

ELLIOTT 9000

Volume 2: PROGRAMMING INFORMATION
Part 5: SIR SYSTEMS
Section 6: SSYS2 (SIR SYSTEMS TAPE 2)

CONTENTS

	Page
Chapter 1: INTRODUCTION	
1.1 Purpose	1
1.2 Form of Distribution	1
1.3 Method of Use	1
Chapter 2: INTERFACE AND FUNCTIONS	
2.1 Initial Setting	2
2.2 Interrupt Routines (Levels 2 and 3).. .. .	2
2.3 Level 1 Interrupt Routines	2
2.4 Global Labels	3
Chapter 3: EXAMPLES	
3.1 Typical Version of SSYS2	4
3.2 Example of an Initial Setting Routine	5
3.3 Example of a Typical Device Interrupt Routine ..	5

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ELLIOTT-AUTOMATION COMPUTERS LIMITED
Engineering Unit, Elliott-Automation Computers Limited,
100, Brook Hill Drive, Reading, RG2 9AT, England
Tel: 01235 444111

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100, Brook Hill Drive, Reading, RG2 9AT, England
Tel: 01235 444111

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Chapter 1: INTRODUCTION

1.1 Purpose

SSYS2 is a set of SIR systems routines for handling interrupts on standard peripherals. Its main feature is the modular interrupt routine, which is built up according to the peripherals and interface units which are actually fitted to a central processor.

The modular approach is used for flexibility and store economy, since a general purpose routine dealing with all possible peripherals would be large and probably very inefficient. It should be noted, however, that certain peripherals (e.g. Magnetic Tape) require specialised interrupt routines because of their speed of operation.

1.2 Form of Distribution

Tapes of SSYS2 are not generally distributed, they may be made up according to the requirements of the particular installation.

1.3 Method of Use

The routines are assembled as blocks of the user's SIR program.

Chapter 2: INTERFACE AND FUNCTIONS

2.1 Initial Setting

The initial entry to the user's program system is normally on Level 1, by means of the address keys and manual 'Jump' button. This entry to the program should set the appropriate addresses in the S registers for levels 2, 3 and 4 (locations 2, 4 and 6) and then program terminate to run normally on level 4. This is the recommended method of operation. It is not recommended to set locations 2, 4 and 6 by patches in SIR assembly code, since running the program will alter these locations, and the program cannot then be re-run.

If one of the levels (e.g. level 3) is not to be used, its S register location need not be set. However, if any of the Manual interrupt controls are to be used, it is recommended that a dummy program be provided for this level, to guard against accidental entry. (See Chapter 3 for an example of a dummy program at QLEV3).

For the standard SSYS2, location 2 (level 2) should be set to point to QL2ENT. Location 4 (level 3) should be set to point to QL3ENT. Location 6 (level 4) should be set to the starting address of the Main program.

2.2 Interrupt Routines (Levels 2 and 3)

The interrupt routine for each level should check any appropriate status words, and branch to the required peripheral routine. The exact form of the routine depends on the peripherals and interfaces used.

The individual peripheral interrupt routine takes action to input, output or store information. It must then transfer control back to label QLEV2 or QLEV3 (for level 2 and level 3 programs respectively) within the shortest possible time.

If only one peripheral is fitted to any one level, or if a level is used only for manual interrupts, the modular routine for that level reduces to 4 or 5 instructions only, and may be built into another routine.

2.3 Level 1 Interrupt Routines

Level 1 is a special case, since the address left in location 0 (level 1 S register) after initial entry depends entirely on the position of the 15 7168 (program terminate) instructions obeyed then.

To use level 1, a jump to QL1ENT, (a level 1 interrupt routine), should be inserted immediately after the 15 7168 on initial setting up. Note that if QPAUSE is used, this contains a terminate from level 1.

The standard version of QPAUSE has a dummy level 1 routine that ignores interrupts, this must be replaced by a jump to QL1ENT.

Level 1 is normally reserved for Manual control and no standard 903 peripherals use it at the time of writing.

2.4 Global Labels

QL2ENT, QL3ENT, QLEV2, QLEV3, QL1ENT, QLEV1, are global labels, which will be placed within SSYS2 (if the appropriate levels are used).

Chapter 3: EXAMPLES

3.1 Typical Version of SSYS2

Example of use with Lineprinter, Card Reader; both fitted via 4100 Interface Matching Unit (I. M. U.).

```
[QLEV2 QL2ENT QLPT3 QCARD2 QCARD3 QLEV3 QL3ENT]
L2A +0
L2Q +0
W +0
L2E      2 L2Q (Load Q)
          14 1
          4 L2A (Load A)
          15 7168 (Terminate level 2 program)
QL2ENT   5 L2A (Start of interrupt routine)
          3 L2Q (Store A and Q)
QLEV2   15 1600 (Read I. M. U. status)
          2 -1 (Invert bit pattern)
          5 W
          6 +3
          7 NOINT (Zero if no peripheral with '4100 interrupt')
          6 +2
          7 QCARD2 (Channel 1 'interrupt'; card reader)
          8 QLPT2 (Channel 2 'interrupt'; lineprinter)
NOINT    4 W
          6 &001400
          7 L2E (No more interrupts; terminate)
          6 &001000
          7 QCARD3 (Channel 1 'attention' card reader)
          8 QLPT3 (Channel 2 'attention' lineprinter)
QLEV3   15 7168 (Dummy level 3 routine)
QL3ENT   8 QLEV3
```

The card reader is connected to Channel 1 of the I. M. U. and the lineprinter to Channel 2. The I. M. U. status indicates which channel is interrupting by bits 1 to 8 indicating which of channels 1 to 8 respectively has a '4100 interrupt'. The appropriate bit is zero if the channel is interrupting, one if it is not. Bits 8 to 16 indicate whether channels 1 to 8 have a different type of interrupt known as a '4100 Attention'. Exit from a routine is always back to QLEV2 (for level 2) so that the status is tested to see if any more interrupts have occurred while the previous one was dealt with. Only when the status is 'clear' does the routine exit. (In fact, if the status was not clear another level 2 interrupt would occur on termination, so that QLEV2 could be placed at the same instruction as L2E, saving time as long as interrupts are relatively infrequent).

3.2 Example of an Initial Setting Routine

```
[ENTRY QL1ENT QL2ENT QL3ENT START]
ENTRY  4  AL2
        5  2
        4  AL3
        5  4
        4  ASTART
        5  6
        15 7168 (Terminate level 1 to level 4)
        8  QL1ENT (Jump to level 1 interrupt routine)
AL2     0  QL2ENT
AL3     0  QL3ENT
ASTART  0  START
START           (Start of main program on base level 4)
```

3.3 Example of a Typical Device Interrupt Routine

A level 2 routine for output of a lineprinter buffer:

[QLPT2 QLEV2]

```
QLPT2  4 MARK (TEST IF BUFFER READY FOR OUTPUT)
        9 ;+4
        4 +1 (IF BUFFER EMPTY SUPPRESS)
        15 5665 (INTERRUPTS AND TERMINATE)
        8 QLEV2
        4 BUFAD
        0 CT
        14 5697 (OUTPUT BUFFER)
        4 +1
        5 MARK (SET BUFFER EMPTY)
        8 QLEV2
```