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## SH7000 Series

## Multi-Bit Shift of 32-Bit Data (Arithmetic Right Shift)

Label:	SHARN
Functions Used:	SHLR2 Instruction SHLR8 Instruction SHLR16 Instruction

#### Contents

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## 1. Function

Performs a multi-bit (0–31) arithmetic right shift of 32-bit data.

#### 2. Arguments

Description		Storage Location	Data Length (Bytes)
Input	Number of shift bits (0–31)	R0	4
	32-bit data before shift	R1	4
Output	32-bit data after shift	R1	4

## 3. Internal Register Changes and Flag Changes

	(Before Execution) $\rightarrow$ (After Execution)
R0	Number of shift bits $\rightarrow$ Change
R1	32-bit data before shift $\rightarrow$ 32-bit data after shift
R2	Work
R3	Work
R4	
R5	
R6	
R7	
R8	
R9	
R10	
R11	
R12	
R13	
R14	
R15	(SP)
T bit	
	* : Change
	0 : Fixed 0

1 : Fixed 1



## 4. Programming Specifications

Program memory (bytes)
74
Data memory (bytes)
0
Stack (bytes)
8
Number of states
38
Reentrant
Yes
Relocation
Yes
Intermediate interrupt
Yes

#### 5. Notes

The number of states indicated in the programming specifications is the value when a 31-bit shift is performed.



#### 6. Description

#### (1) Function

Details of the arguments are as follows.

- R0: As the input argument, set the number of shift bits (0-31).
- R1: Set the 32-bit data before the shift as the input argument.

Holds the 32-bit data after the shift as the output argument.

Figure 1 shows a software SHARN execution example.

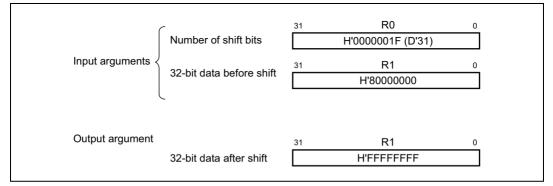


Figure 1 Software SHARN Execution Example

#### (2) Usage Notes

The contents of R1, which holds the 32-bit data before the shift, are destroyed after the shift when the 32-bit data after the shift is stored there. In addition, execution of the software SHARN instruction changes the setting of R0, which specified the number of shift bits.

If the values for the 32-bit data before the shift and the number of shift bits will be needed after the software SHARN instruction is executed, they should be saved beforehand.

#### (3) RAM Used

No RAM is used by the software SHARN instruction.

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#### (4) Usage Example

After the number of shift bits and the 32-bit data before the shift have been set in the input arguments, the software SHARN instruction is executed by a subroutine call.

```
MOV #H'05,R0 .... Sets number of shift bits in input argument (R0)
BSR SHARN .... Subroutine call to software SHARN
MOV.L DATA,R1 .... Sets 32-bit data before shift in input argument (R1)
....
.align 4
DATA .data.l H'80000000
```

#### (5) Operating Principle

(a) Bits 4 to 0 in R0, which is set to the number of shift bits, are tested. If any of them have a value of 1, a shift corresponding to the weighting of the bits in question is performed using the 16-bit logical right shift command (SHLR16), the 8-bit logical right shift command (SHLR8), the 2-bit logical right shift command (SHLR2), and the 1-bit logical right shift command (SHLR).

Bit Number	Weighting	Instruction	
Bit 4	2 <sup>4</sup> = 16	SHLR16	
Bit 3	$2^3 = 8$	SHLR8	
Bit 2	$2^2 = 4$	SHLR2 (twice)	
Bit 1	$2^1 = 2$	SHLR2	
Bit 0	$2^0 = 1$	SHLR	

#### Table 1 Number of Shift Bits and Instructions Used for Each Bit



(b) Since the 32-bit data before the shift is shifted 16 bits, 8 bits, 2 bits, and 1 bit by the logical right shift instructions, when the MSB of 32-bit data before shift is 1, the empty MSB following the shift becomes not 1 but 0.

Therefore, if R2 contains H'FFFFFFF, as shown in figure 2, and this data is shifted logically right by the same number of bits as the 32-bit data before the shift, and if the MSB before the shift is 1, after the shift the top bits of the shifted portion are set to 1 by a logical OR with the inverted R2 value.

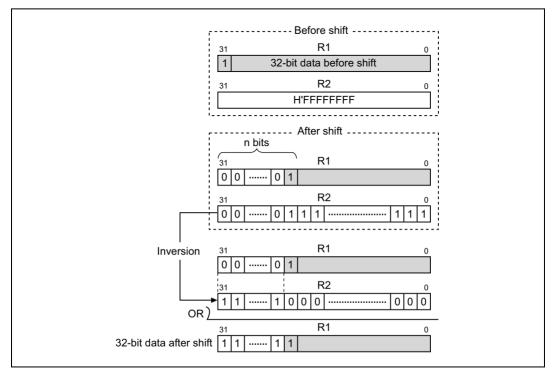
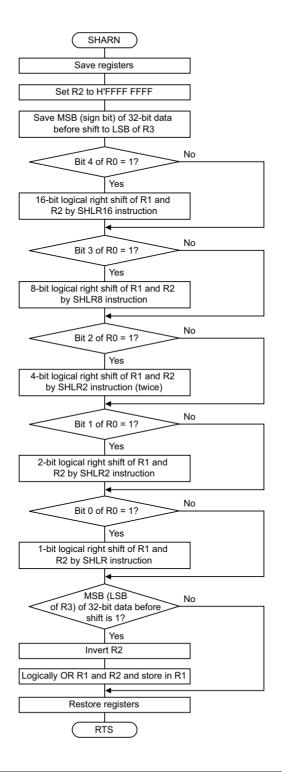


Figure 2 Multiple Bit Shift



#### 7. Flowchart





## 8. Program Listing

ENTRY: R0 (NUMER OF BIT SHITED) R1 (32 BIT DATA) RTURNS: R1 (32 BIT DATA) RTURNS: R1 (SHIT RESULT) 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	NAME: n BITS SHIFT AF	RITHMET	IC RIGH	r (sharn	)		
NETURNS: R1 (SHIFT RESULT)       1       ;         1       1       ;         2       3       3       ;         3       3       3       ;         4       4       ;       ;         5       .       ;       ;         6       .       ;       ;         7       .       7       ;       ;         8       .       ;       ;         9       .       .       ;       ;         10       .       10       ;       ;         11       .       10       ;       ;         12       0001000       13       SNARN .EQU       \$       Recape register         13       0001000       14       MOV.L       R2,e=R15       ;       recape register         14       0001000       228       MOV.L       R2,e2       ;       Recape register         14       0001004       3228       17       MOV.L       R2,e2       ;       Recape register         15       0001004       3228       17       MOV.L       R2,e2       ;       Recape register         16       0001000 <td< td=""><td colspan="7">ENTRY: R0 (NUMBER OF BIT SHIFTED)</td></td<>	ENTRY: R0 (NUMBER OF BIT SHIFTED)						
1       1       ,       ,         2       2       ,       ,         3       3       ,       ,         4       4       ,       ,         5       ,       ,       ,         6       ,       ,       ,         7       ,       ,       ,         8       .8       ,       ,         9       .7       ,       ,         10       .10       ,       ,       ,         11       .11       ,       ,       ,         12       00001000       13       SHARN .CODE .LOCATE-H'1000       ,         13       00001000       13       SHARN .CODE .LOCATE-H'1000       ;         14       00001000       13       SHARN .CODE .LOCATE-H'1000       ;         15       00001000       14       SHARN .CODE .ROTE .ELOCATE-H'1000       ;         16       00001006       13       SHARN .CODE .ROTE .RI       ;       ;         16       00001006       140       SHARN .CODE .ROTE .RI       ;       ;         10       00001000       23       SHARN .CODE .SOTE;       ;         2	R1 (32 BIT DATA)						
2       2       ;         3       3       ;         4       3       ;         5       5       ;         5       5       ;         6       ;       ;         7       7       ;         8       8       ;         9       9       ;         10       10       ;         11       11       ;         12       0001000       13         13       0001000       13         14       0001000       14         15       0001002       2P36         16       0001004       15         17       00001004       16         18       00001006       17         19       00001006       18         10       00001006       19         11       ,       R3C         12       0000100       103         10       00001006       19         11       ,       R3C         12       0000100       19         12       0000100       10         20       0000100       10		LT)					
3       3       ,       ;         4       4       ;         5       5       ;         6       6       ;         7       7       ;         8       8       ;         9       9       ;         10       ;       ;         11       10       ;         12       00001000       13       SHARN .EQU       \$       ;         13       00001000       13       SHARN .EQU       \$       ;       Eacape register         14       00001002       2P26       14       MOV.L       R3. $e$ -R15       ;       Eacape register         15       00001002       2P26       14       MOV.L       R3. $e$ -R15       ;         16       00001004       128       SHARN1       ;       Eacape register         17       00001006       6227       18       NOT       R2.R2       ;         10       00001006       228       ROT       R1       ;         20       00001000       105       23       SHARN3       ;         22       0000100       201       ROT       R1       ;       No							
4       4       ;         5       5       ;         6       ;       ;         7       7       ;         8       8       ;         9       9       ;         10       10       ;         11       11       ;         12       00001000       13       SHARN JEQU       \$       Retry point         14       00001002       2F26       14       MOV.L       R3,e=R15       ;         15       00001004       16       SHARN JEQU       \$       \$       Retry point         15       00001004       16       SHARN JEQU       \$       \$       Retry point         16       00001004       16       SHARN JEQU       \$       \$       Retry point         17       00001004       128       SHARN JEQU       \$       \$       Retry point         18       00001006       6227       18       NOT       R2,R2       ;       R2 $\leftarrow$ MSB of 32 bit data         21       00001005       19       SHARN3       ;       S       S         22       00001005       21       MOT       R3       Bit 4 = 17	2	2				;	
5       5       ;         6       6       ;         7       7       ;         8       8       ;         9       9       ;         10       10       ;         11       11       ;         12       0001000       12       .SECTION A, CODE, LOCATE=H'1000         13       0001000       22       .SECTION A, CODE, LOCATE=H'1000         14       00001000       2726       14       MOV.L       R2,e-R15       ;         16       0001002       2736       15       MOV.L       R3,e-R15       ;         16       0000106       6227       18       NOT       R2,R2       ;       R3 ← MSB of 32 bit data         17       0001006       6227       18       NOT       R2,R2       ;       ;         18       00001006       4044       20       ROTL       R1       ;       ;         20       0000108       103       SHARN3       ;       ;       ;         21       00001006       123       SHARN4       ;       N0       ;         22       00001010       132       SHARN5       ;       N	3	3				;	
6       6       ;         7       7       ;         8       8       ;         9       9       ;         10       10       ;         11       11       ;         12       00001000       12       .SECTION A, CODE, LOCATE=H'1000         13       00001000       13       SHARN .EQU       \$       : Entry point         14       00001002       2F26       14       MOV.L       R2,e-R15       ; Eacape register         15       00001004       16       SHARN       ;       :       :         17       00001004       16       SHARN       ;       :       :         17       00001004       3228       17       SUB       R2,R2       ;       :         19       00001006       6227       18       NOT       R3       ;       :         20       00001008       19       SHARN3       ;       :       :       :         21       00001008       329       21       MOVT       R3       ;       :         22       00001010       6901       25       SHARN3       ;       :       :						;	
7       7       ;       ;         8       8       ;         9       9       ;         10       10       ;         11       11       ;         12       00001000       13       SHARN .CQU \$       ?       Entry point         14       0000100       13       SHARN .CQU \$       ?       Excape register         15       0000102       2726       14       MOV.L R3.eR15       ?         16       0000104       3228       17       SUB       R2.R2       ?       R2         16       0000104       3228       17       SUB       R2.R2       ?       .         18       0000108       109       SHARN       R0T       R2.R2       ?       .         19       0000108       109       SHARN       R1       ?       .         20       0000108       103       SHARN       R0T       R3       .         21       0000100       0329       21       MOVT       R3       .         22       0000100       C810       24       SHARN3       .       .         23       00001010       801       2						;	
8       8       ;         9       9       ;         10       10       ;         11       11       ;         12       0001000       13       SKARN .FQU       \$       fntry point         14       00001002       2P36       14       MOV.L       R2, $e$ =R15       ;       Excurpediate         15       0001002       2P36       15       MOV.L       R3, $e$ -R15       ;       Intry point         16       0001004       3228       17       SUB       R2,R2       ;       R2 ← H'FFFFFFFF         18       0001006       6227       18       NOT       R2,R2       ;       R2 ← MSB of 32 bit data         20       0001008       109       SHARN2       ;       ;       SHARN3       ;         21       00001008       104       20       ROTR       R1       ;       R3 ← MSB of 32 bit data         21       00001002       4104       20       ROTR       R1       ;       R3 ← MSB of 32 bit data         22       00001002       4104       20       ROTR       R1       ;       R3 ← MSB of 32 bit data         23       0000102       510       SHARN3 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>							
9       9       ;         10							
10       10       ;         11       11       ;         12       0000100       12       .SECTION A, CODE LOCATE=H'100         13       00001000       2726       14       MOV.L $R2, e-R15$ ;       Entry point         15       00001002       2726       14       MOV.L $R3, e-R15$ ;         16       00001004       16       SHARN       ;       SUB $R2, R2$ ; $R2 \leftarrow H'FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF$							
11       11       ;         12       00001000       13       SHARN .EQU       \$       ;       Entry point         14       00001000       2F36       14       MOV.L       R2,0=R15       ;       Escape register         15       0001004       3228       17       SUB       R2,R2       ;       R         16       0001006       6227       18       NOT       R2,R2       ;       R         19       0001008       104       20       ROTL       R1       ;       R3 ← MSB of 32 bit data         21       0001008       4104       20       ROTL       R1       ;       R3 ← MSB of 32 bit data         22       00001008       4104       20       ROTL       R1       ;       R3 ← MSB of 32 bit data         21       00001002       6329       21       MOVT       R3       ;       ;         23       00001002       6810       24       TST       #B'0001000,R0       ;       Bit 4 = 1?         25       0001010       8901       25       BT       SHARN4       ;       No         26       00001012       8101       15       SHARN5       ;       Bit 4 = 1?<							
12       0.0001000       12       SECTION A, CODE.JCCATE=H'1000         13       0.0001000       13       SHARN .EQU       \$       Fectoperigiter         14       0.0001001       2P26       14       MOV.L       R2.eR15       ; Escaperegister         15       0.0001002       2P26       15       MOV.L       R2.eR15       ; Escaperegister         15       0.0001004       1228       15       MOV.L       R2.eR2       ; R2 + H'FFFFFFF         18       0.001006       6227       18       NOT       R2.R2       ; R3 + MSB of 32 bit data         19       0.001008       103       SHARN1       r       ; R3 + MSB of 32 bit data         21       0.001008       103       Q2       ROTL       R1       ; R3 + MSB of 32 bit data         21       0.001000       4105       22       ROTL       R1       ; R3 + MSB of 32 bit data         22       0.001000       4105       23       SHARN3       ; No       ;         23       0.001000       5       BT       SHARN4       ; No         24       0.0001010       810       25       BT       SHARN4       ; No         25       0.0001010       810       <							
13       00001000       13       SHARN .EQU       \$       Furty point         14       00001000       2F26       14       MOV.L       R2.0=R15       ; Escape register         15       00001002       2F36       15       MOV.L       R3.0=R15       ;         16       00001004       3228       17       SUB       R2.R2       ; R2 $\leftarrow$ H'FFFFFFFF         18       00001006       6227       18       NOT       R2.R2       ;         19       0001008       4104       20       ROTL       R1       ;       2         20       0001000       3228       22       ROTR       R1       ;       2         20       0001000       4104       20       ROTL       R1       ;       2         20       0001000       105       22       ROTR       R1       ;       2         20       0001000       22       ROTR       R1       ;       16       16         21       0001000       22       ROTR       R1       ;       16       16       17         22       00001010       8001       25       SHARN3       ;       N0       16       16						;	
14       0001000       2F26       14       MOV.L $R2, =R15$ ; Escape register         15       0001002       2F36       15       MOV.L $R3, =R15$ ;         16       0001004       3228       17       SUB $R2, R22$ ; $R2 \leftarrow$ H'FFFFFFFF         18       0001006       6227       18       NOT $R2, R22$ ;         19       0001008       19       SHARN2       ;       ; $R3 \leftarrow$ MSB of 32 bit data         21       0001008       104       20       ROTL       R1       ; R3 \leftarrow MSB of 32 bit data         21       0001006       0329       21       MOVT       R3       ;         22       0001006       105       22       ROTR       R1       ;         23       0001002       C810       24       TST       #B'0001000,R0       ;       Bit 4 = 1?         25       0001010       8901       25       BT       SHARN4       ; No         26       00001012       4129       27       SHLR16       R1       ; Ib is is if 1 egical right         27       00001016       288       SHARN4       ; No       ;       ;							
15       0001002       2F36       15       MOV.L $R3, \theta-R15$ ;         16       0001004       16       SHARN1       ;         17       0001006       6227       18       NOT       R2, R2       ; $R2 \leftarrow H'FFFFFFFF$ 18       0001006       6227       18       NOT       R2, R2       ; $R2 \leftarrow H'FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF$							
16       0001004       328       17       SUB       R2, R2       ;       R2 $\leftarrow$ H'FFFFFFF         18       0001006       5228       17       NOT       R2, R2       ;       R2 $\leftarrow$ H'FFFFFFF         18       00001008       19       SHARN1       ;       ;       R3       ;         19       00001008       100       SHARN1       R1       ;       R3       ;         20       00001008       0329       21       MOVT       R3       ;         23       00001002       21       MOVT       R3       ;         24       00001002       23       SHARN3       ;       ;         25       00001002       SH0       24       TST       #B'0001000,R0       ;       Bit 4 = 1?         25       00001012       4129       27       SHLR16       R1       ;       16       bit shift logical right         27       00001014       4229       27       SHLR16       R1       ;       8 bit shift logical right         30       00001016       8901       30       SHLR16       R1       ;       8 bit shift logical right         31       00001016       8901       30 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td></t<>							
1700001004 322817SUBR2,R2; R2 ← H'FFFFFFF18NOTR2,R2;19000100819SHARN2;2000001008 410420ROTLR1;21000100A 032921MOVTR3;220000100C 410522ROTR1;230000100E23SHARN3;240000100E C81024TST#B'0001000,R0;2500001012 412926SHLR16R1;2600001012 412926SHLR16R1;2700001014 422927SHLR16R1;280000101628SHARN4;NO290000101628SHARN4;NO3000001014411931SHLR8R1;3000001014411931SHLR8R1;310000101263SHARN5;NO3100001014411931SHLR8R1;320000101263SHLR1;Bit 2 = 1?33000010127SHLR2R1;Hit shift logical right34000010280335ST#B'0000100,R0;350001028410937SHLR2R1;36000102410936SHLR2R1;370001024410937SHLR2							
18       0001006       6227       18       NOT       R2,R2       ;         19       0001008       104       20       ROTL       R1       ;       R3 $\leftarrow$ MSB of 32 bit data         21       0001000       0329       21       MOV       R3       ;         22       0001002       105       22       ROT       R3       ;         23       0001002       210       ROT       R3       ;         24       0001002       210       ROT       R3       ;         24       0001002       210       24       TST       #B'0001000,00       ;       Bit 4 = 1?         25       0001010       8901       25       BT       SHARN4       ;       NO         26       0001014       4229       27       SHL16       R1       ;       16 bit shift logical right         27       00001016       28       SHARN5       ;       Si       j         30       00001016       8901       30       SHARN5       ;       No         31       00001014       4119       31       SHARN5       ;       No         31       00001012       8003       S			SHARN1				
19000100819SHARN2;200001008410420ROTLR1;R3 $\leftarrow$ MSB of 32 bit data21000100032921ROTRR1;22000100C410522ROTRR1;23000100E23SHARN3;;24000100EC81024TST $\#$ B'0001000,R0;bit 4 = 1?250001012412926SHARN4;No260001014422927SHL16R1;16 bit shift logical right2700001014422927SHL16R2;;2800001016C80829TST $\#$ B'0001000,R0;Bit 3 = 1?3000001018890130BTSHARN5; No3100001014411931SHARN5; No3300001012410932SHARN5;3400001012890335BT;SHARN6350000102890335SHARN2R1;3600001024410937SHAR2R1;370001024410937SHARN5;i38000102A420938SHARN2;;39000102A420936SHAR2R2;39000102A420936SHARN5;40000102A4209S							
200001008410420ROTLR1; R3 $\leftarrow$ MSB of 32 bit data21000100A032921MOVTR3;22000100C410522ROTRR1;23000100E23SHARN3;;24000100C 681024TST $\#$ 0001000,R0;Bit 4 = 1?2500001010890125BTSHARN4;No2600001012412926SHAR16R1;16 bit shift logical right2700001014422927SHLR16R2;;2800001016C80829TST $\#$ 00001000,R0;Bit 3 = 1?3000001018890130BTSHARN5; No3100001014411931SHARN5; 8 bit shift logical right3200001016C80829TST $\#$ 00000100,R0;3100001014411931SHARN5;330000101633SHARN5;;3400001012890335BTSHARN6; No350000102890335BTSHARN6; No3600001024410937SHLR2R1; 4 bit shift logical right370001024410937SHLR2R1;380001024410939SHLR2R2;39000102A40SHRR6 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td></td<>							
21000100A032921MOVTR3;22000100C410522ROTRR1;23000100EC81023SHARN3;;240000100EC81024TST#B'0001000,R0;Bit 4 = 1?250000101890125BTSHARN4;No2600001012412926SHR16R1;16 bit shift logical right270000101628SHARN4;SHARN5;280000101628SHARN5;Bit 3 = 1?3000001016890130STB'10001000,R0;3000001016890130SHARN5;No3100001014411931SHARN5;No3300001012421932SHARN5;SHARN53400001012680335BTSHARN6;350000102890335BTSHARN6;360000102410937SHAR2R1;4 bit shift logical right370000102420938SHARN6;No380000102420939SHARN6;No390000102A420SHARN6;SHAR1;410000102A40SHARN6;SHAR1;420000102A40SHARN6;SHAR1; <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>							
22000100C 410522ROTRR1;23000100E23SHARN3;;24000100EC81024TST $\#$ B'0001000,R0;Bit 4 = 1?250000101890125BTSHARN4;No2600001012412926SHLR16R1;16 bit shift logical right2700001014422927SHLR16R2;2800001016C80829TST $\#$ B'0000100,R0;Bit 3 = 1?3000001018890130BTSHARN5;No3100001014411931SHLR8R1;8 bit shift logical right320000101628SHARN5;No3100001016411931SHLR8R1;8 bit shift logical right3200001016411931SHLR8R1;bit 2 = 1?3300001016890335BTSHARN6;3400001024410937SHLR2R1;4 bit shift logical right3700001024410937SHLR2R1;4 bit shift logical right3800001024420938SHLR2R2;;40000102A40SHAR06;Bit 1 = 1?410000102A40SHAR06;No430000102A41TST $\#$ 10000010,R0 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>							
23000100E23SHARN3;24000100E C81024TST#B'0001000,R0; Bit 4 = 1?250001010890125BTSHARN4; No260001012412926SHLR16R1; 16 bit shift logical right2700001014422927SHLR16R2;2800001016C80829TST#B'0000100,R0; Bit 3 = 1?3000001018890130ETSHARN5; No3100001014411931SHLR8R1; 8 bit shift logical right320000101C421932SHARN5;330000101E68034TST#B'0000100,R0; Bit 2 = 1?340000101E C80434TST#B'0000100,R0; bit 2 = 1?350000102410936SHLR2R1; A bit shift logical right360000102410936SHLR2R1; A bit shift logical right370001024410937SHLR2R1; A bit shift logical right3800001024420939SHLR2R2;41000102A40SHARN6; Bit 1 = 1?42000102A41TST#B'0000010,R0; Bit 1 = 1?43000102A41TST#B'0000010,R0; Dit 1 = 1?44000102A42FTSHARN7; No44000102A44SHLR2							
24       0000100E C810       24       TST       #B'0001000,R0       ; Bit 4 = 1?         25       00001012 4129       25       BT       SHARN4       ; No         26       00001012 4129       26       SHLR16       R1       ; 16 bit shift logical right         27       00001014 4229       27       SHLR16       R2       ;         28       00001016       28       SHARN4       ; Bit 3 = 1?         29       00001018 8901       30       BT       SHARN5       ; No         31       00001012 4119       31       SHLR8       R1       ; 8 bit shift logical right         32       00001012 4219       32       SHLR8       R2       ;         33       00001012 C804       34       TST       #B'0000100,R0       ; Bit 2 = 1?         35       0000102 8903       35       BT       SHARN6       ; No         36       0000102 4109       36       SHLR2       R1       ; 4 bit shift logical right         38       0000102 4109       37       SHLR2       R1       ;       4 bit shift logical right         39       000102A 4209       38       SHLR2       R2       ;          40       00					RI		
25       0001010       8901       25       BT       SHARN4       ; No         26       0001012       4129       26       SHLR16       R1       ; 16 bit shift logical right         27       0001014       4229       27       SHLR16       R2       ;         28       0001016       C808       29       TST       #B'0001000,R0       ; Bit 3 = 1?         30       0001018       8901       30       BT       ; No         31       0001012       4119       31       SHLR8       R1       ; Bit 3 = 1?         32       0001012       4219       32       SHLR8       R1       ; Bit 3 = 1?         33       0001012       4219       32       SHLR8       R1       ; Bit 3 = 1?         34       0001012       8903       35       SHLR8       R1       ; No         35       000102       8903       35       SHLR2       R1       ; No         36       0001024       4109       37       SHLR2       R1       ; Abit shift logical right         38       0001024       109       38       SHLR2       R1       ; No         40       000102A       40       SHARN6 </td <td></td> <td></td> <td></td> <td></td> <td>#D100010000 D0</td> <td></td>					#D100010000 D0		
26       0001012       4129       26       SHLR16       R1       ; 16 bit shift logical right         27       0001014       4229       27       SHLR16       R2       ;         28       0001016       C808       29       TST       #B'0001000,R0       ; Bit 3 = 1?         30       0001018       8901       30       BT       SHARN5       ; No         31       0001014       4119       31       SHARN5       ; Bit 3 = 1?         32       0001012       4219       32       SHAR       R1       ; 8 bit shift logical right         32       0001012       4219       32       SHAR       R1       ; 8 bit shift logical right         33       0001012       6209       33       SHAR       R1       ; 8 bit shift logical right         34       0001012       6804       34       TST       #B'0000100,R0       ; Bit 2 = 1?         35       0001020       8903       35       BT       SHAR       ; A bit shift logical right         36       0001024       4109       37       SHLR2       R1       ; A bit shift logical right         37       0001024       4109       38       SHLR2       R2       ;							
27       00010114       4229       27       SHLR16       R2       ;         28       0001016       28       SHARN4       ;         29       00001016       C808       29       TST       #B'00001000,R0       ;       Bit 3 = 1?         30       00001018       8901       30       BT       SHARN5       ;       No         31       00001014       4119       31       SHLR8       R1       ;       8 bit shift logical right         32       00001012       219       32       SHARN5       ;       ;         33       00001012       33       SHARN5       ;       ;       Bit 2 = 1?         34       00001012       8903       35       BT       SHARN6       ; No         34       0000102       8903       35       BT       SHARN6       ; No         35       00001024       4109       37       SHLR2       R1       ; 4 bit shift logical right         37       00001024       4209       38       SHLR2       R2       ;       ;         38       0000102A       420       SHARN6       ;       Bit 1 = 1?         41       0000102A       420							
28       00001016       28       SHARN4       ;         29       00001016       C808       29       TST       #B'000100,R0       ;       Bit 3 = 1?         30       00001018       8901       30       BT       SHARN5       ;       No         31       00001014       4119       31       SHLR8       R1       ;       8 bit shift logical right         32       00001012       4219       32       SHLR8       R1       ;       8 bit shift logical right         33       00001012       6804       34       SHLR8       R1       ;       start         34       00001012       8903       35       BT       #B'00000100,R0       ;       Bit 2 = 1?         35       0001020       8903       35       BT       SHARN6       ;       No         36       0001024       4109       37       SHLR2       R1       ;       4 bit shift logical right         38       0001024       4109       37       SHARN6       ;       No         40       0000102A       400       SHARN6       ;       Bit 1 = 1?         41       0000102A       41       TST       #B'00000010,R0 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td></td<>							
29       00001016       C808       29       TST       #B'0000100,R0       ; Bit 3 = 1?         30       00001018       8901       30       BT       SHARN5       ; No         31       0000101A       4119       31       SHLR8       R1       ; 8 bit shift logical right         32       0000101C       4219       32       SHLR8       R2       ;         33       0000101E       C804       34       TST       #B'0000100,R0       ; Bit 2 = 1?         34       0000101E       C804       34       TST       #B'00000100,R0       ; Bit 2 = 1?         35       00001020       8903       35       BT       SHARN6       ; No         36       0001022       4109       36       SHLR2       R1       ; 4 bit shift logical right         38       0001024       4109       37       SHLR2       R1       ;       ;         39       000102A       40       SHARN6       ;       j       ;       ;         41       0000102A       40       SHARN6       ;       j       ;       i         42       0000102A (8901       42       BT       SHARN7       ;       No <t< td=""><td></td><td></td><td></td><td></td><td>KZ</td><td></td></t<>					KZ		
30       00001018 8901       30       BT       SHARN5       ; No         31       00001014 4119       31       SHLR8       R1       ; 8 bit shift logical right         32       00001012 4219       32       SHLR8       R2       ;         33       0000101E       CR04       34       SHARN5       ;       Bit 2 = 1?         34       0000102 8903       35       BT       #B'0000100,R0       ;       Bit 2 = 1?         35       0000102 4109       36       SHLR2       R1       ;       No         38       0001024 4109       37       SHLR2       R1       ;       4 bit shift logical right         39       0001024 4109       37       SHLR2       R1       ;       4 bit shift logical right         39       0001024 4109       37       SHLR2       R1       ;       -         39       0001024 4209       38       SHLR2       R2       ;       -         40       000102A       40       SHARN6       ;       Bit 1 = 1?         41       0000102A       41       TST       #B'0000010,R0       ;       Bit 1 = 1?         42       0000102A 68901       42       BT       SH			SHARNA		#B'00001000 P0		
31       0000101A 4119       31       SHLR8       R1       ; 8 bit shift logical right         32       0000101C 4219       32       SHLR8       R2       ;         33       0000101E       33       SHARN5       ;       ;         34       0000101E C804       34       TST       #B'0000100,R0       ;       Bit 2 = 1?         35       00001022 8903       35       BT       SHARN6       ;       No         36       00001022 4109       36       SHLR2       R1       ;       4 bit shift logical right         37       00001024 4109       37       SHLR2       R1       ;       4 bit shift logical right         38       00001024 4209       38       SHLR2       R1       ;       -         39       0001024 4209       39       SHLR2       R2       ;       -         40       0000102A       40       SHARN6       ;       -       -         41       0000102A       41       TST       #B'00000010,R0       ;       Bit 1 = 1?         42       0000102C 8901       42       BT       SHARN7       ; No         43       0000102E 4109       43       SHLR2       R1							
32       0000101C       4219       32       SHLR8       R2       ;         33       0000101E       33       SHARN5       ;       ;         34       0000101E       C804       34       TST       #B'0000100,R0       ;       Bit 2 = 1?         35       00001020       8903       35       BT       SHARN6       ;       No         36       00001022       4109       36       SHLR2       R1       ;       4 bit shift logical right         37       00001024       4109       37       SHLR2       R1       ;       .         38       00001024       4209       38       SHLR2       R2       ;       .         40       000102A       400       SHARN6       ;       .       .         41       0000102A       40       SHARN6       ;       .         42       0000102A       41       TST       #B'0000010,R0       ;       Bit 1 = 1?         42       0000102A       8901       42       BT       SHARN7       ; No         43       0000102A       410       SHLR2       R1       ; 2 bit shift logical right         44       00001030       4							
33       000101E       33       SHARN5       ;         34       000101E       C804       34       TST       #B'0000100,R0       ;       Bit 2 = 1?         35       00001020       8903       35       BT       SHARN6       ;       No         36       00001022       4109       36       SHLR2       R1       ;       4 bit shift logical right         37       00001024       4109       37       SHLR2       R1       ;       -         38       00001026       4209       38       SHLR2       R2       ;       -         39       0000102A       420       39       SHARN6       ;       Bit 1 = 1?         41       0000102A       41       TST       #B'0000010,R0       ;       Bit 1 = 1?         42       0000102C       8901       42       BT       SHARN7       ;       No         43       0000102E       4109       43       SHLR2       R1       ;       2 bit shift logical right         44       0001030       420       SHLR2       R1       ;       2 bit shift logical right							
34       0000101E C804       34       TST       #B'0000100,R0       ; Bit 2 = 1?         35       00001020 8903       35       BT       SHARN6       ; No         36       00001022 4109       36       SHLR2       R1       ; 4 bit shift logical right         37       00001024 4109       37       SHLR2       R1       ;         38       00001026 4209       38       SHLR2       R2       ;         39       00001028 4209       39       SHLR2       R2       ;         40       0000102A       400       SHARN6       ;       Bit 1 = 1?         41       0000102A C802       41       TST       #B'0000010,R0       ;       Bit 1 = 1?         42       0000102C 8901       42       BT       SHARN7       ;       No         43       0000102E 4109       43       SHLR2       R1       ;       2 bit shift logical right         44       00001030 4209       44       SHLR2       R2       ;       i       stick if i i i i i i i i i i i i i i i i i i			SHARN5				
35       0001020       8903       35       BT       SHARN6       ; No         36       0001022       4109       36       SHLR2       R1       ; 4 bit shift logical right         37       0001024       4109       37       SHLR2       R1       ;							
36       0001022 4109       36       SHLR2       R1       ; 4 bit shift logical right         37       0001024 4109       37       SHLR2       R1       ;         38       0001026 4209       38       SHLR2       R2       ;         39       00001028 4209       39       SHLR2       R2       ;         40       000102A       400       SHARN6       ;       ;         41       0000102A       6802       41       TST       #B'0000010,R0       ;       Bit 1 = 1?         42       0000102C 8901       42       BT       SHARN7       ; No         43       0000102E 4109       43       SHLR2       R1       ; 2 bit shift logical right         44       00001030 4209       44       SHLR2       R2       ;							
37       00001024       4109       37       SHLR2       R1       ;         38       00001026       4209       38       SHLR2       R2       ;         39       00001028       4209       39       SHLR2       R2       ;         40       0000102A       40       SHARN6       ;       ;         41       0000102A       6802       41       TST       #B'00000010,R0       ;       Bit 1 = 1?         42       0000102C       8901       42       BT       SHARN7       ; No         43       0000102E       4109       43       SHLR2       R1       ; 2 bit shift logical right         44       00001030       4209       44       SHLR2       R2       ;							
38       0001026       4209       38       SHLR2       R2       ;         39       0001028       4209       39       SHLR2       R2       ;         40       000102A       40       SHARN6       ;       ;         41       0000102A       C802       41       TST       #B'0000010,R0       ;       Bit 1 = 1?         42       0000102C       8901       42       BT       SHARN7       ;       No         43       00001022       4109       43       SHLR2       R1       ;       2 bit shift logical right         44       00001030       4209       44       SHLR2       R2       ;       *					- 1		
39       0001028       4209       39       SHLR2       R2       ;         40       000102A       40       SHARN6       ;       ;         41       0000102A       C802       41       TST       #B'0000010,R0       ;       Bit 1 = 1?         42       0000102C       8901       42       BT       SHARN7       ;       No         43       00001022       410       SHLR2       R1       ;       2 bit shift logical right         44       00001030       4209       44       SHLR2       R2       ;							
40       0000102A       40       SHARN6       ;         41       0000102A C802       41       TST       #B'0000010,R0       ; Bit 1 = 1?         42       0000102C 8901       42       BT       SHARN7       ; No         43       0000102E 4109       43       SHLR2       R1       ; 2 bit shift logical right         44       00001030 4209       44       SHLR2       R2       ;							
41       0000102A       C802       41       TST       #B'00000010,R0       ; Bit 1 = 1?         42       0000102C       8901       42       BT       SHARN7       ; No         43       0000102E       4109       43       SHLR2       R1       ; 2 bit shift logical right         44       00001030       4209       44       SHLR2       R2       ;			SHARN6				
42 0000102C 8901       42       BT       SHARN7       ; No         43 0000102E 4109       43       SHLR2       R1       ; 2 bit shift logical right         44 00001030 4209       44       SHLR2       R2       ;			-				
43 0000102E 4109       43       SHLR2       R1       ; 2 bit shift logical right         44 00001030 4209       44       SHLR2       R2       ;							
44 00001030 4209 44 SHLR2 R2 ;							
	45 00001032	45	SHARN7				



#### SH7000 Series Multi-Bit Shift of 32-Bit Data (Arithmetic Right Shift)

46	00001032	C801	46		TST	#B'0000001,R0	;	Bit 0 = 1?
47	00001034	8901	47		BT	SHARN8	;	No
48	00001036	4101	48		SHLR	Rl	;	1 bit shift logical right
49	00001038	4201	49		SHLR	R2	;	
50	0000103A		50	SHARN8			;	
51	0000103A	6033	51		MOV	R3,R0	;	
52	0000103C	C801	52		TST	#B'00000001;R0	;	MSB of 32 bit data = 1?
53	0000103E	8901	53		BT	SHARN_END	;	No
54	00001040	6227	54		NOT	R2,R2	;	
55	00001042	212B	55		OR	R2,R1	;	
56	00001044		56	SHARN_E	ND		;	
57	00001044	63F6	57		MOV.L	@R15+,R3	;	Return register
58	00001046	000B	58		RTS		;	
59	00001048	62F6	59		MOV.L	@R15+,R2	;	
60			60		.END			

\*\*\*\*\*TOTAL ERRORS 0

\*\*\*\*\*TOTAL WARNINGS 0



#### SH7000 Series Multi-Bit Shift of 32-Bit Data (Arithmetic Right Shift)

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