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Chapter 1: INTRODUCTION

1.1 Purpose

SSYS1 is a set of SIR systems subroutines which define a software interface for:-

characters input and output: QCHIN, QCHOP
error output : QERROR
end of program situations : QPAUSE, QSTOP.

1.2 Summary

This section defines the interfaces for the operations listed above, and also describes the standard programs provided with the 903 library for these tasks.

1.3 Form of Distribution

SSYS1 is distributed as a SIR coded tape, holding the standard versions of all the routines listed in 1.1.

1.4 Method of Use

The routines are assembled as blocks of the users SIR program. Any unwanted blocks may be removed by the use of the EDIT program (Volume 2.3.2.).

Chapter 2: QCHIN (CHARACTER INPUT)

2.1 Function

QCHIN is the SIR systems routine for input of individual characters. Its specification provides a standard interface for character input.

2.2 Interface

2.2.1 Entry

Enter by: 11 QCHIN
8 QCHIN+1

The number of the input device required must be stored in QDIN.

2.2.2 Exit

Exit is standard, to the first location after entry. On exit the A register holds the character input in SIR internal code form. (Volume 2.1.1. Chapter 1.5).

The Q and B registers are undefined on exit.

2.2.3 Allocated Input Device Codes

The following device codes have been allocated.

1. Paper tape reader.
2. Reserved.
3. Teleprinter.
- 4 to 9 Reserved for future peripheral routines.
10. Any special device routines written by user.

2.2.4 Global Labels

QCHIN and QDIN are global labels, within SSYS1, and the user must declare these as global in any block which contains references to them.

2.3 The Standard Version of QCHIN

The tape SSYS1 contains the standard version of QCHIN, which may be used for input from paper tape or the on line teleprinter only in the standard 903 (I. S. O.) 8 track-code.

2.3.1 Character Set

Character	Action by QCHIN
blank, erase, carriage return	Always ignored.
ISO code values 32 (space) to 95 (←) (except 33)	Converted to internal code equivalent (see Volume 2.1.1; Chapter 1.5.)
Lower case letters	Converted to internal code equivalent upper case
Newline (line feed) Tab (code 9)	gives internal code +1 gives internal code +0 (space)
Halt (code 20)	Causes wait via QPAUSE. On continuation next character is input.
@ (code 96)	gives internal code +32 (^)
! (code 33)	gives internal code +1

All other 8 track characters, including all odd parity characters, are treated as errors, (see 2.3.3.).

2.3.2 Permitted Input Devices

Input from the standard paper tape reader (device 1) and the teleprinter (device 3) is allowed. Any other device number causes input from the paper tape reader.

2.3.3 Error Indications

Errors are output via QERROR. The form of output is:

*CHN <octal number> <address>

<octal number> represents a 5 digit octal number giving the code of the character input. <address> represents a 6 digit decimal number giving the address from which QCHIN was called.

Example: If QCHIN was entered by 11 QCHIN, 8 QCHIN+1 in locations 2500 and 2501 respectively and read character value +254, the error output would be:

*CHN 00376 002501.

2.3.4 Store Used

The standard version of QCHIN occupies approximately 50 store locations.

2.3.5 Time Taken

The standard version of QCHIN is capable of driving a 250 or 500 character per second tape reader at full speed.

2.4 Possible Variations

The user may write other versions of QCHIN, keeping to the specification in 2.2. Possible variations are:

- (a) Input in different telecodes, for 5, 6, 7 or 8 track paper tape.
- (b) Input from special peripheral devices.
- (c) Reduced versions of QCHIN, e.g. cutting out the parity check.

A version for use with special peripheral may be designed to always use the one peripheral, or to offer a choice of input devices by testing the value in QDIN. The globally labelled location QDIN must always be included in any version of QCHIN, even if it is not used.

Chapter 3: QCHOP (CHARACTER OUTPUT)

3.1 Function

QCHOP is the SIR systems routine for output of individual characters. Its specification provides a standard interface for character output.

3.2 Interface

3.2.1 Enter by: 11 QCHOP
8 QCHOP+1

The number of the output device required must be stored in QDOUT.

The A register must hold the SIR internal code value of the character to be output.

Alternatively, A may hold /0 n, where n is a number corresponding to an 8 bit binary pattern, which is output without alteration.

3.2.2 Exit

Exit is standard, to the first location after entry. The A, Q and B registers are undefined on exit.

3.2.3 Allocated Output Device Codes

1. Paper Tape punch
2. Reserved
3. Teleprinter
4. Reserved for Lineprinter
5. Reserved for Plotter
- 6 to 9 Reserved for future peripheral routines
10. Any special device routines written by user.

3.2.4 Global Labels

QCHOP and QDOUT are global labels, within SSYS1, and the user must declare them as global in any block which refers to them.

3.3 The Standard Version of QCHOP

The tape SSYS1 contains the standard version of QCHOP, which may be used for output to paper tape or the teleprinter in 8 track 903 (I. S. O.) code.

3.3.1 Character Set

The standard version of QCHOP will output any character of the 64 in the SIR internal code.

Newline (internal code 1) is output as carriage return, line feed, blank.

3.3.2 Permitted Output Devices

Only the paper tape punch (1) and on-line teleprinter (3) are used as output devices. Any other device number causes output to the paper tape punch.

3.3.3 Store Used

The standard version of QCHOP occupies approximately 40 locations.

3.3.4 Time Taken

Output is limited by the peripheral response time.

3.4 Possible Variations

The user may write other versions of QCHOP, keeping to the interface specification in 3.2. Possible variations are:

- (a) Output in different telecodes, e.g. to 5 track tape.
- (b) Output to a special output device, e.g. QCHOP could call QLPOUT to output to a lineprinter.

A version for use with a special peripheral may either use QDOUT to chose which device is required for output, or always output to the one device regardless of QDOUT. However the globally labelled location QDOUT must be included in any version of QCHOP.

3.5 Example

The following program will produce output of character A followed by erase on the paper tape punch:

```
[QCHOP QDOUT]
4 +1
5 QDOUT
4 +33 (INTERNAL CODE FOR A)
11 QCHOP
8 QCHOP+1
4 =/0 255 (OUTPUT +255 IN BINARY i.e. ERASE)
11 QCHOP
8 QCHOP+1
```

Chapter 4: QERROR

4.1 Function

QERROR is the SIR systems routine for output of error messages. Its specification provides a standard interface for error handling.

4.2 Interface

4.2.1 Entry

Enter by: 11 QERROR
 8 QERROR+1

The entry must be followed by a parameter word, holding an address, (see 4.2.4).

The A register must hold an error number, or error pattern (e.g. the status word of a peripheral) on entry.

4.2.2 Exit

Exit is standard to the second location after entry, i.e. the instruction following the parameter word.

The A, Q and B registers are undefined on exit.

QERROR will normally hold up until the computer operator takes some action, and re-enters the program, which will cause an exit from QERROR.

4.2.3 Global Labels

QERROR is a global label, within SSYS1, and the user must declare it as global in any block which contains a reference to it.

4.2.4 Parameters

The parameter word following the entry to QERROR must contain an address. This address should point to a group of 3 or more locations giving further information concerning the error. The first word of this group contains another address, which normally points to the link location of the subroutine which called QERROR.

The second word of the group should contain 0 n where n is the number of locations in the group following this word.

The third word contains 3 characters in SIR internal code, which should identify the type of error or the routine which is using QERROR.

Further words of the group may contain additional character information. However these will be ignored by the standard version of QERROR.

Example of call of QERROR from subroutine SUBR1:

```

SUBR1   +0
        :
        :
        :
        4   +9   (ERROR NUMBER 9)
ERROR 11  QERROR (ENTRY FOR OTHER ERRORS)
        8   QERROR+1
        0   DATA
        8   TRYAGAIN
DATA 0    SUBR1
        0    1
        &SR1

```

4.3 The Standard Version of QERROR

The tape SSYS1 contains the standard version of QERROR. This version outputs a one line error message on the on line teleprinter (or paper tape punch if no teleprinter fitted).

4.3.1 Output

Output from the standard version is in the form:

```
newline * identifier   octal code   address
```

The identifier consists of the 3 characters taken from the third word of the parameter block (see 4.2.4). This should normally start with a letter and be sufficiently unique to easily identify the particular error or program in which the error was generated. The octal code can be used to distinguish different errors from within the same program.

The octal code consists of the value in the A register on entry to QERROR, output as a five digit octal code.

The address consists of the contents of the content of the first word in the parameter block, printed as a five digit integer. (Result undefined if integer is outside range 0 <integer<32768).

The second word (and anything following the third word) of the parameter block is not used by the standard version of QERROR.

Example: If in the example of 4.2.4 SUBR1 is called from 11 SUBR1, 8 SUBR1+1 at locations 2000 and 2001, the output from standard QERROR will be:

```
* SR1 00011 02001
```

4.3.2 Store Used

The standard version of QERROR occupies approximately 70 store locations. It also uses subroutine QCHOP.

4.4 Possible Variations

The user may write other versions of QERROR, keeping to the specification given in 4.2. Possible variations are:

- (a) Output to devices other than the teleprinter.
- (b) Different layout of error message; use of more than 3 character identifiers.
- (c) Reduced versions, e.g. output of error number only.
- (d) A version which continues immediately after an error, i.e. no entry to QPAUSE.

Chapter 5: QPAUSE, QSTOP

5.1 Function

QPAUSE is the SIR system routine to be used whenever a temporary halt or break is required in the running of a program.

QSTOP is the label to which control should be transferred whenever a program is completed, and will not be used again (unless it is re-entered at an initial entry point).

The specification of QPAUSE and QSTOP provides a standard interface for program completion and continuation, to standardise the current situation and allow for the possible development of simple operating systems.

5.2 Interface

5.2.1 QPAUSE

Program wait is caused by the entry:

```
11 QPAUSE
 8 QPAUSE+1
```

When the operator or operating system takes action to continue the program, it is continued at the first location after the entry. The A, B and Q registers will be undefined. Continuation is normally on level 4.

5.2.2 QSTOP

When a program is completed, transfer control to label QSTOP, normally by the instruction:

```
8 QSTOP
```

There is no means of continuation after entering QSTOP.

5.2.3 Global Labels

QPAUSE and QSTOP are global labels, within SSYS1, and the user must declare them as global in any block which contains references to them.

5.3 The Standard Versions of QPAUSE, QSTOP

The tape SSYS1 contains the standard versions of QPAUSE, QSTOP, for use with the normal manual operating system.

QPAUSE stores the continuation address in absolute location 20, and then comes to a simple dynamic stop. Continuation is by re-entry at 9. Program level 1 is terminated, and the user program is continued on level 4. If more than 8192 words of store are used QPAUSE should be duplicated in each module.

QSTOP in SSYS1 is a simple dynamic stop.

5.4 Possible Variations

The user may write other versions of QPAUSE, QSTOP, keeping to the specification in 5.2.

Possible variations are:

- (a) Incorporation in an automatic or semi-automatic operating system.
- (b) Print out of messages indicating pauses or stops.
- (c) An even shorter version of QPAUSE, e.g. one in which continuation occurs immediately.