USER MANUAL

Accessory 8D Option 9

Yaskawa Absolute Encoder Converter Board

3A9-0ACC8D-xUxx

October 27, 2003

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INTRODUCTION

PMAC's Accessory 8D Option 9 (P/N 309-0ACC8D-OPT9) allows a PMAC interface to the YASKAWA absolute encoder.

This board provides up to 4 channels of absolute encoder inputs to the PMAC controller with both A/B quadrature incremental encoder signal feedback as well as absolute position data. To prevent data from being lost in the case of power loss or power off conditions, a 3V battery is included on the board with a monitor circuit to provide an indication of any drop in excess of 5%. In addition, there are four jumpers on the board to allow the customer to reset the absolute position value. See the related paragraphs below for a detailed description of the absolute encoder setup.

The encoder has internal counters and memory that count and retain the incremental counts. Upon power up, it sends RS232 data to PMAC representing the absolute position. Operation is then automatically switched to incremental. Refer to the YASKAWA manual for further explanation.

Note

If you are using a PMAC with Flash Memory (40 MHz or 60 MHz), you must use firmware version 1.16A or newer. Call the factory for details on upgrading your firmware.

CONNECTORS

JP1 to JP4

These connectors are 20-pin Honda connectors that come directly from the absolute encoder. For detail signal description, refer to the YASKAWA manual.

JP6

This is a 26-pin header that provides the link between PMAC's JTHW (J3) and the absolute encoder conversion board through the supplied flat cable. Through this connector, PMAC captures the absolute position.

JP7

This is a 26-pin header, which brings out the JTHW signals for the next accessory board on the JTHW multiplex memory map. This connector is pin-to-pin compatible with JP6.

JENC1 to JENC4

These are 10-pin headers that provide the normal differential A quad B encoder signal as well as a C channel generated by the absolute encoder. The four connectors are for the first to the fourth encoder, respectively.

JP8

This is a 2-pin terminal block for the power supply input. The power requirement of the system is +5V DC @ 10W. External power is needed only when JP6 or JP7 and JENC1-JENC4 are not connected.

ADDRESS MAP

ACC-8D Option 9 generates both absolute and incremental position data from the absolute encoder. Normally the absolute position is read (by PMAC) through the Thumbwheel Port (JTHW) only during power up. The incremental (A QUAD B) data, however, is counted continuously. A 5-bit DIP switch, S1, determines the address of this board. The factory default setup is as follows:

Multiplex Address	**Encoder (starting address)**	**S1 DIP Switch Setting**				
		5	**4**	**3**	**2**	**1**
1	($08)	CLOSE	CLOSE	CLOSE	CLOSE	OPEN
2	($10)	CLOSE	CLOSE	CLOSE	OPEN	CLOSE
3	($18)	CLOSE	CLOSE	CLOSE	OPEN	OPEN
4	($20)	CLOSE	CLOSE	OPEN	CLOSE	CLOSE
5	($28)	CLOSE	CLOSE	OPEN	CLOSE	OPEN
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
27	($D8)	OPEN	OPEN	CLOSE	OPEN	OPEN
28	($E0)	OPEN	OPEN	OPEN	CLOSE	CLOSE
29	($E8)	OPEN	OPEN	OPEN	CLOSE	OPEN
30	($F0)	OPEN	OPEN	OPEN	OPEN	CLOSE
31	($F8)	OPEN	OPEN	OPEN	OPEN	OPEN

Default Settings

Position	5	4	3	2	1
Set	ON	ON	ON	ON	OFF
There will be 32 different address settings for a possibility of 32 board connections.					

ABSOLUTE ENCODER SETUP

If the battery is connected, the YASKAWA absolute encoder provides 5 digits of signed absolute position data. However, when the absolute position data needs to be cleared to 0, the following setup is needed.

1. Turn off power supply for the entire motor and encoder.
2. Remove the battery from this board.
3. Discharge the capacitor inside of the encoder by moving the corresponding jumper (E1 to E4 for encoder 1 to 4, respectively) from the default setting 2-3 to 1-2, for at least 2 minutes.
4. Place the Jumper back to the default position, and reinstall the battery on the board.

This completes the setup.

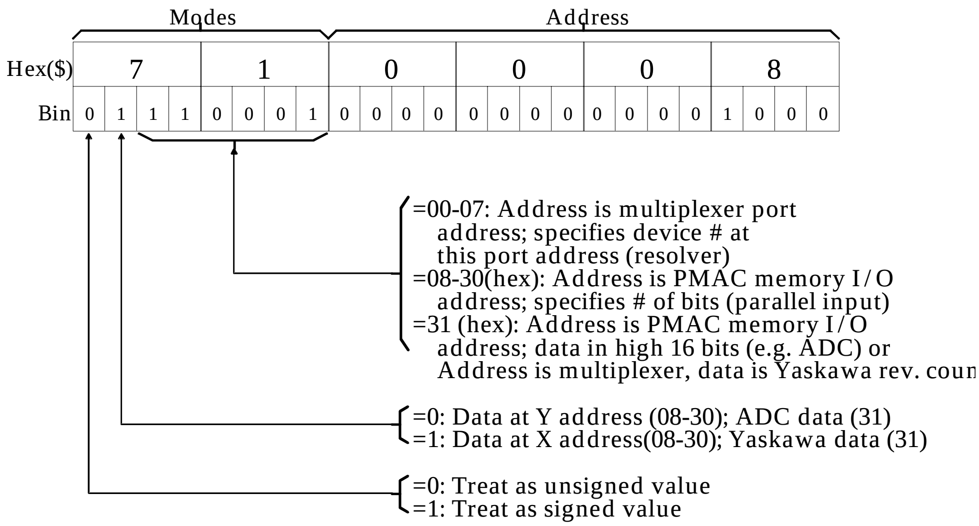
Note

The reset procedure may be different for different models of the encoders. Reference the encoder manual for details.

PMAC I-VARIABLE SETUP

The following PMAC I-variable setup is needed for the system to use the YASKAWA absolute encoder and the ACC 8D Option 9 conversion board:

Ix10 - Motor x Power-On Servo Position Address



The Ix10 variable will allow the system to enable the absolute encoder and get the absolute position data upon power-on condition. (See PMAC User's Manual Addendum 1.15 from June 1994.) To define the Ix10 variable correctly, place a `$7100` value in front of the beginning address +2 hex for each encoder.

Encoder #	I-Variable	I-Variable Value
1	I110	$710008
2	I210	$71000A
3	I310	$71000C
4	I410	$71000E

An easy way to understand the addressing scheme is to look at the dip switch setting table and place a 1 where the open is located and a 0 for the close position. Now, place three zeros after the switch setting, and convert this binary representation to a hex value.

Example:

Address	5	4	3	2	1	
($08)	0	0	0	0	1	000
($10)	0	0	0	1	0	000
($18)	0	0	0	1	1	000

The starting address for board #2 (encoders 5,6,7 and 8) would be $10. Therefore, our definitions for the Ix10 variables would be:

Encoder #	I-Variable	I-Variable Value
5	I510	$710010
6	I610	$710012
7	I710	$710014
8	I810	$710016

I8x - Motor x Resolver Gear Ratio

I9x - Motor x Second -Resolver Gear Ratio

Set I8x= (counts/rev)/4096

I9x= The remainder from above division

Example:
The number of lines per revolution of the YASKAWA absolute encoder in the system is 8192. PMAC will multiply this term by 4 and read (8192×4) = 32768 counts/rev.

$$\therefore \quad I8x = \frac{32768}{4096} = 8$$

$$I9x = 0$$

$$I8x = 8$$

$$I9x = 0$$

Note

The I8x and I9x are defined for something else in the PMAC manual for a general-purpose application. It is necessary to use the above definition for this application.

Ix81 - Motor x Absolute Phasing Position Address

	I-Variable Name	I-Variable Value
Encoder 1	I181	\$4(D)C001 *
Encoder 2	I281	\$4(D)C009 *
Encoder 3	I381	\$4(D)C011 *
Encoder 4	I481	\$4(D)C019 *
*The number in the parenthesis should reflect the number of lines of the absolute encoder in hexadecimal. To derive this value: . Convert the number of lines to a binary number, such as 8192 = 2^{13} = 10000000000000 2. Convert the exponential part (which is 13 in the above example) to a hexadecimal number: 13 (dec.) = D (hex.)		

Example:
If encoder 1 in the system is a YASKAWA absolute encoder with 8192 lines/rev, the correct value for I-181 will be:

```
I-181 = $4DC001
```

However, encoder 2 in the system is a 12-bit YASKAWA absolute encoder. For instance, if the number of lines/rev for this encoder were 4096, then the right value for I-281 would be:

```
I-281 = $4CC009
```

Note

The last four digits are motor x phasing position address (see PMAC manual on Ix83 for details).

TURBO PMAC I-VARIABLE SETUP

Ixx10 – Motor xx Power-On Position Address

Ixx10 should be set to the multiplexer port location associated with the switch setting of the ACC-8D option9. The following table shows the possible address settings of Ixx10.

Board Mux. Addr.	Ixx10	Board Mux. Addr.	Ixx10	Board Mux. Addr.	Ixx10	Board Mux. Addr.	Ixx10
0	$000100	64	$000040	128	$000080	192	$0000C0
8	$000008	72	$000048	136	$000088	200	$0000C8
16	$000010	80	$000050	144	$000090	208	$0000D0
24	$000018	88	$000058	152	$000098	216	$0000D8
32	$000020	96	$000060	160	$0000A0	224	$0000E0
40	$000028	104	$000068	168	$0000A8	232	$0000E8
48	$000030	112	$000070	176	$0000B0	240	$0000F0
56	$000038	120	$000078	184	$0000B8	248	$0000F8

Since each ACC-8D option 9 card can support up to four Yaskawa Absolute encoders, the following table list the channel address of each channel relative to the base address. You can see that each successive channel is two addresses (+2) from the previous channel. For simplicity, we have listed the first six board addresses.

Board Mux. Addr.	Channel 1 Ixx10	Channel 2 Ixx10	Channel 3 Ixx10	Channel 4 Ixx10
$0	$100	$02	$04	$06
$08	$08	$0A	$0C	$0E
$10	$10	$12	$14	$16
$18	$18	$1A	$1C	$1E
$20	$20	$22	$24	$26
$28	$28	$2A	$2C	$2E

Ixx95 - Motor xx Power-On Servo Position Format

Ixx95 will be set to a value which tells the controller that the register from Ixx10 will be processed as an ACC-57E absolute encoder. The following table shows the possible settings of Ixx95.

Encoder Type	Controller	Ixx95 Value
Yaskawa	Turbo PMAC or Turbo PMAC2	$710000 – unsigned $F10000 – signed

Ixx98 - Motor xx Resolver 3rd Gear Ratio (Yaskawa Only) for Turbo

Ixx98 tells the PMAC how many counts per revolution the Yaskawa Encoder has. The units for this parameter are in counts per revolution divided by 4096. The counts per revolution are based on the decode value of I7mn0. Almost all users will use 4× decode.

If the Yaskawa absolute encoder you are using has 32768 counts per revolution, then the user will set Ixx10 to the following value:

$$Ixx98 = \frac{32768}{4096} = 8$$

Ixx99 - Motor xx 2nd Resolver Gear Ratio (Yaskawa Encoder only) for Turbo

This is used to let the PMAC know what the remainder from the Ixx98 division is. For most Yaskawa encoders this value will be zero because the majority of their encoders are based on a power of two line count (1024, 2048, 4096, etc.).

Example: The number of lines per revolution of the YASKAWA absolute encoder in the system is 8192. PMAC will multiply this term by 4 and read (8192×4) = 32768 counts/rev.

$$\therefore \quad Ixx98 = \frac{32768}{4096} = 8$$

$$Ixx99 = 0$$

Example: Turbo PMAC Yaskawa Absolute Encoder Setup

For this example, we will have the ACC-8D option 9 addressed to the base address $08 based on the SW1 settings. The four encoders for this example have 8192 lines per revolution or 32768 encoder counts (with 4× decode). We will also assume that we are setting up motors 1, 2, 3, and 4. To properly setup the ACC-8D option 9 to read Yaskawa absolute encoders, do the following:

Ixx10 Setup

```
I110=$08        ; 1st channel ACC-57E
I210=$0A        ; 2nd channel ACC-57E
I310=$0C        ; 3rd channel ACC-57E
I410=$0E        ; 4th channel ACC-57E
```

Ixx95 Setup

```
I195=$F10000         ;Yaskawa absolute power on position setting
I295=$F10000         ;Yaskawa absolute power on position setting
I395=$F10000         ;Yaskawa absolute power on position setting
I495=$F10000         ;Yaskawa absolute power on position setting
```

Ixx98 Setup

```
I198=8               ; Ixx98 = 32768/4096 = 8
I298=8               ; Ixx98 = 32768/4096 = 8
I398=8               ; Ixx98 = 32768/4096 = 8
I498=8               ; Ixx98 = 32768/4096 = 8
```

Ixx99 Setup

```
I199=0               ; Ixx99 =  remainder from Ix98 calculation
I299=0               ; Ixx99 =  remainder from Ix98 calculation
I399=0               ; Ixx99 =  remainder from Ix98 calculation
I499=0               ; Ixx99 =  remainder from Ix98 calculation
```

Turbo PMAC Power On Phasing

All brushless motors require some type of a phase-search on power up to establish a relationship between the zero position of the motor's commutation cycle and the zero position of the feedback device. Since the data from the ACC-8D option 9 is absolute, the motor phase position relative encoder position is fixed and a "no-movement" motor phase can be performed. To properly phase the motor using the absolute data from the ACC-8D option 9, setup I-variables Ixx81, Ixx91 (for Turbo only), Ixx75, and Ixx80.

The no-movement power-on phase reference works as follows. Initially, when setting up the system (this may be done in a lab setting) the motor is forced to the zero position in its phase cycle. The position of the absolute sensor is read by querying an M-variable previously set up to point to the sensor. After performing some math on this value, the resulting value is stored in PMAC as Ix75 and represents the "power-on phase position offset". Ix81 is set to tell PMAC the address location where it can find the absolute sensor's feedback, and how to decode this information. On power-up (or when a reset motor, "$", command is issued) PMAC will look to this address, grab the current position of the rotor, add to it the pre-determined offset parameter, and instantly it knows where the motor is in its phasing cycle relevant to the current position! No movement is necessary.

Ixx81

Ixx81 tells Turbo PMAC what address to read for absolute power-on phase-position information for Motor xx, if such information is present. This can be a different address from that of the ongoing phase position information, which is specified by Ixx83, but it must have the same resolution and direction sense. Ixx81 is set to zero if no special power-on phase position reading is desired, as is the case for an incremental encoder. The ACC-8D Option 9 Yaskawa Absolute Encoder converter board synthesizes quadrature signals into the Turbo PMAC at power-on until the power-on position within one revolution is reached, so the value of the encoder counter can simply be read.

Turbo PMAC(1) Ixx81 Encoder Register Settings
(Ixx91=$480000 - $580000)

Encoder Register Channel #	PMAC	1st ACC-24P/V	2nd ACC-24P/V	3rd ACC-24P/V	4th ACC-24P/V
Channel 1	$078001	$078201	$079201	$07A201	$07B201
Channel 3	$078009	$078209	$079209	$07A209	$07B209
Channel 5	$078101	$078301	$079301	$07A301	$07B301
Channel 7	$078109	$078309	$079309	$07A309	$07B309

Turbo PMAC2 Ixx81 Typical Encoder Register Settings
(Ix91=$480000 - $580000)

Encoder Register Channel #	PMAC2	1st ACC-24x2	2nd ACC-24x2	3rd ACC-24x2	4th ACC-24x2
Channel 1	$078001	$078201	$079201	$07A201	$07B201
Channel 2	$078009	$078209	$079209	$07A209	$07B209
Channel 3	$078011	$078211	$079211	$07A211	$07B211
Channel 4	$078019	$078219	$079219	$07A219	$07B219
Channel 5	$078101	$078301	$079301	$07A301	$07B301
Channel 6	$078109	$078309	$079309	$07A309	$07B309
Channel 7	$078111	$078311	$079311	$07A311	$07B311
Channel 8	$078119	$078319	$079319	$07A319	$07B319

Ixx91

Ixx91 tells how the data at the address specified by Ixx81 is to be interpreted. It also determines whether the location specified by Ixx81 is a multiplexer (“thumbwheel”) port address, an address in Turbo PMAC’s own memory and I/O space, or a MACRO node number. For the ACC-8D option Ixx91 will be set to a value of $580000.

Ixx75

Ixx75 tells Turbo PMAC the distance between the zero position of an absolute sensor used for power-on phase position (specified by Ixx81 and Ixx91) and the zero position of Turbo PMAC's commutation cycle. It is used to reference the phasing algorithm for a PMAC-commutated motor with an absolute sensor (Ixx81 > 0). Please see Software Reference for proper setting.

Ixx80

Ixx80 controls the power-up mode, including the phasing search method (if used), for Motor xx. If Ixx80 bit 0 is 1 (Ixx80 = 1 or 3), this is done automatically during the power-up/ reset cycle and it also be done in response to a **$** on-line command to the motor, or a **$$** on-line command to the coordinate system containing the motor. If Ixx80 is set to 0, phasing will also be done in response to a **$** on-line command to the motor, or a **$$** on-line command to the coordinate system containing the motor.

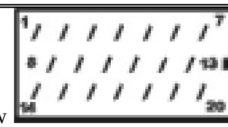
JUMPER SETUP

Jumper	Position	Description	Default Setting
E1		Encoder 1 absolute data reset	2-3
	Default 	Encoder 1 normal operation	
E2		Encoder 2 absolute data reset	2-3
	Default 	Encoder 2 normal operation	
E3		Encoder 3 absolute data reset	2-3
	Default 	Encoder 3 normal operation	
E4		Encoder 4 absolute data reset	2-3
	Default 	Encoder 4 normal operation	
E5		Additional driver for LED	out
E6		CPU reset	2-3
	Default 	CPU normal operation	
E7		Bootstrap mode	2-3
	Default 	Single chip	

CONNECTOR PINOUTS

Headers

JP1 to JP4 (20-Pin Header)

Top View 

Pin #	Symbol	Function	Description	Notes
1	GND	Common	Encoder Common	
2	GND	Common	Encoder Common	
3	GND	Common	Encoder Common	
4	SEN	Power	+5V	
5	SEN	Power	+5V	
6	SEN	Power	+5V	
7	NC			
8	NC			
9	NC			
10	RESET	Input	Encoder Reset	
11	NC			
12	BAT +	Input	+3V	
13	BAT -	Input	Encoder Common	
14	PHASE C	Output	Channel C+	
15	*PHASE C	Output	Channel C-	1
16	PHASE A	Output	Channel A+	
17	*PHASE A	Output	Channel A-	
18	PHASE B	Output	Channel B+	
19	*PHASE B	Output	Channel B-	
20	F-GND	Common	Encoder from Ground	

1. Channel C/ is terminated at the connector.

The part number and manufacture information for connector JP1-JP4 is as follow:

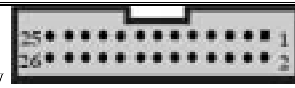
Manufacture: HONDA

Part number: MR-20RMD2(male)

Mate-in connector part number: MR-20F

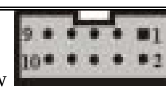
(Vendor: CONNEX - Fremont, CA   Telephone: 1-800-972-5932)

JP6 and JP7 (26-Pin Header)

Top View


Pin #	Symbol	Function	Description	Notes
1	GND	Common	PMAC Common	
2	GND	Common	PMAC Common	
3	DAT0	Output	Data Bit 0	
4	SEL0	Input	Address Line 0	
5	DAT1	Output	Data Bit 1	
6	SEL 1	Input	Address Line 1	
7	DAT2	Output	Data Bit 2	
8	SEL2	Input	Address Line 2	
9	DAT3	Output	Data Bit 3	
10	SEL3	Input	Address Line 3	
11	DAT4	Output	Data Bit 4	
12	SEL 4	Input	Address Line 4	
13	DAT5	Output	Data Bit 5	
14	SEL5	Input	Address Line 5	
15	DAT6	Output	Data Bit 5	
16	SEL6	Input	Address Line 6	
17	DAT7	Output	Data Bit 6	
18	SEL7	Input	Data Bit 7	
19	N.C.			Not connected
20	GND	Common	PMAC Common	
21	N.C.			Not connected
22	GND	Common	PMAC Common	
23	N.C.			Not connected
24	GND	Common	PMAC Common	
25	+5V	Input	+5V DC Supply	
26	N.C.			Not connected

JENC1 to JENC4 (10-Pin Header)

Top View


Pin #	Symbol	Function	Description	Notes
1	CHA1	Output	A Channel	H.P. Standard
2	+5V	Input	Power Supply	H.P. Standard
3	GND	Common	Digital Ground	H.P. Standard
4	CHA1/	Output	Neg. A Channel	H.P. Standard
5	CHB1/	Output	Neg. B Channel	H.P. Standard
6	GND	Common	Digital Ground	H.P. Standard
7	+5V	Input	Power Supply	H.P. Standard
8	CHB1	Output	B Channel	H.P. Standard
9	+5V	Input	Power Supply	H.P. Standard
10	CHC1	Output	C Channel	H.P. Standard

Servopack 1CN Terminal Description

(For Σ Series Motor and Absolute Encoder)

Terminal	Label	Description
1	SG	0V
2	SG	0V
3	PL1	Power supply for open collector reference
4	SEN	SEN signal input
5	V-REF	Speed reference input
6	SG	0V
7	PULS	Reference pulse input
8	*PULS	Reference pulse input
9	T-REF	Torque reference input
10	SG	0V
11	SIGN	Reference sign input
12	*SIG	Reference sign input
13	PL2	Power Supply for open collector reference
14	*CLR	Error counter clear input
15	CLR	Error counter clear input
16	TQR-M	Torque monitor
17	VTG-M	Speed monitor
18	PL3	Power supply for open collector reference
19	PCO	PG dividing output phase C
20	*PCO	PG dividing output phase C
21	BAT	Battery (+)
22	BAT0	Battery (-)
23	+12V	Power supply for speed/torque reference
24	-12V	Power supply for speed/torque reference
25	V-CMP(COIN+)	Speed coincidence signal output
26	V-CMP(COIN-)	Speed coincidence signal output
27	TGON+	TGON output signal
28	TGON-	TGON output signal
29	S-RDY+	Servo ready output
30	S-RDY-	Servo ready output
31	ALM+	Servo alarm output
32	ALM-	Servo alarm output
33	PAO	PG dividing output phase A
34	*PAO	PG dividing output phase A
35	PBO	PG dividing output phase B
36	*PBO	PG dividing output phase B
37	ALO1	Alarm code output (open collector output)
38	ALO2	Alarm code output (open collector output)
39	ALO3	Alarm code output (open collector output)
40	S-ON	Servo ON input
41	P-CON	P control input
42	P-OT	Forward over-travel input
43	N-OT	Reverse over-trivial input
44	ALM-RST	Alarm reset input
45	P-CL	Forward external torque limit ON input
46	N-CL	Reverse external torque limit ON input
47	+24V IN	External power supply input
48	PSO	Phase S signal output
49	*PSO	Phase S Signal output
50	FG	Frame ground

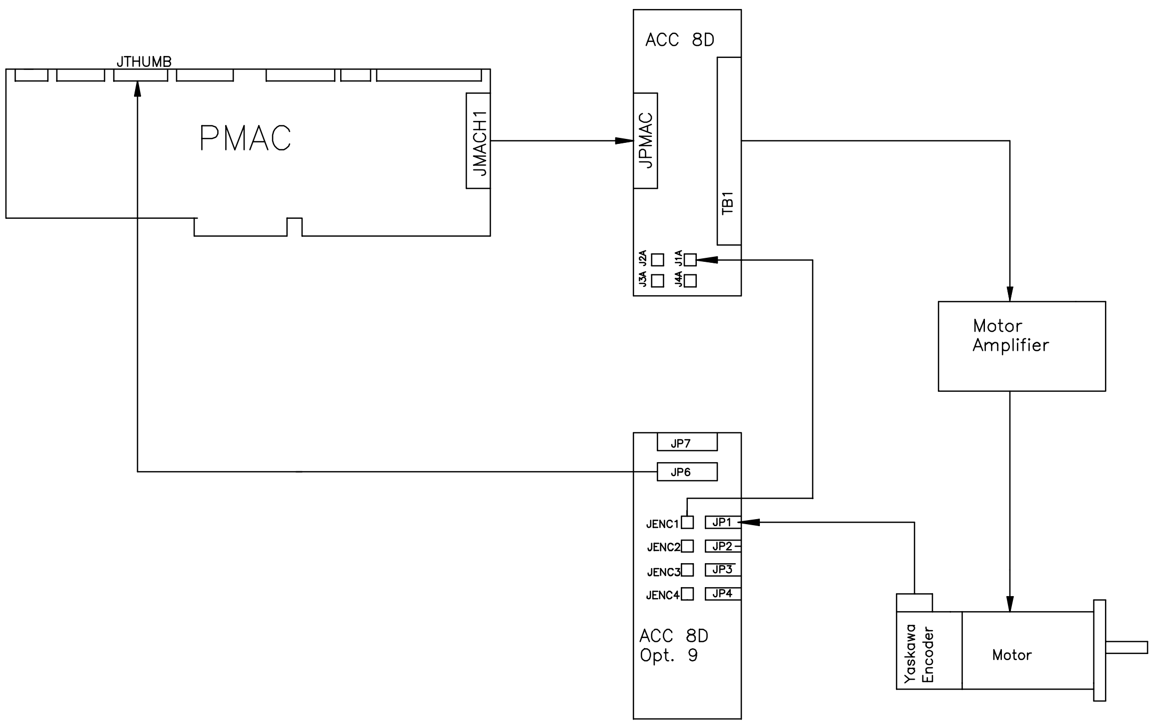
TEST SETUP

The diagram below shows how to connect the ACC-8D Option 9 accessory board to PMAC.

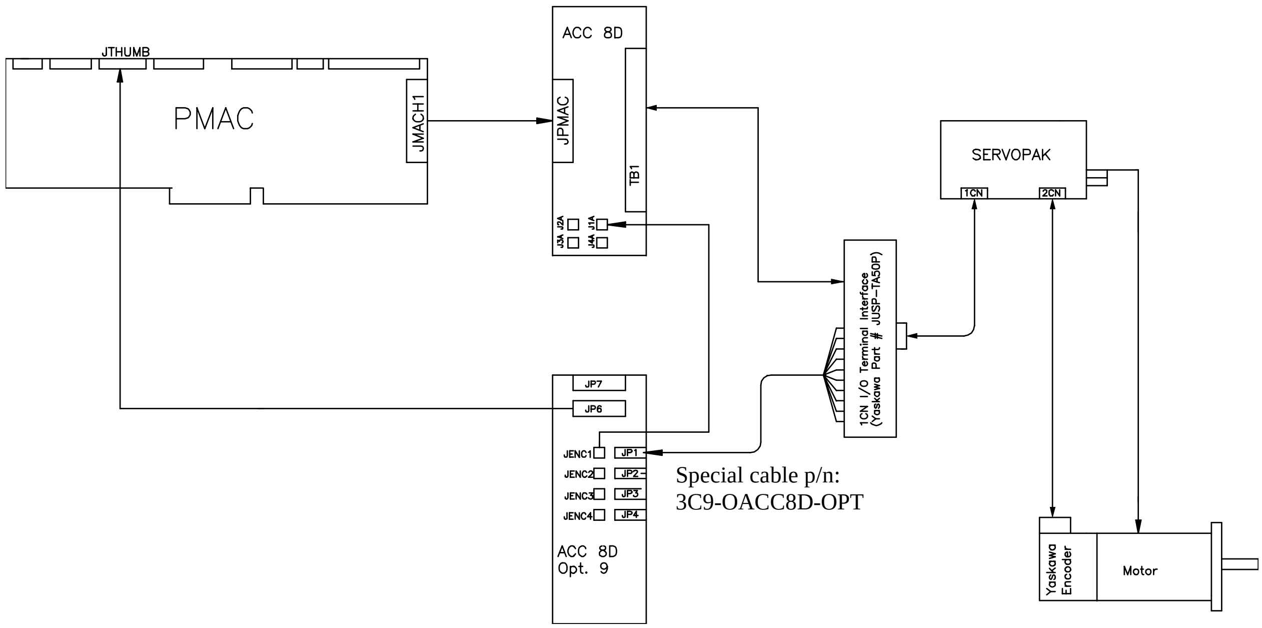
For this example, we will be using a Yaskawa UTMAH-B15AS absolute encoder mounted on the back of a USAGED-2AS2K AC Servo Motor. The encoder has 8192 counts/rev. As shown in the diagram, we will be connecting the encoder to PMAC's encoder channel #1.

Once everything is properly connected, power up the system. Next, go into the Executive program and open the position window. If you spin the motor by hand, you should see the position of motor #1 moving.

Block Diagram of Yaskawa Encoder—PMAC Interface



For User of SIGMA Series Motor & Absolute Encoder



YASKAWA ABSOLUTE ENCODER INTERFACE

(MACRO Interface Version)

Jumper Settings

Jumper E9 selects the compact MACRO interface RS232 (or thumbwheel communication) function. The jumper position is read once at power up, so any changes made after that are invalid.

Once the MACRO interface function is active, the communication between the interface card and the MACRO station is established via RS232. A RS232 cable must be plugged into P2 on the interface card (see the wiring diagram for details).

Two ACC-8D Option 9 cards are allowed in one system. The card address is defined by jumper E8, and is read at power up. Changes to the setting of jumper E8 will not be read until the next time power is turned on.

Jumper E8 & E9 Setup

Jumper	Position	Description	Default Setting
E8	In	Interface board address bit board # 1-for encoder 1 to 4	Jumper in
	Out	Interface board address bit board # 2-for encoder 5 to 8	
E9	In *	Thumbwheel port communication version	Jumper in
	Out	RS232 communication version (compact MACRO station only)	
* For compact MACRO interface application, and for firmware version 1.106 and later, the thumbwheel communication is supported.			

PMAC I-Variable Setup

The following PMAC I-Variable set up are for MACRO interface version **only:**

Ix10 - Power-On Initial Position Type and Address:

# of Encoder	I-Variable Name	PMAC: I-Variable Value
1	I110	$72(0000)
2	I210	$72(0001)
3	I310	$72(0004)
4	I410	$72(0005)
5	I510	$72(0008)
6	I610	$72(0009)
7	I710	$72(000C)
8	I810	$72(000D)
The numbers in parenthesis are valid MACRO motor nodes. The motors are assigned to a Y-MACRO motor node.		

I8x and I9x:

I8x=(counts/rev.)*/4096

I9x= the remainder from above division

Note

Here the counts/rev. = Encoder lines/revolution X 4.

Ix81 - Motor x Absolute Phasing Address:

The following table is a function of its motor X and its MACRO motor node N:

# of Encoder	I-Variable name	PMAC I-Variable Value	PMAC2 I-Variable Value	Y-MACRO Motor Node N
1	I181	$(12)C223*	$(12)C0A3*	0
2	I281	$(12)C227*	$(12)C0A7*	1
3	I381	$(12)C22B*	$(12)C0AB*	4
4	I481	$(12)C22F*	$(12)C0AF*	5
5	I581	$(12)C233*	$(12)C0B3*	8
6	I681	$(12)C237*	$(12)C0B7*	9
7	I781	$(12)C23B*	$(12)C0BB*	12
8	I881	$(12)C23F*	$(12)C0BF*	13
The number in the parenthesis should reflect the number of lines of the absolute encoder in HEX. To derive this value: 1. Convert the number of lines to a binary number, such as $8192 = 2^{13}$ 2. Add 5 to the exponential part (which is 10 in the above example). That is: 13 + 5 =18 3. Convert the result to hex representation: 18(dec) = 12 (hex)				

MI11x (Bit 16-23 only-first two digits)

The following are MACRO I-Variables:

I11n Bits 16-23	Type of Feedback	Notes
$71	Yaskawa Absolute Encoder Converter through Multiplexer Port (bits 0-15 equal to Thumbwheel address)	Used for ACC-8D Opt 9 connected to CPU board JTHW port (use E9 to configure); address is multiplexer port address ($00 - $FF)
$72	Yaskawa Absolute Encoder Converter through RS-232 interface (bits 0-15 equals 0).	Used for ACC-8D Opt 9 connected to CPU board serial port.
Reference "MACRO Station Software Reference" manual for details.		

TROUBLE SHOOTING

Data Acquisition Sequence

The ACC-8D Option 9 Yaskawa interface card is a slave card for PMAC. It acquires the absolute data only when PMAC requests it. The absolute position data is obtained by sending out 'SEN' signal (+5V) to the encoder. The power will remain on if the data is successfully acquired. It will turn off (0V) if the data is not received within approximately 1.5 seconds.

Checking Up Steps

If there is no position data showing on the PMAC window, the following steps could be followed to check the card:

Step 1: Is the jumper setting right?

Which includes:

- Dip switch S1.
- E-point jumpers E1-E9

Step 2: Is there power applied to the card?

Refer to page 2 of this manual for JP8. Check with meter on 'TP11' and 'TP12' to verify (should be 5V).

Step 3: Compare all the necessary PMAC I-variables with this manual:

PMAC is shipped with all the I-variables in default values. The ACC-8D Option 9 user has to change the related I-variable according to this manual. A "**save**" command has to be executed in order to keep those values from being lost when the '$$$' command or a power recycle occurs.

Step 4: Does the encoder need to be reset?

Reference your YASKAWA motor and encoder manual for detailed information on how to reset the absolute position data. If some encoders are disconnected from the battery (on this card) for a certain period of time, either the absolute position data will be lost,
(back to 0) or a reset procedure will need to be done before the encoder starts working correctly.

APPENDIX

Setup Method for 12-bit Absolute Encoder

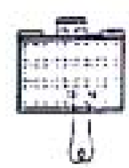
To clear the cumulative rotation number to zero for testing the motor, or when the absolute encoder has been left disconnected from a battery for more than two days, the encoder needs to be setup by the following procedure. (Under the above conditions, capacitors in the encoder may be charged insufficiently so that the internal circuits may malfunction.)

Strictly follow the procedure. Otherwise, an error may occur.

1 Turn ON power to the SGD SERVOPACK.
Connect the SGD SERVOPACK, motor, and encoder properly.
Connect the battery and turn ON power to the SGD SERVOPACK.

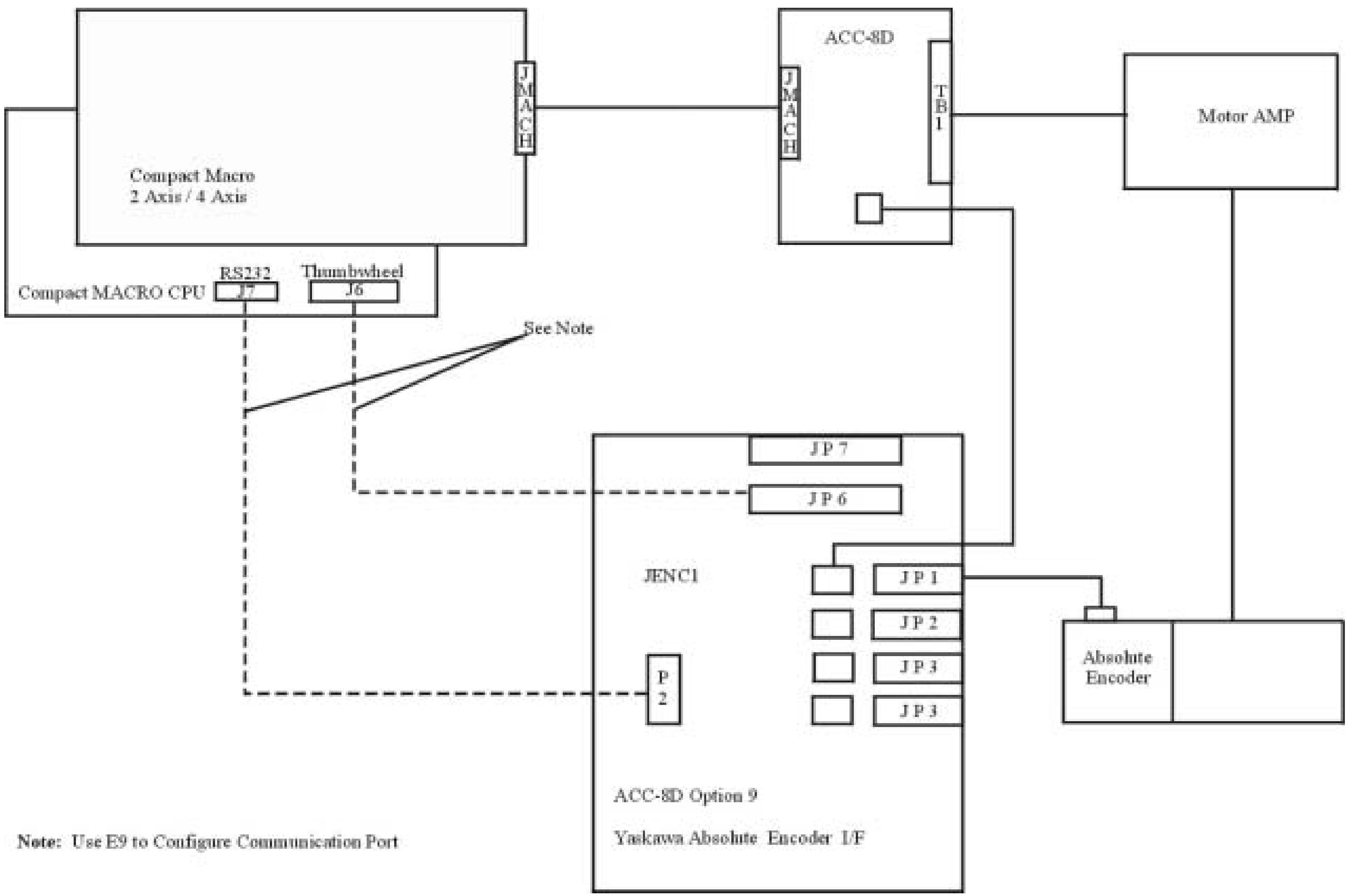
2 Set the SEN signal (1CN-4) high.
When the SEN signal is high, +5V power is supplied to the encoder.
Keep this condition for three minutes or longer to fully charge the backup capacitor.

3 Data reset
Turn OFF power to the SGD SERVOPACK.
Remove the encoder connector.
Connect connector terminal 13 and 14 of the encoder for one or two seconds.



4 Wiring
Restore the normal wiring.

5 Power ON
Turn ON power tot he SGD SERVOPACK.
Set the SEN signal to high-level. If no error occurs, setup has been completed.
If alarm is 0. output, restart from step 1.


ACC-8D
J
M
A
C
H
T
B
1
Motor AMP
Compact Macro
2 Axis / 4 Axis
Compact MACRO CPU
RS232
J7
Thumbwheel
J6
See Note
J P 7
J P 6
JENC1
J P 1
J P 2
J P 3
J P 3
P
2
Absolute
Encoder
ACC-8D Option 9
Yaskawa Absolute Encoder I/F
Note: Use E9 to Configure Communication Port