

IP3416 Diagnostics

Two diagnostic RLL programs are supplied with the IP-EPS software. One will test all the digital inputs and outputs and the other will test the two high-speed inputs. The filenames of these programs are, *diag34.rll* and *diagHSI.rll* and listings are provided below.

To test the inputs and outputs of the IP3416, wire them up as shown in Figure 1. Then download the *diag34.rll* RLL program into the IP3416. This program will cycle the outputs on/off and sense the inputs for the proper state. If the outputs and inputs do not match, then the program will stop cycling through the outputs and display an error. The error number indicates which input failed and if it was a high (upper green LED ON) or low (lower green LED ON) failure.

To test the high-speed inputs, download the *diagHSI.rll* RLL program into the IP3416 and wire X32 and X33 as shown in Figure 2. Y14 and Y15 will provide 1KHz. PWM outputs. This pulse train will then be counted and if the value is less than 1 kHz an error condition will occur and the appropriate input number will be displayed to indicate an error.

To test the analog inputs connect a 10 K Ω potentiometer to the specific input as show in Figure 3. Then place the following RLL into the PLC,

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|
|
1 |-----[A24]-----| Display analog value of X24.
|
|
2 |----- (E) -----|
```

The program will display the contents of the analog value. Vary the potentiometer and see the specific change in the analog input. Change rung 1 for the specific analog input you are testing.

The PLCs shipped from the factory contain the self diagnostic program that turns outputs on and off randomly, it is important that you download your own application program to the PLC before you wire it to any live equipment in the field.

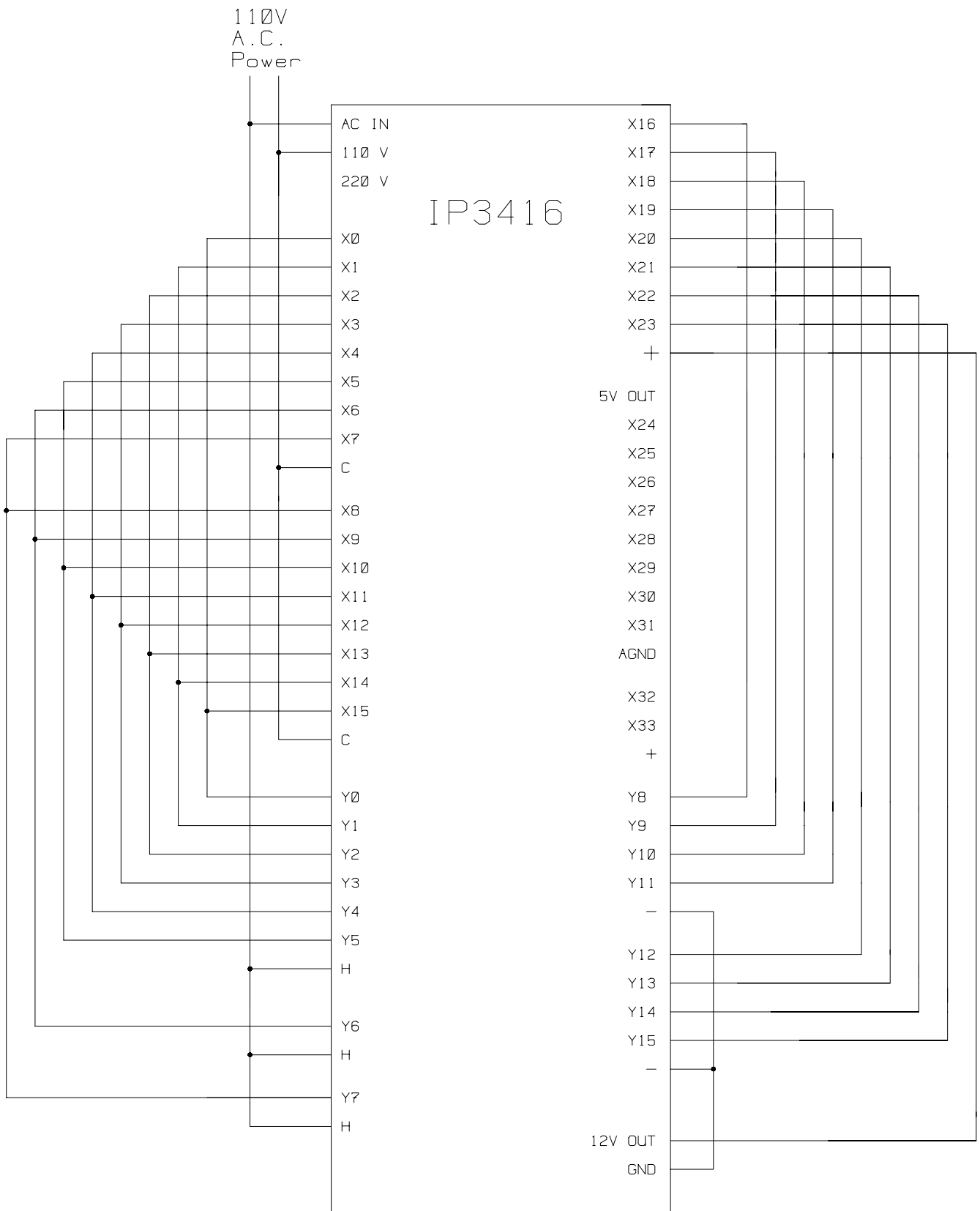


Figure 1. Wiring diagram for diagnostics

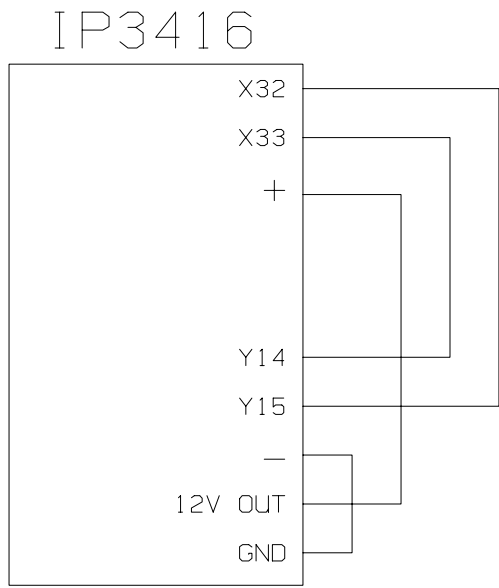


Figure 2. Wiring for high speed input diagnostics

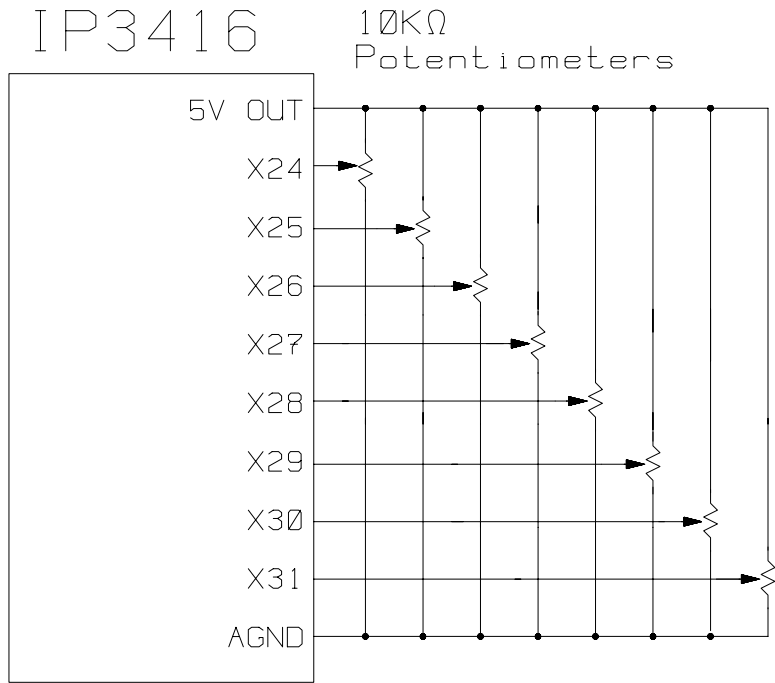


Figure 3. Wiring for analog input diagnostics

diag34

IP3416 RELAY LADDER LOGIC

			IP3416 Diagnostics Program
	T10	T1	=====
1	- /	(7)	
			Generate clock T1 with
	T1	T10	.05 sec. off & .05 on.
2	-	(3)	
	T1	T2	T2 is end .01 second portion
3	-	(2)	of clock.
	T1 R91	R101	R101 ticks every .1 second
4	- /	()	
	R101	R40	R40..R55 is shifted one bit
5	-	(SU2)	every .1 second
	R48	R40	Make 8-bit Johnson counter
6	- /	()	for 2 second display cycle.
	R40 R45	[C2-1]	In first .5 sec. of cycle,
7	-		display test count MS half.
	R42 R45	[10000-C1]	In second .5 sec. of cycle,
8	-		display test count LS half.
	R42 R47	[C16]	In third .5 second of cycle
9	- /		display error code C16.
	R40 R47	[]	In last .5 second of cycle,
10	- /		blank display
	C16	(J)	
11	- /		
	R101	R0	Make another shift register
12	-	(SU3)	R0..R23 on .1 sec. ticks
	R8	R0	R0..R7 is an 8-bit Johnson
13	- /	()	counter.
	R0 R90	C1	C1 is test loop counter.
14	-	()	
	C1	C1	(C2,C1) counts (1,10000),
15	-	[10000]	(1,9999),..., (1,1),
			(2,10000),..., (2,1),
		C2	... so that (C2-1,10000-C1)
16		(^)	is a 9-digit counter.
	R0	Y0	
17	-	()	Map R0 to Y0;
	R1	Y1	
18	-	()	R1 to Y1;
	R2	Y2	
19	-	()

```

| R3 Y3
20|-| |------( )-----|
| R4 Y4
21|-| |------( )-----|
| R5 Y5
22|-| |------( )-----|
| R6 Y6
23|-| |------( )-----|
| R7 Y7
24|-| |------( )-----|
| R8 Y8
25|-| |------( )-----|
| R9 Y9
26|-| |------( )-----|
| R10 Y10
27|-| |------( )-----|
| R11 Y11
28|-| |------( )-----|
| R12 Y12
29|-| |------( )-----|
| R13 Y13
30|-| |------( )-----|
| R14 Y14
31|-| |------( )-----|
| R15 Y15
32|-| |------( )-----|
| T1 T2 R24
33|-| |---|/|------( )-----|
| C16
34|-----[0]-----|
| R24 Y15 X23 C16
35|-| |---| |---|/|-----[10023]----|
| R24 Y15 X23 C16
36|-| |---|/|---| |-----[20023]----|
| R24 Y14 X22 C16
37|-| |---| |---|/|-----[10022]----|
| R24 Y14 X22 C16
38|-| |---|/|---| |-----[20022]----|
| R24 Y13 X21 C16
39|-| |---| |---|/|-----[10021]----|
| R24 Y13 X21 C16
40|-| |---|/|---| |-----[20021]----|

```

and map R15 to Y15

R24 is output/input sampling period.

C16 is error code, 0 being no error.

62	R24	Y5	X10	C16	[20010]
63	R24	Y6	X9	C16	[10009]
64	R24	Y6	X9	C16	[20009]
65	R24	Y7	X8	C16	[10008]
66	R24	Y7	X8	C16	[20008]
67	R24	Y7	X7	C16	[10007]
68	R24	Y7	X7	C16	[20007]
69	R24	Y6	X6	C16	[10006]
70	R24	Y6	X6	C16	[20006]
71	R24	Y5	X5	C16	[10005]
72	R24	Y5	X5	C16	[20005]
73	R24	Y4	X4	C16	[10004]
74	R24	Y4	X4	C16	[20004]
75	R24	Y3	X3	C16	[10003]
76	R24	Y3	X3	C16	[20003]
77	R24	Y2	X2	C16	[10002]
78	R24	Y2	X2	C16	[20002]
79	R24	Y1	X1	C16	[10001]
80	R24	Y1	X1	C16	[20001]
81	R24	Y0	X0	C16	[10000]
82	R24	Y0	X0	C16	[20000]

diaghsi.prn

IP3416 RELAY LADDER LOGIC

1	1st s R248 - ------(S26)-----	On the first scan, set the PWM parameters for Y14 and Y15 to output a 1 kHz. signal.
2	 T15 ------(100)-----	Start a 1 second timer to wait for everything to initialize.
3	T15 - / ------(J)-----	If 1 second warm-up hasn't happened, then skip program.
4	X32 - ------(^)-----	Count the pulses on X32.
5	T0 - / ------(51)-----	Start a 1 second periodic timer.
6	T1 - ------(51)-----	
7	T1 R100 - --- ^ ------(S13)-----	Every second calculate the number of pulses on both HS inputs.
8	C5 T1 - --- + ------[C10]-----	If C5 is 0, then there is no error, so display number of passes.
9	R101 C10 ^- ^ ------[C10+1]---	Increment number of passes.
10	C5 T1 - --- / ------[]-----	There was an error, so blink display and display number of input with error.
11	C5 - / ------[C5]-----	
12	------(E)-----	=====
	C5 - / ------(RT)-----	CHECK HS INPUTS SUBROUTINE
	------(RT)-----	=====
13	C5 - / ------(RT)-----	Error already occurred, so skip subroutine.
14	------(C31 ------[C16-1000]	Check X32 for >= 1000 pulses.
15	Overf R31 C5 - ------[32]-----	< 1000 pulses so set C5 to 32 to indicate error on X32.
16	C16 ------[0]-----	
17	C1 ------[D49*256+D48]---	Calculate current value of HSC.
18	C31 ------[C1-C0]---	Calculate number of pulse into HSC.
19	Overf R31 C31 - ------[32767-C0+C1]---	HSC has wrapped around so perform calculation for pulses.
20	C31 ------[C31-1000]	Check X33 for >= 1000 pulses.

	Overf		
	R31	C5	< 1000 pulses so set C5 to
21	-	[C5*100+33]	indicate X33 has error.
		C0	Make current value of HSC into
22	-----	[C1]-----	previous value.
			Return from subroutine.
23	-----	(RT)-----	=====
		PWM S	PWM FORMAT SUBROUTINE
		D53	=====
24	-----	[5]-----	Set PWM scale to 5 * 4 micro Sec
		Y14 P	= 0.02 msec
		D42	
25	-----	[50]-----	Set Y14 period to 50 * 0.02 msec
		Y14 D	= 1 msec
		D46	
26	-----	[40]-----	Set Y14 duty to 40 * 0.02 msec.
		Y15 P	= 0.8 msec.
		D43	
27	-----	[50]-----	Set Y15 period to 1 msec.
		Y15 D	
		D47	
28	-----	[40]-----	Set Y15 duty to 0.8 msec.
		C0	Store current value of HSC into
29	-----	[D49*256+D48]--	C0.
30	-----	(RT)-----	Return from subroutine
31	-----		