D R A F T

FPR ASSEMBLY PROCEDURES

FOR THE

FISCHER–PORTER REBUILD KIT (FPR-D)

RECORDING RAIN GAUGE

April 29, 2009

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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FPR-D ASSEMBLY INSTRUCTIONS

PART ONE

TAKING DELIVERY OF

THE FPR KIT

Note 1: Please read through all five parts of these instructions before you begin any modification work.

Note 2 : For clear labeled photos of the FPR parts and how they connect with the F&P platform, see Ralph Troutman's power-point training slides on the DAD site: http://www.srh.noaa.gov/ohx/dad/coop/FPR.html .

Note 3 : For clear photos of the legacy F&P gauges, see Ralph Troutman's 'f-p_images' link on the DAD site: http://www.srh.noaa.gov/ohx/dad/coop/f-p_images

Note 4: For assistance please phone the Sterling Field Support Center, Monday - Friday 703-661-1268, or e-mail them, nws.sfsc@noaa.gov .

Sterling Field Support Center

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

1.0 FPR Kit Components

1.1 NLSC Package Contents:

Each FPR Kit will arrive at your WFO in one cardboard box that contains two interior boxes:

a. Primary box: Data Logger, Solar Panel, and 12V Battery. Enclosed in a separate 12” zip-lock bag are tools, washers, screws, and mounting hardware.

b. Interior box: Load cell sensor.

Unpack the shipping cartons, inspect items for visible damage, and use the packing list and the following check off list to verify that the kit is complete.

1.2 FPR Kit Boxes

Container	Content	Yes/No
Cardboard Box #1	Precip Monitor	
	Battery – 12V, 7AH (4 lbs)	
	Solar Panel – 2W, 12V, and integral with 15 foot cable	
	Solar Panel Mounting Bracket	
	Sutron Technical manual (FPR Kit) for NWS-0001-1.	
	Sealed Zip-lock Bag (12" x 12"):	
	Tools: Three Allen-head wrenches	
	Sensor Parts: Four 4-40 bolts (7/8"), with four washers, four skirt caps SEMS #6-32, 0.375 inch with washer Screw set #8-32 (3/8") Screw M6 X 30 Washer, flat #4	
	Contact plunger: One threaded bolt-like post	
	Solar Parts: Two hose clamps #24, Series 68	
	Data Storage Part: One SD Memory Card	
Cardboard box #2 (interior box)	Load Cell Sensor: Load Cell (integral with output cable), Mounting-Block, and Stop Bracket.	

Estimated Time Required: An estimated three hours is required to complete and verify the FPR kit installation whether you perform most of the assembly at your WFO, and swap out the gauge at the site, or if you do all the work at the site. NWS HQ recommends the first option – perform the modification at your WFO and swap out the gauge at the site – particularly for the first time you perform the modification. NWS HQ recognizes there is a large learning curve to transition from mechanical equipment to all electronic instrumentation and encourages all technicians and their MICs to learn this procedure and verify proper gauge operation in the comfort of the WFO before even thinking about doing it in the field.

There are 8 steps to this modification:

- Receive and inspect kit…….0.50 hours
- Teardown old gauge and refurbish remaining parts……1.00 hours
- Install kit parts……..……1.00 hours
- Verify kit operation……...0.50 hours
- Transport to site……TBD hours
- Swap out, set up, and calibrate…….…….2.00 hours
- Capture new metadata……..….……0.50 hours
- Train the observer……..0.50 hours

Total time is 6 hours plus the time to drive to and from the Observer's site.

1.3 Tools and Test Equipment Table:

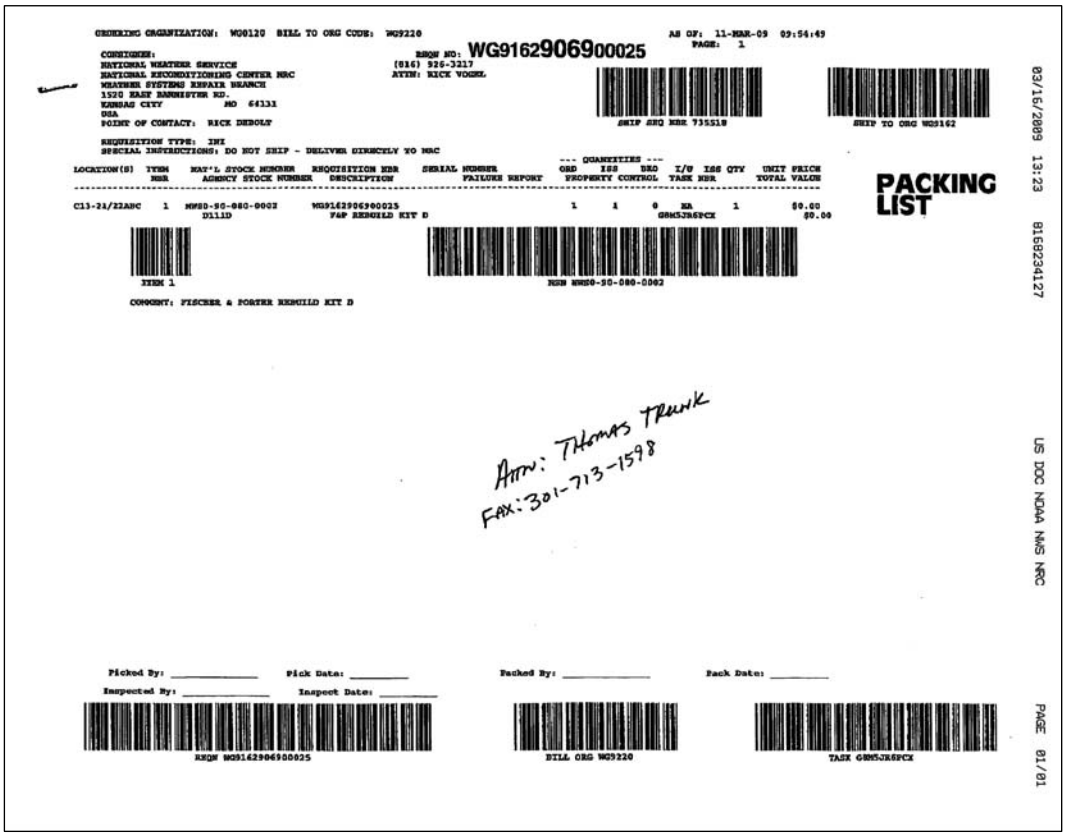
The NWSREP must have the following tools and test equipment:

Tools and Test Equipment Beyond What is Supplied inside the Kit.
Phillips Screw Drivers, sizes: #0, #1, or #2.
Flat Blade Screw Driver (1/4 inch)
Small Adjustable Wrench
Anti-Seize Compound
Feeler Gauge (1mm); or a length of 18AWG solid copper wire (0.038 inch); or 0.040" automotive feeler gauge or spark plug gauge.
Battery Charger, 12V, AC
Multi meter (or voltmeter and ohmmeter)
Needlenose pliers with wire cutters/strippers
Wire terminal crimping tool/stripper tool
SD memory card reader
Laptop computer with modem and terminal emulation program, for access to Sutron data logger.
Serial Communications Cable (for laptop) with 9-pin female end and 9-pin male end (not null modem)
Calibration weight set Agency Stock Number D111-TE500.

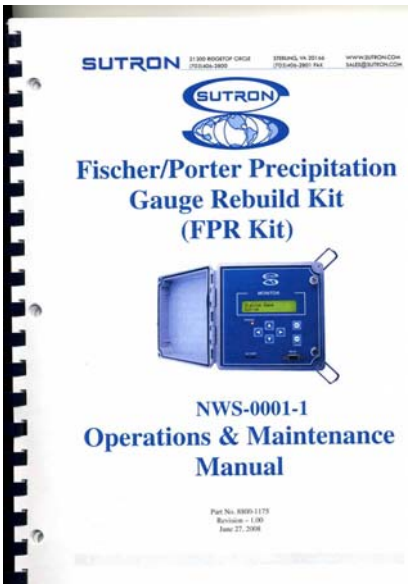
1.4 Charge the New 12V Battery:

Locate a battery charger capable of initial charging the new 12V battery. The battery is a sealed battery, do not use a charger that can charge at 20amps or greater. Attach charger cables to the battery's respective positive and negative terminals. Let charge several hours, or until fully charged, so it will be ready to power the data logger in Section 6. Follow the precautions outlined in NWS Manual 50-1115, *Battery Charging and Storage Operations*, see the web site: click on chapter 15. https://www.ops1.nws.noaa.gov/Secure/SAFETY/Safety_manual.htm .

This is an image of the NLSC packing list that is pasted to the outside of each FPR Kit.


ORDERING ORGANIZATION: WG0120 BILL TO ORG CODE: WG9220
AS OF: 11-MAR-09 09:54:49
PAGE: 1
CONSIGNEE:
NATIONAL WEATHER SERVICE
NATIONAL RECONDITIONING CENTER NRC
WEATHER SYSTEMS REPAIR BRANCH
1520 EAST BANNISTER RD.
KANSAS CITY MO 64131
USA
POINT OF CONTACT: RICK DEBOLT
REQN NO: WG916290690 00025
(816) 926-3217
ATTN: RICK VOGEL
SHIP SEQ NBR 735519
SHIP TO ORG WG3162
REQUISITION TYPE: INT
SPECIAL INSTRUCTIONS: DO NOT SHIP - DELIVER DIRECTLY TO NRC
PACKING LIST
LOCATION(S) ITEM NBR | NAT'L STOCK NUMBER AGENCY STOCK NUMBER | REQUISITION NBR DESCRIPTION | SERIAL NUMBER FAILURE REPORT | QUANTITIES ORD ISS BAL PROPERTY CONTROL | I/U ISS QTY TASK NBR | UNIT PRICE TOTAL VALUE
C13-21/22ABC 1 MWSD-SO-080-0002 D111D WG916290690 00025 F&P REBUILD KIT D 1 1 0 EA GSMSJR6PCX 1 $0.00 $0.00
ITEM 1
NSN MWSD-SO-080-0002
COMMENT: FISCHER & PORTER REBUILD KIT D
ATTN: THOMAS TRUNK
FAX: 301-713-1598
Picked By: Pick Date: Packed By: Pack Date:
Inspected By: Inspect Date:
REQN WG916290690025
BILL ORG WG9220
TASK GSMSJR6PCX
03/16/2009 13:23 8158234127 US DOC NOAA NWS NRC PAGE 01/01

The Sutron Company includes a technical manual with each FPR Kit.



FPR-D ASSEMBLY INSTRUCTIONS

PART TWO

MODIFY F&P GAUGE

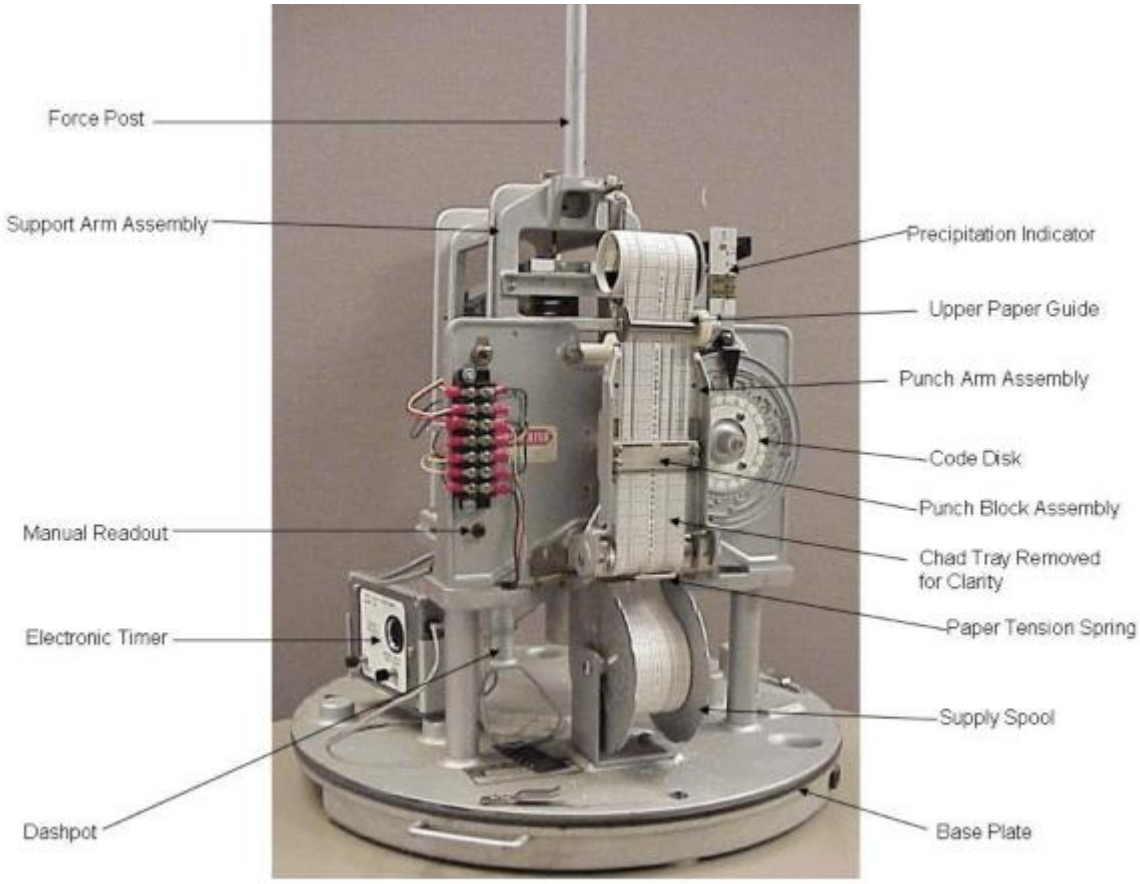
INSIDE YOUR WFO

Scope of Part Two:

- Remove the Paper Recorder Assembly……1.00 hours
- Install the Load Cell…….……..…..…….0.25 hours
- Install the Precip Recorder (Logger)….……...….……0.25 hours
- Install the new Solar Panel……...……..…….……0.25 hours
- Install the 12V Battery……..0.25 hours

2. Disassemble the F&P Gauge at Workbench: *(Perform this Task in Your WFO)*

2.1 Remove the F&P conical hood, the bucket, and the lower housing. Empty and dry the bucket. The legacy rain gauge recorder is now accessible and ready for disassembly.



2.2 If this F&P unit should still have its paper punch tape on spool from its service in the field, then make sure you have already marked an 'OFF' date and time. Manually decode this partial-month tape and enter hour-total and day-total amounts to Form 79ID per NCDC instruction. Follow the instructions in the ***FPR Operations Manual***, Chapter 1.3.7, and e-mail the Form 79ID to Stuart.Hinson@noaa.gov . Complete this data recovery task prior to disassembling the F&P gauge and prior to mailing the partial-month tape to the attention of Debbie Maxey, of SourceCorp in Mt.Vernon, Kentucky.

2.3 Disconnect and remove the 6V battery. Either save for use in another legacy F&P, or package and retain the battery for proper disposal by your WFO.

2.4 Remove the 6V solar panel and its mounting bracket from the pipe supports.

2.5 Remove internal wiring, clamps, and terminal strips.

2.6 Remove the small slotted screw, releasing the eyelet end of the wound cable from the front support arm assembly. Return the screw to the support arm assembly.

2.7 Loosen the two 7/16 inch bolts holding the Paper Recorder Assembly to the support stage.

2.8 Unhook the small tension spring from the front support arm assembly.

2.9 Remove the Paper Recorder Assembly (including the punch motor assembly, and code disk); set it aside. Leave bolts loose for now.

2.10 Raise the front support arm assembly with shipping bolt so that the dash-pot piston is near the top of travel.

2.11 Keep the lower limiting screw in place.

2.12 Unscrew the zero adjust knob and catch and remove the large coupled main spring as it falls away.

2.13 Remove the hook and remove the zero-adjust knob.

2.14 Remove the two screws holding the pointer and remove the pointer. Place back the screws.

2.15 Remove the tape spool assembly. Place back the screws.

2.16 Remove the plunger. Unthread it from the front support arm assembly.

2.17 Remove the dash-pot. Do not place the screws back.

2.18 Remove the dash-pot gasket and clean oil off all surfaces.

2.19 Dispose of the dash-pot oil in accordance with WFO policy.

2.20 Check all 8 flexures. There are 4 on the top arm and 4 on the bottom arm. At the front and back of each arm there is one horizontal flexure and one vertical flexure. Replace any flexure that is bent, kinked, cracked, or broken. The upper-rear-horizontal flexure is the one most often damaged.

Important: All flexures must be flat and in good condition and all flexure mounting screws must be tight to ensure proper operation with the load cell.

2.21 Save only those removed parts that are in good shape per instructions in Appendix E, and e-mail your RCPM an inventory report. Otherwise, dispose of locally in accordance with your WFO's official procedures.

2.22 After you have removed the Paper Recorder Assembly, the Support Stage will be accessible, and bare as seen in this image.

You are ready to begin installing the FPR Kit.

Support Stage

3. Install the Load Cell Assembly:

3.1 Open the Kit box. Unpack the **small** cardboard box. It contains just the load cell assembly.

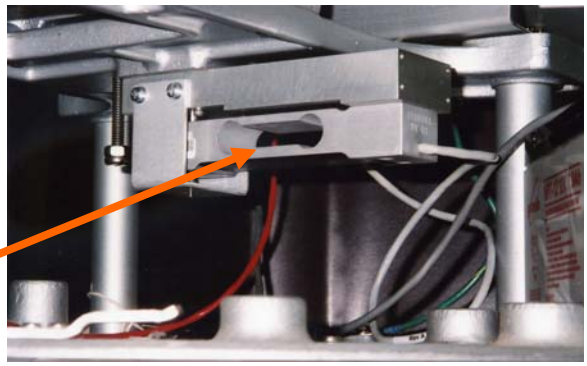
Note: The load cell assembly is installed to the same four holes where the dash-pot was mounted to the underside of the support stage.

3.2 Examine the kit contents and account for the other components (see, Section 1.2) and zip-lock bag with Allen wrenches, mounting bolts, and washers.

3.3 These procedures are similar to the OEM manual provided by Sutron. It may help to follow both - locate the ***F/P Operation & Maintenance Manual, Revision 1.01 (Nov 2008)***, published by Sutron Company.

3.4 Find the load cell assembly. It is installed base plate up, as shown here.

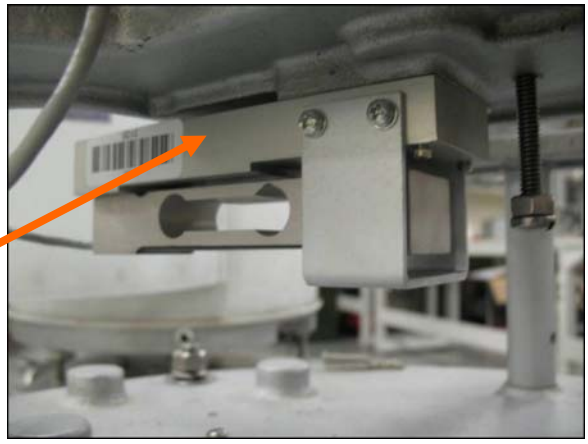
Caution**:** Use care when handling the load cell assembly. Do not scratch the rubberized coating. Do not pick-up, handle or support the assembly by the cable.



Load Cell Beam

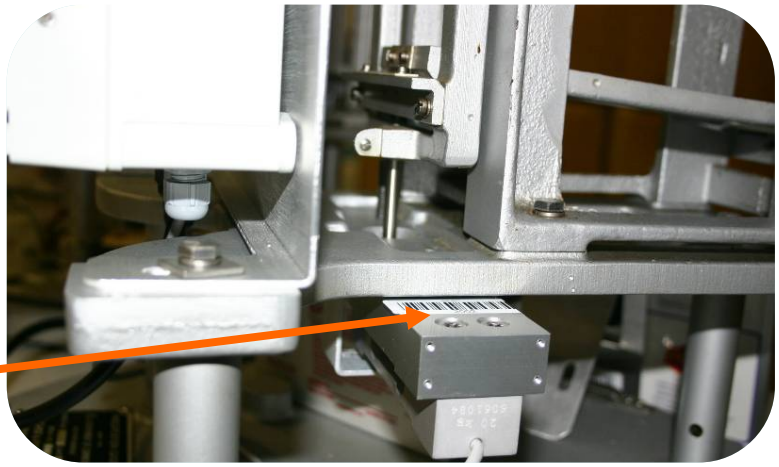
The plunger passes through the mounting block and presses onto the load cell beam, underneath.

3.5 Find the zip-lock bag with four long 4-40 Allen head screws and washers. Place the washers on the screws with a lock washer sandwiched between the flat washer and the head of each screw.



Load Cell Mounting Block

3.6 The Load Cell Beam (Sec 3.4) partially obstructs the mounting holes in the Load Cell Mounting Block (Sec 3.5). You need to loosen the two bolts that hold the beam to its mounting block to insert the two rear mounting screws.



Loosen these two 5mm bolts. Use the 5mm Allen wrench to loosen them.

Then you will be able to jostle the beam just enough to insert the four 4-40 mounting screws into the mounting block. Once all are inserted, re-center and retighten the beam with the 5mm wrench.

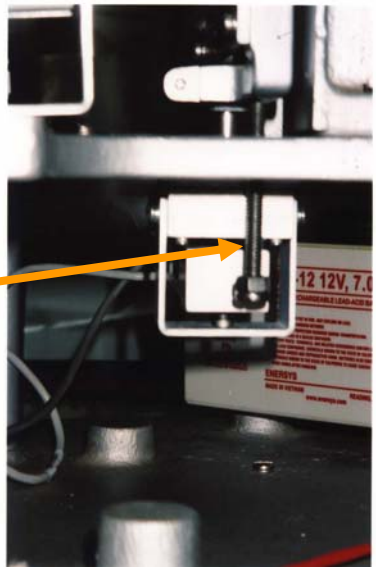
3.7 Using an Allen wrench and the four 4-40 screws – fasten the Load Cell Mounting Block to the underside of the base stage - where the dash pot was mounted. (do not over-tighten)

Note: The load sensor block is designed to be mounted to the dash-pot holes. The load sensor can be mounted to point its cable end either to the left or right of the plunger's point of contact. (In Sec 3.6, the image shows it to the right.)

3.8 Apply anti-seize compound to the threads and install the plunger by threading it into the dash pot piston hole on the bottom of the front support arm assembly. Finger tighten. Do NOT use a wrench.

3.9 Leave the front support arm resting on the shipping bolt until you are ready to lower with the plunger to touch the load cell sensor, when you perform the calibration, as described in Section 9, of this manual.

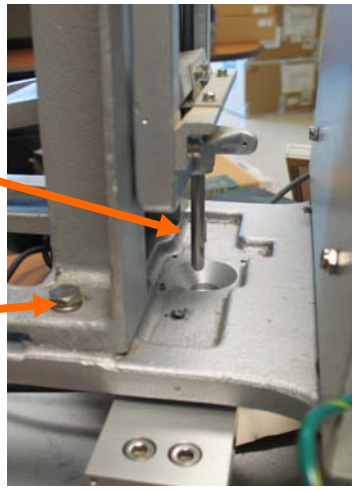
Shipping Bolt



3.10 The plunger must be centered in the hole in the base of the load cell assembly, as shown below. Lower the plunger by hand turning the shipping bolt until the plunger is ¼ inch above the load cell base flat metal surface. If the plunger is not centered in the hole, loosen the four scale support mounting bolts; shift the scale support around to center, and re-tighten the bolts after adjustment.

Plunger

Scale Support Mounting Bolt



4. Mount the Precip Recorder:

4.1 The Precip Recorder is integrated with a back-plate for easy mounting.

4.2 Completely remove the two 7/16 bolts from their support post holes.

43 Rest the Precip Recorder's flanges on the support stage where the paper recorder assembly was attached.

4.4 Locate the Precip Recorder's green grounding wire and position it over the left-side slot of the mounting flange.

4.5 Insert the 7/16 bolt into the left hole with the green grounding wire gripped under the head of the bolt, then tighten.

Support Post Bolt (left and right)

Insert the 7/16 bolt into the right hole and tighten.

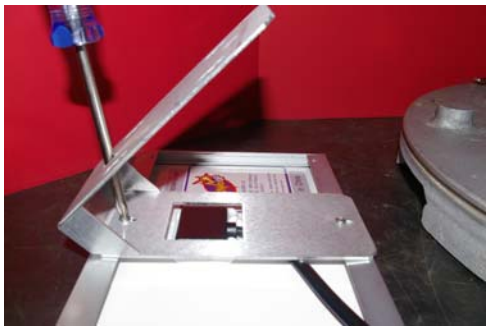
4.6 Locate the **Load Cell Cable** attached to the load sensor, and is light-gray in color. You will connect the six pin plug at the end of this cable to the bottom of the Precip Monitor at the black plastic grommet.

Load Cell Cable Grommet

4.7 The plug socket for the load cell cable is the second from the left on the bottom of the Precip Recorder. It is marked by the black plastic grommet. Plug the cable into the socket and then slip the cable's boot upward to cover the grommet.

5. Mount the Solar Panel:

5.1 Attach the mounting bracket to the back of the solar panel using the two screws provided in the Kit.



5.2 Thread the two hose clamps through the slots of the mounting bracket as indicated in the image.

5.3 Wrap each hose clamp about the horizontal pipe (or about the vertical pipe) taking note to orient the bracket so the solar panel faces up.

5.4 Feed the solar cable into the end of the pipe and push until the cable enters the F&P housing.

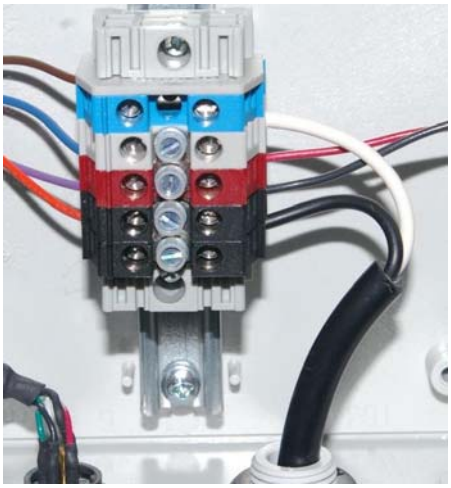
5.5 Find the free end of the solar cable inside the F&P housing, and notice white and black wires on the end. You will connect each wire to separate connections inside the junction box. You may now cut-off the excess cable from the supplied 15 foot length.

5.6 Feed the solar cable through the unused stuffing gland. Then insert the white wire into the white block, and tighten with a screw driver. Then insert the black wire into the black block, and tighten with a screw driver.

<u>Solar Cable Connections:</u>
White wire to white block
Black wire to black block.

5.7 Block connections defined, top to bottom:

1. Blue: not used
2. White: +12v, solar
3. Red: +12v, battery
4. Black: GND, battery
5. Black: GND, solar



6. Power-up System on 12V Battery:

6.1 Place the Battery on the base-plate, behind the Precip Recorder on a flat resting surface, for stability.

6.2 Extend the dark-grey battery cable through the last port on the right hand side. Insert the red wire into the red block, and tighten the set screw with a flat blade screw driver. Insert the black wire into the black block, and tighten with the screw driver.

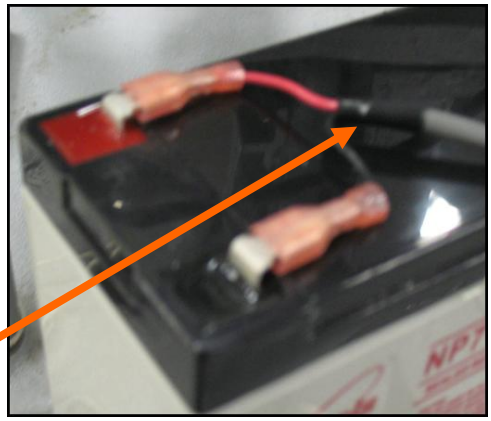
Refer to junction block definitions in Sec 5.7.

6.3 Plug the cable's red wire onto the positive, red-marked battery terminal. Then plug the cable's black wire onto the battery's negative terminal that is marked black.

red wire to (+) terminal

black wire to (-) terminal

Battery Cable



6.4 Immediately after the battery cable is plugged-in, the green vacuum fluorescent display will light-up. After a couple of seconds, the data readings will display. (text boxes, at right).

6.5 The FPR is now automatically taking measurements and logging data.

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FPR-D ASSEMBLY INSTRUCTIONS

PART THREE

INITIALIZE AND CALIBRATE FPR

INSIDE YOUR WFO

Scope of Part Three

- Verify/Update Logger Parameters……..……..….0.50 hours
- Calibrate the system…….……..…0.25 hours
- Generate a Log File/ Laptop Access……..…0.50 hours
- CSSA Metadata Requirements……..0.25 hours

PART THREE: INITIALIZE AND CALIBRATE FPR INSIDE YOUR WFO:

In this part you will enter default settings for the FPR-1 and then calibrate the sensor.

To edit characters you access the appropriate menu, press SET, then repeatedly press either the Up-Arrow button or the Down-Arrow button to scroll through numerals 0- 9, alphabet A-Z, and a blank space character until you arrive at your designated character. Next, move the cursor to the right with the Right-Arrow button to advance down the line, and then repeat the process of repeated Up-Arrow and Down-Arrow scrolling. When you have completed the whole line, press the SET button to save it permanently.

7. INSTALL THE COOP SITE NUMBER (I,e., 41005678) AND SET TIME:

7.1 Determine the COOP site number you are to install in this FPR rain gauge:

From the Home Menu where the parameter 'Precip' appears above the date and time, Press the (down-arrow button) six times to reach the final menu that is the Station Name and Time menu (Table 6.1).

```
Station 99009999
2999/99/99    99:99:99
```

Press the SET button once and it will prompt you to change the 99009999.

Enter the two digit state code (i.e., 41 for Texas), then retain the two zeros (i.e., 00), and then enter the four-digit site identifier (i.e., 5678).

Press the SET button again.

7.2 You will be prompted to update the Date and Time to the local standard time.

```
Station 41005678
2999/99/99    99:99:99
```

Set the local standard time by pressing the Right-arrow button repeatedly until the cursor advances to the hour, minute, and seconds location. The cursor will blink to accept your selection. Press the Down-arrow button to decrease; and the Up-arrow to increase the numerical value of the hour, minute and second field. You must always press SET for each of the numeric characters one step at a time.

Caution: The date and time format is always, **Year/Month/day Hour/Minute/Second**. The Precip Recorder will accept any numbers in any position, but unless you follow the YYYY/MM/DD date, and HH:MM:SS time; the Precip Recorder's date/time stamps will not increment correctly, and the data will be useless.

Press the up-arrow button to increase the numerical digits and the SET button to select

that numeral. Press the right-arrow button to advance to the next character in the date field.

Note: Ensure you have a wrist-watch or chronometer in the forecast office that gives the current time to within 30 seconds. Try United States Naval Observatory's animated web-site: http://tycho.usno.navy.mil/simpletime.html .

When completed the Station Name & Time menu should appear like this:

```
Station 41005678
2009/04/30    11:59:08
```

7.3. 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 -

Table 7.1 Default menus as delivered from NLSC.

8. CONFIRM SETTINGS AND DISABLE AIR TEMP:

In this section you will confirm the Factory installed defaults for the measurement of precipitation. The menu you will access is "Station Setup" it is the fifth menu of the seven primary menus listed in Table 7.1.

Familiarization with **Station Setup**: It has three sub-menus we consider as the 'second level.'

Measurement Setup>

Temperature Setup>

Other Settings>

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	Will vary, -2.4525017
		Offset	Will vary, -3.5502753
		Precip Right Digits	2
		Log Precip Details	Disabled
		Log Every Sample	Disabled
		Sensor Serial Number	-blank-
		Sensor Warmup	8000 ms
	Temperature Setup	Parameters (7)	Air Temp: Disabled
	Other Settings	Parameters (7)	< set password >

Table 8.1 Default menu settings as delivered from NLSC.

8.1 Confirm Measurement Setup:

Confirm these settings by accessing the Measurement Setup menus (Table 7.1) 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.

8.1.1 **Automeasure Interval**
00:15:00

8.1.2 **Automeasure Time**
00:00:00

8.1.3 **Averaging Time**
2.000 sec

8.1.4 **Sampling Interval**
0 ms

8.1.5 **Slope**
-2.4525017

Acceptable range: -2.4 to -2.8.

8.1.6 **Offset**
-3.5502753

Acceptable range: -2.0 to -5.0.

8.1.7 **Precip Right Digits**
2

8.1.8 **Log Precip Details**
Disabled

8.1.9 **Log Every Sample**
Disabled

8.1.10 **Sensor Serial Number**

8.1.11 **Sensor Warmup**
8000 ms

8.2 Disable Air Temp: This parameter is not required by NWS, so please verify it is set to 'Disabled.'

From the home menu press the Down-Arrow button four times, to reach 'Station Setup' Menu.

Primary Menus	Second Level	Third Level	Required Details
Station Setup ►	Measurement Setup▼	Parameters (11)	See Sect 8.1
	Air Temp Settings ►	Air Temp Enable Disable	**Air Temp Disabled**
		Temp Rr	
		Temp A	
		Temp B	
		Temp C	
	Other Settings	Parameters (7)	See Sec 8.3

Table 8.2 Default menu settings as delivered from NLSC.

From the Station Setup menu, follow these procedures to disable the air temperature.

8.2.1 **Station Setup**
RIGHT shows details

From this menu, Press the Right-arrow button.

This gives you three options, 'Measurement Selection,' Air Temp Settings, and 'Other Settings.'

8.2.2 Press the Down-arrow button, once, to reach 'Air Temp Settings' menu

Air Temp Settings
RIGHT shows defaults

8.2.3 Press the Right-arrow button and display will respond, 'Air Temp Enabled.'

Air Temp Enabled
Enabled

Press the **SET** button to disable temperature – the SET button serves as a toggle switch.

8.2.4 **Air Temp Enabled**
Disabled

Ensure the word 'Disabled' appears, and then press OFF.

8.3 Set Password in 'Other Settings' Menu:

Primary Menus	Second Level	Third Level	Required Details
Station Setup ►	Measurement Setup ▼	*See Sec 8.1*	*Sec 8.1*
	Temperature Setup ▼	*See Sec 8.2*	*Sec 8.2*
	Other Settings ►	Station Name (SID) ▼	i.e., 41005678
		Password *(see 8.3.1)* ►	**SET: Enable Password**
		Log Daily Values	Enabled
		Baud Rate	115200
		SDI-12 Address	0
		Default Setup	*Wipes out your entries – be careful!*

Table 8.3 Default menu settings as delivered from NLSC.

8.3.1. Inside the 'Other Settings' menu, you are only accessing the Password (third level) menu, none of the other five menus.

Notice when you access the Password menu, you are given a dynamically changing option, three choices to take: Disable, Log Out, and Enable.

8.3.1 Display appears:

Password
Password Disabled

8.3.2 Display rotates to next,

Password
RIGHT: Log Out

8.3.3 Display rotates to next,

Password
SET: Enable Password

Press the SET to enable a password to be entered.

Note: Only use the password, FPRSUTRON, it is our NWS convention for this rain gauge.

8.3.4. Now type the word FPRSUTRON with Up-Arrow and Down-Arrow keys.

Password **FPRSUTRON**

8.35 Next time you enter this Password menu, you have two options: Log In or Log Out

Password **RIGHT: Log In**

Password protection will shield all the Measurement Setup details, including the numerous parameters you evaluated in Section 7.

Note: Calibration reset does not require a password.

Note: Once you set the password function, you can only de-activate it via the Laptop PC command line: > PASSWORD

8.4 Verify the Software Version Number:

From the menu home page as seen in Table 7.1. Advance down to Diagnostic menu.

Primary Menus	Second Level	Third Level	Required Details
Diagnostic ►	Two Point Calibration ▼	Instructions (3)	- not applicable -
	Precip Details ▼	Parameters (7)	- not applicable -
	Temp Details ▼	Parameters (3)	- not applicable -
	FpRain ver. 1.05 **Sutron Corp**	- none -	**FpRain ver. 1.05** **Sutron Corp**

Table 8.4 Default menu settings as delivered from NLSC.

9. Calibrate the System: *(Perform these Tasks in Your WFO)*

The calibration is dependent on the bucket you use. If you did not retrieve a bucket from the field that you plan to marry to this particular FPR rain gauge, for permanent use, then you will have to conduct an on-site calibration using the bucket to be used permanently at that site.

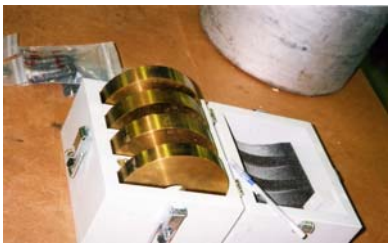
9.1 Calibrate FPR-D System: Use the Precip Monitor's keypad and the F&P brass weights.

a. 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.**"

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

c. 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.

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



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

f. 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.

g. 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.

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

i. The displayed value of **Slope** must be in the range: **-2.2 to -2.7**… <u>and</u> the displayed value of **Offset** must be in the range: **-2.0 to -5.0.**

Note: The Offset is the weight of the bucket/weighing mechanism converted to the equivalent weight in inches of water.

j. If the displayed values of Slope and Offset are in their ranges, press SET button.

k. 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.

l. The sensor displays the last measurement using the new slope and offset. The calibration 'Slope' and 'Offset' are stored in 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.

9.2. Verify the Calibration with the Precip Display:

With the plunger resting on the load cell and the weight of the empty bucket assembly on the load cell, call up the precipitation display by pressing any button.

Verify the Precip reading shows "0.00" in the display window. It should be within ± 0.2 inches. If not within this range, then redo the calibration as instructed in Section 9.1.

Next, place the equivalent weight of 15 inches of precipitation into the weighing bucket. Use the same three large brass weights (4111) as used to set the scale in Section 9.1.

Verify the Precip reading shows "15.00" in the display. It should be within ± 0.2 inches. If not within the above range, redo the calibration as instructed in Section 9.1.

9.3 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 ±0.2 inch of 15.0 inches you need to understand why and by how much Slope and Offset changed.

10. Confirm your Settings with Laptop: *(Perform this task in your WFO)*

This requires a computer with a terminal emulation program such as ProComm or HyperTerminal. It also requires a PC data cable with a straight through (not null-modem) 9-pin male end to connect to the data logger and an appropriate sized end-plug (i.e., female socket) to plug into the serial port of the laptop.

Locate the Precip Recorder's serial port.

Remove the cap from the port.

10.1 Plug in a Serial cable to the Precip Recorder. Connect the other end of this cable to your Laptop PC.

10.2 Set up your laptop's HyperTerminal program.

From the Windows desktop, click on the **Start**, tab; then click on Programs; Accessories, Communications; and finally click on the '**HyperTerminal**' tab.

You will be prompted to enter a **name** for the connection, (e.g., FPR_Link). Also select an **icon** . Then click on the **OK** tab.

At the 'Connect To' prompt select **COM1** and Press OK.

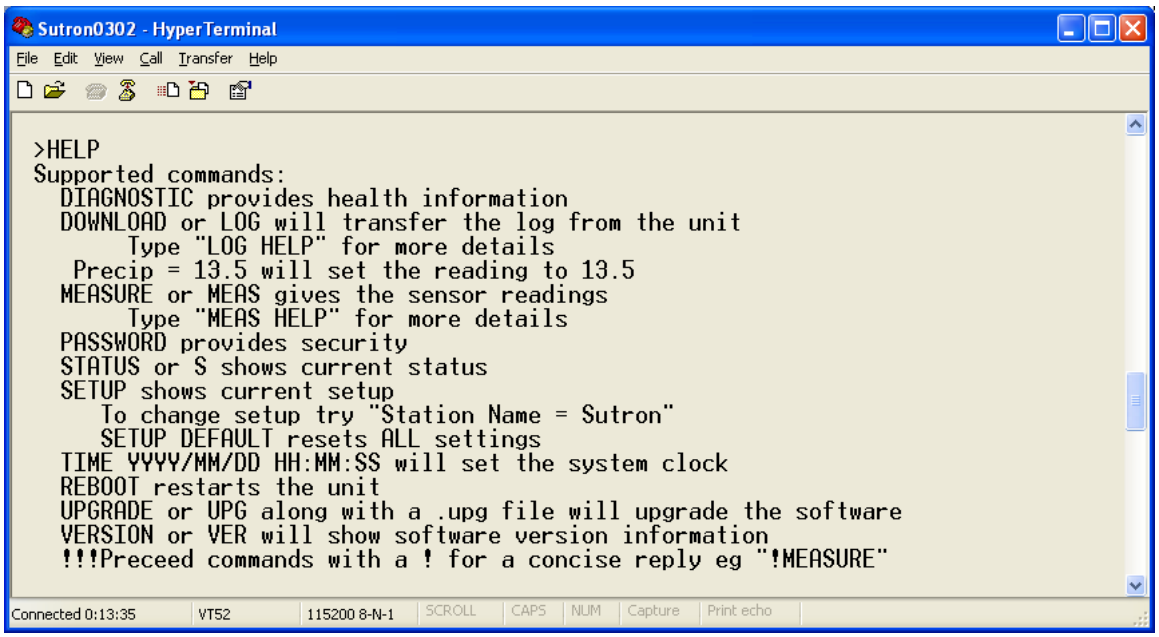
Enter the following Port Settings:

Baud rate: **115200** bits per second.
Data bits: **8 .**
Parity: **none .**
Stop bits: **1 .**
Flow Control: **Hardware .**
Press OK.

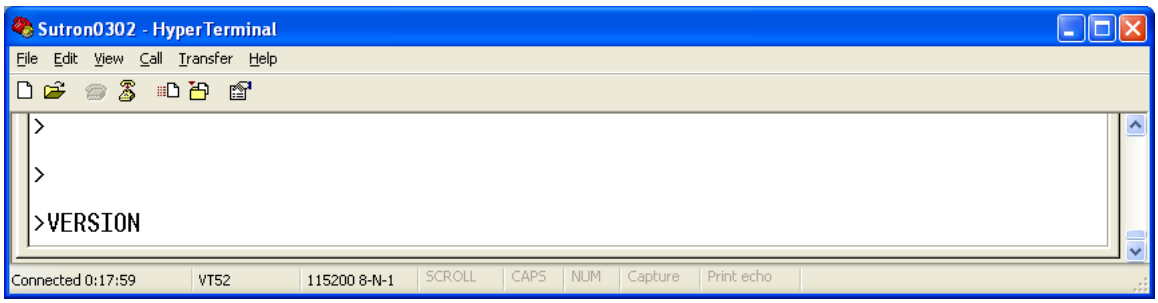
The HyperTerminal screen will appear and you will be connected to COM1.

Press the **Enter** <**return**> key, to activate the cursor in HyperTerminal screen.

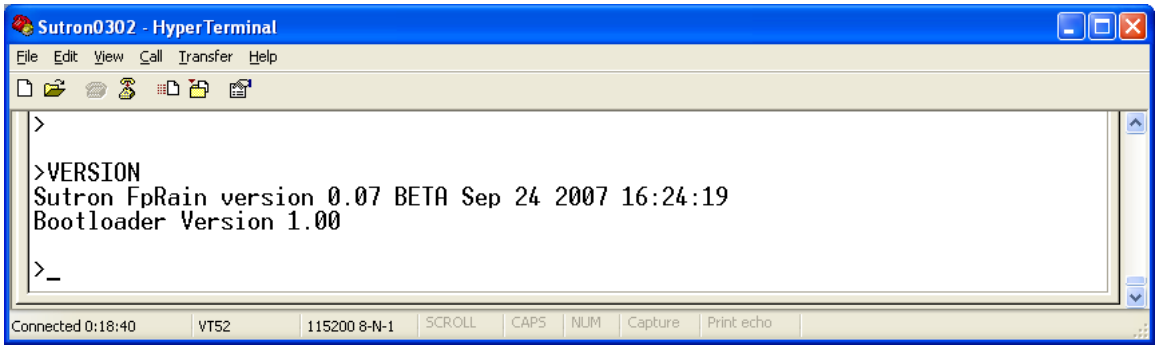
Then type '**HELP**' and press <**return**> key, to display the command options as shown in this figure, below.



10.3 Check the Software Version Number: Type the word '**VERSION**' on laptop.



Press the <**Enter**> key.



Compare this information with what you saw in the Precip Recorder display (Sec 8.4). See how this response in the PC display is slightly more elaborate.

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.

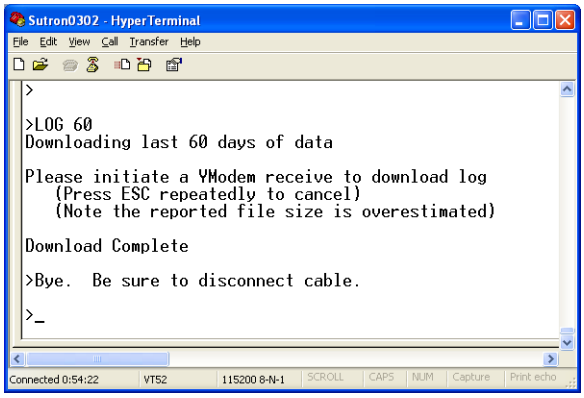
This FPR firmware is standardized and configuration controlled. No one has authority to change the data logger configuration software without the express and written direction from the W/OS7, the Surface Program Office of the NWS.

The FPR data logger will produce two types of measurement by default: the precipitation level and battery voltage. While the logger is capable of temperature sensor input, the FPR-1 will not be configured to input the MMTS thermistor readings.

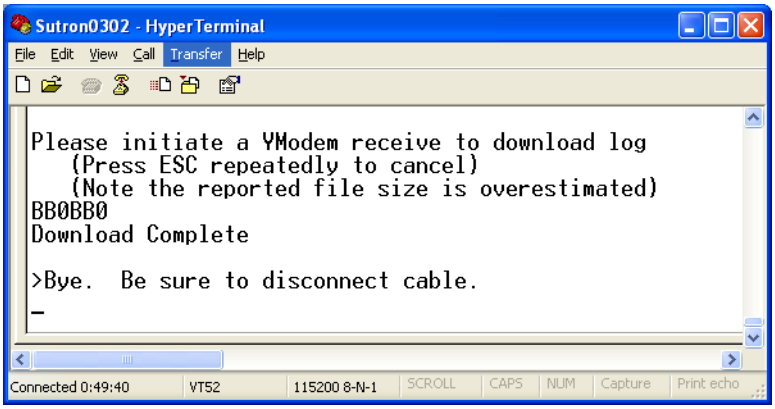
As of 2009, with the initial FPR kit deployments, only the precipitation data is certified for operational use. In the future, if a temperature sensor becomes certified for use, updates will be given to the NWS field offices to install configuration software.

10.4 Transfer Data File via YMODEM to your Lap-top PC:

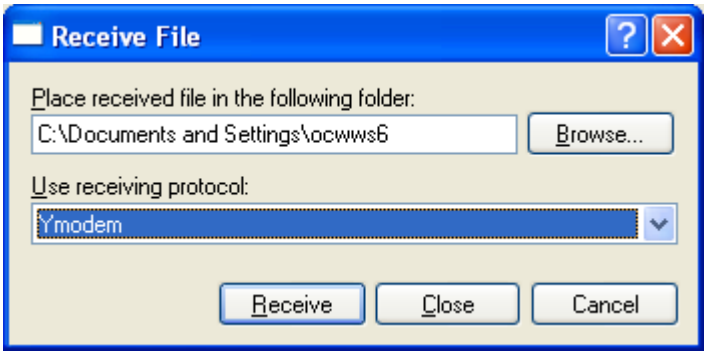
10.4.1 Type **LOG 60** to download the last 60 days of data stored in this logger.



10.4.2 System responds “Please initiate a YModem’ to download the log.



10.4.3 Click on the drop-down menu and select Ymodem from the choices (figure, below).

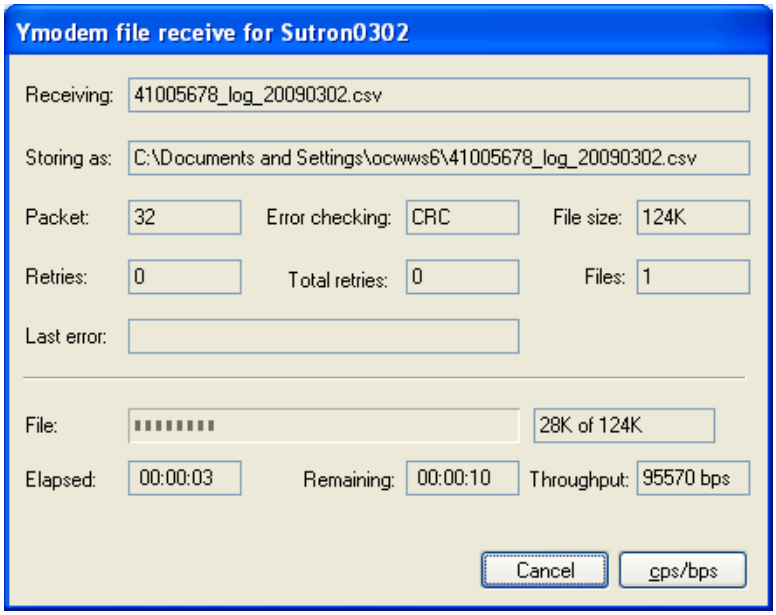


10.4.4 Then, locate the ‘Transfer’ tab on the Menu Bar at very top of the window, on the control bar, and select ‘**Send File.**’

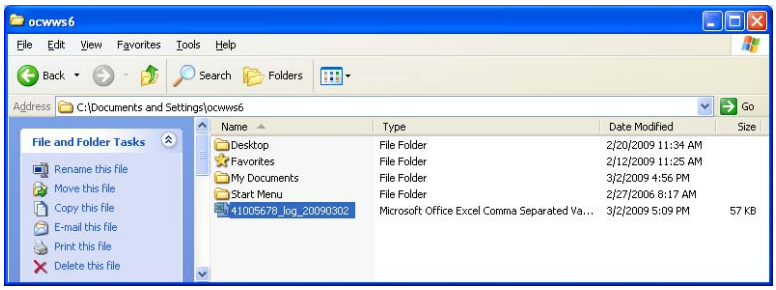
<u>Caution:</u> Always use: "*Send File.*" Do not use '*Send Text File*'.

10.4.5 The Precip Recorder will send the CSV file you just created several minutes ago when you commanded from the Laptop, the dlast 60 days of data to be downloaded.

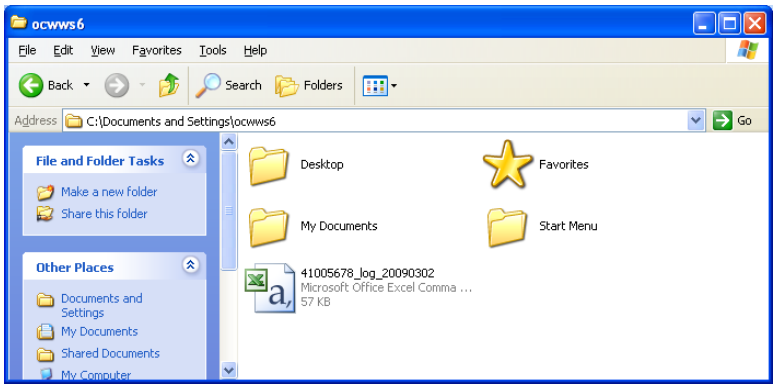
10.4.6 Note the filename is automatically assigned to the CSV file, note the small size of the file, and make a written note the name of your Laptop windows directory and folder where this CSV file is being stored.



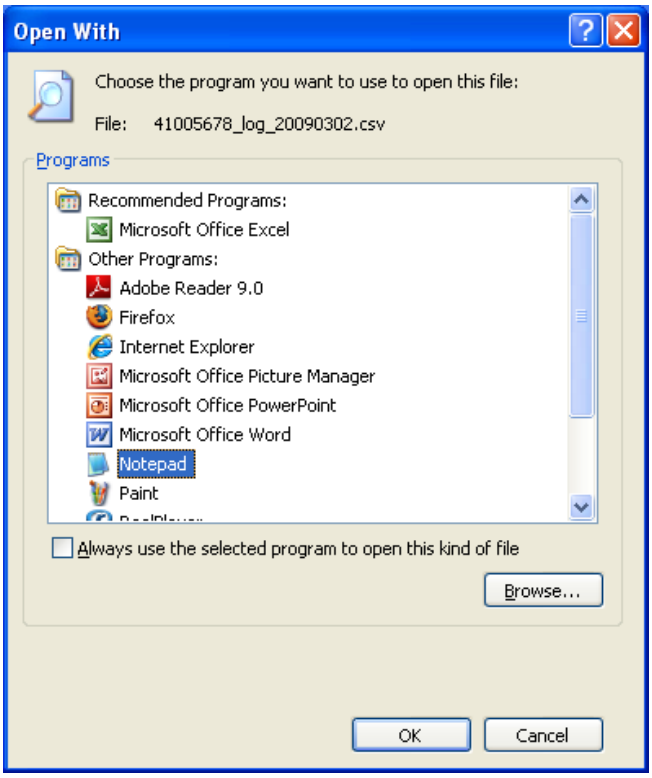
10.4.7 Retrieve your CSV file by navigating with Windows Explorer to your Laptop's root drive and directory – the one you assigned in the HyperTerminal screen (above).



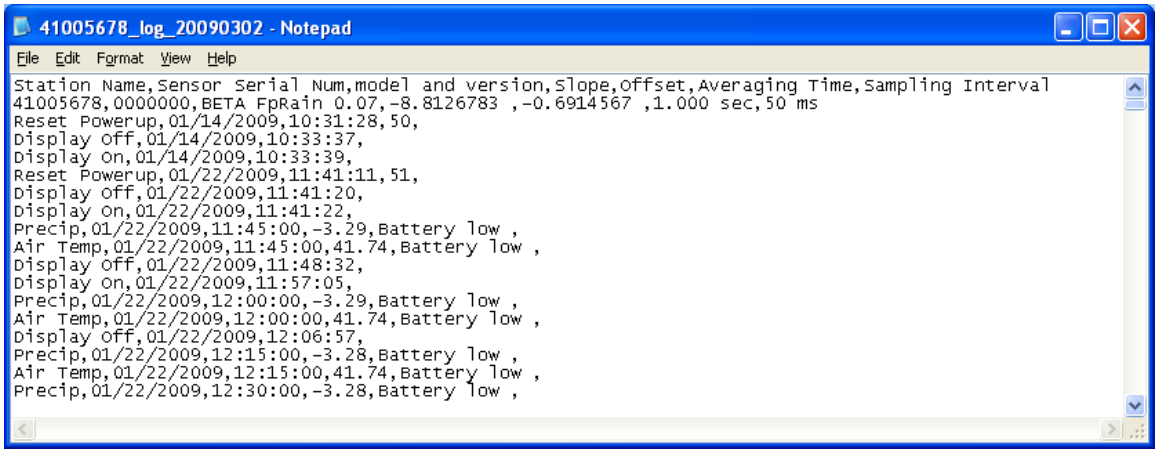
10.4.8 **Do not double click on this CSV file!** Notice the green XLS, comma separated value (CSV) symbol in the Windows panel below.



10.4.9 Next, choose the Notepad as the program to open the CSV file. Open and save the file in TXT format.



10.4.10 View your 60 days of logged data and status messages:



10.5 Verify Data Logging with Laptop PC:

Scrutinize the first two lines of the log you saved to Notepad file in Sec 10.4.

Does the log show the correct COOP station number for where the unit will be deployed?

Does the log show the correct software version, Slope, Offset, Averaging Time, Sampling Interval?

On the third line of the Notepad file, does the log show the correct month/date/year, and the correct Standard Time hour and minute?

Does log include comments such as 'Display On,' 'Display Off,' 'Setup Change,' 'Before Cal,' and 'After Cal.'?

Does the log exclude Air Temp? It should not appear because you disabled it.

If YES to all the above, then the FPR is logging data properly and you have completed the verification of data logging.

10.6 Verify Memory Card / Download Operation:

With the keypad display active, insert a Memory Card into the Precip Recorder's port.

Watch the display for indication it has recognized a memory card inserted.

Verify the display prompts with: "Download log to card" and "SET downloads"

Scroll with Down-arrow button until you reach "Select download type" "Last # Days"

Press the SET button. Notice the trailing '0' is blinking in the numerals "0060"

Press the SET button to perform the copy of the sixty-day log.

Watch for rapidly updating numerals in the keypad display – this indicates download has started.

Verify the display reads "Download Complete 41005678_log_20090209" (i.e., it should give the COOP station number you entered.)

Eject the Memory card.

Note: Realize that without any memory card involved, you can still download the last 60 days via Laptop PC, when you enter the command >LOG 60 . However, data records will never appear in your HyperTerminal's command screen, rather you must YModem transfer which generates a closed data file.

10.7 Verify Date/Time (YYYY/MM/DD HH:MM:SS):

With the Laptop PC, access the TIME command, to verify the current time is accurate to plus or minus two minutes.

Enter command: > TIME

If you need to correct it to Local Standard Time (i.e., never Daylight Time) then enter the following with Laptop PC.

> TIME YYYY/MM/DD HH:MM:SS

Caution: Always remember this format must be obeyed: YYYY/MM/DD HH:MM:SS!

Realize you can always reset the system clock at the Precip Recorder, via the primary menu, 'Station Name & Time' and simply press SET button, advance the character position with Right-arrow button, and select numerals by scrolling through the Up-arrow and Down-arrow keys. Finally press SET when you are done.

10.8 Verify Precipitation Units:

With the Laptop PC, enter the command: > SETUP and then select

Ensure the value is "2" for the hundredths place.

11. Transfer Data File from Memory Card: *(Perform this Task in the WFO)*

11.1 Test the Memory Card Reader:

Each forecast office will purchase a suitable commercial-off-the-shelf product. At a minimum the Memory Card Reader must possess the standard SD memory card slot, and possess a suitable interface for the intended computer. If the intended computer will be a standalone laptop the standard USB interface is recommended.

Follow NWS policy on scanning removable media before use, and verify that "No Viruses Detected." Headquarters recommends MacAfee Active Virus Detection (AVD) software, together with the Federal Desktop Core Configuration (FDCC) installed on a PC running WinXP. The PC should have no internet connections whatsoever, be as devoid as possible of any extraneous applications software. In other words the PC should serve only one purpose, to scan external media for IT security risks.

First plug the memory card reader to the PC, and then insert the SD memory card you saved data to, into the memory card reader's slot. Next, conduct the MacAfee AVD scan of the memory card. Ensure the scan comes up "No Viruses Detected." This completes the virus scan of the memory card.

Then, open the MyComputer folder in the PC and select the SD card related drive. Double click to open the drive. You should see a green CSV file with a filename that contains the year-month-day on which you downloaded information to the memory card in Section 10.5. Open it with Notepad to view the contents of the CSV file. Do not double click on the file name or it will open in Excel and corrupt the file.

Here is a segment of a typical file:

```
Precip,08/14/2008,10:45:00,3.08,
Precip,08/14/2008,11:00:00,3.08,
Precip,08/14/2008,11:15:00,3.08,
Display On,08/14/2008,11:16:23,
Log Download,08/14/2008,11:17:14,0,
Display Off,08/14/2008,11:17:27,
Precip,08/14/2008,11:30:00,3.08,
Precip,08/14/2008,11:45:00,3.08,
Precip,08/14/2008,12:00:00,3.08,
```

If the Notepad file reveals the information you expect from the activities you conducted in the previous sections, then the memory card reader, has passed the operational checkout for use in monthly operations.

11.4 Download CSV File to NWS Workstation

On your NWS workstation, copy the CSV file into the sub directory marked C:\HPD\2009\MAY

Filenames are generated by the Precip Recorder and have the following format:

04001235_log_20090601.csv
SS00NNNN_log_yyyymmdd.csv

SS00: 04 is the station's state code per the CSSA Station ID Number convention (i.e., 04 = California) ***Cooperative Station Service Accountability (CSSA) Manual*** (NDS 10-1313), Table G-27. http://www.nws.noaa.gov/directives/010/010.htm

NNNN: 1235 is the station's alphabetically ordered COOP Station ID Number for that given State or Territory as issued by the National Climate Data Center (NCDC) as described by CSSA Manual (NDS 10-1313), Station Number, Section 2.4.1.2.

yyyy: 2009 is year 2009 when the file was downloaded to memory card

mmdd: 0601 is June 1st is the date when the file was downloaded to memory card

11.5 Viewing Data Files

Saved files may be accessed by opening the CSV file with Notepad using the Mouse right-button.

Notepad should open, displaying the selected file. An example is provided below.

```
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,
```

After you reset your Calibration, examine the log records, realize the old values are documented as 'Before Cal,' and the new values are documented as 'After Cal,.'

```
Precip,08/12/2008,14:00:00,3.08,
Precip,08/12/2008,14:15:00,3.08,
Precip,08/12/2008,14:30:00,3.08,
Display On,08/12/2008,14:43:40,
Setup Change,08/12/2008,14:43:42,
Before Cal,08/12/2008,14:30:00,3.0773,
After Cal,08/12/2008,14:43:42,3.0800,
Display Off,08/12/2008,14:43:55,
Precip,08/12/2008,14:45:00,3.08,
Display On,08/12/2008,14:45:18,
Display Off,08/12/2008,14:46:00,
Precip,08/12/2008,15:00:00,3.08,
Precip,08/12/2008,15:15:00,3.08,
```

SUTRON2_log_20080827.csv - WordPad

File Edit View Insert Format Help

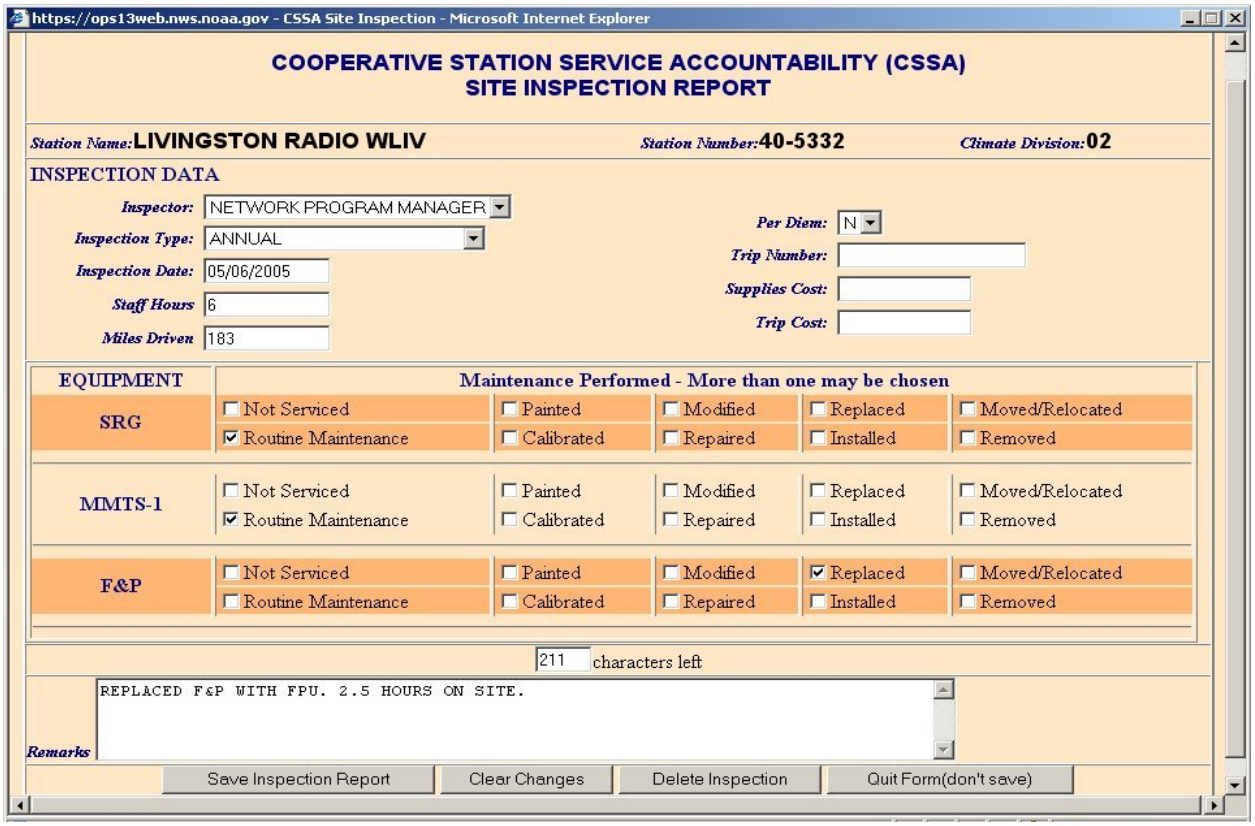
```
Station Name,Sensor Serial Num,model and version,Slope,Offset,Averaging Time,Sampling Interval
SUTRON2,7050030,FpRain ver 1.01,-2.4657340 ,-3.7107741 ,2.000 sec,0 ms
Time After Change,07/01/2008,10:33:50,267875280,
Precip,01/05/2000,01:00:00,33.09,Missing samples ,
Air Temp,01/05/2000,01:00:00,160.46,
Batt Voltage,01/05/2000,23:59:59,12.8,
Hardware Fail,07/01/2008,10:35:49,Strain Gauge Fail,
Hardware Fail,07/01/2008,10:37:10,Strain Gauge Fail,
Display Off,07/01/2008,10:42:04,
Precip,07/01/2008,10:45:00,-10000.00,Sensor failure Missing samples ,
Air Temp,07/01/2008,10:45:00,160.19,Sensor failure ,
Reset Powerup,07/01/2008,16:10:50,2,
Hardware Fail,07/01/2008,16:10:56,Strain Gauge Fail,
Time Before Change,07/01/2008,16:11:08,
Time After Change,07/01/2008,16:11:30,22,
Reset Upgrade,07/01/2008,16:12:16,1,
Hardware Fail,07/01/2008,16:12:18,Strain Gauge Fail,
Precip,07/01/2008,16:15:00,0.00,
Reset Powerup,07/01/2008,17:07:05,3,
Hardware Fail,07/01/2008,17:07:08,Strain Gauge Fail,
Slope Before,07/01/2008,17:10:38,1.0000,
Slope After,07/01/2008,17:10:38,132.6810,
Offset Before,07/01/2008,17:10:38,0.0000,
Offset After,07/01/2008,17:10:38,1.8548,
Setup Change,07/01/2008,17:10:38,
Precip,07/01/2008,17:15:00,23.84,
Precip,07/01/2008,17:30:00,24.28,
Precip,07/01/2008,17:45:00,24.52,
Precip,07/01/2008,18:00:00,24.64,
Precip,07/01/2008,18:15:00,24.64,
Precip,07/01/2008,18:30:00,24.57,
Precip,07/01/2008,18:45:00,24.50,
Precip,07/01/2008,19:00:00,24.42,
Precip,07/01/2008,19:15:00,24.34,
Precip,07/01/2008,19:30:00,24.29,
Precip,07/01/2008,19:45:00,24.24,
Precip,07/01/2008,20:00:00,24.23,
Precip,07/01/2008,20:15:00,24.18,
Precip,07/01/2008,20:30:00,24.13,
```

For Help, press F1 NUM

12. Metadata Requirements on FPR Implementation:

12.1 Create a CSSA Site Inspection Report:

When you have completed the FPR site installation 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 total hours of work and total dollars of expense you incurred to install the FPR system.



Be sure to complete all these fields to account for your FPR installation work!

Inspector:…….. Network Program Manager
Inspection Type:…….. Annual
Inspection Date:…… 09/06/2009
Staff Hours:…….. 6
Miles Driven:…… 183
Per Diem:…….. N
Trip Number:…… 2WT0B3804&05
Supplies Cost:…… 75.50
Trip Cost:…….. 113.75

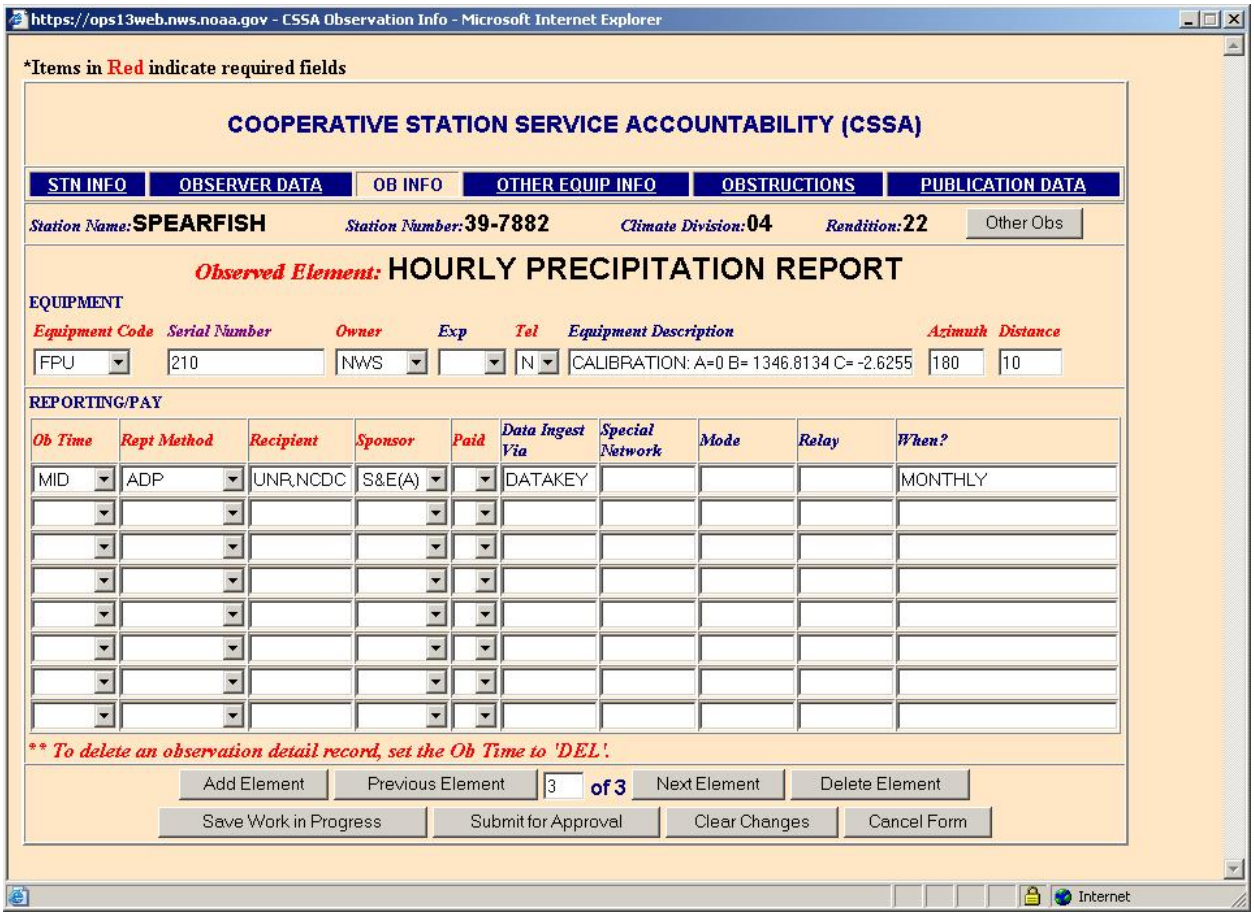
Be sure to mouse click the Equipment category F&P under Maintenance Performed. Finally, in the bottom of the CSSA Site Inspection Report, in the free text field, always remember to write in the following information: "**Replaced F&P with the FPR-D. "**

"Installed the FPR-D Gauge with Memory Card on Sep 6, 2009, serial number "8061477"

Note: These values are for example only, and will differ for each FPR-D system.

12.2 Update the B-44 for FPR Equipment:

Access and print a copy of the ***Cooperative Station Service Accountability (CSSA) Manual*** (NDS 10-1313), effective date, March 18, 2005, for current policy on B-44 updates. Access: http://www.nws.noaa.gov/directives/010/010.htm .

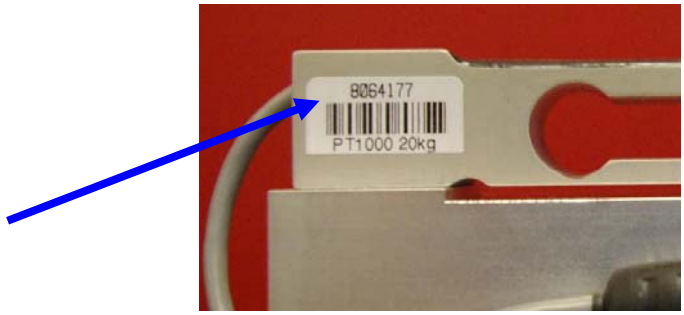


Make the following changes in the Station Information Report (B43):

1. ***Equipment Code***, enter '**FPR-D'**, this replaces, F&P.

2. ***Serial Number*** (see, above example) enter the Load Cell's serial number (i.e., 8064177).

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.



Serial Number
i.e., 8064177

3. ***Equipment Description*** enter text "**FPR-D GAUGE WITH MEMORY CARD**".

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

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

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

7. ***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.

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

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

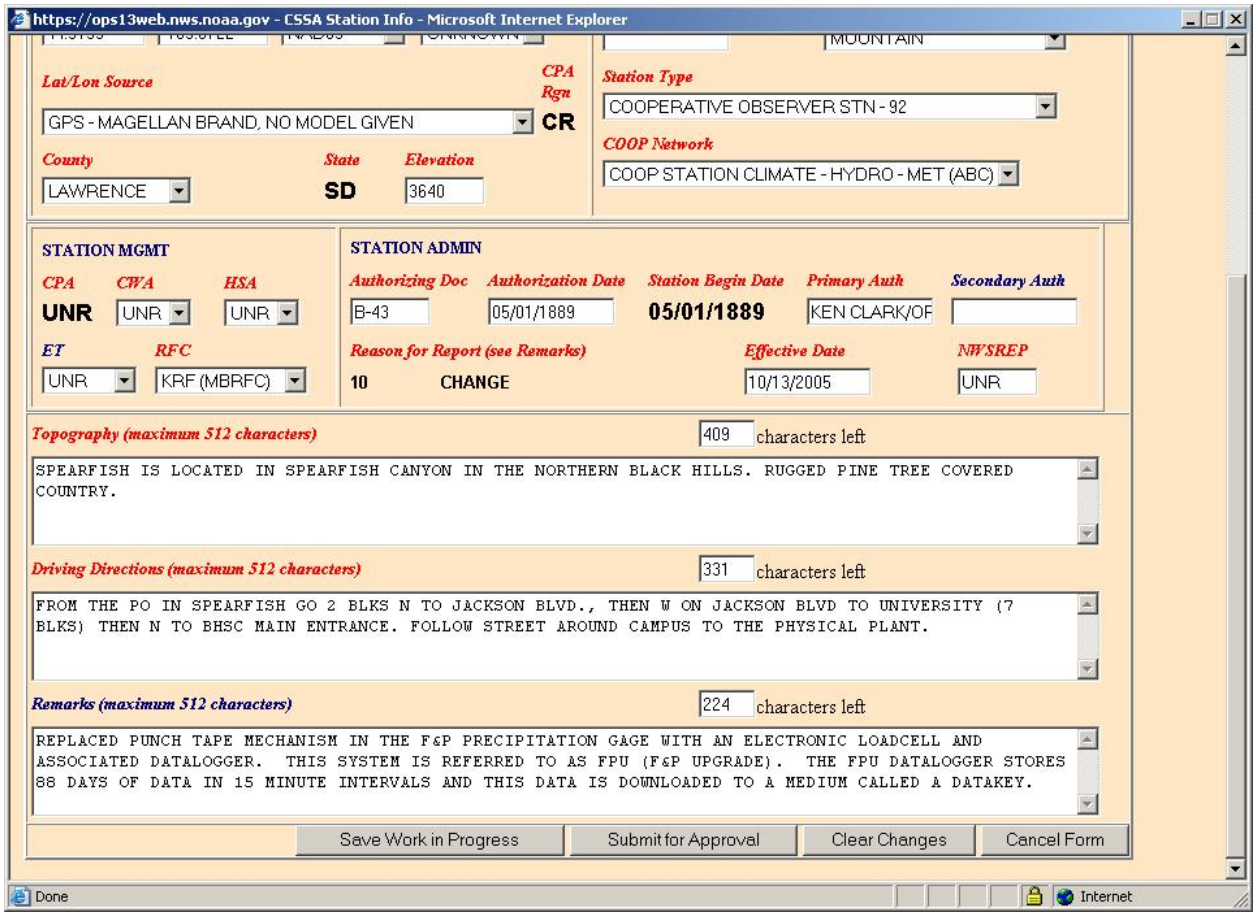
10. ***Mode***, default is a 'blank' field.

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

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

12.3 Update the Remarks Section, B-44:

Before submitting the revised B-44 to NCDC, ensure you have updated the Remarks section to state, "**Updated equipment, changed F&P to FPR-D.**" See figure, below.



References: Access: http://www.nws.noaa.gov/directives/010/010.htm NDS 10-1313, ***CSSA User 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 User Manual***, Sec 2.4.3.7, Equipment Description, (p. C-54).

12.4 FPR Logbook – A Backup to CSSA Metadata:

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 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.

FPR-D ASSEMBLY INSTRUCTIONS

PART FOUR

TRANSPORT THE FPR TO OBSERVER'S SITE

Scope of Part Four

- Enclose gauge in its Casing Shell……..…0.10 hours
- Package battery, solar panel, and Precip Recorder….……..….0.25 hours
- Place Gauge and Parts into Truck/Van…….……..…0.25 hours
- Unload Gauge and Parts from Truck/Van…….0.25 hours

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PART FOUR: TRANSPORT FPR TO OBSERVER'S SITE

13. Pack the FPR Assembly and Battery into Truck/Van: *(At your WFO)*

13.1 In the WFO, remove any test weights from the bucket and remove the bucket from the force post. The FPR weighing assembly needs to be open and accessible for you to adjust the shipping bolt and secure the parallel arms.

13.2 Secure the FPR gauge for the road trip to Observer's site. You need to block the plunger so it does *not* get closer than one quarter inch above the load sensor. There are two bolts on either side of the plunger: the shipping bolt (the longer of the two), and the lower limiting screw. Raise the shipping bolt's height by threading it upward so as to prevent the plunger from hammering down on the load cell. Ensure that this action definitely results in a ¼ inch vertical gap between the plunger and the load cell beam. Then, lock it in position using the lock nut, underneath.

13.3 To ensure the flexures are protected, you may block or tape the movable end of the parallel arms so they can not move or bounce in transit. The upper-rear horizontal flexure is most susceptible to bending. In this way the parallel arms will stay firm against lateral and vertical forces.

13.4 Disconnect the solar panel from its mounting on the outrigger. Next, disconnect the wire leads off the 12V battery terminals and secure the battery.

Securing FPR for Road Trip	**Methods**
Solar Panel	Dismount the Solar Panel from the outrigger pipe and wrap it in protective cardboard, or newspaper. Leave the cable connected to the Precip Monitor. *(If cabin space is limited, remove the outrigger pipe from base plate.)*
CAUTION: Always disconnect the solar panel before disconnecting the battery.	
12V Battery	Remove the four pound 12V battery from the inside of the gauge, and secure it separately in a box outside of the F&P shell. Cover the terminals with plastic protector caps to prevent shorting.
CAUTION: https://www.ops1.nws.noaa.gov/Secure/SAFETY/Safety_manual.htm Read the safety pre-cautions for handling a sealed lead-acid 12V battery.	
Shipping Bolt	Make sure it is threaded upward, raised, and in full contact with the plunger at a safe height, about ¼ inch above the metal bar of sensor.

13.5 Hand-carry the FPR assembly (attached to its base plate and enclosed in its casing) to the truck/van with a second person. Be aware of this assembly's heavy weight. Set it down

gently onto the floor of the truck/van and if possible, anchored, or snugly fitted between boxes to prevent toppling.

13.6 Place the 12V battery, solar panel, Precip Recorder, and tool kit in separate boxes and surrounded with packing material (i.e., newspaper, Styrofoam, or cardboard) to prevent contact and surface damage.

13.7 Finally, place the collection bucket and its force post into the truck/van and secure it from sliding or toppling.

13.8 Observer site installation does not require any extraordinary tools. Items needed for installation and checkout include a printed copy of this ***FPR Assembly Procedures***, the and common SAE standard size hand tools such as screwdrivers (Phillips and slotted blade), open end wrenches and Allen wrenches, and the F&P calibration weight set (D111C-TE500) and a multi meter (voltmeter).

Refer to the Checklist of parts and tools on pages 8 and 9, in Section 1 of this manual.

14. Unload FPR Components from Truck/Van: *(At COOP Observer's Site)*

14.1 At the Observer's site, unload these components in the following order: the tool-kit, bucket, force post, solar panel, FPR assembly, data logger (Precip Recorder), and the 12V battery. Set these components on a clean and level surface that will not interfere with the Observer's work place or access to residence.

Re-inspect the shipping bolt/lower limiting screw to ensure it continues to separate the weighing arm and plunger assembly by at least ¼ inch, with a visible gap above the load sensor's contact ball.

Re-inspect the FPR assembly's flexures.

Note: The Observer's F&P you are about to remove will become the next gauge you modify and deliver to the upcoming site on your FPR deployment list. This efficient method results in a site-by-site rotation of the F&P gauges.

FPR-D ASSEMBLY INSTRUCTIONS

PART FIVE

INSTALLING THE FPR AT OBSERVER'S SITE

Scope of Part Five

- Remove Observer's F&P for retrieval……0.50 hours
- Install the FPR to Observer's pedestal……...0.25 hours
- Mount the Solar Panel and Power 12V…….……..0.25 hours
- Check the Calibration……..0.25 hours
- Train Observer…….……....0.50 hours

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PART FIVE: DISMOUNT F&P AND INSTALL FPR GAUGE AND CHECK-OUT FPR:

15. Dismount Legacy Rain Gauge from its Pedestal: *(At Observer's Site)*

This section 15 deals with the removal of a legacy F&P rain gauge from an observer's site and securing it inside your truck/van for transport back to your forecast office.

15.1 Remove the conical hood by grasping each of the two large white handles. Remove the bucket. Drain the bucket before proceeding. Remove the bucket.

15.2 Directly under the containment shell (white cylinder with service door), view the base plate's circumference where the rim of shell sits. Notice there are two large indentations in the dark gray metal circumference. These are the grip locations for removal.

Remove the containment shell by grasping the bottom edge of the shell with both hands, in the two locations noted above. Slowly raise the shell, exactly vertically, to clear the F&P weighing mechanism.

15.3 Secure the F&P weighing assembly for the road trip back to WFO. Install the code-disk locking device. You may use a pair of alligator clips placed on each side of the code disk pointer to secure the disk. Next, rotate the zero adjust knob (located at the top of the weighing assembly) clockwise until the top of the 'upper main spring hook' is flush with the top of the knob. See code-disk: http://www.srh.noaa.gov/ohx/dad/coop/f-p_images

15.4 At the bottom of the weighing scale, just above the paper supply spool, on either side of the dashpot, notice there are two bolts that rise through the stage plate on each side of the plunger. One is the lower limiting screw and the other is the shipping bolt, and both work to block the plunger's downward travel. Raise the shipping bolt (the longer of the two) so there is ½ inch gap above the dashpot. Also, raise the lower limiting screw by ½ inch for backup. Then lock each bolt into position, using the lock nut underneath the stage plate.

Caution: The upper-rear horizontal flexure is the one most susceptible to bending. To protect all the flexures, you may block or tape the movable end of the parallel arms so they can not move or bounce in transit. In this way the parallel arms will stay firm against lateral and vertical forces.

Finally remove F&P punch block mechanism together with the circular base plate. With a second person lift the base plate and set it onto a smooth and clean surface. Later, after you have installed the FPR system you will load this F&P assembly into a cardboard box and set into your truck/van.

Note: Do *not* split apart the F&P punch block assembly at Observer's site. Bring it back to the WFO and there disassemble it according to the instructions in section 2, of this *FPR Assembly Procedures*.

16. Install the FPR Assembly to Pedestal: *(At Observer's Site)*

16.1 With a second person, carry your pre-assembled FPR gauge to the mounting pedestal where you just removed the legacy F&P. Inspect the triangular foundation plate and clean about the bolt threads if needed. Set the FPR gauge assembly's circular base plate onto its triangular plate and fasten the bolts loosely. You will tighten them by wrench after you inspect the top of the gauge hood with a carpenter's level for horizontal trueness.

16.2 Place back the containment shell you removed in Section 15.2. Carefully and slowly lower it down about the FPR weighing assembly until it fits into the groove of the base plate. Then rotate the casing shell until it slides onto the two metal locking tabs. Mount the force post, mount the bucket onto the force post, and mount the conical hood on top of the containment shell. Ensure the hood is fully seated.

16.3 With a carpenter's level, selectively tighten the three pedestal bolts to ensure the rain gauge is seated level. Tighten bolts. Then remove the conical hood and the casing shell to access the FPR load cell. Leave the force post and bucket attached.

16.4 **Note:** At this point the FPR load sensor is still in its travel-safe position from the road trip. Be careful not to bump the gauge during the following steps – the load cell is very sensitive. If it is windy, install the conical hood. If it is very windy, install the conical hood with its funnel attached.

16.5 Cut away any safety tape you had wrapped about the parallel arms to protect the flexures.

16.6 With the bucket still empty, lower the shipping bolt so that there is a visible gap (¼ inch) between the top of the bolt and the bottom of the FPR support arm (i.e., standard operating position). Verify that the FPR plunger is touching the load cell beam by visually confirming there is a ¼ inch gap above the shipping bolt.

17. Mount the Solar Panel: *(At Observer's Site)*

17.1 The new solar panel is mounted to the same outrigger pipe as the old solar panel. Make sure that the solar panel faces due South and is not shaded by trees or other obstructions.

Caution: THE PANEL MUST NOT BE SHADED! If any portion of the solar panel is shaded, the panel could effectively shut down and not deliver any real power to the application. The solar panels we use are made 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 panel where it will be fully in sun, not in a fringe area under trees or potentially in the shadow of an instrument tower, utility poles, power lines, phone lines, cable lines, antenna masts, or even guy wires. Problems have been reported where construction or farming resulted in a lot of dust on the panel (charging always got better after a good rain!). Please instruct the Observer to inspect and clean the panel on an 'as needed basis.'

The FPR Kit comes with a 15 ft 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.

17.2 The supplied solar panel has a fixed angle mount. Just aim the panel south.

18. Install the 12V Battery: *(At Observer's Site)*

18.1 Place the 12V battery on a flat portion of the base plate behind the load cell sensor.

18.2 Attach the battery cable leads to the battery terminals. See the position of battery terminals, positive and negative, in the photo at right.

red wire to (+) terminal

black wire to (-) terminal

18.3 At this point the12V battery is connected and the system is powered on.

Immediately after the battery cable is plugged the Precip Recorder's display will light-up and display the readings.

The FPR is now automatically taking measurements and logging data.

19. Check Solar Charging of Battery: *(At Observer's Site)*

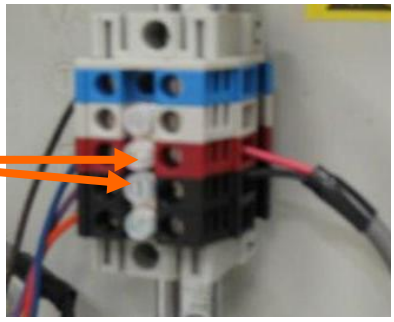
19.1 Ensure the solar panel you mounted in Section 17 is receiving full sun. The panel is generating 12V and should be reaching the junction box inside the Precip Recorder.

19.2 Open the latches of the Precip Recorder and disconnect the white wire of solar cable from the terminal block.

19.3 Measure the voltage between the white wire and the black wire of the solar cable. In full sun it should be above 14V.

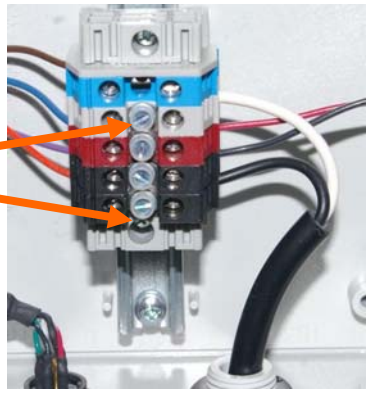
19.4 Measure the battery voltage across the red and black terminal blocks. A fully charged battery should be around 12.6V.

Touch multi meter probes here.



19.5 Now reconnect the white wire from the solar panel to the white terminal block and again measure the voltage coming from the solar panel – it should now equal the battery voltage.

Touch multi meter probes here.



19.6 If it was higher than the battery voltage when un-connected and drops to battery voltage when connected, then the solar panel is providing current to the battery.

20. Check Calibration with Brass Weights: *(At Observer's Site)*

20.1 Use your carpenter's leveling beam (approximately 18 inches long) and span it across the top of the collection bucket. Use the carpenter's level to support one, two, or all three of the brass weights while you take your calibration check measurements.

20.2 Wake-up the display and take a reading of **`Precip:`**. Write down this 'level' value.

20.3 Then place one, two, or three large brass weights (4111g each) on the carpenter's level. See the photo, right. This way you keep the brass weights dry!

20.4 Now take the new reading of **`Precip:`** with the weights applied. Write down this weighted **`Precip:`** value.

20.5 Subtract the value taken in 20.2 from that taken in 20.4. Does the difference sit within the Cal-Check Table's acceptable ranges according to the number of the brass weights you have in or on the bucket.

20.6 If the difference falls into the acceptable range (Cal-Check Table), the calibration check produced 'good readings.' Now enter 'Cal Check – Good Readings' to the Log Sheet. If a Cal Check difference fails to come into acceptable range (Cal-Check Table) conduct a calibration reset as described in Section 9 (pp 28-29) of this manual. Then enter to your station inspection notes, 'Cal Check – Reset Performed.'

Cal-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”

Note: Always take the un-weighted measurement first, and then place the weight in /on bucket to get the weighted **`Precip:`** value.

20.7 Remove the weight(s) from the carpenter’s level. Then remove the carpenter’s level.

20.8 If this is a semi-annual visit and other maintenance is performed, then state so to the Log Sheet; ‘Added Oil’, and/or ‘Added Antifreeze.’ Finally, when you have completed your activity on the bucket press the Up-Arrow button to wake-up the display and thereby enter a flag to the data record.

20.9 **Wake-up** the display upon completing any action that involved the use of the brass weights, or the addition of Oil, or the addition of Antifreeze. This will generate a second flag to mark the end of the disrupted portion of the data. This is an important step!

Note: See Appendix C, for a ready reference of this Calibration Check Procedure.

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APPENDIX A – PLANNING CONSIDERATIONS FOR F&P REBUILD

COOP Site Preparation:

None.

Preparations in WFO:

Remove casing from available F&P gauge.

Unpack, inspect, assemble, and checkout the FPR Kit.

Charge the 12V Battery overnight.

Assemble FPR and Checkout in WFO:

Install load cell assembly and Precip Recorder.

Perform system calibration.

Verify Logger Defaults / Install SID settings.

Prepare for Transport:

Secure FPR and peripherals inside vehicle.

Read your checklist of Tools and FPR parts before and after packing the vehicle.

Install the FPR at COOP Site:

Remove F&P hood, containment shell, and bucket, and dismount the circular mounting plate from the Pedestal

Install the circular base plate with FPR onto the Pedestal, and attach shell.

Charge the bucket with oil and/or antifreeze.

Mount the Solar Panel.

Perform Solar Charging Check.

Perform Cal Check.

Download to memory card - as check-up, and train Observer.

Metadata and Operational Implementation Tasks at WFO:

Update the B-44, ***Equipment Description,*** to account for Data Logger serial number.

Transmit Technical Information Notice (TIN) within 5 days after operational implementation to report month, day, year, of transition.

Retain repairable F&P parts (See Appendix E) at the forecast office because you may need to ship it to a neighboring WFO still operating F&P for another year or two.

Begin 30-day monitoring and coordination with the Observer.

Create a ***Form 79ID 'HPD' Spreadsheet*** to convert partial month's paper tape data to hourly values and enter in Excel spreadsheet. E-mail to NCDC (S. Hinson) and NWSHQ (T. Trunk).

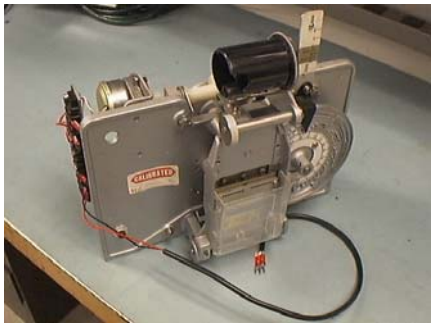
Submit ***Operational Implementation Checklist_B*** signed by MIC and mail or fax to RCPM.

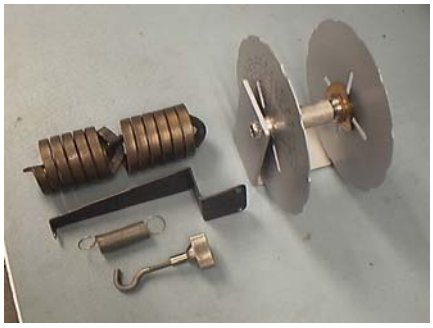
Submit ***FPR OI Certification*** signed by MIC and faxed to NWSHQ / OCWWS / OS7 .

APPENDIX B – DISPOSITION OF OLD F&P PARTS

Disposition of Replaced Items: NWS Logistics has determined that it is not practical to mix used parts with stocked new parts. Instead, they recognize that as you strip these gauges, you will know if the parts you are removing are worth retaining for use with your remaining gauges. Please retain for local use the parts identified below, and dispose of the remainder locally.

- From the punch tape mechanism, please retain the:
  - punch block and pin assembly,
  - the punch motor and microswitch assembly,
  - the two wrap cables,
  - the chad tray,
  - the plastic upper tape spool and spring,
  - and any other parts you have needed before.





- Please keep these small parts,

- And any model, electronic timer and bracket.

Note: If you are upgrading all the F&P's in their area, then e-mail your RCPM to make arrangements to disperse the spare F&P parts to other WFO's.

APPENDIX C – CALIBRATION CHECK PROCEDURE

1. Before you install oil or antifreeze for full-time operation…and while the bucket is still clean and dry, perform this Calibration Check. Use a carpenter's level across top if you have already placed oil or antifreeze in the bucket.

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

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

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

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

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

7. Subtract the first reading written in Step 4, from the second reading taken in Step 6. Write down this difference in hundredths of an inch.

8. If the difference falls into the acceptable range as given in the Table below, the calibration is acceptable and full calibration is not needed. Then write down in your site inspection report 'Cal Check – Good Readings.' into the ***FPR Maintenance Log Sheet***. If any difference falls outside of its respective range listed below, then you will need to do a full calibration as described in Section 9 (pp. 31-32), of this manual. Then write down in the ***Maintenance Log Sheet***, 'Calibration Check – Performed Reset.'

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"

Note: Always take the un-weighted measurement first, and then place the weight in/on bucket to get the weighted **`Precip:`** value.

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

10. Wake-up the display upon completing the Calibration Check, to generate a second flag to mark the end of data instability caused by the brass weights. This is an important step!

APPENDIX D : INSTRUCTIONS FOR MONTHLY DOWNLOAD

If the Memory Card is inserted when the display is dark, the logger automatically loads the most recent 60 days. If the display is awake and you insert the Memory Card, the Observer needs to press SET, and then scroll to the third options to select 'Last # days' and press SET twice more, to initiate the download of the last 60 days.

*If the display is awake take these actions and select the options in **bold** in the yellow boxes.*

Start with this action:	Display Responds:	You respond:	Action completed:
Insert the Memory Card	"**Download log to card**" "**SET downloads** "	Press the **SET** button	Prepares system to recognize the log.
Scroll with the Down-arrow (▼) button and select **'Last # days'**. It is third among the four options.	Select download type Since last download Select download type Start – end dates "**Select download type**" "**Last # days** " Select download type Whole log	Press the **SET** button	Tells the recorder you need to download certain number of days.
	Notice the '0' is blinking: " Enter number of days " " 006**0** "	Press the ▲ (up) button to scroll through numerals until you see **'6'**	Tells recorder to copy the last **60** days to memory card.
	" Enter number of days " " **0060** "	Press the **SET** button	Performs the copy.
	Rapidly updating numerals indicates download action.	**Wait** until the display stops.	The last 60 days of data is copied to memory card.
	"Download Complete 41005678 _log_20090209"	Press the **OFF** button three (3) times.	Cancels the option to make additional downloads.
	"Precip 15.00 2009/04/21 17:52:30 "	**Eject** the memory card	Memory card is available to mail.

The data logger writes a permanent record: "`Log Download,04/21/2009,17:47:12,` "

APPENDIX E – MAINTENANCE NOTES FOR INSPECTION REPORT

The FPR-D system will generate a data file entry, 'Display On – Date/Time' and 'Display Off – Date/Time' every instance a person wakes-up or turns off FPR-D display. However, the data logger does not indicate the reason for activity, nor does it have functionality for user entered notation codes. Therefore, both Observer and NWSREP shall document maintenance actions (i.e., adding antifreeze, or adding oil) to an FPR Log-Sheet to communicate the interruptions in precipitation data to NCDC through the CSSA Site Inspection Report.

COOP Observer Reports these Events to Log-Sheet when delegated by NWSREP:

Valid Remarks for Observer to report in his FPR-D Log Sheet:
Added Oil to Bucket
Added Antifreeze to Bucket
Partially Drained Bucket – Some liquid left in bucket
Emptied Bucket – Bucket completely emptied
Foreign Object Found in Bucket
Routine Gauge Check
Installed Funnel
Removed Funnel
Time is more than 15 minutes fast/slow

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 F – EFFECT ON NATIONAL DIRECTIVE SYSTEM (NDS)

1. Primary Resources On-Line:

a. http://www.nws.noaa.gov/ops2/Surface/coopimplementation
- ***FPR Assembly Procedures*** *– Apr 2009*
- ***FPR Observers Guide****- Apr 2009*
- ***FPR Operations Manual*** *– Apr 2009*

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.

d. https://apps.weather.gov/fp/fp.php
- Headquarters tracking table of F&P conversion status.

2. Support Resources – NWS Policy and Procedures:

a. *NWSI 10-1315, COOP Station Observations* (Aug 2009) *****
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. *Technical Information Notice (TIN) 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 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 G - FPR-D SPARES 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
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
SD Card	SD Card, Flash memory 1 Gb	SD Card, Flash memory, 1 Gb, wide temperature range, SanDisk ExtremeIII (Sutron or Open Market)	**D111D-2A2**	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 FPU 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.

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