COMPUTERIZED MONTHLY REPORTS

EDWARD A. HALBACH
720 Ramshorn Drive
Longs Peak Route
Estes Park, CO 80517

Received 15 June 1987

Abstract

Computerized monthly variable star reports usually start with the manual recording of data at the telescope, followed by the transcription of observations into a computer data bank to be sorted and printed out at the end of the month. With over 500 observations gathered each month to record, a computer program was written to allow direct data entry at the telescope, thus avoiding the later transcription of data.

* * * * *

My monthly variable star observation reports date back to 1934, always manually prepared. Eight years ago I left the Milwaukee area after retirement for a better location, having chosen Estes Park, Colorado, at an elevation of 8000 feet. With an abundance of observing time and good seeing, monthly reports increased to a maximum of 1300 observations on 900 stars, entailing 25 hours of manual data sorting and report writing. Why not totally computerize the procedure, both the data entry at the telescope and the preparation and printing out of the monthly report?

Mark Dakins, a full-time computer programmer and fellow amateur astronomer, wrote a program in PASCAL for my newly-acquired portable Otrona Attache computer. This computer weighs 18 pounds, has a 5" monitor, 8086 processor, 256K of RAM, two 360K 5 1/4-inch diskette drives, and both MS-DOS 2.1 and CP/M 2.2 operating systems. The programming and debugging took nearly two years of periodic visits by Mark to Estes Park to complete.

There were two procedural alternatives: place the computer and keyboard near the telescope, or keep the computer indoors with a remote monitor and the keyboard outdoors adjacent to the telescope. I chose the latter, connecting to an outdoor terminal with underground wiring of 100 feet of coaxial cable for the remote 9" amber monitor and a 4-wire telephone cable for the keyboard. My 10-inch Newtonian reflector operates under the open sky. Nine-inch right ascension (RA) and declination (DEC) circles make for rapid field finding, allowing 12 to 15 observations per hour with none from memory.

Since clear summer nights are usually below 50°F and winter observations are often held when the temperature is below 0°F, heavy gloves are often worn, resulting in clumsy operation of the keyboard leading to many typographical data entry errors. I wear Wells-Lamont flannel chore gloves, Vellux lined, in GIANT size, since looseness promotes warmth. To compensate for "big fingers," the following procedure is utilized when entering data at a keyboard with standard typewriter format. Keys are struck with the eraser end of a pencil loosely suspended over the keyboard. Since the numerals are along the top row, the (.) key near the lower right-hand corner and the SHIFT key amongst others at the lower left were modified. See Figure 1. An auxiliary key was installed above the numeral keys and wired in parallel with the (.) key. An auxiliary large pad covers many keys in the SHIFT key area but activates only the SHIFT when depressed. The

result is fast and flawless entries while wearing heavy gloves.

To simplify the data entry procedure at the telescope, sequential numbers were assigned to all stars visible at this latitude, about 800 long period and 1600 other variables. These numbers were added to AAVSO charts with a rubber stamp (see Figure 2). This same reference number, the star's designation, and its name were then filed in a Master Star List (see Figure 3). A TRUE statement was added to the record if the Julian Date was to be recorded to the nearest thousandth of a day, or a FALSE statement if to the nearest tenth of a day. Calling for a reference number, maximum of 4 digits, at the keyboard at the telescope will display up to 18 digits of star designation and name. As the obervation is completed, the magnitudes for the variable and two comparison stars are entered. After a quick visual scan of the screen for accuracy, the record is saved in an Observation File on another diskette, simultaneously converting the computer's internal clock-time to JD and entering same as part of the observation. At the end of an observing session the Observation File is closed, to be re-opened the next observing session. Loss of data in computer memory during an observing session is prevented by this technique. At the end of the month, the data are automatically sorted and printed in the standard AAVSO format, with 50 entries per page. The start and finish of such a report is shown in Figure 4.

Without going into much detail, the following is a brief description of the program. In all, it is about 2500 lines of the programming language PASCAL. About 1000 lines are from a purchased package mentioned below and the rest were written for this project. Even a cursory description of the program requires some explanation of how its data are stored.

The program keeps a list of all of the stars that are part of the observer's program. Actually, the current version lists all AAVSO catalogued stars visible at this station. In order to look up a star quickly, the program also keeps two indices of the star list, one sorted by star number and one sorted by RA and DEC.

The program keeps a list of all of the observations made during the current month, and this list also has an index which is sorted by star number. This structure allows stars to be found quickly by star number when they are being observed or edited, and it allows stars to be found quickly in RA and DEC order at the end of the month when the report is being printed.

For programmers, the program is written in Turbo PASCAL and uses the Turbo PASCAL Database Toolbox to create, use, and maintain the lists and indices mentioned above. PASCAL was chosen in preference to the simpler BASIC because of its much greater ability to handle complex data objects, its greater speed, and the availability of the Database Toolbox.

The following is a brief description of each of the procedures that make up the 1500-line portion of the program written for this project.

Main Program: Displays the main program and allows the user to select the main function he wishes to use.

Observe: This procedure controls the sub-functions that have to do with star observations.

Record Observation: This procedure allows the user to type in and store an observation of a star.

Edit Observation: This procedure allows user to edit or delete an observation of a star.

Maintain Star List: This procedure controls the sub-functions that have to do with building and maintaining the star list.

Add Star: This procedure allows the user to add a star to the star list.

Edit Star: This procedure allows the user to edit or delete a star entry in the star list.

Print Star List: This procedure prints the star list in either star number order or RA-DEC order.

Create Observation File: This procedure is used at the beginning of each month to create and label a new monthly observation file.

Generate Report: This procedure prints out the accumulated observations in the starndard AAVSO format.

Rebuild Indices: This procedure is only for emergencies. It deletes the indices associated with the star list or the observation list and rebuilds them from the appropriate list. This should be necessary only as a result of a power failure while the program is running, a floppy disk drive or media failure, or some similar disaster that destroys data on the disk.

The program's remaining procedures are "internal" in that they are not called by a direct user request, but are used by one or more of the above procedures to accomplish their purposes.

Parse Observation: This procedure is used by "Record Observation" and "Edit Observation" to parse an observation entered by the observer, check that it is grammatically correct, and assign its various parts to the correct program variables.

Parse Star: This procedure is used by "Add Star" to perform the same function for the description of a star that "Parse Observation" does for an observation.

Find Start and Find End: These two procedures are used by "Parse Observation" and "Parse Star" to search the user's input for the beginning of the next "word" and the end of the current "word."

Get Date-Time: This procedure is used by "Record Observation" to take the current date and time from the computer's internal clock so that the Julian Date can be calculated to the requested decimal accuracy.

Print Report Header: This procedure is used by "Generate Report" to print the standard AAVSO report header on the top of each page.

This program and the equipment modification described above have made data entry at the telescope convenient at all temperatures, and have yielded automatic data sorting and report printing.

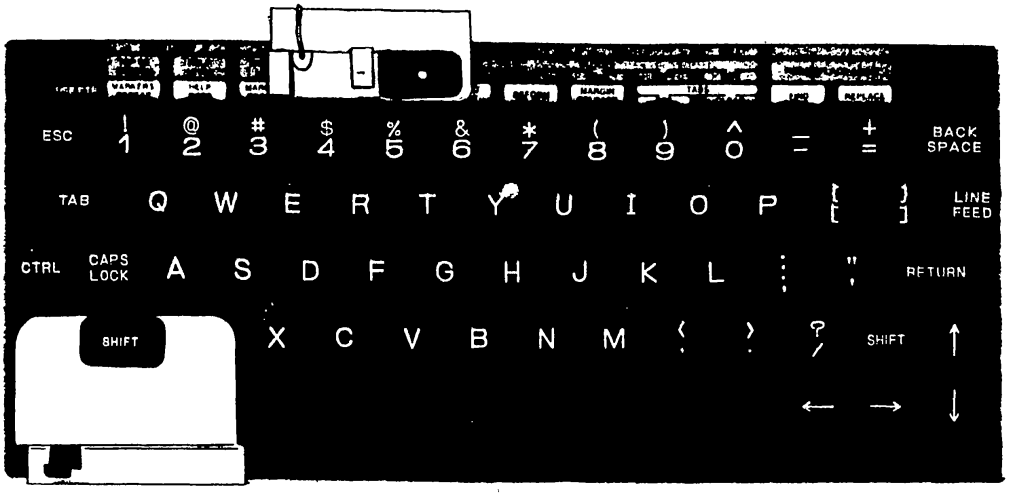

Figure 1. Modifications made to terminal keyboard to allow accurate entry of data while wearing heavy gloves.

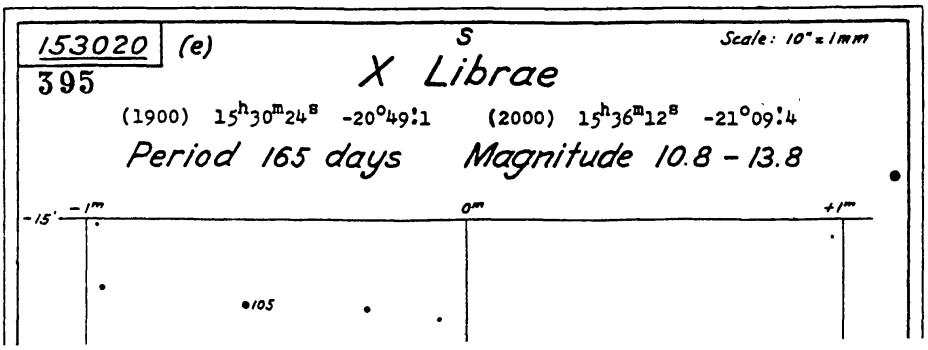

Figure 2. Portion of AAVSO variable star chart, showing Harvard Designation and added Reference Number in upper left-hand corner.

MASTER STAR LIST
by RA/DEC

STAR	RA DEC	STAR/CONST	TIME ACCURACY FLAG
1	0001+26	TT PEG	FALSE
1000	0002-26	SY SCL	FALSE
2	0004+51	SS CAS	FALSE
1001	0006-12	WW CET	TRUE
3	0008+62	UX CAS	FALSE
1002	0009+28	UW AND	FALSE
4	0010+46	X AND	FALSE
5	0010-32	S SCL	FALSE
	+44	VX AND	FALSE
810		CET	FALSE
811	2350+		FALSE
812	2352+55	WY	FALSE
813	2352-09	V CET	
814	2353+50	R CAS	
815	2355+25	Z PEG	FALSE
816	2356+59	WZ CAS	FALSE
1596	2357+48	IW CAS	FALSE
817	2357-15	W CET	FALSE
818	2358+55A	Y CAS	FALSE
819	2359+39	SV AND	FALSE

Figure 3. Portion of Master Star List, showing Reference Number, and Time Accuracy Flag, whose value determines the number of decimal places to which the Julian Date is recorded.

VARIABLE STAR OBSERVATIONS

The American Association of Variable Star Observers

Report No. 8612 Month 12-86 Sheet 2 of 13

Observer Edward A. Halbach (HK)
720 Ramsnorn Dr., Estes Park, CO., 80517
Time Used = JD Instrument = 10" REFL.

Received
Entered
Verified

DESIG.	VARIABLE	JUL.DAY&DEC.	MAGN.	C	COMP	STARS	REMARKS
0202+27	Z TRI	6787.7	11.8		11.7	11.9	
0202+27	Z TRI	6794.7	12.5		12.2	13.1	
0203+56A	UV PER	6793.782	(13.6		13.6		
	RV AND	6787.7	9.7		9.5	9.8	
	RV AND	6794.7	9.7		9.6	10.5	
2352-09		6793.784	(13.5		13.5		
2353+50	R	6768.8	13.5		13.3	13.6	
2355+25	Z PEG		10.4		10.0	10.7	
2355+25	Z PEG	6794.			10.7	11.2	
2356+59	WZ CAS	6769.7			11.2	11.9	
2357+48	IW CAS	6787.6	12.5			12.7	
2357+48	IW CAS	6794.7	(13.4				
2357-15	W CET	6787.5	11.6		11.5		
2358+55A	Y CAS	6768.7	(13.3		13.3		
2359+39	SV AND	6787.6	(12.5	:C	11.4		
2359+39	SV AND	6794.7	(13.8	:C	-		

STARS 586 OBSERVATIONS 635

Figure 4. Sample report form prepared by the computer.