RTEX Driver Application Manual.

Contents

1 **Abstract**

This manual provides the device setup, function introduction and trouble shooting methods for controllers collaborating with RTEX drivers.

2 Supporting Models and Function Table

Communication Developing Progress

	Panasonic A6N	Supporting Version
Axis Control & Alarm Recognition	✅	
Control Mode	Position Control	
*Number of Supporting Axis	16-axis	
Parameter Display/ Read&Write	✅	
Alarm Reading/String Display	✅	
Tuning Function		
Absolute Encoder Initialization	✅	
Absolute Home Setting	✅	
Servo Information Display	✅	
Parameter Synchronization(Kp)	✅	
Parameter Initialization		
Index Function(Threading, Home Searching)	✅	
Backup and Restore	✅	
Spindle/Axis Loading Rate(R5141~、R5151~)	✅	Shows Overload Loading Rate at controller versions 10.118.22B, 10.118.24~10.118.26. Shows Loading Rate from controller version 10.118.27.
Axis Torque Limit(R5171~)		
VFF(R5191~)	✅	Driver version 1.23 and above; controller versions 10.118.12I, 10.118.17 and above.

Speed Spike Compensation(Pr2921~)	✅	Driver version 1.23 and above; controller versions 10.118.12O, 10.118.21 and above.
TFF	✅	
G31 External Signal Latch	✅	
Tool Auto Retract Function	✅	Driver version 1.23 and above; controller versions 10.118.12I, 10.118.17 and above.

*Number of Supporting Axis：Due to environment limitations, we only listed tested data. The stability when connecting more than 16 axis is not guaranteed.

3 Environment Setup

3.1 Driver Parameter Setup

Driver Parameter No.	Parameter Name	Setting Value	Note
Pr0.08	Command pulse counts per motor revolution	Motor encoder resolution	e.g. If the motor encoder resolution is 23 bit, Pr0.08 should be set 8388608。
Pr0.15	Absolute encoder setup	0	Absolute encoder setup： • 0：Applied as an absolute encoder • 1：Applied as an incremental encoder • 2：Applied as an absolute encoder but ignore the overflow of multi-turn counter • 3：Manufacturer Application(Please do not set) • 4：Applied as an absolute system(absolute mode). Able to set the upper limit of multi-turn counter freely, but ignore the overflow 1. Set Pr0.15 to 0 if applied as an absolute encoder 2. If required the absolute encoder to rotate multiple turns, please set Pr0.15 to 2, Pr6.98 to 8 (bit3 set On) and Pr0.08 to 8388608.
Pr4.01~4.07	SI input selection	0	If G31 and the driver latch source is required, please set Pr4.04 following 串列驱动器G31应用文件
Pr4.10~4.12	SO output selection	0	
*Pr7.20	RTEX communication cycle setup	-1	The communication cycle is set by Pr7.91
*Pr7.21	RTEX command updating cycle setup	1	
Pr7.22	RTEX function extended setup 1	1	

Driver Parameter No.	Parameter Name	Setting Value	Note
Pr7.25	RTEX speed unit setup	0~1	Set the speed unit in RTEX communication： • Set 0：r/min • Set 1：pulse(unit)/s If one of Pr7.36~Pr7.37 is set to 1(velocity feedforward function enabled), since the driver allows only integer input, the precision of spike compensation will drop if Pr7.25 is set to 0(unit: r/min), please apply carefully.
Pr7.33	RTEX monitor select 5	65	0x41(hexadecimal) set to 65(decimal), single turn data
Pr7.34	RTEX monitor select 6	18	0x12(hexadecimal) set to 18(decimal), loading rate
Pr7.36~7.37	RTEX command setting 2~3	0~2	Set Sub_Command_Data2 and Sub_Command_Data3： • Set 0：disable(no enabled function) • Set 1：Velocity Feedforward Function enabled(VFF) • Set 2：Torque Feedforward Function enabled (TFF) Enabling multiple feedforward functions is invalid, when one of Pr7.36 and Pr7.37 enables TFF or VFF, the other one must set to 0..
*Pr7.91	RTEX communication cycle expansion setting	2000000 (suggested value)	1. The setting must match with controller Pr3203 2. Suggested value: 2ms。
Pr7.95~7.98	Number of RTEX continuous communication error protection	17	

Remark 1：The parameters with '*' are communication related, need to be set with tuning software(Remark 2) before the communication built up. Rest of the driver parameters can be set on the serial parameter page after communication is built.

Remark 2：Tuning software download (for MINAS A6 series/A5 series)(https://industrial.panasonic.cn/ea/products/motors-compressors/fa-motors/ac-servo-motors/minas-a5-panaterm#a5)

3.2 **Controller Parameter Setup**

| Controller Parameter No.	Setting Value	Note
Pr9 *Servo board type	120	
Pr21~Pr40 * Axis corresponding axis card port number	1~16	For number of supporting axis of each driver model, please refer to **Supporting Models and Function Table**
Pr61~Pr80 Axial encoder resolution	The motor encoder resolution of each axis (driver parameter Pr0.08) / Pr81~Pr100 Axial encoder scaling factor	e.g. 2097152(= 8388608 / 4)。
Pr3203 Interpolation time interval	2000 (suggested value)	1. The set value must match parameters Pr7.91 around all axis driver 2. Suggested value: 2ms。

3.3 **Resolution of Panasonic Models**

Model	Resolution (pulse / rev)
A6N	8388608(23 bit)

3.4 **Notifications**

1. When applying i.MX6 series controller (could be checked on system information page), please update the image file to version 9.11.0 or above, or alarm OP-053 will be triggered.
2. For controller versions 10.118.12I, 10.118.17 and after, alarm MOT-066 "Axis Driver Firmware Version Not Supported" will be triggered if the driver version is under 1.23.
3. Ethernet Connection：
   a. Dual Communication Port Controller：**Controller RTEX out ↔ Driver X2A(RX), … , Driver X2B(TX) ↔ Controller RTEX in**
   Additional: Part No. of the wire: W01-RTEX-A-0*5 (0*5=wire length)
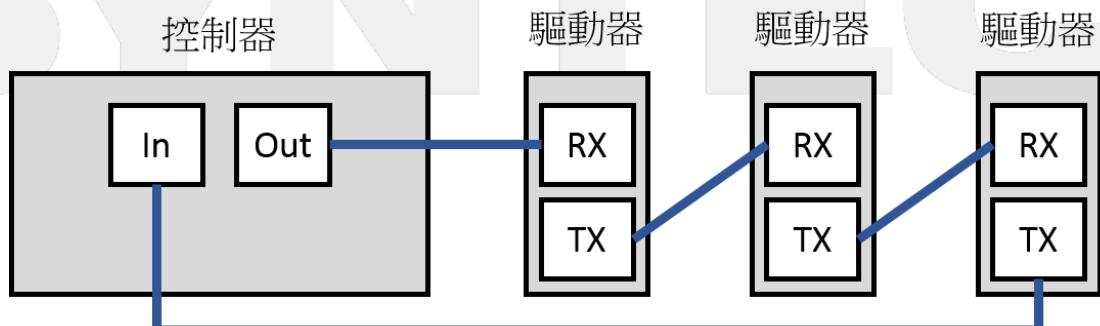
b. Single Communication Port Controller：**Requires a one-to-two wire,** the wire is separated to In and Out and the connection is the same as dual communication port controller
Additional: Part No. of the wire: W01-RTEX-EX. The Out in figure below refers to TX of the wire and In refers to RX.
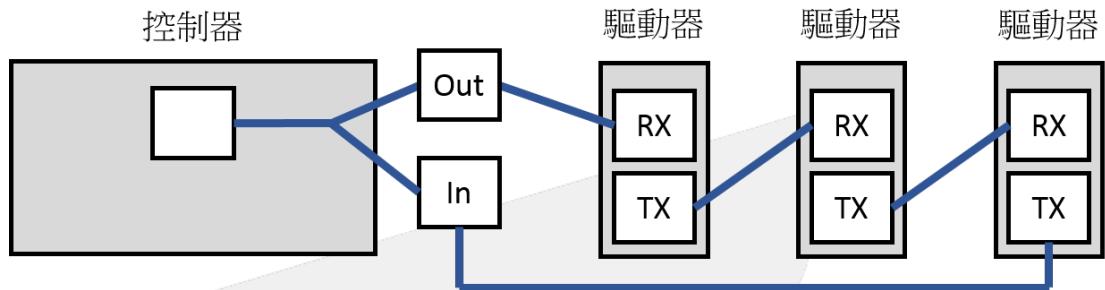
c. Additional：The LINK LED will be green when connected successfully

4. Please use **1~31** for node address of the driver, corresponded to the value of controller parameter Pr21~
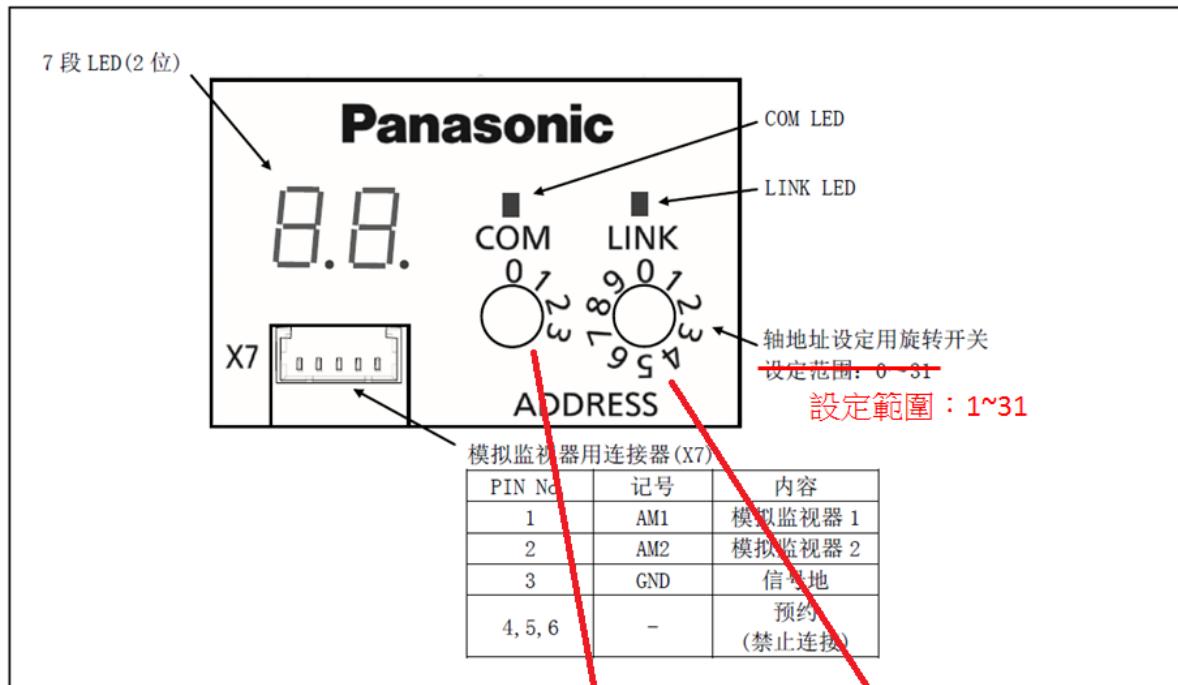
· 节点地址(MAC-ID)请用 10 进制数设定。通过上位 MSD 侧的旋转开关和下位 LSD 侧的旋转开关进行设定。
　　例）MAC-ID=13 时：设定 MSD=1、LSD=3

· 设定的节点地址(MAC-ID)在控制电源接通时只有一次被写入。
　　因此，电源接通后即使变更也无法反应到控制上，因为电源重启后才有效，请注意。

4 Function Introduction

4.1 **Auto Tool Retract Function**

4.1.1 **Applications**

The function is invalid if not meeting the conditions below：

1. Using software version above function extension version 5(driver version 1.23), alarm MOT-066 "Axis Driver Firmware Version Not Supported" will be triggered if the driver version is under 1.23.
2. Communication cycle exceeds 0.25ms
3. Servo connected
4. Not control-related parameters such as torque limit are set properly, motor operating with no error.
5. Operation Testing and Frequency Analyzing functions are not processing

4.1.2 **Parameter Setting**

Driver Parameter No.	Parameter Name	Setting Value	Note
Pr5.08	LV trip selection at main power OFF	0~3	To select whether LV trip or Servo Off when main power supply alarm is triggered Also, the conditions are set for warning detection, in case the main power supply OFF condition lasts longer than the time set in Pr7.14. bit 0 • 0：Execute Servo OFF according to Pr5.07 settings and back to Servo On after the main power supply reclosed. • 1：Trigger by Err13.1 "Main power supply low voltage protection". bit 1 • 0：Main power supply OFF alarm will only be detected in Servo ON state • 1：Main power supply OFF alarm can be detected in any state
Pr5.09	Detection time of main power OFF	20~2000 **Suggested value: 70~150**	1. **The main power OFF detection will become invalid when Pr5.09 is set to 2000, , tool retraction won't be executed** 2. **For excessive values (>200), the controller will shut off the Servo before retraction and driver alarm 85.2 will be triggered**

Driver Parameter No.	Parameter Name	Setting Value	Note

Pr6.85	Retraction condition setting	-32768~32767 **Suggested value: 3**	Select the condition of activating/stopping the retraction
			
			bit 0-3：Conditions of activating the retraction(I/O)
			  • 0：Retraction signal from I/O signal input are invalid
			  • 1：RET signal input
			  • 2：RET/HOME signal input
			  • 3：Main power supply OFF detection
			  • 4～15：For setting error, Err85.2 or Err87.3 will be triggered
			Note：If applying the tool auto retraction function, bit0-3 must set to 3 so the retraction will be depending on main power supply OFF detection
			
			bit 4–7：for manufacturers
			  • Please set to 0
			bit 8-9：Conditions of stopping the retraction
			  • bit 8 set to 0, bit 9 set to 0：Determine the positioning complete state with filter, invalid positioning complete state will be the stopping condition
			  • bit 8 set to 1, bit 9 set to 0：Determine the positioning complete state without filter, invalid positioning complete state will be the stopping condition
			  • bit 8 set to 0, bit 9 set to 1：Determine the positioning complete state with filter, valid positioning complete state will be the stopping condition
			  • bit 8 set to 1, bit 9 set to 1：Determine the positioning complete state without filter, valid positioning complete state will be the stopping condition
			bit 10-15
			  • Values not set to 0 will be determined as error, Err85.2 or Err87.3 will be triggered

SYNTEC

Driver Parameter No.	Parameter Name	Setting Value	Note
Pr6.86	Retraction alarm setting	-32768-32767 **Suggested value: 5**	Set the removal property of retraction alarm bit 0：Err85.0/Err87.1 (retraction completed(I/O)) • 0：Unremovable • 1：Removable bit 1：for manufacturers bit2：Err85.2/Err87.3 (retraction error) • 0：Unremovable • 1：Removable bit 3-14：Not used (fixed to 0) bit 15：Switch retraction related alarms • 0 ：Err85.0～85.2 (compatible for A5N) • 1 ：Err87.1～87.3 (compatible for A6B) **Suggested setting Pr6.86 to 5 thus driver alarm 85.0, 85.2 could be removed**

Driver Parameter No.	Parameter Name	Setting Value	Note
Pr7.23	RTEX function extended setup 2	-32768~32767 **Suggested value: -32750**	bit 0：Parameter writing through RTEX • 0：Enabled • 1：Disabled bit 1：Alarm code sub number setup • 0：Fixed to 0 • 1：Sub number enabled bit 2：RTEX status response condition setup with POT/NOT function disabled (Pr5.04 = 1) • 0：Status enabled • 1：Fixed to 0 bit 3：RTEX status bit arrangement setup of POT/NOT • 0：POT is bit 1, NOT is bit 0 • 1：NOT is bit 1, POT is bit 0 bit 4：[COM]LED display mode • 0：Mode 1 • 1：Mode 2 bit 5：Mode setting of non-cyclic command start • 0：when standard command is changed • 1：when command code and command argument is changed bit 6：Set up POT/NOT RTEX status logic • 0：No inversion • 1：Inversion bit 7：Set up PSL/NSL RTEX status logic • 0：No inversion • 1：Inversion bit8：RTEX status selection between In_Progress and AC_OFF • 0：In_Progress • 1：AC_OFF **Note：associated with bit 15** bit 9：Selects whether to return a command alarm when receive a command is a invalid direction input. • 0：Command alarm is not returned • 1：Command alarm is returned bit 10～13：Not used (fixed to 0) bit 14：Command positional deviation [Command Unit] output setting • 0：Internal command position (after filter)[Command Unit] - Actual position[Command Unit]

Driver Parameter No.	Parameter Name	Setting Value	Note
			• 1：Internal command position (before filter)[Command Unit] - Actual position[Command Unit] bit 15：Extended RTEX status selections: In_Progress/AC_OFF/Pr7.112 value • 0：According to the setting of Pr7.23 bit 8 (In_Progress/AC_OFF)。 • 1：According to the output signal assigned by Pr7.112 **If applying tool auto retraction function, bit 15 must set to 1. Suggested setting Pr7.23 to -32750(bit 1, 4, 15=1).**
Pr7.25	RTEX speed unit setup	0~1	Set the speed unit used in RTEX communication • Set 0：r/min。 • Set 1： pulse(unit)/s。
Pr7.112	RTEX communication flag selection	0~1 **Suggested value: 0**	• 0：RET_status • 1：Return to V_Full_Status (virtual full closed loop control mode) 1. **Set to 0 when applying auto tool retraction function.** 2. When Pr7.23 bit 15 = 1, set the returned data content of RTEX communication response status flag byte2 bit1.
Pr8.01	Profile linear acceleration constant	1~429496	Unit：10000 command unit/s^2。
Pr8.04	Profile linear deceleration constant	1~429496	Unit：10000 command unit/s^2。
Pr8.17	Relative retraction displacement	-2147483648~2147483647	1. **Unit：Command Unit, data with sign, please notice the retraction direction** 2. **When Pr0.08 is set retract 1 revolution and the retraction is not completed in 1 second, the controller will shut OFF the Servo and driver alarm 85.2 will be triggered.** 3. After the changing of electronic gear ratio, the retraction won't be executed with 0 displacement and alarm Err85.0 or Err87.1 will be triggered.
Pr8.18	Retraction speed	0~2147483647	The unit of retraction speed is determined by Pr7.25(RTEX speed unit setup).

4.1.3 **Alarm** Descriptions

Alarm No.	Causes	Solutions
85.0/87.1	I/O activating the retraction abnormally but the retraction is executed properly. Note：Not supported for software versions before function extension version 4	1. This alarm is a safety precaution, it would be normal if the abnormal retraction is activated intentionally. 2. Used to inform that the retraction is completed. 3. After removing the alarm, please reset the zero.
85.2/87.3	Retraction failed • Pr6.85 "Retraction condition setting" error • Retraction valid with communication cycle set shorter than 0.25ms. • Detected inhibit input in the retracting direction (POT/NOT) and retraction stop (STOP)。 • Main power supply OFF(Pr6.85 "Retraction condition setting" bit0-3 not set to 3)/Servo OFF/Alarm triggered/STO input during the retraction • Retraction conditions fulfilled after detected retraction stop (STOP) • Retraction conditions fulfilled according to communication command actions (operation testing function, frequency testing function) from non-host devices. • Unable to start retraction due to Servo OFF state etc. Note：Not supported for software versions before function extension version 4	1. Check the parameter are set correctly 2. Check the operating environment has no problem 3. After removing the alarm, please run return to origin.

4.1.4 **Notifications**

1. When the retraction is activated, the actions during return to origin is not promised.
2. During retraction, the actions during return to origin is not promised.
3. Please avoid overlapping the position of origin and RET input.
4. During the retraction, the control mode assigned by host device will be ignored and be changed to position control. Applications of filters, input/output signals arrangement etc. will be all changed to the settings of position control.
5. When changing the control mode, please modify the value after the retraction is completed.
6. Return command error (002Eh) when receiving control mode changing command during retraction.
7. When executing the retractions activated by main power supply OFF, Err13.1 "Main power supply low voltage protection(AC power off detection)" won't be triggered. However, since the retraction is executed with the remaining voltage of the capacitor, it might cause Err13.0 "Main power supply low voltage protection(low voltage between PN)" before the retraction is competed.

8. In incremental mode, after the retraction is completed (or trigger Err85.0, Err85.2 / Err87.1, Err87.3), it'll become origin reset incomplete state (Homing_Complete=0). Please rerun return to origin after removing the alarm.

5 Trouble Shooting

Panasonic

5.1 **Driver Alarms:**

Alarm No,	Alarm Name	Reason	Solution	Note
40.0	Absolute system security Off	The power supply or battery power of absolute encoder is decreased and cause the internal capacitor voltage lower than regulated value	Reboot the controller and driver after connecting the encoder to the battery or power supply	The encoder position can be cleared to 0 with controller, follow controller alarm(MOT-016 & MOT-034) to trouble shoot after cleared to 0.
84.0/ 83.1	RTEX communication timeout security/ RTEX communication timeout security 2	Communication between controller and driver failed, the situation might happen if reboot only the controller	Reboot both controller and driver	

6 RTEX Communication Developing Progress.

	Panasonic A6N	Supporting Version
Axis Control & Alarm Recognition	✅	
Control Mode	Position Control	
*Number of Supporting Axis	16-axis	
Parameter Display/ Read&Write	✅	
Alarm Reading/String Display	✅	
Tuning Function		
Absolute Encoder Initialization	✅	
Absolute Home Setting	✅	
Servo Information Display	✅	
Parameter Synchronization(Kp)	✅	
Parameter Initialization		
Index Function(Threading, Home Searching)	✅	
Backup and Restore	✅	
Spindle/Axis Loading Rate(R5141~、 R5151~)	✅	Shows Overload Loading Rate at controller versions 10.118.22B, 10.118.24~10.118.26. Shows Loading Rate from controller version 10.118.27.
Axis Torque Limit(R5171~)		
VFF(R5191~)	✅	Driver version 1.23 and above; controller versions 10.118.12I, 10.118.17 and above.
Speed Spike Compensation(Pr2921~)	✅	Driver version 1.23 and above; controller versions 10.118.12O, 10.118.21 and above.

TFF	✅	
G31 External Signal Latch	✅	
Tool Auto Retract Function	✅	Driver version 1.23 and above; controller versions 10.118.12I, 10.118.17 and above.

*Number of Supporting Axis：Due to environment limitations, we only listed tested data. The stability when connecting more than 16 axis is not guaranteed.