YASKAWA

YASKAWA AC Drive GA800

Supplemental Technical Manual

Introduction

Thank you for purchasing YASKAWA AC Drive GA800. This supplemental technical manual describes the functions added or changed with a GA800 software upgrade, and should be read to ensure proper usage. Read this manual together with the Quick Start Guide (TOEPC710617xx) included with the product and the GA800 Technical Manual (SIEPC710617xx) that can be found on our documentation website. Observe the safety messages and precautions to ensure correct application of the product.

Applicable Model

This manual applies to GA800 for software versions S9022 or later.
The software version is indicated on the nameplate affixed to the side of the product, and also can be viewed by using monitor parameter U1-25.

Modified Contents

This supplemental manual explains about these modifications:

1. Changes in Specifications of Parameters Used for Droop Control
2. Support for JOHB-SMP3 MECHATROLINK-4 Communication Protocol
3. Keypad Button Status Monitor
4. Application of Filter Time Constant to MEMOBUS/Modbus Register 00ADH (U1-05: Motor Speed)
5. Modification of Specifications of Current Detection Speed Search Operation during External Base Block Operation
6. Improved High Slip Braking (HSB) Operation

Note:
• models CIPR-GA80U5xxx does not support OLV/PM, AOLV/PM, CLV/PM, and EZOLV.

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1. Changes in Specifications of Parameters Used for Droop Control

Droop control can now be used even when A1-02 = 6 [PM Advanced Open Loop Vector]. (Underlined parts are added items.)

◆ Parameters with changed specifications (Can be set at A1-02 = 6 [PM Advanced Open Loop Vector])

No. (Hex.)	Name	Description	Default Setting (Range)
b7-01 (01CA) RUN	Droop Control Gain	V/f CL-V/f OLV **CLV** **AOLV** OLV/PM **AOLV/PM** **CLV/PM** EZOLV Sets the amount of deceleration when the torque reference is at 100% with E1-04 [Maximum Output Frequency] at 100%.	0.0% (0.0 - 100.0%)
b7-02 (01CB) RUN	Droop Control Delay Time	V/f CL-V/f OLV **CLV** **AOLV** OLV/PM **AOLV/PM** **CLV/PM** EZOLV Sets the responsiveness of Droop control. Decrease this setting when drive response is slow. Increase this setting when hunting or oscillation occur.	0.05 s (0.03 - 2.00 s)
b7-03 (017E)	Droop Control Limit Selection	V/f CL-V/f OLV **CLV** **AOLV** OLV/PM **AOLV/PM** **CLV/PM** EZOLV Sets the Droop control limit function. 0: Disabled 1: Enabled	1 (0, 1)

◆ Fault

Code	Name	Cause	Possible Solutions
LSo	Low Speed Motor Step-Out	The motor code set incorrectly.	• Set E5-01 [PM Motor Code Selection] correctly as specified by the motor. • For specialized motors, refer to the motor test report and set E5-xx correctly.
		The load is too heavy.	• Decrease the load. • Replace the drive and motor with larger capacity models.
		An external force on the load side caused the motor to move at start.	Find and repair problems on the load side that cause the motor to rotate from the load side.
		The drive incorrectly detected the motor magnetic pole position.	• Set b3-01 = 1 [Speed Search at Start Selection = Enabled]. • When U6-57 [PolePolarityDeterVal] < 819, increase n8-84 [Polarity Detection Current]. Consult the motor manufacturer for information about maximum setting values.
		n8-84 (Initial Polarity Estimation Timeout Current) is too low.	Increase the n8-84 setting from the default. Consult the motor manufacturer for information about maximum setting values.
		Incorrect values set in L8-93 [Low Speed Pull-out DetectionTime], L8-94 [Low Speed Pull-out Detect Level], and L8-95 [Low Speed Pull-out Amount].	Increase the values set in L8-93 to L8-95.
		The drive incorrectly detected the motor magnetic pole position.	If you are using an IPM motor, do High Frequency Injection Auto-Tuning.

Note: • The drive detects this fault if it detects step-out while running at low speed.
• Do a Fault Reset to clear the fault.
• LSo is a protective function that stops the motor and stops the reverse run if a motor without a motor code incorrectly detects the initial polarity.
To quickly detect motor reversal, decrease the values set in L8-93 to L8-95 to a range in which the drive does not malfunction.
• **When the motor accelerates when Droop control is enabled, the Lso detection level becomes L8-94 [Low Speed Pull-out Detect Level] + Droop control output.**

◆ OLV/PM, AOLV/PM, CLV/PM and EZOLV features and advantages of control methods

Control Mode	PM Open Loop Vector Control (OLV/PM)	PM Advanced Open Loop Vector Control (AOLV/PM)	CLV for PM Motor (CLV/PM)	EZOLV (EZOLV)	Remarks
Controlled Motor	**PM motor**			**Induction Motors/PM Motors/SynRM (Synchronous Reluctance Motors)**	**-**
Parameter Settings	A1-02 = 5	A1-02 = 6	A1-02 = 7	A1-02 = 8	-
Basic Control	PM Open Loop Vector Control (no speed controller)	PM Open Loop Current Vector Control (with speed controller)	PM Closed Loop Current Vector Control (with speed controller)	Open Loop Vector	-
…					
Droop control	Not possible	**Not possible → Possible (IPM motor only)**	Yes	No	Sets load torque slip for motors. Distributes motor loads.
…					

◆ Parameter setting error

Code	Name	Cause	Possible Solutions
oPE08	Parameter Selection Error	When A1-02 = 6 [PM Advanced Open Loop Vector], you used these parameter settings: • n8-57 = 0 [HFI Overlap Selection = Disabled]. • n8-94 [Flux Position Estimation Method] = 1 [Feedback]	Correct the parameter settings.
		When A1-02 = 6 [PM Advanced Open Loop Vector], you used these parameter settings: **• b7-01 [Droop Control Gain] ≠ 0.0** **• n8-94 [Flux Position Estimation Method] = 0 [Reference]**	**Correct the parameter settings.**

2. Support for JOHB-SMP3 MECHATROLINK-4 Communication Protocol

JOHB-SMP3 MECHATROLINK-4 communication protocol is now supported. JOHB-SMP3 MECHATROLINK-4 communication protocol descriptions have been added to compatible options and related monitors and registers. (Underlined parts are added items.)

Use JOHB-SMP3 software version S8208 (MECHATROLINK-4: Ver8000)*1 or later.

*1: JOHB-SMP3 option cards have an overall software version and a separate software version for each communication protocol. Check the PRG number on the purchased box for the overall software version. Start the applicable communication protocol and check U6-97 to check the communication protocol software version.

◆ **Available communication options**

Type of Communications	Option Model	Type of Communications	Option Model
CC-Link	SI-C3	DeviceNet	SI-N3
MECHATROLINK-II	SI-T3	LonWorks	SI-W3
MECHATROLINK-III	SI-ET3	Modbus TCP/IP	SI-EM3, JOHB-SMP3
MECHATROLINK-4	**JOHB-SMP3**	PROFINET	SI-EP3, JOHB-SMP3
PROFIBUS-DP	SI-P3	EtherNet/IP	SI-EN3, JOHB-SMP3
CANopen	SI-S3	EtherCAT	SI-ES3, JOHB-SMP3

◆ **MEMOBUS/Modbus communications monitor data**

Register No. (Hex.)	Description	
00B0	Option codes connected to CN5-A	The drive stores option codes in the register. AI-A3 = 0003 (Hex.) AO-A3 = 0004 (Hex.) DI-A3 = 0001 (Hex.) DO-A3 = 0002 (Hex.) PG-B3 = 0011 (Hex.) PG-F3 = 0021 (Hex.) PG-RT3 = 0023 (Hex.) PG-X3 = 0012 (Hex.) SI-C3 = 5343 (Hex.) SI-EM3 = 1005 (Hex.) SI-EN3 = 1006 (Hex.) SI-ET3 = 1004 (Hex.) SI-N3 = 534E (Hex.) SI-P3 = 5350 (Hex.) SI-S3 = 5353 (Hex.) SI-T3 = 5354 (Hex.) SI-W3 = 1003 (Hex.) SI-ES3 = 1001 (Hex.) JOHB-SMP3 (EtherCAT) = 1001 (Hex.) JOHB-SMP3 (Modbus TCP/IP) = 1005 (Hex.) JOHB-SMP3 (EtherNet/IP) = 1006 (Hex.) JOHB-SMP3 (PROFINET) = 1006 (Hex.) **JOHB-SMP3 (MECHATROLINK-4) = 100E (Hex.)**

◆ **Peripheral devices and options**

Name	Model	Intended Use	Document No.
MECHATROLINK-III	SI-ET3	This option uses the host controller over MECHATROLINK-III communication to: • Operate and stop the drive • Set and view parameters • Monitor output frequency, output current, and other statuses Note: The drive is compatible with option software versions 6202 and later.	TOBPC73060088 SIJPC73060088
MECHATROLINK-4	**JOHB-SMP3**	**This option uses the host controller over MECHATROLINK-4 communication to:** **• Operate and stop the drive** **• Set and view parameters** **• Monitor output frequency, output current, and other statuses**	**TOBPC7306000H** **SIxPC7306000N**
EtherNet/IP	SI-EN3	This option uses the host controller over EtherCAT communication to: • Operate and stop the drive • Set and view parameters • Monitor output frequency, output current, and other statuses	TOBPC73060092 SIEPC73060092
	JOHB-SMP3		TOBPC7306000H SIxPC7306000J
…		…	

◆ **Correspondence between communication protocols and parameters (JOHB-SMP3)**

Parameters	MECHATROLINK-II SI-T3	MECHATROLINK-III SI-ET3	MECHATROLINK-4 JOHB-SMP3
F6-01 to F6-03	○	○	○
F6-04	-	-	-
F6-06 to F6-08	○	○	○
F6-10, F6-11	-	-	-
F6-14	-	-	-
F6-16	○	○	○
F6-20	○	○	○
F6-21	○	○	-
F6-22	○	-	-
F6-23 to F6-26	○	○	○
F6-30 to F6-32	-	-	-
F6-35, F6-36	-	-	-
F6-45 to F6-49	-	-	-
F6-50 to F6-53	-	-	-
F6-54	-	-	-
F6-55 to F6-71	-	-	-
F7-01 to F7-15	-	-	-
F7-16	-	-	-
F7-17 to F7-42	-	-	-
F7-60 to F7-79	-	-	-
F7-80 to F7-86	-	-	○

◆ **Parameters with changed specifications**

No. (Hex.)	Name	Description	Default Setting (Range)
F6-20 (036B)	MECHATROLINK Station Address	V/f CL-V/f OLV CLV AOLV OLV/PM AOLV/PM CLV/PM EZOLV Sets the station address for MECHATROLINK communication. Change the parameter then cycle power on the drive. Note: • The setting range changes if you use MECHATROLINK-II or MECHATROLINK-III: –MECHATROLINK-II (SI-T3): 0020h to 003Fh –MECHATROLINK-III (SI-ET3): 0003h to 00EFh **–MECHATROLINK-4 (JOHB-SMP3): 0000h to FFEFh** • All station addresses must be unique. Incorrect parameter settings will cause AEr [Station Address Setting Error] errors. • If MECHATROLINK-II (SI-T3) is in use, the drive detects AEr errors when the station address is 20 or 3F. **• If MECHATROLINK-4 (JOHB-SMP3) is in use, when you set this parameter to 0000h, the option uses the station address at the time the previous cyclic communication was established. When cyclic communication is executed for the first time, the station address is 0021h.**	0021H (MECHATROLINK-Ⅱ: 0020h to 003Fh, MECHATROLINK-Ⅲ: 0003h to 00EFh, **MECHATROLINK-4:** (0000h to FFEFh)

◆ **Newly added parameters**

No. (Hex.)	Name	Description	Default Setting (Range)
F7-80 (0794)	MECHATROLINK Monitor Select (10H)	V/f CL-V/f OLV CLV AOLV OLV/PM AOLV/PM CLV/PM EZOLV Sets the MEMOBUS/Modbus register that is monitored when 10H SEL_MON_E7 at INV_CTL_EX (Expanded Inverter Operation Control Command). Note: Cycle power for setting changes to take effect.	0000H (0000h to FFFFh)
F7-81 (0795)	MECHATROLINK Monitor Select (11H)	V/f CL-V/f OLV CLV AOLV OLV/PM AOLV/PM CLV/PM EZOLV Sets the MEMOBUS/Modbus register that is monitored when 11H is specified to SEL_MON_E1 to SEL_MON_E7 at INV_CTL_EX (Expanded Inverter Operation Control Command). Note: Cycle power for setting changes to take effect.	0000H (0000h to FFFFh)
F7-82 (0796)	MECHATROLINK Monitor Select (12H)	V/f CL-V/f OLV CLV AOLV OLV/PM AOLV/PM CLV/PM EZOLV Sets the MEMOBUS/Modbus register that is monitored when 12H is specified to SEL_MON_E1 to SEL_MON_E7 at INV_CTL_EX (Expanded Inverter Operation Control Command). Note: Cycle power for setting changes to take effect.	0000H (0000h to FFFFh)
F7-83 (0797)	MECHATROLINK Monitor Select (13H)	V/f CL-V/f OLV CLV AOLV OLV/PM AOLV/PM CLV/PM EZOLV Sets the MEMOBUS/Modbus register that is monitored when 13H is specified to SEL_MON_E1 to SEL_MON_E7 at INV_CTL_EX (Expanded Inverter Operation Control Command). Note: Cycle power for setting changes to take effect.	0000H (0000h to FFFFh)
F7-84 (0798)	MECHATROLINK Monitor Select (14H)	V/f CL-V/f OLV CLV AOLV OLV/PM AOLV/PM CLV/PM EZOLV Sets the MEMOBUS/Modbus register that is monitored when 14H is specified to SEL_MON_E1 to SEL_MON_E7 at INV_CTL_EX (Expanded Inverter Operation Control Command). Note: Cycle power for setting changes to take effect.	0000H (0000h to FFFFh)
F7-85 (0799)	MECHATROLINK Monitor Select (15H)	V/f CL-V/f OLV CLV AOLV OLV/PM AOLV/PM CLV/PM EZOLV Sets the MEMOBUS/Modbus register that is monitored when 15H is specified to SEL_MON_E1 to SEL_MON_E7 at INV_CTL_EX (Expanded Inverter Operation Control Command). Note: Cycle power for setting changes to take effect.	0000H (0000h to FFFFh)
F7-86 (079A)	MECHATROLINK Monitor Select (16H)	V/f CL-V/f OLV CLV AOLV OLV/PM AOLV/PM CLV/PM EZOLV Sets the MEMOBUS/Modbus register that is monitored when 16H is specified to SEL_MON_E1 to SEL_MON_E7 at INV_CTL_EX (Expanded Inverter Operation Control Command). Note: Cycle power for setting changes to take effect.	0000H (0000h to FFFFh)

3. Keypad Button Status Monitor

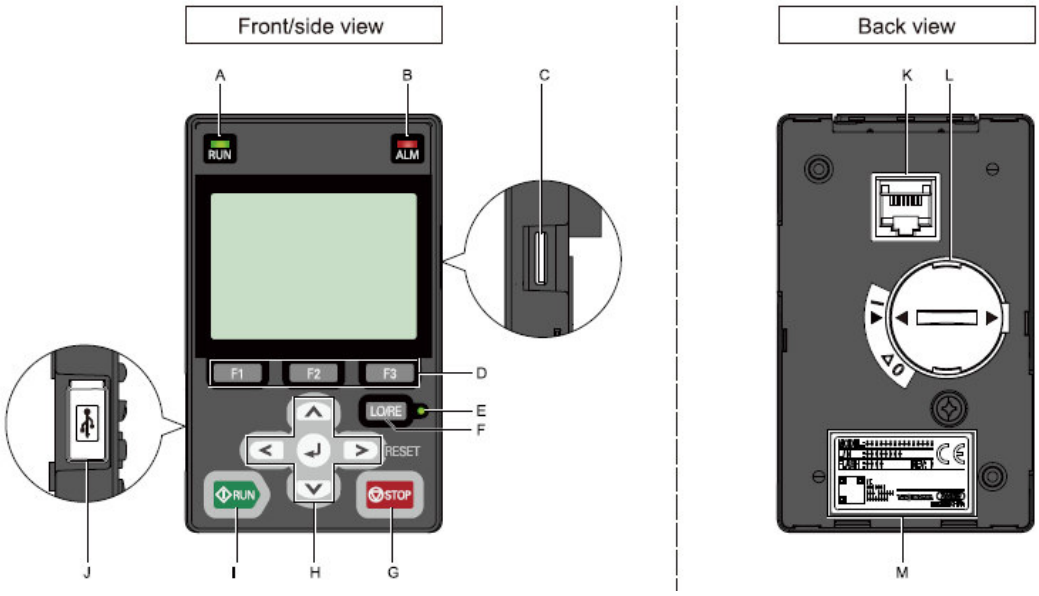
The newly added monitor U5-92 [Keypad Button Status Monitor] can control target bits according to key operation on the keypad. This comes in handy when using this monitor to set an operation sequence on a host controller or the DWEZ. (Underlined parts are added items.)

◆ Newly added monitor

No. (Hex.)	Name	Description	MFAO Signal Level
U5-92 (1EC0)	Keypad Button Status Monitor	V/f CL-V/f OLV CLV AOLV OLV/PM AOLV/PM CLV/PM EZOLV When bit0=OFF, bit0 is turned ON by holding down the left key for one second. (This toggles the status. When bit0=ON, bit0 is turned OFF.) bit0: Left key bit1: Right key bit2: Left key + right key bit3 to bit7: Not used (normal value of 0). This function operates only in the Drive Mode. In modes other than the Drive Mode, the value of U5-92 does not change.	No signal output available

⚠ WARNING Injury to Personnel:

Do not create a host controller program or DriveWorksEZ program that references this monitor to operate and stop the drive. Mishandling may damage the drive or cause death or serious injury.



Model Number Suffix	Name	Function
E	LO/RE LED 	Illuminated: The keypad controls the Run command (LOCAL Mode). OFF: The control circuit terminal or serial transmission device controls the Run command (REMOTE Mode). **Flashes: When the status of U5-92 [Keypad Button Status Monitor] has changed** Note: • LOCAL: Use the keypad to operate the drive. Use the keypad to enter Run/Stop commands and the frequency reference command. • REMOTE: Use the control circuit terminals or serial transmission to operate the drive. Use the frequency reference source entered in b1-01 and the Run command source selected in b1-02.

4. Application of Filter Time Constant to MEMOBUS/Modbus Register 00ADH (U1-05: Motor Speed)

As a result of setting H5-18 [Motor Speed Filter over Comms], the filter effect can now also be obtained in MEMOBUS/Modbus register 00ADH (U1-05: Motor Speed). (Underlined parts are added items.)

No. (Hex.)	Name	Description	Default Setting (Range)
H5-18 (11A2)	Motor Speed Filter over Comms	V/f CL-V/f OLV CLV AOLV OLV/PM AOLV/PM CLV/PM EZOLV Sets the filter time constant used when monitoring motor speed during MEMOBUS/Modbus communications or with a communication option.	0 ms (0 to 100 ms)

Sets the filter time constant when you monitor the output frequency or motor speed during MEMOBUS/Modbus communications or use of the communication option.

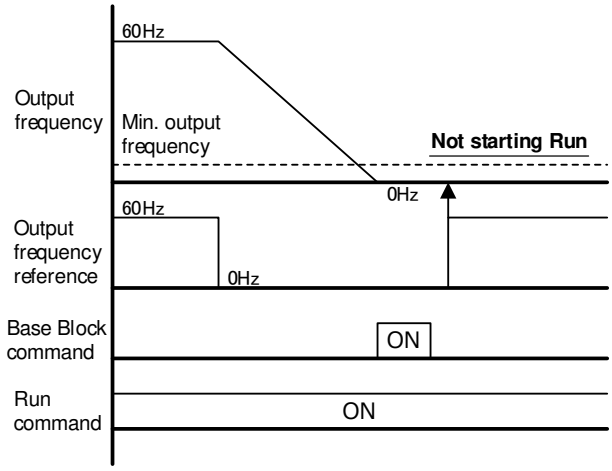
These are the MEMOBUS registers:

- 003EH (Output Frequency)
- 003FH (Output Frequency)
- 0044H (U1-05: Motor Speed)
- 00ACH (U1-05: Motor Speed)
- **00ADH (U1-05: Motor Speed)**

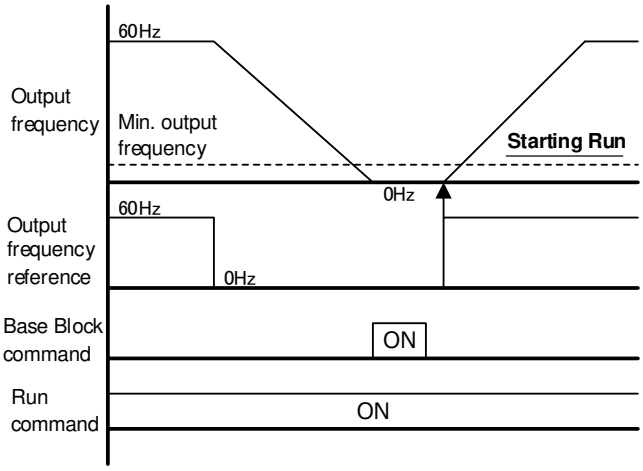
5. Modification of Specifications of Current Detection Speed Search Operation during External Base Block Operation

Modify the specifications of the Current Detection Speed Search operation during external base block operation as follows. (Underlined parts are added items.)

Before Modifications	After Modifications
① Run at the desired frequency	① Run at the desired frequency
② Perform base block operation with the frequency reference lowered to operation below minimum frequency	② Perform base block operation with the frequency reference lowered to operation below minimum frequency
③ Base block reference input→Cancel	③ Base block reference input→Cancel
④ Raise the frequency reference to the minimum output frequency or higher	④ Raise the frequency reference to the minimum output frequency or higher
⑤ Base block state without resuming operation	**⑤ Resume operation**



Before modifications



After Modifications

6. Improved High Slip Braking (HSB) Operation

To improve high slip braking operation, new parameters have been added. (Underlined parts are added items.)

◆ Newly added parameters

No. (Hex.)	Name	Description	Default Setting (Range)
n3-08 (058F) Expert	HSB Speed Drop Voltage Level 1	V/f CL-V/f OLV CLV AOLV OLV/PM AOLV/PM CLV/PM EZOLV The frequency is lowered by the amount set to n3-01 (HSB Deceleration Frequency Width) when the DC bus voltage reaches this voltage. Set in % units with approximately twice the voltage class standard taken to be 100%. Usually it is not necessary to change this parameter.	87% (80 to 90%)
n3-09 (0590) Expert	HSB Speed Drop Voltage Level 2	V/f CL-V/f OLV CLV AOLV OLV/PM AOLV/PM CLV/PM EZOLV The frequency is lowered by the amount set to n3-01 (HSB Deceleration Frequency Width) when the DC bus voltage reaches this voltage. Set in % units with approximately twice the voltage class standard taken to be 100%. Usually it is not necessary to change this parameter.	92% (90 to 95%)
n3-30 (0D46) Expert	HSB Speed Drop Voltage Hysteresis	V/f CL-V/f OLV CLV AOLV OLV/PM AOLV/PM CLV/PM EZOLV Set the hysteresis of the speed drop voltage during high slip braking operation in % units with approximately twice the voltage class standard taken to be 100%. Usually it is not necessary to change this parameter.	0.0% (0.0 to 10.0%)

◆ Fault

Code	Name	Causes	Possible Solutions
oL7	High Slip Braking Overload	The load inertia is too large.	• Decrease deceleration times in C1-02, C1-04, C1-06, and C1-08 [Deceleration Times] for applications that do not use High Slip Braking. • Use a braking resistor to decrease the deceleration time.
		An external force on the load side rotated the motor.	
		Something is preventing deceleration on the load side.	
		The value set in n3-04 [HSB Overload Time] is too small.	• Increase the value set in n3-04. Connect a thermal overload relay to the motor, and set n3-04 = 1200 s (maximum value).
		The input voltage is high.	**• Increase the value set in n3-08[HSB Speed Drop Voltage Level 1].** **• Decrease the value set in n3-30[HSB Speed Drop Voltage Hysteresis].**