

# SPECIAL RELAYS

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# APPENDIX D

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**NOTE: As of 07/2021 CPU D2-260 has been retired.  
Please consider CPU D2-262 as a replacement.**

## D2-230 CPU Special Relays

### Startup and Real-Time Relays

SP0	First scan	ON for the first scan after a power cycle or program to run transition only. The relay is reset to off on the second scan. It is useful where a function needs to be performed only on program startup.
SP1	Always ON	Provides a contact to insure an instruction is executed every scan.
SP2	Always OFF	Provides a contact that is always off.
SP3	1 minute clock	ON for 30 seconds and off for 30 seconds.
SP4	1 second clock	ON for 0.5 second and off for 0.5 second.
SP5	100 ms clock	ON for 50ms and off for 50ms
SP6	50 ms clock	ON for 25ms and off for 25ms
SP7	Alternate scan	ON every other scan.

### CPU Status Relays

SP12	Terminal run mode	ON when the CPU is in the run mode.
SP16	Terminal program mode	ON when the CPU is in the program mode.
SP20	Forced stop mode	ON when the STOP instruction is executed.
SP22	Interrupt enabled	ON when interrupts have been enabled using the ENI instruction.

### System Monitoring

SP40	Critical error	ON when a critical error such as I/O communication loss has occurred.
SP41	Warning	ON when a non-critical error such as a low battery has occurred.
SP43	Battery low	ON when the CPU battery voltage is low (only if bit 12 of V7633 is set).
SP44	Program memory error	ON when a memory error such as a memory parity error has occurred.
SP45	I/O error	ON when an I/O error occurs. For example, an I/O module is withdrawn from the base, or an I/O bus error is detected.
SP47	I/O configuration error	ON if an I/O configuration error has occurred. The CPU power-up I/O configuration check must be enabled before this relay will be functional.
SP50	Fault instruction	ON when a Fault Instruction is executed.
SP51	Watch Dog timeout	ON if the CPU Watch Dog timer times out.
SP52	Grammatical error	ON if a grammatical error has occurred, either while the CPU is running or if the syntax check is run. V7755 will hold the exact error code.
SP53	Solve logic error	ON if CPU cannot solve the logic.

## Accumulator Status

<b>SP60</b>	Value less than	ON when the accumulator value is less than the instruction value.
<b>SP61</b>	Value equal to	ON when the accumulator value is equal to the instruction value.
<b>SP62</b>	Greater than	ON when the accumulator value is greater than the instruction value.
<b>SP63</b>	Zero	ON when the result of the instruction is zero (in the accumulator).
<b>SP64</b>	Half borrow	ON when the 16-bit subtraction instruction results in a borrow.
<b>SP65</b>	Borrow	ON when the 32-bit subtraction instruction results in a borrow.
<b>SP66</b>	Half carry	ON when the 16-bit addition instruction results in a carry.
<b>SP67</b>	Carry	ON when the 32-bit addition instruction results in a carry.
<b>SP70</b>	Sign	ON anytime the value in the accumulator is negative.
<b>SP71</b>	Invalid octal number	ON when an Invalid octal number was entered. This also occurs when the V-memory specified by a pointer (P) is not valid.
<b>SP73</b>	Overflow	ON if overflow occurs in the accumulator when a signed addition or subtraction results in an incorrect sign bit.
<b>SP74</b>	Underflow	ON anytime a math operation results in an underflow error.
<b>SP75</b>	Data error	ON if a BCD number is expected and a non-BCD number is encountered.
<b>SP76</b>	Load zero	ON when any instruction loads a value of zero into the accumulator.

## Counter Interface Module Relays

<b>SP100</b>	XO is ON	XO - ON when corresponding input is on.
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**Equal Relays for Multi-step Presets with Up/Down Counter #1  
(for D2-230)**

SP540			V2320
SP541			V2322
SP542			V2324
SP543			V2326
SP544			V2328
SP545			V2330
SP546			V2332
SP547			V2334
SP550			V2336
SP551			V2338
SP552			V2340
SP553			V2342
SP554	Current = target value	ON when the counter current value equals the value in:	V2344
SP555			V2346
SP556			V2348
SP557			V2350
SP560			V2352
SP561			V2354
SP562			V2356
SP563			V2358
SP564			V2360
SP565			V2362
SP566			V2364
SP567			V2366
SP570			V2368
SP571			V2370

(for use with the Counter Interface Module, D2-CTRINT)

## D2-240, D2-250-1, D2-260 and D2-262 CPU Special Relays

SP0	First scan	ON for the first scan after a power cycle or program to run transition only. The relay is reset to off on the second scan. It is useful where a function needs to be performed only on program startup.
SP1	Always ON	Provides a contact to insure an instruction is executed every scan.
SP2	Always OFF	Provides a contact that is always off.
SP3	1 minute clock	ON for 30 seconds and off for 30 seconds.
SP4	1 second clock	ON for 0.5 second and off for 0.5 second.
SP5	100 ms clock	ON for 50ms and off for 50ms
SP6	50 ms clock	ON for 25ms and off for 25ms
SP7	Alternate scan	ON every other scan.

### Startup and Real-Time Relays

SP11	Forced run mode	ON anytime the CPU switch is in the RUN position.
SP12	Terminal run mode	ON when the CPU switch is in the TERM position and the CPU is in the RUN mode.
SP13	Test run mode	ON when the CPU switch is in the TERM position and the CPU is in the test RUN mode.
SP14	Break Relay 1 (D2-250-1, D2-260 and D2-262)	ON when the BREAK instruction is executed. It is OFF when the CPU is in any other mode.
SP15	Test program mode	ON when the CPU is in the TERM position and the CPU is in the TEST PROGRAM MODE.
SP16	Terminal program mode	ON when the CPU switch is in the TERM position and the CPU is in the PROGRAM MODE.
SP17	Forced stop mode relay (D2-250-1, D2-260 and D2-262)	ON anytime the CPU keyswitch is in the STOP position.
SP20	Forced stop mode	ON when the STOP instruction is executed.
SP21	Break Relay 2 (D2-250-1, D2-260 and D2-262)	ON when the BREAK instruction is executed. It is OFF when the CPU mode is changed to RUN.
SP22	Interrupt enabled	ON when interrupts have been enabled using the ENI instruction.
SP25	CPU battery disabled relay (D2-250-1, D2-260 and D2-262)	ON when the CPU battery is disabled by special V-memory.

CPU

### Status Relays

### System Monitoring Relays

SP40	Critical error	ON when a critical error such as I/O communication loss has occurred.
SP41	Warning	ON when a non-critical error such as a low battery has occurred.
SP43	Battery low/dead	ON when the CPU battery voltage is low or dead. Note: The CPU must have a battery installed.
SP44	Program memory error	ON when a memory error such as a memory parity error has occurred.
SP45	I/O error	ON when an I/O error occurs. For example, an I/O module is withdrawn from the base, or an I/O bus error is detected.
SP46	Communications error	ON when a communications error has occurred on any of the CPU ports.
SP47	I/O configuration error	ON if an I/O configuration error has occurred. The CPU power-up I/O configuration check must be enabled before this relay will be functional.
SP50	Fault instruction	ON when a Fault Instruction is executed.
SP51	Watch Dog timeout	ON if the CPU Watch Dog timer times out.
SP52	Grammatical error	ON if a grammatical error has occurred either while the CPU is running or if the syntax check is run. V7755 will hold the exact error code.
SP53	Solve logic error	ON if CPU cannot solve the logic.
SP54	Intelligent I/O error	ON when communications with an intelligent module has occurred.
SP56	Table instruction overrun	ON if a table instruction with a pointer is executed and the pointer value is outside the table boundary

### Accumulator Status Relays

SP53	Math/Table pointer error	ON if there is math execution error or a table pointer error.
SP60	Value less than	ON when the accumulator value is less than the instruction value.
SP61	Value equal to	ON when the accumulator value is equal to the instruction value.
SP62	Greater than	ON when the accumulator value is greater than the instruction value.
SP63	Zero	ON when the result of the instruction is zero (in the accumulator).
SP64	Half borrow	ON when the 16-bit subtraction instruction results in a borrow.
SP65	Borrow	ON when the 32-bit subtraction instruction results in a borrow.
SP66	Half carry	ON when the 16-bit addition instruction results in a carry.
SP67	Carry	ON when the 32-bit addition instruction results in a carry.
SP70	Sign	ON anytime the value in the accumulator is negative.
SP71	Invalid octal number	ON when an Invalid octal number was entered. This also occurs when the V-memory specified by a pointer (P) is not valid.
SP72	Floating Point	ON when the numerical value in the accumulator is a floating point number.
SP73	Overflow	ON if overflow occurs in the accumulator when a signed addition or subtraction results in an incorrect sign bit.
SP74	Under flow	ON when a floating point math operation results in an underflow error.
SP75	Data error	ON if data is not a numerical value.
SP76	Load zero	ON when any instruction loads a value of zero into the accumulator.

**Counter Interface Module Relays**

<b>SP100</b>	X0 is ON	X0 - ON when corresponding input is ON.
<b>SP101</b>	X1 is ON	X1 - ON when corresponding input is ON.
<b>SP102</b>	X2 is ON	X2 - ON when corresponding input is ON.
<b>SP103</b>	X3 is ON	X3 - ON when corresponding input is ON.

### Communications Monitoring Relays

<b>SP116</b>	D2-240 CPU communication	ON when the CPU is communicating with another device
<b>SP116</b>	D2-250-1, D2-260 and D2-262 communication	ON when Port 2 is communicating with another device
<b>SP117</b>	Comm error Port 2 (D2-250-1/D2-260/D2-262)	ON when Port 2 has encountered a communication error.
<b>SP120</b>	Module busy Slot 0	ON when the communication module in slot 0 is busy transmitting or receiving. You must use this relay with the RX or WX instructions to prevent attempting to execute a RX or WX while the module is busy.
<b>SP121</b>	Comm error Slot 0	ON when the communication module in slot 0 of the local base has encountered a communication error.
<b>SP122</b>	Module busy Slot 1	ON when the communication module in slot 1 of the local base is busy transmitting or receiving. You must use this relay with the RX or WX instructions to prevent attempting to execute a RX or WX while the module is busy.
<b>SP123</b>	Comm error Slot 1	ON when the communication module in slot 1 of the local base has encountered a communication error.
<b>SP124</b>	Module busy Slot 2	ON when the communication module in slot 2 of the local base is busy transmitting or receiving. You must use this relay with the RX or WX instructions to prevent attempting to execute a RX or WX while the module is busy.
<b>SP125</b>	Comm error Slot 2	ON when the communication module in slot 2 of the local base has encountered a communication error.
<b>SP126</b>	Module busy Slot 3	ON when the communication module in slot 3 of the local base is busy transmitting or receiving. You must use this relay with the RX or WX instructions to prevent attempting to execute a RX or WX while the module is busy.
<b>SP127</b>	Comm error Slot 3	ON when the communication module in slot 3 of the local base has encountered a communication error.
<b>SP130</b>	Module busy Slot 4	ON when the communication module in slot 4 of the local base is busy transmitting or receiving. You must use this relay with the RX or WX instructions to prevent attempting to execute a RX or WX while the module is busy.
<b>SP131</b>	Comm error Slot 4	ON when the communication module in slot 4 of the local base has encountered a communication error.
<b>SP132</b>	Module busy Slot 5	ON when the communication module in slot 5 of the local base is busy transmitting or receiving. You must use this relay with the RX or WX instructions to prevent attempting to execute a RX or WX while the module is busy.
<b>SP133</b>	Comm error Slot 5	ON when the communication module in slot 5 of the local base has encountered a communication error.
<b>SP134</b>	Module busy Slot 6	ON when the communication module in slot 6 of the local base is busy transmitting or receiving. You must use this relay with the RX or WX instructions to prevent attempting to execute a RX or WX while the module is busy.
<b>SP135</b>	Comm error Slot 6	ON when the communication module in slot 6 of the local base has encountered a communication error.
<b>SP136</b>	Module busy Slot 7	ON when the communication module in slot 7 of the local base is busy transmitting or receiving. You must use this relay with the RX or WX instructions to prevent attempting to execute a RX or WX while the module is busy.
<b>SP137</b>	Comm error Slot 7	ON when the communication module in slot 7 of the local base has encountered a communication error.

**Equal Relays for Multi-step Presets with Up/Down Counter #1  
(supported by D2-240, D2-250-1 and D2-260).<sup>\*</sup> For use with the  
Counter Interface Module D2-CTRINT**

SP540			V3630
SP541			V3632
SP542			V3634
SP543			V3636
SP544			V3640
SP545			V3642
SP546			V3644
SP547			V3646
SP550			V3650
SP551			V3652
SP552			V3654
SP553	Current = target value	ON when the counter current value equals the value in:	V3656
SP554			V3660
SP555			V3662
SP556			V3664
SP557			V3666
SP560			V3670
SP561			V3672
SP562			V3674
SP563			V3676
SP564			V3700
SP565			V3702
SP566			V3704
SP567			V3706

<sup>\*</sup> Not supported by D2-262

### Equal Relays for Multi-step Presets with Up/Down Counter #2 (supported by D2-240, D2-250-1 and D2-260).\* For use with the Counter Interface Module D2-CTRINT

SP570			V3710
SP571			V3712
SP572			V3714
SP573			V3716
SP574			V3720
SP575			V3722
SP576			V3724
SP577			V3726
SP600			V3730
SP601			V3732
SP602			V3734
SP603			V3736
SP604	Current = target value	ON when the counter current value equals the value in:	V3740
SP605			V3742
SP606			V3744
SP607			V3746
SP610			V3750
SP611			V3752
SP612			V3754
SP613			V3756
SP614			V3760
SP615			V3762
SP616			V3764
SP617			V3766

\* Not supported by D2-262