a Public Information Service (PNS) announcement on AWIPS. This is done after the MIC signed Operational Implementation Certificate is submitted to HQ (FAX# 301-713-1598).

The NWSREP should be familiar with the NDS 10-1805, Section 2.1; Local or Regional Service and Technical Changes. The changes are announced via a local PNS transmitted by the WFO. For specific policy see NWSI 10-501, *WFO Statements, Summaries, Tables Products Specification.*

The format and style of the PNS should be similar to those of the national service and technical change messages described in the NDS 10-1805.

The NWSREP accesses the PNS template, edits it for COOP station name, and enters the 'Implemented Date' which is the calendar day (e.g., Aug 26, 2012) when the FPR began operational service (i.e., date of installation).

The PNS is transmitted after your MIC has signed the FPR-D Operational Implementation Certificate. The certificate officially documents that all FPR-D have been successfully installed in your Cooperative Program Area (CPA).

```
NOUS45 KLKN 291805
PNSLKN
NVZ013-030>037-220300-

PUBLIC INFORMATION STATEMENT
NATIONAL WEATHER SERVICE ELKO NV
1105 AM PDT MON AUG 29 2012

. . . FISCHER-PORTER REBUID /FPR/ NOW IMPLEMENTED ON ALL ELEVEN NON-TELEMETRY
RAIN GAUGES, IN NORTHERN NEVADA, EFFECTIVE AUGUST 26, 2009.

THIS EQUIPIMENT MODIFICATION WILL CHANGE THE WAY THE PRECIPITATION
MEASUREMENT IS TAKEN.  THERE WILL BE NO CHANGE IN THE QUALITY OR THE
TIMELINESS OF THIS STATION'S HOURLY PRECIPITATION DATA /HPD/.  DATA WILL
CONTINUE TO BE REPORTED IN MONTHLY HPD PUBLICATIONS.

A TOTAL OF ELEVEN SITES WERE RETROFIT WITH THE FISCHER-PORTER ELECTRONIC
WEIGHING GAUGE IN THE WFO-ELKO COOPERATIVE PROGRAM AREA /CPA/.  THE
IMPLEMENTATION DATE FOR EACH OF THE RAIN GAUGES IS LISTED TOGETHER WITH THE
COOP SITE NUMBER.

COOP STATION NAME . . . . . .COOP NUMBER . . .  . . IMPLEMENTED
MCDERMITT. . . . . 26-4935. . . . . JUN 28 2012
SHOSHONE 5N .  . . . . . 26-7450. . . . . JUL 17 2012
INDIAN CREEK RANCH-DUCKWATER . . . 26-3964. . . . . JUL 26 2012
LAGES. . . . . 26-4341. . . . . JUL 28.2012
BATTLE MOUNTAIN 4SE. . . . . 26-0691. . . . . JUL 28 2012
ELKO . . . . . 26-2570. . . . . AUG 07 2012
SMOKEY MOUNTAIN CARVERS. . . . . 26-7620. . . . . AUG 09 2012
WILDHORSE RESERVOIR. . . . . 26-9072. . . . . AUG 10.2012
GRANTSVILLE 2W . . . . . 42-3348. . . . . AUG 10 2012
SUNNYSIDE - LUND 2W. . . . . 26-7908. . . . . AUG 17 2012
GREAT BASIN NATL PARK. . . . . 26-3340. . . . . AUG 26 2012

THE DATA FROM FPR GAUGES WILL BE REPORTED BY THE NATIONAL CLIMATE DATA CENTER
/NCDC/ AS A MONTHLY PRODUCT IN THE HOURLY PRECIPITATION DATA /HPD/ BULLETIN
FIVE MONTHS AFTER THE MONTH OF MEASUREMENT.

INFORMATION ON HPD PRECIPITATION PRODUCTS IS AVAILABLE FROM NCDC.

HTTP://WWW.NCDC.NOAA.GOV/OA/MPP/  USE LOWER CASE LETTERS AND SCROLL DOWN TO
/MOST REQUESTED F/ SECTION - THE SIXTH SECTION ON THE PAGE - AND THEN CLICK
ON THE WORD /SAMPLE/ TO VIEW AN HPD BULLETIN.

IF YOU HAVE ANY QUESTIONS REGARDING THE IMPLEMENTATION OF THE FISCHER-PORTER
REBUILD, AT THE ABOVE LISTED SITES, PLEASE CONTACT:

PHILLIP SCHEIBE
NWS/WFO-LKN...OBSERVATIONS PROGRAM LEADER (OPL)
ELKO, NEVADA
PHONE: 775 778 6716
EMAIL: PHILLIP.SCHEIBE@NOAA.GOV
THIS AND OTHER NWS PUBLIC INFORMATION STATEMENTS ARE AVAILABLE ONLINE AT /USE
LOWER CASE LETTERS/:

   HTTP://WWW.NWS.NOAA.GOV/OM/NOTIF.HTM

$$
NNNN
```

Fig 1.6 Public Information Statement (PNS)

CHAPTER 2 – MONTHLY DATA COLLECTION AND TRANSMISSION

2.1 FPR Data File Exchange Requirements and Tasks:

2.1.1. NWSREP Responsibilities:

A major task with the FPR-D is to successfully manage with your Observers, the exchange of the government issued Memory Cards to and from your office. You mail out one Memory Card to your Observers by the 25th of each month as a matter of priority. This will ensure the Observer has at least one Memory Card in his/her possession at the start of the new month to download new data. These responsibilities do not apply for Observers who email you their data.

The Observer is instructed to download FPR data anytime in the first five days of the month, yet not before 12AM on the first day of the month. You should work a monthly Memory Card Log Sheet (see Fig 2.1) to journal the date you mailed your Observers their return Memory Card. The term 'Incoming Data' refers to any Memory Card or Email an Observer sends you, filled with the most recent month's records, but has yet to be uploaded to your WFO's workstation. The term 'Return Memory Card' applies to a Memory Card only after you have downloaded the TXT to the WFO's workstation. Once you complete this transfer, place the 'Return Memory Card' in a container or box, marked 'Outgoing.'

Month Ending	COOP Station Name	When did you mail Observer his 'Return SD Card?	When did WFO Receive this Observer's Incoming Data?	When was the SD Memory Card virus scanned?	When did you transmit the Zip file to NCDC?
MARCH 31 2012	Slidell	March 25th	April 6th	April 24th	April 25th
	Pascagula 3 NE	March 25th	April 8th	April 24th	April 25th
	Biloxi 9 WNW	March 25th	April 19th	April 24th	April 25th
	LSU Ben-Hur Farm	March 25th	April 7th	April 24th	April 25th
	Hammond 5 E	March 25th	**Not In Yet:** Phoned him on 4/20, he'll send in two days.	**NOT as of 4/25.**	**NOT as of 4/25!**

Fig 2.1 SD Memory Card Log Sheet

Important: If you have not received the Observer's Memory Card or Data Email by the 10th day of month, phone the Observer to inform him you are missing the current precipitation report and ask if he had any difficulties or was simply behind in mailing. On the 20th review the Memory Card Sheet to identify any Memory Card still missing, if so, phone that Observer a second time. If the Observer does not have a phone, or Institution Observer's automated phone attendant prevents direct conversation, then mail a letter to the attention of the Observer, to direct him to mail the Memory Card.

Note: Memory Cards, when mailed to the Observers, are not required to be labeled to identify a specific COOP SID. Likewise, the Observers are not required to label or identify on the Memory Card any information. The NWSREP may choose to label the Memory Cards when necessary to resolve certain situations (i.e., Memory Card missing current reporting month's file).

Note: Each incoming Memory Card should contain only two (2) CSV data files. The current reporting month and the preceding reporting month – each were given a filename upon download at the Observer's site. You may not rename any CSV data file, neither those on the Memory Card nor those in your NWS workstation.

Note: Keep a log sheet to account for any incoming Memory Card that arrives 'blank.' You may affix a label to these Memory Cards to check them later when you visit the COOP site.

Your next major responsibility is to transmit the monthly FPR precipitation records to the NCDC before the 30th or last day of each month. For rare occasions, when the Observer was unable to mail the Memory Card or was instructed by the WFO to postpone a download to Memory Card, the date of your transmitting the FPR file may be extended by one or two weeks. The intention here is to limit unnecessary FTP transmissions and to simplify your Memory Card tracking work.

2.1.2 Observer Responsibilities:

New policy in 2011 permits the Observer to e-mail the monthly FPR-D data directly to the NWSREP. This is optional and not a requirement of the observer. The observer must meet the following requirements.

- Be able to read the data file on their computer. The NWS does not provide a card reader.
- Have internet access
- Able to send and email with a file attachment
- Have knowledge of how to attach a file to an email message
- Make clear to observer that NWS can/will not be able to offer **any** IT support for doing this.

Memory Card USPS Exchange: Emphasize to your Observer how his major responsibility is to be the full-time 'keeper' of the FPR Memory Card. He will need the Memory Card at the start of each month to download precipitation for mailing to you in the WFO. His/her full-time awareness of the location of this government issued Memory Card is essential.

The Observer needs to understand how you will use the United States Postal Service (USPS) to routinely mail a Memory Card each month to his preferred mailing address. This Memory Card will be mailed in the familiar looking envelope and will be sent to arrive to accommodate the Observer's scheduled monthly download on or after the 1st day of the month.

To meet this 1st day of month schedule you need to anticipate how each Observer actually receives USPS mail. Where is his/her USPS delivery location?

- Residence?
- Rural highway 'box'?
- PO Box at local Post Office?

Monthly Data Collection: Observer shall download the data to the Memory Card any time after 12:00 AM local time on the first day of the month, through the 5th day of the month. For additional information on how to download data, the Observer should refer to his printed copy of the ***FPR-D Observer Instruction*** guide.

The 'return Memory Card' you mailed is likely to have arrived a day or two before the Observer downloads the monthly records and so the Observer will have two Memory Cards in his/her possession. The Observer should realize that he may use either Memory Card to download as they are both considered available 'blanks.' However, once data is downloaded to the Memory Card the Observer needs to immediately package it to the NWS-addressed mailer envelope, to reduce risk of Observer mailing his other Memory Card, the one that was intended for his next monthly download.

At the time you install FPR equipment and conduct a familiarization tutorial with the Primary Observer (and Secondary Observer, if possible), make sure he is knowledgeable of the NWS operations and maintenance policy as outlined in the W-OS7 issued, '***FPR-D Observer Instructions.'*** Encourage their dialogue, solicit their questions, and offer them additional instruction if needed to bring them to a qualified level of experience after two or three months' operating the FPR-D.

An Observer who is qualified to operate the FPR-D recording gauge will have demonstrated proficiency in the following tasks:

- Able to locate and describe the purpose of the: Sutron display, SD Card port, and the FPR Log Sheet. Possess a printed copy of the ***FPR-D Observer Instructions,*** (August 2009).

- Have him download to Memory Card (i.e., dry run) on the day you install his FPR system. Observe his level of familiarity with inserting the Memory Card, interpreting the Sutron display, understanding the Error 4027 message, and removing the Memory Card.

- Timely operational download to Memory Card on the first five (5) calendar days of the month. The Observer <u>shall not</u> download before 12AM on the first day of month!

- Timely mailing of Memory Card to WFO by the 10th day of month. Observer shall mail you his Memory Card (i.e., 'Reporting Drive') on same day that he downloaded his data.

- Possess a filled-in copy of the ***Mailing Address/WFO POC Sheet*** (Appendix A, *FPR-D Observer Instructions*, April 2011).

- Identify a secure location where the Observer will keep the Memory Card during the month.

2.2 General Month-by-Month Responsibilities and Timeline

2.2.1 Mail Observers a Memory Card:

On or about the 25th of each month mail each Observer a Memory Card.

Note: Memory Cards you mail to the Observer are not required to have any type of label or marking. Each Memory Card should contain only one CSV file, the last reported month. The file is not required to have originated from the Observer to whom you are mailing. Rather, the purpose is to deliver a nearly blank Memory Card.

Write down to the monthly Log Sheet (Fig 2.1) the date you mailed-out the new Memory Cards.

2.2.2 Log-in Each Memory Card as Received by NWSREP:

By the 15th of the month, ensure you have received either the Memory Card or the Email from all your FPR observers.

Read the return address on the USPS mailing envelope (Fig 2.2) to identify from which site this Memory Card originated, and mark the Memory Card Log Sheet (Fig 2.1) for the date it arrived. Positively identify all observer files between the 15th and 25th of each month.

Check the same mailing envelope for these items:

- SD Memory Card,
- *FPR Log Sheet* (for a report of bucket maintenance or anomaly).

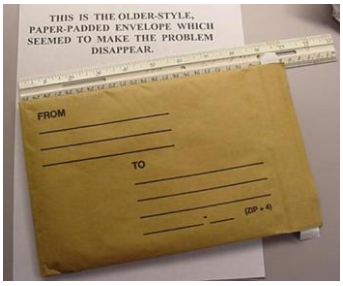


Fig 2.2 Mailer for Memory Card And Log Sheets

The Jiffy No. 0 (zero) padded mailing envelope (Fig 2.2) is sufficient to hold the F&P Log Sheet and Memory Card. This photo shows the standard ten inch square, darker color envelope. Newer, bubble-pack square envelopes have thinner paper and tear more easily and can result in the Memory Card being lost in the mail.

If any Email or Memory Card is missing on the 15th, first search your office's Email inbox, or incoming USPS mail station, for possible mis-distributed / misplaced envelopes.

The same day you open the envelope holding the Observer's mailed Memory Card, log the date to the 3rd column of your Memory Card Log Sheet (Fig 2.1), in the column titled, 'Received the Memory Card.'

Note: You may want to wait until the 25th of the month until all Memory Cards have arrived, and scan them at the same time. Instruct the Information Technology Officer (ITO) to inform you when he/she has run the McAfee software on all Memory Card. After you open the CSV file and check the identity and date for current reporting month (see Section 2.2.7), then log each Memory Card as 'scanned' in the ***Memory Card Log Sheet*** (Sec 2.1.1).

Phone the Observer if his Memory Card has not arrived by the 10th day of month.

Observer Emailed Precipitation Data: Account for each email data file received. If your office has a number of Observers who email, then modify the Memory Card Log Sheet to accommodate the sites that send monthly FPR precipitation files.

2.2.3. Filename and Storage Standard:

The following COOP Program standard for filename and file allocation folder-name convention shall apply to each WFO handling the exchange of FPR-D data files for the NWS and NCDC.

This standard will apply to both platforms in the WFO where you handle FPR data files:

- Virus Scanner PC with McAfee and Federal Desktop Core Configuration (FDCC)
- NWS workstation's directory for "HPD" (i.e., C:\HPD\YEAR\month)

After you run McAfee Active Virus Defense (AVD) suite and you have confirmed 'no detections' remove the Memory Card. Do not save the CSV file to the Virus Scanner PC.

Each Memory Card should hold just two files: (a) the reporting month – with precipitation data in all 15-minute periods, from every day of the entire calendar month; and (b) a second file, the preceding month's CSV file, preferably from the same Observer's site.

Only the current CSV file shall be saved to a dedicated permanent directory on the NWS workstation, with a sub-directory structure that is organized by year and month as follows: C:\HPD\2012\FEBRUARY\.

Store, and do not delete the CSV data files for at least 12 months. Also, never rename files that are being stored. Always keep the file in its original name, coopidno_log_DownloadDate.csv, (e.g., **046730_log_20120302.csv**).

Example: **046730_log_20120302.csv**
Station ID_log_DownloadDate.csv

Format: coopidno_log_yyyymmdd.csv

Translation: **StationID** = Two-digit state code, followed by four-digit local site code
log = Indicates the data originated in a Sutron data logger
yyyy = Year in which the data was downloaded from logger
mm = month of download
dd = date of download

Important: Never rename a data logger generated filename! And never duplicate, i.e., 'copy-cat', an assigned filename if you generate a mark-up or work-file document for personal use!

Filename Format: The first eight characters give the Station ID number (i.e., 04-6730) with the machine writing two zeros after the state code; then the machine automatically writes the word, 'log' in the middle of the filename, and lastly the machine writes the year-month-day into the filename for the local time when the Observer downloaded the data.

2.2.4 Setting the Data Folder-name in NWS Workstation:

In the same NWS workstation you plan to FTP your monthly files to NCDC, you need to establish a directory folder according to the year and month, for easy, ready reference of the precipitation data files.

A good example is to go to root drive C:\ and establish the directory 'HPD' then create a subfolder for the Year, there create a subfolder for the Month in the CSV file that contains the most recent whole month of precipitation observations.

C:\HPD\2012\FEBRUARY\

Note: Always keep in mind that Notepad is the only program for viewing and opening the CSV stored in these directory folders! To do otherwise will corrupt the data format of the CSV file!

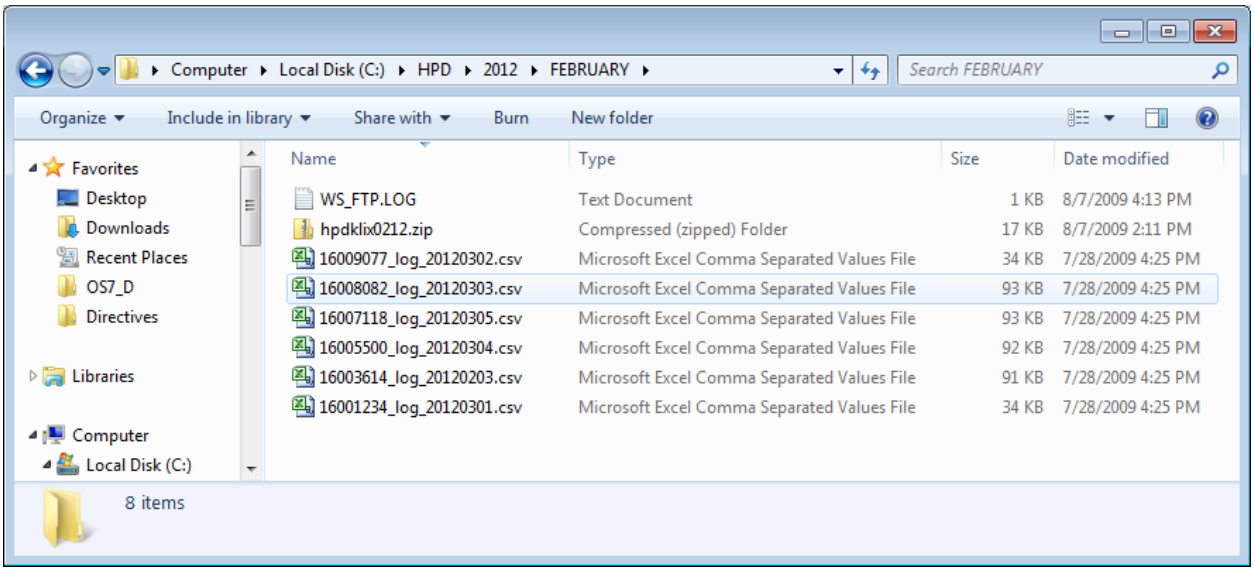


Fig 2.3 Create a New Sub-Directory Each Month

2.2.5. Instructions to Virus Scan and Upload the Data Files:

A. Follow your forecast office's established Virus scanning procedures for external SD Memory Card media. The NWS uses McAfee Active Virus Protection (AVD).

B. If this is your office's policy, then work with your Information Technology Officer (ITO) to arrange a time for the ITO to scan as many SD Memory Cards as possible.

C. Ensure that all the SD Memory Cards are virus-free with no detections. Increment the current collection month in accordance with the convention stated in Section 2.2.3 of this manual (e.g., C:\HPD\2012\FEBRUARY\ ).

D. Upload the most recent month's CSV data file, from each Flash Drive to the NWS workstation. Click "File → Save As." Keep the filename unchanged for each CSV file. See Section 2.2.3, for details on the filename standard.

E. Follow the instructions in sections 2.2.6 and 2.2.7. View the CSV data file's contents from the pop-up 'Notepad' window to ensure the most recent month was delivered.

   Delete the CSV file if it is missing 15 days or more from the collection month. Phone the Observer to inquire into the problem and ask Observer to perform a download today, and mail the data his earliest convenience. When you receive his Memory Card, then mail the Observer a replacement Memory Card because he has none.

F. To finish the process, delete the oldest of the two files on the Memory Card.

G. Remove the Memory Card and place it in a new Jiffy envelope ready for mailing back to the Observer.

2.2.6 Examine CSV file in Windows Notepad:

Examine the contents of the CSV data file, to identify from which COOP Site this Memory Card originated.

At this time, it is essential to read the COOP Site Identifier (SID) in the first eight digits of each line (i.e., #41005678) and use this to update your 'Memory Card Log Sheet.'

Update the Memory Card Log Sheet in the respective row (i.e., Roswell) and write in the date on which this CSV file was virus scanned and uploaded to NWS workstation.

The next section, 2.2.7, explains how to decode each of the nine fields in the FPR-D data records.

Always use Notepad (Fig 2.4) to view the CSV data file. Never open the CSV file at any time in an Excel (XLS) application!

Follow these Windows procedures to call up the Notepad application to view the CSV contents.

Access your Network station's file directory containing these FPR data files and carefully single click the right-mouse-button to select the CSV file for a controlled application opening within **Notepad** and not Excel.

Important: Be careful not to double click the CSV file as this will open it within the Excel spread-sheet applications program and you risk losing the date/time data format!

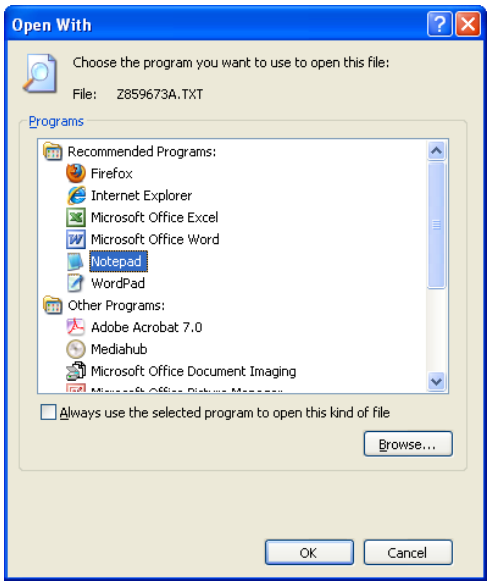


Fig 2.4 Use Notepad to View the Files

Now, click the right-mouse-button once to expand the drop down menu (see graphic, below), and notice the option "Open With". Slide the cursor to the word, 'Notepad' it is the second application listed on this pop-out menu. Single click on it to open a Notepad text screen viewer window and conduct your examination of the 15-minute data records.

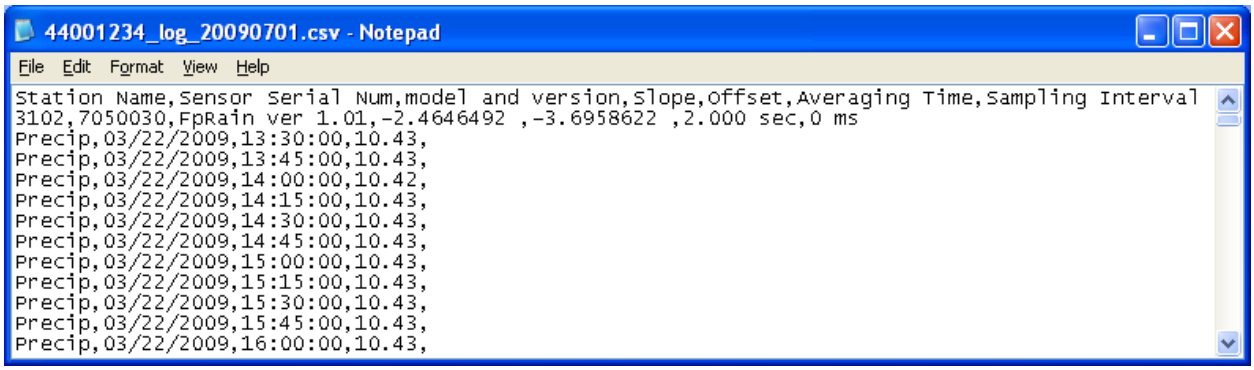


Fig 2.5 One Data File as Viewed in Notepad

Note: When attempting to examine the individual 15-minute data elements, use the Notepad program.

Never open a file by going to Windows Explorer and double clicking the filename because this will open the file and immediately and render a change to the cells' data format settings!

The most obvious corruption is a change to each record's date field. Also, for data that end with a '.n0' or '.00' after the decimal point, the Excel-CSV will permanently truncate these trailing '0' numerals and alter the permanent data record!

2.2.7 Examine CSV to Confirm Observation Month is Present:

Give a quick, one minute or so, visual inspection of your Observer's CSV file's contents, to confirm you have received a complete record of the most recent observation month. Confirm there is data from the start of the month as accounted for by the 12AM record from the first day of the month. The record, **02/29/2012, 00:15:00**,3.09; is the first record of February.

Check to ensure the proper month's data was delivered. This can be diagnosed soon enough for you to document any problem and phone the Observer for a resend. The Observer should have a spare government issued Memory Card available for such a contingency.

```
Precip, 01/31/2012, 23:45:00, 3.09

Batt Voltage,01/31/2012,23:59:59,13.6,

Precip, 02/01/2012, 00:00:00, 3.09

Precip, 02/01/2012, 00:15:00, 3.09

Precip, 02/01/2012, 00:30:00, 3.09
```

Fig 2.6a Verify First Record of the Data Month is Present

Scroll to the end of the CSV file and locate the end of the observation month. Confirm there is data from end of the month as accounted for by the last 15-minute that ends on 12 Midnight of the last day of the month. The record, **03/01/2012, 00:00:00**,3.09, is the final record of February.

```
Precip, 02/29/2012, 23:30:00, 4.83

Precip, 02/29/2012, 23:45:00, 4.83

Batt Voltage,02/29/2012,23:59:59,13.6,

Precip, 03/01/2012, 00:00:00, 4.83

Precip, 03/01/2012, 00:15:00, 4.83
```

Fig 2.6b Verify Last Record of Data Month is Present

In this way you have confirmed the Observer submitted a valid station record for the observation month being reported.

Note: If the beginning and ending lines (fifteen minute records) contain missing data, or skipped readings, then the NWSREP shall note the discrepancy, inquire with the Observer, and then e-mail your RCPM to report the event. Include the CSV file as an e-mail attachment.

Note: Your CSV data will appear in Notepad similar to this example.

```
Station Name,Sensor Serial Num,model and version,Slope,Offset,Averaging Time,Sampling Interval
41005678,7050030,FpRain ver 1.01,-2.4657340 ,-3.7107741 ,2.000 sec,0 ms
Time After Change,07/01/2008,10:33:50,267875280,
Precip,01/05/2000,01:00:00,33.09,Missing samples,
Air Temp,01/05/2000,01:00:00,160.46,
Batt Voltage,01/05/2000,23:59:59,12.8,
Precip,08/26/2008,23:30:00,3.09,
Precip,08/26/2008,23:45:00,3.09,
Batt Voltage,08/26/2008,23:59:59,13.3,
Precip,08/27/2008,00:00:00,3.09,
Precip,08/27/2008,00:15:00,3.09,
Precip,08/27/2008,00:30:00,3.09,
Precip,08/27/2008,00:45:00,3.09,
Precip,08/27/2008,01:00:00,3.09,
Precip,08/27/2008,01:15:00,3.09,
```

Fig 2.6c Contents of an FPR-D Data File

Meta Data Format: 41005678,7050030,FpRain ver 1.01,-2.4657340 ,-3.7107741 ,2.000 sec,0 ms

Definition	Values (example only)	Units
Station Name	41005678	User Settable (8 digits)
Sensor Serial Number	7050030	User settable (7 digits)
Model and Version	FpRAIN 1.01	User settable (FpAAAA)
Slope	-2.4657340	(7 decimal places)
Offset	-3.7107741	Inches (7 decimal places)
Averaging Time	2.000	Seconds (3 decimal places)
Sampling Interval	0	Milliseconds (0 decimal places)

Fig 2.6.d Code Explanation for FPR-D Metadata

Metadata Information Contained in FPR-D Data Files				
Typical Log Events	**Month/Date/Year**	**hh:mm:ss**	**Data Values**	**Description**
Precip	03/02/2012	23:30:00	3.09	3.09 inches
Display On	03/02/2012	23:34:34	3.09	Display woke-up
Slope Before	03/02/2012	23:40:53	- 2.8686	Calibration Slope
Slope After	03/02/2012	23:36:22	- 2.4167	New Calibration Slope
Offset Before	03/02/2012	23:38:14	- 3.5378	Calibration Offset
Offset After	03/02/2012	23:38:34	- 3.1459	New Calibration Offset
Display Off	03/02/2012	23:40:56	3.09	Display fell asleep
Precip	03/02/2012	23:45:00	3.09	3.09 inches
Batt Voltage	03/02/2012	23:59:59	12.8	12.8 volts
Precip	03/03/2012	00:00:00	3.09	3.09 inches
Log Download	03/03/2012	08:22:47	- blank -	Download 60 days

Fig 2.6.e Metadata Comes Included in 15-Min Precip Records

15-Minute Precipitation Code: Precip, mm/dd/yyyy,hh:mm:ss,N.cc		
Field	**Definition**	**Units**
Precip	Observed Weather Element	English Text
mm/dd/yyyy	Month, Day, Year	Numerals (2, 2, 4)
hh:mm:ss	Hour, Minute, Second	Numerals (2, 2, 2)
N.cc	Current Level in Gauge Bucket	Inches of Equivalent Rain (hundredths)

Fig 2.6.f Code Explanation for one 15-Minute Record

2.2.8 Zip Compress FPR Data File:

On or about the 15th of the month, go to the Memory Card Log Sheet and take inventory of the memory cards you have transferred to the NWS-network workstation. When all the Observers have sent their memory cards, and you have successfully Virus Scanned all cards, now you are ready to ‘zip’ together all the CSV data files into a single file on the NWS network workstation.

Use only the NWS network workstation to zip together all CSV files from the observed month.

a. Using Windows Explorer, select all files in folder by selecting one file in the folder and then using (Ctrl-A),

b. Right-Click on files and select "add to ZIP"

c. The file should now be re-named hpdkxxxMMyy.zip

You must always use this NCDC filename convention, hpdkxxxMMyy.zip , for all files transmitted to NCDC. Code explanation: >kxxx= is your 4-letter WFO identification (e.g., kmeg for Memhpis, TN), and >MM= is the data-month (i.e., 06), and >yy= is the data-year (i.e., 09).

Cards Delivered Late to WFO: If any Observers have not yet sent you their memory card, phone and remind them, and wait until the 25th of the month. Then, on or about the 25th of the month use WinZIP to bundle-zip the full complement of CSV files into one ZIP file.

In certain rare cases of lateness, you may postpone the ZIP process and FTP transmission for six weeks beyond the 15th. August 31, 2009, is seven weeks 'late' from the Observer's reporting date for the June 1-30, 2009, precipitation report. Further lateness from the Observer will cause confusion in your account of HPD transmissions to NCDC. Remind the Observer to download and mail the card the first week of each month.

NCDC Advice on Zip Compression:

- The CSV data file must contain the **entire** month's data being reported in the file name of the zip file.

- For example, a ZIP file named **hpdkxxx0609.zip** must contain all data for the month of June. The Observers shall download the data logger to their key only after midnight on June 30, 2009. Since NCDC will be processing the June data, if any data is missing, it will not appear in the publication or archive databases, and will be marked "missing".

Caution: Do not right-click on the folder and "add to zip" as this causes your PC's folder name to appear to NCDC as the path name from which to extract data. Then, your data will never get processed by the ingest program!

Caution: Make sure that the "save full path info" is not checked under the Folder Option. This creates a separate sub-folder. Then, your data will never get processed by the ingest program!

Caution: Do not send a self-extracting executable file (.exe). The files must be zipped with a file compression utility such as winzip or pkzip.

2.2.10. Transmit Precipitation Data to NCDC:

Between the 15th or 25th of month, you should have zipped together all your current CSV files at your NWS-network workstation (Sec 2.2.9, above). Now you are ready to start an FTP session.

Double-click the desktop icon for WsFTPLE (i.e., Ipswich WSFTP95.exe) on your network workstation. If there is no icon, run the executable file that is located in C:\Program_Files\WS_FTP Windows\. The Session Properties 'General' panel will open immediately (graphic, below). Confirm it is configured properly with each NWSRSEP to use 'anonymous' as his User ID, and each NWSREP shall use his NWS- network e-mail address as his Password.

Host Name / Address:
ftp.ncdc.noaa.gov
User ID: anonymous

your.name@e-mail.address.

The general session properties do not change, except for the Password field, which will show the e-mail address of the person who most recently transmitted an FTP data file to NCDC. Also, about half of all offices send upper-air observations this same way. So, now update the Password: dialogue box with your name.

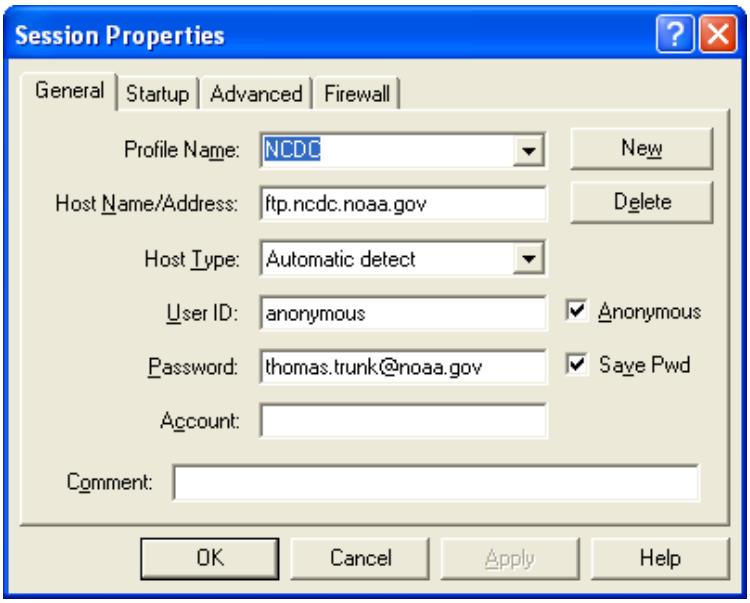


Fig 2.7 Set-up Your FTP Session

Click on the Apply button on the lower portion of the 'General' panel to enter your password (do not click on OK, yet call-up the 'Startup' tab immediately to the right of 'General' in the same Session Properties screen.

Place your mouse cursor inside the second dialogue box, marked 'Initial Local Folder:' (see graphic, right) and update the default local folder from C:\hpd\2009\may, to C:\hpd\2009\june, by typing in the letters 'june' (below) and clicking on the button Apply.

Finally, while still in 'Session Properties', click on the OK, expect sound-effects (i.e., train-whistle), and the program will quickly update your FTP user-control panel (see graphic, below) as the Session Properties windows closes.

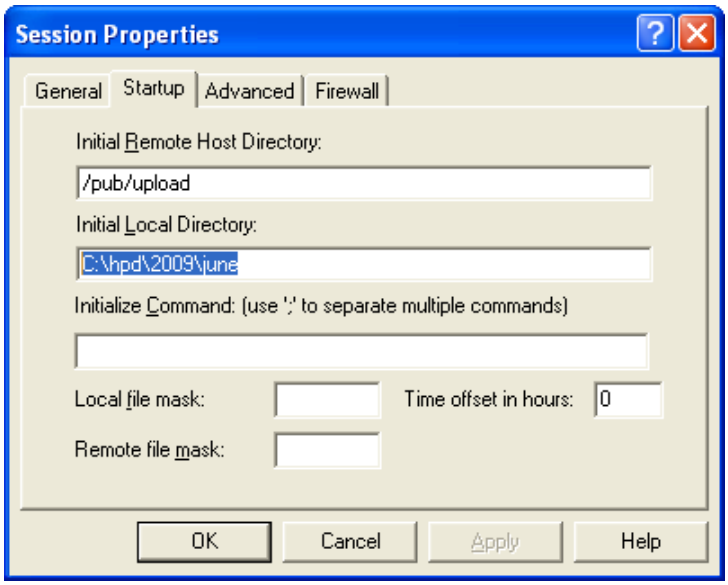


Fig 2.8 Select Your Data Sub-Directory

The FTP twin-pane user-control panel (see, below) is a standard design with the left-pane titled 'Local System', and the right-pane titled, 'Remote Site'. Your Observers' monthly data files are visible in the Local System's left-pane view arranged by filename as they appear in your NWS-network workstation. The NCDC directory path for data file ingestion appears in the right-pane, under the title, Remote Site.

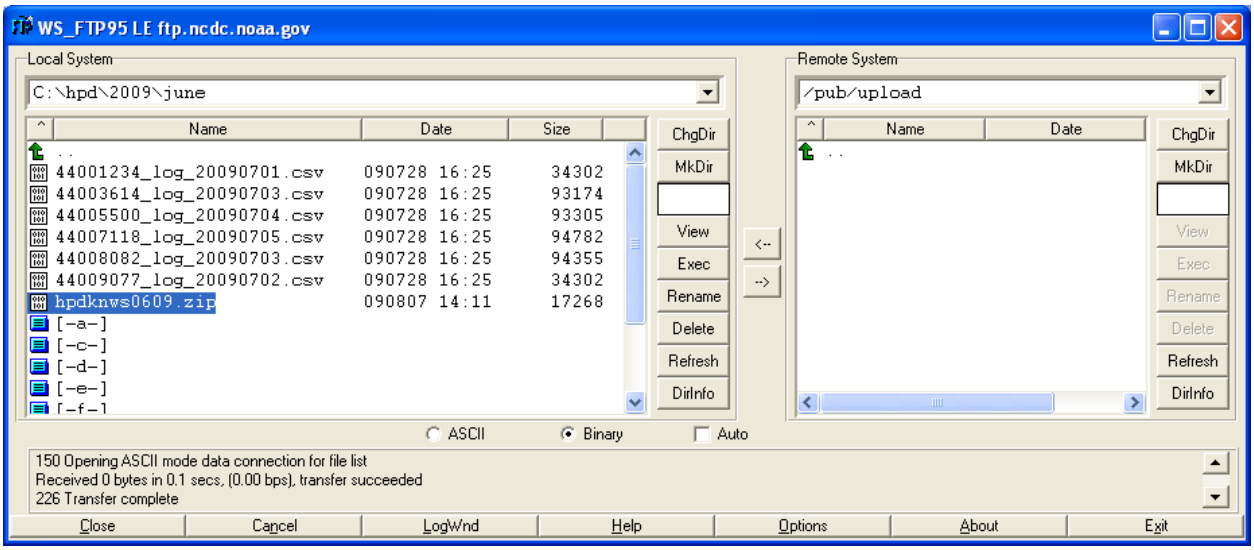


Fig 2.9 Select your ZIP flie to send to NCDC

Note: Verify that your ZIP filename is properly coded and spelled: **hpdkxxxMMyy.zip** is the proper code, where 'kxxx= is your 4-letter WFO identification (e.g., kmeg for Memphis, TN), and 'MM' codes for data-month (i.e., 06), and yy= codes for data-year (i.e., 09). For zip files the year 'yy' is always on the end of the filename!

Note: Always name the ZIP file with the same month designation as the Collection Month of the observed precipitation data being reported to NCDC! You may call-up a full view of the precipitation data files to understand which CSV files you have just zipped. Use your mouse – locate the lowest tab in the median of the double-pane window – labeled 'DirInfo'. Click on this 'DirInfo' tab to open the viewer as seen in the illustration, below.

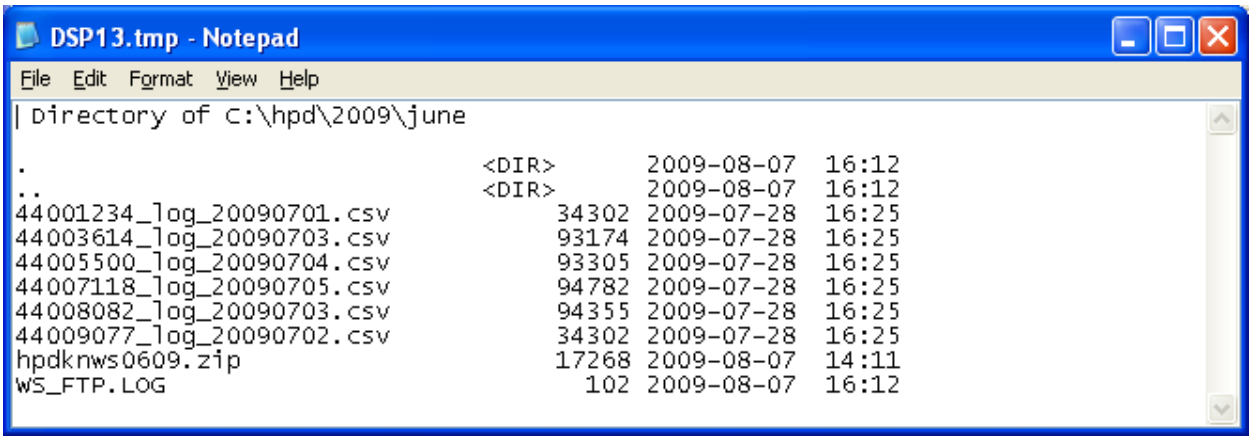


Fig 2.10 Keep the ZIP file saved within the Data Sub-Directory

Ensure that the Local System window displays the relevant month's FPR zip files (e.g., hpdkxxx0609.zip) along with the CSV filenames of each COOP station that sends you monthly FPU data. The Remote Site window will show no files having been uploaded as of this session.

a. **Select** the ZIP file (e.g., hpdknws0609.zip) you will send to NCDC. This is the one file that encapsulates all your FPR stations' precipitation data for the most recent collection month (e.g., June 1-30, 2005). Click (single click with left mouse button) the ZIP filename in the left-side window.

b. Locate the two small square buttons [←] and [→] that **control** the direction of FTP file transfer. They are located in the vertical median of the twin-pane panel.

c. Click on the right pointing button [→] and you will **transmit** your monthly FPR-ZIP file to the NCDC's data ingest port. Your task is now completed.

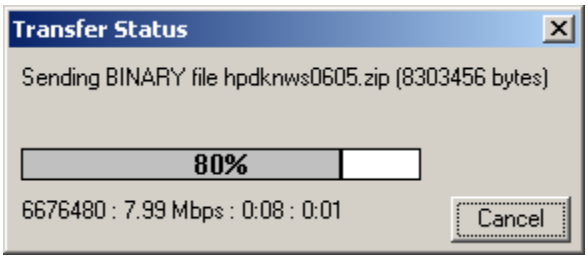


Fig 2.11 Ensure the FTP is successful!

At the 100% transfer complete, audio effects will sound (i.e., several rapid chirps).

d. Click on '**Exit**', on the menu bar at the bottom-right of the twin-pane panel.

Click on the receipt file that arrived upon successful transmission, titled “WS_FTP.LOG”, highlighted in the graphic, below. Note: It has been discovered some versions of Ipswitch FTP will not produce this *log* file.

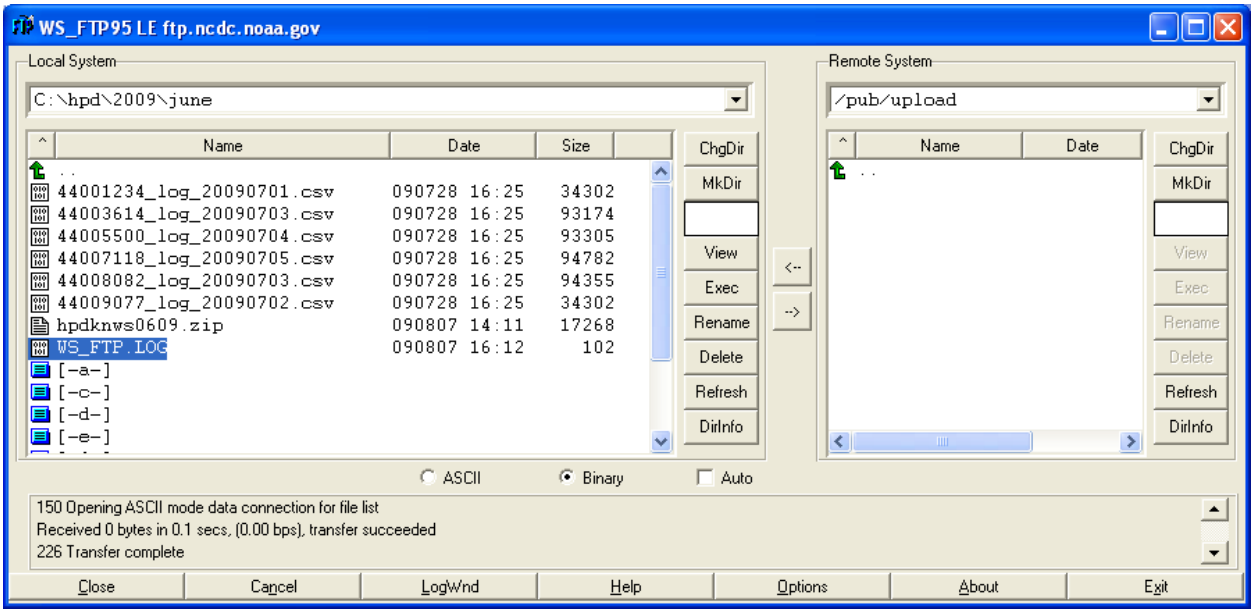


Fig 2.12 Example of a Receipt Message ‘WS_FTP_LOG’

Select the WS_FTP.LOG in your subfolder C:\hpd\2009\june\ with mouse cursor (so it highlights), then click on the ‘View’ tab, to the right, the fourth tab from top of the center median. To produce an ‘FTP transmission receipt’. Note the date and time 16:12 Aug 07, 2009.

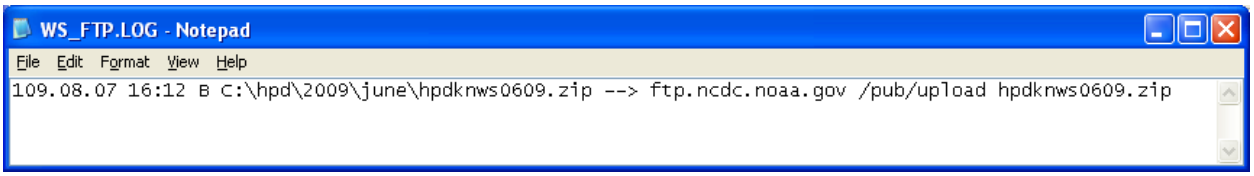


Fig 2.13 Contents of the ‘WS_FTP_LOG’ message

At NCDC an automated program (Cron job) will be looking for the "hpdknws0605” and the “zip" when it runs once each hour. Any files located will be automatically processed.

Note: NWSREPs should e-mail or phone Stuart Hinson (NCDC), on 828-271-4437, if there are any questions on the prescribed FPU data compression and FTP transmission procedures.

Remember: If you have two or more COOP Stations who routinely send you monthly Data Keys, then Zip together the CSV files, one from each COOP Station, to form a single Zip file.

Immediately after you have FTP’d transmitted your Zip file, use the same utility to call up the ‘message log’ to confirm your Zip file was successfully received to the /upload/ folder. See the screen display, of the FTP-LE Message Log (see illustration, below).

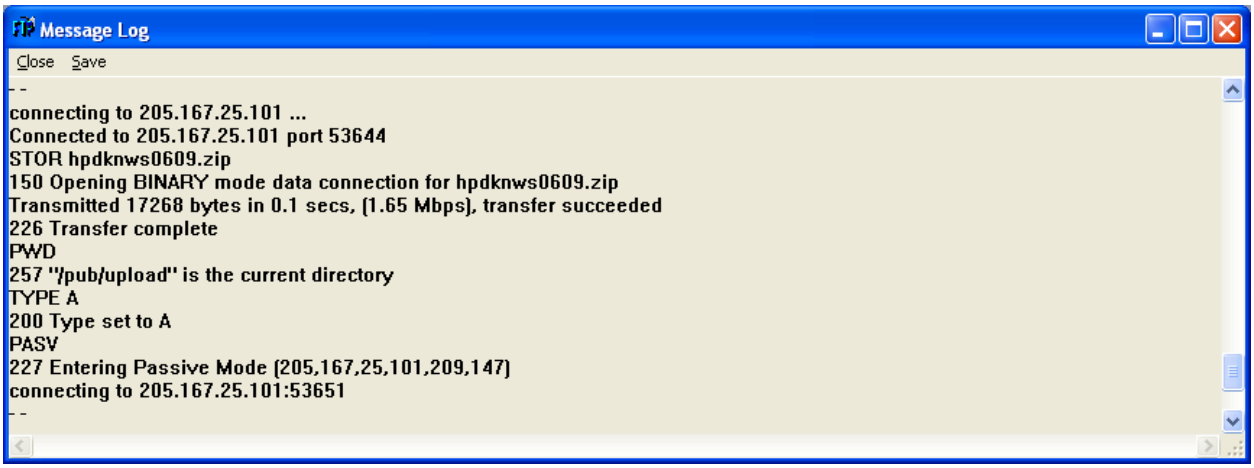


Fig 2.14 Message Log confirms Zip File was received to 'pub/upload'

2.2.11 Confirm NCDC Has Ingested Your Monthly Precipitation File:

Call up this NCDC website, '**hpd-inventory**,' the day after you have transmitted your monthly ZIP file. Always check for the successful arrival of your monthly FPR data files to NCDC.

http://www1.ncdc.noaa.gov/pub/data/hpd/inv/**hpd-inventory**_201207.txt

Access the current month's web page (i.e., hpd-inventory_201203.txt) and ensure the expanded zip file shows the date of the observation month, which is March 2012 (e.g., hpdklix0212.zip).

Scroll through the reports, until you your office ID (e.g., **`hpdklix0612.zip`**) appears with the unzipped files. (*Notice the '0212' in the zip file's name…this is proper –the observation month always is one month behind the reporting month the month of the NCDC web page*!)

```
HPD UnZipped: hpdklix0612.zip: 767,202 Received: 20110725 1338
  16004030_log_20120704.csv Ok: y
  16005620_log_20120702.csv Ok: y
  22006718_log_20120703.csv Ok: y
```

Fig 2.15 Contents of the 'WS FTP LOG' message

Now ensure each of your F&P sites appear beneath this heading. Look for their COOP number (e.g., 16004030; 16005620; etc). Each line should end with an "Ok: y" status and not a "Ok: n." If "Ok: n" appears, then analyze your Zip file to see if you accidentally zipped the folder rather than just the data file. If so, then re-Zip, and transmit data.

Also, you may access any past month's web pages to confirm a missing data file from one of your COOP sites. Keep in mind you may need to search several consecutive months of web pages, to confirm the file was never received by NCDC.

If any problems are encountered with data or with FTP transmission to NCDC, then inform NCDC (Daniel.Manns@noaa.gov) and NWS (Thomas.Trunk@noaa.gov).

2.3 Monthly Timeline of FPR Tasks:

Day of Month	Countdown to FTP X-mission	Task to perform.
Jun 25th	T – 31 days	Access the **/hpd/inv/hpd-inventory201206.txt** website to confirm NCDC has received your FPR stations' monthly CSV files. (**Sec 2.2.11**)
25th	T – 31	Mail each of your Observers their new Memory Card.
July 1st	T - 24	Prepare a new Memory Card Log Sheet for month ending June 30th.
3rd	T – 22	Log first Memory Card arrival into your ***Memory Card Log Sheet***. Did the Observer enclose any operational log-sheet or notes?
3rd	T – 22	McAfee virus scan each Memory Card on same day it arrives. Then plug card into NWS enterprise workstation's reader. Now examine CSV file's date/time headings to confirm proper month.
10th	T – 15	Virus scan any outstanding 'Reporting Cards' and update the ***Memory Card Log Sheet***. Identify any missing (late) cards. Check WFO mail inbox to reduce risk of envelopes getting misplaced. Phone the Observer to prompt for the missing (late) card.
15th	T – 10	Check WFO inbox and retrieve Observer envelopes to reduce risk of being misplaced. Upload any outstanding Memory Cards and update the ***Memory Card Log Sheet***.
15th	T – 10	Take inventory of CSV files on your enterprise workstation. Examine the date/time fields to ensure the first and last days of the reporting month are present with no missing data.
20th	T – 5	Upload any outstanding Memory Cards and update the ***Memory Card Log Sheet***. There should be no missing or late cards now. Check WFO mail inbox for any 'found' memory card envelopes. Phone the Observer a second time (first time was on the 10th) to prompt him to mail it!
25th	T – 0	Confirm all Memory Cards were received and McAffee virus scanned (PC/laptop) - then update the ***Memory Card Log Sheet*** as necessary. Ensure all CSV files were saved to your proper month HPD folder in the NWS enterprise workstation.
25th	T – 0	ZIP all the CSV files submitted this month, to form a single bundled ZIP file.
25th	T – 0	Important: Ensure the filename is spelled properly. **Example: hpdkxxx0612.zip** Where the **kxxx** is the WFO site ID (e.g., kohx); the **06** is the data-filled month (June); and **12** represents year 2012.
July25th	T – 0	FTP Transmit the **June 2012** FPR-ZIP file to NCDC.
25th	T – 0	Access the **/hpd/inv/hpd_inventory201207.txt** website to confirm NCDC has received your FPR sites' monthly CSV files. (**Sec 2.2.11**)
25th	T – 0	Delete the older of the two files from each memory card. Attempt to

		keep each Memory card holding at maximum two files, the most recently two files (months) downloaded by the Observer.
25th	T – 0	Mail each of your Observers his new Memory Card ensure it has just one file on.

Fig 2.16 Monthly Timeline of FPR Data Exchange Tasks

T = Denotes the day on which you FTP'd the monthly file to NCDC.

CHAPTER 3 – ROUTINE OPERATIONS

3. Introduction

Fischer & Porter Rain Gauge: The new recording rain gauge is housed entirely within the body of the original Fischer & Porter (F&P) containment shell (Fig 3.1). Once you open the access door (Fig 1.2) you will see a blue and white plastic box that contains the data recorder. This is the Precip Recorder and it takes the place of the paper-tape assembly for the purpose of recording the weight of the liquid in the bucket (Fig 3.3).

Fig 3.1

Fig 3.2

Fig 3.3

Weighing Sensor: The weight of the catch bucket with liquid rests upon a metallic bar that bends with increased weight. This weighing sensor is very sensitive and can detect changes of one hundredth of an inch of precipitation in a matter of several seconds. Readings from the sensor are processed by the Precip Recorder. Fifteen minute data, based on weighing sensor measurements, are available when you insert a memory card to the slot on the right side of the Precip Recorder (Fig 3.3).

Precip Recorder Display: The Precip Recorder stays in a 'sleep' mode until you wake it up by pressing any one of the key pad's buttons. The blinking green lamp tells you the rain gauge recorder system is working properly.

Fig 3.4

The green fluorescent display communicates the running total of precipitation plus any other additive like oil or anti-freeze. It also shows the current date and time.

Your National Weather Service (NWS) representative has pre-programmed the Precip Recorder for automated operation.

The four Arrow buttons allow you to scroll through six menus to view rain gauge status and view a log of times you checked the recorder and downloaded precipitation data.

Arrow Buttons

Fig 3.5

To collect data, the NWS mails you a small Memory Card, once per month. In the first few days of the month you insert the card to the slot in the right side of the Precip Recorder (Fig 1.6) and download the rain gauge data.

The Memory Card

Fig 3.6

You insert the Memory Card and the system automatically downloads data to the Memory Card. Follow instructions for Monthly Data Retrieval in Section 3.4, to understand how the system responds and when to eject the Memory Card.

Expect the rain gauge to take about five minutes to download the last 60 days of data. Always wait nearby the Precip Recorder while it conducts the download – and never conduct the download when the weather is raining or snowing.

3.2 Viewing the Menus

The Home Display (Fig 3.7) will always appear when you wake-up the system. It gives you the Precip value in hundredths of an inch together with the current date and time. When you press the keypad's down arrow key (▼) you advance to the next menu of the six menus. All six menus are listed in Figure 3.8.

Fig 3.7

Fig 3.8

Primary Menus	Description
Precip 15.00 2009/02/13 10:52:30	This is the 'home menu' it appears on power-up.
Battery Now 12.6V	Battery voltage.
Logged Data	Stored 15-min data.
Station Setup	Password protected
Diagnostic	Calibration
Station Name & Time	COOP site number

The menu revolves back to the Home Display (Fig 3.7) if you keep pressing the down-arrow (▼) key.

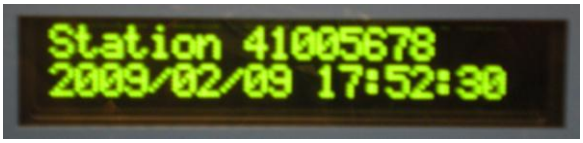
Observers are not required to access any of these six menus. If your NWSREP asks you, you may conduct a routine check of battery voltage, or perhaps a quick check of the Logged Data. See Appendix B, for a table that shows the Precip Recorder's menu and sub-menus.

Press the ▼ (down) key twice, and you advance to the parameter 'Battery Now' – this informs you of the battery's voltage.

Fig 3.9

Press ▼ (down) four more times and your COOP station name and number appear on the screen, this is the Station Name and Time, menu (Fig 3.10).

Fig 3.10



No action is required. To return to the home display, simply press the ▼ (down) button one more time and you revolve back to the first of the six menus.

3.3 Routine Checks

Whenever you open the F&P containment shell, always wake-up the green fluorescent display. Use any of the 'arrow buttons' or either the 'Set,' or 'Off' button.

The ▲(up) button will wake-up the display.

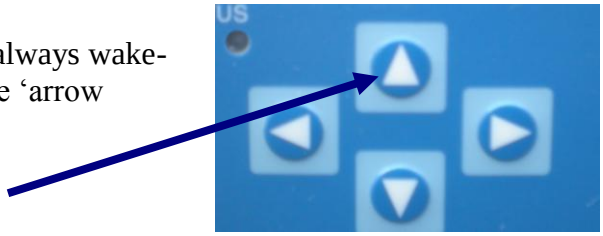


Fig 3.11

Precip Parameter: This **Precip** display gives the current weight of liquid in the bucket. This includes rain water, melted snow, mineral oil, antifreeze, and possibly anything that fell into the bucket since it was last serviced.

Fig 3.12

In this example (Fig 3.11), the Precip shows 15.00 inches of liquid in bucket.

If the display ever reads a negative value or reports more than 15.00 inches (bucket capacity is 20 inches), phone your NWS Representative (NWSREP) so he/she can service the gauge. Your responsibility is to journal any maintenance action (if delegated by NWSREP) or a data discrepancy, to the Log Sheet, as described in Section 3.7.

Date and Time: The current date and time appear in the Home Display (Fig 3.11) and also appear one the last menu, the Station Name and Time.

The year, month, and day, appear on the left side: **2009/02/13.** Shows Feb 13, 2009.

The time in hours, minutes, and seconds, appears next: **10:52:30.** This is 10:52am local Standard time in a 24 hour convention.
Understand that the time is always kept in **Standard** time. Our policy is to never adjust to daylight savings time. If you notice the **minutes** are off by more than 10 minutes, then phone your NWSREP to inform him/her of the error. Discrepancies on the display may indicate a system problem that requires a station visit by your NWSREP.

Spare Memory Card: You should keep a spare Memory Card in its plastic protective case resting on the support stage several inches below the memory card slot. right beside the Precip Recorder. The support stage is visible in Fig 3.3.

3.4 Monthly Data Retrieval

In the first five days of each month, but never before 12am on the first day of month, at a time when it is not raining or snowing, the Observer walks out to the Fischer & Porter gauge, and retrieve the precipitation measurements. This outdoor procedure might take 5 minutes.

3.4.1. Insert Memory Card: **Keep the display asleep.**
Insert the Memory Card into the slot on the right side of the Precip Recorder (Fig 3.12) with the card's label-side facing you. Press it in, until it clicks.

Fig 3.13

3.4.2 Display responds: Auto Log Download of 60 days in 8 seconds.

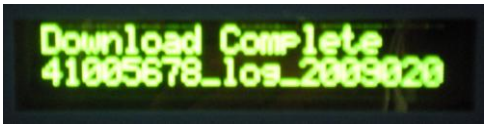
Fig 3.14

Then the display gives a running percentage of the portion of data copied to the memory card until 100% complete. This process might take five minutes to complete.

. Fig 3.15

3.4.5. Verify the End of Download: View the display to confirm the download has completed.

Fig 3.16



3.4.6 Remove Card: Press the **OFF** button three times to return to the Home Menu. Then eject the card by pressing it in and then releasing it gently. Place the plastic protective plug back into its slot.

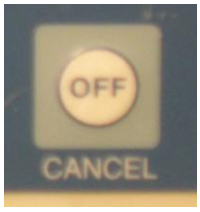


Fig 3.17

Place the plastic Memory Card into its clear plastic protective cover.

3.5 Data Acquisition Requirement:

Your responsibility is to obtain from each Observer the monthly report of precipitation – and not permit your reporting to NCDC to lapse, by even one month.

Instruct your Observer to download always in the first five days of each month at a time when it is not raining or snowing. Remind them to never download before 12am local standard, on the first day of the month! Have them refer to their printed copy of the *FPR Observer Instructions*, the most recent copy is on http://www.nws.noaa.gov/ops2/Surface/coopimplementation .

Remember, the Observer shall always keep a spare Memory Card. So there is ample opportunity, in the event your forecast office is missing, or loses, the Memory Card, you need to request the Observer download the last 60 days to his/her spare Memory Card. Then, the same day, mail this Observer a New memory card, to replace the one lost/missing.

3.6 Monthly Data Transmission:

Each month you are required to 'FTP' the data (i.e., StationNumber_log_yyyymmdd.csv) to the NCDC to be in accord with national policy. See Chapter 2, for detailed instructions.

a. By 10th day of month phone your Observer if you have not received his memory card.

b. Scan the Card on the 'External non-NWS memory device scanning workstation. If the virus checker gives a 'clean' report of the memory card, then download the contents of the memory card to your NWS workstation

c. Display the contents of the file in a Notepad file - Read the card and scroll thru top and bottom lines of the 15-minute data to ensure the full calendar-month of data was sent. Phone the Observer. If his card is missing the totality of the complete calendar-month (i.e., even if it is missing the first several days), phone the Observer and direct him to download to his spare Memory Card the last 60 days of precipitation data from his rain gauge's Precip Recorder.

d. Save each CSV file in its respective file-folder, named according the month the precipitation was measured (i.e., \HPD\JUNE\33001234_log_20090704.csv)

   C:\HPD\2011\\JUNE
   C:\HPD\2011\JUL
   C:\HPD\2011\AUG
   C:\HPD\2011\SEP
   C:\HPD\2011\OCT

e. No later than 25th of month, mail back your Observer one Memory Card, per routine.

f. By 25th of month, transmit to NCDC all of your sites' FPR data in one Zip file.

3.7 FPR Log Sheet Review:

Certain Observers are given the responsibility to perform gauge/bucket maintenance. These Observers are required to review and update the Log Sheet for any performed maintenance or discrepancies that occurred since the last monthly submission.

Closely review your Observer's Log Sheet to see if s/he is in need of supplies or if there is an operational issue that warrants your visit. Phone your Observer to learn more about the reported discrepancy in an attempt to see if the problem is one the Observer could resolve on his/her own. If your Observer's Log Sheet contains any maintenance entries, then update your CSSA Site Inspection Report.

F&P LOG SHEET

COOP Number: 01-5678 Your Name: Walter Roberts, Pinetree St Park NWSREP Name: Michael Jones (TAE) .

Date MM/DD/YY	Time hh:mm am/pm	Amount NN.cc	Routine Actions	Special Notes (i.e., displayed error messages, etc.)
03/28/2011	Start: 10:15 am Stop: 10:45 am	15.47 02.75	☐ Add Oil ☐ Add FGPG ☐ Empty Bucket ☒ Partial Drain Funnel - ☒ In ☐ Out	
06/14/2011	Start: 4:15 pm Stop: 4:45 pm	8.72 8.72	☐ Add Oil ☐ Add FGPG ☐ Empty Bucket ☐ Partial Drain Funnel - ☐ In ☐ Out	'Err 12' message displayed. Phoned NWSREP.
09/28/2011	Start: 2:30 am Stop: 2:45 am	10.39 10.39	☐ Add Oil ☐ Add FGPG ☐ Empty Bucket ☐ Partial Drain Funnel - ☐ In ☒ Out	Wiped down the F&P shell to remove dust.

Fig 3.18 FPR Log Sheet (Also for use with FPR-E.)

3.7.1 Special Notes Reported in FPR Log Sheet: Phone the Observer and inquire into the nature of the event s/he reported on the *FPR Log Sheet.* Analyze and understand the history of installation, implementation, calibration data, maintenance actions, and seasonal weather conditions that might have contributed to the reported event. Does the event involve a faulty or broken system component that could be resolved with a maintenance visit?

Phone Sterling Field Support Center (SFSC), on 703-661-1259, or email nws.sfsc@noaa.gov, if there is a system technical error. Inform your RCPM to report what type of maintenance action was necessary. See Chapter 4, Maintenance, of this *FPR Operations Manual*, for general policy on trouble shooting and procedures for ordering replacement parts.

3.8 Journal Responsibility

3.8.1 Continuous Automated Logging: Previously, any time you suspended the F&P gauge from its 15-minute timer or each month when you removed the Punch Tape from the sprockets, you were required to write down the 'OFF Date/Time', as well as your Station ID (i.e., 23-4652), your Station Name (i.e., Lake City), and your State (i.e., MO) in felt tip marker to your Punch Tape. You then had to draw a straight line (i.e., a "time line") across the width of the Punch Tape, to stand as an unmistakable reference to show where the interruption began. When you rethreaded the paper you would mark 'ON Date/Time.'

With the FPR however, the recorder continues to run un-interrupted while you perform the critical monthly task of downloading precipitation data to the Memory Card. So, you do not need to document the date or time (i.e., OFF date/time) when you download the monthly data.

Each time you wake-up the display or download data to memory card, the Precip Recorder will self-log the date and time of the event as, 'Display On, 09/20/2008, 10:12:54.' This way a permanent record is made to the electronic data, much in the same way your pen-on-paper notations worked.

3.8.2 Bucket Maintenance – Journal Entries: When routine maintenance activity changes the weight of the collection bucket – the precipitation record for the climate program is at risk of data corruption. To avoid damaging the climate data record, changes in the bucket level have to be accounted for with a written entry in the F&P Log Sheet. Each time you or your observer add Food Grade Propylene Glycol (FGPG) for winter season – this must be accounted, and when the one-half quart of oil is added to the bucket to prevent evaporation write an entry to the F&P Log Sheet. Appendix I, gives an example with instructions on how to journal these important interruptions in the data record. This is analogous to the "OFF Date/Time" you entered on the F&P Punch Tape.

The Log Sheet is formatted so you can mark with a pen multiple boxes for a given maintenance job, and simply report the Start Time, Stop Time, the corresponding Bucket Level (i.e., display reading), at start and finish of the maintenance.

3.8.3 Delegated Responsibilities: If your Observer has agreed to take-on routine maintenance activities, then the Observer also must agree to take on the responsibility of writing journal entries to the FPR Log Sheet. The Observer shall follow the instructions for completing the FPR Log Sheet (Appendix I) whenever the buck is drained, emptied, or the fluid levels in any way are altered. Likewise whenever Food Grade Propylene Glycol (FGPG) is added to prevent freezing, or oil is added to retard evaporation. The Observer will write these actions to the Log Sheet.

Then on the next available routine monthly mailing after these actions, the Observer will enclose a hard copy of the FPR Log Sheet, into the same mailer-envelope as the Flash-Drive, and mail to the attention of the NWSREP. If the Observer uses e-mail, he will attach a softcopy of the FPR Log Sheet, as a separate file, when he emails the monthly data file.

Before you Begin Maintenance Activity: Obtain the FPR Log Sheet, and on the next available row, write down the current Date (MM/DD/YYYY), and the Start Time (HH:MM, for local 'standard' hours, i.e., do not use Daylight Time values). Then write down the 'Amount' that appears in the display – this is the bucket level that is about to change.

Maintenance Activities to be Noted Move your pen to Column 3, 'Routine Actions,' and mark off one or more of the Check Boxes that describe this maintenance action.

Types of Maintenance Activities:

- Partial Draining of Bucket: Drain the bucket into a sealable container. When finished, return the drain tube to its operational position, and in the same row of the Log Sheet write down the Stop Time, and the Amount that now appears in the display. Make sure you marked the box, "Partial Drain" in the 'Routine Actions' column. See example in Appendix I.

- Emptying of Bucket: Empty the bucket into a sealable container. When finished, return the drain tube to its operational position, and in the same row of the Log Sheet write down the Stop Time, and the Amount that now appears in the display. Make sure you marked the box "Partial Drain" in the 'Routine Actions' column.

- Added FGPG (Winter): Add one or more whole Quarts of Food Grade Propylene Glycol (FGPG) to prevent seasonal freezing of the bucket fluids. Make sure you marked the box 'Add FGPG' in the 'Routine Actions' column.

- Added Oil: Add one quart of Oil to the bucket to retard evaporation of the collected precipitation liquids. Make sure you marked the box, 'Add Oil' in the Routine Actions, column.

- Removed/Installed Funnel: Remove the funnel at start of winter season, and install the funnel at start of summer season. Make sure you marked the box, 'Funnel In' when you are installing the funnel. Make sure you mark the box, 'Funnel Out' when you are removing the funnel in the Routine Actions column.

- Removed Object from Bucket: Twice yearly inspection of the contents of the bucket is advised. If you find an object, such as a pinecone, bird, or small animal, proceed to empty, rinse, and towel dry the bucket. Then describe the object that was removed, with a written entry to the 'Special Notes' section (Log Sheet, Column 5).

3.9 Recovery from Hardware Error Message 4027:

If your Observer does not fully insert the Memory Card and begins the Download sequence the display will respond: "Hardware failure - RIGHT shows details." The logger system considers the Memory Card as the hardware and the failure is easy to remedy. Follow these procedures to recover from this interruption. For a list of other possible error codes, see Appendix E.

a. If the Memory Card is not in its proper placement, the Sutron will respond.

Fig 3.19 Display Responds "Hardware Failure"

b. Then instruct the Observer to press the RIGHT arrow button.

Fig 3.20 Error Message "Err 4027" Should Appear

c. Instruct the Observer to press the DOWN arrow button.

The display should read: "End of error list Press SET to clear" (Fig 3.21).

Fig 3.21 Get to End of Error List with Down Arrow Button

d. Instruct the Observer to press SET button, the errors are cleared and you get this message:

Fig 3.22 Clear the Errors with the SET Button

e. Instruct the Observer to press the OFF button until the display goes off**.**

3.10 Quality Assurance Checklist:

Use these 'best practices' to prevent transmission of incorrect monthly files, improperly named files, and disorganized exchange of data keys. These guidelines need to be stressed when you train a new person on FPR tasks.

3.10.1. Log-in the Memory Cards that Arrive each Month

- Establish a Memory Card Log Sheet template; update and print it monthly
- Consider a QA Log Sheet for broader, more general FPR responsibilities
- Establish firm time-table, and routine
- Perform Quality Assurance review of the monthly data files (see 3.10.4)

3.10.2. Transmit to NCDC

- Assure all FPR data files are FTP'd to NCDC in sufficient time to meet the deadline of the 25th day of Month.
- Do not e-mail the FPR data files.
- Check NCDC Inventory web site to confirm NCDC receipt of all of your FTP'd files. http://www1.ncdc.noaa.gov/pub/data/hpd/inv/hpd-inventory_201203.txt (see Section 2.2.11 of this Manual).

3.10.3. Set a 'Best Practice Policy' for your WFO to handle all the FPR stations.

- Establish expectations with Cooperative Institutions.
- Establish consistency.
    - Schedule firm cut off for routine receipt
    - Follow-up on missing Keys consistently.
    - Establish deadlines, patterns with Observers

3.10.4. Perform Quality Assurance Review:

Look at the data in a text viewer like Notepad to verify:

- The date/time of the start and end points of the data file are correct.
- Data possesses proper filename, station number, Year/Month/Day?
- There are no data missing problems, no garbled data? No zeros data filling the pages?

Look at the data with a plotting program "FPRD_PlotData_V1_2.xls to verify the following:

- The data is smooth and continuous, not noisy, disjointed, or has other problems
- The battery voltage is being maintained by the system
- That evaporation is not occurring
- If the gauge needs emptying

Resource: Obtain a copy of the FPRD_PlotData program from te NWS HQ website:
http://www.weather.gov/ops2/Surface/coopimplementation.htm

If a problem in the data file does this problem fit a pattern from the same Observer?
Have there been quality improvements (observer) for same site?
Log problems at the WFO to establish patterns.

Read and take action on any FPR Event Log Form that is submitted by the Observer.

- Do you need to check the File to confirm Notation codes are properly entered?
- If they are not entered, then advise the NCDC via e-mail)

Determine QC corrective procedures. Is there something NCDC can do, recover?
Schedule QC-Does NCDC need to be specially notified about this Station's data?
Follow-up with your Observer, and with NCDC if needed.

3.10.5 Records Retention Guidelines from OS7

The following FPR data records and FPR metadata shall be kept on hand in the WFO:

- O Electronic copy of the month's FPR files (CSV) shall be stored for at least 12 months on an NWS-network workstation. Do build a primary storage folder or archive on a laptop PC.

- O Paper or electronic copy of the '***Memory Card Log Sheet'*** for 12 months.

- O Paper or electronic copy of Observer-submitted ***FPR Log Sheets*** for 12 months, and print any e-mail correspondences, and keep for 12 months.

- O Paper or electronic copy or electronic bookmark for each of the FPR documents that appear in Appendix C, of this ***FPR Operations Manual***. This includes the relevant administrative and procedural directives for the FPR program (i.e., Mod-Note, NWSI Directive 10-1315, EHB-1 (equipment catalog), EHB-10 (Hydrologic Equipment), Sutron Corp Technical Manual, and any memos issued by NWSHQ).

CHAPTER 4 – MAINTENANCE POLICY

4.1 Semi-Annual Site Visitation:

A day or two prior to your trip, call up this site's CSSA **Inspection Report** (Form B-23) and review the results of your last inspection. Review the 'Remarks' section to view the calibration "Slope" and "Offset" coefficients. Realize that all updates of these coefficients should be saved to CSSA Inspection Report, and that the B-44 Station Report, should *not* hold coefficients. Print out the 'Slope' and 'Offset' values and note the date the last time a calibration reset was performed. The calibration check shall be performed once per year, though you may check it any time you schedule a site visit.

Some NWSREPS have ten or more FPR to monitor and maintain a collection of the metadata that is saved to the CSSA inspection report. So call up any other ready reference you may have, such as an electronic FPR Event Logbook. In it you might have journalled any operational anomalies or maintenance performed on the FPR that involved an interruption to the data logger of any length of time. See Appendix H, of this handbook, *F&P Maintenance Log Sheet*, for an example of what to keep in an FPR Event Logbook.

Phone the Observer and ask if his site requires any supplies, including mailing envelopes (e.g., Jiff #0), or any printed instructions, or *F&P Log Sheet*. Also, ask if a general cleaning is required for the exterior surfaces, and most importantly, for the solar panel.

For general policy on COOP site visits, access Appendix B, **Visitation Procedures**, in NWSI 10-1307, *Cooperative Station Management* (Jan 2008). The policy is located on the NWS web site: http://www.nws.noaa.gov/directives/sym/pd01013007curr.pdf.

SEMIANNUAL CHECK BY NWSREP

What to Check	How to Check	Precautions and Remarks
1. Overall Appearance	Observe paint finish, or evidence of vandalism.	Clean oil film from the outside of gauge using GSA nonflammable liquid detergent.
2. Weather Stripping around Base Plate and Cylindrical Door.	Check for breaks or general deterioration. Weather stripping is used around Base Plate of the Model 1558 and 1559 gauges only.	Replace as needed: Weather Stripping or Door Gasket. Cut base plate weather stripping to about 50 inches in length.
3. Horizontal Flexures in the FPR Weighing Mechanism.	A quick glance will reveal the condition of all four horizontal flexures. If any are bent, broken, or binding it might effect gauge	Use the smallest test weight of the D111-500TE set to ensure the **Precip** display shows a change in current values. If it does not change,

	calibration. Horizontal flexures which are 'v-shaped' must be replaced. The upper-rear flexure (ASN part # "**D111-SP112**") is most susceptible to bending.	after 15 minutes, the flexure should be repaired. Under no circumstances should any flexures, except the upper-rear flexure be replaced at the observer site.
4. Collection Bucket	The collection bucket is to be emptied whenever the keypad **Precip** display reads in excess of **15.00 inches**.	First, before you start any action on bucket, press a button on **Precip Recorder**, to **wake-up** the display (i.e., creates a record in data file).
A. Emptying and charging collection bucket	Collection bucket is charged for warm weather operation by adding approximately one-half-quart of Oil, (ASN part #"014-O-15"); to retard evaporation.	Remove any foreign material in the collection bucket and clean. Journal to, ***FPR Log Sheet,*** 'Cleaned Bucket,' before charging collection bucket. Journal to, ***FPR Log Sheet,*** 'Bucket completely emptied'; or journal, 'Partially drained bucket'. And/or 'Added oil to bucket'. Finally, when done with all bucket actions, press any button on **Precip Recorder**, to **wake-up** the display. (i.e., creates record in data file).
B. Charging Collection Bucket – Cold Weather Operation	When collection bucket is emptied and charged for cold weather operation, add two quarts of food-grade propylene glycol (FGPG), (ASN part # "D111-153") then add one half-quart of oil.	For colder climate sites where temperatures drop to 15F and below zero, more FGPG needs to be added when collected rain and melted snow dilutes the FGPG concentration. Refer to the table in Section 4.2, for the number of quarts to add as the bucket level rises. Journal to, ***FPR Log Sheet,*** 'Added FGPG to bucket', and 'Added oil to bucket.' Journal to, ***FPR Log Sheet,***

5. Funnel	During the period of year when snow or freezing weather is expected, remove funnel from the conical upper housing.	'Removed Funnel'. Reinstall funnel after cold weather season ends. Reminder: All the ***FPR Log Sheet*** entries should be entered to CSSA Site Inspection Report.

Table 4.1: Semi-Annual Maintenance (Refer to EHB-10; Section 4.2, April 1976)

4.2 Winter Operation:

Minimize the risk of damage to the collection bucket from freezing of the bucket fluids. When water freezes it expands and presses the bucket walls and can crack the floor of the bucket.

a. At the start of winter, remove funnel from the collector. Store it in base of gauge.

b. Empty the collection bucket with the drain tube into a multi-gallon container. If there is any doubt about your ability to drain and then remove the bucket contact your NWSREP for instructions. **Caution:** A full bucket can weigh 40 pounds.

c. Return the empty bucket to its regular position to ready the bucket for its charge of Food Grade Propylene Glycol (FGPG). Following the FGPG you will add one quart of oil. Do not use commercial anti-freeze or add water.

d. Initial charge: Into the empty bucket, pour an amount of FGPG as specified by one of the three temperature categories listed in this table. Choose the category that offers protection against the coldest condition possible for the site. Make an initial charge of 1.0 quart of FGPG if the coldest the site could get is 15ºF.

Coldest Temperature	Initial charge and subsequent charges of FGPG. Each time the Zeno Display rises and reaches: 3.5 inches, 7.0 inches, 10.5 inches, and 14.0 inches, then add this amount of FGPG.	To Maintain this Concentration
+ 15º F	1.0 quart	25%
0º F	1.5 quarts	35%
- 30º F	2.0 quarts	50%

Fig 4.2 For Increasing Display Levels – Add More FGPG to Bucket

Note: An initial 2 quarts charge of propylene glycol produces a height of just one inch in bucket.

e. Subsequent Charges: When the Zeno Display shows the level has reached 3.5 inches add the specified amount of FGPG; for example the coldest category sites

(- 30ºF) require 2 quarts be added. Always add the same amount as the initial charge. If you had not serviced the bucket at either 3.5 inches, or 7.0 inches, or 10.5 inches and now notice the bucket holds 11 inches, and you are in the coldest category, then pour six quarts of propylene glycol to maintain the 50% concentration. To prevent the bucket contents from ever freezing add FGPG per the schedule in Fig 4.2, each time the level reaches 3.5, 7.0, 10.5, and 14.0 inches.

f. Install one quart of oil after the initial charge of FGPG. For sites more prone to evaporation, these include tropical sites and sites with windy conditions with low relative humidity; ensure a film of oil is visible after draining water/FGPG mixture. Use NWS supplies, only.

g. Make no adjustments to the gauge after FGPG and/or oil has been added.

h. Document the date and hour each time the bucket was charged with FGPG and/or oil. Remember to journal this action into the FPR Log Sheet (Appendix I).

4.3 Observer Delegated Activities:

Some offices have an agreement with Observers to assist in basic works of maintenance on the FPR. Consider asking your Observers if they could conduct the following activities:

a. Draining and recharging the collection bucket

b. Installing/removing funnel

c. Cleaning the solar panel

d. Conducting a power-on reset of FPR-D data logger

e. Resetting the date/time at FPR-D keypad

Train Observers in these actions and provide them the necessary supplies and forms. Inform the Observers that all check-ups and bucket discharges are conducted only in dry weather.

4.4 Review CSSA Station Inspection Report:

4.4.1 Rain Gauge Supplies: These quantities will vary as a function of the amount of precipitation a site receives in a given season. Phone your Observer and ask him if his gauge requires a certain type of servicing this visit. For example:

a. One quart of Oil might be consumed each year.

b. Three 2-quart containers of Food Grade Propylene Glycol might be consumed each year.

c. One multi-gallon sealable plastic container available to discard bucket fluids.

4.4.2 Prepare for Cold Season: Partially drain the FPR bucket (journal to *FPR Log Sheet*) so as to retain the oil layer in the bucket. Remember to recharge with two quarts of Food Grade Propylene Glycol (journal to *FPR Log Sheet*). Then if necessary, add oil (journal to *FPR Log Sheet*). You never need more than ¼ inch surface oil layer in the Fischer Porter's fourteen-inch diameter bucket. Add one half quart of oil when completely replacing the charge (journal to *FPR Log Sheet*).

Remove funnel: Remove the cone-shaped hood, tip it upside down and set it down. Rotate the funnel so its slots allow it to slide free from the three pins located on the base of the hood assembly. Check the box marked: 'Removed Funnel' in the *FPR Log Sheet* (Appendix I).

Further Considerations: Snowfall and high-rate rainfall events can lead to a layer of snow, ice, or fresh rainwater that rests on top of the oil layer. For these events stir the bucket with a mixing stick to bring the oil layer to the top. This will prevent freezing and possible equipment damage.

4.4.3 Prepare for Warm Season: Remove the cone-shaped hood and inspect the contents of the bucket with a mixing stick (i.e., paint stirrer). Remove and properly dispose of any leaves or debris that might have collected when the funnel was removed at start of winter season. Then with the stick, ensure there is still a ¼ inch film of oil on the surface to inhibit evaporation. If the Sutron's **Precip Recorder** value exceeds **15.00 inches** on the day you are installing the funnel then perform a partial emptying of the bucket by keeping the oil from running out the drain tube. Add FGPG if local conditions require.

Install the funnel: Remove the conical housing, turn it upside down, and fasten the funnel by rotating its three slots onto the three pins of the cone shaped hood. Return this hood assembly to the gauge (Fig 3.1). Check the box 'Installed Funnel' in the *FPR Log Sheet*, (Appendix I).

4.4.4 Rain Bucket Draining: The bucket's capacity is about 20 inches of precipitation or 4.9 gallons. Advise the Observer to daily monitor the Sutron's **Precip Recorder** readings and to phone you when it surpasses **15.00 inches**, at that time the collection bucket needs to be drained. Always schedule the bucket draining to be done when weather is dry, when no precipitation is forecast for either the day before, or the day of, this important maintenance.

If your Observer has agreed to conduct the bucket draining or emptying, then remind him/her to always **make note of the Level in the bucket to the FPR Log Sheet.** Also, have him/her write down the Day/Hour/Minute the Bucket activity was started and completed, and write down the new Level in the bucket.

Note: Remind your Observer to include the ***FPR Log Sheet*** into the same envelope as the SD Memory Card. You should journal your Observer's maintenance actions to your CSSA site inspection report for continuity of records.

4.4.5 Visual Check List: Ensure there are no obstructions that block the opening of the collection bucket. Ensure that all access doors and their hinges, latches, and locks, are working properly. After clearing obstructions, use a damp cloth or paper towel with gloves to wipe clean exterior surfaces.

a. F&P Hood, Funnel and Bucket: each free and clear of debris.

b. Data Logger Access Door, hinges, latch, and lock is functional.

c. Solar Panel, fastened tight, free and clear of debris. Ensure the cable and cable plugs are properly positioned and appear in good condition. Ensure the solar panel is not covered by dust, bird droppings, or obstructed by any objects.

Note: Always remind the Observer, he never needs to calibrate the FPR sensor. However, if there is a problem reported to the NWSREP, and the NWSREP has delegated maintenance responsibility, then the Observer can reset the load sensor calibration.

4.4.6 Multiple Actions on Gauge: When you perform multiple actions, before taking the first action always press the Up-Arrow button (Display On). Check Appendix E, of this handbook, for the list of required journal entries for the ***FPR Maintenance Log Sheet***.

All the entries you make to the ***FPR Maintenance Log Sheet*** shall be entered into the CSSA Site Inspection Report. For this reason you need to note the Date and Time (perhaps to the minute) to produce an accurate Inspection Report.

Here are ten common entries to the ***FPR Maintenance Log Sheet*** during a Semi-annual visit:

Display Wake-up (Start Maintenance)
Precip Level Before
Semi-annual Visit
Partially emptied bucket
Calibration Check – No Changes
Added antifreeze to bucket
Removed Funnel for Winter
Cleaned Solar Panel
Precip Level After
Display Wake-up (End Maintenance)

Note: You are required to **wake-up** the Precip Recorder twice: first, before your activity, and again after you have completed all maintenance. This will ensure the precipitation data file has a marker (i.e., Display On) for NCDC algorithm to convey rain gauge levels were altered by maintenance. Otherwise you introduce ambiguity to the data file that might be missed by NCDC quality control and degrade the official precipitation record.

4.5 Display Screen Will Not Illuminate:

It is normal for the display to completely dim-out after approximately two minutes of inactivity. We refer to the display as being 'asleep'.

Wake-up the display by simply pressing any of the six buttons on the Precip Recorder and the screen will illuminate. (photo, right).

Fig 4.3 Normal Appearance Upon Wake-up

If it the display fails to respond use your multi-meter and measure the voltage at the battery terminals. If it is lower than 9.6V the unit will not turn on. You will need to replace the battery with a charged one to continue troubleshooting. See the procedures described in the FPR Assembly Procedures, Section 19, 'Check Solar Charging.' With a fresh battery installed, review the most recent data and examine the logged Battery Voltage, it is recorded once per day at 23:59:59, just before the 15-minute precipitation record ending Midnight, 00:00:00. Look to see if it slowly dropped over days (an indication of no solar charging), or if it dropped suddenly (and indication of a fault that drained the battery).

If the Sutron Display fails to respond, there are five fault conditions that could be the cause:

a. Faulty battery,

b. Faulty battery cable or connections,

c. Faulty solar panel,

d. Faulty Precip Recorder Assembly.

Use your multi-meter at the battery terminals, all connections, terminal block, and cable wires to rule out a faulty battery and solar panel. In this Sutron unit, there is no fuse or regulator – the solar panel is directly connected to the battery at the terminal block. Refer to the next section (Sect 4.6) for testing of solar panel output.

4.6 Battery Voltage Too Low – Repeated:

Always carry a spare fully charged battery with you when visiting an FPR-D (Sutron) site. It is not possible to trouble shoot the system if the existing battery is dead or low on charge.

The battery of the FPR weighs four pounds, and is a 12V, sealed lead-acid, rated 7 Amp-Hours. Battery voltage is a problem when it runs below 11.5V. Repeated system shutdown due to low battery voltage is caused by either

a. No sunlight on panel:
   i. Panel fully or partially shaded by obstructions

ii. Weak or low sun angle (i.e., Alaska in winter)
iii. Panel dirty

b. System fault, load failure:
i. System shorted, or high load, draining battery too fast.

c. Charging system failure:
i. Solar Panel, or connection failure (See illustrations in Sec 19, of the *FPR-D Assembly Procedures*, for which terminal in the junction box, the multi meter probes need to touch.)

d. Battery failure:
i. Battery cell shorted
ii. Battery worn out
iii. Battery destroyed by repeated deep discharge cycles

All the above must be checked when you see repeated shutdowns in the data, or have a dead system.

To troubleshoot a failing system:

4.6.1 First check the battery voltage. Disconnect positive lead from battery. Measure voltage across battery.

a. If below 12.0V, swap out battery with fully charged spare and proceed with the System Fault Check. Do not reconnect positive lead to battery, yet.

b. If about 12.0V, proceed to System Fault Check, do not reconnect positive lead to battery, yet.

4.6.2 Check System Fault, Load failure – With solar panel in <u>full</u> sun, oriented to sun, and clean:

a. Solar Panel Wake Up – wake up logger to see if it will run on solar panel alone.
i. Logger wakes up – Good. Proceed to Battery wake up.
ii. Logger does not wake up – proceed to Check Charging System (Sec 4.6.3)

b. Battery Wake Up – Disconnect solar panel, connect positive lead to fully charged battery.
i. Logger wakes up – Good. System will run on both battery and solar panel confirmed. Proceed to Check Charging System (Sec 4.6.3)
ii. Logger does not wake up
1. Check connections at terminal block.
2. If battery voltage is getting from battery, through terminal block and to internal board, then logger logger is bad. Replace Sutron logger assembly.

4.6.3 Check Charging System - With solar panel in FULL sun, oriented to sun, and clean, disconnect positive lead from battery, measure voltage on battery and on positive lead.

Voltage (from the solar panel) on disconnected positive lead must be higher than Battery voltage by 1.2Vmin, in order to charge battery.

a. **Positive lead voltage -** Must be 13.6V or higher and could be > 26V.
   i. If 13.6 to 27.0V, solar panel voltage is okay. Go to Load Test (4.6.3.b)
   ii. If not 13.6 to 27.0V, troubleshoot the connections to the solar panel (4.6.3.c).

b. **Load test** – Connect a 100-150 ohm 10watt resistor across the positive lead and negative lead. Measure the voltage across the resistor.
   i. If still above 13.6V, the solar panel and connections are working fine, as the panel is putting out enough voltage and current to charge the battery.
   ii. If below 13.6V, find what is stopping the current from solar panel / wiring / connectors / path. Corrosion in connectors is a typical cause. Go to Troubleshoot charging system (4.6.3.c).

c. **Troubleshoot charging system** – Leave battery disconnected, disconnect solar panel first connection, and repeat tests 4.6.3.a, and 4.6.3.b (above), at that point.
   i. If both tests are good at solar panel, reconnect solar panel connector and move to next connection, repeat tests at each successive accessible point in charging path until you find blockage. Repair the fault.
   ii. Done when tests (Items 4.6.3.a., and 4.6.3.b, above) pass at the battery leads.

4.6.4 Reconnect everything. At this point the system should be working fine on a good battery /power system.

4.6.5 Check Old Battery – This can NOT be done in the field.

a. Take the old battery back to your WFO workshop charging station

b. Connect it to an AC charger that is appropriate for the size of the battery.

c. Leave it on for three (3) days.

d. Disconnect from the charger.

e. Wait 12 hours for it to cool to room temperature. Have nothing connected to the battery.

f. Measure battery voltage. Should be fully charged.
   i. 12.6 or above, battery is good. Load test it if you have a 1 amp load tester to confirm (do NOT use an automotive load tester!!) Put battery in your truck as a spare.
   ii. 11.2V and below. Battery is bad, has at least one cell dead. Discard/recycle battery per NWS guidelines.

Caution: Be familiar with the safety precautions when you are charging a lead-acid battery. Access https://www.ops1.nws.noaa.gov/Secure/SAFETY/Safety_manual.htm and click on chapter 15, to read, NWSM 50-1115, Procedure 15.3, *Battery Charging and Storage Operations*.

Background Discussion: If any part of the solar panel is shaded, the panel may shutdown and not deliver any real power to the application. The solar panels we use are made up from multiple solar cells connected in series to give the voltage needed and then in parallel to give the power needed. When a solar cell is shaded it becomes a high resistance to any current impressed upon it. Thus, if any individual cell of a series string is shaded, that cell will block the current generated by the other cells in that string, effectively shutting off the output. Mount the solar panels where they are in full sun, not in the fringe area under trees or behind guy wires or tower supports. Also, problems have been reported where construction or farming resulted in a lot of dust on the panel (charging always improved after a good rain!).

So, train the Observer to inspect and clean the solar panel on an 'as needed basis'. The FPR-D is supplied with a 15 foot connecting cable. The cable can be extended as far as you need, provided you use good outdoor rated wire of the same size or larger, and make waterproof connections above ground. If you need to trench the cable, use direct burial rated cable.

REF: For more information access the Lessons Learned web site, and read the third article; http://www.nws.noaa.gov/ops2/Surface/documents/A_PDFLessonFILE.pdf . "Battery Not Charging … Solar Panel All Okay?"

4.7 FPR Site Visitation – Restorative Maintenance:

When you visit a station to perform FPR restorative maintenance consider conducting preventative maintenance including a check on sensor calibration, and draining the collection bucket if needed. Follow the procedures given in Section 4 for practical examples of tasks you perform while at the site.

Reminder: Whenever you open the rain gauge door, always wake-up the display – and just after you complete all your maintenance, also wake-up the display! Waking up the display generates a permanent flag in the precipitation file. Then NCDC algorithms can recognize the flag and exclude the ambiguous data that results when you replaced FPR parts, changed settings in the FPR rain gauge, or installed updates to the data logger software. Always journal these restorative activities to your ***F&P Maintenance Log Sheet***, see App I, of this manual.

4.8 Reference Table for User Selectable Menus. The 'Home Menu' is shaded in top-left.

Primary Menus		Second Level		Third Level	Details
Precip and Time		- none -		- none -	- none -
Battery Voltage		- none -		- none -	- none -
Logged Data	►	Precip	►	Fifteen-minute data.	15-min records
		Logged Events	►	Ie., 'Display on', etc.	Various records
		All Logged Data	►	Data and events.	Both types
Station Setup	►	Measurement Setup	►	11 parameters	Numerous
		Temperature Setup	►	6 parameters	Numerous
		Other Settings	►	Sets the password	Password entry point
Diagnostic	►	Two Point Calibration	►	Instructions (3)	Several
		Precip Details	►	Parameters (7)	Numerous
		Temp Details	►	Parameters (3)	Several
		Software Version		- none -	- none -
Station Name & Time		- none -		- none -	- none -

Fig 4.4 Menu Structure for the Sutron Display

4.9 Confirm Measurement Setup:

Confirm these settings by accessing the 'Measurement Setup' menus (Table 4.2) and pressing the Right-Arrow button, then scroll down with the Down-Arrow button. If Automeasure Interval, Automeasure Time, Averaging Time, or Sampling Interval, do not match these values below – then enter the proper numerical values with the SET command, and press the SET button again to save them.

The Precip Recorder's display window should give these responses as you scroll down the 'Measurement Setup' menu.

Table 4.3 (below) illustrates the factory installed default settings for the measurement of precipitation. Access these details by calling up the 'Station Setup' it is the fourth menu of the six primary menus listed in Table 4.2 (above).

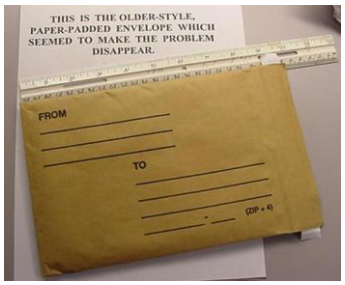
Realize how the '**Station Setup**' menu has three sub-menus we consider as the 'second level.'

Ensure the Observer's system gives you 'Details' that are consistent with the values contained in the 'Required Details' column of this Figure 4.5 (below).

Primary Menus	Second Level	Third Level	Required Details
Station Setup ►	Measurement Setup	Automeasure Interval	**00:15:00**
		Automeasure Time	**00:00:00**
		Averaging Time	**2.000 sec**
		Sampling Interval	**0 ms**
		Slope	**-2.4525017** example
		Offset	**-3.5502753** example
		Precip Right Digits	**2**
		Log Precip Details	**Disabled**
		Log Every Sample	**Disabled**
		Sensor Serial Number	**8064177** example
		Sensor Warmup	**8000 ms**
	Temperature Setup	Parameters (7)	Air Temp: **Disabled**
	Other Settings	Password	{ **FPRSUTRON** }

Fig 4.5 Measurement Setup for Standard Operating Procedure

4.10 Protecting the Memory Card:



The Jiffy No. 0 (zero) padded mailing envelope (photo, right) is the appropriate package for exchanging the Memory Card between the Observers and the NWSREP. This is the standard, ten inch square, darker color envelope. Newer, bubble-pack square envelopes have thinner paper and tear more easily and can result in the Memory Card being lost in the mail.

Fig 4.6 Padded Envelope for Memory Card

Certain United States Postal Service (USPS) centers might use electro-magnetic scanning devices to screen materials coming through the mail. To avoid potential damage to the Memory Card, you may write: **"Sensitive Magnetic Media, Handle Manually**." on the front of the Jiffy No. 0 mailing envelope.

CHAPTER 5 – SENSOR CALIBRATION POLICY

5.1 Rain Gauge Accuracy:

At least once per year, and preferably at the time of the semi-annual site visitation, conduct a Calibration Check-Up on the FPR rain gauge. This requires the use of the large brass test weights. You may use one, two, or three test weights, so long as each is the 4,111 gram size. Each is equivalent to five inches of rain water.

If the rain gauge tests within the standard calibration range (Figure 5.1) you will *not* have to conduct a complete calibration reset of the sensor. If it fails this test, go to Section 5.3, and reset the calibration..

Follow the steps in 'Sensor Check-Up Procedures,' given in section 5.2, below. If the keypad display returns you **Precip:** values that fall into the acceptable range as called for by Table 5.1 (below), then you will *not* need to re-calibrate the load cell sensor. If the display gives values outside the standards given in Table 5.1, then calibrate the sensor through the Zeno data logger's Test Menu. The full calibration instructions are also given in Appendix D, of this manual.

Remember, whenever you conduct the Semi-Annual maintenance, you should check the calibration. If the Calibration Check-up fails to come into tolerance of ±0.25 inch of 15.00 inches, you need to enter the Precip Recorder menu, 'Calibration' and reset the calibration with an empty bucket. Otherwise, you should not perform a calibration reset.

5.2 Calibration Check-Up Procedure:

Always take the un-weighted measurement first, and then place the weight(s) upon the carpenter's level to produce the weighted **Precip:** value.

a. **Wake-up** the display right before you take the following steps.

b Place just a carpenter's level flat-side, across the top of the collection bucket.

c. Wait ten seconds and take a reading of the **Precip:** value and write it down to a piece paper.

d. Then place one, two, or three large brass weights (4111g each) upon the carpenter's level.

e. Wait ten seconds, now take a new reading of **Precip:** and write down this weighted **Precip:** value.

f. Subtract the first reading written in Step "c," from the second reading taken in Step "e". Write down this difference in hundredths of an inch.

g. If this difference comes into the acceptable range (Fig 5.1), then calibration is

acceptable and no further action is necessary. Journal the words, 'Cal Check – Good Readings,' into the ***Maintenance Log Sheet***. However, if the difference falls outside of the range, you must Reset the calibration as described in the next section.

h. Remove the weight(s) from the carpenter's level, and then remove the carpenter's level.

i. **Wake-up** the display upon completing the Check-Up to generate a second flag to mark the end of the disrupted portion of data. This is an important step!

Calibration Check Table		
CAL TEST OPTIONS	**WEIGHTS REQUIRED**	**ACCEPTABLE RANGE**
5.0" equivalent rain	1 large weight	4.75 " thru 5.24"
10.0" equivalent rain	2 large weights	9.75" thru 10.24"
15.0" equivalent rain	3 large weights	14.75" thru 15.24"

Fig 5.1 Acceptable Tolerances for FPR Accuracy – No Reset Required

5.3 Reset Calibration of FPR System:

When the **Precip:** reading fails to come within range of ±0.25 inches for any of the test weights described in the previous section, then take the following steps to perform a complete Reset of calibration. The FPR System is calibrated completely through the Precip Monitor in the steps below.

There are just two calibration parameters, Slope and Offset, and their values are dependent on the bucket you use. If you have installed a different bucket, then you always need to perform a calibration Reset, as soon as the bucket is seated to its post.

Note: You will need to drain and dry the bucket to perform this Reset.

a. **Wake-up** the display before you take the next steps.

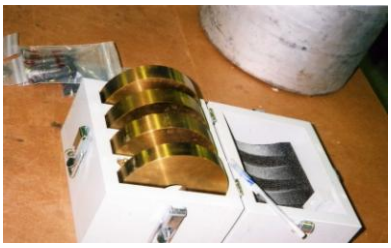
b. From the Home Menu press the Down-arrow four times until you reach the 'Diagnostic' menu and then press the Right-arrow. The display will show, "**Two Point Cal, Press SET to Cal.**"

c. Press the SET button and the sensor will prompt, '**Put Empty Dry Bucket, Press SET to proceed**."

d. Place an empty dry bucket on the sensor and press SET. The sensor will display

the message, '**Calculating, Please Wait'** while it takes a measurement. The sensor will use the current settings for making the measurement.

e. When the sensor completes its measurement, the sensor will prompt, "**Put 15" of Weight, Press SET to Proceed."**



f. Load the bucket with 15 inch weight set. These are the <u>three</u> brass weights marked "4111G." Then press the SET button.

g. The sensor will ask "**Enter Weight in Inches**" and prompt an entry of a number. Enter the numerals, 15, with Up- and Down-arrow buttons.

h. This number corresponds to the weight placed in bucket. The weight will be expressed in inches of water. The sensor will display, "**Calculating, Please Wait**" while it takes a measurements. The sensor will then use the two measurements to compute a calibrated slope and offset.

i. The sensor displays the computed Slope and Offset with the prompt "**Press SET to accept.**"

j. Press the SET button. Values of Slope and Offset may vary among sites.

The Offset equates to the weight of the bucket/weighing mechanism in inches of water.

k. If the displayed values of Slope <u>and</u> Offset are in their respective ranges, then press the SET button.

If not, press CANCEL/OFF button, and investigate the cause of the problem.

l. After pressing SET the sensor displays, '**Calculating, Please Wait**" while it updates the Slope and Offset and begins a new measurement.

m. The sensor displays the last measurement using the new Slope and Offset. The values of the new Slope and Offset are automatically stored into the data logger. Every data file generated upon download, reports the values of Slope and Offset in the top-most line.

n. Once completed, journal the words "Calibration Check – Reset Performed" to the ***FPR Maintenance Log Sheet.***

o. **Wake-up** the display upon completing the Calibration Reset to generate a second flag to mark the end of the disrupted portion of data. This is an important step!

5.4 Retrieve the 'Slope' and 'Offset' Values:

From the Home Menu, scroll down to the 'Station Setup' menu, and press Right-arrow button to call up the 'Measurement Setup' submenu. Press Right-arrow again. Scroll down to the fourth and fifth parameters, to access the values for 'Slope' and 'Offset.'

Write down the 'Slope' and 'Offset' for ready reference for when you are conducting the calibration **check** at the Observer's site. If the check fails to show a measurements within ±0.25inch of 15.00 inches you need to understand why and by how much Slope and Offset changed.

5.5 Site Inspection Report (CSSA):

Open up the edit panel of the CSSA Site Inspection Reports and obtain the ***FPR Maintenance Log Sheet*** with your notes of 'Slope' and 'Offset' values.

Access the first page, look for the rows of check-boxes under Equipment – Maintenance Performed; and located third row titled, "F&P." Mouse-click on the box "Calibrated," if you performed any type of Cal Check Procedure. Then, on the same page, in the Remarks, free-text box, describe the outcome of the Cal-Check Procedure. Write either of these two outcomes:

- Cal Check – Good Readings

- Cal Check – Reset Performed, Slope is now –N.nnnn (i.e., -2.4536); and the Offset is now –N.nnnn (i.e., -3.8163).

CHAPTER 6 – METADATA REQUIREMENTS

6.1 Metadata Requirements:

There are three categories of metadata for the FPR-D:

- Station Equipment Data (i.e., Form B-44) – Once upon implementation and any retrofits.
- Maintenance Data (i.e., FPR Log Sheet and/or Site Inspection Report) - Several times per year (i.e., Emptied Bucket)
- Data Logger events (CSV file) – Several times per month (i.e., Display On, Display Off)

The NWSREP shall produce metadata to account for these FPR-D actions:

- Initial installation of FPR-D system accounted by Form B-44.
- Seasonal Maintenance (draining) accounted by CSSA Inspection Report.
- Routine check of calibration accounted by CSSA Inspection Report.
- Restorative Maintenance accounted by CSSA Inspection Report and FPR Logbook.
- Equipment Modification Notes actions accounted by Form B-44 and Inspection Report.

The NWSREP shall store FPR-D metadata in these locations:

- CSSA Station Information Report (SIR) also known as Form B-44 gets saved to database.
- CSSA Site Inspection Report saved locally at WFO - yet Regional HQ may have access. (if necessary, Form B-23, Station Inspection, is the backup printed form.)
- *FPR Logbook*, electronic file (unrelated to CSSA), holds just FPR information, in a condensed format – some of which overlaps information already stored in the CSSA.

Secondary metadata that is tracked in an *FPR Logbook*, is saved and updated because it is useful for OPL/HMTs to quickly track which sites (i.e., up to 42 per WFO) are in need of a site visit.

6.2 Metadata Accuracy for FPR-D:

The NWSREP conducts semi-annual visits to the Fischer-Porter Rebuild (FPR) sites and checks the calibration of the weighing sensor. If the calibration needs to be reset, then follow the instructions in Section 5.3, of this manual. Every data file produced by the logger will contain the Slope and Offset values. Therefore, calibration data is not saved to the B-44.

If the weighing sensor (load cell) is replaced from failure or due to a system-wide equipment modification, this will change the values of required metadata. The NWSREP is responsible for updating the metadata as needed following restorative maintenance or mod-note implementation.

The Cooperative Station Service Accountability (CSSA) system is the single most authoritative source of COOP station information. The information it contains describes site location, exposure, dates of changed equipment, and method of data reporting. These elements of information constitute ‘metadata’ that are then used by the NCDC to create a permanent archive of station information. The accuracy of each of these parameters should be checked every six months.

When an FPR-D recording gauge is implemented, it is critical to update the B-44 Station Information Report's '***Remarks***' field with the following text: "UPDATED EQUIPMENT, CHANGED F&P TO FPR-D WITH SD MEMORY CARD."

Two pieces of information are saved to the WS Form B-44: the Serial Number of the weighing sensor (i.e., load cell) and Equipment Modifications (i.e., network-wide enhancements administered by NWS HQ). Each time the load cell is replaced or a Mod Note is implemented, the NWSREP updates the B-44 rendition and submits it to CSSA workflow.

Policy on how metadata shall be accounted in CSSA (WS Form B-44) is found in the ***Cooperative Station Service Accountability (CSSA) Manual*** (NWSM 10-1313). The NWSM 10-1313 is undergoing a biennial revision and the new version will be available in 2011 on the NDS web site: http://www.nws.noaa.gov/directives/sym/pd01013013curr.pdf . Part of the manual that deals with equipment description (Appendix G) will be considered a living document and Appendix G, *CSSA Lookup Tables*, will be revised by the Observing Services Division (W/OS7) at NWS Headquarters, more often than every two years.

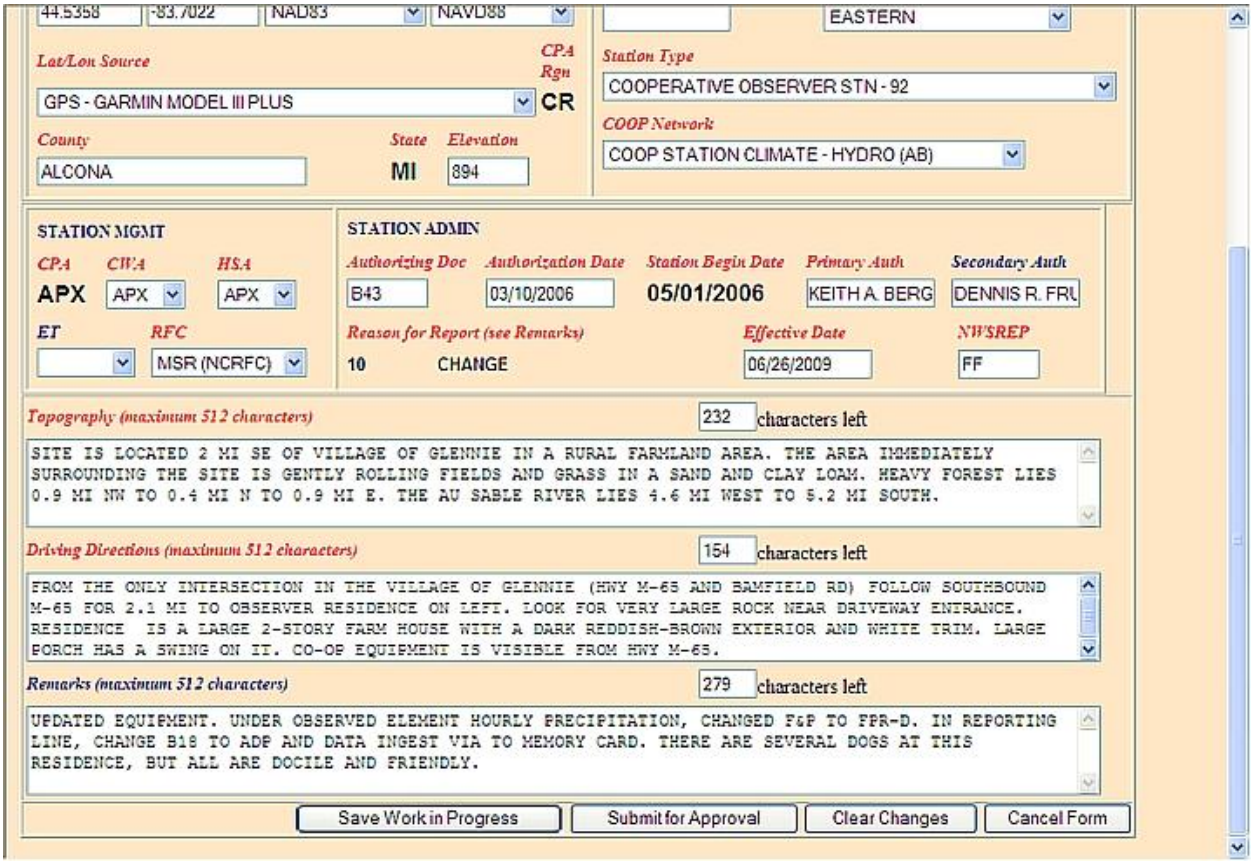


Fig 6.1 B-44 Remarks Section for Installation

6.3 Detailed Metadata Required for Form B-44:

The first page of the Station Information Report (Form B-44), gives the reason why a new Rendition of B-44 was necessary. There are several codes for "Reason for Report."

For initial FPR-D Installation, select " 10 " which signifies "CHANGE."

Enter a short description to the Remarks box (free text up to 512 characters) to explain in plain English the change you have made.

For example: "**Updated equipment, replaced F&P with FPR-D. Requires SD Memory Card to download data.**" See Figure 6.2, below.

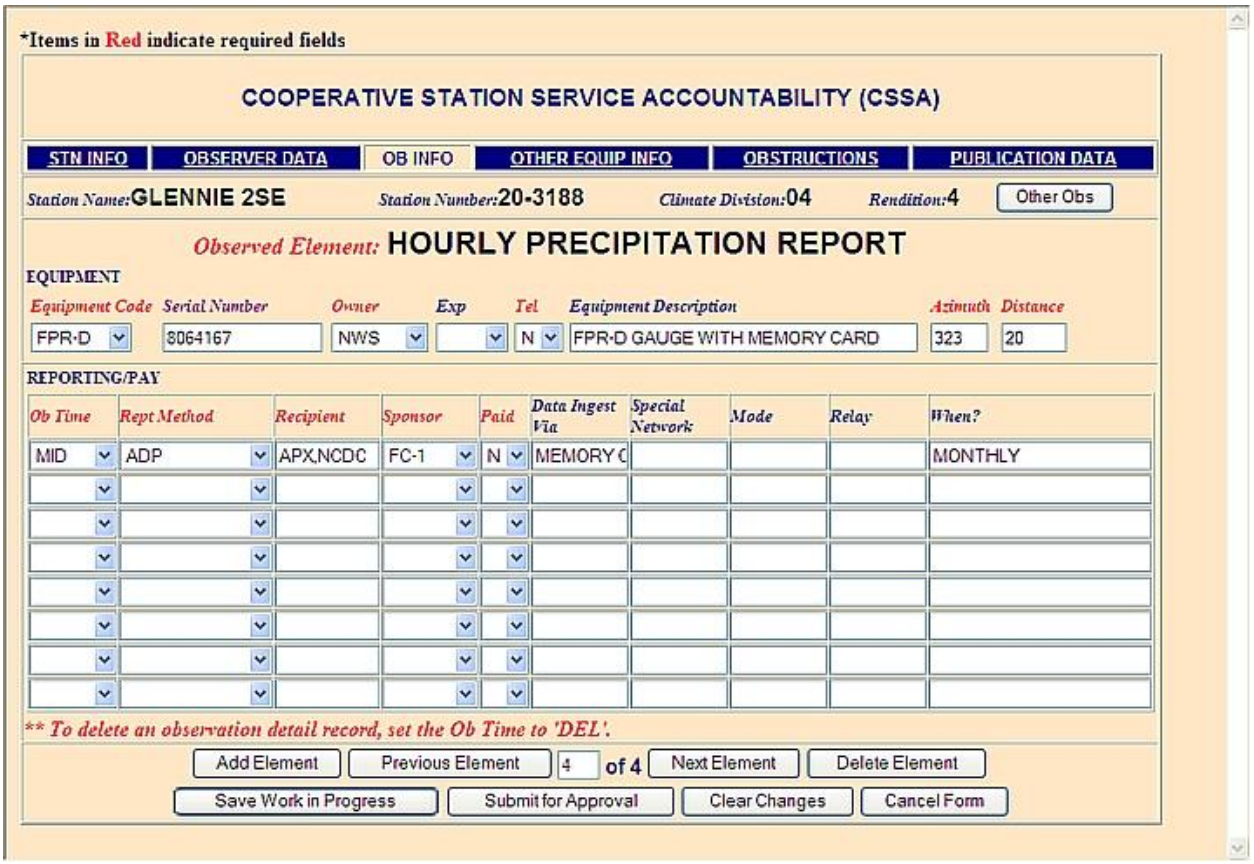


Fig 6.2 Detailed Entries for WS Form B-44 (Hourly Precipitation Report)

Make the following changes in the Station Information Report (Form B-44):

a. ***Equipment Code***, select '**FPR-D'** from the drop-down menu. This replaces F&P.

b. ***Serial Number*** (see, above example) enter the Load Cell's serial number (i.e., 8064167). The serial number appears on the end of the Load Cell Beam. Look for a small white UPC bar code on a white decal on the cable-end of the beam.

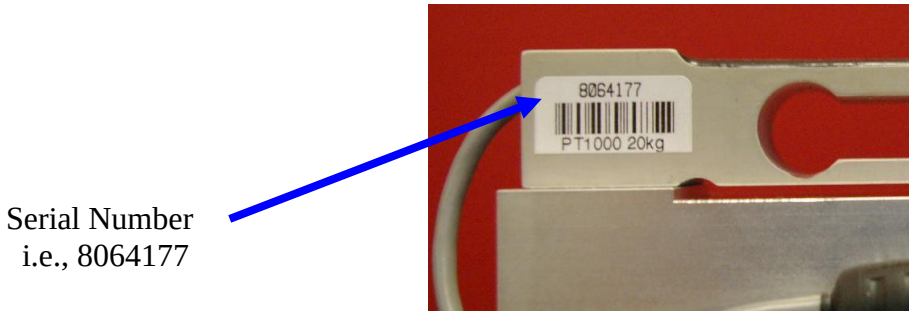


Fig 6.3 Load Cell Serial Number

c. ***Owner***, ensure the **NWS** appears in this category.

d. ***Equipment Description***, enter text "**FPR-D GAUGE WITH MEMORY CARD."** **Note:** Offset and Slope values are saved in each CSV data file.

e. ***Ob Time***, keep 'MID' this refers to midnight, retain 'MID.

f. ***Report Method***, enter '**ADP**' this replaces B18.

g. ***Recipient***, keep 'Your WFO, NCDC' no changes.

h. ***Sponsor***, keep the same. If there is none use "**FC-1**" as the default. For a list of sponsor codes, see p. G-12 in the *CSSA Manual*, NDS 10-1313, and p. C-61, in Section 2.4.3.13, Sponsor.

i. ***Data Ingest Via***, enter text "**MEMORY CARD**" this replaces a blank field.

j. ***Special Network***, default is a 'blank' field.

k. ***Mode***, default is a 'blank' field.

l. ***Relay***, default is a 'blank' field.

m. ***When?*** Keep the word "MONTHLY".

References: Access: http://www.nws.noaa.gov/directives/010/010.htm NWSM 10-1313, ***CSSA Manual***, Sec 2.4.3, Ob Info (p. C-48) and notice there is a left-most drop-down window, and select, **FPR-D.** Also, see the revised instructions in the NDS 10-1313, ***CSSA Manual***, Sec 2.4.3.7, Equipment Description, (p. C-54).

6.4 CSSA Site Inspection Report: When you have completed site visitation and are back in the office, access your CSSA and call up the CSSA Station Name/CSSA Station Number to generate a new Site Inspection Report.

Account for the following in the 'Inspection Data.' Refer to Figure 6.4 (next page) for a guide:

a.	**Inspector (Your Title):**	Network Program Manager (from drop-down menu)
b.	**Inspection Type:**	Annual (if this is initial FPR installation)
c.	**Inspection Date:**	10/17/2010 (free text - use this mm/dd/yyyy format)
d.	**Staff Hours:**	6 (free text)
e.	**Miles Driven:**	183 (free text)
f.	**Per Diem:**	No/Yes (drop-down selection)
g.	**Trip Number:**	2WT0B3804&05 (free text) WFO policy may apply
h.	**Supplies Cost:**	75.50 (free text)
i.	**Trip Cost:**	113.75 (free text)

Next section in Inspection Report is titled, '***Maintenance Performed***.'

So, create accurate metadata with the proper selections of the mouse-clicked check-boxes.

Note: Multiple check-boxes can be marked for the given maintenance.

If this visit is the semi-annual inspection without major modifications or equipment or major parts changes, then click, '**Routine Maintenance**.'

If the bucket was partially drained, or emptied, or charged with FGPG or oil added, click on the check box, '**Routine Maintenance**.'

When a Calibration Check is performed – as is required at least once per year - (See Appendix D, in this *FPR Operations Manual*), and FPR fails to meet standard, a Calibration Reset is made.

- If a Calibration Reset was not necessary, click on the check-box '**Routine Maintenance**.'
- If a Calibration Reset was necessary, and completed, then click on the check-box, '**Calibrated.'**

If the OPL/DAPM removed a bad part from FPR and replaced it, click on check-box '**Replaced.**'

If the OPL/DAPM restored the FPR system to full operation, click on the check-box '**Repaired.**'

If a configuration change (i.e., Modification Note) was made, click on the check-box '**Modified.**'

If the FPR shell (hood and/or lower housing) was painted, click on the check box, '**Painted**.'

If the FPR rain gauge was removed from this COOP site, click on the check box, '**Removed**.'

If an FPR rain gauge was installed to this COOP site, when there had never been and F&P installed to this COOP site, then click on the check box, '**Installed**.'

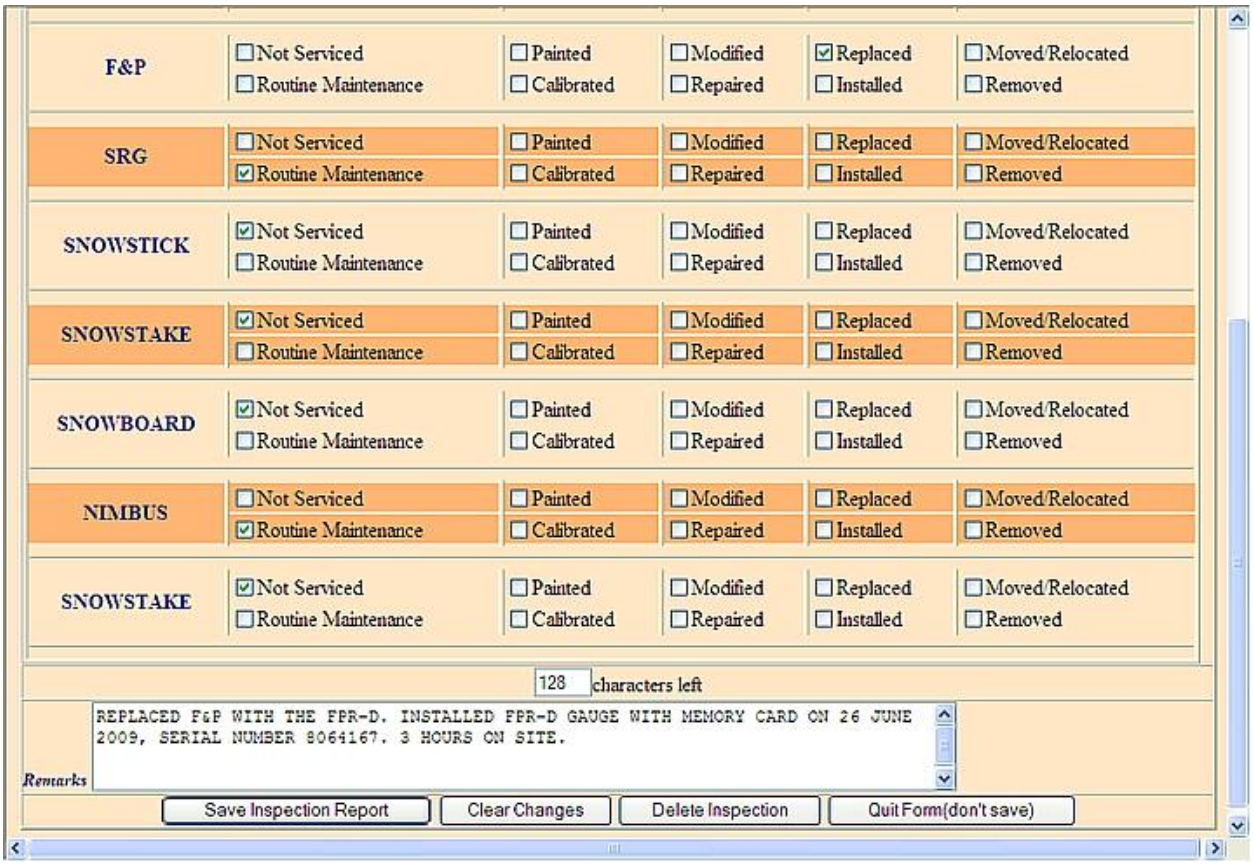


Fig 6.4 CSSA Inspection Report

Lastly, the final section is the '***Remarks***' box at the bottom panel of the first page:

Among the other notes from the site inspection, the ***Remarks*** always include one or the other statement, presented below:

- **FPR Calibration Check: Passed.**

or,

- **FPR Calibration Check: Reset Slope now: -2.4567; Offset now: -3.4456.**

Note: These values are for example only. Each rain gauge will produce unique values.

6.5 FPR Station Logbook:

After you create a Site Inspection Report in CSSA and after your Form B-44 update was successfully processed by NCDC and is accessible in the data base, consider the benefits of organizing an **optional** FPR Logbook (electronic), particularly if you have more than ten COOP sites with FPR equipment.

The FPR Logbook will account for your installation work, expenses, calibration coefficients, calibration check dates, semi-annual visitation, maintenance trips, and any delegated maintenance responsibility given to the Observer. In this way you will have a ready reference from which to retrieve detailed information on FPR system and Observer correspondence, and not be limited to the 250 characters in the Site Inspection Report's 'Remarks' box.

Be careful to distinguish between the several models of FPR. A given forecast office may have a maximum of two varieties of FPR to maintain. One is based on non-telemetry configuration (either the FPR-D or the FPR-E), and the other an FPR installed to telemetry rain gauges.

You may want to spell out the definition of the 'D' suffix in the FPR-D acronym. The 'D' identifies this equipment as manufactured by Sutron Company. Both the weighing sensor assembly and data logger were manufactured by Sutron.

As of 2011, there are just two suffixes for FPR models: 'D' and 'E.' It is our NWS chronological increment of the FPR models that have been deployed. The FPR-D was our first model in 2008 (Sutron) and our second model was the FPR-E (CES) was deployed in 2011.

CHAPTER 7 – SYSTEM MODIFICATION POLICY

7.1 Management Responsibilities:

Unlike ASOS managers, national managers who maintain COOP observing systems are *not* governed by the instructions covered in NWSI 30-1203, *Configuration Management Policy for Operational Systems*. However, instructions in the NWS Directives System written by the Office of Climate, Water, and Weather Services (OCWWS), for the surface observing program, do apply to the cooperative observing program. Specifically, field and regional managers follow the policies outlined in the, *Cooperative Station Management* (NWSI 10-1307) procedural.

The Observing Services Division (OS7), of OCWWS, will:

a. Evaluate existing and new requirements for FPR systems.

b. Delegate to the Office of Operational Systems, Engineering Design Branch, the creation of Maintenance Notes to keep systems properly working.

c. Delegate to the Office of Operational Systems, Engineering Design Branch, the determination of costs for proposed changes.

d. Authorize Maintenance Notes to be issued, coordinates FPR change actions with Regional Managers, and maintains change status information on-line on a NWS Headquarters site: http://www.nws.noaa.gov/osp2/Surface/coopimplementation

e. Verify completion of maintenance actions with effected field offices through the Cooperative Station Service Accountability (CSSA) system B-44 reports.

7.2 Policy on Cooperative Station Management:

The driving directive that governs the implementation, operation, maintenance, and modification of any type of meteorological or hydrological observing equipment, is the NWSI 10-1307, http://www.nws.noaa.gov/directives/sym/pd01013007curr.pdf, *Cooperative Station Management*.

Field and region managers who make equipment and service changes at the volunteer Observer sites whether in response to Observer requests, or in compliance with national headquarters directives, then have to comply with the policies in the Cooperative Station Management, Section 3.1.2. In that section, managers are instructed to use the Cooperative Station Service Accountability (CSSA) system – an online data base to track numerous minor and major modifications to each of the approximately ten thousand observation stations. The CSSA document is NWSM 10-1313: http://www.nws.noaa.gov/directives/sym/pd01013013curr.pdf.

The project to modify the F&P rain gauges was initiated with the *FPU Operational Implementation Plan* (OIP). It was developed in 2004 by the Office of Operational Systems (OPS22). All field managers involved in the FPU project had to abide by the OIP's management and administrative instructions.

A technical manual, the ***FPR Assembly Procedural***, was written to give a detailed description of the authorized configuration of the FPR system with an account of the Part Numbers and Software versions used in the FPR modification kit.

For the management of the FPR systems, including operations, maintenance, and issuance of Mod Notes for the FPR system, this handbook, the *FPR Operations Manual*, will be the governing document.

7.3 FPR System Modifications:

7.3.1 Hardware:

Hardware components that may be affected by modifications appear in Appendix G, of this manual. The significant hardware groupings are:

- Load Cell Sensor Assembly (including chassis)
- Sutron Data Logger
- Solar Panel
- 12V Battery

Hardware modifications shall be issued as Mod-Notes by the NWS headquarters to be filed within this ***FPR Operations Manual***. For example the first FPU Mod-Note, dealt with an enhancement to the electrical grounding of the FPU system. The "Bond FPU Chassis to Gauge Chassis," is authorized as a routine maintenance action, effective September 2006.

7.3.2 Software:

Software may be affected by upgrades issued by NWS Headquarters, refer to Chapter 2, of this manual to identify the version number. The significant software groupings in the FPR are:

- Sutron operating system in the data logger
- FTP (WinFTP) for monthly transmissions to NCDC
- WinZIP (WinZip81) for monthly file compression for transmission to NCDC

7.3.3 Priority of Mod-Note Implementation:

There are three levels of Mod-Note priority for the FPR program:

a. Routine: make the change within 12 months or by the next regularly scheduled visit to the site. An example is the 'Bond FPU Chassis to Gauge Chassis' Mod Note.

b. High: make the change within 1 to 6 months of the release of the Mod-Note as distributed on the COOP-MOD list server.

c. Emergency: make the change as soon as practical (within 1 to 4 weeks) after the announcement. Inform your RCPM by phone and e-mail to coordinate before action.

7.4 What is a Sutron Firmware Update?

As of this time there is no anticipation of manufacturer updates of firmware that would require the NWSREP to install firmware to the Precip Recorder. Should there be one, policy in Section 7.6 will apply.

7.5 Prohibition Against Local Change:

Each FPR system comes delivered with a manufacturer developed firmware already installed. Write down the version number of the data logger firmware (i.e., FpRain ver 1.05 Sutron Corp).

This FPR firmware is standardized and configuration controlled. No one has authority to change the data logger configuration software without the express and written direction from the W/OS7, the Observing Services Division, Cooperative Observer Program, of the NWS.

The FPR data logger will produce two types of measurements by default: the precipitation level and battery voltage. While the logger is capable of temperature sensor input, the FPR-D will not be configured to input the MMTS thermistor readings.

As of August 2009, with the initial FPR kit deployments, only the precipitation data is certified for operational use. In the future, if a temperature sensor becomes certified for use, updates will be given to the NWS field offices to install configuration software.

7.6 Modification Notes:

All Modification Notes issued from headquarters shall take into consideration the length of time that may be required to implement the Modification Note, due to the following: FPR site unique properties, difficult site exposures, harsh climates, difficult electrical grounding, and temporary interruption to institutional site activities, and interruptions to agreements with network users.

Emergency modification work is authorized for immediate restorative maintenance, when hardware or software has been damaged or at risk as described in the Modification Note. Preventative actions will only be authorized on a case by case basis, after the OPS11, Engineering Design Branch has been informed of site history and reviewed system outages or degradation from: (a) damaged hardware or software, or (b) hardware/software failures with damaged equipment.

Issue Date:	Title of Modification Note:	Regions/ Sites Effected	Complete-by Date:
09/2006	FPU Mod-note 01; Bond FPU Chassis to Gauge Chassis.	All	09/2007

Fig 7.1 Example of Mod-Note for the Fischer-Porter Upgrade (2006)

Implementation of a Maintenance Note must be completed by the 'Complete-by Date' specified in Table 7.1, in this ***FPR Operations Manual***. Within two weeks of completion of the

maintenance action, the NWSREP shall update the CSSA Report (Form B-44) in the Remarks section to account for the change to FPU equipment.

Then you shall report the completed modification via CSSA, Inspection Report. Include the following information in the report:

In the ***EQUIPMENT*** block of the Inspection Report under the heading ***Maintenance Performed*** locate the line for F&P equipment and check the box "Modified". Then, in the ***Remarks*** section, enter: "Completed FPU Mod Note 01, to reduce the risk of electrical damage to FPU."

See illustration (below) for an actual example of an Inspection Report, saved to CSSA.

7.6.1 Reporting Instructions:

Report the completed modification (e.g., FPR-D Mod-Note 01) via CSSA, Inspection Report. Include the serial number of the FPR-D system, the SID, and the plain English name of the site which has been modified.

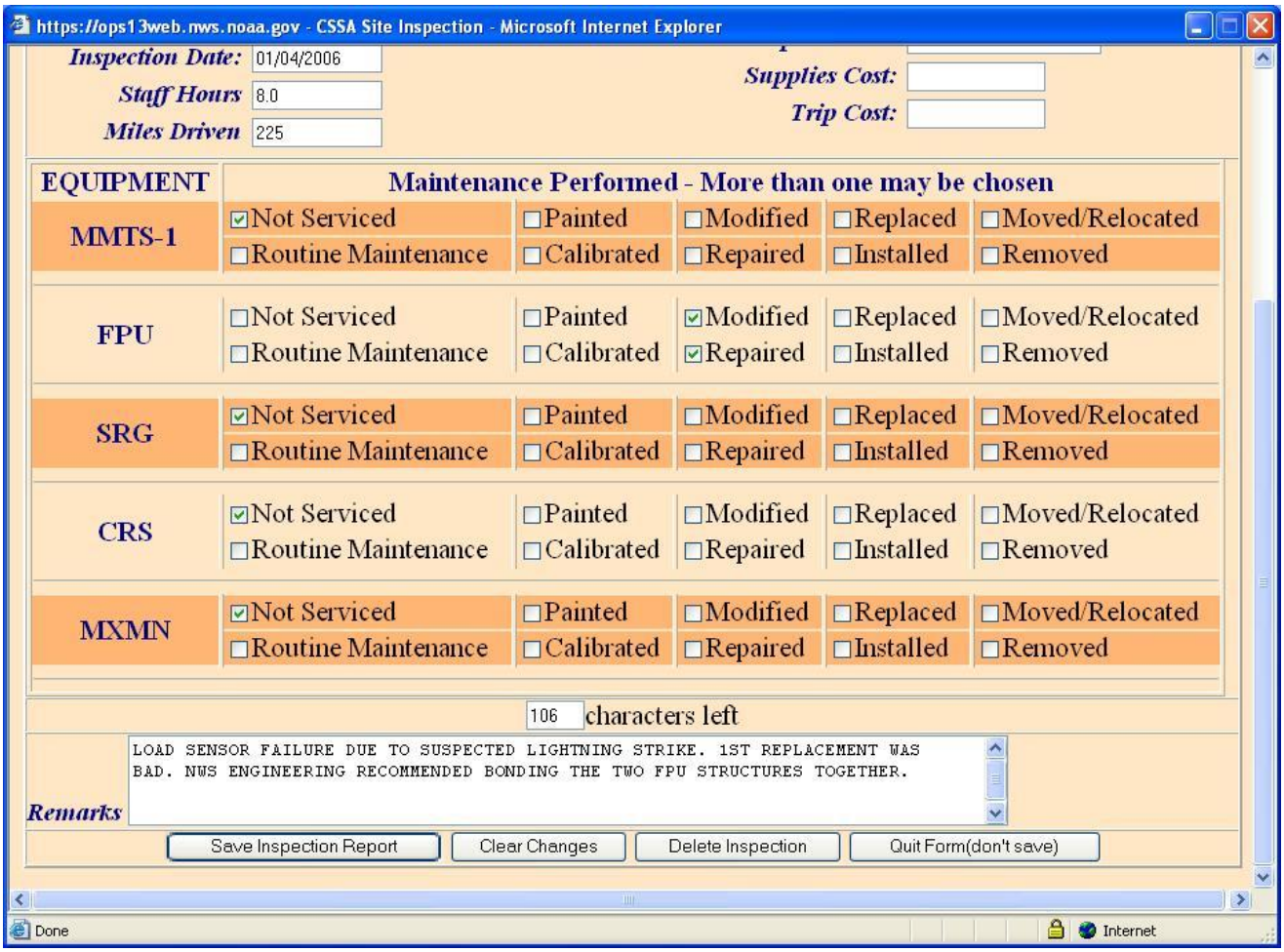


Fig 7.2 CSSA Inspection Report

Station Information Report (Form B-44): When a Mod Note is installed to change an FPR-D system, you must also update the CSSA, Form B-44.

This is accomplished by editing the *Equipment Description* field on the Observed Element page. The Equipment Description field already contains this text, 'FPR-D GAUGE WITH MEMORY CARD." from when you first installed the FPR system. Now simply add these words immediately after them: 'With FPR-D Mod Note #01'

See the example illustrated below under the italicized heading, '*Equipment Description*.'

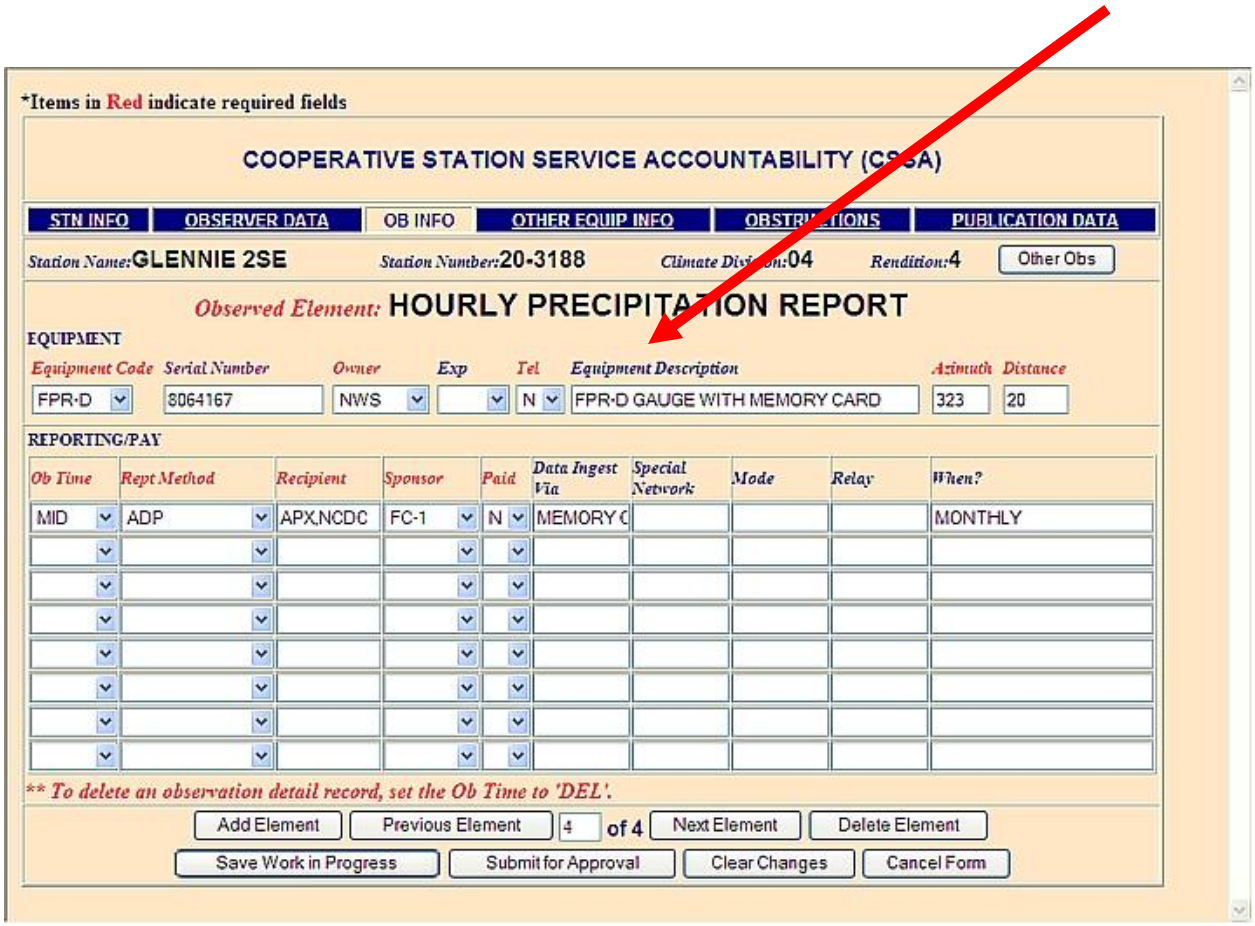


Fig 7.3 B-44 Equipment Description of FPR-D

7.6.2 <u>Records Retention - Modification Notes</u>:

The Appendix G, 'Modification Notes, of this ***FPR Operations Manual***, is updated periodically http://www.nws.noaa.gov/ops2/Surface/coopimplementation (i.e., every 6 months) and posted on-line to instruct the NWSREP to make changes in the FPR system as authorized by the NWS Headquarters, Office of Climate, Water, and Weather Services (OCWWS).

APPENDIX A – WFO IMPLEMENTATION CERTIFICATE

FISCHER-PORTER REBUILD (FPR-D)

WFO OPERATIONAL IMPLEMENTATION CERTIFICATE

WFO - _____.

The WFO (SID) _____ hereby certifies the completion of all Fischer-Porter Rebuild (FPR-D) operational implementation activities in accordance with the *FPR-D Assembly Procedures* (2009), as of (Month/Day/Year) _____. Documentation listed below was submitted to the Meteorologist In Charge to validate the successful implementation of all FPR-D for this Cooperative Program Area / County Warning Area.

Required Documents — Initials / Date

A. ***FPR-D Operational Implementation Checklist*** completed by the NWSREP one per each F&P site converted to FPR-D in the County Warning Area / Cooperative Program Area. _____

B. ***FPR Thirty-Day Report*** provided by NWSREP if necessary to document any FPR-D system outages and/or CSV data file handling problems, that could not be resolved during the 30-day evaluation period. Documentation of follow-on remedial actions taken to resolve the problems, and results achieved, should also be included. COOP Station Number: _____

Meteorologist in Charge (MIC)

_____ _____

MIC Signature Date

Instructions: The NWSREP completes an ***FPR-D Checklist*** for each FPR-D site and notifies the MIC of each. In addition the NWSREP submits a supplemental ***Thirty-Day Report*** to document those problems at each FPR site where they could not be resolved locally in the 30-day evaluation period. Note: The evaluation period starts on the date the FPR was installed and activated. The NWSREP submits all ***FPR-D Checklists*** and ***Thirty-Day Reports*** to the MIC. When all checklists and reports have been reviewed to ensure remedial actions have corrected all documented problems, then the MIC signs and dates the Certificate. The NWSREP faxes just this ***WFO Implementation Certificate*** to Tom Trunk (NWSHQ) on FAX 301-713-1598, and informs his/her RCPM.

APPENDIX B – FPR-D IMPLEMENTATION CHECKLIST

National Weather Service - Cooperative Observer Program

FPR-D OPERATIONAL IMPLEMENTATION CHECKLIST

Planned Product Improvement: Fischer-Porter Rebuild (FPR-D) .

COOP Site (SID, Name, State): _____

NWSREP Completing this Check List: _____ **Date:** _____

Item #	Item Description	OPR	Date
1.	**FPR Operational Support Activities**		
a.	Select F&P sites to rebuild 'FPR Designated Sites Spreadsheet.'	OPL	
b.	Submit 'FPR Pre-Implementation Worksheet' with projected dates.	OPL	
2.	**FPR Installation Activities**		
a.	Assemble FPR-D Kit in field office, or if necessary at COOP site.	OPL	
b.	At COOP site retrieve all B-18 punch tape from gauge. Separate the partial month (ended on installation day) from last who month.	OPL	
c.	Install / Checkout FPR-D according to, *FPR-D Assembly Procedures*	OPL	
3.	**FPR Monitoring and Coordination Activities**		
a.	Generate a Site Inspection Report in CSSA.	OPL	
b.	Submit new B-44 rendition to Workflow within five days of installing.	OPL	
c.	Establish a WFO Log Sheet to track Memory Cards/ Emails received.	OPL	
4.	**FPR Post-Installation Activities**		
a.	Dispose of old equipment according to *FPR-D Assembly Procedures*.	OPL	
b.	Transmit first month's precipitation data and verify NCDC received CSV files according to *FPR-D Operations Manual.*	OPL	
c.	Decode partial month F&P tape, enter Form 79-1D, email to NCDC.	OPL	
d.	FAX the MIC-signed OI Certificate to Tom Trunk (OS7) only after all FPR-Ds in your CPA have been implemented by steps listed, above.	OPL	
e.	Transmit a public notification message (PNS) on AWIPS.	OPL	

Instruction: The Observations Program Leader (OPL) fills-out one Checklist for each FPR-D installed and notes the date of completed actions. When all sites' Checklists are completed and any Thirty-Day Reports completed, then the MIC signs the WFO Implementation Certificate.

APPENDIX C – ONLINE RESOURCES AND REFERENCE MANUALS

1. Primary Resources On-Line:

a. http://www.nws.noaa.gov/ops2/Surface/coopimplementation
- ***FPR-D Assembly Procedures*** *– August 2009*
- ***FPR-D Observer Instructions*** *- July 2009*
- ***FPR-D Operations Manual*** *– September 2011*
- ***FPRD_PlotData_V1_2.xls*** *– September 2011*

b. http://www.srh.noaa.gov/ohx/dad/coop/FPR.html
- NWSTC Training Class – Clear, labeled photos of the new rain gauge, produced by Ralph Troutman (OHX).

c. http://www.srh.noaa.gov/ohx/dad/coop/f-p_images
- Clear photos of the original F&P rain gauge.

2. Support Resources – NWS Policy and Procedures:

a. *NWSI 10-1315, COOP Station Observations* (Feb 2011) *****
http://www.nws.noaa.gov/directives/sym/pd01013015curr.pdf

b. *NWSI 10-1313, CSSA User Manual* (Mar 18, 2005) *****
http://www.nws.noaa.gov/directives/sym/pd01013013curr.pdf

c. Proposed: IT Security Statement (by FPR Project Leader to OS chief).

d. *EHB-1: Instrumental Equipment Catalog*
http://www.ops1.nws.noaa.gov/ehbs/ehb1.htm

e. *NWSM 50-1115: Occupational Safety and Health Manual*
https://www.ops1.nws.noaa.gov/Secure/SAFETY/Safety_manual.htm

f. *Integrated Logistics Support Planning* NDS 30-3102
http://www.nws.noaa.gov/directives/030/030.htm

g. *Supply Manual and Catalog* NDS 30-3101
http://www.nws.noaa.gov/directives/030/030.htm

h. *Public Information Statement (PNS) Template* (for each effected WFO) *****

***** The Observing Services Division (W-OS7) of the Office of Climate, Water, and Weather Services (OCWWS) is the Office of Primary Responsibility (OPR) for these asterisked documents. A PDF formatted version of each is available on the NWS Surface Program's webpage: http://www.nws.noaa.gov/ops2/Surface/coopimplementation.htm.

3. Vendor's Manual Supplied with the NLSC Kit:

a. *Fischer/Porter Precipitation Gauge Rebuild Kit – Operations & Maintenance Manual v1.01* (Nov 12, 2008), delivered with kit is published by Sutron Corp.

Note: The NWSHQ issued '*FPR-D Assembly Procedures (Apr 2009)*' is the primary assembly manual, http://www.nws.noaa.gov/ops2/Surface/coopimplementation. You may reference *F/P Gauge Rebuild Kit – Operations & Maintenance Manual*, for detailed information on sensor measurements and data logger controls.

4. Engineering Handbooks (NWS):

The following content in EHB-10 is superseded by the, ***FPR Operations Manual*** (Apr 2009), and, ***FPR Assembly Procedures*** (April 2009), issued by the NWS, Observing Services Division:

Section 1.2: Items 10-204, 10-206, 10-207, and 10-208.

Section 4.2: Revised maintenance schedule for Fischer & Porter Punched Tape Precipitation Gage, April 30, 1976.

The following content in EHB-1, Issuance Number 02-11 (Nov 1, 2002), needs to be supplemented for the new Fischer-Porter Rebuild (FPR) equipment

Section D: Hydrologic Equipment; Instrumental equipment listings.

The NWS Logistics Branch (W/OPS14) has assigned Agency Stock Number (ASN), a National Stock Number (NSN), a Source, Maintenance and Recoverability (SM&R) Code, and will list this equipment in the EHB-1, Instrumental Equipment Catalog.

5. Sterling Field Support Center (SFSC)

For operational support when you implement the Fischer-Porter Rebuild (FPR) modification, you may phone the Sterling Field Support Center, 8:30am – 5:00pm, Monday – Friday, on 703-661-1268; or e-mail them, nws.sfsc@noaa.gov . Before calling SFSC, write down the issue or question and inform your Regional COOP Manager by phone or email.

The Sterling Field Support Center (SFSC) is located approximately 30 miles west of Washington, DC in Sterling, Virginia. The SFSC operates as an extension of National Weather Service (NWS) Headquarters to provide operational support to field personnel through a combination of sensor testing, sensor system analysis, and contact center support. Sterling provides a critical service to the NWS field community by using their years of knowledge and experience gained through extensive sensor/system testing and maintenance in assisting the field with sensor and system failures. When these failures arise in the field, the SFSC is there to provide assistance and help solve these problems.

The SFSC has been a critical component of the Fischer Porter Rebuild (FPR) Program. The SFSC will play a major role in assisting the field if issues arise when the FPR kits are installed at COOP sites around the country. The facility has created a contact center and should be the first

point of contact made by NWS WFO's if there are questions or issues with the FPR kits. If the SFSC is unable to determine the correction for the issue, the SFSC will elevate it to NWS Headquarter level.

The contact center at the SFSC was established to troubleshoot potential issues in the field with the installation and usage of the FPR kits. The contact center is open Monday through Friday 8:00 AM to 5:00 PM Eastern Time. The SFSC is closed for all federal holidays. All emails and phone calls received during the hours of operation will be responded to in a timely manner. Emails received during non-operation hours will be returned in the order they are received on the following day in which the facility is open.

SFSC Contact Center Information

Main Line: 703-661-1268
Back-up Line: 703-661-1293
Email: nws.sfsc@noaa.gov

APPENDIX D : CALIBRATION RESET

Calibrate the FPR-D System: Use the keypad of Precip Monitor and the F&P brass weights.

1. **Wake-up** the display before you take the next steps. This produces the first of two log entries to delimit the start and end of irregular data values caused by the brass weights.

2. From the Home Menu, press the Down-arrow four times until you reach the 'Diagnostic' menu and then press the Right-arrow. The display reads, "**Two Point Cal, Press SET to Cal.**"

3. Press the SET button and the sensor will prompt, '**Put Empty Dry Bucket, Press SET to proceed**."

4. Place an empty dry bucket on the sensor and press SET. The sensor will display the message, '**Calculating, Please Wait'** while it takes a measurement. The sensor will use the current settings for making the measurement.

5. When the sensor completes its measurement, the sensor will prompt, "**Put 15" of Weight, Press SET to Proceed."**

6. Load the bucket with 15 inch weight set. These are the <u>three</u> brass weights marked "4111G." Then press the SET button.

7. The sensor will ask "**Enter Weight in Inches**" and prompt an entry of a number. Enter the numerals, 15, with Up- and Down-arrow buttons.

8. This number corresponds to the weight placed in bucket and is expressed in inches of water. The sensor will display, "**Calculating, Please Wait**" while it takes a measurements. The sensor will then use the two measurements to compute a calibrated slope and offset.

9. The sensor displays the computed Slope and Offset in one display, together with the Prompt: "**Press SET to accept.**"

10. Press the SET button. Write down the Slope <u>and</u> Offset values into your notes for later entry into the Site Inspection Report, in your CSSA system.

11. If not, press CANCEL/OFF button, and investigate the cause of the problem. After pressing SET the sensor displays, '**Calculating, Please Wait**" while it updates the slope and offset and begins a new measurement.

12. The sensor displays the last measurement using the new slope and offset. The calibration 'slope' and 'offset' are stored into the data logger. The most current values of the calibration's slope and offset, will be posted along with other meta data on the top line of every data file.

13. Once completed, journal the words, “Calibration Check – Reset Performed” to the ***FPR Maintenance Log Sheet.***

14. **Wake-up** the display upon completing the Calibration Rest to generate the second flag to mark the end of the disrupted portion of data. This is an important step!

APPENDIX E – HARDWARE ERRORS

The Sutron Precip Recorder is a microprocessor controlled instrument. It can detect and report malfunctions. When the Precip Recorder detects an error the display will show:

Most of the possible errors are internal hardware errors that are non-fixable in the field.
The following errors relate to hardware failures within the Precip Recorder. If you see any of these, note the error number and try to clear the error following the procedure below. If the error will not clear, repeats after another attempted use of that part of the system, or prevents/affects system operation the unit will need to be replaced. When you return the unit to National Reconditioning Center (NRC), include a note stating the unit is reporting errors and the error number.

-Display errors,	numbers 1001 to 1008
-Real Time Clock errors,	numbers 1101 to 1104
-Keypad errors,	numbers 1201 to 1204
-RS232 errors,	numbers 1301 to 1316
-Flash Memory errors,	numbers 1401 to 1403
-SDI-12 errors,	numbers 1501 to 1506
-Miscellaneous errors,	numbers 3001 to 3201
-Load Cell errors,	numbers 7001 & 7002

The following error relates to the SD card operation. It covers hardware errors as well as issues that can be caused by the user, such as improper insertion or removal, write-protect ON, card full, etc. If you see this error, remove the SD card, make sure the write protect switch found on some SD cards is in the OFF, RW, or UNLOCK position, clear the error as shown below, and retry downloading to the SD card. Observers should note in their log that they saw (and cleared?) this error, so you are aware of it. If the error will not clear or data will still not download, the unit will need to be replaced.

-SD Card Fail error, Number 4027

The SD Card Fail error can easily be caused by operator fumbling, but does include hardware failures. It is not possible to determine what caused the 4027 error from the display. However, if you can get to the logged data - a test message will be logged along with the error message as shown in this example:

Precip,07/13/2009,14:15:00,1.38,
Precip,07/13/2009,14:30:00,1.38,
Display On,07/13/2009,14:37:16,
Test,07/13/2009,14:41:13,16.0000,
Hardware Fail,07/13/2009,14:41:13,4027,

The test message will contain a value between 1 and 27. The example above indicates a Test 16 condition. Anything other than the following is a hardware failure and the unit may need replacing. Unfortunately if it is a hardware failure you will not be able to get a SD card download to remotely check the test message. You will have to connect a laptop to the unit and review the data to see the code.

Test Codes	Meaning
3	card not formatted
8	card is full
16	No init function available/error in init - i.e. card not inserted properly
17	card not detected
19	a sector has developed an error
21	error writing file to volume - i.e. card pulled out before finish
22	media not recognized
23	card is busy
24	card is write protected
25	FAT not recognized

To CLEAR ERRORS

When you get an error:

Press the RIGHT arrow to see the error.

Pressing the DOWN arrow (repeatedly) will show you all errors.

When you get to the end of the error list you will see this message:

Press SET, to clear the errors and the display will briefly show: "**Errors Cleared**"

The unit will automatically revert back to the normal precip, date and time screen.

Then you may press OFF until the display goes off.

APPENDIX F - NOTES REQUIRED FOR INSPECTION REPORT

This table gives the range of potential notes you should enter to the Remarks field of the CSSA Site Inspection Report. While at the rain gauge the NWSREP (and Observer, if delegated) shall journal to the ***FPR Maintenance Log-Sheet*** any maintenance action that appears in this table. Reminder: While at the rain gauge you must wake-up the data logger display (i.e., Up-Arrow) twice: once before the start of maintenance and once after maintenance has ended.

CSSA Site Inspection Report – Valid Entries for FPR-D Maintenance:

Fischer-Porter Rebuild (FPR-D) Valid Entries for Site Inspection Report
Annual Visit
Semi-Annual Visit
Emergency Visit
Awake Display – Start
Awake Display – End
Precip Level Before Bucket Serviced
Precip Level After Bucket Serviced
Calibration Check – Good Readings
Calibration Check – Reset Performed
Partially drained bucket – some liquid remains in bucket
Emptied bucket
Added Oil to bucket
Added Antifreeze to bucket
Emptied and cleaned bucket
Installed Funnel
Removed Funnel
Foreign Object Found in Bucket

Data downloaded to Memory Card
Cleaned F&P Housing
Cleaned Solar Panel
Cleaned Precip Recorder (display and keypad)
Slope Before – Value before Calibration
Slope After – Value after Calibration
Offset Before – Value before Calibration
Offset After – Value after Calibration
Installed Auto-Syphon
Removed Auto-Syphon
Time is more than 15 minutes slow.
Time is more than 15 minutes fast.
Replaced one or more Flexures
Replaced FPR-D Precip Recorder – With same model Precip Recorder
Replaced FPR-D Load Sensor Assembly – With same model Load Sensor Assembly
Gauge moved to a compatible location – equipment move
Gauge moved to a non-compatible location – station relocation
Gauge removed from service – placed in storage
Gauge put back in service after being in storage

APPENDIX G – FPR-D MODIFICATION NOTES

Issue Date:	Title of NWS Engineering Mod Note:	Regions/ Sites Effected	Complete-by Date:
05/2009	FPR-D Installation Instructions, Engineering, May 2009	All	05/2011

APPENDIX H - FPR-D PARTS AND AGENCY STOCK NUMBERS (ASN)

General Name	Short Description	Long Description	ASN	SMR *
Load Cell Assembly	Load Cell Assembly, FPR	Load Cell Assembly, FPR, complete with load cell block, cell, and 4 long allen head machine screws. Sutron, Corp.	**D111D-1A1**	PADDD
Screws, Load Cell Mounting	Screws, Load Cell mounting, FPR	Screws Load Cell mounting, FPR, set of 4 with washers.	**D111D-1A1M1**	PAOZZ
Plunger	Post, FPR, load cell.	Anvil or post for FPR load cell, mates F&P gauge to load cell. Sutron Corp.	**D111D-1A2**	PAOZZ
Precip Recorder	Precip Recorder with Bracket.	Precip Recorder Assembly for F&P Gauge Rebuild, includes Sutron datalogger, solar panel regulator, display keypad, SD card interface, manual, housing and mounting bracket. Sutron Corp.	**D111D-2A1**	PAODD
Sutron FPR Manual	Manual, FPR, OEM, Sutron	Manual, FPR, OEM, Sutron	**D111D-2A1D1**	PAOZZ
Battery	Sealed 12V Battery	Battery, 12V, 7AH, Sealed Lead Acid, spade terminals, 4 lbs, Genesis. (Sutron or Open Market)	**D111D-2B1**	PAOZZ
Solar Panel	Solar Panel, 2W, 12V nom, @0.133A, no regulator.	Solar Panel, 2W, with Diode, 12V nom. @0.133A, no regulator, metal frame, with 15 feet cable, hardware and mounting bracket (two hose clamps, SS, #24, series 68). (Sutron or PowerUp Co.)	**D111D-3**	PAODD

* The FPR unit has just three types of Source, Maintenance, and Recoverability (SMR) codes assigned to its parts: PADDD, PAODD, and PAOZZ.

Reference: **EHB-1, *Instrumental Equipment Catalog* (Issuance 1996-1),** Section 2.3, Source, Maintenance and Recoverability Code (SM&R).

PADDD: You must return these parts (i.e., faulty regulator) to National Reconditioning Center (NRC) in exchange for a replacement.
The 'PA' signifies item procured and stocked for anticipated or known usage that is not deteriorative in nature; the 'DD' signifies the part must be shipped to the depot (NRC) together with its integral component(s) for disassembly and be repaired by the depot (NRC); and the final 'D' signifies that just the depot (NRC) is authorized to repair, condemn, or dispose of this part.

PAODD: You must return these parts (i.e., faulty GMA) to NRC in exchange for a replacement.
The 'PA' signifies item procured and stocked for anticipated or known usage that is not deteriorative in nature; the 'OD' signifies this part shall be isolated and removed by the field and shipped to the depot (NRC) where the depot (NRC) will perform the repair; and the final 'D' signifies that just the depot (NRC) is authorized to repair, condemn, or dispose of this part.

PAOZZ: A non-repairable part. You may dispose of these parts (i.e., 5 Amp fuse) at the Weather Forecast Office (WFO).
The 'PA' signifies item procured and stocked for anticipated or known usage that is not deteriorative in nature; the 'OZ' signifies the field level shall remove and replace this part, however it is non-repairable and no repair to the item is authorized. The final 'Z' signifies that the field office is authorized to condemn and dispose of the part when it becomes unserviceable.

APPENDIX I - SAMPLE FPR LOG SHEET

Forecast Office (SID): TAE **COOP Station Name:** Pinetree State Park (01-5678) **Your NWSREP Name:** M. Jones .

Date MM/DD/YYYY	**Time** hh:mm am/pm	**Amount** NN.cc	**Routine Actions**	**Special Notes (i.e., displayed error messages, etc.)**
03/28/2011	Start: 10:15 am Stop: 10:45 am	15.47 02.75	☐ Add Oil ☐ Add FGPG ☐ Empty Bucket ☒ Partial Drain Funnel - ☒ In ☐Out	
06/14/2011	Start: 4:15 pm Stop: 4:45 pm	8.72 8.72	☐Add Oil ☐ Add FGPG ☐ Empty Bucket ☐ Partial Drain Funnel - ☐In ☐Out	'Error 4027' message displayed. Phoned NWSREP.
09/28/2011	Start: 2:30 am Stop: 2:45 am	10.39 10.39	☐ Add Oil ☐ Add FGPG ☐ Empty Bucket ☐ Partial Drain Funnel - ☐In ☒Out	Wiped down the F&P shell to remove dust.
10/15/2011	Stop: 11:15 am Stop: 12:15 pm	14.35 0.75	☒ Add Oil ☐ Add FGPG ☒ Empty Bucket ☐ Partial Drain Funnel - ☐In ☐Out	Removed pinecone, cleaned bucket, and then added 1-qt of oil.
12/21/2011	Start: 9:30 am Stop: 9:30 am	6.14 6.43	☐ Add Oil ☒ Add FGPG ☐ Empty Bucket ☐ Partial Drain Funnel - ☐In ☐Out	Very cold month – had to add 2 quarts of FGPG to prevent ice damage.

Instructions: Before you start your action, enter the date and then at time of maintenance, enter current time (standard time, not daylight time) on the 'Start' line in Column 2. Then press the Display button to view the Amount in bucket. Write this value in Column 3 (Amount). Then mark appropriate box(es) in Column 4 (Routine Actions) to indicate your actions. If not a routine action, write your comments in Column 5 (Special Notes). When you have completed your action, go back to Column 2, and enter current time (standard time, only) into the 'Stop' line. Always phone your NWSREP if an error message displays or display fails to light-up on command. Always mail your Log Sheets to your NWSREP. Keep spare sheets inside shelter.

FISCHER & PORTER LOG SHEET

Forecast Office (SID): _____ COOP Station Name: _____ Your NWSREP Name: _____.

Date MM/DD/YYYY	**Time** hh:mm am/pm	**Amount** NN.cc	**Routine Actions**	**Special Notes (i.e., displayed error messages, etc.)**
_____.	Start: _____. Stop: _____.	_____. _____.	☐ Add Oil ☐ Add FGPG ☐ Empty Bucket ☐ Partial Drain Funnel - ☐In ☐Out	
_____	Start: _____. Stop: _____.	_____ _____	☐ Add Oil ☐ Add FGPG ☐ Empty Bucket ☐ Partial Drain Funnel - ☐In ☐Out	
_____	Start: _____. Stop: _____.	_____ _____	☐ Add Oil ☐ Add FGPG ☐ Empty Bucket ☐ Partial Drain Funnel - ☐In ☐Out	
_____	Start: _____. Stop: _____.	_____ _____	☐ Add Oil ☐ Add FGPG ☐ Empty Bucket ☐ Partial Drain Funnel - ☐In ☐Out	
_____	Start: _____. Stop: _____.	_____ _____	☐ Add Oil ☐ Add FGPG ☐ Empty Bucket ☐ Partial Drain Funnel - ☐In ☐Out	

Instructions: Before you start your action, enter the date and then at time of maintenance, enter current time (standard time, not daylight time) on the 'Start' line in Column 2. Then press the Display button to view the Amount in bucket. Write this value in Column 3 (Amount). Then mark appropriate box(es) in Column 4 (Routine Actions) to indicate your actions. If not a routine action, write your comments in Column 5 (Special Notes). When you have completed your action, go back to Column 2, and enter current time (standard time, only) into the 'Stop' line. Always phone your NWSREP if an error message displays or display fails to light-up on command. Always mail your Log Sheets to your NWSREP. Keep spare sheets inside shelter.