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SR (SHIFT REGISTER) COLLECT USERS MANUAL

Version 2.00

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1.0 Overview

SR COLLECT is intended to be used by International Atomic Energy Agency (IAEA) inspectors in facilities in Japan for remote unattended collection of data recorded by a shift register electronics unit. In addition, it will send a signal to a monitoring camera to record the occurrence of significant events. SR COLLECT organizes the collected data into a set of files that can be copied to floppy diskettes. The data copied to these diskettes can, in turn, be imported into the SR Review program for analysis.

Unattended data collection requires a high degree of reliability. SR COLLECT is capable of restarting itself after loss of power to the collect computer. SR COLLECT is also capable of recovering from loss of communications with the shift register electronics unit. Data is recorded in files on the hard disk immediately after it is collected. All significant events, called critical events, are recorded in a file. The set of parameters in effect is recorded in a file. Disk write caching is NOT used to prevent the loss of data caused by a sudden power failure.

Data are collected over a period of time called an inspection period. An inspection period lasts approximately 30 days. The data collected in an inspection period are organized into a set of files. These files include an Inspection Period file, a Critical Events file, a Performance file, and several Raw Data and Measurement Log files. The Inspection Period file, Critical Events file, and Performance file are created at the time a new inspection period is started. Raw Data files are created when the first measurement run is collected for a particular day (usually shortly after midnight). Measurement Log files are created with Raw Data files.

The data file set that is associated with the current inspection period is located in the DATA directory (C:\COLLECT\SRDATA). All data files from previous inspection periods are located in the ARCHIVE directory (C:\COLLECT\SRDATA\ARCHIVE).

Data file names follow a naming convention that embeds both the detector number and file creation date. See Appendix 2.2 for details.

Inspection Period files record the duration of an inspection period. Their file names have the extension .IP. The file contains the facility number, the detector number, the inspection period beginning time and date, and the inspection period ending time and date. See Appendix 2.5 for details.

Critical Events files record critical events and the time and date when they occur. Their file names have the extension .CEV. These files provide a log of events that indicates an absolute or possible loss of safeguards data or possible tampering with the system. The files should be scanned by the user to identify a potential loss of safeguards data so these times can be carefully inspected using SR REVIEW. Critical events include starting or terminating program execution, beginning a new inspection period, starting or terminating data collection, deleting data files, and dealing with any shift register communication errors. See Appendix 2.6 for details.

Performance files record the parameter set and the time and date when it is recorded. Their file names have the extension .PFM. The parameter set is recorded whenever the program starts, a new inspection period is begun, or the parameter set is modified. See Appendix 2.7 for details.

Raw Data files contain data records for individual measurement runs. Their file names have the extension .BSR (for binary shift register data). Data records include the start time of the run, the count time, the totals count, the reals plus accidentals count, the accidentals count, a second totals count, and the status of the current measurement in progress. In addition, each .BSR file begins with a header that contains information that identifies the raw data: the date, detector id,

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facility id, software version number, and the associated Inspection Period file name. See Appendix 2.3 for details.

Background runs are subject to the data-reduction algorithm. See Section 4.1.6 for details.

Measurement Log files contain records that summarize the results of measurements that span several individual measurement runs. Their file names have the extension .MEA. Data records include the measurement type, start time, end time, average totals rate, and average reals rate. See Appendix 2.4 for details.

2.0 Installation

2.1 System Requirements

SR COLLECT assumes the following capabilities for the collect computer:

- Intel 286 CPU (or newer)
- 20-MByte hard disk drive (Drive C:)
- 1.44-MByte floppy disk drive (Drive A:)
- DOS Version 3.3 (or newer)
- Shift register electronics unit (JSR-11 at 300 baud, JSR-12 at 9600 baud, or JSR-11A at 9600 baud)
- Shift register electronics unit attached to serial port 1 (COM1)
NOTE: Alternatively, serial port 2 (COM2) may be used (see section 2.4).
- Printer attached to parallel port 1 (LPT1)
- Monitor-camera signal cable attached to parallel port 2 (LPT2)

2.2 External Configuration

Before installing SR COLLECT it is necessary to run SR REVIEW to create the External Configuration File (CONFIG.CFG). This file contains parameters and threshold limits for each detector at each facility where SR COLLECT is to be installed. SR REVIEW must write this file on the SR COLLECT installation diskette.

CAUTION: You are strongly advised to create a working version of the SR COLLECT installation diskette and save the original as backup.

The procedure for creating the configuration file can be found in the SR REVIEW Users Manual.

The contents of the External Configuration File (CONFIG.CFG) are described in Appendix 3.1.

2.3 Installation

The installation procedure creates several directories on the hard disk (Drive C:) and copies several files from the installation diskette to these directories. These directories and the files copied to them include the following:

Directory	Contents
C:\W1BATCH	SR COLLECT start up (SRCOL.BAT)
C:\COLLECT	SR COLLECT executable (SRC.EXE)
C:\COLLECT\CONFIG	Configuration files (CONFIG.CFG & SRC.CFG)
C:\COLLECT\SRDATA	Empty (for current inspection period data file set)
C:\COLLECT\SRDATA\ARCHIVE	Empty (for previous inspection period data files)

In addition, new AUTOEXEC.BAT and CONFIG.SYS files are installed in the root directory of Drive C:. The new AUTOEXEC.BAT and CONFIG.SYS files are listed in Appendix 1.

The installation diskette also contains an installation procedure file (README.TXT). This file is not copied to the hard disk.

The following steps describe how to install SR COLLECT in a collect computer:

CAUTION: If you are replacing an earlier version of SR COLLECT, the older version of the software will be completely overwritten by the newer version including all parameter, configuration, and data files. The AUTOEXEC.BAT and CONFIG.SYS files will also be overwritten during the installation procedure. These files will be renamed AUTOEXEC.BAK and CONFIG.BAK, respectively.

1. Insert the working installation diskette into Drive A: of the collect computer.
2. At the DOS prompt type

a:install [Enter]

NOTE: Disregard DOS messages that appear during the installation. These include "Files not found" while it tries to delete data from the ARCHIVE and DATA directories if no files are found and "Unable to create directory" when it tries to create the ARCHIVE and DATA directories and these already exist.

3. After the software is installed, remove the working installation diskette from Drive A: and reboot the system.
4. Before executing the software for the first time, review the contents of the configuration file, SRC.CFG. The configuration file contains critical values that determine the operation of the software. The path for locating SRC.CFG is C:\COLLECT\CONFIG.

2.4 Internal Configuration

The Internal Configuration File (SRC.CFG) contains critical values that determine the operation of the software. This is facility specific information that rarely changes. The file is fully described in Appendix 3.2. You will need to use an editing program such as DOS's EDLIN to change this file.

The two values that relate to the attached shift register electronics unit should be reviewed at installation. The shift register electronics unit is assumed to be attached to serial port 1 (COM1). Serial port 1 is encoded as 0 in the first line of SRC.CFG. If it is attached to serial port 2 (COM2), change the value in the first line to 1. The shift register electronics unit is assumed to have its gate width set to 64 μ s. This is encoded as 0.000064 in the next to last line of SRC.CFG. If the gate must be set to a different setting, change this value.

3.0 Starting SR COLLECT

3.1 First Time Startup

As the final step of installation, the collect computer is re-booted and SR COLLECT is started automatically. Because this is the first time SR COLLECT has been started, a parameter set must be selected. The user is requested to choose a facility and detector as shown in Fig. 3.1.

Fig. 3.1 Choose Facility and Detector Display

If the user does not respond within the specified time-out period, the program will select the first facility and its first detector as defaults. Choosing the facility and detector selects a parameter set from the External Configuration file created by SR REVIEW and installed with SR COLLECT.

Once a facility and detector have been chosen, startup proceeds as described in the following section.

If SR COLLECT fails to find the External Configuration file (CONFIG.CFG) or this file is discovered to be improperly formatted, an error message will be displayed. SR COLLECT will then exit following user acknowledgment of this message.

3.2 Normal Startup

The recommended procedure for starting SR COLLECT is as follows:

1. From the DOS prompt, type

srcol [Enter]

2. The welcome screen will appear as shown in Fig. 3.2.

Fig. 3.2 Welcome Screen Display

3. If the user pushes a key within the 60 seconds that the welcome screen is displayed, the title page will appear as shown in Fig. 3.3.

Fig. 3.3 Title Page Display

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4. On the title page, adjust the system time and date (if necessary).
5. From the title page, press the [F10] key (or the [Return] key twice) to continue to the Main Menu. Alternatively, press the [Esc] key to terminate SR COLLECT and return to the DOS prompt.

3.3 Automatic Startup

The AUTOEXEC.BAT file is set up to automatically start SR COLLECT when the collect computer is turned on or rebooted. When SR COLLECT is started, the welcome screen (Fig. 3.2) is displayed. If after 60 seconds no key has been pressed, SR COLLECT will automatically proceed into the "Enter data collection mode" of operation (see section 4.1).

4.0 The Main Menu

The Main Menu (see Fig. 4.1) appears after the user exits the title page and when the user completes or terminates any of the options selected from the Main Menu (with the exception of Quit). All the major options for SR COLLECT are accessed from the Main Menu. The Main Menu options are ordered to reflect the normal sequence of steps that would be followed in a typical session.

Fig. 4.1 Main Menu Display

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Six options can be selected:

- ***Enter data collection mode***
- ***Copy data files to diskette***
- ***Delete data files from hard disk***
- ***Modify parameters***
- ***List measurements***
- ***Quit SR COLLECT Program***

An option is selected by typing the first letter of the option or by moving the cursor to the option and pressing the [Enter] key.

The ***Quit SR COLLECT program*** option terminates SR COLLECT and returns the user to the DOS prompt. The other options are discussed in the following sections.

Prior to collecting any data, it is *strongly recommended* that the user choose the ***Modify parameters*** option. This is to make sure that the detector id, shift register id, and analysis thresholds are all set correctly.

4.1 Enter Data Collection Mode Option

The ***Enter data collection mode*** option is the heart of SR COLLECT. It is here that data from the shift register electronics unit is gathered. A display allows the user to observe data being received and analyzed.

Before data can be collected the user must decide if it is time to start a new inspection period. Once that decision is made SR Collect attempts to establish communications with the shift register electronics unit. Having established communications, data collection can begin. As data is collected it is analyzed, background data is filtered, and a decision is made whether to signal the monitoring camera. The following sections detail the operations of the ***Enter data collection mode*** option.

4.1.1 Starting New Inspection Period

When the *Enter data collection option* is selected, the user is prompted to decide whether or not to start a new inspection period (see Fig. 4.2). Starting a new inspection period forces all files in the DATA directory to be moved to the ARCHIVE directory and creates a new set of data files in the DATA directory. The default selection for starting a new inspection period is "NO."

Fig. 4.2 Start New Inspection Period Prompt Display

If a new inspection period has already been started, the Start New Inspection Period prompt is not displayed. This occurs when a new detector has been selected using the *Modify parameters* option. Instead, a message is displayed informing the user that a new inspection period has been started.

When automatic startup proceeds to the *Enter data collection mode* option, the Start New Inspection Period prompt is not displayed. The data are collected in the existing inspection period.

4.1.2 Establishing Communications With The Shift Register Electronics Unit

If SR COLLECT initially fails to communicate with the shift register electronics unit or if it subsequently loses that communication, it will continually attempt to re-establish communication. Possible causes for initial communications failure are an incorrect serial port number (in the Internal Configuration file) or an incorrect type set for the shift register electronics unit (in the External Configuration file). SR COLLECT will display a message if it is trying to re-establish communication with the shift register electronics unit.

4.1.3 Data Collection

Following the successful establishment of communications with the shift register unit, the Parameters and Thresholds screen is displayed. As measurement runs are completed, the data collected and the results of analyzing that data are added to the Parameters and Thresholds screen. The most recent 10 measurement runs are displayed. Fig 4.3 shows an example of the Parameters and Thresholds screen as data are collected.

PARAMETERS AND THRESHOLDS		THRESHOLDS			
Assay threshold (R/t) =	4.0	R/I threshold (I/t) =	100.000		
Low background threshold (I/t) =	10.0	R/I bias limit (x) =	0.100		
High background threshold (I/t) =	100.0	R/I sigma limit =	3.000		
Empty threshold (R/t) =	20.0	Expected length (min) =	5 to 20		
Cf ratio threshold (R/I) =	0.1200	Shift register ID =	xxxxxxx		
Cf normalization threshold (R/t) =	1000.0	Facility ID =	FFFF		
Camera signal threshold (min) =	4	Detector ID =	FC05-1 (6)		
Inspection Period Start: 94.12.19 13:14:53		# interruptions: 00			
MOST RECENT RUNS					
Date	Time	I/t	R/t	R/I	Type
94.12.19	12:29:30	487616.0	33676.0	15317239.0	ASSAY
94.12.19	12:30:40	487616.0	33676.0	15217239.0	ASSAY
94.12.19	12:31:43	487616.0	33676.0	15217239.0	ASSAY
94.12.19	12:32:44	487616.0	33676.0	15217239.0	ASSAY
94.12.19	12:33:46	250000.0	15000.0	160000.0	MOVING
94.12.19	12:34:48	50.0	0.0	0.0	BACKGROUND
94.12.19	12:35:50	50.0	0.0	0.0	BACKGROUND
94.12.19	12:36:52	5.0	0.0	0.0	LOW BKG
94.12.19	12:37:55	5.0	0.0	0.0	LOW BKG
94.12.19	12:38:57	50.0	0.0	0.0	BACKGROUND
Press [Esc] to return to the Main Menu.					

Fig. 4.3 Parameters and Thresholds Display

Each measurement run results in an entry written to the current Raw Data (.BSR) file.

The user presses the [Esc] key to terminate data collection and return to the Main Menu.

If power to the computer is interrupted, SR COLLECT will automatically resume collecting data upon restoration of power. The number of times data collection has been restarted for the current inspection period is also shown on the screen (labeled "# interruptions").

The starting and stopping of data collection is recorded in the Critical Events file. A power failure can be detected in the Critical Events file by a start-collect event without a matching stop-collect event. Run data that have a count time of zero or a count time different from the previous count time are also recorded in the Critical Events file.

4.1.4 Starting A New Day

SR COLLECT detects when measurements are made on a new day. Usually, this will be shortly after midnight. At this time a new set of daily file names is generated (see Appendix 2.2 for file name conventions) for the Raw Data and Measurement Log files. A new Raw Data file is created when the first data record is written to it. The same is true for the Measurement Log file.

Before any data are written for the new day, SR COLLECT determines if there is sufficient space on the hard disk. The required amount of empty space at the start of the day is determined by a parameter in the Internal Configuration file (see Appendix 3.2). Files will be deleted from the ARCHIVE directory to accommodate the space requirements. The policy is to delete the Raw Data and Measurement Log files from the oldest inspection period first. After all Raw Data files for a given inspection period are deleted, the associated Inspection Period, Critical Events, and Performance files are deleted. If no more files are associated with inspection periods remaining, any remaining files in the ARCHIVE directory will be deleted. If there are no more files in the ARCHIVE directory, the oldest data files from the DATA directory will be deleted.

4.1.5 Measurement Analysis

Data from each run are analyzed to determine the run type. Run types are displayed with the run data (start time, totals rate, reals rate, accidentals rate) on the Parameters and Thresholds display (see Fig 4.3). The eight run types include the following:

Run Type	Meaning
BACKGROUND	Normal background run
LOW BKG	Low-background run
HIGH BKG	High-background run
MOVING	Moving source (failed A/T test) run
ASSAY	Plutonium container run
EMPTY	<i>Empty</i> container (low-level Plutonium source) run
CF NORM	Cf normalization run
CF CHECK	Cf check source run

Run-type determination is described in the flow chart in Appendix 5.1. The run type **MOVING** indicates that a source may be moving past the detector. A moving source causes an anomaly in the counting statistics and fails the A/T test. The A/T test procedure is described in Appendix 5.2.

Consecutive runs are grouped into measurement types. There are eight measurement types:

Measurement Type	Meaning
BACKGROUND	Normal background measurement
LOW BKG	Low-background measurement
HIGH BKG	High-background measurement
UNKNOWN	Unknown measurement
ASSAY	Plutonium container measurement
EMPTY	<i>Empty</i> container (low-level Plutonium source) measurement
CF NORM	Cf normalization source measurement
CF CHECK	Cf check source measurement

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Five of these measurement types (ASSAY, EMPTY, CF NORM, CF CHECK, and UNKNOWN) are known as *event* measurements. Three (BACKGROUND, LOW BKG, and HIGH BKG) are known as *background* measurements.

Consecutive measurement runs with the same run types are grouped into their corresponding measurement types:

Run Type	Measurement Type
BACKGROUND	BACKGROUND
LOW BKG	LOW BKG
HIGH BKG	HIGH BKG
ASSAY	ASSAY
EMPTY	EMPTY
CF NORM	CF NORM
CF CHECK	CF CHECK

A measurement type begins with the first run of the corresponding run type and ends with the last run of the same corresponding run type. The average of the totals and reals rates of the runs is maintained for the duration of a measurement type. The duration covers the time from the start of the first run to the end of the last run (i.e., start of last run plus the duration of last run). The average rates are calculated from the sums of the rates of runs included in the measurement type divided by the number of runs included in the measurement type.

The moving (**MOVING**) run type is special. A moving run following a background measurement cannot be characterized until a subsequent run. It is designated an unknown (**UNKNOWN**) measurement type. Subsequent moving runs are grouped into one unknown measurement type. The duration of the unknown measurement type is maintained, but the average rates are defined as zero. If a subsequent run starts an event measurement, then the preceding unknown measurement is reclassified as part of the new event measurement type (i.e., the start of the new event is the start of the previously classified unknown event).

If a moving run follows an event measurement, it is included as part of the duration of the event measurement. If it is between two of the same measurement events, it is included as part of the duration of the event measurement as a whole. If it is at the end of one event measurement but before the beginning of a different event measurement, it is included as part of the duration of the first event measurement. In no case are the statistics of a moving run type included in the statistics of the event measurement.

If a subsequent run starts a background measurement, then the preceding unknown measurement is not reclassified. A moving run type is *never* included in a background measurement.

No assumptions will be made as to the preceding measurement type when data cannot be gathered contiguously. Examples are when the *Enter data collection mode* option is entered or following the re-establishment of communications with the shift register electronics unit.

Each run will result in the writing of a data entry to the current Raw Data file. These data include the start time of the run, the duration of the run, the totals counts, the reals plus accidentals counts, the accidentals counts, and the measurement status. The measurement status is composed of a set of flags that characterize the measurement in which the run resides. There are eleven flags:

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Flag	Meaning
A/T Test Failed	Run is MOVING run type
Low Background	Run is part of a LOW BKG measurement
High Background	Run is part of a HIGH BKG measurement
Empty	Run is part of an EMPTY measurement
Assay	Run is part of an ASSAY measurement
Cf Check	Run is part of a CF CHECK measurement
Cf Norm	Run is part of a CF NORM measurement
Length short	Event measurement duration is less than minimum event limit*
Length long	Event measurement duration is greater than maximum event limit*
Unusual measurement	Run is part of UNKNOWN measurement
First run	First run of a measurement (does not apply to BACKGROUND measurements)

- * Event limits are parameters set in the External Configuration file.

Background events may produce fewer entries in the Raw Data file if data filtering is enabled. See section 4.1.6 for details.

All measurement types, with the exception of the normal background measurements (**BACKGROUND**), are recorded in the Measurement Log file. This file is updated following each run. If the run type indicates a new measurement type, then a new entry is made in the current Measurement Log file. If the run type indicates no change to the measurement type, then the current entry is overwritten in the last written Measurement Log file. An entry in the Measurement Log file includes the measurement type, the start and end time of the measurement, and the average of the totals and reals rates of the runs in the measurement.

It is possible that the Measurement Log file written to is not the current Measurement Log file, i.e., the one for today's date. This occurs when a measurement type is established in one day and consecutive runs of the same measurement type continue in the next day. In this case the Measurement Log file that was written to with the first run of the measurement type is written to with subsequent measurement updates from the next day. It is possible, but unlikely, that there could be no Measurement Log file for a day when run data were recorded if the same measurement type was continued from the previous day and continued through to the next day.

4.1.6 Background Data Filtering

The number of data entries in the Raw Data file for consecutive background runs, within the same background measurement, can be reduced by data filtering. Data filtering is enabled by setting the data filtering parameter to 1 in the Internal Configuration file (see Appendix 3.2).

The data for consecutive background runs are accumulated as if there was one long background run rather than several runs. The start time is the start time of the first run in the set of consecutive background runs and the duration is the sum of the runs' durations. The totals counts, reals plus accidentals counts, and accidentals counts are likewise the sums of the runs' counts. The status is the status of the first run.

Data are accumulated with the start of a new background measurement type. Assuming that a given background measurement type continues from run to run, there are three conditions that

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will re-start data accumulation. First is exceeding the "number of background runs to reduce" parameter in the Internal Configuration file. The second is exceeding the "sigma threshold for background averaging" parameter covering the acceptable deviation in the current data set as compared with the accumulated data. This parameter is also in the Internal Configuration file. The third condition occurs with the start of a new day.

The current Raw Data file is updated with each new run. The first time data are accumulated they are written to a new entry in the current Raw Data file. Subsequent data accumulations overwrite the same data entry with the accumulated data.

The data-reduction algorithm is described in Appendix 5.3.

4.1.7 Signaling The Monitor Camera

There is a monitor camera that must be signaled to record a picture of the significant events. SR COLLECT sends this signal whenever a measurement of a particular type (**ASSAY**, **EMPTY**, **CF NORM**, or **CF CHECK**) has persisted beyond the "Camera signal threshold" parameter. This threshold is displayed on the Parameters and Thresholds screen (see Fig. 4.3) and can be examined and modified with the *Modify parameters* option (see Section 4.4).

Sending the camera signal is recorded as a critical event in the Critical Events file.

The camera signal is described in Appendix 6.

4.2 Copy Data Files To Diskette Option

The **Copy data files to diskette** option permits the user to export collected data files to floppy diskettes. The data on these diskettes can then be carried to the review computer and imported into SR REVIEW.

When this option is selected, the user is asked (see Fig. 4.4) to specify the destination drive and directory on the floppy diskette. The default is A:\DATA. The user can also specify the type of copying to be performed. There are two choices: AUTOMATIC and MANUAL. The default is AUTOMATIC. AUTOMATIC copying selects data files from the current inspection period; MANUAL copying selects data files from prior inspection periods.

Fig. 4.4 Copy Data Files Display

The user presses the [F10] key to accept the destination and continue with the copy type selected. Alternatively, the user can cancel the operation and return to the Main Menu by pressing the [Esc] key.

4.2.1 Automatic Copy

Normally *automatic copy* is the type of copy selected. It permits copying of all data files in the current inspection period (i.e. those contained in the DATA directory). Multiple copies can be made by repeatedly selecting this option.

If automatic copy is selected, a screen appears (see Fig. 4.5) that permits the user to specify a date range for copying data files. The user can change the starting and ending dates to copy any range of days within the current inspection period. The default range covers the duration of the current inspection period.

94.12.19	SR COLLECT 2.00	16:35:15
----------	-----------------	----------

SELECT DATE RANGE FOR AUTOMATIC COPY

Copy start date: 94.12.19 00:00:00

Copy stop date: 94.12.18 23:59:59

[F1], <Tab>, <Shift-Tab> to move; [F10] to continue; [Esc] to cancel/exit.

Fig. 4.5 Automatic Copy Display

The user presses the [F10] key to accept the selected range of dates for the files to be copied. Alternatively, the user can cancel the operation and return to the Main Menu by pressing the [Esc] key.

The *approximate* number of formatted 1.44-MByte floppy disks needed to copy the files is now determined. If more than one is needed, a message informing the user will be displayed. The user is now asked to insert a new disk and start the copying. During the copy the user will be prompted to insert a new disk if the current one is full. A message will be displayed if, for any reason, the disk cannot be written on. The user can cancel copying at any time by pressing the [Esc] key.

Files copied include the daily Raw Data (.BSR) files and their associated Measurement Log (.MEA) files. Also included is the set of files covering the current inspection period. These include the Inspection Period (.IP), Performance (.PFM) and Critical Events (.CEV) files.

4.2.2 Manual Copy

Manual copy permits copying of selected data files from prior inspection periods (i.e., those contained in the ARCHIVE directory).

If *manual copy* is selected, a screen appears (see Fig. 4.6) that permits the user to select the individual daily Raw Data files to be copied. Files are displayed with the newest file listed first. The user enters a "Y" next to those files to be copied. The default is that no files are to be copied ("N" is next to all).

94.12.19		SR COLLECT 2.00		16:37:15	
SELECT FILES TO COPY					
Copy (Y/N)					
Y	94.11.30	00:00	14B0A00	.BSR	
N	94.11.29	00:00	14B7000	.BSR	
N	94.11.28	00:00	14B5A00	.BSR	
N	94.11.27	00:00	14B8A00	.BSR	
N	94.11.26	00:00	14B0A00	.BSR	
N	94.11.25	00:00	14B7A00	.BSR	
N	94.11.24	00:00	14B0A00	.BSR	
N	94.11.23	00:00	14BNA00	.BSR	
N	94.11.22	00:00	14BNA00	.BSR	
N	94.11.21	00:00	14B7A00	.BSR	
N	94.11.20	00:00	14BNA00	.BSR	
N	94.11.19	00:00	14B7A00	.BSR	
N	94.11.18	00:00	14B7A00	.BSR	
N	94.11.17	00:00	14B7A00	.BSR	
N	94.11.16	00:00	14B7A00	.BSR	
N	94.11.15	00:00	14B7A00	.BSR	
N	94.11.14	00:00	14B7A00	.BSR	

Enter Y to copy this file.
[Tab],<Tab>,<Shift-Tab> to move; [F10] to continue; [Esc] to cancel/exit.

Fig. 4.6 Manual Copy Display

The user presses [F10] to accept the specified Raw Data files to be copied. Alternatively, the user can cancel the operation and return to the Main Menu by pressing the [Esc] key.

The *approximate* number of formatted 1.44-MByte floppy disks needed to copy the files is now determined. If more than one is needed a message informing the user will be displayed. The user is now asked to insert a new disk and start the copying. During the copy the user will be prompted to insert a new disk if the current one is full. There will be a message displayed if, for any reason, the disk cannot be written on. The user can cancel copying at any time by pressing the [Esc] key.

In addition to the selected daily Raw Data (.BSR) files, *manual copy* copies the Measurement Log (.MEA) files associated with the Raw Data files. It also copies the set of files covering the inspection period in which each of the Raw Data files were created. These include the Inspection Period (.IP), Performance (.PFM) and Critical Events (.CEV) files.

4.3 Delete Data Files From Hard Disk Option

The *Delete data files from hard disk* option permits the user to clean out old data files from the hard disk. The data files that the user has access to are associated with prior inspection periods and, therefore, are located in the ARCHIVE directory.

When this option is selected, a screen appears (see Fig. 4.7) that permits the user to select Raw Data files to be deleted. Files are displayed with the oldest file listed first. The user enters a "Y" next to those files to be deleted. The default is that no files are to be deleted ("N" is next to all).

94.12.19		SR COLLECT 2.00		16:39:24	
SELECT FILES TO DELETE					
Delete (Y/N)					
N	94.11.01	00:00	14R1000.BSR		
N	94.11.03	00:00	14R2000.BSR		
N	94.11.03	00:00	14R3000.BSR		
N	94.11.04	00:00	14R4000.BSR		
N	94.11.05	00:00	14R5000.BSR		
N	94.11.06	00:00	14R6000.BSR		
N	94.11.07	00:00	14R7000.BSR		
N	94.11.08	00:00	14R8000.BSR		
N	94.11.09	00:00	14R9000.BSR		
N	94.11.10	00:00	14R0000.BSR		
N	94.11.11	00:00	14R1000.BSR		
N	94.11.13	00:00	14R3000.BSR		
N	94.11.13	00:00	14R4000.BSR		
N	94.11.14	00:00	14R5000.BSR		
N	94.11.15	00:00	14R6000.BSR		
N	94.11.16	00:00	14R7000.BSR		
N	94.11.17	00:00	14R8000.BSR		

Enter Y to delete this file.
 [F1],<tab>,<Shift-tab> to move; [F10] to continue; [Esc] to cancel/exit.

Fig. 4.7 Delete Files Display

The user presses the [F10] key to accept the specified Raw Data files to be deleted. Alternatively, the user can cancel the operation and return to the Main Menu by pressing the [Esc] key.

As each file is about to be deleted, the user is prompted to confirm that the file is to be deleted. The user can cancel deleting at any time by pressing the [Esc] key.

In addition to the Raw Data (.BSR) file, its corresponding Measurement Log (.MEA) file will also be deleted. If all the Raw Data files from an inspection period are deleted, the associated Inspection Period (.IP), Critical Events (.CEV), and Performance (.PFM) files for that inspection period will be also be deleted.

4.4 Modify Parameters Option

The **Modify parameters** option permits the user to examine and modify the current parameter set. The current parameter set is maintained in the parameter file (SRC.PAR). See Appendix 4.1 for details.

When this option is selected, a screen appears (see Fig. 4.8) that permits the user to select and modify any of the parameter fields. Changing the facility also changes the list of valid detectors. If the detector is changed, then the parameters and thresholds are updated to those found in the External Configuration file for the specified detector. (The External Configuration file was generated by SR REVIEW).

94.12.19		SR COLLECT 2.00		13:19:58	
MODIFY PARAMETERS					
Facility		PCAS-1 Canister (A)			
Detector		PCAS-1 Canister (A)			
Low background threshold (totals/time)		10.000			
High background threshold (totals/time)		100.000			
Empty container threshold (reals/time)		20.000			
Assay threshold (reals/time)		1.000			
Cf/totals ratio threshold (reals/totals)		0.120			
Cf normalization threshold (reals/totals)		1000.000			
A/I totals threshold (totals/time)		100.000			
A/I bias limit (%)		0.100			
A/I sigma limit		3.000			
Camera signal threshold (minutes)		4			
Minimum measurement length (minutes)		5			
Maximum measurement length (minutes)		20			
Shift register type		JSR-11			
Shift register ID		XXXXXXXX			
[F2] to display list of valid entries.					
[T.I.<Tab>,<Shift-Tab>] to move; [F10] to continue; [Esc] to cancel/exit.					

Fig. 4.8 Modify Parameters Display

The user presses the [F10] key to accept the new parameter set. Alternatively, the user can cancel the changes and return to the Main Menu by pressing the [Esc] key.

SR COLLECT USERS MANUAL

A new inspection period must be started whenever the detector changes. If the user changes the detector, a screen appears (see Fig. 4.9) that asks the user to confirm the intent to start a new inspection period. If the user accepts creation of a new inspection period, SR COLLECT returns to the Main Menu. If the user declines the creation of a new inspection period, SR COLLECT remains in the Modify parameters option. (The user can now press the [Esc] key to return to the Main Menu.)

Fig. 4.9 Detector Changed Display

Parameter modifications do not affect the entries in the External Configuration file (CONFIG.CFG) that was generated by SR REVIEW. Changes made with the **Modify parameters** option are saved in the parameter file (SRC.PAR) and will be retained if the program is terminated and restarted.

4.5 List Measurements Option

The *List measurements* option permits the user to examine the contents of all Measurement Log files in the current inspection period.

When this option is selected, a screen appears (see Fig. 4.10) that permits the user to select the measurement types to display, the period to be covered, and the output devices where the listing is to be sent. Measurement types that can be selected include the following:

Choice	Meaning
ALL	Select all measurements (including UNKNOWN measurements)
LOW BKG	Select only LOW BKG measurements
HIGH BKG	Select only HIGH BKG measurements
EMPTY	Select only EMPTY measurements
ASSAY	Select only ASSAY measurements
CF NORM	Select only CF NORM measurements
CF CHECK	Select only CF CHECK measurements

The default period covers the current inspection period. This period includes all measurements in all Measurement Log files in the current inspection period. The default output device is the screen, but the user may also choose the printer or both.

Fig. 4.10 Select Measurements Display

SR COLLECT USERS MANUAL

The user presses the [F10] key to list the selected measurements. Alternatively, the user can cancel the changes and return to the Main Menu by pressing the [Esc] key.

In addition to the individual measurements, a summary of the number of times each measurement type appears is listed at the end of the display.

Figure 4.11 shows a sample listing of measurements.

94.12.19		SR 6088561 2.00		13:00:30		
MEASUREMENT LIST FOR 94.12.19 12:14:53 THROUGH 94.12.19 12:43:05						
Meas Type	Beginning Date Time		Ending Date Time		Avg I/I	Avg R/t
ASSAY	94.12.19	12:15:06	94.12.19	12:20:10	487616.00	33676.00
ASSAY	94.12.19	12:26:31	94.12.19	12:33:46	487616.00	33676.00
LOW BRG	94.12.19	12:36:52	94.12.19	12:37:55	5.00	0.00
HIGH BRG	94.12.19	12:42:03	94.12.19	12:42:03	150.00	0.00
TOTALS SUMMARY BY MEASUREMENT TYPE:						
Low Background	=	1				
High Background	=	1				
Empty	=	0				
Assay	=	2				
CF Check	=	0				
CF Normalization	=	0				
Current Top Line: 1; Total Lines: 17						
Use ↑ L, ↓, PgUp, PgDn, Home or End - [Esc, F10] when finished.						

Fig. 4.11 Measurement List Display

Appendix 1 -- Installed AUTOEXEC.BAT & CONFIG.SYS Files

The following AUTOEXEC.BAT and CONFIG.SYS files are copied to the root directory of the hard drive (Drive C:) as part of the installation procedure.

1.1 Installed AUTOEXEC.BAT File

```
echo off
set path=c:\;c:\dos;c:\n1batch
prompt $p$g
mode bw80
mode com1:9600
set tz=mst7
srcol
```

1.2 Installed CONFIG.SYS File

```
files=20
buffers=20
device=c:\dos\ansi.sys
```

Appendix 2 -- Data Files

2.1 Data File Organization

Data files generated by SR COLLECT are located in either the data directory (C:\COLLECT\SRDATA) or the archive directory (C:\COLLECT\SRDATA\ARCHIVE). Both directories are created during SR COLLECT installation. The data directory contains the files that are associated with the current inspection period. The archive directory contains files associated with previous inspection periods.

An inspection period consists of an Inspection Period (.IP) File, a Critical Events (.CEV) File, a Performance (.PFM) File, plus several Raw Data (.BSR) and Measurement Log (.MEA) Files. There will be one Raw Data File for each day data were collected. There will usually be a Measurement Log File associated with each Raw Data File.

2.2 Data File-Naming Convention

Data files generated by SR COLLECT have names that indicate the creation date, detector number, and file type. File names have the form "abcdefg.ext."

The file extension ("ext") indicates the file type. The five file types are shown in the following table:

Extension	Meaning
.IP	Inspection Period File
.CEV	Critical Events File
.PFM	Performance File
.BSR	Raw Data File
.MEA	Measurement Log File

The first seven characters ("abcdef") of the file name indicate the detector number and an encoding of the file creation date. The following table defines the meanings of the individual character positions:

Character	Meaning
a	Detector number (see codes below)
b	Year file was created (see codes below)
c	Month file was created (see codes below)
d	Day file was created (see codes below)
e	Hour file was created (see codes below)
fg	Minute file was created (00-59)

SR COLLECT USERS MANUAL

The codes for the detector number ("a"), year ("b"), month ("c"), day ("d"), and hour ("e") are defined in the following:

Code	Det #	Code	Year	Code	Month	Code	Day	Code	Hour
0	0	0	1990	1	January	1	1	A	0
1	1	1	1991	2	February	2	2	B	1
2	2	2	1992	3	March	3	3	C	2
3	3	3	1993	4	April	4	4	D	3
4	4	4	1994	5	May	5	5	E	4
5	5	5	1995	6	June	6	6	F	5
6	6	6	1996	7	July	7	7	G	6
7	7	7	1997	8	August	8	8	H	7
8	8	8	1998	9	September	9	9	I	8
9	9	9	1999	A	October	A	10	J	9
A	10	A	2000	B	November	B	11	K	10
B	11	B	2001	C	December	C	12	L	11
C	12	C	2002			D	13	M	12
D	13	D	2003			E	14	N	13
E	14	E	2004			F	15	O	14
F	15	F	2005			G	16	P	15
G	16	G	2006			H	17	Q	16
H	17	H	2007			I	18	R	17
I	18	I	2008			J	19	S	18
J	19	J	2009			K	20	T	19
K	20	K	2010			L	21	U	20
L	21	L	2011			M	22	V	21
M	22	M	2012			N	23	W	22
N	23	N	2013			O	24	X	23
O	24	O	2014			P	25		
P	25	P	2015			Q	26		
Q	26	Q	2016			R	27		
R	27	R	2017			S	28		
S	28	S	2018			T	29		
T	29	T	2019			U	30		
U	30	U	2020			V	31		
V	31	V	2021						
W	32	W	2022						
X	33	X	2023						
Y	34	Y	2024						
Z	35	Z	2025						

For example, an Inspection Period file for detector number 5 created on 94.12.19 at 00:00:13 would be named "54CJA00.IP." (Note the seconds of the file creation date do not affect the file name.)

2.3 Raw Data (.BSR) File

A Raw Data (.BSR) File is created each day data are collected. Each Raw Data File consists of an ASCII header followed by one or more binary data records. There is one binary data record for each data set returned by the shift register electronics.

The ASCII header contains the following information:

Field Size (in bytes)	Description
5	Size of header that follows this field (e.g. "AAA95")
1	(blank)
2	Facility number (e.g. "A1")
1	(blank)
2	Detector number (e.g. "A5")
1	(blank)
4	Version number of SR COLLECT (e.g. "2.00")
1	(blank)
8	Date (e.g. "94.12.19")
1	(blank)
8	Time (e.g. "00:00:13")
1	(blank)
2	Detector type (e.g. "A1")
	1 - JSR-11
	3 - JSR-12
	5 - JSR-11A
12	Inspection period filename (e.g. "54CJA00.IP")
50	(reserved)

Each binary data record captures the results of one run and contains the following information:

Data Type	Field Size (in bytes)	Description
unsigned long	4	Start time of run (in Julian seconds)
unsigned short	2	Count time of run (in seconds)
double	8	Totals counts
double	8	Reals + accidentals counts
double	8	Accidentals counts
double	8	Second totals counts (unused)
unsigned short	2	Measurement status
		d00 - A/T test failed 0 = no, 1 = yes
		d01 - Low background 0 = no, 1 = yes
		d02 - High background 0 = no, 1 = yes
		d03 - Empty 0 = no, 1 = yes
		d04 - Assay 0 = no, 1 = yes
		d05 - Cf check source 0 = no, 1 = yes
		d06 - Cf normalization 0 = no, 1 = yes
		d07 - Length short 0 = no, 1 = yes
		d08 - Length long 0 = no, 1 = yes
		d09 - Unusual measurement 0 = no, 1 = yes
		d10 - First run 0 = no, 1 = yes
		d11 - d15 (reserved)

2.4 Measurement Log (.MEA) File

A Measurement Log (.MEA) File is created each day data are collected. Analysis of that data determines that the measurement type is different from the measurement type previously recorded. Each Measurement Log File contains one or more ASCII measurement records.

Each ASCII measurement record contains the following information:

Field Size (in bytes)	Meaning
3	Measurement type: (e.g. "AA4") <ul style="list-style-type: none"> 1 - Low background 2 - High background 3 - Empty 4 - Assay 5 - Cf check source 6 - Cf normalization 7 - Unknown
1	(blank)
8	Begin date (e.g. "94.12.19")
1	(blank)
8	Begin time (e.g. "00:00:13")
1	(blank)
8	End date (e.g. "94.12.19")
1	(blank)
8	End time (e.g. "00:00:13")
1	(blank)
11	Average totals rate (e.g. "AA487616.00")
1	(blank)
11	Average reals rate (e.g. "AAA33676.00")
2	CR-LF

2.5 Inspection Period (.IP) File

An Inspection Period (.IP) File is created when the user starts a new inspection period. An Inspection Period File contains only one ASCII data record.

The ASCII inspection period data record contains the following information:

Field Size (in bytes)	Description
3	Facility number (e.g. "111")
2	CR-LF
3	Detector number (e.g. "115")
2	CR-LF
8	Start date (e.g. "94.12.19")
1	(blank)
8	Start time (e.g. "00:00:13")
1	(blank)
8	End date (e.g. "94.12.19")
1	(blank)
8	End time (e.g. "00:00:13")
2	CR-LF

2.6 Critical Events (.CEV) File

A Critical Events (.CEV) File is created when the user starts a new inspection period. A Critical Events File contains one or more ASCII event records.

An ASCII event record contains a time stamp (yy.mm.dd hh:mm:ss) followed by one of these event descriptions:

- Program started
- Program terminated
- New inspection period started
- Data collection started
- Data collection terminated
- Data file deleted: <file name>
- Error in communicating with shift register: <error>
 - Invalid port
 - Invalid SR type
 - Invalid request
 - Arg out of range
 - Port not open
 - I/O error
 - Time-out
- Count time has changed
- Camera signal sent
- Count time is zero

An ASCII event record is terminated with a CR-LF pair.

2.7 Performance (.PFM) File

A Performance File (.PFM) is created when the user starts a new inspection period. A Performance File contains one or more ASCII parameter set records.

An ASCII parameter set record consists of 17 lines, each terminated with a CR-LF pair. The first line contains the reason the parameters are being recorded together with a time stamp (yy.mm.dd hh:mm:ss). The recording reason will be one of the following:

Reason	Description
PARMS AT PROG START ON	Each time program is started the parameters are recorded.
PARMS MODIFIED ON	Each time the parameters are modified the parameters are recorded.
PARMS AT NEW IP START ON	Each time a new inspection period is started the parameters are recorded.

The 16 lines that succeed the reason line contain the parameter settings. They consist of the following:

- Facility
- Detector
- Low-background threshold (totals/second)
- High-background threshold (totals/second)
- Empty-container threshold (reals/second)
- Assay threshold (reals/second)
- Cf/totals ratio threshold (reals/totals)
- Cf normalization threshold (reals/totals)
- A/T totals threshold (totals/second)
- A/T bias limit (%)
- A/T sigma limit
- Camera signal threshold (minutes)
- Minimum measurement length (minutes)
- Maximum measurement length (minutes)
- Shift register type
- Shift register ID

Appendix 3 -- Configuration Files

3.1 External Configuration File (CONFIG.CFG)

The External Configuration File (CONFIG.CFG) generated by SR REVIEW contains parameters and thresholds for each detector at each facility. This file is written to the working installation disk by SR REVIEW. It is placed in C:\COLLECT\CONFIG by the SR COLLECT installation. It is read by SR COLLECT when the program starts.

The file consists of three types of ASCII records. The first is a header specification. The second is a facility specification. The third is a detector specification. Each facility specification is followed by one or more detector specifications. At least one facility and one detector must be specified.

Each line is terminated with a CR-LF pair. Lines begin with the relevant data; successive spaces, tabs, and comments (delimited by "/" ... "/" pairs) are ignored. A blank line terminates each facility and detector specification.

The header specification consists of 1 line.

- Number of facilities

The facility specification consists of 4 lines.

- Facility number
- Facility pick list number
- Facility name
- Number of detectors for this facility

The detector specification consists of 21 lines.

- Detector number
- Detector pick list number
- Detector full name
- Detector short name
- Detector (shift register) type
- Dead time coefficient A
- Dead time coefficient B
- Minimum background threshold
- High background threshold
- Empty container threshold
- Assay threshold
- Cf/Totals ratio threshold
- Cf normalization threshold
- A/T threshold
- A/T bias limit
- A/T sigma limit
- Camera signal threshold
- Minimum event limit
- Maximum event limit
- Shift register type
- Shift register number

3.2 Internal Configuration File (SRC.CFG)

The Internal Configuration File (SRC.CFG) contains facility-specific information. This file is read by SR COLLECT when the program starts. It consists of 12 ASCII lines, each terminated with a CR-LF pair. Each line begins with the relevant data; successive spaces or tabs and comments (delimited by "/* ... */" pairs) are ignored. The lines are organized as follows:

- Serial port number (0=COM1, 1=COM2).
- Drive and path for current inspection period files.
- Name of parameter configuration file.
- Minimum available hard disk space (%) that will be maintained for writing data (usually 5).
- Number of seconds software will wait before auto starting (usually 60).
- Number of seconds for time-out on facility/detector prompt screen.
- Number of background runs to be reduced to a single point (e.g., 50).
- Sigma to be exceeded that will cause a new background reduction interval to begin.
- Shift register diagnostics flag (1=ON, 0=OFF).
Caution: Do not turn on the shift register diagnostics flag unless requested by LANL.
- Gate width setting on shift register (e.g. 0.000064).
- Activate data filter (1=ON, 0=OFF).

The Internal Configuration File (SRC.CFG) is placed in C:\COLLECT\CONFIG by the SR COLLECT installation. It contains the following:

```

0          /* serial port number          */
c:\collect\sldata\ /* include drive letter & slash at end */
config.cfg  /* name of parm db file        */
5          /* minimum percent avail for writing data */
60         /* seconds to wait before auto starting */
60         /* quick form timeout seconds          */
50         /* # of runs to reduce at a time       */
3.0        /* sigma threshold for bkg averaging   */
0          /* SR diagnostics:  1 - ON    0 - OFF  */
0.000064   /* gate width setting on shift register */
1          /* data filtering:  1 - ON    0 - OFF  */

```

Appendix 4 -- Internal Files

4.1 Parameters File (SRC.PAR)

The Parameters File (SRC.PAR) contains the current parameter set. It consists of a single binary record:

Data Type	Field Size (in bytes)	Description
char	31	Facility name
unsigned int	2	Facility number
unsigned short	2	Detector number
char	31	Detector full name
char	11	Detector short name
double	8	Minimum background threshold
double	8	High background threshold
double	8	Empty container threshold
double	8	Assay threshold
double	8	Cf/totals ratio threshold
double	8	Cf normalization threshold
int	2	Minimum event length
int	2	Maximum event length
double	8	A/T threshold
double	8	A/T bias limit
double	8	A/T sigma limit
int	2	Camera signal thresh
char	9	Shift register #
char	8	Shift register type

4.2 Operations File (SRC.OPS)

The Operations File (SRC.OPS) contains the current operations data. It consists of a single binary record:

Data Type	Field Size (in bytes)	Description
int	2	Interruption count
int	2	Facility number
int	2	Detector number
char	13	Current .IP file
char	13	Current .CEV file
char	13	Current .PFM file
char	13	Current .BSR file
char	13	Current .MEA file

4.3 SR Log File (SR.LOG)

The SR Log File (SR.LOG) contains a log of all commands sent to the shift register electronics unit. It is available for debugging communications problems. This file will only be written if the shift register diagnostics parameter in the Internal Configuration file is set to 0; it will subsequently be overwritten at the start of each day.

The file is composed of ASCII lines. Each line includes a reference to the command being sent to the shift register electronics unit, the numerical value of the status returned by the SR Library in invoking that command, and the time at which the command status was returned. Each line is terminated with a CR-LF pair.

Appendix 5 -- Analysis

5.1 Run Type Determination

5.2 A/T Test

5.3 Background Data Reduction

Appendix 6 -- Monitor Camera Signal

The monitor camera is signaled by a pulse (from low to high followed by high to low) with a duration of at least 200 milliseconds on pin 2 (Data bit 0) of the second parallel port (LPT2). The camera signal level is maintained at low otherwise.