MFRSR NOTES

1. Important that the MFRSR **HEAD** is level, not the crows feet platform. You can use a neat little round leveler made especially for the MFRSR head manufactured by Yankee. You need to move the level around small amounts to get the head level. As you move the level around, you can adjust the leveling screws on the crows feet (the base). You want the bubble a to be in the circle, about the same amount all the way around.

2. Important that the motor angle goes through the sensor. You can use a special tool, called the Band Alignment Tool, for this operation. You put the tool on the motor shaft and make sure the end goes though the sensor (the white thing on the head). The end should be centered on the sensor.

3. Important for the instrument to be aliened towards true north.

Method: Get the sun dial (aluminum) near or set up by the MFRSR.

Run one of the DOS based programs like asunpos
asunpos asks you the following questions:

Latitude = +35.0517 (for ABQ)
Longitude = -106.5358 (for ABQ)
Year = 1997 (or current year)
Zone = +6 for DST for ABQ or +7 for normal
Time to add to get WWV or GMT
call 303-499-7111 to get GMT
Day of the year = EX: 167 = 6/16/97
Current time = If you use DST for the zone use DST here also
Use dots when giving the time like 9.30.30 NOT 9:30:30.

This will give you the azimuth. You want to fool with the program enough to get azimuths like 85 or 120 (basically degrees that end with 0 or 5). You can get real close by keep adjusting the time. If you got 122.4609, you would try another time with the program. You could subtract or add minutes/seconds to see the different results. You want to get 120 or 125 degrees (for this example). The sundial is in 5 degree

increments, so degrees that end in 0 or 5 make the alignment more accurate.

When the time you selected for your azimuth approaches, go over to the MFRSR.

Set up the sundial. You are looking for the shadow of the stand to hit one of the marks on the sun dial. If it is morning, then add 180 degrees to your azimuth number (the place where the shadow will fall). If it is the afternoon, the subtract 180 degrees from the azimuth number. At the prescribed time, the shadow of the stand should be at the degrees number you figured out. If it is not, then move the stand to get the shadow correct. You can check this several times.

4. It is important that the band motor is set to the correct latitude. Use can use a protractor to perform this task. For ABQ the band motor should be set around 35 degrees.

5. Using the Band Alignment Tool you used to get the sensor in line with the band motor, you can get the shadowband in the right shape. The shadowband should fit the back of tool. Sometimes the shadowband can get off to one side or the other.

6. Once the MFRSR is working and the shadowband is rotating you need to check to see if the shadowband itself is adjusted. The shadowband goes over the sensor and shades the sensor once every rotation. There is a small screw in the rod that holds the shadow band. A .05" allen wrench will perfectly adjust the screw. A little goes a long way here. So you watch the shadowband a few times and decide which way to move the band if necessary. You move the band (yes, while the MFRSR is running). Now watch the band for SEVERAL rotations. You'll go crazy adjusting the band every rotation, due to the fact the stepper motor adjusts itself every 800 steps. After several rotations, you can adjust the band again.

7. At a bench, you can adjust the band motor for the correct latitude, make sure the shadow band is the correct shape, and make sure the sensor is in line with the band motor. Then you can take the stand outside and to the rest of the adjustments.

8. To setup the MFRSR, use a terminal emulation program.

Connect to the microprocessor port either in ARCS2 or the microprocessor itself.

Settings:

Baud Rate: 19200 or less if line is bad

Data Bits: 8
Parity: None
Stop Bits: 1
Flow Control: None (No Xon/Xoff stuff)
Connector: COM1
Receive
files with: Xmodem

When setup is complete, hold down the return key for several seconds. You will get a Hello: prompt. Type in the password. Then you will get the PROM version and the !> prompt as shown below.

Hello:
Hello:

PROM YESR7N, L. Harrison, 03/97.
!>

One of the commands you can type here is ‘s 0’. This is the status command. The fields are described below. With this command you can check to make sure the MFRSR is setup correctly.

```
!>s 0
 $BFD8  $C0CA 7Y [7]   35.0463   106.5399
16:41:43   06-16-1997  35596.69563 (1997)
$20 $00000101 $00000000 $000000                    <<< Flags - see manual
   20     20
  117      3
```

Field	Comment
$BFD8	YESDAS system ID
$C0CA	MFR head ID
7Y	PROM version
[7]	Number of channels
35.0463	Latitude
106.5399	Longitude
16:41:43	Time
06-16-1997	Date
35596.69563	Time since 1/1/1900
(1997)	Year
20	Sampling interval in seconds
20	Averaging interval in seconds
117	Bytes in memory
3	Records in memory

To set the flags or look/read memory you need to be superuser. The ‘h 0’ command takes care of this, plus the superuser password.

PROM YESR7N, L. Harrison, 03/97.
!>h 0 Irradiance!

To setup the MFRSR, perform the following commands:

!> I $20 $00000101 0 20 1 <<<set flags - see manual
!> N 7 <<<Set number of active channels to 7

Other commands:

Command	Comment
U	Update system clock. See manual (p. 4-29) for details.
m 0	See how much data is on the memory card
m 1	Move data from the local buffer to the memory card.
t 2	Read the memory card. Need to use Receive Binary command to get the data. Don’t use checksums for the transfer and use Xmodem protocol.
g 0	Stop the processing
g 1	Start the processing (g 0 and then g 1 clears the memory card)

Samples:
!>m 0
MEMCARD SIZE, USED = 1024 kB, 289.6396 kB
!>m 1
READY
!>m 0
MEMCARD SIZE, USED = 1024 kB, 289.7539 kB
!>

9. The MFRSR has 2 heaters in it to keep the head at a constant temperature. If the temperature is not around 40 degrees then you have a problem with the unit.

10. The MFRSR gives out raw data which is binary and consists of counts from 0-4096. Normally the data goes into a program called CALLANG (for UNIX only and made by ASRC). The PC equivalent is DOSBAND. The MAC equivalent is BANDAID.

You can view the raw data. You can apply a Solar Info file (file contains angle corrections) to the data, so you can view the angle corrected data. Next you can apply a Calibration file to view calibrated data. This file has the calibrated coefficients in it. The calibrated data is in the form watts/meter squared/nano meter.

Process:
Get data to CALLANG
View raw data if desired
Apply Solar Info file and view data in desired
Apply Calibration file and view data (must have solar info file applied before hand)

11. SZA - solar zenith angle
The angle between the sun when is straight up in the sky and the position of sun currently. The Solar Info file uses the cos(SZA).

direct = total - diffused / (cos(SZA))

12. DOSBAND - the PC version of CALLANG

Data files:
Column 1: Time since 1/1/1900 in GMT
Column 2: cos (SZA)
Column 3: Counts - the data should be 23 columns of data. The counts should be in the high 2900s. 7 columns for total radiation; 7 columns of diffused; 7 columns for direct; 1 column logger board voltage; 1 column for head temperature

13. To use DOSBAND:

In the DOSBAND directory, start dosband. DOSBAND is an old DOS based program and the mouse is not supported. Use the ALT key to move around the menus. For
example, ALT+F will open the FILE menu.

Steps:
Open your raw file
Under Function->Day Plot you can view the data
Keys: Left arrow key will view the PM data and the right arrow key will view the AM data
Up arrow views the next channel
ESC exits the plotting

For angle data use Function->Solor Angle and for calibrated data use Function->Calibrated. Both will ask you for the associated input files.

14. Steps in order:

Do the bench steps: adjust the angle of the motor (Note 4), make sure the motor angle goes though the sensor (Note 2), and adjust the shape of the shadowband (Note 5).

Outside setup the MFRSR and align it to true north (Note 3), then level the head (Note 1). Next get the microprocessor working (Note 8) and then as the last thing, adjust shadowband rotation (Note 6).

15. MFRSR stuff on ADaM:

-.xttyrc in /files0/ADaM/config/mfrsr
-xtty is in /files0/ADaM - reads the data
-.xttyrc tells xtty how to read the data
-xtty can configure the MFRSR micro processor
-xtty also checks the microprocessor configuration and complains if the configuration is different
-see the data in /files1/ADaM/data_hold/raw/mfrsr
-to run xtty by hand use the following command:

in /files0/ADaM/config/mfrsr

xtty -o ../data_hold/raw/mfrsr -y ../../data_hold/logs/mfrsr -v 3 tty /dev/cua/19

where -o is the output file location
-y is the log file location
-v 3 is the level of verbose (3 is the most wordy)
/dev/cua/19 is the serial port to work with